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GENERAL PROVISIONS

§ 21.01.010. Title.

These regulations shall be known and cited as the City of Grand Junction Zoning and Development Code ("Code"). This Code replaces the previous Zoning and Development Code adopted pursuant to Ordinance No. 4419 dated April 5, 2010, and as amended thereto.
(Ord. 5190, 12/20/2023)

§ 21.01.020. Authority.

The City of Grand Junction ("City") is authorized by its home rule powers pursuant to the Colorado Constitution and the Charter of the City of Grand Junction, Colorado. The City Council chooses to exercise broad powers including the regulation of zoning, planning, and subdivision of land. In addition, the City Council intends that all other available powers shall support this Code including those provided by state law, such as but not limited to municipal powers: § 31-15-101 C.R.S., et seq.; planning and zoning § 31-23-101 C.R.S., et seq.; § 30-28-201 C.R.S., et seq.; § 29-20-101 C.R.S., et seq.; the power to designate and administer areas and activities of state interest, § 24-65.1-101 C.R.S., et seq.; and regulation of planned unit development, § 24-67-101 C.R.S., et seq. If other authority is available because of changes in statutory and case law, state and federal, the City Council intends to avail itself of those resources as well.
(Ord. 5190, 12/20/2023)

§ 21.01.030. Effective date.

(a) This Code shall become effective on January 21, 2024 (Effective Date). The Zoning and Development Code that was effective immediately prior to this Code shall be referred to as the 2010 Code.

(b) Two copies of the 2010 Code shall be maintained and remain of record in the City Clerk's Office and the Community Development Department, either in hard copy or electronically. An unofficial public copy may also be maintained on the City's website. All copies of the 2010 Code that are publicly available shall be clearly identified as outdated.

(Ord. 5190, 12/20/2023)

§ 21.01.040. Scope.

(a) This Code shall apply to all activities on public and private land over which the City has jurisdiction under the constitution and laws of the State of Colorado, the United States, or pursuant to the City's powers.

(b) Not all situations will fall into easily identifiable processes and requirements. This Code provides flexibility in dealing with situations in general, and especially those which do not fit well with typical processes and standard requirements. The elements that make up this Code are interrelated and cannot be taken in isolation; all provisions and regulations must be taken within the context and intent of the entire Code.

(c) No person shall begin or change a land use or development in the City without first obtaining an appropriate permit or approval.

(Ord. 5190, 12/20/2023)

§ 21.01.050. Purpose.

This Code is intended to:

(a) Promote the health, safety and general welfare of the citizens and residents of the City;

(b) Implement the goals and policies of the Comprehensive Plan;

(c) Promote a compact pattern of growth and encourage the efficient use of land;

(d) Bring about more opportunities for housing choices that meet the needs of people of all ages, abilities, and incomes;

(e) Balance the safety and needs of all transportation modes to ensure an efficient transportation system for pedestrians, cyclists, transit, and other vehicles;

(f) Preserve and enhance natural resources and unique assets, such as scenic, riparian, recreation areas, and wildlife habitat through sustainable development practices;

(g) Protect the City's historic resources including agriculture and industry and support the development and expansion of public spaces that promote a collective identity; and

(h) Ensure regulations do not disproportionately affect a particular group or geographic location.

(Ord. 5190, 12/20/2023)

§ 21.01.060. Severability.

The provisions of this Code shall be severable. If any provision is declared invalid by a court of competent jurisdiction, the effect of the decision shall be limited to that provision or provisions which are expressly stated in the decision to be invalid and may, as determined by the City Attorney, be further limited to the specific persons or parcels that are the subject of the decision. The applicable provision shall be removed from the Code or otherwise identified as severed, and the decision shall not affect, impair, or nullify the remainder of the Code.

(Ord. 5190, 12/20/2023)

§ 21.01.070. Minimum standards.

This Code sets the minimum requirements necessary for the promotion of public health, safety, and welfare. In many instances, the public is best served when such minimums are exceeded. Where the requirements of this Code are at variance with other applicable law, rule, contract, resolution, or regulation of the City, county, state, or federal government contains standards covering the same subject matter, the more restrictive requirement or higher standard shall control.

(Ord. 5190, 12/20/2023)

§ 21.01.080. Private restrictions.

(a) If any provision of this Code is more restrictive or imposes a higher standard than any such private restriction, the requirements of this Code shall control.

(b) This Code is not intended to affect any private agreement or condition such as a deed restriction or covenant. Where the provisions of any private restriction are more restrictive or impose higher standards than the provisions of this Code, the City has no duty to enforce such private restrictions, nor is the City obligated to adopt regulations consistent with private restrictions.

(Ord. 5190, 12/20/2023)

§ 21.01.090. Application of regulations during local emergency.

The Director may waive applicable provisions of this Code during a local emergency declared by the Mayor or City Manager. A public health emergency, wildfire, flood, or other catastrophic situations are examples of a local emergency.

(Ord. 5190, 12/20/2023)

§ 21.01.100. Fees, charges, and expenses.

The City Council shall set fees in amounts sufficient to recover all or a portion of the taxpayer costs spent administering this Code, including for processing, giving notice, and reviewing development applications. The City Council may, by resolution, modify any fee at any Council meeting.

(Ord. 5190, 12/20/2023)

§ 21.01.110. Transitional provisions.

(a) Intent and Applicability. This Code is not intended to abrogate or annul any building permit, certificate of occupancy, variance, or other lawful permit issued before the Effective Date. Applications and permits that have not achieved final approval as of the Effective Date shall be processed according to the provisions of this section.

(b) Existing Development Approvals.

(1) Any development validly approved under any prior regulations, may be carried out under the terms and conditions of the approval provided the approval has not expired and the development complies with any applicable standards of this Code regarding ongoing operations and maintenance.

(2) Any Planned Development approved prior to the Effective Date shall comply with the requirements of GJMC § 21.02.050(j).

(3) If a prior approval expires based on an expiration established in the 2010 Code or the project development approval, is revoked, or otherwise becomes invalid, any subsequent development of the site shall be subject to the procedures and standards of this Code.

(4) The Director may renew or extend the time of a previous approval if the required standards or criteria for approval remain valid. Any extension granted shall not exceed the time specified for the extension of the specific approval specified in GJMC § 21.02.030(j).

(5) Any re-application for an expired, lapsed, or terminated project approval shall meet the standards in effect at the time of re-application.

(6) Unless otherwise provided in the initial approval, any proposed revision to an existing application or approval shall be reviewed based on the Code in effect at the time of submission of a complete application for the revision.

(c) Applications in Progress.

(1) A complete application for a single-step approval, submitted prior to the Effective Date and pending approval at the time of adoption of this Code may be decided under the regulations in effect when the application was determined to be complete, or may be reviewed and decided under this Code at the request of the applicant. Applications shall not be processed under a combination of prior regulations and this Code. Any reapplication after the Effective Date shall comply with the requirements of this Code.

(2) Complete applications for the first step of a multiple-step approval process submitted prior to the Effective Date shall continue to be processed pursuant to the 2010 Code. Later step applications shall be processed pursuant to the 2010 Code if the first step approval was design specific, and pursuant to the 2023 Code if the first step approval was conceptual, as follows:

Table 21.01-1: Applications in Progress

Complete Application, First Step	2023 Code	2010 Code	Later Step Application [1]	2023 Code	2010 Code
Conditional Use Permit					
CUP Application		x	Site Plan	x	
Planned Development					
Outline Development Plan		x	Final Development Plan(s)		x
			Site Plan(s) [2]		x
Rezoning					
Rezoning Application		x	Site Plan	x	
Subdivision					
Preliminary Plan		x	Final Plat		x

Notes:

[1] Processed pursuant to 2010 Code only if First Step approval has not expired.

[2] Applicant may elect review under 2023 Code.

(3) Any questions about whether this Code or the 2010 Code is applicable shall be determined by the decision-making body. An applicability decision by either the Planning Commission or the City Council may only be appealed in accordance with Colorado Rule of Civil Procedure 106.

(d) No Applications Submitted.Projects for which no application has been submitted and accepted as complete prior to the Effective Date shall be subject to all requirements and standards of this Code.

(e) Lapsing.Regardless of whether or not a completed application has been received prior to the Effective Date, any permit or approval issued following the Effective Date shall be subject to the lapsing provisions of GJMC § 21.02.030(j).

(f) Violations Under Prior Code.Any violation occurring under the 2010 Code will continue to be a violation under this Code and be subject to penalties and enforcement pursuant to GJMC Chapter 21.13.

(Ord. 5190, 12/20/2023)

Chapter 21.02
ADMINISTRATION AND PROCEDURES

§ 21.02.010. Decision-making authority.

(a) City Council.In addition to the powers and duties in City Charter Article VI, the City Council shall:

(1) Appoint members to the Planning Commission, the Zoning Board of Appeals, and the Historic Preservation Board.

(2) As it deems appropriate, decide, adopt, and/or amend a:

(i) Comprehensive Plan;

(ii) Area, corridor, neighborhood, circulation, street, annexation, or other City plan;

(iii) Vacation of right-of-way and of lesser interest in land such as an easement;

(iv) Designation of a local historic site, structure and/or district, and revocation of such designation; and

(v) Fee to pay for, at least in part, the impacts of development, consistent with the nexus study for the fee when applicable.

(3) Hear and decide requests for:

(i) Annexation and change to the City's limits;

(ii) Zoning and/or change to zone or a Zoning Map, including a Planned Development zone;

(iii) Special Dimensional Permit;

(iv) Planned Development Outline Development Plan (ODP) or change to an ODP;

(v) Preliminary Plan for a Planned Development without a valid ODP;

(vi) Revocable Permit for use or occupancy of a City right-of-way or public place (except that the City Council may delegate such authority to the Director for minor or temporary uses or occupancies such as landscaping or irrigation facilities);

(vii) Vested right for a site-specific development plan per GJMC § 21.02.050(r)(2);

(viii) Appeal of Planning Commission and Director decisions as provided in this Code;

(ix) Street name change;

(x) Fee in lieu of land dedication waiver;

(xi) Sewer variance; and

(xii) Appeal of decisions of Historic Preservation Board.

(b) Planning Commission.

(1) Composition.The Planning Commission shall consist of seven regular members and two alternate members. Alternate members shall attend Commission meetings and shall serve and vote as may be required during the temporary unavailability of any regular member. The City Council shall, at the time of appointment, designate a first alternate and a second alternate; each shall fill in during the temporary absence of a regular member according to their priority. Members shall be appointed to provide a balanced, community-wide representation.

(2) Member Qualifications.Regular and alternate members shall be residents of the City of Grand Junction and shall represent the interests of the City as a whole. No member shall be employed by the City, hold any other City office, or be a contractor with the City. The members shall be selected from the fields of engineering, planning, architecture, construction trades, and/or law, and from citizens at large.

(3) Term.Members shall serve terms of four years. Members are limited to two consecutive terms.

(4) Vacancies.When there is a vacancy among the regular members of the Planning Commission, the first alternate shall be appointed to fill it, the second alternate shall become the first alternate, and a new second alternate shall be appointed. All vacancies shall be filled by appointment by the City Council. If a member ceases to reside in the City, that person's membership on the Commission shall immediately terminate and an appointment made to fill the unexpired term.

(5) Removal.Members may be removed after public hearing by the City Council on grounds of inefficiency, neglect of duty, malfeasance, or misfeasance in office. The City Council shall make public a written statement of reasons for removal prior to any public hearing seeking removal of a member.

(6) Meetings.Planning Commission meetings shall be regularly scheduled not fewer than one time per month, provided there are pending items or matters to be brought before the Commission, at a time and place designated annually by resolution of the City Council. Special meetings may be held as provided by rules of procedure adopted by the Commission and/or this Code or law.

(7) Voting.The presence of four voting members shall constitute a quorum. All recommendations to the City Council and all final decisions of the Planning Commission shall require an affirmative vote of no fewer than four members (a majority of the seven members of the Commission, which may be comprised of regular, or regular plus alternate, members).

(8) Compensation.Members shall be compensated at a rate established by the City Council by resolution.

(9) Powers and Duties.Except as otherwise provided by this Code, or by ordinance, rule, policy or regulation of the City Council, the Commission shall be governed by § 31-23-201 C.R.S., et seq. and shall have the powers provided therein. The Commission's actions shall be governed by the procedures set forth in this Code, and/or law, ordinance, rule, regulation, or policy of the City Council. The powers and duties of the Planning Commission include, but are not limited to:

(i) Provide a recommendation to the City Council on adoption of or amendment to any of the following:

(A) Comprehensive Plan; and

(B) Area, corridor, neighborhood, circulation, traffic, or other City plan.

(ii) Hear and make a recommendation to the City Council upon any request for a:

(A) Vacation of Public Right-of-Way or Easement;

(B) Code text amendment;

(C) Zoning or change to a zone or Zoning Map, including Planned Development zoning;

(D) Special Dimensional Permit;

(E) Planned development Outline Development Plan or major amendment thereto;

(F) Vested right as provided in this Code for a Site-Specific Development Plan; and

(G) Sewer Variance.

(iii) Decide:

(A) Plat Vacation;

(B) Conditional Use Permit;

(C) Variance as provided by this Code; and

(D) Other tasks as assigned by the City Council.

(c) Zoning Board of Appeals (ZBA).

(1) Composition.The Zoning Board of Appeals shall consist of three members, who shall represent the interests of the City as a whole. Members shall be appointed by the City Council from time-to-time. Generally, members shall be the Chairperson of the Planning Commission along with the first and second alternate Planning Commission members, or as otherwise appointed by the City Council.

(2) Removal.The City Council may, after a public hearing, remove any member of the Board for good cause including inefficiency, neglect of duty, malfeasance, or misfeasance in office. The Council shall make public a written statement of the reasons for the removal prior to the public hearing.

(3) Meetings.The Board shall meet on an as-needed basis.

(4) Voting.The presence of two members shall constitute a quorum of the Board. A majority of a quorum of the Board shall be sufficient to conduct the business of the Board. A lesser number than a quorum may act to adjourn or continue a meeting.

(5) Compensation.Members shall be compensated at a rate established by the City

Council by resolution.

(6) Powers and Duties.Except as otherwise provided by this Code, ordinance, rule, policy, or regulation of the City Council, the Zoning Board of Appeals shall be governed by § 31-23-307 C.R.S. The Board shall have the power and duty to decide:

(i) Appeals of administrative determinations as provided in GJMC § 21.02.050(k);

(ii) Requests to for Variances per GJMC § 21.02.050(q); and

(iii) Requests for relief from the nonconforming provisions established in GJMC Chapter 21.12.

(d) Director.The Director shall serve as the administrator of this Code at the direction of the City Manager. The Director shall serve as staff to the Planning Commission, the Zoning Board of Appeals and the Historic Preservation Board and shall have such other duties and responsibilities as specifically prescribed in this Code. The term Director also includes the Director's designee(s).

(1) Powers and Duties.The Director shall render the decision on every request for

(i) Any Administrative Permit listed in GJMC § 21.02.040;

(ii) Site Plan Review (Major or Minor);

(iii) Sign Package;

(iv) Simple Subdivision

(v) Subdivision Final Plat;

(vi) Subdivision Construction Plan;

(vii) Subdivision Preliminary Plan;

(viii) Planned Development Final Plan and minor amendment to a Final Plan;

(ix) Development Improvement Agreement;

(x) Administrative Adjustment;

(xi) Revocable Permit for landscaping and irrigation in the public right-of-way and other such use of the right-of-way as delegated by the City Council;

(xii) Administrative Comprehensive Plan Amendment.

(e) Historic Preservation Board.

(1) Composition.The Historic Board shall consist of not fewer than five nor more than seven members appointed by the City Council. The City Council shall determine the number of members when it makes an appointment. Members shall be appointed to provide a balanced, community-wide representation.

(2) Member Qualifications.When there are more than five members, at least four shall be professionals or have expertise in a preservation-related discipline such as history, architecture, or planning or archaeology; when there are five members, at least three

shall have such qualifications.

(3) Term.Members shall serve four-year terms. City Council shall stagger the terms from the date of appointment. A member may continue to serve until a successor has been appointed.

(4) Vacancies.Vacancies shall be filled by appointment by the City Council.

(5) Removal.Members may be removed by the City Council without cause.

(6) Meetings.The Historic Board shall establish a regular meeting schedule. Minutes shall be kept of all proceedings. The Board shall conduct its business in accordance with the Open Meetings and Public Records Acts and other laws applicable to public bodies.

(7) Voting.A quorum shall require three members if the Historic Board consists of five members; four if it consists of more than five members. A quorum shall be required for the Board to conduct any business, and an affirmative vote of the majority of those present shall be required to pass any motion.

(8) Compensation.Members serve without compensation, except that the City Council may authorize, in advance, payment of such amounts it determines appropriate to offset expenses incurred in the performance of Board duties.

(9) Powers and Duties.The Historic Board shall, after public notice and solicitation of public comment:

(i) Recommend eligibility criteria for the designation of historic resources and for review of proposals to alter designated resources;

(ii) Review and determine qualifications of properties nominated for designation as either an historic structure, site or district and recommend to City Council approval or denial of a designation;

(iii) Upon property owner's request, review and make recommendations to the owner on proposed alterations to a designated historic structure, site, or district;

(iv) Advise and assist owners of historic properties on physical and financial aspects of preservation, renovation, rehabilitation, and reuse, including nomination to the City Register, the State Register, and the National Register of Historic Places;

(v) Develop and assist in public education programs including, but not limited to, walking tours, brochures, a marker program for historic properties, lectures, exhibits and conferences;

(vi) Conduct surveys of historic sites, properties, and areas for the purpose of defining those of historic significance and prioritizing the importance of identified historic areas. The Historic Board may create a list of structures of historical or archeological merit which have not been designated;

(vii) Advise the City Council on matters related to preserving the historic character and substance of the City and recommend easements, covenants, licenses, and other methods which would implement the completion of the purposes of this

section;

(viii) Actively pursue financial assistance for preservation-related programs;

(ix) Review and decide applications for a Certificate of Appropriateness for alteration to a site and/or structure in the North Seventh Street Historic Residential District; and

(x) Review and decide applications for changes to other historic sites and structures as specifically prescribed by this Code for a duly designated historic site, district, or area.

(Ord. 5190, 12/20/2023)

§ 21.02.020. Summary table of review and decision-making bodies.

Table 21.02-2: Summary Table of Review and Decision-Making Bodies
R = Recommendation D = Decision A = Appeal

Section	Procedure	Director	Plan Comm.	HPB	City Council	ZBA
Administrative Permits						
§ 21.02.040(c)(2)(i)	Change of Use Permit	D	A			
§ 21.02.040(b)	Fence Permit	D	A			
§ 21.02.040(c)(2)(ii)	Floodplain Development Permit	D	A			
§ 21.02.040(b)	Home Occupation Permit	D	A			
§ 21.02.040(b)	Planning Clearance and Building Permit	D	A			
§ 21.02.040(c)(2)(iii)	Sign Permit	D	A			
§ 21.02.040(b)	Temporary Use Permit	D	A			
§ 21.02.040(b)	Any Administrative Permit not listed	D	A			
Administrative Approvals						
§ 21.02.040(d)	Administrative Adjustment	D				A
§ 21.02.040(e)	Code Interpretation by Director	D				A

Table 21.02-2: Summary Table of Review and Decision-Making Bodies R = Recommendation D = Decision A = Appeal						
Section	**Procedure**	**Director**	**Plan Comm.**	**HPB**	**City Council**	**ZBA**
§ 21.02.040(f)	Comprehensive Plan Amendment, Administrative Changes [1]	D			A	
§ 21.02.040(l)(5)	Final Plat	D			A	
§ 21.02.040(g)	Group Living Processes	D			A	
§ 21.02.040(h)	Minor Plat Amendment	D				
§ 21.02.040(l)(4)	Preliminary Subdivision Plan	D			A	
§ 21.02.040(b)	Revocable Permit, Director approval [2]	D			A	
§ 21.02.040(i)	Sign Package	D				
§ 21.02.040(j)	Simple Subdivision	D			A	
§ 21.02.040(k)	Site Plan, Major or Minor	D			A	
Applications Requiring a Public Hearing						
§ 21.02.050(c)	Annexation	R			D	
§ 21.02.050(d)	Code Text Amendment	R	R		D	
§ 21.02.050(e)	Comprehensive Plan Amendment (CPA), Non-Administrative	R	R		D	
§ 21.02.050(f)	Conditional Use Permit (CUP)	R	D		A	
§ 21.02.050(g)	Conditional Use and Special Dimensional Permit Amendment, Termination, or Revocation	R	D		A	

Table 21.02-2: Summary Table of Review and Decision-Making Bodies R = Recommendation D = Decision A = Appeal						
Section	**Procedure**	**Director**	**Plan Comm.**	**HPB**	**City Council**	**ZBA**
§ 21.02.050(h)	Extended Temporary Use	R	R		D	
§ 21.02.050(i)	Institutional and Civic Facility Master Plans	R	R		D	
§ 21.02.050(j)	Planned Development	R	R		D	
§ 21.02.050(l)	Revocable Permit, City Council Approval	R			D	
§ 21.02.050(m)	Rezoning	R	R		D	
§ 21.02.050(n)	Special Dimensional Permit	R	R		D	
§ 21.02.050(o)	Vacation of Plat [4]	R	D		A	
§ 21.02.050(p)	Vacation of Public Right-of-Way or Easement	R	R		D	
§ 21.02.050(q)	Variance	R				D
§ 21.02.050(r)	Vested Property Rights	R	R		D	
Historic Preservation						
§ 21.02.060	Historic Preservation Procedures	R		R or D[4]	D or A[4]	

Notes:

[1] Administrative Changes as defined in GJMC § 21.02.040(f).

[2] Revocable Permit for irrigation or landscaping.

[3] For a Vacation of Plat without public right-of-way or easement.

[4] For Certificate of Appropriateness, North Seventh Street Historic District.

(Ord. No. 5229, 8/21/2024; Ord. 5190, 12/20/2023)

§ 21.02.030. Commonly applicable procedures.

The requirements described in this section are common to many of the procedures contained

in this Code. Table 21.02-3 summarizes the common application procedures in this Code and identifies whether they are required for the specific procedures defined in GJMC § 21.02.050. Exceptions to these general rules apply and may be identified in the regulations for the specific procedures.

(a) Summary Table of Commonly Applicable Procedures.

Table 21.02-3: Summary Table of Commonly Applicable Procedures
*** = Optional check mark ✓= Required Gray Box = Not Applicable**
PDIM = Proposed Development Information Meeting
NCM = Neighborhood Comment Meeting

Section	Procedure	General Mtg	Pre-App Mtg	Applic. Outreach Mtg	Public Notice	Public Hearing
	Detailed requirements in GJMC:	§ 21.02.030 (b)(1)	§ 21.02.030 (b)(2)	§ 21.02.030(c)	§ 21.02.030(g)	
Administrative Permits						
§ 21.02.040 (c)(2)(i)	Change of Use Permit					
§ 21.02.040(b)	Fence Permit					
§ 21.02.040 (c)(2)(ii)	Floodplain Development Permit					
§ 21.02.040(b)	Home Occupation Permit					
§ 21.02.040(b)	Planning Clearance and Building Permit					
§ 21.02.040 (c)(2)(iii)	Sign Permit					
§ 21.02.040(b)	Temporary Use Permit					
Administrative Approvals						
§ 21.02.040(d)	Administrative Adjustment	*	*			
§ 21.02.040(e)	Code Interpretation					
§ 21.02.040(f)	Comprehensive Plan Amendment, Administrative Changes [1]	*	*			
§ 21.02.040(l)(5)	Final Plat	*	*			
§ 21.02.040(g)	Group Living Processes	*	*	PDIM		

Table 21.02-3: Summary Table of Commonly Applicable Procedures * = Optional check mark ✓= Required Gray Box = Not Applicable PDIM = Proposed Development Information Meeting NCM = Neighborhood Comment Meeting						
Section	**Procedure**	**General Mtg**	**Pre-App Mtg**	**Applic. Outreach Mtg**	**Public Notice**	**Public Hearing**
	Detailed requirements in GJMC:	§ 21.02.030 (b)(1)	§ 21.02.030 (b)(2)	§ 21.02.030(c)	§ 21.02.030(g)	
§ 21.02.040(h)	Minor Plat Amendments	*	*			
§ 21.02.040(l)(4)	Preliminary Subdivision Plan	*	✓	PDIM [2]		
§ 21.02.040(b)	Revocable Permit, Director approval [2]	*	*			
§ 21.02.040(i)	Sign Package	*	*			
§ 21.02.040(j)	Simple Subdivision	*	*			
§ 21.02.040(k)	Site Plan (Major and Minor)	*	✓ [1]			
Applications Requiring a Public Hearing						
§ 21.02.050(c)	Annexation	*	*	NCM	✓	✓
§ 21.02.050(d)	Code Text Amendment	*	*	NCM	✓	✓
§ 21.02.050(e)	Comprehensive Plan Amendment (CPA), Non-Administrative	*	*	NCM	✓	✓
§ 21.02.050(f)	Conditional Use Permit (CUP)	*	*	NCM	✓	✓
§ 21.02.050(g)	Conditional Use and Special Dimensional Permit Amendment, Termination, or Revocation	*	*	NCM	✓	✓
§ 21.02.050(h)	Extended Temporary Use	*	*	NCM	✓	✓

Table 21.02-3: Summary Table of Commonly Applicable Procedures * = Optional check mark ✓ = Required Gray Box = Not Applicable PDIM = Proposed Development Information Meeting NCM = Neighborhood Comment Meeting						
Section	**Procedure**	**General Mtg**	**Pre-App Mtg**	**Applic. Outreach Mtg**	**Public Notice**	**Public Hearing**
	Detailed requirements in GJMC:	§ 21.02.030 (b)(1)	§ 21.02.030 (b)(2)	§ 21.02.030(c)	§ 21.02.030(g)	
§ 21.02.050(i)	Institutional and Civic Facility Master Plans	*	*	NCM	✓	✓
§ 21.02.050(j)	Planned Development	*	✓	NCM [4]	✓	✓
§ 21.02.050(k)	Rehearing and Appeal	*	*		✓	✓
§ 21.02.050(l)	Revocable Permit, City Council Approval	*	*		✓	✓
§ 21.02.050(m)	Rezoning	*	*	NCM	✓	✓
§ 21.02.050(n)	Special Dimensional Permit	*	*	NCM	✓	✓
§ 21.02.050(o)	Vacation of Plat	*	*	NCM	✓ [5]	✓ [5]
§ 21.02.050(p)	Vacation of Public Right-of-Way or Easement	*	*	NCM	✓	✓
§ 21.02.050(q)	Variance	*	*	NCM	✓	✓
§ 21.02.050(r)	Vested Property Rights	*	*		✓	✓
Historic Preservation						
§ 21.02.060	Historic Preservation Procedures	*	*		✓	✓

Notes:

[1] Major site plans only.

[2] PDIM, Major subdivision only.

[3] NCM required for Fraternity/Sorority, Group Living, and Rooming/Boarding House applications.

[4] Neighborhood Comment meetings are only required at the time of Outline Development Plan and a subsequent Neighborhood Comment or Proposed Development Information Meeting is not required for the associated Final Development Plan and Preliminary Subdivision Plan.

[5] Vacation of Plat with public right-of-way or easement.

(b) General and Pre-Application Meetings.The purpose of General and Pre-Application Meetings is to provide an opportunity for the applicant and the City to discuss the development concept prior to the application submission for a project or permit.

(1) General Meeting.

(i) Purpose.The purpose of a General Meeting is to allow an applicant to discuss a project concept with City staff to obtain general feedback and ideas.

(ii) Applicability.A General Meeting is optional for all development applications.

(iii) Procedure.

(A) Based on the level of detail and information provided, the staff will give direction on the merits, procedures, and issues on a proposed project.

(B) A General Meeting is advisory only and does not constitute or effect approval of any aspect or item of an application.

(C) Applicants that participate in a General Meeting may still participate in a Pre-Application Meeting.

(2) Pre-Application Meeting.

(i) Purpose.The purpose of a Pre-Application Meeting is to:

(A) Understand the proposed project and the applicant's specific objectives;

(B) Identify applicant time goals such as property closing dates, construction starts, and operation dates;

(C) Identify City approvals needed before any development starts;

(D) Identify documents, plans, drawings, fees, and process other materials necessary for a complete application;

(E) Identify significant issues; and

(F) Begin to familiarize the applicant with City requirements and this Code.

(ii) Applicability.A Pre-Application Meeting is required for the following application types and optional for all other development applications:

(A) Preliminary Subdivision Plan;

(B) Major Site Plan; and

(C) Planned Development.

(iii) Procedure.

(A) The Director shall inform the applicant what information the applicant must supply at the time of application submittal to begin the assessment of the project. The Director shall list the requirements and all relevant information in the applicant's project file.

(B) Any information or discussions held at the Pre-Application Meeting shall not be binding on the City or the applicant. Discussions of potential conditions or commitments to mitigate impacts do not reflect actions by the decision-making body until and unless a decision-making body takes formal action to attach that condition or commitment to an approval.

(C) The City is not responsible for making or keeping a summary of the general topics discussed at the Pre-Application Meeting.

(D) Where a Pre-Application Meeting is required for a specific application type, the application shall be filed within one year of the meeting or a new meeting shall be required.

(c) Application Outreach Meetings.

(1) Purpose.The purposes of Application Outreach Meetings are to:

(i) Inform neighboring property owners of the details of a proposed development;

(ii) Identify how the developer intends to meet the standards contained in this Code; and

(iii) For specific application types, to allow the applicant to receive preliminary public comment on the proposal.

(2) Meeting Types.There are two types of Application Outreach Meetings:

(i) A Neighborhood Comment Meeting (NCM) is held prior to a public hearing on an application. The purpose of an NCM is to allow the neighborhood to provide that applicant with feedback that may be relevant to improving the design of the project to address neighborhood concerns that may otherwise be raised at the public hearing.

(ii) A Proposed Development Information Meeting (PDIM) is held to share information about a proposed project with the neighborhood. Attendees are invited to share comments but shall be informed that the standard of approval for the application is compliance with this Code and suggestions may not be incorporated.

(3) Applicability.

(i) An Application Outreach Meeting is required as indicated in Table 21.02-2 and is optional for all other applications.

(ii) The Director may waive this step if the project will have little potential to create material negative impacts on the surrounding neighborhood. If the Director waives a required outreach meeting, the Director will provide the applicant a written explanation of the reasons why the meeting was waived for inclusion with the project application.

(4) Notice.

(i) The applicant shall provide written notice of the meeting type (NCM/PDIM), date, time, place, and subject of the meeting to the Director for approval at least 14 days before the meeting. This shall include all information required to access the meeting if conducted virtually.

(ii) Once the notice has been approved, the Director will assist the applicant to identify all property owners and organized groups in the neighborhood or outreach area. The application shall:

(A) Mail the notice to every owner and group identified, as well as the Community Development Department.

(B) Provide courtesy electronic notice to any affected neighborhood organizations that request notification from the Community Development Department. A copy of the meeting notice shall be attached to the electronic notice to allow additional distribution within the organization.

(iii) The notice must be mailed/emailed no later than 10 calendar days prior to the meeting date.

(iv) For purposes of this section, all properties located within a radius of 500 feet of any portion of the project are considered "the neighborhood." Notice shall also be provided to organized groups that have registered with the City, such as a homeowners' association, condominium association, neighborhood group, or any member's lot or parcel within 1,000 feet of the project.

(v) Community Development staff is not responsible for verifying or correcting email addresses provided by a neighborhood organization and failure of a neighborhood organization or individual member to receive notice does not affect the validity of the Application Outreach Meeting.

(5) Procedures.

(i) Meeting Time and Procedure.

(A) The applicant must provide for and conduct either a physical or virtual meeting. Meetings must be held on a non-holiday, weekday evening beginning between 5:30 p.m. and 8:00 p.m.

(B) A required Application Outreach Meeting must be held 180 days or fewer before the application is submitted.

(ii) Meeting Content and Conduct.

(A) At the meeting, the applicant shall present a concept plan, describe project impacts, describe ways to mitigate impacts, facilitate a discussion, and answer questions during the meeting. A concept plan is not required at a NCM for comprehensive plan amendments, code text amendment, zone of annexation and/or rezones.

(B) The concept plan shall, at a minimum, delineate access to the site, internal circulation, the range of density of the entire property or the maximum

intensity (square footage and stories for all buildings).

(C) The meeting shall be conducted so that participants have an opportunity to ask questions and provide comments.

(D) A member of City staff shall attend the meeting and be available to explain applicable Code requirements and, as needed, the project's compliance with the Comprehensive Plan and any applicable adopted plan or ordinance.

(iii) Information Provided with Application.

(A) The following information shall be included with the application submittal:

a. A written list of names and addresses of those given notice, how notice was provided, and meeting participants.

b. A written summary of the meeting including all public comments.

(B) The Director shall make, or instruct the applicant to make, the summary available to the meeting attendees and the public for inspection following the filing of a complete application.

(d) Application Submittal and Fees.

(1) Application Requirements.

(i) Applications shall be submitted on the prescribed forms and according to the deadlines contained in the Submittal Standards for Improvements and Development (SSID) manual. The City may also make application forms available electronically.

(ii) The Director may require additional information necessary to evaluate the application based on size, complexity, development timeline, or potential impacts of the project on the surrounding neighborhood or the City's transportation or utility systems.

(iii) The Director may waive application submittal requirements of this Code in order to reduce the burden on the applicant and tailor the requirements to the information required to review a specific application. The applicant shall make a written request identifying the specific submission items to be waived and why, and the Director may waive the requirements on a finding of the following:

(A) The applicant shows good cause for the requested waiver;

(B) The project size, complexity, anticipated impacts, or other factors support a waiver;

(C) The waiver does not compromise a proper and complete review; and

(D) The information is not material to describing the proposal or demonstrating compliance with approval criteria.

(2) Fees.

(i) Initial Application.The applicant shall pay all required application fees to the City in full before an application will be reviewed by the Director or scheduled for a public hearing. Application fees are generally nonrefundable.

(ii) Changes to Complete Applications.In addition to fees set forth in the City fee schedule, the following fees shall apply to actions taken on a complete application:

(A) Withdrawn Application.All fees are forfeited in the event the City has incurred any expense related to the application. If the application is refiled within 180 calendar days a resubmittal fee must be paid. The submission fee shall be paid again in full if the application is resubmitted after six months.

(B) Continuance of Application.Payment of fees may be required to cover the cost of additional notice.

(C) Reapplication.Payment of fees shall be required for a reapplication where a previous application has been denied.

(D) Modification or Revision of Approved Site Plan.

a. Minor Modifications.An application for administrative relief and payment of the associated fee is required.

b. Major Modifications.Any requested modifications that do not qualify for administrative relief shall be considered major modifications. A new application is required along with the associated application fee.

(3) Who Can File an Application.Applications processed under this Code shall be submitted by one of the following unless otherwise specified in this Code:

(i) The owner(s), or any other person having a recognized property interest in the land on which development is proposed within the City;

(ii) A person authorized to submit the petition on behalf of the owner or other person having a recognized property interest in the land, as evidenced by a letter or document signed by the owner; or

(iii) Planning Commission, City Council, or City staff may file an application for a Comprehensive Plan Amendment, Code Amendment, Planned Development, or a Rezoning.

(4) Determination of a Complete Application.

(i) A complete application is one that contains all of the information, materials, and fees required by Subsections (d)(1) and (2), above. On determining the application is complete, the Director shall accept the application for review in accordance with the procedures and standards of this Code. Incomplete applications will not be processed or reviewed by the City.

(ii) If the application is deemed incomplete, the Director shall notify the applicant of the information or materials that are still needed to make the application complete.

(A) The applicant shall have 45 days to resubmit a completed application.

(B) If the applicant does not resubmit the application within 45 days, the application shall be considered abandoned. The City shall return the application to the applicant and take no further steps of review.

(e) Application Review.

(1) Staff Review.An application shall be reviewed by City staff and other appropriate external agencies for compliance with applicable regulations, laws, and policies. Upon completion of staff review, the staff shall provide its comments in writing to the applicant.

(2) Review by Other Agencies.The staff shall forward copies of the applications to appropriate agencies for their comments. Examples of review agencies are:

(i) City departments;

(ii) Telecommunications, gas, electric and other utilities;

(iii) Irrigation, drainage, water and sewage, sewer provider special districts;

(iv) School and fire agencies;

(v) Law enforcement;

(vi) Mesa County staff, Planning Commission, or Board of Commissioners;

(vii) State agencies (e.g., Colorado Geologic Survey, Colorado Department of Transportation, Colorado Department of Natural Resources, Colorado Division of Wildlife); and

(viii) Federal agencies (e.g., Federal Emergency Management Agency, Bureau of Land Management, U.S. Army Corps of Engineers).

(3) Agency and Department Comments.External agency reviews will be advisory in character and do not constitute approval or disapproval. All comments shall be forwarded to the applicant for response.

(4) Applicant's Response. An application submitted to the City for review must be diligently pursued and processed by the applicant. Applicants shall have 90 days to resubmit revised documents to address comments from the City or the application shall be considered inactive and abandoned. The Director may grant two extensions to the resubmission deadline, not to exceed a total extension of 180 days.

(5) Review of Response.The Director shall determine if sufficient information has been provided to schedule an application for a hearing or approve, approve with conditions, or disapprove the application. If the application is insufficient the applicant shall be notified. The applicant shall be allowed additional resubmittals and responses, pursuant to the same timeframes as the original response, before the application is scheduled for a hearing or before the Director decides whether the application is complete.

(6) Final Report.The Director's written report and recommendations shall be made

publicly available at least three calendar days before a public hearing.

(f) Complete Applications with Changed Status.

(1) Withdrawn Application.

(i) An applicant may withdraw an application by providing written notice to the Director of the applicant's intent to withdraw. After such withdrawal, no further City action on the application shall take place.

(ii) Fees will not be refunded for a withdrawn application.

(iii) For any application requiring a public hearing, the applicant may request in writing that the application be withdrawn before the hearing is opened. An applicant may ask to withdraw after the hearing is opened, but the decision-making body will decide whether or not to approve the request.

(2) Postponement.

(i) The applicant may request an application be postponed to a future scheduled public hearing date.

(ii) A request submitted prior to public notice: shall be in writing, sent either by mail or email, and received by the Director prior to date of publication of the notice of public hearing.

(iii) If a request is either submitted or received by the Director following publication of notice: The applicant must attend the public hearing to request the application be postponed to a future scheduled public hearing date.

(iv) If the Director determines the applicant is not taking affirmative steps to advance a postponed application for a final determination or the applicant requests that an application be postponed for a second time, the Director may declare the application terminated.

(A) No further processing of such application shall occur and the application fees shall be forfeited.

(B) Any re-submittal of the application shall be treated as a new application for purposes of review, scheduling, and payment of application fees.

(g) Public Notice and Public Hearing Requirements.

(1) Purpose.Public hearings must comply with legal requirements for due process (the opportunity to be heard) and allow for community input.

(2) Applicability.

(i) Notice shall be provided as required by Table 21.02-4 and all costs to provide notice shall be paid by the applicant.

(ii) The Director may determine based on the scope or nature of the project that additional notice shall be provided, which shall be done at the applicant's cost.

(iii) If a project requires action on several applications at the same hearing, the

Director may provide for a single, combined notice.

(3) Public Notice.

(i) Notice Required.

(A) Applications for development shall comply with the Colorado law and the provisions of this section with regard to public notification. The required notice for each application type is identified in Table 21.02-4. Application-specific notice requirements are located in the section for the specific application types.

(B) No public notice under this section shall be made for incomplete applications or for applications requiring additional revisions and review. Applications that remain incomplete or requiring revision after the notice publishing, posting, or mailing deadline shall be removed from the applicable meeting agenda and placed on the next available meeting agenda.

(ii) Summary Table of Public Notice Requirements.

Table 21.02-4: Summary Table of Public Notice Requirements
Date/Distance/Yes = Required Notice Gray Box = Not Applicable

Section	Procedure	Published Notice	Mailed Notice	Sign Notice
Administrative Permits				
§ 21.02.040(c)(2)(i)	Change of Use Permit			
§ 21.02.040(b)	Fence Permit			
§ 21.02.040(c)(2)(ii)	Floodplain Development Permit			
§ 21.02.040(b)	Home Occupation Permit			
§ 21.02.040(b)	Planning Clearance and Building Permit			
§ 21.02.040(c)(2)(iii)	Sign Permit			
§ 21.02.040(b)	Temporary Use Permit			
Administrative Approvals				
§ 21.02.040(d)	Administrative Adjustment			
§ 21.02.040(e)	Code Interpretation			

Table 21.02-4: Summary Table of Public Notice Requirements Date/Distance/Yes = Required Notice Gray Box = Not Applicable				
Section	**Procedure**	**Published Notice**	**Mailed Notice**	**Sign Notice**
§ 21.02.040(f)	Comprehensive Plan Amendment, Administrative Changes [1]	7 days		
§ 21.02.040(l)(5)	Final Plat		Owners within 500 feet	Yes
§ 21.02.040(g)	Group Living Processes			
§ 21.02.040(h)	Minor Plat Amendment			
§ 21.02.040(l)(4)	Preliminary Subdivision Plan		Owners within 500 feet	Yes
§ 21.02.040(b)	Revocable Permit, Director approval [2]			
§ 21.02.040(i)	Sign Package			
§ 21.02.040(j)	Simple Subdivision		Owners within 500 feet	Yes
§ 21.02.040(k)	Site Plan (Major and Minor)		Owners within 500 feet	Yes
Applications Requiring a Public Hearing				
§ 21.02.050(c)	Annexation	7 days	Owners within 500 feet [1]	Yes
§ 21.02.050(d)	Code Text Amendment [2] or Rezoning	7 days	Owners within 500 feet [1]	Yes
§ 21.02.050(e)	Comprehensive Plan Amendment (CPA), Non-Administrative [1]	7 days	Owner within 500 feet	Yes
§ 21.02.050(f)	Conditional Use Permit (CUP)	7 days	Owners within 500 feet	Yes
§ 21.02.050(g)	Conditional Use and Special Dimensional Permit Amendment, Termination, or Revocation	7 days	Owners within 500 feet	Yes

Table 21.02-4: Summary Table of Public Notice Requirements Date/Distance/Yes = Required Notice Gray Box = Not Applicable				
Section	**Procedure**	**Published Notice**	**Mailed Notice**	**Sign Notice**
§ 21.02.050(h)	Extended Temporary Use	7 days	Owners within 500 feet	Yes
§ 21.02.050(i)	Institutional and Civic Facility Master Plans	7 days	Owners within 500 feet	Yes
§ 21.02.050(j)	Planned Development	7 days	Owners within 500 feet	Yes
§ 21.02.050(k)	Rehearing and Appeal	[3]	[3]	[3]
§ 21.02.050(l)	Revocable Permit, City Council Approval			
§ 21.02.050(m)	Special Dimensional Permit	7 days	Owners within 500 feet	Yes
§ 21.02.050(o)	Vacation of Plat [4]	7 days	Owners within 500 feet	Yes
§ 21.02.050(p)	Vacation of Public Right-of-Way or Easement	7 days	Owners within 500 feet	Yes
§ 21.02.050(q)	Variance	7 days	Owners within 500 feet	Yes
§ 21.02.050(r)	Vested Property Rights	Within 10 days of approval		
Historic Preservation				
§ 21.02.060	Historic Preservation Procedures	7 days		

Notes:

[1] Mailed notice and sign posting is not required for CPA, Rezonings, or Annexation for requests relating to more than 5% of the area of the City and/or related to a Citywide or area plan process.

[2] Mailed and sign notice are not required for a Code Text Amendment.

[3] Notice of the appeal hearing shall be provided in the same manner as was required with the original action.

[4] Plats with rights-of-way or easements only.

(iii) Content.

(A) Required notices, except for property signs, shall meet the general requirements of notice provided by the City and provide the following information:

a. Address or location of the property subject to the application and the name of the applicant or the applicant's agent;

b. Date, time, and place of the public hearing;

c. Description of the nature, scope, and purpose of the application or proposal including a description of the development plan and, where appropriate, the classification or change sought;

d. Notification about where the public may view the application; and

e. State that the public may appear at the public hearing.

f. Contact information for arranging participation in the public hearings for individuals with hearing, speech, or vision impairment.

(B) Property signs shall include the following information:

a. Application number.

b. City website.

c. City phone number.

(iv) Agenda Notice.Agenda notice shall be posted and published on the City's website a minimum of 48 hours prior to a meeting.

(v) Published Notice.

(A) When required by Table 21.02-4, a notice including the information described in GJMC § 21.02.030(g)(3)(iii) must be published at least once. The Director shall be responsible for giving notice.

(B) In computing notice time, the day of the hearing shall be excluded.

(C) The applicant shall either provide the information for the notice or pay the City to prepare the information.

(D) All published notices shall be published in a local newspaper of general circulation recognized by the City. Based on the size, complexity, or potential impacts of a proposed application, the Director may require that courtesy notice be provided to other newspapers, radio, and television stations servicing the City for use as a public service announcement.

(vi) Mailed Notice.

(A) When required by Table 21.02-4, a notice including the information described in GJMC § 21.02.030(g)(3)(iii) shall be sent by U.S. mail as provided in this section.

(B) Notice shall be provided to:

a. Within the distance specified in Table 21.02-4, each owner and tenant at the address on file with the Mesa County, Colorado, Assessor;

b. Each person who attended any required Application Outreach Meeting and signed-up to receive notice.

(C) All mailed notices must be sent at least 10 days before a public hearing or within 15 business days from receipt of a complete application for administrative applications.

(D) Failure of any individual addressee of such letter of notification to receive the same shall not in any way invalidate or affect subsequent action on the application and such requirement shall not be construed as a legal precedent to the official approval.

(E) Mailed notice to property owners shall be required only for the initial presentation of the proposed development at a public hearing. Additional mailed notice shall not be required for any subsequent hearings except when the hearing is deferred or continued at the applicant's request. In that case, the applicant shall be responsible for paying any additional fees for the purposes of re-notifying adjacent property owners.

(vii) Property Sign.

(A) The City shall prepare and the applicant shall post signs giving notice of the application. At least one sign shall be posted on each street frontage of the property.

(B) For administrative applications, signs shall be posted as follows:

a. Each sign shall be posted within 15 business days from receipt of a complete application.

b. The applicant shall maintain the sign on the property until the project has received approval per § 21.02.030(h)(2)(i) or has been withdrawn by the applicant.

c. The applicant shall be required to provide proof that the property sign has been posted for a minimum of 15 calendar days prior to issuance of any approval pursuant to GJMC § 21.02.030(h).

(C) For applications requiring a public hearing, signs shall be posted as follows:

a. Each sign shall be posted at least 10 calendar days before the initial public hearing and remain posted until the day after the final hearing.

b. The applicant shall be required to provide proof that the property sign has been posted for a minimum of 15 calendar days prior to the scheduling of a public hearing.

c. The applicant shall maintain the sign on the property until the day after the final public hearing.

(viii) Courtesy Notice.

(A) The City may, as a courtesy, provide notice to any persons or organization in the City or Mesa County, or to any governmental, public, or quasi-government organization regarding any matter related to this Code that may be of interest to of that person or organization, or on any matter on which any such person or organization has requested notice.

(B) Courtesy notice may be provided in any appropriate manner, including electronically, and may be directed to an organization through its leadership for distribution rather than to the entire membership.

(C) The failure of the City to send courtesy notice or the failure of any resident or property owner to receive such notice shall not affect the validity of any City action with respect to an application.

(ix) Five Percent Notice.Applications that are applicable to more than 5% of the area of the City and/or related to a Citywide or area plan process, such as Comprehensive Plan Amendments, some Rezonings, or zones of annexation, are not required to provide mailed or property sign notice.

(x) Constructive Notice and Substantial Compliance.

(A) Notice is sufficient if there is substantial compliance with the requirements of this section.

(B) Minor defects in any notice shall not impair the notice or invalidate proceedings pursuant to the notice if a bona fide attempt has been made to comply with applicable notice requirements. Minor defects in notice may include, but are not limited to errors in legal descriptions, typographical or grammatical errors, or errors of actual acreage that do not impede communication of the notice to the affected parties.

(C) Failure of one or more individual parties to receive written notice shall not invalidate subsequent action.

(D) If questions arise at a review hearing regarding the adequacy of notice, the decision-making authority shall direct the Director to make a formal finding as to whether there was substantial compliance with the notice requirements of this Code, and such finding shall be made available to the decision-making authority prior to final action on the request.

(E) When City records document the publication, mailing, or posting of notices as required by this section, it shall be presumed that notice of a public hearing was given as required by this section.

(4) Public Hearing.

(i) Timing.The Director shall schedule an application for hearing only when all issues have been resolved or can be resolved through post-review procedures,

and a determination of compliance with all codes and regulations is made.

(ii) Applicant's Option. An applicant has the right to request a hearing at any time during the review process.

(iii) Request for a Continuance Prior to Hearing.

(A) An applicant shall have the right to one continuance before the Planning Commission, Zoning Board of Appeals or City Council. A written request for the continuance shall be submitted to the Director by the applicant or their representative at least three days before the hearing. A request for a continuance may also be made by the City staff, the Planning Commission, or City Council.

(B) An applicant requesting a continuance shall make reasonable efforts to notify all persons previously advised of the hearing that a continuance has been requested. Reasonable efforts shall include, but not be limited to, personal notice, broadcast or print media notice and any other form of notice determined by the Director to be reasonable.

(C) The review body may grant one continuance to a time, place, and date certain, without taking any testimony, except pertaining to the adequacy of the notice.

(iv) Conduct of Hearing.

(A) Any person may offer relevant information in writing or in person. Every speaker representing one or more other persons shall state their name, street address, and if an organization or group, the name and mailing address of the organization or group.

(B) The Chair shall exclude testimony and evidence that is irrelevant, immaterial, unduly repetitious, or disruptive. Ordinarily no one presenting testimony or evidence may ask questions of other persons appearing as witnesses; although the chairperson of the body may ask questions suggested by a person presenting testimony. At any point, members of the body conducting the hearing may ask questions of the applicant, staff or public.

(C) No person shall knowingly make a false statement nor present false, deceptive, or slanderous testimony, comment, or remarks at a public hearing.

(v) Continuance of Public Hearing.The decision-making body may grant a continuance of the public hearing.

(vi) Additional Rules.The decision-making body conducting the hearing may adopt rules of procedure to limit the number of applications to be considered per meeting, limit the time for each presentation or speaker or as provided by this section, temporarily hear and decide quasi-judicial hearings in accordance with the alternative hearing procedure, which are adopted by this reference and incorporated as if fully set forth.

(h) Recommendation and Decision.

(1) Planning Commission as Recommending Body.If the Planning Commission is the recommending body, the Planning Commission shall review the application against applicable decision-making criteria and prepare a recommendation that shall be forwarded to the City Council. All recommendations, including recommendations of denial, shall be heard by the City Council without necessity of appeal.

(2) Approval Criteria.

(i) Decision by Director.

(A) Where Table 21.02-2 indicates that the Director must make the decision on an application, the Director shall review and approve the application, approve it with conditions designed to bring the application into compliance with the specific requirements of this Code, or deny the application based on the application of the criteria specified for the application.

(B) The decision shall be based on the information submitted with the application, comments from referral agencies, and any required approvals from other agencies.

(ii) Decision by Planning Commission, City Council, or Zoning Board of Appeals.

(A) Where Table 21.02-2 or another provision of this Code indicates that the Planning Commission, City Council, or Zoning Board of Appeals shall make the decision on an application, the decision-making body shall review and approve the application, approve it with conditions, or deny the application.

(B) The decision-making body shall review the application against the applicable criteria and make decisions based on policies, standards, plans, recommendations, the applicable law, the testimony, and information presented at the hearing.

(C) Where there has been a public hearing before the Planning Commission, hearings shall be de novo before the Council. An affirmative vote of five members of the City Council shall be required to approve rezones and Comprehensive Plan amendments recommended for denial by the Planning Commission. Procedural requirements provided elsewhere in this Code shall be applicable.

(iii) Conditions.

(A) A decision-making body, including the Director, this Code may impose conditions as needed to ensure that the approval is consistent with the purposes of the Comprehensive Plan and the general purpose of this Code stated in GJMC § 21.01.050.

(B) All conditions of approval shall be reasonably related to the anticipated impacts of the proposed use or development or shall be based upon standards duly adopted by the City prior to the review of an application.

Conditions may include those necessary to carry out the purpose and intent of the Comprehensive Plan and this Code.

(C) Discussions of potential conditions to mitigate impacts do not reflect actions by the decision-making body unless and until the decision-making body takes formal action to attach that condition to a development approval.

(D) Any conditions that require an applicant to dedicate land or pay money to a public entity in an amount that is not calculated according to a principle applicable to a broad class of applicants, any condition imposed shall include an individualized determination and shall be roughly proportional both in nature and extent to the anticipated impacts of the proposed development, as shown through an individualized determination of impacts.

(3) Development Improvements Agreement (DIA).

(i) Development Improvements Agreement Authorized. The Director may defer the requirement for the completion of required improvements if the applicant enters into a Development Improvements Agreement (DIA) by which the applicant agrees to complete all required public improvements in accordance with an agreed schedule. The Director may require the applicant to complete and dedicate some required public improvements prior to approval of the Final Plat and to enter into a DIA for completion of the remainder of the required improvements. The City Attorney shall approve any DIA as to form.

(ii) Agreement to Run with the Land.The Development Improvements Agreement shall provide that the requirements contained therein shall run with the land and bind all successors, heirs, and assignees of the applicant. The DIA for subdivisions shall be recorded with the Mesa County Clerk and Recorder. All other DIAs may, at the Director's discretion, be recorded or deposited with the City Clerk. All existing lien holders shall be required to subordinate their liens to the guarantees contained in the DIA.

(iii) Performance Security.

(A) Whenever the Director permits an applicant to enter into a Development Improvements Agreement, the applicant shall be required to provide sufficient security to ensure completion of the required public improvements. The security shall be in the form of a cash deposit made to the City, a letter of credit or disbursement agreement from an authorized financial institution, a subdivision bond, or a completed, unrecorded plat. The letter of credit, disbursement agreement, or subdivision bond shall be in a form approved by the City Attorney.

(B) The guarantee shall be in an amount estimated by the Director as reflecting 120% of the cost of the improvements in the approved Construction Plan and shall be sufficient to cover all promises and conditions contained in the DIA.

(C) In addition to all other security, when the City participates in the cost of an

improvement, the applicant shall provide a performance bond from the contractor, with the City as a co-obligee.

(D) The issuer of any guarantee shall be subject to the approval of the City in accordance with adopted policies.

(iv) Maintenance Guarantee for DIA.

(A) The applicant shall guarantee the improvements against defects in workmanship and materials for a period of one year from the date of City acceptance of such improvements. The maintenance guarantee shall be secured by a letter of credit, cash escrow, maintenance bond, or other form acceptable to the Director.

a. If the security is a letter of credit or cash escrow, then it shall be in an amount reflecting 20% of the cost of the completed improvements.

b. If the form of security is a maintenance bond, it must be in a form acceptable to the City Attorney, in the principal amount of 20% of the value of the project's public improvements, for a period of one year from the date of final acceptance by the City of all improvements in the project, or as applicable, the phase or filing of a project for which improvements are constructed and accepted.

c. If repairs, replacements, or modifications to the project's public improvements are made by the applicant or are required to be made by the City during the one-year maintenance period, then the City, at its sole option and discretion, may require an extension of the security in an amount equal to the actual or estimated repair, replacement, or modification costs plus 20%. If the Director has reason to believe that the security will be extended beyond the one-year initial term, then the Director shall notify the applicant in writing no later than 30 days before expiration of the security. Mailing of an extension notice shall cause the applicant to extend the security (bond, cash, or letter of credit) for an additional 12 months. The extension shall be on the same terms as the security being extended. The security may be extended for one additional year as may be necessary for the bond to be called or for the improvements to be repaired, modified, or replaced in a manner that satisfies the City. If the Director has reason to believe that the type or extent of the repair, replacement or modification does not warrant extension of the maintenance security, then the security may be released after the initial one-year period. In making the decision to extend the security the Director may consider any facts or information deemed relevant, which may include, but is not limited to, whether the failed improvements are above or below grade, whether the failed improvements may reasonably be found to constitute life, health and/or imminent safety hazard; whether other phases or filings depend on the improvements and/or the degree of failure of the improvements.

(B) If the applicant has not warranted and guaranteed required improvements pursuant to a DIA, the applicant shall give the City security equal to at

least 50% of the cost of the required improvements.

(v) Offers to Dedicate Streets, Roads, and Other Lands.

(A) Acceptance of Dedication.The City Council, or its designees, may accept, accept with conditions, or reject any offer to dedicate any land or facility. Any offer to dedicate made pursuant to or as a condition of a review or approval pursuant to this Code constitutes the owner irrevocable warranty that such owner has the right, title, and interest to convey to the City and that no hazardous or other regulated substance is present on, under or in the property.

(B) Acceptance of Maintenance.Approval of a subdivision does not mean the City will accept any road, street, or public site for maintenance. The City shall not be obligated to maintain any land unless it explicitly agrees to do so in writing.

(vi) Temporary Improvements.The Developer shall construct and pay for all costs of temporary improvements required by the City to protect the public, neighborhood, or another person. The applicant shall maintain said temporary improvements for the period specified.

(vii) Completion of Improvements.

(A) Construction of Required Improvements.

a. Before construction begins, the developer must be familiar with the submittal, construction, plans and inspection requirements of each utility or agency.

b. After the City and/or other utility providers has inspected and approved all or a portion of the required improvements, the developer may request, in writing, that the approved portion be accepted for maintenance by the appropriate agency. The City shall establish the developer's limits of responsibility for the improvements. The City may condition its acceptance and may require additional guarantees and assurances for at least one year following acceptance.

c. Even if the City does not accept all or a portion of the required improvements, or delays any acceptance, the City may require the Developer to correct such defects or deficiencies identified by the City, in which case, final acceptance may be extended for one additional year.

(B) Release of Improvements Agreement and Guarantee.

a. The developer shall submit a written request for a release from the Development Improvements Agreement for the improvements that have been accepted for maintenance by the appropriate agency. Proof of acceptance for maintenance and proof that there are no outstanding judgments or liens against the property shall accompany this request.

b. The City Council, or its authorized representative, shall review the

request. If the requirements of the DIA concerning that portion requested for release have been complied with, the appropriate document of release shall be recorded with the Mesa County Clerk and Recorder's Office.

c. Release of the DIA does not constitute a certificate of completion and release of responsibility.

(C) Certificate of Completion and Release of Responsibility. Upon expiration of the limits of responsibility established in this Code, the developer may request a certificate of completion and release of responsibility from the appropriate agency.

(viii) Extension of Development Improvements Agreement and Security.

(A) If the applicant is unable to complete all required improvements contained in an executed Development Improvements Agreement within the time stated therein, he/she shall provide written notice of same to the Director at least 30 calendar days prior to the deadline of the milestones he will be unable to meet. The applicant shall make a formal written request for an extension of the completion date for performance in the DIA and security and provide a revised development schedule, which shall be reviewed by the Director. The Director shall approve, approve with conditions or deny the request for an extension. Based on the Director's decision the existing DIA may be amended, a new DIA drawn up and executed, or the Director may exercise any default provisions contained in the approved DIA. Any amendments or new agreements shall be recorded in the same manner as the original DIA, if required by the Director.

(B) If the DIA is to be extended or a new DIA is to be executed, the applicant shall provide sufficient security which may be the same as or greater than the original security, up to 120%, as was required with the original guarantee. No amendment or replacement DIA shall be executed, recorded or effective until security acceptable to the Director is provided.

(i) Post-Decision Actions.

(1) Change in Ownership.Unless otherwise stated for a specific type of permit, application, or decision under this Code, or unless otherwise stated on the permit or approval document, permits, approvals, and approvals with conditions under this Code run with the land and are not affected by changes in ownership, tenancy, or the form of ownership or tenancy of the property. Subsequent owners and tenants of the property have the same rights and obligations with respect to the permit, approval, or decision as the initial applicant.

(2) Successive Applications.No application for Rezoning, Conditional Use Permit, or Variance on the same request nor one involving the same tract shall be permitted within one year of an application denial.

(3) Modifications of Approvals.After City approval or approval with conditions of an application under this Code, a property owner or holder of a permit or approval may apply for an Administrative Adjustment of the permit or approval under GJMC

§ 21.02.040(c).

(4) Amendments.

(i) All substantial changes, modifications, removal, or release of the provisions of an approved application that do not qualify as Administrative Adjustments under GJMC § 21.02.040(c) shall be considered amendments of the application. Amendments shall include, but are not limited to, changes in use, access, layout, any condition of approval, any change resulting in significant increased off-site impacts, and similar changes as determined by the Director.

(ii) Proposed amendments shall be treated as new applications. If the proposed amendment is not consistent with an earlier, preliminary approval, the Director shall inform the applicant that a new application for the earlier approval will need to be submitted.

(iii) The Director may require that an application for Administrative Adjustment to an approved application be treated as an application for amendment if the Director determines that the application raises a significant public controversy in which numerous parties other than the owner of the property may want to offer testimony.

(5) Effect of Modification or Amendment.If approved, the modification or amendment shall then supersede the previous approval, and subsequent development on the property shall be in accord with the amended approval.

(6) Rehearing and Appeal.Any aggrieved person, including the Director, may request a rehearing or file an appeal of final action under GJMC § 21.02.050(k).

(j) Lapsing and Extension of Approvals.

(1) Period of Validity.

(i) Permit or Administrative Approval.An administrative permit or approval granted under this Code shall lapse and shall become void one year following the date of final approval unless, prior to the expiration date, construction is commenced and pursued toward completion. A different timeframe may be established during the approval of a permit or specific administrative approval.

(ii) Approval Requiring a Public Hearing.

(A) Except where a different timeframe is provided in a specific procedure or set by the decision-making body, the validity of any approval requiring a public hearing is two years.

(B) A Rezoning, including rezoning to Planned Development, is not subject to expiration.

(2) Extension of Approval Term.

(i) Extension Request.A request to extend any approval shall be submitted in writing to the Director prior to the expiration of the original approval.

(ii) Permit or Administrative Approval.

(A) Unless otherwise stated in a permit or specific procedure for an administrative approval, the Director may extend the validity of the permit or approval for up to 180 more days if the applicant proves they can complete the project in conformance with the approved plan set.

(B) The Director may grant one extension of 12 months for a preliminary subdivision or unrecorded Final Plat, in accordance with GJMC § 21.02.040(l)(5)(ii)(F)b.

(iii) Approval Requiring a Public Hearing.The decision-making body may extend any deadline if the applicant demonstrates why the original effective period or development phasing schedule was not sufficient and cannot be met. When deciding to extend or change any deadlines, the decision-making body shall consider if development regulations have materially changed so as to render the project inconsistent with the regulations prevailing at the time the extension would expire.

(Ord. No. 5242, 12/4/2024; Ord. No. 5229, 8/21/2024; Ord. 5218, 5/1/2024; Ord. 5205, 3/20/2024; Ord. 5190, 12/20/2023)

§ 21.02.040. Administrative applications.

(a) Overview.Administrative applications are reviewed and decided on by the Director or other specified City staff member. The following application types are administrative and some of them have additional review requirements that are identified in the right column:

Table 21.02-5: Administrative Applications

Application Type	Purpose	Additional Application Requirements
Administrative Permits		
Change of Use Permit	Changes to use of structure or property	§ 21.02.040(c)(2)(i)
Fence Permit	Erect a fence or wall up to 6 feet in height	
Floodplain Development Permit	Construct structures or make changes within a floodplain	§ 21.02.040(c)(2)(ii)
Home Occupation Permit	Allow home occupations	
Planning Clearance and Building Permit	Establish, construct, modify, or expand a use or structure	
Revocable Permit, Director Approval	Allow limited use of public right-of-way for specific installations	
Sign Permit	Approve non-exempt signs	§ 21.02.040(c)(2)(iii)
Temporary Use Permit	Allow a temporary use that will last longer than 48 hours	
Administrative Approvals		

Table 21.02-5: Administrative Applications		
Application Type	**Purpose**	**Additional Application Requirements**
Administrative Adjustment	Small change to specific regulations	§ 21.02.040(d)
Code Interpretation	Provide an interpretation of the contents and requirements of the Code	§ 21.02.040(e)
Comprehensive Plan, Administrative Changes	Allow minor changes to plan language and land use designations	§ 21.02.040(f)
Group Living Processes	Confirm requirements for group living facilities, rooming and boarding houses, fraternities, and sororities.	§ 21.02.040(g)
Revocable Permit, Director Approval	Review to ensure that any private development on public land is safely conducted in a manner that does not pose potential burdens on the public	
Sign Package	Allow review of multiple signs on a site that function as one	§ 21.02.040(i)
Subdivision, Minor	Allow an applicant to create or consolidate lots, move lot lines, and correct plats.	§ 21.02.040(j)
Site Plan, Major and Minor	Review of proposed development for compliance with this Code and applicable plans and policies	§ 21.02.040(k)
Subdivision, Major (includes Preliminary Subdivision and Final Plat)	Review of proposed subdivisions of land that are not otherwise exempt	§ 21.02.040(l)

(b) Common Procedures.

(1) Review Procedures for Administrative Applications.Procedures for review and decision of administrative applications are established in GJMC § 21.02.030. They are summarized here for applicant convenience.

Administrative Applications			
Action		**When Applicable**	**Described in Section**
1	General Meeting or Pre-Application Meeting	Per Table 21.02-3	§ 21.02.030(b)

2	Application Submittal & Review	All Applications
3	Making changes to complete applications: Complete Applications with Changed Status	Individually, As Needed
4	Director Decision	All Applications
5		

(2) Review Criteria for All Administrative Application Types. The decision-maker shall review each application against the following criteria. Individual application types may include exceptions to these criteria or impose additional criteria.

(i) The application complies with all provisions of this Code;

(ii) The application is consistent with the Comprehensive Plan;

(iii) The application complies with any other approvals on the property;

(iv) The applications complies with or will comply with other City, state, and federal regulations;

(v) The property is not subject to a pending notice of violation or legal action as a result of a violation of any federal, state, county, or city land use law or administrative rule.

(vi) Public facilities and utilities shall be available concurrent with the development.

(3) Lapsing and Extension of Approvals.Administrative permits shall remain valid according to the following table unless otherwise specified in this section:

Table 21.02-6: Administrative Permit Validity

Permit Type	Valid For:
Fence Permit	180 days
Floodplain Development Permit	Per approved permit
Home Occupation Permit	N/A
Planning Clearance	180 days
Revocable Permit, Director Approval	N/A
All Other Administrative Permits	One year

(4) Applicability, Procedures, and Review Criteria for Specific Administrative Applications.The common procedures and review criteria for administrative applications apply unless otherwise specified in the specific application type in the following sections.

(c) Administrative Permits.

(1) General Procedures.

Follow GJMC § 21.02.040(b).

(2) Specific Procedures.The following administrative permit applications have requirements in addition to the general procedures.

(i) Change of Use Permit.

Common Procedures for Administrative Permits	
1	General Meeting or Pre-Application Meeting Per Table 21.02-3
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Director Decision § 21.02.030(h)
5	

(A) Purpose and Applicability.A Change of Use Permit is required to change the use of a structure or property.

(B) Additional Permits.The following additional permits may be required with a Change of Use Permit:

a. Other permits (such as a CUP), review (such as a Major or Minor Site Plan review) or approvals may also be required when use of a land or structure has changed.

b. A change from any use in the Household Living use category to any other use requires a Site Plan review.

c. A change of use from any nonresidential use to a residential use requires a Site Plan Review.

d. For a change of use within the same principal use listing in Table 21.04-1: Principal Use Table (for example, a change from Retail Sales, Small use to another Retail Sales, Small use), a Change of Use Permit is not required unless:

1. The Code requires more off-street parking for the new use than is available on the property;

2. There is any actual or projected increase in traffic; or

3. The amount of stormwater runoff or impervious area is increased.

(ii) Floodplain Development Permit.

(A) Applicability.No person shall construct or maintain any use or structure nor make any development or topographically alter land for any purpose including agriculture that may adversely impact the floodplain or floodway or within any area of special flood hazard (GJMC § 21.06.020) unless the Director has issued a floodplain permit.

(B) Additional Approval Criteria.When base flood elevation data has not been provided in accordance with GJMC § 21.06.020(c), the Director may use any flood elevation and floodway data available from a federal, state, or other source as criteria to decide how and if construction, substantial improvements, or other development in the floodplain may be permitted.

(iii) Sign Permit.

(A) Required.No person shall erect or display a nonexempt sign (see GJMC Chapter 21.10) unless the Director has issued a Sign Permit.

(B) Exceptions.

a. An on-premises temporary sign may be erected without a permit if done as referred to in GJMC § 21.10.070(e).

b. Touching up or repainting existing letters, symbols, or other non-electric sign features, is maintenance and does not require a permit.

(d) Administrative Adjustment.

(1)

Common Procedures for Administrative Applications	
1	General Meeting or Pre-Application Meeting Per Table 21.02-3
2	Application Submittal & Review | §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Director Decision § 21.02.030(h)
5	

Purpose.The purpose of an Administrative Adjustment is to allow for the modification of existing numeric dimensional standards to accommodate site-specific or minor construction issues.

(2) Applicability.

(i) Administrative Adjustments may be requested for the situations described in Subsection (d)(4) below.

(ii) Administrative Adjustments may not be used to:

(A) Permit uses other than those permitted in the zone district, or

(B) Make any changes to sign standards.

(3) Review Procedures.Applications for Administrative Adjustment shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b), with the following modifications:

(i) All applications for Administrative Adjustment shall identify the specific issue that the Administrative Adjustment is intended to address and how the Administrative Adjustment will resolve that issue:

(A) A request for Administrative Adjustment prior to issuance of a building

permit shall be submitted with the project Site Plan or Planning Clearance application. Where the Site Plan is submitted in conjunction with a primary application, such as a Conditional Use Permit request, that is decided by the City Council, the request for Administrative Adjustment shall also be decided by that body. For example, if an Administrative Adjustment request is submitted with a Rezoning application, the City Council will also decide on the Administrative Adjustment.

(B) A request for Administrative Adjustment to address a minor construction issue shall be submitted with the approved project Site Plan, a written description of the minor construction issue, and an amended drawing of that part of the site for which the Administrative Adjustment is requested.

(ii) The applicant is responsible for ensuring that the requested Administrative Adjustment does not conflict with any recorded covenants applicable to the property.

(4) Permitted Type and Scope of Administrative Adjustment. The Director may grant Administrative Adjustments up to the following maximum adjustment percentage, measurement, or location. No more than six distinct Administrative Adjustments may be approved for any development application; one type of adjustment may be applicable in more than one location, as specified by the Director.

(i) Residential and Public, Parks, and Open Space Zone Districts.

(A) Height.

a. Maximum Height.Up to 5% total increase in building height.

b. Fence Requirements.

1. Height.Fences not located in a front yard may be increased by up to 10% but no fence may be taller than eight feet.

2. Setbacks.Fences may encroach up to two feet into any required setback.

(B) Setbacks and Structure Placement.

a. Required build-to line or setback-adjust forward across the build-to line or setback up to two feet; may not encroach into the public right-of-way.

b. Required build-to line minimum percentage built-to-reduction of up to 5% of required length.

(ii) Mixed-Use and Industrial Zone Districts. The Director may grant Administrative Adjustments that conform to the following requirements:

(A) Setbacks.

a. Principal Structure.Modifications of the front, side, or rear yard setback requirement, provided that the total modification shall not reduce the applicable setbacks by more than 10% of those otherwise

required in the zone.

b. Accessory Structure.Modification of the side or rear yard setback requirement, provided that the total modification shall not reduce the applicable setbacks by more than 30% of those otherwise required in the zone.

(B) Structure Heights.Modifications of the building or structure height requirement; provided, that the total modification shall not increase the applicable building or structure height by more than 10% of the otherwise maximum height in the zone, nor add another habitable story or mezzanine.

(C) Fences.

a. Height.Modifications of the maximum fence height requirement provided that the total modification shall not increase the applicable fence height by more than 10% of the otherwise maximum height in the zone or no more than eight feet tall, whichever is lower.

b. Setbacks.Fences may encroach up to five feet into any required setback.

c. Electric Fence.May be installed no more than one foot higher than the structural fence on which it is located.

(D) Parking.In any zone, a decrease in the number of required parking spaces of not more than 10% when total required spaces are at least 10 spaces.

(E) Deviations from Final Planned Development Maps. In any planned development zone, adjustments of up to 10% of elements of final planned development maps that are:

a. Made to a dimensional or development standard with a specific measurement, and

b. Consistent with the requirements of the preliminary planned development, final planned development conditions of approval, or development standards of the underlying zone district.

(5) Review Criteria.The following additional review criteria shall apply to requests for specific types of Administrative Adjustments:

(i) The proposed use, structure, or activity is permitted in the underlying zone district.

(ii) There are special circumstances existing on the property for which the application is made related to size, shape, area, topography, surrounding conditions, and location that do not apply generally to other property in the same area and zone district; and

(iii) The special circumstances have not been created by the applicant.

(e) Code Interpretation.

(1)

Common Procedures for Administrative Applications	
1	General Meeting or Pre-Application Meeting Per Table 21.02-3
2	Application Submittal & Review | §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Director Decision § 21.02.030(h)
5	Post-Decision Actions § 21.02.030(i)

Applicability.

(i) The Director is authorized to provide a written interpretation of the contents and requirements of this Code.

(ii) The Director is authorized to interpret the any use table to determine whether a use not specifically mentioned can reasonably be interpreted to fit into a use category.

(iii) Interpretations may be requested for a provision of this Code subject to a proposed or current application, hearing, or appeal.

(iv) Director may also provide a property-specific code interpretation in the form of a Code clarification that identifies whether specific regulations in this Code are applicable to the subject property.

(2) Authority.An interpretation may be requested by any:

(i) Applicant.

(ii) Person affected by an action proposed pursuant to this Code, or

(iii) Any City departments or other governmental agencies that may be subject to the provisions of this Code.

(3) Review Procedures.

(i) Applications for Code Interpretation shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b).

(ii) The Director may ask the Planning Commission at a regularly scheduled meeting to ratify any use interpretation decisions.

(f) Comprehensive Plan, Administrative Changes.

Common Procedures for Administrative Applications	
1	General Meeting or Pre-Application Meeting Per Table 21.02-3
2	Application Submittal & Review | §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	

(1)

5	Post-Decision Actions § 21.02.030(i)

Purpose.To ensure that administrative changes to the Comprehensive Plan are consistent with the vision, goals, and policies include in the Plan.

(2) Applicability.Where the City has sole jurisdiction, the Director has the authority to:

(i) Make minor additions or clarifications to the policy sections; and

(ii) Correct errors or grammar.

(3) Review Procedures.Applications for administrative changes to the Comprehensive Plan shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b).

(g) Group Living Processes.

(1) Application Outreach Meeting.

(i) Prior to establishing a new group living facility, boarding or rooming house (including conversion of an existing building or buildings), fraternity, or sorority, the applicant shall hold a Project Development Information Meeting per GJMC § 21.02.030(c), inviting owners of property within 1,000 feet of the proposed facility.

(ii) At the meeting, the applicant shall describe the facility and its proposed uses.

(2) Application Review.

(i) The Director shall review and decide on applications for a group living facility that does not house sex offenders, boarding/rooming house, fraternity, or sorority based on GJMC § 21.02.040.

(ii) The Planning Commission shall review and decide on any application for a group living facility that houses one or more sex offenders, as defined by Colorado law.

(A) In addition to the other criteria provided in this subsection, the Planning Commission shall consider whether the proposed owner/operator has established by clear and convincing evidence that the facility will not adversely impact the neighborhood and/or its residents.

(B) An appeal from a Planning Commission decision made under this subsection shall be in accordance with Rule 106 of the Colorado Rules of Civil Procedure.

(3) Validity.

(i) A development approval for a group living facility, rooming/boarding house, fraternity, or sorority is valid for a period of 12 months, subject to renewal by the Director. When annual registration is required, renewal is made subject to valid annual registration.

(ii) A group living facility development approval is specific to a maximum number

of residents and specifically permitted accessory use(s). If the applicant wants to increase the number of residents or modify the specifically permitted accessory use(s), a new application is required.

(4) Annual Registration Required.

(i) Fraternity or Sorority.

(A) Application.

a. A fraternity or sorority shall register with the City once every 12 calendar months. No person shall own, operate, or manage a fraternity or sorority unless the facility is registered with the City. Annual registration shall include:

1. Proof that the fraternity or sorority is recognized and in good standing with an accredited school, university, or college;

2. Proof that the fraternity or sorority is affiliated and in good standing with a nationally or locally chartered fraternal membership organization;

3. Documentation that the fraternity or sorority has complied with the applicable City, state and other building, fire, health, and safety codes as well as all applicable requirements of the zone district in which the fraternity or sorority is located;

4. Statement that the only administrative activities conducted on the premises are those of the fraternal organization sponsored, conducted, or related to the fraternity or sorority;

5. Documentation that the fraternity or sorority complies with the applicable parking requirements, as demonstrated by accurate graphic depiction of parking lot(s), and/or copies of parking agreements, leases, or licenses;

6. Documentation that the maximum number of residents allowed is not exceeded, as demonstrated by the total square feet of the living areas, the number of residents, the number of sleeping rooms and the number of beds; and

7. The total number of calls for police or emergency services to the premises within the previous year.

b. A fraternity or sorority that does not meet the standards and registration requirements of this subsection is subject to revocation of land use permit, abatement, prosecution and/or other enforcement as provided in this Code.

c. A fraternity or sorority is subject to and shall permit annual inspection by the Building Department, Fire Department and Code Enforcement Department to ensure compliance with applicable standards.

(B) Renewal.A development approval for a fraternity or sorority is valid for a period of 12 months, with renewal by the Director upon a review and confirmation of the facility's annual registration as described in GJMC § 21.02.040(g)(4)(i)(A) above and a finding that:

a. The facility has not adversely affected the neighborhood. A facility is considered to have an adverse effect on a neighborhood if one or more of the following are shown:

b. Public and private services such as street, sewers, water and/or utility systems are burdened by the facility, to the extent that usage exceeds that normally associated with such a use or in the particular neighborhood;

c. The facility unreasonably interferes with the peace, quiet, and dignity of the neighborhood;

d. The facility creates, imposes, aggravates, or leads to inadequate, impractical, unsafe, or unhealthy conditions; or

e. The facility is found to be dangerous or unsafe due to an increased number of police or emergency visits, or to a single criminal act by a resident involving serious bodily injury or extensive property damage, or to an increased number of incidences of criminal acts by residents of the facility involving bodily injury or property damage.

f. Within 10 days of the Director's renewal, nonrenewal or condition of renewal, an individual aggrieved by the Director's decision may appeal the Director's decision to the Zoning Board of Appeals. Appeals shall be in writing and perfected in accordance with GJMC § 21.02.030(i)(6).

(ii) Group Living Facility.

(A) Application.

a. A group living facility shall register with the City once every 12 calendar months. No person shall own, operate, or manage any group living facility unless the facility is registered with the City.

b. A group living facility for adult or juvenile offenders shall also submit all registration documentation to the juvenile and/or adult corrections board for review in accordance with Subsection (g)(4)(ii)(C) of this section.

c. Annual registration shall include:

1. Proof that the group living facility has a valid Colorado license, if any is required by state law, and documentation showing that the facility complies with the requirements of the state license. In the event there is a conflict between a City and a state requirement for the facility, the more stringent rule shall apply;

2. Documentation showing that the group living facility has complied with the applicable City, state and other building, fire, health, and safety codes as well as all applicable requirements of the zone district in which the group living facility is located;

3. Documentation showing that the group living facility complies with the parking requirements of this Code;

4. Documentation showing that the maximum number of residents allowed is not exceeded;

5. For a group living facility housing adult or juvenile offenders, all documentation necessary for review by the juvenile and/or adult corrections board(s) in accordance with Subsection (p)(2)(iv)(B) of this section;

6. Documentation showing that any and all conditions of the initial land use permit/approval are met;

7. Description of the administrative or other activities that occur at the facility, including number of staff and general duties of each staff member;

8. Description and documentation of any changes to the site or structure(s) made since the prior registration.

d. A group living facility that fails to register or does not meet the registration requirements may be denied renewal, abated, prosecuted and/or otherwise subject to enforcement action under this Code.

(B) Renewal.

a. The Director may renew the land use approval for a group living facility upon an annual registration of the facility if the Director finds that the registration requirements have been met and that the facility has not adversely affected the neighborhood.

b. A facility is considered to have an adverse effect on a neighborhood if one or more of the following are shown:

1. Public and private services such as street, sewers, water and/or utility systems are burdened by the group living facility, to the extent that usage exceeds that normally associated with such a use or in the particular neighborhood;

2. The group living facility unreasonably interferes with the peace, quiet, and dignity of the neighborhood;

3. The group living facility creates, imposes, aggravates, or leads to inadequate, impractical, unsafe, or unhealthy conditions; or

4. The group living facility is found to be dangerous or unsafe due to an increased number of police or emergency visits, or to a single criminal act by a resident involving serious bodily injury

or extensive property damage, or to an increased number of incidences of criminal acts by residents of the facility involving bodily injury or property damage.

c. When considering whether an adverse impact exists, the Director shall consider the following:

1. Whether the impact is real or perceived based upon stereotypes of the population served by the group living facility;

2. The existence of alarms and/or fences in and of itself shall not constitute a safety issue which would be an adverse impact; or

3. Whether complaints and/or police calls regarding the group living facility have been founded or unfounded.

d. In determining whether an adverse impact exists, the Director may rely on comments received by the residents of the neighborhood or other interested persons in making the decision whether to renew, renew with conditions, or non-renew the permit upon annual registration. The Director shall not be required to research the comment or otherwise investigate the motive of the commenting parties unless the Director relies on that information when making the decision.

e. The Director may modify the land use permit/approval upon renewal (or renew with conditions) by limiting the number of residents and/or by limiting accessory uses if the Director finds that the neighborhood is adversely impacted by the number of residents or intensity or number of accessory uses occurring on the site.

f. The Director shall issue a decision within 30 days of receiving a complete registration application from the facility. If the Director does not issue a decision within 30 days of receiving a complete registration application, the registration shall be deemed renewed for the next year.

(C) Special Review for Group Living Facility for Adult or Juvenile Offenders.An application for a group living facility for adult or juvenile offenders shall be reviewed as follows:

a. The Mesa County Juvenile Community Corrections Board shall conduct the review if the facility houses juvenile offenders or the Adult Community Corrections Board if the facility houses adult offenders. If the facility houses a combination of adult and juvenile offenders, the facility shall be reviewed by the Juvenile Board if there are a greater number of juveniles residing in the facility or, if there are a greater number of adults than juveniles residing in the facility, by the Adult Board.

b. The review shall include but not necessarily be limited to criteria established by the applicable board and adopted by the City. Criteria

shall be established and maintained by the applicable board and shall be based upon researched factors that have been demonstrated to be correlative to risk to the community, community expectations, prudent land use practices and legal standards. Before any criteria being used by either board, the City shall review and adopt such criteria.

c. It is the responsibility of the group living facility that is being reviewed to provide the appropriate board with complete and accurate information regarding the types of offenders, the number of offenders, the average length of placements and responses to the other established criteria.

d. The appropriate board shall make a recommendation to the Director to approve, deny, or approve with conditions the land use application for the facility. The appropriate board shall take into consideration the interests of the community in light of the criteria established by the board and approved by the City.

(h) (Reserved)

(i) Sign Package.

(1)

Common Procedures for Administrative Applications	
1	General Meeting or Pre-Application Meeting Per Table 21.02-3
2	Application Submittal & Review | §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Director Decision § 21.02.030(h)
5	

Purpose.The purpose of a sign package application is to allow the review and approval of signs that function as one on a developed site or abutting developed sites with the sharing of vehicular access through, across, over, entrance onto, and/or exit from the site and/or parking.

(2) Review Procedures.Applications for a Sign Package shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b), with the following modifications:

(i) Review Criteria.The following addition review criteria apply to a sign package application:

(A) All signs included on the site shall be in conformance with the criteria set forth in GJMC § 21.10.070.

(B) The application of the sign package is not contrary to and better implements the goals and objectives of the Comprehensive Plan, including but not limited to applicable neighborhood plans, corridor plans, and other adopted plans.

(C) The application of the Sign Package is not contrary to and better implements the goals and objectives of moderating the size and number of signs as well as the reduction of clutter and obtrusive placement of signs.

(ii) Post-Decision Actions.A Sign Package approval limits the characteristics of each sign within the Sign Package. Any increase in any sign characteristic must be reviewed and approved as a new Sign Package. Any changes to the Sign Package approval, including modification or termination, other than termination due to change of use on a site or termination of the shared access or parking, shall require the written consent of all landowners of each of the sites included within the approved Sign Package.

(iii) Lapsing and Extension of Approvals.A Sign Package does not expire as long as the Sign Package is established within 180 days of approval and as long as a use on a site has not changed and the site continues to share vehicular access through, across, over, entrance onto, and/or exit from the site and/or parking. All the parcels functioning as one shall be considered the site to which the Sign Package is applicable.

(j) Subdivision, Minor.

(1)

Common Procedures for Administrative Applications	
1	General Meeting or Pre-Application Meeting Per Table 21.02-3
2	Application Submittal & Review | §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Director Decision § 21.02.030(h)
5	

Purpose.The Minor Subdivision process allows an applicant to create or consolidate lots, move lot lines, and correct plats.

(2) Applicability.This section shall apply to any application to:

(i) Consolidate one or more lots;

(ii) Create up to three additional lots where no new infrastructure is required except as provided in GJMC § 21.02.040(j)(3)(i) below;

(iii) Adjust a lot line(s) between parcels in the same ownership;

(iv) Change a non-disputed boundary line between abutting lots or parcels; or

(v) Change a plat to:

(A) Correct an error in the description;

(B) Correct any monument; or

(C) Correct a clerical error such as lot numbers, acreage, street names and identification of adjacent recorded plats.

(3) Review Procedures.Applications for a Minor Subdivision shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b) with the following modifications:

(i) Lots with Individual Septic Disposal Systems. An applicant may request a subdivision of existing parcels that are 25 acres or larger into three or fewer lots each of which are two acres or larger in size in Residential zone districts provided the resulting subdivision complies with the following criteria:

(A) All lots comply with this Code; except that the minimum density/intensity requirements of a zone district or the Comprehensive Plan do not apply except in the R-R zone and the sewer regulations pertaining to the extension of sewer as a condition of subdivision need not be complied with if the applicant can demonstrate the following:

a. The applicant's Colorado professional engineer affirms in writing that the lot can be served by an individual septic disposal system (ISDS) constructed at or prior to use of the lot for uses allowed by this Code then in existence;

b. The constructed ISDS system continues to function properly;

c. Sewer is not constructed within 400 feet of any lot line of any lot or out lot or out parcel created under the minor exemption subdivision process; and

1. The landowner executes a utility extension agreement in a form acceptable to the City. The utility extension agreement shall authorize the sewer to be extended by the City at a future date (all as provided herein) at the then landowner's expense and/or in accordance with financing provided by the City and/or the sewer system.

2. The applicant is not seeking a variance or is seeking only to vary the requirement of extending sewer. No other variances shall be considered with a Minor Subdivision. Any other variances requested shall require the application be processed as a Major Subdivision;

3. The proposed lot(s) is two acres or larger in size on a gross acreage basis and is created from a parcel at least 25 acres in size;

4. The property from which the new lot(s) is proposed has been taxed agriculturally for the five years preceding the Minor Subdivision application; and

5. The lot or originating parcel has not previously had a Minor Exemption Subdivision (2010 Code), Minor Subdivision, a Mesa County minor subdivision, and/or Mesa County simple land division approval.

(B) If the Minor Subdivision does not comply with the sewer regulations at the

time of approval, then the approval shall be a conditional approval requiring the ISDS to be abandoned prior to the end of its useful life if a sewer is constructed either within 400 feet of the lot line of any lot or out lot or out parcel created under the Minor Subdivision process, or if the ISDS fails, or a sewer improvement district is formed that includes the lot created and any out lot or parcel.

(ii) Review Criteria.The Director shall review the application against the following additional criteria:

(A) Any changes to existing easements or right-of-way have been completed in accordance with this Code or otherwise allowed by law (additional easements or right-of-way may be dedicated);

(B) The right-of-way shown on the Grand Junction Circulation Plan is not changed;

(C) If any part of the original parcel has an ISDS, the requirements of GJMC § 21.02.040(j)(3)(i) are met; and

(D) If a new lot(s) is being created, the total number of new lots on the property created through Minor Subdivision within the preceding 10 years does not exceed four.

(iii) Plat Notes.Approved Minor Subdivisions shall include the following plat notes, as applicable:

(A) "Any additional lot splits are required to be processed through applicable City subdivision processes. The property shown hereon may not be further subdivided without approval of the City in accordance with then applicable law."

(B) "In accordance with a Utility Extension Agreement the City may require any ISDS on the property to be abandoned prior to the end of its useful life if a sewer is constructed within 400 feet of the lot line of any lot created under the Minor Subdivision process or the ISDS fails or a sewer improvement district is formed that includes the lot."

(4) Post-Decision Actions.The final Minor Subdivision plat shall be recorded pursuant to GJMC § 21.02.040(l)(5)(ii)(F)b.

(5) Lapsing and Extension of Approvals.A Minor Subdivision shall be recorded within two years of approval or it shall expire.

(6) Effect.Approval of a Minor Subdivision does not transfer property between the two affected property owners. The real estate transfer must be achieved through separate action by both property owners involved.

(k) Site Plan, Major and Minor.

(1)

Common Procedures for Administrative Applications	
1	General Meeting or Pre-Application Meeting Per Table 21.02-3
2	Application Submittal & Review | §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Director Decision § 21.02.030(h)
5	

Purpose.The purpose of this section is to determine if proposed development is in compliance with this Code, the Comprehensive Plan, adopted corridor guidelines, and other applicable regulations.

(2) Applicability.Site Plan review is required for all development applications except as provided in this section.

(i) Major Site Plan.Any proposed development that exceeds the criteria for a Minor Site Plan in Subsection (k)(2)(ii) and that is not exempt in Subsection (k)(2)(iii) is required to be reviewed through the Major Site Plan process.

(ii) Minor Site Plan.The following types of development require a Minor Site Plan:

(A) A new, non-habitable structure of up to 1,000 gross square feet of water and sewer services are not provided and if no structures currently exist on the parcel;

(B) An addition of up to 1,000 gross square feet to an existing structure, or a new structure of up to 1,000 square feet on a lot with one or more structures;

(C) An existing unpaved parking lot or existing unpaved work area to be paved with asphalt or concrete;

(D) Similar low-impact uses; and

(E) A development that the Director determines does not require a Major Site Plan review when the development will not adversely affect the neighborhood and meets the purpose and intent of this Code.

(iii) Exempt Development Types.The following development types are exempt from the Site Plan review process:

(A) A residential structure with one or two dwellings and associated accessory structures;

(B) Nonresidential, interior remodeling which will cost 25% or less of the fair market value of the existing structure;

(C) An approved home occupation;

(D) An approved temporary use;

(E) An approved fence or wall;

(F) An approved sign;

(G) Parking lot resurfacing, provided that the number of stalls is not reduced beyond the minimum required or, if legally nonconforming, in compliance with GJMC Chapter 21.12;

(H) A temporary office trailer;

(I) Enclosing outdoor courtyards within existing building envelopes;

(J) Co-location of telecommunication tower;

(K) Electric vehicle charging stations;

(L) Public utility structures;

(M) Unenclosed structures constructed over already impervious areas that do not require water/sewer; and

(N) A development that the Director determines does not require a Minor Site Plan review when the development will not adversely affect the neighborhood and meets the purpose and intent of this Code.

(3) Post-Decision Actions.

(i) Planning Clearance and Building Permit. Major Site Plan review shall be completed prior to issuance of a Planning Clearance and a Building Permit.

(ii) Construction Plans.

(A) Purpose and Applicability.

a. The purpose of Construction Plans is to confirm the location, design, and composition of all improvements identified in an approved development application.

b. Construction Plans are required for any Major Site Plan approval that necessitates the construction, reconstruction, or modification of new or existing improvements.

(B) Review Procedures.

a. When required, a completed Development Improvements Agreement (DIA) for any required public improvements, together with an acceptable financial guarantee, must be submitted with the construction drawings.

b. Construction Plans shall be prepared in conformance with the approved Final Plat and the City's adopted standards for public improvements including those contained in this Code.

c. As-built plans must be submitted to the Director prior to acceptance of public improvements for City maintenance.

(4) Lapsing and Extension of Approvals.Approved Major or Minor Site Plans shall

remain valid for two years.

(l) Subdivision, Major.

(1) Purpose.The purposes of the major subdivision review process are to:

(i) Ensure conformance with the Comprehensive Plan and other adopted plans including all corridor design guidelines;

(ii) Assist orderly, efficient, and integrated development;

(iii) Promote the health, safety, and welfare of the residents of the City;

(iv) Ensure conformance of land subdivision plans with the public improvement plans of the City, county and state;

(v) Ensure coordination of the public improvement plans and programs of the several area governmental entities;

(vi) Encourage well-planned and well-built subdivisions by establishing minimal standards for design and improvement;

(vii) Improve land survey monuments and records by establishing minimal standards for survey and plats;

(viii) Safeguard the interests of the public, the homeowner, and the subdivider;

(ix) Secure equitable handling of all subdivision plans by providing uniform procedures and standards;

(x) Ensure that pedestrian and bicycle paths and trails are extended in accordance with applicable City plans;

(xi) Preserve natural vegetation and cover, and to promote the natural beauty of the City;

(xii) Prevent and control erosion, sedimentation, and other pollution of surface and subsurface water;

(xiii) Prevent flood damage to persons and properties;

(xiv) Restrict building in areas poorly suited for building or construction;

(xv) Prevent loss and injury from landslides, mudflows, and other geologic hazards;

(xvi) Ensure adequate public facilities and services are available or will be available concurrent with the projected impacts of the subdivision; and

(xvii) Ensure the proposal will not impose hardship or substantial inconvenience to nearby landowners or residents.

(2) Subdivision Required.No person shall record a plat of a subdivision nor prepare or execute any documents which purport to create or creates a new parcel or airspace unit, nor record or execute a deed of trust or a mortgage descriptive of the property other than all of a lot or parcel unless such plat, deed, deed of trust or mortgage has been approved by the City and unless it conforms to all of the provisions of this Code.

(3) Applicability.This section shall apply to all subdivisions that do not meet the criteria for a Simple Subdivision.

(4) Preliminary Subdivision Plan.

Common Procedures for Administrative Applications	
1	General Meeting or Pre-Application Meeting Per Table 21.02-3
2	Application Submittal & Review | §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Director Decision § 21.02.030(h)
5	

(i) Review Procedures.Applications for a Preliminary Subdivision Plan shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b), with the following modifications:

(A) Application.In an effort expedite Final Plat approval, the applicant may provide more detailed information than is required for Preliminary Subdivision Plan review.

(B) Public Notice.Notice shall be provided as follows:

a. Within five working days of receipt of a complete application, the Director shall give notice, at the applicant's cost, by U.S. mail to each person shown as an owner within 500 feet and at the address by the County Assessor.

b. The Director may require the applicant pay for additional notice, in any form, for any type of proposal if such notice will further the purpose or intent of this Code.

(C) Review Criteria.The Director shall review the application for Preliminary Subdivision Plan in light of the following additional criteria:

a. Conformance with the Comprehensive Plan, Grand Junction Circulation Plan, and other adopted plans;

b. Conformance with the standards and requirements of this Code and other City policies and regulations;

c. The project will have little or no adverse or negative impact(s) upon the natural or social environment;

d. Adequate public facilities and services will be available concurrent with the subdivision;

e. Compatibility with existing and proposed development on adjacent properties;

f. Adjacent agricultural property and land uses will not be harmed;

g. Is neither piecemeal development nor premature development of agricultural land or other unique areas;

h. There is adequate land to dedicate for provision of public services; and

i. This project will not cause an undue burden on the City for maintenance or improvement of land and/or facilities.

(ii) Lapsing and Extension of Approvals.

(A) The applicant may propose a development phasing schedule at the time of application for a Preliminary Subdivision Plan for consideration by the Director.

(B) In the absence of an approved phasing schedule, a Preliminary Subdivision Plan approval shall be valid for only two years, during which the applicant shall obtain Final Plat approval for all or a portion of the property.

(C) If a part of the property in the Preliminary Subdivision Plan is Final Platted within two years, the Preliminary Subdivision Plan approval shall be automatically renewed for an additional one year following the recording of each Final Plat, unless the Director notifies the applicant, in writing, to the contrary.

(D) The applicant shall plat the entire property included in the Preliminary Subdivision Plan within six years of the initial plan approval date. After six years, approval of unplatted portions of the Preliminary Subdivision Plan shall be considered void unless an extension is requested and approved by the decision-making body. One extension of 12 months may be granted by the Director so long as the Preliminary Subdivision Plan is consistent with the approved plan set, unless the Director determines that any currently adopted requirements of current codes, laws or regulations are necessary for public health, safety, and welfare. The Director may approve an extension of the approved plan set with the amendment(s) determined necessary or deny the extension. Additional extensions may be granted by the Planning Commission so long as the plan is consistent with the approved plan set and the plan set has been amended as determined necessary by the Director for public health, safety, and welfare purposes.

(5) Final Plat.

(i) Applicability.This section shall apply to all subdivisions that do not meet the criteria for a Simple Subdivision.

(ii) Review Procedures.Applications for a Final Plat shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b), with the following modifications:

(A) Portion of Preliminary Plan.A portion of the land area within the approved Preliminary Plan may be approved for platting.

(B) Common Interest Community.If the subdivision is a "common interest

community" as defined in § 38-33.3-103(8) C.R.S., then the following shall apply:

a. The applicant shall include a declaration pursuant to §§ 38-33.3-201, 38-33.3-205 and 38-33.3-209 C.R.S.;

b. The applicant shall address the exercise of development rights pursuant to § 38-33.3-210 C.R.S.;

c. The applicant shall include the association bylaws pursuant to § 38-33.3-306 C.R.S. as applicable; and

d. An association shall be formed pursuant to § 38-33.3-301 C.R.S. and filed with the Colorado Secretary of State.

(C) Title Commitment.A title commitment no older than 10 days shall be provided before the filing of the Final Plat for all of the platted property.

(D) Concurrent Processing.If a minor revision of a Preliminary Subdivision Plan is required, the review of the revised Preliminary Subdivision Plan may, at the discretion of the Director, proceed concurrently with Final Plat review.

(E) Review Criteria.The Director shall review the application for Final Plat in light of the following additional criteria:

a. The decision criteria for a Preliminary Subdivision Plan set forth in GJMC § 21.02.040(l)(4)(i)(C);

b. The terms of the Preliminary Subdivision Plan approval and any conditions attached to the approval; and

c. Any actions required to remedy existing or potential boundary line encroachments, including the relocation of fences or structures, prior to recording the Final Plat.

(F) Post-Decision Actions.

a. Plat Revisions.If the Director approves the Final Plat, then the applicant's surveyor or engineer shall then make any changes necessary or required to comply with final approval conditions. The form of final approval by the Director shall be the recording of the Final Plat.

b. Recordation.

1. The Director shall record all Final Plats and related documents.

2. When all boundary line encroachments have been remedied, the Director shall proceed with recording as follows:

i. The original plat, together with any other required documentation such as, but not limited to, the following, shall be submitted for recording along with all necessary

recording fees: a Mylar copy; improvements agreements; powers of attorney; easement or right-of-way dedications not shown on the plat; covenants; deeds conveying property to the homeowners' association; etc. The plat shall contain notarized signatures of each owner of the property, necessary engineer's and surveyor's signatures, and corporate seal, if required. All signatures and seals on the plat shall be in permanent black ink.

ii. The Director shall obtain the applicable signatures of public officials required on the plat. Upon review and payment of fees by the applicant, the Director shall record the plat at the office of the County Clerk and Recorder.

iii. Upon recording the plat, applications for Planning Clearances and Building Permits may be submitted in accordance with the provisions of this Code.

c. Guarantees for Public Improvement.

1. Except as provided herein, before the plat is recorded by the Director, all applicants shall be required to complete, to the satisfaction of the Director, all street, sanitary, and other public improvements, as well as lot improvements on the individual lots of the subdivision or addition as required by this Code. The required improvements shall be those specified in the approved Construction Plans.

2. The plat shall not be recorded until the improvements have been completed or as a condition of Final Plat approval, the City shall require the applicant to enter into a Development Improvements Agreement and post a guarantee for the completion of all required improvements.

d. Construction Plans.Construction Plans shall be submitted and reviewed pursuant to GJMC § 21.02.040(f).

(iii) Lapsing and Extension of Approvals.A Final Plat shall be recorded within two years of action by the Director or as directed in the approved development phasing schedule, subject to the extensions set forth in GJMC § 21.02.040(l)(4)(ii). Final Plats that are not recorded within the appropriate timeframe shall be considered expired.

(Ord. No. 5242, 12/4/2024; Ord. 5218, 5/1/2024; Ord. 5190, 12/20/2023)

§ 21.02.050. Applications requiring a public hearing.

(a) Overview.Major development applications are reviewed and decided on by the Planning Commission or City Council. The following application types are major development applications:

Table 21.02-7: Major Development Application Summary		
Application Type	**Purpose**	**Additional Application Requirements**
Annexation	Expand the City's boundaries to include new land area or relocate the City's boundaries to remove existing land area	§ 21.02.050(c)
Code Text Amendment	Review requested amendments to the Code Text	§ 21.02.050(d)
Comprehensive Plan Amendment, Non-Administrative	Review requested non-administrative amendments to the Comprehensive Plan or Circulation Plan.	§ 21.02.050(e)
Conditional Use Permit	Review a request to use a property for an activity that normally is not permitted within a zone district	§ 21.02.050(f)
Conditional Use and Special Dimensional Permit Amendment, Termination, or Revocation	Allow the post-approval review of Conditional Use Permits and Special Dimensional Permits for change or termination.	§ 21.02.050(g)
Extended Temporary Use	Review requested for a temporary use for a period of time exceeding 180 days	§ 21.02.050(h)
Institutional and Civic Facility Master Plans	Early review of major institutional and civic facilities that provide a needed service to the community	§ 21.02.050(i)
Planned Development	Allow the creation of developments with project-specific standards in situations where the development will provide a benefit to the community.	§ 21.02.050(j)
Rehearing and Appeal	Provide for a rehearing and appeal process for permits and approvals	§ 21.02.050(k)
Revocable Permit, City Council Approval	Review to ensure that any private development on public land is safely conducted in a manner that does not pose potential burdens on the public	§ 21.02.050(l)

Table 21.02-7: Major Development Application Summary		
Application Type	**Purpose**	**Additional Application Requirements**
Rezoning	Review requested amendments to the Zoning Map	§ 21.02.050(m)
Special Dimensional Permit	Provide an opportunity for additional dimensional flexibility in certain zone districts	§ 21.02.050(n)
Vacation of Plat	Process for the vacation of any plat that has not been developed, has been partially developed, or has not been developed as approved	§ 21.02.050(o)
Vacation of Public Right-of-Way or Easement	Process for the vacation of any street, alley, easement, or other public reservation	§ 21.02.050(p)
Variance	Process for consideration of variances from certain standards of this Code	§ 21.02.050(q)
Vested Property Right	Procedures to implement the statutory vested rights provisions	§ 21.02.050(r)

(b) Common Procedures.

(1) Review Procedures for Major Development Applications. Procedures for review and decision of major development applications are established in GJMC § 21.02.030. They are summarized here for applicant convenience.

Major Development Applications		
Action	**When Applicable**	**Described in Section**
1	Per Table 21.02-3	
2	All Applications	
3	Individually, As Needed	
4	Determined by Specific Application Type	§ 21.02.030(g)
5		

Major Development Applications			
	Action	When Applicable	Described in Section
6		Determined by Specific Application Type	§ 21.02.030(h)
7			

(2) Review Criteria for Major Development Application Types. The decision-maker shall review each application against the criteria described in the specific application type.

(c) Annexation.

(1) Purpose.In accordance with state law, land may be annexed to, or de-annexed from, the City as determined by the City Council.

(2) Applicability.Any lands to be added to or deleted from the corporate limits of the City shall comply with this section.

(i) Waiver of Vested Rights.Any landowner requesting annexation shall waive in writing any preexisting vested property rights from other jurisdictions in the petition for annexation. An owner's written consent is considered sufficient to waive any prior vested property rights.

(ii) City-Initiated Annexations.Annexations of enclaves, property owned by the City or under lease to the City with an option to purchase, and property predominately containing a City-managed or - operated facility are exempt from Steps 1 through 3 of the common review procedures for major development applications.

(3) Review Procedures.Application requirements and processing procedures shall comply with those described in state law.

(4) Approval Criteria.The application shall meet all applicable statutory and City administrative requirements. The City Council shall use the following criteria when evaluating a request for annexation. Annexation is, however, a discretionary, legislative act. The City shall never be compelled to annex, unless otherwise required by state law, even if all these review criteria have been satisfied.

(i) The annexation complies with the Municipal Annexation Act of 1965, as amended (§ 31-12-101 C.R.S., et seq.). Contiguity is presumed to satisfy the eligibility requirement of § 31-12-104 C.R.S.

(ii) The proposed zoning is appropriate, based upon consideration of the following factors:

(A) The proposed zoning is consistent with the Comprehensive Plan designation of the property; and

(B) The proposed land uses are consistent with the purpose and intent of the proposed zone district.

(iii) The annexation will not limit the ability to integrate surrounding land into the City or cause variances or exceptions to be granted if the adjacent land is annexed or developed.

(iv) The landowner has waived in writing any preexisting vested property rights as a condition of such annexation.

(5) Review and Recommendation.The Director shall make recommendations to City Council.

(6) Decision by City Council.City Council shall approve, conditionally approve, or disapprove all applications for annexation or de-annexation of the municipal limits.

(7) Zoning of Annexed Areas.Land annexed to the City shall be zoned in accordance with GJMC § 21.02.050(d) to a district that is consistent with the adopted Comprehensive Plan and the criteria set forth. Where a required density is not specified in the Comprehensive Plan, future development shall be at a density equal to or greater than the allowed density of the applicable County zone district.

(d) Code Text Amendment.

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose.The purpose of this section is to establish the procedure and requirements for requested amendments to the text of this Code.

(2) Authority to Initiate.Amendments to this Code may be proposed by property owners, the City, the Planning Commission, or City Council in order to:

(i) Reflect trends in development or regulatory practices;

(ii) Expand, modify, or add requirements for development in general or to address specific development issues;

(iii) To add, modify or expand zone districts; or

(iv) To clarify or modify procedures for processing development applications.

(3) Review Procedures.Applications for Code Text Amendment shall meet the common review procedures for major development applications in GJMC § 21.02.050(b), with the following modifications:

(i) Application Information.An application for a Code Amendment shall address in

writing the reasons for the proposed amendment.

(ii) Public Notice and Hearing Requirements. The application for either Code Text Amendment shall be scheduled for public hearings before the Planning Commission and City Council and shall be noticed pursuant to GJMC § 21.02.030(g).

(iii) Review Criteria.An applicant for a Code Text Amendment has the burden of producing evidence that proves each of the following criteria:

(A) Consistency with Comprehensive Plan.The proposed Code Text Amendment is generally consistent with applicable provisions of the Comprehensive Plan.

(B) Consistency with Zoning and Development Code Standards. The proposed Code Text Amendment is consistent with and does not conflict with or contradict other provisions of this Code.

(C) Specific Reasons.The proposed Code Text Amendment shall meet at least one of the following specific reasons:

a. To address trends in development or regulatory practices;

b. To expand, modify, or add requirements for development in general or to address specific development issues;

c. To add, modify or expand zone districts; or

d. To clarify or modify procedures for processing development applications.

(4) Lapsing and Extension of Approvals.Approved Code Text Amendments do not expire.

(e) Comprehensive Plan Amendment, Non-Administrative.

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice | § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose.The purpose of this section is to ensure that proposed amendments to the Comprehensive Plan are consistent with the vision, goals, and policies included in the Plan.

(2) Applicability.

(i) This section shall apply to all proposed amendments to or adoption of the text of the Comprehensive Plan. For purposes of this section, the Comprehensive Plan shall include all neighborhood plans, corridor plans, area plans, the Grand Junction Circulation Plan, and all other elements adopted as a part of the Comprehensive Plan.

(ii) Any proposed development that is inconsistent with any goals or policies of the Comprehensive Plan shall first receive approval of a Comprehensive Plan Amendment.

(3) Jurisdiction Approvals.Changes to various areas of the Grand Junction Comprehensive Plan require different land use approvals:

(i) Land use changes located within the City limits may be approved by the City and do not require County approval.

(ii) Changes to land use designations inside the Persigo 201 Boundary (outside the City limits) require annexation and City approval and do not require County approval.

(iii) Changes to land use designations outside of the Persigo 201 Boundary require County approval and do not require City approval.

(iv) Changes to the Persigo 201 Service Area require approval by the Persigo Board, which is comprised of the County Commissioners and the City Council.

(v) Each entity will have an opportunity to comment on proposed changes to the Comprehensive Plan prior to adoption of the amendment.

(4) Review Procedures.Applications for Comprehensive Plan Amendment shall meet the common review procedures for major development applications in GJMC § 21.02.050(b), with the following modifications:

(i) Public Notice and Public Hearing Requirements. The application shall be scheduled for public hearings before the Planning Commission and City Council and shall be noticed pursuant to GJMC § 21.02.030(g) unless the amendment meets the criteria for an administrative change.

(ii) Administrative Changes.Where the City has sole jurisdiction, the Director has the authority to approve Comprehensive Plan Amendment Applications pursuant to GJMC § 21.02.040(f).

(iii) Review Criteria for Comprehensive Plan Amendments (Non-Administrative).The Planning Commission and City Council shall review a Comprehensive Plan Amendment request in light of the following criteria:

(A) The existing Comprehensive Plan and/or any related element thereof requires the proposed amendment; and

(B) The community or area will derive benefits from the proposed amendment; and/or

(C) The amendment will be consistent with the vision, goals, principles, and policies of the Comprehensive Plan and the elements thereof.

(iv) Review Criteria for Circulation Plan Amendments (Non-Administrative). Unless otherwise specified in Subsection (a), above the Planning Commission and City Council shall review a Circulation Plan Amendment request in light of the following criteria:

(A) There was an error such that then-existing facts, projects, or trends that were reasonably foreseeable were not accounted for; or

(B) Subsequent events have invalidated the original premises and findings;

(C) The character and/or condition of the area have changed enough that the amendment is acceptable;

(D) The community or area, as defined by the presiding body, will derive benefits from the proposed amendment;

(E) The change will facilitate safe and efficient access for all modes of transportation; and

(F) The change furthers the goals for circulation and interconnectivity.

(v) Failure of Amendment. If an amendment request fails, any pending development application must be changed to be consistent with the plan.

(5) Lapsing and Extension of Approvals. An approved Comprehensive Plan or Circulation Plan Amendment does not expire.

(f) Conditional Use Permit (CUP).

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice | § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose. The purpose of this section is to provide an opportunity for an applicant to request to use a property for an activity that normally is not permitted within a zone district because it could be detrimental to other permitted uses. A conditional use may be permitted under circumstances particular to the proposed location and subject to conditions that provide protection to adjacent land uses. A conditional use is not a use by right; it is one that is otherwise prohibited within a given zone district without approval of a Conditional Use Permit.

(2) Applicability. This section shall apply to any use that is classified as a Conditional Use in Table 21.04-1: Principal Use Table, Table 21.04-2: Accessory Use Table, or elsewhere in this Code.

(3) Review Procedures, General.Applications for Conditional Use Permits shall meet the common review procedures for major development applications in GJMC § 21.02.050(b), with the following modifications:

(i) Site plan review and approval (pursuant to GJMC § 21.02.040(k)) can occur either before or after the approval of a Conditional Use Permit by the Planning Commission. In either case, the applicant shall submit a site sketch showing sufficient detail to enable the Planning Commission to make findings on the Conditional Use Permit criteria and showing all site design features which are proposed or necessary to mitigate neighborhood impacts and/or enhance neighborhood compatibility.

(ii) The Planning Commission can request additional information from the applicant if it deems the site sketch is insufficient to enable it to make a determination on the criteria. In any subsequent site plan review, the Director shall ensure and determine that all mitigating/enhancing site features approved or made conditions of approval by the Planning Commission are depicted on the approved site plan.

(iii) Public Notice and Public Hearing Requirements. The application shall be scheduled for a public hearing before the Planning Commission and shall be noticed pursuant to GJMC § 21.02.030(g), unless the application is for a minor expansion or change of a Conditional Use Permit in accordance with GJMC § 21.02.050(g), below.

(iv) Review Criteria for Conditional Use Permits. The Planning Commission shall review and decide on a Conditional Use Permit request in light of the following criteria:

(A) The proposed use is consistent with the Comprehensive Plan and the purpose of the applicable zone district.

(B) The proposed use complies with the requirements of this Code, including any use-specific standards for the use in GJMC Chapter 21.04.

(C) The proposed use is of a scale and design and in a location that is compatible with surrounding uses and potential adverse effects of the use will be mitigated to the maximum extent practicable.

(D) The proposed conditional use will not substantially diminish the availability of land for principal uses within the applicable zone district.

(E) The City's existing infrastructure and public improvements, including but not limited to its street, trail, and sidewalk systems, have adequate capacity to serve the proposed development.

(4) Review Procedures, Mining and Extraction.

(i) Commercial extraction of mineral deposits shall not begin or occur until an excavation and land reclamation plan have been approved in writing by the Colorado Mined Land Reclamation Board. A plan approved as part of a Conditional Use Permit and/or a reclamation/development schedule being followed under previous regulations fulfills this requirement.

(ii) Asphalt, cement and/or other batch plant operations shall be subject to Conditional Use Permit requirements.

(iii) Upon approval, the excavation and reclamation plans shall be filed with the City and recorded with the Mesa County Clerk and Recorder. Any change in excavation or reclamation plan shall be prohibited unless amended through the Conditional Use Permit process.

(iv) If the development schedule is not, met the Conditional Use Permit:

(A) May be revoked;

(B) The Director may grant a two-year extension per request;

(C) The Planning Commission shall have the power, after hearing, to revoke any Conditional Use Permit for any violation;

(D) Upon at least 10 days' written notice to the owner, the Planning Commission may hold a hearing to determine the nature and extent of the alleged violation, and shall have the power, upon showing of good cause, to revoke the permit and the plan and to require reclamation of the land;

(E) If not extended or revoked, a new application and extraction plan will need to be submitted and reviewed in the manner described in this subsection;

(F) An extension request shall provide information in writing detailing the reasons for the request. The Director shall consider the stated reasons, as well as the extent conditions have changed in the area, if any, before granting an extension;

(G) If a written request to extend the development schedule is submitted to the Director it shall include but not necessarily be limited to the factors and reasons for the requested extension. New conditions may be imposed as a part of the granting of an extension. New conditions, if any, may be appealed to the Planning Commission to be considered at a public hearing;

(H) The Director may forward any extension request to the Planning Commission; and

(I) Extension requests will be evaluated by the Director and/or Planning Commission on the same basis and with the same information as per the Conditional Use Permit process.

(v) If the use has not operated or if no material has been extracted in accordance with the development schedule or any extension of the development schedule, the Conditional Use Permit shall expire.

(5) Post-Decision Actions.

(i) Major or Minor Change or Expansion.If the applicant proposes to change or expand a structure or other feature of a site that is subject to a Conditional Use Permit, the Director shall determine whether the expansion/change is major or minor as follows:

(A) Determination of Major or Minor Status.

a. A major expansion or change is one that:

1. Affects, changes, removes, or eliminates a site feature or condition that was approved or imposed for the purpose of mitigating neighborhood impacts or enhancing neighborhood compatibility;

2. Increases the intensity of the use, the off-site impacts such as noise, light or odor, or the hours of operation; and

3. Results in a substantial change to the features shown on the site sketch which formed the basis of the Planning Commission's approval of the Conditional Use Permit.

b. All other expansion/changes shall be considered minor.

(B) Application Process.

a. A major expansion/change shall be reviewed by the Planning Commission in accordance with the criteria for an original application for Conditional Use Permit.

b. A minor expansion/change shall be reviewed by the Director in accordance with the applicable site plan review criteria and conditions of the Conditional Use Permit.

(ii) Amendment, Revocation, or Termination. Conditional Use Permits may be amended, revoked, or terminated pursuant to GJMC § 21.02.050(g).

(iii) Lapsing and Extension of Approvals.A Conditional Use Permit approval shall remain valid until the property changes use or the use is abandoned and nonoperational for a period of 12 consecutive months.

(g) Conditional Use, Extended Temporary Use, and Special Dimensional Permit Amendment, Termination, or Revocation.

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose.This section is intended to allow the post-approval review of Conditional Use Permits, Extended Temporary Use Permits, and Special Dimensional Permits for amendment, termination, or revocation.

(2) Interested Party.Any interested party may apply to the City for the amendment, termination, or revocation of a Conditional Use, Extended Temporary Use, or Special Dimensional Permit. For purposes of this section, "interested party" shall include the following:

(i) The original applicant or successor in interest, or the current owner or lessee of the property for which the conditional use was granted (permit holder);

(ii) The City; and

(iii) Any owner or lessee of property that lies within 500 feet of the property for which the Conditional Use Permit was granted.

(3) Preliminary Criteria.An applicant for amendment, termination, or revocation of a Conditional Use, Extended Temporary Use, or Special Dimensional Permit must establish the following to the satisfaction of the decision-maker before the requested change(s) can be considered by the decision-maker:

(i) Permit Holder.A Conditional Use, Extended Temporary Use, or Special Dimensional Permit may be amended or terminated at the request of the permit holder as follows:

(A) Grounds for Amendment.

a. The permit holder shall show that a substantial change in circumstance has occurred since the approval of the permit that would justify a change in the permit.

b. An Extended Temporary Use permit may only be amended in accordance with GJMC § 21.02.050(h)(6)(i).

(B) Grounds for Termination.The permit holder shall show that the use is an allowed use in the zone district in which it is now established or that the use has ceased to exist.

(ii) Other Interested Party.A Conditional Use, Extended Temporary Use, or Special Dimensional Permit may be revoked at the request of any other interested party if one or more of the following is established:

(A) The permit was obtained by misrepresentation or fraud;

(B) The use, or, if more than one, all the uses, for which the permit was granted has ceased or has been suspended for six months;

(C) The permit holder has failed to comply with any one or more of the conditions placed on the issuance of the permit;

(D) The permit holder has failed to comply with one or more of the City regulation governing the conduct of that use;

(E) The permit holder has failed to construct or maintain the approved site as shown on the approved Site Plan;

(F) The operation of the use or the character of the site has been found to be a

nuisance or a public nuisance by a court of competent jurisdiction in any civil or criminal proceeding.

(4) Due Process.

(i) No Conditional Use, Extended Temporary Use, or Special Dimensional Permit shall be revoked without first giving the permit holder an opportunity to appear before the decision-maker and show cause as to why the permit should not be revoked.

(ii) Revocation of the permit shall not limit the City's ability to initiate or complete other legal proceedings against the holder or user of the permit.

(5) Review Procedures.

(i) All applications for amendment, or revocation, of a Conditional Use, Extended Temporary Use, or Special Dimensional Permit shall be processed in the same manner and based on the same review criteria as a new request for a Conditional Use or Special Dimensional Permit.

(ii) All applications for termination of a Conditional Use or Extended Temporary Use Permit shall be reviewed and decided on by the Director.

(iii) Any person or entity, other than the City, seeking to amend, terminate, or revoke an approved Conditional Use, Extended Temporary Use, or Special Dimensional Permit shall pay a fee in the amount established for an original application for a Conditional Use or Special Dimensional Permit.

(h) Extended Temporary Use Review.

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose. The purpose of this subsection is to provide an opportunity for an applicant to request review of a temporary use for a period of time exceeding 180 days.

(2) Applicability. This subsection shall apply to any use that is classified as an Extended Temporary Use in Table 21.04-1: Principal Use Table or Table 21.04-2: Accessory Use Table.

(3) Review Procedures, General. Applications for Extended Temporary Use review shall meet the common review procedures for major development applications in GJMC 21.02.050(b), with the following modifications:

(i) A neighborhood meeting is required.

(ii) Site plan review and approval (pursuant to GJMC § 21.02.040(k)) can occur either before or after the approval of an Extended Temporary Use. In either case, the applicant shall submit a site sketch showing all site design features that are proposed or necessary to mitigate site and neighborhood impacts and/or enhance neighborhood compatibility in sufficient detail to enable the Planning Commission to recommend on or the City Council to make findings on the Extended Temporary Use criteria.

(iii) The Planning Commission or City Council can request additional information from the applicant if it deems the site sketch is insufficient to enable it to decide on the criteria.

(iv) In any subsequent site plan review, the Director shall determine that all mitigating/enhancing site features approved or made conditions of approval by the City Council are depicted on the approved site plan.

(4) Public Notice and Public Hearing Requirements. The application shall be scheduled for a public hearing before the Planning Commission and City Council, and shall be noticed pursuant to GJMC § 21.02.030(g), unless the application is for a minor expansion or change of an Extended Temporary Use approval in accordance with GJMC § 21.02.050(h)(6), below.

(5) Review Criteria for Extended Temporary Use. The Planning Commission shall review and recommend, and the City Council shall decide on an Extended Temporary Use application in light of the following criteria:

(i) The proposed use complies with the applicable requirements of this Code, including any use-specific standards for the use in GJMC Chapter 21.04.

(ii) The proposed use is of a scale and design and in a location that is compatible with surrounding uses.

(iii) Potential adverse effects of the use will be mitigated to the maximum extent practicable.

(iv) The proposed use does not pose an unreasonable risk to public health or safety.

(v) Each parcel or lot is limited to the operation of one extended temporary use at a time.

(6) Post-Decision Actions.

(i) Major or Minor Change or Expansion. If the applicant proposes to change or expand a structure or other feature of a site that is subject to an Extended Temporary Use approval, the Director shall determine whether the expansion/ change is major or minor as follows:

(A) Determination of Major or Minor Status.

a. A major change or expansion is one that:

1. Affects, changes, removes, or eliminates a site feature or

condition that was approved or imposed for the purpose of mitigating neighborhood impacts or enhancing neighborhood compatibility;

2. Increases the intensity of the use, the off-site impacts such as noise, light or odor, or the hours of operation; and

3. Results in a substantial change to the features shown on the site sketch which formed the basis of the City Council's approval of the Temporary Extended Use.

b. All other expansion/changes shall be considered minor.

(B) Application Process.

a. A major change or expansion shall be reviewed by the City Council in accordance with the criteria for an original application for an Extended Temporary Use.

b. A minor expansion/change shall be reviewed by the Director in accordance with the applicable site plan review criteria and conditions of the Extended Temporary Use approval.

(ii) Revocation or Termination. Extended Temporary Use approvals may be revoked or terminated pursuant to GJMC § 21.02.050(g).

(7) Period of Validity. The approval of an interim shelter site may, pending compliance with all applicable standards, be valid for a period of two years from the issue date of the Planning Clearance. One extension for a two-year period may be granted by the City Council, not to exceed a cumulative period of four years.

(8) Criteria for Extensions of Approval or Expansion of the Site.

(i) The City Council may extend the term of an approval in the case of inclement weather, natural disaster, state or federal disaster, or other public emergency, including limited availability of interim shelter sites, necessitates the continued use of the site.

(ii) The City Council will consider the following when reviewing a request for an extension of the Extended Temporary Use permit or expansion of the number of units on a site:

(A) The continuing need for the site as shown through continuous applications for residency and low to no vacancy rates;

(B) The number of life safety code complaints pursued by the Code Enforcement Division on the subject property during the duration of the interim shelter site operation;

(C) The number and type of calls placed to police or fire that result in charges or arrest due to disruptions by on-site residents, not including personal medical incidents not caused by another resident;

(D) Documentation of the transitioning of residents into other long-term or

more stable housing; and

(E) Other documentation related to the outcomes of residents, site conditions, and operations as deemed necessary based on experience with interim shelter sites in Grand Junction.

(9) Expiration of Approval. The approval for an interim shelter site shall expire if the interim shelter site:

(i) Is voluntarily vacated prior to the expiration date and terminated in accordance with GJMC § 21.02.050(g); or

(ii) Does not receive an extension.

(10) No New Applications. Following the operation of one or more interim shelter site(s) for any cumulative period of four years, no new applications may be made for another interim shelter site on the same property.

(i) Institutional and Civic Facility Master Plans.

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose.The purpose of this section is to provide an opportunity for the early review of major institutional and civic facilities that provide a needed service to the community but might impact the surrounding community. The I&C Facility Master Plan review allows the City to assess any impacts early in the review process and direct the applicant about how best to address the impacts.

(2) Applicability.This section shall apply to any institutional and/or civic use when the use will include two or more buildings sharing common facilities on an undivided lot and the development will include any of the following:

(i) Multiple phases of construction;

(ii) One hundred thousand square feet in one or more buildings;

(iii) Modification of the existing transportation circulation patterns; or

(iv) When the Director deems the project and/or the City would benefit from such a review.

(3) Review Procedures.Applications for I&C Facility Master Plans shall meet the common review procedures for major development applications in GJMC

§ 21.02.050(b) with the following modifications:

(i) Application Review.

(A) The review of an I&C Facility Master Plan shall precede, or be concurrent with, any other required review process.

(B) The content of the I&C Facility Master Plan document shall be sufficient to generally assess the following:

a. Site access, traffic flow, pedestrian circulation/safety;

b. Adequate parking;

c. Location of open space and trails;

d. Drainage and stormwater management;

e. General building location and size; and

f. Adequate screening and buffering.

(ii) Public Notice and Hearing Requirements. The application shall be scheduled for public hearings before the Planning Commission and City Council and shall be noticed pursuant to GJMC § 21.02.030(g).

(iii) Review Criteria.The Planning Commission and City Council shall review the application in light of the following criteria:

(A) Conformance with the Comprehensive Plan and other area, corridor, or neighborhood plans;

(B) Conformance with the Grand Junction Circulation Plan and general transportation planning requirements;

(C) Conformance with the standards in this Code;

(D) Consistency with prior approvals and conditions placed on the site; and

(E) Community benefits from the proposal.

(4) Effect of Approval.

(i) Approved I&C Facility Master Plans shall be binding upon the property owner(s) and their successors, transferees, and assigns.

(ii) No permit shall be issued for any building, structure, or use that does not conform to an approved I&C Facility Master Plan.

(iii) No building, structure, use or other element of the approved master site plan shall be modified without amending the I&C Facility Master Plan.

(iv) All buildings, structures and uses shall remain in conformance with the approved master site plan or be subject to enforcement action.

(v) All phases of projects being developed shall be in conformance with the

approved plan.

(5) Amendment.

(i) Amendments to the I&C Facility Master Plan may be proposed at any time through this process.

(ii) An amended Master Plan is required if changes are proposed to any of the following:

(A) Site access;

(B) Traffic flow; or

(C) Pedestrian circulation/safety.

(6) Lapsing and Extension of Approvals.An I&C Facility Master Plan shall remain valid for a minimum of five years, unless otherwise established by the City Council.

(j) Planned Development.

(1) Purpose.The planned development (PD) district is intended to apply to mixed-use or unique single use projects to provide design flexibility not available through strict application and interpretation of the standards established in this Code. Modifications to applicable base zone districts may be permitted as approved and made applicable to the subject property through the PD rezoning process.

(2) Applicability.

(i) PD zoning is applicable to parcels of 10 acres or greater.

(ii) PD zoning may not be used to provide a site-specific solution to a single issue that can be resolved through a more appropriate administrative means.

(3) Residential Density.PD zoning shall not be used to increase the density of the base zone districts. Rezoning is the appropriate process to request a density increase.

(4) Required Approvals.Planned Development applications are reviewed through a two-step process, both of which are described below:

(i) Outline Development Plan.

(ii) Final Development Plan.

(5) Outline Development Plan (ODP).

(i) Applicability.An outline development plan is required for all PD applications.

(ii) Purpose and Content.

(A) The purpose of an ODP is to demonstrate conformance with the Comprehensive Plan, identify applicable base zone districts and requested adjustment to applicable standards, and coordination of improvements within and among individually platted parcels, sections, or phases of a development prior to the approval of a Final Plat.

(B) An ODP shall include a site plan that identifies the base zoning established for the entire property or for each phase designated for development.

(C) An applicant may file an ODP with a Final Development Plan (FDP) for all or a portion of the property, as determined by the Director at the Pre-Application Meeting.

(iii) Review Procedures.Applications for ODP shall meet the common review procedures for major development applications in GJMC § 21.02.050(b) with the following modifications:

(A) Site plan review and approval [pursuant to GJMC § 21.02.040(k)] can occur either before or after the approval of ODP by the City Council. In either case, the applicant shall submit a site sketch, as described in the Submittal Standards for Improvements and Development (SSID) manual, showing sufficient detail to enable the Planning Commission and City Council to review and make findings on the ODP review criteria.

(B) The Planning Commission or City Council can request additional information from the applicant if it deems the site sketch is insufficient to enable it to make a on the criteria. In any subsequent site plan review, the Director shall ensure and determine that all mitigating/enhancing site features approved or made conditions of approval by the City Council are depicted on the approved site plan.

(C) An applicant may file an ODP with a final development plan for all or a portion of the property, as determined by the Director at the Pre-Application Meeting.

(iv) Public Notice and Public Hearing Requirements. The ODP application shall be scheduled for public hearings before the Planning Commission and City Council and shall be noticed pursuant to GJMC § 21.02.030(g).

(v) Review Criteria for ODP.The Planning Commission shall review and recommend, and the City Council shall review and decide on an ODP based on demonstrated conformance with all of the following criteria:

(A) The Comprehensive Plan, Grand Junction Circulation Plan and other adopted plans and policies;

(B) The applicable corridor guidelines and other overlay districts in GJMC Titles 23, 24 and 25;

(C) The rezoning criteria provided in GJMC § 21.02.050(d);

(D) The ODP specifically shows the following requirements of a planned development:

a. Adequate public services and facilities shall be provided concurrent with the projected impacts of the development;

b. Adequate circulation and access shall be provided to serve all development pods/areas to be developed;

c. Appropriate screening and buffering of adjacent property, uses, and structures shall be provided;

d. An appropriate range of density for the entire property or for each development pod/area to be developed;

e. An appropriate set of base zone district standards for the entire property or for each development pod/area to be developed;

f. An appropriate phasing or development schedule for the entire property or for each development pod/area to be developed.

g. Any requested adjustments to the standards of the base zone district(s) and/or other applicable standards such as landscaping, uses, or parking shall be identified both by location on the site plan and in an accompanying narrative summary; and

h. An appropriate community benefit shall be described through the application narrative, which incorporates at least one of the following:

1. The PD protects, preserves, and/or manages areas of significant natural resources beyond the requirements of the base zoning regulations;

2. The general arrangement of proposed uses in the PD better integrates future development into the surrounding neighborhood, either through more compatible street layout, architectural styles, and housing types, or by providing better transitions between the surrounding neighborhood and the PD with compatible development or open space buffers;

3. Areas of open space, their intended levels of use, and their relationship to other proposed uses in the PD provide enhanced opportunities for community gathering areas;

4. The PD features outstanding site design and construction, such as best management practices for on-site storm water management, green building materials, and/or water and energy efficiency:

5. Site design in the PD will create a diverse neighborhood with a mix of housing choices; or

6. The PD features enhanced opportunities for walkability or transit ridership, including separated parking bays, off street walking paths, shorter pedestrian routes than vehicular routes, linkages to or other provisions for bus stops, etc.

(vi) Creation of Overlay Zone District.The PD zone district creates an overlay district that reflects adjustments made to applicable base zone districts as stated in the PD zoning ordinance. Where the PD is silent as to a development term or requirement, the requirements of the applicable base zone district or this Code

shall apply.

(vii) Post-Decision Actions.

(A) Modification or Amendment.The ODP amendment process is provided in GJMC § 21.02.050(j)(5).

(B) Lapsing and Extension of Approvals.

a. The effective period of the ODP/phasing schedule shall be determined concurrently with ODP approval.

b. The ODP/phasing schedule shall be subject to the validity provisions GJMC § 21.02.050(j)(7).

c. The ODP/phasing schedule may be extended by the City Council per GJMC § 21.02.050(j)(8).

(6) Final Development Plan (FDP).

(i) Applicability.

(A) Following approval of an ODP, a subsequent final development plan approval shall be required before any development activity occurs. The plan and the plat ensure consistency with the approved ODP and specific development and construction requirements of various adopted codes.

(B) Unless specified otherwise at the time of ODP approval, if the form of ODP approval was a subdivision plan, a Final Plat may be approved and recorded prior to FDP approval for individual lots.

(ii) Review Procedures.

(A) Applications for a Final Development Plan shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b), with the following modifications:

(B) A portion of the land area within the approved ODP may be approved for FDP.

(iii) Public Notice and Public Hearing Requirements. Notice of a Final Development Plan is not required unless the Planning Commission elects to take final action. In such instances, notice shall be provided in the same manner and form as is required with an ODP.

(iv) Review Criteria.The Director, or the Planning Commission if applicable, shall review and decide on the application for FDP in light of the following additional criteria:

(A) The approved ODP, if applicable;

(B) The approved PD rezoning ordinance, if applicable;

(C) The Submittal Standards for Improvements and Development, Transportation Engineering Design Standards (GJMC Title 29), and

Stormwater Management Manual (GJMC Title 28) manuals and all other applicable development and construction codes, ordinances, and policies;

(D) The applicable site plan review criteria in GJMC § 21.02.040(k); and

(E) The applicable Final Plat review criteria in GJMC § 21.02.040(l)(5).

(v) Post-Decision Actions.

(A) Improvements and Recordation.

a. The Final Plat shall be recorded pursuant to GJMC § 21.02.040(l)(5)(ii)(F)b.

b. Except as provided herein, before the plan and plat are recorded by the Director, all applicants shall be required to complete, to the satisfaction of the Director, all street, sanitary, and other public improvements, as well as lot improvements on the individual lots of the subdivision as required by this Code. The required improvements shall be those specified in the approved Construction Plans as per GJMC § 21.05.020(c); or

c. As a condition of final plan and plat approval, the City shall require the applicant to enter into a development improvements agreement and post a guarantee for the completion of all required improvements as per GJMC § 21.05.020(c)(2).

(B) Contractual Agreement.

a. Approval of a PD allows the development and use of a parcel of land under certain, specific conditions. Conditions of approval shall be filed with the Director in the review process.

b. No use of the parcel, nor construction, modification, or alteration of any use or structures within a PD project shall be permitted unless such construction, modification or use complies with the terms and conditions of an approved final development plan.

c. Each subsequent owner and entity created by the developer, such as property owners' associations or an architectural review committee, shall comply with the terms and conditions of approval. The developer shall set forth the conditions of approval within covenants. Such covenants shall be recorded with the final approved plan and plat.

(C) Transfer of Ownership.No person shall sell, convey, or transfer ownership of any property or any portion thereof within a PD zone until such person has informed the buyer of the property's status with respect to the PD process and conditions of approval. The City shall bear no liability for misrepresentation of terms and conditions of an existing approval.

(D) Planned Development Zone Designation.The Director shall designate each approved PD on the Official Zoning Map.

(7) Amendment to Approved Plans.

(i) Planned Development Rezoning Ordinance. The use, density, dimensional, and base zone district standards contained in an approved PD rezoning ordinance may be amended only as follows, unless specified otherwise in the rezoning ordinance:

(A) No use may be established that is not permitted in the PD without amending the rezoning ordinance through the rezoning process. Uses may be transferred between development pods/areas to be developed through an amendment to the ODP provided the overall density for the entire PD is not exceeded;

(B) maximum and minimum density for the entire PD shall not be exceeded without amending the rezoning ordinance through the rezoning process. Density/intensity may be transferred between development pods/areas to be developed unless explicitly prohibited by the ODP approval; and

(C) The dimensional and base zone district standards may not be amended for the PD or a development pod/area to be developed without amending the PD rezoning ordinance through the rezoning process.

(ii) Outline Development Plan.The approved Outline Development Plan may be amended only by the same process by which it was approved, except for minor amendments. Unless the adopted PD rezoning ordinance provides otherwise, the approved Outline Development Plan may be amended as follows:

(A) Minor Amendments.

a. Permitted Amendments.The Director may approve the following amendments for individual lots within the area covered by an outline development plan provided all standards in the adopted PD rezoning ordinance are met:

1. Decreases in density so long as the character of the site is maintained;

2. Changes in dimensional standards of up to 10% so long as the character of the site is maintained;

3. Changes in the location and type of landscaping and/or screening so long as the character and intent of the original design are maintained;

4. Changes in the orientation or location of parking areas and vehicular and pedestrian circulation areas so long as the effectiveness and character of the overall site circulation, parking and parking lot screening are maintained;

5. The reorientation, but not complete relocation, of major structures so long as the character of the site is maintained; and

6. Simple subdivision.

b. Minor Amendment Review Process.Minor amendments shall be reviewed and decided on by the Director based on the review criteria that the amendment shall not represent a significant change in any of the agreed upon deviations from the default standards.

(B) Major Amendments.All other amendments to the ODP shall be reviewed by the Director and Planning Commission using the same process and criteria used for ODP review and approval. Final decision shall be made by City Council.

(8) Planned Developments Approved Under Prior Codes.

(i) Intent.The City's intent is to continue to allow the development PDs approved under prior codes, determining that they remain valid under this Code subject to the lapse provisions of GJMC § 21.02.050(j)(7). To give effect to this intent, interpretation may be required to fully describe applicable terms and requirements and to avoid the continuance of shell PDs that cannot be fully implemented or developed.

(ii) Interpretation.PDs approved under prior codes shall be interpreted as follows:

(A) Planned Developments that predate this Code shall be narrowly interpreted and are limited to the specified terms of approval.

(B) The base zone district of an active Planned Development shall be interpreted and applied according to the code (2010 or earlier) under which it was adopted.

(C) If the Planned Development approval is silent as to a term or requirement, the most closely similar provision of this 2023 Code shall be applied. For example, if a Planned Development does not specify a process for amendment, the process for amending Planned Development approvals in GJMC § 21.02.050(j)(5) will be used.

(D) Where a base zone district(s) was not specified in the Planned Development approval, the Director shall interpret and apply a zone district(s) from this Code that most closely reflects the PD's dimensional and use standards.

(E) Where this Code changes a generally applicable standard, such as updates to ADU or outdoor lighting standards, the updated generally applicable standards are also applicable to approved PDs unless the PD was approved with a specific standard(s) regulating the same topic.

(9) Lapse of Plan.If a single-phase Planned Development is less than 75% completed, as measured in terms of residential unit count or approved total mixed-use or nonresidential structure footprint, or a multiphase Planned Development is less than 75% complete in terms of residential unit count, total structure footprint, or total phases, as specified in the ODP approval, as of the end date of the approved development schedule, a lapse of the ODP as applied to the incomplete lots or parcels shall be deemed to have occurred.

(i) If the PD was approved with base zone districts, future development may

proceed in compliance with the requirements of the base zone districts and this Code, but any approved PD modifications shall be lapsed.

(A) If the PD was approved with a base zone district that is identified as a legacy zone district in Table 21.03-1, the requirements shall be in accordance with those of the updated zone district identified in the Table.

(ii) If the PD was not approved with base zone districts, the Director may determine the appropriate base zone districts and future development may proceed in compliance with the requirements of the base zone districts.

(10) Development Schedule Extension.

(i) An applicant may request an extension of the development schedule as follows:

(A) The Director may extend the schedule one time for up to one year.

(B) The applicant may request a PD development schedule review from the City Council at any point prior to the end date of the schedule.

(ii) The Director may extend the development schedule timeframe for up to three years in the event of any of the following:

(A) A national or regional economic recession,

(B) A national or regional health emergency, or

(C) National or regional events in or outside of the United States that impact the general price or availability of labor or materials by more than 20%.

(iii) The maximum allowed cumulative extension period is five years. Any PD that has not been completed within this extension timeframe may be resubmitted as a new application or shall be subject to GJMC § 21.02.050(j)(7), above.

(k) Rehearing and Appeal.

(1) Purpose.The purpose of this section is to provide for a rehearing and appeal process for decisions and actions by the Director, Zoning Board of Appeals, Planning Commission, and City Council.

(2) Applicability.

(i) Administrative Appeal.An Administrative Appeal shall include:

(A) Any person, including any officer or agent of the City, aggrieved, or claimed to be aggrieved by an interpretation of this Code rendered by the Director; or

(B) Any person, including any officer or agent of the City, aggrieved, or claimed to be aggrieved by a final action of the Director on an administrative application.

(ii) Non-Administrative Appeal.A Non-Administrative Appeal shall include any person, including any officer or agent of the City, aggrieved by or claimed to be aggrieved by a final decision of the Planning Commission.

(3) Review Procedure.Applications for Rehearing or Appeal shall meet the common review procedures for major development applications in GJMC § 21.02.050(b), with the following modifications:

(i) Application Submittal.

(A) The application shall be submitted pursuant to GJMC § 21.02.030(d) within 10 calendar days of the action taken or interpretation made by the decision maker.

(B) The appellant shall provide a written statement with the application:

a. Citing the specific provision of this Code that the appellant believes the Director has incorrectly interpreted and the appellant's interpretation of the provision; or

b. Explaining the rational of the appeal based on the criteria provided in GJMC § 21.02.050(k)(3)(iii).

(C) The Director shall:

a. Prepare a report detailing the specific provision of this Code that is in question, interpretation of the provision, and the general basis of the interpretation; or

b. Compile all material made a part of the official record of the decision-maker's action. As may be requested by the appellate body, the Director also may provide a summary report of the record.

(D) If the appellant is not the applicant, the Director, within five working days of receipt of the request for appeal, shall notify the applicant of the request and the applicant shall have 10 working days to review the request and provide a written response.

(E) For a Non-Administrative Appeal, the appellant shall submit evidence of their attendance at the original hearing or other testimony or correspondence from them that was in the official record at the time of the original hearing.

(ii) Public Notice and Hearing Requirements.

(A) Administrative Appeal.

a. Notice of the hearing shall be provided to the applicant and is not required to be provided to anyone else.

b. The appellate body shall hold a hearing pursuant to GJMC § 21.02.030(g).

c. At the hearing, the appellate body shall consider only that evidence that was before the Director at the time of the Director's final action.

(B) Non-Administrative Appeal.

a. Notice of the appeal hearing shall be provided in the same manner as

was required with the original action.

b. The Director shall schedule the appeal before the appellate body within 45 calendar days of receipt of the appeal. The appellate body shall hold a hearing pursuant to GJMC § 21.02.030(g) and render a decision within 30 calendar days of the close of that hearing.

c. At the hearing, the appellate body shall review the record of the decision-maker's action. No new evidence or testimony may be presented, except that City staff may be asked to interpret materials contained in the record.

(iii) Decision.The appellate body shall affirm, reverse, or remand the decision pursuant to GJMC § 21.02.030(h) and the following criteria. In reversing or remanding the decision back to the decision-maker, the appellate body shall state the rationale for its decision. An affirmative vote of four members of the appellate body shall be required to reverse the decision-maker's action.

(A) Administrative Appeal.

a. Director's Interpretation. In granting an appeal of a Director's interpretation, the Zoning Board of Appeals shall determine whether the interpretation by the Director was in accordance with the intent and requirements of this Code.

b. Director's Decision. The appellate body shall consider, based on the information in the record before the Director, whether the Director:

1. Acted in a manner inconsistent with the provisions of this Code or other applicable local, state, or federal law; or

2. Made erroneous findings of fact based on the evidence and testimony on the record; or

3. Failed to fully consider mitigating measures or revisions offered by the applicant that would have brought the proposed project into compliance; or

4. Acted arbitrarily, or capriciously.

(B) Non-Administrative Appeal.

a. Findings.In granting a Non-Administrative Appeal the appellate body shall find:

1. The decision maker may have acted in a manner inconsistent with the provisions of this Code or other applicable local, state, or federal law; or

2. The decision maker may have made erroneous findings of fact based on the evidence and testimony on the record; or

3. The decision maker may have failed to fully consider mitigating measures or revisions offered by the applicant that would have

brought the proposed project into compliance; or

4. The decision-maker may have acted arbitrarily, acted capriciously, and/or abused its discretion; or

5. In addition to one or more of the above findings, the appellate body shall find the appellant was present at the hearing during which the original decision was made or was otherwise on the official record concerning the development application.

b. Facts on Record.

1. In considering a request for appeal, the appellate body shall consider only those facts, evidence, testimony, and witnesses that were part of the official record of the decision-maker's action. No new evidence or testimony may be considered, except City staff may be asked to interpret materials contained in the record.

2. If the appellate body finds that pertinent facts were not considered or made a part of the record, they shall remand the item back to the decision-maker for a rehearing and direct that such facts be included on the record.

(l) Revocable Permit.

(1)

Common Procedures for Administrative Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal and Review | §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Director Decision § 21.02.030(h)
5	

Purpose.The purpose of this section is to ensure that any private development on public land is safely conducted in a manner that does not pose potential burdens on the public.

(2) Applicability.This section shall apply to the construction, maintenance, and use of public right of way for any structure, fence, sign, or other permanent object.

(3) Review Procedures.Applications for a Revocable Permit shall meet the common review procedures for administrative applications in GJMC § 21.02.040(b), with the following modifications:

(i) Application Submission Requirements.The application complies with the submittal requirements as set forth in Section 127 of the City Charter, this section, and the Submittal Standards for Improvements and Development (SSID) manual.

(ii) Review Criteria.The application shall be reviewed against the following additional criteria:

(A) There will be benefits derived by the community or area by granting the proposed Revocable Permit;

(B) There is a community need for the private development use proposed for the City property;

(C) The City property is suitable for the proposed uses and no other uses or conflicting uses are anticipated for the property;

(D) The proposed use shall not negatively impact access, traffic circulation, neighborhood stability or character, sensitive areas such as floodplains or natural hazard areas; and

(E) The proposed use is in conformance with and in furtherance of the implementation of the goals, objectives and policies of the Comprehensive Plan, other adopted plans and the policies, intents and requirements of this Code and other City policies.

(iii) Decision.

(A) A Revocable Permit for fences, irrigation, drainage infrastructure, or landscaping in a right-of-way shall be reviewed and decided on by the Director.

(B) The City Council shall review and decide on all other applications for Revocable Permit.

(4) Lapsing and Extension of Approvals.A Revocable Permit shall remain valid pursuant to GJMC § 21.02.030(j).

(m) Rezoning.

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice | § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose.The purpose of this section is to establish the procedure and requirements for requested amendments to the Zoning Map.

(2) Authority to Initiate.Amendments to the Zoning Map may be proposed by property owners, the City, the Planning Commission, or City Council in order to add, modify or expand zone districts.

(3) Review Procedures.Applications for Rezoning shall meet the common review procedures for major development applications in GJMC § 21.02.050(b), with the

following modifications:

(i) Public Notice and Hearing Requirements.

(A) The application for Rezoning shall be scheduled for public hearings before the Planning Commission and City Council and shall be noticed pursuant to GJMC § 21.02.030(g).

(B) The Planning Commission or City Council may add additional property to be considered for a Rezoning if such additional property is identified in the notice.

(ii) Review Criteria.An applicant for Rezoning has the burden of producing evidence that proves each of the following criteria:

(A) Consistency.The proposed zoning is generally consistent with applicable provisions of the Comprehensive Plan.

(B) Development Patterns.The proposed zoning will result in logical and orderly development pattern(s).

(C) Benefits.The community or area, as decided by the reviewing body, derives an overall benefit(s) from the proposed zoning.

(4) Lapsing and Extension of Approvals.Approved Rezonings do not expire.

(n) Special Dimensional Permit.

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice | § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose.The purpose of this section is to provide an opportunity for additional dimensional flexibility in certain zone districts when more flexibility is required beyond that afforded to the Director through the Administrative Adjustment process.

(2) Applicability.A Special Dimensional Permit may be requested in the following circumstances:

(i) For development in those areas designated Neighborhood Center, Village Center, City Center (which includes Downtown) or Mixed-Use Opportunity Corridors on the Future Land Use Map of the Comprehensive Plan or in the C-1 and I-OR zone districts along Horizon Drive north of G Road including Crossroads Boulevard and Horizon Court to allow:

(A) Additional height beyond that permitted by a zone district's dimensional standards; or

(B) Additional building area beyond that permitted by a district's dimensional standards.

(ii) In all zone districts for the following uses, and shall be required prior to an interim use located in any zone district where:

(A) The development is proposed as an interim use that is allowed in the district, or as an interim use established with a minimal investment that can be easily redeveloped at the density or intensity envisioned by the Comprehensive Plan; and

(B) The applicant demonstrates that the development design and any proposed infrastructure improvements further the future development of the property at the density or intensity envisioned by the Comprehensive Plan.

(iii) Any other Special Dimensional Permit found elsewhere in this Code.

(3) Review Procedures.Applications for Special Dimensional Permit shall meet the common review procedures for major development applications in GJMC § 21.02.050(b) with the following modifications:

(i) Public Notice and Hearing Requirements. The application shall be scheduled for public hearings before the Planning Commission and City Council and shall be noticed pursuant to GJMC § 21.02.030(g).

(ii) Decision.

(A) The Special Dimensional Permit review is accomplished through a City Council discretionary review process.

(B) A Special Dimensional Permit may be permitted under circumstances particular to the proposed location and subject to conditions that provide protection to adjacent land uses.

(4) Lapsing and Extension of Approvals.A Special Dimensional Permit does not expire unless otherwise limited by the City Council.

(o) Vacation of Plat.

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice | § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	

(1)

Common Procedures for Major Development Applications	
7	Post-Decision Actions § 21.02.030(i)

Applicability.This section shall apply to the vacation of any plat that has not been developed, has been partially developed, or has not been developed as approved and does not include rights of ways or easements.

(2) Review Procedure.Applications for Vacation of Plat shall meet the common review procedures for major development applications in GJMC § 21.02.050(b), with the following modifications:

(i) Public Notice and Public Hearing Requirements. The application shall be scheduled for a public hearing before the Planning Commission and shall be noticed pursuant to GJMC § 21.02.030(g).

(ii) Review Criteria.The Director and the Planning Commission shall review the application in light of the following additional criteria:

(A) The vacation is in conformance with the Comprehensive Plan, Grand Junction Circulation Plan, and other adopted plans and policies of the City;

(B) No parcel shall be landlocked as a result of the vacation;

(C) Access to any parcel shall not be restricted to the point that access is unreasonable, economically prohibitive, and/or reduces or devalues any property affected by the proposed vacation;

(D) There shall be no adverse impacts on the health, safety, and/or welfare of the general community, and the quality of public facilities and services provided to any parcel of land shall not be reduced (e.g., police/fire protection and utility services); and

(E) The provision of adequate public facilities and services to any property as required in GJMC § 21.05.020 shall not be inhibited by the proposed vacation.

(3) Lapsing and Extension of Approvals.A Vacation Plat shall be recorded within two years of approval or it shall be considered expired.

(p) Vacation of Public Right-of-Way or Easement.

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice | § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	

(1)

Common Procedures for Major Development Applications

7

Applicability.This section shall apply to the vacation of any street, alley, easement, or other public reservation.

(2) Review Procedure.Applications for Vacation of Public Right-of-Way or Easement shall meet the common review procedures for major development applications in GJMC § 21.02.050(b), with the following modifications:

(i) Public Notice and Public Hearing Requirements. The application shall be scheduled for public hearings before the Planning Commission and City Council and shall be noticed pursuant to GJMC § 21.02.030(g), unless the request is for the vacation of an easement created for a temporary purpose, granted to the City by a separate instrument and not dedicated on a plat or map.

(ii) Public Vote.A public vote is not necessary for a vacation of a public right-of-way or easement. The process of vacating a public right-of-way or easement does not involve the sale of public property in accordance with Charter Article VI, Paragraph 48.

(iii) Review Criteria and Decision.

(A) The Director shall decide on any request for the vacation of an easement created for a temporary purpose, granted to the City by a separate instrument, and not dedicated on a plat or map.

(B) The Planning Commission shall recommend to and the City Council shall decide on all other request in light of the following criteria:

a. The vacation is in conformance with the Comprehensive Plan, Grand Junction Circulation Plan, and other adopted plans and policies of the City;

b. No parcel shall be landlocked as a result of the vacation;

c. Access to any parcel shall not be restricted to the point where access is unreasonable, economically prohibitive, or reduces or devalues any property affected by the proposed vacation;

d. There shall be no adverse impacts on the health, safety, and/or welfare of the general community, and the quality of public facilities and services provided to any parcel of land shall not be reduced, including, but not limited to, police and fire protection and utility services;

e. The provision of adequate public facilities and services to any property as required in GJMC § 21.05.020 shall not be inhibited by the proposed vacation; and

f. The proposal shall not hinder public and City functions.

(C) Vacation of a right-of-way shall be accomplished by the passing of an ordinance by the City Council. Vacation of an easement shall be accomplished by resolution of the City Council.

(3) Post-Decision Actions.The final ordinance or resolution establishing the vacation shall be recorded pursuant to GJMC § 21.02.040(l)(5)(ii)(F)b.

(4) Lapsing and Extension of Approvals.A resolution or an ordinance for a Vacation of Public Right-of-Way or Easement shall not expire.

(q) Variance.

(1)

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice | § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)
6	City Council Decision § 21.02.030(h)
7	

Purpose.The purpose of this section is to provide a process for consideration of variances from certain standards of this Code.

(2) Applicability.

(i) A variance may be requested for a departure from bulk standards, performance or use-specific standards of GJMC Chapter 21.04, all overlay district regulations of GJMC §§ 21.03.090, 21.06.010, and 21.02.060, excluding corridor overlay districts, and the sign regulations of GJMC Chapter 21.10.

(ii) Variances are not permitted for:

(A) The establishment or expansion of a use in a district in which the use is not permitted by this Code;

(B) Residential development that would result in an increase in density greater than that permitted in the applicable zone district; and

(C) Changes or modifications to any definition contained in this Code.

(3) Review Procedure.Applications for Variance shall meet the common review procedures for major development applications in GJMC § 21.02.050(b), with the following modifications:

(i) Public Notice and Public Hearing Requirements. The application shall be scheduled for a public hearing before the Zoning Board of Appeals or Planning Commission and shall be noticed pursuant to GJMC § 21.02.030(g).

(ii) Decision-Maker.

(A) Zoning Board of Appeals shall hear requests for variance from:

a. Bulk or dimensional standards in the individual zone districts,

b. Performance or use-specific standards of GJMC Chapter 21.04,

c. All overlay district regulations of GJMC §§ 21.03.090, 21.06.010, and 21.02.060 excluding corridor overlay districts, and

d. Sign regulations of GJMC Chapter 21.10.

(B) The Planning Commission shall hear and decide requests for variances to all other standards, unless otherwise specified.

(iii) Review Criteria.The Zoning Board of Appeals or Planning Commission shall review the application in light of the following:

(A) There are exceptional conditions creating an undue hardship, applicable only to the property involved or the intended use thereof, which do not apply generally to the other land areas or uses within the same zone district, and such exceptional conditions or undue hardship was not created by the action or inaction of the applicant or owner of the property;

(B) The Variance shall not confer on the applicant any special privilege that is denied to other lands or structures in the same zone district;

(C) The literal interpretation of the provisions of the regulations would deprive the applicant of rights commonly enjoyed by other properties in the same zone district and would cause unnecessary and undue hardship on the applicant;

(D) The applicant and the owner of the property cannot derive a reasonable use of the property without the requested Variance;

(E) The Variance is the minimum necessary to make possible the reasonable use of land or structures;

(F) The granting of a Variance shall not conflict with the purposes and intents expressed or implied in this Code; and

(G) The granting of a Variance shall not conflict with the goals, policies, and guiding principles of the Comprehensive Plan.

(r) Vested Property Rights.

Common Procedures for Major Development Applications	
1	General Meeting or Pre-Application Meeting § 21.02.030(b)
2	Application Submittal & Review §§ 21.02.030(d) and 21.02.030(e)
3	Complete Applications with Changed Status § 21.02.030(f)
4	Public Notice | § 21.02.030(g)
5	Planning Commission Recommendation or Decision § 21.02.030(h)

(1)

Common Procedures for Major Development Applications

Purpose.The purpose of this section is to provide the procedures necessary to implement the provisions of § 24-68-101 C.R.S., et seq. and § 29-20-101 C.R.S., et seq.

(2) Definitions.The following definitions are for the purposes of administration of this section only and do not apply to any other sections of this Code.

(i) "Site-specific development plan" (SSDP) means, for all developments requiring a public hearing, the final step, irrespective of its title, which occurs prior to building permit application; provided, however, that if the landowner wishes said approval to have the effect of creating vested rights, pursuant to § 24-68-101 C.R.S., et seq., the landowner must so request, in writing, at the time of application for said approval. Failure to so request renders the approval not a "site-specific development plan," and no vested rights shall be deemed to have been created.

(ii) "Vested property right" means the right to undertake and complete the development and use of property under the terms and conditions of a site-specific development plan.

(3) Limitations.Nothing in this section is intended to create any vested property right, but only to implement the provisions of § 24-68-101 C.R.S., et seq. and § 29-20-101 C.R.S., et seq. In the event of the repeal of § 24-68-101 C.R.S., et seq. and § 29-20-101 C.R.S., et seq. or a judicial determination that these statutory provisions are invalid or unconstitutional, this section shall be deemed to be repealed, and the provisions hereof no longer effective.

(4) Applicability.An applicant may request, in writing, to have property rights vest with a Site-Specific Development Plan (SSDP). The SSDP shall be applicable only to:

(i) Property zoned Planned Development with the approved Final Development Plan constituting the SSDP; or

(ii) Any other application (i.e., Outline Development Plan, Site Plan, Conditional Use, Subdivision Plat, Final Development Plan or Development Improvements Agreement); provided, that:

(A) The applicant requests in writing that the Planning Commission hold a public hearing and approve a specific document/application as a SSDP; and/or

(B) State law requires that a vested property right be granted, in which case the Planning Commission shall determine, at its discretion, which, if any, document/application shall constitute a SSDP.

(5) Review Procedure.Applications for a determination of Vested Rights shall meet the common review procedures for major development applications in GJMC

§ 21.02.030 with the following modifications:

(i) Application Submittal.

(A) In addition to any and all other fees and charges imposed by this Code, the applicant shall pay all costs incurred by the City as a result of the SSDP review, including publication of notices, public hearing, and review costs.

(B) An application for approval of a SSDP shall be submitted and reviewed concurrently with an application for a Final Development Plan or any other document that the Planning Commission shall determine, at its discretion, constitutes a SSDP.

(C) It is the applicant's responsibility to ensure that each final plan, map, plat or site plan, or other document constituting a SSDP contains the following language: "Approval of this plan may create a vested property right pursuant to § 24-68-101 C.R.S., et seq." Omission of this statement shall invalidate the creation of the vested property right.

(ii) Public Notice and Hearing Requirements. The application shall be scheduled for public hearings before the Planning Commission and City Council and shall be noticed pursuant to GJMC § 21.02.030(g).

(iii) Decision-Maker.The Planning Commission shall recommend to and City Council shall decide on an application based on compliance with the following:

(A) The provisions stated in § 24-68-101 C.R.S., et seq.; and

(B) The final development plan review criteria of GJMC § 21.02.050(j)(4).

(iv) Effect of Determination.

(A) A SSDP shall be deemed approved upon the last action by the City Council related to the SSDP.

(B) Approval of a SSDP shall not constitute an exemption from, or waiver of, any other provisions of this Code pertaining to the development or use of property.

(6) Post-Decision Actions.

(i) Within 14 calendar days after the approval of the SSDP, the applicant shall:

(A) Satisfy the notice requirements of § 24-68-103(1) C.R.S. by publishing at their expense a notice, in a newspaper of general circulation within the City, advising the public of the SSDP approval and creation of vested property rights pursuant to law, together with a legal description of the property at issue in the SSDP; and

(B) Acknowledge by written instrument that the applicant confirms their obligation to satisfy all other requirements under the City codes, rules and regulations including, but not limited to, all studies that may be required, including studies concerning traffic, drainage, erosion control, and utilities.

(ii) No amendment of a SSDP shall extend or change the effective date of vesting of a property right unless specifically provided by written agreement. In the event amendments to a SSDP are proposed and approved, the effective date of such amendments, for purposes of duration of vested property right, shall be the initial date of the approval of the SSDP.

(iii) Any waiver, be it in part or in full, of a vested property right shall be accomplished by written agreement between the owner and the City and shall be recorded in the Mesa County land records.

(7) Lapsing and Extension of Approvals.The duration of any vesting shall be no longer than required by state law unless a different duration is provided by written agreement between the owner and the City. Failure to comply with any condition of approval of a SSDP shall result in forfeiture of vested rights and the SSDP shall be declared void and lapsed.

(8) Pending Applications for a Site-Specific Development Plan—Applicable Rules and Regulations.

(i) General Rule.Pursuant to § 24-68-102.5 C.R.S., the review, approval, approval with conditions, or denial of a complete application for a site-specific development plan shall be governed by the duly adopted laws and regulations in effect at the time a complete application for a site-specific development plan is submitted pursuant to this Code.

(ii) Exception.Notwithstanding the limitations contained in Subsection (p)(8)(i) above, the City may apply to the pending complete application for a site-specific development plan any subsequently enacted or amended ordinances, rules, regulations, or policies that are necessary for the immediate preservation of the public health and safety.

(9) Waiver.A landowner may waive a vested property right by separate agreement, which shall be recorded in the county where the property is located.

(10) Other Provisions Unaffected.Approval of a site-specific development plan shall not constitute an exemption from or waiver of any other provisions of this development code pertaining to annexation, development, and use of property.

(Ord. No. 5242, 12/4/2024; Ord. No. 5229, 8/21/2024; Ord. 5218, 5/1/2024; Ord. 5205, 3/20/2024; Ord. 5190, 12/20/2023)

§ 21.02.060. Historic preservation procedures.

(a) Purpose.This purpose of this section is to enhance the community's local resources and promotes the public health, safety, prosperity and welfare through the protection and preservation of the City's architectural, historic, and cultural heritage, as embodied in designated historic structures, sites and districts, by application of appropriate regulations and incentives. Those regulations and incentives include:

(1) The establishment of a City Register listing designated structures, sites, and districts; and

(2) The provision of educational opportunities to increase public appreciation of Grand

Junction's unique heritage.

(b) Board Established.The City Council hereby creates a Historic Preservation Board, which may be referred to as the Historic Board or Preservation Board. The Historic Board shall have principal responsibility for matters of historic preservation, and shall have such membership, authority, duties, and responsibilities as further provided in GJMC § 21.02.010(e).

(c) City Registry Established.

(1) The City Council hereby establishes the City Register of historic sites, structures, and districts. Historic sites, structures or districts may be listed on said register only if said site, structure or district has been designated by the City Council following recommendation by the Historic Board.

(2) All properties listed on the National or State Register are eligible for the City Register but are not designated until approval, pursuant to this Code, is obtained.

(d) Designation of Historic Structures, Sites and Districts.

(1) The City Council:

(i) May by resolution designate as historic an individual structure, site or other feature or an integrated group of structures or features on a lot or site. Designation shall be for a special historical or architectural value; or

(ii) May by resolution designate as an historic district an area containing a number of structures or sites having a special historical or architectural value.

(2) Each such designation shall include a description of the characteristics of the structure, site or historic district which justify its designation and a description of the particular features that should be preserved and shall include a legal description of the location and boundaries of the historic structure, site, or district.

(3) No individual structure or site shall be designated without the consent of all owners of record. Historic districts may be designated in accordance with state law and the provisions in this section.

(4) The purpose and effect of designation is:

(i) To assist local interests in preservation of physical structures, sites, or districts and to recognize locally significant structures, sites, or districts;

(ii) To provide a mechanism to educate the public on local history, development of the community, architectural styles and housing and business development;

(iii) To enable the owners of the property in the City to take advantage of historic preservation programs and opportunities; and

(iv) To make all properties listed on the City Registry eligible for such incentive programs as may be developed.

(e) Procedure for Designating Historic Structures, Sites and Districts for Preservation.

(1) Nomination.A nomination for designation to the City Register may be made by the

Historic Board or by any citizen by filing an application with the Community Development Department. The applicant shall pay all public notice expenses, recording fees and any other fees established by resolution of the City Council.

(2) Historic Board Review.

(i) The Historic Board shall hold a public meeting on the designation application no more than 30 days after the filing of the application.

(ii) The Historic Board shall review the application for conformance with the established criteria for designation and with the purposes of this section.

(iii) Within 10 days after the conclusion of the public meeting, but in no event more than 30 days after the meeting, unless mutually agreed to by the Historic Board, the applicant, and the owner or owners other than the applicant, the Historic Board shall recommend either approval, modification and approval or disapproval of the application.

(iv) The Historic Board may recommend approval conditional upon the execution of certain easements, covenants, or licenses.

(v) The Historic Board shall forward to the City Council written recommendations concerning a designation and further state any recommendations as to easements, covenants or licenses that must be met by the property owner in order to receive and/or maintain the designation.

(3) City Council Review.

(i) The City Council shall hold a public hearing on the designation application no more than 30 days after receipt of the Board's recommendation.

(ii) The City Council shall review the application for conformance with the established criteria for designation and with the purposes of this section.

(4) Notification.When a structure, site or historic district has been designated as provided herein, the Director shall promptly notify the record owners of the property, as shown in the County Assessor's records or other available information, and record the designation in the land records of the Mesa County Clerk and Recorder.

(5) Limitation on Resubmission and Reconsideration of Proposed Designation.If the City Council disapproves a proposed designation, no person shall submit an application that is the same or substantially the same for at least one year from the Effective Date of the denial of the application.

(f) Criteria for Designation.The Historic Board and City Council shall consider the following criteria in reviewing nominations/applications for designation.

(1) Structures.Structures must be at least 50 years old and meet one or more of the architectural, cultural, or geographic/environmental significance criteria. A structure can be exempted from the age requirement if the Council finds it to be exceptionally important in other criteria.

(i) Historic structures or sites shall meet one or more of the following in order to be considered for designation.

(A) Architectural.

a. Exemplifies specific elements of an architectural style or period;

b. Is an example of the work of an architect or builder who is recognized for expertise nationally, statewide, regionally, or locally;

c. Demonstrates superior craftsmanship or high artistic value;

d. Represents an innovation in construction, materials, or design;

e. Represents a built environment of a group of people in an era of history;

f. Exhibits a pattern or grouping of elements representing at least one of the above criteria; or

g. Is a significant historic remodel.

(B) Cultural.

a. Is a site of an historic event that had an effect upon society;

b. Exemplifies the cultural, political, economic, or ethnic heritage of the City; or

c. Is associated with a notable person or the work of a notable person.

(C) Geographic/Environmental.

a. Enhances the sense of identity of the City; or

b. Is an established and familiar natural setting or visual feature of the City.

(ii) Prehistoric and historic archaeological structures or sites shall meet one or more of the following:

(A) Architectural.

a. Exhibits distinctive characteristics of a type, period, or manner of construction; or

b. Is a unique example of structure.

(B) Cultural.

a. Has the potential to make an important contribution to the knowledge of the area's history or prehistory;

b. Is associated with an important event in the area's development;

c. Is associated with a notable person or the work of a notable person;

d. Is a typical example or is associated with a particular ethnic or other community group; or

e. Is a unique example of an event in local history.

(C) Geographic/Environmental.Is geographically or regionally important.

(iii) Each property shall also be evaluated based on physical integrity using the following criteria (a property need not meet all the following criteria):

(A) Shows character, interest, or value as part of the development, heritage or cultural characteristics of the community, region, state, or nation;

(B) Retains original design features, materials and/or character;

(C) Is in the original location or same historic context if it has been moved; or

(D) Has been accurately reconstructed or restored.

(2) Historic Districts.

(i) For the purposes of this section, a historic district is a geographically definable area including a concentration, linkage or continuity of sites, buildings, structures and/or objects. A historic district is related by a pattern of either physical elements or social activities.

(ii) Significance is determined by applying criteria to the pattern and unifying elements.

(iii) Nominations/applications for historic district designation shall not be approved unless the application contains written approval from owners of at least 60% of the properties within the proposed district boundaries.

(iv) Properties that do not contribute to the significance of the historic district may be included within the boundaries so long as the noncontributing elements do not noticeably detract from the district's sense of time, place, and historical development. Noncontributing elements shall be evaluated for their magnitude of impact by considering their size, scale, design, location and/or information potential.

(v) Historic district boundaries shall be defined by visual changes, historical documentation of different associations or patterns of development, or evidence of changes in site type or site density as established through testing or survey.

(vi) When districts are designated, applicable design guidelines and other appropriate restrictions may be included as part of the designation.

(vii) In addition to meeting at least one of the criteria as outlined in Subsection (f)(2)(viii) below, the designated contributing sites and structures within the district must be at least 50 years old. The district could be exempt from the age standard if the resources are found to be exceptionally important in other significant criteria.

(viii) Historic districts shall meet one or more of the following:

(A) Architectural.

a. Exemplifies specific elements of an architectural period or style;

b. Is an example of the work of an architect or builder who is recognized for expertise nationally, statewide, regionally, or locally;

c. Demonstrates superior craftsmanship or high artistic value;

d. Represents an innovation in construction, materials, or design;

e. Represents a built environment of a group of people in an era of history;

f. Is a pattern or a group of elements representing at least one of the above criteria; or

g. Is a significant historic remodel.

(B) Cultural.

a. Is the site of an historic event that had an effect upon society;

b. Exemplifies cultural, political, economic, or social heritage of the community; or

c. Is associated with a notable person or the work of a notable person.

(C) Geographic/Environmental.

a. Enhances the sense of identity of the community; or

b. Is an established and familiar natural setting or visual feature of the community.

(D) Archaeology/Subsurface.

a. Has the potential to make an important contribution to the area's history or prehistory;

b. Is associated with an important event in the area's development;

c. Is associated with a notable person or the work of a notable person;

d. Has distinctive characteristics of a type, period, or manner of construction;

e. Is of geographical importance;

f. Is a typical example/association with a particular ethnic group;

g. Is a typical example/association with a local cultural or economic activity; or

h. Is a unique example of an event or structure.

(g) Review of Alterations.

(1) City Registry.The owner of any historic structure or site on the City Registry designated pursuant to Subsection (e) of this section is requested to consult with the

Historic Board before making any alteration. The Historic Board shall determine if the alteration is compatible with the designation. In reviewing a proposed alteration, the Historic Board shall consider design, finish, material, scale, mass, and height. When the subject site is in an historic district, the Historic Board must also find that the proposed development is visually compatible with development on adjacent properties, as well as any guidelines adopted as part of the given historic district designation. For the purposes of this section, the term "compatible" shall mean consistent with, harmonious with and/or enhances the mixture of complementary architectural styles either of the architecture of an individual structure or the character of the surrounding structures. The Historic Board shall use the following criteria to determine compatibility of a proposed alteration:

(i) The effect upon the general historical and architectural character of the structure and property;

(ii) The architectural style, arrangement, texture, and material used on the existing and proposed structures and their relation and compatibility with other structures;

(iii) The size of the structure, its setbacks, its site, location, and the appropriateness thereof, when compared to existing structure and the site;

(iv) The compatibility of accessory structures and fences with the main structure on the site, and with other structures;

(v) The effects of the proposed work in creating, changing, destroying, or otherwise impacting the exterior architectural features of the structure upon which such work is done;

(vi) The condition of existing improvements and whether they are a hazard to public health and safety; or

(vii) The effects of the proposed work upon the protection, enhancement, perpetuation, and use of the property.

(2) North Seventh Street Historic Residential District.The owner of any property within the North Seventh Street Historic Residential District shall comply with the North Seventh Street Historic Residential District Guidelines and Standards.

(i) Before making any construction or alteration to a site or structure, such owner shall make application to the City for a Certificate of Appropriateness. The Director shall review such application for compliance with the Guidelines and Standards and make an initial determination and recommendation to the Board. The Director may include in that recommendation any conditions deemed appropriate to comply with the Guidelines and Standards and with the Zoning and Development Code.

(ii) The Board shall have jurisdiction to review City staff recommendations and to decide applications for Certificates of Appropriateness at a public hearing. The Board may include any conditions of approval deemed appropriate for compliance with the Guidelines and Standards. No owner shall construct or alter a structure or site in the District without first obtaining a Certificate of

Appropriateness from the Board.

(iii) A decision of the Board may be appealed to City Council within 30 days of the issuance of the decision. Appeals to City Council shall be de novo.

(iv) All reviews pursuant to this Subsection (g)(2) shall determine if the new construction or alteration is compatible with the historic designation as provided in the North Seventh Street Historic Residential District Guidelines and Standards. In reviewing an application, consideration shall be given to design, siting, form, texture, setbacks, orientation, alignment, finish, material, scale, mass, height, and overall visual compatibility, according to and with reference to the applicable Guidelines and Standards of the North Seventh Street Historic Residential District. For purposes of this section, the term "compatible" shall mean consistent with, harmonious with and/or enhancing the mixture of complementary architectural styles either of the architecture of an individual structure or the character of the surrounding structures.

(h) Revocation of Designation.

(1) If a building or special feature on a designated site has been altered in such a way so as to negate the features necessary to retain designation, the owner may apply to the Historic Board for a revocation of the designation or the Historic Board shall recommend revocation of the designation to the City Council in the absence of the owner's application to do so.

(2) If a designated structure is moved or demolished, the designation shall, without notice and without Historic Board recommendation, automatically terminate. If moved, a new application for designation at the new location must be made in order for designation to be considered.

(3) Upon the City Council's decision to revoke a designation, the Director shall cause a revocation notice to be sent to the property owner.

(Ord. 5190, 12/20/2023)

§ 21.02.070. Development fees.

(a) Development Impact Fees.

(1) Title.This section shall be known and may be cited as the "Grand Junction, Colorado, Impact Fee Ordinance" or "Impact Fee Ordinance."

(2) Authority.The City has the authority to adopt this section pursuant to Article XX, § 6 of the Colorado State Constitution, the City's home rule charter, the City's general police powers, and other laws of the State of Colorado.

(3) Application.This section shall apply to all development within the territorial limits of the City, except development exempted pursuant to GJMC § 21.02.070(a)(5)(ii).

(4) Purpose.

(i) The intent of this section is to ensure that new development pays a proportionate share of the cost of City parks and recreation, fire, police, and transportation capital facilities.

(ii) It is the intent of this section that the impact fees imposed on new development are no greater than necessary to defray the impacts directly related to proposed new development.

(iii) Nothing in this section shall restrict the City from requiring an applicant for a development approval to construct reasonable capital facility improvements designed and intended to serve the needs of an applicant's project, whether or not such capital facility improvements are of a type for which credits are available under GJMC § 21.02.070(a)(6), Credits.

(5) Development Impact Fees to Be Imposed.

(i) Fee Obligation, Payment, and Deposit.

(A) Obligation to Pay and Time of Payment.Any person who causes the commencement of impact-generating development, except those exempted pursuant to GJMC § 21.02.070(a)(5)(ii) shall be obligated to pay impact fees pursuant to the terms of this section. The obligation to pay the impact fees shall run with the land. The amount of the impact fees shall be determined in accordance with GJMC § 21.02.070(a)(5)(iii) and the fee schedule in effect at the time of issuance of a Planning Clearance and paid to the Director at the time of issuance of a Planning Clearance. If any credits are due pursuant to GJMC § 21.02.070(a)(6) those shall be determined prior to the issuance of a Planning Clearance and payment of the impact fees.

(B) Fees Promptly Deposited into City Accounting Funds. All monies paid by a fee payer pursuant to this section shall be identified as impact fees and shall be promptly deposited in the appropriate City impact fee accounting funds established and described in GJMC § 21.02.070(a)(7).

(C) Extension of Previously Issued Development Approval. If the fee payer is applying for an extension of a development approval issued prior to January 1, 2026, the impact fees required to be paid shall be the net increase between the impact fees applicable at the time of the current permit extension application and any impact fees previously paid pursuant to this section, and shall include any impact fees established subsequent to such prior payment.

(D) Fee Based on Approved Development.If the Planning Clearance is for less floor area than the entire development approved pursuant to the development approval, the fee shall be computed separately for the floor area of development covered by the Planning Clearance, and with reference to the use categories applicable to such development covered by the Planning Clearance.

(E) Permit for Change in Use, Expansion, Redevelopment, Modification.If the fee payer is applying for a Planning Clearance to allow for a change of use or for the expansion, redevelopment, or modification of an existing development, the impact fees required to be paid shall be based on the net increase in the impact fees for the new use as compared to the previous use and actual fee paid for the previous use, and shall include any impact fees

established subsequent to such prior payment.

(F) Prior Conditions and/or Agreements.Any person who prior to January 1, 2026, has agreed in writing with the City, as a condition of permit approval, to pay an impact fee shall be responsible for the payment of the impact fees under the terms of such agreement, and the payment of the impact fees may be offset against any impact fees due pursuant to the terms of this section.

(G) Time of Submittal.For nonresidential and multifamily development [excluding townhomes, duplexes, and condominium residence(s)] the fee shall be calculated as of the submission of a complete application and construction commences within two years of approval. Should construction fail to commence within two years, the applicant shall pay those fees in place at the time of issuance of a Planning Clearance.

(ii) Exemptions.The following types of development shall be exempt from payment of impact fees. Any claim for exemption shall be made no later than the time when the applicant applies for the first Planning Clearance. Any claim for exemption not made at or before that time shall be waived. The Director shall determine the validity of any claim for exemption pursuant to the standards set forth below.

(A) Replacing Existing Residential Unit with New Unit. Reconstruction, alteration, or replacement of a previously existing residential unit that does not create any additional residential units.

(B) New Impact-Generating Development Creates No Greater Demand than Previous Development.New impact-generating development that the fee payer can demonstrate will create no greater demand over and above that produced by the existing use or development.

(C) Building After Fire or Other Catastrophe. Rebuilding the same amount of floor space of a structure that was destroyed by fire or other catastrophe.

(D) Accessory Structures.Construction of unoccupied accessory structures related to a residential unit.

(E) Previous Payment of Same Amount of Impact Fees. Impact-generating development for which an impact fee was previously paid in an amount that equals or exceeds the impact fee that would be required by this section.

(F) Government.Development by the federal government, the state, school district, county or the City.

(G) Complete Development Application Approved Prior to Effective Date of Chapter.For development for which a complete application for a Planning Clearance was approved prior to January 1, 2026; and for nonresidential and multifamily development for which a complete application was submitted prior to January 1, 2026, so long as construction commences by January 1, 2028, the required fees shall be those in effect at time of submittal.

(H) Small Additions and Renovations for Residential Uses.Construction of an addition to an existing dwelling unit of 500 square feet or less, or expansion of finished space for an existing dwelling unit of 500 square feet or less. This exemption shall only be used one time for each dwelling unit and does not apply to accessory dwelling units.

(iii) Calculation of Amount of Impact Fees.

(A) Impact Fee Schedule.Except for those electing to pay impact fees pursuant to GJMC § 21.02.070(a)(5)(iii)(B), the impact fees applicable to the impact-generating development shall be as determined by the impact fee schedule, which is hereby adopted and incorporated herein. The impact fee schedules are based on the impact fee studies. It applies to classes of land uses within the City, differentiates between types of land uses, and is intended to defray the projected impacts caused by proposed new development on city capital facilities. The determination of the land use category(ies) in the impact fee schedules that are applicable to impact-generating development shall be made by the Director with reference to the impact fee studies and the methodologies therein; the then-current edition of the ITE Trip Generation Manual, published by the Institute of Traffic Engineers; the City zoning and development code; the then-current land use approvals for the development; and any additional criteria set forth in duly promulgated administrative rules.

a. Annual Adjustment of Impact Fees to Reflect Effects of Inflation.Impact fees shall be adjusted starting January 1, 2026 and on July 1 and January 1 thereafter until July 1, 2029, starting with the amount and step(s) shown in Table 21-02-8 Impact Fee Schedule. Commencing on January 1st of each subsequent year, each impact fee amount set forth in the Impact Fee Schedule shall be adjusted for inflation, utilizing the following formula and as follows:

Current Fee + (Total Fee X Inflation) + Step Increase = New Fee

(Total Fee and Step Increase as shown in Table 21.02-8)

b. Impact-Generating Development Not Listed in the Impact Fee Schedule.If the proposed impact-generating development is of a type not listed in the impact fee schedule, then the impact fees applicable are those of the most nearly comparable type of land use. The determination of the most nearly comparable type of land use shall be made by the Director with reference to the impact fee study and City code.

c. Mix of Uses.If the proposed impact-generating development includes a mix of those uses listed in the impact fee schedule, then the impact fees shall be determined by adding the impact fees that would be payable for each use as if it was a freestanding use pursuant to the impact fee schedule.

(B) Independent Fee Calculation Study.In lieu of calculating the amount(s) of impact fees by reference to the impact fee schedule, a fee payer may

request that the amount of the required impact fee be determined by reference to an independent fee calculation study.

a. Preparation of Independent Fee Calculation Study. If a fee payer requests the use of an independent fee calculation study, the fee payer shall be responsible for retaining a qualified professional (as determined by the Director) to prepare the independent fee calculation study that complies with the requirements of this section, at the fee payer's expense.

b. General Parameters for Independent Fee Calculation Study.Each independent fee calculation study shall be based on the same level of service standards and unit costs for the capital facilities used in the impact fee study and shall document the relevant methodologies and assumptions used.

c. Procedure.

1. An independent fee calculation study shall be initiated by submitting an application to the Director together with an application fee to defray the costs associated with the review of the independent fee calculation study.

2. The Director shall determine if the application is complete. If it is determined the application is not complete, a written statement outlining the deficiencies shall be sent by mail to the person submitting the application. The Director shall take no further action on the application until it is complete.

3. When it is determined the application is complete, the application shall be reviewed by the Director and a written decision rendered on whether the impact fees should be modified, and, if so, what the amount should be, based on the standards in GJMC § 21.02.070(a)(6)(i).

d. Standards.If, on the basis of generally recognized principles of impact analysis, the Director determines the data, demand information and assumptions used by the applicant to calculate the impact fees in the independent fee calculation study more accurately measure the proposed impact-generating development's impact on the appropriate capital facilities, the impact fees determined in the independent fee calculation study shall be deemed the impact fees due and owing for the proposed development. The fee adjustment shall be set forth in a fee agreement. If the independent fee calculation study fails to satisfy these requirements, the impact fees applied shall be the impact fees established in the impact fee schedule.

(6) Credits.

(i) Standards.

(A) General.Any person causing the commencement of impact-generating development may apply for credit against impact fees otherwise due, up to but not exceeding the full obligation of impact fees proposed to be paid pursuant to the provisions of this section, for any contributions or construction (as determined appropriate by the Director) accepted in writing by the City for capital facilities. Credits against impact fees shall be provided only for that impact fee for which the fee is collected.

(B) Valuation of Credits.

a. Construction.Credit for construction of capital facilities shall be valued by the City based on complete engineering drawings, specifications, and construction costs estimates submitted by the fee payer to the City. The Director shall determine the amount of credit due, if any, based on the information submitted, or, if he/she determines the information is inaccurate or unreliable, then on alternative engineering or construction costs determined by and acceptable to the Director.

b. Contributions.Contributions for capital facilities shall be based on the value of the contribution or payment at the time it is made to the City.

(C) When Credits Become Effective.

a. Construction.Credits for construction of capital facilities shall become effective after the credit is approved pursuant to this section, a written credit agreement is entered into and a) all required construction has been completed and has been accepted by the City, b) suitable maintenance and financial warranty has been received and approved by the City, and c) all design, construction, inspection, testing, financial warranty, and acceptance procedures have been completed in compliance with all applicable City requirements. Approved credits for the construction of capital facilities may become effective at an earlier date if the fee payer posts security in the form of an irrevocable letter of credit, escrow agreement, or cash and the amount and terms of such security are acceptable by the City Manager. At a minimum, such security must be in the amount of the approved construction credit plus 20%, or an amount determined to be adequate to allow the City to construct the capital facilities for which the credit was given, whichever is higher.

b. Contribution.Credits for contributions for capital facilities shall become effective after the credit is approved in writing pursuant to this section, a credit agreement is entered into and the contribution is made to the City in a form acceptable to the City.

c. Transferability of Credits.Credits for contributions, construction or dedication of land shall be transferable within the same development and for the same capital facility for which the credit is provided but shall not be transferable outside the development. Credit may be transferred pursuant to these terms and conditions by a written instrument, to which the City is a signatory, that clearly identifies

which credits issued under this section are to be transferred. The instrument shall be signed by both the transferor and transferee, and the document shall be delivered to the Director for registration of the change in ownership. If there are outstanding obligations under a credit agreement, the City may require that the transferor or transferee or both (as appropriate) enter into an amendment to the credit agreement to assure the performance of such obligations.

d. Total Amount of Credit.The total amount of the credit shall not exceed the amount of the impact fees due for the specific facility fee (e.g., fire, police, parks).

e. Capital Contribution Front-Ending Agreement. The City may enter into a capital contribution front-ending agreement with any developer who proposes to construct capital facilities to the extent the fair market value of the construction of these capital facilities exceeds the obligation to pay impact fees for which a credit is provided pursuant to this section. The capital contribution front-ending agreement shall provide proportionate and fair share reimbursement linked to the impact-generating development's use of the capital facilities constructed.

(ii) Procedure.

(A) Submission of Application.In order to obtain a credit against impact fees, the fee payer shall submit an offer for contribution or construction. The offer shall be submitted to the Director and must specifically request a credit against impact fees.

(B) Contribution Offer Contents.The offer for contribution credit shall include the following:

a. Construction.If the proposed credit involves construction of capital facilities:

1. The proposed plan for the specific construction certified by a duly qualified and licensed Colorado engineer;

2. The projected costs for the suggested improvement, which shall be based on local information for similar improvements, along with the construction timetable for the completion thereof. Such estimated costs may include the costs of construction or reconstruction, the costs of all labor and materials, the costs of all lands, property, rights, easements and franchises acquired, financing charges, interest prior to and during construction and for one year after completion of construction, costs of plans and specifications, surveys of estimates of costs and of revenues, costs of professional services, and all other expenses necessary or incident to determining the feasibility or practicability of such construction or reconstruction;

3. A statement made under oath of the facts that qualify the fee

payer to receive a contribution credit.

b. Contribution.If the proposed offer involves a credit for any contribution for capital facilities, the following documentation shall be provided:

1. A copy of the Planning Clearance for which the contribution was established;

2. If payment has been made, proof of payment; or

3. If payment has not been made, the proposed method of payment.

(C) Determination of Completeness.The Director shall determine if the application is complete. If it is determined that the proposed application is not complete, the Director shall send a written statement to the applicant outlining the deficiencies. No further action shall be taken on the application until all deficiencies have been corrected.

(D) Decision.The Director shall determine if the offer for credit is complete and if the offer complies with the standards in GJMC § 21.02.070(a)(6)(i).

(iii) Credit Agreement.If the offer for credit is approved by the Director, a credit agreement shall be prepared and signed by the applicant and the City Manager. The credit agreement shall provide the details of the construction or contribution of capital facilities, the time by which it shall be dedicated, completed, or paid, and the value (in dollars) of the credit against the impact fees the fee payer shall receive for the construction or contribution.

(iv) Accounting of Credits.Each time a request to use approved credits is presented to the City, the Director shall reduce the amount of the impact fees, and shall note in the City's records and the credit agreement the amount of credit remaining, if any.

(7) Impact Fee Accounts.

(i) Establishment of Impact Fee Accounts.

(A) Establishment of Impact Fee Accounts.For the purpose of ensuring impact fees collected pursuant to this section are designated for the mitigation of capital facility impacts reasonably attributable to new impact-generating development that paid the impact fees.

(B) Establishment of Impact Fee Accounts.Impact fees shall be deposited into four accounts (collectively, Impact Fee Accounts): transportation, parks and recreation, fire capital facilities, and police capital facilities.

(ii) Deposit and Management of Impact Fee Accounts.

(A) Managed in Conformance with § 29-1-801 C.R.S. et seq.The Impact Fee Accounts shall bear interest and shall be managed in conformance with § 29-1-801 C.R.S. et seq. No impact fees(s) or other similar development land development charge(s) shall be imposed or collected except pursuant

to a schedule(s) that is(are) a) adopted by ordinance by the City Council, pursuant to a legally sufficient study(ies); b) generally applicable to a broad class of property; and c) serves to defray the projected impacts on capital facilities caused by development. The City shall from time to time quantify the reasonable impacts of proposed development on existing capital facilities and establish the impact fee(s) or land development charge(s) at a level no greater than necessary to defray such impacts directly related to proposed development. No impact fee or other similar land development charge shall be imposed to remedy any deficiency in capital facilities that exists without regard to the proposed development.

(B) Immediate Deposit of Impact Fees in City Accounting Funds.All Parks and Recreation, Fire, Police, and Transportation impact fees collected by the City pursuant to this section shall be promptly deposited into the appropriate interest bearing accounting fund(s) ("Impact Fee Accounts") of the City designated, as allowed by § 29-1-803 C.R.S., by category, account or fund as determined by the City Manager or their designee. Any interest or other income earned on money deposited shall be credited to the Impact Fees Account(s) and no other City accounting fund(s).

(C) Interest Earned on Impact Fee Account Monies. Any impact fees not immediately expended shall be deposited as provided in this section. Interest earned on money in the Impact Fee Accounts shall be considered part of such account(s) and shall be subject to the same restrictions on use applicable to the impact fees deposited in such account.

(D) Income Derived Retained in Accounts Until Spent. All income derived from the deposits shall be retained in the accounts until spent pursuant to the requirements of this section.

(E) Expenditure of Impact Fees.Monies in each account shall be considered to be spent in the order collected, on a first-in/first-out basis.

(iii) Annual Report.At least once annually the City will publish on its official website a report for the most recent fiscal year stating the amount of each Impact fee and/or land development charge collected to the Impact Fee Accounts, the average annual interest rate on each account and the total amount disbursed from each account.

(8) Expenditure of Impact Fees.

(i) Capital Facilities Impact Fees.The monies collected from each capital facilities impact fee shall be used only to acquire or construct capital facilities within the City. Each and all capital facilities impact fees may, as determined by the City Council, be expended anywhere within the City notwithstanding the location of the project for which the impacts were paid.

(ii) No Monies Spent for Routine Maintenance, Rehabilitation or Replacement of Capital Facilities.No monies shall be spent for periodic or routine maintenance, rehabilitation, or replacement of any City transportation, parks and recreation, fire, or police capital facilities.

(iii) No Monies Spent to Remedy Deficiencies Existing on Effective Date of Chapter.No monies shall be spent to remedy existing deficiencies in transportation capital facilities, parks and recreation capital facilities, fire capital facilities, or police capital facilities.

(iv) Transportation Impact Fees.Transportation impact fee monies may be spent for the reconstruction and replacement of existing roads, the construction of new road systems and may be used to pay debt service on any portion of any current or future general obligation bond or revenue bond issued after July 6, 2004, and used to finance major road system improvements. All Transportation Impact Fees may, as determined by the City Council, be expended anywhere within the City notwithstanding the location of the project for which the impacts were paid.

(9) Refund of Impact Fees Paid.

(i) Refund of Impact Fees Not Spent or Encumbered in 10 Years.A fee payer or the fee payer's successor-in-interest may request a refund of any impact fees not spent or encumbered within 10 years from the date the fee was paid, along with interest actually earned on the fees. Impact fees shall be deemed to be spent on the basis of the first fee collected shall be the first fee spent.

(ii) Procedure for Refund.The refund shall be administered by the Director, and shall be undertaken through the following process:

(A) Submission of Refund Application.A fee payer or successor-in-interest shall submit within one year following the end of the tenth year from the date on which the Planning Clearance was issued for which a refund is requested. The refund application shall include the following information:

a. A copy of the dated receipt issued for payment of the impact fee;

b. A copy of the planning clearance.

(B) Determination of Completeness.The Director shall determine if the refund application is complete. If the application is not complete, the Director shall mail the applicant a written statement outlining the deficiencies. The Director shall take no further action on the refund application until it is complete.

(C) Decision on Refund Application.When the refund application is complete, it shall be reviewed and approved if the Director determines a fee has been paid which has not been spent within the ten-year period. The refund shall include the fee paid plus interest actually earned on the impact fee.

(iii) Limitations.

(A) Expiration of Planning Clearance Without Possibility of Extension.If a fee payer has paid an impact fee required by this section and obtained a Planning Clearance, and the Planning Clearance for which the impact fee was paid later expires without the possibility of further extension, then the fee payer or the fee payer's successor-in-interest may be entitled to a refund of the impact fee paid, without interest. In order to be eligible to receive a refund of impact fees pursuant to this subsection, the fee payer or the fee

payer's successor-in-interest shall be required to submit an application for such refund to the Director within 30 days after the expiration of the Planning Clearance for which the fee was paid. If a successor-in-interest claims a refund of the impact fee, the City may require written documentation that such rights have been conveyed to the claimant. If there is uncertainty as to the person to whom the refund is to be paid or if there are conflicting demands for such refund, the City Attorney may interplead such funds.

(iv) No Refund if Project Demolished, Destroyed, Altered, Reconstructed or Reconfigured.After an impact fee has been paid pursuant to this section, no refund of any part of such fee shall be made if the development for which the impact fee was paid is later demolished, destroyed, or is altered, reconstructed, reconfigured, or changed in use so as to reduce the size or intensity of the development or the number of units in the development.

(10) Low-Moderate Income Housing.In order to promote the provision of low-moderate income housing in the City, the City Council may agree in writing to pay some or all of the impact fees imposed on a proposed low or moderate income housing development by this section from other unrestricted funds of the City. Payment of impact fees on behalf of a fee payer shall be at the discretion of the City Council and may be made pursuant to goals and objectives adopted by the City Council to promote housing affordability.

(11) Administration, Appeals and Updates of Determination or Decision of Director to City Manager.

(i) Review.The impact fees described in this section and the administrative procedures of this section shall be reviewed by the City Council at least once every six years to ensure that: i) the demand and cost assumptions underlying the impact fees are still valid, ii) the resulting impact fees do not exceed the actual costs of constructing capital facilities that are of the type for which the impact fees are paid and that are required to serve new impact-generating development, iii) the monies collected or to be collected in each impact account have been and are expected to be spent for capital facilities for which the impact fees were paid, and iv) the capital facilities for which the impact fees are to be used will benefit the new development paying the impact fees. At the direction of the City Manager, a new impact fee study shall be conducted by an independent consultant no less than every eight years.

(ii) Appeal.

(A) Director Determination or Decision.Any determination or decision made by the Director under this section may be appealed to the City Manager by filing with the City Manager within 30 days of the determination or decision for which the appeal is being filed: A) a written notice of appeal on a form provided by the City Manager, B) a written explanation of why the appellant feels the determination or decision is in error, and C) an appeal fee established by the City.

(B) City Manager Review.The City Manager shall fix a time and place for hearing the appeal, and shall mail notice of the hearing to the appellant at

the address given in the notice of appeal. The hearing shall be conducted at the time and place stated in the notice given by the City Manager. At the hearing, the City Manager shall consider the appeal and either affirm or modify the decision or determination of the Director based on the relevant standards and requirements of this section. The decision of the City Manager shall be final.

(C) Administrative Rules.The City Manager and Director, and their respective designees, may from time to time establish written administrative rules, not inconsistent with the provisions of this section, to facilitate the implementation of this section as provided in GJMC § 21.02.010. Without limiting the foregoing, the Director is authorized to establish written administrative rules, not inconsistent with the provisions of this section, for use in the determination of the land use category(ies) in the impact fee schedule that is applicable to impact-generating development. All administrative rules adopted pursuant hereto shall be published in written form and copies thereof maintained in the offices of the Director and City Clerk. Administrative rules adopted pursuant hereto and a copy of such rules shall be made available without charge to fee payers and other persons requesting a copy thereof.

(12) Impact Fee Schedule - Fire, Police, Parks and Recreation, and Transportation.

Table 21.02-8 Impact Fee Schedule Fire, Police, Parks and Recreation and Transportation

Unit Size	Development Unit	Fire			Police			Transportation			Parks		
		1-Jan-26	Step Increase	Total Fee	1-Jan-26	Step Increase	Total Fee	1-Jan-26	Step Increase	Total Fee	1-Jan-26	Step Increase	Total Fee
850 or less	Dwelling	$501	—	$501	$179	—	$179	$2,853	—	$2,853	$1,078	$90	$1,530
851 to 1,000	Dwelling	$561	$17	$648	$232	—	$232	$3,539	$23	$3,655	$1,153	$165	$1,978
1,001 to 1,250	Dwelling	$590	$46	$822	$243	$10	$294	$3,698	$182	$4,610	$1,241	$253	$2,508
1,251 to 1,500	Dwelling	$359	$32	$1,016	$357	$1	$364	$5,428	$46	$5,658	$1,742	$274	$3,110
1,501 to 2,000	Dwelling	$902	$75	$1,276	$373	$17	$457	$5,662	$280	$7,064	$1,873	$405	$3,695
2,001 to 2,500	Dwelling	$948	$121	$1,550	$389	$33	$555	$6,541	$399	$8,534	$2,012	$544	$4,731
2,501 to 3,000	Dwelling	$933	$156	$1,764	$402	$46	$632	$3,321	$277	$9,704	$2,121	$653	$5,384
3,001 to 3,500	Dwelling	$1,013	$186	$1,944	$413	$57	$696	$8,482	$438	$10,674	$2,213	$745	$5,935
3501 or greater	Dwelling	$1,039	$212	$2,093	$422	$66	$751	$8,623	$579	$11,517	$2,291	$823	$6,404
Retail/Commercial	1,000 SF	$715	$146	$1,445	$284	$44	$506	$8,266	$10	$8,313			
Convenience Commercial	1,000 SF	$806	$237	$1,989	$316	$76	$697	$11,443	—	$11,443			
Office	1,000 SF	$292	$70	$641	$117	$22	$225	$4,985	—	$4,985			
Institutional/Public	1,000 SF	$235	$13	$297	$97	$2	$104	$1,742	$113	$2,307			
Industrial	1,000 SF	$98	$21	$200	$39	$6	$70	$1,548	—	$1,548			
Warehousing	1,000 SF	$50	$10	$102	$20	$3	$36	$787	—	$787			
Hotel/Lodging	Room	$473	—	$473	$166	—	$166	$3,676	—	$3,676			
RV Park	Pad	$160	—	$160	$56	—	$56	$1,241	—	$1,241			

(b) School Land Dedication Fee.

(1) Standard for School Land Dedication.Dedication of suitable school lands for school purposes shall be required of any development if the school district determines that such development includes within it land which is necessary for implementing a school plan. In all other cases, the fee required under GJMC § 21.02.070(b)(1)(ii) shall be paid in lieu of a school land dedication.

(i) Standard for Fee in Lieu of School Land Dedication. Except in cases where a school land dedication is required in accordance with this section, or an exemption under this section applies, all development and all projects which contain a new dwelling shall be subject to fees in lieu of school land dedication (SLD fee) in an amount per dwelling unit determined by resolution of the City Council. SLD fees shall be collected by the City for the exclusive use and benefit of the school district in which such development is located and shall be expended by the school district solely to acquire real property or interests in real property reasonably needed for development or expansion of school sites and facilities, or to reimburse the school district for sums expended to acquire such property or interests. Revenues from such fees shall be used only for such purposes.

(ii) Payment, Prepayment, Exemption, Credit, and Refund of SLD Fee.

(A) No building permit shall be issued for a dwelling, multiple-family dwelling or multifamily dwelling which is or contains one or more dwelling units until and unless the SLD fee for such dwelling unit in effect at the time such permit is applied for has been paid as required by this section.

(B) Nothing in GJMC § 21.02.070(b)(1)(i) shall preclude a holder of a development permit for a residential development or mixed-use development containing a residential development component from prepaying the SLD fees to become due under this section for one or more dwellings, multiple-family dwellings or multifamily dwellings to be constructed in such development. Such prepayment shall be made upon the filing of a Final Plat for residential development, at the SLD fee rate then in effect and in the amount which would have been due had a building permit application for such dwelling been pending at the time of prepayment. A subsequent building permit for a dwelling, multiple-family dwelling or multifamily dwelling which is or contains one or more dwelling units for which the SLD fees have been prepaid shall be issued without payment of any additional SLD fees. However, if such permit would allow additional dwelling units for which SLD fees have not been prepaid, such permit shall not be issued until the SLD fees for such additional dwelling units have been paid at the rate per dwelling unit in effect at the time the building permit application was made.

(C) Any prepayment of SLD fees in accordance with this section shall be documented by a memorandum of prepayment which shall contain, at minimum, the following:

a. The legal description of the real property subject to residential

development for which an SLD fee is being prepaid;

b. A description of the development permit issued concerning such real property, and a detailed statement of the SLD fees owed pursuant to such permit which are being prepaid;

c. The notarized signatures of the record owner of the property or their duly authorized agents; and

d. The notarized signature of the County Manager indicating approval of the prepayment plan, if the fee was paid while the real property was outside the limits of the City; or if the fee was paid at the time the real property was within the limits of the City, of the City Manager, indicating approval of the prepayment plan.

(iii) Exemptions.The following shall be exempted from payment of the SLD fee:

(A) Alterations or expansion of an existing building except where the use is changed from nonresidential to residential and except where additional dwelling units result;

(B) The construction of accessory buildings or structures;

(C) The replacement of a destroyed or partially destroyed building or structure with a new building or structure of the same size and use;

(D) The installation of a replacement mobile home on a lot or other parcel when a fee in lieu of land dedication for such mobile home has previously been paid pursuant to this section or where a residential mobile home legally existed on such site on or before the Effective Date of the ordinance codified in this section;

(E) Nonresidential buildings, nonresidential structures, or nonresidential mobile homes;

(F) Nursing homes, adult foster care facilities or specialized group facilities; and

(G) City- or County-approved planned residential developments that are subject to recorded covenants restricting the age of the residents of said dwelling units such that the dwelling units may be classified as housing for older persons pursuant to the Federal Fair Housing Amendments Act of 1988.

(iv) Credits.

(A) An applicant for a development permit (or a holder of such a permit) who owns other suitable school lands within the school district in which the development is located may offer to convey such lands to the school district in exchange for credit against all or a portion of the SLD fees otherwise due or to become due. The offer must be in writing, specifically request credit against fees in lieu of school land dedication, and set forth the amount of credit requested. If the City and the school district accept

such offer, the credit shall be in the amount of the value of the suitable school lands conveyed, as determined by written agreement between the City, the school district and the permit holder or applicant.

(B) Credit against SLD fees otherwise due or to become due will not be provided until good and sufficient title to the property offered under this subsection is conveyed to and accepted by the school district. Upon such conveyance, the school district and the City shall provide the applicant with a letter or certificate setting forth the dollar amount of the credit, the reason for the credit, and a description of the project or development to which the credit shall be applied.

(C) Credits shall not be transferable from one project or development to another.

(v) Refund of Fees Paid.

(A) Any SLD fee which has not been expended by the school district within five years of the date of collection shall be refunded, with interest at the rate of 5% per annum compounded annually, to the person who paid the fee. Prior to such refund, such amount shall be reduced by an amount equal to 3% of the principal amount to be refunded, for the costs incurred by the City in the refund of such fee. The City shall give written notice by U.S. mail to the person who paid the fee at their address as reflected in the records of the Mesa County Clerk and Recorder. If such person does not file a written claim for such refund with the City within 90 days of the mailing of such notice, such refund shall be forfeited and shall be retained and used for the purposes set forth in this section.

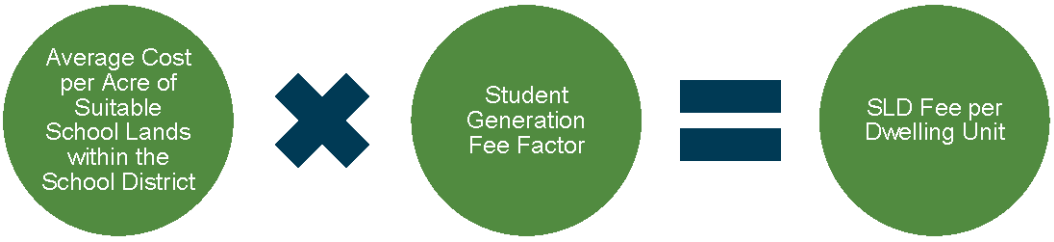
(B) The City Council may, upon the school district's request, extend the five-year period of time specified in GJMC § 21.02.070(b)(1)(v)(A) upon a showing that such extension is reasonably necessary in order for the school district to complete or close a purchase transaction entered into in writing by such district prior to expiration of such period, or to give the school district an opportunity to exercise a purchase option it acquired prior to expiration of such period. Such request shall be made at a public hearing of the City Council. In no event shall any extension of time exceed an additional five-year period.

(2) Fees in Lieu of School Land Dedication (SLD Fees).

(i) SLD fees shall be collected and held in trust for the use and benefit of the school district containing the residential development for which the fee is collected. Such fees shall be expended by the school district to acquire additional real property for expansion of school facilities and construction of new school facilities necessitated by new residential development in the school district, or to reimburse the school district for sums expended to acquire such property. The amount of the SLD fee shall be based on a methodology which takes into account the student generation rates of new residential development, the quantity of land required to build new school facilities on a per pupil basis, and the anticipated cost of acquiring suitable school lands in the school district to expand existing school facilities and construct new school facilities to

accommodate new residential development without decreasing current levels of educational services.

(ii) The SLD fee and the value of the variables in the formula to determine the SLD fee shall be set by resolution of the City Council in accordance with the following formula:



(For example, if the average cost of suitable school lands within the school district is $15,000 per acre and the student generation fee factor is 0.023, the SLD fee per dwelling unit would be $15,000 x 0.023, or $345.)

(iii) The average cost per acre of suitable school lands within the school district ("average cost per acre for SLD fee") and the student generation fee factor ("SGF factor") shall be determined by City Council. Before City Council considers modification of either, a sixty-day prior written notice shall be provided to the school district. If a written request for a public hearing specifying which factor, the average cost per acre for SLD fee and/or the SGF factor, the school district wants to be heard on is received by the City from the school district at least 30 days before the matter is scheduled to be determined by City Council, a public hearing shall occur. At a hearing where City Council is considering the modification of the average cost per acre for SLD fee, City Council shall consider the school district's long range capital improvement plans and any other evidence, comments or recommendations submitted by the school district. At a hearing where City Council is considering the modification of the SGF factor, City Council shall consider the school district's school facilities plan currently in place, the methodology and data supporting the proposed modification, and any evidence, comments or recommendations submitted by the school district.

(iv) The SLD fee in effect as of January 1, 2006, was $460. The SGF factor used to determine the SLD fee was 0.023. This SLD fee and SGF factor shall continue until otherwise modified by City Council as set forth in this Code.

(Ord. No. 5250, 4/2/2025; Ord. 5190, 12/20/2023)

Chapter 21.03
ZONE DISTRICTS AND DIMENSIONAL STANDARDS

§ 21.03.010. Purpose.

The purpose of this section is to establish zone districts that:

(a) Implement the Comprehensive Plan;

(b) Encourage the most appropriate use of land throughout the City and to ensure logical and orderly growth and development of the physical elements of the City;

(c) Prevent scattered, haphazard growth and guide the orderly development, infill, and redevelopment of urban areas;

(d) Conserve and enhance economic, social, and aesthetic values;

(e) Protect and maintain the integrity and character of established neighborhoods;

(f) Facilitate provision of adequate public facilities and services, such as transportation, water, sewerage, schools, streets, and parks;

(g) Promote the development of convenient and beneficial clusters of uses, including business and shopping facilities, in locations that provide safe walkability and reasonable vehicular access;

(h) Provide for adequate light and clean air;

(i) Aid in designing safe and effective mobility in the streets and public ways of the City;

(j) Prevent unduly noisome and/or injurious substances, conditions, and operations in or near residential areas;

(k) Secure safety from fire, panic, and other dangers; and

(l) Promote the public health, safety, and welfare.

(Ord. 5190, 12/20/2023)

§ 21.03.020. Zoning Map.

(a) Establishment.

(1) The boundaries of the zone districts established by this Code shall be shown on a map entitled Zoning Map of the City of Grand Junction. The Zoning Map is, by this reference, made a part of this Code.

(2) The official Zoning Map shall be located in, and maintained by, the Community Development Department in keeping with the City Clerk's custodial requirements. An electronic version of the official map shall be displayed on the City of Grand Junction website or other online venue.

(3) All amendments to the Zoning Map shall be shown on the map. Changes made to zone district boundaries shall be promptly entered on the Zoning Map after amendment by the City Council.

(b) Boundaries.The following rules shall be applied as necessary to interpret the Zoning Map. Rules of interpretation may be applied either singularly or jointly, as needed.

(1) Zone Boundaries.

(i) Zone boundaries shall be located on municipal corporate lines, section lines, parcel lines, natural feature boundary lines or on the center lines of highways, streets, alleys, railroad rights-of-way, water bodies (natural and man-made), ditches, or canals or these lines extended. Boundaries that appear to follow an established line shall be construed to follow the line.

(ii) In cases where these lines are not used, the zone district lines shall be as determined by using the Zoning Map scale.

(iii) Rights-of-way are not zoned unless vacated. Vacated ROW is zoned with the same district as the parcel into which it is incorporated or next to which it is adjacent. If a vacated ROW is adjacent to two or more zone districts the Director shall interpret the application of the Zoning Map.

(2) Zoning Standards.If a parcel of land is divided by a zone district boundary line at the time of enactment of this Code or by subsequent amendments, the appropriate standards and uses for each zone district shall apply on the portion of the parcel covered by that zone district.

(3) District Boundary Disputes.Disputes concerning the exact location of any zone district boundary line shall be decided in accordance with GJMC § 21.02.040(e).

(Ord. 5190, 12/20/2023)

§ 21.03.030. Zone district establishment.

(a) Zone Districts Created.

(1) To carry out the provisions of this title, the City is hereby divided into the following zone districts. The regulations in each zone district shall be uniform throughout that district but may differ from those in other districts.

(2) Within the various zone districts and as indicated on the Zoning Map and subject to the requirements of those districts, no building or structure shall be erected, reconstructed, or structurally altered, nor shall any land, building or structure be used for any purpose except as allowed in the applicable zone district unless the provisions of GJMC Chapter 21.12 apply.

Table 21.03-1: Zone Districts Summary

Legacy Districts	Updated District Titles	Section
Residential		
R-R: Residential - Rural	Residential - Rural, R-R	§ 21.03.050(d)
R-E: Residential - Estate	Residential - Estate Retired, R-ER	§ 21.03.050(e)
R-1: Residential - 1	Residential 1 Retired, R-1R	§ 21.03.050(f)
R-2: Residential - 2	Residential 2 Retired, R-2R	§ 21.03.050(g)

Table 21.03-1: Zone Districts Summary		
Legacy Districts	**Updated District Titles**	**Section**
R-4: Residential - 4	Residential Low 4, RL-4	§ 21.03.050(h)
R-5: Residential - 5	Residential Low 5, RL-5	§ 21.03.050(i)
R-8: Residential - 8	Residential Medium 8, RM-8	§ 21.03.050(j)
R-12: Residential - 12	Residential Medium 12, RM-12	§ 21.03.050(k)
R-16: Residential - 16	Residential High 16, RH-16	§ 21.03.050(l)
R-24: Residential - 24	Residential High 24, RH-24	§ 21.03.050(m)
Mixed-Use Commercial		
R-O: Residential - Office	Mixed-Use Neighborhood, MU-1	§ 21.03.060(c)
B-1: Neighborhood Business	[Combined with R-O into MU-1]	
B-2: Downtown Business	Mixed-Use Downtown, MU-3	§ 21.03.060(e)
M-U: Mixed Use	Mixed-Use Light Commercial, MU-2	§ 21.03.060(d)
C-1: Light Commercial	[Combined with M-U into MU-2]	
BP: Business Park Mixed-Use	[Combined with M-U into MU-2]	
C-2 General Commercial	Commercial General, CG	§ 21.03.060(f)
MXR: Mixed Use Residential	[Combined with Residential Districts]	
MXG: Mixed Use General	[Combined with closest MU district]	
MXS: Mixed Use Shopfront	[Combined with closest MU district]	
MXOC: Mixed Use Opportunity Corridor	[Combined with MU-2]	
Industrial		
I-O: Industrial/Office Park	Industrial/Office Park Retired, I-OR	§ 21.03.070(d)
I-1: Light Industrial	Industrial Light, I-1	§ 21.03.070(e)
I-2: General Industrial	Industrial General, I-2	§ 21.03.070(f)
Public, Parks, and Open Space		
CSR: Community Services and Recreation (Parks and Open Space only)	Public Parks and Open Space, P-1	§ 21.03.080(c)
CSR: Community Services and Recreation (Public, Civic and Institutional Facilities)	Public, Civic, and Institutional Campus, P-2	§ 21.030.080(d)
Planned Development		
PD: Planned Development	Planned Development, PD	§ 21.03.0100

Table 21.03-1: Zone Districts Summary		
Legacy Districts	**Updated District Titles**	**Section**
Overlay		
AE: Airport Environs Overlay	Airport Environs Overlay, AE	§ 21.03.090
H Road/Northwest Area	H Road/Northwest Area	GJMC Title 22
North Avenue Overlay	North Avenue Overlay	GJMC Title 23
Greater Downtown Overlay	Greater Downtown Overlay	GJMC Title 24
24 Road Corridor Standards	24 Road Corridor Standards	GJMC Title 25
North Seventh Avenue Historic Residential District	North Seventh Avenue Historic Residential District	GJMC Title 26
Horizon Drive District Overlay	Horizon Drive District Overlay	GJMC Title 27

(b) Districts to Regulate Development and Implement the Comprehensive Plan.

(1) Table 21.03-2: identifies which zone district(s) appropriately implement(s) a given future land use designation identified in the Land Use Plan of the One Grand Junction Comprehensive Plan ("OGJ LUP").

(2) An OGJ LUP designation is a broad identified of future land use and can be implemented through more than one zone district. A dot indicates that the zone district implements the corresponding OGJ LUP designation and is therefore an appropriate option for zoning or rezoning of land within that designated area on the OGJ LUP map.

(3) A blank cell (no dot) indicates that the zone district is not an appropriate option for zoning or rezoning of land within the corresponding OGJ LUP designation.

(4) This Code includes zone districts that pre-date and do not implement the OGJ LUP. These zone districts have been carried forward to this Code and remain current and conforming zoning, but lack of implementation of an OGJ LUP designation may be considered reason for rezoning denial. This Code also includes zone districts that have been retired and to which property may not be rezoned. These districts are not included in the following table.

Table 21.03-2: Comprehensive Plan Implementation									
Zone Districts	**Rural Res.**	**Res. Low**	**Res. Med**	**Res. High**	**Mixed Use**	**Comm.**	**Ind.**	**Airport**	**Parks and Open Space**
Residential									
Residential — rural	●								
Residential — estate									
Residential — 1									
Residential - 2									
Residential low 4		●							
Residential low 5		●							
Residential medium 8			●						
Residential medium 12			●						
Residential high 16				●	●				
Residential high 24				●	●				
Mixed-Use and Commercial									
Mixed-use 1: neighborhood				●	●				
Mixed-use 2: light commercial					●	●			
Mixed-use 3: downtown					●				
Commercial general						●	●		
Industrial									
Industrial 1: light							●		
Industrial 2: general							●		
Public, Parks, and Open Space									

Table 21.03-2: Comprehensive Plan Implementation									
Zone Districts	**Rural Res.**	**Res. Low**	**Res. Med**	**Res. High**	**Mixed Use**	**Comm.**	**Ind.**	**Airport**	**Parks and Open Space**
Public, parks and open space, P-1	●	●	●	●	●				●
Public, civic, and institutional campus, P-2	●	●	●	●	●	●		●	●
Planned Development									
Planned development		●	●	●	●	●	●		

(Ord. 5190, 12/20/2023)

§ 21.03.040. Dimensional standards general rules and exceptions.

(a) Dimensional Standards Established by Zone District.

(1) The dimensional standards applicable to each zone district are located within that zone district.

(2) Legally nonconforming lots may be developed per GJMC § 21.12.050.

(3) Exceptions and restrictions applicable to some dimensional standards are provided in this section. Other exceptions or restrictions may be provided for elsewhere in this Code. Where there is uncertainty about the applicability of dimensional exception, an applicant may request a Code Interpretation per GJMC § 21.02.040(e).

(b) Flag Lots.Where permitted by the Director, flag lots shall meet the standards in GJMC Chapter 21.09.

(c) Height Exceptions.

(1) Structures and Equipment.

(i) Zone district height limit exceptions are allowed for attached accessory structures as follows:

Table 21.03-3: Permitted Height Exceptions

Projection	Height Increase, max
Chimneys, stacks, vents, and flues	30% over zone district maximum height
Antennas and towers (except as provided in § 21.04.030(e)(5) Wireless Communication Facilities)	30 feet
Emergency sirens and similar devices	Any distance
Mechanical, electrical, and plumbing equipment; solar panels or solar array; air conditioner and evaporative coolers	30% over zone district maximum height
Parapet walls, safety railings, and screening walls	4 feet
Architectural features such as unoccupied belfries, flagpoles, spires, silos, domes, and windmills	30% over zone district maximum height

(2) Federal Aviation Administration Prohibitions.

(i) Any hazard or obstruction to aircraft as regulated by the FAA is prohibited. Buildings, belfries, towers, trees, and flagpoles are examples of such hazards depending on location and height.

(ii) The construction, maintenance, or establishment of any building, tree, smokestack, chimney, flagpole, wire, tower or other structure or appurtenances

thereto, which may constitute a hazard or obstruction to safe air navigation, landing, or takeoff of aircraft near an airport, is prohibited.

(iii) Regulations adopted by the Federal Aviation Administration (FAA) shall be minimum standards. No request shall be approved if it violates FAA standards.

(d) Lot Area, Width, or Setback Exceptions.

(1) Unoccupied public utility installations, such as substations, shall be permitted in an area smaller than the minimum lot area prescribed by this Code. While coverage requirements shall not apply, all landscaping, screening and other requirements shall apply.

(2) The location of minimum lot width measurement on existing, irregularly shaped lots may be adjusted by the Director to the widest location on the lot.

(3) The minimum lot size, width, or required setbacks may be reduced (dimensional reduction) by the Director on lots abutting "tracts" (as defined below) where the following conditions are met and to the extent the abutting tract provides for a portion of the minimum lot size, width, or setback space:

(i) The abutting "tract" includes one or more of the following:

(A) A park, trail, or open space that has been dedicated to the City for the use of the general public;

(B) Public water or public sewer lines;

(C) A required landscape buffer;

(D) A required drainage facility; or

(E) Open space (whether required by this Code or otherwise established), which is land within a development designed for and perpetually limited to the common use or enjoyment of the residents or occupants of the development and/or the public, but not including areas used for streets, alleys, driveways, or off-street parking or loading areas.

(ii) Only that portion of the proposed lot line that is contiguous with the abutting tract may be used for purposes of determining the proposed dimensional reduction;

(iii) The dimensional reduction shall be less than or equal to the open area provided by the tract;

(iv) Maintenance of the tract shall be provided for in a binding agreement approved by the City;

(v) The tract is part of the subdivision or development that is the subject of the application.

(vi) Abutting tracts may not be used to reduce any dimension of an easement.

(e) Setback Exceptions.

(1) Calculating Setbacks Across Contiguous Parcels.More than one contiguous parcel of land in the same ownership may be used for a principal use and to satisfy setback requirements for structures. The owner shall record an instrument, approved by the City Attorney, that limits the uses and rights to convey (including for loans) the contiguous parcel.

(2) Permitted Encroachments.

(i) Setback encroachments are building and site elements that project into or are located on the "non-buildable" side of a setback line, typically in a required setback area.

(ii) Permitted encroachments, identified below, are allowed where the required dimension is measured by a setback line, not a build-to line.

Table 21.03-4: Permitted Setback Encroachments

	Encroachment into Principal Structure Setback	
Permitted Encroachment	**Front or Street Side Setback (maximum feet)**	**Internal or Rear Setback (maximum feet)**
Building Element		
Approved accessibility ramps	Any distance	Any distance
Bay windows	3	3
Belt courses, sills, lintels, pilasters, pediments	1	1
Breezeways, unenclosed	Not permitted	Not permitted
Carport, Open	Not permitted	Up to 0.5 into the setback, but not closer than 3 feet to the lot line
Chimneys not greater than 6 feet in width	2	2
Eaves, roof overhangs, cornices, gutters, and downspouts	6	6
Porches, stoops, decks, terraces, balconies, and associated stairs (uncovered and unenclosed)	6 feet into the setback, but no closer than 3 feet to any property line	6 feet into the setback, but no closer than 3 feet to any property line
Shading devices such as awnings and canopies	5	5
Stairs and fire escapes (unenclosed)	6	6
Window wells	Any distance	3

Table 21.03-4: Permitted Setback Encroachments		
	Encroachment into Principal Structure Setback	
Permitted Encroachment	Front or Street Side Setback (maximum feet)	Internal or Rear Setback (maximum feet)
Site Elements		
Accessory Structure	Not permitted	Not permitted
Clothes lines and poles	Not permitted	Any distance
Driveway, curbs, and sidewalks	Any distance	Any distance
Fences and walls	Any distance	Any distance
Flagpoles and signs	Any distance	Any distance
Gardens and landscaping	Any distance	Any distance
Ornamental lights in yards and service areas	Any distance	Any distance
Pergolas	Any distance	Any distance
Play equipment	Not permitted	Not permitted
Swimming pools and hot tubs including mechanical equipment and deck	Not permitted	Any distance
Trash containers	Not permitted	Not permitted
Mechanical, Electric, and Plumbing Elements		
Evaporative coolers or air conditioners (window)	2	2
Evaporative coolers or air conditioners (ground)	3	3
Gas and electric meters	2	2
Solar energy collectors and heat storage units	3	3
Underground utilities	Any distance	Any distance
Transformers	Not permitted	Not permitted

(3) Residential Setback Adjustments.

(i) Zero Lot Line Development.In a zero lot line development, dwellings are shifted to one side of the lot to provide greater usable yard space on each lot.

(A) A zero lot line development is allowed in any Residential zone district except in R-R, R-E, R-1R or R-2R.

(B) The outside boundary of the permissible building envelope for each lot must be graphically depicted on a map and be recorded with the plat. The corresponding plat shall note the existence of the building envelope map and reference its recording information.

(C) One side setback may be reduced down to zero. The street side setback and interior side setbacks abutting a property outside the project shall not change.

(D) All zero lot line development shall comply with the following:

a. The minimum distance between adjacent structures in the development must be equal to twice the required side setback of the zone unless changed pursuant to a cluster.

1. The eaves, including any gutters, on the side of the dwelling with the reduced setback may encroach up to 18 inches into the abutting lot within the project.

2. The building envelope map shall note the extent and location of the potential encroachment. Appropriate easements shall be created for maintenance/repair purposes.

b. A maintenance/repair easement shall be created when the eaves or side wall of a proposed house would be within four feet of the abutting property. In addition, any structure on the abutting lot is restricted to one or more feet from the common boundary so that after construction of both dwellings there remains at least five feet between the structures at all points, except when the structure is attached dwelling units.

c. If a side wall of a structure is on the property line, or within three feet of the property line, windows or other openings that allow for visibility into the side yard of the adjacent lot are not allowed. Openings do not allow for visibility into the side yard of the adjacent lot, such as a clerestory skylight or opaque window, are allowed.

1. Windows that do not allow visibility into the side yard of the adjacent lot, such as a clerestory window or translucent window, are allowed.

2. When openings are permitted, all building and fire codes shall apply.

(4) Setback Averaging.Regardless of the minimum front setback required by the zone district, a front or street side setback may be reduced to the average of the setbacks of the immediately adjoining lots that are on both sides of the subject lot. The following rules apply in calculating the average setback:

(i) Only the setbacks on the lots that abut a side of the subject lot at the street and are on the same side of the street may be used. Setbacks across the street or along a different street may not be used; and

(ii) When one abutting lot is vacant, or if the subject lot is a corner lot, then the average is calculated using the setback of the not vacant lot and the zone district minimum setback.

(iii) Approval of setback averaging shall be in the form of a letter from the Director.

(5) Special Setbacks.The following special setbacks shall apply where noted:

(i) On corner lots, in areas where an existing parkway strip exceeds 10 feet in width between a sidewalk and the curb, the front yard setback on a side street may be varied by the Director under the conditions and restrictions listed below. A side street shall be considered that street corresponding to the side yard of the majority of the structures on a block. In unusual or conflicting circumstances, the Director shall designate which street is the side street.

(A) No variance shall be approved to less than five feet from property line.

(B) A variance may be approved only for a single-family residential use.

(C) Any variance approved shall meet all other provisions of this Code, including sight distance requirements. No variance shall be granted unless the City Engineer finds, in writing, that the proposal will not create a danger to pedestrians or vehicle circulation.

(D) No vehicular access shall be allowed from a side street to any structure approved for a variance under the provisions of this section.

(E) A variance shall only be effective if it is issued by the Director, contains the legal description and any terms and conditions, and is recorded by the applicant prior to issuance of a building permit.

(ii) Accessory structures may be allowed in a front setback through an administrative adjustment [see GJMC § 21.02.040(c)], unless prohibited in the zone district.

(f) Cluster Development.

(1) Purpose.The purpose of cluster developments is to encourage the preservation of environmentally sensitive areas, open space, stands of three or more significant trees, and agricultural lands, while encouraging and providing the ability to develop at a density range supported by the Comprehensive Plan and those densities that are consistent with the property's zoning designation.

(2) Applicability.

(i) Cluster development is permitted in all Residential districts except RH-16 and RH-24.

(ii) In any Residential zone district where clustering is permitted, the Director may approve lots that are smaller and arranged differently than otherwise allowed under this Code.

(3) Design Standards.Unless provided otherwise by the subdivision approval, cluster subdivisions must meet the following standards:

(i) Lot Size and Layout.

(A) The minimum lot size is the percentage of open space of total acres of the entire development multiplied by 1.5, with a resulting minimum lot size no smaller than 3,000 sq. ft. Expressed as an equation, this is:

(B) Minimum Lot Size = (existing minimum lot size) - ((% open space x 1.5) x existing minimum lot size).

(C) The minimum lot size requirement of the underlying zone district may then be reduced by the resulting percentage. The following table provides example lot sizes based on various open space reservations.

Table 21.03-5: Cluster Development Lot Size Examples

Zone Districts	Min Lot Size (square feet)	20% Open Space (square feet)	30% Open Space (square feet)	50% Open Space (square feet)	66% Open Space (square feet)
R-R	5 acres	3.5 acres	2.75 acres	1.25 acres	2,178
R-E	1 acre	30,492	23,958	16,890	2,000
R-1R	30,000	21,000	16,00	7,500	2,000
R-2R	15,000	10,500	8,250	3,750	2,000
RL-4	7,000	4,900	3,850	3,000	2,000
RL-5	4,000	3,000	3,000	3,000	2,000
RM-8	3,000	2,100	2,000	2,000	2,000

(D) Minimum lot size shall also be subject to other provisions, such as GJMC § 21.06.010(f), which might further restrict lot size.

(E) In no event shall any lot be less than 2,000 square feet.

(F) Dimensional standard requirements for clustered lots are those of the district which has the closest lot sizes. For example, if an R-2R district is developed with 30% open space then the dimensional requirements of the RL-4 district apply.

(G) Where clustering is used in areas that are not otherwise limited by topography or other natural features, lots shall generally be organized where lots located near adjacent developments are designed with similarly sized lots or should be planned where open space, buffering and/or other tools such as building envelopes and setbacks can help minimize impacts on existing adjacent development.

(ii) Open Space Size and Design.

(A) At least 20% of the gross acreage of a cluster development shall be open space.

(B) Unless the Director approves otherwise, public open space shall abut or

provide easy access to or protect other public land, especially federal land. Open space design and developer constructed improvements shall:

a. Be linked to existing and planned public open spaces, constructed areas and trails as the Director deems possible;

b. Maximize access and use by residents of the cluster development; and

c. Provide trails, paths and walkways to recreation areas, schools, commercial areas, and other public facilities.

(C) The Director may require:

a. Paved pedestrian paths, located in rights-of-way or easements;

b. Paved bicycle ways; and

c. Trails surfaced with softer materials such as wood chips or gravel.

(D) All open space shall be conveyed to, owned, and maintained by an entity approved by the City. The applicant for cluster development shall:

a. Offer the open space to dedicate to a local government or other entity approved by the Director. Open space in a cluster shall be offered as a dedication to the City or, at the election of the City, to a nonprofit trust or conservancy approved by the City;

b. Convey open space to an entity to hold it in perpetuity for the owners of lots and/or the public; or

c. Establish a conservation easement for agricultural land to be preserved in the form approved by the City Attorney.

(E) The covenants and restrictions regarding perpetual preservation and maintenance of the open space shall include provisions addressing:

a. Maintenance duties of the grantee;

b. A mechanism so that each lot owner may be assessed by the grantee; and

c. The power but not any duty of the City to enforce any covenant or restriction.

(iii) Buffering.

(A) A perimeter enclosure in accordance with GJMC § 21.07.090 may be required to create a visual barrier between the cluster development and adjoining development.

(B) The perimeter of a cluster development that abuts a right-of-way shall provide a buffer. The type of buffer shall take in to account the future road classification, right-of-way width, and type of current and future development on adjacent properties.

(C) The project landscaping and buffer design shall be established as part of any preliminary subdivision plan approval.

(4) Project Phasing.A cluster development project may be developed in phases. The Director may require the applicant to divide the project into phases in order to meet these standards.

(i) Each phase must be self-sufficient with adequate facilities and services and contain a mix of residential uses and densities and open space, while meeting the requirements, standards, and conditions applicable to the project as a whole.

(ii) Open space shall be provided for each phase of a development or all may be provided at the first phase. If common open space will not be provided proportionally by phase, the developer shall identify on the first plat all areas of all phases that are intended to be open space and deliver to the City Clerk a warranty deed to all open space areas. The plat will be recorded if the development is not completed.

(Ord. No. 5242, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.03.050. Residential districts.

(a) Residential Districts Established.The following Residential zone districts are established in this Code, as summarized in Table 21.03-1. When the Code refers to "Residential" zone districts, these districts are included:

Table 21.03-6: Residential Zone Districts Summary

Legacy Zone Districts	Zone District Name	Section
R-R: Residential — Rural	Residential — Rural, R-R	§ 21.03.050(d)
R-E: Residential — Estate	Residential — Estate Retired, R-ER	§ 21.03.050(e)
R-1: Residential — 1	Residential 1 Retired, R-1R	§ 21.03.050(f)
R-2: Residential — 2	Residential 2 Retired, R-2R	§ 21.03.050(g)
R-4: Residential — 4	Residential Low 4, RL-4	§ 21.03.050(h)
R-5: Residential — 5	Residential Low 5, RL-5	§ 21.03.050(i)
R-8: Residential — 8 and MXR-3: Mixed-Use Residential	Residential Medium 8, RM-8	§ 21.03.050(j)
R-12: Residential — 12 and MXR-5: mixed use residential	Residential Medium 12, RM-12	§ 21.03.050(k)
R-16: Residential — 16	Residential High 16, RH-16	§ 21.03.050(l)
R-24: Residential — 24 and MXR-8: mixed-use residential	Residential High 24, RH-24	§ 21.03.050(m)

(b) Purpose.The Residential zone districts are intended to:

(1) Implement the goals, strategies, and future land use plan of the Grand Junction Comprehensive Plan;

(2) Provide appropriately located areas for residential development in a range of patterns, housing mixes, and densities to create housing opportunities for the community;

(3) Protect the character of existing residential neighborhoods while encouraging the creation of new neighborhoods and mixed-use living options;

(4) Discourage the establishment of incompatible uses that would create safety, health, or quality of life concerns for the residents of Grand Junction.

(c) Standards Applicable to All Residential Zone Districts.

(1) Setbacks.

(i) Setback averaging [GJMC § 21.03.040(e)(4)] may be applied to primary and accessory setbacks and the vehicle storage setback may be adjusted proportionately.

(ii) Attached single-family dwellings that front onto a private drive, shared drive, parking lot, or other private access way shall be set back a minimum of 15 feet from the edge of the access way, with front loading garages set back a minimum of 20 feet from any vehicular or pedestrian access way.

(d) Residential Rural (R-R).

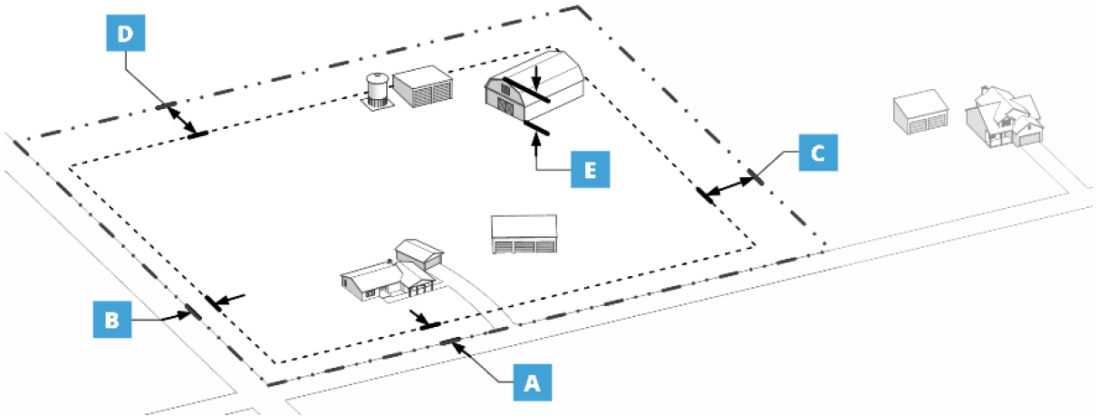
(1) Intent.To provide areas for low intensity agricultural operations and large lot single-family detached dwelling uses in a rural setting. This district is appropriate for the Rural Residential future land use designation or where terrain and/or lack of public facilities and services require low intensity development, as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Sewer and Roads.Each structure shall be served by the Persigo 201 Sewer System unless waived by the City Council. Rural road standards may apply.

(3) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the R-R zone district:



Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot area	5 acres
Lot width	150
Lot frontage	50
Density (units/acre)	
Minimum units/acre	n/a
Maximum units/acre	1 unit/5 acres
Cluster allowed per § 21.03.040(f)?	Yes
Lot Coverage (maximum)	
Lot coverage	5%

Building Standards		
Setbacks: Principal Structure (minimum, feet)		
A	Front	20
B	Street Side	20
C	Side	50
D	Rear	50
Setbacks: Accessory Structure (minimum, feet)		
	Front	25
	Street Side	25
	Side	50
	Rear	50
Height (maximum, feet)		
E	Height	35
Notes: See § 21.03.050(c) for setback adjustments		

(e) Residential Estate Retired (R-ER).

(1) Intent.The Residential Estate zone district has been retired from future use. Property that is zoned R-E as of the Effective Date shall be permitted to continue as conforming to this Code but rezoning any additional areas to R-E is prohibited. The intent of the R-ER zone district is to provide areas for low density, estate-type single-family residential detached dwelling development on lots of at least one acre in size.

(2) Sewer and Roads.Each structure shall be served by the Persigo 201 Sewer System unless waived by the City Council. Rural road standards may apply.

(3) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the R-ER zone district:

Lot area	1 acre
Lot width	150
Lot frontage	50
Cul-de-sac	30
Density (units/acre)	
Minimum | Maximum	n/a | 1
Density measurement GJMC § 21.14.010(a)	
Cluster allowed per § 21.03.040(f)	Yes
Lot Coverage (maximum)	
Lot coverage	15%

Front	20
Street Side	15
Side	15
Rear	30
Setback: Accessory Structure (minimum, feet)	
Front	25
Street Side	20
Side	5
Rear	10
Height (maximum, feet)	
Height	35
Notes: See § 21.03.050(c) for setback adjustments	

(f) Residential 1 Retired (R-1R).

(1) Intent.The Residential 1 zone district has been retired from future use. Property that is zoned R-1 as of the Effective Date shall be permitted to continue as conforming to this Code but rezoning any additional areas to R-1 is prohibited. R-1R development shall comply with the dimensional standards in this section and general standards in other sections of this Code. The intent of the R-1R zone district is to provide areas for low density residential uses in less intensely developed areas.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the R-1R zone district:

Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot area	30,000

Building Standards	
Setback: Principal Structure (minimum, feet)	
Front	20

Lot Standards	
Lot width	100
Lot frontage	50
Cul-de-sac	30
Density (units/acre)	
Minimum | Maximum	n/a | 1
Density measurement GJMC § 21.14.010(a)	
Cluster allowed per § 21.03.040(f)	Yes
Lot Coverage (maximum)	
Lot coverage	20%

Building Standards	
Street Side	15
Side	15
Rear	30
Setback: Accessory Structure (minimum, feet)	
Front	25
Street side	20
Side	3
Rear	10
Height	35

(g) Residential 2 Retired (R-2R).

(1) Intent. The Residential 2 zone district has been retired from future use. Property that is zoned R-2 as of the Effective Date shall be permitted to continue as conforming to this Code but rezoning any additional areas to R-2 is prohibited. The intent of the R-2R district is to provide areas for single-family and two-family residential uses where adequate public facilities and services exist.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the R-2R zone district:

Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot area (per structure, not unit)	15,000
Lot width	100
Lot frontage	50
Cul-de-sac (minimum feet)	30
Density (units/acre)	
Minimum | Maximum	n/a | 2
Density measurement GJMC § 21.14.010(a)	

Building Standards	
Setbacks: Principal Structure (minimum, feet)	
Front	20
Street side	15
Side	15
Rear	30
Setback: Accessory Structure (minimum, feet)	
Front	25
Street side	20
Side	3

Lot Standards	
Cluster allowed per § 21.03.040(f)	Yes
Lot Coverage (maximum)	
Lot coverage	30%

Building Standards	
Rear	5
Height (maximum, feet)	
Height	35
Notes: See § 21.03.050(c) for setback adjustments	

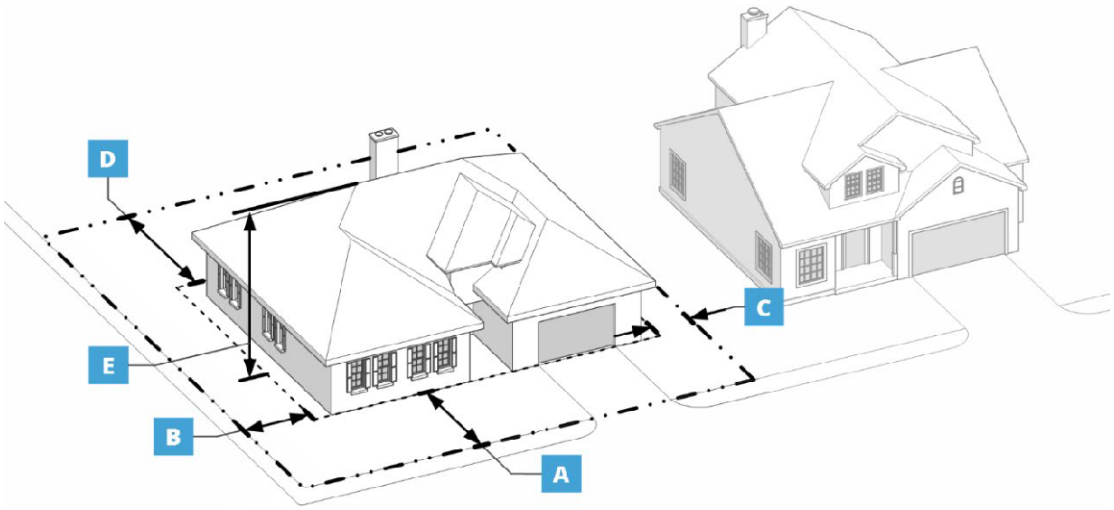
(h) Residential Low 4 (RL-4).

(1) Intent.To provide for single-family and two-family residential uses where adequate public facilities and services are available. The RL-4 zone district is appropriate to implement the Residential Low future land use designation, as indicated in Table 21.03-2: Comprehensive Plan Implementation, and may be used as a transition between Rural Residential more intense RL-5 for RM-8 zone districts.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the R-4 zone district:



Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot area	
Single unit, duplex	7,000/structure
Single-family attached	2,500/unit

Building Standards		
Setbacks: Principal Structure (minimum, feet)		
A	Front	15
B	Street Side	15
C	Side	7

Multifamily	Not allowed
Civic and institutional	20,000/ structure
Lot width	
Lot area measured by structure	70
Lot area measured by unit	25
Lot frontage	20
Cluster allowed per § 21.03.040(f)	Yes
Density (units/acre)	
Minimum | Maximum	2 | 4
Cluster allowed per § 21.03.040(f)	Yes
Lot Coverage (maximum)	
Lot Coverage	50%
Maximum Number of Dwelling Units	
Single-family attached	4
All other residential uses	As allowed by density

	Rear	25
	Front	25
	Street Side	20
	Side	3
	Rear	5
Height (maximum, feet)		
E	Height	40

Notes: See § 21.03.050(c) for setback adjustments

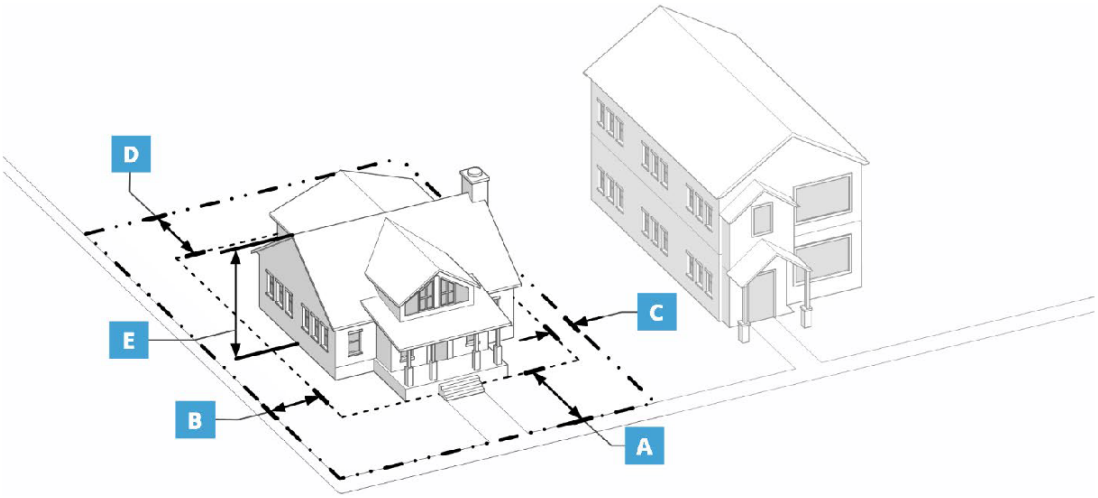
(i) Residential Low 5 (RL-5).

(1) Intent.To provide for a low-density development pattern that may include detached and attached dwellings along with small-scale multifamily structures in the Residential Low future land use designation, as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the RL-5 zone district.



Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot Area	
Single Unit, Duplex	4,000/structure
Single-Family Attached	2,000/unit
Multifamily	No min
Civic and Institutional	20,000
Lot Width	
Lot area measured by structure	40
Lot area measured by unit	20
Lot frontage	20
Cluster allowed per § 21.03.040(f)	Yes
Density (units/acre)	
Minimum | maximum	3 | 5.5
Lot Coverage (maximum)	
Lot coverage	60%
Maximum Number of Dwelling Units	

Building Standards		
Setbacks: Principal Structure (minimum, feet)		
A	Front	15
	Street Side	15
C	Side	5
D	Rear	15
Setbacks: Accessory Structure (minimum, feet)		
	Front	25
	Street Side	20
	Side	3
	Rear	5
Height (maximum, feet)		
E	Height	40
Notes: See § 21.03.050(c) for setback adjustments		

Lot Standards	
Multifamily	4
All other residential uses	As allowed by density

(j) Residential Medium 8 (RM-8).

(1) Intent.To provide for medium density detached dwellings, two-family and other attached single-family dwellings, and medium-sized multifamily structures. RM-8 is appropriate for the creation of neighborhoods with a mix of housing types or as a transitional district between low density zone districts such as RL-4 and higher density multifamily or Mixed-Use districts. RM-8 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the RM-8 zone district.

Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot area	
Single unit or duplex	3,000/structure
Single family attached	1,200/unit
Multifamily	No min
Civic and institutional	20,000
Lot width	

Building Standards		
Setbacks: Structure (minimum)		
A	Front [1]	15
B	Street side	15
C	Side	5
D	Rear	10
Setbacks: Accessory Structure (minimum)		
	Front	25
	Street Side	20

Lot Standards	
Lot area set by structure	40 per lot
Lot area set by unit	16 per unit
Lot frontage	20 per lot
Density (units/acre)	
Minimum | maximum	5.5 | 8
Lot coverage (maximum)	
Lot coverage	75%

	Side	3
	Rear	5
Height (maximum, feet)		
E	Height	50

Notes: [1] Vehicle storage, including a garage, required front setback is 20 feet.

See § 21.03.050(c) for setback adjustments

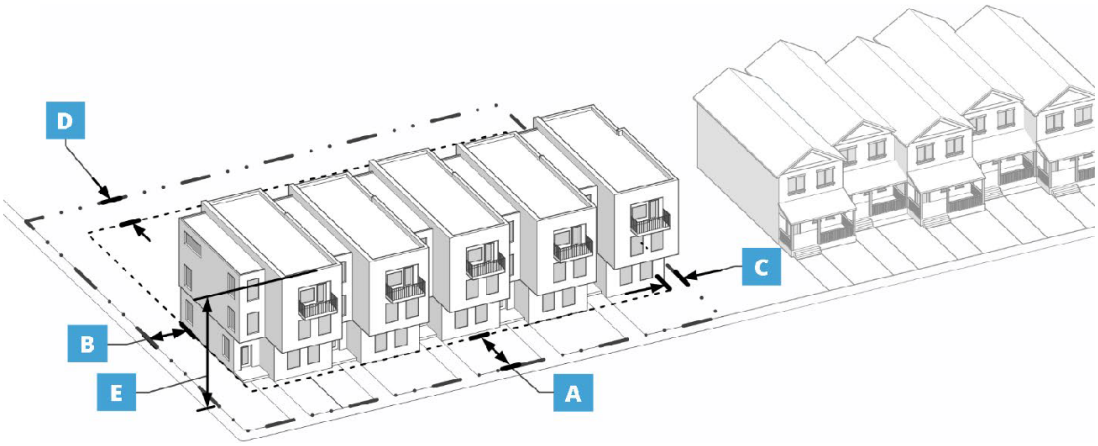
(k) Residential Medium 12 (RM-12).

(1) Intent.To provide for medium density development allowing several types of residential units within specified densities. RM-12 is appropriate for the creation of a neighborhood with a mix of housing types and may serve as a transitional district between Residential Low zone districts and higher density residential or mixed-use development. RM-12 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the RM-12 zone district.



Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot Area, any type of unit	No min
Lot Width	30 per lot
Triplex, fourplex, townhome	16 per unit
Lot frontage	20
Density (units/acre) GJMC § 21.14.010(a)	
Minimum | maximum	8 | 12
Lot Coverage (maximum)	
Lot coverage	75%
Notes: [1] Single-family attached vehicle storage, including a garage, required front setback is 20 feet See § 21.03.050(c) for setback adjustments	

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front [1]	15
B	Street Side	15
C	Side	5
D	Rear	10
Setbacks: Accessory Structure (minimum)		
	Front	25
	Street Side	20
	Side	3
	Rear	5
Height (maximum, feet)		
E	Multifamily	65
	Single-Family Attached	50

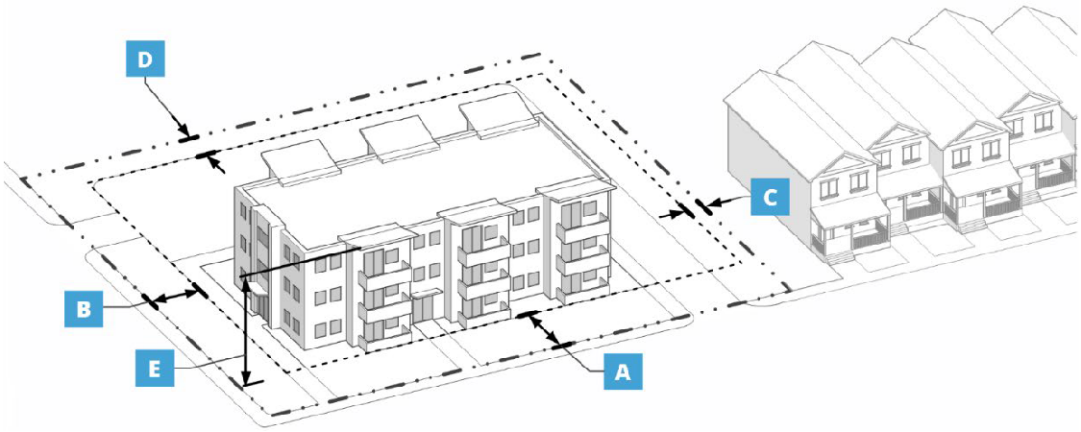
(l) Residential High 16 (RH-16).

(1) Intent.To provide for high density residential use. This district allows multifamily development within specified densities. This district is intended to allow high density residential unit types and densities to provide a balance of housing opportunities in the community. RH-16 may also serve as a transitional district between Residential Medium and Mixed-Use or Commercial future land use designations and zone districts. RH-16 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the RH-16 zone district:



Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot area any type of unit	No minimum
Lot width	30 per lot
Triplex, fourplex, townhome	16 per unit
Lot frontage	20
Density (units/acre)	
Minimum | maximum	12 | 16
Density measurement GJMC § 21.14.010(a)	
Lot Coverage (maximum)	
Lot coverage	75%
Notes: [1] Single-family attached vehicle storage, including a garage, required front setback is 20 feet. See § 21.03.050(c) for setback adjustments	

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front [1]	15
B	Street Side	15
C	Side	5
D	Rear	10
Setbacks: Accessory Structure (minimum)		
	Front	25
	Street Side	20
	Side	3
	Rear	5
Height (maximum, feet)		
E	Multifamily	60
	Single Family Attached	50

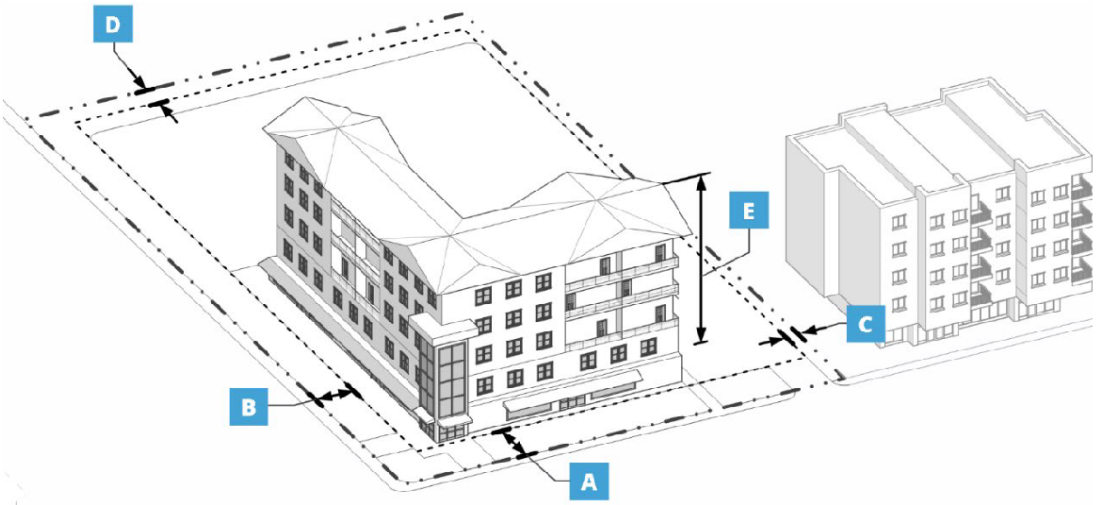
(m) Residential High 24 (RH-24).

(1) Intent.To provide for high density residential use. RH-24 allows multifamily development within specified densities. This district is intended to allow high density residential unit types and densities to provide a balance of housing opportunities in the community. RH-24 may also serve as a transitional district between Residential Medium and Mixed-Use or Commercial future land use designations and zone districts. RH-24 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the RH-24 zone district.



Lot Standards	
Dimensions (minimum, length feet or area square feet)	
Lot area, all unit types	No minimum
Lot width	30 per lot
Triplex, fourplex, townhome	16 per unit
Lot frontage	20
Density (units/acre)	
Minimum | Maximum	16 | N/A
Density measurement GJMC § 21.14.010(a)	
Lot Coverage (maximum)	

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front [1]	15
B	Street Side	15
C	Side	5
D	Rear	10
Setbacks: Accessory Structure (minimum)		
	Front	25
	Street Side	20
	Side	3
	Rear	5

Lot coverage	80
Notes: [1] Single-family attached vehicle storage, including a garage, required front setback is 20 feet. See § 21.03.050(c) for setback adjustments	

Building Standards		
Height (maximum, feet)		
E	Multifamily	100
	Single-Family Attached	50

(Ord. 5190, 12/20/2023)

§ 21.03.060. Mixed-use districts.

(a) Districts Established.The following Mixed-Use zone districts are established in this Code, as summarized in Table 21.03-1. When the Code refers to "Mixed-Use" zone districts, these districts are included:

Table 21.03-7: Mixed-Use Zone Districts Summary

Legacy Zone Districts	Zone Districts Name	Section
R-O: Residential - Office+nB-1: Neighborhood Business	Mixed-Use Neighborhood, MU-1	§ 21.03.060(c)
M-U: Mixed Use C-1: Light Commercial BP: Business Park Mixed-Use MXOC: Mixed-Use Opportunity Corridor	Mixed-Use Light Commercial, MU-2	§ 21.03.060(d)
B-2: Downtown Business	Mixed-Use Downtown, MU-3	§ 21.03.060(e)
C-2: General Commercial	Commercial General, CG	§ 21.03.060(f)

(b) Purpose.The Mixed-Use districts are intended to:

(1) Implement the vision, strategies, and future land use plan of the Grand Junction Comprehensive Plan;

(2) Create and enhance neighborhoods with variety of residential and commercial uses at a scale that complements the established surrounding areas;

(3) Provide for a mixed-use centers of activity that support but do not compete with each other;

(4) Allow for different types of compatible land uses close together in appropriate locations to shorten transportation trips and facilitate multi-modal transportation; and

(5) Encourage infill and redevelopment of commercial, residential, and mixed-use development within surrounding uses.

(c) Mixed-Use Neighborhood (MU-1).

(1) Intent.The MU-1 district is intended to provide low intensity, neighborhood service, office, and limited retail uses that can include second residential uses and are

compatible with adjacent residential neighborhoods. Development should be compatible and complementary in scale and appearance to a residential environment. MU-1 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

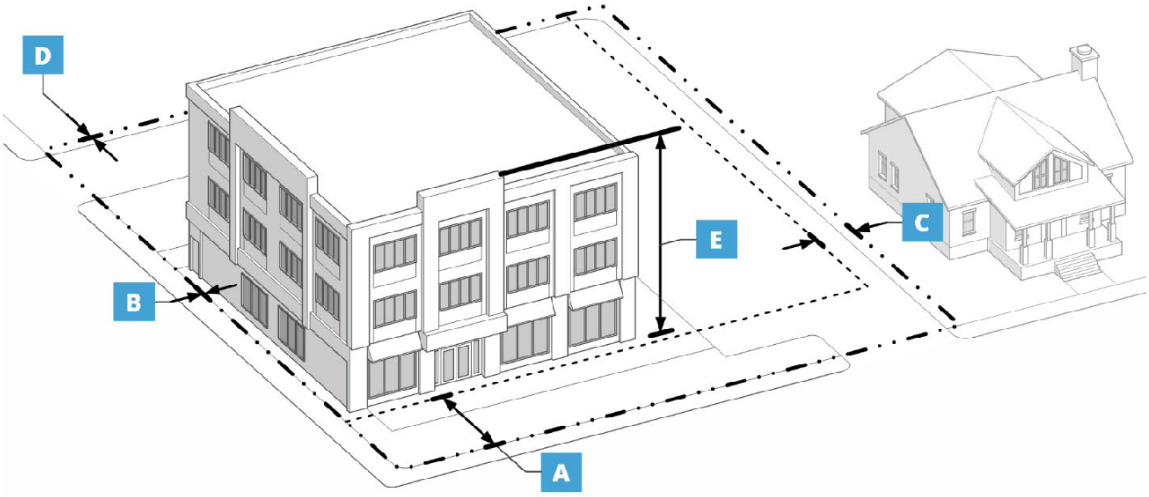
(2) Uses.Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(3) Dimensions.

(i) The following dimensions apply in the MU-1 zone district as follows:

(A) Structures that are designed for residential use only shall comply with the dimensional standards of the Residential zone district referenced here. Residential development shall comply with the density standards provided for MU-1.

(B) Structures that are either mixed-use or nonresidential shall comply with the dimensional standards for MU-1 provided here.



Lot Standards	
Residential Standards	
Applicable district standards [1]	RM-8 or RM-12
Minimum density	8 du/acre
Mixed-Use Lot Standards	
Lot area (minimum, feet)	4,000
Lot width (minimum, feet)	50

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front	15
B	Side	0
D	Rear	10
Setbacks: Accessory Structure (minimum)		
	Front	25
	Side	0

Lot Standards	
Lot coverage (maximum)	70%
Parking, Loading, Service	
Access and location	Side or Rear
Use Limits	
Retail uses require a Conditional Use Permit on lots with a Comprehensive Plan land use designation including "Residential" in the title.	
Notes: [1] Either district may be chosen at rezoning; the chosen district shall be applied consistently.	

	Rear	0
Height (maximum, feet)		
E	Height	40
Gross Floor Area (maximum, square feet)		
	Office	30,000

(d) Mixed-Use Light Commercial (MU-2).

(1) Intent.The MU-2 district is intended to accommodate commercial, employment, multifamily, and other uses along transportation corridors to promote development that is comfortably accessible via all modes of transportation, including motor vehicles, bicycles, and walking. Commercial uses in the MU-2 district may be somewhat larger in scale and more flexible than the MU-1 district, including more auto-oriented uses such as gas stations. While ground stories along streets are intended for commercial uses, the upper stories are appropriate for residential and/or office uses. MU-2 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

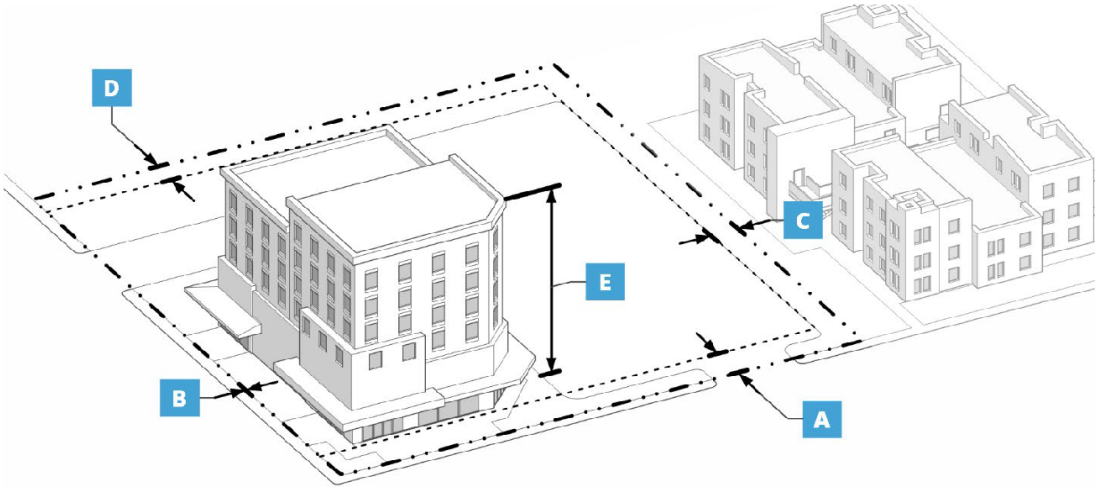
(2) Uses.Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(3) Dimensions.

(i) The following dimensions apply in the MU-2 zone district as follows:

(A) Structures that are designed for residential use only shall comply with the dimensional standards of the Residential zone district referenced here. Residential development shall comply with the density standards provided for MU-2.

(B) Structures that are either mixed-use or nonresidential shall comply with the dimensional standards for MU-2 provided here.



Lot Standards	
Residential Standards	
Applicable district standards	RH-16 or RH-24
Minimum density	16 du/acre
Mixed-Use Lot Standards	
Lot area (minimum, feet)	20,000
Lot width (minimum, feet)	50
Lot coverage (maximum)	100%
Parking, Loading, Service	
Access and location: alley where available, otherwise side or rear	
Notes: [1] 0 feet for a lot on an alley.	

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front	15
B	Side	0
D	Rear	10 [1]
Setbacks: Accessory Structure (minimum)		
	Front	25
	Side	0
	Rear	10
Height (maximum, feet)		
E	Height	65
Use Limits		
Outdoor storage is not allowed within the front setback.		

(e) Mixed-Use Downtown (MU-3).

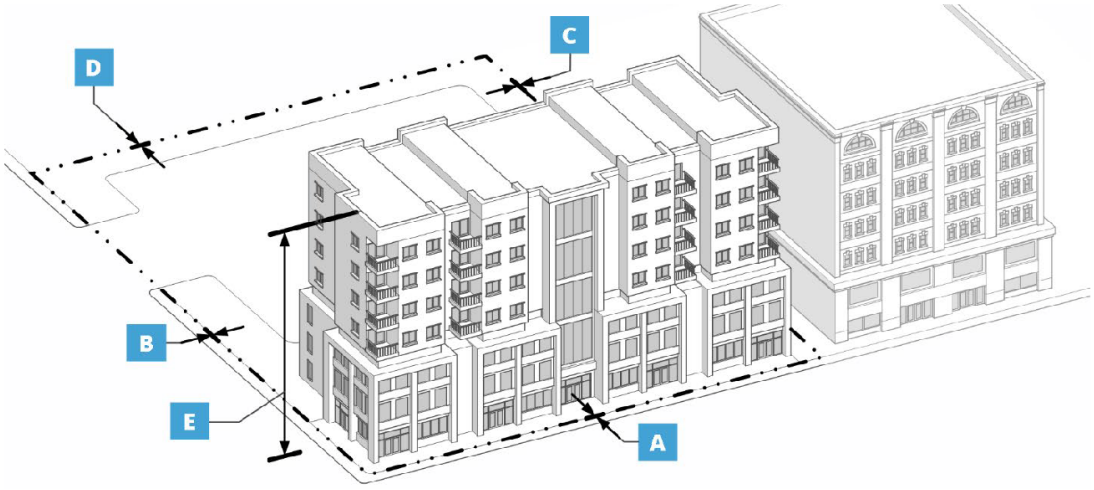
(1) Intent. The MU-3 Downtown district is intended to provide highly walkable downtown retail, service, office, lodging, and mixed uses with ground story storefronts and upper story residential, lodging, and office uses. Downtown Grand Junction is intended to be attractive to both residents and visitors and should include active public spaces and a range of community amenities. The scale of new development and redevelopment can be larger than current structures but must incorporate transitions between larger and smaller structures. Retaining the historic character of Downtown is an important priority to balance with the consideration of

new and redevelopment. MU-3 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses.Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(3) Dimensions.

(i) The following dimensions apply in the MU-3 zone district as follows:



Lot Standards	
Residential Standards	
Minimum density	8 du/acre
Mixed-Use Lot Standards	
Lot area (minimum, feet)	n/a
Lot width (minimum, feet)	n/a
Lot coverage (maximum)	100%
Parking, Loading, Service	
Access: alley where available, otherwise side or rear	
Location: side or rear	

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front	0
B	Side	0
D	Rear	0
Setbacks: Accessory Structure (minimum)		
	Front	0
	Side	0
	Rear	0
Height (maximum, feet)		
E	Height	80

Use Limits
Outdoor Entertainment and Recreation uses require a Conditional Use Permit on lots adjacent to a residential zone district.

(4) District Specific Standards.

(i) Parking Location.

(A) When parking, either commercial or private, is the principal use on a lot there shall be a thirty-foot front setback to the edge of the parking area.

(B) When parking, either commercial or private, is an accessory use on a lot, there shall be at least a six-foot front setback to the edge of the parking area.

(ii) Open Space.Applications for multifamily or mixed-use developments in an MU-3 zone district shall be required to pay the in-lieu fee, as determined in GJMC § 21.05.030(a), rather than provide a land dedication.

(f) Commercial General (CG).

(1) Intent.The CG zone district is intended for auto-oriented retail commercial and commercial services, wholesale, and warehouse-facilities. This district allows outdoor storage and limited outdoor operations. In some areas of the community, CG accommodates truck traffic. This district is intended to be located along corridors where proximity to residential and walkable mixed-use development is limited. CG is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

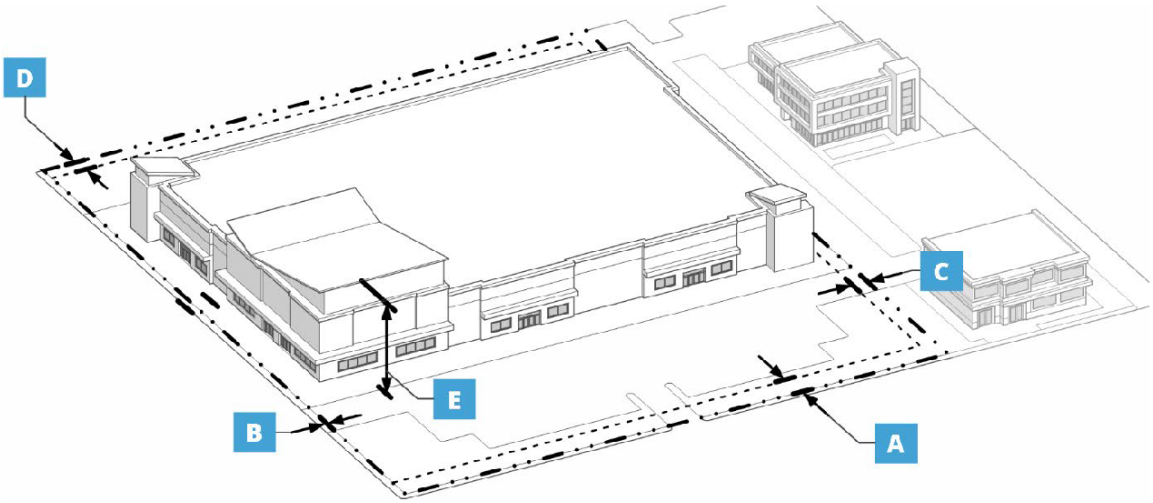
(2) Uses.Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(3) Dimensions.

(i) The following dimensions apply in the CG zone district as follows:

(A) Structures that are designed for residential use only shall comply with the dimensional standards of the Residential zone district referenced here.

(B) Structures that are either mixed-use or nonresidential shall comply with the dimensional standards for CG provided here.



Lot Standards	
Residential Standards	
Applicable district standards	RH-16
Minimum density	n/a
Mixed-Use Lot Standards	
Lot area (minimum, feet)	20,000
Lot width (minimum, feet)	50
Lot coverage (maximum)	100%
Parking, Loading, Service	
Access: Alley where available, otherwise side or rear	

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front	15
B	Side	0
D	Rear	10[1]
Setbacks: Accessory Structure (minimum)		
	Front	25
	Side	0
	Rear	10
Height (maximum, feet)		
E	Height	65
Use Limits		
Outdoor uses are not allowed in a front setback.		
Notes:		
[1] 0 feet for lot on an alley		

(Ord. No. 5260, 5/7/2025; Ord. No. 5242, 12/4/2024; Ord. 5218, 5/1/2024; Ord. 5190, 12/20/2023)

§ 21.03.070. Industrial Districts.

(a) Districts Established.The following Industrial Zone Districts are established in this Code,

as summarized in Table 21.03-1. When the Code refers to "Industrial" zone districts, these districts are included:

Table 21.03-8: Industrial Zone Districts Summary		
Legacy Zone Districts	**Zone District Names**	**Section**
Industrial		
I-O: Industrial/Office Park	Industrial/Office Park, Retired, I-OR	§ 21.03.070(d)
I-1: Light Industrial	Industrial Light, I-1	§ 21.03.070(e)
I-2: General Industrial	Industrial General, I-2	§ 21.03.070(f)

(b) Purpose.The Industrial zone districts are intended to:

(1) Promote the retention of existing industrial businesses and strengthen and diversify the future economic base for Grand Junction;

(2) Identify appropriate locations for industrial uses that create on-site or off-site impacts and ensure the separation of those uses from other, less intensive uses in the community; and

(3) Provide opportunities for innovative technology, manufacturing, and larger footprint uses and structures that are not suitable for other locations in the City because of transportation needs, hours of operation, or utility/infrastructure demands.

(c) Performance Standards.

(1) Vibration, Smoke, Odor, Noise, Glare, Wastes, Fire Hazards, and Hazardous Materials.No person shall occupy, maintain, or allow any use in an Industrial district without continuously meeting the following minimum standards regarding vibration, smoke, odor, noise, glare, wastes, fire hazards and hazardous materials. Conditional Use Permits for uses in this district may establish higher standards and conditions.

(2) Vibration.Except during construction or as authorized by the City, an activity or operation which causes any perceptible vibration of the earth to an ordinary person on any other lot or parcel shall not be permitted.

(3) Noise.The owner and occupant shall regulate uses and activities on the property so that sound never exceeds 65 decibels at any point on the property line.

(4) Glare.Lights, spotlights, high temperature processes or otherwise, whether direct or reflected, shall not be visible from any lot, parcel or right-of-way.

(5) Solid and Liquid Waste.All solid waste, debris and garbage shall be contained within a closed and screened dumpster, refuse bin and/or trash compactor. Incineration of trash or garbage is prohibited. No sewage or liquid wastes shall be discharged or spilled on the property.

(6) Hazardous Materials.Information and materials to be used or located on the site, whether on a full-time or part-time basis, that are required by the SARA Title III Community Right to Know shall be provided at the time of any City review, including

site plan. Information regarding the activity or at the time of any change of use or expansion, even for existing uses, shall be provided to the Director.

(d) Industrial/Office Park, Retired (I-OR).

(1) Intent.The Industrial/Office zone district has been retired from future use. Property that is zoned I-O as of the Effective Date shall be permitted to continue as conforming to this Code but rezoning any additional areas to I-OR is prohibited. The intent of the I-OR zone district is to provide for a mix of light manufacturing uses, office park, limited retail and service uses in a business park setting with proper screening and buffering, all compatible with adjoining uses.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(ii) The following dimensions apply in the I-OR zone district:

Lot Standards	
Lot Standards	
Lot area (minimum, feet)	1 acre
Lot width (minimum, feet)	100
Lot coverage (maximum)	100%
Use Limits	
Retail sales area maximum 10% GFA of principal structure, and no more than 5,000 square feet per parcel	

Building Standards		
Setbacks: Principal Structure (minimum)		
	Front	15
	Side	0
	Rear	10
Setbacks: Accessory Structure (minimum)		
	Front	25
	Side	0
	Rear	10
Height (maximum, feet)		
	Height	65

(3) District Specific Standards.

(i) Outdoor storage and permanent display areas may be located beside or behind the principal structure. Site plan approval is required for lots with double or triple frontage where the side and rear yards will be used for permanent display areas.

(ii) Portable display of retail merchandise may be permitted as provided in GJMC § 21.04.030(e)(4).

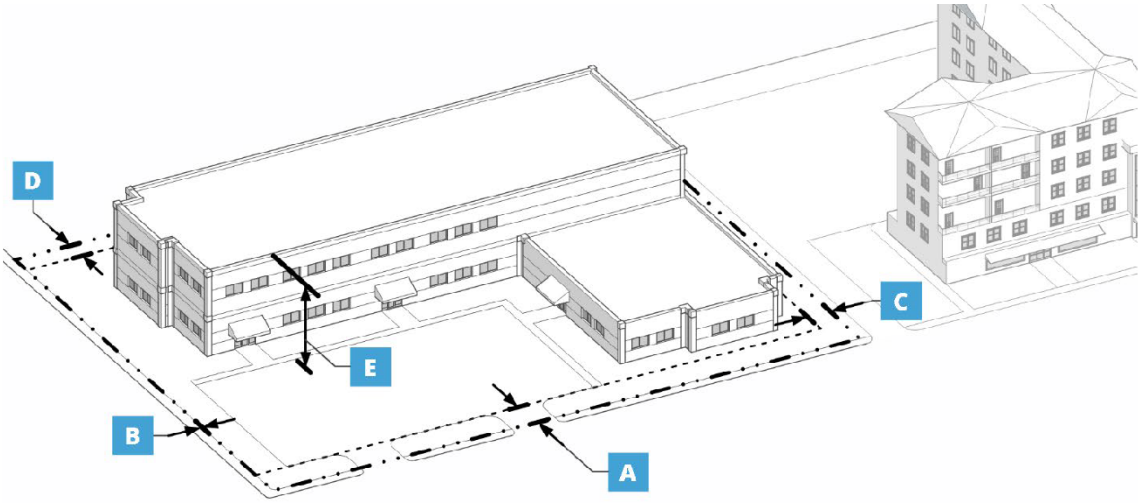
(e) Industrial Light (I-1).

(1) Intent.To provide for areas of light fabrication, manufacturing, technology, and industrial uses with limited, accessory commercial uses, all of which are compatible with existing adjacent land uses, access to transportation and the availability of public

services and facilities. I-1 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses.Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(3) Dimensions.The following dimensions apply in the I-1 zone district:



Lot Standards	
Lot Standards	
Lot area (minimum feet)	1 acre
Lot width (minimum feet)	100
Lot coverage (maximum)	100%
Use Limits	
Retail sales area maximum: 10% GFA of principal structure, and no more than 5,000 square feet per parcel	
Outdoor uses are not allowed in a front setback.	

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front	15
B	Side	0
D	Rear	10
Setbacks: Accessory Structure (minimum)		
	Front	25
	Side	0
	Rear	10
Height (maximum, feet)		
E	Height	50

(f) Industrial General (I-2).

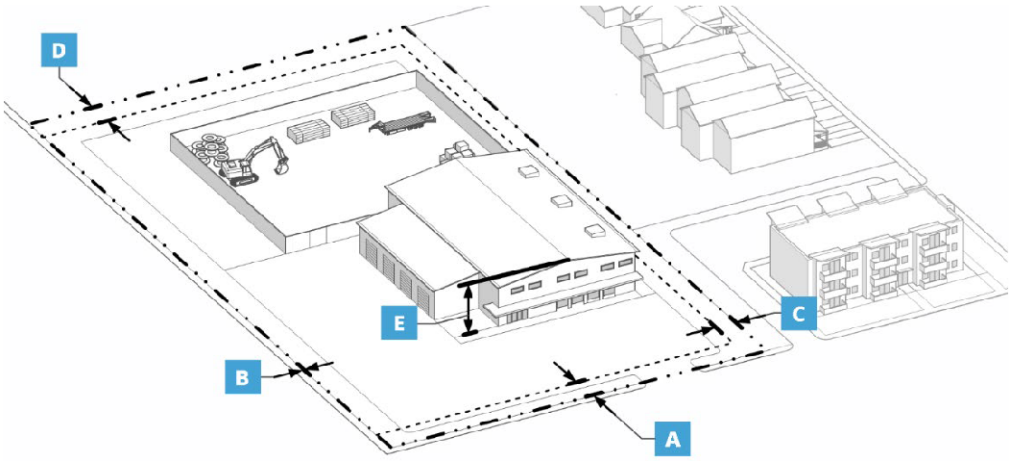
(1) Intent.I-2 is intended to provide areas for the accommodation of normal operations of heavy and concentrated fabrication, manufacturing, technology, and industrial uses and associated outdoor activities and storage. I-2 zone districts shall have easy semi-tractor trailer access to the state and federal highway system and/or railroads and the availability of adequate public services, utilities, and facilities. I-2 is appropriate as

indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses and Dimensions.

(i) Permitted principal and accessory uses are identified in GJMC Chapter 21.04

(ii) The following dimensions apply in the I-2 zone district:



Lot Standards	
Lot Standards	
Lot area (minimum, feet)	1 acre
Lot width (minimum, feet)	100
Lot coverage (maximum)	100%
Use Limits	
Retail sales area maximum: 10% GFA of principal structure, and no more than 5,000 square feet per parcel.	
Outdoor uses are not allowed in a front setback.	

Building Standards		
Setbacks: Principal Structure (minimum)		
A	Front	15
B	Side	0
D	Rear	10
Setbacks: Accessory Structure (minimum)		
	Front	25
	Side	0
	Rear	10
Height (maximum, feet)		
E	Height	50

(Ord. 5218, 5/1/2024; Ord. 5190, 12/20/2023)

§ 21.03.080. Public, parks, and open space districts.

(a) Districts Established.The following Public, Parks, and Open Space Zone District(s) is established in this Code, as summarized in Table 21.03-1. When the Code refers to "public" zone district(s), this district(s) is included:

Table 21.03-9: Public, Park, and Open Space Zone Districts Summary		
Legacy Zone Districts	**Zone District Names**	**Section**
Public, parks, and open space		
CSR: Community services and recreation (parks and open space only)	Public Parks and Open Space, P-1	§ 21.03.080(c)
CSR: Community services and recreation (public, civic and institutional facilities)	Public, Civic, and Institutional Campus, P-2	§ 21.03.080(d)

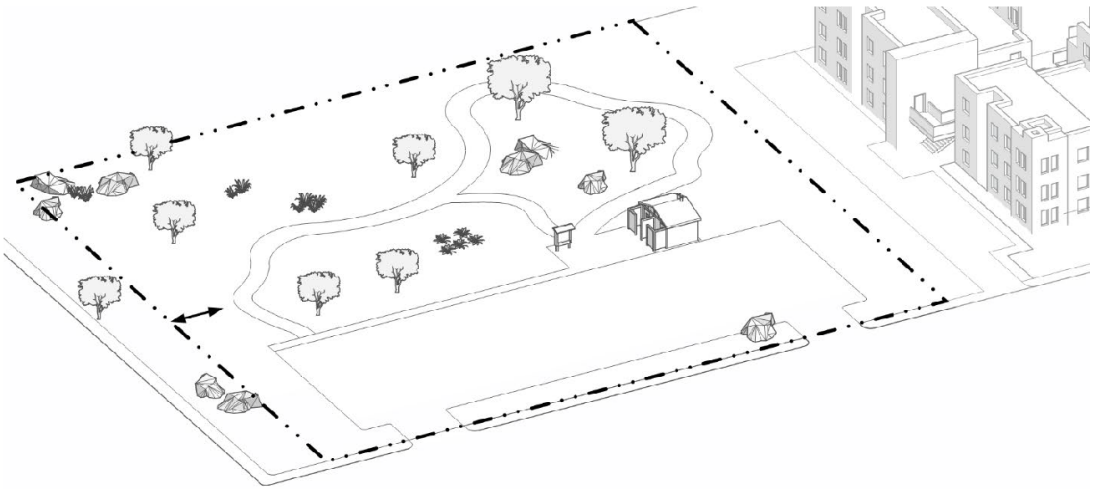
(b) Purpose.Public districts are intended to identify and allow for the establishment of permanent public parks, open spaces, and activities in the community.

(c) Public Parks and Open Space (P-1).

(1) Intent.The P-1 district is intended to protect and preserve open spaces that are held in either public or private ownership. P-1 districts may include parks, open spaces, trails, wetlands, floodplains, environmentally sensitive areas, and unique habitats and landscapes. P-1 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses.Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(3) Dimensions.To preserve access to clean air, pure water, natural recreation areas, and scenic natural beauty, the subdivision and development of land is restricted in P-1 districts. P-1 development shall be reviewed through GJMC § 21.02.040(k).



(4) District Specific Standards.All buildings constructed in any P-1 district must be permanent construction without a chassis, hitch, or wheels, or other features that would make the structure mobile, unless otherwise expressly stated in this Code.

(d) Public, Civic, and Institutional Campus (P-2).

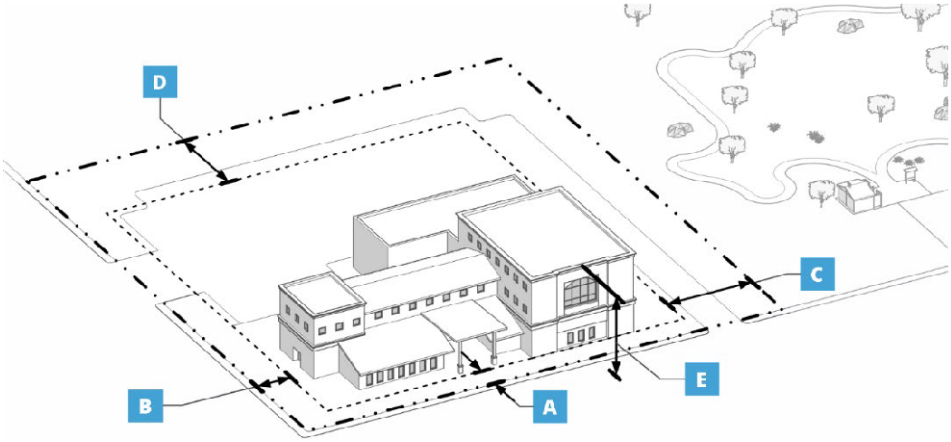
(1) Intent.The P-2 district is intended to allow the creation of mixed-use civic and institutional campuses where housing is provided in support of the other uses on the campus. P-2 is appropriate as indicated in Table 21.03-2: Comprehensive Plan Implementation.

(2) Uses.Permitted principal and accessory uses are identified in GJMC Chapter 21.04.

(3) Dimensions.

(i) The following dimensions apply in the P-2 district:

(A) Structures that are designed for residential use only shall comply with the dimensional standards of the Residential zone district referenced here. Residential development shall comply with the density standards provided for P-2.



Lot Standards	
Residential Standards	
Applicable district standards [1]	RM-8 or RM-12
Minimum density	8 du/acre
Mixed-Use Lot Standards	
Lot area (minimum, feet)	10,000
Lot width (minimum, feet)	50
Lot coverage (maximum)	80%
Parking, Loading, Service	
Access and location	Internal

Building Standards		
Setbacks: Exterior Boundary (minimum)		
A	Front	20
B	Side	20
C	Side Abutting Residential	20
D	Rear	20
Height (maximum, feet)		
E	Height	65
	Height Adjacent to Residential	40

(Ord. No. 5242, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.03.090. Airport Environs Overlay District.

(a) Purpose.The airport environs overlay zone district (AE) is hereby created with the following purposes:

(1) To protect the public health, safety, and welfare by regulating development and land use within noise sensitive areas and airport hazard areas;

(2) To ensure compatibility between Grand Junction Regional Airport and surrounding land uses; and

(3) To protect the airport from incompatible encroachment.

(b) Overlay District.The airport environs overlay zone district (AE) shall serve as an overlay zoning that applies additional standards and requirements to properties located within an underlying zone district. In case of conflicting standards and requirements, the more stringent standards and requirements shall apply.

(c) Airport Environs Overlay Maps.Airport environs overlay maps referred to in this Code are on file at the Community Development Department. The maps are incorporated by this reference as if fully set forth.

(d) Airport Environs Subdistricts.The airport environs overlay zone district (AE) is comprised of four subdistricts. The subdistricts represent a determination by the Federal Aviation Administration (FAA) of differing levels of expected noise impact and hazard from aircraft overflight. If any parcel is within more than one subdistrict, the more restrictive subdistrict determination shall apply. The subdistricts are as follows:

(1) Area of Influence (Subdistrict A).An area surrounding the airport impacted or influenced by proximity of the airport, either by aircraft overflight, noise and/or vibrations.

(2) Noise Zone (Subdistrict B).Includes the area within the 65 Ldn to 70 Ldn noise-exposure area as shown in the Grand Junction Regional Airport Master Plan.

(3) Critical Zone (Subdistrict C).A rectangular-shaped zone located directly off the end of a runway's primary surface, beginning 200 feet from the end of the pavement, which is critical to aircraft operations (i.e., more apt to have accidents within it because of the takeoff and landing mode in that particular area) as shown in the Grand Junction Regional Airport Master Plan.

(4) Clear Zone (Subdistrict D).A triangular-shaped zone located directly off the end of a runway's primary surface, beginning 200 feet from the end of the pavement, which is clear of all above-ground obstruction or construction. The width is the same as the primary surface. The length is determined by the use of the runway, in accordance with FAA regulations.

(5) Boundary Updates or Amendments.The boundaries of the AE zoning and its subdistricts shall be reviewed whenever the Grand Junction Regional Airport Authority updates and/or amends the noise contour maps and/or master plan. The Grand Junction Regional Airport Authority shall notify the City of any such update

and/or amendment and provide a copy of it to the City.

(e) Exemptions.The terms, provisions, conditions, and restrictions of 5-11 et seq. of the former code pertaining to land use for land around airports shall control development in existence prior to the Effective Date. This chapter shall apply to development, structures and/or lots platted after the Effective Date.

(f) Land Use Compatibility.

(1) Airport Environs Matrix.

(i) The airport environs land use compatibility matrix below, also known as the airport matrix, establishes requirements and limitations in addition to those provided in GJMC Chapter 21.03. In the case of conflict, the more restrictive requirements shall control.

(ii) The airport matrix below identifies development standards that apply to development within the AE zone. Any proposed use and/or development shall comply with the requirements of this section, in addition to all other applicable standards.

(iii) All structures shall be constructed to comply with the noise level reduction (NLR) standards of the airport matrix. National Technical Information Service (NTIS) report Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations (AD- A258 O32), latest edition, shall be used for noise reduction methods for new development.

(2) Use Restrictions.Notwithstanding any other provision of this Code, no use may be made of land or water within any zone or subdistrict that creates or may create:

(i) Interference with navigational signals or radio communication between the airport and aircraft;

(ii) Difficulty for pilots to distinguish between airport lights and other lighting;

(iii) Glare in the eyes of pilots using the airport;

(iv) Impaired visibility in the vicinity of the airport;

(v) A hazard or endanger landing, takeoff or maneuvering of aircraft.

(g) Avigation Easement.New development located within the AE zone shall convey an avigation easement to the Grand Junction Regional Airport Authority in a form and with terms and conditions approved by the Director. Such conveyance shall not be required for repair or maintenance of existing structures.

(h) Record Notice of Critical and Noise Zone Subdistricts. A written notice, in a form approved by the Director, shall be affixed to and recorded with each Final Plat/plan when the development is located in a noise zone. The notice shall also be required when the development is located within a critical zone. The notice shall minimally provide that:

(1) All or part of the development is potentially subject to aircraft noise levels high enough to annoy users of the property and interfere with its unrestricted use.

(2) If in the critical zone add: All or part of this property is also located in the approach and departure path of the airport in an area more apt to have accidents because of the takeoff and landing of aircraft.

Table 21.03-10: Airport Land Use Compatibility Standards Matrix
Y = Yes N = No C = Conditional Use Permit required 25 or 30, see Note [2]

Land Use	Zone			
	A	B	C	D
Residential (≤ 1 unit per 5 acres)	Y	30 [1]	30 [1]	N
Residential (≥ 1 unit per 5 acres)	Y	C30 [1]	N	N
Hotels/Motels	Y	C25	N	N
Schools, Hospitals, Libraries	Y	C25	N	N
Churches	Y	C25	N	N
Auditoriums, outdoor amphitheaters, concert halls	Y	C25	N	N
Sports arenas	Y	C25	N	N
Playgrounds, parks, open space, golf courses, cemeteries, riding stables	Y	Y	C	N
Office buildings, personal, business, and professional services	Y	C	C	N
Commercial establishments: retail	Y	C	C	N
Commercial establishments: wholesale, manufacturing, transportation, communications, and utilities	Y	C	C	N
Manufacturing - noise-sensitive	C	C	C	N
Communications - noise-sensitive	C	C	C	N
Farming (livestock)	Y	Y	Y	N
Agriculture, mining, fishing (except livestock farming)	Y	Y	Y	C
Poultry production	Y	Y	Y	N

Notes:

[1] Where possible, no residential development shall be permitted within Subdistricts B and C; however, for properties substantially or wholly burdened by Subdistrict C, residential development may be permitted at a density not to exceed one unit per five acres. Clustering of homes outside of Subdistricts B and C shall, where possible, be used.

[2] 25: Measures to achieve noise level reduction (NLR) of 25 dB must be incorporated into the design and construction of structures. 30: Measures to achieve noise level reduction (NLR) of 30 dB must be incorporated into the design and construction of structures.

(i) Height Limitations.Nothing, including structures and trees, shall be erected, altered, allowed to grow, or be maintained so that it crosses or enters into the applicable runway approach zone districts as defined in Federal Aviation Regulations (FAR) Part 77, as amended.

(Ord. 5190, 12/20/2023)

§ 21.03.100. (Reserved)

(Ord. 5205, 3/20/2024; Ord. 5190, 12/20/2023)

Chapter 21.04
USE STANDARDS

§ 21.04.010. Purpose.

The purpose of this chapter is to identify the land uses allowed in the Grand Junction zone districts and establish the standards that apply to certain uses (use-specific standards). This chapter is organized as follows:

(a) GJMC § 21.04.020, lists the uses allowed by zone district and cross-references applicable use-specific standards.

(b) GJMC § 21.04.030, establishes the unique standards applicable to certain land uses.

(c) GJMC § 21.04.040, establishes standards applicable to uses and structures that are accessory to the principal use of the property and/or structure.

(d) GJMC § 21.04.050, establishes standards applicable to non-permanent (temporary) structures and uses.

(Ord. 5205, 3/20/2024; Ord. 5190, 12/20/2023)

§ 21.04.020. Principal Use Table.

(a) Organization of the Table.

(1) In Table 21.04-1, land uses and activities are classified into six general use categories: 1) Residential; 2) Public, Institutional, and Civic; 3) Commercial; 4) Industrial; 5) Temporary, and 6) Extended Temporary. Specific uses are organized within the general use categories, based on common functional, product, or physical characteristics such as the type and amount of activity, the type of customers or residents, how goods or services are sold or delivered, and site conditions. This provides a systematic basis for assigning present and future land uses into appropriate zone districts and for avoiding overlaps and inconsistencies between similar land uses.

(2) The left-side column of Table 21.04-1 lists all use categories and many of the specific uses that might be approved by the City. Columns in the center of the table correspond to each base zone district and indicate whether the use is allowed in that district. The right-side column provides a cross-reference to use-specific standards that apply to that use in some or all of the zone districts in which it is allowed. Use standard cross-references are provided for informational purposes only; use-specific standards are applicable whether the cross-reference is provided or not.

(b) Compliance with Additional Requirements.

(1) Any use approved within a zone district shall also comply with all applicable standards in this Code; any requirements of local, state, or federal law; and the conditions placed on the approval.

(2) All uses required by any unit of local, state, or federal government to have an approval, license, or permit to operate are required to have that local, state, or federal approval, license, or permit in effect at all times, and failure to do so is a violation of this Code.

(3) All uses subject to the operational standards of a local, state, or federal government agency, including without limitation the regulations contained in the Grand Junction Municipal Code and regulations of the Colorado Department of Public Health and Environment, shall operate in compliance with those standards and regulations at all times, and failure to do so is a violation of this Code.

(c) Abbreviations Used in the Table.This except from Table 21.04-1 is included to illustrate the use table abbreviations. Current use allocations are provided in Table 21.04-1; this excerpt is not regulatory.

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2
Residential Uses												
Household living												
Dwelling, single-family detached	A	A	A	A	A	A	A				A	

(1) Allowed Uses.An "A" indicates the use is allowed by right within the respective zone district. Administrative approval per GJMC § 21.02.040(b) required prior to establishing an allowed use.

(2) Conditional Uses.A "C" indicates the use is only allowed through the Conditional Use Permit (CUP) process of GJMC § 21.02.050(f), subject to specified conditions.

(3) Prohibited Uses.A blank space indicates the listed use is not allowed within the district, unless otherwise expressly allowed by another provision of this Code.

(4) Extended Temporary Uses.An "E" indicates the use is only allowed through the Extended Temporary Use permit process of GJMC § 21.02.050(h), subject to specified conditions.

(d) Uses for Other Purposes.Approval of a use listed in Table 21.04-1 authorizes that use only. Development or use of a property for any other use not specifically allowed in Table 21.04-1 and approved pursuant to this Code is prohibited.

(e) Use Table.

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Residential Uses																				
Household Living																				
Dwelling, single-family detached	A	A	A	A	A	A	A				A								A	
Dwelling, single-family attached			A		A	A	A	A	A	A	A	A	A						A	
Dwelling, cottage court					A	A	A	A	A	A	A	A							A	
Dwelling, duplex				A	A	A	A	A			A								A	
Dwelling, multifamily						A	A	A	A	A	A	A	A						A	
Manufactured housing community						A	A	A												§ 21.04.030(b)(2)
Group Living																				
Boarding or rooming house							A	A	A	A	A	A	A							§ 21.04.030 (b)(3)
Fraternity or sorority																			A	§ 21.04.030 (b)(4)
Group living facility, small	A	A	A	A	A	A	A	A	A	A	A	C	A							§ 21.04.030 (b)(5)
Group living facility, large						A	A	A	A	A	A	A	A							§ 21.04.030 (b)(5)
Group living facility, unlimited								A	A	A	A	A	A							§ 21.04.030 (b)(5)
Public, Institutional, and Civic Uses																				

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Adult or Child Day Care																				
Day care center, adult or child	C	C	C	C	C	C	A	A	A	A	A	A	A	A	A				A	
Community and Cultural Facilities																				
Assembly, community	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A	§ 21.04.030 (c)(1)
Assembly, religious/private group	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A			A	§ 21.04.030 (c)(1)
Community corrections facility																			C	§ 21.04.030 (c)(2)
Crematory														A	A	A	A			
Funeral home or mortuary											A	A	A	A	A					
Government service facility												A	A	A					A	
Jail													C	C		C	C		C	
Meeting, banquet, event, or conference facility	C	C										A	A	A		C			A	
Parking, public											A	A	A	A	A	A	A	A	A	
Safety service facility	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A	
Educational Facilities																				
Boarding school								A	A	A	A	A	C						A	
College or university												A	A	A	A	A	A		A	

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Public or private school	A	A	A	A	A	A	A	A	A	A	A	A	A	A					A	
Vocational, technical, or trade school											A	A	A	A		A	A			
Health Facilities																				
Hospital											C	A	C	C	C				C	
Medical or dental clinic										A	A	A	A	A	A	A				§ 21.04.030 (c)(3)
Parks and Open Space																				
Cemetery	A	A	A	A	A	A	A	A	A	A	A	A	A	A				A	A	
Golf course	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Golf driving range	A	A	A	A	C	C	C	C	C	C	A	A	A	A	A	A	A	A	A	
Park, lake, reservoir, other open space	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Commercial Uses																				
Adult entertainment												A		A		A	A			§ 21.04.030 (d)(1)
Agriculture and Animal																				
Animal agriculture																C	C		C	§ 21.04.030 (d)(2)
Animal care, boarding, or sales, indoor operations only	A										A	A	A	A	A	A				
Animal care, boarding, or sales, outdoor operations	C											C		A	C	C				

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Animal clinic or hospital											A	A	A	A		A			A	§ 21.04.030 (d)(3)
Dairy operations or feedlot	C															C	C		C	§ 21.04.030 (d)(2)
Farmers' market										A	A	A	A	A				A	A	
Nursery or greenhouse	C	C	C	C								A		A		A	C		C	
Pasture, commercial	A	A	A	A												A	A			
Urban agriculture	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Food and Beverage																				
Bar or tavern											C	A	A	A	C	C				
Brewery, distillery, or winery	A										C	A	A	A	A	A	A		A	
Brewpub, distillery pub, or limited winery									C	C	A	A	A	A		A			A	
Food service or catering											A	A	A	A		A				
Mobile food vendor										A	A	A	A	A	A	A	A	A	A	§ 21.04.030 (d)(4)
Mobile food vendor court										C	A	A	A	A	A	A	A		A	§ 21.04.030 (d)(4)
Restaurant									C	C	A	A	A	A	A	A			A	
Lodging Facilities																				
Emergency shelter, permanent												A		C					C	

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Hotel or motel												A	A	A	A					
Resort cabin and lodge	C																	A	A	
Short-term rental	A	A	A	A	A	A	A	A	A	A	A	A	A							§ 21.04.030 (d)(5)
Office and Personal Services																				
Office									C	C	A	A	A	A	A	A			A	
Personal service									C	C	A	A	A	A	C	A				
Recreation and Entertainment																				
Campground or recreational vehicle park	C											A		A				A	A	§ 21.04.030 (d)(6)
Indoor entertainment and recreation	A										A	A	A	A	A	A			A	§ 21.03.060 (e)(3) (MU-3)
Outdoor entertainment and recreation	C											A	A/C	A	C	C		A	A	
Riding academy, roping, or equestrian area	C	C																	C	
Shooting range, indoor												C		C		C	C		C	
Shooting range, outdoor																C	C		C	
Swimming pool, community	A	A	A	A	A	A	A	A	A	A	A	A	A	A					A	
Zoo												C		C					C	
Retail Sales																				

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Flea market														A		A	A			§ 21.04.030 (d)(7)
Manufactured building sales and service														A		A				
Regulated cannabis store											A	A	A	A						§ 21.04.030 (d)(8)
Retail sales and service, small									C	C	A/C	A	A	A		*	*			§ 21.03.060 (c)(3) (MU-1)
Retail sales and service, medium											A/C	A	A	A						§ 21.03.060 (c)(3) (MU-1)
Retail sales and service, large												A		A						
Retail sales and service, big box												A		A						
Transportation																				
Airport or heliport															C				C	
Helipad												C	C	C	C	C	C		C	
Parking garage, commercial											A	A		A	A	A	A		A	
Parking lot, commercial											A	A		A	A	A	A		A	
Transportation depot												A	A	A	A	A	A		A	
Truck stop														A		A	A			
Vehicles and Equipment																				
Vehicle fleet operations center												A		A	A	A	A			

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Vehicle fuel sales and service station											C	A	A	A	A	A	A			
Vehicle impound lot														C		C	C			§ 21.04.030 (d)(10)
Vehicle repair, major														A	A	A	A			
Vehicle repair, minor												A		A	A	A	A			
Vehicle sales, rental and leasing, heavy														C		A				§ 21.04.030 (d)(11)
Vehicle sales, rental and leasing, light												A		A		A				§ 21.04.030 (d)(11)
Vehicle wash											A	A	A	A	A	A	A			
Industrial Uses																				
Manufacturing and processing																				
Industrial, artisan											A	A	A	A		A	A			§ 21.04.030 (e)(1)
Industrial, light												A	A	A	A	A	A			§ 21.04.030 (e)(9)
Industrial, heavy														A		A	A			
Mining and extraction	C	C													C	C	C		C	
Oil and Gas Drilling	C	C														C	C		C	
Storage, Wholesale, and Warehousing																				

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Mini-Warehouse									C	C	C	A		A	A	A	A			§ 21.04.030 (e)(3)
Outdoor Storage, Commercial														A/C	A/C	A/C	A/C			§ 21.04.030 (e)(4)
Wholesale or warehouse	C											C		A	A	A	A			
Telecommunication																				
Facilities on wireless master plan priority site when developed in accordance with wireless master plan site-specific requirements	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.030 (e)(5)
Temporary PWSF (e.g., COW)	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.030 (e)(5)
Co-location	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.030 (e)(5)
Tower replacement	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.030 (e)(5)
Dual purpose facility	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.030 (e)(5)
DAS and small cell facilities	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.030 (e)(5)

Table 21.04-1: Principal Use Table

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Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Base station with concealed attached antennas	A Except NOT allowed on structures the principal use of which is a single-family detached or attached dwelling, tiny home dwelling, duplex, group living (all), day care center, and multifamily dwellings of fewer than three stories.											A	A	A	A	A	A	A	A	§ 21.04.030 (e)(5)
Base Station with non-concealed attached antennas	C Except NOT allowed on structures the principal use of which is a single-family detached or attached dwelling, tiny home dwelling, duplex, group living (all), day care center, and multifamily dwellings of fewer than three stories.											A	C	A	A	A	A	A	A	§ 21.04.030 (e)(5)
Tower, concealed	C	C Except NOT allowed on any site or lot where the principal use is a single-family detached or attached, tiny home, or duplex dwelling.						C	C	C	C	A	C	A	C	A	A	C	C	§ 21.04.030 (e)(5)
Tower, non-concealed												C	C	C		C	C	C	C	§ 21.04.030 (e)(5)
Broadcast tower																C	C			§ 21.04.030 (e)(5)
Utility Uses																				
Utility facility, basic	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Utility facility, major															C	C	C	C		
Transmission line	C	C	C	C	C	C	C	C	C	C	C	A/C	C	A/C	A/C	A/C	A/C	C	C	§ 21.04.030 (e)(6)
Waste and Salvage																				
Composting facility																C	C			

Table 21.04-1: Principal Use Table

A = Allowed Use C = Conditional Use A/C = Allowed or Conditional (refer to Use-Specific Standards)

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Junkyard or salvage yard																C	C			§ 21.04.030 (e)(7)
Transfer facility, medical and hazardous waste																C	C			§ 21.04.030 (e)(8)
Transfer facility, solid waste																C	C			
Recycling collection facility																C	C			
Recycling collection point											C	C	C	C	C	C	C	C	C	
Solid waste disposal or processing facility																C	C			
Temporary Uses																				
Emergency shelter, temporary	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Parking lot, temporary											A	A	A	A	A	A	A		A	§ 21.04.050(b)
All Other											A	A	A	A		A	A	A	A	§ 21.04.050(c)
Extended Temporary Uses																				
Interim shelter site											E	E	E	E	E	E	E	E	E	§ 21.04.050(b)

(Ord. No. 5260, 5/7/2025; Ord. No. 5252, 3/19/2025; Ord. No. 5244, 1/15/2025; Ord. No. 5242, 12/4/2024; Ord. No. 5229, 8/21/2024; Ord. 5218, 5/1/2024; Ord. 5205, 3/20/2024; Ord. 5190, 12/20/2023)

§ 21.04.030. Use-specific standards.

(a) Performance Standards for All Uses.No person shall occupy, maintain, or allow any use in any zone district without continuously meeting the following minimum standards regarding vibration, smoke, odor, noise, glare, wastes, fire hazards, and hazardous materials.

(1) Vibration.Except during construction or as authorized by the City, an activity or operation that causes any perceptible vibration of the earth to an ordinary person on any other lot or parcel shall not be permitted.

(2) Noise.The owner and occupant shall regulate uses and activities on the property so that sound never exceeds 65 decibels at any point on the property line.

(3) Glare.Lights, spotlights, high temperature processes, or otherwise shall not be visible from any lot, parcel, or right-of-way.

(4) Solid and Liquid Waste.All solid waste, debris and garbage shall be contained within a closed and screened dumpster, refuse bin and/or trash compactor. Incineration of trash or garbage is prohibited. No sewage or liquid wastes shall be discharged or spilled on the property.

(5) Hazardous Materials.Information and materials to be used or located on the site whether on a full-time or part-time basis that are required by the SARA Title III Community Right to Know shall be provided at the time of any City review, including the site plan. Information regarding the activity or at the time of any change of use or expansion, even for existing uses, shall be provided to the Director.

(b) Residential Uses and Structures.

(1) Cottage Court Dwelling.

(i) Dimensional and Density Standards.

(A) The minimum project size for a cottage court development is one-half acre and the maximum project size is five acres. The cottage court development may be a designated area within a larger development.

(B) The following standards shall apply to individual units:

Lot Standards	
Private Common Open Space	
Area of individual open space (minimum, square feet)	400
Dimensions of any Side (minimum, feet)	20
Building Standards	
Density (units/acre)	

Lot Standards	
Minimum | maximum	Per zone district
Footprint Area (maximum)	
Per cottage (square feet)	1,200 average
Height and Separation	
Height (maximum)	Per zone district
Building separation (minimum)	Per Building Code

(C) A minimum of one dwelling unit or an increase of up to 20% over the maximum density (rounded up) is allowed when the project can meet all other applicable GJMC standards.

(D) All other building and lot requirements, including principal and accessory structure setbacks and lot coverage limitations, for the base zone district shall apply to the project site as a whole, not individual units.

(ii) Design Standards.

(A) A minimum of 10% of the total lot area shall be private common open space. The private common open space may be divided into multiple locations, each of which shall meet the minimum area and dimensional standards.

(B) A community building(s) for the sole use of the cottage court dwelling residents may be used to meet up to 25% of the required common open space requirement. Community buildings shall not count toward the maximum density calculation.

(C) Paved paths for pedestrian circulation may count toward common open space, but parking areas and driveways for vehicular circulation may not count toward common open space.

(D) Accessory dwelling units are prohibited.

(E) Multifamily dwellings landscaping requirements apply per GJMC Chapter 21.07 and may count toward up to 30% of the required private common open space.

(2) Manufactured Housing Community.

(i) Density and Setbacks.All building and lot requirements, including principal structure setbacks and maximum density requirements, for the base zone district shall apply to the project site as a whole (not individual units).

(ii) Manufactured Homes and Spaces.

(A) Recreational vehicles or travel trailers may not be used as residences within a manufactured housing community. Mobile homes, as defined in this Code and separate from manufactured homes, may not be used as a dwelling in the City except in an established mobile home park. No new

mobile homes shall be placed in the City.

(B) Each space shall be numbered in a conspicuous location and a space map posted at the entrance to the property.

(C) All manufactured home spaces shall abut on a hard-surfaced roadway of not less than 20 feet in width. The roadway shall:

a. Be adequately lighted and drained;

b. Have unobstructed access to a paved public street or highway; and

c. Not contain on-street parking.

(D) No additions shall be built onto any manufactured home other than a porch or entryway. Porches and entryways may not extend any closer than 10 feet from the nearest manufactured home and its additions.

(E) All manufactured homes shall be skirted and anchored in a manner approved by the Director.

(iii) Site Design.

(A) All buildings and manufactured homes within the community shall be served with centralized water supply and sewage disposal systems approved by the City.

(B) All parking and driveway areas shall be paved with an all-weather surface that is constructed of concrete, asphalt, or a similar dust-free impermeable or permeable material.

(C) Convenient, safe pedestrian path networks at least five feet wide shall be provided from dwelling units to recreation areas, bus stops, parking areas, commercial uses, nearby schools, and any public facility within or directly adjacent to the subject property. All access shall conform to City standards.

(D) At least 15% of the gross area of the manufactured housing community shall be set aside for recreational purposes for use by the residents of the community. Outdoor recreation areas may include but are not limited to adult recreation and child play areas, such as outdoor games, picnic tables and seating, playgrounds, and swimming pools. They do not include areas for guest parking, or utilities.

(E) No portion of a recreation area may be less than 20 feet in width or length.

(F) All manufactured housing communities shall meet the applicable landscaping and buffering standards set forth in GJMC Chapter 21.07. Maintenance.

(G) All manufactured housing communities shall be maintained in accordance with the requirements of this section, applicable State of Colorado Department Health regulations, and other applicable City regulations.

(H) The property owner shall be responsible for ongoing maintenance for all site elements included in the original approval of the manufactured housing park such as landscaping, signage, parking, streets, stormwater, drainage, outdoor recreation areas and other features unless otherwise specified in the development agreement.

(iv) Existing Manufactured Housing Communities. Existing manufactured housing communities shall comply with the above standards to the maximum extent practicable, except that:

(A) Existing mobile homes may continue to be used in mobile home parks established prior to 1976;

(B) Existing spaces may be used provided that any additions made after the Effective date of the Code shall comply with setback requirements of this subsection; and

(C) Paving of existing driveways only shall be required if the community is expanded or the number of spaces increased.

(3) Boarding or Rooming House.

(i) Standards.In a Residential zone district, a boarding or rooming house shall not exceed the maximum density for the zone district, with density calculated as two rented rooms equal one dwelling unit.

(ii) Process.An application for a boarding or room housing shall meet and follow the procedural requirements of GJMC § 21.02.040.

(4) Fraternity or Sorority.

(i) Location and Applicability.

(A) A fraternity or sorority is allowed only within the core campus of Colorado Mesa University or within 500 feet of the boundary of the core campus. The core campus is that area situated south of Orchard Avenue, west of North 12th Street, north of North Avenue and east of North 7th Street, and that area north of Orchard Avenue, west of 12th Street, south of Walnut Avenue, and east of College Place.

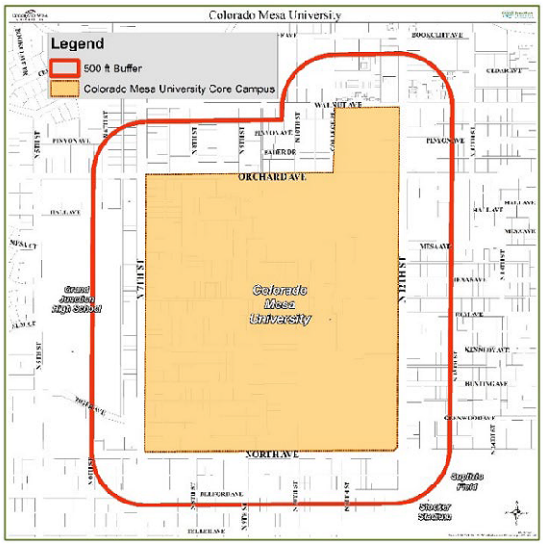


Figure 04.03-1 Colorado Mesa University Core Campus Boundary

(B) The limitations, standards and requirements of this subsection do not apply to a fraternity or sorority located entirely within the core campus.

(ii) Standards for Fraternity or Sorority.

(A) In a Residential zone district, a fraternity or sorority may exceed the maximum residential density so long as the standards described in this subsection are met.

(B) Each residential structure shall provide a minimum of 100 square feet per occupant. Regardless of square footage, the number of residential occupants shall not exceed 35.

(C) There shall not be more than four beds in a single room.

(D) Each property line abutting a right-of-way, open or undeveloped tract or another property that is not used as a fraternity or sorority shall have a minimum six-foot-tall solid fence and an eight-foot-wide landscaped strip located inside the fence.

(iii) Process.An application for a fraternity or sorority shall meet and follow the procedural requirements of GJMC § 21.02.040.

(5) Group Living Facility.

(i) Standards.

(A) Spacing Requirement.

a. A group living facility in an R-R, R-ER, R-1R, R-2R, RL-4, RL-5, or RM-8 zone district shall be at least 750 feet from every other group living facility in any such zone district.

b. There is no spacing requirement where either one of the two group

living facilities being measured against one another is in a zone district not listed in this subsection.

c. The separation distance shall be measured in the following manner: Computed by direct measurement from the nearest property line of the land used for a group living facility to the nearest property line of an existing group living facility, using the most direct route of public pedestrian access, measured as a person would walk along right-of-way, with right angles at crossings and with the observance of traffic regulations and traffic signals (see Figure 04.03-2); except that a group living facility shall not be located adjacent to another even if by such route the distance is greater than 750 feet.

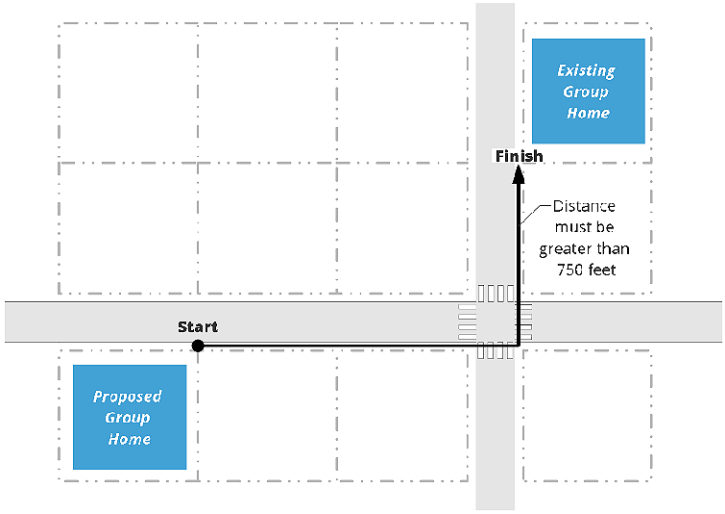


Figure 04.03-2 Group Living Facility Separation Calculation

(B) Compliance with Other Standards.

a. The group living facility must comply with the applicable City, state and other building, fire, health, and safety codes as well as all applicable requirements and development standards applicable to the zone district in which the group living facility is to be located except as modified in this subsection.

b. Group living facilities in a Residential zone district shall meet all applicable district, use, and development standards.

(C) Density and Minimum Lot Area.

a. Group living facilities must not exceed maximum density for the zone district, with density of the facility calculated as four beds equal one dwelling unit.

b. The site must contain at least 500 square feet per resident, except where a multifamily structure is being converted to a group living facility, in which case the minimum adequate lot area shall be in

accordance with the requirements of the zone district.

(D) Accessory Uses.

a. Accessory uses authorized with a group living facility are on-site recreational facilities, parking of vehicles for visitors, occupants and staff, and staff housing. The Director may approve other accessory uses that will have substantially similar impacts.

b. Only the administrative activities of the person or organization operating the facility shall be conducted at the facility. No office or other space in the facility or on the site may be leased or used for activities unrelated to the group living facility.

(E) Provision of Services in Residential Zone Districts. A group living facility in a Residential zone may provide services to nonresidents, but only up to the total number of residents permitted in the facility. For example, if there are nine residents at a group living facility that is allowed to have 16 residents, no more than seven nonresidents may use the services the facility provides at any one given time. This restriction does not apply in Mixed-Use, Commercial, Industrial, and Public, Parks, and Open Space zone districts.

(ii) Process.An application for a group living facility shall meet and follow the procedural requirements of GJMC § 21.02.040.

(c) Public, Institutional, and Civic Uses.

(1) Assembly, Community or Religious/Private Group.

(i) Art Gallery, Museum, or Library.An art gallery, museum, or library is prohibited in the R-R, R-ER, R-1R, R-2R, RL-4, RL-5, and RL-8 zone districts. All other community assemblies are allowed.

(ii) General Requirements.

(A) Seating Capacity and Public Notice.

a. Maximum seating capacity shall be based upon the seating capacity in the largest assembly area of the principal structure.

b. Community and religious/private group assembly uses with a maximum seating capacity of up to 300 or a maximum seating capacity of 301 to 600 for those uses that are located on a parcel or lot abutting a principal or minor arterial or collector street, as identified on the City's Streets Classification Map, are allowed uses in all Residential zone districts.

c. Community and religious/private group assembly uses with a maximum seating capacity of 301 to 600 in a Residential zone district require public notice if not located on a parcel or lot abutting a principal or minor arterial or collector street, as identified on the City's Grand Junction Circulation Plan.

d. Community and religious/private group assembly uses with a maximum seating capacity greater than 600 require a public notice in all Residential zone districts.

(B) Site Design and Layout.The front yard setback shall be counted towards the percentage of gross land area to be landscaped in all RM zone districts.

(2) Community Corrections Facility.

(i) A community corrections facility shall manage and supervise "offenders" in accordance with adopted standards and pursuant to a contract supervised and administered by an agency of the State of Colorado.

(ii) Independent community corrections facilities are subject to the same or equivalent, standards and rules applicable to a facility which is subject to § 17-27-101 C.R.S., et seq.

(iii) The applicant for a community corrections facility that is not administered pursuant to § 17-27-101 C.R.S., et seq., shall identify, and provide as required by the Director, the rules and contract under which such facility is regulated and administered.

(iv) An applicant for a community corrections facility shall provide to the Director, upon request, evidence that the facility/program is:

(A) Subject to "program audits" by the state or an agent of the state; and

(B) Operating and has been operated in compliance with all applicable standards.

(3) Natural Medicine Healing Center.

(i) A natural medicine healing center shall be an allowed use in all districts in which medical or dental clinics are allowed, except RH-24.

(ii) No natural medicine healing center shall be permitted to operate within 1,000 feet of any child day care center or public or private school.

(iii) Subsection (c)(3)(ii) above shall not apply to a natural medicine healing center that was actively doing business under a valid license prior to any other use referenced in subsection (c)(3)(ii) being constructed.

(iv) No natural medicine healing center shall be permitted to operate in the City unless it is licensed by the State Licensing Authority.

(d) Commercial Uses.

(1) Adult Entertainment.

(i) The City Council finds that the concentration of certain adult entertainment establishments in cities tends to result in the blighting and deterioration of the areas of such concentration. Accordingly, it is necessary that these establishments be regulated in a manner as to prevent the erosion of the character of affected neighborhoods.

(ii) No adult entertainment establishment shall be permitted within the City of Grand Junction except as provided in this Code.

(iii) The purpose of this subsection is to establish for the zoning and location of adult entertainment establishments that:

(A) Are not a nuisance; and

(B) Do not violate the provisions of the law regarding sexual conduct, obscene material, or obscene conduct.

(iv) Nothing in this Code authorizes, legalizes, or permits the establishment, operation, or maintenance of any business, building or activity which violates any other municipal ordinance or provision of the laws regarding nuisances, sexual conduct, obscene material, or obscene conduct. "Obscene material" or "obscene conduct" means that material or conduct that, taken as a whole, appeals to the prurient interest of the average person, applying a contemporary local standard and depicts or describes sexual conduct that, taken as a whole, lacks serious literary, artistic, political, or scientific value. The term "contemporary local standard" means that the material or conduct at issue must be measured in terms of the contemporary community standards of the City.

(v) Prohibition.No person, corporation, or business of any sort or description, shall cause or permit the location or operation of an adult entertainment establishment within 1,000 feet of the property line of another such business or within 1,000 feet of the property line of any church, school, park, playground, public building or within 1,000 feet of any residentially zoned property as the same are established under this Code. The operation of an adult entertainment establishment shall include the opening of such business as a new business, the relocation of such business or the conversion of an existing business location to any of the uses described in this subsection.

(vi) Gaming Arcades.The City Council finds that it is necessary to preserve the public health, safety, morals, and general welfare of the residents and businesses of the City by affording time for City staff to evaluate the impact of gaming arcades, whether such uses are legal and, if so, can be appropriately sited within the City with appropriate regulation, or whether such uses are or should be prohibited.

(A) Imposition of Moratorium.A moratorium period is hereby declared on all new establishments not in existence or the relocation of existing establishments as of March 5, 2023, constituting gaming arcades (aka skilled gaming businesses), slot machine(s), gambling device(s) and simulated gambling device(s) from the effective date of the ordinance codified in this subsection, March 5, 2023, for the period of 365 days to March 5, 2024 (inclusive), or until further action of the City Council ending, modifying or extending this moratorium, whichever occurs first. Such further action shall be taken accordingly by ordinance of the City Council. No applications pertaining to sales and use tax, amendments to the official Zoning Map, site development, liquor license, sign permit, building permit, any development permit, or renewal or transfer of any of the aforementioned shall be accepted for review by the City for the

moratorium period as defined herein.

(B) Repeal.Subsection (d)(1)(vi) of this section is repealed effective March 5, 2024.

(2) Animal Agriculture.

(i) Total Number of Large Animals Allowed.For the purpose of this subsection, large agricultural animals shall include horses, mules, burros, sheep, cattle, pigs, alpacas, llamas, and standard goats and are subject to the following:

(A) The R-R, R-ER, R-1R, R-2R, P-1, and P-2 districts shall not have more than one large agricultural animal per 1/4 acre of land.

(B) All other districts shall not have more than one large agricultural animal per 1/2 acre of land.

(ii) Total Number of Small Animals Allowed. For the purpose of this subsection, small agricultural animals shall include dwarf or pygmy goats, rabbits and any type of fowl and are subject to the following:

(A) Parcels of 1/2 acre or less shall not have more than six adult animals.

(B) Parcels greater than 1/2 acre shall not have more than 15 adult animals per acre.

(iii) Roosters Prohibited.Roosters, of any breed, are prohibited in all districts except on properties of at least five acres. A rooster shall be defined as any adult male domestic chicken that is three months of age or older.

(iv) General Requirements.

(A) Fencing and Separation.

a. All large agricultural animals kept on a parcel shall be fenced so that they are no closer than 100 feet from any residential structure on another property. For the purpose of this section, the first in time shall be the first in right. Written permission, if the animal were not first in time, for a lesser distance may be obtained from the property owner, or if not owner occupied, from the occupant.

b. Small agricultural animals that are kept outside the residence shall be confined by a fence, cage, pen, or coop so as to be no closer than 20 feet from a principal residential structure on an adjoining property.

(B) Allowances by Conditional Use Permit.

a. No person shall keep, house, or shelter one or more pigs in any zone district other than R-R unless such person has obtained a Conditional Use Permit in accordance with the provisions of GJMC § 21.02.050(f).

b. In the R-R district, the number of agricultural animals and small animals (including roosters) allowed under this subsection may be

exceeded with a Conditional Use Permit. If the Conditional Use Permit is approved, the permit shall state the maximum number of animals allowed by type and in the aggregate.

(3) Animal Clinic or Hospital.Any outdoor animal areas shall be located at least 150 feet from each abutting property, except where the abutting property is owned or occupied by the operator of the use.

(4) Mobile Food Vendor and Mobile Food Vendor Court.

(i) Applicability.These regulations apply to all mobile food vendors and mobile food vendor courts operating on private property, except when a mobile food vendor is operating as a temporary use under the provisions of GJMC § 21.04.050.

(ii) Signage.The total allowable square footage of signage for a mobile food vendor shall be 32 square feet, excluding signage fixed to an operable motor vehicle.

(iii) Landscaping, Screening and Buffering. Mobile food vendors and mobile food vendor courts are exempt from the landscaping, screening, and buffering provisions of GJMC Chapter 21.07.

(iv) Sanitary Facilities.

(A) Any mobile food vendor or mobile food vendor court shall provide and maintain a sanitary facility on site or shall provide and maintain a written agreement with a property and/or business owner allowing mobile food vendor employees and customers to share the use of that property's existing sanitary facilities.

(B) The structure containing shared sanitary facilities must be located within 750 feet from location of the mobile food vendor as identified on the approved site sketch.

(C) No shared sanitary facility may be shared with a residential land use. Mobile food vendors operating as temporary uses under the standards of GJMC § 21.04.050 shall be exempt from this requirement.

(v) Utilities.Permanent hookups to utilities shall not be provided for mobile food vendors but may be provided for mobile food vendor courts.

(vi) Wastewater Discharge.Wastewater produced by mobile food vendors shall be discharged only at a facility with an approved industrial pretreatment system or by a licensed waste hauler.

(5) Short-Term Rentals (STR).

(i) Purpose.The purpose of this regulation is to allow short-term rentals with a permit within the regulatory boundaries established by the City. These regulations are to assist in protecting the health, safety, and welfare of property owners, neighbors, and occupants.

(ii) Applicability.These regulations apply to all uses meeting the definition of short-term rental. Private covenants running with land may restrict or prohibit short-

term rentals; it is the responsibility of the property owner, not the City or any employee or agent thereof, to ensure compliance with restrictive covenants.

(iii) Permit Required.No person or entity shall sell lodging to a temporary occupant(s) of a dwelling unit for fewer than 30 consecutive days without first having obtained a short-term rental permit issued by the City and complying with any conditions or restrictions thereof. A short-term rental permit is valid for a period of one year and is subject to annual permit reviews in a form prescribed by the City. A separate short-term rental permit is required for each short-term rental unit and will be issues as either a primary or secondary short-term rental. A short-term rental permit may be issued only to the owner of the property used for short-term rental and is not transferable. A short-term rental permit may be issued by the Director upon finding that the requirements of this Subsection (d)(5) are met. A permit may contain conditions and restrictions.

(A) Primary short term rental permits shall not be issued for more than 7% of residentially zoned lots within the downtown area, defined as south of North Avenue, West of North 17th Street, North of Interstate 70 Business. and East of Highway 50.

(B) Primary short-term rental permits shall not be issued for more than 3% of the residentially zoned lots outside of the downtown area as defined in Subsection (d)(5)(iii)(A) above.

(C) No more than two short-term rental permits shall be issued in a residentially zoned building with four dwelling units or less. Only one of the two permits issued may be a primary short-term rental permit.

(D) A residentially zoned building with more than four dwelling units shall not be issued short-term rental permits for more than 10% of the units in the building, provided that a minimum of one short-term rental is permitted on all lots.

(iv) Occupancy.

(A) The number of occupants at any given time in a short-term rental unit shall not exceed two persons per bedroom plus two additional renters, including the operator, except where the Director determines that the size, configuration and/or structural features of the unit allow greater or lesser occupancy.

(B) A short-term rental permit shall only be issued and/or renewed in a Residential zone district when an applicant demonstrates that there is one additional parking space for each bedroom above four bedrooms on the lot. No additional required parking may be located between the front facade of the principal structure and the public street or private access way.

(C) The permit shall specify the maximum occupancy of the unit.

(v) Designated Local Responsible Party.

(A) The property owner shall designate one or more local person(s) who will be permanently available and responsible for immediately responding to

complaints about or violations of law or of permit terms. Local as used herein means having a permanent address within a twenty-mile radius from the short-term rental property and a twenty-four-hour contact phone number.

(B) The designated local responsible party may be the owner of the property if he or she meets the local criteria.

(C) The designated local responsible party must be authorized by the property owner to permit inspection of the premises by the City and/or its agent or employee to ensure compliance with applicable fire and building codes and with the requirements for and/or of the short-term rental permit.

(vi) General Requirements.The owner of a dwelling used or to be used as a short-term rental shall:

(A) Obtain a tax license from the City of Grand Junction and comply with all applicable local, state, and federal taxes;

(B) Demonstrate and certify that the unit contains the following on the premises at all times:

a. A smoke detector in good working order;

b. A carbon monoxide detector in good working order;

c. Adequate and functional building egress from each sleeping room in the unit;

d. Posted notice providing in detail the following information in a highly visible location and readily accessible form:

1. Location of building exits and fire extinguishers;

2. Twenty-four-hour emergency contact information;

3. Parking areas and parking restrictions, including a notice that parking on lawns is not allowed;

4. Noise restrictions and quiet hours;

5. Trash disposal instructions including trash pickup location and schedule;

6. Maximum occupancy restrictions; and

7. City permit number.

(C) Certify all units maintain a fire extinguisher in good working order;

(D) Permit inspection of the premises by the City or its agent or employee during the pendency of the permit application, and thereafter upon reasonable notice;

(E) Provide with its application a sketch or drawing of the unit that depicts all

rooms, doors, and windows, including dimensions, and shows on-site areas available for guest parking;

(F) If the short-term rental unit is accessed by a shared driveway, provide the City with a copy of a written instrument authorizing use of the driveway for short-term rental purposes;

(G) Provide the name, address, and phone number of the designated local responsible party to the City, and update such information with the City whenever it changes;

(H) Renew permit annually with the City, certifying that the permit terms and requirements are still being met and updating any material changes to the unit or property; and

(I) Where food is prepared and served to guests/lodgers on the premises, demonstrate compliance with Mesa County Health Department regulations.

(vii) Revocation, Suspension, and Appeal.

(A) A short-term rental permit may be suspended or revoked for any of the following reasons:

a. The owner or designated responsible party has failed to comply with a requirement of this Subsection (d)(5).

b. The owner or designated responsible party has failed to comply with a condition of or restriction set forth in the short-term rental permit.

c. The owner has failed to collect or remit lodging taxes or otherwise comply with local, state, and/or federal tax requirements.

d. Materially false or misleading information has been provided to the City by the applicant, owner or designated responsible party on an application.

e. The City has received excessive and substantial complaints by neighbors or affected persons that were not adequately and timely addressed by the owner or designated responsible party.

(B) Notice of permit revocation shall be provided to the owner, who shall then be given an opportunity to respond within 10 days. The Director will issue any decision to revoke or suspend a permit within 10 days of the response date.

(C) Any aggrieved person may appeal the issuance, denial, suspension, or revocation of a short-term rental permit to the Zoning Board of Appeals within 10 days of the issuance of the decision.

(6) Campground or Recreational Vehicle Park.

(i) Residential Occupancy Prohibited.A camping guest shall not use a campsite as a permanent residence or domicile.

(ii) Campground Design and Overall Site Layout. All commercial campgrounds shall meet the requirements of the Colorado Code of Regulations found in 9 CCR 1010-9, as may be amended, in addition to the standards provided in this section.

(A) Access and Circulation.

a. Entries, access drives, and parking areas shall meet City dimensional and fire standards and grading, drainage, and dust control requirements as applicable.

b. The surface of entries and access drive aisles shall be paved with asphalt or concrete with a pavement section paved in compliance with the Fire Code.

c. Pedestrian walkways shall be surfaced with a firm and stable, ADA-accessible material and designed to provide safe pedestrian circulation within the campground.

(B) Lighting.

a. Entries, access drive aisles and walkways shall be lighted every 500 feet consistent with the overall design of the campground. All lighting fixtures shall comply with the standards in GJMC Chapter 21.11.

b. Entryways to common service buildings shall be lighted during all operational hours between dusk and dawn.

(C) Parking.Parking or unit pull-in spaces shall be finished with a firm and stable material.

(D) Site Layout.

a. At least one campsite with accessible/mobility features shall be provided for each 25 campsites within the campground.

b. An overflow area for campsites may be established, but shall not exceed five campsites/parking areas per 100 in the campground.

c. Common service buildings including restroom and shower facilities shall be located no closer than 20 feet nor more than 500 feet from any campsite that may be used by a dependent camping unit.

(E) Landscaping.

a. Areas of campgrounds that abut residential properties shall be screened by a solid fence or year-round vegetation measuring six feet in height. Fences shall comply with GJMC § 21.05.090 and any design guidelines.

b. All areas shall be covered with either the natural vegetation and/or an acceptable form of ground cover so as to facilitate drainage, reduce dust, prevent erosion, and reduce fire hazards.

c. One tree per 2,500 square feet of the total net area used as campsites (excluding drive aisles, common areas or areas with common buildings) is required. Trees may be distributed throughout the campground.

d. All other landscaping shall comply with GJMC Chapter 21.07.

(F) Recreation Area.Each campground with 50 campsites or more shall provide an active recreational area(s) such as a tot lot or playground, horseshoe pits or lawn game area consisting of a minimum of 100 square feet per campsite.

(iii) Campsite Design.

(A) Any campsite shall be set back a minimum of 25 feet from a right-of-way.

(B) Each campsite shall provide a minimum of 750 square feet of space per intended camping unit and have a minimum width of 25 feet.

(C) A camping unit either in full set-up mode (all extensions/pull-outs in place), placed or built on a site shall not occupy more than 75% of the area of the campsite. Campsite size shall be larger than the minimum if larger camping units are intended and/or allowed.

(D) If a campsite may be used for multiple units, it shall provide at least another 400 square feet per each additional camping unit.

(E) Camping units or attachments to camping units (e.g., slideouts, awnings) shall be set back a minimum of three feet from individual campsite boundary lines or five feet from campground property boundary lines.

(F) Each site shall be marked and/or numbered for identification in a conspicuous location that is legible from the campground access drives.

(G) No permanent or semi-permanent structures, such as cabins, lean-tos, accessory structures, sheds, or habitable buildings, whether placed on a permanent foundation or not, shall be erected on a campsite except by the owner/operator of the property.

(iv) Water Services.

(A) The campground water supply system shall be designed, constructed, and maintained in compliance with all applicable codes. At campsites that provide for full or partial hook-up, the water system shall be connected to a public water supply system.

(B) Common water faucets shall be conveniently accessible from any campsite intended for dependent camping units.

(C) Spillage, overflow, drainage, or wastewater from common faucets shall be discharged to approved drains or otherwise designed to prevent impoundment of water, creation of mud holes, or other nuisance conditions.

(D) A water station for filling water storage tanks shall be provided at the rate of one station for every 100 campsites or part thereof that are designed for independent camping units. The water station shall be posted with a sign indicating it is potable water.

(v) Sanitary Sewer.

(A) At campsites that provide for full or partial hook-up, the sewer service shall be connected to a public sewer system.

(B) It is recommended that one sanitary waste station connected to a public sewer system be provided for campgrounds designed for greater than 100 independent camping units.

(C) When a sanitary waste station is provided, it shall be located on a level site with a concrete slab sloped to a center drain and be easily accessible from the access drive.

(D) When a sanitary waste station is provided, a means for flushing holding tanks and the immediate area shall be provided at each sanitary waste station. The flushing station shall consist of a properly supported water riser pipe, valved outlet and attached hose.

(E) A flushing sink or other means of disposal connected to the public sewer system shall be provided for disposal of liquid wastes from dependent camping units unless a sanitary waste station is provided and is conveniently located to these campsites.

(vi) Restroom and Shower Facilities.

(A) All common restroom and shower facilities shall be connected to public water and sewer systems. Privies are not allowed within campgrounds within the City limits.

(B) Required toilet, sink and shower facilities shall be provided in the following minimum numbers:

a. Where a campground is designed and operated for exclusive use by independent camping units, at least one toilet and one sink shall be provided for each 50 campsites.

b. Where a campground accepts or accommodates dependent camping units, at least one toilet and one sink shall be provided for every 15 campsites not provided with sewer connections and one shower shall be provided for every 15 campsites or fractional part thereof. Sinks shall be provided at each building containing toilet facilities at a rate of one sink per toilet for up to six toilets and one sink for every two toilets thereafter.

(vii) Health, Safety and Maintenance.

(A) Emergency and fire safety rules and regulations shall be conspicuously posted by campground management and shall include the following

information in addition to any other information required by the Fire and/or Police Department and any other laws and regulations:

a. Information needed for summoning the Fire and Police Departments.

b. Campground location information needed to provide to responding emergency services.

c. Location of common water faucets.

d. Location of fire suppression hydrant(s).

e. Location of sanitary waste station(s).

f. Map of campground, identifying all buildings and campsites by number.

(B) All areas including the storage, collection and disposal of refuse shall be maintained to minimize health and accidents, fire, air quality and other nuisance conditions.

(C) Durable, water-tight, easily cleanable refuse containers, sufficient to contain all refuse from the campground, shall be provided. Provision of recycling containers for separation of plastic, glass, metal, and aluminum containers is recommended.

(D) All trash collection areas shall be contained with a six-foot privacy fence or wall on at least three sides of the area.

(E) A six-foot fence shall be provided around hazardous areas such as swimming pools, utility areas or storage of hazardous materials.

(F) A fire ring shall be provided at any campsite that allows the use of combustible fuel. Location of the fire rings shall be shown on the site plan.

(7) Flea Market.

(i) Site Design.

(A) Flea markets shall not derive access from a collector or local street that serves a Residential zone district located within 1,200 feet of the property on which the flea market is located.

(B) Parking areas shall only be accessible by driveways meeting standards established in TEDS (GJMC Title 29).

(C) No booth, stall, or other display area shall be placed or maintained within any required setback area.

(D) Sanitary facilities shall be provided on site as required by the Director.

(ii) Storage.All items for sale shall be stored indoors, within an approved screened storage area per GJMC § 21.04.040(e)(3)(ii) or removed from the site at the close of each business day.

(iii) Operational Standards.Flea markets shall not be open for business in excess of 16 hours per day.

(8) Regulated Cannabis Store.

(i) Applicability.These regulations apply to all regulated cannabis stores in addition to the other provisions in the GJMC pertaining to cannabis stores, including, but not limited to, Chapters 5.13 and 5.14 GJMC.

(ii) Zoning.

(A) It is unlawful for a regulated cannabis store to operate in a building that contains a dwelling unit that is occupied or unoccupied.

(B) There shall be no more than two regulated cannabis stores operating within the boundaries of the Horizon Drive Business Improvement District, as may be amended.

(C) There shall be no regulated cannabis stores located on the ground floor of any buildings in the downtown Grand Junction area defined as Main Street bounded by the west intersection line of First Street and bounded by the east by the centerline of 7th Street.

(iii) Separation.No regulated cannabis stores shall be located within any of the following required separation distances, measured as specified in GJMC § 21.14.010(b)(1):

(A) Within 1,000 feet of any private or public elementary, middle, junior high, or high school.

(B) Within 1,000 feet of Colorado Mesa University (Main Campus) and Western Colorado Community College.

(C) Within 500 feet of any services for prevention, treatment, or recovery from substance use and mental health concerns, as licensed by the Colorado Department of Human Services, Office of Behavioral Health (OBH).

(9) Vehicle Fuel Sales, Vehicle Repair, Major and Minor, or Vehicle Wash.

(i) No above ground equipment for the service of gasoline, oil, air, or water shall be closer than 10 feet to any right-of-way.

(ii) If the principal use of the property is major or minor vehicle repair, the vehicles intended for repair shall not be stored in any right-of-way or in required parking spaces. Areas for storage of vehicles intended for repair must be screened along any street frontage.

(10) Vehicle Impound Lot.

(i) Screening.Screening shall be provided as required in GJMC § 21.05.080.

(ii) Location.No storage yard or storage lot shall be placed or maintained within a required setback.

(iii) Waste Management.

(A) Unusable items shall be disposed of and not be allowed to collect on the premises.

(B) No garbage or other putrescent waste, likely to attract vermin, shall be kept on the premises. Gasoline, oil, or other hazardous materials which are removed from scrapped vehicles or parts of vehicles kept on the premises shall be disposed of in accordance with applicable federal, state, and local regulations.

(11) Vehicle Sales, Rental, and Leasing, Heavy and Light. No more than one vehicle display pad, elevated up to six-feet in height as measured at the highest point, shall be permitted per 100 feet of street frontage.

(e) Industrial Uses.

(1) Artisan Industrial.

(i) All activities shall be conducted within a completely enclosed building.

(ii) If located in a Mixed-Use zone district, this use shall not exceed 10,000 square feet of gross floor area.

(iii) In the I-2 zone district, retail sales of goods produced on the property shall be prohibited.

(2) Mining and Extraction.

(i) Application.Where a minim or extraction use requires CUP approval in Table 21.04-1: Principal Use Table, an application for a Major Site Plan pursuant to GJMC § 21.02.040(k) shall be submitted simultaneously.

(ii) Location.

(A) Gravel extraction and/or processing activities should occur on parcels of sufficient size so that extraction and reclamation can be undertaken while still protecting the health, safety, and welfare of the citizens.

(B) Where gravel extraction and/or processing is adjacent to zoning or land uses other than I-1 or I-2, mining, handling, and batch processing activities may be restricted, buffering may be required and/or disturbance/ reclamation may be accelerated to be compatible with the adjacent zone district or use.

(iii) Standards.

(A) Compliance with State and Federal Requirements.

a. Mineral extraction, washing, crushing, cement and asphalt batch planting and other mined products related uses shall be subject to an approved excavation permit, well permit, air pollution permit, reclamation plan and any and all other permits, certifications, or requirements of the state or federal agencies having jurisdiction as required.

b. All air emissions shall comply with standards established by the Mesa County Health Department, State Health Department and Colorado Air Quality Control Commission.

c. All water use and/or discharge shall conform to standards established by law and administered by the Environmental Protection Agency (EPA), the Colorado Department of Public Health and Environment (CDHPE), the City of Grand Junction and the Mesa County Health Department.

(B) Location of Operations.

a. Excavation or deposit of overburden is not permitted within 30 feet of an abutting parcel, an easement, an irrigation ditch or canal or right-of-way unless by written agreement of the owner of such property, easement, irrigation ditch, canal or right-of-way.

b. Excavation within 125 feet of an existing residence is not permitted unless by written agreement of the owners and occupants of the residence. No rock crushing, asphalt/cement plant or other similar equipment or operations shall take place any closer than 250 feet of a residence. The Planning Commission may require a greater distance if the operation is abutting a Residential zone district.

c. At a minimum, 100 feet greenbelt setback shall be provided from jurisdictional wetlands or navigable watercourses as the same are defined by the U.S. Army Corps of Engineers (USACE). The Director upon recommendation and consent of the USACE may vary this standard.

(C) Vegetation and Screening.

a. Prior to starting operation, existing trees and vegetation shall, to the maximum extent practicable, be preserved and maintained in the required setback to protect against and reduce noise, dust, and erosion. The Director may require vegetative screening and/or buffering in accordance with GJMC Chapter 21.07 if the operation is adjacent to a residential use or Residential zone district. Required fencing, screening and/or buffering shall not be removed until reclamation has been completed.

b. Fencing around the perimeter of the property is required.

c. All disturbed areas shall be revegetated in accordance with the vegetation plan.

d. Following initial revegetation efforts, the revegetated area shall be maintained for a period of three years or until all vegetation is firmly established in the reclamation area.

(D) Operational Characteristics.

a. Excavation, loading, handling, processing, and batch operations

adjacent to Residentially zone districts shall not exceed 65 decibels at the property line of any adjacent parcel.

b. Hours of operation shall be restricted to 6:00 a.m. to 6:00 p.m. The Director may authorize different hours; however, the Director may also restrict as part of the Conditional Use Permit the hours of operation near residential or urbanized areas.

c. Operations shall comply with the noise, vibration and other applicable standards and requirements of this Code. If there are conflicting or competing provisions in this Code, the most stringent shall apply.

(E) Site Design and Maintenance.

a. In no event shall a slope of steeper than 2:1 be left for dry pits. A pit with a slope of 3:1 or steeper shall not exceed a depth of 10 feet. The floor of excavation pits, whether wet or dry, shall be left in a suitable condition.

b. The owner/operator shall not excavate, store overburden or mined material or dike the property in such a manner as to increase any drainage or flooding on property not owned by the operator or damage public facilities and/or property.

c. After mining has been completed, the site shall not to be used to stockpile sand and/or gravel except in I-1 and I-2 with a Conditional Use Permit. In any event the owner/operator is to reclaim the site as rapidly as possible.

d. All slopes shall be stabilized. Land remaining at the natural water level shall be revegetated in a manner compatible in type as/with the immediately prevailing area. Revegetation plans are required and shall minimally meet the standards of the Colorado Mine Land Reclamation Board.

e. The Director may place restrictions on right-of-way use after review of the traffic analysis. Restrictions may include but are not limited to the owner or operator being responsible for the extraordinary upgrade and maintenance of the designated haul route.

f. Streets, bridges, and highways designated as haul routes shall be maintained by the owner/operator in a reasonably clean condition. This may include, depending on local conditions, watering, oiling, or sweeping as determined by the Director.

g. Signage for public safety is required.

(3) Mini-Warehouse.

(i) Uses Permitted.

(A) This use shall not include the sale of any item of personal property, any

type of commercial activity, including such uses as sales, service and repair operations, manufacturing, or truck/equipment rentals, other than the leasing of the units.

a. Sales incidental to storage use out of the leasing office, such as that of boxes or moving supplies, shall be allowed.

b. The mini-warehouse owner or operator may provide a moving vehicle for use by lessees provided there are no rentals provided to members of the general public.

(B) Estate or foreclosure sales held by the mini-warehouse owner or operator shall be allowed.

(ii) Outdoor Storage.No outside storage shall be permitted except the storage of licensed vehicles within approved areas designated for such storage. This storage shall meet the requirements of GJMC § 21.04.040(e)(3)(ii).

(iii) Landscaping and Screening.All mini warehouses shall provide the following in addition to meeting standards of GJMC Chapter 21.07:

(A) For outdoor mini warehouse units, landscaping islands shall be provided at the end of each row of storage units when visible from the public right-of-way. Landscape islands shall be planted with shrubs that reach at least five feet of height at maturity.

(iv) Driveway Standards.Drive aisles within outdoor mini-warehouse facilities shall be a minimum of 26 feet wide for single-load aisles and 30 feet for double-load aisles.

(v) Identification.Individual mini warehouses shall be clearly marked with numbers or letters identifying the individual units and a directory of the unit locations shall be posted at the entrance or office of the facility.

(4) Outdoor Storage, Commercial.

(i) All outdoor storage shall be screened per GJMC § 21.05.080(b)(3).

(ii) Except for integral units, stored items shall not project above any screening.

(iii) The storage or accumulation of waste products, including paint, stain, oils, grease, or other flammable, toxic, or hazardous materials, or stagnant water, shall require a Conditional Use Permit and shall not exceed applicable Fire Code requirements.

(5) Telecommunications Facilities.

(i) Permit Required.

(A) No telecommunications facility shall be installed, constructed, altered, added to, or permitted unless the Director has first approved a site plan review for the property and the facilities and a permit has been issued. Telecommunications facilities and infrastructure shall be constructed and maintained in conformance with all applicable building code requirements

as well as with the terms of the permit issued under this section.

(B) No telecommunications facility shall be altered, added to, installed, or permitted unless the applicant has shown compliance with all the requirements of this section. The requirements of this section apply to all telecommunications facilities, whether concealed or not, whether aboveground or underground, including but not limited to existing towers, proposed towers, public towers, replacement of towers, ancillary structures and equipment, co-location on existing towers, base stations, temporary telecommunications facilities, PWSF facilities, DAS facilities, small cell sites and/or networks, and broadcast towers, except that the following are exempt and no permit is required:

a. An amateur radio tower that is used exclusively for noncommercial purposes;

b. A government-owned telecommunications facility erected for a state of emergency officially declared by a federal, state, or local government and where the City Manager has made a written determination of public necessity for the facility, and only during the duration of the state of emergency;

c. A government-owned public safety facility; and

d. Over-the-air reception devices (OTARD), including satellite earth stations, so long as the device does not require construction of a tower or other structure exceeding 12 feet above the home or building and the device is no more than one meter in diameter in a Residential zone district or two meters in any other zone district.

(ii) Permit Types.

(A) Administrative Permit.For those types of facilities that are allowed in the given zone district, and for qualified co-locations, an administrative permit (a permit issued by the Director) is required. The permit shall be processed and decided in accordance with GJMC § 21.02.040 and this subsection.

(B) Conditional Use Permit.For those types of facilities that require a Conditional Use Permit, the Director shall review the application and make a recommendation to the Planning Commission who shall hold a hearing on the application and who may approve, approve with conditions, or deny the application in accordance with GJMC § 21.02.050(f) and this subsection.

(C) Right-of-Way Work/Use Permit.Facilities/structures located in the right-of-way shall be placed so as not to interfere with vehicular or pedestrian use of the rights-of-way or with traffic safety. Any/all work in the right-of-way requires a separate permit pursuant to the City's right-of-way management ordinance. The provider shall comply with all the provisions and terms of the right-of-way management ordinance and right-of-way work permit. As-built construction drawings shall be provided to the City for all structures, equipment, cable, pipes, and conduit located within the

right-of-way or within a public or City-owned utility or multipurpose easement, that must include, for fiber optic cable, the number of strands of fiber in the conduit.

(D) Consolidated Application/Permit.For the following facility types, the applicant shall be allowed, at the applicant's discretion, to file a single, consolidated application for multiple facilities and receive a single review/ permit/decision instead of filing separate applications for each facility (however, right-of-way work permit(s) may also be required):

a. For small cell networks involving multiple individual small cell facilities within the City; and

b. For an applicant desiring to co-locate on several wireless service facilities within the City.

(E) Shadow Conduit.For all telecommunications facility development/ installation that involves trenching or excavation in the right-of-way or in a public or City-owned utility or multipurpose easement, the applicant shall notify the City 30 days prior to commencing such excavation and provide the City the opportunity to install conduit in the same trench/ excavation area. The City will pay for the incremental costs of the shadow conduit only.

(iii) General Requirements Applicable to All Telecommunications Facilities.

(A) Signage.Commercial messages shall not be displayed on any tower, support structure or ancillary structure, unless the tower is concealed and the means of concealment is or includes an existing sign or unless a sign is serving as a dual purpose facility or a base station. Required noncommercial signage shall be subject to the following:

a. The only signage that is permitted upon a concealed tower, equipment cabinet, shelter or fence shall be informational, and for the purpose of identifying the tower (such as ASR registration number), as well as the party responsible for the operation and maintenance of the facility, and any additional security and/or safety signs as applicable.

b. If more than 220 voltage is necessary for the operation of the facility and is present in a ground grid or in the tower, signs located every 20 feet and attached to the fence or wall shall display in large, bold, high contrast letters, minimum height of each letter four inches, the following: "HIGH VOLTAGE - DANGER."

c. Name plate signage shall be provided, in an easily visible location, including the address and telephone number of the contact to reach in the event of an emergency or equipment malfunction, including property manager signs as applicable.

(B) Lighting.Lighting on PWSF towers shall not exceed the Federal Aviation Administration (FAA) minimum standards. All other lighting shall be

subject to the following:

a. Any lighting required by the FAA must be of the minimum intensity and number of flashes per minute (i.e., the longest duration between flashes) allowable by the FAA. Dual lighting standards are required with strobe during daytime and red flashing lights at night unless prohibited by the FAA.

b. Lights shall be filtered or oriented so as not to project directly onto surrounding property or rights-of-way, consistent with FAA requirements.

(iv) Siting of Telecommunications Facilities.

(A) Compliance with Siting Preferences.For every application for siting of new telecommunications facilities on or above ground level (except temporary PWSF and co-locations), the applicant must submit an affidavit by a radio frequency engineer demonstrating compliance with the siting preferences of Subsection (e)(5)(x). Where a lower ranking alternative is proposed, the affidavit must address why each of the higher ranked options are not technically feasible, practical, and/or justified.

(B) Where the application is for siting of PWSF, whether for a new facility, modification of existing facility, replacement facility or co-location, and whether the permit is administrative or a Conditional Use Permit, the following additional decision-making requirements apply:

a. If the application is denied, the decision maker shall issue the decision in writing, including the basis for the denial, which must be supported by substantial evidence contained in a written record. The written basis for the decision must be issued contemporaneously with the decision.

b. The application cannot be denied, nor can conditions be applied or required, based upon considerations of radio frequency (RF) emissions safety, other than to require the applicant to demonstrate that all applicable FCC rules are satisfied.

(v) Streamlined Processing for Co-Location of PWSF.

(A) If the applicant believes its co-location application is an eligible facilities request or a qualified co-location request, the applicant must submit:

a. A complete co-location application specifically requesting streamlined processing and stating the applicable permitting time frame (e.g., 60 days for eligible facilities request or 90 days for qualified co-location request);

b. Documentation evidencing that any structure proposed to be replaced or modified has previously been subject to zoning/development approval by the City;

c. Documentation evidencing the replacement/modification does not

create a substantial change in the underlying support structure or tower, or a statement that it does create a substantial change;

d. Documentation that the proposed modifications will be used to provide personal wireless services.

(B) The Director shall review and decide applications for co-location of PWSF.

(C) The Director will notify the applicant within 30 days of submission (or within some other mutually agreed upon time frame) if the submission is incomplete, identifying the specific deficiencies in the application which, if cured, would make the application complete.

(D) Upon notice of deficiency, the timeline for a decision shall be tolled until the applicant resubmits to correct such deficiency. The City shall, within 10 days of resubmission, notify the applicant of continuing deficiencies or the application will be deemed complete. The timeline for a decision shall be likewise tolled during the additional resubmission deficiency period until the second resubmission. Upon resubmitting of the revised application the City shall follow the process identified in this section, above, until all deficiencies identified are deemed cured.

(E) If the Director fails to provide such notification, the application will be deemed complete.

(F) The Director's decision shall be in writing and shall be postmarked to the applicant within 60 days after the initial submission, excluding any tolling period, for an eligible facilities request, or, for a qualified co-location, within 90 days after the initial submission, excluding any tolling period, or within some other mutually agreed upon time frame.

(G) If the City does not respond in writing to an eligible facilities request within the specified time frame, the application shall be deemed approved. If the City does not respond in writing to a request for a qualified co-location within the specified time frame, the applicant may pursue its remedies established by federal or state law.

(vi) Timing for Review of New PWSF Tower Applications. A new PWSF tower, whether concealed or nonconcealed, shall be reviewed and a decision rendered within 150 days of receipt of the application, subject to any applicable tolling for application deficiencies and resubmissions as described in Subsection (e)(5)(iv), so long as the applicant demonstrates that the facilities will be used, immediately upon completion of construction, to provide personal wireless services, or within such other mutually agreed upon time. ("Spec" towers are not entitled to review and decision within 150 days, or to any of the other protections of the Telecommunications Act.) Construction permits issued for new PWSF towers shall be valid for a term of 18 months and shall lapse and be void if construction of the contemplated PWSF structure is not completed within that time.

(vii) Application and Fees.

(A) Application materials required for telecommunications facilities shall be in accordance with this section and with the specific application requirements in the City's Submittal Standards for Improvements and Development (SSID) Manual. The application form and requirements are specific to the type of telecommunications facility.

(B) The City Council shall establish fees to cover or offset the processing cost of all permits under this section which will be included in the development fee schedule. Every application for a telecommunications facility shall be accompanied by the full payment of the fee established for the type of facility requested. Payment of fees is required in order for an application to be considered complete. The fee shall not be, in whole or in part, deferred or waived.

(C) The City reserves the right to require, in its sole discretion, a supplemental review by experts for any application for a telecommunications facility where the complexity of the analysis requires technical expertise, and/or for any request to vary a standard under Subsection (e)(5)(xix), and all the costs of such review shall be borne by the applicant, in addition to scheduled fees.

(D) Based on the results of the supplemental review, City staff responsible for the initial application review may require changes to or supplementation of the applicant's submittal(s).

(E) The supplemental review may address any or all of the following:

a. The accuracy and completeness of the application and any accompanying documentation.

b. The applicability of analysis techniques and methodologies.

c. The validity of conclusions reached.

d. Whether the proposed telecommunications facility complies with the applicable approval criteria and standards of this Code and other applicable law.

(viii) Abandonment/Discontinued Use.

(A) All telecommunications facility structures, equipment, fencing and devices shall be removed from the property and the site returned to its natural state and topography and vegetated consistent with the natural surroundings or current surrounding land uses at the property owner's and/or service provider's expense within 180 days of cessation of use, or within 90 days of cessation of use if the abandonment is associated with a replacement.

(B) The City may extend the time for removal and site restoration up to 60 additional days if the owner or service provider requests and shows good and unique cause for the extension.

(C) If removal and/or site restoration is not accomplished within the prescribed time, the City may initiate removal and restoration within 30 days

following written notice to the property owner, and the property owner and service provider shall be jointly and severally responsible for all costs associated with the removal and restoration.

(D) Conduit and/or fiber optic cable, whether below or above ground, that is or has been abandoned or the use of which is discontinued for one year shall become the property of the City of Grand Junction. Easements for the maintenance of such conduit/cable shall also become the property of the City of Grand Junction, which shall have all the benefit and interest of the original easement holder with respect to installation, maintenance, and repair of conduit/cable.

(ix) No Interference with Public Safety Communications.

(A) Applicant shall, regardless of the type of facility, comply with "Good Engineering Practices" as defined by FCC regulations and shall provide a composite analysis of all users of the site to determine that the proposed facilities will not cause radio frequency interference with any governmental public safety communications and shall implement appropriate technical measures to prevent such interference.

(B) When the City notifies a wireless service provider that it believes the provider's antenna(s) or array(s) are creating such interference, the provider shall investigate and mitigate the interference, if any, utilizing the procedures set forth in the joint wireless industry-public safety "Enhanced Best Practices Guide," released by the FCC in Appendix D of FCC 04-168 (released August 6, 2004), including the "Good Engineering Practices," as may be amended or revised by the FCC from time to time in any successor regulations.

(C) If the provider fails to comply with this Subsection (e)(5)(ix), including but not limited to by initiating an appropriate response within 24 hours of the City's notification, the provider and the property owner shall be jointly and severally responsible for reimbursing the City for all costs associated with ascertaining and resolving the interference.

(x) Siting Preferences for New Telecommunications Facilities.Siting of new PWSF of any type shall be in accordance with the siting preferences below and with Table 21.04-1: Principal Use Table. Broadcast towers are not subject to the siting preferences. Broadcast towers shall not be located on a Wireless Master Plan priority site; those are reserved and planned for PWSF and public safety telecommunications facilities. Where a lower ranked alternative is proposed, the applicant must demonstrate through relevant information including, but not limited to, an affidavit by a radio frequency engineer demonstrating that despite diligent efforts to adhere to the established hierarchy within the geographic search area, higher ranked options are not technically feasible, practical or justified given the location of the proposed facilities, by clear and convincing evidence. The applicant must provide such evidence in its application in order for the application to be considered complete. The siting preferences are, in order:

(A) Co-located or combined PWSF.

(B) Concealed antenna(s) on a base station.

(C) Nonconcealed antenna(s) on a base station.

a. On a Wireless Master Plan priority site.

b. On City-owned property in any nonresidential zone district.

c. On other public property in any nonresidential zone district.

d. On nonpublic property in the following zone districts, ranked highest to lowest:

1. I-2, I-1, or I-OR.

2. C-2.

3. MU-2.

4. P-2.

5. P-1.

6. Other zone districts in accordance with Table 21.04-1: Principal Use Table.

(D) Replacement of existing telecommunications facility in any zone district.

(E) Dual purpose facility.

(F) Concealed small cell site.

(G) Nonconcealed small cell site.

(H) Distributed Antenna System.

a. Attached.

1. Concealed on City-owned property, right-of-way, or public easement.

2. Concealed on other public property.

3. Concealed on nonpublic property.

4. Nonconcealed on City-owned property, right-of-way, or public easement.

5. Nonconcealed on other public property.

6. Nonconcealed on nonpublic property.

b. New Freestanding DAS Facility.

1. Concealed on City-owned property, right-of-way, or public easement.

2. Concealed on other public property.

3. Concealed on nonpublic property.

4. Nonconcealed on City-owned property, right-of-way, or public easement.

5. Nonconcealed on other public property.

6. Nonconcealed on nonpublic property.

(I) Concealed Freestanding Towers.

a. On a Wireless Master Plan priority site.

b. On City-owned property in any nonresidential zone district.

c. On other public property in any nonresidential zone district.

d. On nonpublic property in the following districts, ranked highest to lowest:

1. I-2 or I-1.

2. CG.

3. MU-2.

4. Other zone districts, in accordance with Table 21.04-1: Principal Use Table.

e. Preferred Concealment Type (Wherever Located):

Concealment types listed below are general preferences, in no particular order. The appropriate means of concealment will depend upon the structures and developed features already existing in the area. Innovative concealment is encouraged so long as it is visually integrated into the immediate surroundings.

1. Tree of a type naturally occurring or normally found in the geographic area.

2. Church steeple.

3. Bell or clock tower.

4. Belfries, domes, or chimneys.

5. Elevator towers.

6. Flag poles.

7. Water towers.

8. Cupolas.

9. Other architectural or art feature.

Figure 04.03-3 Examples of Concealed Facilities

(J) Nonconcealed Towers.

a. On a Wireless Master Plan priority site.

b. On City-owned property in any nonresidential zone district.

c. On other public property in any nonresidential zone district.

d. On nonpublic property in the following districts, ranked highest to lowest:

1. I-2;

2. I-1;

3. CG;

4. MU-2.

e. Preferred Tower Type (Wherever Located):

1. Monopole.

2. Lattice.

3. Guyed.

(xi) Temporary PWSF Specifications and Requirements. Temporary PWSF shall be permitted by the Director where all of the following are met:

(A) It will be in place for no more than 60 days (subject to a one time extension of an additional 60 days for good cause);

(B) Notification of construction is provided by the applicant to the FAA;

(C) It does not require marking or lighting by the FAA;

(D) It will be less than 200 feet in height; and

(E) It does not involve any excavation (or excavation where prior disturbance exceeds proposed excavation by at least two-feet).

(xii) Telecommunications Facility Co-Location and Combination.The City requires co-location and combining of telecommunications facilities on existing towers,

existing base stations or existing alternative support structures (dual purpose facilities) as a highest priority where such co-location is possible. A permit shall be required for co-location of facilities on an existing tower, existing base station, or dual purpose facility. Co-location or combination of telecommunications facilities requires an administrative permit, and is subject to the following:

(A) A co-located or combined antenna or antenna array shall not exceed the maximum height prescribed in the applicable land use permit or increase the height of an existing tower by more than 20 feet and shall not affect any tower lighting, except as provided for herein below. A PWSF co-location that does not create a substantial change in the tower or support structure shall be approved within 60 days (subject to tolling) in accordance with Subsection (e)(5)(iv).

(B) If the applicant who seeks to co-locate PWSF demonstrates a coverage gap that cannot be addressed by a co-location that meets Subsection (e)(5)(xii)(A), the applicant may request a Variance of the height limitation in accordance with Subsection (e)(5)(xix). If the co-location is a qualified co-location under 47 U.S.C. § 332(c)(7)., the Director shall render a decision within 90 days, subject to tolling, in accordance with Subsection (e)(5)(iv) of this section.

(C) New antenna mounts shall be flush-mounted onto existing structures where flush mounting was a condition of the original approval, unless it is demonstrated through radio frequency (RF) propagation analysis that flush-mounted antennas will not meet the network objectives of the desired coverage area, or unless applicant demonstrates that flush-mounting would interfere with existing antenna mounting or coax arrangements that were previously approved.

(D) The equipment cabinet shall be subject to the setback requirements of the underlying zone district.

(E) When a co-located or combined antenna is to be located on a nonconforming building or structure, then the existing permitted nonconforming setback shall prevail.

(F) No signage shall be permitted on an antenna or antenna array that is combined with or co-located on an alternative support structure; however, the support structure may itself be an existing sign, so long as the sign was approved through a non-telecommunications facility development permit or Sign Permit.

(xiii) <u>New Base Stations - Concealed and Nonconcealed.</u>

(A) Antennas and equipment may be mounted onto a structure that is not primarily constructed for telecommunications purposes in accordance with Table 21.04-1: Principal Use Table. A permit is required for base station antennas and equipment mounted onto such an alternative structure. In Residential zone districts, the following structures shall not be used as base stations or to support PWSF or commercial antenna(s): single-family

detached dwelling, single-family attached dwelling, duplex dwelling, multifamily dwelling of fewer than three stories in height, any use categorized as group living in Table 21.04-1: Principal Use Table, or adult or child day care center.

(B) If the facility is concealed, the top of antenna(s) shall not be more than 35 feet above the existing or proposed building or structure, except that antenna(s) located on the perimeter of the supporting structure shall not be more than 10 feet above the supporting structure.

(C) If the facility is nonconcealed, the top of the antenna shall not be more than 20 feet above the existing or proposed building or structure and shall not be located on the perimeter of the supporting structure.

(D) New antenna mounts shall be flush-mounted onto existing structures unless it is demonstrated through radio frequency (RF) propagation analysis that flush-mounted antennas will not meet the network objectives of the desired coverage area.

(E) New antenna mounts shall meet the setbacks and height restrictions of the underlying zone district.

(F) When attached base station antenna(s) and equipment is/are to be located on a nonconforming building or structure, the existing permitted nonconforming setback or height shall prevail.

(G) Concealed base station attached antennas, feed lines and antennas shall be designed to architecturally match the facade, roof, wall, and/or structure on which they are affixed so that they blend with the existing structural design, color, and texture.

(H) No signage shall be allowed on an antenna or antenna array that is located on an alternative structure; however, the alternative structure itself may have a sign that was otherwise approved as part of a non-telecommunications facility development application or Sign Permit.

(xiv) Antenna Element Replacement or Modification. A permit is required for any replacement or modification of existing antenna(s) and associated equipment, and the replacement or modification shall comply with the following:

(A) Height.The increase in height of a PWSF that is modified shall not create a "substantial change" in the PWSF.

(B) Equipment Cabinets and Equipment Shelters. Electronic equipment shall be contained in either a) equipment cabinets or b) equipment shelters. Equipment cabinets shall not be visible from pedestrian and right-of-way views. Equipment cabinets may be provided within the principal building on the lot, behind a screen on a rooftop, or on the ground within the fenced-in and screened equipment compound.

(C) Sounds.No unusual sound emissions such as alarms, bells, buzzers, or the like are permitted. Emergency generators are allowed. Sound levels shall not exceed 65 decibels as measured at the property boundaries for the

facility.

(xv) Tower/Support Structure Replacement.

(A) Permit Required.A permit is required for replacement of a tower and support structure. The applicant must demonstrate by clear and convincing competent evidence that replacement will accomplish at least one of the following:

a. Reduction in the number of telecommunications facility support structures or towers;

b. Replacement of a nonconcealed tower with a concealed tower;

c. Significant reduction of the visual impact of a telecommunications facility;

d. Replacement of an existing tower with a new tower so as to improve network functionality resulting in compliance with this section; and/or

e. Replacement of an existing support structure to increase the number of personal wireless service providers located on such structure.

(B) Development Standards.

a. Setbacks.A new tower approved for replacement shall not be required to meet new setback standards so long as the new tower and its equipment compound are no closer to any property lines or dwelling units as the tower and equipment compound being replaced. The intent is to encourage the replacement process, not penalize the tower owner for the change out of the old facility. (For example, if a new tower is replacing an old tower, the new tower is permitted to have the same setbacks as the tower being removed, even if the old tower had nonconforming setbacks.)

b. Height.The height of the replacement tower or support structure shall not create a substantial change of the facility being replaced.

c. Breakpoint Technology.A replacement monopole tower shall use breakpoint technology in the design of the replacement facility.

d. Visibility.Replacement towers or support structures shall be configured and located in a manner that minimizes adverse effects on the landscape and adjacent properties, with specific design considerations as to height, scale, color, texture, and architectural design of the buildings on the same and adjacent zoned lots.

e. Construction Standards.All replacement towers shall be constructed and maintained to meet ANSI/EIA/TIA-G (as amended) Series III, Exposure C structural standards.

(xvi) DAS and Concealed Small Cell Facilities.

(A) Attached DAS Development Standards.

a. Where feasible, antennas can be placed directly above, below or incorporated with vertical design elements of a building or structure to maximize concealment. The top of the antenna(s) shall not exceed more than seven feet above the tallest level of the structure on which it is attaching.

b. Attached equipment box and power meter is discouraged; however, if attachment is justified, equipment box and meter shall be located on the pole at a height that does not interfere with pedestrian or vehicular traffic or visibility and where applicable shall not interfere with street name signs or traffic lighting standards.

c. Freestanding equipment box and/or power meter not attached to an existing structure shall be located no farther than two feet from the base of the structure and shall not interfere with pedestrian or vehicular traffic. Screening materials may be required if the equipment box and/or meter are adjacent to a right-of-way or along a pedestrian sidewalk or pathway.

d. All cables shall be installed internally; but where internal mounting is not possible, surface mounted wires shall be enclosed within conduit or a similar cable cover which should be painted to match the structure or building on which that DAS is mounted.

(B) New Freestanding DAS Facility and Concealed Small Cell Facility Development Standards.

a. Height.The total height of DAS facility/small cell facility including antenna shall not exceed one foot above the height of existing public utility poles for power or light in the same geographic area.

b. Setbacks.Setbacks for DAS/small cell outside of the right-of-way shall meet the same setbacks of the underlying zone district for similar structures.

c. Ground Equipment.

1. The use of foliage and vegetation around ground equipment may be required by the City based on conditions of the specific area where the ground equipment is to be located.

2. In order to avoid the clustering of multiple items of ground equipment in a single area, a maximum of two ground equipment boxes may be grouped together in any single location. In addition, such locations must be spaced a minimum of 500 linear feet of right-of-way apart from each other.

3. Individual ground equipment boxes shall not exceed three feet wide by three feet deep by five feet high in size.

4. The size and height of new freestanding DAS and concealed

small cell facility poles shall be no greater than the size and height of any other telecommunications facility poles located in the same or similar type of rights-of-way in the City.

d. Visibility of New DAS/Small Cell Poles.

1. New DAS/small cell structures shall be configured and located in a manner that minimizes adverse effects on the landscape and adjacent properties, with specific design considerations as to height, scale, color, texture, and architectural design of the buildings on the same and adjacent zoned lots. Concealment design is required to minimize the visual impact of wireless communications facilities.

2. All cables, conduits, electronics, and wires shall be enclosed within the structure.

3. Small cell facilities shall be no larger in size than what is specified in the definition.

4. New DAS/small cell structures shall be located in arterial rights-of-way whenever possible. Placement of new DAS/small cell structures in rights-of-way other than arterials shall be justified by an engineering analysis from the applicant to the satisfaction of the city engineer prior to the issuance of any permit. Whenever new DAS/small cell structures must be placed in a right-of-way with residential uses on one or both sides of the street, no pole, equipment, antenna, or other structure may be placed directly in front of a residential structure. If a right-of-way has residential structures on only one side of the street, the new DAS/small cell structure shall be located on the opposite side of the right-of-way whenever possible. All new DAS/small cell structures shall be located such that views from residential structures are not significantly impaired. Newly installed poles for new DAS/small cell structures should be located in areas with existing foliage or other aesthetic features in order to obscure the view of the pole.

5. New DAS/small cell structures located in rights-of-way shall be constructed and maintained so as not to interfere with, displace, damage, inhibit or destroy any other utilities or facilities, including but not limited to sewer, gas or water mains or service lines, storm drains, pipes, cables or conduits, or any other facilities lawfully occupying the right-of-way, whether public or private. All wireless communications facilities shall be placed and maintained so as not to create interference with the operations of public safety telecommunications service. The City reserves the right to place and maintain, and permit to be placed or maintained, sewer, gas, water, electric, storm drainage, communications, and other utilities and facilities, cables or conduit, and to do, and to permit to be done, any

underground and overhead installation or improvement that may be deemed necessary or proper by the City in rights-of-way occupied by the new DAS/small cell structure.

e. Equipment Cabinets.Equipment shelters or cabinets shall be consistent with the general character of the neighborhood and historic character if applicable. Equipment shelters or cabinets shall be screened from the public view by using landscaping, or materials and colors consistent with the surrounding backdrop.

1. Screening enclosures shall be allowed when the design is architecturally compatible with the building.

2. Screening materials shall consist of materials and colors consistent with the surrounding backdrop and/or textured to match the existing structure.

3. The use of foliage and vegetation around ground equipment may be required based on conditions of the specific area where the ground equipment is to be located.

4. Small cell equipment cabinets shall comply with the size requirements set forth in the definitions above.

(C) DAS Hub Development Standards.

a. Setbacks.Setbacks for DAS hubs outside of the right-of-way shall meet the setback standards of the underlying zone district.

b. DAS Hub.Equipment shelters or cabinets shall be consistent with the general character of the neighborhood and historic character if applicable. Equipment shelters or cabinets shall be screened from the public view by using landscaping, or materials and colors consistent with the surrounding backdrop.

1. Screening enclosures shall be allowed when the design is architecturally compatible with the building.

2. Screening materials shall consist of materials and colors consistent with the surrounding backdrop and/or textured to match the existing structure.

3. The use of foliage and vegetation around ground equipment may be required based on conditions of the specific area where the ground equipment is to be located.

(xvii) Concealed and Nonconcealed Telecommunications Towers (Not Including DAS or Broadcast Tower).

(A) Procedure.

a. A Pre-Application Meeting is required for a new telecommunications tower. A permit and a Major Site Plan review shall be required for a new telecommunications tower. The permit required may be an

administrative permit or a Conditional Use Permit, depending upon the zone district and/or whether or not the site is a priority site on the Wireless Master Plan.

b. No new tower shall be permitted unless the applicant demonstrates that no existing tower or qualified alternative support structure can accommodate the applicant's proposed use, or that co-location on such existing facilities would have the effect of prohibiting personal wireless services in the geographic search area to be served by the proposed tower.

(B) Development Standards.

a. Height.

1. New concealed towers shall be limited to 200 feet in height. Height calculations shall be made in accordance with FAA standards, and shall include all appurtenances.

2. New nonconcealed (nonbroadcast) towers shall be limited to 150 feet in height. An applicant desiring a new nonconcealed tower taller than 150 feet must request a Variance in accordance with Subsection (e)(6)(xix). However, under no circumstance shall any nonconcealed tower exceed 199 feet.

b. Setbacks and Spacing from Residential Structures. A new tower shall be subject to the principal structure setbacks of the underlying zone district, and, with respect to any residential structure on adjacent property:

1. If the tower has been constructed using breakpoint design technology, the minimum distance from any residential structure shall be equal to 110% of the distance from the top of the structure to the breakpoint level of the structure, or the minimum principal structure setbacks, whichever is greater. Certification by a registered professional engineer licensed by the State of Colorado of the breakpoint design and the design's fall radius must be provided together with the other information required herein from an applicant. (For example, on a 100-foot-tall monopole with a breakpoint at 80 feet, the minimum distance from the residential structure would be 22 feet (110% of 20 feet, the distance from the top of the monopole to the breakpoint) plus the minimum principal structure setback requirements for that zone district.)

2. If the tower is not constructed using breakpoint design technology, the minimum distance from any residential structure shall be equal to the height of the proposed tower.

c. Equipment Cabinets and Equipment Shelters. Electronic equipment shall be contained in either a) equipment cabinets or b) equipment shelters. Equipment cabinets shall not be visible from pedestrian and

right-of-way views. Equipment cabinets may be provided within the principal building on the lot, behind a screen on a rooftop, or on the ground within the fenced-in and screened equipment compound.

d. Fencing.All equipment compounds shall be enclosed with an opaque fence or masonry wall in Residential zone districts and in any zone district when the equipment compound adjoins a right-of-way. Alternative equivalent screening may be approved through the site plan approval process described in Subsection (e)(5)(xvii)(B)e below.

e. Buffers.The equipment compound shall be landscaped with a minimum ten-foot-wide perimeter buffer containing the following planting standards:

1. All plants and trees shall be indigenous to this part of Colorado.

2. Existing trees and shrubs on the site should be preserved and may be used in lieu of required landscaping as approved by the Community Development Department.

3. One row of evergreen trees with a minimum two-inch caliper, twenty-five-foot on center.

4. Evergreen shrubs capable of creating a continuous hedge and obtaining a height of at least five feet shall be planted, minimum three-gallon or 24 inches tall at the time of planting, five-foot on center.

5. Alternative landscaping plans which provide for the same average canopy and understory trees but propose alternative locating on the entire subject property may be considered and approved by the Director, provided the proposed alternative maximizes screening as provided above, and is otherwise consistent with the requirements of this section.

f. Equipment Compound.The fenced-in compounds shall not be used for the storage of any excess equipment or hazardous materials. No outdoor storage yards shall be allowed in a tower equipment compound. The compound shall not be used as habitable space.

g. Structural Standards.All new concealed or nonconcealed PWSF towers shall be constructed and maintained to meet ANSI/EIA/TIA-G (as amended) Series III, Exposure C structural standards.

h. Visibility.

1. Concealed.

i. New concealed towers shall be designed to match adjacent structures and landscapes with specific design considerations such as architectural designs, height, scale, color, and texture.

ii. New antenna mounts shall be concealed and match the concealed tower.

iii. In Residential zone districts and in Mixed-Use zone districts that include residential uses, new concealed towers shall not be permitted on lots where the principal use or principal structure is single-family detached dwelling, single-family attached dwelling, duplex dwelling, multifamily dwelling of fewer than three stories in height, any use categorized as group living in Table 21.04-1: Principal Use Table, or adult or child day care center of fewer than three stories. Examples of land uses/ structure types in residential areas where the site may include a concealed tower are: school, religious assembly, fire station, stadium tower or stand, or other similar institutional/civic uses/structures.

2. Nonconcealed.New antenna mounts shall be flush-mounted unless the applicant can demonstrate that flush-mounted antennas will not reasonably meet the network objectives of the desired coverage area or that more co-locations will be available on the tower if flush-mounting is not required.

3. Concealed and Nonconcealed.

i. New concealed and nonconcealed towers shall be configured and located in a manner that shall minimize adverse effects including visual impacts on the landscape and adjacent properties.

ii. A balloon test shall be required subsequent to the receipt of the photo simulations in order to demonstrate the proposed height and concealment solution of the PWSF. The applicant shall arrange to raise a red or orange colored balloon no less than three feet in diameter at the maximum height of the proposed tower, and within 25 horizontal feet of the center of the proposed tower. The applicant shall meet the following for the balloon test:

(1) Applicant must inform the Community Development Department and abutting property owners in writing of the date and times, including alternative date and times, of the test at least 14 days in advance.

(2) A three-foot-by-five-foot sign with lettering no less than three inches high stating the purpose of the balloon test shall be placed at closest major intersection of proposed site.

(3) The date, time, and location, including alternative date, time, and location, of the balloon test shall be

advertised in a locally distributed paper by the applicant at least seven but no more than 14 days in advance of the test date.

(4) The balloon shall be flown for at least four consecutive hours during daylight hours on the date chosen. The applicant shall record the weather, including wind speed, during the balloon test.

(5) Re-advertisement will not be required if inclement weather occurs.

iii. Towers shall be constructed to accommodate antenna arrays as follows:

(1) Up to 120 feet in height shall be engineered and constructed to accommodate no fewer than four antenna arrays.

(2) All towers between 121 feet and 150 feet shall be engineered and constructed to accommodate no fewer than five antenna arrays.

iv. Grading shall be minimized and limited only to the area necessary for the new tower and equipment compound.

v. No unusual sound emissions such as alarms, bells, buzzers, or the like are permitted. Emergency generators are allowed. Sound levels shall not exceed 65 decibels as measured at the property boundaries.

(xviii) Broadcast Towers.No new broadcast facilities shall be constructed or installed without a site plan review and a permit under this section. No new broadcast facilities shall be permitted unless the applicant provides a valid FCC construction permit and demonstrates that no existing broadcast tower can accommodate the applicant's proposed use. A Pre- Application Conference shall be required for any new broadcast facility.

(A) Height.Height for broadcast facilities shall be evaluated on a case-by-case basis; the determination of height contained in the applicant's FCC Form 351/352 construction permit or application for construction permit and an FAA determination of no hazard (FAA Form 7460/2) shall be considered prima facie evidence of the tower height required for such broadcast facilities.

(B) Setbacks.New broadcast facilities and anchors shall be set back a minimum of 500 feet from any single-family detached dwelling unit on the same zone lot; and a minimum of one-foot for every one-foot of tower height from all adjacent lots of record.

(C) Equipment Cabinets.Except for AM broadcast facilities, cabinets shall not be visible from pedestrian views.

(D) Fencing.All broadcast facility towers, AM antenna(s) towers, and guy anchors shall each be surrounded with an anti-climbing fence compliant with applicable FCC regulations.

(E) Buffers.

a. Except for AM broadcast facilities, it is the intent that all pedestrian views from rights-of-way and adjacent residential land uses be screened from proposed broadcast facilities. AM broadcast facilities shall, where practicable, use artificial screening devices in lieu of natural vegetation for screening its ground equipment located at the base of AM tower(s).

b. Alternative landscaping plans which provide for the same average canopy and understory trees but propose alternative siting on the entire subject property on which the proposed facility is projected may be considered and approved by the Planning Division, provided the proposed alternative maximizes screening as provided above, and is otherwise consistent with the requirements of this section.

(F) Signage.

a. Commercial messages shall not be displayed on any tower.

b. The only signage that is permitted upon an antenna support structure, equipment cabinets, or fence shall be informational, and for the purpose of identifying the antenna support structure (such as ASR registration number), as well as the party responsible for the operation and maintenance of the facility; i.e., the address and telephone number, security or safety signs, and property manager signs (if applicable).

c. If more than 220 volts are necessary for the operation of the facility, signs located every 20 feet and attached to the fence or wall shall display in large, bold, high contrast letters (minimum height of each letter four inches) the following: "HIGH VOLTAGE - DANGER."

(G) Lighting.

a. Lighting on towers shall meet and not exceed the FAA minimum standards.

b. Any lighting required by the FAA must be of the minimum intensity and number of flashes per minute (i.e., the longest duration between flashes) allowable by the FAA. Dual lighting standards are required and strobe light standards are prohibited unless required by the FAA. The lights shall be oriented so as not to project directly onto surrounding property, consistent with FAA requirements.

(H) Equipment Compound.The fenced-in compounds shall not be used for the storage of any excess equipment or hazardous materials. No outdoor storage yards shall be allowed in a tower equipment compound. The compound shall not be used as habitable space.

(I) Grading.Grading shall be minimized and limited only to the area necessary for the new tower and equipment.

(J) Sounds.No unusual sound emissions such as alarms, bells, buzzers, or the like are permitted. Emergency generators are allowed. Sound levels shall not exceed 65 decibels as measured at the closest property boundaries for the facility.

(K) Parking.The required parking space shall be provided within the leased area, or equipment compound or the development area as defined on the site plan.

(xix) Variance - PWSF Only.The purpose of this subsection is to ensure that land use decisions with respect to siting of personal wireless service facilities (PWSF) comply with 47 U.S.C. § 332(c)(7)(B).

(A) From time to time, due to unique characteristics specific to a single application, such as terrain, existing infrastructure, or other factors unique to the particular location and proposed PWSF thereon, strict application of a specific development standard for siting of PWSF could have the effect of unreasonably discriminating among providers of functionally equivalent services within the meaning of 47 U.S.C. § 332(c)(7)(B)(i)(I) or of prohibiting personal wireless services within the meaning of 47 U.S.C. § 332(c)(7)(B)(i)(II). In such a case the applicant, so long as the applicant is a provider of personal wireless services who will be using the facility for provision of personal wireless services, may seek a Variance from such standard under this section. Considerations of increased financial costs are not unique characteristics and shall not constitute a valid basis for a Variance under this subsection. Moreover, the only development standards from which a Variance can be sought/approved under this subsection are the following:

a. Maximum tower height;

b. Flush mounting requirement; and

c. Maximum height of antenna above base station/supporting structure (for nonconcealed PWSF only).

(B) To obtain a Variance under this subsection, the provider must demonstrate by clear and convincing evidence that:

a. Due to characteristics specific and unique to the particular facilities and location, strict application of the development standard would not permit the applicant to address a demonstrable coverage gap or would result in unreasonable discrimination among providers of functionally equivalent services; and

b. There is no reasonable alternative available, other than varying the standard, to address the demonstrable coverage gap or to avoid unreasonable discrimination among providers of functionally equivalent services, including but not limited to use of another site,

co-location on another facility, or modification of the proposed facility so as to meet the applicable standard; and

c. The extent of the variance proposed is the minimum necessary to address the demonstrable coverage gap or to avoid unreasonable discrimination among providers of functionally equivalent services, as confirmed by qualified, independent third-party review of the proposal.

(C) The decision-maker for the Variance shall be the decision-maker for the underlying permit type required in accordance with this section and with Table 21.04-1: Principal Use Table. For example, if the facility requires an administrative permit, the Director shall decide the Variance request. If the facility requires a Conditional Use Permit, the Planning Commission shall decide the Variance request.

(6) Transmission Line.In the CG, I-OR, I-1, and I-2 zone districts, a Conditional Use Permit is required for above ground transmission lines.

(7) Junkyard or Salvage Yard.

(i) Screening.Stored items shall not project above the screening except for integral units as defined in GJMC § 21.14.020 and stacking of no more than two vehicles on top of a wheel stand. Integral units shall include shelving up to 20 feet in height for the purpose of storing recyclable materials. Integral units shall not be stored within the first 20 feet of the property from any street frontage property line.

(ii) Location.No storage yard or storage lot shall be placed or maintained within a required setback.

(iii) Operations and Site Management.

(A) All compaction, cutting and/or other material volume reducing operations shall be conducted to minimize the noise generated by the operation.

(B) Unusable items shall be disposed of and not be allowed to collect on the premises.

(C) All tires not mounted on operational vehicles shall be neatly stacked or placed in racks. If stacked, the stacks shall not be over six-feet in height; if on racks, the top of any tire on any rack shall not be over 10 feet in height.

(D) No garbage or other putrescent waste, likely to attract vermin, shall be kept on the premises. Gasoline, oil, or other hazardous materials which are removed from scrapped vehicles or parts of vehicles kept on the premises shall be disposed of in accordance with applicable federal, state and local regulations.

(8) Medical and Hazardous Waste Transfer Facility.

(i) Exemptions.A facility that provides temporary storage of hazardous or medical wastes generated on the site for a period not to exceed seven days or the time

period allowed by the state is not subject to the provisions of this subsection.

(ii) Medical or Hazardous Waste Transfer Facility Report Requirements.An application for a Conditional Use Permit for a medical or hazardous waste transfer facility shall include the submission of a hazardous waste facility siting report by the applicant. This report shall summarize and analyze all pertinent information regarding the proposed siting of the facility, and shall meet all other application requirements as set forth on the City's website.

(iii) Medical or Hazardous Waste Transfer Facility Review Requirements.

(A) In granting a Conditional Use Permit for a Medical or Hazardous Waste Transfer Facility, the City may establish reasonable conditions including, but not limited to:

a. Containment safeguards to prevent contamination of surface or groundwaters;

b. Buffering, screening and berming to ensure that operations or activities on site are adequately screened from off-site locations;

c. Noise levels at the property line shall not exceed the guidelines for community noise published in the American National Standard ANSI 53.23-1980, entitled "Sound Level Descriptions for Determination of Compatible Land Use,"[§ 25-12-103 C.R.S.];

d. Seismic vibrations, if any blasting is to occur during either construction or operations, are not to exceed the standard established in U.S. Bureau of Mines Bulletin 656;

e. All on-site roads, driveways, parking and loading areas shall be paved to limit fugitive dust;

f. Odors shall be controlled to the maximum extent practicable using the best available technology;

g. Access to the site shall not use residential streets;

h. Fiscal assurances in a specified amount, in a form mutually acceptable to the operator and the City, to guarantee the operator's performance during the operation, closure and post-closure period, and to provide financial assurance with respect to any third party claimants for personal injury or property damage by persons residing or owning property within a specified distance from the facility, which damage can be shown to be a direct consequence of facility operations;

i. Limitation of the hours of operation;

j. A surface water drainage system to provide runoff and erosion control that can accommodate a 100-year, twenty-four-hour storm and that any surface drainage which does come in contact with waste handled outside of sealed DOT approved containers is directed to an

independent collection system;

k. Periodic monitoring of operations and stormwater runoff from the site. The facility operator shall reimburse the local government for their costs related to inspection, monitoring and other administration of facility operations;

l. Limitation of the types of waste which can be received at the site and standards ensuring that personnel are properly trained to handle wastes accepted at the site;

m. A franchise fee calculated to pay the City for the costs to review, monitor and enforce the permit;

n. To the extent that any technical environmental issues are raised, the operator, as part of the review process and prior to approval, shall reimburse the City for the cost of engaging the services of an independent expert to study and provide an opinion concerning the issues;

o. The operator shall allow the City and its designees to inspect the site during hours of operation without prior notice, to ensure that the facility is being operated in accordance with applicable conditions of approval;

p. Reimbursement to the City for the cost of special training, equipment and labor required for response to medical, fire and other emergencies; and

q. A yearly performance report for the facility. This report shall be presented to the Planning Commission annually and shall include, but not be limited to, the following:

1. Volume and chemical classification of the substances received;

2. Volume and chemical classification of the substances shipped from the site;

3. Accidents;

4. Location, type, and cause of the accident;

5. Number and type of spills on and off site;

6. Fires - Type and location;

7. List of corrective measures taken by the operator of the facility to prevent future occurrences;

8. Site testing data;

9. Number and type of violations found by E.P.A. or state inspectors; and

10. Street and traffic safety improvements.

r. An expiration date for the Conditional Use Permit approval.

(9) Natural Medicine Cultivation Facilities, Products Manufacturers, and Testing Facilities.

(i) Natural medicine cultivation facilities, products manufacturers, and testing facilities shall be allowed uses in any zone in which the Industrial, light use is allowed.

(ii) No natural medicine cultivation facility, products manufacturer, or testing facility shall be permitted to operate within 1,000 feet of any child daycare center or public or private school.

(iii) Subsection (e)(9)(ii) above shall not apply to a natural medicine cultivation facility, products manufacturer, or testing facility that was actively doing business under a valid license prior to any other use referenced in subsection (e)(9)(ii) being constructed.

(iv) No natural medicine cultivation facility, products manufacturer, or testing facility shall be permitted to operate in the City unless it is licensed by the State Licensing Authority.

(Ord. No. 5244, 1/15/2025; Ord. No. 5242, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.04.040. Accessory uses and structures.

(a) Purpose.The purpose of this section is to:

(1) Establish and promote neighborhoods with integrity and character;

(2) Provide residents with the opportunity to use their property to enhance or fulfill personal objectives so long as the use of the property is not incompatible with this Code; and

(3) Provide an appropriate level of flexibility for the use of property while maintaining compatibility.

(b) Applicability.Commonly allowed accessory uses are shown in Table 21.04-2, but that list does not include all possible uses that are secondary and subordinate to a principal use of land in each zone district. All principal uses allowed in a zone district shall be deemed to include those accessory uses, structures, and activities typically associated with the use, unless specifically prohibited in this Code and shall comply with all use-specific standards applicable to the use.

(c) General Standards for Accessory Uses and Structures.

(1) Subordinate to Principal Structure or Use.No accessory building shall be constructed or used unless the principal building is also being used. The accessory use or structure shall be conducted and/or located on the same lot(s) as the principal use. The principal use and the accessory use shall be under the same ownership.

(2) Performance Standards.Accessory structures or uses shall be constructed, maintained, and conducted in compliance with GJMC § 21.04.040(c)(2).

(3) Location.In all zone districts, accessory structures shall not be located in the front

yard or the exterior side yard of a corner lot unless approved by an Administrative Adjustment in accordance with GJMC § 21.02.040(c). Accessory dwelling units may be located in the front yard or exterior side yard of a corner lot.

(4) Accessory Structures.

(i) In Residential zone districts with a density of two units per acre or higher (R-2R and above), the size of accessory structures, except accessory dwelling units, will be limited to a maximum of 75% of the square footage of the principal structure. Accessory dwelling units are subject to the requirements in GJMC § 21.04.040(e)(1)(i).

(ii) For all other Residential zone districts, accessory structures will be allowed up to a maximum of 75% of the square footage of the principal structure or 10% of the parcel size, whichever is greater. In the R-R, R-ER, and R-1R zone districts, accessory structures incidental to the principal uses categorized as Agriculture and Animal Services in Table 21.04-1: Principal Use Table and used for agricultural activities shall be exempt from these size regulations.

(5) Design.Accessory uses or structures shall have an appearance compatible with that of the neighborhood and shall have an appearance compatible with the character of the principal structure, building or use on the property. Determinations of compatibility shall include considerations of the height, scale, mass, or bulk of structures; architectural features; and building materials.

(d) Accessory Use Table.

Table 21.04-2: Accessory Use Table

A = Allowed Use C = Conditional Use

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Residential Uses																				
Accessory dwelling unit	A	A	A	A	A	A	A	A			A		A							§ 21.04.040 (e)(1)(i)
Agricultural labor housing	A																		A	
Dwelling, business residence											A	A	A	A	A	A			A	§ 21.04.040 (e)(1)(ii)
Guest ranch	A	A																	A	
Household pets	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.040 (e)(1)(iii)
Other animals	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.040 (e)(1)(iv)
Public, Institutional, and Civic Uses																				
Home occupation, day care	A	A	A	A	A	A	A	A	A	A	A	A	A	A					A	§ 21.04.040 (e)(2)(iii)
Commercial Uses																				
Agri-business	C	C																C	C	
Animal agriculture	A/C	A/C	A/C													A/C	A/C	A/C	A/C	§ 21.04.030 (d)(2)
Drive-through facility																				

Table 21.04-2: Accessory Use Table

A = Allowed Use C = Conditional Use

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Office											C	A	A	A	A	A			A	§ 21.04.040 (e)(2)(i)
Restaurant												A	A	A		A				§ 21.04.040 (e)(2)(i)
Retail											C	A	A	A		A				§ 21.04.040 (e)(2)(i)
Electric vehicle (EV) charging facility	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Home occupation	A	A	A	A	A	A	A	A	A	A	A	A	A						A	§ 21.04.040 (e)(2)(iii)
Outdoor display and sales												A	A	A		A				§ 21.04.040 (e)(2)(v)
Produce stand	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.040 (e)(2)(vi)
Industrial Uses																				
Antenna	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.040 (e)(3)(i)
Outdoor storage, accessory	A	A	A	A	A	A	A	A	A	A		A		A		A	A			§ 21.04.040 (e)(3)(ii)
Recreation and commercial vehicles	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	§ 21.04.040 (e)(3)(iii)
Retail sales and service, small																A	A			

Table 21.04-2: Accessory Use Table

A = Allowed Use C = Conditional Use

For accessory use regulations, see Table 21.04-2 in § 21.04.040

Zone Districts	R-R	R-ER	R-1R	R-2R	RL-4	RL-5	RM-8	RM-12	RH-16	RH-24	MU-1	MU-2	MU-3	CG	I-OR	I-1	I-2	P-1	P-2	Use-Specific Standards
Renewable energy facility, accessory	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	C	A	§ 21.04.040 (e)(3)(iv)

(e) Accessory Use-Specific Standards.

(1) Residential Uses.

(i) Accessory Dwelling Unit.An accessory dwelling unit (ADU) is allowed only in conjunction with a single-family attached dwelling, a single-family detached dwelling, or a duplex dwelling. ADUs are not allowed in conjunction with cottage court dwellings. ADUs shall not be included in density calculations. A Planning Clearance is required for any ADU and an ADU must demonstrate compliance with the following:

(A) Maximum Number of ADUs.

a. A lot with one single-family detached dwelling or a single-family attached dwelling with two units in the structure may have two ADUs if at least one of the ADUs is attached to the principal dwelling unit (e.g., attic, basement, carriage house, etc.).

b. A duplex dwelling unit may have no more than one ADU on the lot.

(B) Site Layout.

a. The design and location of the ADU shall be clearly subordinate to the principal structure.

b. The ADU shall not be located in front of the principal structure.

c. On corner lots, an ADU may use the setbacks for the principal structure where the property abuts a roadway.

d. One parking space shall be provided for the ADU. On-street parking within 100 feet of the lot may serve as the required parking.

(C) Structure Requirements.

a. The ADU must meet all requirements of the building and fire codes.

b. The ADU shall not exceed 900 square feet of habitable space.

c. The design and construction material of the ADU shall be complementary to those of the principal structure.

(ii) Business Residence.

(A) Occupancy.A business residence is a principal residence of the owner, operator, or employee of the business that is located within a nonresidential structure. This section is not intended to permit general residential uses in nonresidential areas.

(B) General Standards.The following conditions shall apply to all business residences:

a. The residential unit shall comply with all appropriate building and fire codes and with all applicable portions of this Code;

b. Only one dwelling unit per business or structure is allowed and it shall be occupied only by the owner, operator, or employee of the principal use;

c. The dwelling unit shall be located within a structure used primarily for business purposes; and

d. Other conditions as required through the site plan approval process.

(iii) Household Pets.

(A) In all zone districts, a maximum of three adult (four months or older) household pets, including, but not limited to, dogs, cats, pygmy and dwarf goats, per species, shall be allowed. In no event shall the total number of adult household pets exceed six.

(B) The requirements of Subsection (e)(1)(iii)(A) above shall not apply to those small animals kept within a residence as household pets, including, but not limited to fish, small birds (parakeets, parrots), rodents (mice, rats), and reptiles (nonpoisonous snakes, lizards).

(C) Dogs or cats kept confined in kennels shall be kept no closer than 20 feet from the nearest principal residential structure on an adjacent property, unless written permission for a lesser distance is obtained from the adjacent occupant or property owner. Such permission may be revoked at any time. Upon revocation, the owner of the animal shall have 30 days to move the animal so that compliance is achieved.

(iv) Other Animals.

(A) General.Other animals may be kept only after obtaining approval from the Director.

(B) Racing Pigeons."Racing pigeon," by definition, is a pigeon which, through selective past breeding, has developed the distinctive physical and mental characteristics as to enable it to return to its home after having been released a considerable distance therefrom, and which is accepted as such by the American Racing Pigeon Union, Inc., or the International Federation of Racing Pigeons Fanciers. Also commonly known as Racing Homer, Homing Pigeon, or Carrier Pigeon. The structure for the keeping of housing of pigeons permitted by this regulation is defined as a "loft." The keeping of pigeons as defined above shall be permitted on the following conditions which are, in part, recommended by the Avian Assistance Council and the American Racing Pigeon Union, Inc.:

a. The loft shall be of such sufficient size and design, and constructed of such material, that it can be maintained in a clean and sanitary condition and shall contain at least one square foot of floor space for each mature pigeon kept therein.

b. The construction and location of the loft shall not conflict with the requirements of this Code or building code. The loft shall be enclosed except for the aviary portion which cannot exceed 20% of the floor

area of the loft.

c. The loft shall be maintained in a sanitary condition and in compliance with all applicable health regulations of the City.

d. All feed for said pigeons shall be stored in such containers as to protect against intrusion by rodents and other vermin.

e. A maximum of 50 performing birds shall be allowed on parcels of one-half acre or less. On parcels greater than one-half acre, a maximum of 100 performing birds shall be allowed. Performing birds are birds that leave the loft in training and for racing.

f. All pigeons shall be confined to the loft, except for limited periods necessary for exercise, training, and competition; and at no time shall pigeons be allowed to perch or linger on the buildings or property of others. Pigeons shall be fed only in the confines of the loft.

g. No one shall release pigeons to fly for exercise, training, or competition except in compliance with the following rules:

1. The owner of the pigeons must be a member in good standing of an organized pigeon club, such as the Grand Junction Racing Pigeon Club, The American Racing Pigeon Union, Inc., or other club that has rules that will help preserve the peace and tranquility of the neighborhood.

2. Pigeons will not be released for flying which have been fed within the previous four hours.

3. Pigeons shall be banded and registered with one of the national pigeon associations/registries.

4. A structure housing racing pigeons shall be no closer than 50 feet to any adjacent residential or commercial structure on another property.

(2) Commercial Uses.

(i) Drive-Through Facility.

(A) All drive-through facilities shall be designed and located to avoid impairing pedestrian mobility to or from the principal structure or creating risks to pedestrian safety.

(B) Drive-through facilities shall be clearly signed and marked to provide efficient flow through the facility.

(C) Drive-through lanes shall be set back at least 10 feet from a residentially zoned lot.

(D) All drive-through facilities shall comply with the loading and stacking standards as set forth in TEDS (GJMC Title 29).

(E) Drive-through windows, menu boards, speaker boxes, and drive-through lanes shall not be located between the designated front of the building pursuant to § 21.14.010(c)(iii) and the adjacent public right-of-way.

(F) Drive-throughs for restaurants and retail are not allowed within the boundaries shown in Figure 04.04-1.

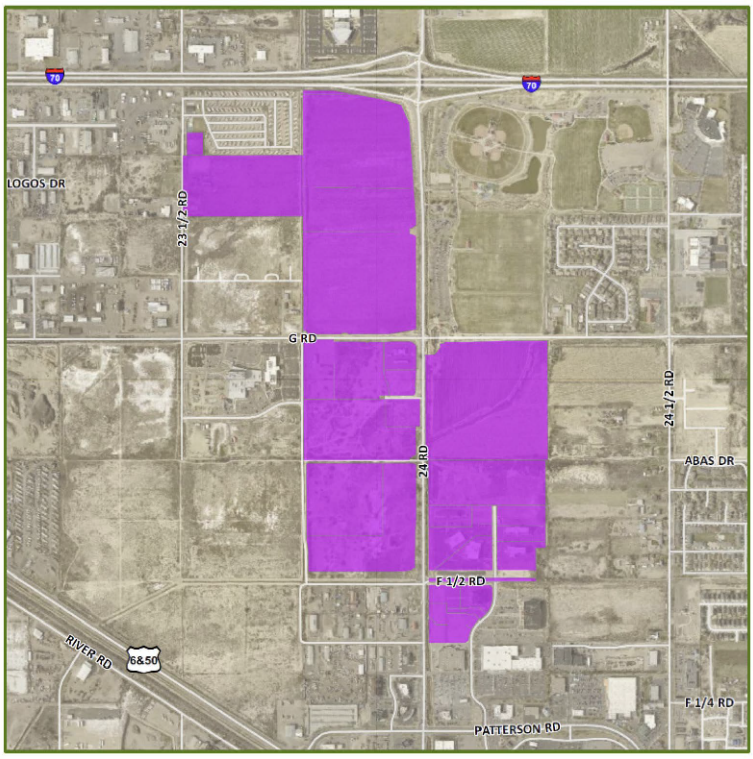


Figure 04.04-1
Prohibited Restaurant and Retail Drive-Through Areas

(ii) Electric Vehicle (EV) Charging Facility.

(A) EV charging facility spaces shall count toward the minimum off-street parking requirement and shall be located on the same lot as the principal use.

(B) EV charging facility spaces shall be signed for the charging of electric vehicles only.

(C) EV charging facility equipment shall be located so that it does not interfere with vehicular, bicycle, or pedestrian access and circulation, or with required landscaping.

(iii) Home Occupation, Daycare or Other.

(A) Applicability.

a. A home occupation, daycare or other is allowed in accordance with

Table 21.04-2: Accessory Use Table.

b. All home occupations listed below shall not be subject to all applicable home occupation regulations and standards if all persons engaged in such activities reside on the premises and all applicable conditions are satisfied:

1. Artists, sculptors, composers not selling their artistic product to the public on the premises;

2. Craft work, such as jewelry-making and pottery with no sales permitted on the premises;

3. Home offices with no client visits to the home permitted;

4. Telephone answering and message services; and

5. Medical marijuana cultivation by a patient or primary caregiver; provided, however, that:

i. There shall not be more than one primary caregiver per dwelling unit growing, storing, or providing medical marijuana in any form to their patients;

ii. Such growing, storing or providing of medical marijuana is conducted in accordance with Article XVIII, Section 14 of the Colorado Constitution and § 25-1.5-106 C.R.S. as amended;

iii. The primary caregiver shall have not more than six plants per patient with a maximum of 30 plants for five patients being grown on the premises of the dwelling unit at any given time; and

iv. Accessory buildings such as a detached garage, shed, green house or other structure used for growing, storing, or providing medical marijuana must comply with all applicable zone district standards and building and fire code provisions.

(B) Prohibited Home Occupations.The following home occupations are prohibited regardless of whether they comply with the standards of this subsection.

a. Occupations that involve highly combustible or hazardous materials. Occupations where the dimensions, power rating, or weight of equipment and tools used exceed that of normal household equipment and tools.

b. Occupations where the dimensions, power rating, or weight of equipment and tools used exceed that of normal household equipment and tools.

c. Animal care, boarding or sales.

d. Retail sales.

e. Medical, dental, or animal clinics.

f. Personal services, except low-volume operations, such as a beauty shop and seamstress.

g. Escort services.

h. Heavy equipment or vehicle repair.

i. Any other use that is not listed as an allowed or conditional use in any zone district in the City.

(iv) Requirements and Restrictions.Unless otherwise waived by the Director, all home occupations shall comply with the following:

(A) Number of Home Occupations.There shall be no limitations on the number of home occupations allowed for each property so long as the combined operations for each occupation do not exceed the requirements of this section.

(B) Resident Operated.The home occupation shall be operated by a full-time resident of the property.

(C) Number of Employees.A home occupation shall not employee nonresident employees, unless the Director determines that there will be minimum impact to the surrounding properties, in which case one additional nonresident employee is allowed.

(D) Maximum Floor Area.A home occupation shall not use more than 25% gross floor area of the dwelling and all accessory buildings.

(E) Residential Compatibility.

a. A home occupation shall be incidental and subordinate to the use of the property for residential purposes, shall not change the residential character of the property, and shall not create the appearance or impact of commercial activity to the surrounding neighborhood.

b. No structural or decorative additions shall be allowed to accommodate a home occupation that will alter the residential character of the home or otherwise be incompatible with surrounding residences.

(F) Outdoor Storage Prohibited.Storage of goods and materials shall be inside and shall not include flammable, combustible, or explosive materials other than those customary to household uses.

(G) Parking and Deliveries.

a. Parking shall be provided and shall not create hazard or street congestion.

b. Deliveries and pickups shall be those normally associated with

residential services and shall:

1. Not block traffic circulation; and

2. Occur only between 8:00 a.m. and 8:00 p.m. Monday through Saturday.

(H) Client and Employee Visitation.

a. Not more than six customers or clients are allowed to visit a home occupation per day, except music, art, craft, or other similar lessons that are allowed up to 12 clients per day.

b. Customer hours shall be between 8:00 a.m. and 8:00 p.m.

(I) Operational and Site Requirements.

a. Adequate public facilities and utilities shall be adequate to safely accommodate equipment used for home occupation.

b. Mechanized equipment shall be used only in a completely enclosed building.

c. Dust, odors, noise, vibration or electrical interference or fluctuation that is not perceptible beyond the property line.

(J) Unsafe Home Occupations.

a. If the Director finds that any home occupation is dangerous or unsafe, the Director shall issue an order to the dwelling owner and/or tenant of the property on which the home occupation is being undertaken directing that the home occupation be immediately made safe, as determined by the Director, or be terminated.

b. The property owner and/or tenant shall be responsible for taking the necessary corrective steps or measures, but in the event of a failure to do so by the owner and/or tenant, after notice and a reasonable period of time, the Director may take any and all available enforcement actions to render the home occupation, dwelling, or property safe.

c. Enforcement cost shall be paid by the property owner and shall be treated as a zoning violation pursuant to GJMC Chapter 21.13.

(K) Home Occupation Signage.A nameplate not exceeding two square feet containing only the name of the resident, title of the person conducting a permitted home occupation, name of building, business name and/or name of agent. The nameplate may be located anywhere on the property.

(v) Outdoor Display.

(A) No portion of a right-of-way shall be used for any type of display without a valid Revocable Permit.

(B) Display lots shall be paved, except that only the access roads shall be required to be paved for lots displaying large merchandise, such as

manufactured homes or heavy equipment.

(C) All outdoor displays shall conform to all requirements of TEDS (GJMC Title 29) and the applicable sight distance triangle. Regardless of any provision to the contrary, no display shall be maintained in a location if it obstructs view, thereby constituting a traffic or pedestrian hazard.

(vi) Produce Stand.

(A) A produce stand shall be portable and capable of being dismantled or removed from the sales site.

(B) In Residential zone districts, produce stands shall only sell products produced on the premises. Produce stands in Residential zone districts shall be located and operated so as to not create hazards with parking, ingress, egress, and signage, and the operation shall not be disruptive to adjacent uses.

(C) In all zone districts, excluding Residential zone districts, a produce stand may include products produced off-premises and require a Temporary Use Permit.

(3) Industrial Uses.

(i) Antennas.Telecommunications receiving or transmitting antennas that meet the exemption criteria of GJMC § 21.04.030(e)(5)(i) are permitted subject to the following:

(A) Ground-mounted satellite dishes shall not exceed 10 feet in height from the grade where mounted;

(B) Ground mounted satellite dishes shall be located within the rear yard or in any side yard which does not abut a street and shall meet accessory structure setbacks;

(C) All cables and lines serving the satellite dish shall be located underground;

(D) Satellite dishes larger than 32 inches in diameter shall only be ground-mounted and the above provisions shall apply unless otherwise approved as to location or ground mounting by a Conditional Use Permit;

(E) Roof mounted antennas shall not extend more than 10 feet above the roof line on which mounted; and

(F) None of the above shall relieve a person from the necessity of satisfying any and all governmental licenses or permits required for operation of telecommunications equipment.

(ii) Outdoor Storage, Accessory.

(A) All Zone Districts.

a. Junk or rubbish shall not be stored unless the use is a permitted junkyard or salvage yard or solid waste disposal or processing

facility.

b. If the principal use of the property is other than vehicle repair, major and minor, vehicle impound lot, junkyard or salvage yard, or vehicle fleet operations, a maximum of two vehicles intended for repair or restoration may be stored on a property provided all of the following conditions are satisfied:

1. Vehicles shall be owned by the owner or occupant of the premises upon which the vehicles are located;

2. The vehicles shall be kept in an enclosed garage, under an opaque cover designed for the vehicle or otherwise screened from off-premises view; and

3. There shall be no outdoor storage of vehicle parts.

c. Except for integral units, stored items shall not project above any screening.

(B) Additional Standards for Residential Zone Districts.

a. All outdoor storage shall be located in the rear half of the lot and shall be screened.

b. Dumpsters and refuse containers for new multifamily dwellings, commercial and industrial uses shall be enclosed in a solid, opaque enclosure constructed of brick, masonry, stucco, or wood at least six feet tall.

(C) Additional Standards for Nonresidential Zone Districts.

a. All Uses.

1. Unless otherwise indicated, no outdoor storage shall be located in a required front yard setback or in any setback adjacent to a Residential or Mixed-Use zone district.

2. Dumpsters and refuse containers for new uses in all zone districts except I-1 and I-2 shall be enclosed in a solid, opaque enclosure constructed of brick, masonry, stucco, or wood at least six feet tall.

b. Existing Junkyard or Salvage Yards and Vehicle Impound Lots.If the principal use of the property is a junkyard or salvage yard or vehicle impound lot and if the use was an existing legal use as of January 1, 2002, outdoor storage shall meet the following conditions.

1. Storage and dismantling areas shall require screening along all street frontages and along the first 50 feet of the side perimeter from the street. Sites may use opaque slats in existing chain link fences or vegetation to meet the screening requirement as long as the screening is at least six feet in height. Any new fencing shall be a minimum of six feet.

2. If the recycler abuts a property with zoning that is not CG, I-1 or I-2, the recycler shall also screen each perimeter that abuts such zone district that is not CG, I-1, or I-2. Buildings on property lines shall serve as screening.

3. No item shall be allowed to project above the screening except integral units and stacking of no more than two vehicles on top of a wheel stand. End recyclers are exempt from this requirement.

4. Each owner, operator, independent contractor and employee of a recycling business, and every other person who dismantles, repairs or installs motor vehicle parts or appliances or other equipment containing any fluid, gas or liquid or other regulated substance shall, in accordance with applicable laws and rules, control, contain, collect, and dispose of all fluids, hazardous wastes, and other regulated fluids in or generated by the dismantling, shredding, baling or storage of motor vehicles, appliances, other equipment or parts, including but not limited to oils, antifreezes, CFCs, transmission fluids, diesel fuel, and gasoline.

5. A recycler shall have a five-day grace period to remove items placed outside of a perimeter fence. If the City gives a notice after the fifth working day, the recycler shall remove such items within five working days.

(iii) Recreational and Commercial Vehicles.

(A) In Residential zone districts, recreational and commercial vehicles and trailers shall be stored within an enclosed building, or in the rear yard, or behind the front setback line in a side yard other than the street side yard of a corner lot.

(B) No recreational vehicle shall be used for living, sleeping or housekeeping purposes for longer than two weeks total during any twelve-month period when parked in any location not zoned and approved for such use. Any use of this provision shall be limited to one recreational vehicle per lot.

(C) Persons shall not live, sleep, or housekeep in a recreational vehicle parked on a public street, a public or private parking lot, or any vacant lot.

(D) Recreational or commercial vehicles shall not be parked on a public street or public or private parking lot for more than 72 consecutive hours.

(iv) Renewable Energy Facility, Accessory.

(A) Accessory Solar Collectors.

a. Accessory solar collectors shall only be located in side or rear yards or on rooftops.

b. If the solar collector is not flush with the roof the applicant shall

minimize the visibility of the collector from a public street, park, open space, or golf course to the most reasonable extent possible without prohibiting the installation.

c. Ground-mounted collectors are allowed as an accessory structure outside the setbacks.

d. Ground-mounted accessory solar collectors shall not exceed the height of the principal structure on the lot or parcel or the maximum height allowed in the zone district.

(B) Accessory Wind Energy System.

a. An individual small wind system shall be set back from the property line and the principal structure at least 1.5 times the height of the turbine.

b. In Mixed-Use and Commercial zone districts, accessory wind energy systems shall only be located in side or rear yards

c. In Mixed-Use zone districts, an accessory wind energy system shall not exceed the maximum building height of the applicable zone district.

d. In the I-1 and I-2 districts, an accessory wind energy system may exceed the maximum building height of the applicable zone district by 20 feet.

(Ord. No. 5242, 12/4/2024; Ord. 5218, 5/1/2024; Ord. 5205, 3/20/2024; Ord. 5190, 12/20/2023)

§ 21.04.050. Temporary uses and structures.

(a) Purpose.The purpose of this section is to allow for a use to locate within the City on an occasional, temporary, or seasonal basis and ensure such use or activity is consistent with the intent and regulations of this Code.

(b) Temporary Parking Lots.

(1) Temporary parking lots are parking areas that serve during transition of a property during development and shall not be used for more than 24 months from issuance of a City site plan for such parking use.

(2) A temporary parking lot:

(i) Shall be hard surfaced;

(ii) Shall be graded for drainage;

(iii) Shall be maintained in good condition free of weeds, dust, trash, and debris;

(iv) Shall be landscaped and screened along the perimeter of any abutting public street;

(v) Parking spaces within a gravel lot shall be delineated with concrete "bumper blocks"; and

(vi) May only be used for a total of 24 months unless a site plan for a permanent lot usage is approved. Parking lots as a permanent use are not allowed in MU-3.

(c) All Other Temporary Uses.

(1) Applicability.

(i) This subsection shall apply to the following types of temporary uses and structures:

(A) Temporary buildings;

(B) Temporary display and sale of merchandise;

(C) Model homes, trailers, activities, and/or uses incidental to the construction of a building or group of buildings on the same or adjacent premises;

(D) Seasonal uses (e.g., fireworks stands, Christmas tree lots, and produce stands); and

(E) Other uses that clearly are not associated with a holiday, the growing season, or a construction project may be considered for approval by the Director.

(ii) Special events and activities conducted on public property, such as school sites and City parks, shall be exempt from the provisions of this Code, but shall comply with any guidelines, regulations and permitting process required by the authorizing agency.

(2) Compliance with This Code and Other Regulations.

(i) Prior to conducting or establishing a temporary use or temporary structure, approval of a Temporary Use Permit per GJMC § 21.02.040(b) is required.

(ii) Before a temporary use involving the sale of merchandise may begin, a sales tax license must be obtained from the City Finance Department. If not obtained, the Temporary Use Permit shall be revoked if issued or shall not be issued until licensure.

(iii) Prior to the issuance of a Temporary Use Permit, the Director may require the applicant to post security with the City as required to cover expected costs of enforcement, monitoring, clean-up, and site restoration.

(3) Location.

(i) Structures and/or display of merchandise shall meet the minimum setback requirements for the zone district. Displays shall not interfere with the sight visibility triangle of the intersection of the curb line of any two streets or a driveway and a street. No personal property, including structures, and tents shall be located within the right-of-way.

(ii) Each parcel or lot is limited to the operation of one temporary use at a time.

(4) Off-Street Parking.

(i) Adequate off-street parking shall be provided;

(ii) The use shall not displace the required off-street parking spaces or loading areas of the principal use/structure on the site; and

(iii) The entrance and exit shall be designed to prevent traffic hazards, nuisances and as required by TEDS (GJMC Title 29).

(5) Duration.

(i) Temporary uses shall not exceed 120 calendar days, except as provided herein.

(ii) Aa temporary low-traffic storage yard may be permitted in a CG, I-1 or I-2 zone district for up to one year from the date of issuance. One extension of one year may be granted by the Director upon showing of good cause. Any additional extensions may be granted by the Planning Commission. The Planning Commission must find good cause for granting an extension.

(iii) A winter emergency shelter may be granted an extension of up to 60 days by the Director if unusual and extraordinary weather conditions necessitate its continued operation.

(iv) No temporary uses shall be allowed until a minimum of 30 calendar days have passed since any previous temporary use on the parcel or lot.

(v) Mobile food vendors are not subject to the 30-day waiting period.

(6) Other Standards.

(i) The temporary use shall not cause traffic to exceed the capacity of nor significantly impact the circulation of affected streets.

(ii) Access to right-of-way shall comply with City requirements, except that hard surface travel lanes are not required for a temporary use.

(iii) Permanent hookups to utilities are prohibited.

(iv) Temporary use sign shall be permitted only for and during the time of the temporary use. The total sign allowance for a temporary use shall be 32 square feet, not including permanent signage that may be on a vehicle or booth. All signs for temporary uses shall be attached to a structure, vehicle, or existing signpost. Portable signs, such as sandwich boards, etc., shall not be allowed. Off-premises signage is not allowed.

(Ord. No. 5242, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.04.060. Extended temporary uses and structures.

(a) Interim Shelter Site.

(1) Purpose.

(i) These standards allow for and encourage the creation of temporary housing for people experiencing homelessness or are at risk of becoming homeless. Interim shelter sites are intended to provide a stable and safe living option for people

that may not be able to or are not prepared to move into other temporary, semi-permanent, or permanent housing.

(ii) These standards are intended to promote the public health, safety, and welfare of residents within the site and surrounding area.

(2) Shelter Types.

(i) Interim shelters may include either of the following shelter types, both of which shall be provided and installed by the managing entity, subject to this section and the conditions of the site approval:

(A) Prefabricated shelters; or

(B) Micro-shelters.

(ii) Interim shelters shall not be individually connected to water or sewer and are not considered dwelling units.

(iii) Each individual shelter shall be designed to meet minimum wind loads and snow loads with proper anchoring in accordance with GJMC Chaper 15.12 as determined by the Chief Building Official.

(iv) Functional smoke and carbon monoxide alarms shall be included within each individual shelter.

(v) Individual shelters shall be provided with an approved address identification. Each character shall be a minimum of four inches tall with a minimum stroke width of 1/2 inch and visible from the fronting street or road. A permanent weatherproof site map identifying the address numbers/letters shall be provided at each entrance of the interim shelter site. The site map information shall match the identifications of each shelter.

(vi) Shelters must comply with any other requirement set by the Chief Building Official and/or the Fire Marshal.

(3) Maximum Number of Shelters and Maximum Occupancy.

(i) The maximum number of shelter spaces permitted on a site is calculated by dividing the square feet of usable shelter site area by 150, which is the minimum square footage of area per space required. All fractional measurements are rounded down. For example, a 2,500-square foot site could have 16 shelters (2,500/150 = 16.6).

(ii) The initial maximum number of shelters per interim shelter site is 30, up to 20% of which may be double occupancy shelters.

(A) An applicant may request multiple interim shelter sites (increments of 30 shelters) on a single parcel that may be added in phases, up to a maximum total capacity that is approved in the Extended Temporary Use approval. A single parcel with multiple interim shelter sites does not need to meet the standards individually for each site but may provide the requirements as a unified site.

(B) When the initial phase meets the following criteria, the applicant may request an amendment to the Extended Temporary Use approval for an increase in the number of shelters:

a. The commencement of operations;

b. Continuous capacity at or over 80% for two consecutive months; and

c. A showing of successful operation.

(C) The City Council will consider the review criteria in GJMC § 21.02.050(h)(8)(ii) in determining the success of the operation and may approve the increase based on available space on the site and the ability of the expanded site to meet the terms of the initial approval.

(D) Phased approvals must be requested with the original application. If an applicant seeks to expand a site without a phased approval, a new Extended Temporary Use application is required.

(iii) The total maximum occupancy of a 30-shelter site is 30 adults. If an interim shelter site has double occupancy shelters, the maximum adult occupancy may be increased to 36 to account for double occupancy of those shelters. Interim shelter sites that allow household pets shall detail pet accommodation provisions in the management plan.

(4) Location and Site Layout.

(i) Mixed-Use and Nonresidential Zone Districts. Sites may be located in mixed-use and nonresidential zone districts on the same property as an existing principal use, including nonconforming uses, or may be allowed on properties without a principal use.

(ii) Setbacks.The interim shelter site, including all shelters and other structures used as part of the site, shall meet the required principal structure setbacks. The City Council may allow a lesser setback if it determines there is sufficient fencing, vegetation, topographic variation, or other site conditions that block the view of the site from abutting properties.

(iii) Spacing.All shelters on an interim shelter site shall be separated by a minimum of 10 feet from any other structure. The minimum separation between a shelter and any building which includes a kitchen shall be 20 feet.

(iv) Location on the Lot.Interim shelters shall only be located on the portion of the lot approved for interim shelter use. Shelters may not be placed outside of the approved site perimeter.

(v) Fencing.An interim shelter shall be secured as described in the site security plan, including temporary fencing on all sides. Temporary fencing used to screen an interim shelter site shall be exempt from the requirements of GJMC § 21.05.090 provided the fence is constructed of acceptable materials such as wire, wrought iron, plastic, wood, and other materials with a similar look. Unacceptable materials include glass, tires, razor wire and concertina wire, or salvaged or similar materials.

(vi) Sanitary Facilities.Interim shelter sites shall maintain connections to public water and public sewer systems or provide portable on-site facilities that are adequate to meet state and local standards. Only potable water shall be supplied to plumbing fixtures that provide water for drinking, bathing, or cooking purposes. A potable water supply system shall be designed, installed, and maintained in such a manner to prevent contamination from non-potable liquids, solids or gases being introduced into the potable water supply through cross connections or any other piping connections to the system.

(A) The application for interim shelter site approval shall include a sanitation plan that specifies the number, location, and hours of accessibility of toilet, drinking water, handwashing stations, and shower facilities. These facilities may be located in a permanent structure on the site provided access is available at all times the interim shelter site is in use.

(vii) Waste Disposal.

(A) Spillage, overflow, drainage, or wastewater from sanitary facilities and potable water sources shall be discharged to approved drains or otherwise designed to prevent impoundment of water, creation of mud holes, or other nuisance conditions.

(B) Durable, water-tight, easily cleanable refuse containers, sufficient to contain all refuse from the site, shall be provided. Safe needle disposal containers (sharps containers) shall be provided. Provision of recycling containers for separation of plastic, glass, metal, and aluminum containers is recommended.

(C) The storage of junk, waste, discarded, or salvaged materials, or items customarily associated with indoor use (e.g., upholstered furniture or indoor appliances), is prohibited.

(viii) Fire Safety.

(A) The minimum distance from a shelter to a fire hydrant is 600 feet as measured by a route approved by the Fire Marshal. The Fire Marshal will determine the necessary number of hydrants and fire-flow for an interim shelter site.

(B) The minimum distance from the furthest point of a shelter to a Fire Department access road approved by the Fire Marshal is 200 feet.

(C) A Fire Department access lanes that exceeds 150 feet in length and dead-ends, shall be provided with an approved Fire Department turn-around.

(D) No recreational fires or open burning are allowed on an interim shelter site.

(E) Outside storage of combustible materials and hazardous materials, including aerosols and propane, between shelters is prohibited.

(ix) Vehicle Parking.

(A) Parking shall be provided in accordance with Table 21.08-2. All parking

spaces shall be designed in accordance with GJMC § 21.08.010(e).

(B) If the interim shelter site is located on the same lot as an existing principal use, the required parking for the principal use may be reduced if the property owner can demonstrate that the displacement of parking spaces will not cause significant off-site traffic or result in insufficient parking for the principal use, as determined by the Director.

(x) Bicycle Storage.Secure bicycle storage, such as bicycle racks or an enclosed structure, shall be provided on site. Bicycle storage may be located within a shared area on the site or provided for each of the shelter spaces. The managing entity shall provide a secure means of locking bicycles.

(xi) Site Amenities.The following site amenities shall be provided:

(A) One designated smoking area.

(B) If pets are allowed on the site, one pet relief area.

(C) Sufficient community space for the provision of meals or cooking, services, and gathering with other residents within an enclosed structure that meets fire, electrical, and health safety standards, and that may be located in a permanent structure on the site.

(5) Operations.

(i) The managing entity and residents of the site shall ensure compliance with all local and state regulations concerning, but not limited to, drinking water connections, solid waste disposal, human waste, and electrical systems.

(ii) At a minimum, one trained staff member shall be identified for each interim shelter site for continuous (24 hours per day/seven days per week/365 days per year) on-site management.

(A) An additional trained staff member for on-call assistance shall be provided for sites with an anticipated occupancy of more than 30 residents.

(B) Persons acting as the on-site manager shall be awake and available to site residents while on shift.

(C) The trained staff member shall perform the security tasks described in the management, including, at a minimum: regularly monitoring the security of the site, providing entry and exit access to residents as needed, and contacting police and/or other emergency responders if the need arises.

(iii) All interim shelter sites shall maintain a management plan that shall be updated annually. The management plan shall address, at a minimum, all of the following factors:

(A) Provision of on-site management from a trained staff member.

(B) Provision of staff training from a program that meets City specifications.

(C) Intake screening of residents to ensure compatibility of services provided

at the facility.

(D) Transportation plan or on-site provision of transportation services.

(E) Fire Safety Plan, to include at a minimum:

a. Emergency vehicle ingress and egress;

b. Emergency evacuation routes; and

c. Site map that outlines the following, to be made available in each shelter unit:

1. Areas of refugee;

2. Assembly points; and

3. Location of portable fire extinguishers.

(F) Detailed site security measures.

(G) Resident code of conduct agreement addressing acceptable conduct for residents both at the interim site and in the surrounding neighborhood.

(H) Keeping of or prohibitions on household animals, including capacity limitations and a plan for maintaining the pet relief area.

(I) Lights out and quiet hours.

(6) Code Exemptions.Interim shelter sites are temporary uses and are exempt from the following standards provided they are otherwise met by the principal use on the site or exempted by the principal use's nonconforming status:

(i) Minimum or maximum density requirements;

(ii) Lot coverage standards;

(iii) Landscaping, buffering, and screening requirements except as provided in this section;

(iv) Site and structure development standards except as provided in this section; and

(v) Off-street parking requirements except as provided in this section.

(Ord. No. 5229, 8/21/2024)

Chapter 21.05
SITE AND STRUCTURE DEVELOPMENT STANDARDS

§ 21.05.010. Purpose.

This chapter includes standards that regulate the physical layout and design of development within Grand Junction to ensure the protection of the health, welfare, safety, and quality of life. These standards address the physical relationship between development and adjacent properties, public streets, neighborhoods, and the natural environment, in order to implement the Comprehensive Plan vision for a more attractive, efficient, and livable community.
(Ord. 5190, 12/20/2023)

§ 21.05.020. Required improvements.

(a) Applicability.All development shall comply with this section.

(b) Plans and Standards.The plan, design, construction, and perpetual maintenance of all development shall be consistent with:

(1) Adopted City plans and policies, including without limitation the Comprehensive Plan and the Grand Junction Circulation Plan, as those plans may be amended or replaced in the future;

(2) The lot, design, and use standards applicable to the zone district in which the property is located;

(3) All other applicable requirements of this Code;

(4) Any previous plans or development approvals approved by the City and applicable to all or part of the property on which the development, structure, or subdivision is proposed; and

(5) All technical and engineering, design, construction, and inspection criteria, standards, and specifications adopted or accepted by City, including but not limited to applicable GJMC Title 29, Transportation Engineering Design Standards (TEDS), the City's adopted fire code, and the Submittal Standards for Improvements and Development (SSID) Manual.

(c) Public Improvements Required.

(1) Types of Improvements and Dedications.

(i) All development applications are required to include plans for the following public improvements unless waived by the Director:

(A) Multi-modal transportation system [see GJMC § 21.05.020(e)];

(B) Sanitary sewer system [see GJMC § 21.05.020(d)(2)];

(C) Utilities [see GJMC § 21.05.020(d)(3)];

(D) Potable water system including fire hydrants [see GJMC § 21.05.020(d)(1)];

(E) Stormwater management system [see GJMC § 21.05.020(d)(4)];

(F) Other improvements and/or facilities as may be required by changing technology and the approval process; and

(G) Permanent survey reference monuments and monument boxes (see § 38-51-101 C.R.S.).

(ii) The improvements described in this chapter shall be built by the applicant and constructed in accordance with adopted standards, unless otherwise indicated. The City may elect to participate in the design, installation, and cost of any improvement and may require the developer to coordinate construction with the City and with other development taking place nearby and in a similar timeframe.

(iii) No improvements shall be made until required plans, profiles, and specifications have been submitted to and approved by the City.

(iv) ROW Dedication.A developer shall dedicate to the City all rights-of-way and easements needed to serve the project, consistent with adopted standards (Title 29) of the GJMC. Such dedications shall be at no cost to the City and shall not be eligible for impact fee credit(s). If a developer dedicates road or street right-of-way beyond what is needed to serve the project, or if the developer dedicates the right-of-way or easement for an Active Transportation Corridor (as described in § 31.08.130 and as shown in § 31.08.150, Appendix A, Figure 2), the developer shall receive credit at fair market value for such dedication against the project's Transportation Impact Fee. The credit shall not exceed the total Transportation Impact Fee for the project. If a dedication or a determination regarding a fee credit is claimed to exceed constitutional standards, the owner shall inform the City Attorney who, if he/she agrees, shall make a recommendation to the City Council to evaluation whether to pay or not additional value of such dedication or to waive all or part of such required dedication. .If a developer donates road or street right-of-way beyond what is needed to serve the project, or if the developer donates the right-of-way or easement for an Active Transportation Corridor (as described in § 31.08.130 and as shown in § 31.08.150, Appendix A, Figure 2), the developer shall neither claim, nor receive credit for such donation against the project's Transportation Impact Fee.

(2) Guarantee of Public Improvements.No development shall be approved until the City has accepted constructed infrastructure or the developer has executed and recorded a development improvements agreement and provided adequate security per GJMC § 21.02.030(h)(3).

(3) Permits and Approvals.No Planning Clearance for any use or activity shall be issued until minimum required improvements have been constructed, paid for, or adequately secured.

(d) Standards for Specific Improvements.The following improvements shall be provided for all development unless the appropriate official determines otherwise based on a process provided in the specific standards or, where applicable, through GJMC § 21.02.050(q).

(1) Potable Water System.

(i) All development shall be served by a water treatment and distribution system operated or approved by the City.

(ii) Fire hydrants shall be placed and have fire flow capabilities in accordance with GJMC 15.44, Fire Code.

(2) Sanitary Sewer System.All lots must be served by a sewer system connected to a public wastewater treatment facility. Sewer variance requests are subject to "Permit Application for Sewer Variance" administered by the Manager of the Persigo Wastewater Treatment Plant.

(3) Utilities.All new utilities shall be provided and paid for by the developer and shall be installed underground. Above-ground facilities associated with new electric utility installations (e.g., pedestals, transformers, and transmission lines of 50 kV capacity or greater) and temporary overhead lines may be allowed if deemed necessary by the Director.

(4) Stormwater Management.

(i) All proposed development must comply with GJMC Title 28, Stormwater Management Manual (SWMM), and applicable state and federal regulations.

(ii) An impact fee may be paid in-lieu of the construction of applicable stormwater facilities where the project meets the requirements of GJMC § 28.56.050, Drainage Fee in-Lieu of Detention.

(e) Multi-Modal Transportation System.

(1) Design Standards.

(i) The developer shall dedicate, design, and construct all streets, alleys, sidewalks, trails, and Active Transportation Corridors in accordance with TEDS (GJMC Title 29).

(ii) Alleys may be used for placement of utilities and infrastructure.

(2) Required Street Improvements.

(i) All Streets.Minimum street improvements shall be those required for the safe ingress and egress of traffic to and from the development. All development shall be responsible for the design and construction of all streets internal to and along the perimeter of a development that are designated as local or unclassified in the Grand Junction Circulation Plan.

(ii) Internal Streets.

(A) Any unbuilt street that is designated in the Grand Junction Circulation Plan as a collector or arterial and is internal to the development shall be constructed to a local street standard by the developer.

(B) The City may require the developer to design and construct the street to a collector or arterial standard, thereby requiring the oversizing of streets. If oversizing is required, the developer will be eligible for a City cost-share agreement in the differential amount between the required local street

improvement and the required collector or arterial street improvement.

(iii) External Streets.

(A) All development shall provide Minimum Access, pursuant to GJMC § 29.24.020, required for the safe ingress and egress of vehicular traffic to and from the development. Minimum Access includes 20 feet width of asphalt and may include curb and gutter if safety or infrastructure concerns exist.

(B) Where a perimeter street is not required for Minimum Access, no local improvements will be required.

(C) The developer shall design and construct safety improvements (e.g., turn lanes, traffic lights) needed to achieve safe ingress and/or egress, as may be warranted based on a traffic impact study.

a. Where a safety improvement is for the benefit of a development but will also benefit other future developments, the developer may request the City to create a reimbursement agreement.

b. Where a safety improvement also benefits existing development, the developer may request the City create a cost share agreement for the improvement.

(3) Improvement Deferral for Existing Local Streets.

(i) Policy and Applicability.

(A) Many areas of the City were developed in the unincorporated areas of Mesa County without modern urban street and drainage facilities. In many such neighborhoods and areas, the existing local streets do not have curbs, gutters, or sidewalks. Given that there are no serious safety or drainage problems associated with these local streets, there is no current reason to improve these streets or to install curbs, gutters and/or sidewalks. When an owner in one of these established neighborhoods chooses to subdivide a lot or parcel or an owner in a commercial or industrial area chooses to develop a lot or parcel, unless such improvements are extended off site to connect to a larger system, the new "short runs" of curbing, gutters and/or sidewalks are of little value as drainage facilities or pedestrian ways until some future development or improvement district extends them to other connecting facilities.

(B) This section is applicable only in areas originally developed in Mesa County that meet the description of Subsection (e)(3)(i)(A).

(ii) Request for Deferral.

(A) Instead of constructing "short run" improvements, the owner may apply to the Director to defer full and permanent improvements ("permanent improvements") through the creation of an improvement district and construction of street, curb, gutter, and sidewalk improvements to the standards established for the improvement district.

(B) The Director allows the use of an improvement district for residential street improvements if all of the following criteria are met:

a. The development is for three or less residential lots;

b. The zoning or existing uses in the block or neighborhood are residential. The Director shall determine the boundaries of the block or neighborhood, based on topography, traffic patterns, and the character of the neighborhood;

c. The existing local residential street that provides access to the lots or development meets minimum safety and drainage standards, and has a design use of fewer than 1,000 average daily traffic ("ADT");

d. At least 80% of the lots and tracts in the neighborhood or block are already built upon, so that the street and drainage character is well established;

e. If an existing safety hazard or drainage problem, including pedestrian or bicycle traffic, it can be improved or remedied without the street improvements being built; and

f. There is at least 250 feet from any point on the development to the nearest existing street improvements (on the same side of the street) that substantially comply with the City standard for similar street improvements.

(C) The Director may allow the use of an improvement district for nonresidential street improvements if all of the following criteria have been met:

a. The development is conforming to the zone district and is for a single commercial or industrial lot or parcel that does not create a new lot or parcel;

b. The lot or parcel size is two acres or less;

c. The lot or parcel does not have more than 500 feet of frontage on a local nonresidential street;

d. If an existing safety hazard or drainage problem, including pedestrian or bicycle traffic, it can be improved or remedied without the local nonresidential street improvements being built; and

e. There is at least 250 feet from any point on the development to the nearest existing street improvements (on the same side of the street) that substantially comply with the City standard for similar local nonresidential street improvements.

(iii) Requirement for Full Compliance.Prior to any development or change of use which is projected to increase traffic generation by the greater of 5% or 10 vehicle trips per day, the applicant shall dedicate right-of-way required to bring abutting streets into compliance with the adopted circulation plan, or as

otherwise approved by the City Engineer. Upon receipt of the appropriate deed, and if all other requirements have been met, the final development permit shall be issued.

(iv) Street Naming and Addressing System.A street naming system shall be maintained to facilitate the provisions of necessary public services (police, fire, mail), reduce public costs for administration, and provide more efficient movement of traffic. For consistency, this system shall be adhered to on all newly platted, dedicated, or named streets and roads. The Director shall check all new street names for compliance to this system and issue all street addresses. Existing streets and roads not conforming to this system shall be made conforming as the opportunity occurs.

(4) Private Streets.

(i) Applicability.Private streets are prohibited unless there is no practicable design alternative available through the public street standards and the proposed private street meets the review criteria in this section.

(ii) Policy.Private streets have historically posed problems over time as they deteriorate and property owners do not realize the burden of maintenance is theirs. Application of the criteria established in this section are established to avoid problems encountered in the past with private streets and provide property owners some protection through a maintenance agreement and funding.

(iii) Review Criteria.The developer must conclusively demonstrate that a proposed private street meets all of the following:

(A) Provides flexibility in residential street access due to design or topographic conditions;

(B) Encourages more creative design including but not necessarily limited to the clustering of units in residential development;

(C) Provides an immediate and continuing public benefit, e.g., by reducing public street maintenance costs;

(D) Provides a safe residential environment; and

(E) Promotes attractive streetscapes that give neighborhoods character and identity, e.g., by allowing alternative street surfaces, finishes and designs.

(iv) Design Requirements.A private street that meets the requirements of this section shall be allowed for residential development under the following conditions:

(A) Street Capacity and Design.

a. The maximum annual average daily traffic (AADT) of the proposed private street shall not exceed 250 trips per day as determined by the ITE - Trip Generation publication.

b. The street shall be designed so that all traffic, including vehicular and pedestrian, exiting from the private street(s) shall not adversely impact the existing and proposed transportation network. A private

street shall conform to the TEDS (GJMC Title 29) or the Submittal Standards for Improvements and Development (SSID) manual, as applicable, for the following:

1. Turnaround requirements;

2. On-street parking requirements;

3. Cross-sections;

4. Curb and gutter construction; and

5. Utility and multipurpose easements.

c. Pedestrian facilities and connections as shown on the Grand Junction Circulation Plan shall be required within the proposed development and made accessible by the general public.

d. The finished surface of the private street may be composed of variable surfaces such as brick, interlocking pavers, cobblestones, or other similar finishes, designed by a professional engineer and as approved by the City Engineer.

e. An entrance design feature such as decorative paving, special signage or other conspicuous improvement shall be incorporated into the final design of the private street such that the design clearly distinguishes the private street from the public street.

(B) Adjoining Properties.

a. All entrances to garages shall be set back from the private street or pedestrian trail a minimum distance of 20 feet.

b. Each residential structure accessed from a private street shall have landscaped areas of at least 10 feet in width between the street and the structure except for the driveway to the garage.

(C) Off-Street Parking.If off-street parking is utilized, it shall conform to the following:

a. Table 21.08-2: Minimum Off-Street Vehicle Parking Requirements.

b. Off-street parking shall be located within 200 feet of any unit the private street serves.

c. Off-street parking shall be included within the same tract as the private street and shall be maintained by the homeowners' association.

(D) Platting, Dedication, Homeowners' Association.

a. Private streets shall be platted in a tract dedicated to the homeowners' association and maintenance of the private street shall be funded and provided by the homeowners' association.

b. The homeowners' association shall be responsible to maintain a vegetation-free zone along the private street that is 20 feet in width (10 feet each side from the center of the street) and 13 feet, six inches in height as measured from the paved surface of the street.

(5) Shared Driveway (Autocourt).

(i) Intent.A shared driveway (or autocourt) is designed to provide access to lots where a full public street is not practical or economical. The number of shared driveways used in a subdivision shall be limited due to the undesirable lot layouts they often create, potential conflicts over shared common space, and private versus public maintenance cost issues.

(ii) Ownership.

(A) A shared driveway shall be owned and maintained by the owners of the parcels or lots that abut the shared driveway.

(B) The shared driveway shall be platted in a tract dedicated to the property owners of the parcels that abut the shared driveway.

(iii) Access.

(A) No more than five single-family lots shall abut or touch any portion of the shared driveway and no more than five single-family units may utilize a single shared driveway.

(B) Each lot abutting a shared driveway shall access off of the shared driveway unless approved otherwise at the time of subdivision.

(iv) Design.

(A) Shared driveways shall be a minimum of 16 feet wide flowline to flowline and a maximum of 150 feet long.

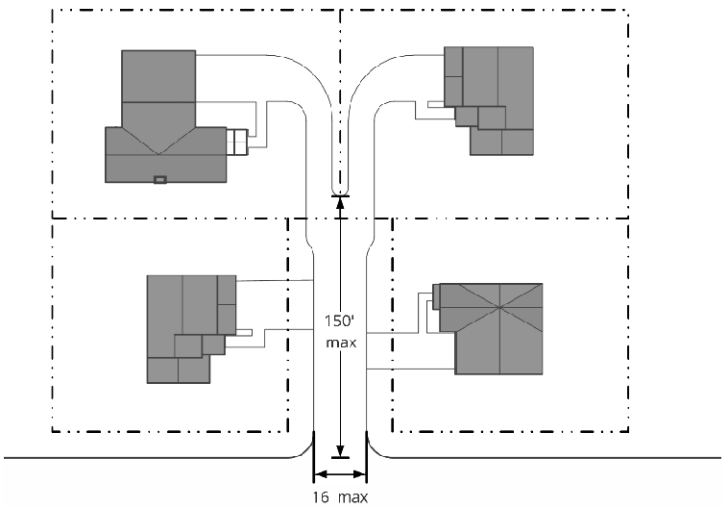


Figure 05.02-1 Shared Driveways

(B) Shared driveways shall be designed to permit the ASHTO "P" design vehicle to back out of an individual driveway and turn 90° in either direction on the shared driveway without any portion of the vehicle:

a. Leaving the individual driveway from which the vehicle is exiting or the shared driveway; or

b. Entering on or over the individual driveways of any other residence.

(C) Finished surface may be composed of variable hard surfaces such as brick, interlocking pavers, cobblestones, or similar finishes, designed by a professional engineer and as approved by the City or County Engineer.

(v) Parking.

(A) Parking on a shared driveway shall be prohibited.

(B) A shared driveway may be used only where it intersects a street with on-street parking.

(C) Each lot abutting a shared driveway shall provide four on-site parking spaces. For homes on shared driveways that access a cul-de-sac, five on-site parking spaces shall be provided. These additional spaces may be provided on the shared driveway if it is widened to accommodate such parking.

(vi) Adjacent Lots and Structures.

(A) The building setback adjacent to a shared driveway shall be the minimum setback required for that side of the property by the underlying zone district or 15 feet, whichever is greater. All entrances to garages shall be set back a minimum distance of 20 feet from the shared driveway.

(B) No fences or hedging taller than 30 inches shall be located within the setback adjacent to the shared driveway. Open fences are acceptable.

(C) No gateways, locked entries or other restrictive access constraints are allowed across a shared driveway.

(6) Loop Lane.Loop lanes shall comply with the following standards. Any variation from these specifications shall require an administrative adjustment.

(i) Intent.A loop lane is an alternate street design that provides a turnaround in place of a cul-de-sac. The loop lane is desirable because it allows for additional open space/park area instead of an expanse of asphalt paving found in a standard cul-de-sac.

(ii) Ownership.

(A) The loop lane and parking shall be dedicated to and maintained by the City.

(B) The park shall be owned and maintained by the homeowners' association, subject to any easements.

(iii) Access.

(A) Corner lots with frontage on the loop lane and the abutting street shall be required to access from the loop lane only.

(iv) Design.

(A) The minimum loop lane is 16 feet from flowline to flowline and shall consist of a paved surface with roll-over curb and gutter on at least one side and a roll-over curb or vertical curb on the other side.

(B) No curve on any portion of the flowline of the loop lane shall have an inside radius of less than 33 feet and an outside radius of less than 48 feet.

(C) No portion of the loop lane shall extend more than 250 feet from the abutting street right-of-way.

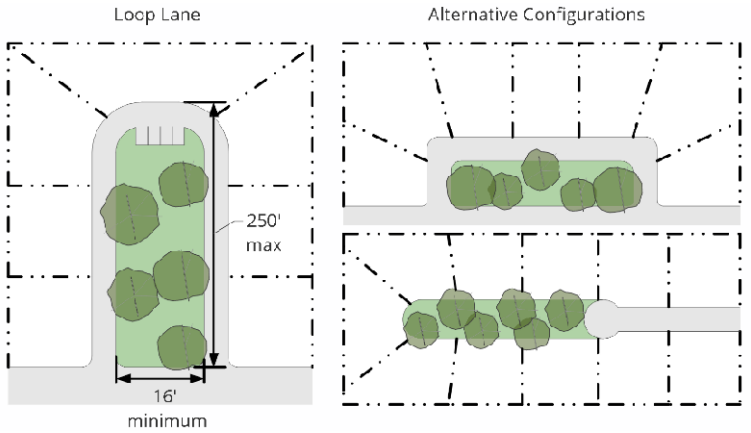


Figure 05.02-2 Loop Lane Design

(D) A minimum separation of 66 feet is required between the right-of-way on

each side of the loop.

(E) The right-of-way shall extend one foot beyond the curb on the park side of the lane and one foot beyond curb on outside edge of the lane.

(F) A fourteen-foot multipurpose easement shall be dedicated on the outside edge of the lane. The park may be used for stormwater detention.

(G) The loop shall provide for two-way traffic.

(H) A sidewalk is required only where the park abuts a street other than the loop.

(I) The developer shall landscape the park and provide an irrigation system in accordance with the Zoning and Development Code.

(v) Parking.

(A) Four guest parking spaces, located in the public right-of-way, are required at the end of the loop. The parking area is reserved for guest parking and shall not be used for the parking of residents' vehicles and/or recreation vehicles for more than a twenty-four-hour period.

(B) "No parking" signs shall be installed and maintained so that no parking is allowed between the curbs on any traveled portion of the loop lane, except the guest parking area.

(C) Each residence shall provide and maintain four off-street parking spaces, two of which may be within a garage or carport.

(vi) Adjacent Lots and Structures.

(A) No front-loading garage or carport may be closer than 20 feet to the front lot line. Individual driveways must have a five-foot radius fillet on driveway corners.

(B) The front yard setback for the house is 15 feet from the right-of-way (16 feet from the curb).

(C) Lots on the loop lane may be 20% smaller and the rear setback can be 10 feet less (10 feet minimum) than as required by the zone district.

(D) No gateways, locked entries or other access constraints are allowed across the loop lane.

(7) Bicycle Circulation.

(i) Required Bicycle Access.

(A) All new development, except individual lot development of a single-family detached or duplex dwelling, shall include reasonably direct connections to Active Transportation Corridors to the maximum extent practicable.

(B) Bicycle circulation shall be given equal consideration to motor vehicle

traffic.

(ii) Bike Lane Right-of-Way Required.

(A) All new development except individual lot development of a single-family detached or duplex dwelling (including subdivisions for such dwellings) shall provide right-of-way for bike lanes along the frontage of the development site with an existing street where bike lanes are called for by the Comprehensive Plan or other City-adopted plans addressing transportation (unless an existing bike lane meeting City standards is already in place). The Director and/or the City Engineer may allow alternatives to this requirement where compliance is impractical.

(B) Required bike lanes shall be located within the right-of-way of the street and not on private property unless the City Engineer determines that location within the right-of-way is not practicable or preferable — In which case, alternatives may be allowed by the Director and/or the City Engineer.

(C) Bike lanes shall conform to TEDS (GJMC Title 29).

(8) Pedestrian Circulation.

(i) Required Pedestrian Access.

(A) Each development with one or more buildings, except individual lot development of a single-family detached or duplex dwelling, shall provide reasonably direct paved pedestrian sidewalk connections from the front of principal building main entrances to abutting public streets, between all principal buildings, between buildings and outlying parking areas, between buildings and transit facilities, and between the development and any abutting Active Transportation Corridor.

(B) Pedestrian circulation shall be given equal consideration to motor vehicle traffic.

(ii) Design Requirements.

(A) Each pedestrian sidewalk connection shall be a minimum of six feet wide and shall be constructed of concrete.

(B) At least one pedestrian sidewalk connection between a principal building and an abutting street shall provide access to a public sidewalk allowing continuous travel to all abutting streets. The connection shall be separated from motor vehicle areas by a curb or other physical barrier approved by the Director, except that crossing a motor vehicle area is allowed when the following standards are met for each such crossing:

a. The crossing shall be as close to a perpendicular angle to the vehicular path of travel as possible.

b. The crossing shall be raised to a minimum of three inches above the height of the adjacent pavement.

c. The crossing shall be constructed of concrete which contrasts in color and/or texture with the pavement of the motor vehicle area.

d. The distance of the crossing shall be the minimum necessary. No crossing shall exceed 20 feet.

e. Curb extensions shall be used to minimize crossing distance and maximize visibility.

f. Vehicle turning movements shall be spaced as far as possible from the crossing.

g. Advance warning signage and striping shall be provided.

(C) All other pedestrian sidewalk connections shall meet the following standards:

a. The connection shall be clearly visible and provide adequate lighting.

b. Where connections cross motor vehicle areas, each such crossing shall be constructed of concrete which contrasts in color and/or texture with the pavement of the motor vehicle area.

c. Advance warning signage and striping shall be provided as necessary to facilitate circulation and improve public safety and awareness.

(9) Access.Site layout and access design shall minimize the number of traffic conflict points into and out of a development by defining and consolidating driveways or access points and designing shared access between/among businesses.

(Ord. No. 5250, 4/2/2025; Ord. No. 5241, 12/4/2024; Ord. No. 5228, 8/7/2024; Ord. 5190, 12/20/2023)

§ 21.05.030. Parks, open space, and trails.

(a) (Reserved)

(b) Pedestrian and Bicycle Trails.

(1) Trails shall be constructed in accordance with applicable City standards.

(2) Trail Construction for Transportation Impact Fee Credit. If a required Active Transportation Corridor is constructed for any purpose other than replacing a required sidewalk (pursuant to § 29.68.020(f) Pedestrian Facilities), then the developer/owner may request a credit for the cost of construction of the trail(s) against the project's Transportation Impact Fee in an amount not to exceed the total transportation fee. The amount of the credit will be determined by the City using established and uniform cost for labor and materials for the specific type and width of the trail(s) constructed.

(Ord. No. 5250, 4/2/2025; Ord. 5190, 12/20/2023)

§ 21.05.040. Residential compatibility standards.

(a) Purpose.The purpose of this section is to protect existing Residential zone districts, neighborhoods, and uses from the potentially adverse impacts arising from the development of taller or more intense structures in close proximity to residences.

(b) Applicability.

(1) The residential compatibility standards in this subsection apply when single-family attached of three units or more, multifamily residential, mixed-use development, or nonresidential development is proposed adjacent to structures in an R-R, R-ER, R-1R, R-2R, RL-4, or RL-5 zone district (protected residential districts).

(2) In cases where multiple structure types are contained on the same lot, residential adjacency shall apply to the area within that lot which encompasses the protected residential building, use, or associated activity and all accessory buildings, uses, or areas necessary to support them.

(3) Conformity with the design requirements in this section shall be the responsibility of the multifamily, mixed-use, or nonresidential development applicant and shall be located on the property subject to the development application.

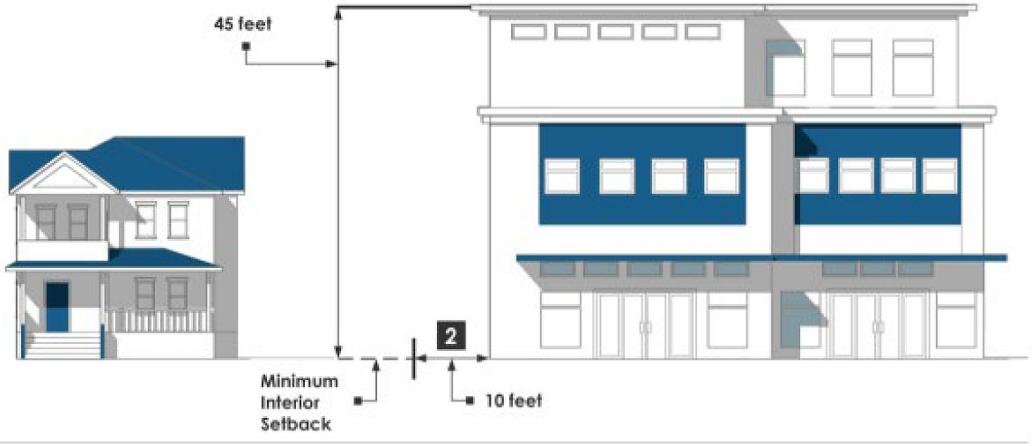
(c) Building Height Stepdown.

(1) Height Transition Area.A height transition area of 25 feet in width is established along each side and rear property line abutting an existing residence in a protected residential district. All new construction and additions within the height transition area are limited in height to no more than the maximum height of the protected residential district. Beyond the twenty-five-foot transition zone, the height limit in the non-protected zone district is the maximum height for the applicable zone district.

(2) New Principal Structure Height Greater Than 35 Feet. New principal buildings with a height greater than 35 feet shall reduce the perceived height of the building when viewed from the protected residential lots by using at least one of the following techniques.

(i) "Stepping down" building height of any portion of the building within 100 feet of the side and rear lot lines abutting a lot zoned in any neighborhood district to a maximum of 35 feet; or

(ii) Increasing the side yard and rear yard setbacks abutting the neighborhood-zoned lots by at least 10 feet beyond that otherwise required.



(d) Building Orientation.

(1) Privacy.All buildings and structures shall be designed and oriented in a manner ensuring privacy of residential uses in a protected residential district.

(2) Upper Story Balconies and Patios.Balconies, patios, or other exterior public gathering spaces that are more than 24 feet above grade shall not be located within 30 feet of a protected residential district lot line.

(e) Screening, Buffering, and Site Layout.

(1) Mechanical Equipment.All mechanical equipment, including but not limited to air conditioning units, air-handling units, back-up power generators, installed at ground level or on a roof must be fully screened from public view.

(i) The screening shall be at least the height of the mechanical equipment.

(ii) Mechanical equipment that generates or is expected to generate noise in excess of 55 decibels when measured at a distance of three feet of the equipment location must provide sound abatement or suppression, which may require the equipment to be enclosed in a structure.

(2) Loading Docks.Loading docks, if necessary or required by the operation, must be located the farthest distance practicable from the protected residential district and

shall meet all other applicable standards in this Code.

(3) Outdoor Storage.

(i) Outdoor storage of merchandise or equipment must be within an area enclosed with a sight-obscuring fence at least six feet in height that is architecturally coordinated in color and design with the building.

(ii) Vehicle sales lots and plant materials may be displayed outside of an approved building or enclosed area so long as they are on the same site wherein the business displays the bulk of its goods for sale.

(iii) Outside promotional displays are allowed during business hours only.

(4) Outdoor Waste Storage.No outdoor waste storage shall be located within 30 feet of a property line that adjoins a protected residential district or within 10 feet of a property line that parallels a protected residential district. This requirement shall not apply where the mixed-use property is separated from protected residential district by an alley or street.

(5) Vehicle Service Bays.All vehicular service bays within 150 feet of a protected residential district shall face away from the residential districts unless separated by a building or permanent architectural feature of minimum height matching the height of the service bays.

(f) Sound.

(1) No outdoor music system, whether permanent or temporary, is allowed in any mixed-use district but MU-3, Downtown.

(2) Any use containing individual service speakers, such as drive-through ordering or payment windows, vehicle fueling pump islands, and car washes, shall not be permitted within 150 feet of any Residential zone district unless the speaker is appropriately screened. The Director may require wing walls, landscape screens, changes in building orientation, and/or other design elements to screen and minimize the impact of individual service speakers.

(3) Any use containing public address/paging systems, such as car dealers, building materials sales, and garden centers, shall not be permitted within 1,000 feet of any Residential zone district unless separated by an arterial or higher classification roadway.

(g) Parking and Loading.

(1) No auto-related site element, including parking area, drive-through lane, or vehicle circulation driveway, shall be located between a principal structure on the lot and any side or rear property line abutting a protected residential district.

(2) If the Director determines that, due to site topography, soils, easements, or other constraints, compliance with Subsection (g)(1) is impracticable, the Director may approve a site design that locates a single or combination of auto-related site elements, between a principal structure and a side or rear property line abutting a protected residential district, provided the site element(s) is located at least 10 feet

from any applicable rear or side property lines.

(h) Accessory Uses and Equipment.Outdoor vending machines, ice dispensers, vacuums, and air pumps shall not be permitted within 100 feet of any protected residential district and shall be screened to be completely out of view from adjacent residential uses.

(Ord. No. 5242, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.05.050. Residential attached and multifamily design standards.

(a) Purpose.The standards of this section are intended to promote high-quality residential development and construction; protect property values; encourage visual variety and architectural compatibility; and promote the unique character of Grand Junction's neighborhoods. Specifically, the standards:

(1) Promote new multi-unit residential developments that relate and connect to established neighborhoods;

(2) Enhance public safety by preventing garages from obscuring main entrances or blocking views of the street from inside residences; and

(3) Improve the compatibility of infill projects with the residential character of surrounding neighborhoods.

(b) Applicability.

(1) New Development.This section applies to all new attached residential with three or more units, and all multifamily development. This section does not apply to single-family detached or duplex units, or to multifamily uses composed of multiple individual dwelling units in separate buildings on the same lot.

(2) Redevelopment.Redevelopment that includes the replacement or addition of units shall comply to with these standards to the maximum extent practicable for the new or replacement units.

(c) General Standards for All Residential Attached and Multifamily Development.

(1) Mix of Housing Types.Developments should promote a diverse community through the provision of a variety of housing types, such as a combination of duplex, tri-plex, four-plex, townhomes, apartments, and single-family units in a range of sizes. Developments are encouraged that are not dominated by a single type of home or dwelling unit.

(2) Transitions Between Different Land Use Areas.When located adjacent to designated zone districts, development shall comply with applicable height and setback transitional standards in GJMC § 21.05.040.

(3) Infill Development.Infill residential structures, including garages, shall be designed with form, shapes, textures, and functions that are compatible in scale, siting, detailing and overall character with comparable residential structures in the immediate neighborhood.

(4) Energy Conservation and Site Orientation Guidelines.

(i) Consideration should be given to energy conservation in the building design.

Use of solar space or water heating, or use of in-line hot water systems, efficient lighting systems, insulation and other energy efficient techniques are strongly encouraged.

(ii) Orientation of buildings and windows to improve solar access and energy conservation is strongly encouraged.

(iii) The site plan may be required to be modified so that view planes identified by the City are preserved for as many structures as possible.

(5) Structured Parking Design.

(i) Parking structures shall be constructed of materials of similar quality and shall be compatible in appearance with adjacent buildings and shall contain lighting sufficient for security as approved by the Director.

(ii) Ground floor facades of parking structures not occupied by active uses shall be articulated through the use of three or more of the following architectural features.

(A) Windows or window-shaped openings with decorative mesh or similar features as approved by the zoning administrator;

(B) Masonry columns;

(C) Decorative wall insets or projections;

(D) Awnings;

(E) Changes in color or texture of materials;

(F) Approved public art;

(G) Integrated landscape planters; or

(H) Other similar features approved by the Director.

(iii) Where feasible, the ground floor of parking structures in Mixed-Use or nonresidential districts shall be wrapped with active public or residential uses along at least 60% of the ground-floor street frontage.

(d) Development with Three or More Principal Structures. In addition to GJMC § 21.05.050(c), these standards apply to all attached single-family or multifamily developments with three or more principal structures. For example, this would include a development with three rows of townhomes or three apartment buildings. These standards are applicable whether the units are designed for individual lots or not.

(1) Building Layout.

(i) Buildings shall be organized to promote a compact pattern of development, pedestrian-friendly spaces, streetscapes, areas of naturalized landscaping, and to screen parking areas.

(ii) Buildings shall be arranged and grouped to define one or more of the following:

(A) Framing the corner of an adjacent street intersection or entry point to the development;

(B) Framing and enclosing a pedestrian and/or vehicle road or access corridor within or adjacent to the development site;

(C) Framing and enclosing parking areas, public spaces, or other site amenities on at least three sides;

(D) Framing and/or enclosing outdoor dining or gathering spaces for pedestrians between buildings; or

(E) Framing one or more areas of natural vegetation.

(2) Building Design Elements.

(i) To the maximum extent practicable, the principal building entrance shall face:

(A) An adjacent public street;

(B) An adjacent publicly accessible plaza; or

(C) An adjacent primary public walkway.

(ii) In cases where the long axis of a building is perpendicular to the primary street, the portion of the structure facing the primary street shall be configured with at least one functioning entry and one or more transparent windows.

(iii) In cases where the principal entrance does not face the principal street, the entrance shall be connected to the street and adjacent parking areas with a sidewalk(s).

(3) Circulation and Parking.

(i) The project shall be designed to minimize negative traffic impacts on and of the surrounding uses.

(ii) To the maximum extent practicable, garage entries, carports, parking areas, and parking structures shall be internalized in building groupings or oriented away from street frontage.

(iii) Parking areas and freestanding parking structures (detached garages or carports) shall not occupy more than 30% of each perimeter public street frontage of a multifamily development.

(iv) To the maximum extent practicable, freestanding parking structures that are visible from perimeter public streets shall be sited so that the narrow end of the parking structure is perpendicular to the perimeter street.

(v) Temporary parking structures are not permitted.

(vi) Projects that require parking areas with more than six parking spaces shall provide maneuvering areas that accommodate ingress and egress from the lot by forward motion of vehicles. The Director may allow parking that backs out directly onto a street if the applicant can show this is a safe alternative for both

pedestrians and the driver.

(vii) The visual focal point of drives and walkways should be free of utilities, trash receptacles, and outdoor storage areas.

(4) Garages, Parking, and Bulk Storage.

(i) Attached Garage.On blocks where the existing garage layout is predominately detached or alley-loaded, attached garages for attached residential units shall meet the following design standards.

(A) The structural opening for street-facing garages on attached dwellings shall not comprise more than:

a. Two-car garage: 45% of the facade width or 18 feet, whichever is greater; or

b. Three-car garage: 55% of the facade width or 27 feet, whichever is greater.

(B) The use of side-loading garages is permitted. The outside wall of a street-facing side-loading garage must have a minimum of two of these design features:

a. Siding materials identical to that found on the primary facade;

b. Two or more windows of a size and design similar to those found on the primary facade; or

c. Garage or living area facade offset from the other a minimum of four feet.

(C) Townhome (or similar attached structure design) rows shall have no more than six garage openings on any principal building elevation containing entry doors.

a. Each garage opening shall have a maximum width of nine feet.

b. No more than four garage openings may be grouped together without an intervening wall surface of at least 20 linear feet (measured horizontally).

(ii) Bulk Storage.

(A) Bulk storage areas intended for storage of materials other than food and clothing, such as tools, bicycles, ski equipment, etc. shall be designed for this purpose. Bulk storage areas shall be free of encumbrances such as water heaters or other types of mechanical or electrical equipment.

(B) Exterior or detached bulk storage areas shall be designed as an integral part of the project and be integrated with the architectural character of the dwellings on the site. Bulk storage areas incorporated into garages, car ports, and screening walls shall use materials and details similar to those of the dwelling unit to achieve an integrated appearance.

(C) The provision of additional storage beyond these minimum requirements is encouraged.

(Ord. No. 5252, 3/19/2025; Ord. No. 5241, 12/4/2024; Ord. No. 5242, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.05.060. Nonresidential and mixed-use design standards.

(a) Purpose. The purpose of these standards is to provide a consistent level of architectural character, quality, and aesthetics for mixed-use and commercial development, as well as to improve and enhance pedestrian access, vehicular access, parking, and circulation.

(b) Applicability. This section is applicable to nonresidential and mixed-use development in the MU-1, MU-2, MU-3, CG, and P-2 zone districts.

(c) Materials. All nonresidential and mixed-use buildings shall be constructed with exterior materials that are durable, including but not limited to stone, brick, cementitious board, and architectural metals.

(d) Architectural Features.

(1) The main entrance to the building(s) shall be on the front facade of the building.

(i) Additional entrance(s) may be provided on the side and/or rear of the building to parking areas or other pedestrian facilities.

(ii) A front door may be constructed anywhere along the front facade of the building including at the corner of the front facade.

(2) Buildings shall include the following architectural design elements:

(i) The building shall be designed to include recessed or projecting elements to provide facade articulation. This can be accomplished through the design of entryways, awnings, rooflines, projecting bays, pilasters, columns, or other features. Articulation shall occur a minimum of every 30 feet for all sides of the building.

(ii) The first floor of a building designed to accommodate a commercial space (such as a restaurant or retail use) shall have windows facing the public street to create visual interest to pedestrians and provide views from inside of buildings to the street.

(3) All sites or structures shall incorporate a minimum of three of the following architectural design elements:

(i) Variation in materials, material modules, expressed joints and details, surface relief and texture to break up building forms and wall surfaces. Such detailing may include sills, headers, belt courses, reveals, pilasters, window bays or similar features for all sides of the building.

(ii) Variation in roof lines/roof materials in order to add interest to and reduce the scale of buildings or expanses of blank wall. This can be accomplished through design elements such as overhangs, eaves, recesses, projections, raised cornice parapets over doors or bays and peaked roof forms.

(iii) Facade features that emphasize the principal building entrance through projecting or recessed forms, detail, color and/or material.

(iv) Outdoor patio in combination with or without outdoor seating located between the building and the primary public street.

(v) Ground story transparency of at least 50% in the form of windows and/or door(s) for facades facing all public street frontages.

(vi) Public art, as approved by the Director, or

(vii) Other architectural or site features that help create a consistent design for the site and reflect the design character of the area where the project is located, as determined by adopted plan or by the Director.

(Ord. No. 5241, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.05.070. Retail sales, big box.

(a) Applicability.The following standards and guidelines are applicable to any retail commercial structure in excess of 60,000 square feet or any retail center in which any one structure exceeds 60,000 square feet (hereinafter "big box").

(b) Building Design.

(1) The following standards shall apply to all building facades and exterior walls that are visible from adjacent public streets and/or parcels. These standards are intended to reduce the massive scale of large buildings, which, without application of these standards, may be incompatible with Grand Junction's desired character.

(i) Facades greater than 150 feet in length, measured horizontally, shall incorporate wall plane projections or recesses having a depth of at least 3% of the length of the facade and extending at least 20% of the length of the facade. No uninterrupted length of any facade shall exceed 150 horizontal feet.

(ii) Ground floor facades that face public streets shall have display windows, entry areas, awnings, or other such features along no less than 60% of their horizontal length. If the facade of the building facing the street is not the front, it shall provide the same features and/or landscaping in scale with the facade.

(2) Buildings should have visually interesting architectural features and patterns that are designed to reduce mass and scale and reflect local character.

(3) The following, in regard to trim, graphics or paint should be integral and not superficially applied: color and material change, texture change and relief such as offsets, projections and reveals.

(4) Variation in roof lines/roof materials, in order to add interest to and reduce the massive scale of large buildings, is required. Roofs shall have no less than two of the following features:

(i) Parapets concealing flat roofs and rooftop equipment, such as HVAC units, from public view. Parapets shall not exceed one-third of the height of the supporting wall and shall not be of a constant height for a distance of greater than 150 feet;

(ii) Overhanging eaves, extending no less than three feet past the supporting walls, for no less than 30% of the building perimeter;

(iii) Sloping roofs that do not exceed an average slope greater than or equal to one foot of vertical rise for every three feet of horizontal run and less than or equal to one foot of vertical rise for every one foot of horizontal run; and

(iv) Three or more roof slope planes.

(5) The following standards are intended to ensure that large structures are consistent with community values.

(i) Predominant exterior building materials shall be high quality material. These include, without limitation:

(A) Brick;

(B) Other native stone;

(C) Tinted, textured, concrete masonry units;

(D) Wood; and

(E) Sandstone.

(ii) Facade colors shall be nonspecular, neutral, or earth tone colors. The Director shall prohibit the use of high intensity, metallic, black, or fluorescent color.

(iii) Building trim and accent areas may feature brighter colors, including primary colors.

(iv) Predominant exterior building materials shall not include the following:

(A) Smooth-faced concrete block;

(B) Smooth-faced tilt-up concrete panels; or

(C) Prefabricated steel panels.

(6) Entrances.

(i) Big boxes, where possible, shall provide multiple entrances. Multiple entrances reduce walking distances from cars, facilitate pedestrian and bicycle access from public sidewalks and provide convenience where certain entrances offer access to individual stores or identified departments of a store. Multiple entrances also mitigate the effect of unbroken walls and neglected areas that often characterize building facades that face other properties.

(ii) Entryway design elements and variations should give orientation and aesthetically pleasing character to the building. The following standards identify desirable entryway design features. Each principal building on a site shall have clearly defined, highly visible customer entrances featuring no less than three of the following:

(A) Canopies or porticos;

(B) Overhangs;

(C) Recesses/projections;

(D) Arcades;

(E) Raised corniced parapets over the door;

(F) Peaked roof forms;

(G) Arches;

(H) Outdoor patios;

(I) Display windows;

(J) Architectural details such as tile work and moldings which are integrated into the building structure and design; and

(K) Integral planters or wing walls that incorporate landscaped areas and/or places for sitting.

(7) To the greatest extent possible, mechanical appurtenances shall be located within the structure. External mechanical appurtenances such as heating and air conditioning equipment shall be screened and finished to match the colors and materials of the building.

(8) All buildings and enclosures shall be designed to be compatible with the principal structure. Compatibility shall be measured in terms of design, form, use of materials, and color.

(9) All applications for any superstore/big box development/shopping center development shall submit, as part of their site plan review, a complete sign package consistent with the latest edition of the Submittal Standards for Improvements and Development (SSID) manual.

(c) Site Layout.Where practicable, buildings shall be located closer to the street so that the scale of the building appears to be reduced, pedestrian traffic is encouraged and architectural detail is more apparent.

(d) Outdoor Spaces and Amenities.

(1) Big box shall provide outdoor spaces and amenities to link structures with the community. Bus stops, drop-off/pick-up points, as well as pedestrian circulation routes, shall be integrated with traffic patterns on the site. Special design features enhance the building's function with its relationship to the community.

(2) Big box site or structure design shall provide at least two of the following features:

(i) Patio/seating area;

(ii) Pedestrian plaza with benches;

(iii) Window display area (covering at least 75% of the length of one facade or 50% of the length of two facades);

(iv) Outdoor playground area;

(v) Kiosk area;

(vi) Water feature;

(vii) Clock tower;

(viii) Public art; or

(ix) Other features approved by the Planning Commission.

(3) Each big box shall provide an off-street bus stop for customers and employees when located on an established or planned bus route.

(4) Each of these features shall be constructed of material that is compatible with the principal structure and be linked by pedestrian connections as required by this Code.

(e) Sidewalks.Pedestrian accessibility from a big box to the neighborhood is important to reducing traffic impacts and projecting a friendlier, more inviting image. This subsection sets forth standards for public sidewalks and internal pedestrian circulation systems that can provide user-friendly pedestrian access as well as pedestrian safety, shelter, and convenience within the center grounds.

(1) Continuous internal pedestrian walkways, no less than eight feet in width, shall be provided from the public sidewalk or right-of-way to the principal customer entrance of the principal structure. At a minimum, walkways shall connect pedestrians to transit stops, street crossings, building and store entries and shall feature adjoining landscaped areas that include trees, shrubs, benches, flower beds, ground covers or other materials for no less than 50% of its length.

(2) Sidewalks, no less than eight feet in width, shall be provided along the full length of the building along any facade featuring a customer entrance and along any facade abutting public parking.

(3) Sidewalks shall be located an average of six feet from the facade of the building to provide planting beds for foundation landscaping, except where features such as arcades, display windows or entryways are part of the facade.

(4) Walkways within 30 feet of at least half of the customer entrances shall have weather protection features such as awnings or arcades.

(5) A walkway not governed by this subsection shall be designed in accordance with § 21.05.020(e)(8).

(f) Parking.

(1) Parking areas should provide safe, convenient, and efficient access.

(2) Parking shall be distributed to shorten the distance to buildings and public sidewalks and to reduce pavement.

(3) Where possible, no more than 75% of the off-street parking for the entire property shall be located between the front facade of the principal structure and the primary abutting street ("front parking area").

(i) The front parking area shall be determined by drawing a line from the front corners of the building to the nearest property corners. If any such line, when connected to the plane of the front facade of the building, creates an angle that is greater than 180°, then the line shall be adjusted to create an angle of 180° when connected to the plane of the front facade of the building. If any such line, when connected to the plane of the front facade of the building, creates an angle that is less than 90°, then the line shall be adjusted to create an angle of 90° when connected to the plane of the front facade of the building.

(ii) Parking spaces in the front parking area shall be counted to include all parking spaces within the boundaries of the front parking area, including:

(A) All partial parking spaces if the part inside the front parking area boundary lines constitutes more than one-half of said parking space; and

(B) All parking spaces associated with any pad sites located within the front parking area boundaries.

(g) Outdoor Storage, Display, and Operations.

(1) Outdoor storage, loading and operations areas shall be attractively screened from adjacent parcels and streets.

(2) Outdoor storage, trash collection and/or compaction, loading or other such uses shall be located in the rear of the lot.

(3) If, because of lot configuration, the Director determines that such placement is not practicable, then the side yard may be used, but in no case shall such area be located within 20 feet of any public street, public sidewalk, or on-site pedestrian way.

(4) Outdoor storage, HVAC equipment, trash collection, trash compaction and other service functions shall be incorporated into the overall site design. Views of these areas shall be screened from visibility from all property lines and separated from sidewalks and on-site pedestrian ways. Screening structures shall be made of the same materials as the principal structure.

(5) Non enclosed areas for the storage and sale of seasonal merchandise shall be permanently defined and screened with walls and/or fences. Fences must comply with GJMC § 21.07.080(b)(3), any design guidelines, and other conditions of approval. Materials, colors, and design of screening walls and/or fences shall conform to those used as in the principal structure. If such areas are to be covered, then the covering shall conform to the colors on the building. Outdoor display and storage shall not encroach on any portion of a walkway, drive aisles or required parking spaces.

(6) Portable outdoor display shall be allowed and shall be placed so that a minimum of eight feet of sidewalk remains open at all times in the display area. Display shall not be placed in the drive aisles or required parking spaces.

(7) No delivery, loading, trash removal or compaction, or other such operations shall be permitted between the hours of 10:00 p.m. and 7:00 a.m. unless the applicant submits proof that sound barriers between all areas for such operations effectively reduce noise emissions to a level of 45 decibels, as measured at the lot line of any abutting property.

(8) One outdoor vendor shall be allowed for each tenant over 50,000 square feet. The area established for the vendor shall be identified on the site plan.

(9) Any special event occurring in any outdoor area, including pedestrian ways and parking lots, shall comply with GJMC § 21.02.040(b).

(Ord. No. 5241, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.05.080. Screening.

(a) Single Unit Residential.To the maximum extent practicable, utility equipment on residential lots should be located behind the front building line of the house and screened from public view by an opaque wall, fence, or landscaping screen.

(b) Multi-Unit Residential, Mixed-Use, and Nonresidential.

(1) Screening Generally.

(i) All multi-unit residential development, manufactured and mobile home parks, and all mixed-use and nonresidential projects shall include on the landscape plan, a detailed drawing of enclosure and screening methods to be used in connection with trash bins, recycle bins, storage yards, service areas, loading docks, and equipment areas on the property.

(ii) No existing screening or landscape buffer shall be removed from any developed or undeveloped commercial property which directly abuts a residentially zoned property without first submitting and obtaining approval for a landscaping plan which provides for replacement screening conforming to all provisions of this section.

(2) Mechanical Equipment.

(i) Applicability.

(A) The standards of this section shall apply to all of the following:

a. Electrical and gas-powered mechanical equipment;

b. Ductwork and major plumbing lines used to heat, cool, or ventilate; and

c. Power systems for the building or site upon which the equipment is located.

(B) Roof or wall-mounted antennas and vent openings shall not be considered mechanical equipment for purposes of these screening standards. The standards of this section are not intended to apply to solar arrays, solar energy collection systems, or small wind energy systems, if such systems are otherwise in compliance with applicable building codes and development standards requirements.

(ii) Screening Standards.

(A) Roof-Mounted Mechanical Equipment.

a. Roof-mounted mechanical equipment shall be screened by a parapet wall or similar feature that is an integral part of the building's architectural design.

b. The parapet wall or similar feature shall be of a height equal to, or greater than the height of the mechanical equipment being screened.

c. Roof-mounted mechanical equipment, except solar energy collection systems, is prohibited on single-unit residential dwellings.

(B) Wall-Mounted Mechanical Equipment.Wall-mounted mechanical equipment, except air conditioning equipment (e.g., window AC units), shall be screened from view by structural features that are compatible with the architecture of the subject building.

(C) Ground-Mounted Mechanical Equipment.

a. Ground-mounted mechanical equipment shall be screened from view by landscaping, a fence, or a decorative wall that is integrated into the architecture of the structure.

b. The fence or wall shall be of a height equal to, or greater than the height of the mechanical equipment being screened and no taller than 8 feet.

(D) Alternate Screening.

a. Alternate screening methods that meet the intent of this section may be approved by the Director.

b. Alternative screening might include, but shall not be limited to, increased landscaping, grouping the equipment on specific portions of a site, architectural elements, and painting or otherwise causing the equipment to blend with the site or structure.

(3) Service, Loading, and Storage Areas.

(i) Applicability.These screening requirements are applicable to all service, loading, and storage areas. Applicants are encouraged to locate the types of features listed in this subsection where they are not visible from off-site, or from public areas of a site, so that screening is unnecessary.

(ii) Placement.

(A) All service areas shall be placed at the rear, on the side of, or inside buildings.

(B) No service area shall be visible from a public right-of-way, not including an alley, or from adjacent residential areas.

(C) Service areas and access drives shall be located so they do not interfere with the normal activities of building occupants or visitors on driveways, walkways, in parking areas, or at entries.

(iii) Outside Storage Areas and Loading Docks.

(A) All storage areas, service areas, and loading docks visible from any public street right-of-way shall be screened according to one or more of the screening options provided in these standards. Property zoned industrial must also screen from view all outside storage areas that are adjacent to, or can be seen from non-industrial zoned property, unless the adjacent non-industrial-zoned property is located in the industrial classification of the City's Future Land Use Map.

(B) Screening shall be a minimum height of eight feet to screen truck berths, loading docks, areas designated for permanent parking, or storage of heavy vehicles, equipment, or materials.

(C) Screening shall be long enough to screen the maximum size trailer that can be accommodated on site. Sites that can accommodate a full-size tractor-trailer shall provide a forty-eight-foot wing wall, where wing walls are used.

(iv) Shopping Cart Storage.All shopping carts shall be stored inside the building they serve. Shopping cart corrals shall be made of a material suitable for withstanding weathering and rusting.

(v) Dumpster, Garbage, or Trash Enclosure.

(A) Each required garbage enclosure shall be accessible for truck pick-up. Access drives shall be constructed of material and thickness to accommodate truck loading. Year-round accessibility to the enclosure for service trucks area shall be maintained by the property owner or tenant.

(B) The container shall not be visible from any adjacent property or from any public right-of-way. Each required enclosure shall be screened through the use of a solid wall on at least three sides to a height of at least six inches above the height of the top of the container. The use of materials that are not solid, such as slates in chain-link fencing, shall not be used to meet this requirement.

(C) Enclosure openings directly visible from a public right-of-way and/or adjoining properties shall have a gate constructed of solid material.

(D) Enclosure structures shall be designed to protect the walls from damage by containers. Such protection may include use of barrier curbing reinforced masonry walls, or other similar means.

(E) Trash enclosures shall not be located within a required street front or street side setbacks or buffer yard or occupy area used for required parking spaces.

(Ord. 5190, 12/20/2023)

§ 21.05.090. Fences.

(a) Permit Required.

(1) A Fence Permit is required for installation of any fence, except that a fence or wall that exceeds six feet in height and a retaining wall of four feet or higher are considered a structure requiring a Planning Clearance and building permit rather than a Fence Permit, and setbacks for structures apply (except where otherwise specifically provided).

(2) All fences, including those considered structures, shall meet the standards, limitations and requirements of this section, and shall comply with TEDS (GJMC Title 29).

(b) Fence Height Measurement.

(1) The height of fences shall be determined by measurement from the ground level upon which the fence is located. Grade shall not be altered for the sole purpose of increasing fence height. An increase of up to two inches in height shall be allowed when spacing for drainage under the fence is needed.

(2) For fences erected on retaining walls, the height of the retaining wall shall be included in the height of the fence.

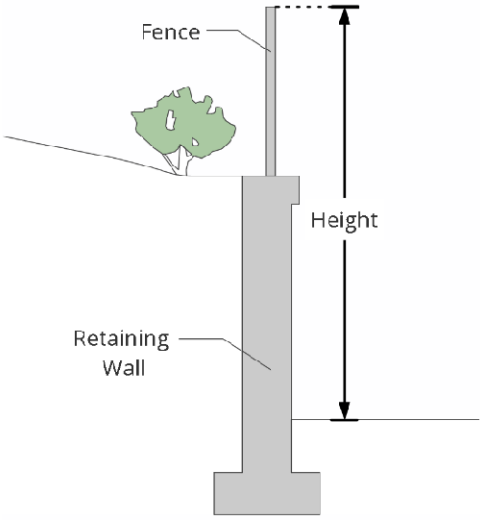


Figure 05.09-1 Fence Height Measurement

(3) Pillars or other support structures for a fence shall be allowed to exceed the maximum fence height by up to one foot at intervals no closer than eight feet.

(4) The height and location requirements of this subsection may be modified as part of subdivision, planned development or conditional use approval.

(c) Fence Materials.

(1) Fences and walls shall be constructed of materials approved by the Director.

(2) Acceptable materials include wire, wrought iron, plastic, wood, and other materials with a similar look.

(i) Fences within the Downtown Core shall only be wrought iron, PVC vinyl, or wood.

(3) Unacceptable materials that are visible include glass, tires, razor wire and concertina wire, or unconventional salvaged materials or similar materials. Electric fencing shall be allowed to contain large animals.

(4) The Director may approve materials for secure facilities or critical facilities.

(d) Residential Districts.Fences in all Residential zone districts and the MU-1 district, shall meet the following standards:

(1) Fences in the required front yard setback shall not exceed 30 inches in height. Such fences may be increased to 48 inches maximum height if the fencing material is at a ratio of two-thirds open space to one-third closed space per square foot for that part of the fence extending above the thirty-inch height.

(2) Unless the approval of the development required a landscape strip, fences up to six feet in height are permitted within front yard setbacks along arterial or major collector roads, provided they are in accordance with adopted corridor overlay zone standards, TEDS (GJMC Title 29) and all other engineering standards and meet the following minimum standards:

(i) Fences or walls four feet or less in height consisting of an open design that has at least two-thirds open space to one-third closed space (e.g., picket and split rail fences), or a decorative wall, with no required landscape strip;

(ii) Fences or walls over four feet in height with a minimum five-foot-wide planting strip between the fence or wall and right-of-way. The landscaped strip shall contain at least one tree per 40 feet and have adequate ground cover; or

(iii) Perimeter fences and walls in new developments must meet the requirements of GJMC § 21.07.090, Residential Subdivision Perimeter Enclosures.

(3) On that part of the lot other than the required front yard setback area, fences may be erected to six feet in height. Fences within a required principal structure setback exceeding six feet in height require an Administrative Adjustment in accordance with GJMC § 21.02.040(c).

(4) On corner lots, that part of a backyard fence that extends to and along the side property line on the street side may be six feet high but is subject to the provisions of TEDS (GJMC Title 29) and other engineering standards.

(e) Nonresidential Districts.Fences in all Mixed-Use and nonresidential zone districts shall meet the following standards:

(1) Location of these fences must be approved by the City Engineer to ensure that adequate sight distance is maintained.

(2) On those sites located within the MU-3 Downtown zone district, fences in the required front yard setback area shall not exceed 30 inches in height. The height may be increased to 48 inches maximum height if the fencing material is at a ratio of two-thirds open space to one-third closed space per square foot for that part of the fence extending above the thirty-inch height.

(3) In all other Mixed-Use and nonresidential zone district locations, fences to a height

of six feet shall be located outside the front yard setback. Fences which are thirty-inch solid height or four feet in height if two-thirds open may be located within the front yard setback. The addition of not more than three strands of barbed wire shall be allowed and shall not be considered in the height calculation.

(f) Maintenance. All fences or walls shall be maintained in good repair.

(Ord. 5205, 3/20/2024; Ord. 5190, 12/20/2023)

§ 21.05.100. Use of public right-of-way.

No private structure, fence, sign, parking lot, detention/retention pond, or other temporary or permanent object or structure shall be constructed, maintained, or erected in any portion of any public right-of-way without first obtaining a Revocable Permit from the City. The City Engineer or other City official may allow traffic control devices, street signs, public notices, utility poles, lines, and street banners consistent with this Code.

(a) No person shall use any structure or use, store, display, or sell any merchandise in a public right-of-way without having first obtained a Revocable Permit, except that this provision shall not be enforced in a manner which limits unreasonably any person's freedom of speech or assembly.

(b) No commercial vehicle which exceeds 1 1/2 tons rated carrying capacity shall be parked in a public right-of-way which abuts any Residential zone district.

(c) Parking of an RV or any vehicle for more than 72 hours shall not be allowed in a public right-of-way or on any vacant lot.

(Ord. 5190, 12/20/2023)

Chapter 21.06
NATURAL RESOURCES AND ENVIRONMENTALLY SENSITIVE LANDS

§ 21.06.010. Environmental and sensitive land regulations.

(a) Purpose.Environmental and sensitive lands (ESL) regulations shall apply to identified hazard areas and/or lands, which have or may have specific environmental conditions. The intent of this regulation is to:

(1) Guide development and land use within these areas;

(2) Protect the public from avoidable financial expenditures for hazard control projects, hazard relief measures and damages to public utilities, streets, and bridges;

(3) Protect people and property and minimize damage from possible hazards; and

(4) Provide a mechanism by which people owning/purchasing land can gain information about the land and whether the land is suitable for development.

(b) Applicability.The provisions of this section, in addition to any other applicable regulation, shall apply to a Planned Development Outline Development plan, Preliminary Subdivision Plat or Simple Subdivision for environmental and sensitive lands. This section shall not apply to the following:

(1) Development of a single-family detached dwelling on any lot or parcel in existence as of the Effective Date;

(2) State, county or City highway personnel engaged in constructing or effecting repair of bridges and/or roads;

(3) Colorado Division of Wildlife and/or U.S. Fish and Wildlife Service engaged in habitat improvement; and

(4) Railroad personnel engaged in constructing or effecting repair of bridges and track.

(c) General Requirements.

(1) The Director shall administer this Code making any necessary interpretations of maps and other documents or information necessary or required, to determine among other things the boundaries of geologic and wildfire hazard areas.

(2) Any development application involving a property with a known or suspected geologic hazard shall be submitted by the Director for review by the Colorado Geological Survey.

(3) Any development application involving a property with a known or suspected wildfire hazard shall be submitted by the Director for review by the State Forestry Service.

(4) Protection from or against hazard or loss by the application of this regulation is not guaranteed. The analysis and recommendations are based on engineering and scientific studies, which are reasonably believed to be accurate and complete. A review consistent with this regulation does not guarantee, either expressly or impliedly that areas outside of established hazard boundaries or uses permitted within

hazard boundaries will be free from damage or that people will be free from death or injury caused by known or unknown hazards. Application of this regulation to any development shall not create any liability on the part of, or create a cause of action against, the City or any officer or employee thereof.

(d) Wildfire Standards.

(1) Defensible Space.Any new residential development on or adjacent to land that is predominantly woods, brush or grasslands, shall be developed to minimize the potential for the buildings to be ignited by wildfire and for a building fire to ignite surrounding woods, brush or grasslands. In addition to all other applicable regulations woods, brush or grassland development shall be developed with the area surrounding each dwelling unit modified and managed using a two-area system as follows:

(i) Area 1.Area 1 shall consist of a thirty-foot area immediately surrounding the dwelling unit, not to extend beyond the property line. No dead trees or other dead vegetation may remain in Area 1 at the time of initial sale or initial construction, whichever is first. Area 1 shall be further subdivided into two segments:

(A) Segment A shall consist of the five feet immediately surrounding all sides of the dwelling unit. All vegetation shall be removed from this area at the time of initial sale or construction, whichever is first. No new vegetation shall be planted in Segment A if the structure is sided with combustible materials such as wood or logs. If noncombustible siding is used, however, low-growing shrubs may remain or be installed. In no case shall shrubs be planted so as to be continuous with grass. No propane tanks may be installed in Segment A and no firewood or other combustible materials may be stored there.

(B) Segment B shall consist of the 25 feet immediately beyond Segment A. At the time of initial sale or initial construction, whichever occurs first, all installed trees within Area 1 shall be located, and all existing vegetation shall be thinned, as follows to break up the horizontal and vertical continuity of fuels:

a. Spacing between clumps of brush or trees, as measured between the crown of each clump, shall be no closer than two times the height of the taller clump. The maximum width of any clump of brush or trees shall be no greater than two times the height of the clump. Thinned material shall be removed from the site.

b. All branches of trees or brush shall be pruned to a minimum height of 10 feet above the ground or one-half the total height of the tree or bush, whichever is less. Pruned material shall be removed from the site.

c. Propane tanks and firewood may be located in Segment B, but in no case shall such tanks be located within 20 feet of the principal structure. Propane tanks shall be located on gravel pads and shall not be located immediately adjacent to grass-covered areas.

(ii) Area 2.Area 2 shall consist of the area immediately beyond Area 1 and extending to 75 feet from the principal structure, not to extend beyond the property line. Trees shall be initially thinned in this area to maintain a minimum of five feet between tree crowns at maturity. All dead trees must be removed from Area 2 prior to initial sale or initial construction, and subsequent dead trees shall be removed annually, except that two dead trees per acre may remain to serve as wildlife habitat.

(2) Maintenance.Persons owning, leasing or otherwise maintaining new dwelling units covered by provisions of this Code are responsible for proper maintenance of the defensible space. Maintenance of the defensible space shall include modifying or removing flammable vegetation and keeping leaves, needles, and other dead vegetative material from accumulating on roofs of structures.

(e) Wildlife Habitat Protection.

(1) Prior to development of a moderate, high, or very high potential for impact category parcel, as shown on the 1999 Wildlife Composite Map for the urban area or an amended map approved by the City, the developer shall consult with the Colorado Division of Wildlife to substantiate the basis for the potential impact and to address various specific measures to avoid, minimize, or mitigate negative impacts to wildlife and/or habitat.

(2) New structures shall not be located within 100 feet of the floodways of the Colorado or Gunnison Rivers or as recommended by the Colorado Division of Wildlife. Roads, trails, recreation access sites, bridges, fences, irrigation and water diversion facilities, erosion and flood control devices, underground utilities, and similarly necessary structures may be located within this setback, if necessary. The installation of these structures shall comply with all other applicable federal, state, and local regulations.

(f) Hillside Development.

(1) Purpose.The provisions in this section are designed to accomplish the following:

(i) Prohibit development or uses which would likely result in a hazardous situation due to slope instability, rock falls, or stormwater runoff and excessive soil erosion;

(ii) Minimize the threat and consequent damages resulting from hillside area fires by establishing fire protection measures and adequate emergency vehicle access;

(iii) Preserve natural features, wildlife habitats, natural vegetation, trees, and other natural plant formations;

(iv) Provide for safe vehicular circulation and access to recreation areas, natural drainage channels, paths, and trails;

(v) Encourage the location, design, and development of building sites in a manner that will provide for greater aesthetic appeal, blend with the slopes and hillside terrain, minimize the scarring and erosion effects of cutting, filling and grading of hillsides and prohibit development of ridge lines as defined; and

(vi) Encourage preservation of open space by encouraging clustering or other design techniques to preserve natural terrain, views, and vistas.

(2) Applicability.Hillside development standards are applicable to hillside development and excavation of hillside so that:

(i) Soil and slope instability and erosion is minimized;

(ii) The adverse effects of grading, cut and fill operations are minimized;

(iii) The character of the City's hillsides is preserved; and

(iv) The public's interest is protected.

(3) Hillside Development Standards.In furtherance of the purposes set forth in this section, any hillside development shall comply with the tables below. Any portion of a development having a slope greater than 30% with an elevation change of 20 feet or greater shall not be included in calculation of the area of such parcel for the purposes of determining conformity with the minimum lot parcel size and density requirements below.

Table 21.06-1: Minimum Lot Size and Width for Hillside Development: Single-Family, Planned Development, and Cluster Development

Average Slope of Development Area	Minimum Lot Size (square feet) [1]	Minimum Lot Width (feet) [2]
0% to 10%	See existing zone	See existing zone
10.01% to 20%	10,000	At least 100 at front setback line
20.01% to 30%	15,000	At least 200 at front setback line
30.01%+	Development not permitted [3]	Development not permitted [3]

Notes:

[1] Minimum lot size as finally approved.

[2] Maximum setback for single-family dwelling structures - 150 feet from public or private street.

[3] Development on slopes of greater than 30% is not permitted unless, after review and recommendation by the Planning Commission and approval by the City Council, it is determined that: a) Appropriate engineering measures will be taken to minimize the impact of cuts, fills, erosion and stormwater runoff consistent with the purpose of this section; and b) The developer has taken reasonable steps to minimize the amount of hillside cuts and also has taken measures to mitigate the aesthetic impact of cuts through landscaping or other steps.

Table 21.06-2: Minimum Width and Maximum Density for Hillside Development: Multiple Dwelling Units		
Average Slope of Development Area	**Minimum Lot Width (feet)**	**Maximum Density**
0% to 10%	See existing zone	See existing zone
10.01% to 20%	100	Maximum density of underlying zone x 0.80 unless clustered
20.01% to 30%	100	Maximum density of underlying zone x 0.60 unless clustered
30.01% +	Development not permitted [1]	Development not permitted [1]

Notes:

[1] Development on slopes of greater than 30% is not permitted unless, after review and recommendation by the Planning Commission and approval by the City Council, it is determined that: a) Appropriate engineering measures will be taken to minimize the impact of cuts, fills, erosion and stormwater runoff consistent with the purpose of this section; and b) The developer has taken reasonable steps to minimize the amount of hillside cuts and also has taken measures to mitigate the aesthetic impact of cuts through landscaping or other steps.

(4) Cluster Development.Property with slopes in excess of 20% may be clustered on the portion of the site with slopes less than 20% per GJMC § 21.06.010(f)(4).

(5) Determination of Slope and Slope Areas.

(i) Slope shall be determined on a parcel-by-parcel basis if the slope is not generally uniform.

(ii) The Director may allow some incursion hillside disturbance between slopes. Such incursions shall not exceed 20 feet unless, upon recommendation of the Planning Commission, the City Council finds that a greater incursion is consistent with the purposes of this section.

(iii) All property with a slope greater than 30% shall be excluded from the calculation of development area for purposes of determining hillside disturbance and density/intensity limitations.

(iv) Natural slope delineation for the purposes of this section shall be determined as follows:

(A) Contour intervals, maps and calculations required to determine the natural slope shall be prepared by the applicant and shall be submitted with the development application.

(B) Contour maps shall be prepared and certified by a licensed professional engineer or licensed surveyor showing contours at intervals no greater than two feet (the contour map).

(C) A qualified professional shall prepare all reports, documents, maps, reports, and calculations. The basis of the information used/analyzed shall be conspicuously disclosed thereon. Each report shall include a current statement of the professionals' certifications, credentials, and qualifications to prepare the report.

(D) The Director may require that the applicant perform a field survey to verify the accuracy of the contour lines shown on the contour map.

(E) The contour map shall identify profile lines, which shall be used for performing the field survey. Profile lines shall be perpendicular to contour lines and in no case occur at intervals greater than 150 feet apart or 75 feet from a property line.

(6) Determination of Slope Areas/Density Calculation.Using the field survey, slopes shall be calculated in horizontal intervals no greater than 40 feet. Points identified as slopes, as listed above, shall be located on the contour map and connected by a continuous line. The area bounded by the lines and intersecting property lines shall be used for determining dwelling unit density.

(7) Street Design.TEDS (GJMC Title 29) shall apply to all hillside development, except that streets, roads, driveways, and other vehicular routes shall not traverse property that has a slope greater than 30%. The Planning Commission may recommend and the City Council may approve vehicular routes on slopes greater than 30% when:

(i) Appropriate engineering measures will be taken to minimize the impact of cuts, fills, erosion, and stormwater runoff consistent with the purposes of this section; and

(ii) The site design minimizes the amount of hillside cuts and includes measures to mitigate the aesthetic impact of cuts through the use of landscaping and other mitigation measures.

(A) Existing vegetation, where streets are to be located, shall be preserved to the greatest extent possible. As much as possible street alignment should follow the natural terrain.

(B) The Director may recommend and the Planning Commission may approve the waiver of sidewalk construction when sidewalk construction would result in excessive grading and/or cut/fill of slopes.

(C) Vertical or drive-over, curb and gutter, as determined by the Director, shall be installed along all public streets.

(8) Joint Development Applications.Multiple owners of hillside property, whether or not such property is contiguous, may file a joint development application for all such property or the City Council may direct the Director to file such an application on behalf of the City.

(i) For all purposes of this section, hillside property shall be treated as a single development parcel.

(ii) Development permitted on hillside property, pursuant to this section, may be clustered on any one or more of the parcels under such joint application subject to the requirements and limitations of this section. The provisions of this section shall not allow variance in the use requirements of the underlying and existing zoning category for the receiving parcel and may not result in a violation of the purposes of these regulations.

(g) Ridgeline Development.

(1) Purpose.The City recognizes the value of its visual resources and amenities. The purpose of the ridgeline development standards is to preserve the character of the identified ridgelines and to minimize soil and slope instability and erosion.

(2) Ridgeline Setback.

(i) For all lots platted within the mapped ridgeline protection area shown on Exhibits 7.2.C1, 7.2.C2 and 7.2.C3, buildings, fences and walls shall be set back a minimum of 200 feet from the ridgeline except as follows:

(A) This section does not apply to existing structures or lots platted prior to the Effective Date or to fences constructed primarily of wire.

(B) This setback can be reduced to a minimum of 30 feet if the applicant produces adequate visual representation that a proposed new structure will not be visible on the skyline from public view, or that mitigation will be provided. Mitigation techniques might include:

a. Earth tone colors to blend with the surrounding area;

b. The use of nonreflective materials;

c. Vegetation to screen and soften the visual impact of the structure; and/or

d. A reduction of building height or the "stepping" of the building height; or

e. Other means that minimize the appearance from the road corridor.

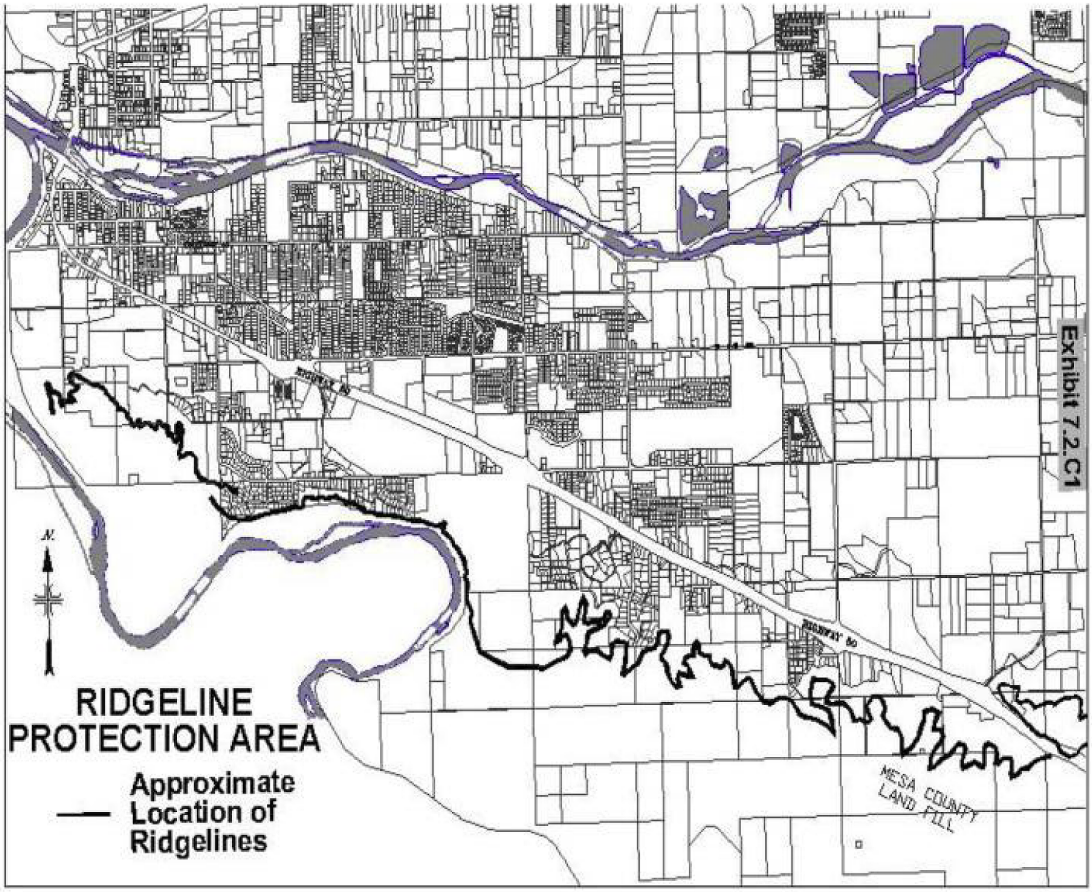
(ii) The required setback shall be measured to the building envelope, to be established at the time of platting.

(3) Measurements.

(i) View impact shall be measured by a straight line measuring the line of sight between any public view, public road, or public area and the ridgeline protection area.

(ii) Ridgeline shall be determined on a site-specific basis and shall be that point at which the line of sight is tangent with the slope profile.

Exhibit 7.2.C1



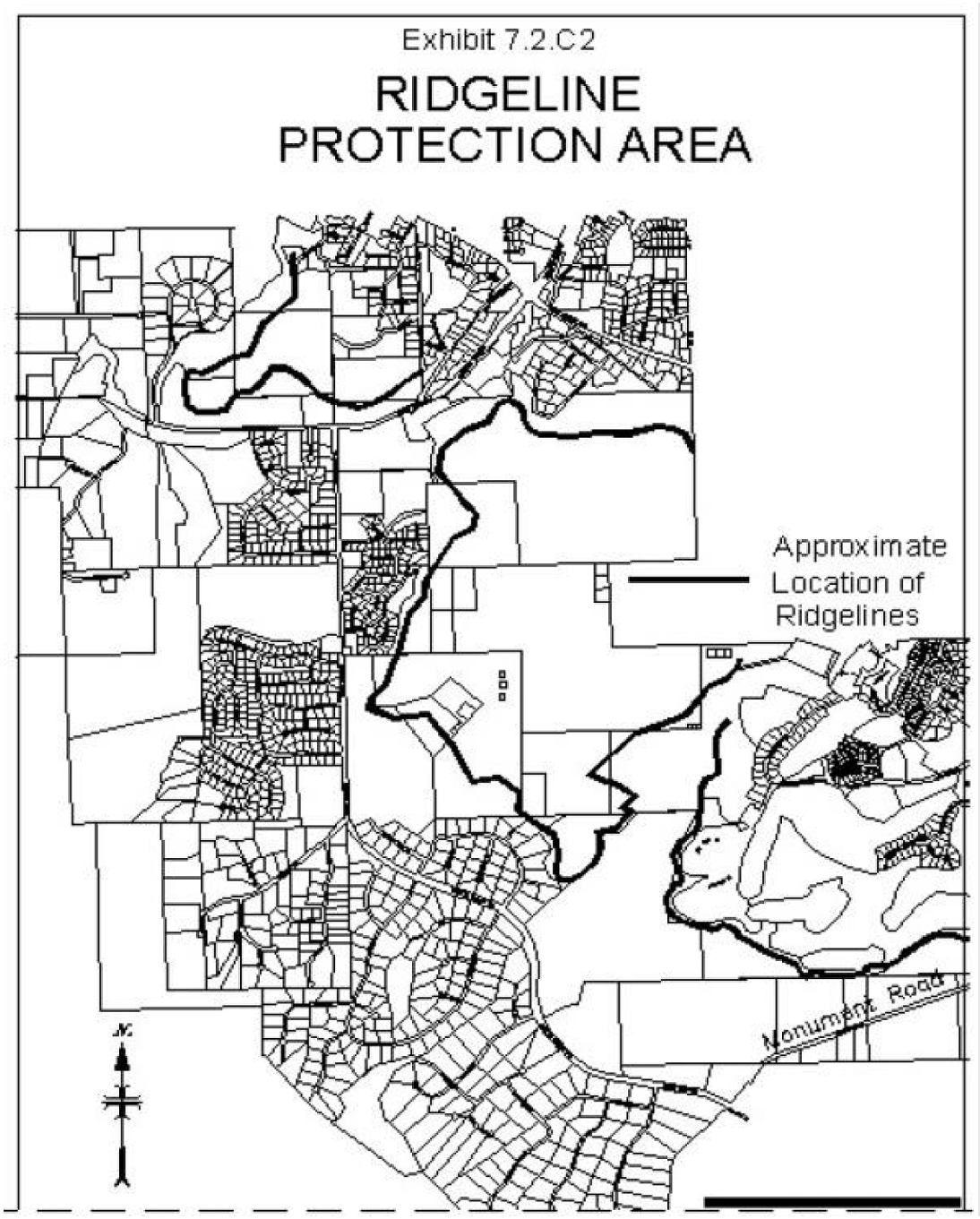
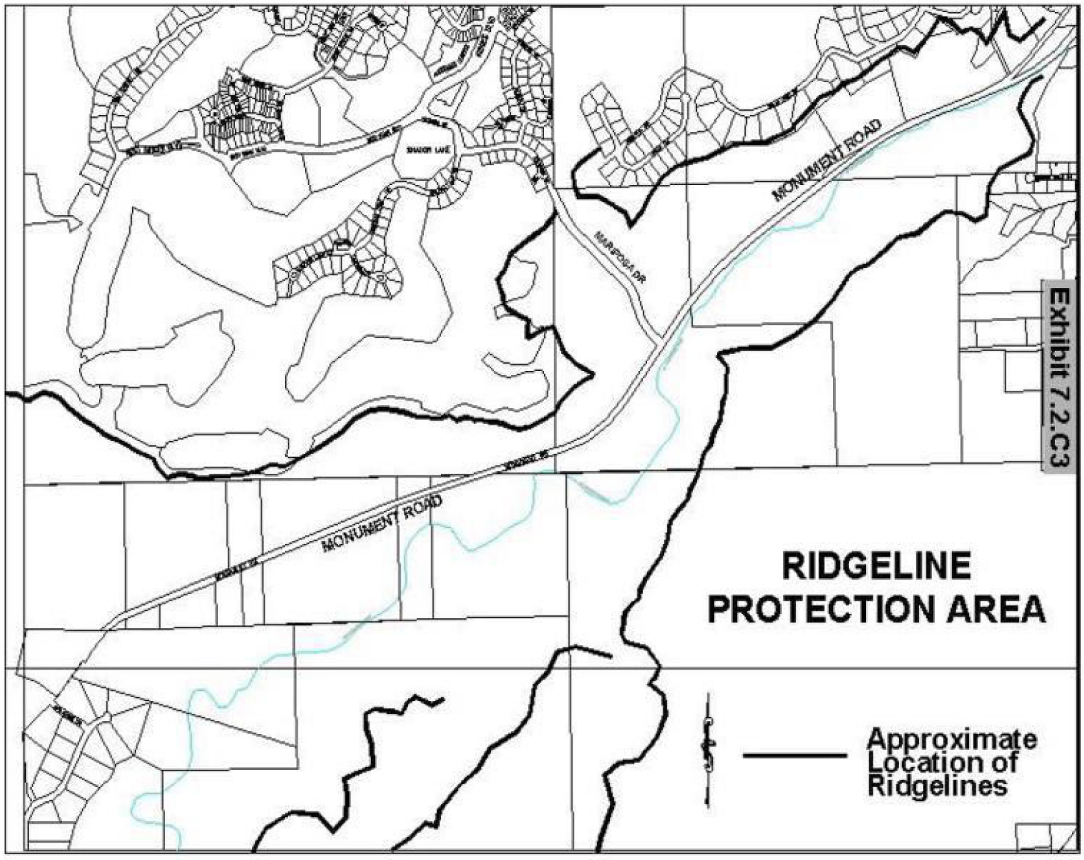


Exhibit 7.2.C2
RIDGELINE
PROTECTION AREA
Approximate
Location of
Ridgelines
Monument Road
N

Exhibit 7.2.C3



(h) Natural Resources.

(1) Natural resources, especially mineral resources, shall be protected. In the event that development is proposed in an area of known mineral deposits, the applicant shall provide an estimate of the economic value of the on-site mineral resources.

(2) This estimate shall be prepared by a registered engineer and submitted prior to approval of development.

(3) The City Council shall make an evaluation of the value of both the resource and the cost of extraction prior to development of the property. The City Council may delay development approval until extraction has been accomplished or protection provided within the design of the development.

(i) Geologic Hazard Maps.

(1) The Colorado Geological Survey (CGS) has identified geologic hazard areas. The CGS maps, together with explanatory text, references and supporting and supplemental studies, results and findings delineating the boundaries of geologic hazard areas are incorporated into this Code by reference.

(2) The CGS maps approximate the boundaries of hazard areas. The maps shall primarily provide notice to the Director, Planning Commission, City Council, and the applicant,

that geologic hazards may exist and if so require consideration prior to and if approved, during development. Precise boundaries and determination of hazard require on-site evaluation by qualified professionals. The Director may require a detailed engineering analysis, study and/or report if a hazard is known or reasonably believed to exist. The engineering analysis, study and/or report, if required, may, as determined by the Director, be required to include a map of the extent of the hazard, a definition of its degree of severity, a determination of the frequency of occurrence/reoccurrence, an evaluation of the compatibility of the proposed land use and consideration of the means and methods of hazard mitigation.

(3) Hazard mitigation is not intended to categorically preempt development but development may occur only if mitigation is appropriate and proportionate to the severity and frequency of the hazard.

(4) Mitigation techniques, which may be acceptable, are:

(i) Avoidance of the hazard area;

(ii) Retaining walls, fill, rock bolting, pilings;

(iii) Diversion, channeling, damming, barriers;

(iv) Excavation of unstable areas, bridging of weak zones, proper distribution of loading;

(v) Improvement of surface and subsurface drainage.

(5) Mitigation plans shall be prepared and stamped by a Colorado registered, professional engineer.

(j) Environmental Audit.A Phase I environmental audit shall be required for any property dedicated or deeded to the City. The City may require additional investigation.

(Ord. 5190, 12/20/2023)

§ 21.06.020. Flood damage protection.

(a) Purpose.Flood damage prevention regulations promote the public health, safety and general welfare and minimize public and private losses due to flooding. The regulations are designed to:

(1) Protect human life and health;

(2) Minimize expenditure of public money for costly flood control projects;

(3) Minimize the need for rescue and relief efforts associated with flooding;

(4) Minimize prolonged business interruptions;

(5) Minimize damage to critical facilities, infrastructure and other public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges;

(6) Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;

(7) Ensure that potential buyers are notified that property is in an area of special flood hazard; and

(8) Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

(b) Methods and Provisions for Flood Damage Prevention.In order to accomplish its purposes, this section includes methods and provisions for:

(1) Restricting or prohibiting uses which are dangerous to health, safety and property because of water or erosion hazard;

(2) Restricting or prohibiting uses which result in damaging increases in erosion or in flood heights or velocities;

(3) Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

(4) Controlling the alteration of natural floodplains, stream channels and natural protective barriers which help accommodate or channel flood waters;

(5) Controlling filling, grading, dredging and other practices which may increase flood damage; and

(6) Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

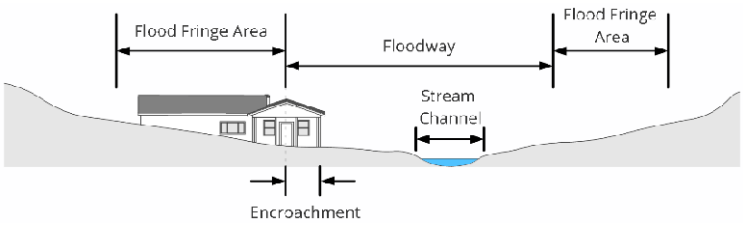


Figure 06.02-1 Areas of Special Flood Hazard

(c) General Provisions.This section applies to all areas of special flood hazard and areas removed from the floodplain by the issuance of a Federal Emergency Management Agency (FEMA) Letter of Map Revision Based on Fill (LOMR-F) within the City.

(1) Basis for Establishing the Areas of Special Flood Hazard. FEMA has identified areas of special flood hazard in a scientific and engineering report entitled, "The Flood Insurance Study for Mesa County and Incorporated Areas," dated October 16, 2012. The study together with the Flood Insurance Rate Maps (FIRMs) are hereby adopted by reference and declared to be a part of this Code. The FIRMs may be superseded by local engineering studies approved by the Director, provided such studies fully describe and analyze, based on the FIRMs and generally accepted engineering practice, design floodwater build-out conditions.

(2) Compliance.No structure shall be constructed, located, extended, converted, or altered without full compliance with the terms of this section and other applicable regulations. No land shall be developed without full compliance with the terms of this

section and other applicable regulations. For waterways with base flood elevations (BFEs) for which a regulatory floodway has not been designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the City's FIRMs, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one-half foot at any point within the City. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the NFIP regulations, the City may approve certain development in Zones A1-30, AE, AH, on the City's FIRM which increases the water surface elevation of the base flood by more than one-half foot; provided, that a conditional FIRM revision through FEMA (Conditional Letter of Map Revision), fulfills the requirements for such revisions as established under the provisions of Section 65.12 and receives FEMA approval.

(3) Relationship to Existing Restrictions.This section does not and it is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. If this section and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions on use and development shall prevail and be applied.

(4) Terms and Provisions.All terms and provisions of this section shall be:

(i) Considered as minimum requirements;

(ii) Liberally construed in favor of the City; and

(iii) Deemed neither to limit nor repeal any other powers granted or reasonably construed or interpreted under law, charter, rule or regulation.

(5) Warning and Disclaimer of Liability.The degree of flood protection required by this section is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur. Flood heights may be increased because of manmade or natural causes. This section does not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding or flood damages. This section shall not create liability on the part of the City, or any officer or employee thereof, or FEMA for any flood damage that results from reliance on this section or any administrative decision lawfully made hereunder.

(6) Flood Carrying Capacity.The flood carrying capacity within an altered or relocated portion of any watercourse shall be maintained.

(7) Records.The Director shall maintain records obtained as part of a Floodplain Development Permit, including but not limited to the lowest floor and floodproofing elevations for new and substantially improved construction.

(8) Riverine.In riverine situations, notice shall be given by the Director to an adjacent community(ies) prior to any alteration or relocation of a watercourse.

(d) Provisions for Flood Hazard Reduction.

(1) General Standards.The following standards shall apply to all property located in special flood hazard areas:

(i) Anchoring.

(A) All new construction and substantial improvement shall be anchored to prevent flotation, collapse, or lateral movement of the structure and as anchored must be capable of resisting the hydrostatic and hydrodynamic loads.

(B) All manufactured homes shall be elevated and anchored to resist flotation, collapse, or lateral movement and as anchored is capable of resisting the hydrostatic and hydrodynamic loads. Methods of anchoring may include, but are not limited to, over the top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces. Specific requirements may be:

a. Over the top ties provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with manufactured homes less than 50 feet long requiring one additional tie per side;

b. Frame ties provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than 50 feet long requiring four additional ties per side;

c. Each component of the anchoring system shall be capable of carrying a force of 4,800 pounds; and

d. Any addition to the manufactured home shall be similarly anchored.

(ii) Construction Materials and Methods.

(A) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

(B) All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.

(C) All new construction and substantial improvements shall be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during flooding.

(iii) Utilities.

(A) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system;

(B) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharge from the systems into floodwaters; and

(C) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

(iv) Subdivision Proposals.

(A) All subdivision proposals shall be consistent with the need to minimize flood damage;

(B) All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage;

(C) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and

(D) BFE data shall be provided for subdivision proposals and other proposed development which contain at least 50 lots or five acres (whichever is less).

(2) Specific Standards.The following provisions, as determined from BFE data, are required for all special flood hazard areas:

(i) New Construction and Substantial Improvements.

(A) New construction and substantial improvement of any residential structure shall have the lowest floor (including basement) elevated at least one foot above the BFE.

(B) New construction and substantial improvement of any commercial, industrial, or other nonresidential structure shall either have the lowest floor (including basement) elevated at least one foot above the level of the BFE; or, together with attendant utility and sanitary facilities, shall:

a. Be flood-proofed so that below the BFE the structure is watertight with walls being substantially impermeable to the passage of water;

b. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and

c. Be certified by a Colorado registered professional engineer. The certification shall state that the design and methods of construction are in accordance with accepted standards of practice and meet the minimum provisions of this Code. Such certifications shall be provided to and reviewed by the Director.

(ii) Openings in Enclosures Below the Lowest Floor. For all new construction and substantial improvements, fully enclosed areas below the lowest floor that are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement shall be certified by either a Colorado registered professional engineer or architect and must meet or exceed the following minimum criteria:

(A) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided;

(B) The bottom of all openings shall be no higher than one foot above grade;

(C) Openings may be equipped with screens, louvers, or other coverings or devices; provided that they permit the automatic entry and exit of floodwaters.

(iii) Manufactured Homes.

(A) All manufactured homes that are placed and/or substantially improved on a site:

a. Outside of a manufactured home subdivision;

b. In a new manufactured home park or manufactured home subdivision;

c. In an expansion to an existing manufactured home park or manufactured home subdivision; or

d. On an existing manufactured home park or manufactured home subdivision on which a manufactured home has incurred substantial damage as a result of a flood;

(B) Shall be anchored and elevated on a permanent foundation such that the lowest floor of the manufactured home is at least one foot above the BFE;

(C) The manufactured home shall be securely anchored to an anchored foundation system in order to resist flotation, collapse, and lateral movement; and

(D) Manufactured homes that are placed or substantially improved on sites in existing manufactured home parks or manufactured home subdivisions that are not subject to the provisions of this subsection shall be elevated so that either:

a. The lowest floor of the manufactured home is at least one foot above the BFE; or

b. The manufactured home frame or chassis is supported by reinforced piers or other foundation elements that are no less than 36 inches in height above grade and securely anchored to an anchored foundation system in order to resist flotation, collapse, and lateral movement.

(iv) Recreational Vehicles.Recreational vehicles occupied as a temporary dwelling in a special flood hazard area shall meet all of the following requirements or meet permit requirements, elevation, and anchoring requirements for manufactured homes:

(A) Be on the site for fewer than 180 consecutive days;

(B) Be fully licensed and ready for highway use;

(C) Be attached to the site only by quick disconnect type utilities and security devices; and

(D) Include no permanently attached additions.

(3) Specific Standards for Areas of Shallow Flooding.Specific standards are required for special flood hazard areas associated with base flood depths of one to three feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow; therefore, the following provisions apply:

(i) Residential Construction.All new construction and substantial improvements of residential structures must have the lowest floor (including basement) elevated above the highest adjacent grade at least one foot above the depth number specified in feet on the City's FIRM (at least three feet if no depth number is specified). Upon completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered Colorado professional engineer.

(ii) Nonresidential Construction.

(A) With the exception of critical facilities, all new construction and substantial improvements of nonresidential structures must have the lowest floor (including basement) elevated above the highest adjacent grade at least one foot above the depth number specified in feet on the City's FIRM (at least three feet if no depth number is specified), or together with attendant utility and sanitary facilities be designed so that the structure is watertight to at least one foot above the base flood level with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy. A registered Colorado professional engineer or architect shall submit a certification which shall state that the design and methods of construction are in accordance with accepted standards of practice and meet the minimum provisions of this Code.

(B) Within Zones AH or AO, adequate drainage paths around structures on slopes are required to guide floodwaters around and away from proposed structures.

(4) Specific Standards for Floodways.A floodway is an area within a special flood hazard area. The floodway is extremely hazardous due to the velocity of floodwaters, debris, and erosion potential. To mitigate those hazards the following provisions apply:

(i) Encroachments, including fill, new construction, substantial improvements, and other development are prohibited unless a Colorado registered professional engineer certifies in writing with a no-rise certificate that encroachments will not result in any increase in flood levels during the occurrence of the base flood discharge. The supporting technical date for the no-rise certificate shall be based on the standard step-backwater computer model used to develop the 100-year floodway shown on the FIRM or Flood Boundary and Floodway Map (FBFM), unless otherwise approved by the Director.

(ii) All new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of this section.

(5) Specific Standards for Alteration of a Watercourse.For all proposed developments that alter a watercourse within a special flood hazard area, the following standards apply:

(i) Channelization and flow diversion projects shall appropriately consider issues of sediment transport, erosion, deposition, and channel migration and properly mitigate potential problems through the project as well as upstream and downstream of any improvement activity. A detailed analysis of sediment transport and overall channel stability should be considered, when appropriate, to assist in determining the most appropriate design.

(ii) Channelization and flow diversion projects shall evaluate the residual 100-year floodplain.

(iii) Any channelization or other stream alteration activity proposed by a project proponent must be evaluated for its impact on the regulatory floodplain and be in compliance with all applicable federal, state and local floodplain rules, regulations and ordinances.

(iv) Any stream alteration activity shall be designed and sealed by a registered Colorado professional engineer or certified professional hydrologist.

(v) All activities within the regulatory floodplain shall meet all applicable federal, state, and City floodplain requirements and regulations.

(vi) Within the regulatory floodway, stream alteration activities shall not be constructed unless the project proponent demonstrates through a floodway analysis and report, sealed by a registered Colorado professional engineer, that there is not more than a 0.00-foot rise in the proposed conditions compared to existing conditions floodway resulting from the project, otherwise known as a no-rise certification.

(vii) Maintenance shall be required for any altered or relocated portions of watercourses so that the flood-carrying capacity is not diminished.

(6) Specific Standards for Properties Removed From the Floodplain by Fill.A Floodplain Development Permit shall not be issued for the construction of a new structure or addition to an existing structure on a property removed from the floodplain by the issuance of a FEMA Letter of Map Revision Based on Fill (LOMR-F), with a lowest floor elevation placed below the base flood elevation with one foot of freeboard that existed prior to the placement of fill.

(7) Specific Standards for Critical Facilities.A critical facility is a structure or related infrastructure, but not the land on which it is situated, as classified below, that if flooded may result in significant hazards to public health and safety or interrupt essential services and operations for the City at any time before, during and after a flood.

(i) Classification of Critical Facilities.Critical facilities are classified under the following categories: a) essential services; b) hazardous materials; c) at-risk populations; and d) vital to restoring normal services.

(A) Essential services facilities include public safety, emergency response,

emergency medical, designated emergency shelters, communications, public utility plant facilities, and transportation lifelines.

a. These facilities consist of:

1. Public safety (police stations, fire and rescue stations, emergency vehicle and equipment storage, and emergency operation centers);

2. Emergency medical (hospitals, ambulance service centers, urgent care centers having emergency treatment functions, and non-ambulatory surgical structures but excluding clinics, medical offices, and nonurgent care medical structures that do not provide these functions);

3. Designated emergency shelters;

4. Communications (main hubs for telephone, broadcasting equipment for cable systems, satellite dish systems, cellular systems, television, radio, and other emergency warning systems, but excluding towers, poles, lines, cables, and conduits);

5. Public utility plant facilities for generation and distribution (hubs, treatment plants, substations, and pumping stations for water, power, and gas, but not including towers, poles, power lines, buried pipelines, transmission lines, distribution lines, and service lines); and

6. Air transportation lifelines [airports (municipal and larger)], helicopter pads and structures serving emergency functions, and associated infrastructure (aviation control towers, air traffic control centers, and emergency equipment aircraft hangars).

b. Specific exemptions to this category include wastewater treatment plants (WWTP), non-potable water treatment and distribution systems, and hydroelectric power generating plants and related appurtenances.

c. Public utility plant facilities may be exempted if it is demonstrated to the satisfaction of the Director that the facility is an element of a redundant system for which service will not be interrupted during a flood. At a minimum, it shall be demonstrated that redundant facilities are available (either owned by the same utility or available through an intergovernmental agreement or other contract) and connected, the alternative facilities are either located outside of the 100-year floodplain or are otherwise compliant with all floodplain regulations, and an operations plan is in effect that states how redundant systems will provide service to the affected area in the event of a flood. A development approval includes the condition that evidence of ongoing redundancy be provided to the Director upon the Director's request.

(B) Hazardous materials facilities include facilities that produce or store highly volatile, flammable, explosive, toxic and/or water-reactive materials.

These facilities include:

a. Chemical and pharmaceutical plants (chemical plant, pharmaceutical manufacturing);

b. Laboratories containing highly volatile, flammable, explosive, toxic and/or water-reactive materials;

c. Refineries;

d. Hazardous waste storage and disposal sites; and

e. Above ground gasoline or propane storage or sales centers.

(C) At-risk population facilities include medical care, congregate care, and schools. These facilities consist of:

a. Elder care (nursing homes);

b. Congregate care serving 12 or more individuals (day care and assisted living);

c. Public and private schools (pre-schools, K-12 schools, before-school, and after-school care serving 12 or more children);

(D) Facilities vital to restoring normal services including government operations.

a. These facilities consist of:

1. Essential government operations (public records, courts, jails, building permitting and inspection services, community administration and management, maintenance, and equipment centers);

2. Essential structures for public colleges and universities (dormitories, offices, and classrooms only).

b. These facilities may be exempted if it is demonstrated to the Director that the facility is an element of a redundant system for which service will not be interrupted during a flood. At a minimum, it shall be demonstrated that redundant facilities are available (either owned by the same entity or available through an intergovernmental agreement or other contract), the alternative facilities are either located outside of the 100-year floodplain or are otherwise compliant with all floodplain regulations and an operations plan is in effect that states how redundant facilities will provide service to the affected area in the event of a flood. Evidence of ongoing redundancy shall be provided to the Director on an as-needed basis as determined by the Director upon request.

(ii) Protection for Critical Facilities.All new and substantially improved critical facilities and new additions to critical facilities located within the special flood hazard area shall be regulated to a higher standard than structures not determined to be critical facilities. For the purposes of critical facilities, protection shall include one of the following:

(A) Location outside the special flood hazard area; or

(B) Elevation or floodproofing of the structure to at least two feet above the BFE.

(iii) Ingress and Egress for New Critical Facilities. New critical facilities shall, when practicable as determined by the Director, have continuous non inundated access (ingress and egress for evacuation and emergency services) during a 100-year flood event.

(e) Data, Information, and Interpretation.

(1) The Director shall obtain and maintain the following information:

(i) The actual elevation, relative to mean sea level, of the lowest floor, including basement, of each structure;

(ii) For each new or substantially improved floodproofed structure, the actual elevation, relative to mean sea level, to which the structure has been floodproofed and the required floodproofing certifications;

(iii) Proof that an applicant has, prior to altering or relocating any watercourse or part thereof, notified adjacent communities and the Colorado Water Conservation Board of such alteration and demonstrated that there is adequate maintenance within the altered or relocated portion of the watercourse so that the flood-carrying capacity is not diminished. The Director shall also submit evidence of such notification to the Federal Emergency Management Agency.

(2) The Director shall interpret the Flood Insurance Rate Maps (FIRM) to decide location of the boundaries of the areas of special flood hazard.

(Ord. 5190, 12/20/2023)

Chapter 21.07
LANDSCAPING, BUFFERING, AND SCREENING

§ 21.07.010. Purpose and goals.

The purpose of this section is to enhance the aesthetic appeal of new development. Landscaping reduces heat and glare, facilitates movement of traffic within parking areas, shades cars and parking surfaces reducing local and ambient temperatures, buffers, and screens cars from adjacent properties, promotes natural percolation of surface waters, improves air quality, buffers, and screens potentially incompatible uses from one another, and conserves the value of property and neighborhoods within the City.
(Ord. 5190, 12/20/2023)

§ 21.07.020. Authority.

(a) The Director shall decide all questions of soils, plant selection and care, irrigation installation and other vegetation and landscaping questions, except for trees, shrubs, vines, and evergreens in the right-of-way. The City Forester shall decide all questions of plantings in the right-of-way.

(b) Variances to this section and appeals of administrative decisions (where this Code gives the Director discretionary authority) shall be referred to the Planning Commission.
(Ord. 5190, 12/20/2023)

§ 21.07.030. General landscape standards.

(a) Compliance.

(1) All landscaping required by this Code shall comply with the standards and requirements of this section.

(2) The landscaping requirements of this Code shall not apply to a lot zoned for one or two dwelling units.

(3) Landscaping for new developments shall occur in buffer areas, all interior parking areas, along the perimeter of the property, around new and existing structures, and along street frontages and within any right-of-way not used nor planned to be used for infrastructure.

(b) Plant Quantities.

(1) The amount of landscaping is based on gross area of proposed development.

(2) When calculating quantities, any fraction is rounded up to the next whole number.

(c) Acceptable Plant Material.

(1) Suitable Plant List.

(i) Vegetation must be suitable for Grand Junction's climate and soils and shall be selected from the City of Grand Junction Suitable Plant List. To be maintained by the Director. Applicants may petition the inclusion of plants not found on the Suitable Plant List and shall provide sufficient information about the proposed

species to facilitate review. The Suitable Plant List identifies the anticipated water needs of each plant species. The Director may allow the use of any plant if sufficient information is provided to show suitability including salt tolerance, sun and shade requirements based on planting locations, growth habitat, etc. Noxious or invasive species are not allowed to be planted in development but may be preserved in development.

(ii) The Director maintains the authority not to approve a plant species that appears on the Suitable Plant List if the Director deems it inappropriate under the planting conditions proposed in a development.

(iii) A minimum 25% of the proposed shrubs and ground cover shall be identified as native or native alternative on the Suitable Plants List.

(iv) A minimum 90% of the proposed shrubs and ground cover shall be identified as xeric, xeric-low, xeric-medium, or low water on the Suitable Plants List.

(v) A minimum of 50% of proposed tree plantings shall have a preferred New Planting status on the Suitable Plants List.

(vi) No more than 15% of the proposed trees shall have a limited status on the Suitable Plants List.

(2) Plant materials shall meet or exceed the plant quality and species standards of the current American Standard for Nursery Stock and be consistent with the Colorado Nursery Act.

(3) All plants proposed for installation shall be selected, spaced, and planted appropriately based upon their adaptability to the climatic, geologic. And topographical conditions of the project site.

(4) Turf not meeting the definition of functional turf shall not exceed 15% of any required landscaping area in the City of Grand Junction. Functional turf may exceed the 15% maximum.

(d) Minimum Plant Sizes.All plants shall meet the following minimum plant sizes when installed.

Table 21.07-1: Minimum Plant Sizes

Planting Type	Size at Time of Planting
Shade tree	Two caliper inches [1]
Ornamental tree	One-and-one-half caliper inches
Evergreen tree	Two caliper inches and six feet tall
Shrub	#5 Container
Perennial	#1 Container
Groundcover	#1 Container
Turf [2]	As seed, by plug, or as sod roll

Notes:

[1] If two caliper inch shade trees are not available due to seasonal shortages or shortages in desired varieties, the Director may approve the installation of smaller trees, provided the proportional difference in caliper inches is compensated for by installing additional trees. However, a minimum caliper of 1 1/2 inches shall be required.

[2] Turf mix, native grasses and wild flower mix are the only vegetation that may be planted as seed or by plugs. Turf may be planted as sod rolls.

(e) Plant Diversity.

(1) Tree Diversity.The percent of any one type of tree that can be planted in a development shall be as follows:

(i) Zero through five trees: No limitation.

(ii) Six to ten trees: No more than 50% of one genus.

(iii) Eleven to twenty trees: No more than 33% of one genus.

(iv) Twenty-one or more trees: No more than 20% of one genus.

(2) Shrub Diversity.The percent of any one type of shrub that can be planted in a development shall be as follows:

(i) 10 through 19 shrubs: 50% per genus.

(ii) 20 through 39 shrubs: 33% per genus.

(iii) 40 or more shrubs: 25% per genus.

(f) Trees.

(1) Tree canopies may overlap by up to 30% of the diameter of the tree at maturity. Tree clustering may be allowed with some species so long as clustering does not adversely affect the mature canopy.

(2) Trees which will grow to a height of greater than 25 feet at maturity shall not be planted under overhead electrical lines.

(3) Ornamental trees shall be planted in a landscape strip that is no less than six feet in width (not including curb and gutter).

(4) Shade trees shall be planted in a landscape strip that is no less than eight feet in width (not including curb and gutter).

(5) Trees shall not be planted near a light pole if eclipsing of light will occur at maturity. Placing light poles in the parking lot, away from landscape areas and between parking bays, helps eliminate this conflict and should be considered.

(g) Landscaping Requirements.

Table 21.07-2: Landscaping Requirements	
Development Procedure and Zoning or Use of Proposed Development	**Landscape Requirement**
Major Subdivision	As required in subsections of this section where applicable
Major Site Plan: R-R, R-ER, R-1R, R-2R, RL-4, RL-5, RM-8, RM-12, RH-16, RH-24, MU-1, MU-2, MU-3, CG, I-OR, P-1, P-2	Two caliper inches of tree per 3,000 square feet of improved area, with no more than 40% of the total being ornamental trees or evergreens. One #5 container shrub per 450 square feet of improved area
Major Site Plan: I-1, I-2	As required in subsections of this section where applicable
Facilities: Mining and extraction, dairy operations or feedlot, vineyard, airport or heliport, commercial pasture	Two caliper inches of tree per 5,000 square feet of improved area. One #5 container shrub per 600 square feet of improved area

(h) Irrigation.All vegetation and landscaped areas must be provided with a permanent irrigation system, which may include a system supplied by water from an approved graywater treatment works.

(1) An underground pressurized irrigation system and/or drip system is required for all landscape areas.

(2) Non-potable irrigation water shall be used if available for the proposed development area.

(3) All irrigation for non-potable irrigation water systems must have adequate filters easily accessible above ground or within an appropriately sized valve box.

(4) If connected to a potable water system, all irrigation systems require state-approved backflow prevention devices.

(5) Native grasses must have a permanent irrigation source that is zoned separately from higher water demand landscapes. Once the grasses are established, irrigation to native grass areas can be reduced to a level that maintains coverage typical of the grass mix and to suppress weed growth.

(6) Irrigation applied to trees shall be expanded or supplemented as appropriate to rootzone expansion over the life of the tree.

(i) Landscape Plans.

(1) All applications for development shall identify the required landscaped areas and include a landscape plan in accordance with the requirements in this section.

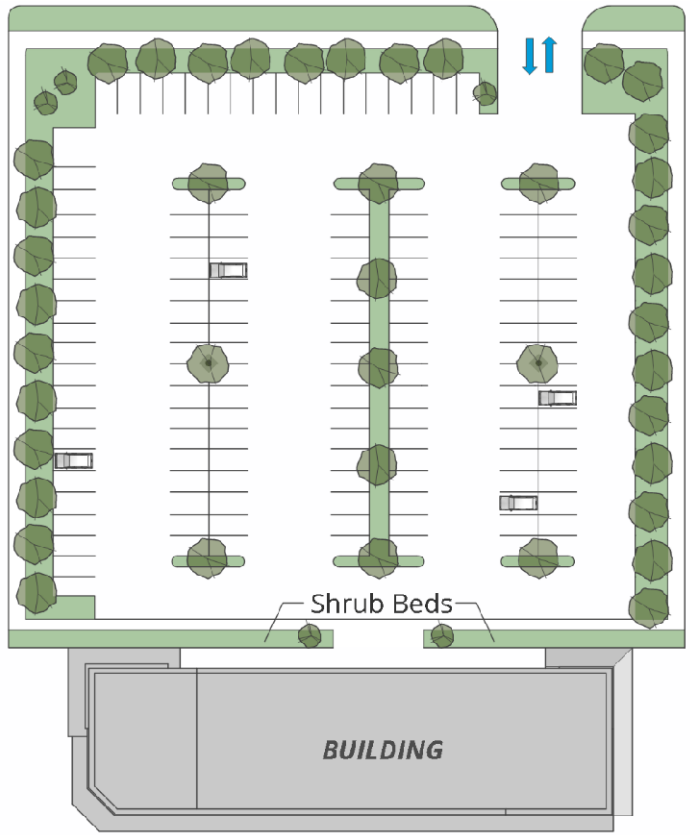


Figure 07.03-1 Landscape Plan Example

(2) Landscape plans shall identify all attributes of vegetation included on the Suitable Plants List.

(3) Landscape plans shall include calculations of required landscaping, provided landscaping, and compliance with Acceptable Plant Material and Minimum Plant Sizes as identified in this section.

(4) Tree protection measures shall be clearly identified on the construction and landscape plans.

(5) Wall and fence elevations and typical cross sections must be submitted with the landscape plan at a minimum scale of one-half inch equals one foot.

(6) Landscape plans shall be stamped by a landscape architect licensed in the State of Colorado. Inspection and compliance with approved landscape plan must be certified by a licensed landscape architect prior to issuance of a certificate of occupancy, or the release of DIA security funds.

(i) A licensed landscape architect is not required to produce landscape plans if the plans are submitted for a Minor Site Plan review unless required by state statute. All other requirements continue to apply to landscaping for Minor Site Plans.

(7) All landscape plans shall include an irrigation plan. Irrigation plans shall be certified by an irrigation design professional who has been certified through the Irrigation

Association (CID), or a similar EPA WaterSense labeled certification program.

(i) This certification will be required on all irrigation plans no later than three years after December 21, 2022. The irrigation plan shall also comply with the standards in the Submittal Standards for Improvements and Development (SSID) manual.

(8) Utility composite plans must be submitted with landscape plans.

(9) Expansion of a developed site as defined in GJMC § 21.02.050(f)(5)(i) that requires a Site Plan Review shall require a landscaping plan and correction of nonconforming landscaping as provided in GJMC § 21.12.040.

(10) An equivalent species may be substituted in the field without prior written approval of the Director. Plants are "equivalent" if they have the same growth habit and rate, same cover, leafing, shade characteristics and function, have similar water requirements as identified as the City of Grand Junction Suitable Plants List, and thrive in the same microclimate, soils, and water conditions.

(i) All other changes to the landscape plan require prior written approval from the Director.

(j) Protection of Landscape Areas.All landscape areas (except in the right-of-way where a street side curb does not exist) shall be protected from vehicles through the use of concrete curbing, large rocks, or other similar obstructions.

(k) Utility Lines.If the location of utilities conflicts with the landscaping provisions, the Director may approve an equivalent alternative.

(l) Sight Distance.The owner shall maintain all vegetation, fences, walls, and berms so that there is no sight distance hazard nor road or pedestrian hazard. See TEDS (GJMC Title 29).

(m) Soil and Planting Beds.Soil in landscape areas must be amended and all vegetation planted in accordance with good horticultural practices.

(1) Details for the planting of trees, shrubs and other vegetation must be shown on the landscaping plans.

(2) Shrub beds adjacent to turf or native grass areas are to be edged with concrete, metal, brick, or substantial wood material. Plastic and other light duty edgings are not allowed.

(3) Organic mulch to a minimum of three inches is required for all shrub beds.

(4) Prior to planting, compacted soils shall be transformed to a friable condition.

(5) Compost, soil amendments, or retained topsoil shall be incorporated into the soil to a

(n) Planting Standards.

(1) All landscaping shall be installed, maintained, and protected as shown on the approved plan.

(2) The minimum area for planting an evergreen or deciduous shrub is 16 square feet.

(3) Trees.

(i) The minimum square footage of planting area for a shade tree is 140 square feet.

(ii) Weed fabric shall not be used within eight feet of the base of a tree.

(iii) At planting, tree shall be healthy and free of disease. Tree trunks must be reasonably straight with minimal doglegs. Roots shall be checked prior to planting and corrected for optimal growth patterns.

(iv) Wire baskets, burlap wrappings, rope, twine, or any similar shipping materials shall be removed before planting.

(v) Tree planting holes shall be of sufficient depth so that the flare of the tree above the root ball is no higher than one inch above grade.

(vi) Tree planting holes shall be of a diameter no less than three times the diameter of the tree's root ball at time of planting.

(o) Maintenance.

(1) The owners, tenants, and occupants, including homeowners' associations, for all new and existing uses in the City must maintain landscaping in a healthy, growing, neat and well-maintained condition:

(i) Maintenance includes watering, weeding, pruning, fertilization, pest control, trash and litter removal, replacement of dead or diseased plant material, reseeding, and other reasonable efforts.

(ii) Any plant that dies or is substantially damaged due to improper maintenance must be replaced with an equivalent live plant within 90 days of plant death or by the next April 1.

(2) Hay mulch used during the preparation or establishment of landscaping must be certified weed-free by the Colorado Department of Agriculture.

(3) The Director may from time to time inspect the condition of landscaping wherever no reasonable expectation of privacy exists.

(i) The purpose of such site inspections shall be to verify that all required landscaping has been maintained in a healthy, growing, neat and well-maintained condition. Property owners shall be notified of necessary corrective action for failure to comply with the maintenance provisions of this section.

(4) Maintenance of landscaping in unimproved rights-of-way shall be the responsibilities of owners, occupants, and tenants.

(5) Fire hydrants shall not be unobscured by plant material. Fire hydrants shall be visible from the center of the right-of-way at an angle of 45°.

(6) These requirements shall be specified in the articles of incorporation or bylaws for a homeowners' association whenever the homeowners' association is assigned the responsibility of maintaining landscape areas.

(Ord. 5190, 12/20/2023)

§ 21.07.040. Preservation of significant trees.

(a) This section applies to the following:

(1) New residential, mixed-use, and commercial development;

(2) Redevelopment as follows:

(i) Preservation is required for all lots in MU-3.

(ii) Preservation is required for lots larger than one acre in all other zone districts unless otherwise exempt.

(3) All development in Industrial zone districts is exempt from this section.

(b) Existing landscape features such as escarpments, large trees or stands, heavy vegetative cover, ponds, and bluffs shall be identified by the applicant as part of the development review process.

(1) This identification shall include a surveyed inventory of significant trees. Prior to undertaking a survey, an applicant may have a landscape professional view the site and determine whether there are any potential significant trees on the site. If there are no potentially significant trees on the site, the applicant may request the Director waive the survey requirement.

(2) Any significant tree to be preserved during development shall be identified on the proposed landscaping plan.

(c) All trees, except those identified as 'excluded' on the Suitable Plants List, that meet all of the following criteria as determined by a certified arborist shall be considered significant:

(1) Are 15 inches or larger in DBH;

(2) Are in fair or better condition;

(3) Are free from irreparable structural defects; and

(4) Are not infested with a disease or pestilence that threatens the good health of other trees.

(d) Preservation Required.

(1) Where significant trees exist on a property, at least one and no less than 30% of significant trees shall be preserved during development.

(i) Significant trees may be preserved in individual lots or private common areas.

(ii) Significant trees may also be preserved in land dedicated for public use while still credited to the site tree preservation requirement. Where the value of the land dedication does not meet the minimum assessment requirement of GJMC § 21.05.030(a), the valuation of the significant tree shall not be considered separately from or added to the assessment total.

(iii) The developer may request review by the City Forester to determine if well-established. healthy trees under 15 inches in diameter may be approved for

credit towards preservation at an equivalent DBH.

(2) If the 30% minimum preservation requirement impedes the proposed Primary Development of a site, then the Director may grant a 10% adjustment of the minimum setbacks, lot size, parking lot interior landscaping, and parking count requirements, or allow the use of cluster development.

(3) Furthermore, the City Forester may adjust the drip line protection standards described in Subsection (d)(6)(i) of this section so to allow for additional flexibility for the development to occur around the identified significant trees.

(4) If the provisions in Subsections (d)(2) and (3) do not provide a viable means of development the site with the preservation of the minimum required significant trees then, at the developer's discretion, the developer may remove significant trees present on the site. Tree replacement shall be required for all significant trees removed on a property at the following ratios:

Table 21.07-3: Tree Replacement Requirements

Percent of Trees Preserved	Tree Replacement Ratio
Minimum 30% preservation	3 caliper inches per 5 inches DBH [1]
Above 30% minimum	1 caliper inch per 3 inches DBH [2]
Significant trees damaged or killed during construction	3 caliper inches per 5 inches DBH [1]

Notes:

[1] If developer cannot replace trees on-site, they may pay a fee-in-lieu according to GJMC § 21.07.040(f).

[2] See GJMC § 21.07.040(d)(1)(ii) for credit applied to preserved trees.

(e) Replacement of Significant Trees.Replacement trees may be planted in individual lots and private common areas.

(f) Fee-In-Lieu.The fee in-lieu shall be based on the value of the required replacement tree(s) not planted on site, along with the total cost of installation. The City shall use this payment to purchase the required replacement trees not planted on-site and plant them on nearby public property.

(g) Features to be preserved shall be protected throughout site development. No person shall kill or damage a landscape feature required to be preserved by this section. The developer shall protect trees from compaction.

(1) During construction, existing plant material to be preserved shall be enclosed by a temporary fence at least five feet outside the canopy dripline. In no case shall vehicles be parked, or materials or equipment be stored or stockpiled within the enclosed area.

(2) Irrigation shall be provided to trees preserved during construction of sufficient quantity to ensure their health and survival.

(Ord. No. 5242, 12/4/2024; Ord. 5190, 12/20/2023)

§ 21.07.050. Parking lots.

The requirements of this subsection are applicable to all public and private parking areas, but not to park, lake, reservoir, or other open space uses, vehicle display areas for vehicle sales, rental and leasing light or heavy and mini-warehouse as defined in GJMC Chapter 21.04. Where a single row of less than 20 parking spaces abuts and backs into an alley, these requirements are not applicable.

(a) Interior Landscaping Requirement.Landscaping is required in the interior of parking lots to direct traffic, to shade cars and structures, to reduce heat and glare and to screen cars from adjacent properties. The interior of all parking lots shall be landscaped as follows:

(1) One landscape island, parallel to parking spaces, is required for each 20 parking spaces.

(2) A landscape island is required at the end of every row of parking spaces, regardless of length or number of spaces.

(3) One landscape divider island, parallel to the parking lot drive aisles, designed to prevent diagonal movement across the parking lot, shall be located for every three parking lot drive aisles.

(4) Landscape islands must be at least 140 square feet. The narrowest/smallest dimension of a parking lot island shall be eight feet, measured from back of curb to back of curb.

(5) A corner area (where it is not feasible to park a vehicle) may be considered an end island for the rows on the perimeter of the parking lot.

(6) Landscaping of the interior of a parking lot shall include trees and shrubs.

(7) Trees planted in parking lot islands shall be selected from those identified as Parking Lot Island Trees on the Plant List.

(8) To improve the management of stormwater runoff, structurally-sound permeable pavers may be used in parking areas, subject to the approval of the Director. Use of permeable pavers for 10 parking stalls shall result in a reduction of one required parking stall per the required parking ratios in GJMC Chapter 21.08.

(9) The use of bioswales in parking lot designs is encouraged to facilitate stormwater management.

(b) Parking Lot Perimeter.Landscaping is required around the entire perimeter of a parking lot to assist in the abatement of heat and to reduce the amount of glare from glass and metal, and to assist in the screening of cars from adjacent properties. The perimeter of a parking lot is defined as the curb line defining the outer boundaries of the parking lot, including dumpster enclosures, bike racks, or other support facilities that are adjacent to the outer curb. Entry drives between a parking lot and the street, drives connecting two internal parking lots or building entry plazas are not included in the perimeter area. The requirements of this subsection are applicable to all public and private parking areas but not to vehicle display areas for vehicle sales, rental, and leasing light or heavy and mini-warehouse as defined in GJMC Chapter 21.04.

(1) The minimum dimension allowed for the parking lot perimeter landscape strip is eight

feet.

(2) Landscaping along the perimeter of parking lots shall include trees and shrubs.

(3) Parking lots shared by more than one owner shall be landscaped around the perimeter of the combined lots.

(4) In the I-1 and I-2 zone districts, a minimum of 75% of the parking lot perimeter landscape shall be covered by plant material including tree canopy, shrubs, and groundcover at maturity.

(c) Screening.All parking lots abutting rights-of-way, entry drives, and adjacent properties must be screened. For this subsection, a "screen" means a berm with appropriate groundcover or shrubs.

(1) Screening shall not be required between parking lots on adjoining lots where the two lots are designed to function as one.

(2) A thirty-inch-high screen is required along 70% of parking lots abutting rights-of-way, entry drives, and adjacent properties, excluding curb cuts. The thirty-inch screen shall be placed so as to maximize screening of the cars in the parking lot, when viewed from the right-of-way and shall be measured from the ground surface, or the elevation of the roadway if the adjacent road is higher than the property.

(3) If a landscape area is 30 feet wide or greater between a parking lot and a right-of-way, the thirty-inch-high screen is not required. This thirty-foot-wide or greater area must be 75% covered in plant material including tree canopy coverage, shrubs, and groundcover at maturity.

(4) The Director may approve a screen wall between a parking lot and a right-of-way if the lot or parcel is unusually small. There must be at least five feet between the right-of-way and the paved part of a parking lot to use a wall as a screen.

(i) A screen wall must not be taller than 30 inches, unless the adjacent roadway is higher than the property, in which case the screen wall shall be 30 inches higher than the adjacent roadway.

(ii) The back of the wall must be at least 30 inches from the face of curb for bumper overhang.

(iii) Walls shall be solid masonry with finish on both sides. The finish may consist of stucco, brick, stone, or similar material. Unfinished or merely painted concrete block is not permitted.

(iv) Shrubs shall be planted on the street side of the wall.

(v) Shrub plantings in front of a wall are not required in the MU-3 district.

(d) Cul-de-Sac Parking Pods.

(1) Where a parking pod fits within a standard cul-de-sac, per current standards in TEDS (GJMC Title 29), no landscaping is required.

(2) If a cul-de-sac is elongated, or in an otherwise non-traditional shape, landscaping

islands shall be provided within the parking pod.

(3) Landscaping provided in parking pods shall meet the requirements of an interior landscape island.

(Ord. 5190, 12/20/2023)

§ 21.07.060. Street frontage landscape.

(a) For all development, except construction of one or two dwelling units or development within the MU-3 zone district, the owner shall provide and maintain a minimum fourteen-foot-wide street frontage landscape adjacent to the public right-of-way.

(1) Where detached walks are provided, a minimum street frontage landscape of five feet is acceptable.

(2) For a new residential subdivision, the street frontage landscape is only required on the perimeter of the subdivision adjacent to a right-of-way, not along new internal roadways.

(b) A minimum of 75% of the street frontage landscape shall be covered by plant material at maturity, including tree canopy, shrubs, and groundcover.

(c) Landscaping within the street frontage shall include trees and shrubs. If detached walks are not provided with street trees, street trees shall be provided in the street frontage landscape, including one tree for every 40 feet of street frontage.

(1) In the I-1 and I-2 zone districts, 70% of trees must be shade trees.

(Ord. 5190, 12/20/2023)

§ 21.07.070. Public right-of-way.

(a) All unimproved right-of-way adjacent on the side abutting a development which is not in the City's ten-year capital plan to be improved must be landscaped.

(b) For the purpose of meeting minimum plant quantities, 50% of landscaping plantings on public right-of-way shall be counted toward the landscape or open space requirements of this Code, unless specifically provided otherwise in this Code.

(1) At least 75% of the unpaved adjacent right-of-way shall be covered by plant material at maturity, including tree canopy, shrubs, and groundcover. No more than 15% of the right-of-way shall be landscaped with turf.

(2) The right-of-way landscaping between the curb and sidewalk shall contain street trees spaced every 40 feet. Right-of-way landscaping shall be a minimum of eight feet wide in any direction.

(3) Trees planted in the public right-of-way shall be of species identified on the list of Approved Street Trees for Grand Junction's Rights-of-Way.

(c) All right-of-way landscaping shall be irrigated and maintained by the adjoining private property owner unless the City agrees to accept it for maintenance. If it is to be maintained by the City, a separate irrigation system shall be provided.

(d) The owner of the nearest property shall keep all rights-of-way, which are not hard surfaced,

free of weeds, litter, junk, rubbish, and obstructions. To prevent weed growth, erosion and blowing dust, right-of-way areas not covered by vegetation or paving shall be covered with organic mulch, wood chips, or similar natural materials.

(e) No tree shall be removed from the public right-of-way without the approval of the City Forester. Trees removed from the right-of-way without approval shall be subject to penalties per GJMC § 9.04.100.

(Ord. 5190, 12/20/2023)

§ 21.07.080. Buffers.

(a) General.Buffers shall be provided between different zone districts as indicated in Table 21.07-4. Buffer landscaping is required in addition to overall site landscaping requirements as required by this Code.

(1) Seventy-five percent of each buffer area shall be covered by plant material at maturity including tree canopy, shrubs, and groundcover.

(2) One tree is required per every 40 linear feet of boundary between different zones.

(b) Exceptions.

(1) Where residential or collector streets or alleys separate zone districts, the Director can require more landscaping instead of a wall or fence.

(2) Where walkways, paths, or a body of water separates zone districts, the Director may waive a fence or wall requirement provided the buffering objectives are met by private yards.

(3) Where a railroad or other right-of-way separates zone districts, the Director may waive the buffer strip if the buffering objectives are met without them.

Table 21.07-4: Buffer Requirements

Zoning of Proposed Development [1] [2] [3]	Zoning of Adjacent Property											
	R-R, R-ER, R-1R, R-2R, RL-4	RL-5	RM-8	RM-12, RH-16	RH-24	MU-1	MU-2	MU-3	C-1	CG, I-OR	I-1	I-2
R-R, R-ER, R-1R, R-2R, RL-4	—	—	—	—	—	—	F	—	F	W	W	W
RL-5	—	—	—	—	—	—	F	—	F	W	W	W
RM-8	—	—	—	—	—	F	F	—	F	W	W	W
RM-12, RH-16	—	—	—	—	—	—	F	—	W	W	W	W
RH-24	—	—	—	—	—	—	F	—	W	W	W	W
MU-1	A or F	A or F	A or F	A or F	A or F	—	A or F	—	A or F	A and F or W	A and F or W	A and F or W
MU-2	A or F	A or F	A or F	A or F	A or F	A or F	—	—	A or F	A or F	A or F	A or F
MU-3	—	—	—	—	—	—	—	—	—	—	—	—
CG, I-OR	W	W	W	W	W	W	F	—	—	—	—	A or F
I-1	W	W	W	W	W	W	F	—	—	—	—	—
I-2	A and F or W	W	W	W	W	W	F	—	—	—	—	—
P-1, P-2 [4]	—	—	—	—	—	—	—	—	—	—	—	—

Notes:

[1] A berm with landscaping is an alternative for a required fence or wall if the total height is a minimum of six feet.

[2] Where alleys or streets separate different zone districts, the Director may approve increased landscaping rather than requiring a wall or fence.

[3] The Director may modify this table based on the uses proposed in any zone district.

[4]	Gravel operations subject to buffering adjacent to residential.

Table 21.07-5: Buffer Landscaping Requirements		
Buffer Types [1]	**Landscaping Requirements**	**Location of Buffers on Site**
Type A	Eight-foot-wide landscape strip with trees and shrubs	Between different uses
Type A and F	15-foot-wide landscape strip with trees and shrubs	Between different uses
Type F, W	Six-foot fence and wall (see Subsection (f) of this section)	Between different uses

Notes:

[1] Fences and walls are required for most buffers.

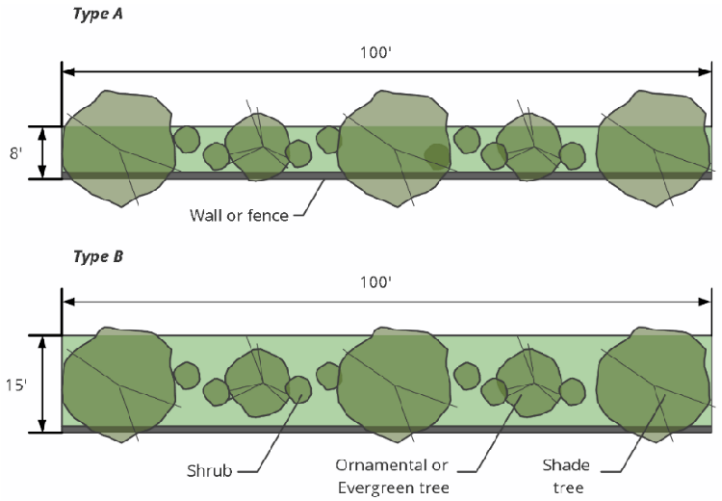


Figure 07.08-1 Buffer Requirements

(c) Fences and Walls.

(1) When a higher density or intensity zone district abuts a lower density or intensity zone district, it is the responsibility of the higher density or intensity property to buffer the abutting zone district according to Table 21.07-4.

(2) When an existing fence or wall substantially meets the requirements of this section, and Table 21.07-4 requires the same form of buffering, an additional fence on the adjacent developing property shall not be required.

(3) However, if the new development requires the placement of a wall, and a fence exists on the adjacent property, the wall shall be required.

(4) If a wall is required and a fence is in place, the wall must be placed adjacent to the fence. (Table 21.07-4 should be referenced to determine when a wall or a fence is required. The more stringent standard shall apply; i.e., if a wall is required and a fence is in place, the wall must be placed adjacent to the fence.)

(5) Fences must comply with GJMC § 21.05.090, any design guidelines and other conditions of approval. Fences and walls required by this section must meet the following:

(i) Fence type: solid wood or material with a similar appearance, finished on both sides.

(ii) Wall type: solid masonry finished on both sides. Finish may consist of stucco, brick, stone, or similar material but unfinished or merely painted concrete block is not permitted.

(iii) Location: within three feet of the property line unless the space is needed to meet landscaping requirements.

(iv) A wall must have a column or other significant architectural feature every 30 feet of length.

(d) Berms.Minimum requirements for berms are as follows:

(1) Maximum slope of 4:1 for turf areas and 3:1 for shrub beds; and

(2) To control erosion and dust, berm slopes must be stabilized with vegetation or by other means consistent with the requirements for the particular landscape area.

(Ord. 5190, 12/20/2023)

§ 21.07.090. Residential subdivision perimeter enclosures.

(a) Intent.The Director may require perimeter enclosures (fences and/or walls) around all or part of the perimeter of a residential development. Perimeter enclosures shall be designed to meet the following objectives of protecting public health, safety, and welfare: screen negative impacts of adjoining land uses, including streets; protect privacy; maintain a consistent or complementary appearance with enclosures in the vicinity; maintain consistent appearance of the subdivision; and comply with corridor overlay requirements.

(b) Applicability.When required by the Director, the standards of this subsection shall apply to all residential subdivisions as well as to all mixed-use subdivisions where the square footage of proposed residential uses exceeds the square footage of proposed nonresidential uses.

(c) Required Perimeter Enclosures.A perimeter enclosure may be required if one or more of the following apply:

(1) Use or enjoyment of property within the development or in the vicinity of the development might be impaired without a perimeter enclosure.

(2) A perimeter enclosure is necessary to maintain a consistent and complementary appearance with existing or proposed perimeter enclosures in the vicinity.

(3) A perimeter enclosure is necessary to control ingress and egress for the development.

(4) A perimeter enclosure is necessary to promote the safety of the public or residents in the vicinity.

(5) A perimeter enclosure is needed to comply with the purpose, objectives, or

regulations of the subdivision requirements.

(6) A perimeter enclosure is needed to comply with a corridor overlay district.

(d) Specifications.Unless specified otherwise at the time of final approval:

(1) A perimeter enclosure includes fences, walls or berms, and combinations thereof, located within five feet of the exterior boundary of a development.

(2) Fences must comply with GJMC § 21.05.090, any design guidelines, and other conditions of approval. Fences and walls required by this section shall meet the following:

(i) An enclosure constructed on a berm shall not extend more than eight feet above the adjoining sidewalk or crown of road, whichever is lower.

(ii) New enclosures shall be compatible with existing enclosures in the vicinity if such enclosures meet the requirements of this Code.

(iii) A perimeter wall must have a column or other significant architectural feature every 30 feet.

(3) Street frontage landscaping, in accordance with GJMC § 21.07.060 shall be located between the perimeter enclosure and the on the right-of-way if applicable.

(e) Construction of Perimeter Enclosures.The perimeter enclosure and required landscape buffer shall be installed by the developer and included in the development improvements agreement.

(f) Ownership and Maintenance.All perimeter enclosures and landscape buffers must be within a tract dedicated to and maintained by the homeowners association. The developer shall refer to the perimeter enclosure in the covenants and restrictions and so that perpetual maintenance is provided for either that the perimeter enclosure be owned and maintained by the owners' association or by individual owners. The perimeter enclosure shall be identified on the plat.

(g) Alternative Construction and Ownership.If the Director finds that a lot-by-lot construction, ownership and/or maintenance of a perimeter enclosure landscape strip would meet all applicable objectives of this section and the design standards of GJMC Chapter 21.09 approved plans shall note the type and size of materials, placement of fence posts, and length of sections.

(h) Overlay District Conflicts.Where in conflict, the perimeter enclosure requirements or guidelines of approved overlay districts shall supersede the requirements of this section.

(Ord. 5190, 12/20/2023)

§ 21.07.100. Substitutions.

The requirements outlined below may be varied based at the following rates of substitution.

(a) Required trees may be substituted for shrubs and required shrubs may be substituted for trees at a rate of three shrubs equaling one caliper inch of tree. For example: three-two-inch caliper trees equaling six caliper inches may be exchanged for 12 shrubs, or vice versa.

(b) No more than 30% of the number of trees required may be substituted for shrubs.

(c) Two #5 container shrubs may be substituted for four linear feet of wall when walls are required per GJMC § 21.07.050(b)(4). Shrubs substituted for walls must reach a height of at least 30 inches at maturity.

(d) Ten percent of the required shrubs may be converted to perennials and/or ground covers at a ratio of three #1 container perennials and/or ground covers for one #5 container shrub.

(e) The number of shrubs may be reduced in exchange for additional trees or tree size at a rate of three shrubs per caliper inch.

(f) Existing trees preserved during development shall count toward the total tree requirement at a ratio of two inch of DBH of preserved tree is equivalent to one caliper inches of required tree plantings.

(g) Existing significant trees preserved above the required 30% shall count toward the total tree requirement at a ratio of one inch of DBH of preserved significant tree is equivalent to three caliper inches of required tree plantings.

Table 21.07-6: Planting Substitutions

	Tree	Shrub	Groundcover/ Perennials	Wall
Tree	Two inches in DBH of preserved tree to one caliper inch required new trees	Three shrubs for one caliper inch of tree	N/A	N/A
Shrub	Three shrubs for one caliper inch of tree	N/A	Three #1 container perennials and/or ground cover for one #5 container shrub	Two #5 container shrubs (minimum 30 inches in height) for four linear feet of wall
Groundcover/ Perennial	N/A	Three #1 container perennials and/or ground cover for one #5 container shrub	N/A	N/A
Wall	N/A	Two #5 container shrubs (minimum 30 inches in height) for four linear feet of wall	N/A	N/A

(Ord. 5190, 12/20/2023)

Chapter 21.08
OFF-STREET PARKING

§ 21.08.010. Off-street parking and loading.

(a) Purpose. The purpose of this section is to:

(1) Ensure that off-street parking areas are well designed with regard to safety, efficiency and convenience for vehicles, bicycles, and pedestrians;

(2) Ensure parking requirements result in land usage and intensity that align with the City's goal;

(3) Provide enough vehicular parking to accommodate the need generated by the uses without providing excessive amounts of parking that unduly burden businesses with the cost of building or maintaining parking;

(4) Manage and improve existing public parking facilities and future development in Downtown; and

(5) Provide for creative and innovative approaches to parking reduction mechanisms, alternative parking arrangements, and parking design.

(b) General Parking Standards.

(1) Compliance with TEDS Manual. In addition to the standards in this section, all off-street parking shall meet TEDS (GJMC Title 29).

(2) Uses Not Identified. The Director shall determine the parking requirement for a use that is not listed in Subsection (d) of this section. The applicant shall provide adequate information so that the Director can make such decision by including:

(i) Type of uses;

(ii) Number of employees;

(iii) Building design capacity;

(iv) Square feet of sales area, service area, etc.;

(v) On-site parking spaces;

(vi) Proposed off-site parking spaces; and

(vii) Hours of operation.

(3) Multiple Uses. If there are accessory or multiple uses within one or more structures, these standard shall apply to each use and structure, resulting in a total parking requirement for the complex or property except as provided in Subsection (e).

(4) Accessible Parking.

(i) All development that provides off-street vehicle parking spaces shall comply with the requirements of the Americans with Disabilities Act (ADA) and the International Building Code (IBC), and the standards in this section. If the

standards in this section conflict with the requirements of the ADA or IBC, the requirements of the ADA or IBC shall apply.

(ii) Requirements for accessible parking spaces are detailed in the City Standard Street Details and are also in the Federal Register.

(iii) All development shall provide at least the following number of accessible parking spaces:

Table 21.08-1: Required Number of Accessible Parking Spaces

Total Parking Spaces in Lot or Garage	Minimum Number of Accessible Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1,000	2% of spaces provided
1,001 and Over	20 plus 1 for each 100 over 1,000

(iv) The additional width required for an accessible parking space may be created by reducing the width of an adjacent sidewalk area, provided the clear portion of the sidewalk width is not reduced below five feet, when providing accessible parking spaces in public right-of-way.

(c) Minimum and Maximum Off-Street Parking Standards.

(1) Notwithstanding Subsection (c)(2) below, all development shall provide vehicle parking spaces in the amount required by Table 21.04-1, as those amounts may be modified by GJMC § 21.08.010(d).

(2) For all nonresidential uses, no minimum parking requirements apply in the Redevelopment Area and Corridor Infill Area as show in Figure 08.01-1 below.

Figure 08.01-1
Redevelopment and Corridor Infill Area Map

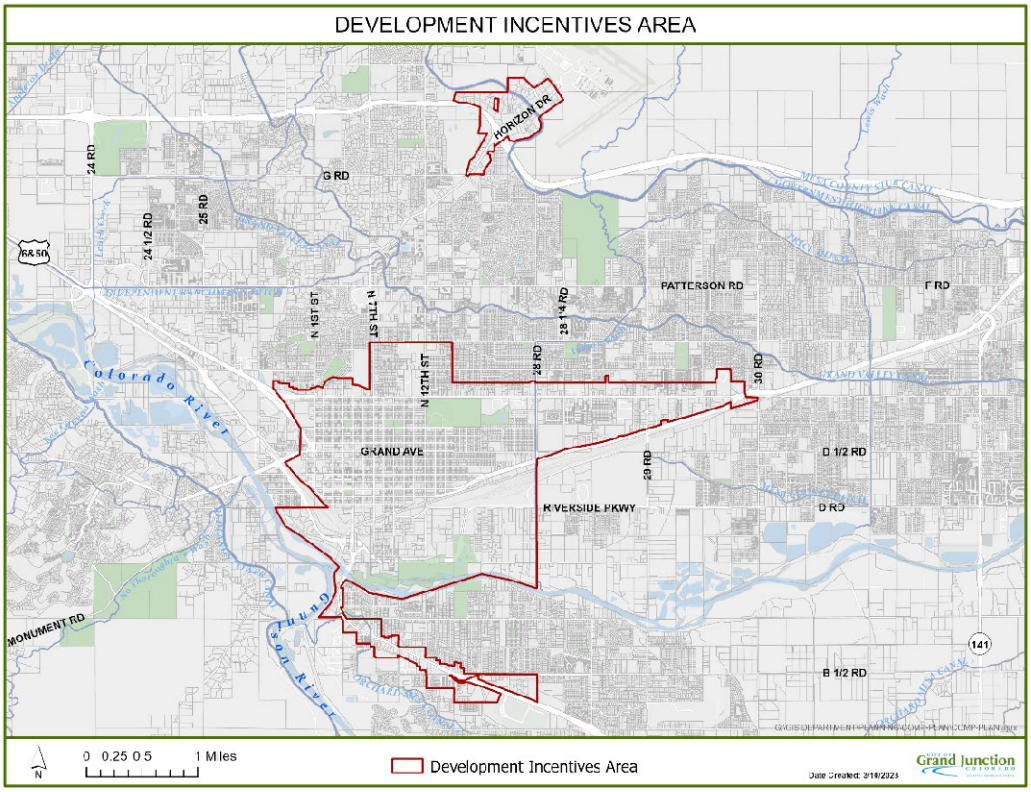


Table 21.08-2: Minimum Off-Street Vehicle Parking Requirements GFA = Gross Floor Area	
	Minimum Vehicle Parking
Household Living	
Dwelling, single-family detached	2 per unit
Dwelling, single-family attached	1 per unit
Dwelling, cottage court	1 per unit
Dwelling, duplex	1 per unit
Dwelling, multifamily	1 bedroom: 1 per unit 2 bedroom: 1.5 per unit 3+ bedroom: 2 per unit Affordable Housing: 0.75 per unit
Manufactured housing community	2 per unit
Group Living	

Table 21.08-2: Minimum Off-Street Vehicle Parking Requirements GFA = Gross Floor Area	
	Minimum Vehicle Parking
Boarding or rooming house	1 per bedroom + 2 spaces
Fraternity or sorority	1 per bedroom
Group living facility, small	1 per 4 beds + 1 per each 3 employees
Group living facility, large	
Group living facility, unlimited	
Public, institutional, and civic uses	
Adult or Child Day Care	
Day care center, adult or child	1 per 400 square feet GFA
Community and Cultural Facilities	
Assembly, community	2 per 1,000 square feet GFA
Assembly, religious/private group	2 per 1,000 square feet GFA
Community corrections facility	2 per 1,000 square feet GFA
Crematory	None
Funeral home or mortuary	2 per 1,000 square feet GFA
Government service facility	2 per 1,000 square feet GFA plus 1 space per service vehicle
Jail	2 per 1,000 square feet GFA
Meeting, banquet, event, or conference facility	2 per 1,000 square feet GFA
Safety service facility	2 per 1,000 square feet GFA plus 1 space per service vehicle
Educational Facilities	
Boarding School	0.8 per bed
College or university	2 per 1,000 square feet GFA office, research, and library area plus 1 space per 250 square feet GFA assembly areas and classrooms
Public or private school	Elementary and Junior High: 1 per classroom High Schools: 6 per classroom
Vocational, technical, or trade school	2 per 1,000 square feet GFA
Health Facilities	

Table 21.08-2: Minimum Off-Street Vehicle Parking Requirements GFA = Gross Floor Area	
	Minimum Vehicle Parking
Hospital	1 per 2 beds based on maximum design capacity plus 2 per 1,000 square feet GFA office and administrative area
Medical or dental clinic	2 per 1,000 square feet GFA
Parks and Open Space	
Cemetery	None
Golf course	4 per hole
Golf driving range	1 per 20 feet of driving area
Park, lake, reservoir, other open space	None
Commercial Uses	
Adult entertainment	2 per 1,000 square feet GFA
Animal agriculture	None
Animal care, boarding, or sales, indoor operations only	2 per 1,000 square feet GFA
Animal care, boarding, or sales, outdoor operations	2 per 1,000 square feet GFA
Animal clinic or hospital	2 per 1,000 square feet GFA
Dairy operations or feedlot	None
Farmers' market	As determined by the Director
Forestry, commercial	None
Nursery or greenhouse	2 per 1,000 square feet GFA
Pasture, commercial	None
Urban agriculture	None
Food and beverage	
Bar or tavern	4 per 1,000 square feet GFA and outdoor dining area
Brewery, distillery, or winery	4 per 1,000 square feet GFA and outdoor dining area
Brewpub, distillery pub, or limited winery	4 per 1,000 square feet GFA and outdoor dining area
Food service or catering	2 per 1,000 square feet GFA
Mobile food vendor/court	2.5 per vendor

Table 21.08-2: Minimum Off-Street Vehicle Parking Requirements GFA = Gross Floor Area	
	Minimum Vehicle Parking
Restaurant	4 per 1,000 square feet GFA and outdoor dining area
Lodging Facilities	
Emergency shelter	As determined by the Director
Hotel or motel	1 per guest room plus 3 per 1,000 square feet GFA restaurants, bars, or meeting areas
Resort cabin and lodge	1 per guest room
Short-term rental	1 per each bedroom above 4 bedrooms on the lot
Office and Personal Services	
Office	2 per 1,000 square feet GFA
Personal service	2 per 1,000 square feet GFA
Recreation and Entertainment	
Campground or recreational vehicle park	1 per campsite
Indoor entertainment and recreation	2 per 1,000 square feet GFA
Outdoor entertainment and recreation	1 per 300 square feet GFA area plus 1 space per 10,000 square feet GFA site area
Riding academy, roping, or equestrian area	1 per 5 stalls
Shooting range, indoor	1 per 2 shooting stations
Shooting range, outdoor	1 per 2 shooting stations
Swimming pool, community	2 per 1,000 square feet pool surface area
Zoo	As determined by the Director
Retail Sales	
Flea market	2 per 1,000 square feet GFA or use area
Manufactured building sales and service	2 per 1,000 square feet GFA
Regulated cannabis store	1 per 300 square feet
Retail sales and service, small	2 per 1,000 square feet GFA
Retail sales and service, medium	1.5 per 1,000 square feet GFA
Retail sales and service, large	1 per 1,000 square feet GFA
Retail sales and service, big box	1 per 1,000 square feet GFA
Transportation	
Airport or heliport	3 per 1,000 square feet GFA terminal area

Table 21.08-2: Minimum Off-Street Vehicle Parking Requirements GFA = Gross Floor Area	
	Minimum Vehicle Parking
Helipad	None
Parking lot or garage	None
Transportation depot	3 per 1,000 square feet GFA waiting area
Truck stop	2 per 1,000 square feet GFA
Vehicles and Equipment	
Vehicle fleet operations center	1 per 1,000 square feet GFA plus 1 space per commercial fleet vehicle
Vehicle fuel sales and service station	2 per 1,000 square feet GFA
Vehicle impound lot	1 per 1,000 square feet GFA
Vehicle repair, major	2 per 1,000 square feet GFA retail, office, waiting area plus 1 per service bay
Vehicle Repair, Minor	
Vehicle sales, rental and leasing, heavy	2 per 1,000 square feet GFA of enclosed buildings plus 1 per 5,000 square feet of outdoor display area
Vehicle sales, rental and leasing, light	
Vehicle wash	3 stacking spaces per service lane, stall, or bay
Industrial Uses	
Manufacturing and processing	
Industrial, artisan	2 per 1,000 square feet GFA
Industrial, light	1 per 1,000 square feet GFA
Industrial, heavy	1 per 1,000 square feet GFA
Mining and extraction	None
Oil and gas drilling	None
Storage, Wholesale, and Warehousing	
Mini-warehouse	2 per development
Outdoor storage, commercial	1 per 1,000 square feet GFA of enclosed buildings
Wholesale or warehouse	1 per 1,000 square feet GFA
Telecommunication	
Facilities on wireless master plan priority site when developed in accordance with wireless master plan site-specific requirements	None
Temporary PWSF (e.g., COW)	None

Table 21.08-2: Minimum Off-Street Vehicle Parking Requirements GFA = Gross Floor Area	
	Minimum Vehicle Parking
Co-location	None
Tower replacement	None
Dual purpose facility	None
DAS and small cell facilities	None
Base station with concealed attached antennas	None
Base station with non-concealed attached antennas	None
Tower, concealed	None
Tower, non-concealed	None
Broadcast tower	1 per each tower development
Utility Uses	
Utility facility, basic	None
Utility facility, major	None
Transmission line	None
Waste and salvage	
Composting facility	1 per 1,000 square feet GFA
Junkyard or salvage yard	1 per 1,000 square feet GFA of enclosed buildings
Transfer facility, medical and hazardous waste	1 per 1,000 square feet GFA
Transfer facility, solid waste	1 per 1,000 square feet GFA
Recycling collection facility	1 per 1,000 square feet GFA
Recycling collection point	None
Solid waste disposal or processing facility	1 per 1,000 square feet GFA
Accessory Uses	
Residential Uses	
Accessory dwelling unit	1 per unit
Agricultural labor housing	1 per 2 beds
Business residence	1 per residence + required parking of the nonresidential use
Guest ranch	1 per 2 beds
Household pets	None

Table 21.08-2: Minimum Off-Street Vehicle Parking Requirements GFA = Gross Floor Area	
	Minimum Vehicle Parking
Other animals	None
Public, Institutional, and Civic Uses	
Home occupation, day care	None
Commercial Uses	
Agri-business	None
Animal agriculture	None
Drive-through facility	None
Electric vehicle (EV) charging facility	None
Home occupation	None
Outdoor display and sales	None
Produce stand	None
Industrial Uses	
Antenna	None
Outdoor storage, accessory	None
Recreation and commercial vehicles	None
Renewable energy facility, accessory	None
All other	As determined by the Director during the review of a Temporary Use Permit
Extended Temporary Uses	
Interim shelter site	2 per 30 shelter sites

(d) Parking Credits and Adjustments.

(1) Parking Reductions.The minimum parking requirements in Table 21.04-1 may be adjusted as described in this section. The following reductions do not require the submittal of an alternative parking plan.

(i) Reduction Allowed by Administrative Adjustment. Applications meeting the requirements of GJMC § 21.02.040(c) shall be eligible for the parking reduction as set forth in that section.

(ii) Shared Parking Facility Reduction.

(A) Calculation.

a. Where two or more uses listed in Table 21.04-1 share a parking lot or structure, the total off-street parking requirement for those uses may

be reduced by the factors shown in the table below.

Table 21.08-3: Shared Parking Reduction					
Property Use	**Multifamily Dwellings**	**Public, Institutional, and Civic**	**Food and Beverage, Indoor Recreation, or Lodging**	**Retail Sales**	**Other Commercial or Industrial**
Multifamily Dwellings	1.0				
Public, institutional, and civic	1.1	1.0			
Food and beverage, indoor recreation, or lodging	1.1	1.2	1.0		
Retail sales	1.2	1.3	1.3	1.0	
Other commercial	1.3	1.5	1.7	1.2	1.0

b. To calculate the shared parking reduction, add the requirements for each use category and then divide the sum by the factor shown for that combination of use categories in Table 21.08-3. For example, a development with 5,000 square feet of small retail space (three per 1,000 square feet gross floor area) and 20, two-bedroom multifamily dwelling units (1.5 per dwelling unit) would take the total spaces required and divide by 1.2.

(15) + (30) = 45

45/1.2 = 37.5

The shared parking requirement is 38 spaces.

c. If the shared parking includes more than two categories of uses, this reduction only applies to the two uses with the greatest parking demands. After calculating the reduction for those two use categories pursuant to Table 21.08-3., parking for a third, fourth, or additional use categories sharing the parking facility shall be provided at the rates shown in Table 21.08-3.

(B) Location.Shared parking spaces shall be located within 1,000 feet of the primary entrance of all uses served along the shortest available pedestrian route (measured from the nearest point of the parking area to the nearest point of the building, structure or use served by such parking lot) unless shuttle bus service is provided to the parking area.

(C) Agreement.

a. A shared parking plan shall be enforced through written agreement

among all owners of record. An attested copy of the agreement between the owners of record shall be submitted to the Director on forms made available by the City.

b. A shared parking agreement may be rescinded only if all required off-street parking spaces are provided in accordance with this section.

(iii) Transit and Pedestrian/Bicycle Proximity Reduction.

(A) The minimum parking required by Table 21.04-1 may be reduced by 5% if the majority of the site for which parking is being provided is within 1/4 mile of a transit stop.

(B) The minimum parking required by Table 21.04-1 may be reduced by 5% if the majority of the site for which parking is being provided is within 1/4 mile of a regional trail providing pedestrian and bicycle access.

(iv) Transportation Demand Management Reduction. The Director may allow a reduction in required parking for employers that enter into a Transportation Demand Management (TDM) Agreement that specifies how on-site parking will be reduced through property owner or operator programs or initiatives that reduce the number of employees on-site. Any TDM Agreement, whether used independently or in combination with other allowed parking reductions, is subject to the 50% limitation on overall parking reduction. Such programs may include the following:

(A) Compressed work week schedules;

(B) Flexible arrival and departure times;

(C) Telework opportunities; or

(D) Incentives for employees to use alternative modes of transportation to the work place.

(v) Additional and Enhanced Bicycle and Electric Bicycle Parking.

(A) The minimum parking required by Table 21.04-1 may be reduced by 5% if the applicant provides at least five bicycle spaces in excess of the minimum requirements of GJMC § 21.08.020(a); or

(B) The minimum parking required by Table 21.04-1 may be reduced by 10% if the applicant:

a. Provides at least five bicycle spaces in excess of the minimum requirements of GJMC § 21.08.020(a); and

b. Provides a dedicated bicycle storage area with at least two showers and four lockers for every shower provided.

(2) Alternative Parking Plans.An applicant shall submit an alternative parking plan with a proposed site plan to adjust the minimum off-street parking requirements as follows.

(i) Applicant-Submitted Parking Data.The required parking ratios may be modified where applicant-submitted parking data illustrates that required parking ratios do not accurately apply to a specific development.

(ii) Credit for On-Street Parking.Credit may be provided by the Director for any on-street parking spaces abutting the subject property. Such spaces must not be located within a clear sight triangle. No fractional spaces shall be credited.

(iii) Off-Site Parking.Required off-street parking spaces may be permitted on a separate lot from the lot on which the principal use is located if the off-site parking complies with all of the following standards:

(A) Ineligible Activities.Required accessible parking spaces may not be located off site.

(B) Location.

a. Off-site parking spaces shall be located within 1,000 feet from the primary entrance of the use served along the shortest available pedestrian route (measured from the nearest point of the parking area to the nearest point of the building or structure served by such parking lot).

b. Off-site parking may not be separated from the use that it serves by a street right-of-way with a width of more than 80 feet unless a designated pedestrian crosswalk or walkway is provided.

c. The off-site parking shall be located wholly within a district that allows commercial parking lots or garages as principal use.

(C) Agreement.

a. In the event that an off-site parking area is not under the same ownership as the principal use served, a written agreement between the record owners shall be required.

b. An off-site parking agreement may be rescinded only if all required off-street parking spaces are provided in accordance with this section.

(iv) Valet Parking.Valet parking may be permitted as a means of satisfying otherwise applicable parking requirements where all of the following standards have been met:

(A) Adequate assurance of the continued operation of the valet parking is provided, such as a contractual agreement for valet services or the tenant's affidavit agreeing to provide such services.

(B) An equivalent number of valet spaces are available to replace the number of required on-site parking spaces. Such valet spaces do not require individual striping, and may take into account the tandem or mass parking of vehicles.

(C) The design of the valet parking shall not cause customers who do not use

the valet service to park off-premises or cause queuing in the right-of-way.

(D) An accessible passenger loading and unloading area meeting ADA standards shall be provided.

(v) Recording of Approved Plans.An attested copy of an approved alternative parking plan shall be recorded in the deed records for Mesa County on forms made available by the Director. An alternative parking plan may be amended by following the same procedure required for the original approval. The applicant shall provide proof of recording prior to approval of the certificate of occupancy.

(e) Vehicle Parking Location and Design.

(1) Location.

(i) Except as provided in an approved alternative parking plan, all parking shall be provided on the same property as the principal structure, unless the Director deems it impracticable.

(ii) Parking spaces in Residential zone districts shall not be in a front yard setback, except for parking in driveways for detached single-family detached or duplex dwelling structures. In no case shall parking be allowed in parkway strips (the area between the sidewalk and curb or edge of pavement).

(2) Parking Stall and Aisle Design.

(i) Parking stalls shall be located outside TEDS (GJMC Title 29) sight triangle at access locations.

(ii) Each parking space must be accessible independently of others.

(iii) All parking stalls shall be oriented such that any vehicle exiting a parking stall is not required to back into any public street. Spaces shall be arranged so that no part of any parked vehicle extends beyond the boundaries of the parking area and to ensure that the vehicle overhang does not obstruct sidewalks or other pedestrian walking areas. This shall be accomplished through one of the following methods:

(A) Wheel or bumper blocks provided in each stall; or

(B) An additional 18 inches of sidewalk width, above the minimum width required for compliance with ADA or TEDS standards, provided with a raised curb.

(iv) Parking stalls may be oriented at 0°, 30°, 45°, 60°, 75° or 90° to the parking aisle. Both stall and aisle dimensions and layout will vary depending on the stall orientation. The use of parking stalls oriented 90° to the building face with two-way aisles is generally preferred as this permits the most direct route between the parking stall and the building and minimizes auto/pedestrian conflicts adjacent to buildings.

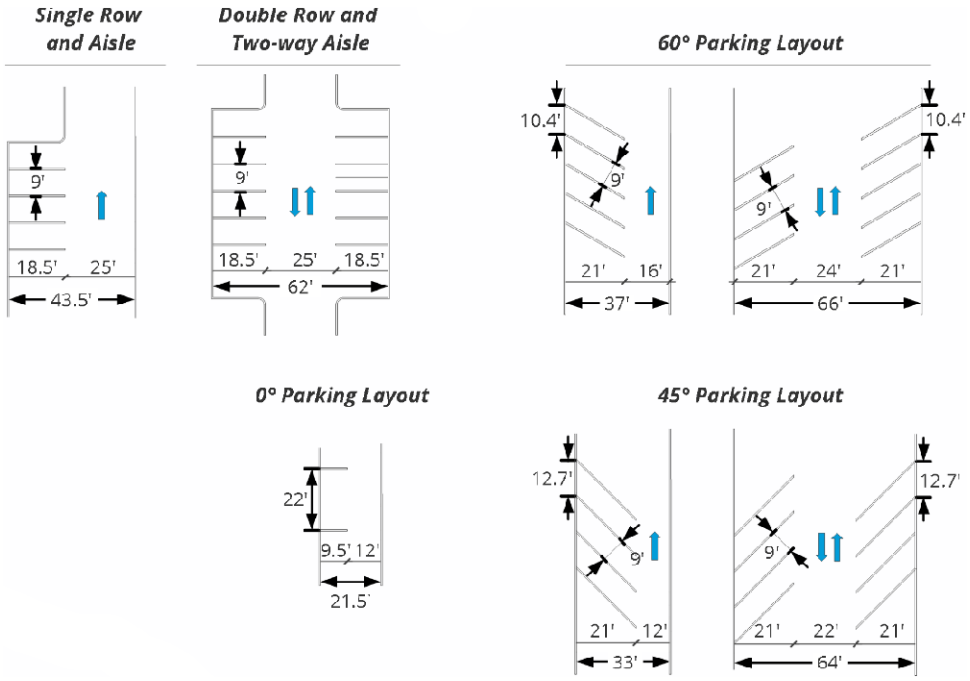
(v) Where larger vehicles may be frequent users of the parking facilities, it is appropriate to increase the parking stall dimensions according to the dimensions and turning characteristics of the vehicle.

(vi) Parking aisles shall be designed to accommodate the turning characteristics of the vehicles that will most commonly use the parking facilities. Dead-end parking aisles are prohibited without provision of an adequate turn around. Aisles shall not exceed 350 feet in length without a break in circulation.

Table 21.08-4: Required Parking Stall Dimensions

Parking Angle	A	B	C
	Stall Width in Feet	Stall Length in Feet	Aisle Width in Feet
0°	22.0	9.0	12.0
	22.0	9.5	12.0
	22.0	10.0	12.0
30°	9.0	18.0	11.0
	9.5	18.0	11.0
	10.0	20.0	11.0
45°	8.5	21.0	13.0
	9.0	21.0	12.0
	9.5	21.0	11.0
60°	8.5	21.0	18.0
	9.0	21.0	16.0
	9.5	21.0	15.0
75°	8.5	19.5	25.0
	9.0	19.5	23.0
	9.5	19.5	22.0
90°	8.5	18.5	28.0
	9.0	18.5	25.0
	9.5	18.5	24.0

Figure 08.01-2
Parking Layout Options



(3) Maximum Allowable Grades in Parking Lots.Maximum grades allowed in parking lots shall be 8%.

(4) Pedestrian Crossings.

(i) Pedestrian crossing areas shall be provided for each building egress or for every 125 feet of building which fronts a part of the parking area.

(ii) Pedestrian crossing areas in parking lots shall be constructed of surface pavers, such as brick, stone blocks, interlocking brick pavers, stamped concrete or other materials as may be approved by the Director which form a smooth surface but contrast with asphalt. For parking lots of less than 50 cars, the Director may accept paint or similar markings.

(iii) All parking lots that contain more than two double rows of vehicle parking shall include pedestrian walkways through the parking lot to the principal building entrance or a sidewalk providing access to the principal building entrance. At a minimum, walkways shall be provided for every three driving aisles.

(iv) To the maximum extent practicable, parking lots for multifamily, mixed-use, and nonresidential development shall be designed to allow for cross-access to adjacent properties to encourage shared parking and access points on public or private streets. This may be established by one or more of the following:

(A) Connecting streets and driveways;

(B) Coordinating parking lot and parking structure entrances;

(C) Common service/delivery areas;

(D) Legally shared parking lots and parking structures;

(E) Linkages between parking lots and parking structures; or

(F) Providing shared access for two adjacent lots from public rights-of-way to minimize curb cuts.

(5) Surfaces.All driveways and parking areas, except for a single dwelling on one lot, shall comply with the following:

(i) All required parking and vehicular traffic surfaces shall drain and be surfaced with concrete or bituminous pavement in accordance with City standards. The City Engineer may permit a gravel or other permeable surface in overflow parking areas, a low-traffic storage yard, park, lake, reservoir, other open space uses as defined in GJMC Chapter 21.14 or, as in Subsection (e)(5)(ii) of this section, if the applicant establishes that very little dust will be generated. "Overflow parking" is defined as "parking in addition to the minimum required by ordinance which is designed not to be used more than 10 times per year." A "low-traffic storage yard" is defined as "a storage area generating less than 30 average daily trips." Industrial yards that accommodate large trucks and/or heavy equipment shall be surfaced and maintained with materials to prevent dust, mud, and debris from leaving the site and being tracked onto the public right-of-way.

(ii) All surfaces shall be maintained in good condition free of weeds, dust, trash, and debris. All vehicular traffic areas shall be built according to the construction standards established by the City.

(6) Parking Lot Landscaping.Parking lots, excluding those accessory to a park, lake, reservoir, or other open space use, shall be landscaped pursuant to GJMC § 21.07.040.

(f) Loading.A site plan for a proposed nonresidential use shall identify loading/unloading areas and shall be built and maintained in accordance with TEDS (GJMC Title 29).

(Ord. No. 5242, 12/4/2024; Ord. No. 5229, 8/21/2024; Ord. 5190, 12/20/2023)

§ 21.08.020. Bicycle parking and storage.

(a) Amount Required.

(1) Each nonresidential principal structure shall provide the following, depending on the category of the use as shown in Table 21.04-1: Principal Use Table:

Table 21.08-5: Minimum Bicycle Parking Spaces Required

Use or Use Category	Short-Term Spaces	Long-Term Spaces
Multifamily dwelling	2 plus .05 per bedroom	2 plus .05 per bedroom
Food and beverage service, recreation and entertainment, and retail uses	2 plus 1 per 5,000 square feet of gross floor area	2 plus 1 per 12,000 square feet of gross floor area

Table 21.08-5: Minimum Bicycle Parking Spaces Required		
Use or Use Category	**Short-Term Spaces**	**Long-Term Spaces**
Office uses	2 plus 1 per 20,000 square feet of gross floor area	2 plus 1 per 10,000 square feet gross floor area
Industrial uses	2	2 plus 1 per 15,000 square feet internal gross floor area
All other nonresidential uses	2 plus 1 per 20,000 square feet of gross floor area	2 plus 1 per 12,000 square feet internal gross floor area

(2) If more than 10 bicycle parking spaces are required, a minimum of 10% of the required bicycle parking spaces shall be designed to accommodate cargo bicycles or bicycles with trailers.

(b) Location.

(1) Short-Term Bicycle Spaces.

(i) Short-term bicycle spaces shall be located within 50 feet from the main entrance of the principal building.

(ii) Short-term bicycle racks shall be located so that they:

(A) Are easily accessed from the street and protected from motor vehicles;

(B) Are visible to passers-by to promote usage and enhance security;

(C) Do not impede or interfere with pedestrian traffic or routine maintenance activities;

(D) Do not block access to buildings, bus boarding or freight loading;

(E) Allow reasonable clearance for opening of passenger-side doors of parked cars; and

(F) Are covered, to the maximum extent practicable, where users will leave their bikes for a longer amount of time.

(2) Long-Term Bicycle Parking.Long-term bicycle parking shall be enclosed and secured to the maximum extent practicable. Enclosed bicycle parking includes but is not limited to: an area enclosed by a secure fence with a lockable entrance, a secure and accessible room in a building, a secure and accessible enclosure within a parking structure, or a cluster of bicycle lockers.

(c) Design Standards.

(1) No more than 50% of the required bicycle parking spaces may require the bicycle to be hung or parked vertically, rather than being parked with both tires on the ground.

(2) Standard bicycle parking spaces shall be a minimum of six feet long and 2 1/2 feet wide.

(3) Cargo bicycle and bicycle trailer parking spaces shall be a minimum of 10 feet long

and three feet wide.

(4) A four foot wide aisle is required between rows of bicycle parking spaces or between a row of bicycle parking spaces and any wall or any other obstruction.

(5) Bicycle racks shall be located on improved non-permeable surfaces and shall be anchored to the ground.

(6) Bicycle racks shall provide two points of contact with the bicycle frame such as an inverted "U" or a post and ring. Wave, schoolyard, wheel well, bollard and spiral racks are prohibited.

(7) Bicycle racks shall accommodate varied bicycle and styles, including electric bicycles and cargo bicycles, with greater clearance from obstructions, walkways, and other bicycle parking spaces to the maximum extent practicable.

(8) Bicycle racks shall be constructed of rust-resistant, sturdy, and high-quality materials and designed so that they cannot be dissembled or tampered with.

(9) Areas designated for bicycle parking shall be clearly marked and reserved for bicycle parking only.

(d) Alternative Bicycle Parking.The Director may waive or reduce the requirements of this section if:

(1) Unique or unusual characteristics exist on a development site; or

(2) Existing bicycle parking facilities are located within the public right-of-way and within 100 feet of the building's main entrance, provided that a minimum of two bicycle parking spaces are provided on site.

(Ord. 5190, 12/20/2023)

§ 21.08.030. Electric vehicle charging facilities.

Where a permanent parking lot or structure is required for new development or the redevelopment of multifamily dwellings or nonresidential uses, the lot or structure shall be provided with electric vehicle power transfer infrastructure in compliance with the Colorado Model Electric Ready and Solar Ready Code. For the purpose of this section, redevelopment shall include the replacement or addition of dwellings units or redevelopment or expansion that results in a 65% or greater increase of the gross square footage of an existing structure.
(Ord. 5190, 12/20/2023)

Chapter 21.09
SUBDIVISION STANDARDS

§ 21.09.010. Purpose.

The purpose of this chapter is to ensure that all divisions of land subject to this Code are designed to help implement the goals and objectives of the Comprehensive Plan and to:

(a) Ensure that all developable lots have adequate provision for water service, sewer disposal, and other utilities;

(b) Ensure that all developable lots had adequate legal access to the public street and highway system;

(c) Incorporate and emphasize unique features of the land;

(d) Protect existing natural resources and wildlife habitat, and preserve stands of existing mature trees and native vegetation;

(e) Reduce fire hazards;

(f) Mitigate erosion from wind and water;

(g) Reinforce the importance of public places such as boulevards, parks, and open spaces;

(h) Avoid development in riverine slide areas, geologically hazardous areas and in floodplains;

(i) Provide active opens spaces for active and passive use that are integrated with those on abutting properties where possible;

(j) Promote pedestrian uses, bicycling, and transportation modes other than the private automobile;

(k) Reduce long-term service and maintenance costs to the City, its residents, and owners in the subdivision;

(l) Avoid repetitive building and lot layouts;

(m) Complement adjacent neighborhoods development and uses; and

(n) Mitigate significant adverse impacts on neighboring developments.

(Ord. 5190, 12/20/2023)

§ 21.09.020. Applicability.

Unless otherwise provided in development or annexation agreement approved by City Council, the provisions of this section shall apply to all divisions of land into legal parcels for development. See GJMC Chapter 21.02 for the process of subdivision review and approval.
(Ord. 5190, 12/20/2023)

§ 21.09.030. General standards.

All subdivisions shall comply with the following:

(a) GJMC § 21.05.020.

(b) All state laws and regulations regarding surveying and monumentation of land.
(Ord. 5190, 12/20/2023)

§ 21.09.040. Lot layout and design.

(a) Designation of Lot Lines.Each plat shall identify the front and rear lot line of each lot.

(b) Maximum Block Length.No subdivision shall create a block that is greater than 1,400 feet in length in any direction.

(c) Lot Designs to Be Avoided.The creation of the following types of lots shall be avoided to the maximum extent practicable.

(1) Through (Double Frontage) Lots. Where there is no reasonable alternative to the creation of through lots, each lot shall comply with the subdivision perimeter enclosures provisions of GJMC § 21.07.090.

(2) Reverse corner lots.

(3) Three frontage lots.

(4) Lots with rear lot lines abutting a residential collector street, local street, or cul-de-sac. Creation of lots abutting an arterial or collector street is permitted, but may be required to provide larger building setbacks from those streets.

(5) Flag lots. Where there is no reasonable alternative to the creation of flag lots, provided each flag lot complies with the following standards:

(i) In a subdivision of four or fewer lots, not more than one lot may be a flag lot;

(ii) In a subdivision of five or more lots, not more than 15% of the lots may be flag lots;

(iii) The developable "flag" portion of each flag lot shall meet the minimum lot size required in the zone district where the property is located, without counting the area within the "flagpole" access portion of the lot;

(iv) Additional building setbacks for the "flag" portion of the lot may be required to reduce adverse impacts on surrounding properties;

(v) Not more than two flag lots may abut each other;

(vi) Where two flag lots abut each other, their two "flagpole" access portions of each lot shall abut and a shared driveway shall be provided;

(vii) Except as provided in Subsection (d) below, each flag lot shall have at least 25 feet of street frontage;

(viii) Where the Director determines that access will be needed to access future development, the Director may require the applicant to provide an access easement and an irrevocable offer of dedication of right-of-way 50 feet wide running the full depth of the lot or lots.

(ix) Each lot shall be designed to allow a motor vehicle to exit the site to the public street driving forward.

(d) Reserve Strips.The creation of reserve strips on the outer edges or elsewhere in any subdivision, when used to the control of access to any public right-of-way, is not permitted.

(e) Alleys.

(1) Alleys shall be included in all residential subdivisions where:

(i) One or more adjacent blocks contain alleys, and the inclusion of alleys would continue that pattern; and

(ii) Alleys would provide access to residential lots abutting residential collector streets or local streets, and where with garages or parking areas are located behind a principal structure.

(2) Alleys shall be included in all other residential blocks to the maximum extent practicable.

(3) Alleys shall be included in mixed-use, commercial, or industrial subdivisions unless alternative service access is provided.

(Ord. 5190, 12/20/2023)

§ 21.09.050. Access, circulation, and connectivity.

(a) General.

(1) Each subdivision shall be designed to continue or create an integrated system of lots, streets, trails, and infrastructure that provides for efficient movement of pedestrians, bicycles, and automobiles to and from adjacent development, while facilitating the use of mass transit.

(2) Each subdivision shall include a street layout that continues the alignments of streets in adjoining subdivisions or their anticipated locations when adjoining property is not yet developed.

(3) Each subdivision shall allow for through movement of general traffic to avoid isolation of residential areas and overreliance on arterial streets on the edges of the subdivision for traffic movement, except as required by Subsection (g).

(4) Each subdivision shall be designed to enable emergency service providers, including but not limited to police, fire, and ambulance vehicles to access each lot quickly and efficiently.

(5) Each subdivision shall accommodate a system of major collector, minor/residential collector, and local/residential streets providing multiple direct connections between local destinations such as parks, schools, and shopping, without requiring the use of arterial streets to the maximum extent practicable.

(6) Each residential and mixed-use subdivision shall provide efficient and reasonably direct motor vehicle, pedestrian, and bicycle access to nearby commercial development, and shall avoid the creation of physical barriers between adjacent residential and commercial areas unless necessary for safety reasons.

(7) Each subdivision shall include reasonably direct connections to the City's on-street bikeway network and off-road trail system to the maximum extent practicable.

(8) Street names and property addresses in each subdivision shall comply with the City's adopted Street Naming and Addressing Manual.

(9) Each subdivision designed for nonresidential principal land uses shall provide for vehicular circulation between adjacent lots and must dedicate or grant appropriate easements ensuring such cross-access between lots.

(10) No subdivision design which could result in the developer controlling access to a street, alley, or right-of-way shall be permitted.

(b) Access to Public Streets.

(1) All lots shall have direct or indirect access to a dedicated public road. The creation of private streets is not permitted unless approved by City Council.

(2) If the plat provides for indirect access (i.e., over intervening private drives), access easements or tracts benefiting all lots with indirect access shall be provided on the recorded plat. Easements shall be used to access not more than one lot with no street frontage.

(3) Single-family attached dwellings and/or multifamily dwellings with no street frontage or limited street frontage may be allowed by the Director provided access is reasonably and readily available for each dwelling unit through the use of private streets, shared drives, parking lots, and/or other specifically identified limited common elements.

(4) Single-family residential lots may be located on a loop lane providing access to a public street, provided the loop lane complies with standards in GJMC § 21.05.020(e)(6).

(c) Sidewalks and Walkways.

(1) Each subdivision shall provide an integrated system of bikeways, walkways, and sidewalks to allow residents, customers, and the public to safely and directly access all principal uses, public areas, streets, bus stops, parking areas, and trash, recreation, and mail pickup facilities on bicycle and on foot.

(2) Pedestrian circulation systems shall be separated by a curb or other physical barrier from motor vehicle and bicycle circulation areas to the maximum extent practicable.

(3) Each subdivision shall provide internal walkways to allow pedestrians reasonably direct access from perimeter sidewalks to the major pedestrian entry of each principal building. If a surface parking lot is located between the principal building and the perimeter sidewalk, at least one pedestrian walkway through the parking lot to the major pedestrian entry of each principal building shall be provided.

(4) Within each subdivision lot containing multiple principal buildings or principal uses, internal walkways not located adjacent to a street shall be included to provide reasonably direct connections between common points of pedestrian origin and destination.

(5) Bicycle and pedestrian access points shall be provided at least every 750 linear feet any roadway within or abutting the subdivision.

(6) Where the turn-around of a cul-de-sac is separated only from an arterial or collector street by lots accessed from the cul-de-sac, a pedestrian and bicycle easement or tract shall be provided between the turn-around of the cul-de-sac and the arterial or collector street. The design shall be consistent with TEDS (GJMC Title 29) and as shown below:

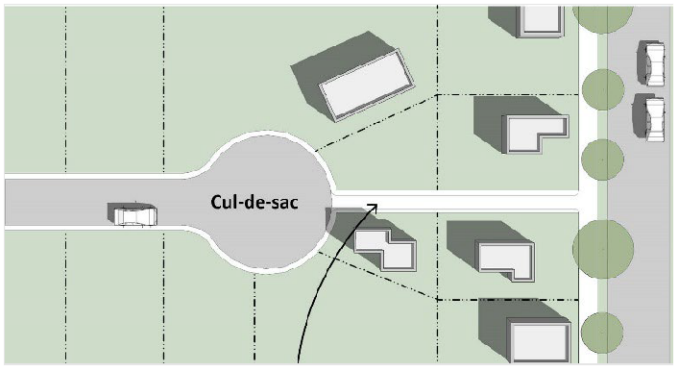


Figure 09.05-1 Cul-de-sac Connection Requirement

(d) Support for Public Transit.

(1) Each subdivision adjacent to or including an existing or planned or public bus transit route shall include streets designed to facilitate the use of public bus transit.

(2) The Director may require each subdivision to dedicate and/or construct adequate waiting areas for bus stops in the locations adjacent to arterial or major collector streets identified by a public transit authority; and may also require that the subdivision include reasonably direct walkways to each bus stop area from each nearby street, commercial, industrial use, and public park or gathering area.

(Ord. 5190, 12/20/2023)

§ 21.09.060. Open and undeveloped spaces.

(a) Sensitive Lands and Unique Site Features.Each subdivision plat shall include and protect as much of the following open space as the Director deems reasonable to protect public health and safety based on the anticipated size, use, and impacts of the proposed development:

(1) Stream beds and corridors, bluffs, ridges, steep slopes, mature trees and/or stands of native vegetation, rock outcroppings, wetlands, native upland ecosystems, riparian areas, and wildlife corridors;

(2) Water features such as drainages, waste ditches, washes, canals, ditches, lakes, natural ponds, and retention and detention ponds; and

(3) Natural, geologic, or other hazard areas, such as potentially unstable slopes, faults, landslides, rockfalls, expansive soils, and floodplains.

(b) Location and Integration of Open Space.

(1) The open space in each subdivision shall be located to create or enhance:

(i) Active and passive recreational opportunities,

(ii) Landscaped buffers or visual transitions between different types or intensities of land uses,

(iii) Community focal points,

(iv) Scenic vistas,

(v) Wildlife habitat,

(vi) Passive water quality treatment, and/or

(vii) Opportunities to accommodate multiple compatible uses rather than a single use.

(2) The open space in each subdivision shall be located to be contiguous to and integrated with schools, parks, and other open spaces or public property in or near the subdivision or on neighborhood property to the maximum extent practicable.

(3) Storm drainage, retention, and detention ponds shall be located, designed, maintained, planted, and managed to serve as visual amenities, entryway features, or opportunities for passive recreation within the subdivision.

(4) Open space shall not be located in isolated areas or corners of the subdivision, in peripheral strips along the borders of rights-of-way or the subdivision, or in unconnected patterns unless the Director finds the proposed location would further one of the other goals described above.

(c) Public Access and Visibility.

(1) Open spaces in each subdivision shall be open, accessible, and visible to all residents of the subdivision and to the public using public streets, trails, and open spaces to the maximum extent practicable and consistent with public health and safety.

(2) If a subdivision contains or abuts a publicly owned natural area, the Director may require the subdivision plat to include such easements and rights-of-way as are necessary to allow reasonable access for the public to such natural area. Conveyance to the public requirement or dedication to the City may be credited against any park or open space dedication or fee in lieu of such land required by the City, upon approval of the City Council.

(Ord. 5190, 12/20/2023)

§ 21.09.070. Natural hazards and significant natural features.

(a) Natural Hazards.If natural or geologic hazards exist within the property, the applicant shall comply with either Subsection (a)(1), (2), or a combination of those approaches:

(1) Identify the limits of development (as defined in Subsection (b) below on the plat and include a plat note that those areas are not available for sale nor development;

(2) Provide a report from a geotechnical engineer licensed in Colorado designating the specific mitigation measures or engineering precautions necessary to make such areas safe for development and occupancy, and include a plat note stating that development will be subject to those mitigation measures and engineering precautions although the

specific design needed as a part of a building permit may occur as a part of the building permit; or

(b) Significant Natural Features.

(1) Each subdivision plat shall identify each of the following that exist within the area covered by the subdivision plat.

(i) All significant natural features, including but not limited to bluffs, ridges, steep slopes, stands of mature trees, rock outcroppings, wetlands, native upland ecosystems, riparian areas, and wildlife corridors; and

(ii) All significant water features, including but not limited to drainages, washes, canals, ditches, lakes, natural ponds, and retention and detention ponds.

(2) Each subdivision plat containing any of the features listed or referenced in Subsection (b)(1) shall show the limits of development established pursuant to Subsection (c) below and shall include a plat note clearly stating that such areas are not available for sale or development.

(c) Limits of Development.Each subdivision plat shall specify the limits of development (LOD), which shall include all specific areas of a subdivision within which development and construction shall be limited or prohibited so that natural hazard areas are avoided and significant natural features are preserved. LODs shall be determined based on:

(1) Available mapping of hazard areas and significant natural features;

(2) Site topography, including but not limited to steepness of slopes, existing drainage features, rock outcroppings, river and stream terraces, valley walls, ridgelines, and scenic topographic features; and

(3) The practical needs to give access to heavy equipment for the developed project and reasonable staging and operational areas. Plat notes shall indicate any areas in which construction or development activities are only permitted during build-out of the subdivision, and that shall thereafter be outside the LODs.

(Ord. 5190, 12/20/2023)

Chapter 21.10
SIGN STANDARDS

§ 21.10.010. Purpose and applicability.

This chapter governs exterior signs on real property. The proliferation and disrepair of signs can deter the effectiveness of signs, cause dangerous conflicts with traffic control signs and signals, and contribute to visual pollution to the detriment of the general public. No sign shall be displayed in any zone district without a Sign Permit, except where the provisions of this section expressly provide otherwise. Signs placed by a governmental entity are exempt from this section. (Ord. 5190, 12/20/2023)

§ 21.10.020. Prohibited signs.

Prohibited signs are signs that:

(a) Contain an obscene statement, word, or picture describing or depicting sexual activities or sexual anatomical areas;

(b) Contain, or are an imitation of, an official traffic sign or signal or contain the words: "STOP,""GO SLOW,""CAUTION,""DANGER,""WARNING," or similar words;

(c) Are of a size, location, movement, content, coloring, or manner of illumination which may be confused with, or construed as, a traffic control device or which hide from view any traffic or street sign or signal;

(d) Contain or consist of portable signs, tent signs, or strings of light bulbs not permanently mounted on a rigid background, except that one portable sign per business will be allowed next to the building in shopping areas where pedestrians circulate, so long as such portable sign is not placed in a parking lot or in any median, does not visually or physically obstruct vehicular or pedestrian circulation, and does not exceed 12 square feet in size and three feet in width;

(e) Are erected after adoption of this Code and do not comply with the provisions of this regulation;

(f) Do not comply with the laws, rules, and regulations of the State of Colorado as now or hereafter enacted and/or amended. See § 43-1-401 C.R.S., et seq.;

(g) Create a hazard for, or impede safe or efficient movement of, motorists or pedestrians;

(h) Are placed in whole or in part in, on or over any part of a public right-of-way, except where the sign is placed by a governmental entity. The Director has the authority to remove and dispose of any sign placed in or on or protruding into, onto or over any part of a public right-of-way without compensation to any person or entity; or

(i) Are interactive signs that are readable with normal vision from the public right-of-way. Interactive signs readable from the public right-of-way are prohibited because they distract drivers and pedestrians so as to constitute a significant safety risk.

(Ord. 5190, 12/20/2023)

§ 21.10.030. Signs that do not require a permit.

The following signs are allowed on a lot/parcel in any zone district:

(a) One sign that is integral to or flush-mounted on a building or structure that is no greater than four square feet in area.

(b) A sign that is not illuminated, not digital or electronic, and not permanent in nature; for example, one that is planted into the ground or affixed to an object or structure by temporary means, does not have a foundation, is made of lightweight and thin materials such as a single sheet of plastic, thin metal, plywood or paper, except for wind driven signs and banners which are regulated separately in GJMC § 21.10.040, and except for prohibited signs discussed in GJMC § 21.10.020, with the following limitation:

(1) On a parcel of less than one acre, up to six such signs are allowed, so long as each sign is not greater than six square feet in area, except in that one of these signs may be up to 32 square feet in area when construction is occurring on a parcel or a subdivision of land is being developed.

(2) On a parcel of one acre or larger, up to six such signs per acre are allowed, so long as each sign is not greater than six square feet in area, except that one sign per acre can be up to 32 square feet in area.

(Ord. 5190, 12/20/2023)

§ 21.10.040. Wind driven signs and banners.

(a) A banner permit shall be required prior to any use of wind driven signs or banners.

(b) Banners and wind driven signs shall meet all standards set forth in GJMC § 21.10.070.

(c) Banners and wind driven signs may be displayed for a up to 30 consecutive days up to four times in a twelve-month calendar year. Permit periods may run consecutively.

(d) All banners must be secured directly to the structure, fence, or post that is permanently affixed to the ground.

(e) All wind driven signs must be professionally made, must be in good repair and appearance, and must also be so located and installed so as not to pose a safety hazard for motorists or pedestrians. Such signs shall not be attached to any object located in the public right-of-way.

(f) In addition to other available penalties, failure to comply with the terms of a permit issued under this section shall result in the loss of a permit.

(Ord. 5190, 12/20/2023)

§ 21.10.050. Nonconforming signs.

(a) All signage on site shall be brought into conformance with this Code prior to approval of any new Sign Permit on the property.

(b) Any nonconforming sign that has been damaged in excess of 50% of its replacement cost by fire, wind or other cause except vandalism shall not be restored without conformance with the provisions of this regulation.

(c) Sign face changes are allowed without a permit, including converting from static display to digital/electronic display, if no other changes are made to the sign size, height, or structure. Digital and electronic signs must comply with regulations governing such.

(Ord. 5190, 12/20/2023)

§ 21.10.060. Digital or electronic sign standards.

(a) Purpose and Intent.Advancements in technology permit signs to change copy electronically, utilizing LED, LCD, and other technologies. The impacts of these may disrupt the peace and quiet enjoyment of other properties in the area and create traffic hazards. Limitations on brightness is necessary in order to mitigate these impacts, protect public health and safety, and preserve the character of areas, especially residential neighborhoods.

(b) Brightness.

(1) The maximum brightness levels for signs shall not exceed 0.3 footcandles over ambient light levels. Measurements of light are based on the area of the sign versus measurement of the distance. Using a footcandle meter, brightness shall be in conformance with the following distance table:

Table 21.10-1: Measurement of Distance by Sign Area

Area of Sign (square feet)	Measurement of Distance (feet from sign)
0-10	30
10-24	45
25-49	55
50-99	90
100-149	110
150-199	135
200-300	150

(2) The measurement shall be conducted at least 30 minutes after sunset or 30 minutes before sunrise. Certification must be provided to the City upon installation that the sign has been preset to automatically adjust the brightness to these levels or lower. Re-inspection and recalibration may be periodically required by the City at the permitee's expense, to ensure that the specified brightness levels are maintained at all times.

(3) Interactive signs are prohibited.

(4) All new electronic display signs shall have photocell technology that will be used to dim the displays for appropriate nighttime viewing from dusk to dawn or when ambient light conditions warrant such changes.

(Ord. 5190, 12/20/2023)

§ 21.10.070. General requirements.

(a) All Zone Districts.The following requirements shall apply to all signs in all zone districts unless otherwise indicated:

(1) A permit is required for placement or display of any new sign, except where otherwise stated or where specifically exempted by the provisions of this section.

(2) Touching up, repainting, or changing existing letters, text, symbols, graphics, or other content is considered maintenance and repair and does not require a permit.

(3) Only a licensed sign contractor can obtain a Sign Permit.

(4) All signs shall be permanent in nature except for those nonpermanent signs allowed under GJMC § 21.10.030.

(5) All exterior signs shall be engineered to withstand a minimum wind load of 30 pounds per square foot.

(6) No sign shall be placed on any curb, sidewalk, post, pole, hydrant, bridge, tree, or other surface located on public property including the posting of handbills except as expressly authorized by this section.

(7) Regardless of sign allowances by zone district, no single sign shall exceed 300 square feet in area.

(b) Sign Measurement.

(1) The total surface area of one sign face of freestanding signs and projecting wall signs shall be counted as part of the maximum total surface area allowance. Sign enhancement features such as bases, pillars, and other decorative elements as part of monument signs shall not be counted as part of the maximum square footage of the sign, provided such features do not exceed the size of the sign face.

(2) The total surface area of all sign faces of roof signs shall be counted as part of the maximum total surface area allowance.

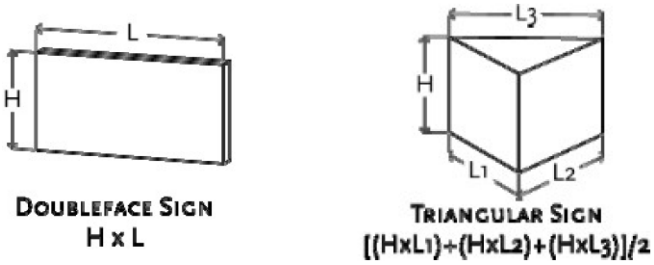
(3) For measurement of different shapes of signs, see the graphics below.

(4) The total surface area of three-dimensional figures shall be counted as part of the maximum sign allowance.

(5) The area of flush wall signs with backing or a background that is part of the overall sign display or when backed by a surface which is architecturally a part of the building shall be measured by determining the sum of the area of each square, rectangle, triangle, portion of a circle or any combination thereof which creates the smallest single continuous perimeter enclosing the extreme limits of each word, written representation (including any series of letters), logo or figure including all frames, face plates, nonstructural trim or other component parts not otherwise used for support.

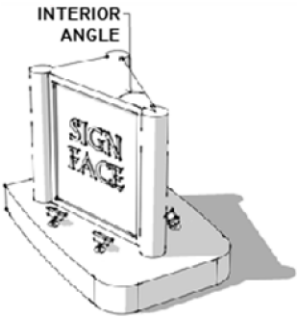
(6) The area of a I sign shall be determined to be the sum of the area of each of the smallest perimeter enclosing the limits of each work and written or graphic representation, including letter, number, character, and/or logo used for advertising, offering, or merchandising a product, or for service identification. The area of a mural painted on a wall shall not be included in the sign area calculation.

Figure 10.07-1
Sign Area Measurement



(7) Only one display face is measured if the sign faces are parallel or form an interior angle of less than or equal to 60° provided that the signs are mounted on the same structure. If the faces are of unequal area, then sign area is equal to the area of the larger face.

Figure 10.07-2
Sign Face Area Measurement



(c) Sign Illumination.No illumination of a sign is permitted unless the following criteria are met:

(1) The light from any illuminated sign shall be so shaded, shielded and directed that the light intensity or brightness shall not be objectionable to surrounding areas.

(2) Neither the direct or reflected light from a light source shall create a traffic hazard to operators of motor vehicles on public thoroughfares or approaches to public thoroughfares.

(3) No exposed reflective type bulb or incandescent lamp, which exceeds 40 watts, shall be used on the exterior surface of a sign to expose the face of the bulb, light or lamp to any public street or adjacent property.

(4) Electrical service provided to illuminated signs may require an electrical permit from the Building Department.

(d) Identification and Marking.Each sign requiring a permit shall bear an identification plate stating the following information:

(1) Date the sign was erected; and

(2) Name of person, firm, or entity responsible for its construction and erection.

(e) Temporary Use Signs.Sign(s) placed in connection with a temporary use that requires a Temporary Use Permit shall conform to the requirements, conditions, and terms of the Temporary Use Permit.

(Ord. 5190, 12/20/2023)

§ 21.10.080. Sign standards by zone district.

The following restrictions and requirements apply to permanent signs in the given zone districts.

(a) All Zone Districts.Any property containing a nonresidential use that abuts an arterial street may be permitted to have one monument style sign on one such frontage that meets the requirements of Subsection (d) of this section.

(b) Residential Zone Districts.One permanent sign per residential lot not exceeding six square feet in area is allowed, subject to the standards below.

(1) One permanent monument sign up to 32 square feet in area is allowed at a multifamily apartment/condominium building/complex and on each common area parcel that abuts a public right-of-way; for purposes of this subsection, "common area parcel" means a parcel that is owned by a homeowners' association for the benefit of all lot owners in a planned community, common interest community or condominium.

(2) For a nonresidential use in a Residential zone district, one sign not to exceed 24 square feet in area is allowed per street frontage.

(3) Location. Permitted signs may be anywhere on the property. If freestanding, the top shall not be over eight feet above the ground. If building-mounted, the sign shall be flush-mounted and shall not be mounted on a roof of the building or project above the roof line.

(4) Illumination. Indirect or internal illumination only shall be utilized for letter faces and/or logos.

(c) MU-1 District.

(1) General.The MU-1 zone district provides a transition from residential to commercial development. Those properties within the MU-1 zone district which have an underlying land use designation including "Residential" in the title are frequently developed with existing residences or are adjacent to residences and require more restrictive sign regulations to maintain compatibility. The standards within this subsection apply only to properties within the MU-1 zone district with a land use designation with "Residential" in the title. For standards applicable to properties within the MU-1 zone district with a Mixed Use, Commercial, or other land use designation, refer to GJMC § 21.10.080(d).

(2) Types Allowed.Flush wall signs and monument signs shall be the only sign types allowed.

(3) Location and Size.Signs shall be located at least 10 feet behind the front property line. Total sign area shall not exceed 25 square feet per street frontage. The sign allowance for one street frontage may be transferred to a side of a building that has no street

frontage, but cannot be transferred to another street frontage. Monument signs shall not exceed eight feet in height.

(4) Illumination.Signs may be externally illuminated; no other illumination of signs is allowed. All lights used for illumination of signs shall be arranged so as to confine direct light beams to the lighted sign and away from adjacent residential properties and out of the direct vision of motorists passing on adjacent streets. Illumination of signs shall comply with GJMC Chapter 21.11 and shall be limited to authorized business hours.

(5) Sign Area.The area of flush wall signs and monument signs shall be calculated as per the graphics shown under GJMC § 21.10.070(b).

(d) All Other Mixed-Use and Industrial Zone Districts.

(1) General.This section shall apply to the MU-2, MU-3, P-2, CG, I-OR, I-1, and I-2 zone districts.

(2) Types Allowed.Signs in the Mixed-Use and Industrial zone districts may include facade signs, flush wall signs, freestanding signs, projecting signs and roof signs. All signs allowed in Residential zone districts are also allowed in Mixed-Use and Industrial zone districts.

(3) Location and Size.Permitted signs may be anywhere on the premises except as specifically restricted in this subsection (see specific sign type and pertinent zoning regulation). The total amount of signage to be allowed on any property shall not exceed the sign allowance as calculated in accordance with Subsection (d)(5)(ii) or (d)(7)(ii) of this section, whichever is greater. No single sign may be larger than 300 square feet. No projecting sign may exceed the allowances in Subsection (d)(6) of this section.

(4) Illumination.Unless specifically prohibited, all of the following signs may be illuminated within the limits allowed under GJMC § 21.10.070(c) and GJMC Chapter 21.11.

(5) Facade Signs, Flush Wall Signs and Roof Signs.

(i) The sign allowance shall be calculated on the basis of the area of the one building facade that is most nearly parallel to the street that it faces. Each building facade which faces a dedicated public street shall have its own separate and distinct sign allowance. The sign allowance for facade signs and flush wall signs on buildings located on interior lots (lots not on a corner) which are oriented perpendicular to the street shall be based on the longer building facade. The total sign allowance, or any percentage thereof, of one frontage may be transferred to a building facade that has no frontage on a dedicated public street, provided the transferred amount does not exceed two square feet of sign area per linear foot of the facade on which it is being placed.

(ii) Two square feet of sign area shall be allowed for each linear foot of building facade for facade signs, flush wall signs and roof signs. The measurement of a roof sign shall be based on the square footage of each sign face. Flush wall signs may extend up to 12 inches from the face of the building if the base of the sign

is at least eight feet above ground level. (Show window signs in a window display of merchandise when incorporated with such display will not be considered part of the total sign allowance.)

(iii) On any building which allows facade signs, flush wall signs, roof signs, or projecting signs, a maximum of two of these types may be used. If a flush wall sign and roof sign are used, the sign allowance of two square feet per linear foot of building may be divided between the two types of signs. If either a flush wall sign or roof sign and a projecting sign are used, the allowance for the projecting sign shall be subtracted from the flush wall sign or roof sign allowance.

(iv) Roof signs shall be manufactured such that no guy wires, braces, or secondary supports shall be visible. Maximum height for roof signs shall be such that height of the structure and the sign together do not exceed the maximum height for the zone district.

(v) One sign that is flush-mounted on the rear facade of a structure that is no more than 16 square feet in area is allowed, which sign does not count toward the total sign allowance for the parcel or building (if there is more than one such sign, the other(s) shall count toward the total sign allowance).

(6) Projecting Signs.Signs may project up to 72 inches from the face of the building if located eight feet or more above grade. They shall not project beyond the back of curb, nor within two feet of the edge of the roadway if there is no curb. Total area per sign face shall not exceed one-half square foot per linear foot of building facade. If the projecting sign is the only sign mounted on the building, the minimum sign allowance shall be 12 square feet.

(7) Freestanding Signs.Freestanding signs shall comply with the following requirements:

(i) No more than one freestanding sign shall be permitted for any parcel for each street frontage. The sign allowance per frontage can only be used on that frontage and shall not be transferred to any other frontage, except where otherwise provided.

(ii) Maximum sign allowance shall be calculated by the linear front foot of property on a public street right-of-way in conformance with the following:

(A) Two traffic lanes: Maximum area of sign per face per front foot of property, three-quarters square foot; maximum height, 25 feet.

(B) Four or more traffic lanes: Maximum area of sign per face per front foot of property, one and one-half square feet; maximum height, 40 feet.

(iii) Signs may be installed at street right-of-way line. The sign face may project up to 72 inches into the right-of-way, if located 14 feet or more above grade, but shall not project closer than 24 inches to the back of the curb. If the existing street right-of-way width is less than that required in this Code, the distance shall be measured from the line of such right-of-way as required by this Code rather than from the existing right-of-way line. Ute and Pitkin Avenues shall be calculated using four lanes.

(iv) On a corner lot, a freestanding sign shall not be placed within the sight distance

triangle, as defined in TEDS (GJMC Title 29), unless free air space is maintained as provided in TEDS (GJMC Title 29). A single pipe support with no sign structure or copy shall not be considered a violation of the free air space requirement.

(v) In addition to freestanding signs as allowed above, up to two additional freestanding signs per street frontage, not greater than three square feet in area and no more than 30 inches in height, are allowed.

(vi) When electrical service is provided to freestanding signs, all such electrical service shall be underground.

(vii) All freestanding signs shall require a building permit in addition to a sign clearance.

(8) Flush wall or freestanding sign(s) with text so small as to not be readable with normal eyesight from a public right-of-way are allowed, so long as such sign does not exceed 32 square feet in area. Such signs shall not count toward the total sign allowance or the maximum freestanding sign allowance.

(e) Outdoor Advertising Signs.Outdoor advertising signs erected on ground or wall locations (and roof locations done within the regulations and limitations of roof signs) shall only be permitted in the C-2 (general commercial) and I-1 and I-2 (industrial) zone districts, subject to the following conditions, limitations, and restrictions:

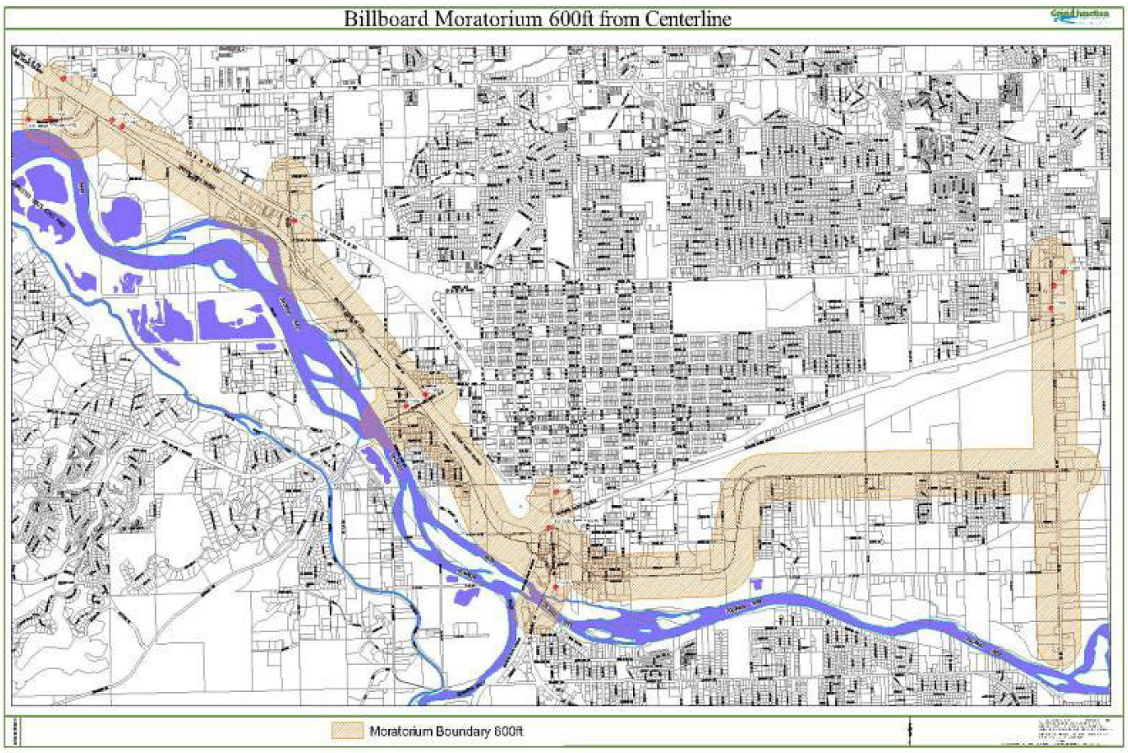
(1) Height Limitations.No outdoor advertising sign shall be erected higher than 40 feet above the level of the street or road upon which the sign faces, or above the adjoining ground level if such ground level is above the street or road level. No outdoor advertising sign shall have a surface or face area exceeding 300 square feet in area or containing less than 15 square feet in area.

(2) Distance.For each square foot of surface or facing of the sign, two feet of space from adjacent outdoor advertising signs shall be maintained. Such distances shall be determined by using the largest sign as criterion. For example, no sign can be erected closer than 600 feet to an existing 300-square-foot sign. A maximum of one outdoor advertising sign shall be allowed per lot or parcel of land.

(3) Location.

(i) A sketch, drawn to scale, depicting the size and location of the proposed billboard shall be provided. The sketch shall be prepared by a licensed surveyor and shall indicate dimensions from the proposed billboard to the closest adjacent aliquot section line and shall include coordinates. The sketch shall also include the location of the proposed billboard to the nearest adjacent right-of-way line, if applicable. The sketch shall be signed and sealed by the surveyor.

(ii) Outdoor advertising signs shall not be located within 600 feet from the centerline of the Riverside Parkway as depicted below.



(4) Illumination.Outdoor advertising signs that are illuminated by indirect or external illumination shall use only downward facing, downcast light to confine direct light beams to the sign and out of the direct vision.

(5) Prohibited Signs.Prohibited signs are signs that do not comply with the laws, rules, and regulations of the State of Colorado as now or hereafter enacted or amended. See § 43-1-401 C.R.S., et seq.

(f) P-1 and P-2 Districts.Signage on a property zoned P-1 or P-2 shall be limited to signage allowed in the surrounding zone districts.

(g) Planned Developments.No sign other than those permitted in any zone district in GJMC § 21.10.030 shall be allowed on properties in a planned development zone unless the sign has been approved as part of the development plan. Variance of the maximum total surface area of signs shall not be permitted, but the maximum sign allowance for the entire development or use may be aggregated and the total allowance redistributed.

(h) Sign Packages.A site or sites that consist of more than one developed parcel of land that are abutting and function as one through the sharing of vehicular access through, across, over, entrance onto, and/or exit from the site and/or parking (such as a shopping center) may be considered for a sign package through a sign package permit. Variance of the maximum total sign allowance shall not be permitted, but the maximum sign allowance for the entire site or sites may be aggregated and the total allowance redistributed for the same type of sign. For example, freestanding sign allowance may be redistributed among freestanding signs, but a freestanding sign allowance may not be redistributed for a facade sign. See GJMC § 21.02.040(i).

(Ord. No. 5260, 5/7/2025; Ord. 5190, 12/20/2023)

§ 21.10.090. Removal and disposition of signs.

(a) Maintenance and Repair.No person shall allow, on any premises owned or controlled by him, any sign that is in a dangerous or defective condition.

(1) The Director shall require the owner of the sign and/or the owner of the premises upon which it is located to remove or repair any such sign. In cases of immediate danger to the public due to the defective nature of a sign, the Director may have the sign removed and assess the costs of the removal against the property. Such assessment shall constitute a first and prior lien on the property, equivalent to ad valorem taxes, and shall be collected in the same manner as the real estate taxes on the property.

(2) All signs shall be safe and maintained in good appearance as well as safety including the replacement of defective parts, painting, repainting, cleaning, and other acts required for proper maintenance. Failure to properly maintain a sign shall be a violation of this Code.

(b) Abandoned Signs.

(1) Signs are allowed on otherwise vacant property so long as a permit is obtained (unless a permit is otherwise expressly not required) and so long as the sign allowance for the zone district is adhered to. However, a sign structure that has no content or is "blank" and has fallen into disrepair and which is located on property which is unoccupied for a period of 12 consecutive months or more shall be deemed abandoned.

(2) An abandoned sign is prohibited; the owner of the sign or the owner of the premises shall remove the sign and supporting structure. An abandoned sign which is not removed in a timely manner may be removed by the Director under the provisions of this section.

(Ord. 5190, 12/20/2023)

§ 21.10.100. Regulated cannabis business signage and advertising.

(a) General.

(1) All signs and advertising for regulated cannabis stores shall comply with all applicable provisions of the Colorado Marijuana Code, any regulations adopted pursuant thereto, the provisions of this chapter and of Chapter 5.13 GJMC, and the City's ordinances and regulations regarding signs and advertising.

(2) No sign shall use the terms "pharmacy,""pharmacist,""pharmaceutical,""rx," or any other similar variation of such terms as its corporate, business, or "doing business as" name, so as to prevent a reasonable person from concluding such business is involved in the practice of pharmacy, as regulated by Pharmaceuticals and Pharmacists, C.R.S. Article 22 of Chapter 12.[1] Additionally, no regulated cannabis stores may use any of the above terms or any similar variation thereof in any of its signs, placards, promotional, or advertising materials. Additionally, no signs that mimic or allude to

1. **Editor's Note: C.R.S. Article 22 of Title 12 §§ 12-22-101 to 12-22-806 was repealed.**

pharmacy or medical related symbols, including but not limited to medical style crosses regardless of proportions or colors, shall be used or displayed in nonmedical regulated cannabis stores.

(3) No sign shall include advertising material that is misleading, deceptive, or false or that, as evidenced by the content of the advertising material or by the medium or the manner in which the advertising material is disseminated, is designed to appeal to persons under 21 years of age.

(b) Maximum Sign Dimensions.

(1) For properties that lie within an existing overlay district regulated by GJMC Title 22, 24, 25, 26, or 27 the specific regulations within the overlay shall apply.

(2) For all other properties within the City, only flush wall mounted signs or monument signs shall be allowed. Maximum sign allowances shall be calculated according to the provisions of this chapter and subject to the following limitations:

(i) Maximum height: 20 feet; and

(ii) Maximum area: 150 square feet per sign face.

(c) Signs Not Requiring a Permit.Signs and advertising not requiring a permit include:

(1) Sign-wavers or other natural persons standing in the public. No regulated cannabis stores shall advertise with sign-wavers or other natural persons within the buffering distances from specified land uses as provided in GJMC § 21.04.030(d)(8)(iii).

(2) Any advertisement contained within a newspaper, magazine, or other periodical of general circulation within the City or on the internet, which may include coupons.

(3) Any nonconsumable merchandise or accessories.

(4) A booth at an adult event or job fair where the only items distributed are company or educational materials and no other items are distributed, shown, or sold.

(5) Business cards within the business or handed directly to an individual who is over the age of 21.

(6) Showing a government-issued verification of age or military status, or registration for a charitable event, or similar item the showing of which, without providing a separate printing to the business, entititles the holder to a discount for a particular product or service.

(7) Company materials and educational materials distributed inside the cannabis business.

(Ord. 5190, 12/20/2023)

Chapter 21.11
OUTDOOR LIGHTING

§ 21.11.010. Purpose.

The purpose of this section is to:

(a) Minimize light pollution, light trespass, and glare;

(b) Conserve energy and resources;

(c) Provide safe roadways for motorists, bicyclists, and pedestrians;

(d) Promote wildlife habitation and migration by minimizing light pollution into and adjacent to habitat areas;

(e) Ensure sufficient lighting can be provided where needed to promote safety and security; and

(f) Protect and reclaim the ability to view the night sky.

(Ord. 5190, 12/20/2023)

§ 21.11.020. Applicability.

(a) Applicability.This section shall apply to all lighting installed on new development, development that increases the gross floor area of the development by more than 10% and use changes that require an increase in parking as well as all replacement lighting.

(b) Exemptions.The following are exempt from this section:

(1) Luminaires with lamps of 100 watts or less on residential structures in Residential zone districts existing prior to April 5, 2010;

(2) Emergency lighting used by police, fire fighting, or medical personnel, or at their direction;

(3) Traffic control devices and luminaires on these devices installed by the City or other governmental entity;

(4) Navigational lighting systems at airports and other lighting necessary for aircraft safety;

(5) Holiday lighting and seasonal decorations using typical unshielded low-intensity incandescent lamps; and

(6) Lighting for temporary festivals, carnivals, or other special events lasting less than 14 consecutive days, provided the lighting turned off within 30 minutes after the last event of each day.

(Ord. 5190, 12/20/2023)

§ 21.11.030. Prohibited lighting.

The following types of outdoor lighting are prohibited:

(a) Any lighting that could interfere with the safe movement of motor vehicles, bicycles, or pedestrians on public or private streets;

(b) Searchlights and rotating beacons;

(c) Laser, strobe, and or flashing light sources or any similar high intensity light for outdoor advertising or entertainment;

(d) Mercury vapor and low-pressure sodium lighting;

(e) Upward-directed lighting that allows spillage into the sky; and

(f) Tower lighting, unless required by the Federal Aviation Administration (FAA).

(Ord. 5190, 12/20/2023)

§ 21.11.040. Lighting plan required.

A lighting plan shall be submitted for all uses that require the submittal of a Major or Minor Site Plan review as set forth in GJMC § 21.02.040(k).

(Ord. 5190, 12/20/2023)

§ 21.11.050. General standards.

(a) Lighting Types and Efficiency.

(1) LED or other high efficiency light fixtures shall be used to the maximum extent practicable.

(2) All light fixtures shall generate at least 80 lumens per watt of energy consumed, as shown on the manufacturers' specifications for the fixture.

(3) All exterior lighting shall have a correlated color temperature (CCT) below 3,001 Kelvin degrees. The CCT of lighting may exceed 3,000 Kelvin if the Director determines that accurate color rendition is crucial to public safety, which shall be reasonably given. In no case shall the CCT of such lighting exceed 5,000 Kelvin.

(b) Lighting Height.No light fixtures shall be mounted more than 35 feet above the ground unless as a part of an approved sports field or outdoor amphitheater.

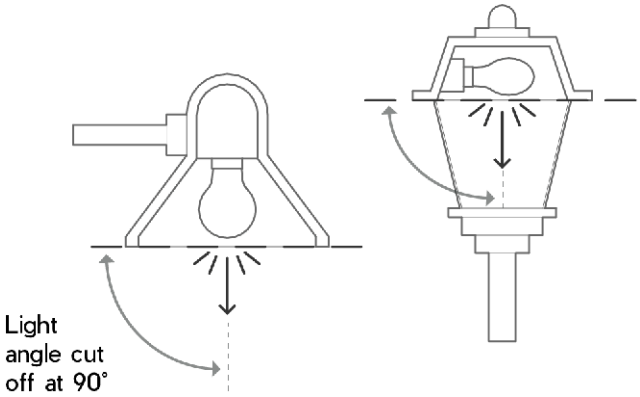
(c) Shielding and Light Trespass.

(1) All light fixtures shall be aimed and shielded so that the direct illumination shall be confined to the property boundaries of the light source. Lighting shall not be aimed onto adjacent properties, except in cases of shared parking, shared pedestrian pathways, or for coordinated development sites spanning multiple parcels.

(2) Lighting fixtures shall not be directly visible from adjacent roadways or residential uses and shall not interfere with the safe operation of vehicles moving on or near the site.

(3) Light sources shall be concealed or shielded with luminaires with cut-offs with an angle not exceeding 90° to minimize the potential for glare and unnecessary diffusion on adjacent properties.

Figure 11.05-1
Light Shielding



(4) Light levels measured at the property line of the development site shall not exceed 0.2 footcandles as a direct result of the on-site lighting.

(d) Lighting Output Levels. All lighting used to illuminate buildings, parking lots, walkways, or other site features, with the exception of lighting for public streets, shall comply with the following minimum and maximum outputs.

Table 21.11-1: Lighting Level Requirements

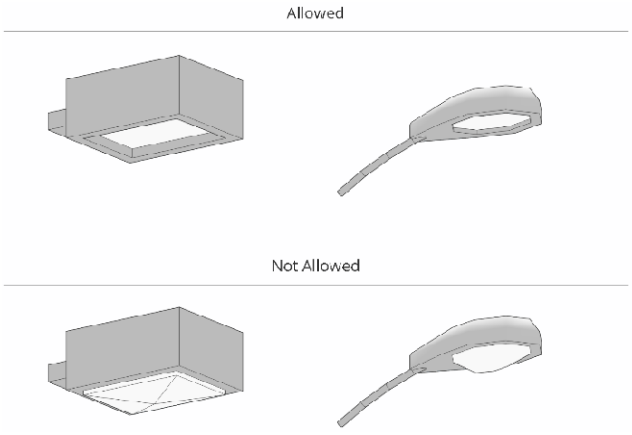
Area	Minimum (footcandles)	Maximum (footcandles)
Building Entries (Nonresidential)	1.0	10.0
Bicycle Paths and Pedestrian Walkways	0.6	10.0
Loading and Unloading Platforms	5.0	20.0
Parking Areas	0.6	10.0
Playgrounds	5.0	10.0
Under-Canopy Areas	5.0	20.0

(e) Lighting Controls.

(1) Floodlights shall not be used to light all or any portion of any building facade between the hours of 10:00 p.m. and 6:00 a.m.

(2) All exterior lighting not necessary for security purposes shall be reduced, activated by motion sensor devices, or turned off during non-operating hours. Any illumination between 10:00 p.m. and sunrise shall use full cutoff light fixtures and be reduced to levels sufficient for security purposes only.

Figure 11.05-2
Full Cutoff Light Fixtures



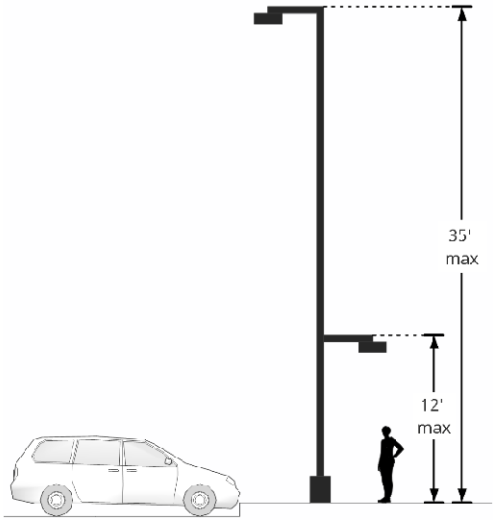
(Ord. 5190, 12/20/2023)

§ 21.11.060. Standards for specific lighting types.

(a) Parking Areas.

(1) The maximum height of required lighting is 35 feet, measured from the parking surface to the top of the lighting fixture. Lighting located near buildings and adjacent to sidewalks shall not exceed 12 feet in height.

Figure 11.06-1
Parking Lot Lighting Height

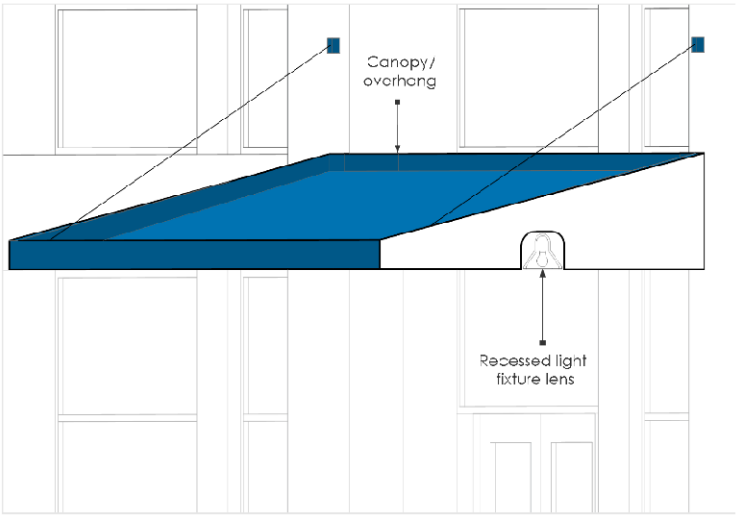


(2) The total lighting output in parking areas shall meet the requirements set forth in Table 21.11-1 above.

(b) Canopy Lighting.

(1) Canopy lights, such as service station lighting, shall be fully recessed or fully shielded so as to ensure that no light source is visible from or causes glare on public rights-of-way or adjacent properties.

Figure 11.06-2
Canopy Lighting



(2) The total lighting output of canopies shall meet the requirements set forth in Table 21.11-1 above.

(c) Pedestrian-Scale Lighting.Low-level pedestrian lighting may be used along walkways pursuant to the following:

(1) The lighting fixture shall direct light downward;

(2) The lighting fixture shall use shatterproof lamp coverings;

(3) The lighting fixture shall not be located to present hazards for pedestrians or vehicles; and

(4) Post or bollard-type lights shall be mounted no higher than four feet above grade.

(Ord. 5190, 12/20/2023)

Chapter 21.12
NONCONFORMITIES

§ 21.12.010. Nonconformities in general.

(a) Continuation.A nonconformity may be continued in accordance with the appropriate provisions in this chapter.

(b) Types of Nonconformity.There are several types of nonconformities that may exist, as follows:

(1) Nonconforming uses (GJMC § 21.12.020).

(2) Nonconforming structures (GJMC § 21.12.030).

(3) Nonconforming sites, including parking, landscaping, and screening/buffering (GJMC § 21.12.040).

(4) Nonconforming lots (GJMC § 21.12.050).

(5) Nonconforming signs (GJMC § 21.10.050).

(c) Evidence of Status.Evidence of the status of a nonconforming use shall be supplied by the owner of the property upon request of the Director.

(d) Abandonment.The following standards apply to abandoned nonconformities. Evidence of intent to abandon is not required.

(1) Nonresidential Nonconformities.A nonconforming use or structure that has been discontinued for any twelve-month period for whatever reason shall be considered to be abandoned and shall not be reestablished. Any use or structure on the property after that time shall conform to all provisions of this Code.

(2) Residential Nonconformities.

(i) A nonconforming residential use, other than a single-family dwelling, that has not been occupied for a continuous period of 12 months, for whatever reason, shall be considered to be abandoned and shall not be reoccupied except in conformance with all applicable provisions of this Code.

(ii) A nonconforming single-family dwelling that has not been occupied for a continuous period of 12 months or longer shall not be considered to be abandoned and may be reoccupied at any time provided the structure has not been changed, legally or illegally, to a nonresidential use or multiple-unit residential use.

(iii) Removal of a nonconforming mobile home or manufactured home, not in a mobile home park, from its foundation or pad for a continuous period of 12 months shall constitute abandonment of the use and placement of a new unit must comply with the provisions of this Code.

(e) Time Extensions.The Zoning Board of Appeals may permit one extension of up to 12 additional months to the time periods for abandonment, obtaining a building permit or completing construction, provided the applicant can demonstrate circumstances out of their

control have prevented a good faith attempt to reestablish or rebuild the nonconforming use and/or structure. Such circumstances may include the health of the applicant, court proceedings, failure to reach an insurance settlement, acts of God, or similar hardships.

(f) Variance.The Zoning Board of Appeals may vary the provisions of this chapter. Application and processing shall be in accordance with the provisions of GJMC § 21.02.050(q).

(Ord. 5190, 12/20/2023)

§ 21.12.020. Nonconforming uses.

(a) Continuation.A lawful use made nonconforming by the adoption of this Code or other City ordinances may continue only for so long as such use is not abandoned, expanded, increased, or changed, except as provided in this section.

(b) Nonresidential Uses.

(1) Expansion.In a nonresidential zone, on a parcel of land on which there exists an otherwise lawful nonconforming use, an existing structure and/or an outdoor operations/storage/display area may be expanded provided all other provisions of this Code are met. Nonconforming use shall not be expanded in any Residential zone district.

(2) Change of Use.No use shall be changed to a conforming use until the Director has determined that the requirements of the zone district will be met. The Director may approve a different use, provided such use is deemed by the Director to be less intense than the existing use. Prior to approval, the Director shall determine that traffic generation and parking requirements for the new nonconforming use are less than what was required for the existing use. No change to a more intense nonconforming use is allowed.

(3) Destruction.A nonconforming nonresidential use that is damaged may be reestablished following approval by the Director in accordance with the following:

(i) A use may only be reestablished within a conforming structure.

(ii) All restorative and other work must conform to adopted building codes.

(iii) A building permit must be issued within two years from the date of the damage.

(iv) The certificate of occupancy (or other final inspection) must be issued as provided by adopted codes.

(c) Residential Uses.A "nonconforming residential use" is a structure which contains more dwellings than allowed by the zone or is a dwelling located in a nonresidential zone that does not permit residential uses.

(1) Expansion.In all zone districts, a residential use may be expanded by up to 20% of the gross floor area as it existed on April 5, 2010, if no additional dwelling units are created and all other provisions of this Code are met. Accessory structures for a nonconforming residential use such as a garage or storage shed shall be allowed if the provisions of GJMC § 21.04.040 are met. Accessory dwelling units shall not be permitted.

(2) Destruction.Nonconforming residential uses that are damaged may be reestablished in accordance with the following:

(i) All portions of the structure being restored are not and were not on or over a property line;

(ii) The number of dwelling units does not increase;

(iii) All construction is in compliance with current construction codes, such as the fire and building codes;

(iv) A Building Permit is obtained within one year from the date of the damage; and

(v) The Certificate of Occupancy (or other final inspection) is issued within two years of the issuance of the building permit.

(Ord. 5190, 12/20/2023)

§ 21.12.030. Nonconforming structures.

(a) Continuation.A lawful structure as of April 5, 2010, that is nonconforming due solely to failure to meet the dimensional standards or performance standards pertaining to a structure and criteria of the underlying zone may be used for any purposes permitted in the zone so long as the use is in conformance with the provisions of this section.

(b) Maintenance and Restoration.A nonconforming structure may be maintained or restored provided no expansion of the nonconformity occurs. The cost of the maintenance, restoration or remodeling shall be as shown on the approved building permit application and the current fair market value of the existing structure shall be based on improvement value as determined by the Mesa County Assessor or an appraisal performed by a certified general appraiser licensed to do business in the State of Colorado utilizing the "cost" approach. This appraisal shall be performed at the applicant's expense. The Mesa County Assessor's appraisal may be used if not more than 12 months old.

(1) Maintenance, restoration, or remodeling projects that cost 25% or less of the current fair market value of the structure shall not require any correction to existing nonconforming parking, landscaping or screening/buffering other than what may be required by fire and building codes.

(2) Maintenance, restoration, or remodeling projects that cost more than 25%, but less than 75%, of the current fair market value of the structure shall require a corresponding percentage increase in compliance with the landscaping requirements of this Code until the site achieves 100% compliance. For example, if a site has only 20% of the required landscaping and the cost of the remodeling is 30% of the value of the building, then 30% of the required landscaping shall be provided.

(3) Maintenance, restoration, or remodeling projects that cost 76% or greater of the current fair market value of the structure shall require 100% compliance with the landscaping requirements of this Code.

(4) Maintenance, restoration, or remodeling projects that require an increase in landscaping shall have up to 24 months after the issuance of a certificate of occupancy (or other final inspection) to install the required landscaping and related improvements. A Development Improvements Agreement (DIA) with financial

security shall be required for the cost of all landscaping materials and improvements, including the irrigation system. See GJMC § 21.02.030(h)(3).

(5) Properties that are physically constrained from complying with these provisions shall comply to the maximum extent practical as determined by the Director using the following criteria:

(i) Is the general intent of the requirement being met by the applicant, such as landscaping along the site frontage, even if some of it is in the right-of-way?

(ii) Are there other upgrades, amenities, or public benefits being provided, such as upgrades to building facade, relocating landscaping on site, increasing plant sizes and/or planting density, public art, etc.?

(iii) Will the proposed deviation result in a safe, efficient condition?

(iv) What other alternatives have been considered that would meet the current standards?

(c) Expansion.A nonconforming structure may be expanded; provided, that no increase in the structural nonconformity occurs. For example, an addition may be constructed, provided it meets the dimensional requirements for the zone. If the expansion results in an expansion of the nonconforming use, then see GJMC §§ 21.12.020(b)(1) and 21.12.020(c)(1).

(d) Destruction.

(1) A nonconforming residential structure which is damaged may be restored within the existing footprint; provided, that:

(i) All portions of the structure being restored are not on or over a property line;

(ii) All construction is in compliance with current construction codes, such as fire and building codes;

(iii) A building permit is obtained within 12 months from the date of the damage;

(iv) The certificate of occupancy (or other final inspection) is issued within one year of the issuance of the building permit.

(v) If damage exceeds 50% or more, restoration or improvement shall not be permitted unless the restoration results in a structure and site conforming to all applicable requirements of this Code.

(2) A nonconforming nonresidential structure which is damaged to 50% or less of its fair market value, based on a market appraisal performed by a certified appraiser, may be restored within the existing footprint; provided, that:

(i) All portions of the structure being restored are not on or over a property line;

(ii) All construction is in compliance with current construction codes, such as fire and building codes;

(iii) A Building Permit is obtained within 12 months from the date of the damage;

(iv) The Certificate of Occupancy (or other final inspection) is issued within one

year of the issuance of the building permit.

(v) If damage exceeds 50% or more, restoration or improvement shall not be permitted unless the restoration results in a structure and site conforming to all applicable requirements of this Code.

(e) Signs.This section shall not apply to nonconforming signs (see sign regulations, GJMC § 21.10.050.

(Ord. 5190, 12/20/2023)

§ 21.12.040. Nonconforming sites.

(a) Continuation.A parcel of land existing as of April 5, 2010, that is nonconforming due solely to failure to meet the parking, landscaping, or screening/buffering standards may be used for any purposes permitted in the zone so long as the use is in conformance with the provisions of this section.

(b) Maintenance and Restoration.A nonconforming site may be maintained or restored provided no expansion of the nonconformity occurs unless the expansion occurs in conformance with this section.

(c) Expansion.Additions to structures or additional paving, parking or outdoor storage on nonconforming sites shall require correction of existing nonconforming parking, landscaping, and screening/buffering.

(1) Redevelopment or expansion which results in a 65% or greater increase of the gross square footage of the existing structure, outdoor operations/storage/display, paving, or parking areas requires the entire property to meet all of the landscaping and screening/buffering requirements of this Code. The increase may be to only one of the gross square footage areas or a combination of increases of the gross square footage areas which result in an overall increase of 65% or greater. (For example, if the gross square footage area of the structure increases by 50% and the outdoor storage gross square footage area increases by 20%, then the overall increase is 70% and the entire property shall be required to meet all landscaping and screening/buffering requirements of this Code.)

(2) Redevelopment or expansion which would result in less than a 65% increase of the gross square footage of the existing structure, outdoor operations/storage/display, paving or parking areas shall require a corresponding percentage increase in compliance for landscaping and screening/buffering requirements of this Code until the site achieves 100% compliance. (For example, if the gross square footage area of the structure increases by 10% and the outdoor storage gross square footage area increases by 15%, then the overall increase is 25% and the site contains only 50% of the required landscaping, 25% of the required landscaping for the entire site must be provided, thereby bringing the site to 75% of the total required.) Existing landscaping on the site shall be retained or replaced but shall not count toward the required percentage of new landscaping.

(3) Redevelopment or expansion that necessitates an increase in the number of parking spaces shall be required to provide 50% of the required parking spaces for the additional floor area in accordance with this Code. The additional parking area shall comply with all associated landscaping and drainage requirements of this Code.

(4) The conversion of nonconforming commercial and/or residential structures and sites to condominiums shall not require that the site be brought into compliance with parking, lighting, and landscaping requirements of this Code.

(5) Properties that are physically constrained from complying with these provisions shall comply to the maximum extent practicable as determined by the Director using the following criteria:

(i) Is the intent of the requirement being met by the applicant, such as landscaping along the site frontage, even if some of it is in the right-of-way?

(ii) Are there other upgrades, amenities, or public benefits being provided, such as upgrades to building facade, relocating landscaping on site, increasing plant sizes and/or planting density, public art, etc.?

(iii) Will the proposed deviation result in a safe, efficient condition?

(iv) What other alternatives have been considered that would meet the current standards?

(d) Change of Use.

(1) Changes of use that necessitate an increase in the number of parking spaces shall be required to provide the difference between the required parking for the prior use and that required for the proposed use in accordance with this Code. Where this calculation results in the addition of less than five spaces, no additional spaces shall be required. Any additional parking area shall comply with all associated landscaping and drainage requirements of this Code.

(2) New outdoor operations/storage/display uses require that the entire lot or parcel meet all requirements of this Code.

(e) Destruction.

(1) A nonconforming residential structure which is damaged may be restored within the existing footprint; provided, that: all portions of the structure being restored are not and were not on or over a property line; all construction is in compliance with current construction codes, such as the fire and building codes; a building permit is obtained within six months from the date of the damage; and the certificate of occupancy (or other final inspection) is issued within one year of the issuance of the building permit. If damage exceeds 50% or more, restoration or improvement shall not be permitted unless the restoration results in a structure and site conforming to all applicable requirements of this Code.

(2) A nonconforming nonresidential structure which is damaged to 50% or less of its fair market value, based on a market appraisal performed by a certified appraiser, may be restored within the existing footprint; provided, that: all portions of the structure being restored are not and were not on or over a property line; all construction is in compliance with current construction codes, such as the fire and building codes; a building permit is obtained within six months from the date of the damage; and the certificate of occupancy (or other final inspection) is issued within one year of the issuance of the building permit. If damage exceeds 50% or more, restoration or improvement shall not be permitted unless the restoration results in a structure and

site conforming to all applicable requirements of this Code.
(Ord. 5190, 12/20/2023)

§ 21.12.050. Nonconforming lots/parcels.

A lot or parcel of land with an area less than prescribed in the applicable zone may be used for any purpose permitted in the zone if:

(a) The owner is able to demonstrate to the satisfaction of the Director that the parcel was lawful at the time it was created; and

(b) The use meets all other regulations prescribed for the zone prior to occupancy or use.
(Ord. 5190, 12/20/2023)

Chapter 21.13
VIOLATIONS AND ENFORCEMENT

§ 21.13.010. Director.

The Director may delegate enforcement authority, duties, and powers pursuant to this Code.
(Ord. 5190, 12/20/2023)

§ 21.13.020. Inspection.

The Director may enter or inspect any building, structure, lot, parcel, or property to ensure compliance with the provisions of this Code as follows:

(a) Inspections shall be carried out during business hours unless the Director determines that an emergency exists.

(b) Entry onto those portions of private property which are not open to the public, business invitees, and others for the purpose of conducting the owner's business shall be made only after contact with the owner of the premises, whose permission for the inspection should be obtained.

(c) Application for any approval, development, or project constitutes permission to inspect all of the property including structures relating to the application.

(d) Failing permission from the owner, no inspection of private portions of property shall be undertaken without an order from the Municipal Court or another court of competent jurisdiction.

(Ord. 5190, 12/20/2023)

§ 21.13.030. Code violations and enforcement.

The remedies provided for violation of any provision of this Code, whether civil or criminal, shall be cumulative and be in addition to any other legal or equitable remedy. Except as otherwise provided, any development or use which is initiated or maintained or is not in compliance with the provisions of this Code is prohibited and shall be an "unlawful" development or use.
(Ord. 5190, 12/20/2023)

§ 21.13.040. Continuing violations.

Each day that a violation of any provision of this Code exists, occurs, or remains uncorrected shall constitute a separate violation.
(Ord. 5190, 12/20/2023)

§ 21.13.050. Civil remedies and enforcement powers.

(a) Stop Work.Upon a finding that any of the following conditions exist, all activities taken pursuant to such a permit or development application shall immediately cease, and no person shall continue construction or make use of or maintain any activity pursuant to such approval if:

(1) The applicant fails to satisfy any condition of the approval;

(2) The applicant fails to timely complete all work and construction set forth in a Development Improvements Agreement. If no time limit for satisfaction of conditions is specified in the original or revised approval of the application, the time shall be presumed to be one year from the date of approval; or

(3) The applicant fails to fulfill any promise made in writing or at any public hearing.

(b) Withhold Permit.The Director, for any unlawful use or development, may:

(1) Deny or withhold any permit, certificate, or other form of authorization to use or develop any land, structure, or improvements thereon. This provision shall apply regardless of whether the current owner or applicant is responsible for the violation.

(2) Revoke any development permit or other authorization when the Director determines:

(i) That there is departure from the plans, specifications, or conditions as required under terms of the permit or other authorization;

(ii) That the development permit was procured by false representation or was issued by mistake; or

(iii) That any of the terms, conditions or provisions are being violated or reasonably believed to be violated. Written notice of revocation shall be served upon the owner, the owner's agent, or contractor that such permit was issued to or notice may be posted in a conspicuous or prominent location at the place of violation.

(3) With or without revoking permits, stop work on a property where there is a violation of a provision of this Code or of a permit or other form of authorization issued hereunder.

(4) Upon notice to the applicant the Director may petition the Planning Commission to, at public hearing, revoke the plan or other approval or condition its continuance on strict compliance with this Code, the provision of a financial guarantee or other security to ensure that construction is completed in compliance with approved plans or such other conditions as the Planning Commission may reasonably impose.

(5) Initiate injunctive relief or abatement proceedings or other appropriate legal action in Municipal Court or another court of competent jurisdiction against any person who fails to comply with any provision of this Code or any requirement or condition imposed pursuant to this Code. The Director shall act to prevent, enjoin, abate, or terminate violations.

(6) Seek a court order in the nature of mandamus, abatement, injunction prohibition or other action or proceeding to abate or remove a violation or to otherwise restore the premises in question to the condition in which they existed prior to the violation.

(c) Civil Penalty.

(1) Any person who fails to comply with any provision of this Code shall be subject to a civil penalty of not less than $100 or more than $1,000 for each offense.

(2) Each day that a violation exists shall constitute a separate offense; however, the maximum civil penalty that may be imposed, even in circumstances where there are multiple and continuing offenses, shall be $10,000.

(3) Every such action shall be brought before the Municipal Court of the City. The Municipal Court shall have original jurisdiction to hear and decide such cases.

(4) The City is entitled to recover judgment against any person failing to comply with any provision of this Code for reasonable attorney's fees in an amount determined by the Municipal Court.

(5) The City, its officers and employees may initiate an action under this section, but neither the City nor its officers or employees shall be liable for any claim or cause of action.

(d) Other Remedies.The City shall have such other powers and remedies as are and as may be provided by Colorado law for the violation of this or any duly and lawfully enacted code.

(e) Continuation.Nothing in this Code shall prohibit the continuation of enforcement actions undertaken by the City pursuant to previous lawful and valid ordinances, laws, rules, or regulations.

(Ord. 5190, 12/20/2023)

§ 21.13.060. Criminal penalty.

A violation of any provision of this Code or any requirement or condition imposed pursuant to this Code, including violations of standards and requirements adopted by reference, shall be a misdemeanor. Upon conviction, any person found in violation shall be punished by a fine of not more than $1,000 or by imprisonment for not more than one year or by both fine and/or imprisonment, for each violation. Each person violating this Code or any requirement or condition imposed pursuant to this Code, whether the person directly commits the act or aids or abets the same, whether present or absent, may be prosecuted and punished as a principal.

(Ord. 5190, 12/20/2023)

§ 21.13.070. Enforcement procedures.

(a) Nonemergency Matters.

(1) For violations of this Code that do not constitute an emergency, the Director shall give notice of the general nature of the violation to the property owner, agent, occupant, or any applicant for any relevant permit in a manner reasonably calculated to afford notice.

(2) Enforcement action shall be stayed for a period of 10 days after notice, as provided in this section, has been posted on the property, mailed to the last known owner of the property or been hand delivered. Lack of personal notice shall not defeat any enforcement action.

(3) Notice may be given in person, by United States mail, or by posting notice on the premises.

(4) Notice of violation shall state the nature of the violation and the time period for compliance and may state the corrective steps necessary and the nature of subsequent penalties and enforcement actions should the situation not be corrected.

(5) Notices are deemed to run with the land and may be recorded by the Director in the Mesa County land records.

(6) Notices of violation are effective for 12 months from the date of issue.

(b) Emergency Matters.For violations of this Code, actual or alleged, that constitute an emergency as determined by the Director, City Council, City Manager, or declaration of the county, state or federal government, the City may use the enforcement powers available under this chapter without prior notice.

(Ord. 5190, 12/20/2023)

§ 21.13.080. Continued compliance.

Once constructed, the owner and developer shall be treated as an association (unless otherwise formed) and shall be liable for and responsible to maintain the development in substantial compliance with City regulations, approved plans, and conditions. Failure to achieve substantial compliance including, but not limited to, the replacement of required plant materials that have died or are diseased, shall constitute a violation of this Code and may be enforceable by the City in Municipal Court subject to the provisions of this chapter.

(Ord. 5190, 12/20/2023)

§ 21.13.090. Enforcement and revocation.

In accordance with the provisions of this chapter, the Director may revoke any permit for failure to comply with the conditions of the permit or failure to comply with any provision of this Code, or if any information, statement, or documents supplied by or on behalf of an applicant are false, misleading or omit any material fact or information.

(a) Revocation of Permit or Approval.

(1) Director Duties.If the Director determines there are one or more reasons to revoke a development permit or approval, he/she shall revoke such permit or approval. Any appeal of the Director's decision shall be heard by the Zoning Board of Appeals in accordance with GJMC § 21.02.010(c).

(2) Notice and Hearing.Notice and hearings for a revocation are the same as for the original application.

(3) Decision and Appeals.A decision to revoke a development permit shall become effective immediately. After revocation of any permit or approval, any activities continuing pursuant to such permit or approval shall be deemed to be in violation of the Code.

(4) Right Cumulative.The Director's right to revoke any approval, development permit, or other privilege or right shall be cumulative to any other remedy.

(Ord. 5190, 12/20/2023)

Chapter 21.14
MEASUREMENTS AND DEFINITIONS

§ 21.14.010. Measurements.

(a) Density/Intensity. The following measurements shall apply to all maximum and minimum density calculations for zoning and land use classifications, unless otherwise indicated.

(1) Maximum Residential Density.

(i) "Maximum residential density" means the number calculated by multiplying the maximum allowed number of units per acre defined by the zone district by the gross acreage expressed in square feet or acres of the development property.

(ii) Maximum residential density is rounded down to the nearest dwelling unit per acre.

(iii) Gross land area includes the entire parcel or property at the time a development application is filed.

(A) In the R-4 through R-24 zone districts, for the purpose of calculating density on parcels smaller than five acres, one-half of the land area of all adjoining rights-of-way may be included in the gross lot area. The area of the right-of-way shall not be included to determine compliance with the minimum lot area requirements.

(B) In RH-16 and RH-24, for purpose of calculating density on any parcel, one-half of the land area of all adjoining rights-of-way may be included in the gross lot area.

(2) Minimum Residential Density.

(i) This calculation applies to the term "net minimum residential density as used in this Code. "Minimum residential density" means the number calculated by multiplying the minimum required number of units per acre defined by the zone district by the net developable land area of the development parcel. "Net developable land area" means all portions of the parcel at the time a development application is filed, minus the following if they are to be left as open space:

(A) Floodways and floodplains;

(B) As defined by the Clean Water Act: wetlands, surface waters, stream, and river channels, banks, and corridors;

(C) Slopes of greater than 30% or other areas of unstable soils that are not suitable for development;

(D) Clear zone districts and critical zone districts;

(E) Open space or recreation areas to be dedicated to a public agency or to a private entity approved by the Director to perpetually maintain the open space;

(F) Ridgeline setback areas in excess of any required setbacks;

(G) Areas of geologic hazards; and

(H) Other areas that, in the opinion of the body reviewing the development, are similarly unsuitable for development.

(ii) Minimum residential density is rounded up to the next dwelling unit per acre.

(3) Transitional Densities.Larger lots or other screening and buffering areas that are provided as a transition for adjoining established neighborhoods may be excluded from the density calculations for purposes of determining minimum density on those parcels that are not large enough to accommodate the transition and meet minimum density.

(4) Other Residential Density.Density of group living facilities shall be calculated as four beds equal one dwelling unit. Group living facilities are meant to fit into a neighborhood with the same characteristics and requirements.

(5) Application of Density/Intensity Definitions.The maximum and minimum residential density or nonresidential intensity requirements apply to all development except:

(i) Minimum density requirements shall not apply to a simple subdivision if one or more lots can reasonably be resubdivided or developed in a manner that complies with the minimum density and other requirements of this Code;

(ii) There shall be no minimum density requirement applicable to a major subdivision if all but two of the resulting lots comply with the minimum density requirements and at least one of the two lots that do not comply can reasonably be resubdivided or developed in a manner that complies with the minimum density and other requirements of this Code and no other development is allowed; and

(iii) A mix of residential and nonresidential uses.

(6) Mixed Use Density/Intensity.The density of a lot with a mix of residential and nonresidential uses ("mixed-use").

(i) Mixed-Use Lot.The density of a mixed-use lot shall be calculated by dividing the total number of dwellings on the lot by the gross land area of the lot. The gross residential density of the lot shall be the maximum density permitted in the underlying zone district. There is no minimum density requirement for a mixed-use lot if at least 10% of the gross floor area is used for nonresidential purposes.

(ii) Mixed Use Subdivision.In a mixed-use subdivision, the density shall be calculated for each lot, unless provided otherwise at the time of subdivision approval.

(b) Distances.Unless otherwise specified, separation distances shall be calculated as a radial buffer extending from property lines of the use to be buffered (i.e., "as the crow flies").

(1) Cannabis Operation or Natural Medicine Separation.The separation distance shall be computed by direct measurement from the nearest property line of the land use to the

nearest portion of the building or unit in which the use is to occur, using a route of direct pedestrian access, measured as a person would walk safely and properly, without trespassing or utilizing alleys, following striping or parking patterns or on-site designated pedestrian routes, with right angles at crossings and with the observance of traffic regulations and traffic signals.

(c) Lot and Site Measurements.

(1) Frontage.

(i) Lot frontage or street frontage is measured as the distance between side lot lines along the front lot line.

(ii) When a lot fronts on more than one public street, one side may be designated by the property owner or applicant as the front. This will be used for the purposes of determining setbacks, street orientation, and other similar measurements. Where a lot abuts more than two public streets, the applicant and Director will determine location of front and identification of other sides for setback purposes based on existing or anticipated site context.

(2) Lot Area Measurement.Lot area is measured as the amount of net land area contained within the property lines of a lot or parcel, not including street right-of-way.

(3) Lot Coverage.

(i) Lot coverage is measured as the percentage of the total lot area covered by structures. It is calculated by dividing the square footage of structure coverage by the square footage of the lot.

(ii) The following shall be counted as structures for purposes of determining lot coverage:

(A) Areas covered by swimming pools;

(B) Areas covered by structures with a roof; and

(C) Structures that are more than six feet tall and enclosed on three or more sides with walls that are less than 25% open.

(4) Lot Width.

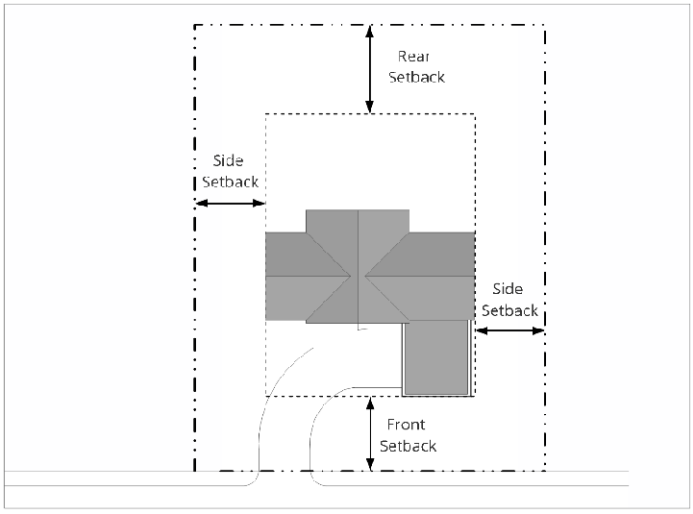
(i) Lot width is measured at the front yard setback line between side property lines measured parallel to the street, said property lines or to the tangent of a curved street property line. If side property lines are not parallel, the lot width is the shortest distance between the side property lines.

(5) Setbacks.

(i) Measurement.

(A) Setbacks are measured as the unobstructed unoccupied open area between the furthermost projection of a structure and the property line of the lot on which the structure is located, except as modified by the standards of this Code.

Figure 14.01-1
Setbacks



(B) There is no internal side setback for attached single-family dwellings or the common wall of two-family dwellings. Side setbacks shall be measured at the external wall of attached dwellings.

(C) Setbacks shall be unobstructed from the ground to the sky except as specified in GJMC §§ 21.03.040(d) and 21.03.040(e).

(D) Vehicle storage setbacks are measured from the storage entrance to the property line.

(ii) Setback Encroachment Measurement.Setback encroachment shall be measured from the minimum required setback line towards the lot line; setback encroachments are always measured from the same point and are not cumulative.

(d) Structure Measurements.

(1) Gross Floor Area (GFA).

(i) Gross floor area is measured within the exterior face of exterior walls or the centerline of walls separating two abutting buildings, but excluding any space where floor-to- ceiling height is less than 6.5 feet. Gross floor area includes covered and uncovered outdoor courtyards, arcades, atria, paseos, walkways, and corridors location at or near the street level that are accessible to the general public and are used as sales, display, storage, service, or production areas.

(ii) Gross floor area calculated for maximum size may exclude eaves, covered or uncovered porches, upper story decks and balconies, breezeways, exterior covered stairwells and attached decorative walls which are less than or equal to three feet in height.

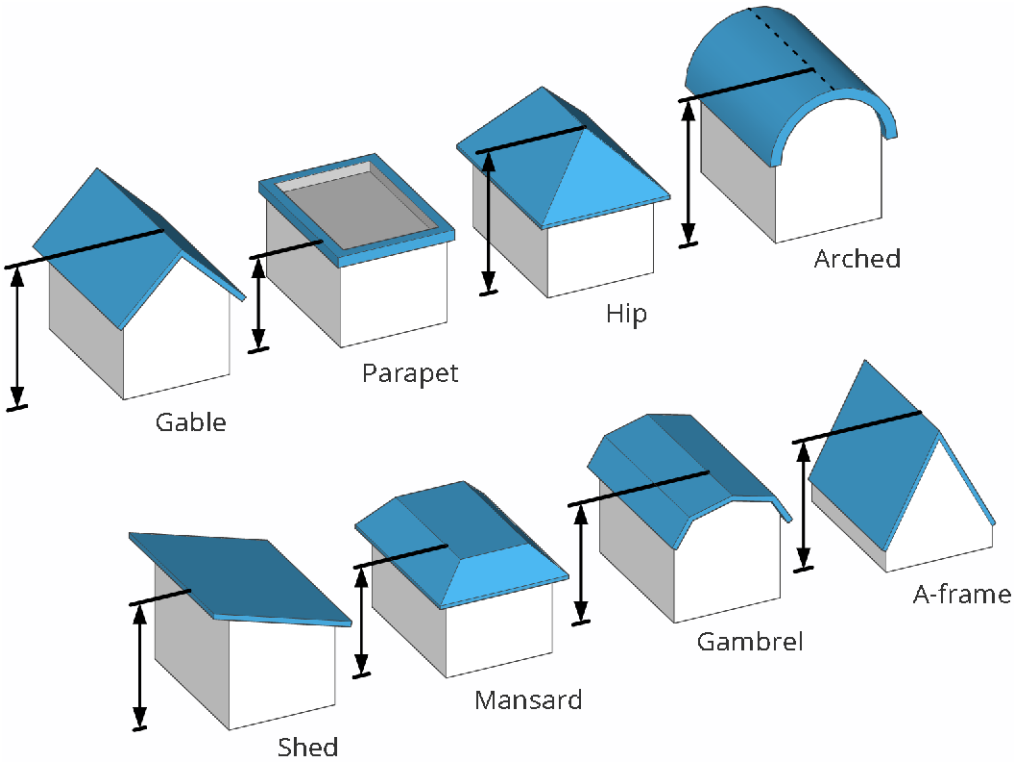
(2) Ground Floor Elevation.Ground floor elevation is measured from natural or improved grade (whichever is more restrictive) to the finished floor level of the ground floor.

Grade is measured continuously across a lot.

(3) Height.

(i) Measurement. Building height is the vertical distance between the mean finished grade between the lowest and highest grades along the foundation and the highest point of the roof or facade (see graphic).

Figure 14.01-2
Roof Height



(ii) Height Encroachment Measurement.

(A) Each height encroachment shall be measured from the maximum building height.

(B) Building height encroachments are not cumulative in that they are always measured from the same point.

(4) Story Height.

(i) An attic story is considered a half-story and counts toward the calculation of maximum number of stories.

(ii) Basements are not considered a story.

(iii) If a ground story is more than five feet above original grade, the space below counts as an additional story.

(iv) Story height is measured from the top of finished floor to the top of the finished floor above.

(Ord. No. 5244, 1/15/2025; Ord. No. 5242, 12/4/2024; Ord. 5218, 5/1/2024; Ord. 5190, 12/20/2023)

§ 21.14.020. Definitions.

(a) Rules of Construction.To help interpret and apply this Code, the following rules shall apply:

(1) The particular controls the general;

(2) The text shall control if there is a difference of meaning or implication between the text and any caption or title;

(3) The words "shall" and "must" are always mandatory. The words "may" and "should" are permissive and are at the discretion of the decision-maker;

(4) Words used in the present tense include the future;

(5) Words in the singular include the plural;

(6) Words of one gender include all other genders, unless the context clearly indicates otherwise;

(7) Any term not herein defined shall be as defined elsewhere in the City Code or, if not defined elsewhere in the City Code, as defined in Webster's New International Dictionary, most recent edition;

(8) Unless otherwise indicated, the term "days" means calendar days, if the period of time referred to is more than 30 days. If the period of time referred to is less than 30 days, "days" means days when the City is open for business;

(9) If the last day of a submission date, period or other deadline is a Saturday, Sunday or a holiday recognized by the City, the period shall end on the last business day; and

(10) Use of words like "City Council," "Planning Commission," "Director," and "Engineer" includes City officials and staff.

(b) Terms Defined.

A

Abandonment means the relinquishment of property, or a cessation of the use of the property, by the owner or lessee without any intention of transferring rights to the property to another owner or of resuming the use of the property.

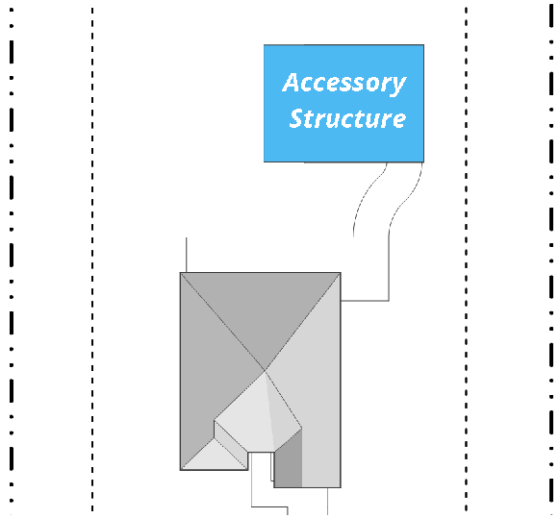
Abut/abutting means uses or parcels that directly touch. Parcels across a right-of-way would not be abutting but would be adjacent.

Access means a way or means of approach to provide vehicular or pedestrian physical entrance to a property.

Accessory dwelling unit means a dwelling unit that is secondary to a principal dwelling unit that may be attached to the principal structure or freestanding.

Accessory structure means a detached subordinate structure, the use of which is customarily incidental to, and supportive of, the principal structure or the principal use of land, and that is located on the same parcel of ground with the principal structure or use.

Figure 14.02-1
Accessory Structure



Accessory use means the use of land or a building customarily incidental to, subordinate to, and supportive of the principal use of the parcel.

Addition

(1) A structure added to the original structure at some time after certificate of occupancy has been issued for the original structure; or

(2) An extension or increase in floor area or height of a building or structure.

Adjacent means property or use, any portion of which is within a 100-foot radius. Right-of-way, easements, canals or waste ditches, and waterways are not counted when deciding if one property or use is adjacent to another.

Adjoin means a lot or parcel of land that shares all or part of a common lot line with another lot or parcel of land.

Administrative decision means any decision on an application made by an authorized City employee pursuant to this Code.

Adult Entertainment-Related Definitions.

Adult entertainment establishment means any establishment that conducts the sale, rental, display or other offering of live entertainment, dancing or material that is distinguished or characterized by its emphasis on depicting, exhibiting, describing, or relating to specified sexual activities or specified anatomical areas as a principal use of the premises or as a significant or substantial adjunct to another use of the premises, including but not limited to:

1. Adult bookstore: Any establishment which sells or rents adult material including but not limited to books, magazines, movies, films, slides, or other photographic or written material and/or devices;
2. Adult hotel or motel: Any hotel or motel in which the presentation of adult material is the principal attraction;
3. Adult motion picture theater: Any fully enclosed theater in which the presentation of adult material is the principal attraction; and
4. Adult cabaret, restaurant, or place of business: a cabaret, restaurant or place of business which features topless and/or bottomless dancers, waitresses, waiters, or entertainers, or any other depiction of adult material.

Adult material means any material including, but not limited to, books, magazines, newspapers, movie films, slides, or other photographic or written materials, video tapes and/or devices that are distinguished by their emphasis on depicting, describing, or relating to specified anatomical areas or specified sexual activities:

1. Specified anatomical areas are any of the following that are less than completely and opaquely covered:
    a. Human genitals and public region;
    b. Buttocks;
    c. The human female breast or breasts to a point immediately below the top of the areola; and
    d. Human male genitals in a discernibly turgid state even if completely and opaquely covered.
2. Specified sexual activities or sexual conduct:
    a. Human genitals in a state of sexual stimulation or arousal;
    b. Actual or simulated acts of sexual intercourse, masturbation, sodomy, bestiality, cunnilingus, fellatio, anilingus or any sexual acts which are prohibited by law; and
    c. Touching or fondling of the human female breast, buttock, anus or genital.

Church means any structure or building for public worship.

Crane game means an amusement machine that, upon insertion of a coin, bill, token, or similar object, allows the player to use one or more buttons, joysticks, or other controls to maneuver a crane or claw over a nonmonetary prize, toy, or novelty, none of which shall have a cost to the arcade of more than $25 per item, and then, using the crane or claw, to attempt to retrieve the prize, toy, or novelty for the player.

Gambling device means any device, machine, paraphernalia, or equipment that is used or usable in the playing phases of any professional gambling activity, whether that activity consists of gambling between persons or gambling by a person involving the playing of a machine; except that the term does not include a crane game.

Gaming arcade (aka skilled gaming business) means any business location, including a private club, that is owned, leased, or otherwise possessed, in whole or in part, by a person or by that person's partners, affiliates, subsidiaries, agents, or contractors which features i) slot machine(s), ii) gambling device(s), iii) simulated gambling device(s), or iv) any mechanical, electrical, video, electronic, or other device, contrivance or machine which after insertion or conveyance of a coin, debit card, credit card, cash, token or similar object or upon payment of any required consideration whatsoever by a player, is available to be played or operated, and which, whether by reason of the skill of the player or application of the element of chance, or both, may deliver or entitle the player operating the machine to receive monetary compensation and/or redeemable game credits, or any other thing of value. This definition expressly includes 'fish game' 'fish game table' 'fish game gambling table' however denominated that consists of a tabletop electronic display with one or more stations featuring buttons, joysticks, or other control(s) that delivers to the player cash, cash premiums, redeemable game credits or any other thing of value for successful play, whether the redeemable payout is made from the machine, another machine, or from an employee of the business. This definition expressly excludes any business location which features bona fide amusement devices that pay nothing of value, cannot be adjusted to pay anything of value, provide only unredeemable free games, or provide only tickets redeemable for nonmonetary prizes consisting of toys or novelties of nominal value; crane games; BINGO operations, coin-operated music machines; or any bona fide amusement device authorized within restaurants by C.R.S. 44-3-103(47).

Park means any public property kept, used, and maintained for recreational, ornamental, or aesthetic purposes.

Playground means any property, public or private, used for and equipped with facilities for recreation especially by children. A playground may be incidental to school use but is not limited to school use or school facilities as defined in this Code.

Public building means any building owned, leased or held by the United States of America, the State of Colorado, Mesa County, or the City of Grand Junction, any school district or other agency or political subdivision, which building is used for governmental purposes.

School means any public or private educational facility including child day care facilities, nursery schools, preschools, kindergartens, elementary schools, middle schools, junior high schools, high schools, vocational schools, special education schools, colleges, universities, and trade schools. "School" includes the school grounds, buildings, structures, and facilities.

Simulated gambling device means a mechanically or electronically operated machine, network, system, program, or device that is used by an entrant and that displays simulated gambling displays on a screen or other mechanism at a business location, including a private club, that is owned, leased, or otherwise possessed, in whole or in part, by a person conducting the game or by that person's partners, affiliates, subsidiaries, agents, or contractors; except that the term does not include bona fide amusement devices, as authorized in C.R.S. 44-3-103(47), that pay nothing of value and cannot be adjusted to pay anything of value. "Simulated gambling device" includes:

(I) A video poker game or any other kind of video card game;

(II) A video bingo game;

(III) A video craps game;

(IV) A video keno game;

(V) A video lotto game;

(VI) A video 102 roulette game;

(VII) A pot-of-gold;

(VIII) An eight-liner;

(IX) A video game based on or involving the random or chance matching of different pictures, words, numbers, or 104 symbols;

(X) An electronic gaming machine, including a personal computer of any size 105 or configuration that performs any of the functions of an electronic gaming machine; and

(XI) A slot machine, where results are determined by reason of the skill of the player or the application of the element of chance, or both, as provided by Article XVIII, § 9(4)(c) of the Colorado constitution; and

(XII) A device that functions as, or simulates the play of, a slot machine, where results are determined by reason of the skill of the player or the application of the element of chance, or both, as provided by Article XVIII, § 9(4)(c) of the Colorado constitution.

"Simulated gambling device" does not include any parimutuel totalizator equipment that is used for pari-mutuel wagering on live or simulcast racing events and that has been approved by the director of the division of racing events for entities authorized and licensed under article 32 of title 44 of the Colorado Revised Statutes.

Slot machine means any mechanical, electrical, video, electronic, or other device, contrivance, or machine which, after insertion of a coin, token, or similar object, or upon payment of any required consideration whatsoever by a player, is available to be played or operated, and which, whether by reason of the skill of the player or application of the element of chance, or both, may deliver or entitle the player operating the machine to receive cash premiums, merchandise, tokens, redeemable game credits, or any other thing of value other than unredeemable free games, whether the payoff is made automatically from the machines or in any other manner; except that the term does not include a crane game or vintage slot machine models introduced on the market in 1984, does not contain component parts manufactured in 1984 or thereafter and is not used for gambling purposes or limited gaming purposes.

Adult or child day care (Use Category). Uses in this category include temporary care facilities on a less than twenty-four-hour basis for adults and children of varying ages. Activities include supervision, education, and recreation for care facility participants. Accessory uses commonly include recreation, personal storage buildings, and parking.

Adult or juvenile offenders means persons who have committed a crime or are accused of having committed a crime and are housed at a group living facility for that reason.

Adverse impact means a condition that creates, imposes, aggravates, or leads to inadequate, impractical, unsafe, or unhealthy conditions on a site proposed for development or on off-tract property or facilities.

Aggrieved person means a person having suffered actual loss or injury or being exposed to potential loss or injury to legitimate interests including, but not limited to, business, economic, aesthetic, governmental, recreational, or conservation interests.

Agri-business means a business and/or commercial use operated primarily for the support of agricultural needs. Such use may consist of products, materials, and equipment servicing and sales; storage and/or processing of agricultural products and/or animals; medical and/or technical support services.

Agricultural activities means general on-going and active activities, including agronomy, aquaculture, grazing, biotechnical agriculture (including education parks for biotechnical agriculture or a demonstration farm), forestry, fisheries, honey production, silviculture (including the harvesting of timber), and similar uses. Agricultural activities do not include a grocery store or the retail or wholesale sale of products remotely related to the production of agricultural products.

Agricultural animals. The following animals are considered agricultural animals to an agricultural use, whether used for personal enjoyment or for commercial purposes: horses, mules, burros, sheep, cattle, rabbits, pigs, llamas, alpacas, goats, and any type of fowl.

Agricultural labor housing means a facility for the dormitory-style housing of agricultural workers on a seasonal basis.

Agricultural products means agricultural or horticultural products such as vegetables, fruits, dairy products, eggs, grains, meat, poultry, fish, honey, hay, bedding plants, herbs, and wool.

Agriculture and animal services (Use Category). Uses in this category include agricultural and farming activities, including nurseries and facilities for processing and selling agricultural products. Agricultural uses involve farming, dairying, pasturage, apiculture, horticulture, floriculture, viticulture, and animal husbandry. Animal-related uses include the boarding and care of animals on a commercial basis. Accessory uses may include confinement facilities for animals, parking, and storage areas.

Airport or heliport means a landing area, runway, or other or other ground level or elevated facility designed, used, or intended to be used for the landing or taking off of airplanes and/or helicopters, including all necessary taxiways, aircraft storage and tie-down areas, hangars, fueling and maintenance equipment areas, and other necessary buildings and open spaces, and including auxiliary facilities such as waiting rooms.

Alcohol beverage means fermented malt beverage or malt, vinous, or spirituous liquors.

Alley means a service road providing a secondary means of public access to abutting property and not intended for general traffic circulation.

Alterations means any proposed modification to a designated historic site, structure, or district that could have an effect on the character of the historic resource relative to the criteria by which it was designated. Examples of alterations for structures may include additions, any exterior modifications, including signage to be affixed to the facade, and any interior modifications that may affect the characteristics for which the structure was designated.

Amateur radio means radio communications that are licensed or regulated by the Federal Communications Commission and are not subject to provisions of this Code.

Amendment means major changes to an application or approval. Requests that cannot be accomplished within GJMC § 21.02.040(c) are amendments.

Amortization means a method of eliminating nonconforming uses by requiring the termination of the nonconforming use after a specified period of time.

Animal agriculture means any parcel of land used for the principal or accessory use of breeding, raising, and/or keeping of agricultural animals for sale or use of the animal, their products or byproducts, and/or the processing of those products or byproduct.

Animal care, boarding, or sales means a facility in which four or more animals of the same species are housed, groomed, bred, boarded, trained in return for compensation, or sold. Such facility may offer incidental medical treatment.

Animal clinic or hospital means a facility for the medical care, treatment, and/or hospitalization of animals under the supervision of a licensed veterinarian.

Annexation means the incorporation of a land area into an existing community with a resulting change in the boundaries of that community.

Antenna means any device designed and intended for transmitting or receiving television, radio, microwave signals, or other electromagnetic waves. An antenna includes all mounting and stabilizing items such as a tower, a pole, a bracket, guy wires, hardware, connection equipment and related items.

Appeal means a request for a review of the Grand Junction Community Development

Department's interpretation of any provisions of this Code or a request for a variance therefrom.

Applicant means any person, firm, partnership, joint venture, association, corporation, group, or organization applying for any permit, approval or decision governed or required by this Code. "Developer" or "subdivider" may be used interchangeably.

Application means a written request for any approval, permit, or action required by this Code. "Proposals" and "requests" are used interchangeably. An application is not complete until each requirement in this Code is met and all fees are paid.

Approved street trees for Grand Junction's rights-of-way means the list of trees, shrubs, vines, and evergreens in public rights-of-way maintained by the Forestry Board (see § 8.32.020).

Appurtenances means the visible, functional, or ornamental objects accessory to and part of buildings.

Area of influence (airport) means an area surrounding an airport which is impacted or influenced by its proximity to the airport, either by aircraft overflight, noise, vibrations, or by vehicular traffic associated with airport operations.

Art gallery, museum, or library means a facility or area that is open to the public and is intended for the display, appraisal, purchase, sale, loan, of art books, paintings, sculpture, or other works of original art that have architectural, artistic, cultural, literary, historical, or scientific value.

Assembly, community means places of community assembly, such as libraries, museums, community centers, senior centers, and recreation centers that are open and available to the general public.

Assembly, religious/private group means private, non-profit membership organizations that provide meeting space and facilities for their members. Examples include religious institutions and civic and social organizations such as private lodges, clubs, fraternal organizations, and similar private, non-commercial membership organizations.

Average means the arithmetic mean, unless specified otherwise.

Avigation easement means an easement that limits the construction and heights of vegetation, and grants the right of flight over the surface together with the right, subject to the applicable local, state, and federal laws (such as noise pollution laws), to cause noise, vibrations, smoke, fumes, glare, dust, fuel particles, and other effects of aircraft operations.

B

Bar or tavern means an establishment engaged in the preparation and retail sale of alcoholic beverages for consumption on the premises and that may or may not serve food. This use also includes "hookah" bars in which patrons consume flavored tobacco from a stemmed instrument designed for vaporizing tobacco. If food is served, the revenue from sales of food is smaller than the revenue from alcohol sales.

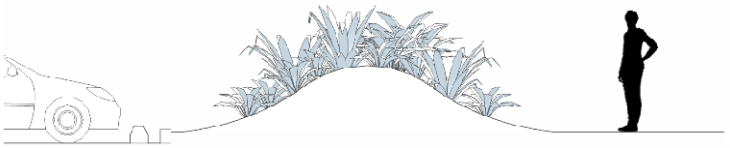
Basement means any area of a building having its floor subgrade (below ground level) on all sides.

Bed and breakfast means a house, or portion thereof, where short-term lodging rooms

and meals are provided and where the operator of the house lives on the premises or in adjacent premises. A bed and breakfast is a type of short-term rental.

Berm means a mound of earth designed so that slope drainage is directed away from a paved area and sidewalks, which serve as a screen or bufferyard with landscaping.

Figure 14.02-2
Landscaped Berm



Block means a land area consisting of contiguous lots established by recorded plats, usually bordered by a combination of streets, public parks, cemeteries, railroad right-of-way, or other barrier to the continuity of development.

Block frontage means all property fronting on one side of a street between intersecting or intercepting streets, or between a street and a street right-of-way, waterway (wider than 30 feet), or end of a dead end street. An intercepting street shall determine only the boundary of the frontage of the side of the street which it intercepts.

Board means the Zoning Board of Appeals, unless otherwise indicated in the text.

Boarding or rooming house means a residential structure that is the operator's personal primary residence where lodging for more than 30 days is provided, with or without meals, for compensation. A boarding house is not a bed and breakfast or short-term rental.

Brewery, distillery, or winery

Brewery means any establishment where malt liquors are manufactured, except a brew pub.

Distillery means any establishment where spirituous liquors are manufactured, except a distillery pub.

Winery means any establishment where vinous liquors are manufactured, except a limited winery. For purposes of this Code, a winery shall include a vintner's restaurant that sells food for consumption on the premises and that manufactures not more than 250,000 gallons of wine on its premise each calendar year.

Brewpub, distillery pub, or limited winery

Brewpub means a retail establishment that manufactures not more than 1,860,000 gallons of malt liquor on its licensed premises or licensed alternating proprietor licensed premises, combined, each calendar year.

Distillery pub means a retail establishment whose primary purpose is selling and serving food and alcohol beverages for on-premises consumption; and that ferments and distills not more than 45,000 liters of spirituous liquor on its licensed premises each calendar year.

Limited winery means any establishment manufacturing not more than 100,000 gallons, or the metric equivalent thereof, of vinous liquors as defined in Article 3, Title 44, C.R.S. annually within Colorado.

Buffer/buffering means an object or area with landscaping, including trees, shrubs, a wall, fence, berm, or any combination thereof that serves as a visual and auditory screen between properties.

Building means any structure used or intended for supporting or sheltering any use or occupancy. (See also Structure.)

Building design capacity means the maximum occupancy load of a building as provided by the most recent version of the International Building Code adopted by the City.

Building envelope means the three-dimensional space occupied by a building, including all eaves, covered porches, breezeways, and other portions of the building, but excluding attached decorative walls which are less than or equal to three feet in height.

Building facade means that exterior side of a building which faces, and is most nearly parallel to, a public or private street.

Bulk standard means a standard that applies to individual lots that control the placement, intensity, and character of development, including, but not limited to, the amount of open space on the lot, the height of structures, setbacks from property lines and rights-of-way, impervious coverage, and density.

C

Caliper means the diameter of the tree trunk measured six inches above the root ball at time of planting. Caliper is applied only when measuring new plantings.

Campground or recreational vehicle park means a parcel of land on which two or more recreational vehicle sites and/or camping sites are located, established, or maintained for occupancy by recreational vehicles or camping units of the general public as temporary living quarters for vacation or recreation purposes.

Camping guest means one or more persons assigned to a campsite.

Camping unit means a self-propelled or towed recreational vehicle, other vehicle used for temporary human occupancy, or a cabin, tent or other type of shelter intended, designed, or used for temporary human occupancy.

Camping unit, dependent means a camping unit that has no toilet, sink or bathing facilities and is dependent upon a common building for these services.

Camping unit, independent means a camping unit that has toilet, sink and bathing facilities requiring connection to a water and/or sanitary sewer system at the individual campsite.

Campsite means any defined area which is used for overnight stays by an individual, a single camping family, group, or other similar entity.

Cannabis testing facility means an entity licensed to analyze and certify safety and potency of cannabis.

Canopy drip line means the area directly located under the outer circumference of the tree branches from which water drips onto the ground.

Carport means a roofed structure providing space for the storage of one or more motor vehicles and enclosed on not more than two sides by walls.

Cemetery means land used or designated for the interment of human or animal remains, including columbaria, crematoria, mausoleums, mortuaries, and associated maintenance facilities when operated in conjunction with, and within the boundaries of, such cemetery.

Centerline means the true centerline of a street right-of-way that has been fully dedicated to the required width according to the master street plan.

Certificate of occupancy means as defined in the current International Building Code adopted by the City.

Change in use or *change of use* means a change from one principal use of a building or land to another principal use of the building or land.

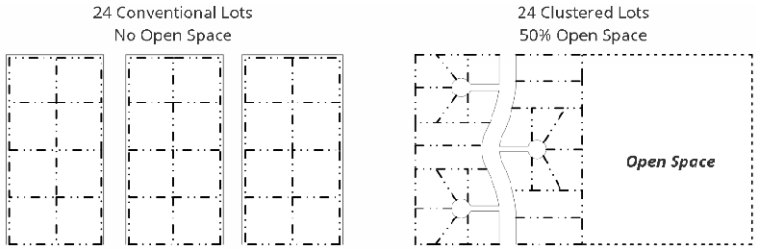
City means the City of Grand Junction.

Civic use means a municipal use that may include cultural, recreational, athletic, convention and entertainment facilities.

Clear zone (airport) means an area located directly off the end of an airport runway in which no above-ground construction or obstruction is permitted.

Cluster development means a development design technique that concentrates buildings in specific areas on a site to allow the remaining land to be used for recreation, common open space, and preservation of environmentally sensitive areas.

Figure 14.02-3
Cluster Development



Cluster/clustered means a development that complies with the requirements, rules and design guidelines set forth in GJMC § 21.03.040(f).

Code refers to the City of Grand Junction Zoning and Development Code, which is also referred to as GJMC Title 21, unless otherwise specified.

Collector street means streets, as identified in the Master Street Plan, which access neighborhoods and routes serving intra-city rather than intra-state travel.

College or university means an institution of higher learning providing facilities for teaching and research and authorized to grant academic degrees.

Colorado Nursery Act means C.R.S. Title 35 Article 26 as amended.

Commercial vehicle means all vehicles that require the issuance of any of the following license plates by the State of Colorado: passenger bus plates; GVW truck and GVW tractor plates; farm trucks and farm tractor plates; special mobile machinery plates/tabs; special use vehicle plates; light truck plates; but shall not include the following: any vehicle issued any of the above license plates that otherwise would be issued passenger plates or recreational truck plates by the State of Colorado were the vehicle not used for commercial purposes; any pickup truck issued light truck plates with bed rails no higher than 30 inches from the floor of the bed; any van issued light truck plates whose basic design could serve as a passenger van and be issued passenger plates.

Common elements means land amenities, certain areas of buildings, such as lobbies, corridors and hallways, central services and utilities and any other elements and facilities owned and used by all owners and designated in the master deed as common elements.

Common open space means land within or related to a development, not individually owned or dedicated for public use, that is designed and intended for the common use or enjoyment of the residents and their guests of the development and may include such complementary structures and improvements as are necessary and appropriate. Common open space does not include areas used for streets, alleys, driveways, or off-street parking or loading areas. However, the area of recreational activities such as swimming pools, tennis courts and other recreation facilities may be counted as common open space.

Community and cultural facilities include buildings and facilities owned, operated, or occupied by a governmental or non-profit entity providing a service to the public.

Community center means a building, together with accessory structures and uses, used for recreational, social, educational, or cultural activities by and for the benefit of community groups and individuals, that is accessible to the general public or to members of the residential development in which it is located, and that is not operated for profit.

Community corrections facility

(1) A facility providing residential or nonresidential services operated under the direction of a community corrections program, as defined by § 17-27-101 C.R.S., et seq.; or

(2) A facility providing residential or nonresidential services substantially similar to that described in § 17-27-102(3) C.R.S., although not being administered pursuant to § 17-27-101 C.R.S., et seq., which is operated by a private individual, partnership, corporation, or association.

Composting facility means a facility where organic matter that is derived primarily from off-site is processed by composting and/or is processed for commercial purposes. Activities of a composting facility may include management, collection, transportation, staging, composting, curing, storage, marketing, or use of compost.

Concept plan means a generalized plan indicating the boundaries of a tract or tracts under common ownership, and identifying proposed land use, land use intensity and thoroughfare alignment.

Conditional use means a use identified by this Code that requires action by the Planning Commission or City Council after public hearings. A conditional use means a use that because of its unique or varying characteristics, cannot be properly classified as a permitted use in a particular district.

Condominium means as defined in § 38-33.3-103, C.R.S. or any successor statute.

Construction plan means complete construction drawings of a facility or improvement, including but not limited to road plans and profiles, drainage plans and utility plans.

Contiguous means next to, abutting, or touching and having a boundary, or portion thereof, that is coterminous.

Convey means to transfer all or a part of a title or equitable interest in land; to lease or assign an interest in land; or to transfer any other land interest.

County means Mesa County.

Crematory means an establishment for the reduction of deceased bodies of humans or animals to ashes by fire.

Critical facility means a structure or other improvement that, because of its function, size, service area, or uniqueness, has the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired.

Critical zone (airport) means a rectangular-shaped zone located directly off the end of a runway's primary surface, which is critical to aircraft operations.

Cul-de-sac means a dead end street terminating in a vehicular turn around area.

Curb face means the vertical or shaped portion of a curb, facing the roadway, and designed to direct stormwaters.

D

Dairy operations or feedlot means agricultural operations where livestock is kept and raised in confined situations and the owners of the livestock pay for yardage, feed, and feed processing.

Day care center, adult or child means a nonresidential establishment providing for the care, supervision, and protection of children under the age of 16 years or the elderly and/or disabled adults for less than 24 hours. The term includes facilities commonly known as day care centers, day nurseries, nursery schools, kindergartens, preschools, play groups, day camps, summer camps, and includes those facilities for children under the age of six years with stated educational purposes operated in conjunction with a public, private, or parochial college or a private or parochial college or a private or parochial school, except that the term shall not apply to any kindergarten maintained in connection with a public, private, or parochial elementary school system of at least six grades.

Days means, unless otherwise indicated, calendar days, if the period of time referred to is more than 30 days. If the period of time referred to is less than 30 days, "days" means working days (days when the City is open for business).

Dedication means the transfer of property by the owner to another party.

Deed means a legal document conveying ownership of real property.

Default standards or *default zone districts* means the underlying zone of a Planned Development (PD) zone district. The default zone district shall be established with any PD zone district. The standards for the default zone shall be used unless deviations were specifically approved within the PD zoning ordinance.

Density means the number of dwelling units per acre of land.

Developer means a person, firm, partnership, joint venture, association, corporation, group, or organization who shall participate as owner, promoter, developer or sales agent in the planning, platting, development, promotion, sale, or lease of a development.

Development means all property adjacent or abutting, whether or not to be then planned or developed, owned by the same owner. Includes any of the following: the division of a parcel of land into two or more parcels; the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any mining, drilling, excavation, clearing of roadways or building sites, landfill or land disturbance and any use or extension of the use of land, the placement of a use on any property, or any Planned Development. Development does not include movement of earth associated with crops and/or farming or landscaping.

Development Impact Fee-Related Definitions. For purposes of GJMC § 21.02.070, the following terms shall have the following meanings:

Impact fee means a fee imposed on a development to help finance the cost of improvements or services.

Capital facilities means any improvement or facility that: i) is directly related to any service that the City is authorized to provide; ii) has an estimated useful life of five years or longer; and iii) is required by the charter, ordinances or policy of the City pursuant to a resolution or ordinance.

Commencement of impact-generating development. Commencement of impact-generating development occurs upon either:

1. The submittal of a complete application for the development of a nonresidential development or multifamily for-rent development for which construction commences on or before two years from the date of complete application submittal; or
2. Planning Clearance for residential uses intended for fee simple ownership such as single-family homes, townhomes, or condominiums.

Complete application. An application shall not be considered complete unless and until i) all the required information and submittal materials required by all relevant City ordinances, resolutions, rules, and regulations are submitted and received by the Director, and ii) the Director has determined the application is complete. The decision of the Director with respect to completeness is final.

Development means any construction or expansion of a building, structure, or use, any change in use of a building or structure, or any change in the use of land, which creates additional demand for parks and recreation, fire, and police capital facilities.

Development approval means any final approval of an application for a rezoning, an approved Planned Development ordinance, Conditional Use Permit, Subdivision, development or Site Plan, Planning Clearance, or similar application for new construction.

Fee payer means a person commencing impact-generating development who is obligated to pay an impact fee in accordance with the terms of GJMC § 21.02.070.

Fee schedule or *impact fee schedule* means the impact fees for police, fire, parks and recreation, and transportation established by GJMC § 21.02.070. The impact fee schedule is set forth in the fee schedule to GJMC § 21.02.070 and is incorporated herein by reference.

Floor area means the total finished square footage of all levels included within the outside walls of a building or portion thereof, but excluding courts, garages having no habitable area, uninhabitable areas that are located above the highest habitable level, or uninhabitable areas that are located below the first floor level.

Impact fee study means the study entitled "City of Grand Junction, Colorado 2019 Impact Fee Study," prepared by TischlerBise dated August 8, 2019 and/or the study entitled "Transportation Impact Fee Study" by Duncan Associates dated November 2019 with Minor Revisions February 28, 2019.

Independent fee calculation study means a study prepared by a fee payer, calculating the cost of parks and recreation capital facilities, fire capital facilities, and police capital facilities required to serve the fee payer's proposed development, that is performed on an average cost (not marginal cost) methodology, uses the level of service standards, service units and unit construction costs stated in the impact fee study, and is performed in compliance with any criteria for such studies established by GJMC § 21.02.070.

Level of service (LOS) means a measure of the relationship between service capacity and service demand for capital facilities.

Planning clearance means a Planning Clearance issued by the Director permitting the construction of a building or structure within the City of Grand Junction.

Successor-in-interest means a person, as defined by GJMC § 21.02.070, who is conveyed a fee simple interest in land for which an impact fee is paid or a credit is approved pursuant to the terms of GJMC § 21.02.070.

Transportation capital facilities means site-related improvements such as minimum street improvements, local street improvements and safety improvements shall not constitute transportation capital facilities.

Development schedule or *phasing schedule* means regulating the rate and geographic sequence of development so as to ensure that each phase can stand on its own in terms of circulation, utilities, and so on, in the event subsequent phases are delayed or cancelled.

DIA means Development Improvements Agreement.

Diameter at breast height (DBH) means the diameter of the tree trunk measured 4.5 feet above the ground on the uphill side of the tree. For split trunk trees that fork below 4.5 feet from the ground, OBH measurements shall be taken at the narrowest point below the fork. For multi-stem trees, which are trees that have more than

one trunk at 4.5 feet above ground originating from a common trunk or common root system, DBH measurements shall be taken for each stem at 4.5 feet above the ground and aggregated by adding all values together for a single measurement, to be considered as a single tree for the purposes of this Code. DBH is applied only when measuring existing trees.

Director means the administrator of the Code shall be the Director of the Grand Junction Community Development Department and/or designated staff.

Disposition means a transfer of all or part of a title or equitable interest in land; a lease or an assignment of an interest in land; or any other transfer or conveyance of an interest in land.

Drive-through facility means a facility, building feature, or equipment at which an occupant of a vehicle may make use of the service or business without leaving their vehicle. This use includes drive-by parcel pickup facilities.

Driveway means a private roadway providing access to a street or highway, excluding the sidewalk when parking vehicles in the driveway.

Dwelling unit means a building or portion thereof that provides complete, independent living facilities for a single family maintaining a household, including permanent provisions for living, sleeping, eating, cooking, and sanitation.

Dwelling, business residence means a single residential dwelling unit, accessory to and located within a structure primarily devoted to nonresidential uses.

Dwelling, co-housing means a community of private dwelling units that includes shared spaces, such as a community room, or shared facilities, such as a kitchen for community use. Each private unit must include sleeping and sanitary facilities. Where community spaces or facilities are provided, they need not be provided in individual units. Dormitories, rooming/boarding houses, and fraternities or sororities are not considered co-housing. Co-housing may be designed as either a multifamily structure or cottage court development.

Dwelling, cottage court means a residential development, including co-housing developments, that combines a group of small individually owned or rented single-family dwelling units, including tiny homes, on a single parcel of land that are oriented around a shared open space for communal use by the residents of the development and may include a shared parking area and/or a shared community building.

Dwelling, duplex means a single residential building on a single lot containing two dwelling units, each designed for use and occupancy by no more than one family. The two units must be able to function as dwelling units independently of each other, but may be located side-by-side, in front and behind, or above and below each other.

Dwelling, multifamily means a building(s) arranged, designed, and intended to be used for occupancy by three or more families living independently of each other and containing three or more dwelling units on the same or separate lots.

Dwelling, single-family detached means a residential building designed for use and occupancy by no more than one family and is not attached to any other dwelling or building by any means (except an approved accessory dwelling unit), on a single lot. Manufactured homes and tiny homes shall be considered single-family detached

dwellings.

Dwelling, single-family attached means two or more attached single-family dwelling units attached side by side under one roof that share a common vertical side or rear wall reaching from the building foundation to the roof structure, each of which is located on its own separate lot. This use is also referred to as a townhome.

Dwelling, tiny home means a structure that:

(1) Is permanently constructed on a vehicle chassis;

(2) Is designed for long-term residency;

(3) Includes electrical, mechanical, or plumbing services that are fabricated, formed, or assembled at a location other than the site of the completed home;

(4) Is not self-propelled; and

(5) Has a square footage of not more than 400 square feet.

In order to meet this definition, a tiny home must be built to the International Residential Code as adopted by the Building Codes & Standards program within the Division of Housing. Colorado tiny homes will receive a metal plate insignia that certifies the tiny home is built to the codes and standards of the program. This use does not include manufactured homes, recreational park trailers, or recreational vehicles.
A tiny home may be a single-family detached dwelling unit or an accessory dwelling unit.

Dwelling, tiny house. See Dwelling, Single-Family Detached.

E

Easement means an interest in land that is less than fee title which entitles the holder to a specific limited use or enjoyment.

Educational facilities (Use Category). Uses in this category include public, private, and parochial institutions at the primary, elementary, middle, high school, or post-secondary level, including colleges and college campuses. Accessory uses commonly include play areas, cafeterias, recreation areas, auditoriums, and day care facilities.

Electric vehicle charging facility means a facility in which electric vehicle charging services are made available to the public or to members for a fee, including structures, machinery, and equipment necessary and integral to support an electric vehicle, including battery charging stations, rapid charging stations, and battery exchange stations.

Emergency shelter, permanent means a facility providing basic services that may include food; personal hygiene support; information and referrals; employment, mail, and telephone services; including overnight sleeping accommodations, to people with limited financial resources, including people who are experiencing homelessness.

Emergency shelter, temporary means a temporary facility providing relief or assistance services to the public, including those experiencing homelessness, or to provide services related to the administration or management of such relief or assistance services in times of natural disaster or other emergency circumstances.

Eminent domain means the authority to acquire or take, or to authorize the taking of, private property for the public use or public purpose.

Engineer means an engineer licensed by the Colorado Board of Registration.

Equipment means rolling stock or movable personal property except that, for the purpose of this Code, it shall not include those items defined as heavy equipment.

Evergreen means any tree having foliage that persists and remains green throughout the year.

Evidence means any map, table, chart, contract or other document or testimony prepared or certified which is offered by a person to establish a claim, condition, or assertion.

Exaction means contributions or payments required as an authorized recondition for receiving a development permit.

F

FAA means the Federal Aviation Administration.

Facade means the front exterior wall of a building.

Family means any number of related persons living together within a single dwelling unit as a single housekeeping unit, but not more than four persons who are unrelated by blood, marriage, guardianship, or adoption.

Farmers' market means a structure or place where agricultural products are brought for the purpose of retail sales. A farmers' market differs from a produce stand in that there may be more than one seller allowed per parcel of land and the structure from which produce is sold at a farmers' market need not be portable or capable of being dismantled or removed from the site.

Fence means an artificially constructed barrier of any material or combination of materials, including walls but not retaining walls interior to the property, erected to enclose, screen, or separate areas. ("Material" does not include vegetation.)

Fenestration means the arrangement of windows and other exterior openings on a building.

Final plat means a survey map of record which indicates the boundaries for streets, blocks, lots and other property divisions which is prepared pursuant to GJMC § 21.02.040(l)(5).

Flea market means a flea market, swap shop, or similar activity by whatever name, where the use involves the setting up of two or more booths, tables, platforms, racks, or similar display areas for the purpose of selling, buying, or trading merchandise, goods, materials, products, or other items offered for sale outside an enclosed building. Flea markets do not include any of the following activities that occur at the same location four or fewer days in any calendar year: garage sales, produce stands, garage sales or fund-raising activities done by a nonprofit organization.

Flood-Related Definitions.

Area of shallow flooding means a designated Zone AO or AH on the City's Flood Insurance Rate Map (FIRM) with a 1% chance or greater annual chance of flooding to an average depth of one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

Area of special flood hazard (floodplain) means the land in the floodplain subject to a 1% or greater chance of flooding in any given year.

Base flood means the flood having a 1% chance of being equaled or exceeded in any given year.

Base flood elevation (BFE) means the elevation shown on a FEMA Flood Insurance Rate Map for Zones AE, AH, A1-A30, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO, V1-V30, and VE that indicates the water surface elevation resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year.

Conditional letter of map revision (CLOMR) means FEMA's comment on a proposed project which does not revise an effective floodplain map that would upon construction affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodplain.

Critical facility means a structure or related infrastructure, but not the land on which it is situated, that if flooded may result in significant hazards to public health and safety or interrupt essential services and operations for the City at any time before, during and after a flood.

Existing manufactured home park or subdivision means a manufactured home park for which the construction of facilities serving the lots on which the manufactured homes are to be affixed are completed before the Effective Date.

Expansion of existing manufactured home park or subdivision means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

Five-hundred-year (500-year) flood means a flood having a recurrence interval that has a 0.2% chance of being equaled or exceeded during any given year (0.2%-chance annual flood).

Five-hundred-year (500-year) floodplain means an area of land susceptible to being inundated as a result of the occurrence of a 500-year flood.

Flood or *flooding* means a general and temporary condition of partial or complete inundation of normally dry land areas from:

1. The overflow of inland waters; and/or
2. The unusual and rapid accumulation or runoff of surface waters from any source. (See graphic.)
3. Mudslides or mudflows that occur from excess surface water that is combined with mud or other debris that is sufficiently fluid so as to flow over the surface of normally dry land areas (such as earth carried by a current of water and deposited along the path of the current).

Flood control structure means a physical structure designed and built expressly or partially for the purpose of reducing, redirecting, or guiding flood flows along a particular waterway. These specialized flood modifying works are those constructed in conformance with sound engineering standards.

Flood fringe district means that area within a 100-year floodplain where the flood waters are relatively shallow, and move at velocities from one to four feet per second. (See graphic.)

Flood Insurance Rate Map (FIRM) means the official map on which the Federal Emergency Management Agency has delineated both the areas of special flood hazards and the risk premium zones.

Flood Insurance Study means the official report provided by the Federal Emergency Management Agency that includes profiles, the Flood Boundary-Floodway Map, and the water surface elevation of the base flood.

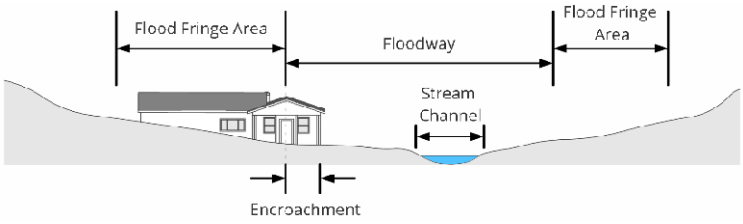
Floodplain means an area adjacent to a watercourse which may be subject to flooding as a result of an increase in water flow beyond a normal high water mark. (See graphic.)

Floodplain development means any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations located within the area of special flood hazard. (See graphic.)

Flood profile means hydrological conclusions based upon historical facts and engineering principles represented graphically showing the relationship of the water surface elevation during a 100-year flood to the channel and adjacent topography.

Flood prone area means an area near a watercourse which is subject to flooding during a 100-year flood based on historical information, topography, vegetation, and other indicators, but where the precise dimensions of a 100-year floodplain have not been delineated by Federal Emergency Management Agency studies. (See graphic.)

Figure 14.02-4
Flood Prone Area



Floodproofing means a combination of provisions, changes or adjustments to structures and movable objects or to surrounding areas, primarily for the reduction or elimination of flood damage.

Flood regulatory area means that portion of the floodplain which is subject to inundation by a 100-year flood. This area may be divided into the floodway district and the flood fringe district. (See graphic.)

Floodway means the channel of a river or other water course and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. The Colorado Statewide standard for the designated height to be used for all newly studied reaches shall be one-half foot (six inches). (See graphic above.)

Freeboard means the vertical distance in feet above a predicted water surface elevation intended to provide a margin of safety to compensate for unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood such as debris blockage of bridge openings and the increased runoff due to urbanization of the watershed.

High water mark means the ordinary high water level or bank of a stream, river, lake, or impoundment which, in the absence of evidence to the contrary, shall be presumed to be the edge of the vegetation growing along the shore.

Mudflow means a flowing mass of predominantly fine grained earth material possessing a high degree of fluidity during movement.

New construction means structures for which the "start of construction" commenced on or after the Effective Date of the ordinance enacting the flood damage prevention regulations, and includes any subsequent improvements to such structures.

New manufactured home park or subdivision means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the Effective Date of the ordinance enacting the flood damage prevention regulations.

No-rise certification means a record of the results of an engineering analysis conducted to determine whether a project will increase flood heights in a floodway. A no-rise certification must be supported by technical data and signed by a registered Colorado professional engineer.

Obstruction (floodplains) means a dam, wall, embankment, levee, dike, pile, abutment, projection, excavation, channel rectification, culvert, building, fence, stockpile, refuse, fill, structure or material, in, along, across, or projecting into any drainageway, channel, or watercourse, which might impede, retard or change the direction of the flow of water, either by itself or by catching and collecting debris carried by the water, or which is placed where the 100-year flood may carry the debris downstream.

One-hundred-year (100-year) flood means a flood having a recurrence interval that has a 1% chance of being equaled or exceeded during any given year (one-percent-annual-chance flood).

One-hundred-year (100-year) floodplain means the area of land susceptible to being inundated as a result of the occurrence of a 100-year flood, including the low land near a watercourse which has been, or may be, covered by water of a flood of 100-year frequency, as established by engineering practices of the U.S. Army Corps of Engineers and/or the Colorado Water Conservation Board.

Special flood hazard area means the land in the floodplain within the City subject to a 1% or greater chance of flooding in any given year, i.e., the 100-year-floodplain.

Start of construction includes substantial improvement and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement, or other improvements was within 180 days of the permit date. The "actual start" means the first placement of a permanently constructed structure on a site, such as the pouring of slab or footings, the installation of pilings, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.

Substantial damage means damage to a structure from one event not due to the knowing act of the owner such that the cost to restore the damage is 50% or more of the fair market value of the structure before the damage occurred.

Substantial improvement means any reconstruction, rehabilitation, addition, or other improvement of a structure, which costs 50% of the market value of the structure before the "start of construction" of the improvement. Substantial improvement includes structures which have incurred "substantial damage," regardless of the actual repair work performed. The term does not include either:

1. Any improvement of a structure to correct existing violations of any code which the local code enforcement official determines and are necessary to make the structure safe or habitable; or
2. Any alteration of a "historic structure," if the alteration shall not preclude the structure's continued designation as a "historic structure."

Water surface elevation means the height, in relation to the North American Vertical Datum (NAVD) of 1988 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas.

Food and beverage (Use Category). Uses in this category include establishments that serve prepared food or beverages for consumption on or off the premises. Accessory uses may include food preparation areas, offices, and parking.

Food service or catering means an establishment in which the principal use is the preparation of food or meals on the premises, and where such food or meals are delivered to an off-site location for sale or consumption.

Fraternity or *sorority* means a place of residence other than a hotel, rooming or boarding house or dormitory that is operated by a nationally or locally chartered membership organization and is used, occupied, and maintained as living and dining quarters for its members who are enrolled in an accredited college or university or other accredited educational institution and which is recognized and subject to controls by such educational institution.

Front lot line means the property line dividing a lot from a road right-of-way.

Frontage. The frontage of a parcel of land is that distance where a property line is common with a road right-of-way line.

Functional turf means an area of turf measuring no less than 30 feet in width and length with a minimum area 1,500 square feet for the purposes of common recreational uses open to the public, members of a neighborhood, or clients and/or customers of a commercial or office use.

Funeral home or *mortuary* means an establishment with facilities for the preparation of human or animal remains for burial or interment, including cremation, for the display of the deceased and rituals connected with, and conducted before burial or cremation, and for funeral services. This definition includes columbaria and may include a facility for the permanent storage of cremated human or animal remains.

G

Geologic hazard area means an area identified by a qualified state or federal government agency as containing or being directly affected by a geologic hazard.

Golf course means a tract of land typically laid out for at least nine holes for playing the game of golf that may include the following accessory uses: a clubhouse, dining and snack bars, pro shop, and practice facilities.

Golf driving range means a tract of land devoted as a practice range for practicing golf shots.

Government service facility means a facility owned or operated by a unit of local, state, or federal government and engaged in providing services unique to government or generally performed by units of government rather than by private commercial businesses.

Grade means the lowest point of elevation of the finished surface of the ground, paving or sidewalk within the area between the building and the property line or, when the property line is more than five feet from the building, the point between the building and a line five feet from the building.

Grade, finished means the level of the soil after completion of site development.

Grade, natural means the undisturbed ground level which may be determined by on-site evidence (vegetation, ground level on adjacent land, elevation of adjacent streets and roads, soil types and locations, etc.).

Grand Junction Circulation Plan (formerly known as Major Street Plan and Grand Valley Circulation Plan) means a plan or plans showing the location of right-of-way which will be developed and for which development and uses must accommodate. Plans for areas smaller than the entire City are still "Grand Valley Circulation Plans or Major Street Plans." The City relies on the authority in Title 31 C.R.S. in addition to its other powers and authority.

Gross acre means a full acre of land prior to subdivision and prior to dedication of any required rights-of-way or easements.

Gross acreage means the area of a proposed development, including proposed dedications of easements, rights-of-way, or other property rights, but excluding existing rights-of-way dedicated prior to January 1, 1995.

Gross floor area (GFA) means the sum of the areas of all floor levels of a building or

structure.

Gross leasable area (GLA) means the total building area, expressed in square feet and designed for tenant occupancy and exclusive use, including any basements, mezzanines, or upper floors, as measured from exterior walls or the centerline of walls separating two abutting buildings, but excluding any space where floor-to-ceiling height is less than 6.5 feet.

Ground cover means grass or other plants and landscaping grown to keep soil from being blown or washed away.

Ground story means the story closest to and above grade along the street.

Group living (Use Category). Uses in this category are characterized by residential occupancy of a structure by a group of people who do not meet "the definition of "household living." Tenancy is arranged on a month-to-month or longer basis and the size of the group may be larger than a family. Group living usually includes common eating areas for residents, and residents may receive care, training, or treatment. Caregivers often reside at the site. Accessory uses commonly include recreational facilities, personal storage buildings, gardens, and parking.

Group living facility means a type of group living characterized by the provision of training, treatment, supervision or other professional support or care and who receive care, training, treatment, supervision or other support from caregivers or staff on site. Tenancy is arranged on a monthly or longer basis, and the size of the group may be larger than a typical family. Uses where tenancy may be arranged for a shorter period are not considered residential; they are considered to be either a form of lodging facility. Generally, group living structures have a common eating area for residents, but a common eating area by itself, without other care, treatment, supervision or other professional or health support services being provided on site, does not indicate a group living facility (a multifamily residential facility, such as apartments, may, for example, have a common eating area).

Group living facility, small means a facility designed for and occupied by five to nine residents living together.

Group living facility, large means a facility designed for and occupied by 10 to 16 residents living together.

Group living facility, unlimited means a facility designed for and occupied by 17 or more residents living together.

Guest ranch means a working ranch with an accessory use for the lodging and/or boarding of guests which provides recreational activities on, or adjacent to, the ranch.

H

Habitable space means any habitable room or group of habitable rooms that provide sleeping facilities alone or in combination with required cooking, eating, or living facilities.

Hardscape means stone, brick, rock, sand, textured or shaped concrete, decorative walls and/or pedestrian facilities (i.e., benches, tables, play equipment, walking or bike paths).

Hazard prone area means an area which has not yet been designated by the state or federal government as a geological hazard area but where historical evidence, climatological data, surface or subsurface geological, topographical, vegetative, or other on-site naturally occurring factors indicate a relatively greater risk of property damage than exists on other parcels in the City.

Hazardous substance means any material that, by reason of its toxic, corrosive, caustic, abrasive, or otherwise injurious properties, may be detrimental or deleterious to the health of any person handling or otherwise coming into contact with such material or substance.

Headwater means the source of a stream or river.

Health club means an establishment that provides facilities for exercise activities, such as running, jogging, aerobics, weight lifting, court sports and swimming, as well as locker rooms, showers, massage rooms, saunas, and related accessory uses.

Health Department means the Mesa County Health Department.

Health facilities (Use Category). Uses in this category are characterized by activities focusing on medical services, particularly licensed public or private institutions that provide primary health services and medical or surgical care to persons suffering from illness, disease, injury, or other physical or mental conditions. Accessory uses may include laboratories, outpatient, or training facilities, and parking or other amenities primarily for the use of employees in the firm or building. These uses do not include spas, massage parlors, or other health and wellness establishments that meet the definition of personal services.

Heavy equipment means large equipment including, but not limited to: trucks with greater than a one and one-half ton rating, cranes, crawler type tractors, earth movers, dump trucks and other equipment of equal or greater size and weight.

Hedge vegetation means a plant from the list approved by the City Forester which will grow, with regular trimming, to a height of four to six feet maximum. At planting, the hedge shall be at least one foot high.

Height of structure means the vertical distance from the grade to the highest point of any portion of a structure.

Helipad means a facility without the logistical support provided by a Heliport where helicopters takeoff and land. Helipads do not include facilities for maintenance, repair, fueling or storage of helicopters.

Highest adjacent grade means the highest natural elevation of the ground surface prior to construction next to the proposed wall of a structure.

Hillside disturbance means any and all areas of the building site disturbed during construction by grading or excavation and temporary or permanent construction for all buildings, parking areas, driveways, roads, sidewalks, and other areas of concrete, asphalt, or other construction materials.

Home occupation means a business activity or occupation carried on within a dwelling by members of the family occupying the dwelling.

Homeowner association means a formally constituted nonprofit association made up of the property owners and/or residents of a fixed area, which association is

formed for the purpose of assuming permanent responsibility for costs and upkeep of common areas, open space, and similar shared facilities. May also be referred to as a form of Owner Association, such as Property Owner Association or Community Owner Association.

Hospital means an institution providing health services primarily for human inpatient medical or surgical care and including related facilities as laboratories, outpatient departments, training facilities, rehabilitation facilities, central services facilities, and staff offices that are an integral part of the facilities.

Hotel or *motel* means an establishment in which lodging is provided and offered to the public for compensation, for periods of time not exceeding 30 days and that is commonly known as a hotel or motel in the community in which it is located.

Household means a family, or a group of not more than four unrelated persons, living together in a single dwelling unit, with common access to and common use of all living and eating areas and all areas and facilities for the preparation and serving of food within the dwelling unit.

Household living (Use Category). Uses in this category are characterized by residential occupancy of a dwelling unit by a household. Tenancy is arranged on a month-to-month or longer basis. Common accessory uses include recreational activities, gardens, personal storage buildings, and residential parking.

Household pets means those animals which are commonly kept as pets: dogs, cats, fish, small birds (e.g., parakeets, parrots), rodents (e.g., mice, rats), and reptiles (nonpoisonous snakes, lizards).

I

Impervious surface means any material that prevents absorption of stormwater into the ground.

Improved area means the developed portion of a property consisting of areas occupied by buildings, asphalt, concrete, gravel, or landscaped area. Where phased development is proposed, the improved area shall be identified and measured separately for each phase of development.

Improvements means right-of-way pavements, curbs, gutters, sidewalks, paths, trails, bikeways, sedimentation control facilities, revegetation, landscaping, water mains, sanitary and storm sewers, drainageways, gas lines, electrical and telephone lines and appurtenances, street signs, trees and lights, lot pin monuments, range point boxes, and any other similar items required for compliance with the regulations of this Code or the conditions of approval.

Indoor entertainment and recreation means an enclosed facility for entertainment, sports, and recreational activities such as health clubs, game arcades, bowling, skating rinks, swimming, tennis, health and fitness centers, gyms, movie theaters, wedding venues, and similar indoor activities.

Industrial, artisan means an establishment or business where an artist, artisan, or craftsperson teaches, makes, or fabricates crafts or products by hand or with minimal automation and may include direct sales to consumers.

Industrial, heavy means the assembly, fabrication, or processing of goods and materials using processes that ordinarily have greater than minimal impacts on the

environment, or that ordinarily have significant impacts on the use and enjoyment of adjacent property in terms of truck traffic, railroad activities, noise, smoke, fumes, visual impact, odors, glare, or health and safety hazards, or that otherwise do not meet the definition of light industrial. Heavy manufacturing generally includes processing and fabrication of products made from extracted or raw materials or products involving flammable, hazardous, or explosive materials and processes, uses involving the fabrication, use, or repair of heavy special purpose equipment. Examples of this use include atmospheric gas production plant, lumbermill or sawmill, tannery, asphalt, and concrete batch plant, bottling and distribution plants, and construction materials manufacturing unless performed on a scale that meets the definition of "artisan industrial."

Industrial, light means the assembly, fabrication, or processing of goods and materials using processes that ordinarily do not involve significant truck traffic or railroad operations and do not create material amounts of noise, smoke, fumes, odors, glare, or health or safety hazards outside of the building or lot where such assembly, fabrication, or processing takes place, and where such processes are housed entirely within an enclosed building, except as may be authorized in this Code. Light manufacturing generally includes processing and fabrication of finished products predominantly from previously prepared materials and includes processes not involving flammable or explosive materials. Examples of activities include, but are not limited to, commercial laundries, food products and wholesale bakeries, newspaper and printing establishments, hair products and barbering supplies, signs and other metal workings, architectural and artist supplies, ceramics and miscellaneous clothing or accessories, small medical or specialty equipment, or musical instruments; and assembly of small appliances or equipment. This use includes research, testing and non-medical laboratory facilities, and natural medicine cultivation facilities, products manufacturers, and testing facilities.

Infill development means the development of new housing or other buildings on scattered sites in a built-up area.

Infrastructure means facilities and services needed to sustain industry, residential, commercial and all other land use activities.

Integral units means items, equipment, or machinery which are assembled or constructed to function as a single unit, such as, but not limited to, large cranes, drilling rigs or other large vehicles, large diameter pipes or culverts, large scale motors or transformers, etc., or, in the case of salvage or junkyards, shelving or other storage units, not to exceed 20 feet in height, that are used to store and display salvage items.

Interim shelter site means a location on a lot for the temporary residential occupancy of multiple relocatable temporary structures for people experiencing homelessness. An interim shelter site may include other temporary structures that contain sanitary facilities and support services including administration, security, food preparation and eating areas, or other communal amenities.

Irrigation or *irrigate* means use of water, whether or not potable, to sustain or grow landscaping or flora.

J

Jail means a facility established by a law enforcement agency for the detention of adult or juvenile persons while being processed for arrest or detention, awaiting trial, or for punishment and/or counseling as a result of sentencing by a court of jurisdiction for criminal or antisocial behavior.

Junk means ferrous or nonferrous metals, wood or wood products, appliances not used for their intended purposes, rubber, or plastic products, dismantled or inoperable machinery, equipment, tools, junk vehicles, trash, or similar materials. The term junk excludes outside storage permitted as an accessory use.

Junk vehicle means any motor vehicle, trailer, or semitrailer, as those terms are defined by § 42-1-102 C.R.S. that: is not operable in its existing condition because of damage or because parts necessary for operation such as, but not limited to, tires, engine, or drive train, are removed, destroyed, damaged, or deteriorated; or, is not capable of being lawfully driven on a public highway or street pursuant to the minimum standards set forth in Title 42 of the Colorado Revised Statutes. Any such motor vehicle, trailer, or semitrailer shall be presumed to be a junk vehicle if no current Colorado license plates are displayed thereon, or if Colorado license plates have been invalid for more than 60 days. (Note: The owner or possessor of such a motor vehicle, trailer, or semitrailer may rebut such a presumption by providing proof of current registration or licensing.)

Junkyard or *salvage yard* means any yard, lot, land, parcel, building or structure, or part thereof, used for storage, collection, processing, purchase, sale, salvage, or disposal of used or scrap materials, equipment, vehicles, or appliances. Junkyards include, but are not limited to, wrecking yards, salvage yards and automobile impoundment areas where stored vehicles are inoperative or unlicensed. Junkyards do not include storage of vehicles used for agricultural purposes on a property used for agricultural purposes, or facilities qualifying as motor vehicle repair shops.

Jurisdiction means the sphere of responsibility of the Grand Junction City Council or a political subdivision of the state.

K (Reserved)

L

Land reclamation means increasing land use capability by changing the land's character or environment through drainage and/or fill.

Land use means a list of uses within categories enumerated in this Code for various uses of land in the City.

Landscape means an area set aside from structures and parking which is developed with natural materials (i.e., lawns, trees, shrubs, vines, hedges, bedding plants, rock) and decorative features, including paving materials, walls, fences, and street furniture.

Landscape professional means a licensed Colorado landscape architect; or a landscape contractor licensed by the Associated Landscape Contractors of Colorado or the Colorado Arborists and Lawn Care Professionals; or other similarly qualified or certified professional approved by the Director.

Leasehold interest means a contractual agreement for a possessory estate for the use of lands, structures, buildings, or parts thereof for a fixed time and consideration.

Lighting-Related Definitions.

Full cutoff light fixture means a light fixture in which no more than 2 1/2% of its total output is emitted above 90° from the vertical pole or building wall on which it is mounted.

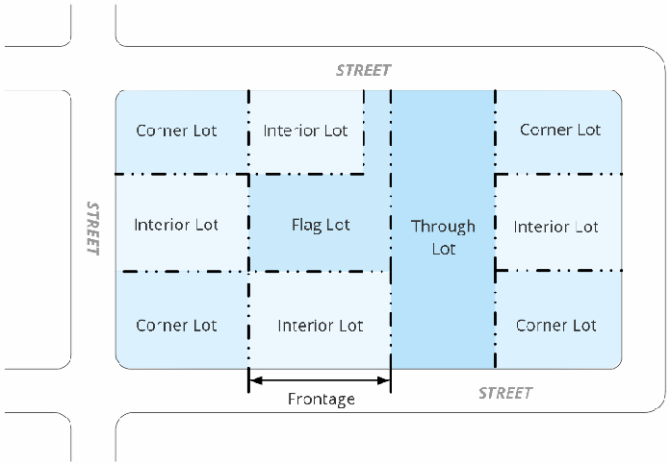
Lighting means an artificial supply of light or the apparatus providing it.

Local road or street means a street that provides direct access to adjacent land and access to higher street classifications. All streets or roads not otherwise classified are local.

Lodging facilities (Use Category). Uses in this category include facilities where lodging, meals, and other services are provided to transient visitors and guests for a fee for a defined period of time less than 30 days per instance. Accessory uses may include storage, cafeterias, limited retail, health and recreation facilities, and parking or other amenities.

Lot A parcel of land that is defined on a subdivision plat of record, which is intended to be occupied by a principal building or building and open space. Streets are not included in this definition. (See graphic.)

Figure 14.02-5
Lot Types



Lot area means the area of the lot shall be the horizontal area of the lot and shall not include portions of streets and alleys.

Lot, corner means a lot abutting upon two or more intersecting streets.

Lot coverage means that area of the lot or parcel which may be occupied by impervious surfaces.

Lot depth means the horizontal distance from the front property line to the rear property line. If front and rear property lines are not parallel, the lot depth is the shortest distance between the front and rear property lines.

Lot, flag means a lot having no frontage or access to a street or place except by a narrow strip of land.

Lot, interior means a lot whose side lines do not abut on any street.

Lot line means a line of record bounding a lot which divides one lot from another lot or from a public or private street or any other public space.

Lot, through (double frontage) means an interior lot having frontage on two nonintersecting streets.

Lot width means the distance between the side lot lines.

Low traffic storage yard means an enclosed outdoor storage area generating less than 30 average daily trips (30 ADT).

M

Maintain means to use, to keep in existence. To continue upkeep is not required to meet the definition of "maintain."

Major subdivision means a subdivision consisting of two or more proposed new lots.

Managing entity means the person or group of persons or entity responsible for the management of an interim shelter site.

Manufactured building sales and service means a retail sales and service use in which prefabricated or manufactured buildings are displayed and sold.

Manufactured home or housing means factory-built, single-family structures that meet the National Manufactured Home Construction and Safety Standards Act (42 U.S.C. Section 5401 et seq.), commonly known as the HUD Code (U.S. Department of Housing and Urban Development).

Manufactured home subdivision means a parcel or contiguous parcels of land subdivided into two or more lots configured for development of manufactured housing.

Manufactured housing community means a site, lot, tract, or parcel of land used for the continuous accommodation of two or more occupied manufactured homes and maintained for dwelling purposes on a permanent basis on individual lots, pads, or spaces; whether those lots, pads, or spaces be individually owned, leased, or rented. A manufactured housing community does not include manufactured home subdivisions or property zoned for manufactured home subdivisions.

Manufacturing and processing (Use Category). Uses in this category includes the excavation, transporting, manufacture, fabrication, processing, reduction, destruction, or any other treatment of any article, substance, or commodity, in order to change its form, character or appearance. Accessory uses may include retail sales, offices, storage, cafeteria, employee amenities, parking, warehousing, and repair facilities.

Master plan means a long-range plan for major institutional and civic facilities that considers community benefits and impacts.

Maximum extent practicable means the Director has determined that no feasible or prudent alternative exists, that all possible efforts to comply with the standards or regulation or minimize potential harmful or adverse impacts have been undertaken by an applicant, and that the costs of complying with a Code standard or criteria clearly outweigh the benefits to the public of complying with the standard or criteria. Economic considerations may be taken into account, but shall not be the overriding

factor determining whether compliance with a standard or criteria in this Code is impracticable.

Medical or dental clinic means a health care facility where patients are admitted for examination and treatment on an outpatient basis by one or more physicians, dentists, other medical personnel, psychologists, counselors, therapists, or social workers, and where patients are not usually lodged overnight. This use includes dialysis and other outpatient services clinics and emergency care clinics without ambulance services. This use includes establishments providing support to the medical profession and patients, such as medical and dental laboratories, blood banks, oxygen, and miscellaneous types of medical supplies and services. This use also includes natural medicine healing centers.

Meeting, banquet, event, or conference facility means a facility with or without food preparation equipment, used for meetings, conferences, receptions, fellowship, catered meals, and other social functions; and available on a rental basis to the general public.

Micro-shelter means a moveable and typically modular shelter with an internal area of less than 400 square feet that is designed to be installed quickly and affordably. Micro-shelters are not pre-fitted with beds, electricity, or heating and air conditioning.

Mini-warehouse means a structure or group of structures containing separate, individual, and private storage spaces of varying sizes, leased, or rented on individual leases for varying periods of time.

Mining and extraction means the development or extraction of mineral deposits, including but not limited to limestone, coal, sand, rock, clay, dirt, gravel, and other materials, and quarry aggregate from their natural occurrences on affected land. The term includes but is not limited to cement and asphalt batch plants, open pit mining and surface operations, strip mining, quarrying, dredging, and the disposal of refuse from those activities.

Minor arterial means a street, as identified in the Grand Junction Circulation Plan, which has a relatively high overall travel speed, with minimal interference and which interconnects with the principal arterial system.

Mitigation means methods used to alleviate or lessen the impact of development.

Mobile food vendor means a readily movable, motorized wheeled vehicle or towed wheeled vehicle that is equipped to prepare, serve, and sell or dispense food and is registered with a department/division of motor vehicles.

Mobile food vendor court means three or more Mobile Food Vendors on the same property.

Mobile home means a single-family dwelling, factory-built and factory-assembled residence which does not comply with the National Manufactured Homes Construction Safety and Standards Act. (42 U.S.C. Section 5401 et seq., 1978, as amended).

Mobile home park means a parcel of land used for the continuous accommodation of two or more occupied mobile homes. Mobile home parks are typically operated for the financial benefit of the owner of the parcel of land but may also include individual lot ownership. Mobile home park does not include manufactured home

parks or subdivisions.

Mudflow means a flowing mass of predominantly fine grained earth material possessing a high degree of fluidity during movement.

Mulch means wood chips, bark, rock, or other accepted material placed around plants to assist in moisture retention and weed prevention.

Multi stem tree means a tree that has one stem at ground level but that splits into two or more stems above ground level. Trees whose stems diverge below ground level are considered separate trees.

Municipality means an incorporated city or town.

N

Natural hazard means a geologic, floodplain, or wildfire hazard as identified by a state or federal agency.

Natural Medicine-Related Definitions

Facilitator means a natural person who meets the criteria for a "facilitator" as that term is defined in the Colorado Natural Medicine Code.

Natural medicine means psilocybin or psilocin and other substances described in the Colorado Natural Medicine Code as "natural medicine."

Natural medicine cultivation facility means a location where regulated natural medicine is grown, harvested, and prepared in order to be transferred and distributed to either a healing center, a natural medicine products manufacturer, or to another natural medicine cultivation facility.

Natural medicine healing center means a facility licensed by the State Licensing Authority pursuant to the Colorado Natural Medicine Code that permits a facilitator to provide and supervise natural medicine services for a participant.

Natural medicine product means a product that is infused with natural medicine and intended for consumption.

Natural medicine products manufacturer means a person who manufactures regulated natural medicine products for transfer to a natural medicine healing center or to another natural medicine products manufacturer.

Natural medicine testing facility means a public or private laboratory licensed and certified or approved by the division of professions and occupations to perform testing and research on regulated natural medicine and regulated natural medicine product.

Participant means a person who is at least 21 years of age receives natural medicine services performed by and under the supervision of a natural medicine facilitator as provided in the Colorado Natural Medicine Code.

Regulated natural medicine means natural medicine that is cultivated, manufactured, tested, stored, distributed, transported, or dispensed as provided in the Colorado Natural Medicine Code.

Regulated natural medicine product — means a natural medicine product that is cultivated, manufactured, tested, stored, transported, or dispensed as provided in the Colorado Natural Medicine Code.

State Licensing Authority — means the authority created for the purpose of regulating and controlling the licensing of the cultivation, manufacturing, testing, storage, distribution, transportation, transfer, and dispensation of regulated natural medicine and regulated natural medicine product pursuant to the Colorado Natural Medicine Code.

Natural resource means existing natural elements relating to land, water, air, plant, and animal life, including, but not limited to, soils, geology, topography, surface and subsurface waters, wetlands, vegetation, and animal habitats.

Neighborhood means an area of a community with characteristics that distinguish it from other areas and that may include distinct ethnic or economic characteristics, housing types, schools, or boundaries defined by physical barriers, such as major highways and railroads or natural features, such as rivers. (Note: Historically, the neighborhood was defined as the area served by an elementary school, with shopping and recreation facilities to serve neighborhood residents. While the description is probably dated, the neighborhood designation is useful in analyzing the adequacy of facilities and services and in identifying factors affecting the quality of the built environment. In addition, as a distinct and identifiable area, often with its own name, neighborhoods are recognized as fostering community spirit and a sense of place, factors recognized as important in community planning.) Or: That area with definite boundaries as determined by the Director on a case-by-case basis to meet the intent and purpose of the Code.

Neighborhood association means any group that has been recognized by the Community Development Department or has registered with the Community Development Department the boundaries of a particular area with which it is related and which the association represents.

Net floor area means the square footage of the principal use area of a building including restrooms, hallways and stairwells, but not including normally unoccupied areas such as garages, storage rooms, and furnace areas.

Nonconforming means a legal use, structure, and/or development which existed prior to the adoption of this Code or any amendment thereto, which does not presently conform to this Code or its amendments.

Nonconforming structure or building means a structure or building, the size, dimensions, or location of which was lawful prior to the adoption, revision, or amendment to the zoning ordinance but that fails by reason of such adoption, revision, or amendment to conform to the present requirements of the zone district.

Nonconforming use means a use or activity that was lawful prior to the adoption, revision, or amendment of the zoning ordinance but that fails by reason of such adoption, revision, or amendment to conform to the present requirements of the zone district.

Nonprofit means organizations having 501(c)(3) filing status with the Internal Revenue Service.

Notice means the method of informing persons of requests, hearings, actions taken and similar actions. The form and specifics of notice will vary depending on the application, step, and other factors.

Noxious or invasive species means non-native plants that have a recognized harmful impact on natural habitats and/or are likely to displace native plant species for light, space, soil moisture and nutrients, including those noxious species identified under the Colorado Noxious Weed Act codified at C.R.S. Title 35 Article 5.5, as amended.

Nursery or *greenhouse* means a place where plants are raised, acquired, and maintained for transplanting or sale. It may also include, either exclusively or in conjunction with the above activities, the sale of materials commonly used for landscaping purposes, such as soil, rock, bark, mulch and the sale or rental of small landscaping tools and supplies.

Nursing care or convalescent facility means a licensed health care entity that is planned, organized, operated, and maintained to provide supportive, restorative, and preventative services to persons who, due to physical and/or mental disability, require continuous or regular inpatient nursing care. Convalescent facilities may be either an integral patient care unit of a general hospital or a facility physically separated from, but maintaining an affiliation with, all services in a general hospital.

O

Off-site improvement means improvements required to be made off site as a result of an application for development and including, but not limited to, road widening and upgrading, stormwater facilities and traffic improvements.

Off-site parking means parking provided for a specific use, but located on a site other than the one on which the specific use is located.

Off-street parking space means the space required to park one vehicle, exclusive of access drives, and not on a public right-of-way.

Offenders means, for the purpose of community corrections facilities, persons accused or convicted of a felony, misdemeanor, or other criminal offense.

Office means establishments that provide executive, management, administrative, or professional services, but not involving the sale of merchandise except as incidental to a permitted use. Typical examples include banks or financial institutions, government, real estate, insurance, property management, investment, employment, travel, advertising, law, architecture, design, engineering, accounting, call centers, and similar offices.

Office and personal services (Use Category). Uses in this category provide executive, management, administrative, governmental, or professional services or are primarily engaged in the provision of informational, instructional, personal improvement, personal care, and similar services. Accessory uses may include retail sales, cafeterias, health facilities, and parking.

Oil and gas drilling means equipment or improvements used or installed at an oil and gas location for the exploration, production, withdrawal, gathering, treatment, or processing of crude oil, condensate, E&P waste, or gas. Any well, wellhead, flowlines, tanks, surface equipment, or associated infrastructure used in the development, production, storage, or marketing of oil, natural gas, natural gas liquids,

or other hydrocarbon resources.

Open space means any property or portion without any structure or impervious surface and not designated and used for a specific purpose.

Open space fee means a fee paid by the developer of a new residential development to the City for the purpose of acquisition and development of open space.

Ornamental tree means a tree that has a height and spread between 15 feet and 30 feet at maturity.

Outdoor display and sales includes portable display taken inside at the close of each business day or a display of items of merchandise for immediate sale and open to customers for browsing (such as, but not limited to, operable autos, RVs, trucks, modular homes, hot tubs) that is permanently located outdoors. Retail displays including shelving or rack areas higher than six feet, wholesale merchandise displays and other areas not accessible to the general public are considered outdoor storage. This use does not include merchandise displayed immediately adjacent primary facade near the customer entrance(s) that does not protrude into parking areas or drive aisles or beyond the eaves, roof overhang or covered entrance area.

Outdoor entertainment and recreation means outdoor facilities, excluding racetracks, for outdoor concerts, amusement parks, miniature golf, drive-in theaters, go-cart tracks, stadiums, and other similar outdoor activities, and that may provide limited bleacher-type seating for the convenience of users. This use includes facilities for outdoor sports such as private swimming pools, tennis and basketball courts, skate parks, sports fields, and playgrounds/passive recreation. This use includes outdoor wedding venues.

Outdoor living area means any property or portion thereof which is permanently set aside for public or private use, is landscaped with living plant material (a minimum of 75% coverage), and will not be further developed. The area can include landscape buffers. The area calculation excludes detention areas, parking areas, and driveways.

Outdoor storage, accessory means an outdoor area used for the long-term deposit (more than 48 hours) of any goods, material, merchandise, or vehicles that occupy a volume of more than 150 cubic feet as an accessory use to and associated with a principal use on the property.

Outdoor storage, commercial means an outdoor area in which storage spaces are used by consumers/tenants for short- and long-term storage of personal property. Consumers/tenants retain "care, custody and control" of their personal property. Outdoor storage includes, but is not limited to, camper/RV storage, commercial and industrial product storage (e.g., sand and gravel), as well as landscape storage and contractor storage.

Overburden means all the earth and other materials which lie above natural mineral deposits or materials disturbed from their natural state in the process of mining and/or other development.

Overflow parking means any off-street, ground level open area used for the temporary storage of excess motor vehicles.

Overlay district means a zone district which has been superimposed over basic districts to address development constraints which require special attention and

treatment and to alert developers to issues they need to address in preparing an application for development.

Owner means an individual, firm, association, syndicate, partnership, or corporation having sufficient proprietary interest to seek development of land.

P

Parcel means an area of land defined by a legal description and recorded with the County Clerk and Recorder.

Park impact fee means a fee paid by the developer of a new residential development to the City for the purpose of acquisition and development of park facilities.

Park, lake, reservoir, or other open space means uses of land that are characterized primarily by natural areas, large areas consisting mostly of vegetative landscaping or outdoor recreation, or community gardens, or public squares. Structural improvements are generally limited to those structures that facilitate the use of the land as park and open space. Accessory uses may include playgrounds, maintenance facilities, swimming pools, restrooms and dressing rooms, concessions, and parking.

Parking garage, commercial means a structure or portion of a structure composed of one or more levels or floors exclusively used for the parking of vehicles as a principal use of land. A parking garage may be totally below grade or either partially or totally above grade, with those levels being either open or enclosed. Parking is generally available to the public, and a fee is generally charged. Parking facilities that are accessory to a principal use are not considered commercial parking uses.

Parking lot, commercial means an off-street, ground-level, open area used for the parking of vehicles as a principal use of land. Parking is generally available to the public, and a fee is generally charged. Parking facilities that are accessory to a principal use are not considered commercial parking uses.

Parking, public means a municipal site which does not fall within the boundaries of a street and which is reserved for the benefit of and accessible to the general public exclusively for the parking of vehicles, with or without payment.

Parks and open space (Use Category). Uses in this category focus on natural areas, large areas consisting mostly of vegetative landscaping or outdoor recreation, community gardens, or public squares. Lands tend to have few structures. Accessory uses may include clubhouses, playgrounds, maintenance facilities, concessions, and parking.

Parkway strip means the undeveloped portion of right-of-way between the back of curb and the detached sidewalk.

Pasture, commercial means land, including fenced fields, where plants, including but not limited to hay, grass, alfalfa, or corn are cultivated and irrigated or watered and are grown for the purpose of grazing.

Pedestrian right-of-way means a right-of-way or easement dedicated for public pedestrian access.

Pergola means an open structure usually consisting of parallel colonnades supporting a roof of beams and crossing rafters or trellis work, at least 50% of which is open to the sky.

Persigo agreement means the agreement between the City of Grand Junction and Mesa County, signed on October 13, 1998, setting forth the agreed upon boundaries of the 201 Sewer District and how development and annexation shall occur within those boundaries.

Person means natural persons as well as any other entity recognized by law, including: association, partnership, corporation, and joint venture, whether for-profit or nonprofit.

Personal service means a facility that provides individualized services generally related to personal needs. These include, but are not limited to, laundry, including cleaning and pressing service, beauty shops, barbershops, shoe repair, personal copying/shipping services, health spas, photographic studios, tailor/seamstress shop, indoor equipment/party/event rental, tanning salon, bicycle and sports equipment repair, small and large appliance repair, tattoo parlors and similar uses.

Petitioner means an applicant.

Planned development (PD) means an area of land zoned and improved as a development for which the otherwise applicable bulk use and other requirements may be modified in order to allow for more flexible planning in conformance with the development approval process.

Planning clearance means a permit that allows development to proceed, a use to be made or maintained or improvements, including structures to be built.

Planning Commission means the City of Grand Junction's Planning Commission. Also referred to as Commission.

Plat means a map approved by the City which creates lots or tracts and is recorded, surveyed, and legally described land, having appropriate dedication and/or restrictions, which is an instrument for recording of real estate interests with the Mesa County Clerk and Recorder's office.

Prefabricated shelter means a relocatable structure made from aluminum and composite panels or other durable materials that is prefabricated off site and shipped to the end user. Prefabricated shelters are pre-fitted with a variety of features, including, but not limited to, beds, outlets, heating and air conditioning, and storage space.

Preliminary plan means the map or maps of a proposed development and supporting materials which permit the evaluation of the proposal prior to final detailed engineering and design.

Preliminary subdivision plan means a map indicating the proposed layout of the subdivision or site plan that is submitted to the approving authority for preliminary approval.

Primary development means any enclosed habitable structure on a permanent foundation, any engineered wall required for orderly development such as retaining walls, underground utilities, required paved surfaces such as roads, trails and/or sidewalks, and any site work required for public safety such as storm drain systems.

Primary transmission line means either (GVP): Overhead D4 Line Size, or (Xcel) a three-phase mainline ("feeder") 600-amp or greater construction and with conductors greater than #4/0 ACSR.

Principal arterial means a street, as identified in the Grand Junction Circulation Plan, which provides a network of continuous routes serving intrastate and interstate travel as well as interurban and intraurban travel.

Principal structure means the structure in which the principal use of a property is conducted. This shall include any buildings which are attached to the principal structure by a covered structure.

Principal use means the main or principal use of a parcel of land.

Private means anything not owned or operated by the federal government, state government, or any political subdivision.

Produce stand means a temporary open air stand or place for the seasonal selling of agricultural products.

Property means a lot, parcel, tract, or other real estate. Separate parcels, lots, tracts and/or other real estate which are under the same ownership and which adjoin or abut are, for the purpose of this Code, treated as one lot, parcel or tract or other real estate, even if classified as different tax parcels and even if separated by a right-of-way, watercourse, or similar barrier.

Public means anything owned or operated by the federal government, state government, or any political subdivision.

Public building means any building owned, leased or held by the United States of America, the State of Colorado, Mesa County, the City of Grand Junction, any school district or other agency or political subdivision, which building is used for governmental purposes.

Public hearing means a public meeting for which public notice has been given and an opportunity for public testimony is provided.

Public land for dedication and ownership means parks, playgrounds, schools, drainage channels, trails, highways, roads and streets or other areas of land accepted by the City Council and dedicated for the public's use or benefit.

Public meeting means a meeting of a board, Planning Commission, City Council, or their representatives where the public may attend.

Public notice means notice to the public of a public hearing or meeting as required by state or local law. See GJMC § 21.02.030(g).

Public trail means any pathway designed for public recreation.

Q (Reserved)

R

Reclamation means rehabilitation of plant cover, soil stability, water resources, and other measures which will allow or cause flora to permanently grow on land.

Recorded/record means a document filed with and indexed by the Mesa County Clerk and Recorder.

Recreation and entertainment (Use Category). Uses in this category include indoor and outdoor recreation and entertainment activities. Accessory uses may include limited retail, concessions, parking, and maintenance facilities.

Recreational vehicle means all vehicles, with or without motive power, designed, converted, or used to provide temporary living quarters that include four or more of the following permanently installed facilities: cooking, refrigeration or ice box, self-contained toilet, heating and/or air conditioning, potable water supply system including faucet and sink, separate 110 to 125 volt electrical power supply and/or LP gas supply. Recreational vehicles shall also include the following: all watercraft subject to registration by the State of Colorado, all motorcycles, mini bikes, all-terrain vehicles (ATVs), go-carts and similar vehicles with motive power that are prohibited from operating on a public street by the State of Colorado. All other vehicles and crafts designed to carry one or more adults used primarily for recreational purposes that are prohibited from operating on a public street by the State of Colorado, all trailers designed or used to carry any recreational vehicle described herein. For the purpose of this Code, an empty trailer or a recreational vehicle not on a trailer shall each be counted as one recreational vehicle. However, a trailer carrying one or more recreational vehicles shall together be counted as one recreational vehicle. Also includes a semi-trailer, loaded, or unloaded, utility trailers, loaded or unloaded, or any other type or use of a trailer.

Recycling collection facility means a structure or facility in which used materials such as papers, glassware, plastics, and metal cans are separated, recycled, and processed prior to shipment to others that will use those materials to manufacture new products.

Recycling collection point means an incidental use that serves as a neighborhood drop-off point for temporary storage of non-hazardous recoverable or recyclable goods such as, but not limited to, newspapers, glassware, plastics, clothing, and metal cans. No on-site processing of such items would be allowed.

Regulated cannabis cultivation facility means an entity licensed to cultivate, prepare, and package cannabis and sell cannabis to retail cannabis stores, to cannabis product manufacturing facilities, and to other cannabis cultivation facilities, but not to consumer.

Regulated cannabis hospitality and sales business means a facility that cannot be mobile, that is licensed to permit the consumption of only the retail cannabis or retail cannabis products it has sold pursuant to the provisions of an enacted, initiated, or referred ordinance or resolution of the local jurisdiction in which the licensee operates.

Regulated cannabis products manufacturing facility means an entity licensed to purchase cannabis; manufacture, prepare, and package cannabis products; and sell cannabis and cannabis products to other cannabis product manufacturing facilities and to retail cannabis stores, but not to consumers.

Regulated cannabis store means an entity licensed to purchase regulated cannabis from regulated cannabis cultivation facilities and to sell regulated cannabis to consumers and regulated cannabis testing facilities that are licensed to analyze and certify the safety and potency of cannabis.

Regulated cannabis transporter business means an entity or person that is licensed to transport retail cannabis and retail cannabis products from one regulated cannabis business to another regulated cannabis business and to temporarily store the transported regulated cannabis and regulated cannabis products at its licensed premises but is not authorized to sell regulated cannabis or regulated cannabis

products under any circumstances.

Regulation means an applicable provision of this Code or any other requirement promulgated under this Code or the Grand Junction Municipal Code.

Renewable energy facility, accessory means the use of land for:

(1) Solar collectors or other devices or structural design features of a structure that rely upon sunshine as an energy source and is capable of collecting, distributing, or storing the sun's radiant energy for a beneficial use;

(2) Land area and equipment for the conversion of natural geothermal energy into energy for beneficial use; or

(3) Wind energy systems.

Request means a writing seeking a Planning Clearance. This is the same as an application.

Residence means a home, abode, or place where an individual is actually living at a specified point in time.

Resort cabin and lodge means a building or group of buildings, under single management and ownership, containing rooms and/or units available for temporary rental to transient guests, which serves as a destination point for visitors, and where the primary attraction is major natural areas, recreational features, or activities for persons on vacation.

Restaurant means an establishment serving food and/or beverages that are prepared, served, and consumed either within an enclosed building or accessory outdoor eating and drinking areas on the premises, taken out, or delivered.

Resubdivision means the changing of an existing parcel created by a plat and recorded with the County Clerk and Recorder.

Retail sales (Use Category). Uses in this category involve the sale, lease, or rent of new or used products directly to the final consumer for whatever purpose, but not specifically or exclusively the purpose of resale. Accessory uses may include offices, parking, storage of goods, assembly, repackaging, or repair of goods for on-site sale.

Retail sales and service means establishments engaged in selling, leasing, or renting goods or merchandise to the general public for personal or household consumption, including, but not limited to, antiques, art, art supplies, bicycles, clothing, dry goods, electronic equipment, fabric, furniture, garden supplies, gifts, hardware, home improvements, household products, jewelry, pet food, pharmaceuticals, printed material, and sporting goods, and rendering services incidental to the sale of such goods.

Retail sales and service, small means a facility or establishment with up to 5,000 square feet of gross floor area.

Retail sales and service, medium means a facility or establishment with more than 5,000 square feet and up to 15,000 square feet of gross floor area.

Retail sales and service, large means a facility or establishment with more than 15,000 and up to 60,000 square feet of gross floor area.

Retail sales and service, big box means a facility or establishment with more than 60,000 square feet of gross floor area.

Retaining wall means a manmade barrier constructed for the purpose of stabilizing soil, retarding erosion, or terracing a parcel or site.

Revision means minor changes to an application or approval. Revisions are changes that can be approved within the scope of GJMC § 21.02.040(c).

Revocable permit means a permit issued by the City Council, pursuant to Section 127 of the City Charter, allowing the construction in, or use of, a public right-of-way and revocable after 30 days' notice.

Ridgeline means the highest elevation of a mountain chain or line of hills; the intersection of two roof surfaces forming the highest horizontal line of the roof.

Riding academy, roping or equestrian area means a facility or place used for horse boarding (including equestrian pasture boarding) and/or equestrian activities for a fee, and/or for an exchange of goods or services. This includes facilities where horses are harbored and the general public may, for a fee, hire horses for riding.

Right-of-way means a strip of land acquired by reservation, dedication, forced dedication, prescription, or condemnation and intended to be occupied by a road, crosswalk, railroad, electric transmission lines, oil or gas pipeline, waterline, sanitary storm sewer, and other similar uses; generally, the right of one to pass over the property of another.

Roadway means the improved portion of a street within a right-of-way and/or easement.

Roof line means the highest edge of the roof or the top of parapet, whichever establishes the top line of the structure when viewed in a horizontal plane.

Rooster means any adult male domestic chicken which is three months of age or older.

Root ball means the mass formed by the roots of a plant and the soil surrounding them at the time of planting.

Rootzone means the area of the ground around the base of the tree where rooting occurs, as measured from the trunk to a distance twice the radius of the canopy drip line.

Rubbish includes but is not limited to food waste, ashes and other solid, semisolid, and liquid waste, by-products and generally decomposable residue taken from residences, commercial establishments and institutions. Rubbish may also be known as/referred to as "garbage,""trash," or "waste" as those terms are used and/or defined in this Code or any other City code, law, rule, or regulation.

S

Safety service facility means facilities for the provision of local rapid response emergency services such as policing, firefighting, and mobile medical emergency services, including areas for the storage and maintenance of emergency vehicles and equipment and housing and feeding of emergency personnel.

Sanitary facility means a facility providing a toilet and washbasin that may or may

not be connected to a central sanitary sewer system.

Satellite dish means an antenna, consisting of radiation elements that transmit or receive radiation signals, that is supported by a structure with or without a reflective component to the radiating dish, usually circular in shape with a parabolic curve design constructed of a solid or open mesh surface and intended for transmitting or receiving television, radio, microwave signals or other electromagnetic waves to or from earth satellites.

School, boarding means an educational institution at which pupils are provided with meals and lodging.

School, public or private means a public or private institution that offers general academic instruction at preschool, kindergarten, elementary, and secondary levels.

School, vocational, technical, or trade means a secondary or higher education facility primarily teaching usable skills that prepares students for jobs in a trade or in industry, construction, or commerce, and meeting all applicable state requirements for a facility of its type

Screening means shielding, concealing, and effectively hiding from view of a person standing at ground level on an abutting site, or outside the area of the feature so screened by a wall, fence, hedge, berm, or any combination of these methods, or any similar architectural or landscaped feature, such as a landscape perimeter strip.

Secure facility means a county, city and county, or municipal jail or a nonstate-owned prison facility, or similar operation.

Secured/security means cash, letter of credit or other readily available source of money.

Service lines means electric, gas, communication, water, sewer, irrigation, and drainage lines providing local distribution or collection service.

Setback means the minimum distance between a structure and a property line of a parcel of land or other established reference point.

Shade tree means a tree that has a height and/or spread of 30 feet or greater at maturity.

Shooting range, indoor means an indoor facility used for firearm target practice, competitions, or similar uses, including but not limited to archery, skeet, trap, paintball, and similar shooting activities.

Shooting range, outdoor means an outdoor area or facility to be used for firearm target practice, competitions, or similar uses, including but not limited to archery, skeet, trap, and similar shooting activities.

Short-term rental means a type of lodging wherein a dwelling unit, either in full or in part, is rented to a temporary occupant(s) for monetary consideration for fewer than 28 consecutive days. A bed and breakfast and a home used similar to a rooming/boarding house but where stays are fewer than 30 consecutive days is also a short-term rental. Short-term rental does not include shelters or other transient lodging as defined as a community service use.

Short-term rental, primary means a short-term rental that makes available for rent all bedrooms in a dwelling unit in a principal structure, excluding accessory dwelling units attached to a principal structure.

Short-term rental, secondary means a short-term rental that makes available for rent less than all the bedrooms in a principal dwelling unit, or an accessory dwelling unit.

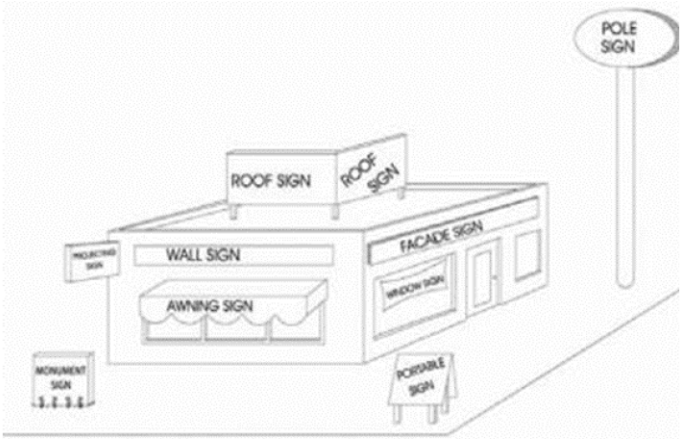
Shrub means a woody plant, smaller than a tree, consisting of several small stems from the ground or small branches near the ground; may be deciduous or evergreen.

Sight distance triangle means a triangular-shaped portion of land established at street intersections in which nothing is erected, placed, planted, or allowed to grow in such a manner as to limit or obstruct the sight distance of motorists entering or leaving the intersection.

Sign-Related Definitions.

Sign means any device, fixture, placard, structure, painted surface, or part thereof that uses any color, word, written representation, graphic symbol, logo, letters, illumination, numbers, or writing to advertise, announce or identify the purpose of, a person or entity, to advertise or merchandise a product or service, or to communicate written information to the public. (See graphic.)

Figure 14.02-6
Sign Types



Sign, awning means a sign that is mounted, painted, or attached to an awning.

Sign, monument means a sign other than a pole sign in which the entire bottom is in contact with, or is close to, the ground and is independent of any other structure.

Sign, facade means a sign painted on a wall of a building with or without a background. A facade sign shall not project from the building on which it is painted.

Sign, flush wall means a sign attached to, or erected against, the wall of a structure which has the sign face in a plane parallel to the plane of the wall and which does not extend more than 12 inches from the building face. (See graphic above.)

Sign, freestanding means a sign structure which is supported by one or more columns, uprights, poles, or braces extended from the ground or which is erected on the ground. (See graphic above.)

Sign, illegal means a sign which is in violation of the requirements of this Code except for those signs qualifying as nonconforming (see sign regulations, GJMC § 21.10.050).

Sign, integral means a sign that is carved into stone, concrete or similar material or made of bronze, aluminum, or other permanent type construction and made an integral part of the structure.

Sign, permanent means a sign which is securely attached to the ground or a structure so that it cannot readily be moved.

Sign, portable means a sign which is not permanently attached to the ground or a structure. A sign that is mounted or erected upon a vehicle, van, truck, automobile, bus, railroad car or other vehicle which is not registered and not in operating condition shall be considered a portable sign. (See graphic above.)

Sign, projecting means a sign attached to a structure wall and extending outward from the wall more than 12 inches. (See graphic above.)

Sign, roof top means a sign that is mounted on the roof of a building or that is wholly dependent upon a building for support and that projects above the top walk or edge of a building with a flat roof, the eave line of a building with a gambrel, gable or hip roof, or the deck line of a building with a mansard roof. (See graphic above.)

Sign, wind driven means one or more banners, flags, pennants, ribbons, spinners, streamers, captive balloons or other objects or materials designed or intended to move when subjected to pressure by wind or breeze and by that movement attract attention and function as a sign (see definition of Sign).

Sign without backing means any word, letter, emblem, insignia, figure or similar character or group thereof that is neither backed by, incorporated in, or otherwise made a part of any larger display.

Significant landscape feature means any outstanding natural element, including, but not limited to, vegetation, rock outcrops, and prominent landforms.

Site plan means the development plan for one or more lots on which is shown the existing and proposed conditions of the lot, including topography, vegetation, drainage, floodplains, wetlands and waterways; landscaping and open spaces, walkways, means of ingress and egress, circulation, utility services, structures and buildings, signs and lighting, berms, buffers, and screening devices, surrounding development, and any other information that reasonably may be required in order that an informed decision can be made by the approval authority.

Solid waste disposal or processing facility means an area of land and any related facility owned or operated by the City of Grand Junction that is designed or operated for the purpose of disposing of solid waste on or in the land and at which solid waste is disposed of in or on the land.

SSID means Submittal Standards for Improvements and Development as adopted by the City of Grand Junction.

Staff means the staff of the Grand Junction Community Development Department.

Storage, wholesale, and warehousing (Use Category). Uses in this category are engaged in the storage or movement of goods for themselves or other businesses. Goods are generally delivered to other businesses or the final consumer, except for some will-call pickups. There are typically few customers present.

Street means any public or private roadway, but not an alley.

Street, primary means the principal frontage for a building site, as defined during site plan review.

Street, side means the frontage that is not a primary street, as defined during site plan review.

Streetscape means the landscaping and other manmade objects located within the public right-of-way which add variety and are placed for aesthetic purposes as well as functional, pedestrian guidance and traffic control.

Structure means anything constructed or erected which requires location on or in the ground, or is attached to something having a location on the ground or anything as defined by the International Building Code. Structures do not include piped ditches and their appurtenances, poles, lines, cables, transmission or distribution facilities of public utilities, freestanding mailboxes, on grade slabs, walks, driveways, landscaping materials or fences, except that fences in excess of six feet shall be considered a structure. (See also "Building".)

Subdivision means the division of land into two or more parcels, separate interests including condominium(s) and leasehold interest(s), or interests in common, unless exempted by this Code. Unless the method of disposition is adopted for the purpose of evading any provision or purpose of this Code, the term "subdivision" shall not apply to any division of land:

(1) Which is created by order of any court in this state, but only if the City Attorney has received sufficient notice of the proposed order so that the City may object thereto, as its interests may dictate;

(2) Which is created by a lien, mortgage, deed of trust, or any other security instrument which became effective prior to June 1, 1989;

(3) Which is created by a security or unit of interest in any investment trust regulated under the laws of this state or any other interest in any investment entity which became effective prior to June 1, 1989;

(4) Which creates cemetery lots;

(5) Which creates an interest or interests in oil, gas, minerals, or water which are now or hereafter severed from the surface ownership of real property; or

(6) Which is created by the acquisition of an interest in land in the name of a husband and wife or other persons in joint tenancy or as tenants in common, so long as any partition so that the City may object thereto, as its interests may dictate; any such interest shall be deemed, for the purposes of this Code, as only one interest.

Suitable plant list means a list maintained by the Director of plant species and

generally approved to be installed in accordance with this Code.

Support services for interim shelter sites include, but are not limited to, healthcare facilities, mental and behavioral services, educational and job training, case management, and other similar uses.

Surveyor means a land surveyor registered by the State of Colorado.

Swimming pool, community means a swimming pool maintained by individuals for the use of more than one household and open to the public, maintained by a school, park district, municipality or other public not for profit organizations.

SWMM means the Stormwater Management Manual (GJMC Title 28) as adopted by the City.

T

TEDS means the Transportation and Engineering Design Standards (GJMC Title 29) as adopted by the City.

Telecommunication-Related Definitions.

Alternative structure means a structure that is not primarily constructed for the purpose of holding antennas but on which one or more antennas may be mounted, such as buildings, water tanks, pole signs, billboards, church steeples, and electric power transmission towers.

Amateur radio tower means a tower used for noncommercial amateur radio transmissions consistent with the "Complete FCC U.S. Amateur Part 97 Rules and Regulations" for amateur radio towers.

Ancillary structure means, for the purpose of this section, any form of development associated with a Telecommunications Facility, including foundations, concrete slabs on grade, guy anchors, generators, and transmission cable supports, but excluding equipment cabinets.

Antenna means any apparatus designed for the transmitting and/or receiving of electromagnetic waves, including telephonic, radio or television communications. Types of elements include omni-directional (whip) antennas, sectionalized (panel) antennas, multi or single bay (FM and TV), yagi, or parabolic (dish) antennas.

Antenna array means a single or group of antenna elements and associated mounting hardware, transmission lines, or other appurtenances which share a common attachment device such as a mounting frame or mounting support structure for the sole purpose of transmitting or receiving electromagnetic waves.

Antenna element means any antenna or antenna array.

ASR means the antenna structure registration number as required by the FAA and FCC.

Base station means equipment and nontower supporting structure at a fixed location that enable wireless telecommunications between user equipment and a communications network. Examples include transmission equipment mounted on a rooftop, water tank, silo, or other above ground structure other than a tower. The term does not encompass a tower as defined herein or any equipment associated with a tower. "Base station" includes, but is not limited to:

1. Equipment associated with wireless telecommunications services such as private, broadcast, and public safety services, as well as unlicensed wireless services and fixed wireless services such as microwave backhaul;
2. Radio transceivers, antennas, coaxial or fiber optic cable, regular and backup power supplies, and comparable equipment, regardless of technological configuration (including distributed antenna systems and small cell networks);
3. Any structure other than a tower that, at the time the application is filed under this section, supports or houses equipment described in this definition that has been reviewed and approved under the applicable zoning or siting process, or under another City regulatory review process, even if the structure was not built for the sole or primary purpose of providing such support.

"Base station" does not include any structure that, at the time the application is filed under this section, does not support or house wireless communication equipment.

Breakpoint technology means the engineering design of a monopole, or any applicable support structure, wherein a specified point on the monopole is designed to have stresses concentrated so that the point is at least 5% more susceptible to failure than any other point along the monopole so that in the event of a structural failure of the monopole, the failure will occur at the breakpoint rather than at the base plate, anchor bolts, or any other point on the monopole.

Broadband facility means any infrastructure used to deliver broadband services or for the provision of broadband service.

Broadband service means any technology identified by the U.S. Secretary of Agriculture as having the capacity to transmit data to enable a subscriber to the service to originate and receive high-quality Internet access, voice, data, graphics, and video. Broadband service includes, but is not limited to:

1. Cable Service. The one-way transmission to subscribers of video programming or other programming services and subscriber interaction required for the selection or use of such video programming or other programming service.
2. Telecommunications Service. The offering of telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used.
3. Wireless Service. Data and telecommunications services, including commercial mobile services, commercial mobile data services, unlicensed wireless service, and common carrier wireless exchange access services, as all of these terms are defined by federal law and regulations.

Co-location means the mounting or installation of transmission equipment on an eligible support structure for the purpose of transmitting and/or receiving radio frequency signals for communications purposes so that installation of a new support structure will not be required.

Combined antenna means an antenna or an antenna array designed and utilized to provide services for more than one wireless provider, or a single wireless provider utilizing more than one frequency band or spectrum, for the same or similar type of services.

Concealed means a tower, ancillary structure, or equipment compound that is not readily identifiable as a Telecommunications Facility and that is designed to be aesthetically compatible with existing and proposed building(s) and uses on a site or in the neighborhood or area. There are two types of concealed facilities:

1. Antenna attachments, including painted antenna and feed lines to match the color of a building or structure, faux windows, dormers, or other architectural features that blend with an existing or proposed building or structure; and
2. A freestanding concealed tower which looks like something else that is common in the geographic region such as a church steeple, windmill, bell tower, clock tower, light standard, flagpole with a flag that is proportional in size to the height and girth of the tower, or tree that grows naturally or is commonly found in the area.

COW - "Cellular on Wheels" means a temporary PWSF placed on property to provide short term, high volume telecommunications services to a specific location and which can be easily removed from the property.

DAS - Distributed Antenna System means a system consisting of: (i) a number of remote communications nodes deployed throughout the desired coverage area, each including at least one antenna for transmission and reception; (ii) a high capacity signal transport medium (typically fiber optic cable) connecting each node to a central communications hub site; and (iii) radio transceivers located at the hub site (rather than at each individual node as is the case for small cells) to process or control the communications signals transmitted and received through the antennas.

DAS hub means ancillary equipment usually contained in a shelter or other enclosure which does not have any wireless transmission or receive equipment contained therein but is utilized in the deployment and operation of wireless DAS receive/transmit infrastructure that is located elsewhere.

Development area means the area occupied by a Telecommunications Facility including areas inside or under an antenna-support structure's framework, equipment cabinets, ancillary structures, and/or access ways.

Dual purpose facility means a new banner pole, light stanchion, support tower for overhead electric lines, or other similar utility structure onto which one or more antenna(s) are or can be mounted or attached, and which is built for the primary purpose of providing PWSF.

Eligible facilities request means any request for modification of an existing tower or base station involving co-location of new transmission equipment, removal of transmission equipment, or replacement of transmission equipment that does not substantially change the physical dimensions of such tower or base station.

Eligible facility means existing wireless tower or base station that has been approved through a local government land use review process prescribed for the tower or base station.

Eligible support structure means any tower or base station existing at the time the application is filed with the City.

Equipment cabinet means any structure used exclusively to contain equipment necessary for the transmission or reception of communication signals.

Equipment compound means the fenced-in area surrounding, inside or under a ground-based wireless communication facility containing ancillary structures and equipment (such as cabinets, shelters, and pedestals) necessary to operate an antenna that is above the base flood elevation.

Equipment shelter means a self-contained building housing ancillary electronic equipment typically including a generator.

Existing means a constructed tower or base station is "existing" for purposes of this section if it has been reviewed and approved under an applicable City land use review process. "Existing" also includes a tower that was lawfully constructed but not reviewed because it was not in a zoned area when it was built.

Feed lines means cables or fiber optic lines used as the interconnecting media between the base station and the antenna.

Flush-mounted means antenna or antenna array attached to the face of a support structure or building such that no portion of the antenna(s) extend(s) above the height of the support structure or building. The maximum flush-mounting distance, if prescribed, shall be measured from the outside edge of the support structure or building to the inside edge of the antenna.

Geographic search ring means an area designated by a wireless provider or operator for a new base station and/or tower produced in accordance with generally accepted principles of wireless engineering.

Handoff candidate means a wireless communication facility that receives call transference from another wireless facility, usually located in an adjacent first "tier" surrounding the initial wireless facility.

Least visually obtrusive profile means the design of a Telecommunications Facility presenting the minimum visual profile necessary for proper function.

Nonconcealed means a Telecommunications Facility that is readily identifiable as such (whether freestanding or attached).

OTARD means over the air reception devices which are limited to either a "dish" antenna one meter (39.37 inches) or less in diameter designed to receive direct broadcast satellite service, including direct-to-home satellite service, or to receive or transmit fixed wireless signals via satellite, or an antenna that is one meter or less in diameter and is designed to receive video programming services via broadband radio service (wireless cable), or to receive or transmit fixed wireless signals other than via satellite or an antenna that is designed to receive local television broadcast signals.

Personal wireless service facility ("PWSF") means any staffed or unstaffed location for the transmission and/or reception of radio frequency signals or other personal wireless communications, including commercial mobile services, unlicensed wireless services, wireless broadband services, and common carrier wireless exchange access services as defined in the Telecommunications Act of 1996, and usually consisting of an antenna or group of antennas, transmission cables, feed lines, equipment cabinets or shelters, and may include a tower. Facilities may include new or existing towers, replacement towers, co-location on existing towers, base station attached concealed and nonconcealed antenna, dual purpose facilities, concealed towers, and nonconcealed towers (monopoles, lattice and guyed), so long as those facilities are used in the provision of personal wireless services as that term is defined in the Telecommunications Act.

Qualified co-location request means co-location of PWSF on a tower or base station that creates a substantial change in the facility but is entitled to processing within 90 days under 47 U.S.C. § 332(c)(7).

Radio frequency emissions means any electromagnetic radiation or other communications signal emitted from an antenna or antenna-related equipment.

Radio frequency propagation analysis means computer modeling to show the level of signal saturation in a given geographical area.

Replacement means a modification of an existing tower to increase the height, or to improve its integrity, by replacing or removing one or several tower(s) located in proximity to a proposed new tower in order to encourage compliance with this section, or improve aesthetics or functionality of the overall wireless network.

Satellite earth station means a single or group of parabolic or dish antennas mounted to a support device that may be a pole or truss assembly attached to a foundation in the ground, or in some other configuration, including the associated separate equipment cabinets necessary for the transmission or reception of wireless communications signals with satellites.

Site means, for towers other than towers in the rights-of-way, the boundaries of the leased or owned property on which the facilities are or are proposed to be situated.

Small cell facility means a wireless service facility that meets both of the following qualifications:

1. Each antenna is located inside an enclosure of no more than three cubic feet in volume or, in the case of an antenna that has exposed elements, the antenna and all of its exposed elements could fit within an enclosure of no more than three cubic feet; and
2. Primary equipment enclosures are no larger than 17 cubic feet in volume. The following associated equipment may be located outside of the primary equipment enclosure and, if so located, is not included in the calculation of equipment volume: electric meter, concealment, telecommunications demarcation box, ground-based enclosures, backup power systems, grounding equipment, power transfer switch, and cutoff switch.

Small cell network means a collection of interrelated small cell facilities designed to deliver wireless service.

Stanchion means a vertical support structure generally utilized to support exterior lighting elements.

Streamlined processing means expedited review process for co-locations required by the federal government (Congress and/or the FCC) for PWSF.

Substantial change means a modification or co-location constitutes a "substantial change" of an eligible support structure if it meets any of the following criteria:

1. A PWSF co-location or modification of an existing antenna-supporting structure not in a right-of-way increases the overall height of the antenna-supporting structure, antenna and/or antenna array more than 10% or 20 feet, whichever is greater. A PWSF co-location on an existing antenna-supporting structure within a right-of-way increases the overall height of the antenna-supporting structure, antenna and/or antenna array more than 10% or 10 feet, whichever is greater.
2. A PWSF co-location for towers not in a right-of-way protrudes from the antenna- supporting structure more than 20 feet or the width of the structure at the elevation of the co-location, and for towers within a right-of-way, protrudes from the antenna- supporting structure more than six feet.
3. A PWSF co-location on an existing antenna-supporting structure fails to meet current building code requirements (including windloading).
4. A PWSF co-location adds more than four additional equipment cabinets or one additional equipment shelter.
5. A PWSF co-location requires excavation outside of existing leased or owned parcel or existing easements.
6. A PWSF co-location defeats any existing concealment elements of the antenna- supporting structure.
7. A PWSF co-location fails to comply with all conditions associated with the prior approval of the antenna-supporting structure except for modification of parameters as permitted in this section.

Support structure means anything constructed or erected, the use of which requires permanent location on the ground, or attachment to something having a permanent location on the ground.

Telecommunications facility(ies) means, at a specific physical location, one or more antenna, tower, base station, mechanical and/or electronic equipment, conduit, cable, and associated structures, enclosures, assemblages, devices and supporting elements that generate or transmit nonionizing electromagnetic radiation or light operating to produce a signal used for communication, including but not limited to all types of communication facilities defined further herein.

Temporary PWSF means a temporary tower or other structure that provides interim short-term telecommunications needed to meet an immediate demand for service in the event of an emergency or a public event where a permanent wireless network is unavailable or insufficient to satisfy the temporary increase in demand or when permanent PWSF equipment is temporarily unavailable or off line.

Tower means any support structure built for the primary purpose of supporting any antennas and associated facilities for commercial, private, broadcast, microwave, public, public safety, licensed or unlicensed, and/or fixed or wireless services. A tower may be concealed or nonconcealed. Nonconcealed towers include:

1. Guyed. A style of tower consisting of a single truss assembly composed of sections with bracing incorporated. The sections are attached to each other, and the assembly is attached to a foundation and supported by a series of wires that are connected to anchors placed in the ground or on a building.
2. Lattice. A self-supporting tapered style of tower that consists of vertical and horizontal supports with multiple legs and cross bracing, and metal crossed strips or bars to support antennas.
3. Monopole. A style of freestanding tower consisting of a single shaft usually composed of two or more hollow sections that are in turn attached to a foundation. This type of tower is designed to support itself without the use of guy wires or other stabilization devices. These facilities are mounted to a foundation that rests on or in the ground or on a building's roof. All feed lines shall be installed within the shaft of the structure.

Tower base means the foundation, usually concrete, on which the tower and other support equipment are situated. For measurement calculations, the tower base is that point on the foundation reached by dropping a perpendicular from the geometric center of the tower.

Tower height means the vertical distance measured from the grade line to the highest point of the tower, including any antenna, lighting or other equipment affixed thereto.

Tower site means the land area that contains, or will contain, a proposed tower, equipment compound, support structures and other related buildings and improvements.

Transmission equipment means equipment that facilitates transmission of communication service (whether commercial, private, broadcast, microwave, public, public safety, licensed or unlicensed, fixed, or wireless), such as radio transceivers, antennas, coaxial or fiber-optic cable, and regular and backup power supply.

Wireless service facility means a Telecommunications Facility for the provision of wireless services.

Temporary use or structure means any use or structure placed on a parcel of land for a period of 120 days or less, unless otherwise permitted by GJMC § 21.04.050(c)(5).

Three frontage lot means a lot that fronts on three public streets.

Traffic means, as calculated by the Director, according to National or other Director approved objective standards, such as the Institute of Traffic Engineers publications. If an applicant provides proof that actual traffic will be different, the Director may vary from the approved standards.

Transfer facility, medical and hazardous waste means a facility at which solid or liquid medical and/or hazardous wastes are transferred from collection vehicles to another vehicle or container for transportation from one mode of transportation to

another.

Transfer facility, solid waste means a facility at which non-medical or hazardous refuse awaiting transportation to a disposal site is transferred from one type of collection vehicle to another. Refuse may be sorted and repackaged at a transfer station.

Transient means housing or accommodations which are typically occupied by residents for periods of two weeks or less, including, but not limited to, hotels, motels and short term rentals.

Transmission line means an electric line (115 KV and over) and appurtenant facilities; or pipelines/conveyors (10 inches diameter or larger) and appurtenant facilities for transporting natural resources, chemicals, petroleum derivatives, or waste substances.

Transportation (Use Category). Uses in this category are primarily associated with bus, train, and aircraft facilities.

Transportation depot means land and buildings used as a relay station for the transfer of a load of freight from one vehicle to another or from one party to another. Long-term or accessory storage is not permitted in a transportation depot.

Travel trailer means a vehicle or portable unit mounted on its own chassis and wheels which does not exceed eight feet in width and/or 40 feet in length, is drawn by a motor vehicle, and provides temporary living quarters for recreational, camping or travel use.

Tree means a woody perennial plant having a single, usually elongate main stem generally with few or no branches on its lower part.

Tree canopy coverage means the area of ground directly beneath the leaves and branches of trees.

Tree, deciduous means plants that drop their foliage annually before becoming dormant.

Truck stop means a facility for the servicing, repair, and maintenance of motor vehicles, including the dispensing of motor fuels or other petroleum products directly into the vehicles. A truck stop may include a restaurant, overnight accommodations, showers, and other facilities intended to serve travelers.

Turf means grasses planted to form a dense growth of leaf blades and roots, such as Kentucky Blue Grass and similar species used for planting lawns.

201 planning area means a regional plan for sewage collection and treatment to prevent pollution of the state's waters; the boundaries are defined by the official map, a copy of which is kept by the Director.

U

Underground pressurized irrigation system means a watering system for landscaped areas, consisting of underground pressurized pipes connected to sprinkler heads, bubbler heads, or drip systems such that 100% irrigation water coverage is provided.

Unoccupied means a dwelling in which no individual resides or a public, commercial, or industrial building, where no storage or use of equipment, merchandise, or machinery is kept for a period of time.

Urban agriculture means the use of a parcel of land five acres or smaller in size for the cultivation of food and/or horticultural crops, composting, aquaponics, aquaculture and/or hydroponics. This use may include the production of food products from food grown on the premises and accessory keeping of animals in accordance with City regulations.

Urban area means the definite boundary inside which the only development will occur by annexing to the City. See 1998 Persigo City/County Agreement.

Use means the purpose for which land or a structure is designed, arranged, intended, or occupied.

Use, interim means the type of buildings and activities existing in an area, or on a specific site or parcel, for an interim period of time. Such interim use shall not hinder the ability to redevelop the site or parcel at the density or intensity envisioned by the Comprehensive Plan. The scope and duration of an interim use shall be determined by Special Dimensional Permit and approved by the City Council.

Utilities means any agency that provides essential or basic services and related facilities such as electricity, gas, water (domestic and irrigation), sewage disposal, drainage systems, solid waste disposal, television, telecommunications, telephone, or railway.

Utility facility, basic means utility facilities that are necessary to support legally established uses and involve utility structures such as water and sewage pump stations, electrical substations, telephone exchanges, poles or cables, switch boxes, transformer boxes, cap banks, and underground water and sewer lines.

Utility facility, major means a facility providing an important regional utility service, such as water, sewer, or drainage, that normally entails construction of new buildings or structures, and that typically has employees on the site on an ongoing basis. Examples include but are not limited to: water works, sewage treatment plants, reservoirs, regional storm water detention ponds, utility-scale solar (solar farms), and other similar facilities.

Utility structures means electric transformers, switch boxes, telephone pedestals and telephone boxes, cable television boxes, traffic control boxes, and similar devices.

Utility uses (Use Category). Uses in this category includes all lines, buildings, easements, passageways, or structures used or intended to be used by any public or private utility related to the provision, distribution, collection, transmission, or disposal of power, oil, gas, water, sanitary sewage, communication signals, or other similar services at a local or regional level.

V

Variance means a grant of relief from the requirements of this Code which permits construction in a manner that would otherwise be prohibited by this Code.

Vehicle fleet operations center means a central facility for the dispatch, distribution, storage, staging, and loading of vehicles that are owned, leased, or operated for a common purpose, with or without associated offices. Typical uses include, but are not limited to, ambulance service, taxi dispatch, meals-on-wheels dispatch, staging areas for shared vehicle services, and other operations that require frequent arrival and departure of cars or vans such as courier, delivery, and express services, cleaning

services, key and lock services, security services, and taxi services.

Vehicle fuel sales or service station means a facility limited to retail sales to the public of gasoline, biodiesel, electricity, ethanol fuel blends, hydrogen, natural gas, or other fuels for motor vehicles, as well as motor oil, lubricants, travel aides, and minor automobile accessories. Accessory use may include a car wash and convenience food and beverage sales.

Vehicle impound lot means a lot for the storage of vehicles which have been towed or otherwise moved to the lot by a towing carrier permitted to operate pursuant to § 40-13-101 C.R.S., et seq., and no vehicle dismantling or repair work occurs on the lot.

Vehicle repair, major means an establishment primarily engaged in the repair or maintenance of motor vehicles, trailers, and similar large mechanical equipment, including paint, upholstery, muffler, transmission work, tire recapping and major engine and engine part overhaul. Accessory uses include outdoor repair, storage, and staging areas.

Vehicle repair, minor means an establishment primarily engaged in the repair or maintenance of motor vehicles, trailers, and similar mechanical equipment, including brake, muffler, tire repair and change, lubrication, and tune ups, and vehicle bodywork or painting, provided it is conducted within a completely enclosed building.

Vehicle sales, rental, and leasing, heavy means an establishment that specializes in the sale, display, lease, rental, or storage of heavy equipment including, but not limited to, tractors, trucks with a gross vehicle weight of over 10,000 pounds, semi-trucks and/or trailers, boats, recreational vehicles, and other large equipment.

Vehicle sales, rental, and leasing, light means an establishment that specializes in the sale, display, lease, rental, of light motor vehicles, including automobiles, vans, light trucks, and light trailers.

Vehicle wash means any building or premises or portions of the building or premises used for washing motor vehicles, including the use of automatic or semiautomatic application of cleaner, brushes, rinse water, and heat for drying.

Vehicles and equipment (Use Category). Uses in this category include a broad range of uses for the maintenance, sale, or rental of motor vehicles and related equipment. Accessory uses may include incidental repair and storage and offices.

Vested right means a right that cannot be changed or altered by changes in regulation.

W

Wall

(1) The vertical exterior surface of a building;

(2) Vertical interior surfaces that divide a building's space into rooms; or

(3) A vertical architectural partition used to divide, separate, or enclose an outside area, a masonry fence (see definition of "fence").

Waste and salvage (Use Category). Uses in this category receive solid or liquid wastes from others for disposal on the site or for transfer to another location. The

category includes uses that collect sanitary wastes, or uses that manufacture or produce goods or energy from the composting of organic material or processing of scrap or waste material. Waste and salvage uses also include uses that receive hazardous wastes from others. Accessory uses may include recycling of materials, offices, and repackaging and shipment of by-products.

Water wise means landscape methods which conserve water through the use of drought-tolerant plants, planting, and irrigation techniques.

Watercourse means any natural or artificial stream, river, creek, ditch, channel, canal, conduit, culvert, drain, waterway, gully, ravine, or wash in which water flows in a definite direction or course, either continuously or intermittently, and has a definite channel, bed, and bank and includes any area adjacent thereto subject to inundation by reason of overflow or floodwater.

Wholesale or warehouse means a facility that is used for the selling of merchandise to retailers; to industrial, commercial, institutional, or professional business users, or to other wholesalers; or acting as agents or brokers and buying merchandise for, selling merchandise to such individuals or companies, or the storage of merchandise, stock, vehicles, furnishings, supplies, and other trade or business material.

Working day means a business day; those days the Public Works and Community Development Departments are open to the public for business. Federal holidays, Saturdays and Sundays are not working days.

X

Xeriscape or *xeriscaping* means landscape plantings that reduce the need for irrigation.

Y

Yard means an existing or required open space on a parcel with a principal structure. A yard shall be open, unoccupied, and unobstructed from the ground to the sky, except as otherwise provided in this Code.

Yard setback means the minimum horizontal distance between any building and the property line.

Yard, front means a yard extending across the full width and depth of the lot between a road right-of-way or access easement line and the nearest line or point of the building. (For flag lots, see Yard, side.)

Yard, rear means a yard extending across the full width and depth of the lot between the rear lot line and the nearest line or point of the building.

Yard, side means a yard extending from the front yard to the rear yard between the side lot line and the nearest line or point of the building. This side yard definition may apply for three sides of a flag lot if the flagpole portion of the lot exceeds the front yard setback.

Yard, side setback means the minimum horizontal distance between any building and the side property line.

Z

Zero lot line means the location of a building on a lot in such a manner that one or

more of the building sides rests directly on a lot line.

Zone district means a mapped area with a particular set of rules and regulations which limits the types of uses. "Zone" is the same as "district."

Zoo means a facility, indoor or outdoor, where animals are kept for viewing by the public, and that may be accredited by the American Zoological Association.

(Ord. No. 5260, 5/7/2025; Ord. No. 5252, 3/19/2025; Ord. No. 5244, 1/15/2025; Ord. No. 5242, 12/4/2024; Ord. No. 5229, 8/21/2024; Ord. 5218, 5/1/2024; Ord. 5205, 3/20/2024; Ord. 5190, 12/20/2023)

Title 22

H ROAD/NORTHWEST AREA OVERLAY

Chapter 22.04
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Chapter 22.08
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Chapter 22.12
Policies and Performance Standards

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Policies

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§ 22.12.050. Corridor aesthetics/ landscaping.
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Chapter 22.04
(Reserved) [1]

Chapter 22.08
(Reserved) [2]

Chapter 22.12
Policies and Performance Standards

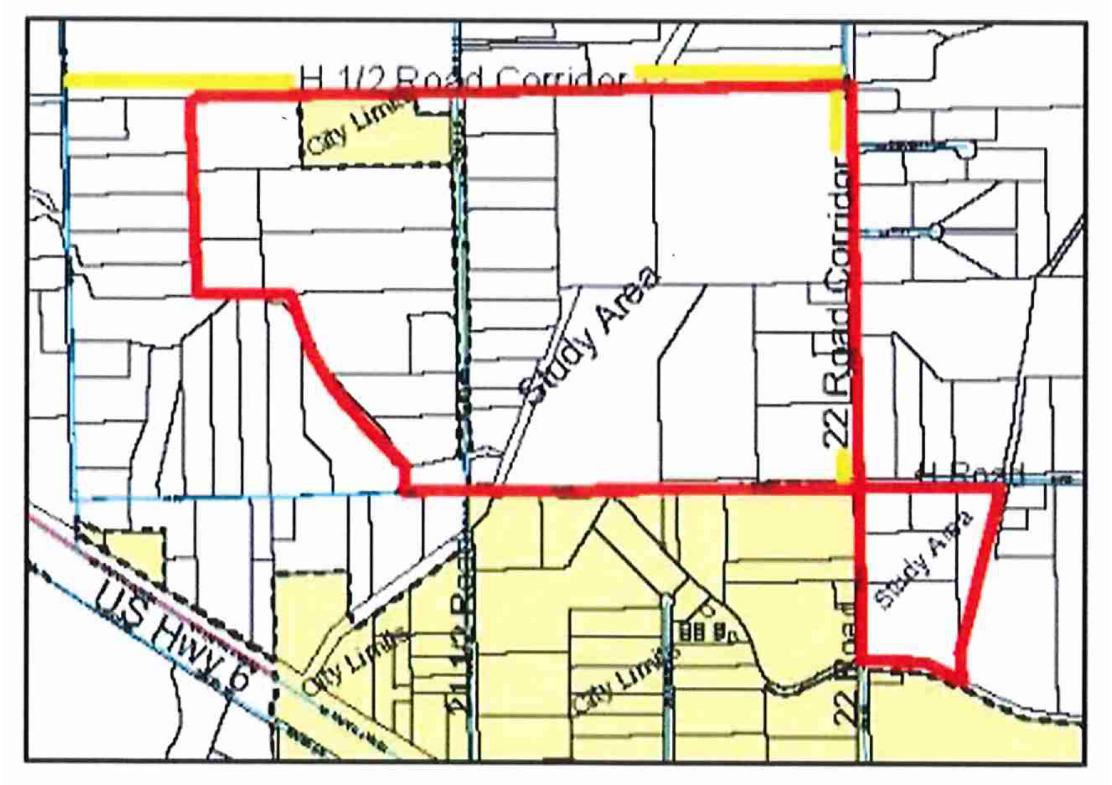
Article I
Policies

§ 22.12.010. Affected area.

The following performance standards shall affect the entire H Road/Northwest Area Overlay.

1. **Editor's Note: Former Ch. 22.04, Background Information, consisting of Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1, was repealed by Ord. No. 5238, 11/6/2024.**

2. **Editor's Note: Former Ch. 22.08, Plan Adoption, consisting of Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1, was repealed by Ord. No. 5238, 11/6/2024.**



The affected area includes those parcels bounded in red.

(Ord. No. 5238, 11/6/2024; Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.020. Truck traffic.

Site design shall direct truck (operations) traffic to the 21 1/2 Road Corridor. All other traffic including customer or light vehicle traffic may also use 22 Road and H 1/2 Road.

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.030. Billboards.

All signage as defined under the existing development codes and regulations of the City and County as off-premises signs are not allowed anywhere within the H Road/Northwest Area Overlay boundaries.

(Ord. No. 5238, 11/6/2024; Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

Article II
Performance Standards

§ 22.12.040. Affected area.

Development on all parcels abutting the west side of 22 Road from H Road to H 1/2 Road and the south side of H 1/2 Road from 21 Road to 22 Road shall be required to meet the following performance standards.

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.050. Corridor aesthetics/landscaping.

All property frontages along these corridors shall provide at a minimum:

(a) A 25-foot-wide landscaping strip the entire length of the frontage (excluding driveways).

(b) A berm the entire length of the frontage with a minimum of 36 inches in height.

Fencing shall not be allowed within the 25-foot landscape strip with the exception of split rail fences with up to three rails and not more than four feet in height.

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.060. Loading docks and fleet parking.

All loading docks and fleet/equipment parking shall be located in the rear half of the lot or behind the principal structure (i.e., south side of buildings fronting on H 1/2 Road and west of buildings fronting on 22 Road).

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.070. Outdoor storage and display.

Outdoor storage areas shall be:

(a) Adequately screened so as not to be visible from adjacent public roads (i.e., H 1/2 Road and 22 Road);

(b) In the rear half of the lot or behind the principal structure (i.e., south of buildings fronting on H 1/2 Road and west of buildings fronting on 22 Road);

(c) Trash dumpsters shall be fully screened and located in the rear half of the lot or behind the principal structure.

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.080. Parking lots.

All parking lots located within the front half of the parcel or front of the principal structure (adjacent to 22 Road and H 1/2 Road rights-of-way) shall only be used for customer parking.

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.090. Architectural standards.

Applies only to building facades facing the 22 Road and H 1/2 Road rights-of-way. Building form shall incorporate projected and recessed elements to provide architectural variety, such as entryways, special functional areas, rooflines, and other features, including the following requirements:

(a) Blank, windowless walls are discouraged. Where the construction of a blank wall is necessary, the wall shall be articulated.

(b) Large monolithic expanses of uninterrupted facades (greater than 50 feet) are not allowed. Pilasters, texture transitions, windows and stepping of the wall plane are required.

(c) Buildings with flat roofs shall provide a parapet with an articulated cornice.

(d) All primary buildings shall use materials that are durable, economically maintained, and of quality that will retain their appearance over time including but not limited to stone, brick, stucco, and pre-cast concretes.

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.100. Signage standards.

Only monument style signs at a maximum of eight feet in height with a maximum total of 64 square feet per sign face shall be allowed. Signs shall not be internally illuminated. External illumination is allowed.

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

§ 22.12.110. Other standards.

The following are adequately addressed under existing development codes and City of Grand Junction and Mesa County regulations and therefore conformance must be met through the development process under then-existing code requirements:

(a) Retail sales/wholesale sales area;

(b) Odors;

(c) Glare;

(d) Parking lots;

(e) Lighting standards;

(f) Noise (regulated in § 25-12-103, C.R.S., maximum permissible noise levels, and GJMC § 8.16.010).

(Ord. 4066, 4-18-07; (City) GPA 2007-025, (County) 2007-027 MP1)

Title 23

NORTH AVENUE OVERLAY ZONE DISTRICT

Chapter 23.04
Background and Intent

§ 23.04.010. Overlay zoning.
§ 23.04.020. The vision.
§ 23.04.030. North Avenue.
§ 23.04.040. Definitions.

Chapter 23.08
Options and Boundaries

§ 23.08.010. Options for development within the district.
§ 23.08.020. Boundaries of the overlay district.

Chapter 23.12
Overlay Zone District Standards and Guidelines

§ 23.12.010. Applicability/conflicts.
§ 23.12.020. Mandatory standards.
§ 23.12.030. Opt-in standards.
§ 23.12.040. Site upgrade point system.

Chapter 23.04
Background and Intent

§ 23.04.010. Overlay zoning.

Overlay zoning creates a special zoning district over a base zone. An overlay adds to or changes the regulations, standards or requirements of the base zone in order to protect or guide development within a specific area or corridor to meet specific needs or objectives. While the base zone determines the permitted land uses, the overlay zone establishes design or other standards that meet the overlay's purposes.

The overlay zone for North Avenue provides direction, vision and incentives for development in the corridor. The purpose of the overlay is to stimulate new development, redevelopment and business and other human activity along the corridor. The overlay supports and implements the Comprehensive Plan goal of making the City a more livable place. The overlay's standards and guidelines are intended to stimulate commercial, pedestrian and other activity in the corridor.

(Ord. 4564, 2-20-13)

§ 23.04.020. The vision.

The vision for the North Avenue corridor was established in the 2007 and 2011 North Avenue Corridor Plans ("the Plans"). The North Avenue overlay zone encourages development features considered critical to implementing the plans by establishing guidelines, standards, development incentives and alternative approaches for development and redevelopment. The Plans envision buildings located near the street, front doors that are inviting and readily accessible, signage on the building rather than pole signs, more and safer pedestrian facilities, and an inviting streetscape, which will create an environment of vitality and livability.

The "streetscape" is the area between the street curb and the building facade. The combination of the adjacent land use and the public space of the streetscape can create a dynamic and inviting space. Streetscape features that create a visually interesting corridor and a safer pedestrian and transit experience create a dynamic sense of place inviting activity. The

overlay also includes development incentives to encourage design and development of an attractive streetscape.

(Ord. 4564, 2-20-13)

§ 23.04.030. North Avenue.

Revitalize North Avenue by establishing it as a "complete street." Development is encouraged to be designed and built according to the plans, which establish a "complete street" vision for North Avenue.

The North Avenue "Complete Street" concept includes:

(a) A multi-modal corridor designed for not only the vehicle, but also for the pedestrian, bicyclist and the transit user.

(b) Wide sidewalks detached from the roadway.

(c) Buildings located close to the street with pedestrian access to the building at the streetscape.

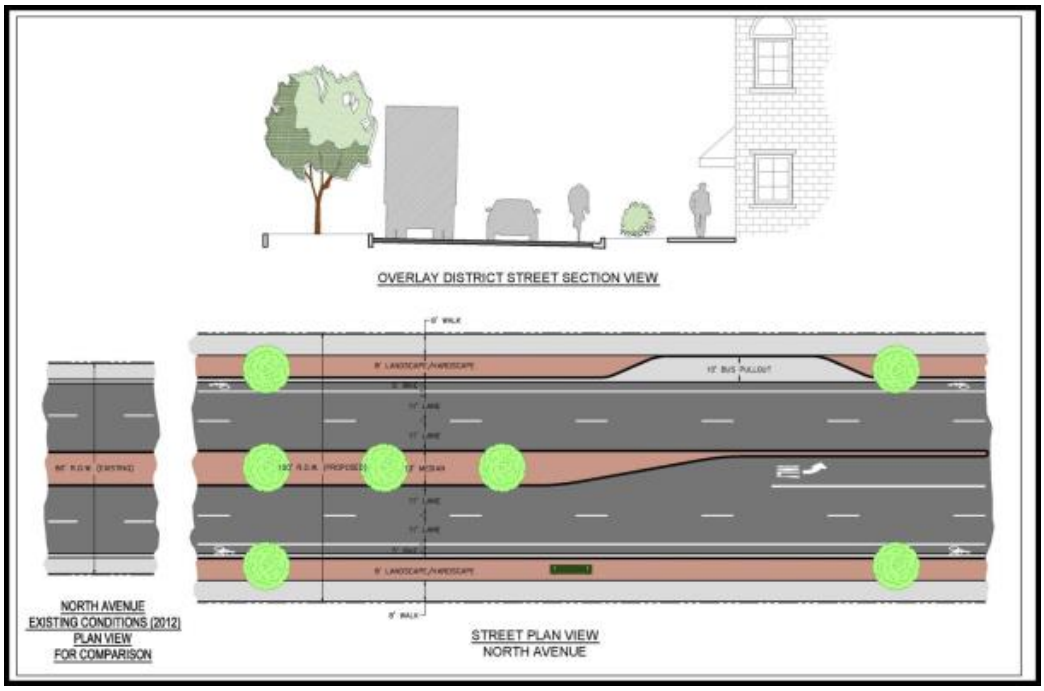
(d) Safe access to businesses from the street and sidewalks and parcel interconnectivity to minimize multiple access points to North Avenue.

(e) Safe and efficient transit stops.

(f) Adequate lighting creating a safer vehicle and pedestrian experience.

(g) Landscaping, street furniture and other hardscape features and amenities that enhance the pedestrian and motoring public's experience, but still allow buildings to be near the street.

The diagram below establishes the right-of-way standards for the overlay district.



§ 23.04.040. Definitions.

The following definitions apply to this overlay:

Abutting means directly touching. For example, parcels across a public right-of-way from one another would not be abutting, but would be adjacent to one another.

Adjacent to something means lying within a 100-foot radius of it. For purposes of adjacency, public right-of-way, easements, canals, waste ditches and waterways are not included in the 100-foot calculation.

(Ord. 4564, 2-20-13)

Chapter 23.08
Options and Boundaries

§ 23.08.010. Options for development within the district.

The North Avenue zoning overlay establishes mandatory standards, “opt-in” standards, and a point system for specific site upgrades. Any and all property development within the district must adhere to the mandatory standards, and in addition must choose among the following three options:

(a) Follow all of the opt-in standards;

(b) Develop according to the “base” zone standards; or

(c) Upgrade a site using the point system.

The mandatory standards of the overlay zone establish the right-of-way width and streetscape features for the corridor. The opt-in standards include incentives which relax some of the base-zone standards (landscaping requirements, for example) in exchange for meeting specified standards which will shape the desired character of the built environment. The point system allows a landowner to improve the site in specific ways which will help create the desired character of the built environment and provides framework for distribution of financial incentives that may become available. (The overlay zone does not establish those financial incentives, but merely establishes a point system for accessing such funds if and when they become available.)

(Ord. 4564, 2-20-13)

§ 23.08.020. Boundaries of the overlay district.

The North Avenue overlay district applies to all properties abutting the North Avenue right-of-way from First Street on the west to I-70 Business Loop on the east.

(Ord. 4564, 2-20-13)

Chapter 23.12
Overlay Zone District Standards and Guidelines

§ 23.12.010. Applicability/conflicts.

Where the standards or requirements of this overlay zone conflict with another overlay zone, area plan or the balance of the Zoning and Development Code, this overlay shall control. Where another overlay zone or area plan gives the Director authority to waive, vary or diverge from a development standard, a requirement of a zone district or another land use

regulation, that authority shall not apply to property within the boundaries of this overlay district. The variance procedure and criteria set forth in GJMC § 21.02.200 shall apply.

(Ord. 4564, 2-20-13)

§ 23.12.020. Mandatory standards.

(a) Right-of-way Standards. All development in the overlay district shall include dedication of sufficient right-of-way so that there are 50 feet of half right-of-way for North Avenue.

(b) Pedestrian/Sidewalk Standards. The North Avenue standard for public sidewalks is an eight-foot detached sidewalk with an eight-foot park strip separating the sidewalk from the street. In connection with any development in the overlay district, the landowner shall dedicate the appropriate amount of land to meet those standards, and the landowner/developer shall construct the sidewalk and park strip areas to City specifications. Exception: The sidewalk and/or park strip widths may be adjusted if a building existing on the property that is not being demolished or substantially remodeled encumbers all or part of the area 16 feet from the back of curb of North Avenue; provided, that the adjustment is the minimum necessary to accommodate the building. Neither the sidewalk nor the park strip, however, can be eliminated altogether, and the sidewalk shall be the higher priority between the two.

The park strip is part of the streetscape and shall include pedestrian and transit amenities including landscaping and hardscape features. It shall include different features which distinguish it from the sidewalk; in other words, the park strip cannot be solid concrete pavement like the sidewalk.

Hardscape features and materials include, but are not limited to the following:

Benches	Bike racks	Pedestrian lighting
Transit pullouts	Transit shelters	Trash cans
Planters	Water features	Art/sculptures
Newsstands	Mail boxes	Banners, hanging baskets

Landowner/developer may select among these and other appropriate (as approved by the Director) hardscape features to install in the park strip. A minimum of two such features shall be installed in the park strip in front of the parcel being developed, improved or re-developed.

(c) Multipurpose Easement. No multi-purpose easement is required along the North Avenue frontage. Utilities shall be located in the street right-of-way, to the rear of the property, in an alley, or in another appropriate location. If public utilities are located on private property, an easement shall be granted or dedicated for those utilities.

All other development standards of the Zoning and Development Code relating to right-of-way, sidewalk and park strip shall apply. Development of property within the district shall in all other respects not addressed in this overlay meet the requirements of the balance of the Zoning and Development Code.

(Ord. 4564, 2-20-13)

§ 23.12.030. Opt-in standards.

The opt-in section includes guidelines and standards. Guidelines are permissive recommendations for development; standards are mandatory requirements once the developer/ landowner has opted in.

(a) Benefits/Incentives. There are significant benefits to opting in to the standards of this section. Opting into all these standards entitles a landowner/developer to the following reductions to the base zone and other Zoning and Development Code standards:

(1) Landscaping and Buffering. Landscaping is required only in parking areas.

- No landscaping/screening buffer is required between adjacent properties.
- No street-frontage landscaping is required.
- Where all parking is located behind a building, no landscaping along access from North Avenue is required.
- No street trees are required in front of buildings that abut or are within 10 feet of North Avenue right-of-way. If a parking area abuts the North Avenue right-of-way, street trees are required along the North Avenue street frontage of the parking area.
- A 30-inch tall decorative screen wall may be substituted for the required parking lot screening between the parking lot located at the right-of-way/ property line and North Avenue. Shrub planting in front of the wall is not required for this option.

All other landscaping regulations of the Grand Junction Municipal Code shall apply.

Purpose: North Avenue is a major commercial district located within the City Center. Historically its development pattern has been both urban and suburban in scale. The Comprehensive Plan identifies high growth in the City Center area through 2035 as the community nearly doubles in population. The plans likewise emphasize urban growth along the North Avenue corridor, including more building mass, hardscape areas, less landscaping, and more pedestrian activity.

(2) Setbacks. The building setback is reduced to zero.

- Minimum building setbacks:

Front = 0 ft.
Side = 0 ft.
Rear = 0 ft.

Purpose: Reducing the setbacks to zero creates more buildable area and creates a more urban built environment. This standard also encourages better site design and complements the streetscape by emphasizing a pedestrian experience.

(3) Parking Space Credits. (See below).

(b) Standards.

(1) Maximum Building Setback Equals 10 Feet. The maximum building setback of 10 feet applies to all building construction including additions with exceptions for public plazas, outdoor seating areas and other pedestrian spaces.

Purpose: A maximum building setback of 10 feet supports the streetscape vision for North Avenue. Buildings close to the street enhance the pedestrian experience and create visual interest along the corridor.

(2) Drive Through Lanes. Drive through lanes shall not be installed between the North Avenue right-of-way and the building.

Purpose: This standard will reduce conflict between vehicles and pedestrians entering the building from the front and therefore enhance pedestrian activity and safety. In the first two examples pictured below, there are potential conflicts between motorists and pedestrians because a drive lane interferes with pedestrian access from North Avenue. The third picture (Taco Bell) shows a drive through lane that does not interfere with the front door access into the restaurant reducing pedestrian/vehicle conflicts and making pedestrian access to the building safer.

(3) Parking.

(i) Parking shall not be permitted between the building and the North Avenue right-of-way.

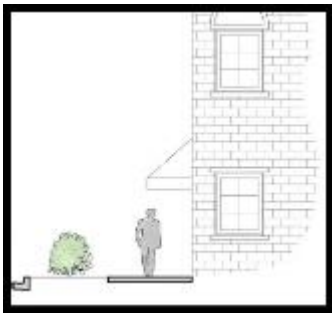
Purpose: The purpose of this standard is to reduce the amount of parking along the North Avenue frontage and to emphasize the buildings and pedestrian friendly streetscape.

(ii) All development shall meet the parking requirements established for the use and the base zone with the following exception. Parking space credit shall be allowed under the following conditions:

(A) Providing shared parking between two abutting properties through a recorded, permanent shared parking easement.

(B) When on-street parking is available (for corner lot development only), two on-street spaces may count as one on-site parking space.

(4) Awning Standards. Awnings and other facade enhancements are encouraged. One or more awnings extending from the building may be erected. Awnings shall be at least eight feet above the sidewalk and shall be at least four feet wide, along the building frontage on North Avenue, and shall not overhang into the right-of-way more than six feet. Awnings shall otherwise meet with the requirements of the Grand Junction Municipal Code and Colorado Department of Transportation (CDOT) regulations.



Purpose: Awnings provide visual interest to the corridor and enhance the pedestrian experience.

(5) Building Entry Standards. The main entrance to the building shall be on the North Avenue face of the building. Additional entrance(s) may be provided on the side and/or rear of the building to parking areas or other pedestrian facilities. A front door may be constructed anywhere along the front facade of the building including at the corner of the front facade as shown in the two examples pictured to the right.

Purpose: When an entrance is visible from the North Avenue corridor, it invites in the pedestrian and motorist alike. A front door also provides direct pedestrian access from the public sidewalk within the streetscape, supporting the revitalization of North Avenue as envisioned by the plans.

(6) Development of property within the district shall in all other respects not addressed in this overlay meet the requirements of the balance of the Zoning and Development Code.

(c) Guidelines. Whenever possible North Avenue development/redevelopment should:

(1) Minimize the number of traffic conflict points into and out of a business.

(2) Create pedestrian, bike and transit friendly amenities.

(3) Better define and consolidate driveways into businesses and access between/ among businesses to minimize vehicle access points onto North Avenue.

(4) Provide turn lanes where appropriate.

(5) Maximize the use of existing local streets and alleys for access to eliminate vehicle access points onto North Avenue.

(6) Include awnings or other visually interesting building features on the front of the building to provide visual interest and enhance the pedestrian experience.

(7) Include living landscaping within the park strip. The use of xeric landscape is encouraged.

Purpose: These guidelines promote pedestrian safety and efficient vehicle movement and provide visual interest along the corridor.

(Ord. 4564, 2-20-13)

§ 23.12.040. Site upgrade point system.

(a) This section is known and may be cited as the "Site Upgrade Point System for the North Avenue Overlay Zone District." It establishes a rating system whereby points are awarded in the development review process when a developer/owner upgrades a site or structure to meet the standards established by the North Avenue overlay zone and/or to achieve the vision of the plans. An owner may choose to develop under this section in lieu of the opt-in section of the overlay district. Also, an owner who opts in can receive points for those aspects of the development that are listed in the improvement table.

(b) Purpose. The purpose of this site upgrade point system is to encourage property owners along North Avenue to take steps that will bring their existing structures and sites more into alignment with the vision for the corridor as established by the plans and by this overlay.

(c) Use with Nonconformities. When installing only one or more specific site upgrade(s) selected from table below, without making other site improvements, a landowner with a nonconforming use, site or structure is not required to bring the site or structure into conformance with the code as prescribed in the "nonconformities" section of the Zoning and Development Code (Chapter 21.08 GJMC). However, if such landowner undertakes a site or structure remodel that includes improvements not listed in the table below, the nonconforming section of the Zoning and Development Code (Chapter 21.08 GJMC) applies, or, if the developer/owner has opted in, the opt-in standards apply.

(d) Validity of Points. Points may be awarded by the Director according to the table below. The points are assignable (subject to any expiration date or time established in the program), but may only be assigned one time. Points can also be shared by two or more landowners (for example, where adjacent owners agree to consolidate and eliminate access points and establish cross-access between or among parcels). If points are

shared, the owners must agree in writing to the allocation of points between/among themselves.

(e) Improvement Table and Point Values. The improvement table below establishes the improvements to the right-of-way, streetscape and private property that are encouraged by the plans and by this overlay and the points that will accrue upon completion of said improvements. The improvement table may be amended by the City Council by resolution. Regardless of the point values in the improvement table, no points shall be awarded for improvements to private property or to right-of-way that are part of a capital improvement program or project of any governmental entity, including but not limited to the City, the County or the Colorado Department of Transportation.

Improvement Table

First Priorities	**Points**
Construction of detached sidewalk/park strip running the entire length of the property along North Avenue and meeting the overlay standards. Total points are determined by dividing proposed streetscape area square feet by 1,600 square feet and multiplying by 30 pts. Benefit: Aesthetics and Pedestrian Safety	30
Right-of-way dedicated along North Avenue for entire frontage sufficient to allow eight feet detached sidewalk and eight feet park strip. Total points are determined by dividing the dedicated ROW area square feet by 1,000 square feet and multiplying by 30 pts. Benefit: Pedestrian Safety	30
Elimination of a North Avenue street access point [1], including construction of curb and gutter and removing the driveway apron and must include dedication of all required North Avenue right-of-way. Benefit: Pedestrian and Vehicle Safety	20

Second Priorities	**Points**
Pole or free-standing sign removed and sign placed on building facade Benefit: Aesthetic Value	7
Addition of plaza, fountain or outdoor dining in front of building along North Avenue Benefit: Pedestrian Access and Aesthetic Values	7
Construction of an addition to building that meets maximum setback (10 or fewer feet from property line); shall include the addition of a front door facing North Avenue; and 50 feet half right-of-way must be dedicated. Benefit: Pedestrian and Aesthetic Values	6
Elimination of parking along North Avenue frontage and placing all parking behind building(s) Benefit: Pedestrian Safety and Aesthetic Values	5

Second Priorities	Points
Pole sign removed and replaced with a monument sign Benefit: Aesthetic Value	5
Elimination of parking along North Avenue in front of the building(s) and all parking placed along the side and/or behind the building(s) Benefit: Pedestrian Safety and Aesthetic Values	3
Parking shared with adjacent properties[2] Benefit: Aesthetic Value	3
Permanent elimination of front yard display or storage [3] Benefit: Aesthetic Value	2
Two hardscape features installed in park strip (maximum for point system) Benefit: Aesthetic Value	2
One hardscape feature installed in park strip Benefit: Aesthetic Value	1

[1] Can be accomplished by sharing access point with neighbor by a cross access easement (which must be reviewed and approved by the City Attorney), or by one property taking access from a lower order street.

[2] Must be established by recorded permanent easement appurtenant, not by shared parking agreement.

[3] Must be established by amended site plan, CUP or other land use approval.

(f) Incentive Program. If and when funding becomes available, the Director shall develop a program and process for allocating funds to points under the improvement table.

(g) Appeals. Any person aggrieved by a decision of the Director regarding an award of points or incentive funds under this section may appeal that decision to the City Council within 30 days of the decision.

(Ord. 4564, 2-20-13)

Title 24

GREATER DOWNTOWN OVERLAY

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§ 24.04.010. Implementation – Standards and guidelines.

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§ 24.08.020. Architectural features.

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§ 24.08.050. Application of standards and guidelines.

§ 24.08.060. New site development or redevelopment – Standards.

§ 24.08.070. Architectural design of new buildings/additions or substantial exterior remodel.

§ 24.08.080. Landscaping for new site development or redevelopment – Standards.

§ 24.08.090. Signage – Standards.

Article III
Industrial Corridor Standards and Guidelines

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§ 24.08.110. 5th Street industrial corridor standards.

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§ 24.12.010. Purpose.

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Central Business District (CBD) Standards and Guidelines

§ 24.12.050. Applicability.

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§ 24.12.070. Overall Central Business District (CBD) vision/ concepts/policies.

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§ 24.12.090. Central Business District Core Area (Downtown Core or Core Area) guidelines.

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Article IV
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Article V
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§ 24.12.150. Applicability.
§ 24.12.160. Policy.
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§ 24.12.180. Guidelines.

Chapter 24.04
Introduction

§ 24.04.010. Implementation – Standards and guidelines.

One of the first steps in implementing the Greater Downtown Plan is a zoning overlay. The overlay is intended to provide guidance and criteria for the planning, design and implementation of public and private improvements in the Greater Downtown area and is set forth in this document to be known as the Greater Downtown overlay district (zoning overlay). If properly administered and adhered to, the standards and guidelines should result in public and private development improvements (or a combination thereof) that achieve, as a minimum, a common level of quality in terms of site design, architectural design, landscaping and other site improvements.

The general purposes of the standards and guidelines are to support the overall goals of the Greater Downtown Plan.

(a) Maintain and enhance the economic, cultural and social vitality of Greater Downtown. Promote downtown living by providing a wide range of housing opportunities in appropriate areas within Greater Downtown.

(b) Enhance the transportation system to accommodate automobiles, bikes and pedestrians, and provide adequate, convenient parking.

(c) Stabilize, preserve, protect and enhance the downtown residential neighborhoods.

(d) Promote and protect the unique identity of the Greater Downtown area.

The standards and guidelines were developed upon an analysis of the existing character of the Greater Downtown area. The area was divided into subdistricts and the Downtown District was further divided into subareas based on existing zoning, character of existing development and potential for redevelopment opportunities. In addition, primary corridors were identified for which overlay guidance is created with the adoption of the document. The subdistricts, primary corridors and subareas are shown on Figures 1, 2 and 3.

These standards supplement other development regulations such as the City of Grand Junction Zoning and Development Code, which includes detailed criteria by zone district, planned development regulations, design and improvement standards, supplemental use regulations, sign regulations and the City Transportation and Engineering Design Standards (TEDS). In the instance the following standards are silent on a development concern, the existing regulations shall apply. None of the guidelines and standards within the zoning overlay is intended to apply to properties within the North Seventh Street Historic Residential District or the North Avenue Corridor Overlay since separate guidelines and standards have been established through overlays for those areas.

The standards identify design alternatives and specific design criteria for the visual character and physical treatment of private development and public improvements within Greater Downtown. They are adopted through an overlay zoning district, which will establish the means by which the standards are administered and enforced. The Director will make all decisions, and appeals and variance requests will be heard by the City of Grand Junction Planning Commission. The Downtown Development Authority (DDA) will be a review agency for all applications and will make recommendations for proposals in the Central Business District.

Figure 1: Greater Downtown Plan Subdistricts

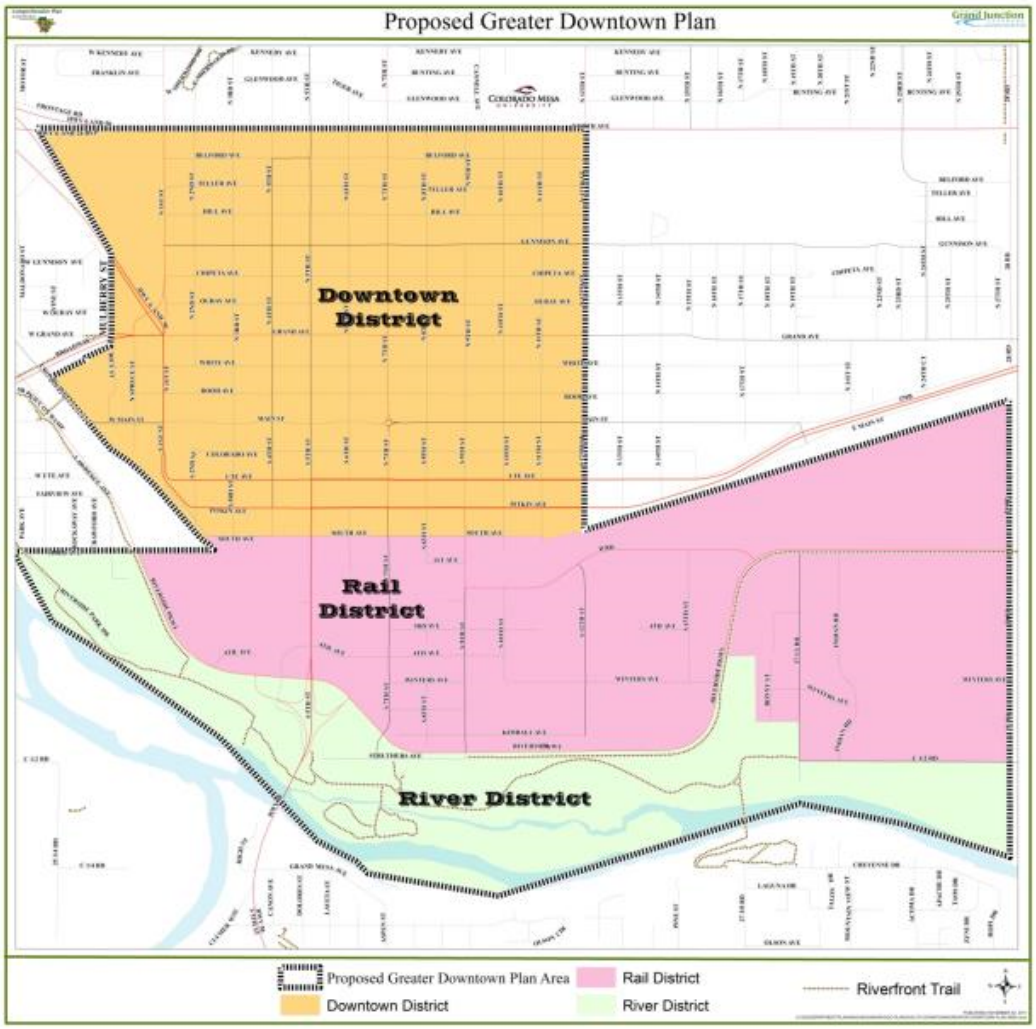


Figure 2

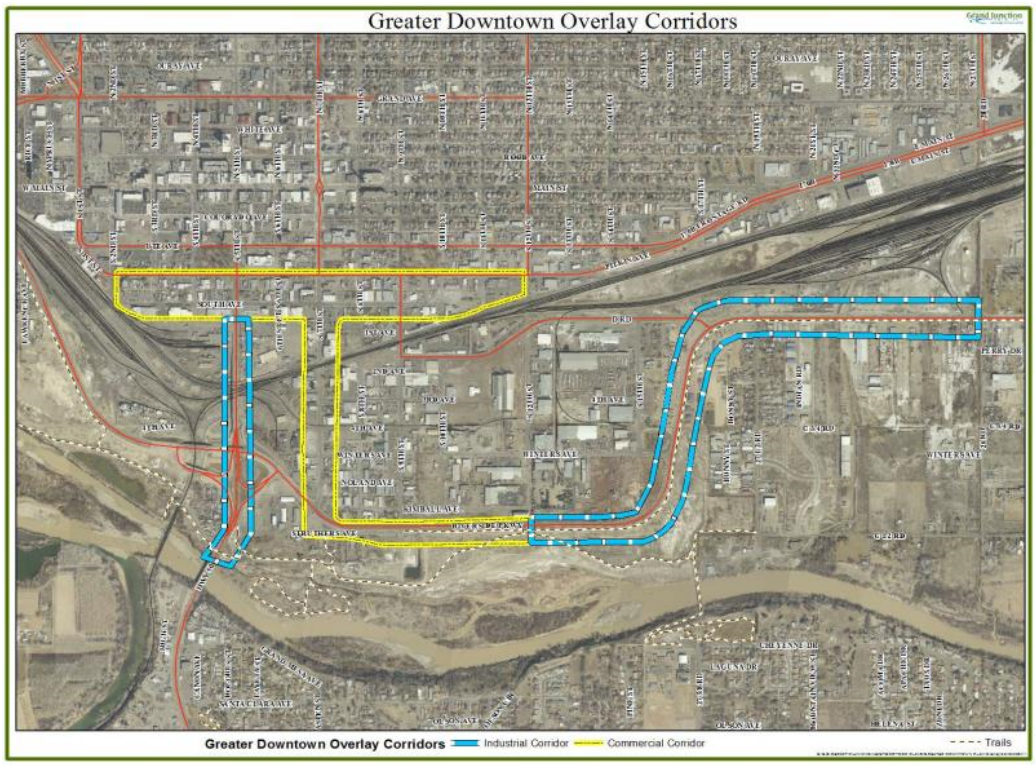
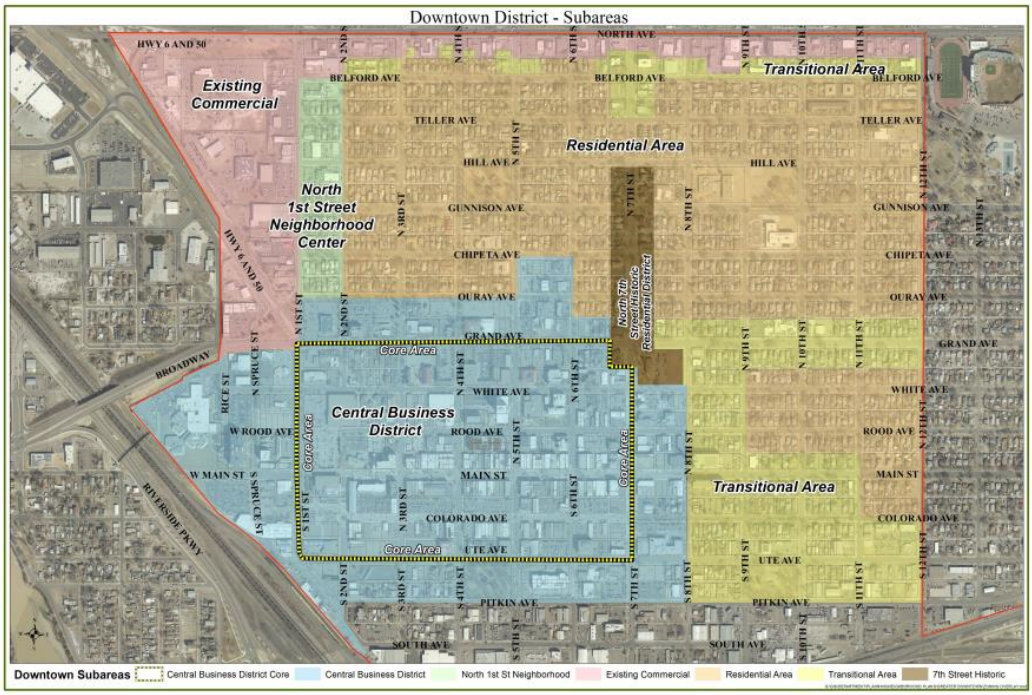


Figure 3



(Ord. 4572, 3-20-13)

Chapter 24.08
Corridor Standards and Guidelines

Article I
Overall Corridor Vision/Concepts

§ 24.08.010. Purpose.

The Greater Downtown overlay district standards for the Greater Downtown commercial and industrial corridors in the Rail and River Districts begin to implement goals of the Greater Downtown Plan to (i) improve the visual impact of development along the corridors; and (ii) promote higher quality architectural treatment and site design as new development and redevelopment occurs along the corridors. The visual features identified below define the concepts proposed along the corridors and, as implemented as new development and redevelopment occurs, will shape the desired character of the built environment. The features are grouped into three categories: architectural features; building materials; and streetscape and site design.

(Ord. 4572, 3-20-13)

§ 24.08.020. Architectural features.

(a) Facade Modulation and Roofline Variations. The corridors can be improved through use of visually interesting architectural features that are designed to reduce mass and scale, including variation in the building form with recessed or projecting bays and variation in the rooflines.

(b) Facade Design. Design details can be used to emphasize architectural features such as the modulation and roof line changes discussed above or other features such as entryways and windows. Facade design details that break up a facade and add visual interest include:

(1) Columns and pilasters that help break up a horizontal plane of a building or other site feature.

(2) Change of material such as on an exterior wainscoting panel.

(3) Accent colors that help define and/or accentuate architectural features.

(c) Defined Entry. Many of the other architectural features above can be used to accentuate and define the primary entrance to a building, add architectural interest, as well as make the building more pedestrian- or customer-friendly.

(d) Window Sizes and Shapes. The shape and sizes of windows used on a building break up the facade, provide visual variety and provide a pedestrian- and customer-friendly character.

(e) Awnings and Porticos. Awnings and porticos are encouraged to help provide architectural interest.

(Ord. 4572, 3-20-13)

§ 24.08.030. Building materials.

(a) Mix of Materials. Variations of materials used on exterior facades break up large building forms and walls.

(b) Different Textures, Colors and Tones. Use of different textures, colors and tones provide visual interest and can be used to accentuate architectural features.

(Ord. 4572, 3-20-13)

§ 24.08.040. Streetscape and site design.

Streetscape features along the primary corridors within the Rail and River Districts in Greater Downtown also help establish the visual character of the corridors. Examples of the desired characteristics are illustrated below.

(a) Building Placement. Buildings are encouraged to be brought forward on a site to the street or sidewalk.

(b) Landscaping. Many of the streets within the Rail and River Districts do not have, nor are planned to have, a sidewalk. However, streetscape interest can be created through landscaping, encouraging use of xeriscape concepts.

Example Existing Streetscape Landscaping

(c) Streetscape Design. An urban streetscape is desired that includes hard surfaces, tree grates and street trees. This design concept exists along some of the corridors in the Rail and River District. The urban streetscape along the street can be blended with the site design of the adjacent parcel so that on-site landscaping complements and enhances the existing streetscape.

Existing 7th Street Landscaping

(d) Detached Sidewalks. Where possible, detached sidewalks are desired along the commercial and industrial overlay corridors and already exist along some streets. The park strip between the curb and sidewalk can provide the landscape relief for an abutting developed property.

Existing Detached Sidewalk on Riverside Parkway (left) and South Avenue (right)

(e) Outdoor Storage, Display and Operations. Minimize the visual impact of outdoor storage, display and operations areas through placement on a site behind a building, to the rear of the property or otherwise screened.

Examples of Outdoor Storage and Operations Located Behind Buildings on 7th Street (left) and Riverside Parkway (right)

Screening Example on Riverside Parkway

(Ord. 4572, 3-20-13)

Article II

Commercial Corridor Standards and Guidelines

§ 24.08.050. Application of standards and guidelines.

The following Commercial Corridor standards and guidelines apply to those parcels on the south side of Pitkin Avenue between 2nd Street and 12th Street as shown in Figure 4: all parcels, or aggregation of parcels to be developed that have frontage on: (i) the east side of 2nd street between Pitkin Avenue and South Avenue; (ii) South Avenue between 2nd Street and 12th Street; (iii) South 7th Street between Pitkin Avenue and the south side of the Riverside Parkway; (iv) Struthers Avenue and Riverside Parkway area from just west of South 7th Street to the alignment of 12th Street; and all parcels between South 7th Street and 12th Street within 100 feet immediately north and south of the centerline of the Riverside Parkway. This area shall be referred to hereafter as the Commercial Corridor.

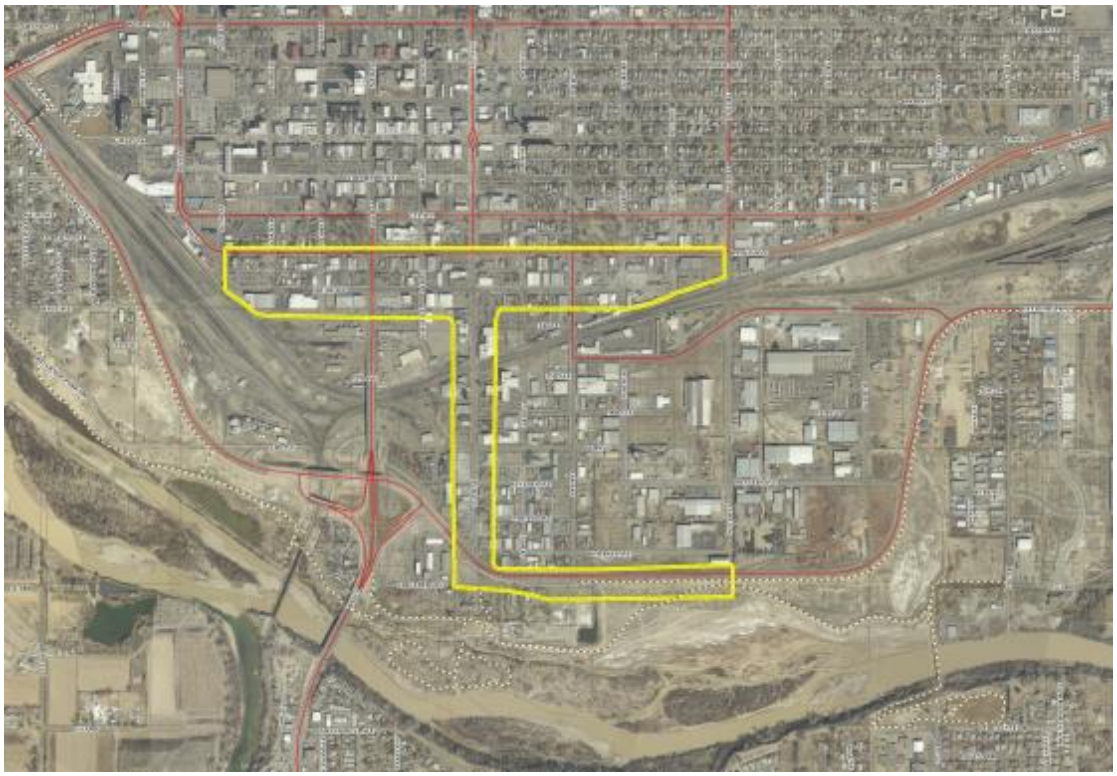


Figure 4

(Ord. 4572, 3-20-13)

§ 24.08.060. New site development or redevelopment – Standards.

(a) Outdoor storage and permanent display areas shall only be allowed in the rear half of the lot, beside and/or behind the principal structure. For properties with more than one street frontage, the front of the lot shall be considered, for purposes of this standard, to be the side abutting the higher or highest order street. Portable display of retail merchandise may be permitted subject to the provisions of the Zoning and Development Code.

(b) In order to prevent parking from dominating the visual setting of the Commercial Corridor, front yards shall allow only principal structures, landscaping, sidewalks, driveway access to parking areas and signage. No parking shall be allowed in the front yard. All parking that is accessory to a principal use shall be located behind or to the side of the building.

(c) Front yard setbacks for principal structures on parcels within the Commercial Corridor are reduced to zero feet.

(d) Residential uses are allowed as allowed in the Mixed-Use Light Commercial (MU-2) Zone District in the Zoning and Development Code, regardless of how the property is zoned.

(Ord. No. 5207, 3/20/2024; Ord. 4572, 3-20-13)

§ 24.08.070. Architectural design of new buildings/additions or substantial exterior remodel.

(a) Policy. For construction of new buildings and additions, or substantial exterior remodel (see definition under subsection (b)(2) of this section), any facade(s) on all buildings that face a street within the Commercial Corridor shall be designed to relate directly to and reinforce the pedestrian scale and quality of the abutting streets, civic and open spaces.

(b) Standards.

(1) Any facade(s) of a new building, addition or substantial exterior remodel (see definition under subsection (b)(2) of this section) that face a street within the Commercial Corridor or that face the public property containing the Riverfront Trail, shall have visually interesting architectural features and patterns that are designed to reduce mass and scale and reflect the desired vision for the corridors as described in GJMC § 24.08.010 through 24.08.040. In order to do so, the facade(s) of a new building, addition or substantial remodel that face a street within the Commercial Corridor shall exhibit a minimum of three of the following nine architectural design elements:

(i) Variation in materials, material modules, expressed joints and details, surface relief and texture to break up building forms and wall surfaces. Such detailing may include sills, headers, belt courses, reveals, pilasters, window bays or similar features.

(ii) Facade articulation/variation such as recessed or projecting bays or pilaster/ column projections a minimum of every 30 feet.

(iii) Variation in color.

(iv) Facade feature that emphasizes the primary building entrance through projecting or recessed forms, detail, color and/or materials.

(v) Variation in roof lines/roof materials in order to add interest to and reduce the scale of buildings or expanses of blank wall. This can be accomplished through design elements such as overhangs/eaves, recesses/projections, raised cornice parapets over doors or bays and peaked roof forms.

(vi) Screening of mechanical equipment either located on the roof or on the ground.

(vii) Windows.

(viii) Window or entry awning.

(ix) Other architectural features that achieve the goals of the overall corridor vision/concept as outlined in GJMC § 24.08.010 through 24.08.040 as determined by the Director.

(2) Definition of Substantial Exterior Remodel. Exterior building alteration that is greater than or equal to 65 percent of the value of the existing site and building. This increase shall trigger 100 percent site development compliance and 100

percent architectural standards compliance. Value shall be the greater of: total actual value per the Mesa County Assessor; or a current appraisal.

(c) Guidelines.

(1) Exterior building materials should be durable, economically maintained, and of a quality that will retain their appearance over time.

(Ord. 4572, 3-20-13)

§ 24.08.080. Landscaping for new site development or redevelopment – Standards.

On-site landscaping shall be required per the Zoning and Development Code. The total amount of required landscaping may be reduced by the Director if a minimum of two of the following five conditions exist or are proposed:

(a) A higher quality of architectural design is achieved with greater than three of the architectural design elements listed in GJMC § 24.08.070.

(b) Fifty percent or more of the building facade is set back no more than 15 feet.

(c) Street trees and other finished landscaping or hardscape exists within the public street immediately in front of the property.

(d) All parking is located to the side and/or rear of the building.

(e) All outdoor storage and operations are located behind the building.

(Ord. 4572, 3-20-13)

§ 24.08.090. Signage – Standards.

(a) Only flush wall and monument style signs are allowed on the parcels that have frontage on 7th Street, Struthers Avenue, and/or Riverside Parkway within the Commercial Corridor. Flush wall signs are allowed in accordance with the Zoning and Development Code. Monument signs shall be a maximum of 12 feet in height with a maximum total of 100 square feet per sign face allowed per parcel. Illumination shall comply with the Zoning and Development Code.

(b) Off-premises signs and billboards as defined by the Zoning and Development Code that did not exist as of April 21, 2013, are not allowed on properties within the Commercial Corridor.

(Ord. 4572, 3-20-13)

Article III
Industrial Corridor Standards and Guidelines

§ 24.08.100. Application of standards and guidelines.

The following Industrial Corridor standards and guidelines apply to all properties or aggregation of parcels to be developed with frontage on 5th Street or the 5th Street/Riverside Parkway intersection right-of-way, south of South Avenue to the river, referred to hereafter as

the 5th Street Industrial Corridor (Figure 5), and on Riverside Parkway from the east edge of 12th Street, extended along the Riverside Parkway, east to 28 Road, referred to hereafter as the Riverside Parkway Industrial Corridor (Figure 6). Please see the maps below. Collectively, the two shall be referred to as the Industrial Corridors.

(Ord. 4572, 3-20-13)

§ 24.08.110. 5th Street industrial corridor standards.

Figure 5

(a) No new outdoor uses and operations shall be allowed on parcels that have frontage on 5th Street or on the right-of-way for the 5th Street/Riverside Parkway interchange. Maximum expansion and construction of any outdoor uses and operations (such as outdoor operation of rail yards, salvage yards, etc.) on properties that abut the 5th Street right-of-way shall be 25 percent of the total square footage as it existed on April 21, 2013.

(b) For uses that require screening per the Zoning and Development Code and will be visible from the elevated portions of the 5th Street viaduct, screening shall be provided on the viaduct that limits views to adjacent uses but still provides longer vistas to the east (Grand Mesa) and west (Colorado National Monument and Uncompahgre Plateau), in accordance with CDOT specifications as follows: 36 inches by three-eighths inches by 11 ga Core, 10 ga finish vinyl coated chain link. The City may accept payment in lieu of screening; the amount of the payment-in-lieu may be established by resolution of the City Council.

(c) Off-premises signs and billboards as defined by the Zoning and Development Code that did not exist as of April 21, 2013, are not allowed on properties within the 5th Street Industrial Corridor.

(Ord. 4572, 3-20-13)

§ 24.08.120. Riverside Parkway industrial corridor standards.

Figure 6

(a) New Site Development or Redevelopment.

(1) Service entrances, service yards and loading areas shall be located only in the rear or side yard. For properties with more than one street frontage, the front yard shall be considered, for purposes of this standard, to be the side abutting the higher or highest order street. The rear and side yards are any other sides that do not meet the definition of a front yard. Along the Riverside Parkway right-of-way, a six-foot-high solid fence or wall of stone, wood or masonry shall screen each service yard or area from adjoining single-family residential zones and uses which are not separated by a street (not counting an alley or any easement).

(2) Outdoor storage and permanent display areas shall be allowed per the zone district of the property. Any storage in the front yard adjacent to the Riverside Parkway right-of-way shall be screened with a six-foot-high solid architectural wall constructed of stone, masonry or combination thereof with a minimum 14-foot landscape buffer provided outside of the wall unless modified per the landscaping in subsection (c) of this section.

(3) The front yard setback for principal structures on parcels within the Riverside Parkway Industrial Corridor is reduced to zero feet.

(b) Architectural Design of New Buildings or Substantial Exterior Remodel.

(1) Any side of a new building, addition or substantial remodel that faces the Riverside Parkway or the public property containing the Riverfront Trail shall exhibit a minimum of three of the following eight architectural design elements:

(i) Variation in materials.

(ii) Facade modulation/articulation a minimum of every 30 feet.

(iii) Variation in color.

(iv) Facade feature that emphasizes the primary building entrance.

(v) Variation in roofline.

(vi) Windows.

(vii) Window or entry awning.

(viii) Other architectural features that achieve the goals of the overall corridor vision/concept as outlined in GJMC § 24.08.010 through 24.08.040 as determined by the Director.

(c) Landscaping for New Site Development or Redevelopment.

(1) On-site landscaping shall be required per the Zoning and Development Code. The total amount of required landscaping may be reduced by the Director if a minimum of two of the following five conditions exist or are proposed:

(i) A higher quality of architectural design is achieved with greater than three of the architectural design elements listed in subsection (b) of this section.

(ii) Fifty percent or more of the building facade has no more than a 20-foot setback.

(iii) Street trees exist within the abutting public street.

(iv) All parking is located to the side and/or rear of the building.

(v) All outdoor storage and operations are located behind the building.

(d) Signage.

(1) Only flush wall and monument style signs are allowed on the Riverside Parkway Industrial Corridor properties. Flush wall signs are allowed per the Zoning and Development Code. Monument signs shall be a maximum of 12 feet in height with a maximum total of 100 square feet per sign face allowed per parcel.

(2) Off-premises signs and billboards as defined by the Zoning and Development Code that did not exist as of April 21, 2013, are not allowed on properties within the Riverside Parkway Industrial Corridor.

(Ord. 4572, 3-20-13)

Chapter 24.12

Downtown District Standards and Guidelines

Article I

Overall Downtown District Vision/Concepts

§ 24.12.010. Purpose.

In order to implement the Greater Downtown Plan, the following zoning overlay standards have been developed for the subareas of the Downtown District. Application of the standards and guidelines will begin to implement goals of the plan to:

(a) Maintain and enhance the economic, cultural and social vitality of the Downtown District.

(b) Promote downtown living by providing a wide range of housing opportunities.

(c) Enhance the transportation system to accommodate automobiles, transit, bikes and pedestrians, and provide adequate, convenient parking.

(d) Stabilize and enhance the historic residential neighborhoods.

(e) Establish and promote a unique identity for each of the subareas of the Downtown District.

(f) Preserve and restore significant historic structures.

(g) Activate the edges of the downtown parks with mixed use and programmed/active use of the parks as urban open space rather than passive green parks.

(Ord. 4572, 3-20-13)

Article II

Downtown District Area-Wide Policies, Standards and Guidelines

§ 24.12.020. Policies.

(a) Maintain and enhance the economic, cultural and social vitality of downtown.

(b) Promote downtown living by providing a wide range housing opportunities.

(c) Enhance the transportation system to accommodate automobiles, bikes and pedestrians and provide adequate, convenient parking.

(d) Stabilize and enhance the historic residential neighborhoods.

(e) Establish and promote a unique identity.

(f) Preserve and restore significant historic structures.

(g) Activate the edges of the downtown parks with mixed use and programmed/active use of the park as urban open space rather than passive green parks.

(Ord. 4572, 3-20-13)

§ 24.12.030. Standards.

Due to the constraints of many downtown properties and the City's desire to promote improvement and redevelopment in the Downtown District, the Director may make reasonable exceptions to the provisions of the Zoning and Development Code and the Greater Downtown Overlay District to bulk standards (except for building height), landscaping, parking or other use-specific special regulations for properties that are within the Central Business District (CBD), Transitional or Residential subareas. The following criteria shall be used to consider exceptions from the bulk standards, landscaping, parking or other use-specific special regulations:

(a) Hardship Unique to Property, Not Self-Inflicted. There are exceptional conditions creating an undue hardship, applicable only to the property involved or the intended use thereof, which do not apply generally to the other land areas or uses within similar zone districts, and such exceptional conditions or undue hardship was not created by the action or inaction of the applicant or owner of the property;

(b) Special Privilege. The exception shall not confer on the applicant any special privilege that is denied to other lands or structures within similar zone districts;

(c) Literal Interpretation. The literal interpretation of the provisions of the regulations would deprive the applicant of rights commonly enjoyed by other properties in similar zoning districts and would work unnecessary and undue hardship on the applicant;

(d) Greater Downtown Plan Goals. The proposal actually meets overall goals of the plan better than if standards are followed;

(e) Conformance with the Purposes of the Zoning Overlay and the Zoning and Development Code. The granting of an exception shall not conflict with the purposes and intents expressed or implied in this Zoning Overlay District or the Zoning and Development Code; and

(f) Conformance with Comprehensive Plan. The granting of an exception shall not conflict with the goals and principles in the City's Comprehensive Plan.

(Ord. 4572, 3-20-13)

§ 24.12.040. Guidelines.

(a) Projects will include good, interconnected transportation choices for better access and better health.

(b) Traffic calming measures will be provided where appropriate, including pedestrian refuge areas, medians, landscaping and corner bulb-outs.

(Ord. 4572, 3-20-13)

Article III

Central Business District (CBD) Standards and Guidelines

§ 24.12.050. Applicability.

The following standards and guidelines apply to the CBD area shown in Figure 7 (blue area). Further development and implementation of these concepts will be done in coordination with the DDA. The standards and guidelines are intended to apply to new development or redevelopment within the area.

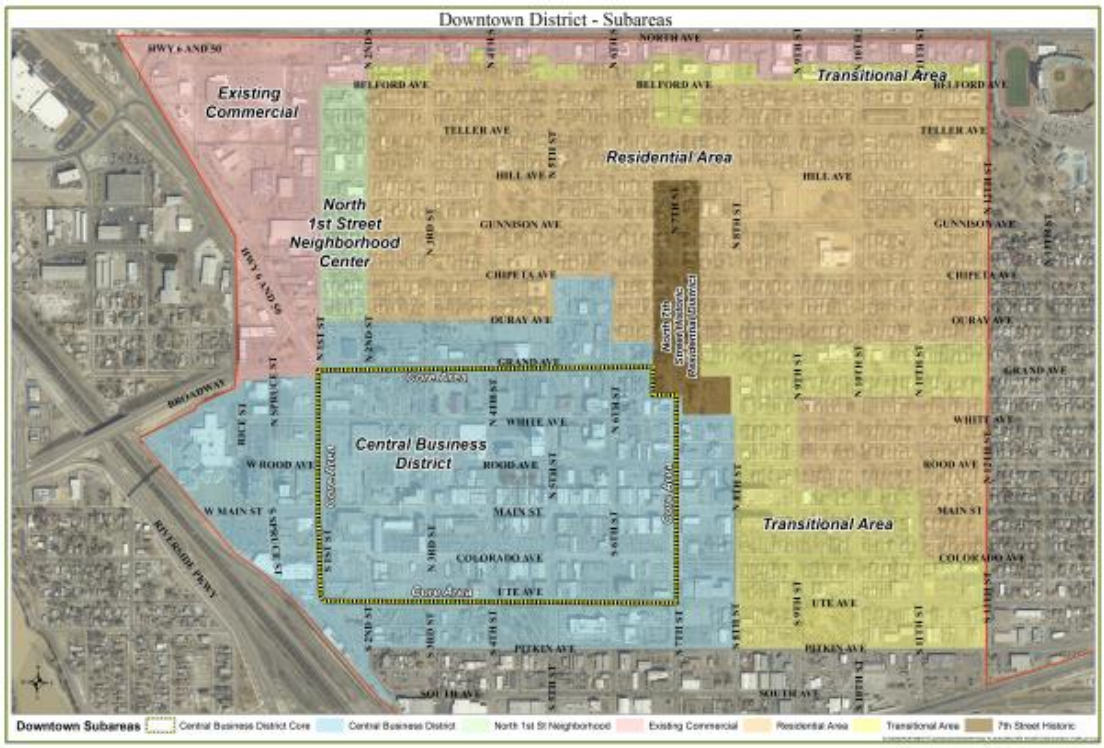


Figure 7

(Ord. 4572, 3-20-13)

§ 24.12.060. Application of standards and guidelines.

(a) Unless otherwise noted below, the standards and guidelines shall apply under the following conditions:

(1) Construction of a new building.

(2) Addition. Construction of an addition to an existing building if the addition increases total building square footage by 100 percent or greater (baseline is building square footage of existing building on April 21, 2013). This expansion standard is cumulative after this date in 2013. Once square footage has exceeded 100 percent of the 2013 square footage, the standards and guidelines shall apply to all further expansions.

(3) Substantial Exterior Remodel. Exterior building alteration that is greater than or equal to 65 percent of the value of the existing site and building. This increase shall trigger 100 percent site development compliance and 100 percent architectural standards compliance. This shall not trigger the requirement of minimum height. Value shall be the total actual value per the Mesa County Assessor or the appraised value based on an appraisal completed by a certified appraiser licensed to do business in the State of Colorado utilizing the "cost" approach.

(b) The standards and guidelines do not apply to:

(1) Construction of an addition to an existing building if the addition will increase the total building square footage by less than 100 percent (baseline is building square footage of existing building on April 21, 2013). This expansion standard is cumulative after this date in 2013. Once square footage has exceeded 100 percent of the 2013 square footage, the standards and guidelines shall apply to all further expansions.

(2) Exterior building alteration that does not exceed 65 percent of the value of the existing site and building (value determined as set forth above).

(3) Interior remodel of an existing building.

(4) This zoning overlay does not prohibit rezoning to a form-based zone within the Downtown District and this zoning overlay shall not apply to properties within a form-based zone within the Downtown District.

(Ord. 4572, 3-20-13)

§ 24.12.070. Overall Central Business District (CBD) vision/concepts/policies.

(a) Activate the Downtown Core area streets through emphasis on higher pedestrian traffic, businesses on the ground level that are oriented towards attracting higher pedestrian volumes, and buildings that "turn the corner" (invite activity on both the primary and cross streets). Refer to the CBD Core Area map in Figure 8.

Existing Downtown Street Activity

(b) Maintain the prominence of buildings along the streets by minimizing building setbacks.

(c) Encourage high quality, compatible design for all new buildings and establish a cohesive architectural character/theme that harmonizes new structures with the existing buildings through common materials, scale and basic architectural details as outlined in greater detail in the following standards and guidelines.

(d) Typical building materials found in the CBD materials are traditional and weather well, allow a broad variety in appearance and ensure buildings are of high quality. To facilitate the creation of a cohesive architectural character/theme for new buildings, additions or exterior remodels in the Downtown Core, the following exterior finishes are most appropriate: brick, sandstone, stucco, metal cladding, tiles, wood, glazing and decorative concrete masonry units (CMU).

Example Downtown Building Materials

(e) Encourage high density, mixed-use development and structures (e.g., retail at street level and residential or office above).

Existing Downtown Mixed Use

(f) Encourage gradual scale transitions between the CBD and adjacent neighborhoods. Taller buildings will be located in the center and southern and western perimeter of the CBD, with shorter buildings on the northern and eastern edges of the CBD.

(g) Encourage maximizing building scale and intensity/density by offering incentives to build above the required minimum height.

(h) Minimize single use, surface parking throughout the CBD.

(i) Maintain streetscapes dominated by buildings with parking located behind. Consider elimination of existing curb cuts as a performance benefit.

(j) Encourage shared parking.

(k) Encourage new infill development on existing, under-utilized surface parking lots.

(l) Provide streetscape details and landscaping that compliment the architectural character of the CBD and exhibit urban character.

(m) Create entries to the CBD at strategic locations as shown on the Wayfinding and Signage Map in the Greater Downtown Plan report. Enhancements may include landscaped medians, corner bulbs and special signs.

(n) The DDA will assist in developing sign standards and guidelines for private signage placed on buildings or as freestanding signs for consideration and adoption by the City.

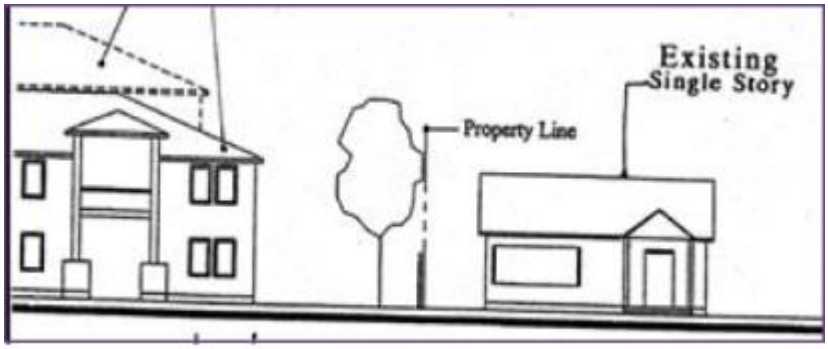
(Ord. 4572, 3-20-13)

§ 24.12.080. Overall Central Business District (CBD) standards.

(a) Maximum building height in the CBD shall be 90 feet. A one-time increase of up to 25 percent per property may be considered by the Grand Junction Planning Commission.

(b) Buildings shall be set back a minimum of 20 feet from the street on Chipeta and Ouray Avenues.

(c) The buildings will step down so that the front facade of the buildings that are directly across Ouray and Chipeta Avenues from residential buildings or uses are no taller than 40 feet. Minimum depth of the step shall be 10 feet.



Example of Building Stepping Down to Single-Family Residential Scale

(d) Scale and massing of buildings or portions of buildings along Ouray and Chipeta Avenues will be compatible with residential scale.

(e) If off-street parking is provided, it shall be located behind buildings on private property. If the property abuts an alley, the parking area shall take access from the alley. If the property has more than one street frontage, "behind the building" shall mean on the opposite side of the building from the front door or the main public door entrance to the building.

(f) Maximize opportunities for on-street parking by minimizing curb cuts along the street.

(g) All pedestrian level lighting shall be downlit and, if on poles, shall be in a historical style light standard.

(h) The streetscape along Grand Avenue and 4th and 5th Streets north to Ouray Avenue within the CBD will continue in a design compatible with the existing improvements along Grand Avenue (e.g., decorative pavement and street trees).

(i) Landscaping is expected to comply with the Zoning and Development Code per the requirements of the zone district. The Director may approve variations for new development or redevelopment in the CBD if: (a) street trees exist within the abutting public street; and (b) streetscape elements (plantings, low walls and/or street furniture) are proposed with the development consistent with the urban design character of the CBD.

(j) The streetscape along 5th and 6th Streets north of Ouray Avenue to Chipeta Avenue within the CBD shall transition between the urban hardscape and a more residential streetscape character (e.g., detached sidewalk, landscaping in park strip between curb and sidewalk and street trees).

Existing Grand Avenue Streetscape

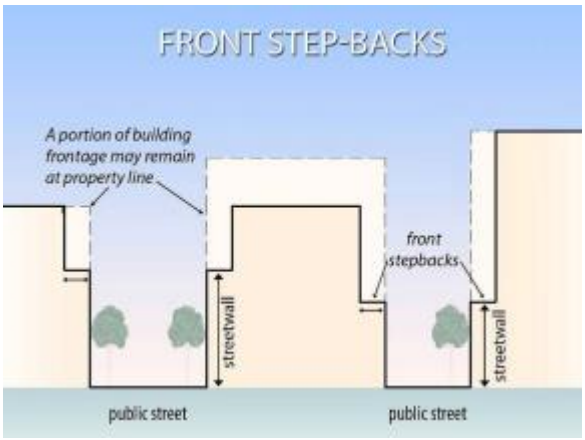
(Ord. 4572, 3-20-13)

§ 24.12.090. Central Business District Core Area (Downtown Core or Core Area) guidelines.

(a) Facade detailing should be compatible with, but not be identical to, that of a neighboring historic building. New facades should have their own, unique design. To create continuity, horizontal lines should be in alignment with neighboring buildings.

(b) Entrances are often the primary focal point of a building and, as such, should be designed to fit with the overall character of the area.

(c) Doorways may be finished with paints, stains, metal and aluminum cladding set to match the existing trim colors.



(d) Single, double, revolving and corner doorways are acceptable in new construction or substantial remodels.

(e) On upper floors of street-facing facades on buildings taller than the traditional three stories in the CBD, consider stepping back the upper floors a minimum depth of 10 feet in order to enhance the traditional scale of the CBD and ensure adequate air and light at the sidewalk level.

(Ord. 4572, 3-20-13)

§ 24.12.100. Central Business District Core Area (Downtown Core or Core Area) standards.

The following standards apply only to the Downtown Core shown in Figure 8 (within the yellow-black dashed line).

Figure 8

Existing Downtown Core Scale

(a) Building Height.

(1) Minimum building height in the Downtown Core shall be two stories.

The following uses as allowed in the zone district and as defined by the Zoning and Development Code shall be exempt from the minimum two-story requirement:

(i) Schools, colleges and universities;

(ii) Vocational, technical and trade schools;

(iii) Community activity building;

(iv) All other community service;

(v) Museums, art galleries, opera houses, libraries;

(vi) Day care;

(vii) Detention facilities;

(viii) Hospital/clinic;

(ix) Parks and open space;

(x) Religious assembly;

(xi) Funeral homes/mortuaries/crematories;

(xii) Safety services;

(xiii) Utility infrastructure and corridors;

(xiv) Car wash, gasoline service station, quick lube;

(xv) Industrial services, contractors and trade shops with indoor operations and storage.

Exemptions to this requirement for other uses of land or occupancies of a building not listed and that is not conducive to a vertical organization of operational space may be considered and approved by the Grand Junction Planning Commission with input from the DDA upon a review of a conceptual level development proposal.

(2) The following criteria shall be used by the Planning Commission to consider exemptions from the bulk standards, landscaping, parking or other use-specific special regulations:

(i) Hardship Unique to Property, Not Self-Inflicted. There are exceptional conditions creating an undue hardship, applicable only to the property involved or the intended use thereof, which do not apply generally to the other land areas or uses within similar zone districts, and such exceptional conditions or undue hardship was not created by the action or inaction of the applicant or owner of the property;

(ii) Special Privilege. The exception shall not confer on the applicant any special privilege that is denied to other lands or structures within similar zone districts;

(iii) Literal Interpretation. The literal interpretation of the provisions of the regulations would deprive the applicant of rights commonly enjoyed by other properties in similar zoning districts and would work unnecessary and undue hardship on the applicant;

(iv) Greater Downtown Plan Goals. The proposal actually meets overall goals of the plan better than if standards are followed;

(v) Conformance with the Purposes of the Zoning Overlay and the Zoning and Development Code. The granting of an exception shall not conflict with the purposes and intents expressed or implied in this zoning overlay or the Zoning and Development Code; and

(vi) Conformance with Comprehensive Plan. The granting of an exception shall not conflict with the goals and principles in the City's Comprehensive Plan.

(b) Building Setbacks/Site Placement, Scale, Massing and Street Encroachment.

(1) Maximum building setback from the abutting street shall be two feet or compatible with the mean setback of the immediately adjoining lots on both sides of the subject lot but in no case greater than 20 feet.

(2) When building setbacks are not determined as in subsection (b)(1) of this section, setbacks of up to 10 feet from the abutting street may be allowed if there is a designed function for the space such as limited outdoor display, seating, outdoor dining areas or a small street park, whether for private or public use.

(3) Architectural features on stories above street level may encroach on the public right-of-way, provided all safety considerations have been met. A revocable permit for such encroachments shall be reviewed and may be approved by the Director or a permanent easement for such encroachments may be reviewed and considered for approval by City Council.

(4) Awnings that overhang windows or entries on street level facades are encouraged and shall be constructed of canvas or heavy cloth or metal (no plastic), utilizing primarily neutral colors.

Existing Canopy on Main Street Building

(c) Architectural Character. The facade(s) of a new building, addition or substantial exterior remodel that abut the streets within the Downtown Core shall have articulated architectural features and patterns that are designed to reflect the desired vision for the CBD described in GJMC § 24.12.070. In order to do so, the facade(s) of a new building, addition or substantial exterior remodel within the Downtown Core shall exhibit a minimum of four of the following nine architectural design elements:

Example Ornamentation for Visual Interest

(1) On corner parcels, facade design of ground floors "turn the corner" to induce activity and interest in the streetscape on the north-south streets within the Downtown Core.

(2) Facades are articulated and have ornamentation such as varied brick patterns, change in material or color accents and window headers or columns that create shadow lines are examples of acceptable ornamentation.

(3) The street level front facade of the building is "active" with at least 50 percent of the facade in windows, with doors spaced no more than 50 feet apart. Side facades shall meet a minimum of 50 percent of this requirement.

(4) Facade features that emphasize the primary building entrance through projecting or recessed forms, detail, color or materials.

(5) Building facades are articulated on any street-facing side. Larger buildings are articulated in a hierarchy of smaller volumes and masses that better relate to other buildings and the scale of streets. This is accomplished through establishment of building bays that are distinguished by recessed or protruding elements or a variation in materials or color to break up the facade and reduce the overall scale of large buildings.

Example Facade Articulation to Define Smaller Scale Bays

(6) Higher levels of fenestration are required for buildings along both sides of the streets within the CBD Core Area. At a minimum, fenestration shall be concentrated on the street level facade and diminish on upper floors (e.g., window size decreases as the floor level increases).

Existing facade with Diminishing Fenestration on Upper Floors

(7) Buildings include a facade cap. The cap is be defined by a distinct roof line or parapet. The design uses ornamentation of these features to enhance the building's identity and support the architectural character of the CBD. The facade cap is in three dimensions that projects and casts a shadow and relates proportionately to the overall building design.

(8) Building design minimizes the visual impact of mechanical equipment located on the roof as viewed from the adjacent streets.

Example Three Dimensional Facade Cap

(9) Other architectural features that achieve the goals of the overall Central Business District (CBD) vision/concept as outlined in GJMC § 24.12.070 as determined by the Director.

(d) On-street parking shall be located and designed to maintain and support a safe pedestrian environment on streets located within the Downtown Core (yellow-black outline in Figure 9). This includes coordinating crosswalks with parking location and eliminating visual and physical obstructions to the pedestrian travel way.

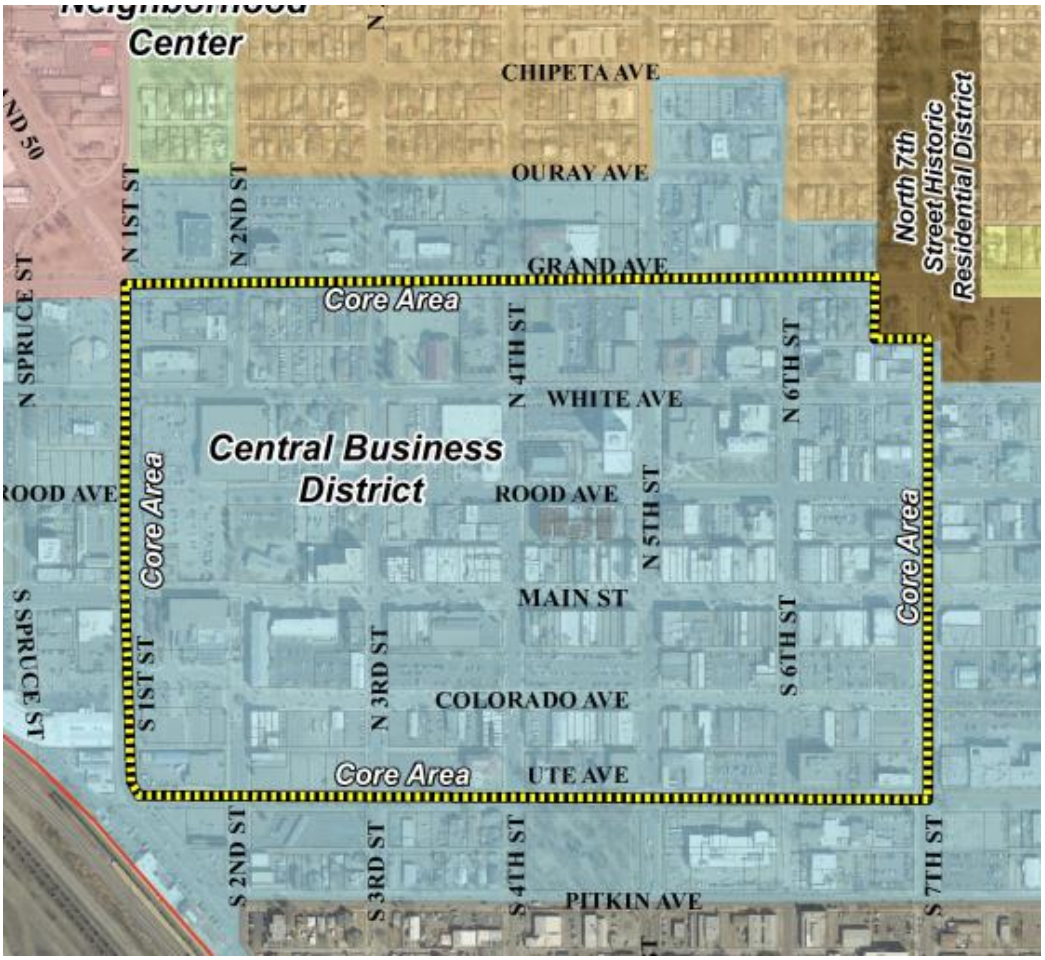


Figure 9

(Ord. 4572, 3-20-13)

Article IV

Residential Areas Standards and Guidelines

§ 24.12.110. Applicability.

The following standards and guidelines apply to the residential areas shown in Figure 10 (orange areas). The standards and guidelines are intended to apply to new development or substantial redevelopment within the area. Substantial redevelopment is any reconstruction, rehabilitation, addition or other improvements to the existing structure(s) on a site where the value of the improvement exceeds 50 percent of the fair market value of the building(s) before the start of construction.

(Ord. 4572, 3-20-13)

§ 24.12.120. Policies.

(a) The existing historic residential neighborhoods within the Downtown District will be stabilized and enhanced.

(b) The existing historic residential neighborhoods within the Downtown District will be preserved for residential uses, with no further encroachment by nonresidential uses.

(c) Where existing residential zoning allows, provide a diversity of housing types through development of multifamily housing that is in keeping with the character of the neighborhood (refer to multifamily development, GJMC § 24.12.130(c)).

(d) Enhance access to and improvements within existing public open spaces (e.g., parks and school grounds) within the downtown residential core.

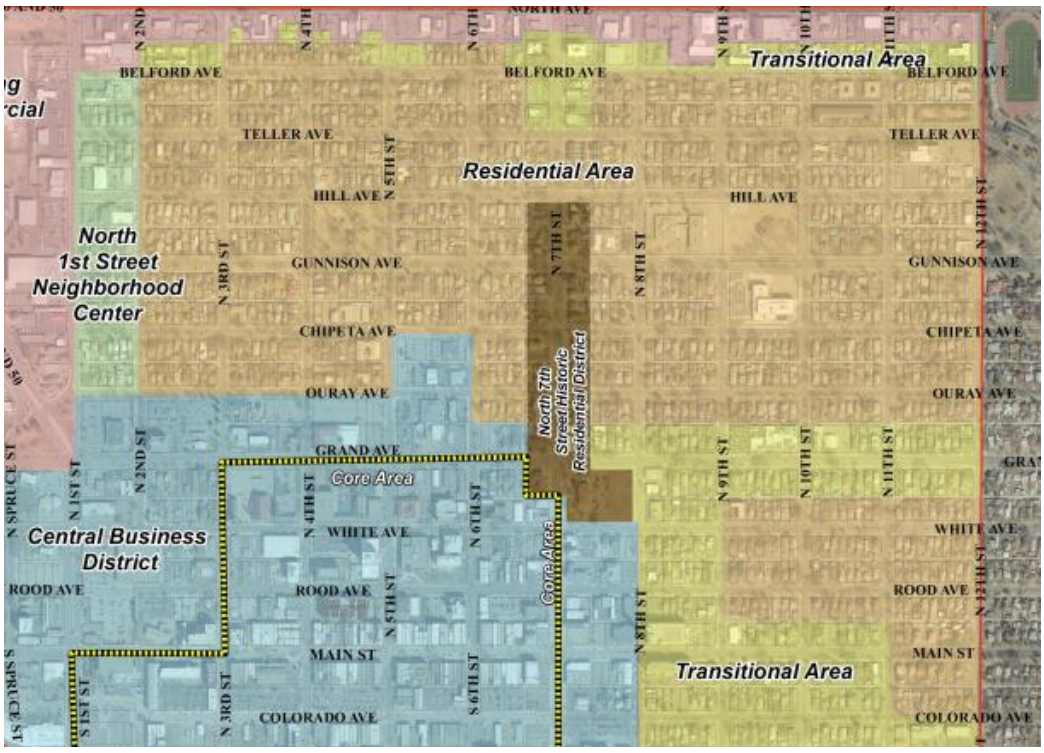


Figure 10

(e) Maintain and enhance the historic character of the streetscape with emphasis on the following elements: street trees, landscaping rather than parking or other uses in the park strip between sidewalk and curb, street signs that identify the neighborhoods, lighting and detached sidewalks.

Existing Residential Subarea Streetscape Character

(Ord. 4572, 3-20-13)

§ 24.12.130. Standards.

(a) Architectural Considerations.

(1) Building Style and Character. Maintain the existing character of the house styles within the residential neighborhoods in the Downtown District. New construction and alterations shall be compatible with key architectural characteristics and site elements of the area.

Existing Residential Building Alignment

(2) Accessory Structure Setbacks. The setback for accessory structures is a zero-foot setback from the alley and three feet from neighboring property line(s). Garages with overhead doors facing the alley must be set back a minimum of 25 feet from the far edge of the alley or the zoning setback, whichever is greater.

(3) Building Mass/Scale and Proportion. New buildings or additions to existing buildings shall be visually compatible with the area. Visually compatible means compatible with adjacent and neighboring buildings including mass and scale, shape, windows, doors, openings, roof shape, roof pitch and orientation.

(4) Roof Shape. The roofs of new buildings shall be visually compatible with adjacent buildings.

(5) Fenestration. The pattern of windows and doors on structures shall be visually compatible with buildings in the area. Visually compatible includes the relationship of width to height, and the spacing of windows and doors. For example, tall evenly spaced rectangular windows are typical of many of the residential styles in the downtown area.

Example Existing Architectural Character

(6) Materials. The exterior materials of all new buildings, additions and alterations shall be similar in size and appearance to area buildings.

(7) Setbacks. On a corner lot, the front yard setback for that part of the yard that extends to and along the side property line on the street side may be reduced to 10 feet on properties within the Downtown District residential subareas. On corner lots where an existing parkway strip exceeds 10 feet in width between a sidewalk and the curb, the front yard setback on a side street may be reduced to five feet.

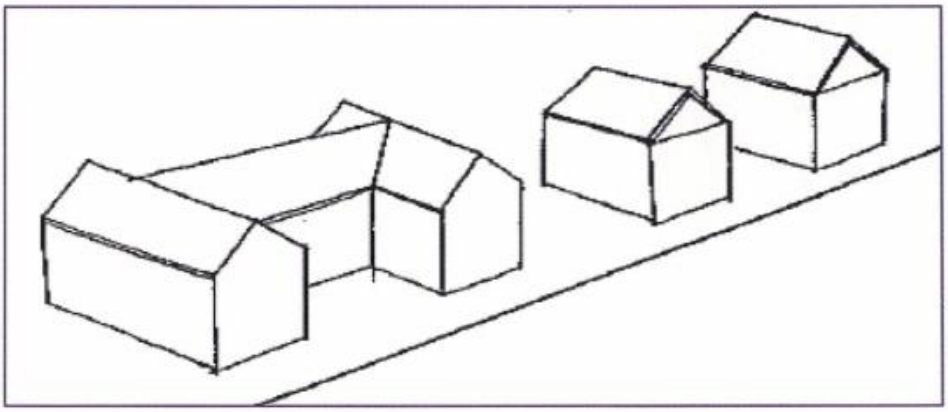
(b) Repealed by Ord. 4723.

(c) Multifamily Development. Infill of new multifamily buildings may occur where zoning allows within the residential neighborhoods of the Downtown District. However, the site design and structures for this type of development must maintain a scale and character compatible with the residential neighborhoods in the Downtown District. In addition to the architectural considerations listed in subsection (a) of this section, multifamily development shall follow the standards below.

(1) Incorporate forms typical of the single-family residential architecture of the Downtown District including sloping roofs, porches, roof dormers and other architectural details.

(2) Break up the mass of larger buildings into forms that are similar in scale to the residential character.

(3) Facades must be composed of smaller sections, similar in scale and material finish to residential structures.



Example – Break Up Facade of Larger Structure to be Compatible with Single-Family Scale

(4) Off-street parking for multifamily development shall not be located in the front yard setback. Parking shall be in the rear or side yards. If the property abuts an alley, the parking area shall take access from the alley. If the property has more than one street frontage, "behind the building" shall mean on the opposite side of the building from the front door or the main public door entrance to the building.

(5) Develop pedestrian links between the front sidewalk and building entrances and between parking and rear or side entrances.

(Ord. 4890, 11-20-19; Ord. 4812, 9-19-18; Ord. 4723, 10-21-16; Ord. 4572, 3-20-13)

§ 24.12.140. Guidelines.

(a) Demolition of existing historic homes in order to construct new residential structures is strongly discouraged.

(b) Maintain and enhance the pattern of landscaped front yards that gives the residential neighborhoods within the Downtown District a distinctive, friendly appearance.

(c) Each new building and addition should be located so that it aligns with existing buildings in the area. "Aligns" means elevation (e.g., horizontal lines of peaks of roofs, cornices and window sills) and plan (e.g., setbacks from the street and rear property lines and spacing between structures/setbacks from side property lines).

(d) Main entrances should open onto a street and should align with those of adjacent residential buildings. For example, on many of the downtown homes, raised

foundations and steps that define the main entrance are prevailing characteristics. Door styles should be similar to those found on residential buildings within the area.

(e) New buildings and additions should have the same number of stories and a height which is compatible with buildings in the area.

(f) Park strips will be landscaped in a traditional style, including street trees, grass, and low plantings or a combination thereof. Park strip landscaping should include some live material – use of all nonliving material such as rock is discouraged. Use of drought-tolerant plants is encouraged.

Existing Character of Front Yards and Park Strips

(Ord. 4812, 9-19-18; Ord. 4572, 3-20-13)

Article V

Transitional Areas Standards and Guidelines

§ 24.12.150. Applicability.

The following standards and guidelines apply to the Transitional areas shown in Figure 11 (yellow areas). The standards and guidelines are intended to apply to new development or substantial redevelopment within the area. Substantial redevelopment is any reconstruction, rehabilitation, addition or other improvements to the existing structure(s) on site where the value of the improvement exceeds 50 percent of the fair market value of the building(s) before the start of construction.

(Ord. 4572, 3-20-13)

§ 24.12.160. Policy.

The peripheral areas of the CBD provide a mix of established residential uses and low intensity, nonretail, neighborhood service and office uses that are compatible with adjacent residential uses and neighborhoods. New development or reuse of existing structures will maintain compatibility with building scale and appearance in the area.

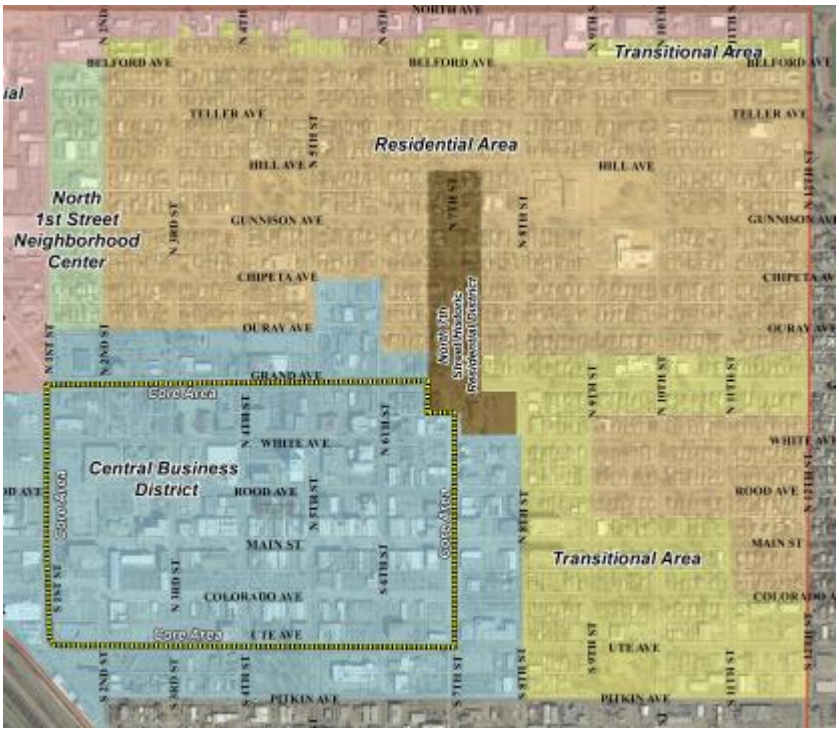


Figure 11

(Ord. 4812, 9-19-18; Ord. 4572, 3-20-13)

§ 24.12.170. Standards.

(a) Land Use and Development Intensity. Nonresidential uses within the transitional subareas shall not open earlier than 7:30 a.m. and shall close no later than 8:00 p.m.

(b) Architectural Considerations. New construction, including additions and rehabilitations, in the transitional subareas shall be designed to have a residential character consistent with existing buildings in the area. "Consistent" means the operational, site design and layout, and architectural considerations described below.

(1) New principal buildings shall be located to align with existing buildings in the area. "Aligns" means elevation (e.g., horizontal lines of peaks of roofs, cornices, window sills) and plan (e.g., setbacks from the street and rear property lines and spacing between structures/setbacks from side property lines).

Example Infill Development in Transitional Area - 9th Street and Colorado Avenue

(2) Building entrances shall face a street or architectural features shall be provided that visually suggest an entrance. Door styles shall be similar to those found on residential buildings.

(3) Each new principal building, its mass in relation to open spaces and its windows, doors, and openings shall be visually compatible. "Visually compatible" means compatible with buildings in the area, including mass, shape, window, doors, openings, roof shape, roof pitch and orientation. For example, a large building shall be compatible with surrounding smaller dwellings by dividing its mass into smaller components to create a building elevation that is more like the size and proportion of the buildings in the area.

(4) The roofs of new principal buildings or additions to principal buildings shall be visually compatible with buildings in the area.

(5) Window and door spacing on structures shall be visually compatible with structures in the area. Visually compatible includes the relationship of width to height, and the spacing of windows and doors. For example, tall evenly spaced rectangular windows are typical of certain residential styles near the transitional subareas.

(c) Signs.

(1) Flush wall signs and monument signs shall be the only sign type allowed.

(2) Signs shall be located at least 10 feet behind the front property line. Total sign area shall not exceed 25 square feet per street frontage. The sign allowance for one street frontage may be transferred to a side of a building that has no street frontage but cannot be transferred to another street frontage. Monument signs shall not exceed eight feet in height.

Example Signs within Transitional Subarea

(d) Parking and Site Development.

(1) Non-single-family uses in the transitional subareas shall be designed and utilized not to increase on-street parking in front of single-family dwellings in the neighborhood.

(2) Service entrances, loading areas and dumpster areas shall be located only in the rear or side yard. If the property has more than one street frontage, the rear or side shall mean on the opposite side of the building from the front door or the main public door entrance to the building; and each loading area shall be screened from each abutting residential use.

(Ord. 4812, 9-19-18; Ord. 4572, 3-20-13)

§ 24.12.180. Guidelines.

(a) New buildings should have the same number of stories and a height which is compatible with those of buildings in the area.

(b) The exterior of all new buildings, additions and alterations should be similar in size and appearance to buildings in the area.

(c) Sign materials should be visually compatible with materials used on the building facade.

(Ord. 4812, 9-19-18; Ord. 4572, 3-20-13)

Title 25

24 ROAD CORRIDOR DESIGN STANDARDS

Chapter 25.01
Introduction

§ 25.01.010. Background and intent.

Chapter 25.02
Site Development

§ 25.02.010. Purpose.

§ 25.02.020. Community framework.

§ 25.02.030. On-site open space.

§ 25.02.040. Organizing features.

§ 25.02.050. Site grading and drainage.

§ 25.02.060. Building and parking setbacks.

§ 25.02.070. Building location and orientation.

§ 25.02.080. Parking, access, and circulation.

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§ 25.03.040. Multi-unit residential development (multifamily structures).

§ 25.03.050. Fencing and walls (nonresidential and multifamily structures).

§ 25.03.060. Service and storage areas (nonresidential and multifamily structures).

Chapter 25.04
Site Lighting

§ 25.04.010. Pedestrian, accent and security lighting.

Chapter 25.05
Signs

§ 25.05.010. Sign standards.

[Prior legislation: Ords. 3305 and 4666.]

Chapter 25.01
Introduction

§ 25.01.010. Background and intent.

The 24 Road Corridor Design Standards provide development standards for public and private improvements in the 24 Road Corridor in order to implement the goals and objectives of the 24 Road Corridor Subarea Plan and to:

(a) Establish a practical, interconnected system of streets, parks, and parkways that allows easy orientation and convenient access for all modes of transportation;

(b) Utilize natural open spaces, such as creeks, and developed public spaces, streets, parks and parkways, to organize and coordinate development;

(c) Accommodate a broad mix of development types that encourage alternative transportation, especially walking, and transit use;

(d) Provide common usable open space that is of mutual benefit to surrounding property owners, businesses, and residents; and

(e) Establish a pattern and character for the long-term evolution of the corridor.

Adherence to these standards and guidelines will ensure that public and private improvements in the 24 Road Corridor will be well planned and executed in a high quality manner, which were important goals established through the 24 Road Corridor Subarea Plan.

These standards supplement other development regulations in the Grand Junction Municipal Code. Where there is a conflict between this title and GJMC Title 21, Zoning and Development Code, the more restrictive standard shall apply.

View corridor along 24 Road highlights natural features

(Ord. 4719, 9-21-16)

Chapter 25.02
Site Development

§ 25.02.010. Purpose.

The location and design of buildings and site improvements are key to establishing the overall character and function of the 24 Road Corridor. Important site development considerations include large area development planning and coordination, the placement of buildings on the lot, relative amounts of area devoted to open space, buildings and parking areas, and vehicular and pedestrian circulation. With large undeveloped parcels such as those in the 24 Road Corridor, there is an opportunity to implement a "big picture" vision. The vision for the corridor is to increase pedestrian movement and encourage a mixture of development types integrating housing, commercial uses, neighborhood centers, shared parking, and other appropriate land uses within neighborhoods and within buildings in a flexible pattern of lots and blocks to allow site planning flexibility and consistency of development patterns.

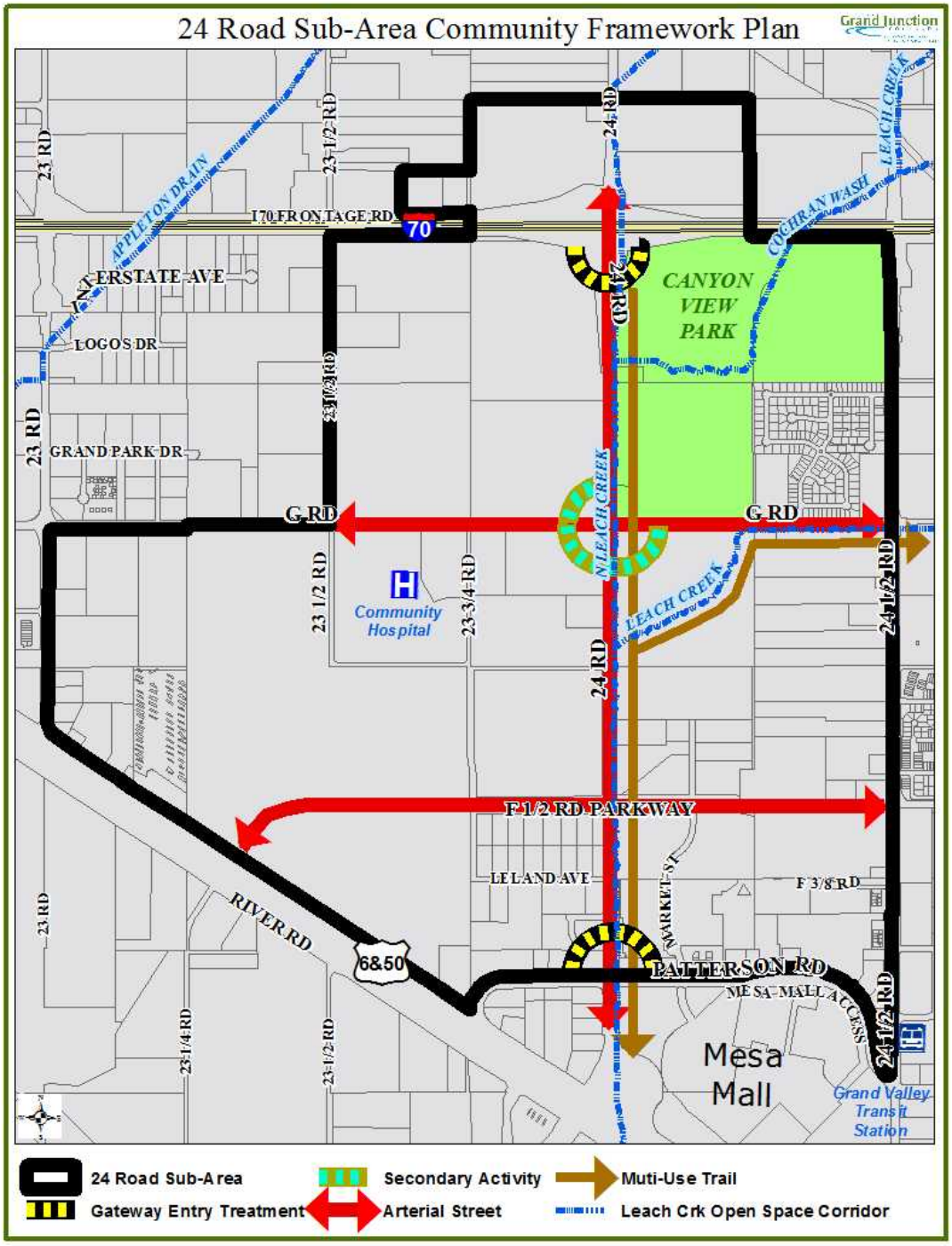
(Ord. 4719, 9-21-16)

§ 25.02.020. Community framework.

The overall planning concept for the 24 Road Corridor includes a community framework (Figure 2.1) that provides a distinctive image and organizing element for public and private development. The community framework includes public streets, parks, open spaces, natural

drainages and future stormwater management facilities that serve and connect part or all of the corridor.

Figure 2.1: Community Framework Plan



(Ord. 4719, 9-21-16)

§ 25.02.030. On-site open space.

On-site open space could be provided within areas that are also set aside for stormwater drainage, landscaped setbacks and other landscape areas associated with on-site buffer landscaping and amenities. Open space shall be provided on site so as to implement and comply with the following:

(a) Utilize well-defined natural and developed open spaces as features to serve as the focus of block, lot, and circulation patterns.

(b) Supplement public open space such as parks and drainage corridors with privately developed open space that helps complete linkages and organize development. (Refer to open space requirements of zoning and development code.)

(c) Open space, such as Leach Creek and developed parks and plazas, shall be used as a positive planning tool to organize and focus lot, block, and circulation patterns. Public access shall be provided to all public open space, natural and developed, directly from the public street/sidewalk system or through a public facility. Natural open space corridors and naturalized drainage ways (with trails) shall be publicly accessible at not less than 800-foot intervals.

(d) Buildings with frontage on open space shall provide windows, doors, plazas, or other amenities that encourage pedestrian activity and provide views onto and/or are oriented toward the open space.

Examples of privately developed and publicly developed open space amenities

Example of development oriented to open space

Organizing features provide a focus for development

(Ord. 4719, 9-21-16)

§ 25.02.040. Organizing features.

(a) Purpose. An organizing feature is a public open space around which development is focused. Organizing features can utilize natural open space, creeks, formal public spaces, streets, parks, and parkways to organize and coordinate development patterns. Organizing features should reinforce the pattern and orientation of streets and buildings through orderly arrangements of landscaping, pedestrian circulation and amenities, such as might be typical of a town square or campus quadrangle. Prominent amenities could be developed within open space to link building groups.

(b) Standards.

(1) At least one central feature or gathering place shall be located within a geographically distinct neighborhood, e.g., a convenient outdoor open space or plaza with amenities such as benches, monuments, kiosks, or public art. These places may be located on "civic blocks," and may include buildings such as libraries, government offices, or public meeting places.

(2) Buildings shall not orient rear, blank, or service dominated facades toward an organizing feature and shall include an entry that is visible, convenient to use, and connected to a public sidewalk by a direct route. Facades facing an organizing feature shall be of at least comparable architectural quality to other primary building facades.

(3) Parking lots and parking spaces shall not be permitted within organizing features.

(4) Multi-building developments shall use an organizing feature to create an internal campus-like arrangement of buildings and open space; provided, that the organizing feature is bounded along at least one side by a public street.

(5) Organizing features shall utilize natural open space, creeks, formal public spaces, streets, parks, and parkways, where such are available on or adjacent to the site, to organize and coordinate development patterns.

Water features invite interaction

Fountain as an organizing feature

(Ord. 4719, 9-21-16)

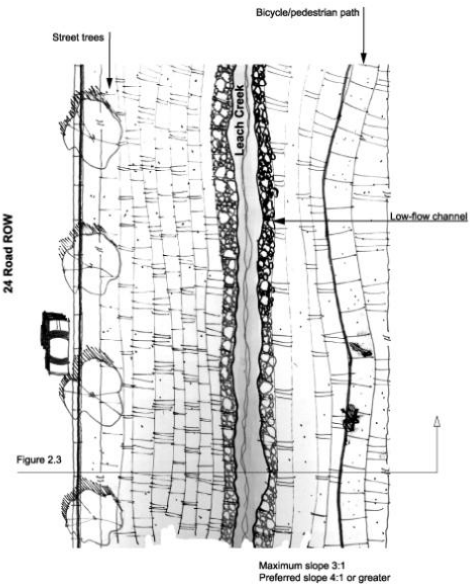
§ 25.02.050. Site grading and drainage.

The site grading and drainage standards ensure that development fits within existing topography, reinforces the community open space framework, and effectively diverts and retains stormwater. In addition to other site grading and drainage requirements of the municipal code, the following standards shall apply in the 24 Road Corridor:

(a) Unless precluded by soil conditions, graded slopes shall not be steeper than 3:1 slope. Where space limitations demand, terracing with retaining walls is the preferred solution.

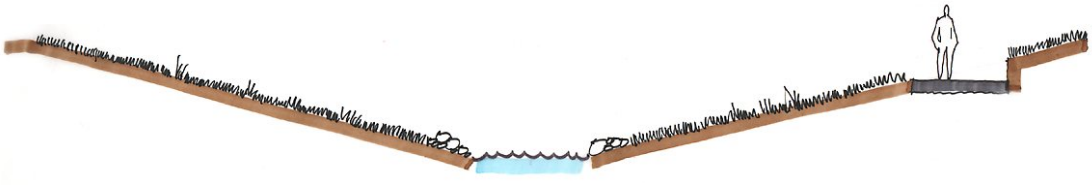
(b) Existing riparian areas and drainages, such as Leach Creek and its tributaries, shall be developed and maintained as natural open space corridors that provide surface drainage and developed pedestrian trails. The treatment of surface drainages shall be an open channel with gently sloping sides and naturalized landscape, except for the west bank of Leach Creek which is constrained by the 24 Road improvements. (See Figures 2.2 and 2.3.)

Figure 2.2: Natural Corridor Plan



Open space incorporates drainage facility and amenities

Figure 2.3: Natural Corridor Section



(Ord. 4719, 9-21-16)

§ 25.02.060. Building and parking setbacks.

Building and parking setback standards establish a coordinated streetscape image and provide sufficient space between buildings, roads and parking areas for adequate light, privacy, views, sound control and landscaping. In order to establish additional open space and maintain views, building and parking setbacks shall be provided as specified in Table 3.1.

Table 3.1: Supplemental Building and Parking Setbacks

Frontage	Building Setback	Parking Setback
24 Road – west ROW	50'	25'
24 Road – east ROW	35' from edge of Leach Creek corridor	10' from edge of Leach Creek corridor
Patterson Road (F Road)	Per zoning	10'
F 1/2 Road	Per zoning	10'
G Road	Per zoning	10'

Notes:

(a) Width of Leach Creek drainage corridor to be determined and will include multi-use trail. (See Figure 2.3.)

(b) All measurements are from the right-of-way.

Coordinated landscaping in the building setback complements ROW landscaping

Buildings at the edges of project site with pedestrian connections through parking areas

(Ord. 4719, 9-21-16)

§ 25.02.070. Building location and orientation.

To encourage the orientation of buildings toward the street, reinforce the character and quality of public streets and sidewalks, maximize useful interconnections, and enhance the appearance of properties from the street, the following standards shall apply:

(a) No development shall be permitted to place or orient buildings, parking, circulation, or service facilities on a lot in such a way as to treat primary street frontage(s) as a rear lot line. "Rear" shall be defined to mean a portion of the property lacking public access and containing a predominance of service functions and/or service facilities that significantly diminish the architectural or landscape quality of the development.

(b) All sides of a building that are visible from a street, residential area, public park or organizing feature shall have the equivalent architectural treatment of the primary building facade.

(c) All service and loading facilities that are visible from a street, public park, residential area or organizing feature shall be completely screened from view.

(d) Nonresidential uses located in the same block with residential uses shall be located on higher traffic streets and at the periphery or the end of each block having both uses and be effectively screened of light, noise, and pollution from service area or other incompatible activities.

(e) Large retail buildings (over 20,000 gross square feet) shall be located to minimize the impact of windowless walls and service areas on public streets. On sites that include large retail buildings, smaller buildings in-line or on pads shall be located to form edges that frame and reinforce the space and appearance of public streets. Pad buildings shall locate at least one facade including windows and similar architectural features within 35 feet of the public right-of-way. Pad buildings shall be located at site corners and entries.

(f) All sites abutting 24 Road shall treat 24 Road as a primary frontage with regard to the quality and orientation of buildings, site design, architectural features, and parking area design. This shall be in addition to any other required access and orientation. Primary frontage is intended to include landscape and building design that conveys the project identity and character and is of equal or superior quality to any other frontage of the project. No truck docks or service areas shall be permitted to face 24 Road.

(Ord. 4719, 9-21-16)

§ 25.02.080. Parking, access, and circulation.

In order to provide for safe and convenient movement of pedestrians and motor vehicles, limit vehicular/pedestrian conflicts, reduce paved areas, provide screening for paved areas and soften the visual impact of parking lots by providing interior planting, the following standards shall apply:

(a) No more than two double-loaded bays of parking, with a maximum length of 125 feet, shall be allowed in front of buildings smaller than 20,000 square feet in size.

(b) For retail buildings 20,000 to 30,000 square feet in size, no more than 50 percent of the total surface parking area shall be located in the restricted area between the street and a building. For retail buildings larger than 30,000 square feet, no more than 60 percent of the total surface parking area shall be located in the restricted area. The restricted area is located between the front facade of the principal structure and the primary abutting street. The restricted area shall be determined by drawing a line from the front corners of the building to the nearest property line as shown in the example.

Example of restricted area

(c) Service entrances, service yards and loading areas shall not be located on a side of any building that faces 24 Road, any arterial street, I-70, or residential uses.

(d) Opportunities for future auto, pedestrian, and bicycle connections to adjoining sites shall be considered in all site design. Such connections shall be provided where reasonably practicable.

Examples of pedestrian circulation systems within parking lots

Sidewalks and landscaping break up and soften the visual impact of large parking lots

(Ord. 4719, 9-21-16)

§ 25.02.090. Auto-oriented uses.

To minimize impacts of auto circulation, queuing, drive-up facilities (including speaker systems and similar activities) and to promote street-oriented building design and pedestrian amenities, the following standards shall apply:

(a) Drive-up and drive-through facilities (order stations, pick-up windows, bank teller windows, money machines, car drop-off areas for auto service or rental, etc.) shall be located on the side or rear of a building and away from residential uses.

(b) For buildings greater than 100 feet from the street and with no intervening buildings, drive-through windows may be allowed to face a perimeter street, and drive-through lanes may be allowed with adequate landscaping buffer from the right-of-way line.

(Ord. 4719, 9-21-16)

§ 25.02.100. Pedestrian and bicycle circulation.

To promote efficient and safe movement of pedestrians and bicyclists through the 24 Road Corridor, sidewalk and/or multi-use trail links shall be provided between development sites and open space including but not limited to an off-street multi-use trail connecting Canyon View Park and the Colorado River Trail.

Direct pedestrian access from sidewalk

Pedestrian circulation in retail area

(Ord. 4719, 9-21-16)

§ 25.02.110. Sidewalks.

To provide opportunity for continuous pedestrian movement through the 24 Road Corridor, the following standards shall apply:

(a) A direct pedestrian connection to the building entry shall be provided from the public sidewalk.

(b) Development shall provide pedestrian circulation from public walks to parking areas, building entries, plazas, and open spaces. Walkways shall be provided to separate pedestrians and vehicles, and shall link ground level uses. Primary walks shall be a minimum of five feet wide.

(c) Clear and safe pedestrian routes shall be defined through parking areas to provide pedestrian access between buildings with minimum conflicts with vehicles. Walkways crossing drive aisles shall be clearly marked with signage, special paving, landscaping or other similar means of demarcation.

(d) Sidewalks at least eight feet wide shall be provided along all building facades that abut public parking areas and feature a public entrance.

(e) Pedestrian walks incorporating bicycle lanes shall be not less than 10 feet in width, unless otherwise approved by an alternate streets request.

(f) All parking areas located between a street and building shall include a landscaped pedestrian walk linking the building with a public sidewalk.

(g) Physical barriers between contiguous development shall be prohibited unless necessary for safety or the mitigation of adverse impacts.

(h) Development shall provide pedestrian linkages between the Leach Creek trail corridor and other public ways and open space areas.

Shared plaza at building entries

Landscaped public sidewalk

(Ord. No. 5206, 3/20/2024; Ord. 4719, 9-21-16)

§ 25.02.120. Bicycle circulation.

To provide a safe, direct, and attractive system of interconnected public bikeways and bike routes throughout the corridor and defined routes to primary building entries, the following standards shall apply:

(a) Bicycle parking shall be located in visible, active, and well-lit areas, near building entries, convenient to primary bicycling access, and not encroaching on pedestrian walkways. If possible, bike parking shall be located so it is visible from the inside of adjacent buildings.

(b) Bicycle circulation shall connect and align with pre-existing and planned off-site bicycle routes. Crossings at intervening streets shall be located where safe means for crossing can be provided.

Public bikeway provides an interconnected system

On-street bicycle route designation separate from the roadway

(Ord. 4719, 9-21-16)

Chapter 25.03
Architectural Design

§ 25.03.010. Purpose.

These architectural design standards are intended to:

(a) Encourage a consistent level of architectural quality throughout the 24 Road Corridor;

(b) Create a unified architectural character at the project level, addressing building form, scale and materials, including for walls, fencing and service and storage areas;

(c) Reinforce the urban character of streets and open spaces;

(d) Provide human scale and orientation;

(e) Define the base, body and top of building elevations through the use of color, materials and details;

(f) Ensure that the highest level of architectural detail occurs adjacent to areas of pedestrian activity;

(g) Ensure that service and storage areas are functional yet do not visually impact views from adjacent uses and public areas;

(h) Provide flexibility to allow for a number of design alternatives for different building types and to encourage design creativity.

Note: Additional standards for architectural design are included in GJMC Title 21, Zoning and Development Code.

Buildings in a variety of forms reinforce the pedestrian scale

(Ord. 4719, 9-21-16)

§ 25.03.020. Building form and scale (nonresidential and multifamily structures).

The following standards shall apply to all building facades and exterior walls that are visible from adjacent public streets and other public spaces. These standards are intended to reduce the massive scale of large buildings, which, without application of these standards, may be incompatible with the 24 Road Corridor Overlay desired character.

(a) Facades greater than 150 feet in length, measured horizontally, shall incorporate wall plane projections or recesses having a depth of at least three percent of the length of the facade and extending at least 20 percent of the length of the facade. No uninterrupted length of any facade shall exceed 150 horizontal feet.

(b) Ground floor facades that face public streets shall have display windows, entry areas, awnings, or other such features along no less than 60 percent of their horizontal length.

If the facade of the building facing the street is not the front, it shall provide the same features and/or landscaping in scale with the facade.

(c) Variation in roof lines/roof materials, in order to add interest to and reduce the massive scale of large buildings, is required. Roofs shall have no less than two of the following features:

(1) Parapets concealing flat roofs and rooftop equipment, such as HVAC units, from public view. Parapets shall not exceed one-third of the height of the supporting wall and shall not be of a constant height for a distance of greater than 150 feet;

(2) Overhanging eaves, extending no less than three feet past the supporting walls, for no less than 30 percent of the building perimeter;

(3) Sloping roofs that do not exceed an average slope greater than or equal to one foot of vertical rise for every three feet of horizontal run and less than or equal to one foot of vertical rise for every one foot of horizontal run; and

(4) Three or more roof slope planes.

(d) Primary building entries shall be connected to the public street sidewalk by the most direct route practical. Corner buildings need only provide public entry on one street-oriented facade.

(e) Ground floor retail shall have direct pedestrian entries onto public streets, parks, or plazas. Primary building entries must be easily and directly accessible from a street and shall be either oriented to or easily visible from the street.

(f) Entryway design elements and variations should give orientation and aesthetically pleasing character to the building. The following standards identify desirable entryway design features. Each principal building on a site shall have clearly defined, highly visible main entrances featuring no less than three of the following:

(1) Canopies or porticos;

(2) Overhangs;

(3) Recesses/projections;

(4) Arcades;

(5) Raised corniced parapets over the door;

(6) Peaked roof forms;

(7) Arches;

(8) Outdoor patios;

(9) Display windows;

(10) Architectural details such as tile work and moldings which are integrated into the building structure and design; and

(11) Integral planters or wing walls that incorporate landscaped areas and/or places for sitting.

(g) To the greatest extent possible, mechanical appurtenances shall be located within the structure. External mechanical appurtenances such as heating and air conditioning equipment shall be screened and finished to match the colors and materials of the building.

Primary building entrances present inviting facades along arterial streets

Retail development includes pedestrian-scale open space

(Ord. 4719, 9-21-16)

§ 25.03.030. Building materials (nonresidential structures).

The following standards shall apply to nonresidential structures:

(a) All primary buildings shall use materials that are durable, economically maintained, and of a quality that will retain their appearance over time including but not limited to stone, brick, stucco, pre-cast concrete, and architectural metals.

(b) Facade colors shall be nonspecular, neutral or earth tone colors. Use of high intensity, metallic, black or fluorescent color is prohibited.

(c) Building trim and accent areas may feature brighter colors, including primary colors.

(d) Predominant exterior building materials shall not include smooth-faced concrete block, smooth-faced tilt-up concrete panels, or prefabricated steel panels.

(e) Ancillary buildings, enclosures and projected building elements shall be designed as an integral part of their primary facility. Where detached buildings are necessary, they shall be compatible to the main building in design, form, use of materials, and color.

(f) Building materials should be used in a manner that achieves a coordinated design on all building facades ("360-degree design").

(g) High quality, durable materials (brick and concrete masonry, pre-cast concrete, stone) should be the dominant treatment on all building facades facing 24 Road, Patterson Road/F Road, F 1/2 Road, and G Road.

(Ord. 4719, 9-21-16)

§ 25.03.040. Multi-unit residential development (multifamily structures).

To ensure that multifamily residential architecture provides human scale and orientation and reinforces the urban character of streets and open spaces, the following standards shall apply to multifamily residential development in the 24 Road Corridor:

(a) Buildings shall be designed to provide human scale, interest, and variety. The following techniques may be used to meet this objective:

(1) Variation in the building form related to the scale of individual dwelling units or rooms such as recessed or projecting bays, shifts in massing, or distinct roof shapes.

(2) Diversity of window size, shape, or patterns that relates to interior functions.

(3) Emphasis of building entries through projecting or recessed forms, detail, color, or materials.

(4) Variations of material, material modules, expressed joints and details, surface relief, color, and texture to break up large building forms and wall surfaces. Such detailing could include sills, headers, belt courses, reveals, pilasters, window bays, or similar features. Changes in materials should generally occur at inside corners or where the transition is accommodated through an architectural detail such as a cap or belt course.

(b) Portions of buildings that are functionally limited from including significant window areas shall either be oriented away from public streets or shall make extensive use of the scaling methods defined above.

(c) Garages and carports shall either be integrated into the primary building form or shall be constructed of the same materials as the primary buildings.

Examples of multifamily housing that provides variety and human scale

(Ord. 4719, 9-21-16)

§ 25.03.050. Fencing and walls (nonresidential and multifamily structures).

To provide for security, to screen unsightly areas, and to provide visual relief and buffers, the following standards shall apply to multifamily and nonresidential structures in the 24 Road Corridor:

(a) The design and materials for walls and fences shall be coordinated with the design and materials of the principal buildings in terms of color, quality, scale and detail. This is not intended to require identical materials and design.

(b) The combined height of walls and fences on top of an earth berm shall not exceed the maximum permitted height for the wall or fence alone.

(c) Fence and wall design shall not include long, unarticulated street fences facing walks and shall prevent "fence canyons."

(d) Chain link fencing in areas visible from nonindustrial properties, parking areas, public streets and pedestrian walkways shall be of a type and color that is aesthetically pleasing and complementary to the building and its surroundings.

(e) Chain link fencing shall be landscaped.

(Ord. 4719, 9-21-16)

§ 25.03.060. Service and storage areas (nonresidential and multifamily structures).

To ensure that service and storage areas are functional while minimizing their visual impact on adjacent properties, parking and open space areas, public streets, walkways and trails, the following standards shall apply to nonresidential and multifamily structures in the 24 Road Corridor:

(a) Outdoor storage, loading and operations areas shall be attractively screened from adjacent parcels and streets.

(1) Outdoor storage, trash collection and/or compaction, loading or other such uses shall be located in the rear of the lot. If because of lot configuration the Director determines that such placement is not feasible, then the side yard may be used, but in no case shall such area be located within 20 feet of any public street, public sidewalk or on-site pedestrian way.

(2) Outdoor storage, HVAC equipment, trash collection, trash compaction and other service functions shall be designed so as to be visually incorporated into the overall site design and architecture of the building(s).

(3) Views of outdoor storage, trash collection and/or compaction, HVAC equipment, loading and other service facilities and functions shall be screened from visibility from all property lines and screened and separated from sidewalks and on-site pedestrian ways. Screening structures shall be made of the same materials as the principal structure.

(b) Rooftop mechanical equipment, including satellite dishes and antennas over 30 inches in diameter, shall be screened from the view of public streets and open space. Alternate structures housing such equipment or wall-mounted painted-to-match units in unobtrusive locations in lieu of traditional screening will be considered. In the discretion of the Director, visual simulation may be required to demonstrate visual impacts on surrounding properties, open spaces, trails, parks, streets or walkways.

(c) Utility connections to buildings, including but not limited to switch boxes, wires and electrical, gas and other meters, shall be screened or located out of view from public streets. All utilities and their connections shall be underground where permitted by the utility provider and other regulations.

(d) Loading doors shall be recessed from the building face to minimize their visual prominence.

(e) In nonindustrial areas, screen fences or walls shall be at least one foot higher than the materials or equipment being screened, and at least six feet tall.

Screening blocks views of loading and storage areas

Service areas incorporated into the architecture of the building

(Ord. 4719, 9-21-16)

Chapter 25.04
Site Lighting

§ 25.04.010. Pedestrian, accent and security lighting.

In order to enhance vehicular and pedestrian visibility while minimizing lighting glare and contrast, prevent undesired off-site glare, emphasize attractive features, illuminate sites and attract visitors to destinations using the minimum amount of light needed to do so, the following standards in addition to the lighting regulations in the City of Grand Junction Zoning and Development Code (GJMC Title 21) shall apply to lighting within the 24 Road Corridor:

(a) All new development shall provide pedestrian lighting along public streets and pedestrian/bicycle trails.

(b) Lighting shall be designed to provide even and uniform light distribution without hot spots, dark spots, or glare.

(c) Lighting shall be designed to minimize dark areas that could pose a security concern near pedestrian areas.

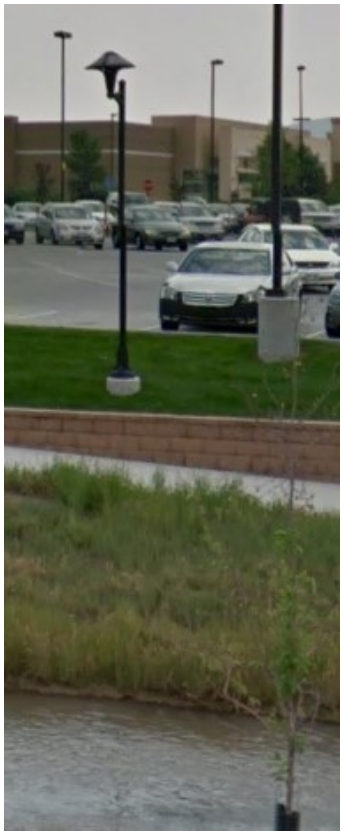
(d) Pedestrian circulation systems shall be highlighted by visible light sources that clearly indicate the path of travel ahead.

(e) Accent fixtures providing direct illumination shall be in character with the architectural and landscape design character of the development.

(f) Architectural lighting shall not be used to draw attention to or advertise buildings or properties. Architectural lighting may be used to highlight specific architectural, artistic or pedestrian features with the intent of providing accent and interest or to help identify entryways.

(g) Accent lighting of landscape and/or pedestrian areas shall be mounted close to the ground and use a low level of illumination, such as bollard lighting or similar low mount fixtures used for illuminating landscaping and pedestrian areas.

(h) All accent and security lighting shall be shielded and downcast.



Examples of appropriate pedestrian lighting

Example of low level accent lighting

(Ord. 4719, 9-21-16)

Chapter 25.05
Signs

§ 25.05.010. Sign standards.

In order to ensure that signs in the 24 Road Corridor communicate information for property owners, tenants and users without adding unnecessary visual pollution to the corridor, to encourage signage that is on a pedestrian scale, and to preserve and accentuate the views of

the natural beauty of the Colorado National Monument and Colorado River corridor, and to ensure continuity of signs within a given project, the following standards, which include restrictions on sign size, height of freestanding signs and prohibition of billboards, shall apply to signage in the 24 Road Corridor, in addition to the sign regulations in the City of Grand Junction Zoning and Development Code (GJMC Chapter 21.10):

(a) Only the following sign types are permitted: freestanding monument signs, flush wall signs, exempt signs, and temporary signs as allowed/regulated by GJMC Chapter 21.10, Sign Standards, except as further restricted in this chapter.

(b) Freestanding signs shall not exceed 12 feet in height from finished grade.

(c) Sign face for freestanding and flush wall signs shall not exceed 100 square feet per sign.

(d) Temporary signs and exempt signs shall be permitted in accordance with GJMC Chapter 21.10.

(e) No billboards shall be permitted in the 24 Road Corridor. Billboards that were installed in accordance with a permit or planning clearance from the City prior to November 1, 2000, may remain, except that they may not be expanded, enlarged, converted to illuminated or changeable copy signage, or replaced once removed.

(f) Freestanding signage shall be placed perpendicular to approaching traffic.

(g) Signs within a development project shall be designed and installed with continuity by use of a coordinating scheme of color, typeface, materials, and construction details throughout the project area.

(h) On freestanding signs, only graphics and typography are to be illuminated.

(i) Freestanding signs shall be single- or double-faced and constructed of a metal panel with stone or veneer base. If the sign is single-faced, the backside shall be painted the same color as the cabinet and poles.

(j) Flush wall signs shall not be illuminated externally; they may be either non-illuminated or internally illuminated.

(k) Trail route identification signs shall be placed at critical locations which shall be determined by the Director during site plan review.

Signs should communicate information and not add to visual pollution

(Ord. 4890, 11-20-19; Ord. 4719, 9-21-16)

Title 26

NORTH SEVENTH STREET HISTORIC RESIDENTIAL DISTRICT GUIDELINES AND STANDARDS

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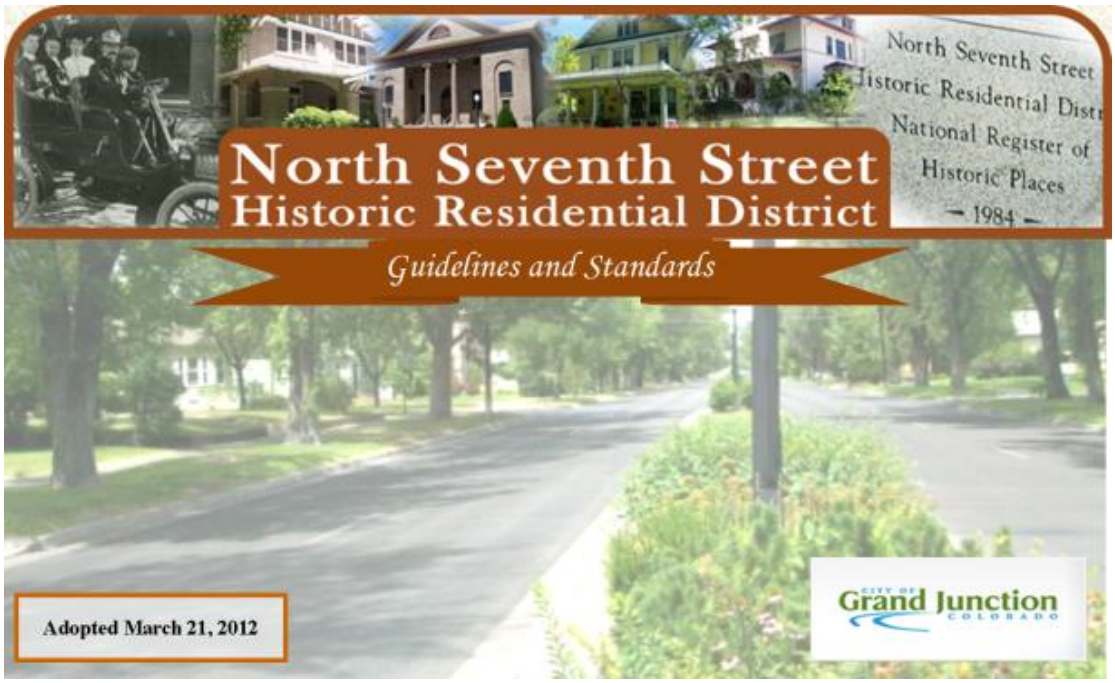
§ 26.04.010. Acknowledgements.



We would like to acknowledge the fine residents of the North Seventh Street Historic Residential District for all their input and dedication to a continued vision and belief in a prosperous and enduring Historic District. We would also like to thank all the residents who attended the neighborhood meetings and gave their input while this document was drafted.

These Guidelines and Standards were made possible because of the hard work, guidance, and vision of the residents and the support of City staff.

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City of Grand Junction Historic Preservation Board

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(Ord. 4508, 3-21-12)

§ 26.04.020. History.

The North Seventh Street Historic Residential District is the heart of the original square mile for the City of Grand Junction. Seventh Street was intended to be a park-like residential area where prosperous residents, who were instrumental in the development of a young city out west, built their homes.

North Seventh Street was a two-lane street with parking for vehicles in the front of their homes. Some of the homes still have a walk across the grass to access Seventh Street.

It has always been the showcase for all the City. Seventh Street was the route chosen for President George H.W. Bush and his wife, Barbara, to travel from the airport to the courthouse for the Education 2000 tour in 1991.

In spite of the traffic now impacting the area, it remains a close-knit neighborhood where neighbors visit neighbors on their front porches. Daughters or sons still get married in the family home or have their wedding receptions there.

Over the years, however, some homes on North Seventh Street have fallen victim to "progress," sacrificing historic preservation to modern expediencies.

The Grand Junction Town Company officers did more than develop lots and provide street names. They had great expectations for Grand Junction. They set aside parks in each quarter of the town, and developed certain areas with hallmarks of beauty, elegance and exceptional quality. Main Street and Grand and Gunnison Avenues were wider than other streets, and the lots facing those streets were deeper than most residential lots. Seventh Street was a fine boulevard, with landscaping in the center, and it was the only street with lots facing east-west rather than north-south. In harmony with the town officials' plan the homes on Main, Grand, Gunnison and especially Seventh Street were larger and more stately.

In 1923, C.F. Martin and C.D. Smith petitioned the Grand Junction City Council to have electric street lights installed on the parkway in the middle of Seventh Street. The City agreed. These lights were removed in 1965.

As a Bicentennial project Kathy Jordan, a North Seventh Street resident, petitioned the Grand Junction City Council for help in having lights of the period re-installed in the parkway. Neighbors on Seventh Street and many business people in Grand Junction donated time, money and materials. In December of 1975, Kathy, along with City Council members, flipped the switch to turn the lights back on.

In 1984 Kathy Jordan was instrumental in getting the area placed on the National Register of Historic Places with the U.S. Department of the Interior. The goal was to preserve the vision that the founding fathers had for this neighborhood.

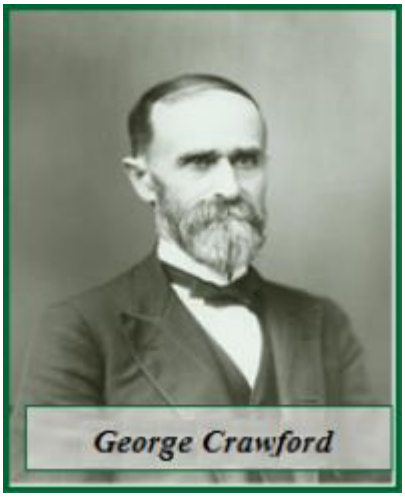
A cluster of the first homes on Seventh Street were constructed by members of the same family, starting with Cyrus “Doc” Shores. Shores built his home at 427 North Seventh Street in 1893.

Franklin I. Lee built his home at 402 North Seventh Street in 1903. His wife, Laura, was the daughter of M.M. (Marcus Morton) Shores, the brother of “Doc” Shores. Franklin’s father, W.H. Lee, built the house at 406 North Seventh Street in 1906.

418 North Seventh Street was also built by Franklin I. Lee in 1904. 428 North Seventh Street was built by Allison “Roe” Monroe in 1900. His wife’s sister was married to Doc Shores.

520 North Seventh was built by Mr. and Mrs. O.H. Ellison in 1924. Mrs. Ellison was the daughter of M.M. and Laura Shores.

The White House at 337 North Seventh Street (the green house at the corner of Seventh and Grand) was built by W.F. White who owned the White Mercantile Co. at Fifth and Main. Claims have been made that this home was built for George Crawford; however, Mesa County records show that the house was built in 1893, two years after Crawford’s death. Crawford’s name is on record showing he owned the land, but his name is on most of the property deeds for the original square mile because he was the developer. George Crawford lived in the Hotel Brunswick, a hotel he built, or on his Rapid Creek Ranch when in Grand Junction. Crawford’s niece, Josephine Rich, did build a home in the 500 block of North Seventh Street in 1892.



Eight homes were built from 1883 to 1899. Of those eight structures, only six remain.

The years 1900 to 1909 showed the largest growth on Seventh Street with 18 homes constructed. Of those 18 homes, 16 remain. From 1910 to 1919 four homes and one church were built and they are all still standing.

From 1920 to 1970 six homes, one school, one duplex and one church were built. They are all still standing. Currently, there are 35 structures in the District.

(Ord. 4508, 3-21-12)

§ 26.04.030. Project background.

The City of Grand Junction's Comprehensive Plan (adopted February 17, 2010, pp. 108 – 109), Title 31 GJMC, states:

Retaining our Heritage

Historic Buildings and Neighborhoods

Many communities have started to capitalize on their best assets such as historic buildings. Grand Junction has, like most cities, seen many of its historic buildings replaced with new construction. Appropriate historic buildings should be preserved to the extent possible. Modifications and additions to historic buildings are acceptable if the alterations are constructed to complement the original character. The neighborhood just north of the Downtown retains the original grid pattern of tree-lined streets and many older homes. To allow the Downtown to grow but not disturb the character of this neighborhood, the Plan recommends that increased density be allowed in this neighborhood through Accessory Dwelling Units.

Individual Neighborhood Character

The Community has expressed the desire to foster neighborhood identity. This can be accomplished through many elements and aspects such as parks, schools, signage, architecture and streetscape that become specific to that neighborhood. Many strategies to foster neighborhood identity, as well as specific land use issues and goals, are addressed in the various neighborhood and area plans adopted by the City and County. The Comprehensive Plan supports these individual neighborhood and area plans of the region. Several of the plans were incorporated into the 2009 Comprehensive Plan. However, others are out of date and need revision. During the revisions, these neighborhood and area plans are to adapt the Comprehensive Plan to each neighborhood at a finer, more detailed level. *(Housing Variety Recommendations and Grand Valley Housing Strategy)*

On February 17, 2010, a public hearing was held for the adoption of Ordinance 4403 to replace Ordinance 2211 that was adopted in 1984. At that meeting, the City Council requested that the City of Grand Junction Planning staff work with the neighborhood on specific historic preservation guidelines and standards for the North Seventh Street Historic Residential District.

The Grand Junction Historic Preservation Board has agreed to be responsible for preserving the historical value and character of the District's structures by reviewing and deciding

development applications through use of these design guidelines and standards. The City Council will hear appeals.

If properly adopted, administered and adhered to, the North Seventh Street Historic Residential District Guidelines and Standards will result in appropriate improvements that achieve a common level of quality in terms of allowed land uses, site design, architectural design, landscaping and other site improvements.

The general purposes of the North Seventh Street Historic Residential District Guidelines and Standards are:

(a) To preserve and protect the single-family residential character of the District.

(b) To preserve the historical and/or architectural value of buildings.

(c) To create an aesthetic appearance of the properties and the streetscape within the District that complements the historic buildings.

(d) To stabilize property values.

The North Seventh Street Historic Residential District Guidelines and Standards are based upon an analysis of the existing character of the North Seventh Street Historic Residential District. The Guidelines and Standards were developed through a collaborative neighborhood-based process. Property owner surveys, public meetings, and guideline development exercises were coordinated by Seventh Street residents and this document is the final result of these efforts.

(Ord. 4508, 3-21-12)

Chapter 26.08
How to Use This Title

§ 26.08.010. Getting started.

If you are thinking about developing or redeveloping property in the North Seventh Street Historic Residential District, you should contact the City Planning Division. They can provide an overview of the planning process and answer any questions you may have.

The North Seventh Street Historic Residential District Guidelines and Standards will provide the site and building design vision that is appropriate for all property in the District. The intent of this title is to provide a template for development and redevelopment within the District. Each standard is drafted to provide a maximum degree of flexibility and creativity in design, while conforming to a consistent and well-planned vision for the District. The architecture of your project must be of a valid recognized style as described in this title. Site design, streetscape, landscape and other elements will be consistent with the architectural style of each property.

(Ord. 4508, 3-21-12)

§ 26.08.020. How this title relates to other City regulations.

The North Seventh Street Historic Residential District Guidelines and Standards provide the ultimate vision and patterning for development and redevelopment of the District. They are to

be used in conjunction with GJMC Title 21, Zoning and Development Code, to guide development according to the principles of historic preservation. They include specific materials, styles, orientation, and other design criteria which, when in conflict with another adopted standard, the more restrictive provision shall apply. Interpretation of the application of regulations, performance standards, criteria, definitions, procedures or any other provision of this title shall be the responsibility of the City of Grand Junction Historic Preservation Board.

(Ord. 4508, 3-21-12)

§ 26.08.030. How to determine the guidelines and standards that apply to a particular property.

Structures within the North Seventh Street Historic Residential District are divided into two categories: contributing and noncontributing structures. GJMC § 26.08.040 has a detailed definition of each term as well as a list of all the properties in the district and how they relate to these terms.

A contributing structure is a structure that already adheres to and/or complies with these Guidelines and Standards in their entirety at the time of adoption. The Guidelines and Standards that are applicable to contributing structures are found in Chapters 26.2, 26.24, 26.28 and 26.32 GJMC.

A noncontributing structure is a structure that does not adhere to and/or comply with these Guidelines and Standards in their entirety at the time of adoption. The Guidelines and Standards that are applicable to noncontributing structures are found in Chapters 26.2, 26.24 and 26.32 GJMC.

Continued alteration of structures over time can lead to the District being reevaluated for its designation status on the National Register of Historic Places by the National Trust of Historic Preservation and the Department of the Interior. If alterations to the exterior of a structure have degraded its historic integrity, a structure may be determined to no longer be a contributing structure. If too many structures are altered, the District may lose its designation status due to no longer having enough contributing structures. Similarly, alterations that enhance a noncontributing structure may result in the structure becoming contributing. The intent of these Guidelines and Standards is to maintain and enhance the existing structures in order to maintain the designation status on the National Register of Historic Places.

(Ord. 4508, 3-21-12)

§ 26.08.040. Contributing and noncontributing structures.

Properties within a historic district fall into one of two types of property: contributing and noncontributing.

A contributing building, site, structure or object adds to the historic architectural qualities, historic associations, or archeological values for which a property is significant because:

(a) It was present during the period of significance and possesses historic integrity reflecting its character at that time or is capable of yielding important information about the period; or

(b) It individually meets the National Register eligibility criteria. For inventory purposes, "primary" shall be used synonymously with "contributing."

This classification has been designated through a survey and a formal hearing process. Contributing structures were identified on North Seventh Street when the National Register Historic District was formed in 1984.

A noncontributing building, site, structure or object is located within the historic district but does not meet the requirements in subsection (a) or (b) of this section.

Contributing Structures
327 North Seventh Street – Doc Shores House
337 North Seventh Street – White House
407 North Seventh Street – Bull House
433 North Seventh Street – Moore House
445 North Seventh Street – Martin House
505 North Seventh Street – Sampliner House
515 North Seventh Street – Sampliner House
535 North Seventh Street – First Church of Christ, Scientist
605 North Seventh Street – Brainerd House
611 North Seventh Street – Blackstone House
621 North Seventh Street – Honeymoon Cottage
625 North Seventh Street – Wilson House
639 North Seventh Street – Murr House
707 North Seventh Street – Wickersham House
727 North Seventh Street – Sinclair House
731 North Seventh Street – Lough House
739 North Seventh Street – Houskins House
750 North Seventh Street – Akers House
712 & 714 North Seventh Street – Home Loan Duplex
706 North Seventh Street – Pabor House/Pansy Cottage

Contributing Structures
640 North Seventh Street – Ferbrache House
620 North Seventh Street – Moyer House
604 North Seventh Street – Talbert House
536 North Seventh Street – Smith/Schmidt House
520 North Seventh Street – Ellison House
710 Ouray Avenue – Sickenberger House
440 North Seventh Street – Smith/Jordan House
428 North Seventh Street – Allison House
720 Grand Avenue – First Baptist Church
310 North Seventh Street – Lowell School

Noncontributing Structures
417 North Seventh Street – Waren House
522 North Seventh Street – Brunner House
626 North Seventh Street – Barkuloo
715 North Seventh Street – Day Care
726 North Seventh Street – Davis House

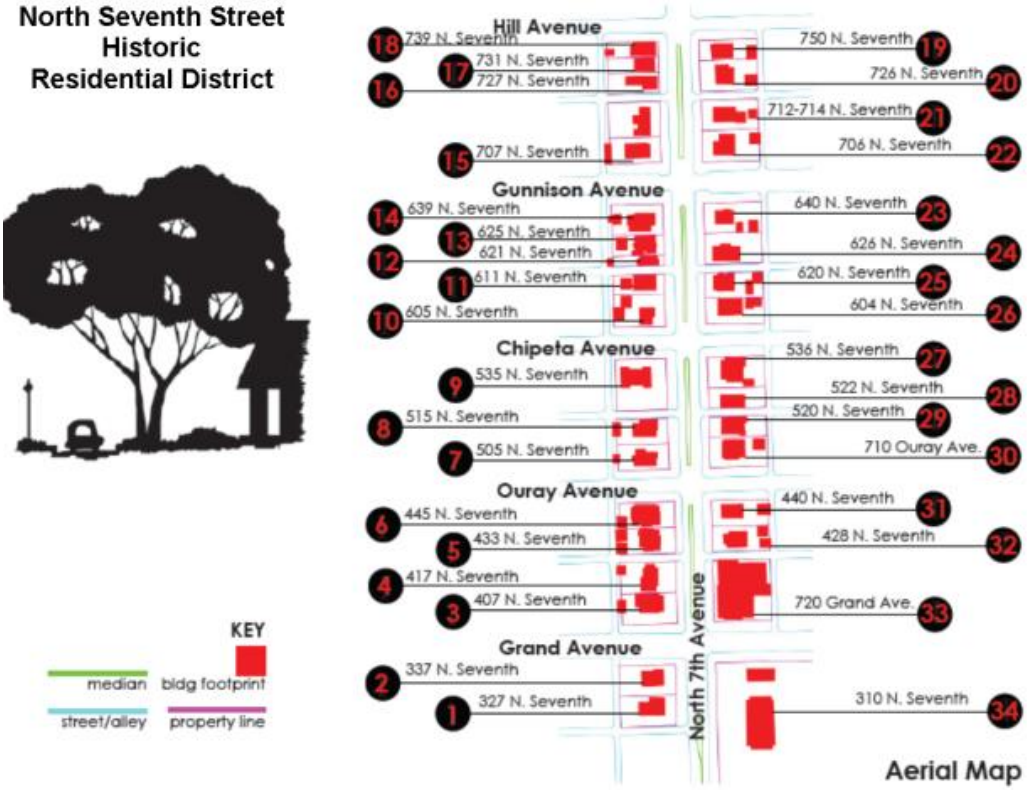
(Ord. 4508, 3-21-12)

§ 26.08.050. Guidelines and Standards supplement other development regulations.

(a) These Guidelines and Standards supplement other development regulations such as GJMC Title 21, Zoning and Development Code, which includes detailed criteria by zone district, planned development regulations, design and improvement standards, supplemental use regulations, sign regulations, and GJMC Title 29, Transportation Engineering Design Standards (TEDS). The Guidelines and Standards identify design alternatives and specific design criteria for the visual character and physical treatment of restoration within the North Seventh Street Historic Residential District.

(b) A complete inventory of all the properties and the site characteristics in the North Seventh Street Historic Residential District at the time this document was adopted is included in GJMC § 26.36.010, Appendix A. This inventory is intended to serve as one resource to assist in the review of development applications. There may be additional historical information or archeological resources that should be taken into account when determining historical appropriateness.

(c) North Seventh Street Historical Residential District. The North Seventh Street Historic Residential District is Grand Junction's only Nationally Registered historic neighborhood. Below is an aerial map of the District. A detailed inventory depicting the architectural styles of the 35 structures is included in GJMC § 26.36.010, Appendix A – Property inventory.



(Ord. 4508, 3-21-12)

Chapter 26.12

Land Use and Zoning

§ 26.12.010. Land use and zoning.

The zoning for the majority of the North Seventh Street Historic Residential District is Planned Development Residential, with a default Residential Medium 8 (RM-8) Zone. Some parcels within the district have not, however, been used historically as residences, including the parcel located at 535 North Seventh Street, which includes the First Church of Christ, Scientist building. The following uses, in addition to those allowed in the default RM-8 Zone District, are allowed on the parcel at 535 North Seventh Street: personal services, small appliance repair, general office, boarding school, museum, art gallery, opera house, library, medical, dental clinic, counseling center (nonresident), and health club, which uses shall be subject to the MU-1 performance standards established in GJMC § 21.03.070(a)(2) and (3) (but not, however, subject to GJMC § 21.03.070(a)(4); rather, these guidelines and standards shall apply to architectural consideration for the site); however, those uses allowed by right in

the RM-8 Zone District are not subject to such performance standards. Except as expressly stated in this section, these guidelines and standards do not affect allowable uses or zoning.

Included in the North Seventh Street Historic Residential District are three properties south of Grand Avenue: two converted houses on the west side of Seventh Street and the RL-5 High School on the east. The houses are zoned Mixed-Use Downtown (MU-3) and the school is zoned Public, Civil, and Institutional Campus (P-2). For more information refer to GJMC Title 21, Zoning and Development Code.

(Ord. No. 5207, 3/20/2024; Ord. 4960, 10-21-20; Ord. 4508, 3-21-12)

Chapter 26.16
Review Process

§ 26.16.010. Review process.

(a) All applications for alterations, new construction or site improvements within the North Seventh Historic Residential District shall be reviewed through the following process:

(b) Preexisting Nonconforming Structures – Grandfathering. Structures and uses which exist at the time of the adoption of these regulations and which do not meet the requirements of these regulations at the time of adoption are considered legal and may continue indefinitely as long as they maintain their current size and scope as legally nonconforming uses and structures. Such nonconforming uses and structures may not be expanded or enlarged without meeting the requirements of the Guidelines and Standards.

(c) Guidelines and Standards Defined.

Guidelines are permissive statements intended to be used as recommendations by homeowners and boards in making decisions.

Standards are mandatory statements that are required and must be met.

(Ord. 4508, 3-21-12)

Chapter 26.20
District-Wide Design Guidelines and Standards

§ 26.20.010. Minimum bulk requirements/standards.

(a) Guideline. Consistent setbacks and placement of buildings on lots will maintain the cohesive character within each block and within the North Seventh Street Historic Residential District.

(b) Standards.

(1) Setbacks for primary structures within the District shall be as follows:

(i) Front setback, Seventh Street: 25 feet.

(ii) Front setback, side street: 10 feet.

(iii) Side setback: five feet.

(iv) Rear setback: 10 feet.

(v) Maximum height: 35 feet.

(2) Setbacks for accessory structures within the District shall be as follows:

(i) Front setback, Seventh Street: 30 feet.

(ii) Front setback, side street: 10 feet.

(iii) Side setback: three feet.

(iv) Rear setback: five feet.

(v) Maximum height: 35 feet.

(Ord. 4508, 3-21-12)

§ 26.20.020. Vistas.

(a) Guideline. The unique buildings of the District are bordered by a mature, tree-lined street, which creates an extended horizontal view. These open views give the buildings visibility and provide safety. Through application of the North Seventh Street Historic Residential District Guidelines and Standards the City and all new development and redevelopment will maintain these vistas. One important way to accomplish this goal is to minimize visual clutter and distractions at street corners.

(b) Standards.

(1) Maintain the direct visual line of sight up and down the corridor and at the cross-street corners by adhering to front setbacks.

(Ord. 4508, 3-21-12)

§ 26.20.030. Landscaping in the public right-of-way.

(a) The North Seventh Street Historic Residential District's unique streetscape has historical significance in its own right. Through application of the North Seventh Street Historic Residential District Guidelines and Standards the City and residents will adhere to the standards of this section. New nonresidential uses shall also implement the mandatory standards of this section as a part of the required site landscaping.

(b) Standards.

(1) Maintain, and restore where missing, the historic spacing of street trees along the North Seventh Street Historic Residential District corridor. Street trees along North Seventh Street Historic Residential District provide full canopy coverage shade for residents and pedestrians. Street trees should remain intact, with new trees planted to fill in where they may be missing or as aging trees are replaced. Trees in the park strip shall be spaced 25 to 35 feet apart, depending on the tree species.

(2) Maintain and enhance the historic character of landscaping in the median and the park strip between the curb and sidewalk along North Seventh Street Historic Residential District. Materials should be primarily grass, street trees, flowers and low ornamental plants. Landscaping these areas with nonliving material is prohibited.

(3) Park strips shall not be planted with dense, tall materials as they detract from the overall character of the streetscape and impede visibility and safety for pedestrians and vehicles.

(Ord. 4508, 3-21-12)

§ 26.20.040. Residential landscaping.

(a) Guidelines.

(1) Property owners should maintain and enhance historically appropriate landscaping in front yards and park strips.

(2) Materials should be primarily grass, flowers, trees and low ornamental plants. Refer to the overall district character inventory form in GJMC § 26.36.010, Appendix A – Property inventory, and the historical plantings listed in GJMC § 26.36.060, Appendix F – Authentic plants for late 19th/early 20th century period landscaping.

(3) A minimum of 40 percent of front yard areas (not counting planting beds) should be maintained as grass or other low, living green ground cover.

(4) Hedges and other landscaping materials should not impede the views of the primary buildings from North Seventh Street.

(Ord. 4508, 3-21-12)

§ 26.20.050. Landscaping for nonresidential uses.

(a) Guidelines. Applications for nonresidential land uses within the District will comply with the City's landscape regulations. In addition, landscape choices should be sensitive to the unique context of the District's primarily residential character. All required landscape plans are to be signed with a seal by a registered landscape architect. Lots containing nonresidential uses should be landscaped, with appropriate foundation plants, shrubs, ground cover beds, hedges and fences to frame the architecture of buildings.

(1) Maintenance of all plantings, including watering, mowing, weeding, edging, fertilizing, pruning, insect control, removal and replacement of dead or damaged plant materials is encouraged for properties within the Historic District.

(2) The landscape should be covered by an automatic irrigation system.

(3) All lawn areas should be sodded. Planting drought tolerant turf varieties is encouraged.

(4) Ground cover beds should be mulched or graveled as necessary.

(Ord. 4508, 3-21-12)

§ 26.20.060. District identification.

(a) Guideline. Identification of the boundaries of the District is an important means of enhancing its recognition as an historical and cultural resource to the community. The City should endeavor to replace historic street names in the sidewalk at all cross-street intersections within the District. Historic street name signs with a distinctive logo are encouraged to replace the standard street name signs. Signage indicating the northern and southern limits of the District should be maintained and enhanced as necessary.

(Ord. 4508, 3-21-12)

§ 26.20.070. Building identification.

(a) Guideline. Through application of these Guidelines and Standards the City, in cooperation with the Seventh Street residents, should develop signage which is compatible with existing signage documenting the history of significant properties within the North Seventh Street Historic Residential District. This will provide downtown walking traffic the opportunity to learn about the unique historical background of significant residences within the North Seventh Street Historic Residential District.

(Ord. 4508, 3-21-12)

§ 26.20.080. Utility systems.

(a) Guidelines.

(1) Energy and water system improvements serving a greater efficiency are encouraged; provided, that they do not adversely impact the historic integrity of a building or the District, by being generally placed out of view from the North Seventh Street public right-of-way.

(2) The more common utilities serving properties in the District are telephone and electrical lines, gas meters, air conditioners, evaporative coolers, and telecommunication systems. However, other systems are becoming more economically viable and accepted for use such as solar panel devices and rain water harvesting systems. Visual impacts associated with utility systems should be minimized.

(b) Standards.

(1) Systems shall be designed to be unobtrusive and not in view of the North Seventh Street public right-of-way.

(2) Alternative roofing materials such as photovoltaic panels shall be located on the side and back elevations of the building.

(3) Utility systems shall not be constructed into the front elevation of roof line of the building.

(4) Satellite dishes shall not be placed in view of the North Seventh Street public right-of-way.

(Ord. 4508, 3-21-12)

§ 26.20.090. Fencing.

(a) Guideline. Fencing materials and styles should complement the character of the District. Fence styles, particularly in front yards, should be similar to those from the restoration era of the buildings on site. In addition to the regulations for fences applicable to the RM-8 Zone, fences in the District shall adhere to the requirements of this section.

(1) Front yard fences should be a maximum height of 48 inches measured from the street side.

(2) Maximum opacity for front yard fences should be 60 percent.

(3) Side and rear yard fences should be a maximum of six feet high measured from the street side of the fence. They should be between 60 percent and 100 percent opaque. They may extend to and be placed on property lines.

(4) The transition between front yard fences and side and rear yard fences should occur five feet behind the front building setback line or three feet behind the front facade line, whichever is greater.

(5) Chain link, split rail and wire mesh fencing should not be used within the District.

(b) Standard. Vinyl or plastic fencing is not appropriate on any part of a property within the North Seventh Street Historic Residential District and use of such fencing is not allowed.

(Ord. No. 5207, 3/20/2024; Ord. 4842, 3-20-19; Ord. 4508, 3-21-12)

§ 26.20.100. Parking for multifamily and nonresidential uses.

(a) Guideline. Parking for uses other than single-family residences should be accommodated primarily on site and to the rear of lots in order to maintain the residential character of the neighborhood. In addition to other parking standards of GJMC Title 21, Zoning and Development Code, the guidelines and standards of this section shall apply.

(b) Standards.

(1) Parking shall be placed to the rear of the lot in relation to Seventh Street.

(2) Parking adjacent to a side street shall be screened from view with a 42-inch tall fence and minimum three-foot landscape buffer area with planting height no less than 42 inches tall.

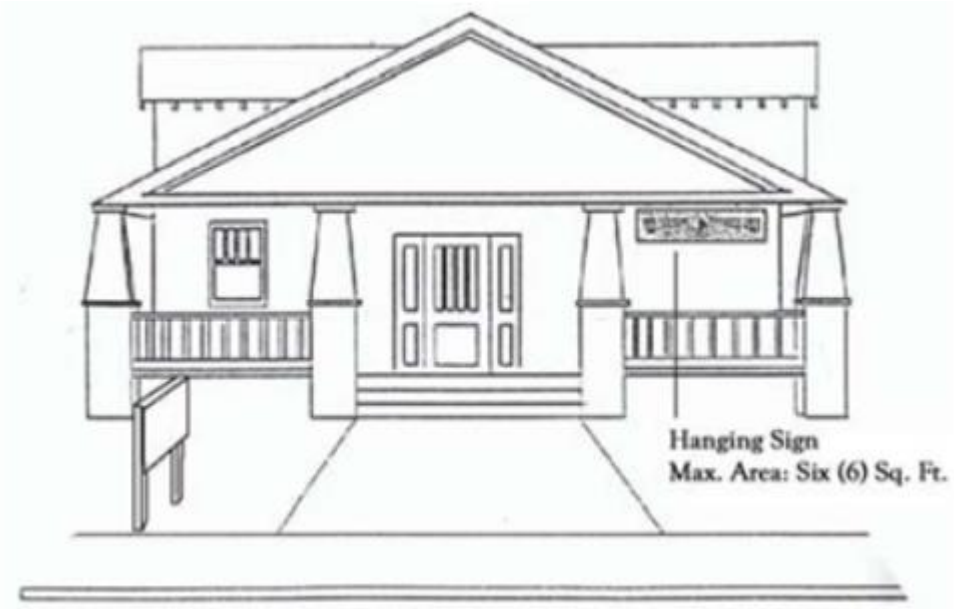
(3) Parking adjacent to another lot shall be screened with a fence or a continuous hedge of at least 42 inches in height planted at a minimum three-gallon/30 inches on center or a six-foot tall opaque fence.

(Ord. 4508, 3-21-12)

§ 26.20.110. Individual building signage for nonresidential uses.

(a) Guideline. The overall visual impression and ability for one to find his or her way can be significantly impacted by the collective image projected by local signs. It is the intent of this section to promote the concept that signage is subservient to architecture and should be understated. To prevent the confusion and clutter that can result from unrestricted signage, specific criteria have been developed. Signage in the District should be discreet and maintain the residential character of the neighborhood. Generally, signage should reflect styles and materials that are consistent with the restoration era.

Below are some examples of signage that would be consistent with architecture and style in an historic area.



Inappropriate Signage

(b) Standards. Please refer to the City's sign regulations, GJMC § 21.06.070.

(Ord. 4508, 3-21-12)

Chapter 26.24

Contributing Structures, Noncontributing Structures and New Construction

§ 26.24.010. General guidelines.

New construction in the North Seventh Street Historic Residential District is allowed, as long as the design, siting, and construction are congruous with the character of the District. It is preferable to design congruous contemporary structures rather than duplicate or mimic the design of historic buildings in the District. Siting is critical due to various lot configurations and in considering the overall appearance within the context of neighboring buildings set within the immediate block.

Important design considerations for new buildings include height, massing, scale, form, texture, lot coverage, setbacks, spacing of buildings, orientation, and alignment. Congruousness of proposed foundations, porches, landscaping, utility systems, and other site features is also important.

(Ord. 4508, 3-21-12)

§ 26.24.020. Building proportions, mass and form.

(a) Guideline. Maintaining a building's historical massing, scale and height gives the North Seventh Street Historic Residential District a unique appearance that helps preserve its historical character and reinforces the North Seventh Street Historic Residential District's architectural period and style.

The arrangement of building components or volumes into a whole structure constitutes its mass and scale. Typically, simple rectangular solid forms are appropriate. The building's overall massing and form shall honor its historical style. In the North Seventh Street Historic Residential District, the building forms have historically reflected a human scale.

(b) Standards.

(1) Buildings shall be similar in height and width to buildings on adjacent sites and block. Two alternatives to this standard are:

(i) New buildings that are wider than the buildings on adjacent sites may be constructed by breaking the building mass or dividing the mass of the building width in appearance to conform to building widths on neighboring properties.

(ii) A new building which is wider and higher than buildings on adjacent sites may be constructed if the new building is broken up into smaller segments that are more similar to adjacent buildings and if the height of the building at the street facade and at the sides facing adjacent sites is similar to the height of buildings on those sites. This is achieved by placing the taller masses away from the street and adjacent buildings to either side.

(2) Foundation height shall be similar in proportion and appearance to neighboring buildings.

(3) Buildings shall not be constructed which do not maintain or blend with the heights of buildings on adjacent sites.

(4) Buildings shall not be constructed which do not maintain or suggest the widths of buildings on adjacent sites.

(5) New buildings shall reinforce a pedestrian-friendly character from the front elevation by maintaining the similarity of building, roof form, and front porches traditionally found on the block when appropriate.

(6) New buildings shall use massing and form similar to neighboring buildings. Design shall convey a human scale through the use of traditional mass, sizes, materials, and window openings.

(7) New construction shall incorporate design elements such as roof forms, lines, openings, and other characteristics commonly found in the District.

(8) New construction may have a building form which is unique in the District but relates to the neighboring buildings and to the neighborhood through its overall massing.

(9) New construction shall not use massing and building forms which are foreign to the Historic District as determined by the Historic Preservation Board.

(Ord. 4508, 3-21-12)

§ 26.24.030. Orientation and lot coverage.

(a) Guidelines. New buildings should be oriented parallel to the street and provide visual continuity with proportional lot coverage similar to other buildings on the same block. The principal facades of new buildings within the District should be oriented to the street. Main entryways should be located along these principal facades. This is a consistent pattern throughout the District which should be preserved to maintain the prevailing visual continuity. When this pattern of primary facades and entryways is moved from the street side of the building, the activity along the street is lost and the character of the District changes. General proportions of buildings-to-lot areas should remain consistent with their historic appearance. Lot coverage should be similar in proportion to the lot coverage of neighboring lots. Side and rear setbacks will be governed by zoning and will limit the minimum spacing between buildings; however, the overall proportions of building-to-lot area should remain consistent from lot to lot along the block.

(b) Standards.

(1) Accessory dwelling units, accessory buildings, and garages shall be subordinate to the primary residential building on the site by placing the structure to the rear of the lot.

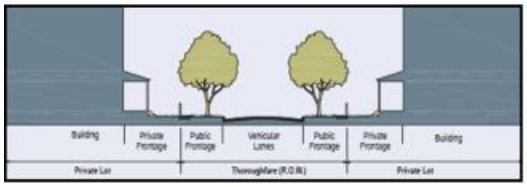
(2) Primary facades of a new building shall be oriented parallel to the street.

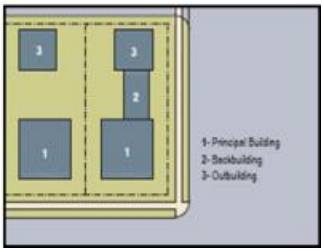
(3) Primary entrances shall be provided on the street facade.

(4) The primary entrance shall be enhanced through the use of steps, functional porches, stoops, porticos or other design features appropriate to the architectural style of the building.

(5) New construction shall maintain proportional lot coverage as found on the neighboring properties of the same block.

(6) Garages shall not be constructed as part of the primary building. Garages shall be accessed from the alley.





(Ord. 4508, 3-21-12)

§ 26.24.040. Alignment, rhythm, and spacing.

(a) Guidelines. Proportions of the facades and the spacing of the buildings should be consistent along the streets of the District. Along a block, the uniformity of the proportions of the facades and the spacing of the buildings must be considered in new construction to achieve harmony along the streetscape. Spacing between buildings should be consistent along the street in order to maintain the rhythm that is traditionally prevalent on the street in the District. Houses built up until the mid-1930s tend to have substantial front porches and often rear or side porches as well. Porches, projecting bays, balconies, and other facade elements are encouraged and should be aligned with those of existing buildings along the street. This alignment creates harmony and maintains the rhythm of facade proportions along the block length. Front widths of new buildings should correspond with existing building widths; however, a wider facade can be broken into separate elements that suggest front widths similar to those of neighboring buildings. Where lots are combined to create a larger development, the building-to-lot proportions should visually suggest a relationship with adjacent buildings by breaking large building masses into smaller elements. Where a building site is comprised of multiple lots, the new building should be clearly of similar proportion to other buildings on the same block.

(b) Standards.

(1) New building facades shall align with the facades of existing buildings on adjacent sites.

(2) New buildings shall be constructed with similar spacing relative to other buildings along that street.

(3) Buildings shall not contain a primary entrance that is simply a door and provides little or no transition from outside to inside.

(4) Primary entrances shall not be at-grade as virtually all existing homes with historic significance provide a "stepping up" to the front entrance.

(Ord. 4508, 3-21-12)

§ 26.24.050. Exterior materials.

(a) Guidelines. Use similar building materials as those found within the District. Prevalent styles found within the District use a variety of common building materials. Clapboard or shiplap wood siding (two to six inches wide), brick, stucco and sandstone are dominant exterior materials. Sandstone blocks are generally relied upon for

foundations. Stucco, rusticated concrete block and stone were sometimes used solely as wall materials or for ornamentation. In new construction, the use of the historic building materials is favored. Several common materials to choose from include wood siding, composite wood-resin and fiber cement siding, among others. As historic homes age, exterior materials inevitably need replacement, repair or restoration. Whether scientific advancement has deemed a certain material unsafe or a material is simply worn, it is important to replace these materials in a manner that reflects the building's historical style in order to preserve the North Seventh Street Historic Residential District's overall character.

(1) Exterior surfaces should be replaced with historically accurate materials.

(2) If it is not possible to replace materials with like materials, exterior wall surfaces, foundation, roofing, trim, gutters, downspouts, exterior lighting and other unique detailing may be replaced with modern materials with an appearance similar to original materials.

(3) Hazardous materials that do not pose a threat may remain a part of the structure.

(b) Standards (Applies to Contributing Structures Only).

(1) Exterior wall materials shall be those that are commonly present in the District.

(2) The predominant texture of the new building shall be consistent with the texture of historic materials in the District.

(3) Allowable siding materials for new construction include, but are not limited to, wood, painted composite wood-resin or fiber cement siding.

(4) Prefabricated or metal buildings are prohibited.

(5) New vinyl and aluminum exterior siding materials are prohibited, except as replacement material on noncontributing structures.

(6) Exterior insulation and finish system (E.I.F.S.) or similar is prohibited.

(Ord. 4508, 3-21-12)

§ 26.24.060. Porches, stairs, entries and doors.

(a) Guidelines.

(1) Front porches are common in the District and are strongly encouraged on new principal structures.

(2) A key characteristic of many of the buildings in the North Seventh Street Historic Residential District is the pattern and prominence of the raised first floor front porches, regardless of the architectural style or period. This important element of the streetscape and its components of construction should be maintained.

(3) The buildings in the North Seventh Street Historic Residential District were designed to face North Seventh Street. This is Grand Junction's only downtown residential example where entire blocks of houses face a north-south street. This detail is a defining characteristic for most of the North Seventh Street Historic Residential District and should be maintained. Modification of the size and/or location of the doorway changes the overall style of a building's facade.

(b) Standards (Applies to Contributing Structures Only).

(1) Front porches shall be maintained as integral parts of the overall building character and style.

(2) The ground plane of any new entry platform or stairs shall stand no higher than one-half a story from the base of the structure.

(3) An open porch shall be enclosed with screening providing the original lines of the porch roof, eaves and supports are preserved. Enclosure of any porch with a material other than screening is prohibited.

(4) Buildings' entrances shall be maintained in their historical location.

(5) Doorway materials and design shall be consistent with the architectural style of the building.

(6) Door cases shall be designed with depth and visual relief.

(7) Doors shall be of overall proportions similar to those used on buildings on adjacent sites.

(8) Screen doors that are simple in design and blend with the design of the inner door and the house shall be used.

(9) Aluminum doors with mill, brush or polished finish or metal louvered doors shall not be used.

(Ord. 4508, 3-21-12)

§ 26.24.070. Accessibility and fire escapes.

(a) Guidelines.

(1) The materials and design of ADA accessible ramps should be compatible with the architectural style of the building. The ramp must provide a nonskid surface and have no greater than a one to 12 slope.

(2) The addition of a fire access should reflect design elements of the building.

(3) For uses that are subject to the Americans with Disabilities Act, all ADA requirements will be honored.

(Ord. 4508, 3-21-12)

§ 26.24.080. Windows and facade treatments.

(a) General Guidelines.

(1) Maintain similar solid-to-void ratios of a new building to those of buildings on adjacent sites within the block with overall proportions of windows, doors, and front facades. The front facades of buildings within the District vary in style and detail; however, certain proportional relationships exist among buildings in the immediate setting. The importance of the relationship between the width and height of the front elevation of buildings on the block has already been discussed. Beyond that, the proportion of openings on the street-side facade, or, more specifically, the relationship of width to height of windows and doors and their placement along the facade should reflect the same relationships along the street.

(2) Driving or walking down Seventh Street, a pattern of window and door openings becomes evident along the block. This rhythm of solids to voids, walls to windows, and juxtaposition of stronger and less dominant elements should be reflected in the facade of a new building. Windows give scale to buildings and visual attention to the composition of individual facades. Many historic building styles have distinctive window designs. Historic windows are generally inset into relatively deep openings or surrounded by casings and sash components that cast shadows and provide depth and relief. Windows in new construction should have similar characteristics.

(3) Windows are an important design element as they are able to establish the scale and character of the building. Windows and window patterns in new construction should be of similar proportion and size to the windows of the other buildings within the neighborhood. For the majority of neighborhoods developed prior to the 1940s, the rule of thumb for windows is generally vertical, double-hung or casement and wood-framed. When placed in pairs or in groups of three, as in many Craftsman houses, these create a horizontal impression. Historic architecture styles display a thoughtful use of natural lighting, often with numerous and well placed arrangement of windows. Doors are also important character-defining features of buildings throughout the District. Original doors on houses from historic styles are generally divided into wood panels and glass. Many doors also have glass side lights and transoms. New doors should reflect these patterns.

(4) New buildings should have double- or single-hung sash windows and provide windows of overall proportions similar to those used on buildings on surrounding sites within the block.

(5) New buildings should have a ratio of wall-to-window or solid-to-void that is similar to that found on other historic buildings within the block and found throughout the District. They should provide a pattern of windows and doors on the facade which recalls similar patterns on facades of other buildings in the District.

(6) Window cases should be designed with depth and visual relief.

(7) It is appropriate to use wood or similar looking materials such as aluminum clad or vinyl windows that provide depth and texture similar in appearance to historic wood windows on the primary facade. Other window materials may be considered on the secondary elevations of the new building.

(8) It is appropriate to use removable storm windows that blend the texturing and match sash styles so they do not appear obtrusive or out of place.

(9) Multiple window styles should not be used throughout a new building.

(b) Standards (Applies to Contributing Properties Only).

(1) Window shape, alignment and style shall be protected to preserve the building's historic character.

(2) Window materials shall be maintained in a historically accurate manner.

(3) Any alteration of windows shall maintain the historic pattern of their vertical and horizontal rhythms.

(4) Openings shall not be enlarged, closed off, or otherwise altered in form.

(5) Shade structures such as awnings may be appropriate additions to windows provided the design and materials are consistent with the architectural style. Primary materials shall be cloth and wood. Plastic, vinyl and metal shade structures are not allowed.

(Ord. 4508, 3-21-12)

§ 26.24.090. Roof forms and materials.

(a) Guidelines. Use similar roof forms, slope ratios and materials drawn from historic structures in the District. Roofs are major features of most historic buildings and when repeated along a street contribute toward a visual continuity. The architectural character of older buildings is generally expressed in roof forms and materials. Roofs in the North Seventh Street Historic Residential District are simple in form and are gabled, hipped or occasionally a combination of the two. Roofs purposely extend beyond the building walls to protect the window and door openings and provide shade. These eaves are sometimes enclosed with wood soffits (the underside of a roof overhang) which are vented. Various materials are used for the roofs of buildings throughout the District, but shingles of varying materials predominate. Some of the more common materials are wood shingle, clay tile, composition material such as asphalt or asbestos shingles, tin and slate. The design of roofs for new buildings should be congruous to the size, shape, slope, color and texture of other roofs on the block.

(1) The roof on a new building should relate to the overall size, shape, slope, color, and texture of roofs on adjacent sites or in other areas of the District. Special consideration shall be given to front-facing facades.

(2) Gable and hipped roofs should be used as primary roof forms that may protrude beyond the plane of the building walls.

(3) The majority of the roof should be of a pitch of 6:12 or greater. Shed roofs may be appropriate for some porch additions.

(4) Roofs should include eaves and decorative elements such as corner boards and brackets shall be used under the eaves to provide depth and relief.

(5) The visual impact of skylights and other rooftop devices visible to the public should be minimized; these should be located toward the rear of a house.

(b) Standards (Applies to Contributing Properties Only).

(1) Materials on a new roof or replacement roof should be similar to materials found on roofs in the District.

(Ord. 4508, 3-21-12)

§ 26.24.100. Trim and details.

(a) Guidelines.

(1) Exterior trim details on new construction should provide a visual link between the old and new buildings. New construction should not necessarily copy every detail of a style or period of architecture found in the District; rather, new construction should be congruous. Using similar forms such as those found in windows, doors, parapets, rooflines, and other facade elements without replicating them can help establish continuity and compatibility within the block and the District. The trim and details of new buildings offer a way to link to the past while still acknowledging a clear differentiation in the present. New details and trim should be well integrated into the design and used to accomplish functional as well as decorative purposes, such as: to express a change of plane; to finish what would otherwise be a ragged edge; to act as a transition between different materials; or even the simple function of shedding water. Detail should be functional with a high level of craftsmanship, rather than simply applied decoration.

(2) Whenever possible, windowsills, moldings, and eave lines should be aligned with similar elements on adjacent buildings within the block.

(3) It is not appropriate to use architectural details in ornamentation that confuse the history or style of a building. For example, do not use Victorian details on minimal traditional homes.

(Ord. 4508, 3-21-12)

§ 26.24.110. Additions.

(a) Guidelines. The landmark structures along North Seventh Street historically define the North Seventh Street Historic Residential District. Each landmark structure should be maintained and each building's historical form should not be altered in order to preserve the character of the North Seventh Street Historic Residential District.

(1) Additions should not exceed 35 percent of the gross square footage of the principal structure and not be visually prominent from North Seventh Street. The appearance of additions should be subordinate to the principal structure and should not alter the original proportions of the front facade.

(2) Additions should not alter the historical alignment of structures in relation to North Seventh Street.

(3) The setback of the addition should preserve the historic eave or roof line of the original structure.

(4) The height of the addition should not exceed the overall height (roof peak) of the original structure.

(5) The materials used for additions should be similar to materials used in the original construction.

(Ord. 4508, 3-21-12)

Chapter 26.28

Contributing Structures Guidelines and Standards

§ 26.28.010. Overall guiding principles.

Building permits for alteration of contributing structures shall be reviewed according to the process described in Chapter 26.16 GJMC. Exterior modifications that do not require a building permit shall obtain a certificate of appropriateness from the Public Works and Planning Department. All modifications that will affect the historical integrity of the structure shall consider the Secretary of the Interior's Standards for the Rehabilitation of Historic Structures. The Secretary of the Interior's Standards should be applied to individual rehabilitation projects taking into consideration technological and economic feasibility, and should be considered as general guidance to supplement the specific guidelines and standards of this title. It should be noted that some of the specific guidelines and standards of this title are less restrictive than the general guidance of the Secretary of the Interior's Standards.

(Ord. 4508, 3-21-12)

§ 26.28.020. Secretary of the Interior's Standards for Rehabilitation of Historic Structures.

(a) A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

(b) The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

(c) Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

(d) Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

(e) Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

(f) Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

(g) Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

(h) Significant archaeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

(i) New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

(j) New additions and adjacent or related new construction shall be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

(Ord. 4508, 3-21-12)

Chapter 26.32

Demolition of All or Part of All Structures Within the North Seventh Street Historic Residential District

§ 26.32.010. Applicability.

Any applicant requesting demolition of all or part of a principal structure within the North Seventh Street Historic Residential District shall demonstrate that the demolition is warranted either by cause or by effect of the structure being noncontributing to the District.

(Ord. 4910, 4-15-20)

§ 26.32.020. Review criteria.

Approval of a certificate of appropriateness for a demolition may be issued upon consideration of the following:

(a) Whether the applicant has made a good-faith effort to pursue reasonable, cost effective alternatives to demolition.

(b) Whether the loss of part or all of the subject property would be detrimental to the quality and continuity of the site, District or surrounding neighborhood.

(c) Whether denial of the application would result in an undue economic hardship for the owner/applicant. Based on a thorough analysis of the financial, economic, and engineering information described below, the City Council may determine that there is an undue economic hardship if the following criteria are met:

(1) No economically viable use consistent with zoning of the property will exist unless the demolition is approved. (Note: inability to put the property to its most profitable use does not constitute an undue economic hardship.)

(2) The hardship is peculiar to the building or property in question and must not be in common with other properties.

(3) The hardship is not self-imposed, caused by action or inaction of the owner, applicant or some other agent.

(4) The applicant has attempted and exhausted all reasonable alternatives which would eliminate the hardship, such as offering the property for sale.

(Ord. 4910, 4-15-20; Ord. 4508, 3-21-12. Formerly 26.32.010)

§ 26.32.030. Submittal requirements.

(a) The applicant for demolition of part or all of a structure shall provide information including:

(1) A report from a licensed engineer, contractor or architect with experience in rehabilitation as to the structural soundness of the structure and its suitability for rehabilitation.

(2) A narrative description with supporting photographs of the structure including architectural features and details and materials used throughout the interior and exterior of the structure.

(3) Additional information identified by staff or the Board to ensure sufficient evidence for reviewing the request.

(b) In addition to those items listed in subsection (a) of this section, an applicant for demolition of part or all of a primary structure shall provide information including:

(1) An estimate of the cost of the proposed demolition or removal and an estimate of any additional cost that would be incurred to comply with recommendations of the Board.

(2) Estimated current market value of the property prepared by a Colorado licensed real estate appraiser, for the property in its current condition and after completion of the proposed demolition or removal.

(Ord. 4910, 4-15-20; Ord. 4508, 3-21-12. Formerly 26.32.020)

§ 26.32.040. Procedure.

(a) Upon submittal of the application for a certificate of appropriateness for demolition to the City, the Community Development Department shall review all the documentation submitted for completeness. The Department staff shall prepare a report with findings, including recommendation regarding historicity. All decisions on certificate of appropriateness shall be noticed and conducted as public hearings consistent with GJMC § 21.02.080(g).

(b) For all accessory structures:

(1) The Historic Preservation Board will make a final decision regarding the certificate of alteration.

(2) An appeal of the Board's decision shall be heard by City Council.

(c) For all primary structures:

(1) The Historic Preservation Board will provide a recommendation to City Council.

(2) Within 90 days of the HPB hearing, the City Council shall consider and decide upon the certificate of alteration for demolition.

(d) If a certificate of alteration is approved for a historic structure, all salvageable building materials shall be collected and waste removed from the property.

(Ord. 4910, 4-15-20; Ord. 4508, 3-21-12. Formerly 26.32.030)

§ 26.32.050. Penalty.

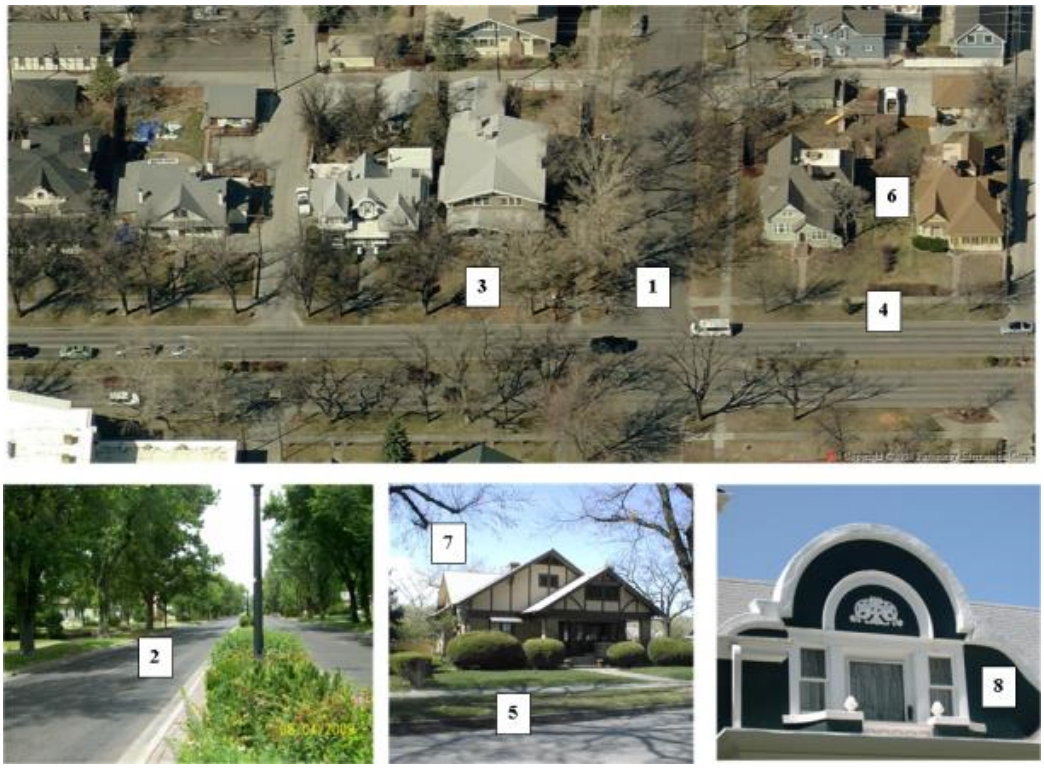
If the applicant of a structure within the North Seventh Street Historic Residential District abates or demolishes part or all of a building without first obtaining the certificate of appropriateness, the applicant shall pay a fine of $250.00 per square foot of the affected area..

(Ord. 4910, 4-15-20; Ord. 4508, 3-21-12. Formerly 26.32.040)

Chapter 26.36
Appendices

§ 26.36.010. Appendix A – Property inventory.

(a) District Character Inventory.



(1) The District is within a grid street pattern forming rectangular blocks, bisected by east-west and north-south alleys.

(2) Visual cohesiveness is created by the natural setting which includes a strong pattern of evenly spaced street trees, an abundance of mature vegetation and a center landscaped median on North Seventh Street.

(3) Within blocks, the lots are approximately the same size and structures are placed on lots in a similar manner. Uniform side and front yard setbacks give the street visual unity.

(4) Buildings are of compatible size and scale, with the majority of buildings in the District having one and one-half to two and one-half stories.

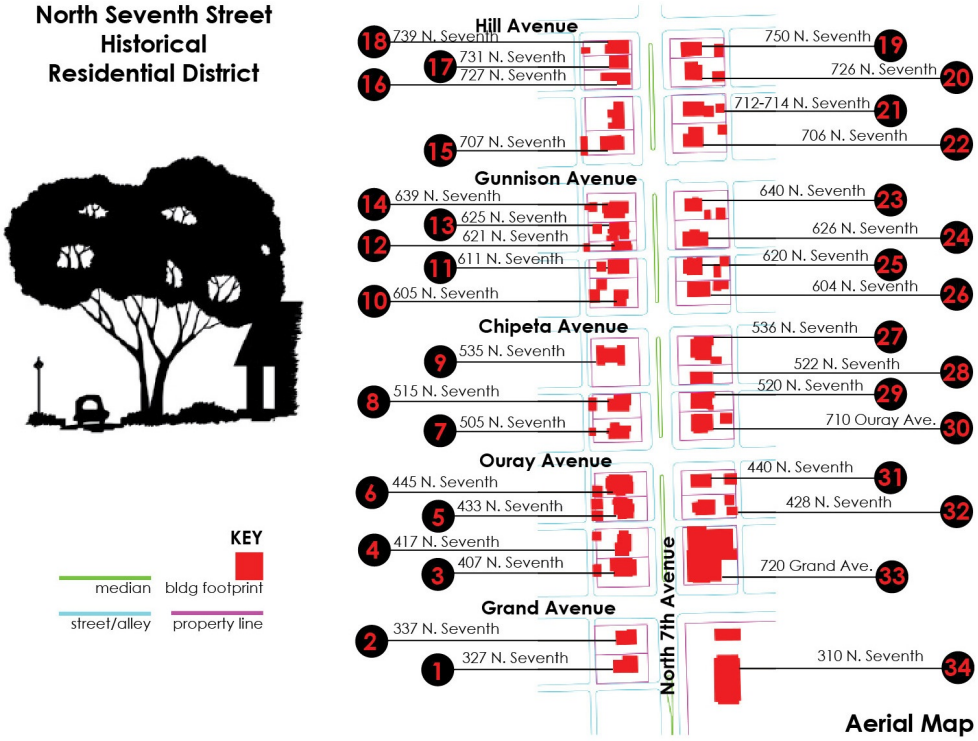
(5) Although varied in architectural style, almost every building has a porch. Altogether, the porches form a uniform horizontal line on the streetscape.

(6) The buildings have prominent triangular roof forms that are primarily oriented with the ridgeline perpendicular to North Seventh Street.

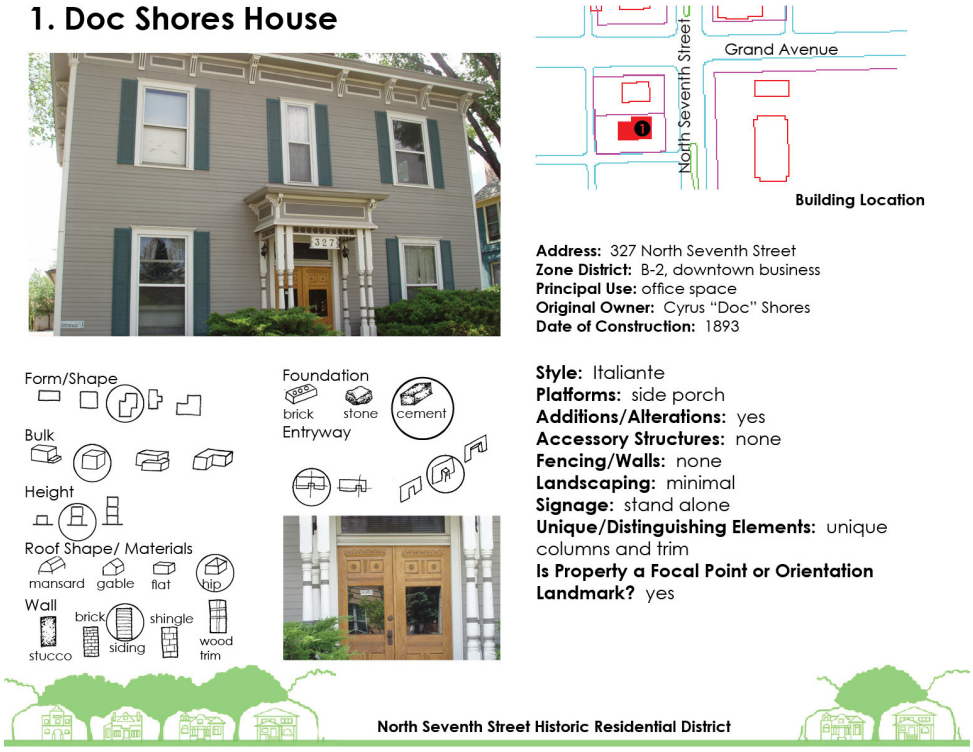
(7) Siding and trim materials create strong horizontal patterns.

(8) Unique details highlight the District's character including some yards set off by wrought iron, picket or brick-pilaster fencing and a variety of architectural ornamentation.

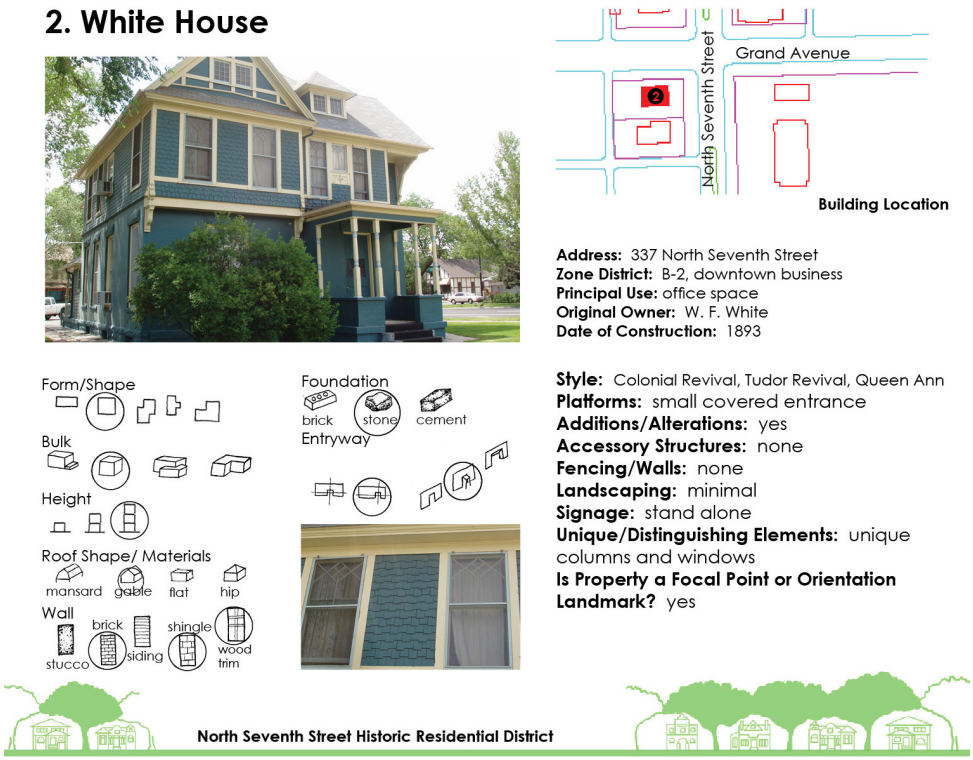
(b) North Seventh Street Historical Residential District. The North Seventh Street Historic Residential District is Grand Junction's only Nationally Registered historic neighborhood. Below is an aerial map of the District and following is a collection of profile cards depicting the unique architectural stylings of all 35 structures in the District.



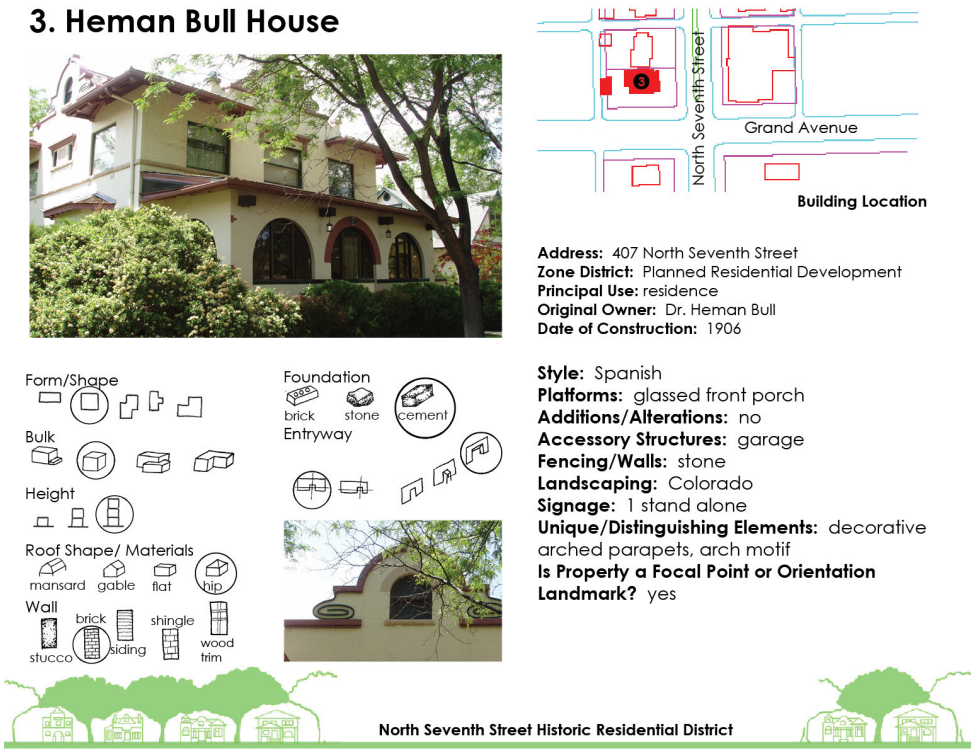
(1) Doc Shores House.



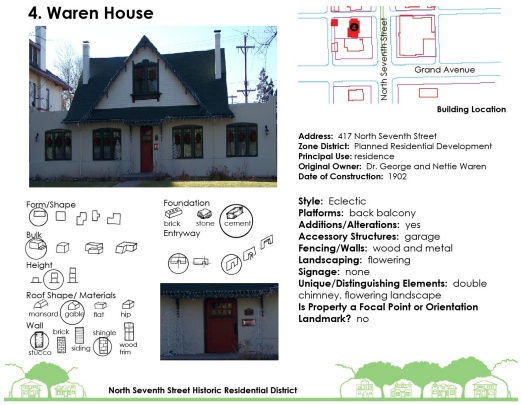
(2) White House.



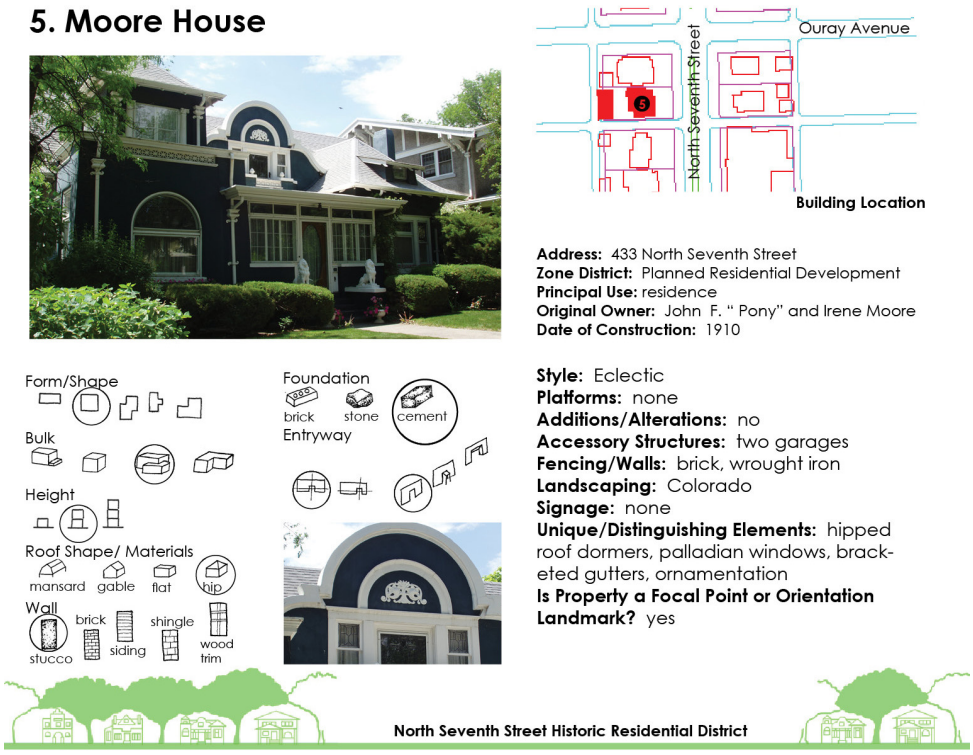
(3) Heman Bull House.



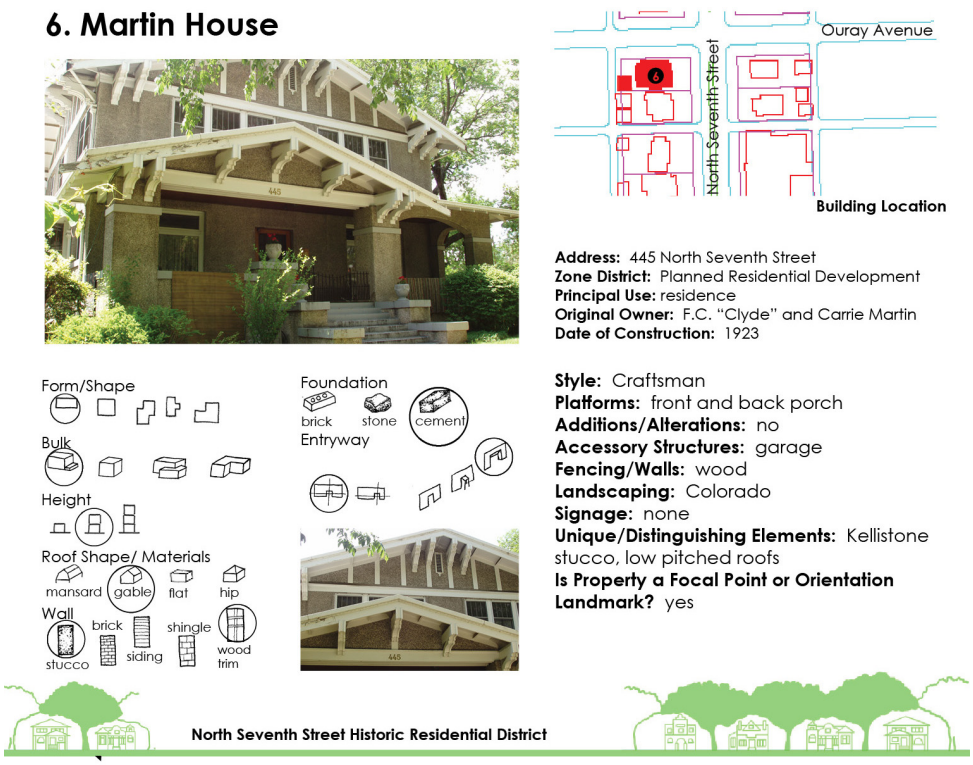
(4) Waren House.



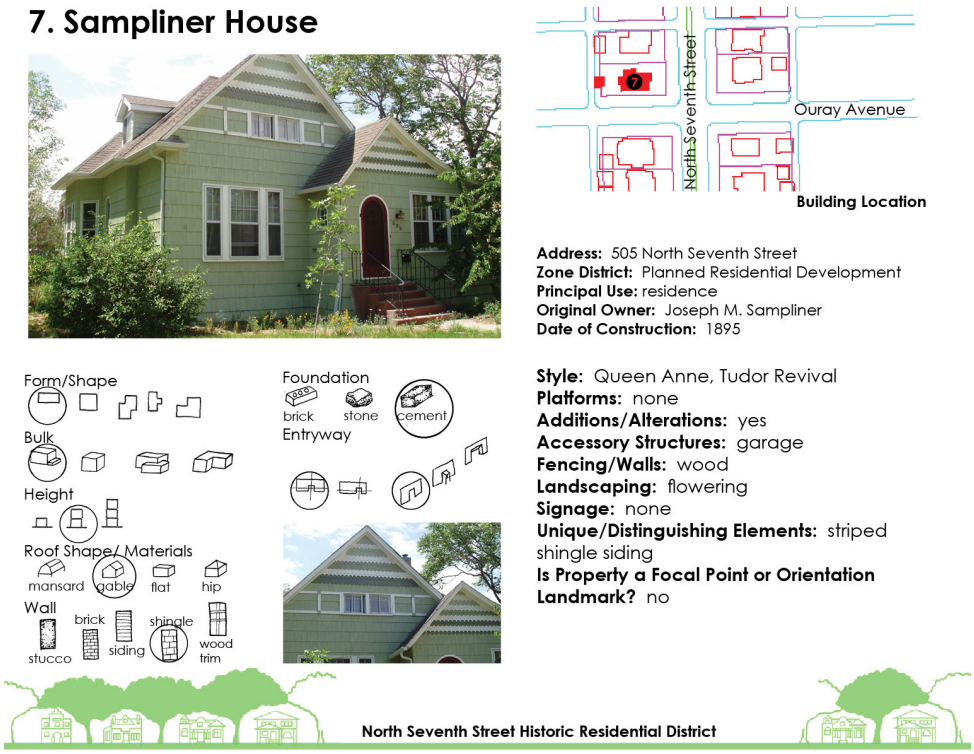
(5) Moore House.



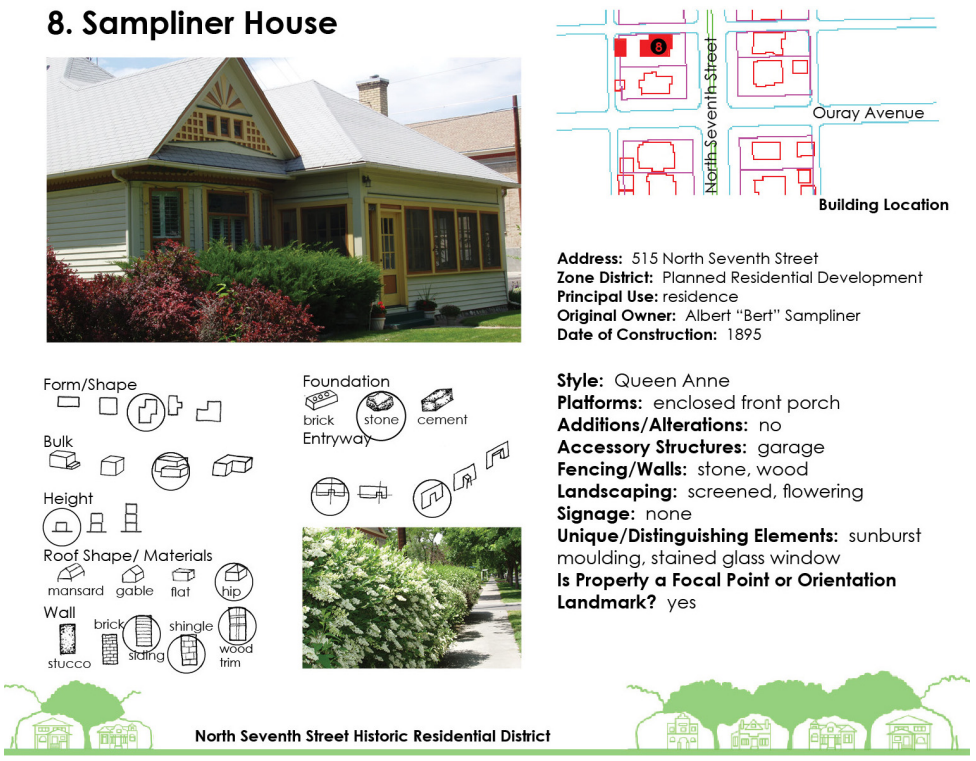
(6) Martin House.



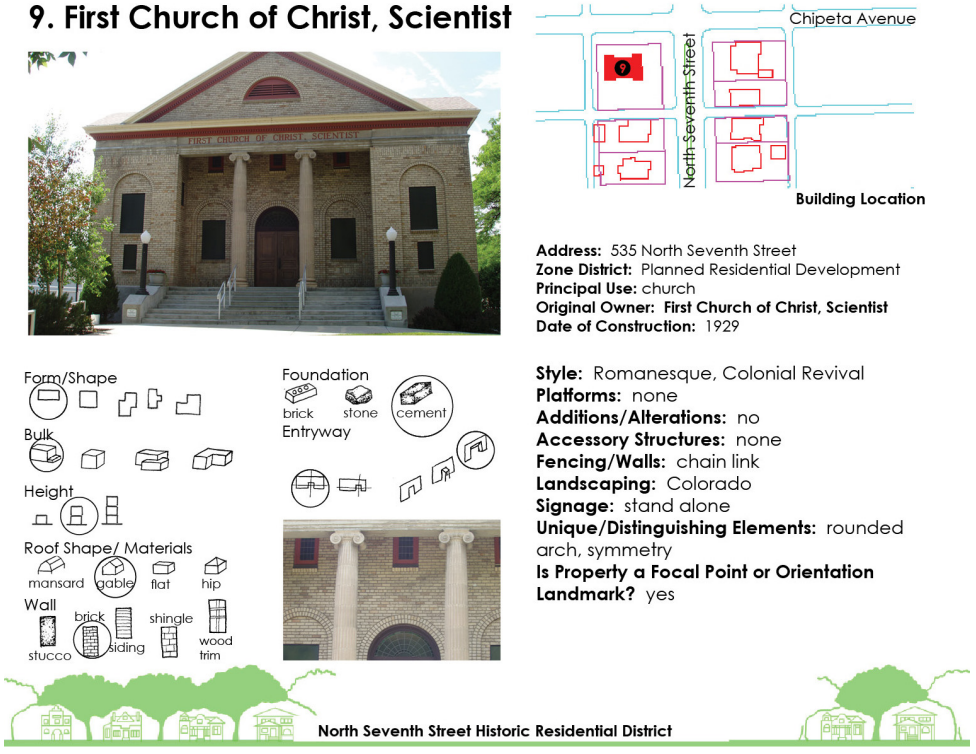
(7) Sampliner House.



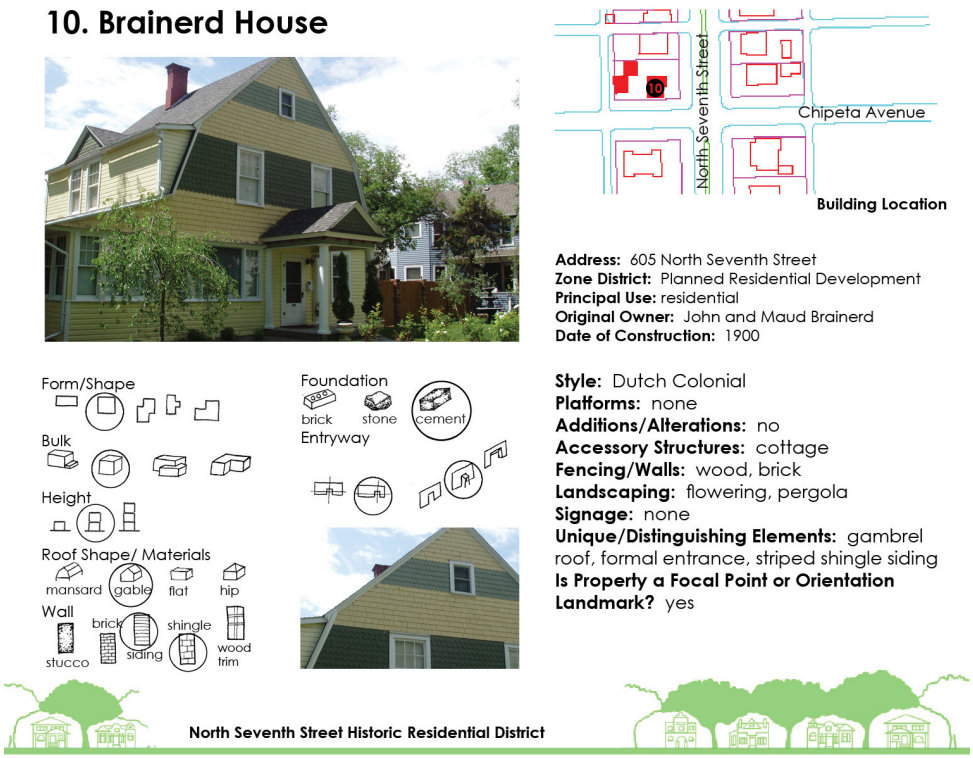
(8) Sampliner House.



(9) First Church of Christ, Scientist.



(10) Brainerd House.

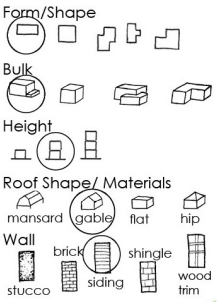


(11) Blackstone House.

11. Blackstone House

Building Location

Address: 611 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Leamon E. Blackstone
Date of Construction: 1904

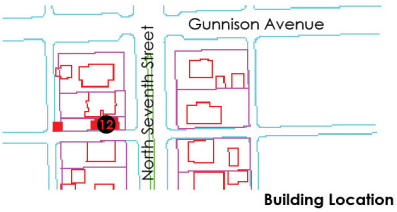


Style: Colonial Revival
Platforms: front porch
Additions/Alterations: no
Accessory Structures: garage
Fencing/Walls: wood
Landscaping: minimal
Signage: none
Is Property a Focal Point or Orientation Landmark? no

North Seventh Street Historic Residential District

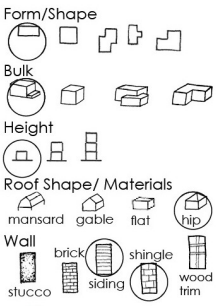
(12) Honeymoon Cottage.

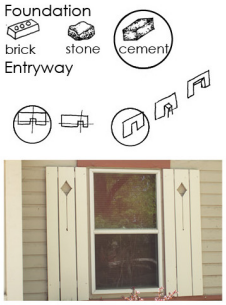
12. Honeymoon Cottage



Building Location

Address: 621 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Albert A. Miller
Date of Construction: 1904

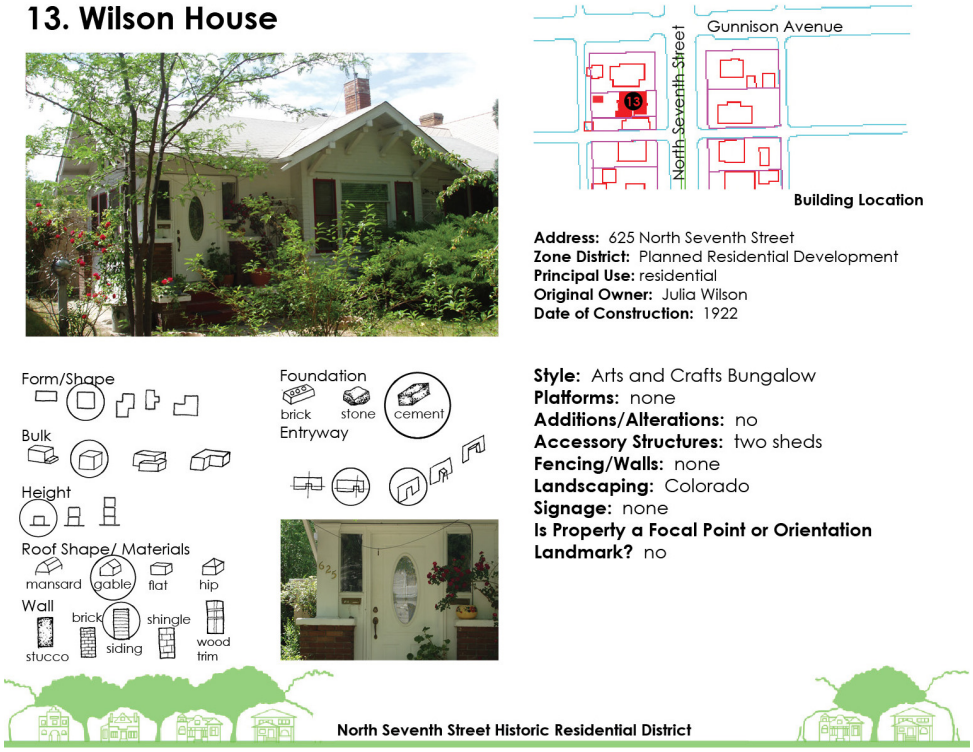




Style: Arts and Crafts Bungalow
Platforms: glassed front porch
Additions/Alterations: no
Accessory Structures: garage
Fencing/Walls: wood
Landscaping: deciduous
Signage: none
Is Property a Focal Point or Orientation Landmark? no

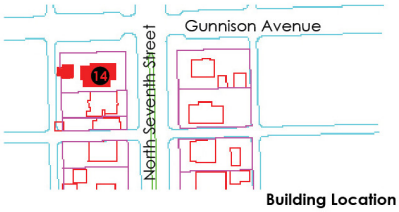
North Seventh Street Historic Residential District

(13) Wilson House.



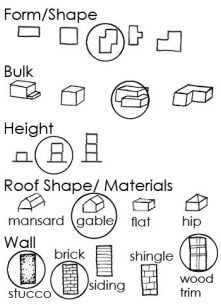
(14) Murr House.

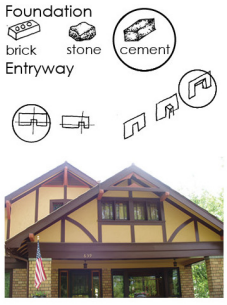
14. Murr House



Building Location

Address: 639 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: William and Hatti G. Murr
Date of Construction: 1926 by Winterburn and Lumsden





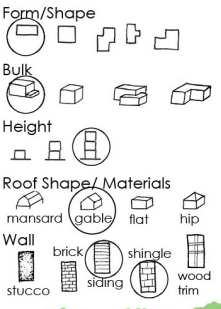
Style: Bungalow Arts and Crafts
Platforms: front porch
Additions/Alterations: no
Accessory Structures: garage
Fencing/Walls: wood
Landscaping: flowering, Colorado
Signage: none
Unique/Distinguishing Elements: wood and stucco gables, facade color palette
Is Property a Focal Point or Orientation Landmark? yes

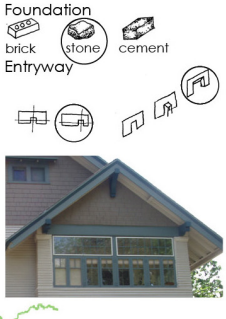
(15) Wickersham House.

15. Wickersham House

Building Location

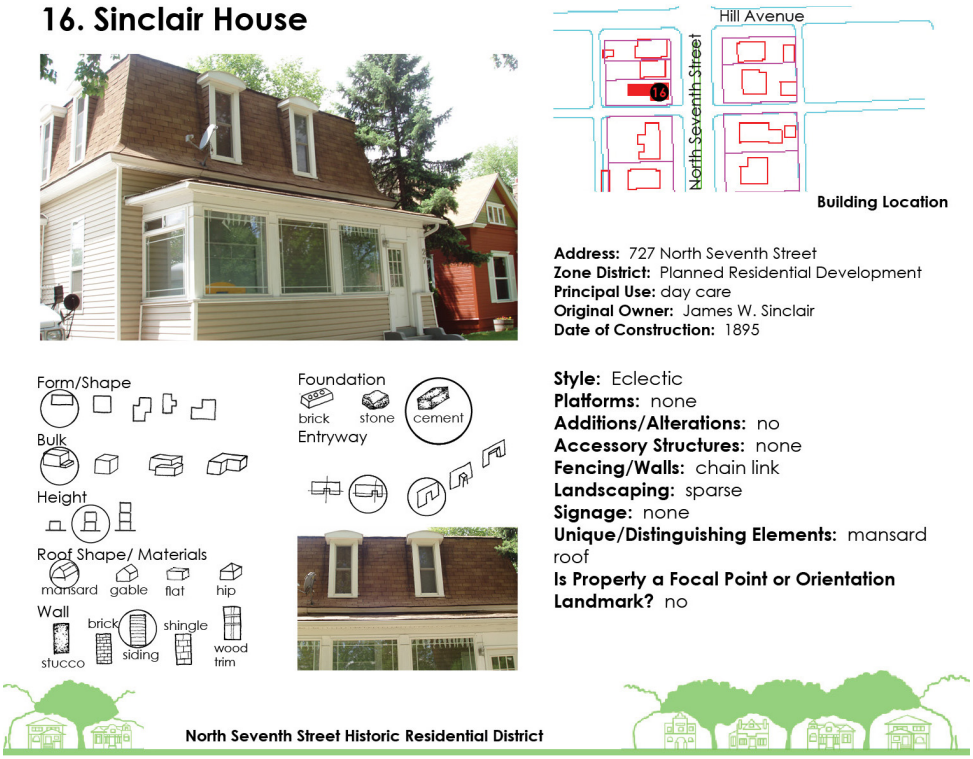
Address: 707 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Lincoln and Ruth Wickersham
Date of Construction: 1910





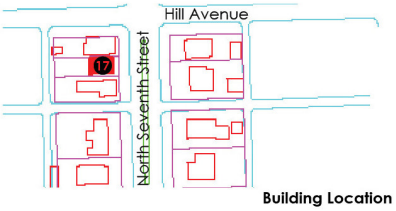
Style: Craftsman
Platforms: front porch
Additions/Alterations: no
Accessory Structures: garage
Fencing/Walls: wood
Landscaping: flowering
Signage: none
Unique/Distinguishing Elements: fenestration, simplicity
Is Property a Focal Point or Orientation Landmark? yes

(16) Sinclair House.



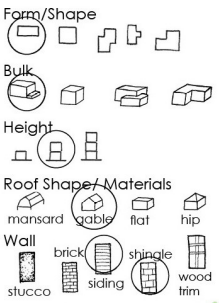
(17) Lough House.

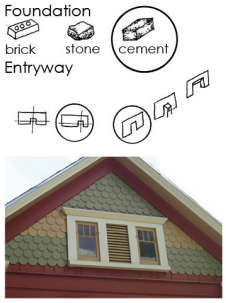
17. Lough House



Building Location

Address: 731 North Seventh Street
Zone District: Planned Residential Development
Principal Use: day care
Original Owner: Clarence Lough
Date of Construction: 1909





Style: Queen Anne
Platforms: none
Additions/Alterations: no
Accessory Structures: shed
Fencing/Walls: chain link
Landscaping: minimal
Signage: attatched
Unique/Distinguishing Elements: near mirror image layout to 739 North Seventh
Is Property a Focal Point or Orientation Landmark? no

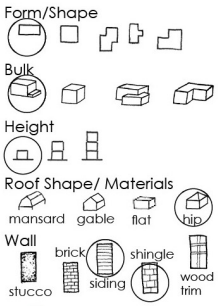
North Seventh Street Historic Residential District

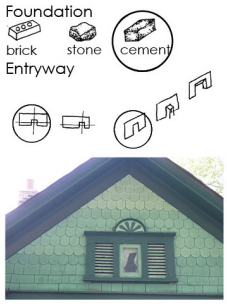
(18) Houskins House.

18. Houskins House

Building Location

Address: 739 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Owen W. Houskins
Date of Construction: 1909

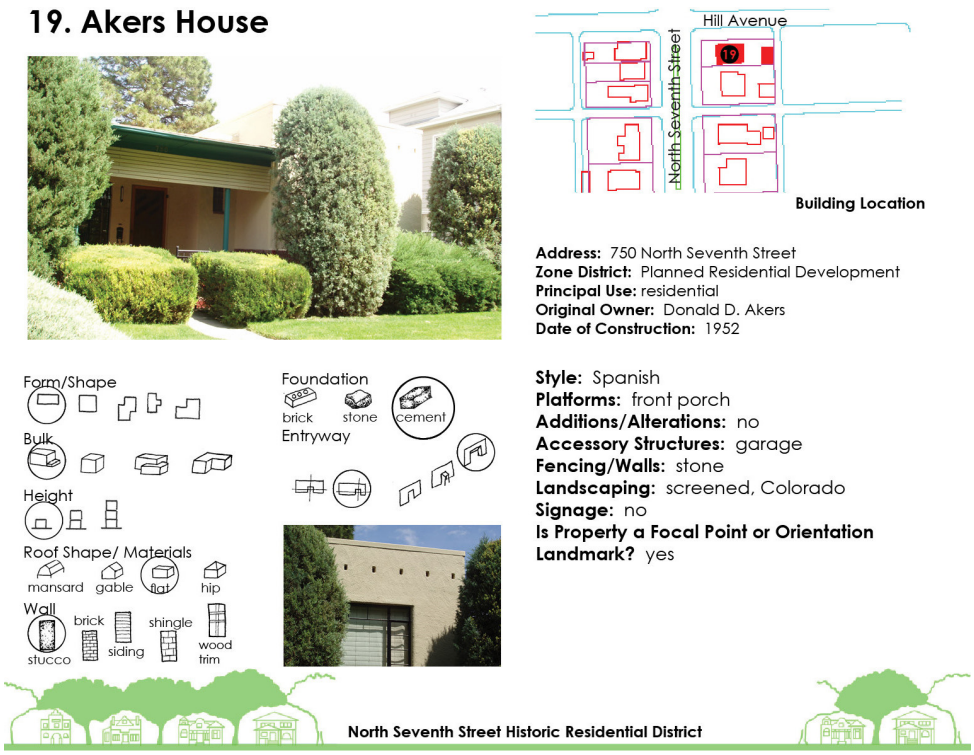




Style: Queen Anne
Platforms: glassed front porch
Additions/Alterations: no
Accessory Structures: garage
Fencing/Walls: brick, wood
Landscaping: sparse
Signage: none
Unique/Distinguishing Elements: near mirror image layout to 731 North Seventh
Is Property a Focal Point or Orientation Landmark? no

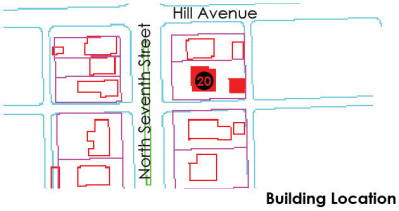
North Seventh Street Historic Residential District

(19) Akers House.



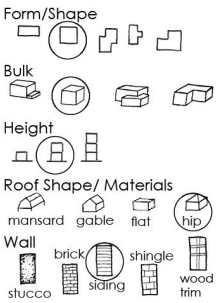
(20) Davis House.

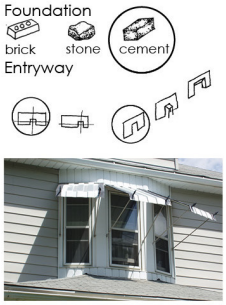
20. Davis House



Building Location

Address: 726 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Alfred H. Davis
Date of Construction: 1909





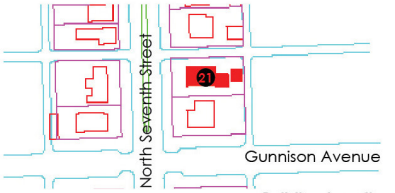
Style: Eclectic
Platforms: enclosed front porch
Additions/Alterations: yes
Accessory Structures: garage *
Fencing/Walls: stone *
Landscaping: minimal
Signage: no
Is Property a Focal Point or Orientation Landmark? no

* Stone work done by well known western slope mason Nunzio Grasso

North Seventh Street Historic Residential District

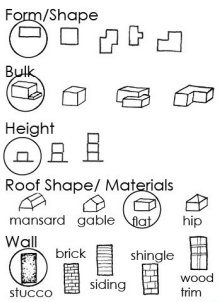
(21) Home Loan Duplex.

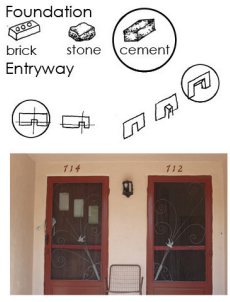
21. Home Loan Duplex



Building Location

Address: 712 and 714 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Home Loan and Investment Co.
Date of Construction: 1931

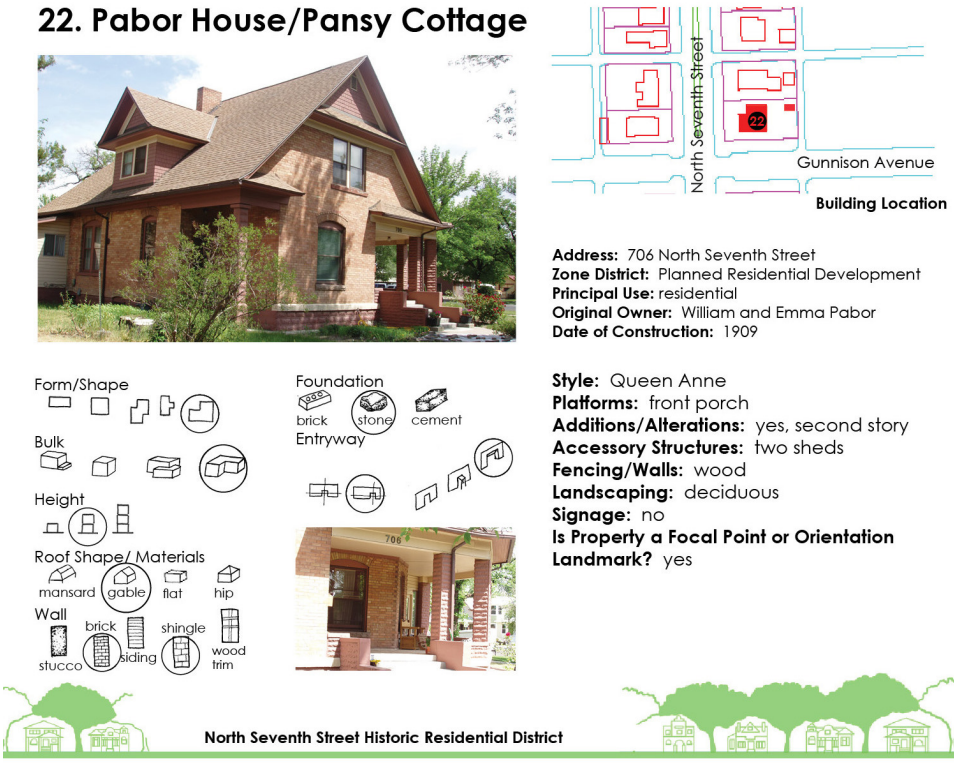




Style: Southwestern
Platforms: none
Additions/Alterations: no
Accessory Structures: garage
Fencing/Walls: chain link
Landscaping: Colorado
Signage: no
Unique/Distinguishing Elements: first duplex built in Grand Junction
Is Property a Focal Point or Orientation Landmark? no

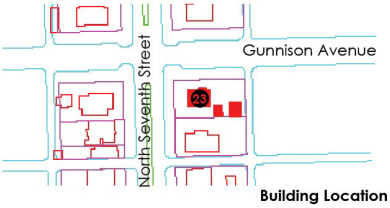
North Seventh Street Historic Residential District

(22) Pabor House/Pansy Cottage.



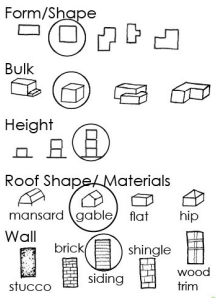
(23) Ferbrache House.

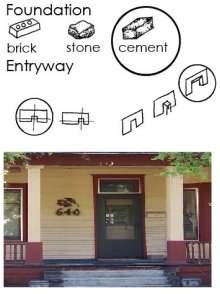
23. Ferbrache House



Building Location

Address: 640 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: C.F. Ferbrache
Date of Construction: 1905





Style: Colonial Revival
Platforms: front porch
Additions/Alterations: no
Accessory Structures: garage, shed
Fencing/Walls: wood, chain link
Landscaping: screened, Colorado
Signage: no
Unique/Distinguishing Elements: color palette, heavily shaded
Is Property a Focal Point or Orientation Landmark? yes

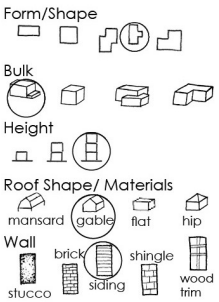
North Seventh Street Historic Residential District

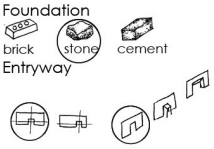
(24) Barkuloo House.

24. Barkuloo House

Building Location

Address: 626 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Henry S. Barkuloo
Date of Construction: 1900

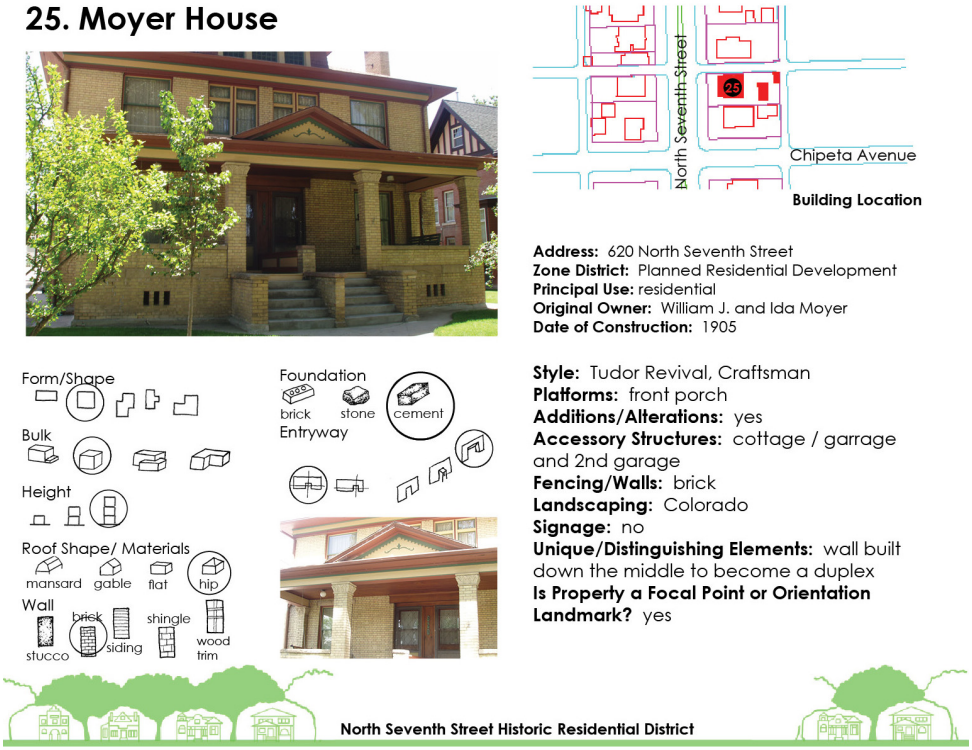




Style: Colonial Revival
Platforms: none
Additions/Alterations: yes
Accessory Structures: none
Fencing/Walls: none
Landscaping: none
Signage: no
Is Property a Focal Point or Orientation Landmark? no

North Seventh Street Historic Residential District

(25) Moyer House.

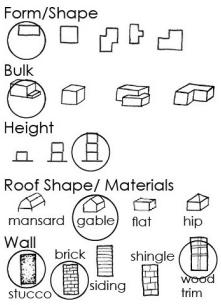


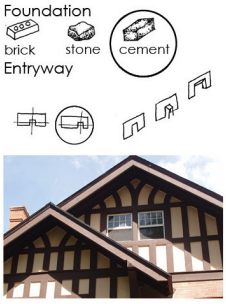
(26) Talbert House.

26. Talbert House

Building Location

Address: 604 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Vernon C. Talbert
Date of Construction: 1906



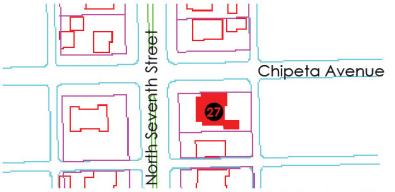


Style: Tudor Revival
Platforms: covered side porch
Additions/Alterations: no
Accessory Structures: garage
Fencing/Walls: wood
Landscaping: flowering, Colorado
Signage: no
Unique/Distinguishing Elements: stucco and stained timber gables
Is Property a Focal Point or Orientation Landmark? yes

North Seventh Street Historic Residential District

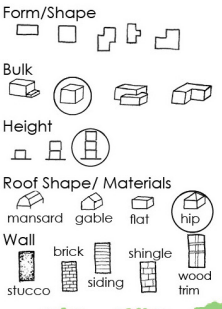
(27) Smith-Schmidt House.

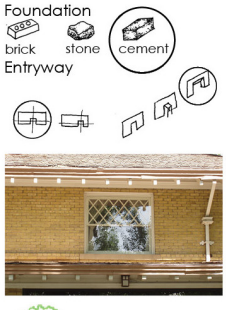
27. Smith-Schmidt House



Building Location

Address: 536 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Henry Barkuloo
Date of Construction: 1912

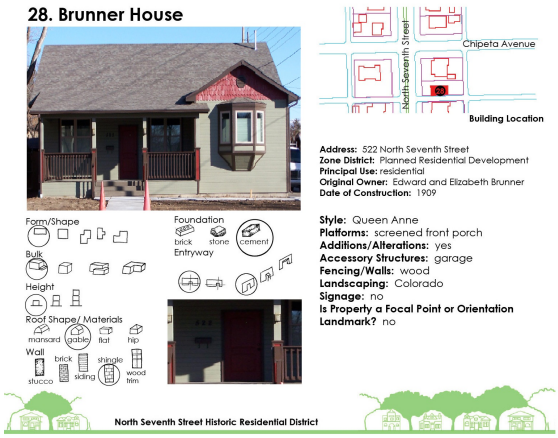




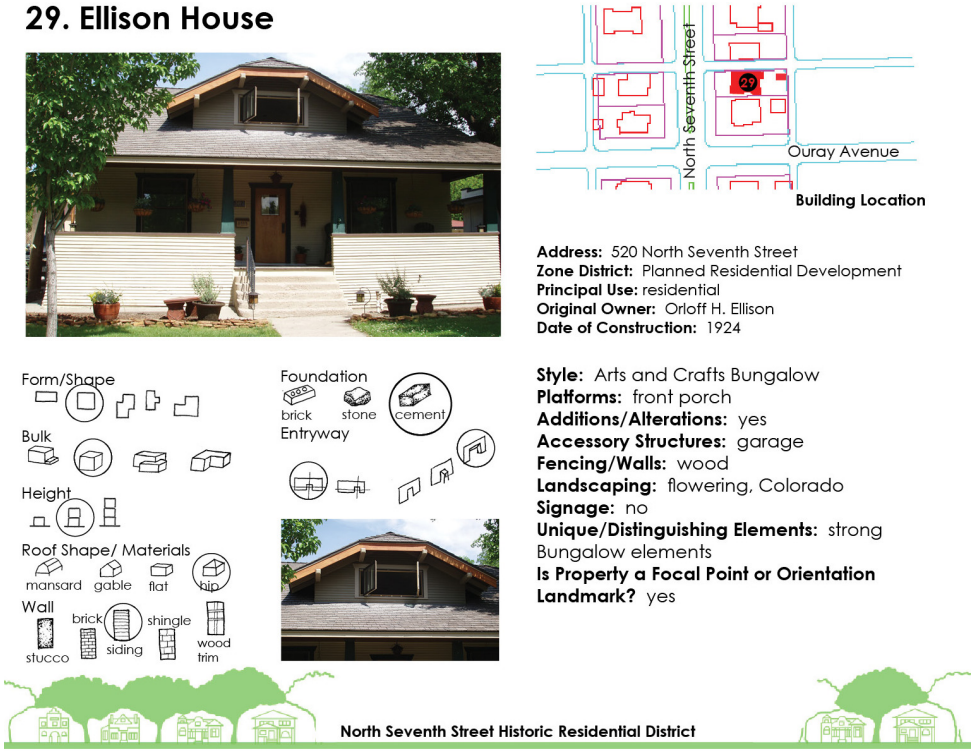
Style: Tudor Revival, Craftsman
Platforms: glassed front porch
Additions/Alterations: no
Accessory Structures: none
Fencing/Walls: wood
Landscaping: Colorado
Signage: no
Unique/Distinguishing Elements: unique fenestration and bracketed gutters
Is Property a Focal Point or Orientation Landmark? yes

North Seventh Street Historic Residential District

(28) Brunner House.

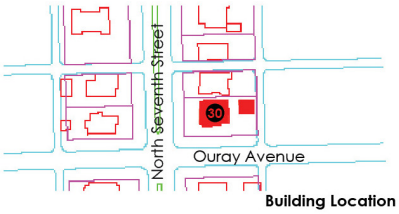


(29) Ellison House.



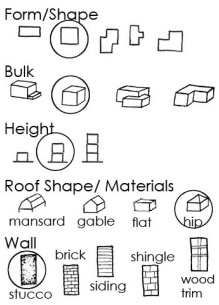
(30) Sickenberger House.

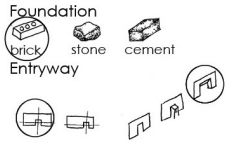
30. Sickenberger House



Building Location

Address: 710 Ouray Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Jesse Urban Sickenberger
Date of Construction: 1923

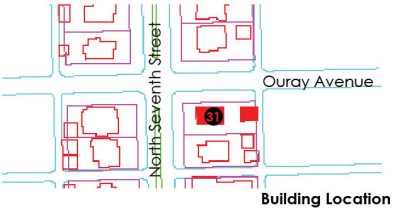




Style: Spanish, Craftsman
Platforms: covered entry
Additions/Alterations: no
Accessory Structures: garage
Fencing/Walls: chain link
Landscaping: flowering, Colorado
Signage: no
Unique/Distinguishing Elements: strong horizontal lines
Is Property a Focal Point or Orientation Landmark? yes

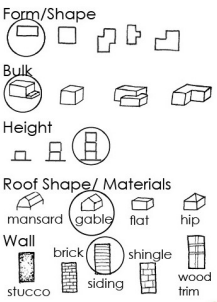
(31) Smith-Jordan House.

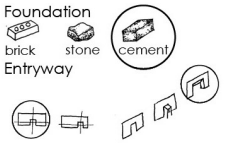
31. Smith-Jordan House



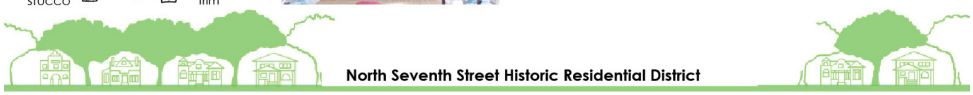
Building Location

Address: 440 North Seventh Street
Zone District: Planned Residential Development
Principal Use: residential
Original Owner: Wiliam and Eva Smith
Date of Construction: 1902

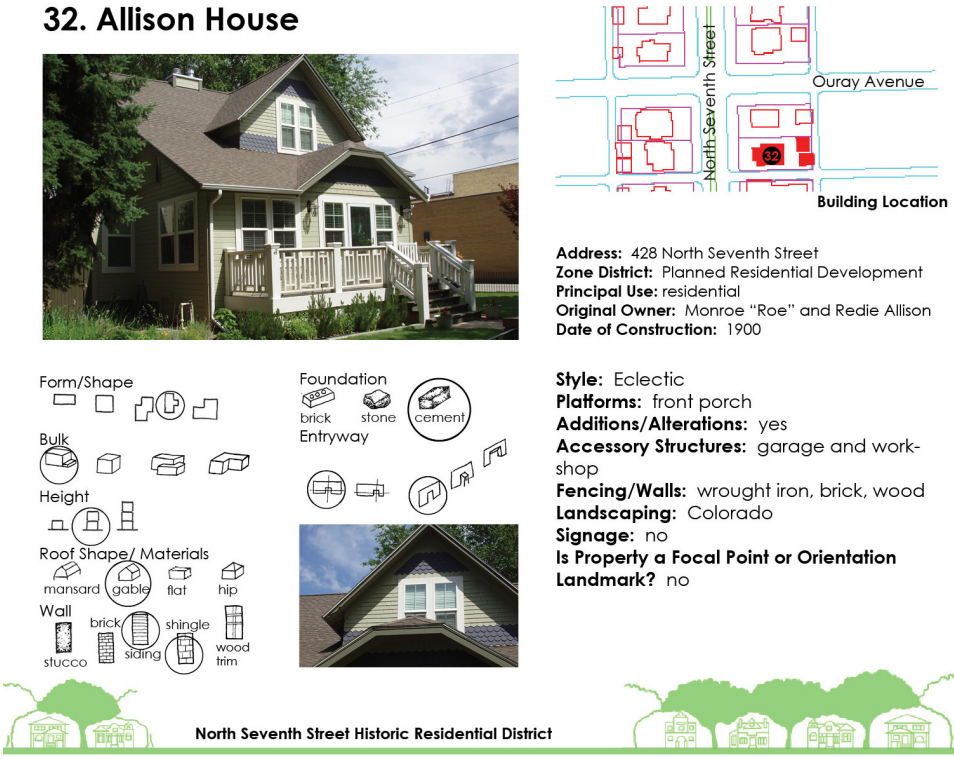




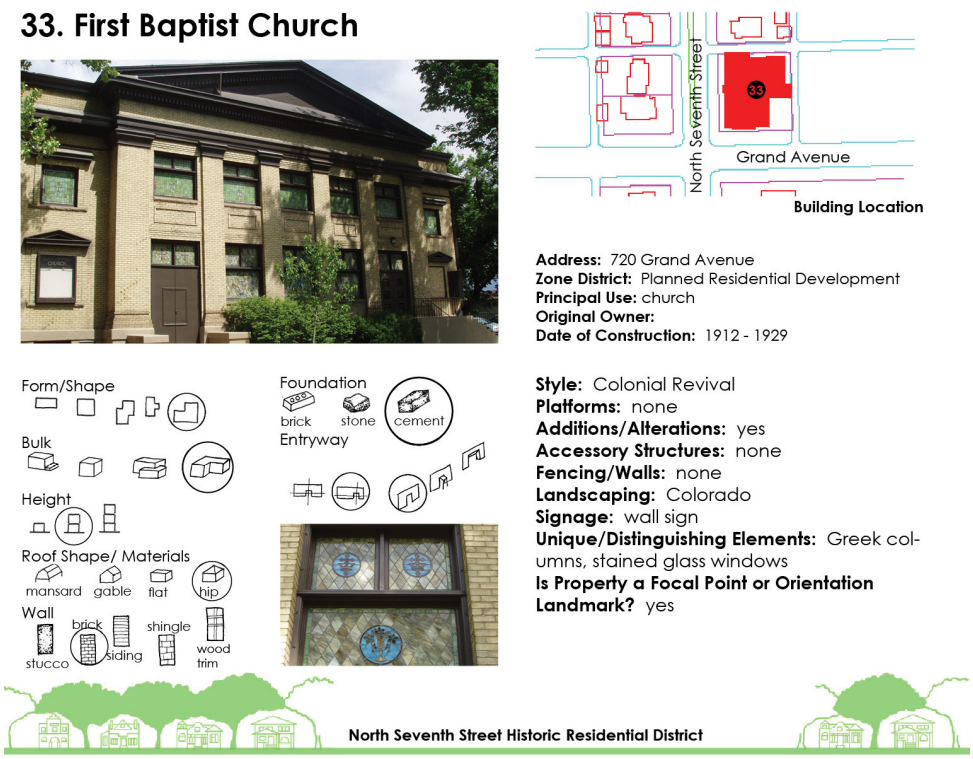
Style: Colonial Revival
Platforms: front porch
Additions/Alterations: no
Accessory Structures: garage, cottage
Fencing/Walls: wrought iron, brick
Landscaping: flowering, Colorado
Signage: no
Unique/Distinguishing Elements: color palette, front door detailing, yard sculptures
Is Property a Focal Point or Orientation Landmark? yes



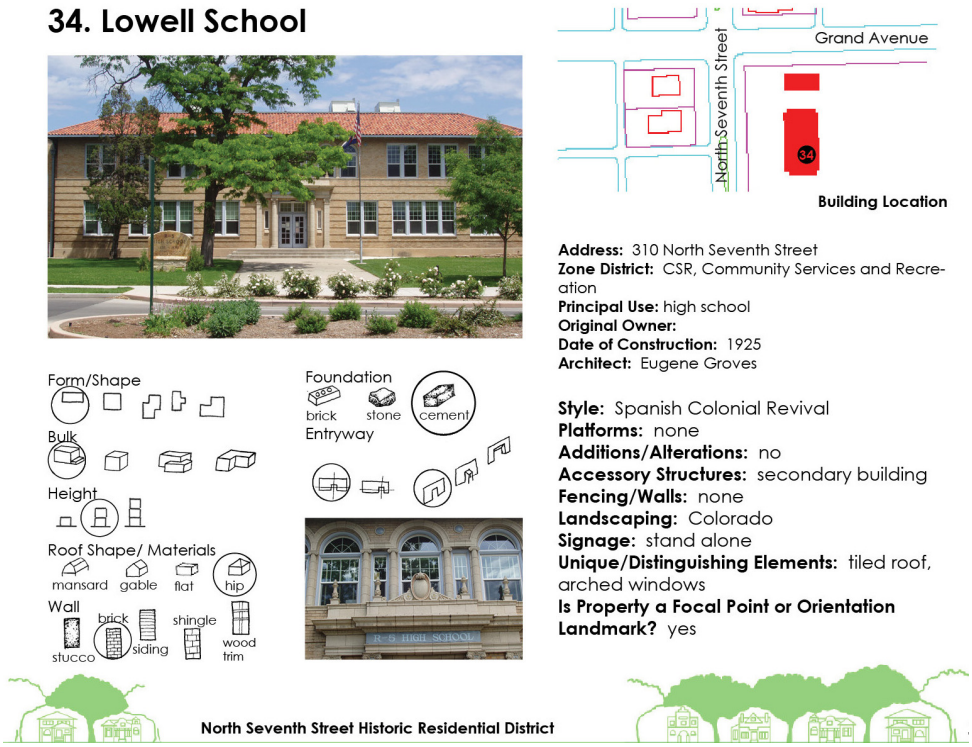
(32) Allison House.



(33) First Baptist Church.



(34) Lowell School.



(Ord. 4508, 3-21-12)

§ 26.36.020. Appendix B – Terms and definitions.

Accessory dwelling unit means a dwelling unit which is secondary to a principal dwelling unit and which may be attached to the principal structure or freestanding.

Accessory structure means a detached subordinate structure, the use of which is customarily incidental to, and supportive of, the principal structure or the principal use of the land, and which is located on the same parcel of ground with the principal structure or use.

Addition means:

(1) A structure added to the original structure at some time after certificate of occupancy has been issued for the original structure;

(2) An extension or increase in floor area or height of a building or structure.

Adjacent means property or use, any portion of which is within a 100-foot radius. Public right-of-way, easements, canals or waste ditches, and waterways are not counted when deciding if one property or use is adjacent to another.

Alignment means the arrangement of objects along a straight line.

Alley setback means the minimum distance from the alley property line that any permanent construction can be built. See also rear yard setback in GJMC Title 21, Zoning and Development Code.

Alter or *alteration* means any proposed modification to a designated historic site, structure or district which could have an effect on the character of the historic resource relative to the criteria by which it was designated. Examples of alterations for structures may include additions or any exterior modifications, including signage to be affixed to the facade.

At-grade means level of a road, building, or other structure at the same grade or level as the adjoining property (as opposed to a depressed or elevated road, building, or other facility).

Banner means any sign intended to be hung, either with or without frames, possessing characters, letters, illustrations or ornamentations applied to paper, plastic or fabric of any kind.

Example of Banner

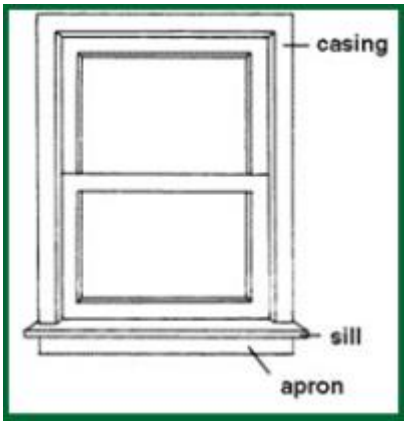
Building means any structure used or intended for supporting or sheltering any use or occupancy.

Building footprint means the portion of a lot covered by a building or structure at the surface level, measured on a horizontal plane.

Building mass means the three-dimensional bulk of a building: height, width, and depth.

Building placement means the location of the structure in relation to property lines.

Casings means the framework around a door or window.



Example of Casings

Cohesiveness means:

(1) The state of cohering or sticking together.

(2) Causing symmetry and balance through design.

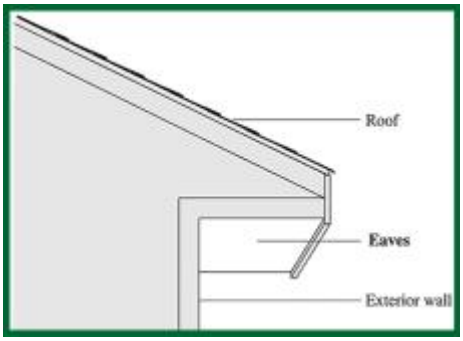
Congruous means corresponding in character or kind; appropriate or harmonious.

Contiguous means next to, abutting, or touching and having a boundary, or portion thereof, that is coterminous.

Contributing structure means a structure that already adheres to and/or complies with these Guidelines and Standards in their entirety at the time of adoption.

Design means a visual arrangement or disposition that indicates a signature motif.

Eaves means the lowest, overhanging part of a sloping roof.



Example of Eaves

Exterior features include the architectural style, general design and general arrangement of the exterior of a building or other structure, including the color, the kind and texture of the building material and type and style of the windows, door, light fixtures, signs, other appurtenant fixtures and natural features such as trees and shrubbery.

Facade means the exterior walls of a building exposed to public view or that wall viewed by persons not within the building.

Feeling, integrity. *Historic integrity* is the ability of a site to retain its identity and, therefore, convey its significance in the history of Grand Junction, Colorado.

Form means the overall shape of a structure.

Gable means the vertical triangular portion of the end of a building having a double-sloping roof, from the level of the cornice or eaves to the ridge of the roof.

Gabled roof means a roof having a gable at one or both ends.

Example of Gabled Roof

Grandfathering/grandfathered describes the status accorded certain properties, uses, and activities that are legally existing prior to the date of adoption of the zoning ordinance or provisions of the zoning ordinance.

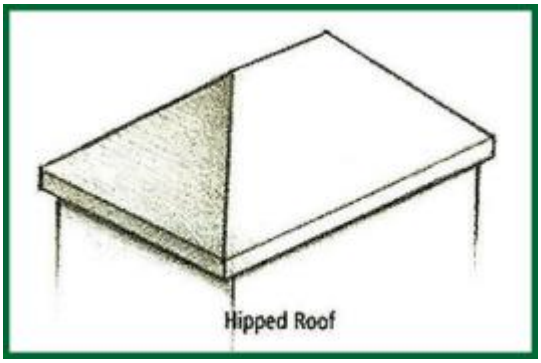
Ground plane means the level of an entry platform into a building.

Guidelines are permissive statements intended to be used as recommendations by homeowners and boards in making decisions.

Height of structure means the vertical distance from the grade to the highest point of any portion of a structure.

Height-width ratio means the ratio of the height of the structure to the width of the structure.

Hipped roof means a roof that slopes upward from all four sides of a building, requiring a hip rafter at each end.



Example of Hipped Roof

Historic property means the research, protection, restoration and rehabilitation of buildings, structures, landmarks, signs, appurtenances, objects, districts, areas and sites significant in the history, archeology, education or culture of the City, State or nation.

Horizontal rhythm means the pattern of shapes, spaces and textures of a structure across a horizontal plane.

Inset means:

(1) Something inserted; insert.

(2) A small picture, map, etc., inserted within the border of a larger one.

(3) To set in or insert.

Integrity. A property retains its *integrity* if a sufficient percentage of the structure dates from the period of significance. The majority of a building's structural system and materials should date from the period of significance and its character-defining features also should remain intact. These may include architectural details, such as dormers and porches, ornamental brackets and moldings and materials, as well as the overall mass and form of the building.

Lot coverage means that area of the lot or parcel which may be occupied by principal and accessory structures, and other impervious surfaces.

Mass means the physical size and bulk of a structure.

Massing means the bulk or size of a structure.

Materials, as related to the determination of "integrity" of a property, refers to the physical elements that were combined or deposited in a particular pattern or configuration to form an historic property.

Median means an area in the approximate center of a City street or State highway that is used to separate the directional flow of traffic, may contain left-turn lanes, and is demarcated by curb and guttering, having painted or thermally applied stripes or other means of distinguishing it from the portion of the roadway used for through traffic.

Metal louvered door means a metal door with fitted or fixed horizontal slats for admitting air and light and shedding rain.

Example of Metal Louvered Door

Mill. A mill finish is the natural appearance of the aluminum as it comes from the rolling mill or the extrusion mill. Often this finish is dull, grainy and without luster.

New construction means any construction of an entirely new structure, construction of an addition to an existing structure or an exterior alteration to an existing structure.

Nonconforming means a legal use, structure, and/or development which existed prior to the adoption of this code or any amendment thereto, which does not presently conform to this code or its amendments.

Nonconforming structure or building means a structure or building, the size, dimension, or location of which was lawful prior to the adoption, revision, or amendment to the zoning ordinance but that fails by reason of such adoption, revision, or amendment to conform to the present requirements of the zoning district.

Nonconforming use means a use or activity that was lawful prior to the adoption, revision or amendment of the zoning ordinance but that fails by reason of such adoption, revision, or amendment to conform to the present requirements of the zoning district.

Noncontributing structure means:

(1) A structure that has undergone significant alterations.

(2) A noncontributing building, site, structure or object does not add to the historic architectural qualities, historic associations, or archeological values for which a property is significant because (i) it was not present during the period of significance and does not possess historic integrity reflecting its character at that time or is not capable of yielding important information about the period, or (ii) it does not individually meet the National Register eligibility criteria.

Opacity means:

(1) The screening effectiveness of a buffer yard or fence expressed as the percentage of vision that the screen blocks.

(2) The degree to which a material blocks light.

Ordinance means an authoritative rule or law; a public injunction or regulation.

Orientation. Generally, *orientation* refers to the manner in which a building relates to the street. The entrance to the building plays a large role in the orientation of a building; whereas, it should face the street.

Overhang means a projection of the roof or upper story of a building beyond the wall of the lower part.

Parapet means a low guarding wall at any point of sudden drop, as at the edge of a terrace, roof, balcony, etc.

Example of a Parapet

Park strip means the space in the public right-of-way between the back of the curb and the sidewalk.

Photovoltaic panel means a solar panel or solar collectors designed to absorb solar radiation and convert it into electricity.

Portico means a walkway or porch with a roof supported by columns, often at the entrance of a building.

Example of a Portico

Principal structure means the structure in which the principal use of a property is conducted. This shall include any buildings which are attached to the principal structure by a covered structure.

Projecting bay. A *bay window* is a window space projecting outward from the main walls of a building and forming a bay in a room, either square or polygonal in plan.

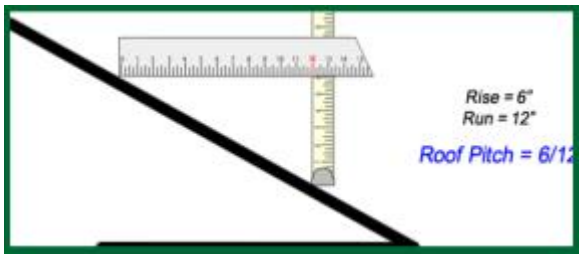
Example of Projecting Bay

Public hearing means a public meeting of a board, Planning Commission, City Council or their representatives where the public may attend.

Public right-of-way means any street, road, highway, alley, pedestrian/bicycle way or other special purpose way or utility installation owned by, or reserved to, the public for present or future public use.

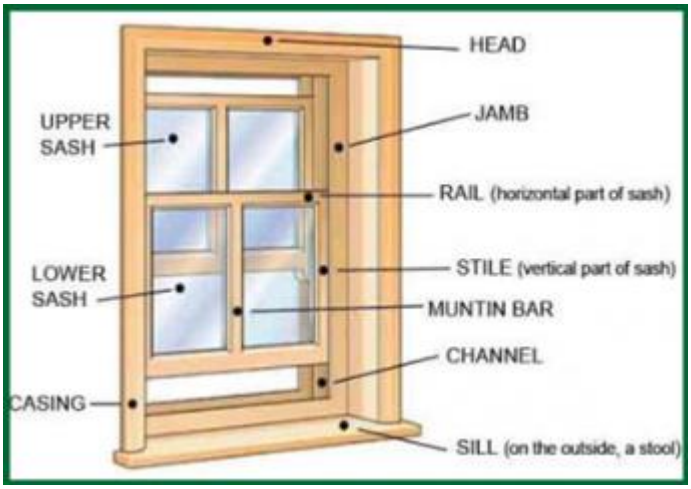
Rhythm means orderly reoccurrence of elements of design with possible variety and variation.

Roof pitch means the amount of slope of the roof in terms of angle or other numerical measure; one unit of vertical rise for three units of horizontal shelter is expressed as "1 in 3."



Example of Roof Pitch

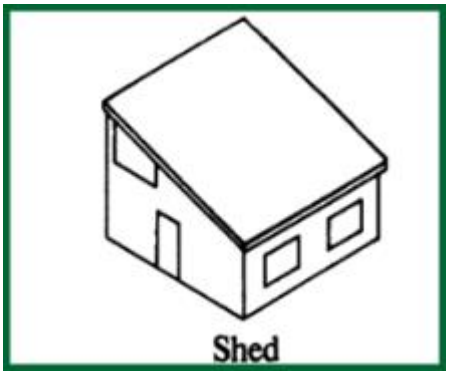
Sash means the movable part of a window holding the glass.



Example of Sash

Setback means the minimum distance between a structure and a property line of a parcel of land or other established reference point.

Shed roof means a flat roof that slopes in one direction and may lean against another wall or building. Also known as lean-to roof.

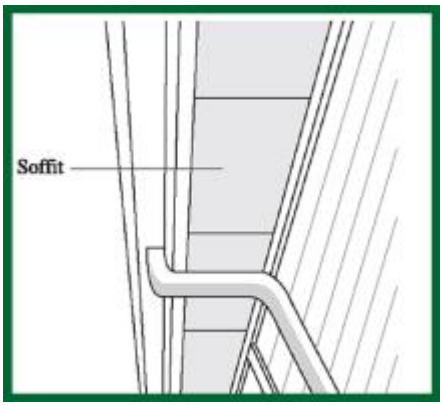


Example of Shed Roof

Siting means the position or location of a town, building, etc., especially as to its environment.

Slope ratio means the same as *roof pitch*. The amount of slope of the roof in terms of angle or other numerical measure; one unit of vertical rise for three units of horizontal shelter is expressed as "1 in 3."

Soffit means the underside of an architectural feature, as a beam, arch, ceiling, vault, or cornice.



Example of Soffit

Solid-to-void ratio means, on a building facade, the ratio of solid space to voids, such as windows, door and other openings.

Standard means a mandatory provision of a development regulation.

Streetscape means the landscaping and other manmade objects located within the public right-of-way which add variety and are placed for aesthetic purposes as well as functional, pedestrian guidance and traffic control.

Subservient means serving or acting in a subordinate capacity; subordinate.

Transom means:

(1) A small, hinged window above another window or a door; the horizontal crosspiece to which such a window is hinged.

(2) A window or group of windows located above a door or larger window.

Example of Transom

Vertical rhythm means the pattern of shapes, spaces and textures of a structure across a vertical plane.

Vista means a view or prospect, especially one seen through a long, narrow avenue or passage, as between rows of trees or houses.

Xeriscape means environmental design of residential and park land using various methods for minimizing the need for water use.

Example of Xeriscape

Zoning means a mapped area with a particular set of rules and regulations which limits the types of uses.

(Ord. 4508, 3-21-12)

§ 26.36.030. Appendix C – Incentives for historic preservation in Grand Junction.

(a) The State Historical Fund. The State Historical Fund is a statewide grants program that was created by the 1990 constitutional amendment allowing limited gaming in the towns of Cripple Creek, Central City and Black Hawk. The amendment directs that a

portion of the gaming tax revenues be used for historic preservation throughout the state.

Competitive grants (aka general grants) are made for any of the three project types: acquisition and development, education and survey and inventory.

There are three essential elements to applying for a competitive State Historical Fund Grant:

(1) You need to be or work with an eligible grant applicant.

(2) If you are planning to do physical work on a structure, building, site or object, the resource must be historically designated. If this is a survey and planning, archaeological survey or education project, the focus of your project must be directly related to historic preservation.

(3) You need to apply for projects, activities and costs that qualify for assistance from the State Historical Fund.

Additional information concerning the selection process is available in the "Grant Program Guidelines" section of the Colorado State Historic Society web site:

http://www.historycolorado.org/grants/grants

(b) Tax Incentives for Historic Preservation. Federal and State tax laws provide tax incentives for historic preservation projects that follow the Secretary of the Interior's Standards for Rehabilitation. The federal government offers a 20 percent investment tax credit for the approved rehabilitation of certified historic buildings used for income-producing purposes as well as a 10 percent credit for certain other older buildings. The State offers a similar 20 percent state income tax credit based on $5,000 or more of approved preservation work on designated properties. Applicants are urged to contact Office of Archaeology and Historic Preservation (OAHP) at the State Historic Society as early as possible when considering an application for either federal or State tax credits. OAHP provides advice to property owners, developers and architects concerning appropriate preservation and rehabilitation measures. OAHP staff review applications for tax incentives and make recommendations for approval.

In 2008 the Colorado Legislature extended the State tax credit through 2019.

(c) Housing Rehabilitation and Weatherization Through Housing Resources of Western Colorado. Housing rehabilitation and weatherization projects in Grand Junction which meet low income guidelines are eligible for assistance through Housing Resources of Western Colorado:

http://www.housingresourceswc.org/

(Ord. 4508, 3-21-12)

§ 26.36.040. Appendix D – Frequently asked questions.

(a) Do the North Seventh Street Historic Residential District Guidelines and Standards force me to make changes in my house?

No, there will not be a requirement to change anything in your house, exterior or interior, unless you are doing a remodel or new construction.

(b) Do the North Seventh Street Historic Residential District Guidelines and Standards affect new construction or remodels?

The North Seventh Street Historic Residential District Guidelines and Standards will give guidance to homeowners and land owners who wish to remodel or do new construction on the exterior of their houses and structures. It does not affect changes you make in the interior of your house.

(c) What land uses will be allowed in the Historic District?

All of the land uses allowed in the RM-8 Residential Medium Zone District will be allowed.

(d) What incentives are there to homeowners to comply with these regulations?

There are several incentives to homeowners including:

(1) Grants under the State of Colorado Historic Fund;

(2) Tax incentives under Federal and State tax laws for historic preservation projects that follow the Secretary of the Interior's Standards for Rehabilitation;

(3) Housing rehabilitation and weatherization projects in Grand Junction which meet low income guidelines are eligible for assistance through Housing Resources of Western Colorado.

(Contact the City of Grand Junction's Neighborhood Services Division or Housing Resources of Western Colorado.)

(e) Will the North Seventh Street Historic Residential District Guidelines and Standards tell me what I can plant in my yard?

No, there are no requirements for what you can plant in your yard; however, there are suggestions and recommendations for landscaping that are compatible with the District. The proposed Seventh Street Historic District regulations suggest contacting Colorado State University Tri River Extension Service in Grand Junction for landscaping recommendations.

(http://www.coopext.colostate.edu/TRA/PLANTS/index.shtml)

(f) Will the North Seventh Street Historic Residential District Guidelines and Standards mean that it will take longer to get approval of my project?

Probably not. With the new North Seventh Street Historic Residential District Guidelines and Standards in place, most minor projects, which meet the requirements, can be approved at staff level or by the Grand Junction Historic Preservation Board and will not require a full public hearing with the City Council (as is now the case).

(g) What will be the effect of the proposed North Seventh Street Historic Residential District Guidelines and Standards on my property value?

National studies have shown that property values increase in historic districts faster than in nonhistoric districts and that rehabilitation of historic districts adds a positive stimulus to economic development. ("The Economics of Rehabilitation," by Donovan Rypkema; The National Trust for Historic Preservation)

(Ord. No. 5207, 3/20/2024; Ord. 4508, 3-21-12)

§ 26.36.050. Appendix E – Sample certificate of appropriateness.

CITY OF Grand Junction COLORADO
PUBLIC WORKS & PLANNING

Certificate of Appropriateness

North Seventh Street Historic Residential District

This box for office use only

File Number:_____ **Review Fee:** _____

This application is a request to construct, add, change or demolish a property within the North Seventh Street Historic Residential District as follows:

_____

_____

_____

APPLICANT INFORMATION

Applicant Name: _____

Are You? ___Owner ___ Buyer ___Lessee

Applicant's Mailing Address: _____

_____

Applicant's Phone: _____ **Email Address:** _____

Representative/Contact Person: _____

Representative/Contact Person Mailing Address: _____

_____

Rep/Contact Phone: _____ **Email Address:** _____

Address of Subject Property: _____ **Tax Parcel Number:** _____

Have you reviewed the North Seventh Street Historic Residential District Guidelines and Standards?

Yes _____ No _____

PROPOSAL AND PROPERTY INFORMATION

This application is a request to construct, add or change the following (check all that apply):

	Add	Change	Demolish	N/A
Roof/Chimney				
Walls/Siding				
Fascia/Other Trim				
Windows/Doors				
Porch				
Other (describe below)				

Fully explain the nature of your request:

_____

_____

_____

Number of Structures on Property: _____ Residential _____ Outbuildings

Total Gross Square Footage of Existing Structures (all floors): _____

Total Gross Square Footage of Proposed Structures or Additions (all floors): _____

Total Gross Square Footage of Existing Structures to be removed (all floors): _____

Existing Height to Building Eave: _____ **Existing Height to Building Peak:** _____

Proposed Height to Building Eave: _____ **Proposed Height to Building Peak:** _____

The existing building is a: _____ Single-Family Dwelling _____ Duplex

Other Multi-Unit_____ Other (specify): _____

Exterior Building Materials:

	Existing	Proposed
Roof	_____	_____
Walls/Siding	_____	_____
Doors	_____	_____
Fascia, Trim, Etc.	_____	_____
Other	_____	_____

Existing Windows:

Existing Material: _____

Existing Sill Depth: _____

Existing Window Type: Casement ____ Slider ____ Double-Hung ____ Single-Hung ____ Fixed ____ Divided Light ____ How many? ____ (e.g. 4 over 1, 3 over 1)

Proposed Windows:

Proposed Material: _____

Proposed Sill Depth: _____

Proposed Window Type: Casement ___ Slider __ Double-Hung ___ Single-Hung ___ Fixed ___ Divided Light ___ How many? ___ (e.g. 4 over 1, 3 over 1)

For proposed divided lights, please describe grid, including width, whether it is flat or contoured:

Will the exterior trim remain on the replacement windows? _____ Yes _____ No

SITE AND LANDSCAPE INFORMATION

Fencing:

	Existing	**Proposed**
Type		
Size/Height		
Location		

Are there any prominent trees or areas of vegetation on the property? If yes, what are the type, size and general location? _____

_____

_____

Does this application propose to remove or alter any of these prominent trees or vegetation areas? If so, which ones? And describe proposed change:

_____

_____

_____

_____

ADDITIONAL INFORMATION:

Are there other proposed changes not yet covered in the application? ____ Yes ____ No

If yes, please explain: _____

_____

_____

_____

_____

Signatures:

_____ _____

Property Owner Date

_____ _____

Representative Date

City Approval:

_____

Printed Name and Title

_____ _____

Signature Date

(Ord. 4508, 3-21-12)

§ 26.36.060. Appendix F – Authentic plants for late 19th/early 20th century period landscaping.

Authentic Plants for Late 19th/Early 20th Century Period Landscaping

Shrubs, trees and vines

American Hornbeam
Asiatic Bittersweet Vine
Bittersweet
Flowering Quince
American Yellow-wood

Clematis

Red-Twigged Dogwood
Rock-Spray
Cock-Spur Thorn
Tulip Tree

Slender Deutzia

Euonymus
American or European Beech
Ginkgo
Honey Locust
Kentucky Coffee Tree
European Ash
Amur Privet

Common Laburnum

Weeping Willow
Blue Spruce
Mugho Pine
Dwarf Scotch Pine
Sycamore
Double Flowering Plums
Sargent Cherry
Crabapple

Scarlet Firethorn

Leatherleaf Mahonia
Fragrant Sumac
Cut-Leaved Sumac
Rose

Authentic Plants for Late 19th/Early 20th Century Period Landscaping

Rock Spirea

Golden Rain Tree
Honeysuckle

Japanese Spurge

Virginia Creeper
Boston Ivy, Japan Ivy
Mockorange
Ninebark
Golden Rain Tree
Oregon Grape Holly

Hydrangea

Mountain Ash
Spirea
Snowberry Waxberry
Indian Currant, Coral-Berry
Lilac
Linden
Rosy Weigela

Wisteria

Tree of Heaven
Maple, except sugar or silver
Horse Chestnut
Barberry

Trumpet Creeper

(Ord. 4508, 3-21-12)

Title 27

HORIZON DRIVE DISTRICT – OVERLAY ZONE DISTRICT STANDARDS

Chapter 27.04
Purpose

§ 27.04.010. Purpose.

Chapter 27.08
Applicability

§ 27.08.010. Applicability.

Chapter 27.12
Standards and Guidelines

§ 27.12.010. Architectural features and materials.

§ 27.12.020. Site design.

§ 27.12.030. Landscaping and public amenities.

§ 27.12.040. Signage.

Chapter 27.16
Map of Horizon Drive Overlay District

§ 27.16.010. Map of Horizon Drive Overlay District.

Chapter 27.04
Purpose

§ 27.04.010. Purpose.

The purpose of the Horizon Drive Zone District Overlay is to provide a consistent level of architectural character, quality and aesthetics of the Horizon Drive area as well as to improve and enhance pedestrian access, vehicular access, parking and circulation within the designated Horizon Drive Zone District Overlay.

(Ord. 4911, 4-15-20)

Chapter 27.08
Applicability

§ 27.08.010. Applicability.

The Horizon Drive Zone District Overlay includes all commercial properties within the general geographic area of Horizon Drive between G Road and H Road as identified on the zone district overlay map.

(Ord. 4911, 4-15-20)

Chapter 27.12
Standards and Guidelines

§ 27.12.010. Architectural features and materials.

Architectural features are intended to provide variations in massing, be at a human scale, and provide variety in design that work to reinforce the importance of the civic, public and open spaces.

(a) All buildings facing Horizon Drive shall use materials that are durable, including but not limited to stone, brick, precast concrete and architectural metals.

(b) Materials prohibited for any building facing Horizon Drive include metal-clad prefabricated buildings and building made from pre-cast concrete and tilt-up wall systems that are structural in appearance.

(c) Building entries shall have a strong visual and pedestrian relationship to the street.

(d) Buildings shall provide the following architectural design elements:

(1) Buildings shall provide their main entry facing Horizon Drive. When not feasible, a side or rear of a building may face Horizon Drive. However, the facade fronting Horizon Drive shall give the appearance of a front facade in terms of quality of architecture, materials and detailing.

(2) Building form shall provide recessed or projecting elements to provide facade articulation. This can be accomplished through the design of entryways, awnings, rooflines, projecting bays, pilasters, columns or other features. Articulation shall occur a minimum of every 30 feet for all sides of the building.

(3) The first floor of a building designed to accommodate a restaurant or retail use shall have windows facing the public right-of-way that create visual interest to pedestrians and provide views from inside of buildings to the street.

(e) In addition, the site shall exhibit a minimum of three of the following seven architectural design elements:

(1) Variation in materials, material modules, expressed joints and details, surface relief and texture to break up building forms and wall surfaces. Such detailing may include sills, headers, belt courses, reveals, pilasters, window bays or similar features for all sides of the building.

(2) Variation in roof lines/roof materials in order to add interest to and reduce the scale of buildings or expanses of blank wall. This can be accomplished through design elements such as overhangs, eaves, recesses, projections, raised cornice parapets over doors or bays and peaked roof forms.

(3) Establishing the main building entrance on the street with facade features that emphasize the primary building entrance through projecting or recessed forms, detail, color and/or material.

(4) Outdoor patio in combination with or without outdoor seating located between the building and the primary street.

(5) Ground story transparency of at least 50 percent in the form of windows and/or door(s) for facades facing all public street frontages.

(6) Public art, as approved by the Director.

(7) Other architectural or site features that achieve the goals of the overall Horizon Drive District Overlay vision or concept, as determined by the Director.

(Ord. 4911, 4-15-20)

§ 27.12.020. Site design.

Elements required or encouraged for site design are intended to minimize vehicular orientation and emphasize pedestrian activities such as ease of access from the public way and safe access to parking areas, increase walkability of the district especially between the public way, transit facilities and other buildings. They are also intended to provide safe access to businesses from the street and sidewalks, as well as parcel interconnectivity to minimize multiple access points to Horizon Drive.

(a) Clearly visible and direct pedestrian paths with adequate lighting should be established between neighboring buildings, between buildings and outlying parking areas, and between buildings and transit facilities.

(b) A six-foot-wide concrete sidewalk is required from the street to the front of the primary building main entrance.

(c) New development shall be required to close redundant or multiple accesses to Horizon Drive from a single site. Access location and turning movements shall be limited to those which can be safely accommodated as determined by City of Grand Junction traffic engineers.

(d) New development shall be required to consolidate accesses with neighboring properties to the extent practicable.

(e) Bicycle parking shall be provided at locations that do not obstruct the flow of pedestrians, are easily identifiable and visible and convenient to customer entrances.

(f) Where pedestrian circulation paths cross vehicular routes, a change in paving materials, textures, or colors shall be provided to emphasize the potential conflict point, improve visibility, enhance safety and enhance aesthetics.

(g) On-site signage and traffic markings necessary to facilitate circulation and improve public safety and awareness are required.

(h) Drive-up windows such as those used for banks, restaurants, groceries and pharmacies or drive-through facilities such as gasoline service islands and car wash or vacuum bays shall be oriented as to not be visible from the public right-of-way.

(Ord. 4911, 4-15-20)

§ 27.12.030. Landscaping and public amenities.

This section is meant to ensure appropriate landscaping improvements and the creation of public amenities that enhance the character of the district, and to utilize xeric principles in landscaping design encouraging the planning of low water plants that are appropriate for Grand Junction's arid climate. The intent is also to encourage future development to include civic areas and open space (parks).

(a) Landscaping shall be designed to provide drought tolerant plant species that are native to the region or otherwise suitable to the climate.

(b) For all development, street trees planted every 40 feet shall be planted along all public rights-of-way.

(c) For all development with landscaped areas fronting Horizon Drive, any groundcover provided shall be visually similar to existing landscape rock (e.g., crushed red granite) in place on Horizon Drive.

(d) Art, sculpture, transit shelters, benches, planters, bike racks, trashcans and other hardscape feature, plazas, landscaping and other amenities shall be included where appropriate.

(Ord. 4911, 4-15-20)

§ 27.12.040. Signage.

Signage is intended to communicate information and reduce existing visual clutter as well as prohibit new visual clutter. Signage shall provide visual continuity within a single project.

(a) Signs shall be consistent in design, color, typeface, materials and construction details with each project.

(b) Freestanding signs shall comply with the following requirements:

(1) Shall be placed perpendicular to the right-of-way.

(2) Shall be constructed with a stone or veneer base. The sign may be single- or double-faced. If single the back side of the sign shall be painted the same color as the cabinet and poles.

(3) Shall be located no closer than 10 feet from a property line and no closer than six feet from the curb of a street or drive.

(4) The height shall be measured from finished grade.

(5) One freestanding sign shall be allowed per street frontage.

(6) Up to two small, freestanding directional signs may be allowed that are three square feet or fewer and no more than 30 inches in height.

(7) The sign allowance per frontage can only be used on that frontage and shall not be transferred to any other frontage.

(8) Maximum sign dimensions shall not exceed the following:

(i) For properties fronting Horizon Drive between G Road and 27 1/2 Road and H Road:

(A) Forty feet in height;

(B) One hundred square feet for properties with up to 150 feet of linear frontage;

(C) One hundred twenty square feet for properties with 150 to 200 feet of linear frontage;

(D) One hundred sixty square feet for properties with 201 to 300 linear feet of frontage;

(E) Two hundred square feet for properties with greater than 300 linear feet of frontage.

(ii) For properties with frontage on Horizon Drive between 7th Street and G Road (27 1/2 Road), the maximum sign dimensions shall not exceed the following:

(A) Twelve feet in height;

(B) One hundred square feet.

(iii) For properties with Interstate 70 frontage maximum sign dimensions are subject to GJMC § 21.10.070.

(iv) For any regulated cannabis business, the maximum sign dimensions shall not exceed the following:

(A) Twenty feet in height;

(B) Seventy-five square feet.

(c) Flush wall signs may be either nonilluminated or internally illuminated.

(d) No off-premises signs or outdoor advertising shall be permitted, except where existing at the time of adoption of the ordinance codified in this title, provided such signs are appropriately permitted through the City of Grand Junction.

(e) Projecting signs shall be permitted as per GJMC § 21.10.080.

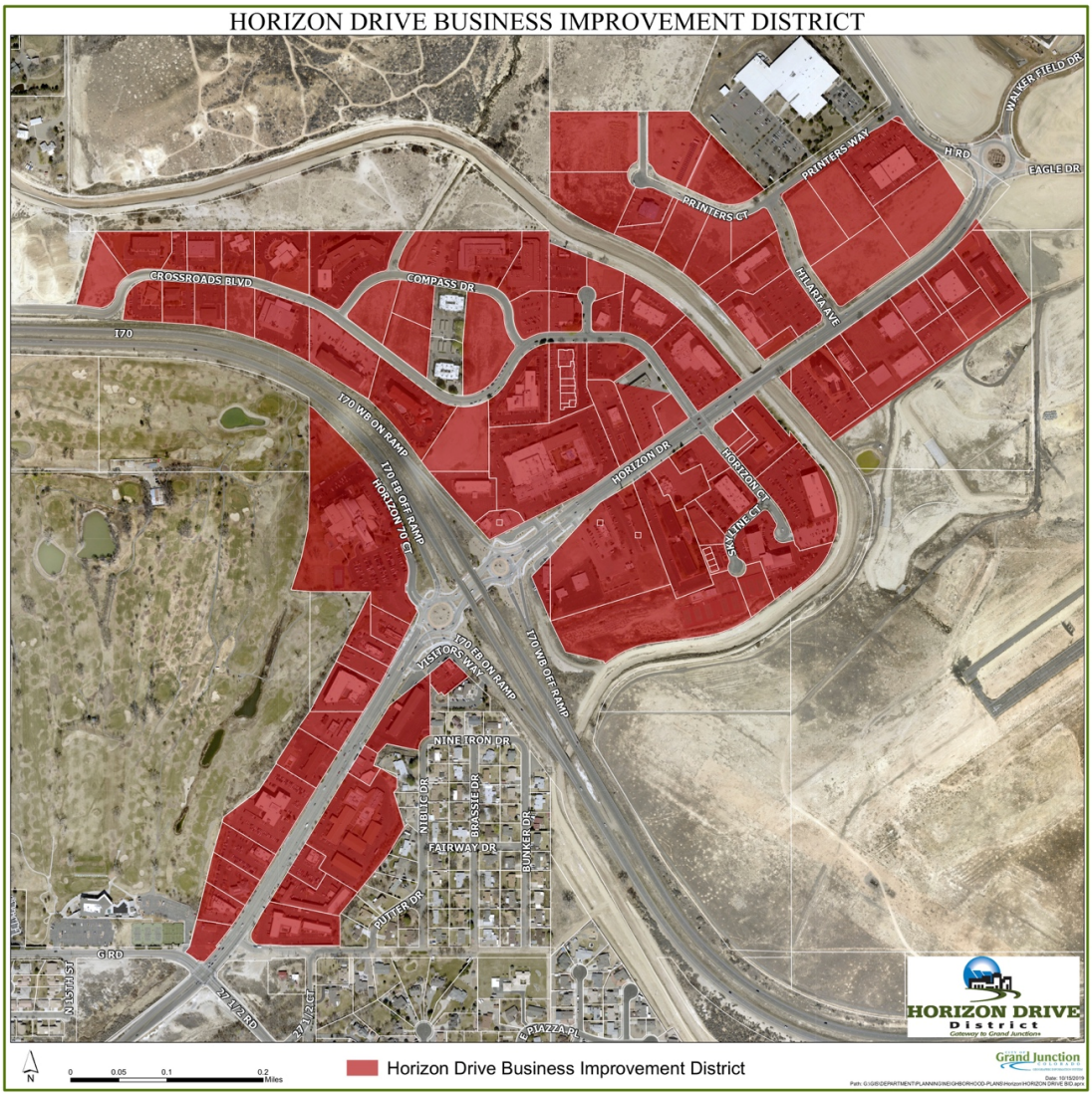
(f) Roof signs are not allowed.

(Ord. 5070, 5-4-22; Ord. 4911, 4-15-20)

Chapter 27.16

Map of Horizon Drive Overlay District

§ 27.16.010. Map of Horizon Drive Overlay District.



MAP OF HORIZON DRIVE OVERLAY DISTRICT

(Ord. 4911, 4-15-20)

Title 28

STORMWATER MANAGEMENT MANUAL

Chapter 28.04
Introduction

§ 28.04.010. General index.
§ 28.04.020. Purpose and intent.
§ 28.04.030. Amendments to this manual.
§ 28.04.040. Purchase of a copy of the manual codified in this title.
§ 28.04.050. Acknowledgement.
§ 28.04.060. Updating and revisions.

Chapter 28.08
General Provisions

§ 28.08.010. Title.
§ 28.08.020. Jurisdiction.
§ 28.08.030. Adoption authority.
§ 28.08.040. Enforcement responsibility.
§ 28.08.050. Review and acceptance.
§ 28.08.060. Interpretation.
§ 28.08.070. Deviation/variance procedures.
§ 28.08.080. Acronyms.
§ 28.08.090. Definitions.

Chapter 28.12
Drainage Planning Submittal Requirements

§ 28.12.010. Review process.
§ 28.12.020. Submittal requirements.
§ 28.12.030. Conceptual/preliminary drainage report.
§ 28.12.040. Conceptual/preliminary report contents.
§ 28.12.050. Conceptual/preliminary report drawing contents.
§ 28.12.060. Final drainage report.
§ 28.12.070. Final report contents.
§ 28.12.080. Final report drawing contents.
§ 28.12.090. Construction plans.
§ 28.12.100. Post-construction BMPs.
§ 28.12.110. Construction SWMP.
§ 28.12.120. Record drawings and acceptances.
§ 28.12.130. Submittal checklist.

Chapter 28.16
Drainage Policy

§ 28.16.010. Introduction.
§ 28.16.020. Basic principles.
§ 28.16.030. Regional and local planning.
§ 28.16.040. Regional master planning.
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Each chapter of this title is numbered separately. All sections are numbered in such a way as to allow additions and deletions with ease. All figures and tables are numbered and are placed either within the text or at the end of respective sections. The figure and table numbers are bold faced in the text for their ease of finding.

(Res. 40-08 (§ 101), 3-19-08)

§ 28.04.020. Purpose and intent.

The purpose of this manual is to promote public health, safety, and general welfare and to minimize public and private losses due to flooding by adopting policies, procedures, standards, and criteria for storm drainage.

All new development and redevelopment, building permits for commercial and industrial uses, or any other proposed construction submitted for acceptance under the provisions of the Stormwater Management Manual shall include adequate storm drainage system analysis and appropriate drainage system design. Such analysis and design shall meet or exceed the criteria set forth herein.

(Res. 40-08 (§ 102), 3-19-08)

§ 28.04.030. Amendments to this manual.

These policies, procedures, standards and criteria may be amended as new technology is developed and/or if experience gained in the use of the manual indicates a need for revision.

(a) Mesa County. Amendments and revisions will be adopted by the Board of County Commissioners.

(b) City of Grand Junction. Amendments and revisions may be made administratively by the City Manager or the City Manager's designee and shall have the same authority as the original document adopted by the City Council. Amendments and revisions may also be made by City Council by ordinance.

(c) Other Jurisdictions. Amendments and revisions may be made by the City of Fruita, the Town of Palisade, and the Grand Junction Drainage District, in accordance with their procedures.

(Res. 40-08 (§ 103), 3-19-08)

§ 28.04.040. Purchase of a copy of the manual codified in this title.

Any party desiring to purchase a copy of the manual, provided such copies are available, may contact the City of Grand Junction Public Works Department at 970-244-1555.

(Res. 40-08 (§ 104), 3-19-08)

§ 28.04.050. Acknowledgement.

This manual was prepared by WRC Engineering, Inc., working under the direction of Mesa County. Representatives from the Cities of Grand Junction and Fruita, Town of Palisade and Grand Junction Drainage District participated and provided valuable input during the preparation of the manual.

We wish to acknowledge and thank the following individuals and organizations for their participation and contribution to the preparation of this manual:

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(Res. 40-08 (§ 105), 3-19-08)

§ 28.04.060. Updating and revisions.

This manual was prepared in accordance with existing engineering methodologies and applicable criteria at the time of publication. The field of stormwater management has

experienced rapid and extensive changes in recent years. Therefore, periodic review and revision of all material contained herein is recommended.

Users of this manual are encouraged to notify Mesa County and/or local jurisdictions of any errors or omissions in this document. Comments and questions relating to the manual may also be directed to the entities listed below.

Please submit input to:

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or

Applicable Local Jurisdiction(s)

(Res. 40-08 (§ 106), 3-19-08)

Chapter 28.08
General Provisions

§ 28.08.010. Title.

This manual and design standards with all future amendments and revisions shall be known as the Stormwater Management Manual (herein referred to as the manual or SWMM).

(Res. 40-08 (§ 201), 3-19-08)

§ 28.08.020. Jurisdiction.

This manual and design standards shall apply to all new development and redevelopment within the boundaries of Mesa County, including any public lands, facilities constructed on rights-of-way, easements dedicated for public use, and to all privately owned and maintained drainage facilities, including but not limited to detention ponds, storm drains, inlets, manholes, culverts, swales, channels and water quality facilities.

(a) Mesa County. Chapter 7.7 of the Mesa County Land Development Code (Code) requires that "Drainage facilities shall be designed and installed in accordance with the Mesa County Stormwater Management Manual."

(b) City of Grand Junction. The City of Grand Junction Zoning and Development Code (GJMC Title 21) requires that "All proposed development must provide for on-site runoff collection and conveyance in accordance with the Stormwater Management Manual (SWMM) and applicable federal and State laws."

The City of Grand Junction adopted stormwater pollution prevention Ordinance Number 3824 (Chapter 13.28 GJMC), which requires that: "All proposed development … must provide for on-site erosion and sediment control, control of illegal discharges, and runoff collection and conveyance in accordance with the Stormwater Management Manual and applicable federal and State laws."

(c) Other Jurisdictions. The City of Fruita, the Town of Palisade, and the Grand Junction Drainage District may adopt the Stormwater Management Manual in whole or in part.

(Res. 40-08 (§ 202), 3-19-08)

§ 28.08.030. Adoption authority.

(a) Municipality. Powers to regulate land use activities, including drainage, are granted to a municipality under Colorado Revised Statutes as noted below:

§ 31-15-701, C.R.S. et seq. grants municipalities the power to establish, improve, and regulate such improvements as streets and sidewalks, water and water works, sewers and sewer systems, and water pollution controls. In addition, a municipality may, among other powers, deepen, widen, pipe, cover, wall, alter or change the channel or watercourses.

§ 31-25-501, C.R.S. et seq. authorizes municipalities to construct local improvements and assess the cost of the improvements wholly or in part upon property specially benefited by such improvements. By ordinance, a municipality may order construction of district sewers for storm drainage in districts called storm sewer districts. (For the City of Grand Junction, see People's Ordinance No. 33.)

§ 31-25-601, C.R.S. et seq. authorizes municipalities to establish improvement districts as taxing units for the purpose of constructing or installing public improvements.

§ 31-35-401, C.R.S. et seq. authorizes municipalities to operate, maintain, and finance water and sewage facilities for the benefit of users within and without their territorial boundaries. Sewerage facilities are defined as "any one or more of the various devices used in the collection, treatment or disposition of sewerage or industrial wastes of a liquid nature or storm, flood or surface drainage waters…."

(b) County. Powers to regulate land use activities, including drainage, are granted to a county under Colorado Revised Statutes as noted below:

§ 24-67-101, C.R.S. et seq. (Planned Unit Development Act of 1972) power to encourage more efficient and innovative use of the land for public services and encourages integrated planning.

§ 29-20-101, C.R.S. et seq. (Local Government Land Use Control Enabling Act of 1974) clarifies and provides broad authority to local governments to plan for and regulate the use of land within hazardous and environmentally sensitive areas.

§ 30-20-401, C.R.S. et seq. authorizes construction, maintenance, improvements and financing of water and sewerage facilities for the County's own use and for the use of the public and private consumers and users within and without the County's territorial limit.

§ 30-20-501, C.R.S. et seq. (County Public Improvement District Act of 1968) authorizes creation of public improvement districts within any county as taxing units and for the purpose of implementing public improvements.

§ 30-20-601, C.R.S. et seq. authorizes a county by resolution to construct local improvements and to assess the costs to properties especially benefited by improvements.

§ 30-28-101, C.R.S. et seq. provides the County with planning authority, such as development of master plans and adoption of such plans by resolution; creation of a regional planning commission; and regulation of development density.

§ 30-30-101, C.R.S. et seq. (control of stream flow) provides power to remove any obstruction to the channel of any natural stream which causes a flood hazard and provides a right of access to any such natural stream.

§§ 37-20-101 and 37-33-101, C.R.S. et seq. authorizes the owner of agricultural lands susceptible to drainage problems from the same general system to petition the Board of County Commissioners to set up a drainage district.

(Res. 40-08 (§ 203), 3-19-08)

§ 28.08.040. Enforcement responsibility.

(a) Mesa County. The Director or an authorized representative is responsible for enforcing the provisions of this manual.

(b) City of Grand Junction. The City Manager or the City Manager's designee is responsible for enforcing the provisions of this manual.

(c) Other Jurisdictions. Contact the City of Fruita, the Town of Palisade, or the Grand Junction Drainage District for information.

(Res. 40-08 (§ 204), 3-19-08)

§ 28.08.050. Review and acceptance.

All drainage submittals will be reviewed for general compliance with this manual. An acceptance does not relieve the owner, engineer, or designer from responsibility of ensuring that the calculations, plans, specifications, construction, and record drawings comply with this manual.

Adequate time must be allocated in development planning to permit a complete review. The intent of this manual is to more clearly define the requirements and reduce the time and effort required to develop an acceptable drainage design.

(a) Mesa County. Acceptance of final drainage report and drainage facility construction plans shall be valid for two years. Documents with approvals more than two years old may require revision prior to development to comply with the provisions of the manual in effect at that time. Amendments to this manual will apply to all drainage reports submitted after the effective date of the amendment. Final drainage reports are exempt from an amendment provided they are submitted for approval within 60 days after the effective date of an amendment.

(b) City of Grand Junction. Drainage submittals shall contain all information required by this manual but the review process will be in accordance with the City's Submittal Standards for Improvements and Development (SSID) and the Zoning and Development Code (GJMC Title 21).

(c) Other Jurisdictions. Contact the City of Fruita, the Town of Palisade, or the Grand Junction Drainage District for information.

(Res. 40-08 (§ 205), 3-19-08)

§ 28.08.060. Interpretation.

In the interpretation and application of the provisions of the manual, the following shall govern:

(a) Minimum Standards. This manual shall be regarded as the minimum requirements for analysis and design of storm drainage facilities. Special site conditions or mitigation for potential impacts from new development or redevelopment may result in more stringent standards.

(b) Higher Standards. For Mesa County if provisions of the code, any law, ordinance, resolution, rule, or regulation contains restrictions covering the same subject matter, the more stringent standards or requirements shall govern. For the City of Grand Junction if provisions of the Zoning and Development Code (GJMC Title 21), any law, ordinance, resolution, rule, or regulation contains restrictions covering the same subject matter, the more stringent standards or requirements shall govern.

(c) Flexibility. There may on occasion be need for site-specific application and interpretation of this manual. The Director in Mesa County or the City Manager or the City Manager's designee in the City of Grand Junction may deviate from the requirements of this manual; provided, that the approved plan is compatible with surrounding in-place improvements and is sufficiently protective. The burden of responsibility shall be on the applicant to show that the requested deviation/variance from standards does not create a public hazard.

(d) Abrogation. This manual shall not abrogate or annul any permits or approved drainage reports, construction plans, easements, or covenants issued before the effective date of this manual.

(Res. 40-08 (§ 206), 3-19-08)

§ 28.08.070. Deviation/variance procedures.

(a) Deviations/variances from specific standards, procedures, or criteria in this manual may only be requested for:

(1) Unusual situations where strict compliance with the manual may not protect the public health and safety; or

(2) Unusual situations which require additional analysis outside the scope of the manual for which the additional analysis shows that strict compliance with the manual may not protect the public health and safety; or

(3) Unusual hydrologic and/or hydraulic conditions which cannot be adequately addressed by strict compliance with the manual.

(b) Mesa County. A variance from the technical provision of this manual may be granted by the Director. All requests for variances shall be submitted in writing (normally with the drainage report, see Chapter 28.12 GJMC), shall state the provision for which the variance is requested, and shall provide evidence, data or other information in support of the request. The Director will review and rule on the request and provide his findings in writing.

(c) City of Grand Junction. A deviation from any requirement of this manual may be granted by the City Manager or the City Manager's designee. A request for deviation shall be submitted in writing as a separate letter attached to the drainage report. The request shall state the provision for which the deviation is requested and shall provide supporting evidence, data, or other appropriate information. The City Manager or the City Manager's designee shall review and rule on the request and provide the findings in writing.

(d) Other Jurisdictions. Contact the City of Fruita, the Town of Palisade, or the Grand Junction Drainage District for information.

(Res. 40-08 (§ 207), 3-19-08)

§ 28.08.080. Acronyms.

The following acronyms are used within the context of this manual:

BMP	Best Management Practice
CAP	Corrugated Aluminum Pipe
CAPA	Corrugated Aluminum Pipe Arch
CMP	Corrugated Metal Pipe
CMPA	Corrugated Metal Pipe Arch
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CDPS	Colorado Discharge Permit System
CRS	Colorado Revised Statutes
CSP	Corrugated Steel Pipe

CSPA	Corrugated Steel Pipe Arch
CSWMP	Construction Stormwater Management Plan
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
EC	Erosion Control
ECP	Erosion Control Plan
EGL	Energy Grade Line
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HDS	Hydraulic Design Series
HEC	Hydrologic Engineering Center or Hydraulic Engineering Circular (FHWA)
HERCP	Horizontal Elliptical Reinforced Concrete Pipe
HGL	Hydraulic Grade Line
MS4	Municipal Separate Storm Sewer System
NAVD	North American Vertical Datum
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resource Conservation Services, formerly the SCS
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
PE	Professional Engineer licensed by the State of Colorado
PMF	Probable Maximum Flood
PVC	Polyvinyl Chloride
RCBC	Reinforced Concrete Box Culvert
RCP	Reinforced Concrete Pipe
ROW	Right-of-Way
SCS	Soil Conservation Service
SPP	Structural Plate Pipe
SSID	Submittal Standards for Improvements and Development (City of Grand Junction)
SWMM	Stormwater Management Manual
SWMP	Stormwater Management Plan (either the construction SWMP or the final drainage report containing post-construction BMPs)
TAC	Technical Advisory Committee
TRC	Technical Review Committee
UDFCD	Urban Drainage and Flood Control District (Denver, Colorado)
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDCM	Urban Storm Drainage Criteria Manual, prepared by the Urban Drainage and Flood Control District in three volumes

USGS	United States Geological Survey
WQCD	Water Quality Control Division of the Colorado Department of Public Health and Environment
WQCV	Water Quality Capture Volume

(Res. 40-08 (§ 208), 3-19-08)

§ 28.08.090. Definitions.

Applicant means a qualified agent, individual or firm acting on behalf of the owner of property requesting approval of plans for new development and redevelopment.

Authority or *Drainage Authority.* Mesa County, the Cities of Grand Junction and Fruita, the Town of Palisade, and the Grand Junction Drainage District have contracted through intergovernmental agreements (IGA) to form the 5-2-1 Drainage Authority (Authority), under Colorado Revised Statutes, specifically § 29-1-204.2, C.R.S.

Best management practices means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of State waters. BMPs also include treatment requirements, operating procedures and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

CDPS permit means a permit issued by the State of Colorado under Part 5 of the Colorado Water Quality Control Act that authorizes the discharge of pollutants to waters of the State, whether the permit is applicable to a person, group or area.

Channel means a natural or artificial low-lying area with a definite bed and banks, which confines and conveys continuous or periodic flows of water. (Mesa County Land Development Code Section 12.1 and GJMC § 21.10.020, Terms defined.)

Clean Water Act means Federal Act of 1977, 33 U.S.C. Section 466 et seq. as amended.

Colorado Water Quality Control Act means Title 25, Article 8, C.R.S.

Commercial means any business, trade, industry or other activity engaged in profit.

Construction activity includes clearing, grubbing, filling, grading, and excavation. Does not include routine maintenance performed by public agencies, private parties, or their agents to maintain original line and grade, hydraulic capacity, or original purpose of the facility. Also see *Land disturbance*. [(Adapted from CDPS General Permit No. COR-030000 @ Part I A(2)(a)]

Construction site means any location where construction or construction related activity occurs.

Construction stormwater management plan means a specific individual construction plan that describes the BMPs to be implemented at a site to prevent or reduce the discharge of pollutants during construction activities.

Director means the Mesa County Planning Director or designee when referring to a Mesa County official, but the City Manager or his designee when referring to a City of Grand Junction official.

Discharge means the addition or release of any pollutant, stormwater, subsurface, groundwater or any substance whatsoever to the storm drainage system.

Downstream refers to locations which are hydraulically lower in elevation than the location at which the comparison is being made. *Downstream* may include locations outside of the stream, channel, pipe, etc., such as sheet flow, which often meanders in several directions.

Drainageway means any natural or artificial (manmade) channel which provides a course for water flowing either continuously or intermittently to downstream areas.

Final stabilization means when all soil disturbing activities at the site have been completed, and uniform vegetative cover has been established with a density of at least 70 percent of pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed. For purposes of the construction SWMP, establishment of a vegetative cover capable of providing erosion control equivalent to pre-existing conditions at the site will be considered final stabilization.

Flood means a temporary rise in a watercourse, flow, or stage, that results in water overtopping its banks and inundating areas adjacent to the channel. (Mesa County Land Development Code Section 12.1; see also GJMC § 21.10.020, Terms defined.)

Grand Valley means the portion of Mesa County whose boundary is approximated by the 5,000-foot elevation contour and extends west of the community of Mack, along the north eastern edge of the Colorado National Monument, south of Whitewater, to the east of Palisade, and along the face of the Bookcliffs to the north.

Land disturbance means a manmade change in the existing cover or topography of the land, including grading, excavation, filling, building, paving, and other activities that may result in or contribute to soil erosion or sedimentation in the discharge of pollutants.

Local facility means a detention and/or water quality facility that has been sized based on the area and imperviousness of the watershed that includes all the development that drains to the facility, but is not publicly owned and maintained. Also see *Regional facility* and *On-site facility*.

Local jurisdiction, within the context of the SWMM, means Mesa County, City of Grand Junction or Fruita, Town of Palisade, or the Grand Junction Drainage Authority.

Major drainage system means a stormwater facility, such as a channel, large conduit, detention or retention, which receives storm runoff from a watershed generally 160 acres in size or larger.

Municipal separate storm sewer system (MS4) means a conveyance or the system of conveyances, including roads with drainage systems, municipal streets, curbs, gutters, ditches, drainage inlets, catch basins, pipes, tunnels, culverts, channels, detention basins and ponds owned and operated by a municipality or county and designed or used for collecting or conveying stormwater that is not a combined sewer or used for collecting or conveying sanitary sewage.

New development and redevelopment. For Mesa County definition, refer to the Mesa County Land Development Code. For the City of Grand Junction definition, refer to GJMC Title 21, Zoning and Development. For the City of Fruita, Town of Palisade and the Grand Junction Drainage District definitions, refer to the applicable development codes.

NPDES means the National Pollutant Discharge Elimination System under Section 402 of the Clean Water Act.

On-site facility means a local facility that is contained within and only serves the development in question and not other developments.

Outfall drainage system means the drainage system typically consisting of swales, curb and gutter, storm drains, and sometimes small open channels that discharge to a major drainage system. Also called "local drainage system."

Owner means a person having dominant and/or servient interest in property, having sufficient interest to convey property, and/or having possessory interest in property. The term *owner* also includes the owner's agent.

Part of a larger common plan of development or sale means a contiguous area where multiple separate and distinct construction activities will take place at different times on different schedules under one plan. An example would be a commercial development with multiple separate buildings constructed over the course of multiple construction schedules.

Pollutant means dredged spoil, dirt, slurry, solid waste, incinerator residue, sewage, sewage sludge, garbage, trash, chemical waste, biological nutrient, biological material, radioactive material, heat, wrecked or discarded equipment, rock, sand, or any industrial, municipal, or agricultural waste. [§ 25-8-103(15), C.R.S.]

Pollution means the alteration of the physical, thermal, chemical, or biological quality of, or the contamination of any water that renders the water harmful, detrimental, or injurious to humans, animal life, plant life, property or public health, safety or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

Post-construction stormwater management plan means the final drainage report, in accordance with GJMC § 28.12.060 through 28.12.110, final drainage report, which includes a combination of structural and/or nonstructural BMPs, further described in Chapter 28.64 GJMC, Post-Construction Stormwater Management, that reduce the discharge of pollutants after construction is complete.

Pre-developed or *pre-existing* means conditions that existed as of the adoption date of this manual.

Private drainage system means all privately owned ground, surfaces, structures or systems, excluding the MS4, that contribute to or convey stormwater including but not limited to roofs, gutters, downspouts, lawns, driveways, pavement, roads, streets, curbs, gutters, inlets, drains, catch basins, pipes, tunnels, culverts, channels, detention basins, ponds, draws, swales, streams and any ground surfaces.

Public improvement means any improvement, facility or service together with its associated public site, right-of-way or easement necessary to provide transportation, drainage, public private utilities, parks or recreational, energy or similar essential services. (Mesa County Land Development Code Section 12.1.)

Qualified erosion control specialist means a qualified person, as defined by GJMC § 13.28.010, with specialized training, education, or experience in the field of erosion control methods, planning, and inspection.

Recurrence Interval. The recurrence interval corresponds to the statistical return period of an event of the same intensity (e.g., a 100-year recurrence interval flood has a one percent chance to occur each year, which does not mean that it will occur every 100 years).

Regional facility means a detention and/or water quality facility that is publicly owned and maintained and serves all properties within the tributary watershed.

Sediment means soil, mud, dirt, gravel and rocks that have been disturbed, eroded and/or transported naturally by water, wind or gravity and/or mechanically by any person, vehicle or equipment.

Significant materials include but are not limited to: raw materials; fuels; materials such as metallic products; hazardous substances designated under Section 101(14) of CERCLA; any chemical the facility is required to report pursuant to Section 313 of Title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with stormwater discharge.

Storm drainage system means all surfaces, structures and systems that contribute to or convey stormwater including private drainage systems and the MS4, and any nonmunicipal drain or pipe, channel or other conveyance, including natural and artificial (manmade) washes and ditches for conveying water, groundwater, drainage water or unpolluted water from any source, excluding sewage and industrial wastes, to waters of the State and United States.

Storm water or *stormwater.* Within the context of the Stormwater Management Manual, stormwater, whether one or two words, shall mean surface runoff resulting from precipitation.

Stormwater construction permit means the permit issued by the CDPHE called the general permit for stormwater discharges associated with construction activities. Mesa County or the City of Grand Junction will also issue a stormwater construction permit for land disturbances related to new development.

Stormwater management plan. Within the context of the Stormwater Management Manual, a stormwater management plan (SWMP) means the construction SWMP (CSWMP) and/or the post-construction SWMP.

Stream channel means the area of the floodplain which carries the normal flow of the watercourse. (Mesa County Land Development Code Section 12.1).

Urbanized area means the area identified by the Colorado Department of Public Health and Environment based on the 2000 census and called the urban area of Mesa County. Within the context of the SWMM, urban area also includes the Redlands within the urban growth boundary of the County.

Water quality capture volume means the minimum storage volume, based on the eightieth percentile event, which is retained and released over a specified period of time, depending on the specific structural BMP and is based on the time it takes to fully drain the brim-full volume contained in storage.

Water quality outlet means a structure designed to release the water quality capture volume over the specified period of time for the specific BMP.

Waters of the State means any groundwater, percolating or otherwise, lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals,

wells, watercourses, drainage systems, and irrigation systems; all sources of water such as snow, ice, and glaciers; and all other bodies or accumulations of water, surface and underground, natural or artificial, navigable or nonnavigable, and including beds and banks of all watercourses and bodies of surface water, public or private, located wholly or partly within or bordering upon this State and within the jurisdiction of this State.

Watershed master plan means the Grand Valley Stormwater Management Master Plan or other stormwater master plans approved by the Drainage Authority representing applicable municipalities and Mesa County.

Wetland means any area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, under normal circumstances, a prevalence of vegetation typically adapted to the saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

(Res. 40-08 (§ 209), 3-19-08)

Chapter 28.12

Drainage Planning Submittal Requirements

§ 28.12.010. Review process.

All development within the jurisdiction of this manual shall submit drainage reports, construction drawings/specifications, and record drawing information for review and approval in accordance with the requirements of this chapter. The City of Fruita, the Town of Palisade, or the Grand Junction Drainage District may alter the requirements of this chapter, in accordance with their guidance documents. Figure 28.12.010 provides a flow chart of the general review process.

(a) Mesa County. The County will review reports and plans for completeness of the submittal to the Planning Department. The County will provide written or oral review comments of the submittal. The County will make every effort to effect a complete review and comment within a reasonable period; however, the County cannot approve reports or plans by default.

The applicant or his designated representative is required to attend a pre-application conference to review processing steps in accordance with the Mesa County Land Development Code (Code Section 3.1.6). The applicant shall consult with the Director or representative for general information regarding land development regulations, required procedures, possible drainage problems and deviations/variances, and specific submittal requirements. As a minimum, a conceptual and final drainage report will be required, unless modified at the pre-application conference.

(b) City of Grand Junction. The City shall review and approve drainage reports and construction plans in accordance with Submittal Standards for Improvements and Development (SSID), Zoning and Development Code (GJMC Title 21), and the pollution prevention stormwater ordinance.

(c) Other Jurisdictions. Refer to requirements of the City of Fruita, the Town of Palisade or the Grand Junction Drainage District for specific information regarding review and acceptance of drainage reports and plans.

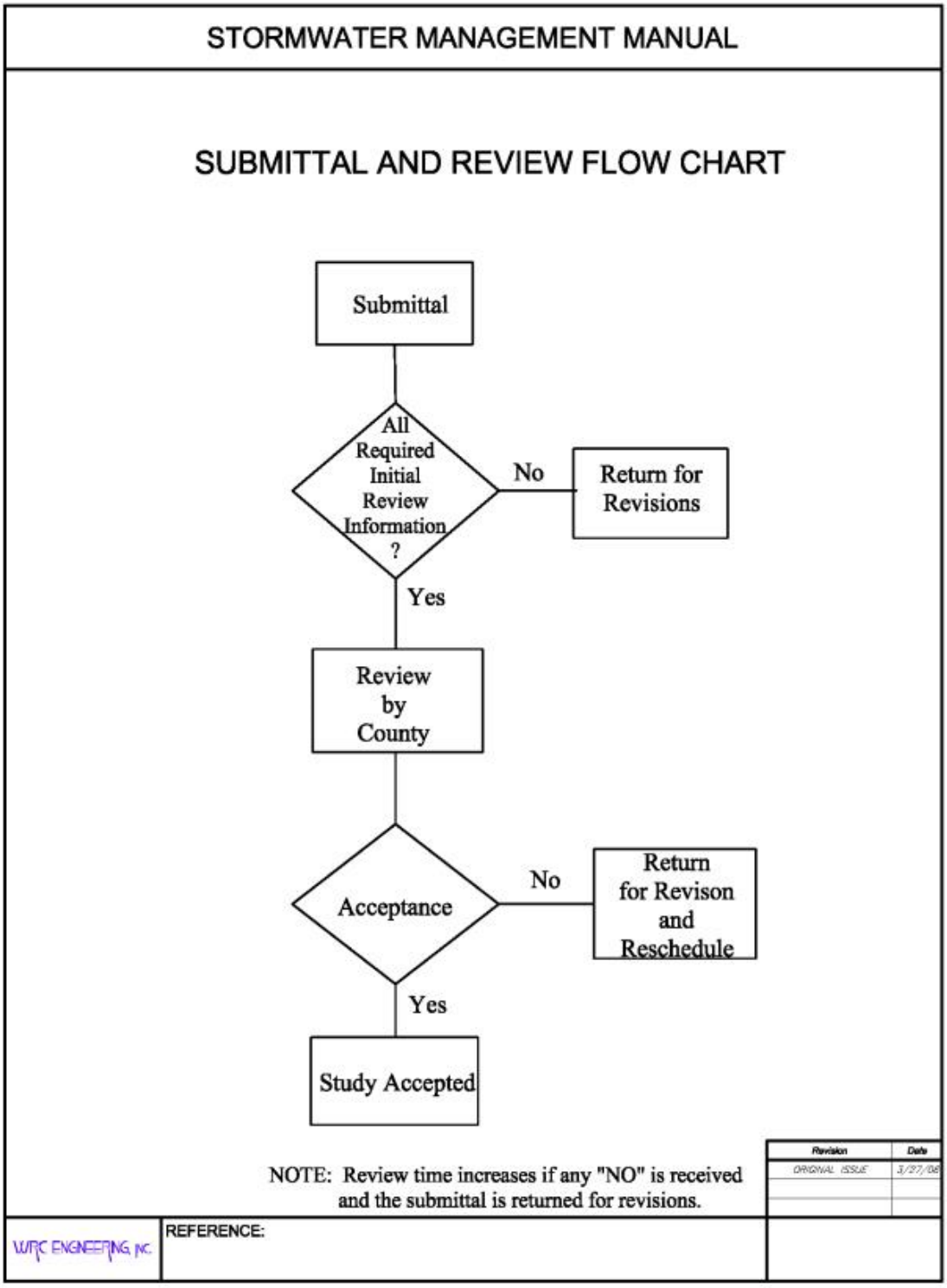


FIGURE 28.12.010

(Res. 40-08 (§ 300), 3-19-08)

§ 28.12.020. Submittal requirements.

A conceptual/preliminary and final drainage report is required for all new development and redevelopment, except as otherwise determined at the pre-application conference. The number of report copies to be submitted will be determined at the pre-application conference. One copy will be returned to the applicant or his representative with comments.

All submitted reports shall be clearly and cleanly reproduced. Copies of charts, tables, nomographs, calculations, or any other referenced material shall be legible. Washed out, blurred or unreadable portions of the report are unacceptable and may warrant resubmittal of the report. The submittal shall include a declaration of the type of report submitted (i.e., conceptual/preliminary or final).

Table 28.12.020 shall be used to determine the adequacy of the submittal, in addition to those requirements identified at the pre-application meeting, which may alter the checklist. Incomplete or absent information may result in the report being rejected for review. Revision dates must be included on all re-submittals.

All development and redevelopment must provide construction site best management practices (see Chapter 28.6 GJMC), on-site detention (see Chapter 28.56 GJMC), and post-construction BMPs (see Chapter 28.64 GJMC), unless otherwise modified at the pre-application conference.

Table 28.12.020: Stormwater Management Manual Drainage Report Checklist

Instructions:

1. Applicant to identify with a check-mark if information is provided with report. If applicant believes information is not required, indicate with "n/a" and attach separate sheet with explanation.
2. The reviewer will determine if information labeled "n/a" is required and whether information must be submitted.
3. Those items noted with an asterisk are not typically required for conceptual/preliminary report. Applicant shall confirm this with local jurisdiction.
4. Submit three copies of report and include copy of check list bound with report.

TITLE PAGE

A. Type of report (conceptual/preliminary or final drainage report).

B. Project name.

C. Preparer name, firm, address, number, and date.

D. Professional Engineer's seal of preparer.

E. Certifications (see GJMC § 28.12.070).

I. INTRODUCTION

A. Background

_____ 1. Identify report preparer and purpose.

_____ 2. Identify date of letter with previous County comments.

B. Project Location

_____ 1. Identify Township, Range, and Section.

_____ 2. Identify adjacent street and subdivision names.

Table 28.12.020: Stormwater Management Manual Drainage Report Checklist

_____ 3. Reference to General Location Map.

C. Property Description

_____ 1. Identify area in acres of entire contiguous ownership.

_____ 2. Describe existing ground cover, vegetation, soils, topography and slopes.

_____ 3. Describe existing drainage facilities, such as channels, detention areas, or structures.

_____ 4. Describe existing irrigation facilities, such as ditches, headgates, or diversions.

_____ 5. Identify proposed types of land use and encumbrances.

D. Previous Investigations

_____ 1. Identify drainage master plans that include the project area, including floodplain studies.

_____ 2. Identify drainage reports for adjacent development.

II. DRAINAGE SYSTEM DESCRIPTION

A. Existing Drainage Conditions

_____ 1. Describe existing topography and provide map with contours extending a minimum of 100 feet beyond property limits.

_____ 2. Identify major drainageway or outfall drainageway and describe map showing location of proposed development within the drainageways.

_____ 3. Identify pre-developed drainage patterns and describe map showing predeveloped sub-basins and concentrated discharge locations. Provide calculations of pre-developed peak flows entering and leaving the site.

B. Master Drainage Plan

_____ 1. Describe location of the project relative to a previously prepared master drainage plan, including drainage plans prepared for adjacent development.

C. Off-Site Tributary Area

_____ 1. Identify all off-site drainage basins that are tributary to the project.

_____ 2. Identify assumptions regarding existing and future land use and effects of off-site detention on peak flows.

D. Proposed Drainage System Description

_____ 1. Identify how off-site stormwater is collected and conveyed through the site and ultimately to the receiving water(s).

_____ 2. Identify sub-basins and describe, in general terms, how on-site stormwater is collected and conveyed through the site for each location where stormwater is discharged from the site.

_____* 3. Describe detention volumes, release rates and pool elevations.

_____* 4. Identify the difference in elevation between pond invert and the groundwater table.

_____ 5. Describe how stormwater is discharged from the site, including both concentrated and dispersed discharges and rates.

_____ 6. Describe stormwater quality facilities.

_____* 7. Describe maintenance access aspects of design.

Table 28.12.020: Stormwater Management Manual Drainage Report Checklist

_____* 8. Describe easements and tracts for drainage purposes, including limitation on use.

E. Drainage Facility Maintenance

_____* 1. Identify responsible parties for maintenance of each drainage and water quality facility.

_____* 2. Identify general maintenance activities and schedules.

III. DRAINAGE ANALYSIS AND DESIGN CRITERIA

A. Regulations

_____ 1. Identify that analysis and design was prepared in accordance with the provisions of this manual.

_____ 2. Identify other regulations or criteria which have been used to prepare analysis and design.

B. Development Criteria

_____ 1. Identify drainage constraints placed on the project, such as by a major drainage study, floodplain study or other drainage reports relevant to the project.

_____ 2. Identify drainage constraints placed on the project, such as from major street alignments, utilities, existing structures, and other developments.

C. Hydrologic Criteria

(If manual was followed without deviation, then a statement to that effect is all that is required. Otherwise provide the following information where the criteria used deviates from this manual.)

_____ 1. Identify developed storm runoff peak flows and volumes and how they were determined, including rainfall intensity or design storm.

_____ 2. Identify which storm events were used for minor and major flood analysis and design.

_____ 3. Identify how and why any other deviations from this manual occurred.

D. Hydraulic Criteria

(If manual was followed without deviation, then a statement to that effect is all that is required. Otherwise provide the following information where the criteria used deviates from this manual.)

_____* 1. Identify type(s) of streets within and adjacent to development and source for allowable street capacity.

_____* 2. Identify which type(s) of storm inlets were analyzed or designed and source for allowable capacity.

_____* 3. Identify which type of storm sewers which were analyzed or designed and Manning's n-values used.

_____* 4. Identify which method was used to determine detention volume requirements and how allowable release rates were determined.

_____* 5. Identify how the capacity of open channels and culverts were determined.

_____* 6. Identify any special analysis or design requirements not contained with this manual.

_____ 7. Identify how and why any other deviations from this manual occurred.

Table 28.12.020: Stormwater Management Manual Drainage Report Checklist

E. Variance from Criteria

_____ 1. Identify any provisions of this manual for which a variance is requested.

_____ 2. Identify pre-existing conditions which cause the variance request.

***IV. POST-CONSTRUCTION STORMWATER MANAGEMENT. See Chapter 28.64 GJMC for requirements.**

Note: This section of the final drainage report identifies additional information required by Mesa County's, City of Grand Junction's, and Town of Palisade's, permit for stormwater discharges associated with municipal separate storm sewer systems (MS4s), Permit No. COR-090000. The final drainage plan and the construction SWMP (see Chapter 28.6 GJMC) meets the requirements of the MS4s permit. In general, this section identifies permanent BMP practices to control the discharge of pollutants after construction is complete.

*A. Stormwater Quality Control Measures

_____* 1. Describe the post-construction BMPs to control discharge of pollutants from the project site.

_____* 2. If compensating detention is provided, discuss practices to address water quality from area not tributary to detention area.

_____* 3. If underground detention is proposed, discuss how water quality facilities will be provided on the surface.

_____ 4. If proprietary BMPs are proposed, provide the justification and sizing requirements (see GJMC § 28.64.040).

*B. Calculations

_____ 1. Provide methods and calculations for WQCV, sediment storage, and water quality outlet structure.

V. CONCLUSIONS

A. Compliance with Manual

_____ Compliance with manual and other approved documents, such as drainage plans and floodplain studies.

B. Design Effectiveness

_____ Effectiveness of drainage design to control impacts of storm runoff.

C. Areas in Flood Hazard Zone

_____ Meet requirements of Floodplain Regulations: Mesa County Land Development Code, Section 7.13; GJMC § 21.07.010.

D. Variances from Manual

_____ Applicant shall identify any requested variances and provide basis for approving variance. If no variances are requested, applicant shall state that none are requested.

VI. REFERENCES

_____ Provide a reference list of all criteria, master plans, drainage reports, and technical information used.

TABLES

_____ Include copy of all tables prepared for report.

FIGURES

_____ A. General Location Map (See GJMC § 28.12.080(a))

_____ B. Floodplain Information

Table 28.12.020: Stormwater Management Manual Drainage Report Checklist

_____	C.	Drainage Plan (See GJMC § 28.12.080(b))
_____	D.	Other pertinent figures.
	APPENDICES	
	A.	DESIGN CHARTS
_____	1.	Provide copy of all design charts (i.e., tables, figures, charts from other criteria) used for the report.
	B.	HYDROLOGIC CALCULATIONS (see Chapters 28.24 and 28.28 GJMC)
_____	1.	Land use assumptions for off-site runoff calculations.
_____	2.	Time of concentration and runoff coefficients for pre-existing and post development conditions.
_____	3.	Pre-developed hydrologic computations.
_____	4.	Developed conditions hydrologic computations.
	C.	HYDRAULIC CALCULATIONS
_____	1.	Capacity of existing channels, streets, storm sewers, inlets, culverts and other facilities.
_____	2.	Calculations for existing storm sewer and open channel.
_____	3.	Irrigation ditch flows and ditch system capacity.
_____*	4.	Detention pond design (see Chapter 28.56 GJMC for requirements).
_____*	a.	Storage volume, release rates, and pool elevations for 10-year and 100-year storm.
_____*	b.	Outlet structure dimensions, orifice diameter, weir lengths, pipe headwater and other data.
_____*	c.	Outlet velocity and energy dissipation requirements.
_____*	d.	Routing of outlet flows and emergency spillway flows.
_____*	5.	Street capacity calculations, if data in manual not used (see Chapter 28.44 GJMC).
_____*	6.	Storm inlet capacity calculations, if data in manual not used (see Chapter 28.44 GJMC).
_____*	7.	Storm sewer capacity calculations, if data in manual not used (see Chapter 28.44 GJMC).
_____*	8.	Channel capacity calculations, if data in manual not used (see Chapter 28.32 GJMC).
_____*	9.	Culvert capacity calculations (see Chapter 28.48 GJMC).
_____*	10.	Other hydraulic structure calculations (see Chapter 28.36 GJMC).
	D.	STORMWATER QUALITY CALCULATIONS
_____	1.	Water quality capture volume (WQCV).
_____*	2.	Storage volume for sediment volume and pool elevations for WQCV.
_____*	3.	Outlet calculations for required area per row, diameter of individual holes, number of holes per row, and number of holes per column.
_____	**CERTIFICATION – PROFESSIONAL ENGINEER'S SEAL AND SIGNATURE**	
	ACKNOWLEDGEMENTS	

Table 28.12.020: Stormwater Management Manual Drainage Report Checklist

Drainage Report checklist was prepared by: _____

(Res. 40-08 (§ 301), 3-19-08)

§ 28.12.030. Conceptual/preliminary drainage report.

The purpose of the conceptual/preliminary drainage report is to:

(a) Identify drainage conditions prior to proposed development, including designated floodplain boundaries (see Table 28.12.020).

(b) Identify existing and potential drainage problems, which may occur on site or off site because of the development.

(c) Identify proposed solutions to drainage problems, including location of detention storage and water quality requirements, in sufficient detail to verify technical feasibility.

Text shall be typed on eight-and-one-half-inch by 11-inch paper. All pages, including appendices, shall be numbered in a fashion that identifies the report (e.g., PDR-#). Text, tables, figures, charts, calculations, and appendices shall be bound to form a formal report. Drawings shall be included in a pocket attached with the report, but shall not be smaller than 11 inches by 17 inches or larger than 24 inches by 36 inches in size. The report shall include a cover letter presenting the conceptual/preliminary design for review and shall be stamped and signed by an engineer licensed in Colorado.

(Res. 40-08 (§ 302), 3-19-08)

§ 28.12.040. Conceptual/preliminary report contents.

The conceptual/preliminary drainage report shall contain general information regarding the proposed drainage facilities for the development. For instance, only identify that a channel or storm drain is proposed for conveyance, and not the size, slope, velocity or other more detailed information. Also, it is only required to identify the location and type of detention (i.e., drainage and water quality), and not the volumes or release rates; however, post-development flow rates shall be calculated and submitted with the preliminary report.

The report shall be prepared in accordance with the outline provided as part of the checklist in Table 28.12.020 (see also GJMC § 28.12.130). Grading and erosion control information are not required. The checklist must be completed by the applicant and included with the drainage report. The checklist will be used to determine the completeness of the report. If information provided is lacking or incomplete, the information may be required prior to further review. It is understood that information in the conceptual/preliminary drainage report is subject to change. More detail can be required if necessary due to the complexity of a development.

(Res. 40-08 (§ 302.1), 3-19-08)

§ 28.12.050. Conceptual/preliminary report drawing contents.

(a) General Location Map. A map (eight and one-half inches by 11 inches) shall be provided in sufficient detail at a scale not larger than one inch equals 1,000 feet and included with the report. The map shall identify:

(1) Drainage flows entering and leaving the development and general drainage patterns within the development.

(2) Path of all drainage from the upper end of any off-site basins to the defined major drainageways (see Chapter 28.16 GJMC, Drainage Policy).

(3) Major construction (i.e., development, irrigation ditches, existing detention facilities, culverts, and storm drains) along the entire path of drainage.

(4) All major basins. Topographic contours are optional.

(b) Conceptual/Preliminary Drainage Plan. Map(s) of the proposed development at a scale of one inch equals 20 feet to one inch equals 200 feet on a 24-inch by 36-inch drawing shall be included. The plan shall show the following:

(1) Existing and (if available) proposed contours at five-foot maximum intervals. The contours shall extend beyond the property boundaries the distance necessary to show how the development interacts hydraulically with the surrounding area, but no less than 50 feet. Mesa County contours are acceptable provided they are representative of actual field conditions.

(2) All existing drainage facilities. If existing (pre-development) conditions cannot be adequately addressed on the proposed drainage plan, then a separate existing conditions drainage plan shall be prepared and included with the submittal document.

(3) Approximate flooding limits based on available information.

(4) Conceptual major drainage facilities including detention basins, storm drains, swales, riprap, and outlet structures in the detail consistent with the proposed development plan.

(5) Major drainage boundaries and sub-boundaries.

(6) Any off-site feature influencing development, including both upstream and downstream structures.

(7) Proposed flow directions entering, within, and exiting the development and, if available, proposed contours. Identify the drainage path from the development to the nearest MS4 facility or major drainageway.

(8) Existing and proposed irrigation facilities.

(9) Legend to define map symbols.

(10) Title block in lower right corner.

(11) All elevations shall be NAVD 1988.

(Res. 40-08 (§ 302.2), 3-19-08)

§ 28.12.060. Final drainage report.

The purpose of the final drainage report is to:

(a) Identify drainage conditions prior to proposed development, including floodplain boundaries.

(b) Identify existing and potential drainage problems, which may occur on site or off site because of the development.

(c) Investigate or refine conceptual solutions to drainage problems, including detention storage and water quality requirements, in sufficient detail to verify their technical feasibility.

(d) Present final design and details for drainage facilities discussed in the conceptual/ preliminary drainage report.

(e) Identify post-construction BMPs to control the discharge of pollutants in stormwater to the maximum extent practicable.

Text shall be typed on eight-and-one-half-inch by 11-inch paper. All pages, including appendices, shall be numbered in a fashion that identifies the report (e.g., FDR-#). Text, tables, figures, charts, calculations, and appendices shall be bound to form a formal report. Drawings shall be 24 inches by 36 inches and included in a pocket attached with the report. The report shall include a cover letter presenting final design for review and shall be stamped and signed by an engineer licensed in Colorado.

(Res. 40-08 (§ 303), 3-19-08)

§ 28.12.070. Final report contents.

The final drainage report shall provide final details of proposed drainage facilities, including grading, erosion control, and water quality enhancement, and is to be submitted along with construction documents (see GJMC § 28.12.130).

The final drainage report shall be prepared by an engineer registered in Colorado in accordance with the outline provided as part of the checklist in Table 28.12.020 (see also GJMC § 28.12.130). The checklist must be completed by the applicant and included with the drainage report. The checklist will be used to determine the completeness of the report. If information provided is lacking or incomplete, the information may be required prior to further review.

The report shall contain the following certifications:

> I hereby certify that this *Final Drainage Report* (plan) for the design of (Name of Development) was prepared by me (or under my direct supervision) in accordance with the provisions of the *Stormwater Management Manual* for the owners thereof. I understand that the (local jurisdiction) does not and will not assume liability for drainage facilities designed by others.

_____
Registered Professional Engineer
State of Colorado No._____
(Affix Seal)

I, (Name of Developer) hereby certify that the drainage facilities for (Name of Development) shall be constructed according to the design presented in this report. I understand that the (local jurisdiction) does not and will not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that the (local jurisdiction) reviews drainage plans but cannot, on behalf of (Name of Development), guarantee that final drainage design review will absolve (Name of Developer) and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Final Plat and/or Final Development Plan does not imply approval of my engineer's drainage design.

_____
Name of Developer

_____ _____
Authorized Signature Date

(Res. 40-08 (§ 303.1), 3-19-08)

§ 28.12.080. Final report drawing contents.

(a) General Location Map. An eight-and-one-half-inch by 11-inch map shall be provided in sufficient detail at a scale not larger than one inch equals 1,000 feet and included with the report. The map shall identify:

(1) Drainage flows entering and leaving the development and general drainage patterns.

(2) Path of all drainage from the upper end of any off-site basins to the defined major drainageways (see Chapter 28.16 GJMC, Drainage Policy).

(3) Major construction (i.e., development, irrigation ditches, existing detention facilities, culverts, and storm drains) along the entire path of drainage.

(4) All major basins. Topographic contours are optional.

(b) Final Drainage Plan. Map(s) of the proposed development at a scale of one inch equals 20 feet to one inch equals 200 feet on a 24-inch by 36-inch drawing shall be included. The plan shall show the following:

(1) Existing and proposed contours at two-foot maximum intervals. The contours shall be based on a USGS datum and extend a minimum of 50 feet beyond property lines, or further if required to show how the development interacts with the surrounding area.

(2) Location of benchmarks, which must be one of the following:

(i) Mesa County monumentation, including GIS reference points;

(ii) USGS NAVD 1988;

(iii) City of Grand Junction; or

(iv) Colorado Department of Transportation.

(3) Property lines and easements with purposes noted.

(4) Existing street names and proposed streets, indicating names, right-of-way width, flowline width, curb type, sidewalk, and approximate slopes.

(5) All existing drainage boundaries and peak flows entering and within the exiting development. Existing facilities such as irrigation and roadside ditches, drainageways, culverts, and detention sites. Include pertinent characteristics, such as location, size, shape, slope, and material. A separate existing conditions drainage plan shall be prepared and included with the submittal document that details the pre-development conditions listed in this line item.

(6) Any off-site feature influencing development, including both upstream and downstream structures.

(7) Proposed drainage boundaries and sub-boundaries.

(8) Proposed type of street flow (i.e., vertical or combination curb and gutter), roadside ditches, gutter slope, and flow directions, and cross-pans.

(9) Proposed storm drains and open drainageways, including inlets, manholes, culverts, and other appurtenances, including erosion/riprap protection.

(10) Proposed outfall point for runoff from the developed area and facilities to convey flows to the final outfall point without damage to downstream properties.

(11) Routing and accumulation and flows at various critical points for the initial storm runoff listed on the drawing.

(12) Volumes and release rates for detention storage facilities and information on outlet works.

(13) Location and elevations of all existing floodplains affecting the property.

(14) Location and elevations of all existing and proposed utilities affected by or affecting the drainage design.

(15) Routing of off-site drainage flow through the development.

(16) Definition of flow path leaving the development through the downstream properties ending at a major drainageway.

(17) Legend to define map symbols (see Table 28.12.080 for symbol criteria).

(18) Title block in lower right hand corner.

(19) Identify each post-construction BMP including the WQCV provided or other bases for sizing BMPs.

(20) All elevations shall be NAVD 1988.

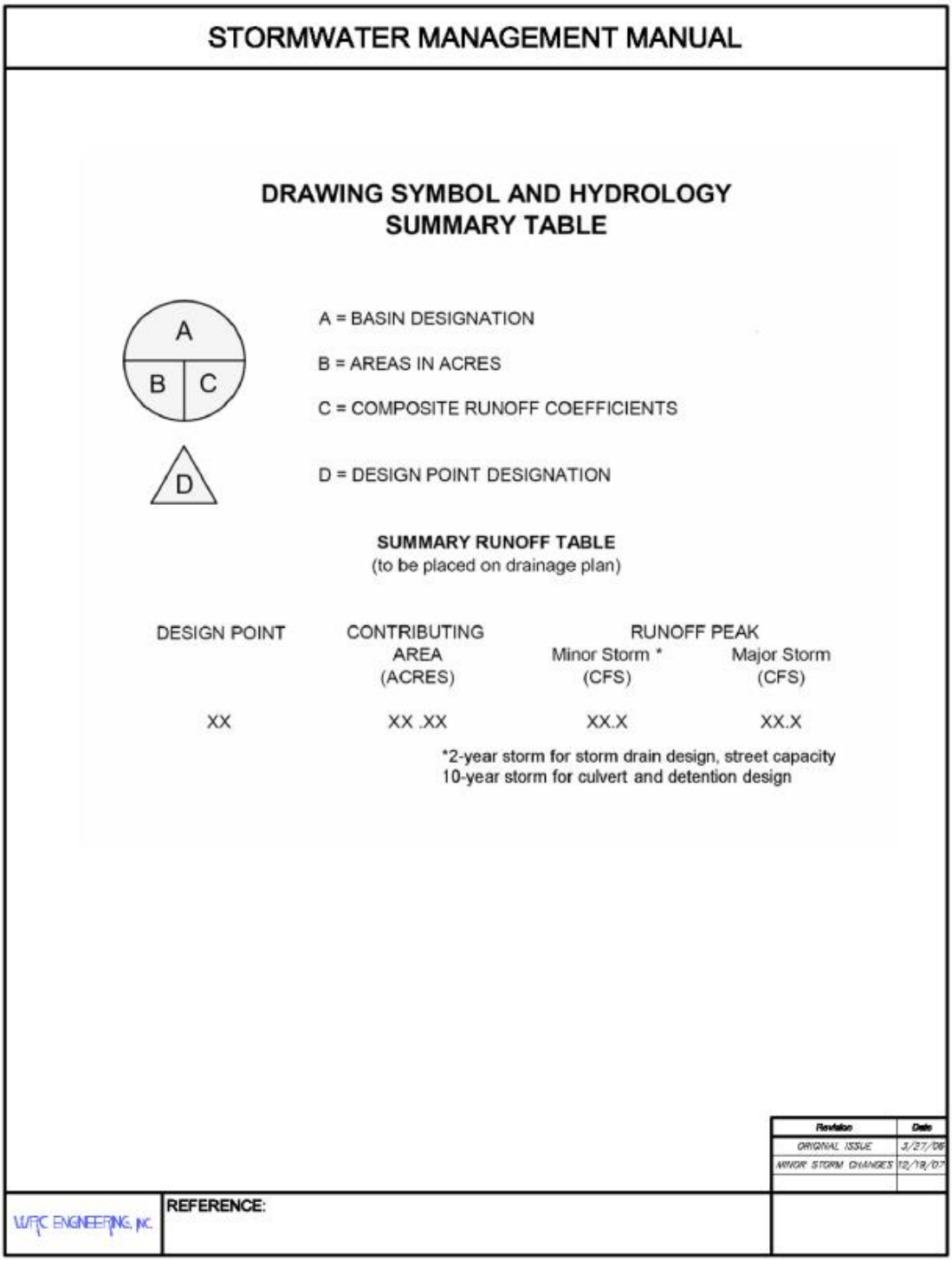


TABLE 28.12.080

(Res. 40-08 (§ 303.2), 3-19-08)

§ 28.12.090. Construction plans.

(a) Mesa County. The final construction plans and final drainage report must be submitted for acceptance to the Director at least 20 working days prior to the consideration of the plat before the County Commissioners. Before final subdivision plats and site plans can be submitted to County Commissioners for approval, the following conditions must be met:

(1) Drainage reports and/or construction plans must be accepted by the Director without conditions;

(2) All required easements and licenses with the County must be approved by the Director and the County Attorney, and the appropriate title insurance provided; and

(3) Easements and other agency approvals must be fully executed and copies provided to the County.

Acceptance of the final construction plans and final drainage report are required prior to issuance of a permit.

Construction plans shall be prepared in accordance with sound engineering principles, this manual and the Mesa County Land Development Code for subdivision designs. Construction documents shall include geometric, dimensional, structural, foundation, bedding, hydraulic, landscaping, and other details as needed to construct the storm drainage facility. The approved final drainage plan shall be included as part of the construction document for all facilities affected by the drainage plan. Construction plans shall be signed by a registered professional engineer as being in accordance with the County approved drainage report, drawings, and this manual. Requirements for construction plans are outlined in the checklist in Table 28.12.090.

(b) City of Grand Junction. Refer to the Submittal Standards for Improvements and Development for specific requirements for construction plans.

(c) Other Jurisdictions. Refer to requirements of the City of Fruita, Town of Palisade or the Grand Junction Drainage District for construction plans.

Table 28.12.090: Stormwater Management Manual Drainage Plan Checklist

Instructions: 1. Applicant to identify with a check-mark if information is provided. If applicant believes information is not required, indicate with "n/a."

2. County will determine if information labeled "n/a" is required and whether information must be submitted.

I. EXISTING FACILITIES

_____ A. Contours at two-foot intervals, based on USGS datum. Contours to extend at least 50 feet past property line.

_____ B. Location and elevation of USGS benchmarks or benchmarks referenced to USGS.

_____ C. Property lines.

_____ D. Drainage easements.

_____ E. Street names.

_____ F. Major and minor channels and floodplains.

Table 28.12.090: Stormwater Management Manual Drainage Plan Checklist

_____ G. A historic drainage plan including historic basin boundaries and flow paths.

II. PROPOSED FACILITIES

_____ A. Contours at two-foot intervals, based on USGS datum.

_____ B. Property lines.

_____ C. Drainage easements.

_____ D. Street names and grades.

_____ E. Right-of-way and easement.

_____ F. Finished floor elevations for protection from major storm runoff.

_____ G. Detention pond information:

_____ 1. Location of each detention pond with site at 1" = 50' scale or larger with two-foot contour intervals.

_____ 2. Inlet and outlet structure, and trickle channel design details.

_____ 3. Details of emergency spillway and channel.

_____ 4. Landscape information, including side slopes, vegetation and planting requirements.

_____ 5. Details of water quality outlet structure.

H. Channel information:

_____ 1. Profiles with existing and proposed grades.

_____ 2. Cross-sections on 100-foot stations showing existing and proposed topography and required rights-of-way.

_____ 3. Locations and size of all existing and proposed structures.

_____ 4. Locations and profiles of adjacent utilities.

_____ 5. Typical channel section and lining details.

I. Storm sewer information:

_____ 1. Alignment and location of manholes, inlets, and outlet structures.

_____ 2. Profile of invert and pipe crown.

_____ 3. Invert elevations at manholes and inlets.

_____ 4. Lengths and grades between manholes and inlets.

_____ 5. Locations and elevations of utilities adjacent to and crossing storm sewer.

_____ 6. Easement and other O&M access geometry.

_____ 7. Outlet details, such as end sections, headwall and wingwalls, erosion control, and vegetation.

_____ J. Street cross-sections with design 100-year flood depth.

_____ K. Other drainage related structures and facilities, including underdrains and sump pump discharge lines.

_____ L. Other permanent BMP measures to control pollutant discharges to the County's MS4 system.

III. HYDRAULIC AND HYDROLOGIC INFORMATION

Table 28.12.090: Stormwater Management Manual Drainage Plan Checklist

_____ A. Routing and accumulative runoff peaks at upstream and downstream ends of the site and at various critical points on-site for initial and major storms. Inflow and outflow from each sub-basin shall be shown for both initial and major storms.

_____ B. Street cross-sections showing 100-year flood levels.

_____ C. Major and minor channels and floodplains.

_____ D. Detention pond data:

_____ 1. Release rates for 10- and 100-year storm events.

_____ 2. Required and provided volumes for 10- and 100-year storm events.

_____ 3. Design depths for 10- and 100-year storm events.

_____ 4. Water quality capture volume and pool elevation.

E. Channel data:

_____ 1. Water surface profiles.

_____ 2. Representative 100-year flow velocity and Froude number.

F. Storm sewer data:

_____ 1. Profile of water surface for design flow rate.

_____ 2. Peak flows for design flow, two-year and 100-year storm events.

IV. STANDARD NOTES

_____ A. No building, structure, or fill will be placed in the detention areas and no changes or alterations affecting the hydraulic characteristics of the detention areas will be made without the approval of the County.

_____ B. Maintenance and operation of the detention and water quality areas is the responsibility of property owner. If owner fails in this responsibility, the County has the right to enter the property, maintain the detention areas, and be reimbursed for costs incurred.

_____ C. Detention pond volumes, all drainage appurtenances, and basin boundaries shall be verified. As-built drawings shall be prepared by a registered professional engineer prior to issuance of certificate of occupancy for any structure within the development.

D. Permission to reproduce these plans is hereby given to Mesa County for County purposes associated with plan review, approval, permitting, inspection and construction of work.

_____ **V. PROFESSIONAL ENGINEER'S SEAL AND SIGNATURE**

VI. OTHER

_____ A. Horizontal and vertical control information and ties to existing and proposed features.

ACKNOWLEDGEMENTS

Drainage Plan checklist was prepared by: _____

(Res. 40-08 (§ 303.3), 3-19-08)

§ 28.12.100. Post-construction BMPs.

Mesa County, the City of Grand Junction, the Grand Junction Drainage District, and the Town of Palisade, who are members of the Drainage Authority, have obtained permits to discharge stormwater under the Colorado Discharge Permit System (permit numbers COR-090031, COR-090077, COR-090006, and COR-090005, respectively). The terms and conditions of the permits set forth minimum requirements for stormwater management programs including construction site stormwater runoff control and post-construction stormwater management for new development and redevelopment to reduce pollutants in all stormwater runoff to the MS4.

These permit conditions are the basis for requirements identified in Chapter 28.64 GJMC. The final drainage report shall identify and include design bases, calculations, and construction details for post-construction BMPs, in accordance with requirements of Chapter 28.64 GJMC.

(Res. 40-08 (§ 303.4), 3-19-08)

§ 28.12.110. Construction SWMP.

The permit conditions described in GJMC § 28.12.100 are the basis for requirements identified in Chapter 28.6 GJMC. The construction SWMP requirements, which are described in Chapter 28.6 GJMC, meet the conditions of the permit. The construction SWMP is a separate document from the final drainage report, must be prepared and certified by a qualified erosion control specialist, and is generally submitted for approval after the final drainage report. Contact local jurisdiction for exact timing of submittal.

(Res. 40-08 (§ 303.5), 3-19-08)

§ 28.12.120. Record drawings and acceptances.

(a) Mesa County.

(1) Record Drawings.

(i) Record drawings for all improvements are to be submitted to the County. Drawings shall be submitted in electronic format, along with mylar (minimum three mil.) reproducible copy and paper prints. Drawings shall include appropriate seals and signatures in accordance with current State law, with the request for probationary acceptance of public improvements or prior to requesting a certificate of occupancy for commercial, industrial or multifamily residential building sites. Certification of the record drawings is required as follows:

(A) Registered Professional Engineer (PE). A registered PE in the State of Colorado shall certify, based on survey from a registered land surveyor, the as-built detention pond volumes and surface areas at the design depths, outlet structure sizes and elevations, storm drain sizes and invert elevations at inlets, manholes, and discharge location, and representative open channel cross-sections, and dimensions of all the drainage structures.

(B) Registered Professional Engineer. The responsible design engineer shall state that "to the best of my knowledge, belief, and opinion, the drainage facilities were constructed in accordance with the design intent of the approved drainage report and construction drawings."

(ii) The Director will compare the certified record drawing information with the construction drawings to ensure that:

(A) The record drawing information demonstrates that the construction is in compliance with the design intent.

(B) The record drawings are certified by a professional engineer licensed in Colorado.

(2) Probationary Acceptance. All public storm drainage facilities shall be guaranteed by the developer to the County for a minimum 18-month warranty period (with the exception of drains over 20 feet deep, which shall require a two-year warranty period or other special cases).

The developer is responsible for routine maintenance, any workmanship defects, and for removal and cleanup of construction debris, dirt and mud in the system during the warranty period.

(3) Acceptances.

(i) For newly constructed public drainage improvements, the County may consent to a reduction of the improvements guarantee provided by the developer when the drainage improvements are granted probationary acceptance.

(ii) For new commercial, industrial and residential building sites, the drainage portion of the certificate of occupancy shall be accepted when the record drawings are determined by the County to comply with the above criteria.

(b) City of Grand Junction. Refer to the Submittal Standards for Improvements and Development (SSID) for specific requirements regarding record drawings and acceptance.

(c) Other Jurisdictions. Refer to requirements of the City of Fruita, Town of Palisade or the Grand Junction Drainage District regarding record drawings and acceptance.

(Res. 40-08 (§ 304), 3-19-08)

§ 28.12.130. Submittal checklist.

(a) Mesa County. To aid the designer and reviewer, a summary of the required certifications and approvals is presented below.

ITEM	CERTIFICATION REQUIRED	COUNTY ACCEPTANCE REQUIRED
Conceptual Drainage Report	Engineer	No
Final Drainage Report	Engineer and Developer	Yes

ITEM	CERTIFICATION REQUIRED	COUNTY ACCEPTANCE REQUIRED
Construction Drawings	Engineer	Yes
Construction SWMP (see Chapter 28.6 GJMC)	Qualified EC Specialist	Yes
Record Drawings	Engineer	Yes

Checklists for conceptual/preliminary and final drainage reports, and for construction plans, are provided in Table 28.12.020 and Table 28.12.090. These checklists contain recommended report outline and contents for all drainage reports. A copy of the completed checklist shall be bound with the conceptual/preliminary and final drainage report.

The applicant is to identify with a "✓" if information is provided with the appropriate submittal. If applicant believes information is not required, indicate with "n/a." The County will review the submittal to determine if information is required and whether information must be submitted. Due to the nature of a conceptual/preliminary report, not all information listed in the outline/checklist may be required for a conceptual/preliminary drainage report, such as those items listed with an asterisk (*). If the applicant is uncertain if information is required, the applicant is encouraged to contact the County.

(b) City of Grand Junction. The submittal checklist for the City of Grand Junction follows the same steps and procedures set forth for Mesa County presented in subsection (a) of this section. In addition the designer and reviewer are to refer to the Submittal Standards for Improvements and Development (SSID) for specific requirements regarding checklist requirements.

(c) Other Jurisdictions. Refer to requirements of the City of Fruita, Town of Palisade or the Grand Junction Drainage District regarding checklist requirements.

(Res. 40-08 (§ 305), 3-19-08)

Chapter 28.16
Drainage Policy

§ 28.16.010. Introduction.

Presented in this chapter of the manual are policies that govern development of specific standards and criteria for the design, evaluation, and construction of drainage facilities. These policies are based on industry standards for stormwater management that have evolved through experience gained. Policy statements are indicated by ***bold italic*** text to distinguish them from background information, which is presented to assist with decisions regarding special circumstances that may arise during development.

(Res. 40-08 (§ 401), 3-19-08)

§ 28.16.020. Basic principles.

(a) Jurisdictional Cooperation. Mesa County, the Cities of Grand Junction and Fruita, the Town of Palisade, and the Grand Junction Drainage District have contracted through

intergovernmental agreements (IGA) to form the 5-2-1 Drainage Authority (Authority), under Colorado Revised Statutes, specifically § 29-1-204.2, C.R.S. The stated purpose of the Authority is to pursue unified stormwater management planning that meets the requirements of the Colorado Water Quality Control Act (§ 25-8-101, C.R.S. et seq.) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.) for the discharge of stormwater associated with municipal separate storm sewer systems.

The Drainage Authority was created to pursue a jurisdictionally unified effort to promote integrated, comprehensive, regional stormwater management planning, while recognizing local requirements may have minor differences in policies, standards and criteria presented in this manual.

(b) Drainage Planning and Required Space. ***All new development and redevelopment shall provide storm drainage planning that includes allocation of space for drainage facilities, construction and maintenance, and dedication of rights-of-way and/or easements.***

(c) Multi-Purpose Resource. Stormwater runoff is an integral part of Mesa County's and the City of Grand Junction's water resources and may have potential for beneficial uses, such as groundwater recharge, recreation, and wildlife habitat. These uses, however, must be compatible with adjacent land uses and applicable State water laws.

Stormwater runoff shall be considered an integral part of Mesa County's water resources.

(d) Water Rights. A drainage design must be planned and constructed with recognition given to adjudicated water rights and applicable water laws.

The existence of adjudicated water rights and all applicable State laws related thereto shall be recognized in stormwater management plans.

(e) Drainage Analysis Tributary Area. Stormwater runoff will follow pathways established by physical boundaries and not political or property boundaries. Therefore:

Any drainage analysis must consider all tributary area and the potential for future land use changes within the tributary area.

(Res. 40-08 (§ 402), 3-19-08)

§ 28.16.030. Regional and local planning.

(a) Reasonable Use Rule. The *reasonable use rule* is defined for drainage planning purposes as permitting the use of an economic and hydraulically efficient drainage system which is demonstrated not to adversely impact downstream properties within reason. This reasonable use of drainage therefore allows development to occur while preserving the rights of adjacent property owners.

Stormwater discharges from new development and redevelopment shall be:

(1) Discharged to downstream properties within the pre-developed drainage path and in a manner and quantity and quality that approximates pre-developed conditions. If developed stormwater discharges occur in a more concentrated manner, then additional measures are required to protect downstream properties.

(2) Limited to pre-developed rates, unless downstream drainage facilities can accommodate increased flow rates from development and permission/easements are granted.

(Res. 40-08 (§ 403.1), 3-19-08)

§ 28.16.040. Regional master planning.

It is the intent of Mesa County and the other cooperating governmental entities to develop, adopt, and use Watershed Master Plans to identify stormwater requirements. Once adopted, these plans will be reviewed and updated regularly. When Watershed Master Plans are not available, then requirements in the Stormwater Management Manual will govern.

(Res. 40-08 (§ 403.2), 3-19-08)

§ 28.16.050. Drainage improvements.

Drainage facilities are categorized as part of either the major drainage system or the outfall system. Recommended public improvements to major drainage and outfall drainage systems are defined in Watershed Master Plans, if they exist. If a Master Plan does not exist, other information will be used to determine the scope of public improvements.

All new development and redevelopment shall participate in drainage improvements as set forth below:

(a) Outfall Drainage System.

(1) Design and construct that portion of the outfall drainage system, as defined by the approved final drainage report (Chapter 28.12 GJMC).

(2) If the outfall system is defined in a Watershed Master Plan, and traverses the development, the developer shall design and construct that portion of the outfall system within the development, in accordance with this manual.

(3) If the outfall system defined in a Watershed Master Plan does not traverse the development, but is required to convey stormwater from the development to the major drainageway, the developer shall design and construct that portion of the outfall system within the development, in accordance with this manual. The local jurisdiction may participate in the connection of the outfall to the major drainageway at their sole discretion.

(b) Major Drainage System.

(1) If new development (i.e., the placement of fill or structures) encroaches into a 100-year floodplain (whether mapped or not), the developer will be required to construct improvements as described in the Watershed Master Plan. If a Watershed Master Plan is not available, the developer shall have prepared a channel stabilization analysis, under the guidance of the local jurisdiction, to identify required improvements and shall implement the mitigation plan.

(2) Additional improvements to protect health, safety, and welfare may be required by the local jurisdiction if new development is within the vicinity of a 100-year floodplain, whether mapped or not. The developer may be required to participate in a channel stabilization analysis, under the guidance of the local jurisdiction, and may be required to participate in the implementation of the mitigation plan. For the purpose of this policy, "vicinity" shall mean any portion of the property that lies within a setback area defined by a slope of 10 feet horizontal to one foot vertical (10:1) from the channel invert to the point where the slope daylights.

(Res. 40-08 (§ 403.3), 3-19-08)

§ 28.16.060. Drainage fee calculation.

Fees may be collected by the local jurisdiction and used by the local jurisdiction solely for the planning, design and construction of drainage improvements to the outfall drainage system and major drainage systems.

When drainage fees are assessed for new development and redevelopment, the drainage fee will be determined based on the following equation:

$$\text{Drainage Fee} = B(C_D - C_H)A^{0.7} \qquad (28.16\text{-}1)$$

where:

	B	=	Fee constant (U.S. dollars, see local jurisdiction for value)
	C_D	=	100-year runoff coefficient (expressed as a decimal) based on developed land use conditions
	C_H	=	100-year runoff coefficient (expressed as a decimal) based on pre-developed land use conditions
	A	=	Area of development (acres)

(Res. 40-08 (§ 403.4), 3-19-08)

§ 28.16.070. Proposed drainage improvements.

All investigations, reports, and construction plans prepared for drainage improvements shall be submitted for review and acceptance before construction of said improvements, and shall be consistent with this Stormwater Management Manual and Watershed Master Plans.

(Res. 40-08 (§ 403.5), 3-19-08)

§ 28.16.080. Floodplain management.

Floodplains within Mesa County, Grand Junction, Fruita and Palisade shall be regulated in accordance with the provisions of the applicable land development/use code.

(Res. 40-08 (§ 403.6), 3-19-08)

§ 28.16.090. Storm runoff detention.

Since urban development can increase the rate, volume, duration, and frequency of stormwater runoff, measures must be implemented to avoid harm to downstream properties. Detention is considered a viable method to reduce development impacts and drainage costs. Temporarily detaining storm runoff can significantly reduce downstream flood hazards as well as reduce pipe and channel sizes in developed areas. Temporary storage also provides for sediment and debris collection which helps to maintain water quality in downstream channels and streams. However, detention may not be necessary where downstream drainage facilities have adequate capacity to convey runoff from fully developed upstream areas without negatively impacting downstream properties.

(a) Detention Requirements.

(1) On-site detention storage is required for all new development or redevelopment to limit 10-year peak stormwater discharges to the 10-year storm runoff based on pre-developed conditions. In addition to the 10-year detention, detention of the 100-year storm event and release at pre-developed rates will be required, if the capacity of the downstream drainage system will be exceeded. With local jurisdiction approval, detention may be considered for off-site flows draining to a site. See Chapter 28.56 GJMC for details.

(2) A fee in lieu of detention may be required in lieu of on-site detention that is not required (see GJMC § 28.56.050 through 28.56.070). Granting fee in lieu of detention does not exempt the development from providing post-construction BMPs.

(b) Detention Exemption. ***At the sole discretion of the local jurisdiction, exemptions to on-site detention may be granted for the following conditions. Note that in all cases, post-construction BMPs are required:***

(1) A development which discharges to a regional drainage facility is exempt provided the regional facility is completed in accordance with a Watershed Master Plan, the regional facility was designed to include runoff from the proposed development, and there is adequate conveyance capacity for the drainage system from the development to the regional facility.

(2) A development lying within the limits of a Watershed Master Plan which explicitly exempts on-site detention for development.

(3) A development which discharges to a local detention facility is exempt provided the local detention is completed in accordance with the final drainage plan for the development and was designed to include runoff from the proposed development.

(4) A development which discharges to an outfall drainage system that has adequate conveyance capacity for the 100-year flood from a fully developed watershed.

(5) When it can be demonstrated that the peak flows from the development will not increase the peak flows from the watershed for storm events up to the 100-year flood. The burden of proof is on the developer to demonstrate this condition.

A fee in lieu of detention may be required in lieu of on-site detention that is not required.

(Res. 40-08 (§ 403.7), 3-19-08)

§ 28.16.100. Storm runoff retention.

Storm runoff retention or over-detention may be used when downstream drainage facilities lack adequate conveyance capacity or are essentially nonexistent and construction of an outfall drainage system is impractical.

Retention or over-detention may be used in those instances where there are severe limitations on the downstream conveyance capacity or where there is essentially no outfall or drainage system to convey storm runoff from the development. The acceptability of retention will be determined on a case-by-case basis.

(Res. 40-08 (§ 403.8), 3-19-08)

§ 28.16.110. Stormwater quality.

Studies by the Environmental Protection Agency (EPA) and others have shown that land disturbances due to construction activities and the resulting development decrease the quality of storm runoff. The CDPS stormwater discharge permit requires that construction activities and new development be controlled to minimize the discharge of pollutants to the maximum extent practicable. As such, it is recognized that construction sediment and erosion control, stream stabilization, and permanent best management practices (BMPs) are necessary to protect the quality of the waters of the State.

All significant development and redevelopment disturbing more than one acre within the urban areas of Mesa County shown on Figure 28.16.110 shall implement:

(a) Sediment and erosion control measures during construction activities;

(b) Stream stabilization measures for the major drainageways;

(c) Post-construction best management practices to control the discharge of pollutants to the municipal separate stormwater system (MS4).

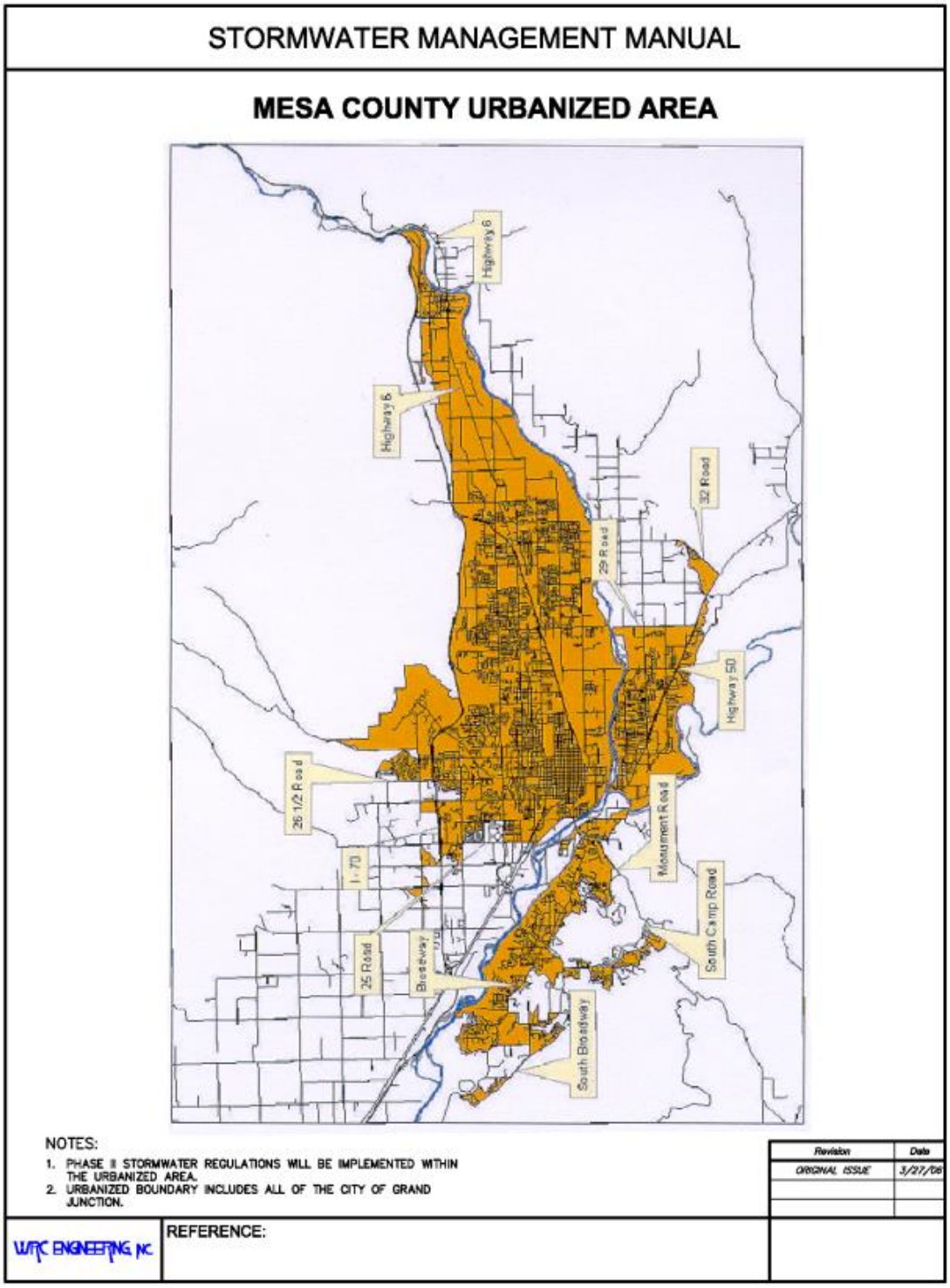


FIGURE 28.16.110

(Res. 40-08 (§ 403.9), 3-19-08)

§ 28.16.120. Drainage facilities maintenance.

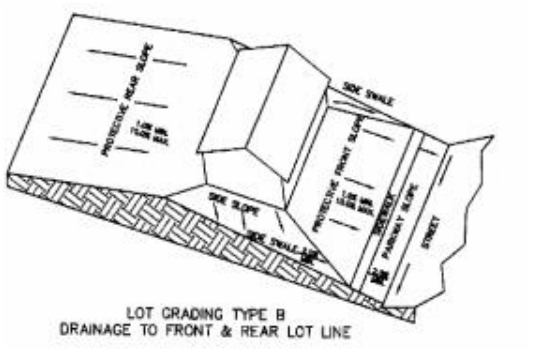
An important part of all storm drainage facilities is continued maintenance of the facilities to ensure they will function as designed. Maintenance of drainage facilities includes a number of routine tasks, such as removal of debris and sediment, and nonroutine tasks, such as restoring damaged structures.

All drainage facilities will be maintained to preserve their function, and shall:

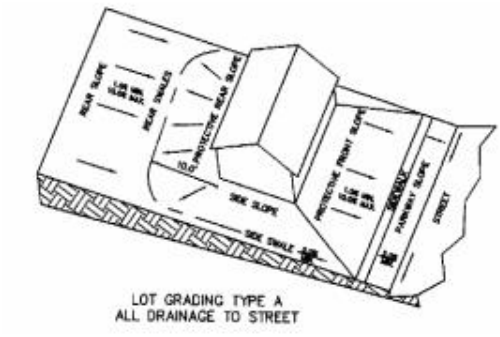
(a) Be designed to minimize and facilitate maintenance.

(b) Include access to the entire drainage facility by dedication of rights-of-way, easements and tracts of land specifically for drainage purposes. Tracts or easement dedications shall prohibit uses and the construction of permanent improvements that restrict or block access. Specifically, detention and retention basins in subdivisions shall be located in tracts owned by the property owners' association with an easement granted to the local jurisdiction. Basins for individual sites require neither a tract nor an easement but do require a maintenance agreement.

(c) Be incorporated in the lot grading for residential development in conformance with FHA lot grading Type A (all drainage to street) or Type B (drainage to front and rear lot line). Typical FHA three dimension Type A and Type B grading plans are shown below:



LOT GRADING TYPE B
DRAINAGE TO FRONT & REAR LOT LINE



LOT GRADING TYPE A
ALL DRAINAGE TO STREET

(d) Be maintained by the property owner, the developer and/or a homeowners' association. Should the property owner fail to adequately maintain drainage facilities, the right is reserved to enter the property, upon proper notice, for the purpose of performing drainage maintenance. All maintenance costs shall be assessed against the owner(s) of the property.

(e) Include v-pans (two-foot minimum width) or storm sewer systems with an inlet in each yard when the grading plan creates backyard swales (regardless of swale slope). These must be installed prior to curb and gutter installation. Check with local municipality to confirm this requirement.

(Res. 40-08 (§ 403.10), 3-19-08)

§ 28.16.130. Watershed transfer of storm runoff.

Drainage law recognizes the inequity of transferring the burden of managing storm drainage from one location or property to another. Liability questions also arise when the historic drainage continuum is altered. The diversion of storm runoff from one basin to another shall be avoided unless specific and prudent reasons justify and dictate such a transfer.

Stormwater diversion may be investigated during development of Watershed Master Plans and may be shown, in some instances, to be a viable option to address drainage and flooding problems. Tests for reasonableness of the potential transfer include:

(a) Determine where the runoff would go if the diversion system were to fail. If the flow stays in the historic basin, then the diversion may be reasonable.

(b) Determine if the downstream channel to which the drainage flows are being transferred is adequate to handle increased flows. If the channel has capacity, the diversion may be reasonable.

(c) Check condition where diversion fails during the major flood. If the downstream natural channel would have adequate capacity without adverse effects, the diversion may be reasonable.

(d) Determine if there would be any adverse water quality impact in either drainageway. If there is little or no impact, the diversion may be reasonable.

The development process can and will significantly alter the historic or natural drainage paths. When these alterations result in development outfall system that discharges back into the natural drainageway at or near the historic location, then the alterations (i.e., intra-basin transfer) are generally acceptable. However, when the subdivision outfall system does not return to the historic drainageway, an inter-basin transfer may result.

Inter-basin transfer as a drainage solution for new development is prohibited, unless allowed as a deviation/variance to this manual (see Chapter 28.08 GJMC) or as part of the Watershed Master Plan. During development of Watershed Master Plans where retrofit facilities are evaluated, inter-basin transfer may be a viable alternative in certain instances and will be reviewed on a case-by-case basis.

(Res. 40-08 (§ 403.11), 3-19-08)

§ 28.16.140. Technical criteria – Stormwater management technology.

All storm drainage facilities shall be planned and designed in accordance with this manual. Criteria in this manual may be revised or amended as new technology is developed and/or experience gained in the use of these criteria. Exemptions to criteria and standards may be approved on a case-by-case basis.

Construction of any drainage facility not initiated within a two-year period from the time of construction plan approval must be reevaluated for approval and must receive re-approval.

(Res. 40-08 (§ 404.1), 3-19-08)

§ 28.16.150. Technical criteria – Design storm events.

All new development and redevelopment shall plan for, design and construct drainage facilities to convey storm runoff from the minor storm and major storm events. Emergency overflow paths for drainage may be required for storms greater than the 100-year flood event as evaluated on a case-by-case basis.

Analysis and design of all drainage improvements for new development and significant redevelopment shall be based on projected future land use conditions, in accordance with local jurisdictional requirements and plans, except as may be modified by adopted Watershed Master Plans.

Culverts for local categorized streets may be designed for a flood more frequent than the 100-year, subject to the following conditions:

- ***(a) The overtopping of the roadway during the 100-year event is limited to depths no greater than one foot and the downstream embankment is protected from erosion during overtopping.***
- ***(b) The culvert must pass the 10-year flood with a minimum of one foot of freeboard from the water surface to the lowest point in the roadway.***
- ***(c) The water surface elevation during the 100-year flood shall not cause additional flooding of adjacent properties and shall be compliant with local floodplain regulations.***

All drainage systems shall be sized without accounting for peak flow reductions from on-site or local detention unless noted otherwise in the tables below. When required to size best management practices, the mean annual storm event shall be used.

A summary of requirements and design storms for the different types of stormwater facilities is presented in the following table.

STREETS	
Minor Storm	***Design Requirements***
2-year	***Flow depth ≤ 0.5 feet at gutter flow line***
	Flow depth ≤ top of curb
	Flow velocity ≤ 8.0 feet per second
Major Storm	***Design Requirements***
100-year	***Flow depth ≤ 1.0 foot at gutter flow line***
	Flow velocity ≤ 8.0 feet per second
	Freeboard ≥ 1.0 foot at all finished floor elevations

STORM DRAIN SYSTEMS	
Minor Storm	***Design Requirements***

STORM DRAIN SYSTEMS	
*2-year**	*Flow velocity between 2.5 and 15 feet per second*
	EGL must remain below manhole rims and inlet throats
Major Storm	*Design Requirements*
*100-year**	*Flow velocity between 2.5 and 15 feet per second*
	EGL must remain below manhole rims and inlet throats
**These flow rates will be whatever the street inlets cumulatively accept during the two-year and 100-year storm events.*	

CULVERTS	
Minor Storm	*Design Requirements for Roadways with right-of-way ≤ 80 feet*
10-year †	*Freeboard ≥ 1.0 foot at lowest point of drive lane(s)*
	Approval of local jurisdiction to use minor storm design
Major Storm	*Design Requirements for Roadways with right-of-way ≤ 80 feet*
100-year †	*Overtopping ≤ 1.0 foot at crown of roadway*
	No additional flooding of adjacent properties
	Comply with all floodplain regulations
	Freeboard ≥ 1.0 foot at all finished floor elevations
	Design Requirements for Roadways with right-of-way ≥ 80 feet
	Flow depth ≤ 0.0 feet at crown of roadway
	Freeboard ≥ 1.0 foot at all finished floor elevations
†Design of culverts may consider the effects of detention.	

DETENTION/WATER QUALITY	
Water Quality	*Design Requirements*
WQCV	*Design is per Volume 3 of the USDCM (see Chapter 28.8 GJMC)*
Detention	
Minor Storm	*Design Requirements*
10-year	*Design volume is the detention volume plus the WQCV*
	Allowable release rates apply
Major Storm	*Design Requirements*

DETENTION/WATER QUALITY	
100-year	***Design volume is the detention volume (do not add WQCV)***
	Allowable release rates apply

(Res. 40-08 (§ 404.2), 3-19-08)

§ 28.16.160. Technical criteria – Storm runoff determination.

Storm runoff peaks and volumes for the design and evaluation of storm drainage facilities shall be determined using statistical analysis of recorded stream gage data, the rational method, or synthetic rainfall runoff models.

(Res. 40-08 (§ 404.3), 3-19-08)

§ 28.16.170. Technical criteria – Streets.

Streets and street rights-of-way may be used to convey storm runoff from the minor and major events, subject to limitations set forth in this manual.

Storm runoff is permitted to cross street crowns at intersections, subject to limitations set forth in this manual.

Storm runoff is permitted to cross street crowns at culverts and bridges, subject to limitations set forth in this manual.

(Res. 40-08 (§ 404.4), 3-19-08)

§ 28.16.180. Technical criteria – Flood proofing.

Flood proofing can be defined as those measures which reduce the potential for flood damages to properties within a floodplain. Measures can range from elevating structures to intentional flooding of noncritical building spaces (i.e., basement) to minimize structural damages.

Flood proofing is permitted in accordance with the provisions of the Mesa County Land Development Code. For other jurisdictions, contact the specific jurisdiction for specific guidance.

(Res. 40-08 (§ 404.5), 3-19-08)

§ 28.16.190. Technical criteria – Alluvial fans.

Alluvial fans, consisting of sand and fine sediment, are subject to radical changes in shape, direction, depth, and flow carrying capacity during storm events. These changes increase the potential flood hazards of developing on alluvial fan areas.

Additional analysis and specialized design is required for any development located within an active alluvial fan. Requirements for analysis and design will be determined on a case-by-case basis.

(Res. 40-08 (§ 404.6), 3-19-08)

§ 28.16.200. Irrigation facilities.

Irrigation conveyance facilities and reservoirs in the Mesa County area have historically intercepted the storm runoff from the rural and agricultural watersheds, generally without major problems. With urbanization of the watersheds, however, the storm runoff has increased in rate, quantity and frequency, as well as changing water quality. In developed areas, the irrigation facilities can no longer be utilized indiscriminately to convey storm runoff. New developments and redevelopment are prohibited from using irrigation facilities to convey storm runoff, except as described below.

(Res. 40-08 (§ 405), 3-19-08)

§ 28.16.210. Irrigation facilities – Watershed analysis.

Drainage analysis and design shall be based on the assumption that an irrigation conveyance facility does not intercept storm runoff from the upper watershed and that the upper watershed is tributary to the watershed downstream of the irrigation conveyance facility, unless such irrigation conveyance facility has been designed to accommodate storm runoff and is part of an adopted Watershed Master Plan.

(Res. 40-08 (§ 405.1), 3-19-08)

§ 28.16.220. Irrigation facilities – Discharge to irrigation conveyance facility.

Storm runoff shall be directed into pre-developed drainageways downstream of the irrigation conveyance facility. Storm runoff shall not be discharged into an irrigation conveyance facility, except as required by water rights law or the discharge is part of an adopted Watershed Master Plan or negotiated with an irrigation company.

Where irrigation ditches will serve as the outfall for a detention facility, the ditch water surface elevation shall be determined for the maximum irrigation flow of the ditch, and the stormwater surface elevation shall be determined for the combination of the maximum irrigation flow and the 100-year stormwater discharge of the detention facility.

(Res. 40-08 (§ 405.2), 3-19-08)

§ 28.16.230. Irrigation facilities – Irrigation reservoirs.

New development is restricted to areas outside of:

(a) The reservoir's high water line created by the design flood for the emergency spillway.

(b) The high water line created by the breach of a dam (except high hazard classified dams which have passed inspection by the State Engineer's Office in accordance with § 37-87-105, C.R.S. et seq.). For dams without the breach high waterline identified, the developer shall analyze and define the high waterline resulting from such a breach.

(c) Existing or potential future emergency spillway paths, beginning at the dam and proceeding to the point where the flood water returns to the natural drainage course.

(Res. 40-08 (§ 405.3), 3-19-08)

§ 28.16.240. Preservation of natural drainageways.

Natural drainageways are considered an important environmental feature that contributes to the image and livability of a community. Their value includes the ability to convey floodwater, to provide opportunities for trails and open space corridors, and to maintain natural vegetation and wildlife habitat to the greatest degree possible.

Preservation of natural drainageways, based on developed land use hydrology, is encouraged. Development of property shall not adversely affect any natural drainage facility or natural watercourse, and shall be subject to the following provisions:

(a) Drainageways shall remain in as near a natural state as is practicable. All proposed modification to the natural drainageway shall be subject to approval.

(b) When the flow rates, velocities, side slopes or other characteristics indicate a potential negative impact to the natural drainageway, the impact shall be mitigated in accordance with criteria set forth in this manual.

(Res. 40-08 (§ 406), 3-19-08)

Chapter 28.20
(Reserved)

Chapter 28.24
Rainfall

§ 28.24.010. Introduction.

Presented in this chapter are design rainfall data for the mean annual, minor, and major storm events. These data are used to determine storm runoff peak flows and volumes in conjunction with the runoff models described in Chapter 28.28 GJMC. All hydrologic analyses within the jurisdiction of this manual shall utilize the rainfall data presented herein for calculating storm runoff.

(Res. 40-08 (§ 601), 3-19-08)

§ 28.24.020. Data sources.

Rainfall data is presented for three areas within Mesa County, the Grand Valley, as approximately defined by the area below 5,000 feet in elevation, area outside the Grand Valley, and the Leach Creek/Horizon Drive watersheds.

(a) Rainfall Data – Grand Valley Area. The rainfall data for the Grand Valley was obtained from the Henz Meteorological Services report prepared for Mesa County (Henz, 1992), which included a detailed analysis of the gage at Walker Field. Tables, figures, and equations are provided for point rainfall, intensity, and storm distributions for various storm recurrence intervals.

(b) Rainfall Data – Outside Grand Valley. For the area outside of the Grand Valley, rainfall data published by the National Oceanic and Atmospheric Administration (NOAA) in the NOAA Atlas 2, "Precipitation – Frequency Atlas of the Western United States, Volume III – Colorado" (NOAA, 1973) is recommended to develop point rainfall values, storm intensities, and distributions for the remainder of Mesa County. Procedures to obtain and interpret the data are provided herein.

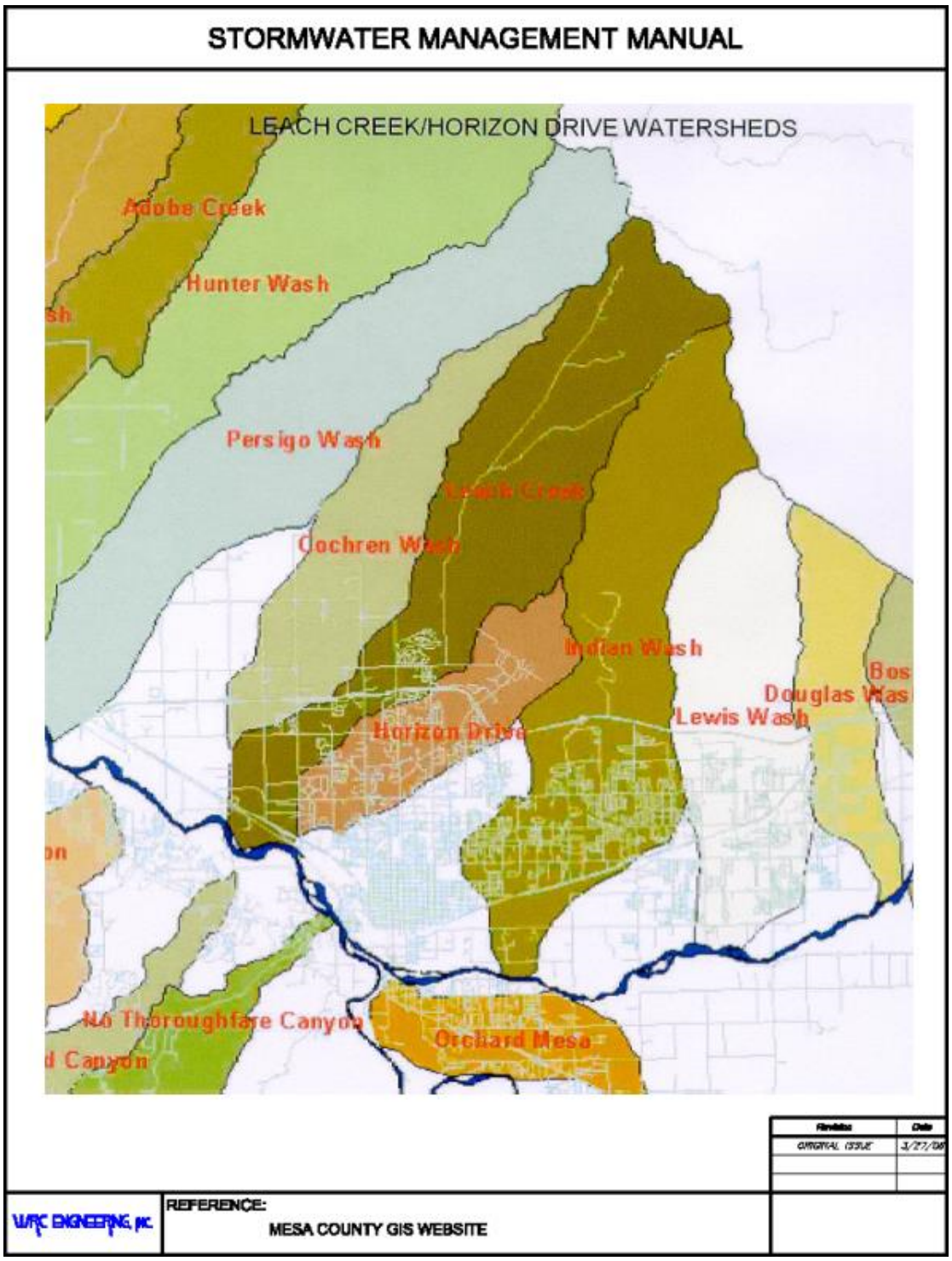
(c) Rainfall Data – Both Areas. In the case where a watershed includes both areas (or areas outside of Mesa County), it is recommended that both sets of rainfall data be used to generate peak runoff rates and volumes, depending on which area the sub-watershed lies within. In addition, if point rainfall values from NOAA Atlas 2 vary throughout the watershed by more than 10 percent, the rainfall values used for analysis should also vary depending on where the sub-watershed lies.

(d) Rainfall Data – Leach Creek/Horizon Drive Watershed. For projects within the Leach Creek/Horizon Drive watershed (see Figure 28.24.020), the depth-duration-frequency data approved by FEMA (FEMA October 1, 2002) are recommended because these data were used for floodplain analysis and for design purposes. However, since the FEMA-approved data did not include all durations and frequencies, and since the Henz data are similar, the Henz data was used to supplement the FEMA data.

(e) Mean Annual Precipitation. Mean annual precipitation and mean annual storm events for design of water quality BMPs were obtained from Driscoll (Driscoll et al., November 1989). *Analysis of Storm Event Characteristics for Selected Rainfall Gages Throughout the United States,* EPA 8919148B 1100). These values are based on recording gage number 3488 and can be used throughout Mesa County.

(f) Probable Maximum Precipitation. In cases where probable maximum precipitation analyses are required, methodology outlined in a publication by NOAA and the USACE entitled "Hydrometeorological Report No. 49, Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainages" (NOAA and USACE, 1977) is recommended.

Figure 28.24.020: Leach Creek/Horizon Drive Watersheds



(Res. 40-08 (§ 601.1), 3-19-08)

§ 28.24.030. Comparison to NOAA Atlas 14.

The National Weather Service (NWS) has updated the precipitation-frequency atlas for the semiarid, southwestern region of the United States (including the Mesa County area) from NOAA Atlas 2 to NOAA Atlas 14. A comparison was made for the 100- and two-year storms for durations of six- and 24-hour between NOAA Atlas 2 and NOAA Atlas 14.

The comparison shows that NOAA Atlas 14 is generally lower than NOAA Atlas 2 (i.e., from four to 16 percent in the Grand Valley and from zero to 46 percent in the mountains). NOAA Atlas 14 does appear to be more consistent with the data developed by Henz for the Grand Valley area. However, since NOAA Atlas 14 has not been accepted by the Colorado Water Conservation Board, precipitation values for areas outside of the Grand Valley were not obtained from NOAA Atlas 14, but were obtained from NOAA Atlas 2. When preparing Watershed Master Plans, the County will evaluate whether NOAA Atlas 14 values are more appropriate and may decide to use NOAA Atlas 14. For new developments and redevelopment, rainfall/runoff relationships shall be in accordance with GJMC § 28.24.020.

(Res. 40-08 (§ 601.2), 3-19-08)

§ 28.24.040. Rainfall analysis – Rainfall depth – Duration – Frequency.

For areas within the Grand Valley, point precipitation values are provided in Table 28.24.040(a) for various recurrence interval storms. These data were used to develop intensity-duration-frequency values and are used in developing storm distributions.

Table 28.24.040(a): Point Rainfall Values for the Grand Valley Area

Storm Duration	Precipitation Depth (inches)					
	2-year Recurrence	5-year Recurrence	10-year Recurrence	25-year Recurrence	50-year Recurrence	100-year Recurrence
5-min	0.1	0.14	0.18	0.25	0.31	0.39
10-min	0.15	0.22	0.28	0.38	0.48	0.6
15-min	0.19	0.28	0.36	0.48	0.61	0.76
30-min	0.27	0.39	0.5	0.67	0.85	1.06
1-hr	0.34	0.49	0.63	0.85	1.07	1.34
2-hr	0.42	0.58	0.72	0.94	1.15	1.4
3-hr	0.47	0.63	0.77	0.99	1.19	1.44
6-hr	0.55	0.73	0.87	1.1	1.31	1.56
12-hr	0.55	0.83	0.98	1.22	1.44	1.69
24-hr	0.7	0.93	1.12	1.42	1.69	2.01

For the area outside of the Grand Valley, the NOAA Atlas 2 Rainfall Depth-Duration-Frequency Maps are reproduced for the Mesa County area in Figures 28.24.040(a) through (l). Maps are presented for the six- and 24-hour durations for the two-, five-, 10-, 25-, 50-, and 100-year recurrence intervals. Depending on the location of the project, point rainfall values are read from these figures, converted to other storm durations, and used to generate intensity-duration-frequency curves and design storms, following procedures described below.

For the areas within the Leach Creek/Horizon Drive watershed, point precipitation values are provided in Table 28.24.040(b) for various frequencies and durations.

Table 28.24.040(b): Point Rainfall Values for the Leach Creek/Horizon Drive Watershed

	Precipitation Depth (inches)					
Storm Duration	**2-year Recurrence**	**5-year Recurrence**	**10-year Recurrence**	**25-year Recurrence**	**50-year Recurrence**	**100-year Recurrence**
5-min	0.1	0.14	0.18	0.25	0.31	0.39
10-min	0.15	0.22	0.28	0.38	0.48	0.6
15-min	0.19	0.28	0.36	0.48	0.61	0.76
30-min	0.27	0.39	0.5	0.67	0.85	1.06
1-hr	*0.29*	*0.41*	*0.52*	0.85	*0.86*	*1.07*
2-hr	0.42	0.58	0.72	0.94	1.15	1.4
3-hr	*0.46*	*0.63*	*0.78*	0.99	*1.24*	*1.52*
6-hr	*0.55*	*0.72*	*0.86*	1.1	*1.28*	*1.52*
12-hr	*0.67*	*0.85*	*0.99*	1.22	*1.39*	*1.61*
24-hr	*0.79*	*1.01*	*1.19*	1.42	*1.71*	*1.99*

NOTE: The *italicized* values are the actual FEMA-approved data. The remaining data was obtained from Table 28.24.040(a).

Figure 28.24.040(a): Rainfall Depth-Duration-Frequency: 2-Year, 6-Hour

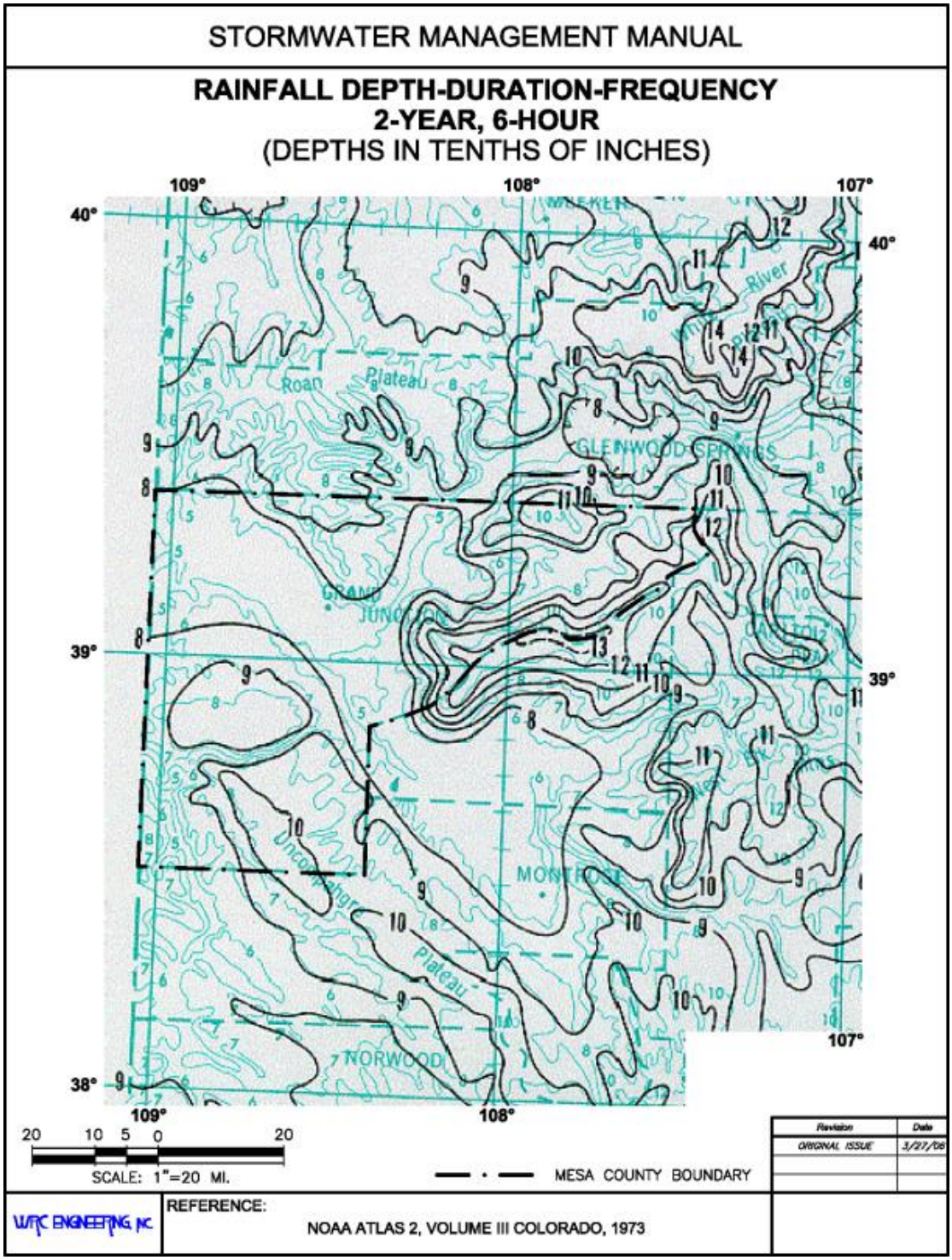


Figure 28.24.040(b): Rainfall Depth-Duration-Frequency: 5-Year, 6-Hour

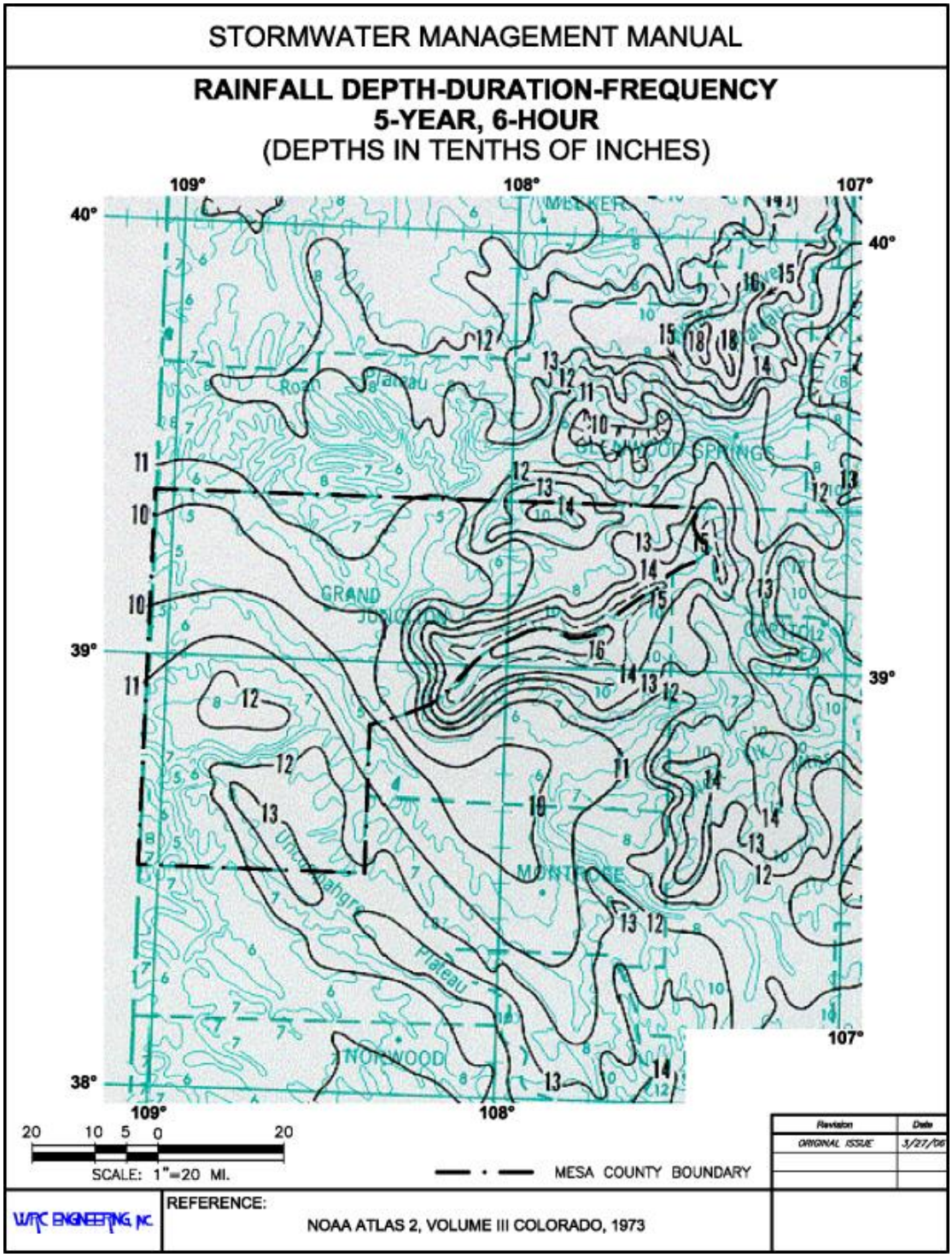


Figure 28.24.040(c): Rainfall Depth-Duration-Frequency: 10-Year, 6-Hour

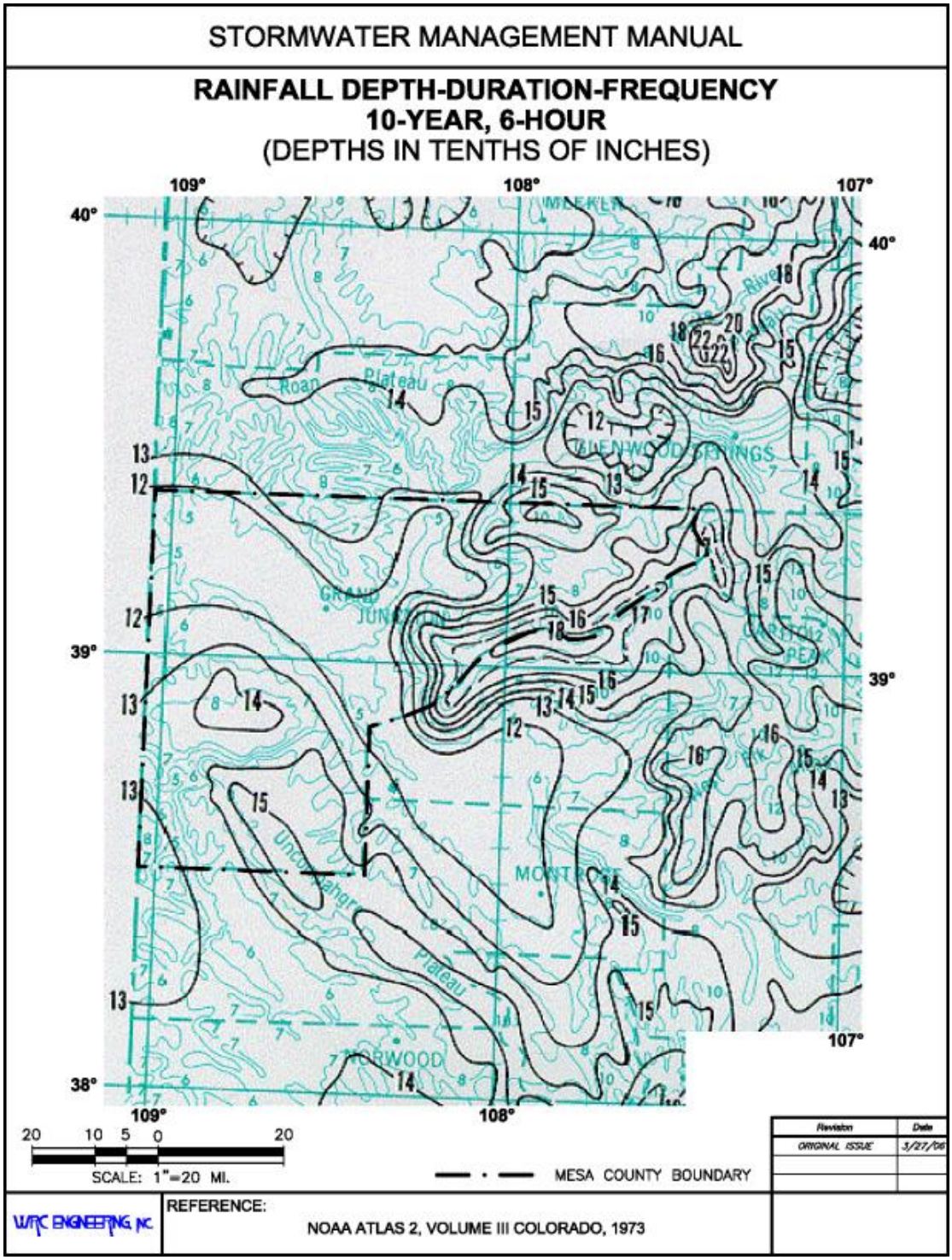


Figure 28.24.040(d): Rainfall Depth-Duration-Frequency: 25-Year, 6-Hour

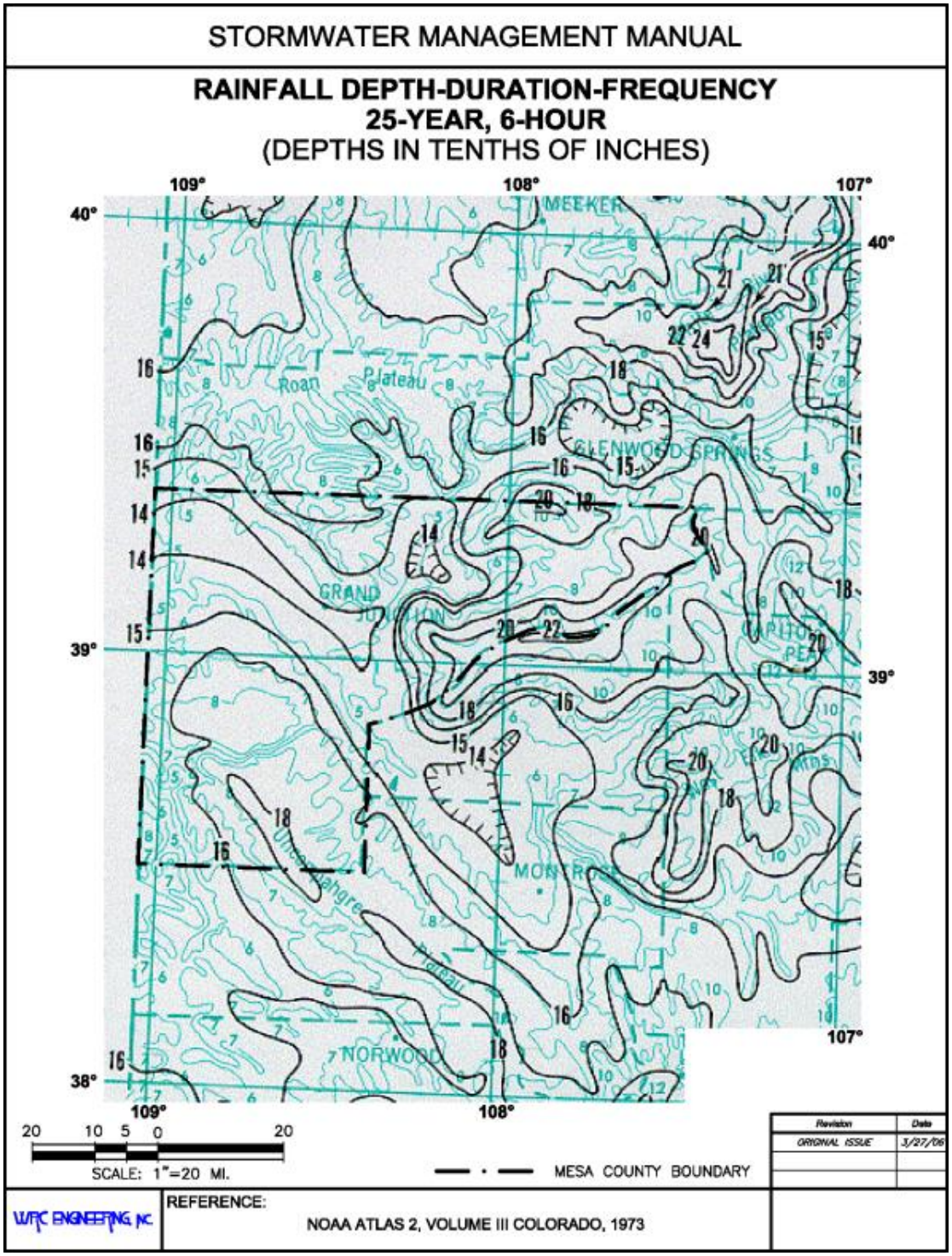


Figure 28.24.040(e): Rainfall Depth-Duration-Frequency: 50-Year, 6-Hour

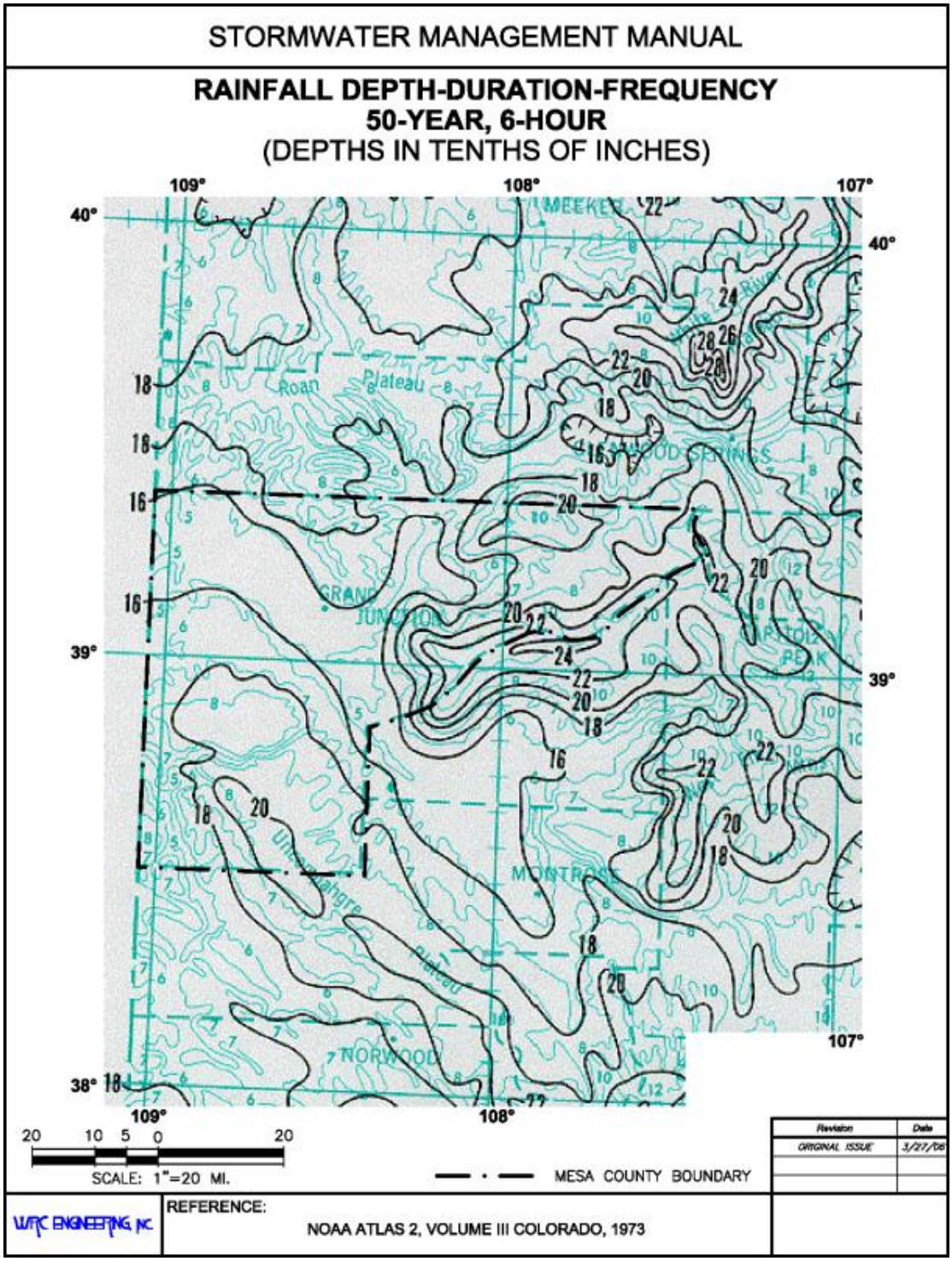


Figure 28.24.040(f): Rainfall Depth-Duration-Frequency: 100-Year, 6-Hour

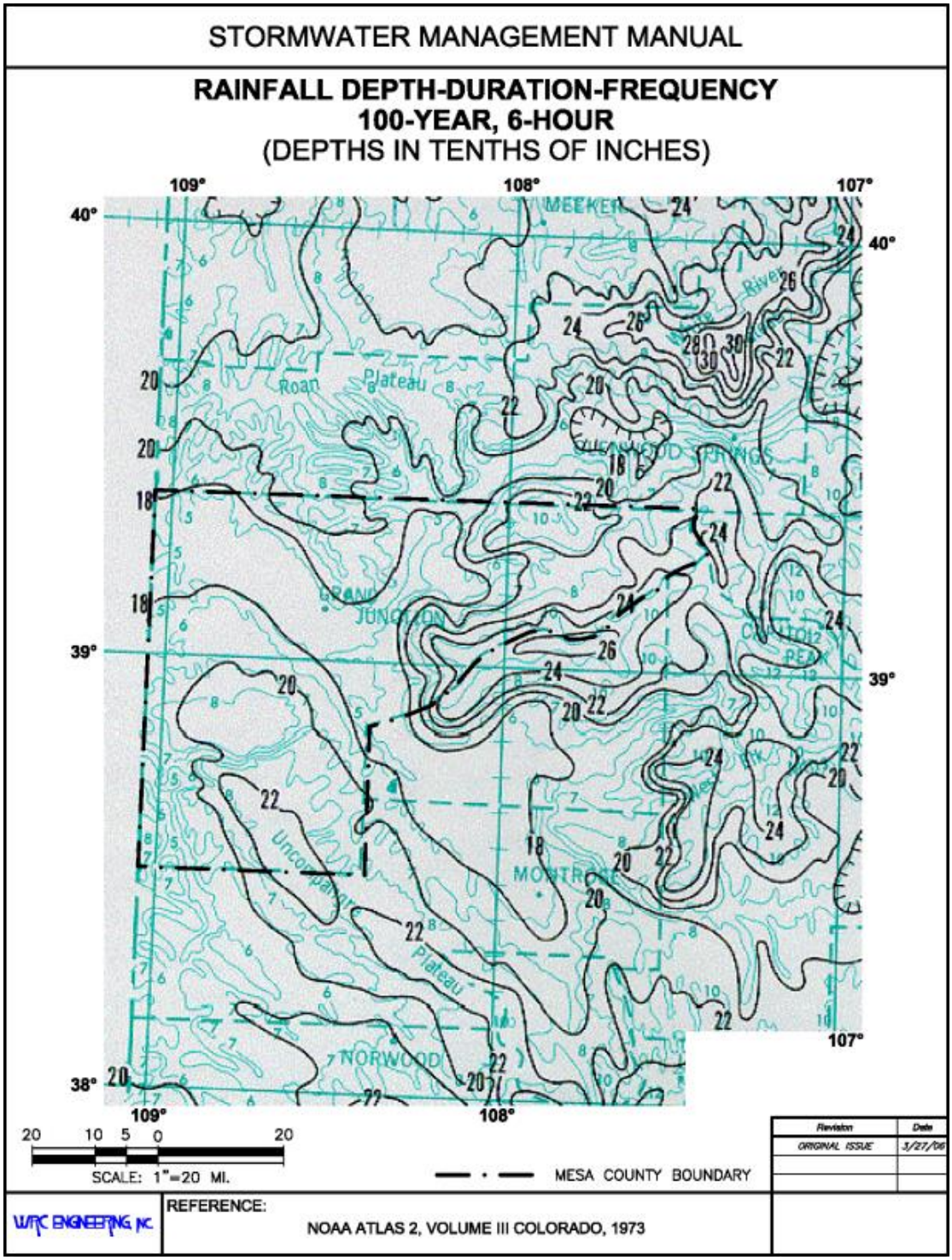


Figure 28.24.040(g): Rainfall Depth-Duration-Frequency: 2-Year, 24-Hour

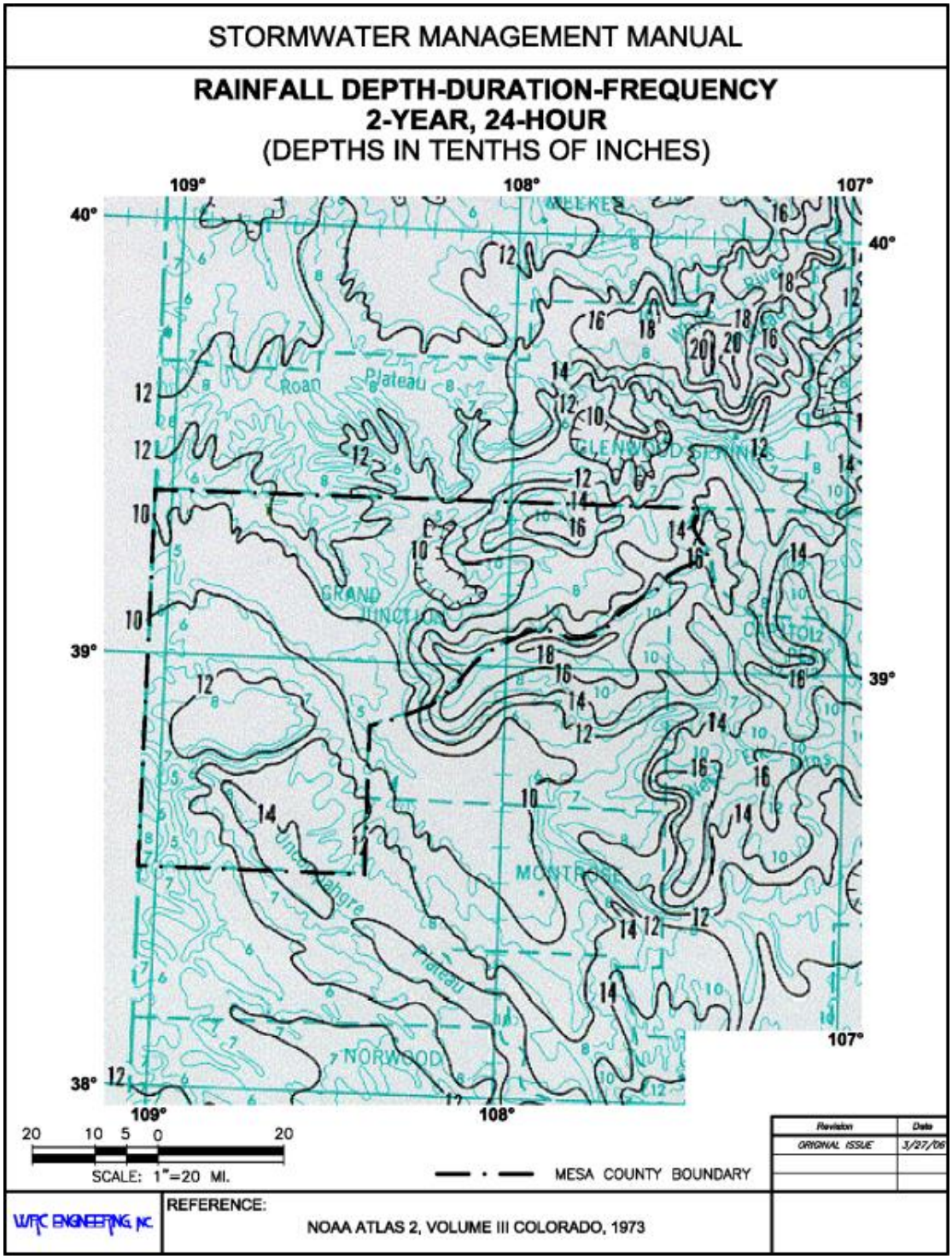


Figure 28.24.040(h): Rainfall Depth-Duration-Frequency: 5-Year, 24-Hour

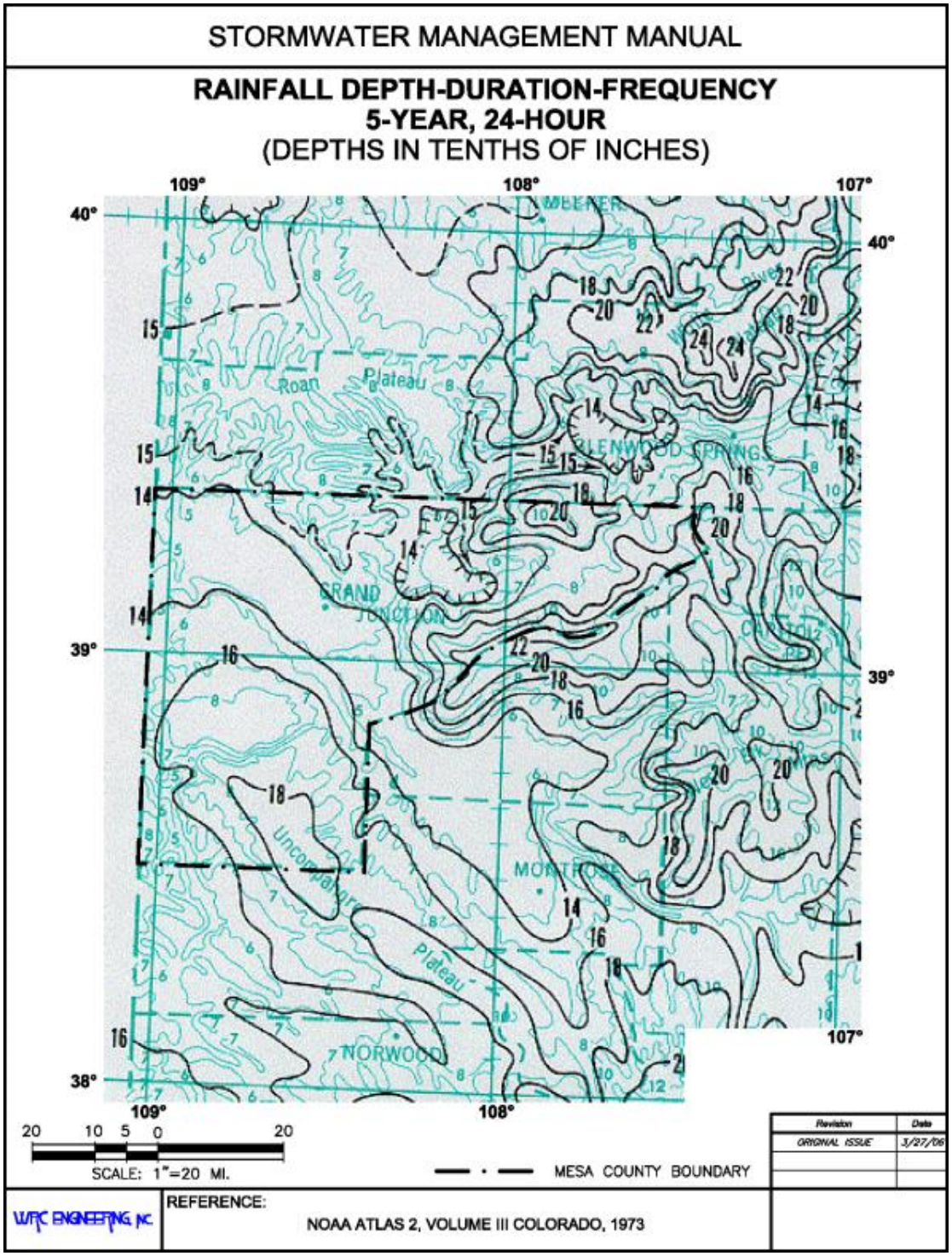


Figure 28.24.040(i): Rainfall Depth-Duration-Frequency: 10-Year, 24-Hour

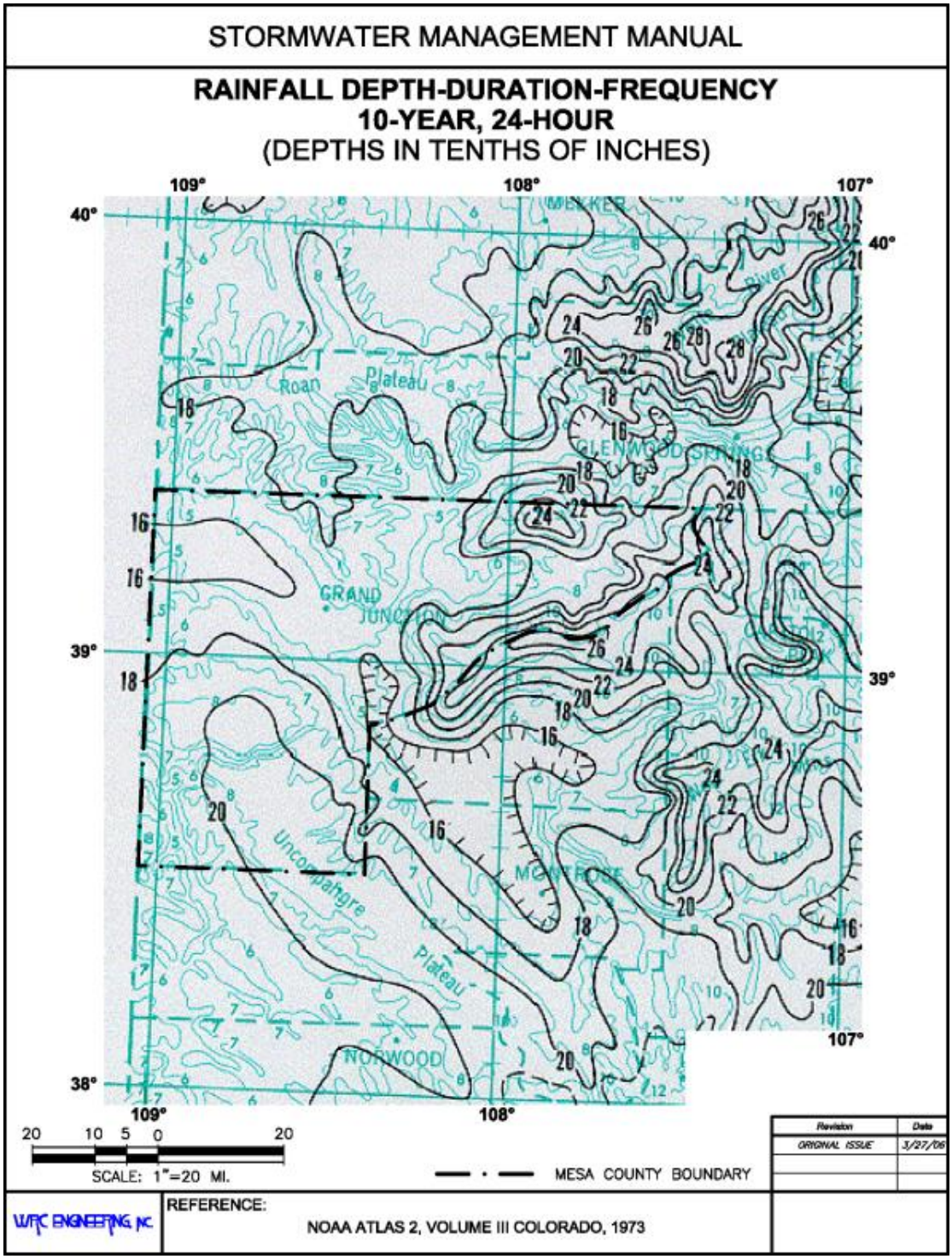


Figure 28.24.040(j): Rainfall Depth-Duration-Frequency: 25-Year, 24-Hour

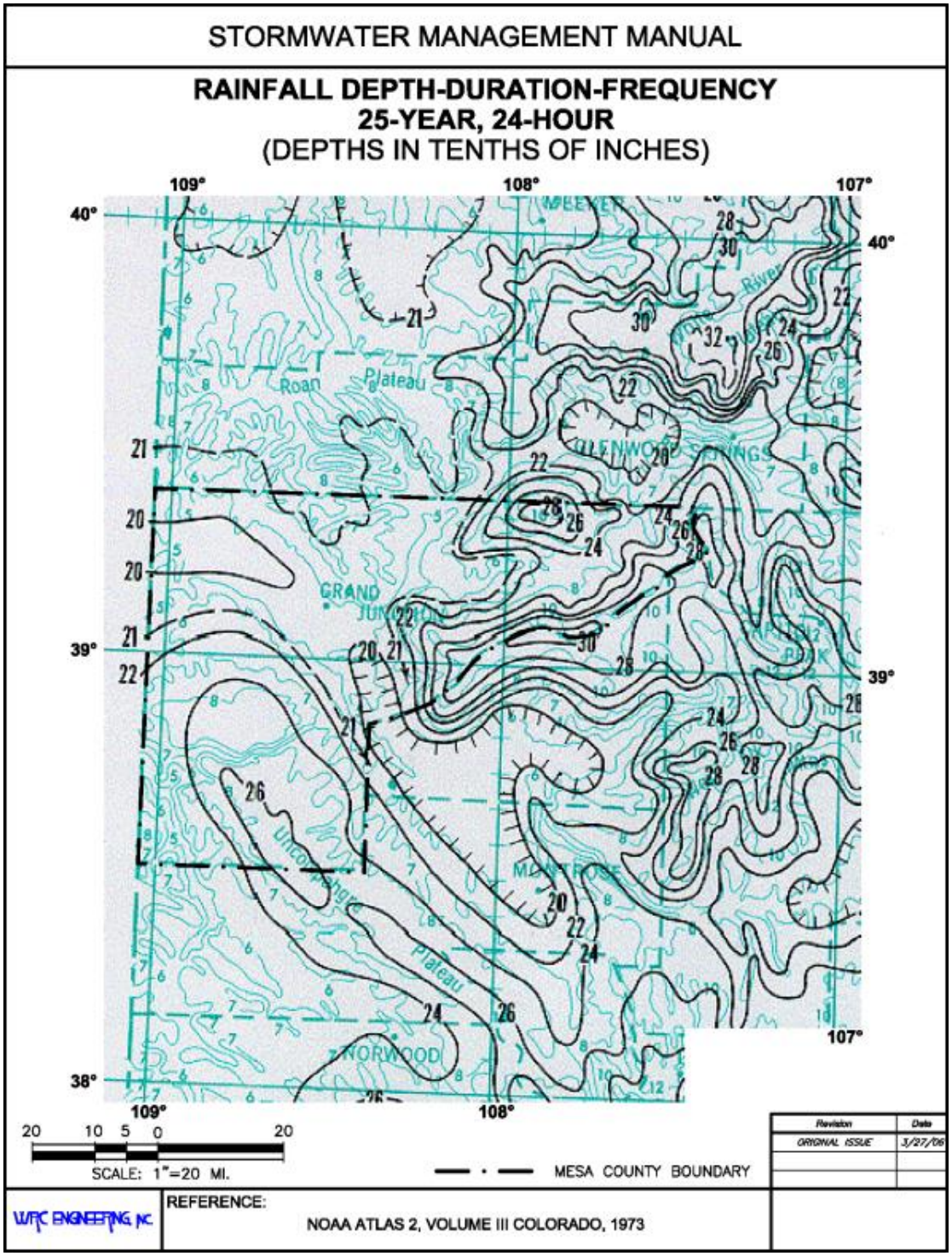


Figure 28.24.040(k): Rainfall Depth-Duration-Frequency: 50-Year, 24-Hour

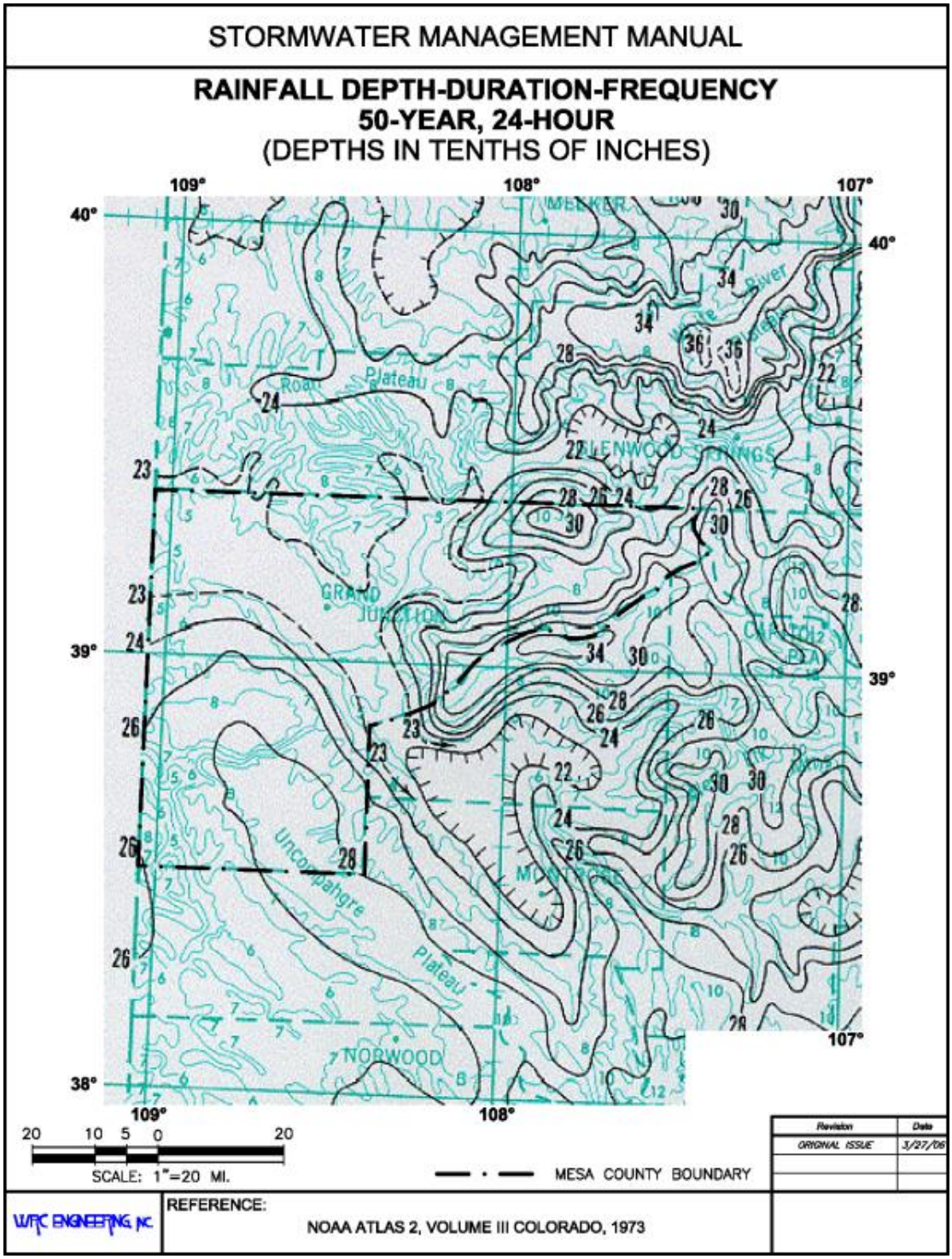
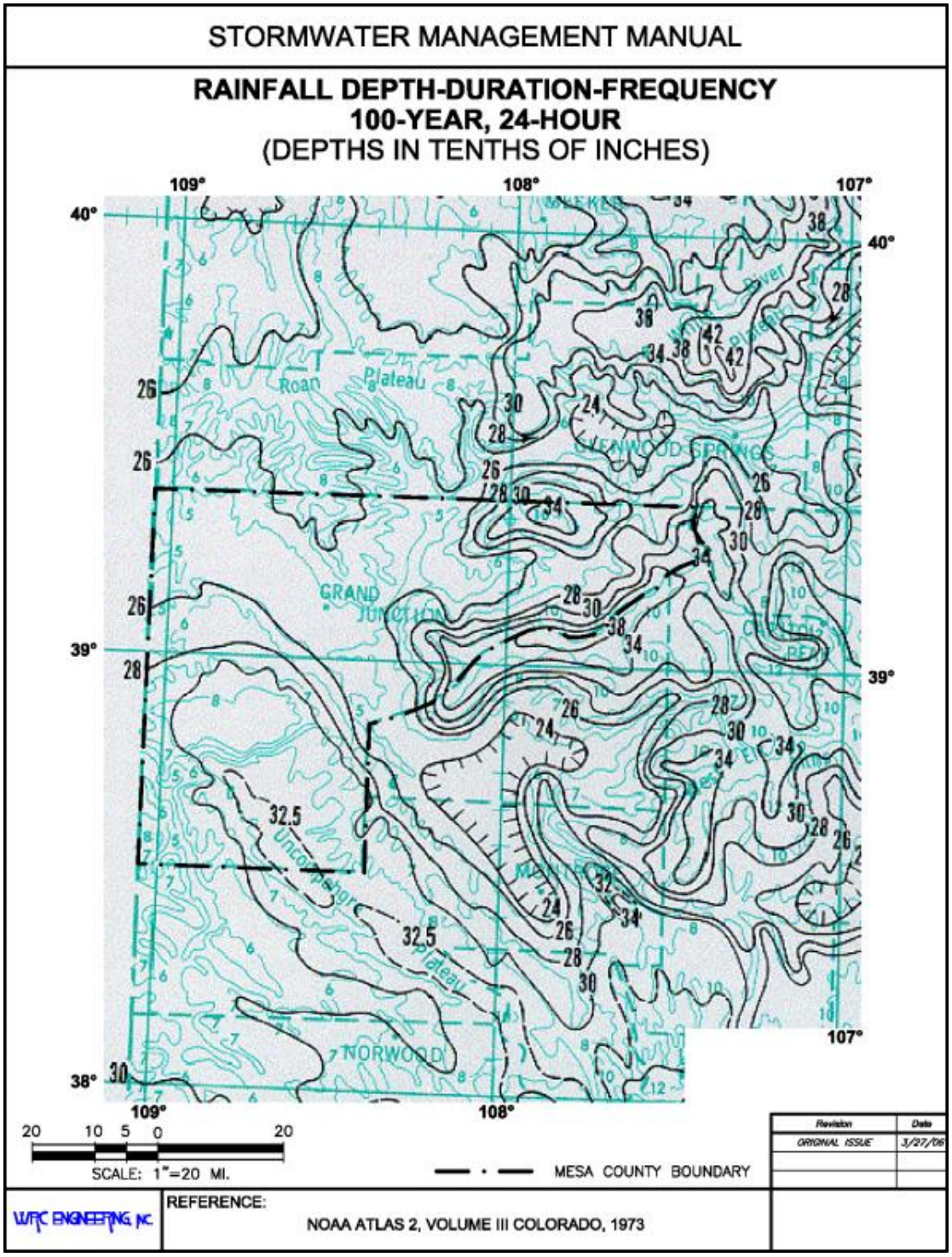


Figure 28.24.040(l): Rainfall Depth-Duration-Frequency: 100-Year, 24-Hour



(Res. 40-08 (§ 602.1), 3-19-08)

§ 28.24.050. Rainfall analysis – Rainfall depths for durations from one to six hours and less than one hour.

For areas within Grand Valley, point rainfall values for different storm durations are obtained from Table 28.24.040(a).

For areas outside the Grand Valley, the rainfall values are determined using procedures recommended in NOAA Atlas 2 and summarized below:

(a) Step 1. Read and record the point rainfall values for the six- and the 24-hour durations obtained from Figures 28.24.040(a) through (l) for the two- and 100-year recurrence intervals at the desired location(s) within Mesa County.

(b) Step 2. Calculate the two-year, one-hour and 100-year, one-hour rainfall amounts using the following equations:

$$Y2 = 0.011 + 0.942 [(x1) (x1 / x2)] \quad (28.24\text{-}1)$$

$$Y100 = 0.494 + 0.755 [(x3) (x3 / x4)] \quad (28.24\text{-}2)$$

Where:

Y2 = 2-yr, 1-hr estimated value (in)

Y100 = 100-yr, 1-hr estimated value (in)

x1 = 2-yr, 6-hr value (in)

x2 = 2-yr, 24-hr value (in)

x3 = 100-yr, 6-hr value from (in)

x4 = 100-yr, 24-hr value from (in)

(c) Step 3. Plot the two- and 100-year, one-hour rainfall (Y2 and Y100) values on Figure 28.24.050 and draw a straight line connecting these points. The one-hour point rainfall values for the five-, 10-, 25-, and 50-year storm events are then read from the graph.

(d) Step 4. Calculate the two- and three-hour duration rainfall for the various recurrence intervals using the following equations:

$$P2\text{-}hr = 0.341\ P6\text{-}hr + 0.659\ P1\text{-}hr \quad (28.24\text{-}3)$$

$$P3\text{-}hr = 0.569\ P6\text{-}hr + 0.431\ P1\text{-}hr \quad (28.24\text{-}4)$$

Where:

P 2-hr = 2-hr ‘x’-yr estimated value (in)

P 3-hr = 3-hr ‘x’-yr estimated value (in)

P 1-hr = 1-hr ‘x’-yr previously determined (in)

P 6-hr = 6-hr ‘x’-yr previously determined (in)

(e) Step 5. Calculate the point rainfall values for durations less than one hour by multiplying the one-hour precipitation depths by the factors listed in Table 28.24.050:

Table 28.24.050: Factors for Durations of Less Than One Hour

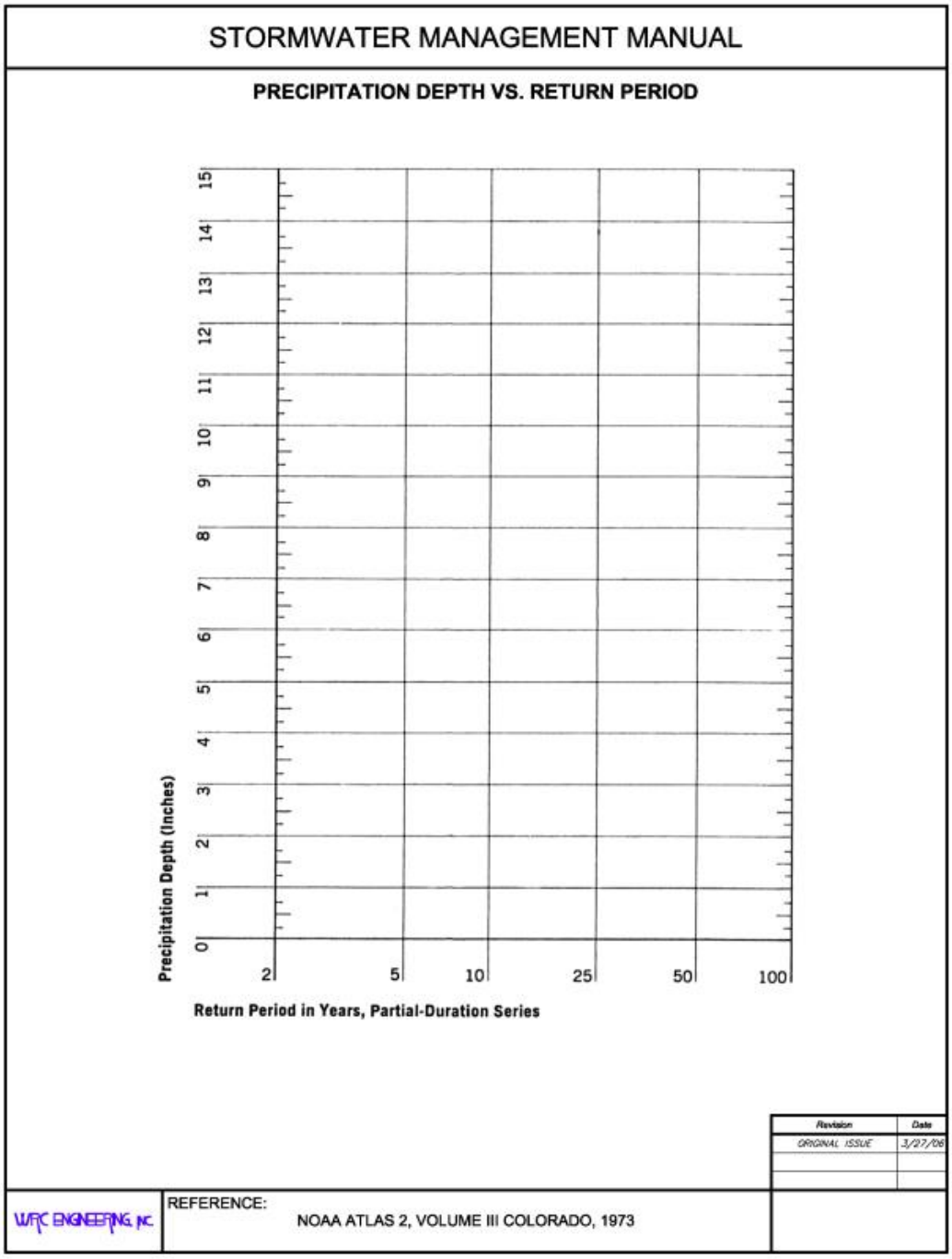
Duration (min)	5	10	15	30	60

Table 28.24.050: Factors for Durations of Less Than One Hour					
Ratio to 1 hour	0.29	0.45	0.57	0.79	1

The results from the steps above will result in a table of point rainfall values for the project area, similar to Table 28.24.040(a). These data can then be adjusted for the size of the watershed if needed (see GJMC § 28.24.070) and used to develop intensity-duration-frequency curves (see GJMC § 28.24.080) design storm (see GJMC § 28.24.090).

For areas within the Leach Creek/Horizon Drive watershed, point rainfall values for different storm durations are obtained from Table 28.24.040(b).

Figure 28.24.050: Precipitation Depth Versus Return Period



(Res. 40-08 (§ 602.2), 3-19-08)

§ 28.24.060. Rainfall analysis – Mean annual precipitation and storm events.

For analysis and design of water quality BMPs, the mean annual precipitation and storm events are used, which are summarized below:

Table 28.24.060: Mean Storm Statistics		
	Average	**Coefficient of Variation**
Annual Statistics		
No. of Storms	25	0.27
Precipitation (in/year)	6.76	0.35
Independent Storm Events		
Duration (hr)	9.4	0.73
Intensity (in/hr)	0.044	1.15
Volume (in)	0.28	0.7
Interval (hr)	370	1.21

Note that the coefficient of variation is defined as the ratio of the standard deviation to the mean.

(Res. 40-08 (§ 602.3), 3-19-08)

§ 28.24.070. Depth-area reduction factors.

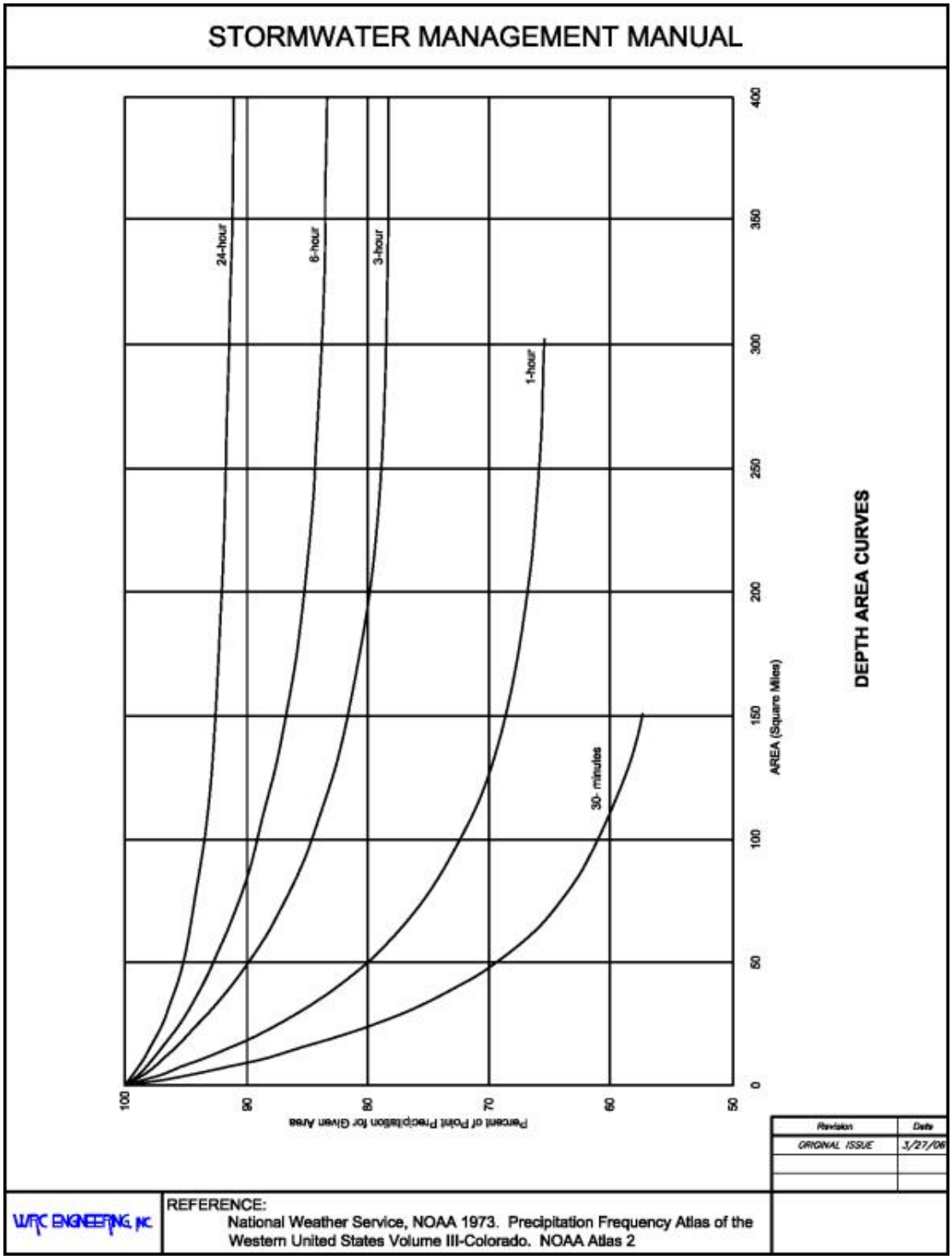
The area adjustment to the point rainfall values described below applies to both the Grand Valley area and areas outside of the Grand Valley. In general, watersheds of less than 10 square miles do not require adjustment.

The NOAA Atlas 2 precipitation depths are related to rainfall frequency at an isolated point. Storms, however, cause rainfall to occur over extensive areas simultaneously, with more intense rainfall typically occurring near the center of the storm. Standard precipitation analysis methods require adjusting point precipitation depths downward to estimate the average depth of rainfall over the entire storm area. This is normally performed using depth-area reduction curves relating to a point precipitation reduction factor to storm area and duration.

The depth-area reduction factors used for rainfall analysis in the Mesa County area are provided in Figure 28.24.070.

For areas greater than 200 square miles, the ability of the thunderstorm generating mechanisms (i.e., available moisture, strong convective currents, etc.) to sustain a thunderstorm much greater than 200 square miles in diameter is greatly reduced. Therefore, only a portion of an entire drainage basin could be subject to precipitation from the thunderstorm event. Analysis of this effect on runoff peaks and volumes is complicated by the necessity to determine the “storm centering” which produces the greatest peak flow and/or volume at the selected design point. In order to obtain a consistent method of analysis for these areas, the designer shall consult with the director to determine the appropriate method of analysis and design rainfall area reduction factors for the specific location and basin under study.

Figure 28.24.070: Depth-Area Curves



(Res. 40-08 (§ 603), 3-19-08)

§ 28.24.080. Intensity-duration-frequency curves for rational method.

For areas within the Grand Valley Area, rainfall intensities as a function of storm duration and recurrence interval are provided in Table 28.24.080 and Figure 28.24.080. These data were derived from the investigation by Henz Meteorological Services (Henz 1992).

Table 28.24.080: Intensity-Duration-Frequency Data for Grand Valley

	Precipitation Intensity – Grand Valley Area (inches/hour)					
Storm Duration	**2-Year Recurrence**	**5-Year Recurrence**	**10-Year Recurrence**	**25-Year Recurrence**	**50-Year Recurrence**	**100-Year Recurrence**
5	1.2	1.68	2.16	3	3.72	4.68
10	0.9	1.32	1.68	2.28	2.88	3.6
15	0.76	1.12	1.44	1.92	2.44	3.04
30	0.54	0.78	1	1.34	1.7	2.12
60	0.34	0.49	0.63	0.85	1.07	1.34

Intensity values for any time of concentration up to 60 minutes can also be determined from the following equation (Froehlich 1995):

$$I_x = a*P_1/(10+Tc)^b$$

Where:

I_x = Intensity for recurrence interval "x," in/hour

P_1 = Point rainfall value for one-hour duration (see Table 28.24.040(a)) (inches)

Tc = Time of concentration, minutes

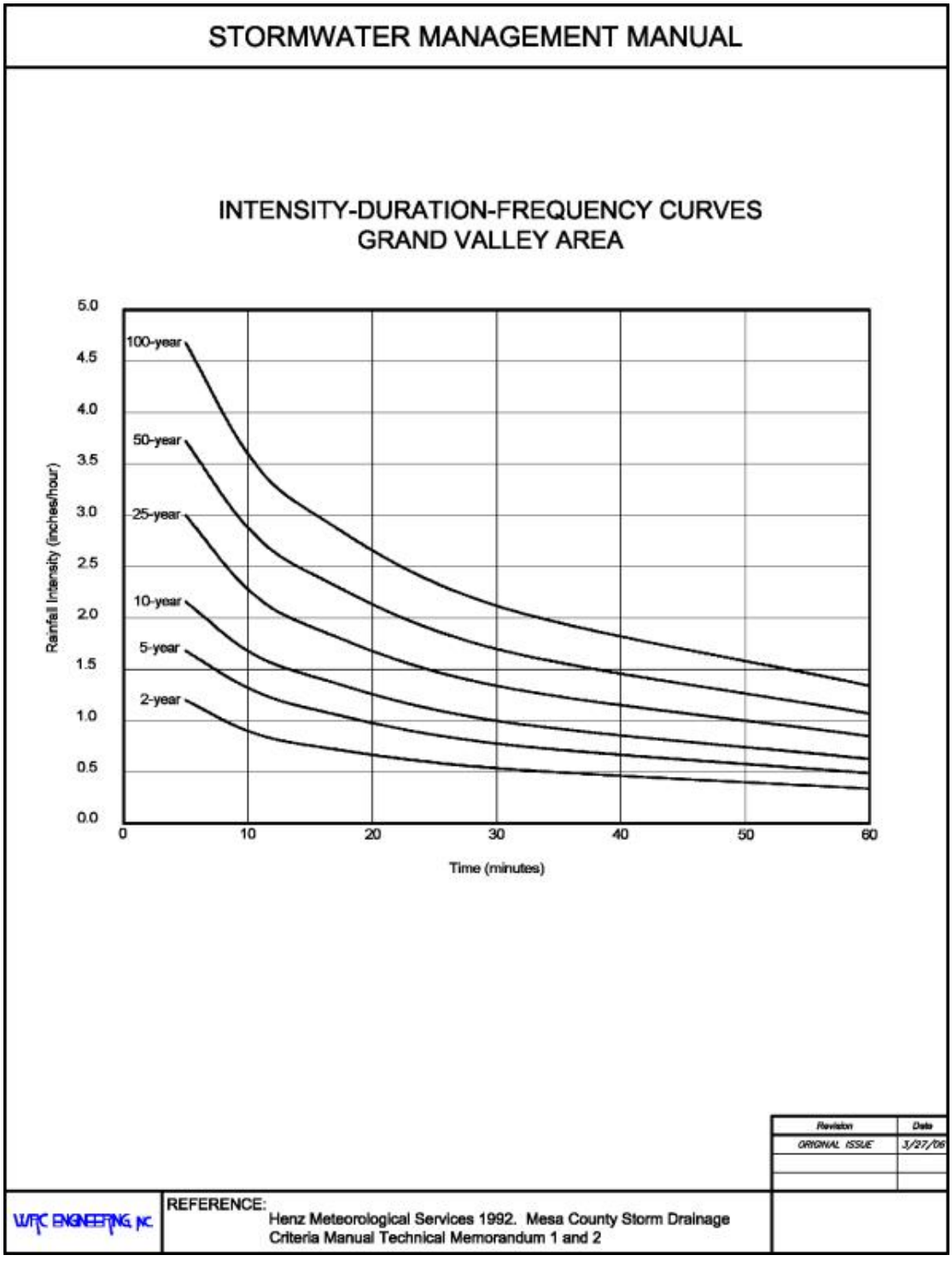
a, b = coefficients, a = 28.9, b = 0.786 for all of Mesa County

Using the coefficients above, this equation will generally match the values in Table 28.24.040(a) to within two percent. Whereas the coefficients have not been verified for areas outside the Grand Valley, since the equation is based on the same ratios provided in Table 28.24.040(b), the results will be comparable.

For areas outside of the Grand Valley, first determine the two- and 24-hour point rainfall values for the desired storm recurrence intervals, then determine the one-hour point rainfall value, as described in GJMC § 28.24.050. Finally, use the above equation to compute the intensity at any time of concentration and for all storm recurrence intervals.

For areas within the Leach Creek/Horizon Drive watershed, determine the two- and 24-hour point rainfall from Table 28.24.040(b), and then follow the procedures described above.

Figure 28.24.080: Intensity-Duration-Frequency Curves – Grand Valley Area



(Res. 40-08 (§ 604), 3-19-08)

§ 28.24.090. Design storms.

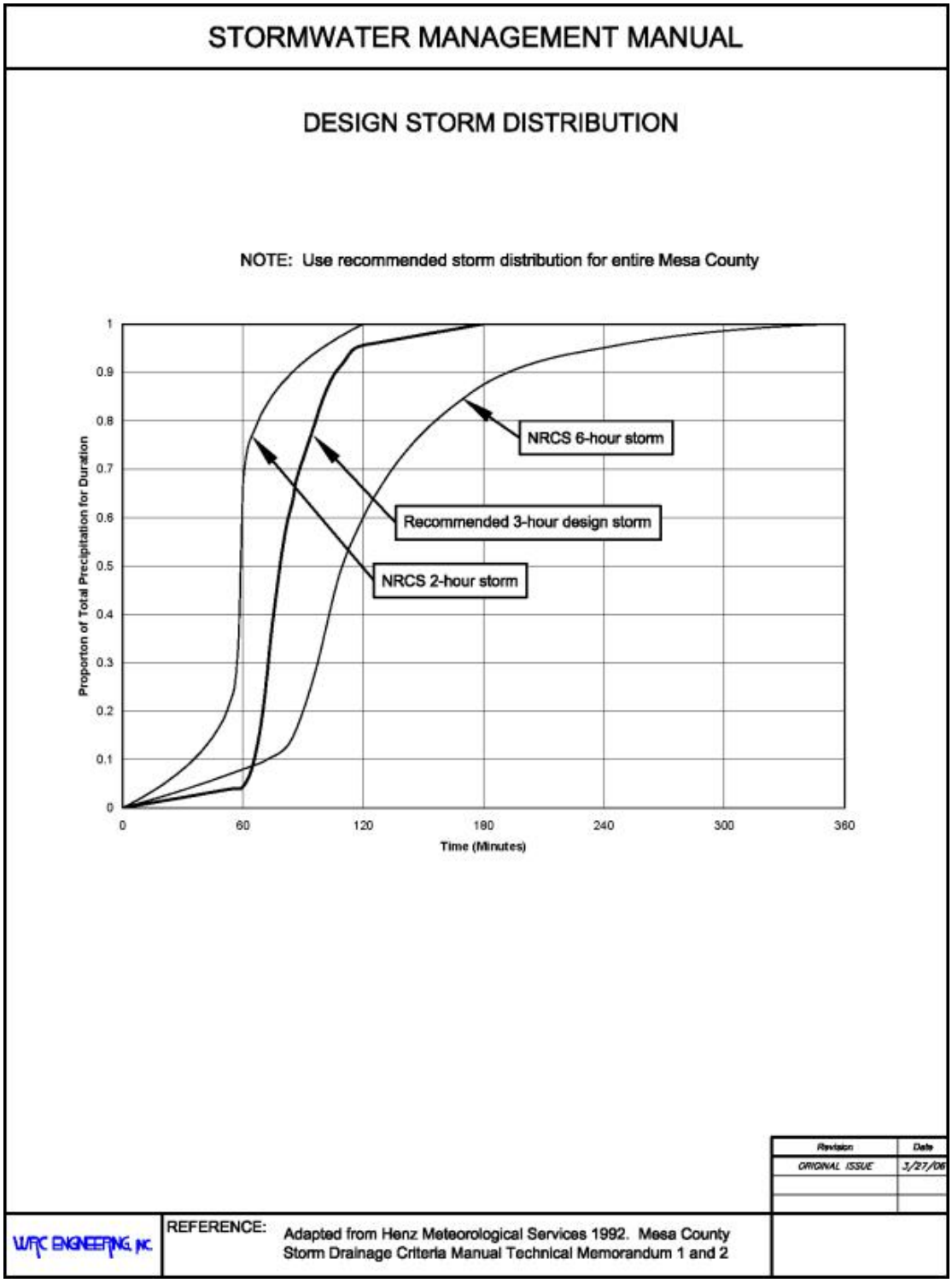
For hydrograph analysis, the recommended minimum design storm duration is three-hour (Henz 1992). Approximately 90 percent of the three-hour total rainfall is distributed within the second hour of the storm, in accordance with recommendations of Henz (Henz 1992). The remaining 10 percent of the storm total is divided equally between the first and third hour.

An example of this distribution is provided in Table 28.24.090 and on Figure 28.24.090, which also compares the recommended design storm to the NRCS two- and six-hour distributions. As can be seen from the figure, the recommended storm is more severe in that 90 percent of the total precipitation occurs in a one-hour period compared to 80 percent for the NRCS two-hour and a little more than 50 percent for the NRCS six-hour event.

Table 28.24.090: Design Rainfall Distribution

Duration (minutes)	Cumulative Proportion of 3-Hour Precipitation	Duration (minutes)	Cumulative Proportion of 3-Hour Precipitation	Duration (minutes)	Cumulative Proportion of 3-Hour Precipitation
5	0.004	65	0.089	125	0.96
10	0.007	70	0.199	130	0.964
15	0.011	75	0.391	135	0.967
20	0.015	80	0.546	140	0.971
25	0.018	85	0.642	145	0.974
30	0.022	90	0.728	150	0.978
35	0.026	95	0.792	155	0.982
40	0.029	100	0.847	160	0.985
45	0.033	105	0.892	165	0.989
50	0.036	110	0.929	170	0.993
55	0.04	115	0.947	175	0.996
60	0.044	120	0.956	180	1

Figure 28.24.090: Design Storm Distribution



(Res. 40-08 (§ 605), 3-19-08)

Chapter 28.28
Storm Runoff

§ 28.28.010. Introduction.

For the area within the jurisdiction of this manual, two deterministic hydrological models can be used to estimate storm runoff, rational formula and the SCS unit hydrograph method. The techniques for these methods are presented in this chapter.

The rational and SCS unit hydrograph methods require the user to determine watershed characteristics (i.e., area, length, slope, imperviousness, etc.) and the characteristic response time for the watershed (time of concentration). The SCS unit hydrograph method also requires calculation of the precipitation losses. Procedures for these parameters are presented first, followed by specific requirements for each method.

For certain circumstances, where adequate recorded stream flow data are available and the watershed area is large (greater than 10 square miles), a statistical analysis may be required to predict the storm runoff peaks or for calibration of deterministic models.

(Res. 40-08 (§ 701), 3-19-08)

§ 28.28.020. Watershed characteristics.

The watershed characteristics needed for the runoff computation methods include the watershed area, the various flow path lengths, slopes, and surface conditions (i.e., overland, grassed channel, gutter), soil infiltration rates, and land use or imperviousness.

(a) Physical Features. Watershed boundaries and areas can be determined from topographic maps, but a field investigation is recommended to verify boundaries. Land use and flow path characteristics can be obtained from zoning maps, aerial photographs, field investigations, or detailed topographic maps. Soil characteristics can be determined from NRCS (formerly SCS) soil reports for Mesa County.

(b) Watershed Imperviousness. Imperviousness, I_{mp}, is a basic characteristic that is a direct measure of the watershed's potential to produce storm runoff in terms of peak rates and total runoff volume. It is also a predictive indicator of watershed response to urbanization and the subsequent impact on stream stabilization and water quality.

Imperviousness is used in the rational method to derive the runoff coefficient and can be used in the SCS unit hydrograph method to derive runoff curve number. Imperviousness is typically determined in one of two ways, either by identification of watershed surface conditions (i.e., natural ground versus hard surfaces) and direct computation or by characterization of the land uses (i.e., undeveloped, residential, commercial, industrial) which have typical values of imperviousness.

Recommended impervious values for surface conditions and for typical land use types are provided in Table 28.28.020. The more precise approach is to divide the watershed into pervious and impervious surfaces and then compute the overall imperviousness directly, which is the required method for determining imperviousness for new development. This approach can be used when aerial photographs or detailed

development plans (i.e., for planned unit developments) are available, or field investigations of existing conditions are performed.

When this information is not available or for projecting watershed imperviousness for future land uses, then typical imperviousness values from Table 28.28.020 are used. For single-family residential development when the housing density (i.e., units per acre) and the size and type of housing (i.e., ranch, split level, and two-story) can be determined, then the use of Figures 28.28.020(a), 28.28.020(b) and 28.28.020(c) is recommended. These figures are indicative of the existing development trend to place larger houses, including driveways, walks, patios, and outbuildings, on smaller lots. However, imperviousness values have also been found to be representative of older developments with small lots where additional impervious surfaces were added over time.

Note that in undeveloped areas that are to remain undeveloped, two percent imperviousness may be used for all areas that have soil and vegetative cover. However, these undeveloped areas often have significant geological features such as rock outcroppings that must be accounted for by calculating a composite imperviousness for these basins. Rock outcroppings are typically assigned an imperviousness of 100 percent for these calculations.

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RECOMMENDED IMPERVIOUSNESS VALUES

Land Use or Surface Characteristic	Percentage Imperviousness
Business	
Commercial Areas	85
Neighborhood Areas	70
Residential	
Single Family	(see figures)
Multi-unit (detached)	60
Multi-unit (attached)	75
Half-acre lot or larger	(see figures)
Apartments	80
Industrial	
Light industrial	80
Heavy industrial	90
Parks, cemeteries	5
Playgrounds	10
Schools	50
Railroad yards	15
Undeveloped Areas	
Historic flow analysis	2
Greenbelts, agriculture	2
Off-site flow analysis (when land use not defined)	45
Streets	
Paved (concrete/asphalt)	100
Gravel	40
Drives and walks	90
Roofs	90
Lawns (all soils)	0

NOTES:
1. The imperviousness values are representative of land uses shown and are for future development projections only. Impervious values for existing land uses may vary.
2. For areas that will not be developed, 2% imperviousness is an appropriate assumption where soil and vegetative cover are present. Areas with geological features, including significant rock outcroppings, need to be accounted for. See GJMC 26.28.020(b).

Revision	Date
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CHANGED BUS. VALUES	12/6/07
ADDED NOTE 2	1/25/08

WRC ENGINEERING, INC.

REFERENCE:
UDFCD 2001. Urban Storm Drainage Criteria Manual, Volume 1 (revised)

TABLE 28.28.020

Figure 28.28.020(a): Watershed Imperviousness, Single-Family Residential Ranch Style House

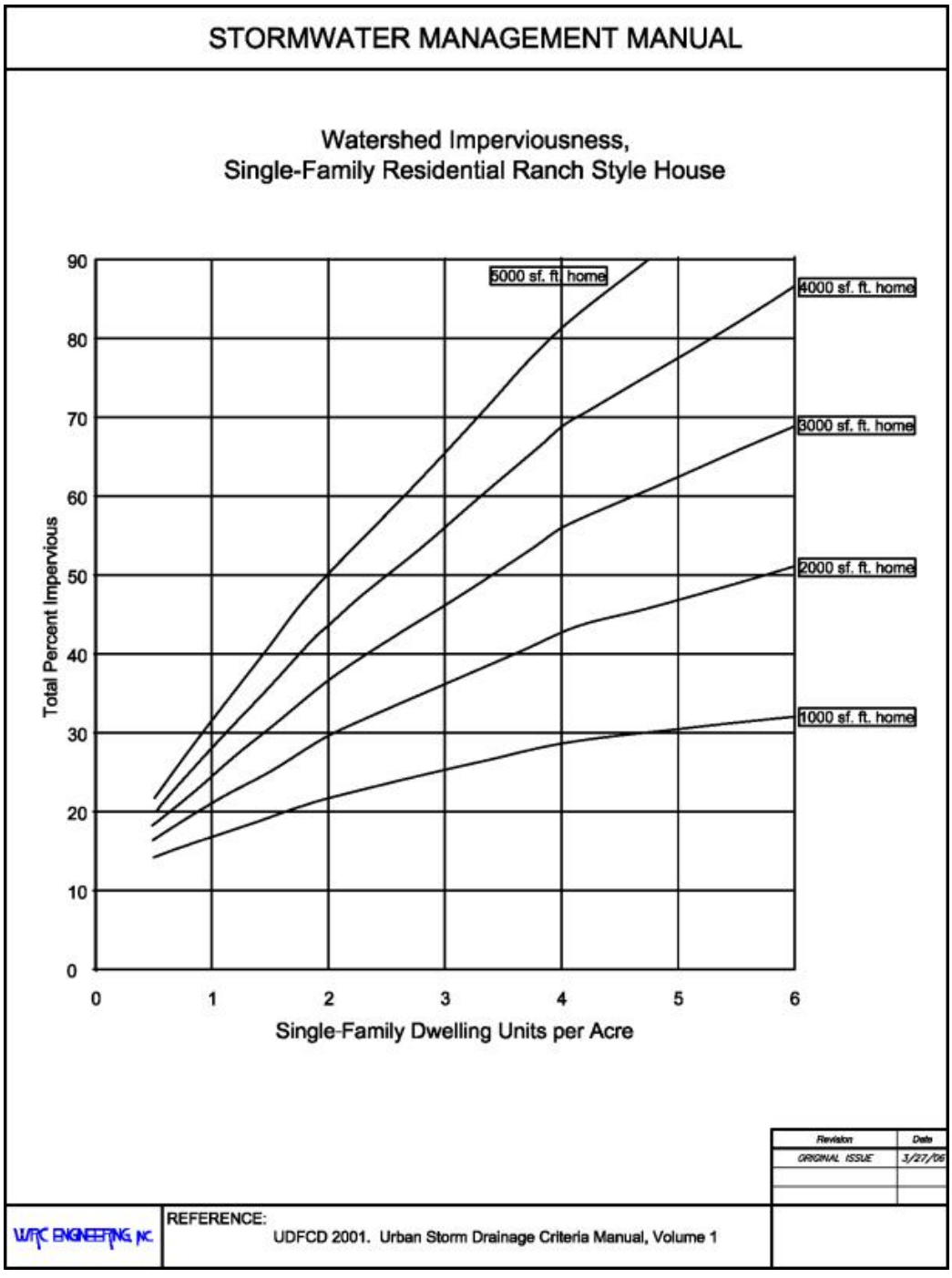


Figure 28.28.020(b): Watershed Imperviousness, Single-Family Residential Split Level House

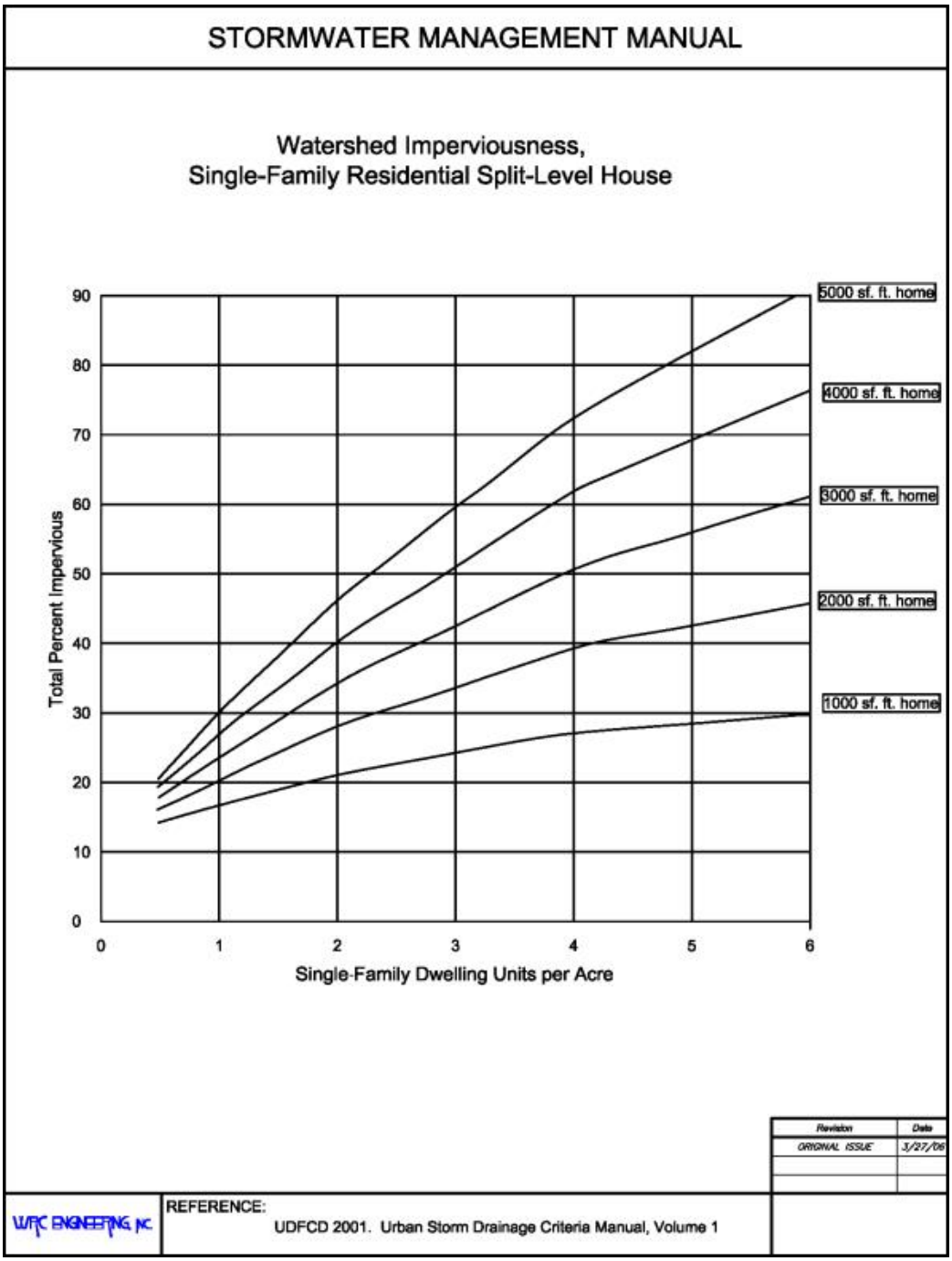
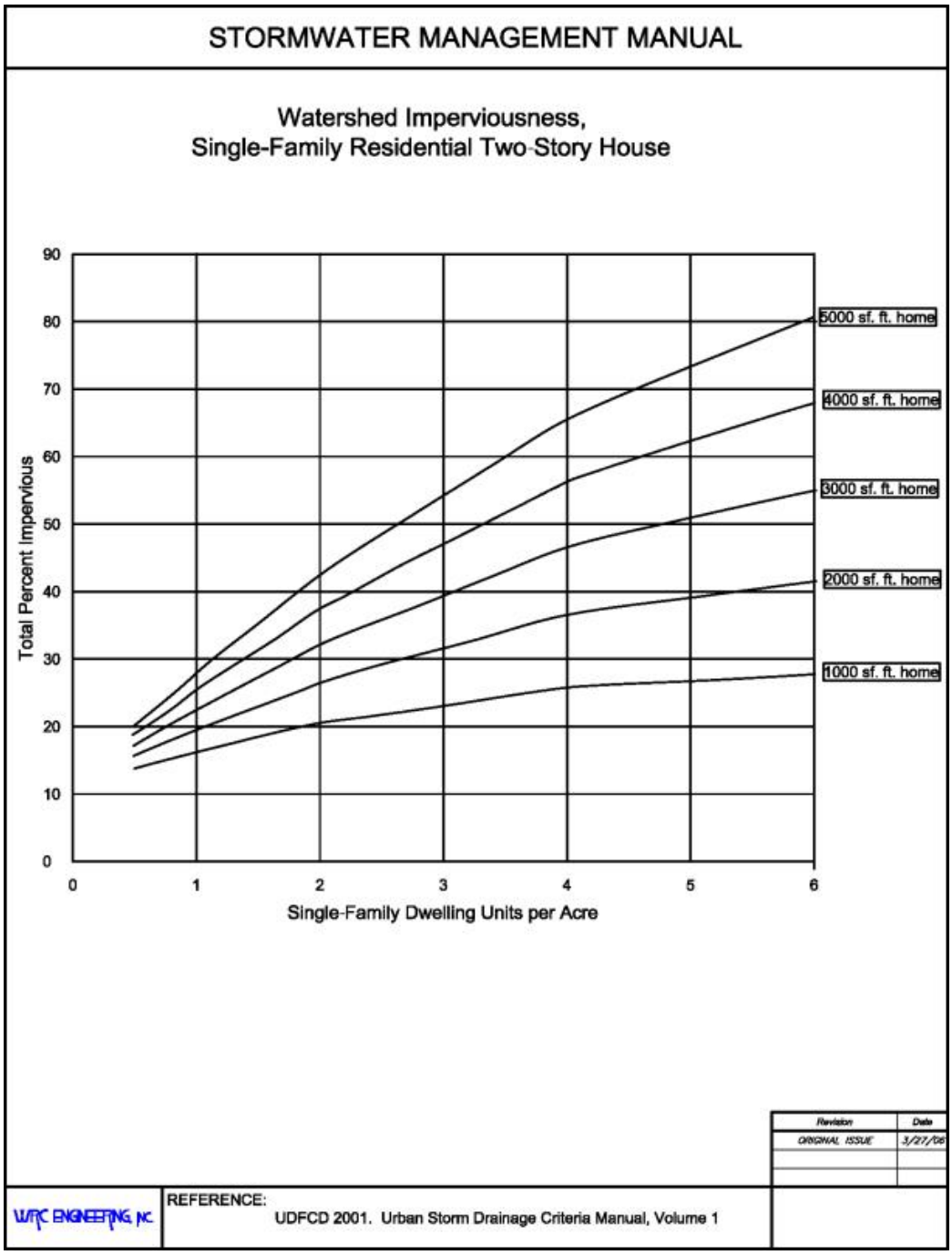


Figure 28.28.020(c): Watershed Imperviousness, Single-Family Residential Two-Story House



(Res. 40-08 (§ 702), 3-19-08)

§ 28.28.030. Time of concentration.

The time of concentration, t_c, is the time required for runoff to flow from the most remote part of the watershed area to the point of interest. For the rational formula, the time of

concentration is calculated so that the average rainfall rate for a corresponding duration can be determined from the rainfall intensity-duration-frequency curves. For the SCS unit hydrograph methods, the time of concentration is used to determine the time-to-peak, t_p, of the unit hydrograph and subsequently, the peak runoff.

For consistency between runoff analyses, the time of concentration equations presented in this chapter shall be used for all small watershed (less than 1.0 square miles) runoff calculations. For large watershed calculations, the watershed lag equation for the SCS unit hydrograph method is recommended (see GJMC § 28.28.110(c)).

Time of concentration consists of an initial time or overland flow time, t_i, plus travel time, t_t, which is in a combined form. In both urban and nonurban environments, the initial or overland flow is assumed to occur as sheet flow and as a function of surface type and slope, with an upper limit on the distance which this type of flow can occur.

(Res. 40-08 (§ 703), 3-19-08)

§ 28.28.040. Nonurbanized watersheds.

For nonurban areas, the travel time occurs in a combined form, such as a small swale, channel, or wash. In urban areas, the travel time occurs in a combined form, such as in the storm drain, paved gutter, roadside drainage ditch, or drainage channel. Travel time can be estimated from the hydraulic properties of the storm drain, gutter, swale, ditch, or wash. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow.

The time of concentration for both urban and nonurban areas is calculated as follows:

$$t_c = t_i + t_t \qquad (28.28\text{-}1)$$

Where:

t_c = Time of concentration (min)
t_i = Initial, inlet, or overland flow time (min)
t_t = Travel time in the ditch, channel, gutter, storm drain, etc. (min)

Standard Form No. 2 has been developed to organize the calculation of t_c.

The initial or overland flow time, t_i, may be calculated using the following equation:

$$t_i = 1.8\,(1.1 - K)\,L_o^{1/2} / S^{1/3} \qquad (28.28\text{-}2)$$

Where:

t_i = Initial or overland flow time (min)
K = Flow resistance coefficient
L_o = Length of overland flow (feet, 300-foot maximum)
S = Average watershed slope (percent)

Equation 28.28-2 was originally developed by the Federal Aviation Administration (FAA, 1970) for use with the rational formula method. However, the equation is also valid for computation of the initial or overland flow time for the SCS unit hydrograph method. The five-year runoff coefficient, C_5, presented in Table 28.28.040(a) is recommended for the flow resistance coefficient, K.

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RATIONAL FORMULA RUNOFF COEFFICIENTS

Equation:

$$C_{CD} = K_{CD} + (0.858i^3 - 0.786i^2 + 0.774i + 0.04$$
$$C_A = K_A + (1.31i^3 - 1.44i^2 + 1.135i - 0.12)$$
$$C_B = (C_A + C_{CD})/2$$

KCD VALUES						
NRCS Soil	2-year	5-year	10-year	25-year	50-year	100-year
C and D	0	-0.10i+0.11	-0.18i+0.21	-0.28i+0.33	-0.33i+0.40	-0.39i+0.46
A	0	-0.08i+0.09	-0.14i+0.17	-0.19i+0.24	-0.22i+0.28	-0.25i+0.32

Impervious Decimal	Type A					
	2-year	5-year	10-year	25-year	50-year	100-year
0.0	0.00	0.00	0.08	0.14	0.18	0.23
0.1	0.00	0.06	0.14	0.20	0.24	0.28
0.2	0.06	0.13	0.20	0.26	0.30	0.33
0.3	0.13	0.19	0.25	0.31	0.34	0.37
0.4	0.19	0.25	0.30	0.35	0.38	0.41
0.5	0.25	0.30	0.35	0.40	0.42	0.45
0.6	0.33	0.37	0.41	0.45	0.47	0.50
0.7	0.42	0.45	0.49	0.53	0.54	0.56
0.8	0.54	0.56	0.60	0.63	0.64	0.66
0.9	0.69	0.71	0.73	0.76	0.77	0.79
1.0	0.89	0.90	0.92	0.94	0.95	0.96

Impervious Decimal	Type B					
	2-year	5-year	10-year	25-year	50-year	100-year
0.0	0.00	0.08	0.17	0.27	0.32	0.36
0.1	0.06	0.14	0.22	0.31	0.36	0.40
0.2	0.12	0.20	0.27	0.35	0.40	0.44
0.3	0.18	0.25	0.32	0.39	0.43	0.47
0.4	0.23	0.30	0.36	0.42	0.46	0.50
0.5	0.29	0.35	0.40	0.46	0.50	0.52
0.6	0.37	0.41	0.46	0.51	0.54	0.56
0.7	0.45	0.49	0.53	0.58	0.60	0.63
0.8	0.57	0.59	0.63	0.66	0.69	0.70
0.9	0.71	0.73	0.75	0.78	0.80	0.81
1.0	0.89	0.90	0.92	0.94	0.95	0.96

Impervious Decimal	Type C and D Soil					
	2-year	5-year	10-year	25-year	50-year	100-year
0.0	0.05	0.16	0.26	0.38	0.46	0.51
0.1	0.11	0.21	0.30	0.41	0.48	0.53
0.2	0.17	0.26	0.34	0.44	0.50	0.55
0.3	0.22	0.30	0.38	0.47	0.53	0.57
0.4	0.28	0.35	0.42	0.50	0.55	0.58
0.5	0.34	0.40	0.46	0.53	0.57	0.60
0.6	0.41	0.46	0.51	0.57	0.61	0.63
0.7	0.49	0.53	0.57	0.62	0.66	0.68
0.8	0.60	0.63	0.66	0.70	0.73	0.74
0.9	0.73	0.75	0.77	0.80	0.83	0.83
1.0	0.89	0.90	0.92	0.94	0.96	0.96

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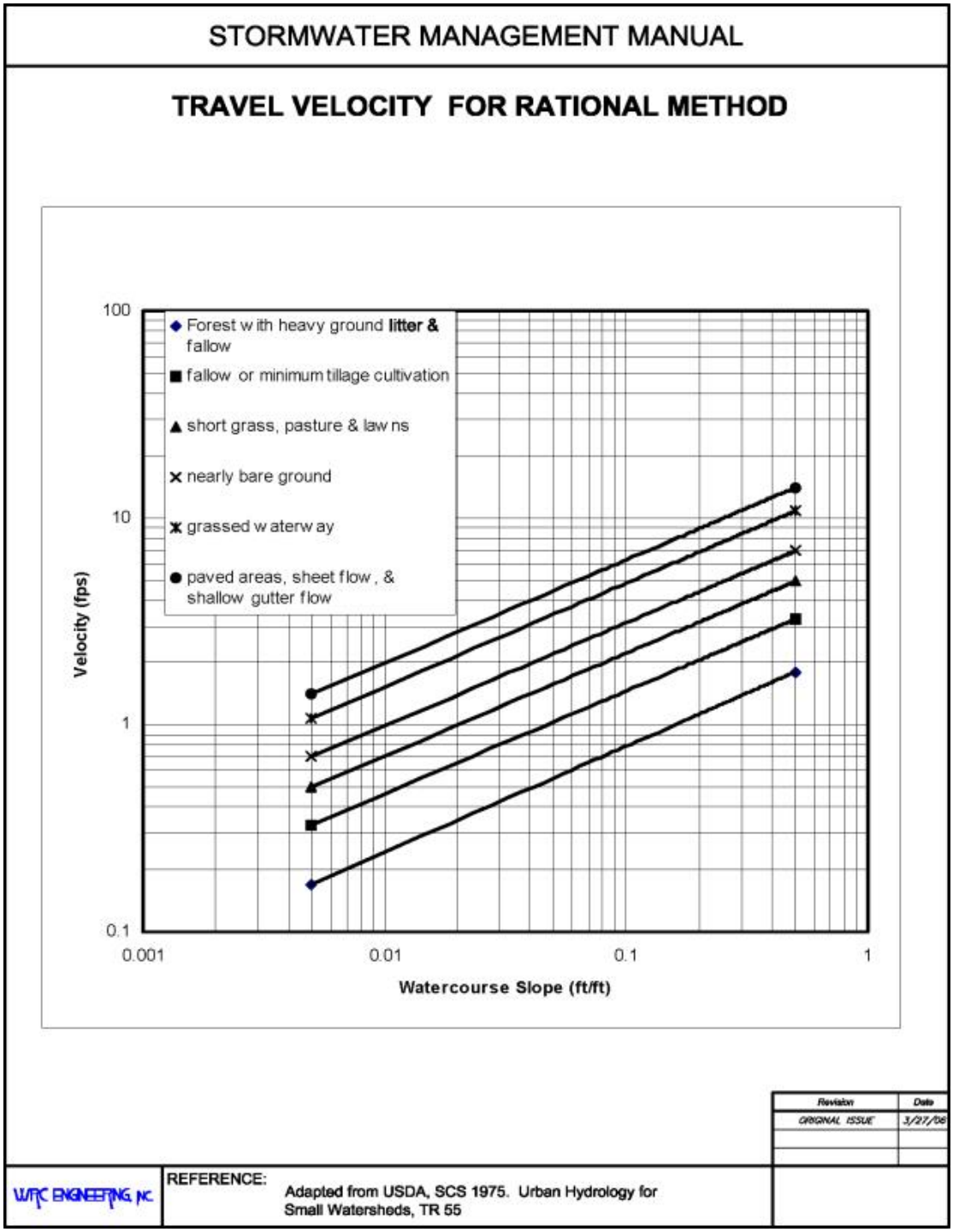
REFERENCE:
UDFCD 2001. Urban Storm Drainage Criteria Manual, Volume 1 (revised)

TABLE 28.28.040(a)

Figure 28.28.040: Travel Velocity for Rational Method



The overland flow length, L_o, is generally defined as the length over which the flow characteristics appear as sheet flow or very shallow flow in broad, grassed swales. Changes in land slope, surface characteristics, and small drainage ditches or gullies will tend to force the overland flow into a combined flow condition, which results in higher flow velocities and

shorter travel times. Therefore, the initial flow time is limited to the time to travel a distance of 300 feet.

For watersheds longer than 300 feet, the travel time, t_t, must be added to the overland flow time. Travel time can be calculated using Manning's equation and the hydraulic properties of the storm drain, gutter, swale, ditch, or channel or can be approximated from Equation 28.28-3 and Figure 28.28.040:

$$V = C_v S_w^{0.5} \quad (28.28\text{-}3)$$

Where:

V = Velocity, fps
S_w = Watercourse slope, ft./ft.
C_v = Conveyance coefficient

Table 28.28.040(b): Travel Time Conveyance Coefficients

Land Surface	Conveyance Coefficient C_v
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterways	15
Paved areas and shallow swales	20

The time of concentration is then the sum of the initial flow time t_i and the travel time t_t. The minimum recommended t_c for nonurban watersheds is 10 minutes.

(Res. 40-08 (§ 703.1), 3-19-08)

§ 28.28.050. Urbanized watersheds.

Overland flow in urbanized watersheds can occur from the back of the lot to the street, in parking lots, in greenbelt areas, or within park areas and can be calculated using the procedure described in GJMC § 28.28.030. Travel time, t_t, to the first design point or inlet is often determined based on the conveyance coefficient for paved areas and shallow swales, but can be estimated using Manning's equation.

The time of concentration for the first design point in an urbanized watershed using this procedure should not exceed the time of concentration calculated using Equation 28.28-4, which was developed using rainfall/runoff data collected in urbanized regions (USDCM, 1969).

$$t_c = L / 180 + 10 \quad (28.28\text{-}4)$$

Where:

t_c = Time of concentration at the first design point (min.)
L = Watershed length (ft.)

Equation 28.28-4 may result in a lesser time of concentration at the first design point and thus would govern in an urbanized watershed. The recommended minimum t_c to the first urban design point is five minutes. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream reaches.

(Res. 40-08 (§ 703.2), 3-19-08)

§ 28.28.060. Precipitation losses.

Two methods for calculating precipitation losses are presented below, the SCS curve number and the Green-Ampt methods, both of which can be used for the SCS unit hydrograph method.

Land surface interception, depression storage and infiltration are referred to as precipitation losses. Interception and depression storage represent the surface storage of water by trees or grass, in local depressions in the ground surface, in cracks and crevices in parking lots or roofs, or in a surface area where water is not free to move as overland flow. Infiltration represents the movement of water through the soil beneath the land surface.

Three important factors should be noted about precipitation loss computations. First, precipitation which does not contribute to the runoff process is considered to be lost from the system. Second, the equations used to compute the losses do not provide for soil moisture or surface storage recovery (i.e., contribute to surface runoff); therefore, the calculated amount of runoff is conservatively high. Finally, precipitation losses are considered to be uniformly distributed over an entire sub-watershed.

(Res. 40-08 (§ 704), 3-19-08)

§ 28.28.070. SCS curve number method.

The National Resources Conservation Service (NRCS, formerly SCS), U.S. Department of Agriculture, has instituted a soil classification system for use in soil survey maps across the country. Based on experimentation and experience, the agency has been able to relate the watershed characteristics of soil groups to a curve number, CN (SCS, 1985). The NRCS provides information relating soil group type to the curve number as a function of soil cover, land use type and antecedent moisture conditions, which can be determined from the soil name.

Precipitation loss is calculated based on supplied values of CN and IA, which are related to a total runoff depth for a storm by the following relationships:

$$Q = (P - IA)^2 / ((P - IA) + S) \quad (28.28\text{-}5)$$

$$S = (1{,}000 / CN) - 10 \quad (28.28\text{-}6)$$

$$IA = 0.2\ S \quad (28.28\text{-}7)$$

Where:

Q	=	Accumulated excess (in.)
P	=	Accumulated rainfall depth (in.)
IA	=	Initial abstraction (in.)
S	=	Currently available soil moisture storage deficit (in.)
CN	=	SCS curve number

Note that initial abstraction, IA, (i.e., soil surface storage capacity) is based on empirical evidence established by the NRCS, and is the default value in HEC-1 Program (HEC, 1988).

Since the SCS method results in total excess for a storm, the incremental excess (the difference between rainfall and precipitation loss) for a time period is computed as the difference between the accumulated excess at the end of the current period and the accumulated excess at the end of the previous period.

(Res. 40-08 (§ 704.1), 3-19-08)

§ 28.28.080. CN determination.

The SCS curve number method uses a soil cover curve number (CN) for computing excess precipitation. The curve number CN is related to hydrologic soil group (A, B, C, or D), land use, treatment class (cover), and antecedent moisture condition.

The soil group is determined from published soil maps for the area, which correlates each soil name with the soil group. Land use and treatment class are determined during field visits or from aerial photographs. Procedures for determining land use and treatment class are found in Chapter 8 of National Engineering Handbook, Section 4 (SCS, 1985). Antecedent moisture condition of the watershed is explained as follows:

The amount of rainfall in a period of five to 30 days preceding a particular storm is referred to as antecedent rainfall, and the resulting condition of the watershed in regard to potential runoff is referred to as an antecedent moisture condition. In general, higher amounts of antecedent rainfall result in greater amounts of runoff from a given storm. The effects of infiltration and evapotranspiration during the antecedent period are also important, as they may increase or lessen the effect of antecedent rainfall. Because of the difficulties of determining antecedent storm conditions from data normally available, the conditions are reduced to three cases, AMC-I, AMC-II and AMC-III. For the Mesa County area, an AMC-II condition is recommended for determining storm runoff.

Having determined the soil group, land use and treatment class and the antecedent moisture condition, CN values can be determined from Table 28.28.080, which is reproduced from Table 2-2 in TR-55 (SCS, 1986).

When land uses shown in Table 28.28.080 are not applicable or when more detailed land use information is available, CN values can be calculated directly from imperviousness estimates using the following equation.

$$CN = 98*Imp + X*(1-Imp) \quad (28.28\text{-}8)$$

Where:

Imp	=	Imperviousness as a decimal
X	=	Adjustment factor based on NRCS Soil Type

NRCS Soil Type	Adjustment Factor
A	39
B	61
C	74
D	80

Note that Equation 28.28-8 was derived from the data plotted on Figure 2-3 in TR-55 (SCS 1986) and applies when impervious surfaces are connected. Adjustment for disconnected impervious surfaces can be made using Figure 2-4 in TR-55. This adjustment is not required as the connected impervious surface assumption will result in conservatively high CN values.

STORMWATER MANAGEMENT MANUAL

RUNOFF CURVE NUMBERS

Land Use or Surface Characteristic	Average Imperv. (%)	Runoff Curve Number Soil Complex A	B	C	D
Business					
Commercial Areas	85	89	92	94	95
Neighborhood Areas	70	80	87	91	93
Residential					
Single Family (note 1)	(note 1)				
Multi-unit (detached)	60	74	83	88	91
Multi-unit (attached)	75	83	89	92	94
Apartments	80	86	91	93	94
Industrial					
Light	80	86	91	93	94
Heavy	90	92	94	96	96
Parks, cemeteries	5	42	63	75	81
Playgrounds	10	45	65	76	82
Schools	50	69	80	86	89
Railroad yards	15	48	67	78	83
Irrigated Areas					
Lawns, parks, golf course	0	39	61	74	80
Agriculture	0	39	61	74	80
Undeveloped Areas					
Pre-development conditions	2	40	62	74	80
Greenbelts, agriculture	2	40	62	74	80
Off-site analysis when land use Unknown	45	66	78	85	88
Outcrops	70	80	87		94
Streets/Roads					
Paved	100	98	98	98	98
Gravel	40	63	76	84	87
Drives/Walks	90	92	94	96	96
Roofs	90	92	94	96	96

Revision	Date
ORIGINAL ISSUE	1/27/08

WRC ENGINEERING, INC.

REFERENCE:
SCS TECHNICAL RELEASE NO. 55 (1986)

TABLE 28.28.080

(Res. 40-08 (§ 704.2), 3-19-08)

§ 28.28.090. Green and Ampt method.

The Green-Ampt method models infiltration by combining an unsaturated flow form of Darcy's law with requirements of mass conservation. The Green-Ampt method involves the simulation of rainfall loss as a two-phase process. The first phase of rainfall loss is called initial abstraction (IA) or surface retention loss, which involves vegetation interception, evaporation, and surface depression storage. Typical surface retention loss values are shown in Table 28.28.090(a).

Table 28.28.090(a): Surface – Retention Loss

Land Use and/or Surface Cover	Surface Retention Loss, IA (inches)
Natural	
Desert and rangeland, flat slope	0.35
Desert hillslopes	0.15
Mountain with vegetated surface	0.25
Developed (residential/commercial)	
Lawn and turf	0.2
Desert landscape	0.1
Pavement	0.05
Agricultural, tilled fields and irrigated pasture	0.5

The second phase of the rainfall loss process is infiltration of rainfall into the soil. The infiltration is assumed to begin after the surface retention loss is completely satisfied. Excess precipitation is computed using the Green-Ampt equations after the initial loss is satisfied. Required parameters are then the hydraulic conductivity of the soil at saturation, volumetric moisture deficit at the beginning of rainfall, and wetting front capillary action.

Typical values for Green-Ampt parameters were obtained from the *Drainage Design Manual for Maricopa County Hydrology* (Maricopa County 2003 (draft)), available at:

http://www.fcd.maricopa.gov/Resources/HydrologyManual.asp.

(a) Soil Hydraulic Conductivity. The soil hydraulic conductivity is based on soil texture classification. Typical values for different soil type are listed in Table 28.28.090(b). For watershed areas of sub-watersheds consisting of several different soil textures, a composite value for Green-Ampt parameters should be used.

Table 28.28.090(b): Soil Hydraulic Conductivity Values (for bare ground)

Soil Texture Classification	Hydrologic Soils Group	Soil Hydraulic Conductivity (in/hr)
Loamy-sand and sand	A	1.2
Sandy-loam	B	0.4

Table 28.28.090(b): Soil Hydraulic Conductivity Values (for bare ground)		
Soil Texture Classification	**Hydrologic Soils Group**	**Soil Hydraulic Conductivity (in/hr)**
Loam	B	0.25
Silty-loam	C	0.15
Sandy clay-loam	C	0.06
Clay-loam	D	0.04
Silty clay-loam	D	0.04
Sandy-clay	D	0.02
Silty-clay	D	0.02
Clay	D	0.01

Hydraulic conductivity is affected by several factors besides soil texture, including soil crusting, tillage, ground cover, and canopy cover and should be adjusted. Ground cover, such as grass, litter, and gravel, will generally increase the infiltration rate over that of bare ground conditions. Canopy cover, such as from trees, brush, and tall grasses, also increases the bare ground infiltration rate. A simplified procedure for adjusting bare ground hydraulic conductivity to account for vegetation cover is provided in Equation 28.28-9:

$$Ck = (Vc-10)/90 + 1.0 \qquad (28.28\text{-}9)$$

Where:

Ck = Hydraulic conductivity ratio to bare ground conductivity
Vc = Vegetated cover as a percentage

(b) Volumetric Soil Moisture Deficit. The soil moisture deficit is a volumetric measure of the soil moisture-storage capacity that is available at the start of the rainfall. The volumetric moisture deficit is a function of the effective porosity of the soil and its value is in the range of near zero to the effective porosity. If the soil is saturated at the start of rainfall, then the moisture deficit equals zero. If the soil is devoid of moisture at the start of rainfall, then the moisture deficit is essentially the effective porosity of the soil.

Three conditions for soil moisture deficit have been defined for use based on the antecedent soil moisture condition that could be expected to exist at the start of the design rainfall. These three conditions are:

(1) “Dry” for antecedent soil moisture near the vegetation wilting point;

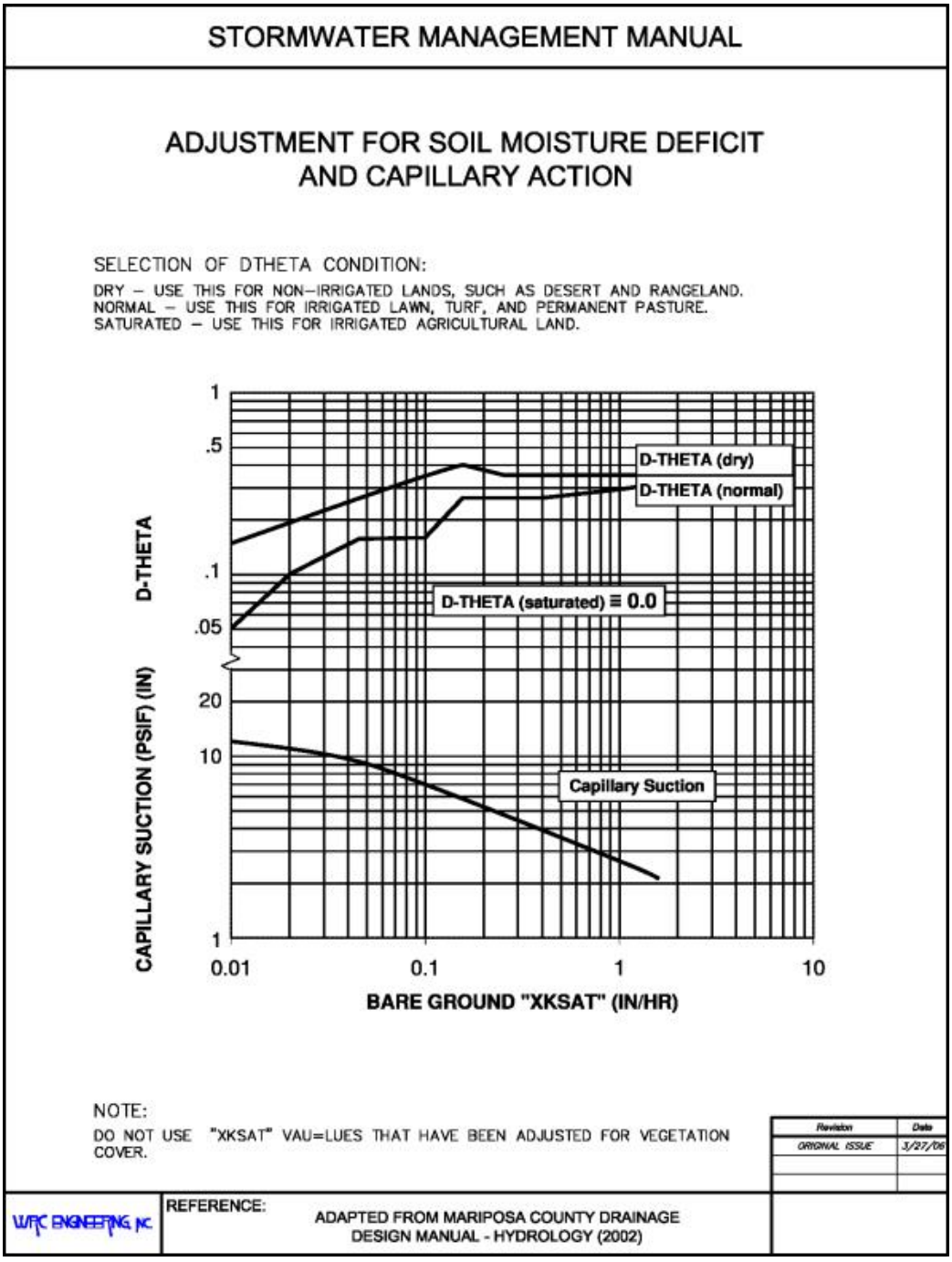
(2) “Normal” for antecedent soil moisture condition near field capacity due to previous precipitation or land irrigation; and

(3) "Saturated" for antecedent soil moisture near effective saturation due to recent precipitation or land irrigation.

Typical volumetric soil moisture deficit values for the above three defined conditions may be taken from Figure 28.28.090. For Mesa County, the recommended condition is "normal," which is consistent with antecedent moisture condition II.

(c) Wetting Front Capillary Action. This parameter is relatively insensitive to ground cover, and is a function of the average bare soil type hydraulic conductivity. Typical values may be taken from Figure 28.28.090.

Figure 28.28.090: Adjustment for Soil Moisture Deficit and Capillary Action



(Res. 40-08 (§ 704.3), 3-19-08)

§ 28.28.100. Rational formula method.

For watersheds that are not complex and have small watershed areas, the design storm runoff may be analyzed using the rational formula method. This method is widely used due to its simplicity and level of general acceptance. The rational formula method, when properly

applied in a consistent manner, results in drainage facilities sizes that adequately convey storm runoff with minimal consequences.

(a) Methodology. The rational method is based on the formula:

$$Q = CIA \qquad (28.28\text{-}10)$$

Where:

Q	=	Maximum rate of runoff in cubic feet per second (cfs)
C	=	Runoff coefficient
I	=	Average intensity of rainfall in inches per hour
A	=	Contributing watershed area in acres

(b) Assumptions. The basic assumptions made when applying the rational formula method are as follows:

(1) The computed maximum rate of runoff to the design point is a function of the average rainfall rate during the time of concentration to that point.

(2) The maximum rate of rainfall occurs during the time of concentration, and the design rainfall depth during the time of concentration is converted to the average rainfall intensity for the time of concentration.

(3) The maximum runoff rate occurs when the entire area is contributing flow.

(c) Limitations on Methodology. The rational formula method adequately estimates the peak rate of runoff from a rainstorm in a given watershed, but does not provide information on the full hydrograph and only approximates the runoff volume.

Typical design procedures assume that all of the design flow is collected at the design point and that there is no carry-over water running overland to the next design point. The problem becomes one of routing the surface and subsurface hydrographs which have been separated by the storm drain system. In general, this sophistication is not warranted and a conservative assumption is made that the entire routing occurs through the storm drain system when the system is present.

Because of the limitations of the rational method, the following guidelines on its application are provided:

(1) The individual sub-watershed sizes should not be greater than 20 acres.

(2) The aggregate of all sub-watershed areas should not be greater than 160 acres.

(3) The sub-watersheds should be reasonably homogeneous for existing and for projected land use.

(d) Rainfall Intensity. The rainfall intensity, I, is the average rainfall rate in inches per hour for the period of maximum rainfall of a given frequency having a duration equal to the time of concentration. Development of rainfall intensities for the rational method is described in Chapter 28.24 GJMC.

(e) Runoff Coefficient. The runoff coefficient, C, represents the integrated effects of infiltration, evaporation, retention, flow routing, and interception, all of which affect the time distribution and peak rate of runoff. Determination of the coefficient requires judgment and understanding on the part of the engineer.

The first step is to determine the composite imperviousness of the watershed using recommended values in Table 28.28.020. Once the imperviousness is determined, recommended C values for various recurrence interval storms are determined from Table 28.28.090 or can be calculated using the following equations:

$$C_{CD} = K_{CD} + (0.858*i^3 - 0.786*i^2 + 0.774*i + 0.04) \quad (28.28\text{-}11)$$

$$C_A = K_A + (1.31*i^3 - 1.44*i^2 + 1.135*i - 0.12) \quad (28.28\text{-}12)$$

$$C_B = (C_A + C_{CD})/2 \quad (28.28\text{-}13)$$

Where:

C_{CD} = Runoff coefficient for C and D soils*
C_A = Runoff coefficient for A soils*
C_B = Runoff coefficient for B soils*
i = Imperviousness as a decimal
K_{CD} = Coefficient adjustment for C and D soils
K_A = Coefficient adjustment for A soils

* If C is not greater than or equal to zero, it should be set to zero.

Table 28.28.100: Adjustment Factors for Runoff Coefficient Equations (values of K_A and K_{CD} based on rainfall intensity (i) in inches/hour)

NRCS Soil	2-year	5-year	10-year	25-year	50-year	100-year
C and D	0	-0.10i+0.11	-0.18i+0.21	-0.28i+0.33	-0.33i+0.40	-0.39i+0.46
A	0	-0.08i+0.09	-0.14i+0.17	-0.19i+0.24	-0.22i+0.28	-0.25i+0.32

Composite imperviousness is computed on the basis of the percentage of different types of surfaces or land uses in the watershed area. This procedure is often applied to typical sample blocks as a guide to selection of reasonable values of the coefficient for an entire area.

The equations for runoff coefficients as a function of imperviousness and recurrence interval were obtained from the *Urban Storm Drainage Criteria Manual* by the Urban Drainage and Flood Control District (UDFCD 2001), which can be obtained in .pdf format on the following website:

http://www.udfcd.org/

(f) Application of the Rational Formula Method. The first step in applying the rational formula method is to obtain a topographic map and define the boundaries of all the relevant watersheds. Watersheds to be defined include all watersheds tributary (i.e., off-site areas) to the area of study and sub-watersheds in the study area. A field check is

recommended and field surveys may be required in some cases. At this stage of planning, the possibility for the diversion of watershed runoff should be identified.

The major storm watershed does not always coincide with the minor storm watershed. This is often the case in urban areas where a low flow will stay within the gutter and follow the lowest grade, but when a large flow occurs, the flow will be sufficiently deep or flowing with a high velocity such that part of the runoff will overflow street crown and flow into a new sub-watershed.

(g) Major Storm Analysis. When analyzing the major runoff occurring on an area that has a storm drain system sized for the minor storm, care must be used when applying the rational formula method. Normal application of the rational formula method assumes that all of the runoff is collected by the storm drain. For the minor storm design, the time of concentration is dependent upon the flow time in the drain. However, during the major storm runoff, the drains will probably be at capacity and could not carry the additional water flowing to the inlets. This additional water then flows overland past the inlets, generally at a lower velocity than the flow in the storm drains.

If a separate time of concentration analysis is made for the pipe flow and surface flow, a time lag between the surface flow peak and the pipe flow peak will occur. This lag, in effect, will allow the pipe to carry a larger portion of the major storm runoff than would be predicted using the minor storm time of concentration. The basis for this increased benefit is that the excess water from one inlet will flow to the next inlet downhill, using the overland route. If that inlet is also at capacity, the water will often continue on until capacity is available in the storm drain. The analysis of this aspect of the interaction between the storm drain system and the major storm runoff is complex. The simplified and conservative approach of using the minor storm time of concentration for all frequency analyses is acceptable for the Mesa County area.

(Res. 40-08 (§ 705), 3-19-08)

§ 28.28.110. SCS unit hydrograph method.

The SCS unit hydrograph was derived from a large number of natural unit hydrographs from watersheds varying widely in size and geographic location.

(a) Methodology. The SCS unit hydrograph method, which uses the unit hydrograph theory as a basis for runoff computations, computes a hydrograph for a unit amount of rainfall excess applied uniformly over a sub-watershed for a given unit of time (or unit duration). The rainfall excess hydrographs are then transformed to a sub-watershed hydrograph by superimposing each excess hydrograph lagged by the unit duration.

The shape of the SCS unit hydrograph is based on studies of various natural unit hydrographs. The basic governing parameters of this curvilinear hydrograph are as follows:

(1) The time-to-peak, T_p, of the unit hydrograph approximately equals 0.2 times the time-of-base, T_b.

(2) The point of inflection of the falling leg of the unit hydrograph approximately equals 1.7 times T_p.

(b) Assumptions. The basic assumptions made when applying the SCS unit hydrograph method (and all other unit hydrograph methods) are as follows:

(1) The effects of all physical characteristics of a given watershed are reflected in the shape of the storm runoff hydrograph for that watershed.

(2) At a given point on a stream, discharge ordinates of different unit graphs of the same unit time of rainfall excess are mutually proportional to respective volumes.

(3) A hydrograph of storm discharge that would result from a series of bursts of excess rain or from continuous excess rain of variable intensity may be constructed from a series of overlapping unit graphs each resulting from a single increment of excess rain of unit duration.

(c) Lag Time. Input data for the SCS dimensionless unit hydrograph method (SCS, 1985) consists of a single parameter, T_{LAG}, which is equal to the lag (in hours) between the center of mass of rainfall excess and the peak of the unit hydrograph.

For small watersheds (less than one square mile) in the Mesa County area, the lag time is related to the time of concentration, t_c, by the following empirical relationship:

$$T_{LAG} = 0.6\ t_c \qquad (28.28\text{-}14)$$

Where:

T_{LAG} = The time (hours) between the center of mass of the rainfall excess and the peak of the unit hydrograph.

t_c = The time of concentration (minutes, see GJMC § 28.28.030 through 28.28.050).

For large watersheds (greater than one square mile), the lag time (and t_c) is generally governed mostly by the concentrated flow travel time, not the initial overland flow time. In addition, as the watershed gets increasingly larger, the average flow velocity (and associated travel time) becomes more difficult to estimate. Therefore, for these watersheds, the following lag equation is recommended for use in computing T_{LAG}:

$$T_{LAG} = 22.1\ K_n\ (L\ L_c\ /\ S^{0.5})^{0.33} \qquad (28.28\text{-}15)$$

Where:

K_n = Manning's roughness factor for the watershed channels

L = Length of longest watercourse (miles)

L_c = Watercourse length from the outflow point to a point on the channel nearest the centroid of the watershed (miles)

S = Average slope of the longest watercourse (feet per mile)

This lag equation is based on the United States Bureau of Reclamation's (USBR) analysis of the above parameters for several watersheds in the Southwest desert, Great Basin, and Colorado Plateau area (USBR, 1989). This equation was developed by converting the USBR's S-graph lag equation to a dimensionless unit hydrograph lag equation.

For watersheds 1.0 square miles in size, it is recommended that the method which results in the shortest T_{LAG} value be used to be conservative.

(d) Roughness Factor. For consistency, recommended roughness factors, K_n, used in the lag time calculation are presented in Table 28.28.110. These factors are based on roughness factor analysis by the USACE (1982) and USBR (1989) as compared to the typical watershed channels found in the Mesa County area. The reader is referred to these documents for further discussion on selection of a proper roughness factor. For multiple land uses within a watershed, composite roughness factors should be determined.

Table 28.28.110: Lag Equation Roughness Factors

Land Use	Imperviousness %	K_n
Commercial, industrial, office and business	70 – 85	0.05
Residential		
Rural	10 – 15	0.08
Low density	20 – 25	0.07
Medium and high density	30 – 65	0.05
Irrigated grass, golf courses, parks and cemeteries	0 – 5	0.1
Undeveloped areas:		
Rock outcroppings		0.04
Irrigated agriculture		0.1
Rangelands:		
Grass lands		0.08
Grass and shrubs		0.09
Shrub and brush		0.1
Forest, evergreen		0.15

(e) Unit Storm Duration. The minimum unit duration, Δt, is dependent on the time of concentration of a given watershed. As a general rule, the unit storm duration, Δt, should be no greater than $T_c/3$. For small watersheds (i.e., less than one square mile), the recommended duration is five minutes. For larger watersheds, larger unit durations may be used, but should not exceed 15 minutes.

(f) Sub-Watershed Sizing. The determination of the peak rate of runoff at a given design point is affected by the number of sub-watersheds within a larger watershed. Typically, the more discrete the analysis of a given watershed (more sub-watersheds), the more representative the resulting peak flow is of actual runoff conditions. The improved predictive capability of multiple sub-watersheds is due to better homogeneity of the

sub-watershed characteristics, as compared to analysis of the watershed with no sub-watersheds. Recommended guidelines are:

(1) For watersheds up to 100 acres in size, the maximum sub-watershed size should be approximately 20 acres.

(2) For watersheds over 100 acres in size, increasingly larger sub-watersheds may be used as long as the land use and surface characteristics within each sub-watershed are homogeneous. In addition, the sub-watershed sizing should be consistent with the level of detail needed to determine peak flow rates at various design points within a given watershed.

(Res. 40-08 (§ 706), 3-19-08)

§ 28.28.120. Channel routing of hydrographs.

Whenever a large or a nonhomogeneous watershed is being investigated, the watershed should be divided into smaller and more homogeneous sub-watersheds. The storm hydrograph for each sub-watershed is then routed through the channel and combined with individual sub-watershed hydrographs to develop a storm hydrograph for the entire watershed. For hydrograph routing, the Muskingum, kinematic wave, and Muskingum-Cunge methods are recommended for use in the Mesa County area.

The kinematic wave method is recommended when the watershed has well defined channels. The Muskingum-Cunge method is recommended for poorly defined channels that have cross-sections that can be determined from detailed topography or from a cross-section survey, otherwise the Muskingum method is recommended.

(a) Muskingum Method. The Muskingum method estimates some channel storage effects and, as a result, the storm hydrograph shape is modified in translation along a channel reach. The basic equation for the Muskingum method as described by HEC-1 (HEC, 1988) is as follows:

$$O_2 = (C_1 - C_2)I_1 + (1\ C_1)O_1 + C_2I_2 \qquad (28.28\text{-}16)$$

Where:

O_2	=	Outflow from the reach at the end of the unit time increment (beginning of the next time increment)
O_1	=	Outflow from the reach at the beginning of the time increment
I_1	=	Inflow into the reach at the beginning of the time increment
I_2	=	Inflow into the reach at the end of the time increment
C_1, C_2	=	Coefficients defined in Equations 28.28-17 and 28.28-18, respectively

And

$$C_1 = (2\Delta t)/[2K(1\text{-}X)] + \Delta t \qquad (28.28\text{-}17)$$

$$C_2 = (\Delta t\text{-}2KX)/[2K(1\text{-}X)] + \Delta t \qquad (28.28\text{-}18)$$

$$K = L/(3{,}600V) \qquad (28.28\text{-}19)$$

Where:

K = Muskingum storage time constant in hours
L = Channel reach length in feet
V = Translation velocity in fps
Δt = Unit time increment in hours
X = Muskingum weighting factor

The velocity used in Equation 28.28-19 is the wave velocity, which can be estimated for various channel shapes as a function of average velocity, V, for steady uniform flow using Manning's equation. The approximate wave velocities for different channel shapes are provided below:

Wave Velocities for Muskingum Method	
Channel Shape	**Wave Velocity**
Wide rectangular	5/8 V
Triangular	4/3 V
Wide parabolic	11/9 V

Where V is the velocity from application of the Manning's equation.

The weighting factor (X) in the Muskingum routing method accounts for the peak flow reduction caused by channel routing. The weighting factor generally varies from 0.0 to 0.5, with 0.0 representing a reservoir type peak reduction and 0.5 representing no peak reduction.

Weighting Factors for Muskingum Method	
Channel Condition	**Weighting Factor "X"**
Some storage in over bank but few obstructions (i.e., alluvial fans)	0.15
Overbanks with severe obstruction	0.1

The reader is referred to the USBR Flood Hydrology Manual (USBR, 1989) for further discussion on the selection of an appropriate Muskingum weighting factor (X).

The storage constant (K) in the Muskingum routing method accounts for the peak flow translation along a channel reach. This constant is therefore directly related to the reach length and the mean channel flow velocity as shown in Equation 28.28-19. An estimate of the mean channel flow velocity may be obtained using Manning's formula with the hydraulic radius estimated as being equal to the flow depth. The flow depth (and thus channel flow velocity) is estimated based on the channel cross-sectional shape and the design discharge for the selected flood frequency.

The routing procedure may be repeated for several sub-reaches so the total travel time through the reach is equal to K. To ensure the method's computational stability and the accuracy of computed hydrograph, the routing reach should be chosen so that:

$$1/[2(1-X)] \leq K/(\Delta T \cdot NSTPS) \leq 1/(2X) \quad (28.28\text{-}20)$$

Where ΔT is the time increment in hours.

(b) Kinematic Wave Method. In the kinematic wave interpretation of the equations of motion, it is assumed that the bed slope and water surface slope are equal and acceleration effects are negligible.

Thus flow at any point in the channel can be computed from Manning's formula:

$$Q = (1.486/n)\, R^{2/3}\, S_o^{1/2}\, A \quad (28.28\text{-}21)$$

Where:

Q	=	Flow rate, cfs
R	=	Hydraulic radius, ft.
S_o	=	Channel bed slope, ft./ft.
A	=	Cross-sectional area, square feet
n	=	Manning's resistance factor

Equation 28.28-21 can be simplified to:

$$Q = \alpha A^m \quad (28.28\text{-}22)$$

Where α and m are related to flow geometry and surface roughness. This is the form of the equation used to route hydrographs through channels.

The kinematic wave method in HEC-1 does not allow for explicit separation of main channel and overbank areas. Therefore, a flood wave routed by the kinematic wave technique through a channel reach is translated, but does not attenuate (although a small degree of attenuation is introduced by the finite difference solution). Consequently, the kinematic wave routing technique is most appropriate in channels where flood wave attenuation is not significant, as is typically the case in urban areas. Otherwise, flood wave attenuation can be modeled empirically by using the Muskingum method or other applicable storage routing techniques.

(c) Muskingum-Cunge Method. The Muskingum-Cunge routing method is similar to the Muskingum method, but is a physically based method whose parameters are determined from actual channel characteristics. Because it does not require calibration to streamflow data, it is suited for use in ungaged watersheds. One limitation to the use of Muskingum-Cunge routing is that this method does not account for backwater and storage in the channel.

Muskingum-Cunge routing is based on wave diffusion theory and is nonlinear in nature. In Muskingum-Cunge routing, the amount of diffusion is matched to physical diffusion determined using physical channel characteristics. This is compared to Muskingum routing which uses the X parameter to control diffusion without any relation to physical channel characteristics. Additional detail about the theory behind the Muskingum-Cunge routing method is presented in the HEC-1 User's Manual (HEC, 1990).

Data required for use with HEC-1 include representative channel cross-section, reach length, Manning's roughness coefficients for main channel and overbanks, and channel bed slope.

The representative channel cross-sections are not limited to the standard prismatic shapes required for kinematic wave routing so eight-point cross-sections can be used to define the channel and overbanks as with normal-depth storage routing.

The results obtained using Muskingum-Cunge routing in HEC-1 should be checked for reasonableness. The increments of time and distance selected internally by HEC-1 and used in the finite-difference computation can affect the accuracy of the results.

(Res. 40-08 (§ 707), 3-19-08)

§ 28.28.130. Reservoir routing of hydrographs.

Storm runoff detention is required for new development (GJMC § 28.16.090) and therefore detention reservoirs will be required (see Chapter 28.56 GJMC). In some instances, the sizing of the detention storage will be based upon hydrograph storage routing techniques rather than direct calculation of volume and discharge requirements. The modified Puls methodology for reservoir routing, which is computerized in the HEC-1 and other programs, is recommended.

The procedure for the original Puls method was developed in 1928 by L.G. Puls of the United States Army Corps of Engineers (USACE). The method was modified in 1949 by the USBR simplifying the computational and graphic requirements. The method is also referred to as the storage indication or Goodrich Reservoir routing method. The differences, if any, are mainly in the form of the equation and means of initializing the routing. The procedures presented herein were obtained from Hydrology for Engineers (Linsley, 1975).

The principle of mass continuity for a channel reach can be expressed by the equation:

$$(I-D)\Delta t = \Delta S \qquad (28.28\text{-}23)$$

I is the inflow rate, D is the discharge rate, Δt is the time interval, and ΔS is the change in storage. If the average rate of flow during a given time period is equal to the average of the flows at the beginning and end of the period, the equation can be expressed as follows:

$$(I_1 + I_2)\ \Delta t / 2 - (D_1 + D_2)\ \Delta t / 2 = S_2 - S_1 \qquad (28.28\text{-}24)$$

Where the subscripts 1 and 2 refer to the beginning and end of time period t. Rearranging the equation gives the following form used for the modified Puls method:

$$I_1 + I_2 + ({}_2S_1 / \Delta t - D_1) = ({}_2S_2 / \Delta t + D_2) \qquad (28.28\text{-}25)$$

(Res. 40-08 (§ 708), 3-19-08)

Chapter 28.32
Open Channels

§ 28.32.010. Introduction.

Presented in this chapter are the technical criteria and design standards for hydraulic evaluation and design of open channels (natural and artificial). Open channel flow can be extremely complex, and often entire textbooks are devoted to the subject. Discussions and hydraulic standards are provided for different channel types that are most likely to be found in Mesa County.

The ultimate responsibility for the design of a safe and stable channel rests with the professional design engineer. A good understanding of the site conditions is vital to the production of a stable channel design. The information presented in this chapter must be considered to be the minimum standards upon which channel evaluation and design shall be based. Additional analysis that goes beyond the scope of this manual may be necessary for unique or unusual channel conditions. For additional information, the users of this manual are encouraged to refer to other textbooks and technical publications addressing this subject.

(Res. 40-08 (§ 801), 3-19-08)

§ 28.32.020. Parameters and terms commonly used in open channel analysis and design.

Several terms and parameters are used and must be understood when analyzing open channel flows. These are described below.

Area (A). The area always means the cross-sectional area of the flow, and is measured perpendicular to the direction of flow.

Critical depth (dc). This refers to the depth of flow under critical flow conditions.

Critical flow. This refers to flow at critical depth or velocity, where the specific energy is a minimum for a given discharge. Critical flow is very unstable.

Critical slope. This refers to the slope which, for a given cross-section and flow rate, results in critical flow.

Critical velocity. This refers to the velocity of flow under critical flow conditions.

Depth (d). If not specified otherwise, depth of flow refers to the maximum depth of water in the cross-section.

Energy grade line (EGL). The grade line of the water surface profile plus the velocity head, or the specific energy line.

Froude number (Fr). This is a dimensionless number, equal to the ratio of the velocity of flow to the velocity of very small gravity waves, the latter being equal to the square root of the product of the acceleration of gravity and the flow depth, or:

$$Fr = \frac{V}{\left(\frac{gA}{T}\right)^{0.5}} = \frac{V}{(gDh)^{0.5}} \quad (28.32\text{-}1)$$

Where:

Fr<1.0, flow is subcritical;
Fr = 1.0, flow is critical; and
Fr>1.0, flow is supercritical
V = velocity (fps)
A = cross-sectional area of flow (sf)
T = top width of flow (ft.)
Dh = hydraulic depth (ft.)

Gradually varied flow. Varied flow in which the depth does not change abruptly over a comparatively short distance.

Hydraulic depth (Dh). The hydraulic depth is the ratio of area in flow to the width of the channel at the fluid surface, or Dh=A/T.

Hydraulic grade line (HGL). In an open channel, the hydraulic grade line is the profile of the free water surface.

Hydraulic gradient (Hg). The slope of the hydraulic grade line is the profile of the free water surface.

Hydraulic radius (Rh). The hydraulic radius is the cross-sectional area of flow divided by the wetted perimeter, or Rh=A/Pw.

Normal depth. When the flow depth is constant along a channel reach; that is, when neither the flow depth nor velocity is changing, the depth is said to be normal.

Slope (S). Slope may refer to the channel bed, the hydraulic grade line, or energy grade line.

Surface spread (T). The surface spread is the width at the top of the flow, measured perpendicular to the flow direction.

Uniform flow. Uniform flow occurs when flow has a constant water area, depth, discharge, and average velocity through a reach of channel.

Wetted perimeter (Pw). The wetted perimeter is the portion of the perimeter of a flow conveyance facility that is in contact with the flowing water.

(Res. 40-08 (§ 802), 3-19-08)

§ 28.32.030. General open channel flow.

Any water flow that is conveyed in such a manner that top surface is exposed to the atmosphere is defined as open channel flow. This type of flow occurs in all channel types described in GJCM 28.32.100 including canals, ditches, drainage channels, culverts, and pipes under partially full flow conditions. The hydraulics of an open channel can be very complex, encompassing many different flow conditions from steady-state uniform flow to unsteady, rapidly varying flow. Most of the problems in stormwater drainage involve uniform, gradually varying or rapidly varying flow states. Examples of these flow conditions are illustrated in Figure 28.32.030. Steady uniform flow is most commonly treated flow in open channel hydraulics, in which the depth of flow remains constant over the time interval studied. The calculations for uniform and gradually varying flow are relatively straightforward and are based upon similar assumptions (e.g., parallel streamlines). Rapidly varying flow computations (e.g., hydraulic jumps and flow over spillways), however, can be very complex, and the solutions are generally empirical in nature.

Presented in this chapter are the basic equations and computational procedures for uniform, gradually varying and rapidly varying flow. The user is encouraged to review the many hydraulics textbooks written on this subject.

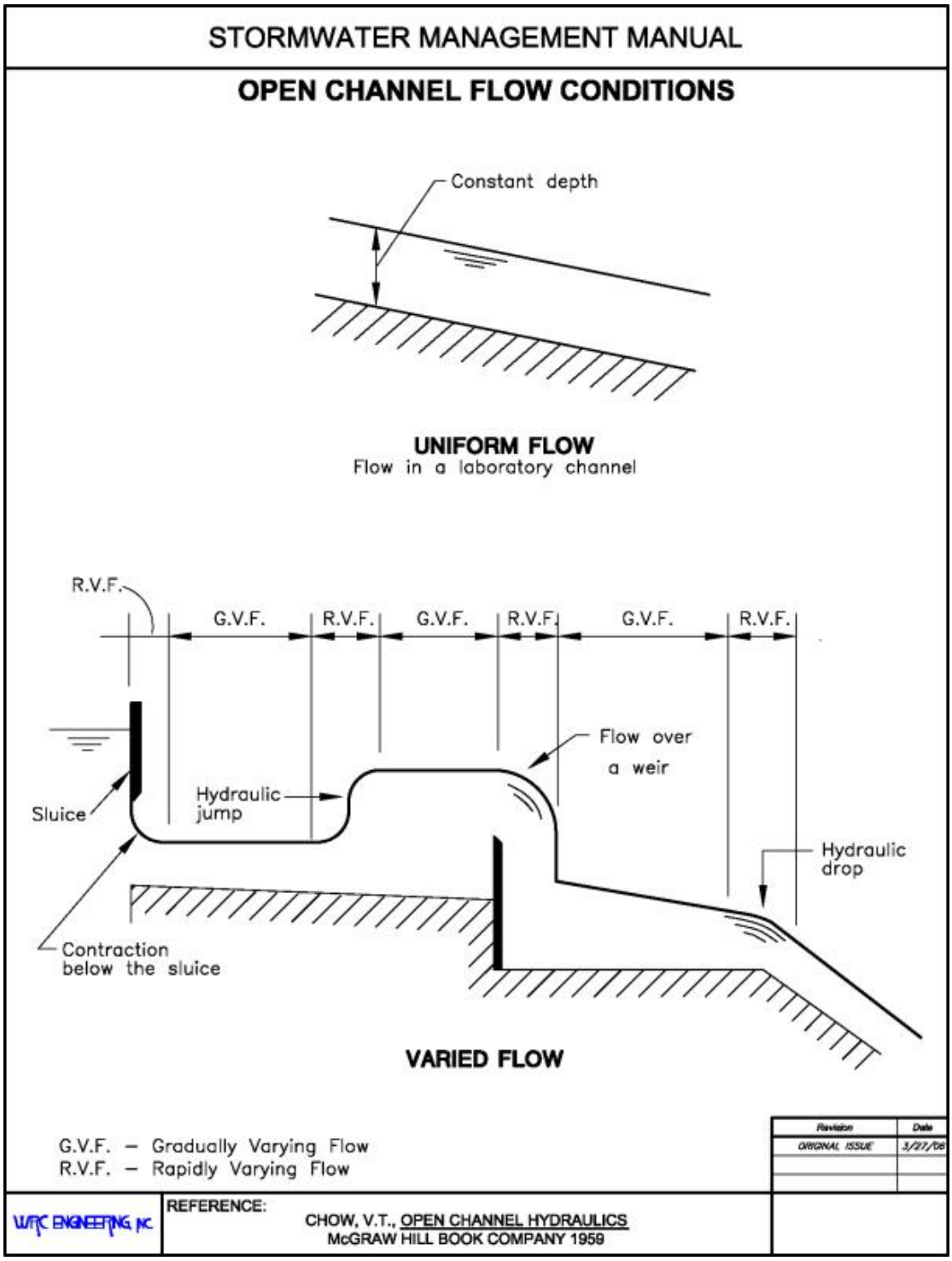


FIGURE 28.32.030

(Res. 40-08 (§ 803), 3-19-08)

§ 28.32.040. Uniform flow computation.

Open-channel flow is uniform if the depth of flow is the same at every section of the channel. For a given channel geometry, roughness, discharge and slope, there is only one possible depth for maintaining uniform flow. This depth is referred to as the "normal depth." For uniform flow within a prismatic channel (i.e., uniform cross-section), the water surface will be parallel to the channel bottom. While uniform flow rarely occurs in nature and is difficult to achieve in a laboratory, a uniform-flow approximation is generally adequate for planning and design purposes.

The computation of uniform flow and normal depth shall be based upon the Manning or uniform flow equation:

$$Q = \frac{1.49}{n} A^{5/3} P^{-2/3} \sqrt{S} = \frac{1.49}{n} A R^{2/3} \sqrt{S} \qquad (28.32\text{-}2)$$

Where:

Q	=	flow rate ($ft.^3/s$)
n	=	Manning roughness coefficient
A	=	area ($ft.^2$)
P	=	wetted perimeter (ft.)
R	=	hydraulic radius, R = A/P (ft.)
S	=	slope of the energy grade line (ft./ft.)

For prismatic channels, the energy grade line (EGL), hydraulic grade line (HGL), and the bottom can be assumed parallel for uniform, normal depth flow conditions.

The variables dependent on channel cross-section geometry (i.e., area and hydraulic radius) can be lumped together as the conveyance (K) of the channel. This simplifies the uniform flow equation to the following expression:

$$Q = K\sqrt{S} \qquad (28.32\text{-}3)$$

Table 28.32.040(a) presents equations for calculating many of the parameters required for hydraulic analysis of different uniform channel sections.

Tables 28.32.040(b), 28.32.040(c), 28.32.040(d), and 28.32.040(e) provide a list of Manning roughness coefficient values for many types of conditions that may occur in Mesa County. The uniform flow equation and its constituent parameters are readily computed using handheld calculators and personal computers.

STORMWATER MANAGEMENT MANUAL

GEOMETRIC ELEMENTS OF CHANNEL SECTIONS

GEOMETRIC ELEMENTS OF CHANNEL SECTIONS

SECTION	AREA, A	WETTED PERIMETER, P	HYDRAULIC RADIUS, R	TOP WIDTH, T	HYDRAULIC DEPTH, D	SECTION FACTOR, Z
Rectangle	by	$b+2y$	$\frac{by}{b+2y}$	b	y	$by^{1.5}$
Trapezoid	$(b+zy)y$	$b+2y\sqrt{1+z^2}$	$\frac{(b+zy)y}{b+2y\sqrt{1+z^2}}$	$b+2zy$	$\frac{(b+zy)y}{b+2zy}$	$\frac{[(b+zy)y]^{1.5}}{\sqrt{b+2zy}}$
Triangle	zy^2	$2y\sqrt{1+z^2}$	$\frac{zy}{2\sqrt{1+z^2}}$	$2zy$	$\frac{y}{2}$	$\frac{\sqrt{2}}{2}zy^{2.5}$
Circle	$\frac{1}{8}(\theta-\sin\theta)d_o^2$	$\frac{1}{2}\theta d_o$	$\frac{1}{4}\left(1-\frac{\sin\theta}{\theta}\right)d_o$	$(\sin\frac{1}{2}\theta)d_o$ or $2\sqrt{y(d_o-y)}$	$\frac{1}{8}\left(\frac{\theta-\sin\theta}{\sin\frac{1}{2}\theta}\right)d_o$	$\frac{\sqrt{2}}{32}\frac{(\theta-\sin\theta)^{1.5}}{(\sin\frac{1}{2}\theta)^{0.5}}d_o^{2.5}$
Parabola	$\frac{2}{3}Ty$	$T+\frac{8}{3}\frac{y^2}{T}$*	$\frac{2T^2y}{3T^2+8y^2}$*	$\frac{3}{2}\frac{A}{y}$	$\frac{2y}{3}$	$\frac{8}{15}\sqrt{6}\,T^{0.5}y^{1.5}$
Round-cornered rectangle ($y>r$)	$\left(\frac{\pi}{2}-2\right)r^2+(b+2r)y$	$(\pi-2)r+b+2y$	$\frac{(\pi/2-2)r^2+(b+2r)y}{(\pi-2)r+b+2y}$	$b+2r$	$\frac{(\pi/2-2)r^2}{b+2r}+y$	$\frac{[(\pi/2-2)r^2+(b+2r)y]^{1.5}}{\sqrt{b+2r}}$
Round-bottom triangle	$\frac{T^2}{4z}-\frac{r^2}{z}(1-z\cot^{-1}z)$	$\frac{T}{2}\sqrt{1+z^2}-\frac{2r}{z}(1-z\cot^{-1}z)$	$\frac{A}{P}$	$2[z(y-r)+r\sqrt{1+z^2}]$	$\frac{A}{T}$	$A\sqrt{\frac{A}{T}}$

*Satisfactory approximation for the interval $0<x\leq 1$, where $x=4y/T$. When $x>1$, use the exact expression $P=(T/2)[\sqrt{1+x^4}+1/x\ln(x+\sqrt{1+x^4})]$

Revision	Date
ORIGINAL ISSUE	1/27/06

WRC ENGINEERING, INC.

REFERENCE:
CHOW, V.T., OPEN CHANNEL HYDRAULICS
McGRAW HILL BOOK COMPANY 1959

TABLE 28.32.040(a)

STORMWATER MANAGEMENT MANUAL

TYPICAL ROUGHNESS COEFFICIENTS FOR OPEN CHANNELS

TYPE OF CHANNEL AND DESCRIPTION	MINIMUM	NORMAL	MAXIMUM
EXCAVATED OR DREDGED			
a. Earth, straight and uniform			
1. Clean, recently completed	0.016	0.018	0.020
2. Clean, after weathering	0.018	0.022	0.025
3. Gravel, uniform section, clean	0.022	0.025	0.030
4. With short grass, few weeds	0.022	0.027	0.033
b. Earth, winding and sluggish			
1. No vegetation	0.023	0.025	0.030
2. Grass, some weeds	0.025	0.030	0.033
3. Dense weeds or aquatic plans in deep channels	0.030	0.035	0.040
4. Earth bottom and rubble sides	0.028	0.030	0.035
5. Stony bottom and weedy banks	0.025	0.035	0.040
6. Cobble bottom and clean sides	0.030	0.040	0.050
c. Dragline-excavated or dredged			
1. No vegetation	0.025	0.028	0.033
2. Light brush on banks	0.035	0.050	0.060
d. Rock cuts			
1. Smooth and uniform	0.025	0.035	0.040
2. Jagged and irregular	0.035	0.040	0.050
e. Channels not maintained, weeds and brush			
1. Dense weeds, high as flow depth	0.050	0.080	0.120
2. Clean bottom, brush on sides	0.040	0.050	0.080
3. Same as above, but highest state of flow	0.045	0.070	0.110
4. Dense brush, high state	0.080	0.100	0.140

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WRC ENGINEERING, INC.

REFERENCE:
CHOW, V.T., OPEN CHANNEL HYDRAULICS
McGRAW HILL BOOK COMPANY 1959

TABLE 28.32.040(b)

STORMWATER MANAGEMENT MANUAL

TYPICAL ROUGHNESS COEFFECIENTS FOR OPEN CHANNELS

TYPE OF CHANNEL & DESCRIPTION	MINIMUM	NORMAL	MAXIMUM
Brass, smooth	0.009	0.010	0.013
Steel:			
Lockbar and welded	0.010	0.012	0.014
Riveted and spiral	0.013	0.016	0.017
Cast Iron:			
Coated	0.010	0.013	0.014
Uncoated	0.011	0.014	0.016
Wrought Iron:			
Black	0.012	0.014	0.015
Galvanized	0.013	0.016	0.017
Corrugated Metal:			
Sub-drain	0.017	0.019	0.021
Storm Drain	0.021	0.024	0.030
Lucite	0.008	0.009	0.010
Glass	0.009	0.010	0.013
Cement:			
Neat, surface	0.010	0.011	0.013
Mortar	0.011	0.013	0.015
Concrete:			
Culvert, straight and free of debris	0.010	0.011	0.013
Culvert with bends, connections, and some debris	0.011	0.013	0.014
Finished	0.011	0.012	0.014
Sewer with manholes, inlet, etc., straight	0.013	0.015	0.017
Unfinished, steel form	0.012	0.013	0.014
Unfinished, smooth wood form	0.012	0.014	0.016
Unfinished, rough wood form	0.015	0.017	0.020
Wood:			
Stave	0.010	0.012	0.014
Laminated, treated	0.015	0.017	0.020
Clay:			
Common drainage tile	0.011	0.013	0.017
Vitrified sewer	0.011	0.014	0.017
Vitrified sewer with manholes, inlet, etc.	0.013	0.015	0.017
Vitrified subdrain with open joint	0.014	0.016	0.018
Brickwork:			
Glazed	0.011	0.013	0.015
Lined with cement mortar	0.012	0.015	0.017
Sanitary sewers coated with sewage slime with bends and connections	0.012	0.013	0.016
Paved invert, sewer, smooth bottom	0.016	0.019	0.020
Rubble masonry, cemented	0.018	0.025	0.030

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WRC ENGINEERING, INC.

REFERENCE:
CHOW, V.T., OPEN CHANNEL HYDRAULICS
McGRAW HILL BOOK COMPANY 1959

TABLE 28.32.040(c)

STORMWATER MANAGEMENT MANUAL

TYPICAL ROUGHNESS COEFFICIENTS FOR OPEN CHANNELS

TYPE OF CHANNEL AND DESCRIPTION	MINIMUM	NORMAL	MAXIMUM
LINED OR BUILT-UP CHANNELS			
a. CONCRETE			
1. TROWEL FINISH	0.011	0.013	0.015
2. FLOAT FINISH	0.013	0.015	0.016
3. GUNITE, GOOD SECTION	0.016	0.019	0.023
4. GUNITE, WAVY SECTION	0.018	0.022	0.023
b. CONCRETE BOTTOM FLOAT FINISHED WITH SIDE OF			
1. DRESSED STONE IN MORTAR	0.015	0.017	0.020
2. RANSOM STONE IN MORTAR	0.017	0.020	0.024
3. DRY RUBBLE OR RIPRAP	0.020	0.030	0.035
c. GRAVEL BOTTOM WITH SIDES OF			
1. FORMED CONCRETE	0.017	0.020	0.025
2. RANDOM STONE IN MORTAR	0.020	0.023	0.026
3. DRY RUBBLE OR RIPRAP	0.023	0.033	0.036
d. ASPHALT			
1. SMOOTH	0.013	0.013	--
2. ROUGH	0.016	0.016	--
e. GRASSED	0.030	0.040	0.050

Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING, INC.

REFERENCE:
CHOW, V.T., OPEN CHANNEL HYDRAULICS
McGRAW HILL BOOK COMPANY 1959

TABLE 28.32.040(d)

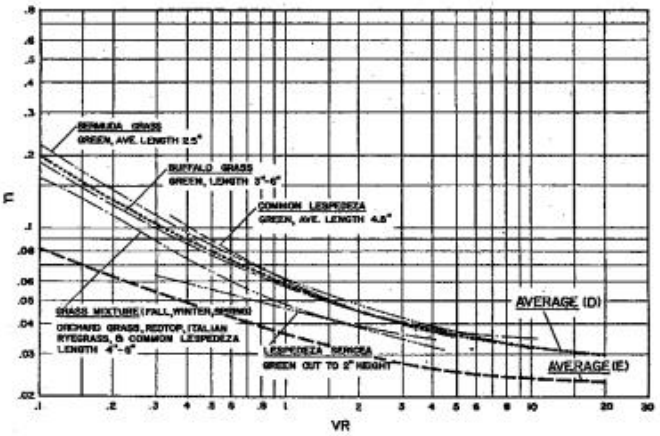
STORMWATER MANAGEMENT MANUAL

TYPICAL ROUGHNESS COEEFICIENTS FOR OPEN CHANNELS

GRASSED CHANNELS WITH LOW RETARDANCE COEFFICIENT*

Retardance	Cover	Condition
D Low	Bermuda grass	Good stand, cut to 2.5 in. height
	Common lespedeza	Excellent stand, uncut (av 4.5 in.)
	Buffalo grass	Good stand, uncut (3 to 6 in.)
	Grass-legume mixture—fall, spring (orchard grass, redtop, Italian rye grass, and common lespedeza)	Good stand, uncut (4 to 5 in.)
	Lespedeza sericea	After cutting to 2 in. height, very good stand before cutting
E Very low	Bermuda grass	Good stand, cut to 1.5 in. height
	Bermuda grass	Burned stubble

STAND=DENSITY OF GRASS(NUMBER OF STEMS PER SQUARE FOOT)



V=MEAN VELOCITY
R=HYDRAULIC RADIUS

* THE 'n' ROUGHNESS COEFFICIENT FOR GRASSED CHANNELS IS KNOWN AS RRETARDANCE COEFFICIENT.

Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING, INC.

REFERENCE: U.S. SOIL CONSERVATION SERVICES, SCS-TP-61

TABLE 28.32.040(e)

(a) Gradually Varying Flow. The most common occurrence of gradually varying flow in storm drainage is the backwater created by culverts, storm drain inlets, or channel constrictions. For these conditions, the flow depth will be greater than normal depth in

the channel, and the water surface profile (a.k.a. "backwater curve") is computed using either the direct-step or standard step method.

(1) Direct-Step Method. The direct-step method is best suited to the analysis of open prismatic channels. Water surface profiles in simple prismatic channels can be computed manually. Chow (1959) presents the basic method for applying the direct-step analysis. The direct-step method is also available in many handheld and personal computer programs. The most general and widely used programs are the U.S. Army Corps of Engineers' *HEC-2 Water Surface Profiles* and *HEC-RAS River Analysis System*. The design engineer may use these programs or proprietary computer software to compute water surface profiles for channel and floodplain analyses.

(2) Standard-Step Method. The standard-step method is required for the analysis of irregular or nonuniform cross-sections. Because the standard-step method involves a more tedious iterative process, this manual recommends that design engineers use computer programs such as HEC-RAS to accomplish these calculations.

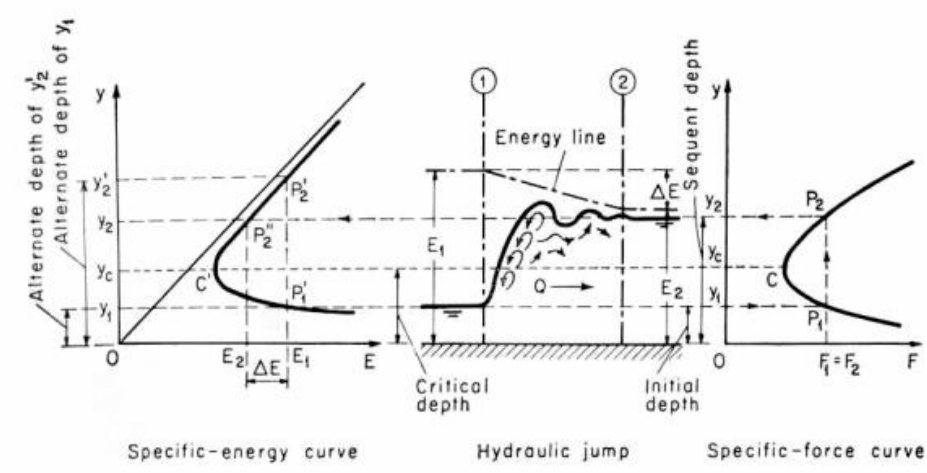


Figure 28.32.040: Specific Energy Curve

(b) Rapidly Varying Flow. Rapidly varying flow is characterized by very pronounced curvature of the water surface profile. The change in water surface profile may become so abrupt as to result in a state of high turbulence. Calculation methods for gradually varying flow (e.g., direct-step and standard-step methods) do not apply for rapidly varying flow. There are mathematical solutions to some specific cases of rapidly varying flow, but the solutions to most rapidly varying flow problems rely on empirical data.

The most common occurrence of rapidly varying flow in storm drainage applications involves weirs, orifices, hydraulic jumps, nonprismatic channel sections (transitions, culverts and bridges), and nonlinear channel alignments (bends). Each of these flow conditions requires detailed calculations to properly identify the flow capacities and depths of flow in the given section. The design engineer must be cognizant of the design requirements for rapidly varying flow conditions and shall include all necessary calculations as part of the design submittal documents. The design engineer is referred

to the hydraulic references for the proper calculation methods to use in the design of drainage facilities with rapidly varying flow facilities.

(Res. 40-08 (§ 803.1), 3-19-08)

§ 28.32.050. Critical flow computation.

(a) The critical flow through a channel is characterized by several important conditions regarding the relationship between the flow, specific energy, and slope of a particular hydraulic cross-section (Figure 28.32.040). Critical state is characterized by the following conditions:

(1) The specific energy ($E=y+v^2/2g$) is at a minimum for a given discharge (Q).

(2) The discharge (Q) is a maximum for a given specific energy (E).

(3) The specific force is a minimum for a given discharge (Q).

(4) The velocity head ($v^2/2g$) is equal to half the hydraulic depth (D/2) in a channel of small slope.

(5) The Froude number (Fr) is equal to 1.0.

(b) Typically, channels must not be designed to flow at or near critical state ($0.80<Fr<1.2$). If the critical state of uniform flow exists throughout an entire reach, the channel flow is critical and the channel slope is at critical slope (S_c). A slope less than S_c will cause subcritical flow. A slope steeper than S_c will cause supercritical flow. A flow at or near the critical state is unstable. Factors creating minor changes in specific energy, such as channel debris or minor variation in roughness, will cause a major change in depth.

(c) The criteria of minimum specific energy for critical flow results in the definition of the Froude number (Fr) as follows:

$$Fr = \frac{v}{\sqrt{gD}} \qquad (28.32\text{-}4)$$

Where:

Fr	=	Froude number (dimensionless)
v	=	velocity (ft./s)
g	=	gravitational acceleration (32.2 $ft./s^2$)
A	=	channel flow area ($ft.^2$)
T	=	top width of flow area (ft.)
D	=	hydraulic depth, D=A/T (ft.)

(d) The critical depth in a given trapezoidal channel section with a known flow rate can be determined using the following method:

(1) Step 1. Compute the section factor (Z).

$$Z = \frac{Q}{\sqrt{g}} \qquad (28.32\text{-}5)$$

Where:

Z = section factor

Q = flow rate (cfs)

g = gravitational acceleration (32.2 ft./s^2)

(2) Step 2. Determine the critical depth in the channel (d_c) from Figure 28.32.050, using appropriate values for the section factor (Z), the channel bottom width (b), and the channel side slope (z).

For other prismatic channel shapes, Equation 28.32-5 determines the critical depth using the section factors provided in Table 28.32.040(a).

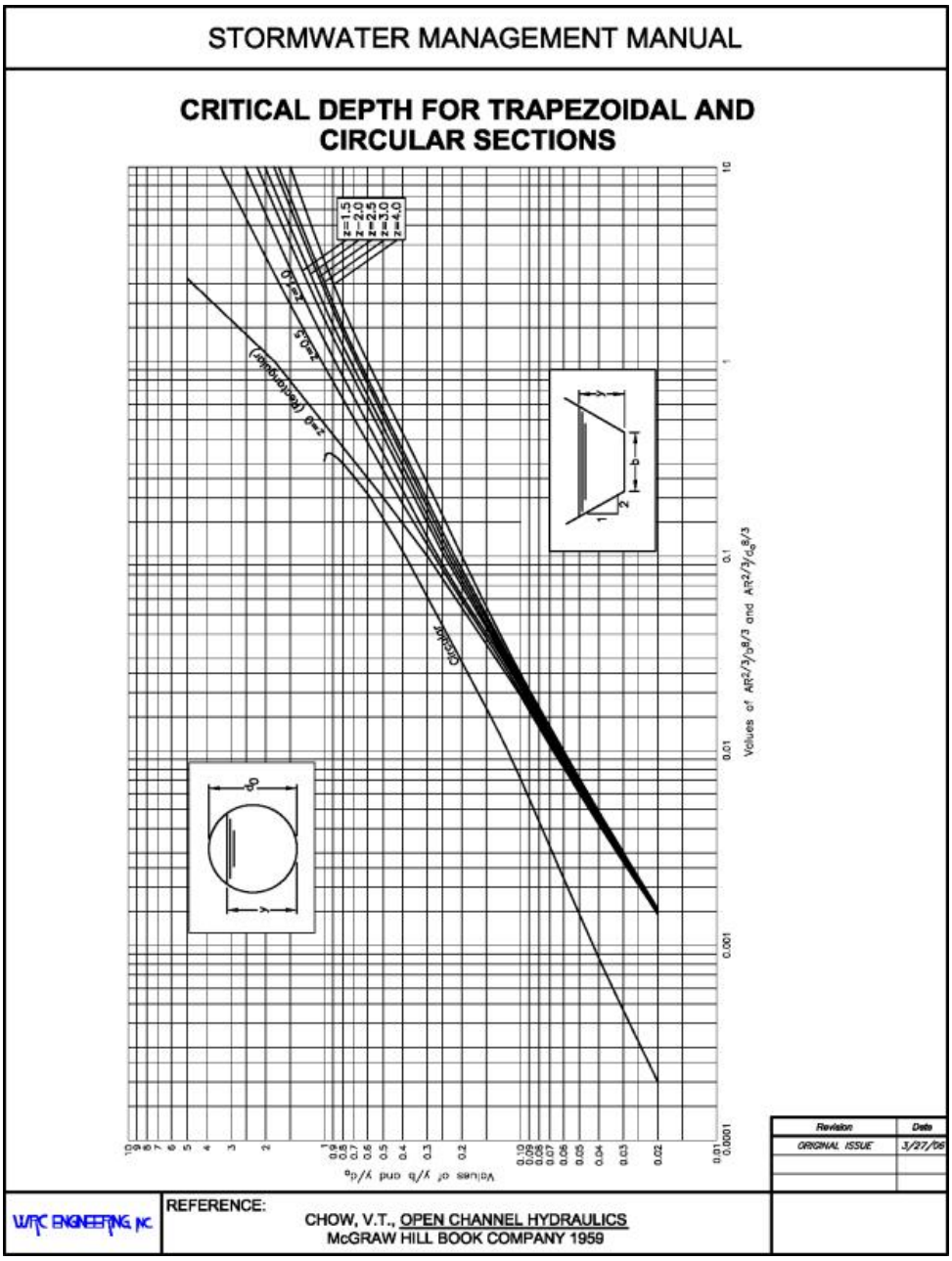


FIGURE 28.32.050

(Res. 40-08 (§ 803.2), 3-19-08)

§ 28.32.060. Design procedures – Subcritical flow.

All open channels shall be designed with the limits as stated in GJMC § 28.32.140 through 28.32.330. The following design procedures shall be used when the design runoff in the channel is flowing in a subcritical condition (Fr<1.0).

(a) Transitions. Subcritical transitions occur when transitioning one subcritical channel section to another subcritical channel section (expansion or contraction), or when a

subcritical channel section is steepened to create a supercritical flow condition downstream (e.g., a sloping spillway entrance).

Figure 28.32.060 presents a number of typical subcritical transition sections. The warped transition section, although most efficient, shall only be used in extreme cases where minimum loss of energy is required since the section is very difficult and costly to construct. Conversely, the square-ended transition shall only be used when either a straight-line transition or a cylinder-quadrant transition cannot be used due to topographic constraints or utility conflicts.

(b) Contractions. The energy loss created by a contracting section may be calculated using the following equation:

$$H_t = K_{tc}\left(\frac{V_2^2}{2g} - \frac{V_1^2}{2g}\right) \quad (28.32\text{-}6)$$

Where:

H_t = energy loss (ft.);
K_{tc} = contraction transition coefficient
V_1 = upstream velocity (ft./s); and
V_2 = downstream velocity (ft./s); and
g = gravitational acceleration (32.2 ft./s^2)

Figure 28.32.060 shows contraction loss coefficient (K_{tc}) values for the typical open-channel transition section.

(c) Expansions. The energy loss created by an expanding transition section may be calculated using the following equation:

$$H_t = K_{te}\left(\frac{V_1^2}{2g} - \frac{V_2^2}{2g}\right) \quad (28.32\text{-}7)$$

Figure 28.32.060 also shows expansion loss coefficients (K_{tc}) values for typical open-channel transition sections.

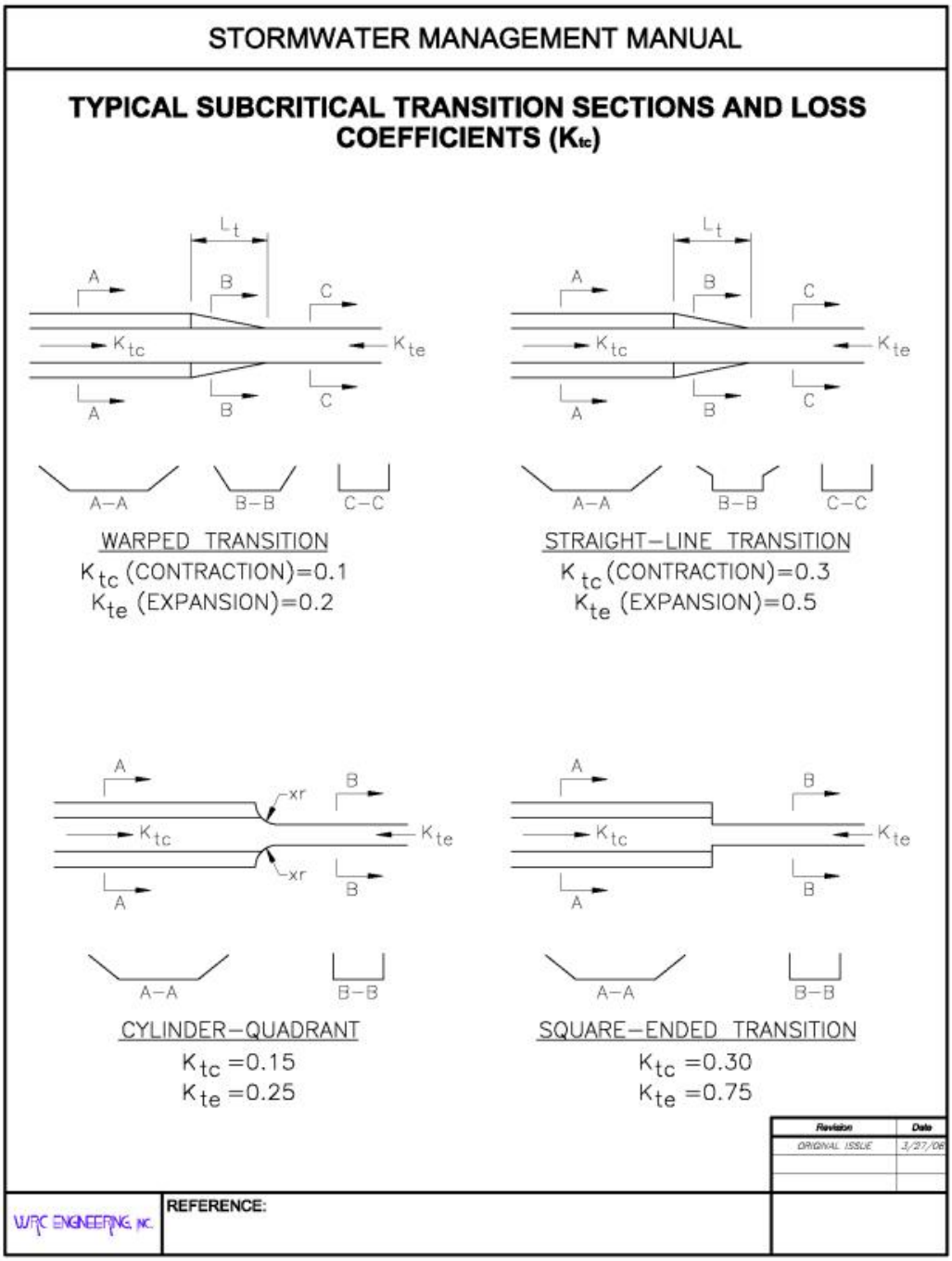


FIGURE 28.32.060

(d) Transition Length. The length of the transition section shall be long enough to keep the streamlines smooth and nearly parallel throughout the expanding (contracting) section. Experimental data and performance of existing structures have been used to estimate the minimum transition length necessary to maintain the stated flow conditions. Based on this information, guidelines for the minimum length of the transition section are as follows:

$$L_t \geq 0.5L_c\ (\Delta T_w) \qquad (28.32\text{-}8)$$

Where:

L_t = minimum transition length (feet);
L_c = length coefficient (dimensionless); and
ΔTw = difference in the top width of the normal water surface upstream and downstream of the transition (feet).

Table 28.32.060 below summarizes the transition length coefficients for subcritical flow conditions. These transition length guidelines are not applicable to cylinder-quadrant or square-ended transitions.

For flow approach velocities of 12 ft./sec. or less, the transition length coefficient (L_c) shall be 4.5. This represents a 4.5L:1W expansion or contraction, or about a 12.5-degree divergence from the channel centerline. For flow approach velocities of more than 12 feet/second, the transition length coefficient (L_c) shall be 10. This represents a 10L:1W expansion or contraction, or about a 5.75-degree divergence from the channel centerline.

Table 28.32.060: Transition Length Coefficients for Subcritical Open Channels

Flow Approach Velocity (v) (ft/s)	Transition Length Coefficient (L_c)
= 12	4.5
> 12	10

(Res. 40-08 (§ 803.3), 3-19-08)

§ 28.32.070. Design procedures – Supercritical flow.

Mesa County and the City of Grand Junction do not encourage supercritical channels, which typically are concrete-lined. The information presented herein is for completeness and in anticipation that analysis of a supercritical channel may be necessary in the future. All supercritical channels shall be designed within the limits as stated in GJMC § 28.32.140 through 28.32.330. The following design procedures shall be used when channels are designed to flow in a supercritical condition (Fr>1.0).

Supercritical flow can become unstable in response to relatively minor disturbances to the channel cross-section; even small obstruction can sometimes cause a hydraulic jump. Good design practice is to test supercritical flow stability during events smaller than the design flow by evaluating flows of specific more frequent storm events (e.g., 10-year, two-year, etc.), or testing successive fractions (e.g., one-half, one-quarter, and further if necessary) of the design flow. Also, the designer shall test for small variations in n-value as well. However, only calculations for the full design flow are required to be submitted for review.

(a) Transitions. The design of supercritical flow transitions is more complicated than subcritical transition design due to the potential damaging effects of the oblique jump created by the transition. The oblique jump results in cross waves and higher flow

depths that can cause damage if not properly accounted for in the design. Supercritical transitions can be avoided by designing a hydraulic jump, which must also be carefully designed to assure the jump will remain where the jump is designed to occur. Hydraulic jumps shall be designed to take place only within concrete-lined portions of the channel, such as energy dissipation or drop structures.

(b) Contractions. igure 28.32.070(a) presents an example of a supercritical contracting transition, with upstream flow contracted from width b_1 to b_3 and a wall diffraction angle of θ. The oblique jump occurs at the points A and B where the diffraction angles start. Wave fronts generated by the oblique jumps on both sides propagate toward the centerline with a wave angle ß1. Since the flow pattern is symmetric, the centerline acts as if there was a solid wall that causes a subsequent oblique jump and generates a backward wave front toward the wall with another angle ß2. These continuous oblique jumps result in turbulent fluctuations in the water surface.

To minimize the turbulence, the first two wave fronts are designed to meet at the center and then end at the exit of the contraction. Using the contraction geometry, the length of the transition shall be as follows:

$$L_T = \frac{b_1 - b_3}{2\tan\theta} \qquad (28.32\text{-}9)$$

Where:

L_T = transition length (ft.);
b_1 = upstream top width of flow (ft.);
b_3 = downstream top width of flow (ft.);
θ = wall angle as related to the channel centerline (degrees).

Using the continuity principle,

$$\frac{b_1}{b_3} = \left(\frac{y3}{y1}\right)^{3/2}\left(\frac{F_{R_3}}{F_{R_1}}\right) \qquad (28.32\text{-}10)$$

Where:

y1 = upstream depth of flow (ft.)
y3 = downstream depth of flow (ft.)
Fr_1 = upstream Froude number
Fr_3 = downstream Froude number

Also, by the continuity and momentum principles, the following relationship between the Froude number, wave angle, and wall angle is:

$$\tan\theta = \frac{\tan\beta_1\left[\left(1+8F_{R1}^2\sin^2\beta_1\right)^{1/2}-3\right]}{2\tan^2\beta_1+\left(1+8F_{R1}^2\sin^2\beta_1\right)^{1/2}-1} \quad (28.32\text{-}11)$$

Where:

$ß_1$ = Initial wave angle (degrees)

By trial and error, this design procedure can be used to determine the transition length and wall angle. Figure 28.32.070(b) offers a faster solution than trial and error using Equation 28.32-10 and Equation 28.32-11 (above). Figure 28.32.070(b) can also be used to determine the wave angle (ß), or may be used with the equations to determine the required downstream depth or width parameter if a certain transition length is desired or required.

To minimize the length of the transition section, the ratio of downstream and upstream flow depths should generally be greater than 2.0 and less than 3.0 ($2.0<y_3/y_1<3.0$). The downstream Froude number should generally be greater than 1.7 to help avoid undulating hydraulic jumps downstream. For further discussion on oblique jumps and supercritical contractions, refer to Chow (1959).

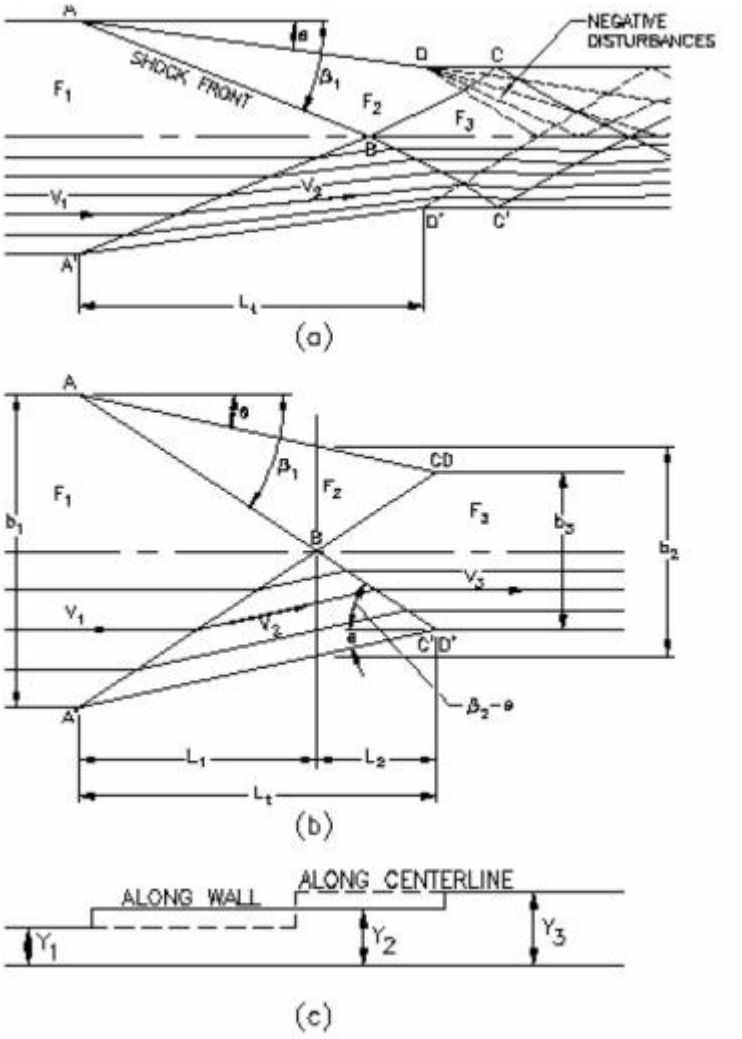


Figure 28.32.070(a): Supercritical Contraction Transition and Angle Definitions

(c) Expansions. A properly designed expansion transition expands the flow boundaries at approximately the same rate as the natural flow expansion. Based on experimental and analytical data results, the minimum length of a supercritical expansion shall be as follows:

$$L_t \geq 1.5\ (\Delta W)\ Fr \qquad (28.32\text{-}12)$$

Where:

L_t = minimum transition length (ft.);

ΔW = difference in the top width of the normal water surface upstream and downstream of the transition

Fr = Upstream Froude number

(d) Transition Curves. A transition curve may be used to reduce the required amount of freeboard or radius of curvature in a rectangular channel. The length of the transition curve measured along the channel centerline shall be determined as follows:

$$L_c = 2D = 0.32\frac{WV}{\sqrt{y}} \quad (28.32\text{-}13)$$

Where:

L_c = length of transition curve (ft.);

D = distance from the start of curve to point of first maximum superelevation (ft.). Typically $D=3L_w$; see description of how to apply superelevation allowance in GJMC § 28.32.080;

W = top width of design water surface (ft.);

V = mean design velocity (ft./s); and

y = depth of design flow (ft.).

The radius of the transition curves shall be twice the radius of the main bend. Transition curves shall be located both upstream and downstream of the main bend.

(e) Slug Flow and Roll Waves. Steep channels with significantly rapid flows (Fr>2.0) are prone to developing pulsating flow profiles, often called slug flows or roll waves. These standing waves can cause flow to exceed freeboard limits and possible damage to the channel lining. The design engineer may resolve pulsating flow issues either by adjusting the channel slope to prevent the development of these waves or providing additional freeboard to account for the height of the standing waves.

Theoretically, slug flow will not occur when the Froude number is less than 2.0. To avoid slug flow when the Froude number is greater than 2.0, the channel slope shall be as follows:

$$S \le \frac{12}{R_E} \quad (28.32\text{-}14)$$

Where:

S = channel slope (feet per feet);

R_E = Reynolds Number, $R_E = \frac{uR}{v}$

u = mean design velocity (feet per second);

R = hydraulic radius (feet); and

v = kinematic viscosity of water (ft^2/s).

More detailed discussion of pulsating flow is beyond the scope of this manual. Several references, including Chow (1959) and Clark County (2000), provide further discussion of this topic. The Los Angeles County Flood Control District (1982) has developed

nomographs for determining the appropriate freeboard allowance for roll wave height based on empirical research at the California Institute of Technology (Brock, 1967).

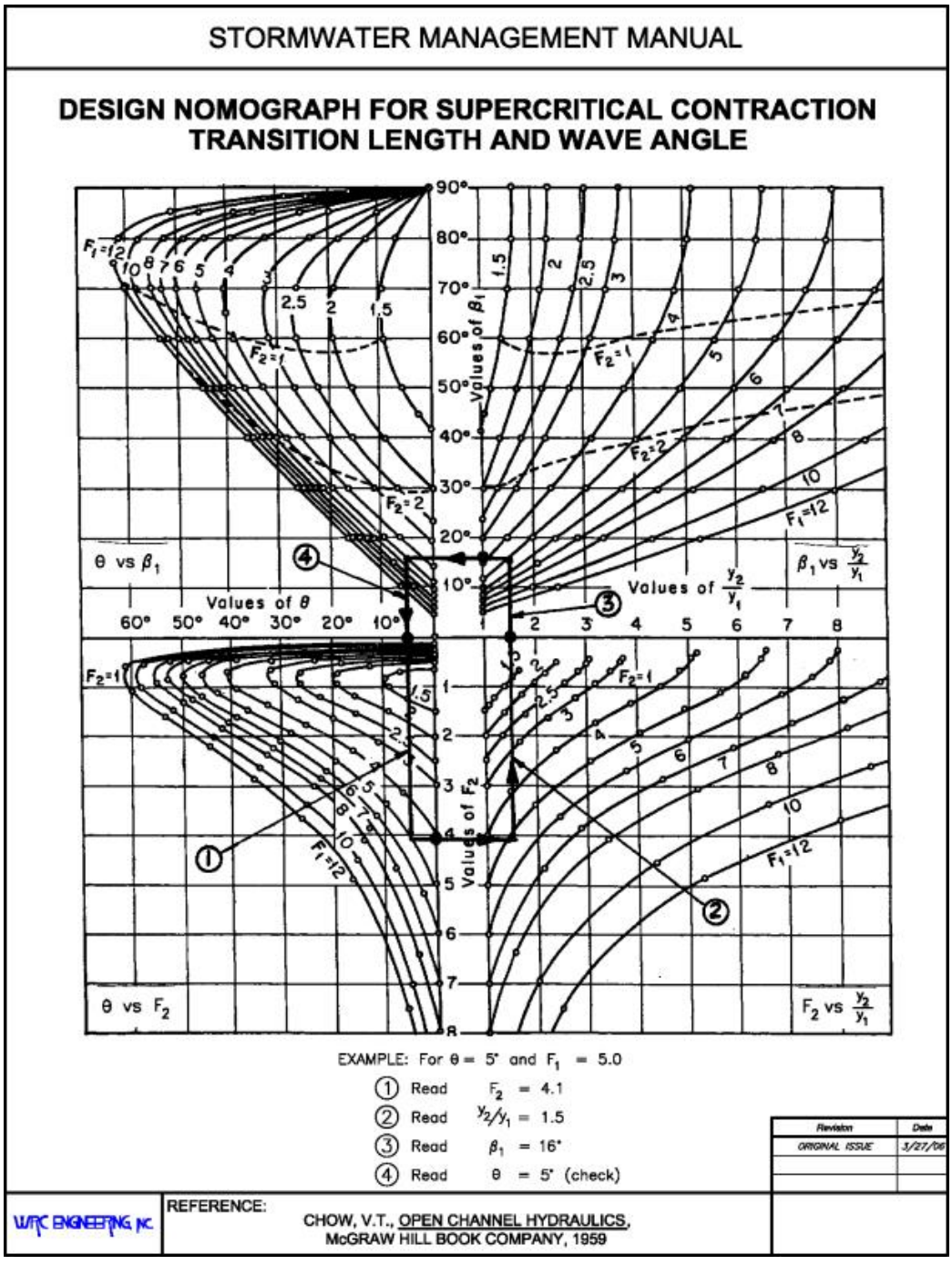


FIGURE 28.32.070(b)

(Res. 40-08 (§ 803.4), 3-19-08)

§ 28.32.080. Design procedures – Superelevation.

Superelevation is the transverse rise in water surface that occurs around a channel bend, measured between the theoretical water surface at the centerline of a channel and the water surface elevation on the outside of the bend. Superelevation in bends shall be estimated from the following equation:

$$\Delta y = \frac{CV^2W}{rg} \qquad (28.32\text{-}15)$$

Where:

r	=	radius of curvature at centerline of channel (ft.);
C	=	curvature coefficient (see Table 28.32.080);
Δy	=	rise in water surface between design water surface at centerline of channel and outside water surface elevation (ft.);
W	=	top width at the design water surface at channel centerline (ft.);
V	=	mean channel velocity (ft./s); and
g	=	gravitational acceleration (ft./s^2).

The curvature coefficient C shall be 0.5 for subcritical flow conditions. For supercritical flow conditions, the curvature coefficient shall be 1.0 for all trapezoidal channels and for rectangular channels without transition curves, and 0.5 for rectangular channels with transition curves. Table 28.32.080 provides superelevation curvature coefficients for various flow regimes, cross-section shapes, and types of curves.

Bends in supercritical channels create cross-waves and superelevated flow in the bend section as well as further downstream from the bend. In order to minimize these disturbances, best design practice is to design the channel radius of curvature to limit the superelevation of the water surface to 2.0 feet or less. This can be accomplished by modifying Equation 28.32-15 to determine the allowable radius of curvature of a channel for a given superelevation value.

Table 28.32.080: Superelevation Curvature Coefficients

Flow Type	Cross-Section	Type of Curve	Curvature C
Subcritical	Rectangular	No Transition	0.5
Subcritical	Trapezoidal	No Transition	0.5
Supercritical	Rectangular	No Transition	1
Supercritical	Trapezoidal	No Transition	1
Supercritical	Rectangular	with Spiral Transition	0.5
Supercritical	Trapezoidal	with Spiral Transition	1
Supercritical	Rectangular	with Spiral Banked Transition	0.5

Source: Corps EM 1110-2-1601 (July 1991)

(Res. 40-08 (§ 803.5), 3-19-08)

§ 28.32.090. Transitions.

(a) Channel transitions occur in open channel design whenever there is a change in channel slope or shape and at junctions with other open channels or storm sewers. The goal of a good transition design is to minimize the loss of energy as well as minimize surface disturbances from cross-waves and turbulence. Special cases of transitions where excess energy is dissipated by design are drop structures and hydraulic jumps. Channel drop structures are discussed in GJMC § 28.32.340(d)(2).

(b) Transitions in open channels are generally designed for the following four flow conditions.

(1) Subcritical flow to subcritical flow.

(2) Subcritical flow to supercritical flow.

(3) Supercritical flow to subcritical flow (hydraulic jump).

(4) Supercritical flow to supercritical flow.

(c) For definition purposes, the conditions in subsections (b)(1) and (2) of this section will be considered as subcritical transitions and are later discussed in GJMC § 28.32.110 through 28.32.130. The conditions in subsections (b)(3) and (4) of this section will be considered as supercritical transitions and are later discussed in GJMC § 28.32.110 through 28.32.130.

(Res. 40-08 (§ 803.6), 3-19-08)

§ 28.32.100. Types of open channels and their selection.

Open channels can be categorized as either natural or engineered (artificial). Natural channels include all watercourses that are carved and shaped by the erosion and sediment transport process. Engineered channels are those constructed by human efforts. Open channels can be separated into six different types:

(a) Natural Channels. Watercourses are carved and shaped by natural erosion processes before urbanization occurs. As the channel's tributary watershed urbanizes, natural channels often experience erosion and may need grade control checks and localized bank protection to stabilize.

Natural channels are also strongly influenced by urbanization in the watershed, which significantly alters the hydrology and therefore, the geometry of the natural channels. If the watershed imperviousness exceeds around 10 percent, it is likely that channel geometry will be altered such that a natural channel is no longer viable and mitigation measures will be required, such as bank and bed stabilization measures.

(b) Grass-Lined Channels. Among various types of constructed or modified drainageways, grass-lined channels are most desirable. They provide channel storage, lower velocities, groundwater recharge, and various multiple-use benefits. Low-flow areas may need to be concrete, rock-lined, or otherwise reinforced with vegetation to minimize erosion and maintenance problems.

(c) Wetland Vegetation Bottom Channels. A subset of grass-lined channels that are designed to encourage the development of wetlands or certain types of riparian vegetation in the channel bottom. These channels offer potential benefits that may include wildlife habitat, groundwater recharge and water quality enhancement. In low-flow areas, the banks may need supplemental reinforcement to protect against undermining.

(d) Concrete-Lined Channels. Concrete-lined channels are high velocity artificial drainageways that are not encouraged. However, in retrofit situations where existing flooding problems need to be solved and where right-of-way is limited, concrete channels may offer advantages over other types of open drainageways. Special attention shall be taken to provide safety measures (i.e., fence) around the concrete-lined channels.

(e) Riprap-Lined Channels. Riprap-lined channels offer a compromise between a grass-lined channel and a concrete-lined channel. They can reduce right-of-way needs as compared to grass-lined channels and avoid the higher costs of concrete-lined channels. Riprap-lined channels are not encouraged.

(f) Other Lined Channels. A variety of artificial channel liners are on the market, all intended to protect the channel walls and bottom from erosion at higher velocities. These include gabion, interlocked concrete blocks, concrete revetment mats formed by injecting concrete into double layer fabric forms, and various types of synthetic fiber liners. As with rock and concrete liners, all of these types are best considered for helping to solve existing urban flooding problems and are not recommended for new developments. Each type of liner has to be scrutinized for its merits, applicability, how it meets other community needs, its long-term integrity, and maintenance needs and costs. Channels lined with artificial materials are not permitted in new development areas of Mesa County, including the City of Grand Junction, except by variance to or deviation from these criteria.

(g) Selection of Channel Type. Mesa County and the City of Grand Junction do not have a preference for any particular channel-lining system, as long as it is properly evaluated on its merits. Each type of channel must be evaluated for its longevity, integrity, maintenance requirements and costs, and general suitability for community needs, among other factors. Selection of a channel type that is most appropriate for the conditions that exist at a project site shall be based on a multi-disciplinary evaluation, which may include hydraulic, structural, environmental, sociological, maintenance, economic, and regulatory factors.

(Res. 40-08 (§ 804), 3-19-08)

§ 28.32.110. Natural channel systems.

(a) In general, a natural channel system continually changes its position and shape as a result of hydraulic forces acting on its bed and banks. These changes may be slow or rapid and may result from natural environmental changes or from changes caused by human activities. When a natural channel is modified locally, the change frequently causes alteration in channel characteristics both upstream and downstream. The

response of a natural channel to human-induced changes often occurs in spite of attempts to control the natural channel environment.

(b) Natural and human-induced changes in natural channels frequently set in motion responses that can be propagated for long distances. In spite of the complexity of these responses, all natural channels are governed by the same basic forces but to varying degrees. It is necessary that a natural channel system design be based on adequate knowledge of:

(1) Geologic factors, including soil conditions;

(2) Hydrologic factors, including possible changes in flow and runoff, and the hydrologic effects of changes in land use;

(3) Geometric characteristics of the stream, including the probable geometric alterations that developments will impose on the channel;

(4) Hydraulic characteristics such as depth, slope, velocity of streams, sediment transport, and the changes that may be expected in these characteristics over space and time; and

(5) Ecological/biological changes that will result from physical changes that may in turn induce or modify physical changes.

(c) Effects of development in natural channels, flood control measures, and constructed channel structures have proven the need for considering the immediate, delayed, and far-reaching effects of alterations imposed on natural channel systems. Variables affecting natural channels are numerous and interrelated. Their nature is such that, unlike rigid-boundary hydraulic problems, it is not possible to isolate and study the role of each individual variable. Because of the complexity of the processes occurring in natural flows that influence the erosion and deposition of material, a detached analytical approach to the problem may be difficult and time consuming. Most relationships describing natural channel processes have been derived empirically. The major factors affecting natural channel geometry are:

(1) Stream discharge;

(2) Sediment load;

(3) Longitudinal slope;

(4) Characteristics of bed and bank material;

(5) Bank and bed resistance to flow;

(6) Vegetation or lack thereof;

(7) Geology, including type of sediment; and

(8) Constructed improvements.

(Res. 40-08 (§ 805), 3-19-08)

§ 28.32.120. Channel morphology.

(a) When seeking to utilize or modify a natural channel, an understanding of the mechanism of its morphology is important. Without incorporating a thorough understanding of the geomorphic conditions of the stream and the watershed, alterations to channels or to their watersheds can lead to unexpected instabilities, bring about unwanted erosion or aggradation, and cause significant damage to fluvial systems.

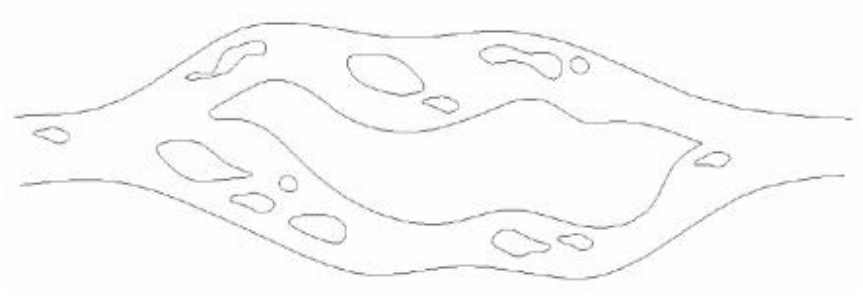
The morphology of a stream is a result of the variables that determine the quantity of water and sediment it carries, including the geology, soils and vegetation of the stream and watershed, the hydrology and dominant discharge of the system, and the slope of the stream. The following is a short discussion of some fundamentals of fluvial geomorphology. The users of this manual are encouraged to review the related textbooks and other technical literatures on the subject for more detailed discussions. The following is a partial list of some of the related publications:

- Dave Rosgen, illustrated by Hilton Lee Silvey, Applied River Morphology, 1996.
- Lane, E.W., 14957. A study of the shape of channels formed by natural streams flossing in erodible material: M.R., D. Sediment Series No. 9, U.S. Army Engineer Division, Missouri River, Corps of Engineers, Omaha, NE.
- Ritter, Dale F., 1986. Process Geomorphology. Wm C. Brown Publishers, Dubuque, Iowa.
- Simons Li and Associates, 1982. Engineering Analysis of Fluvial Systems.

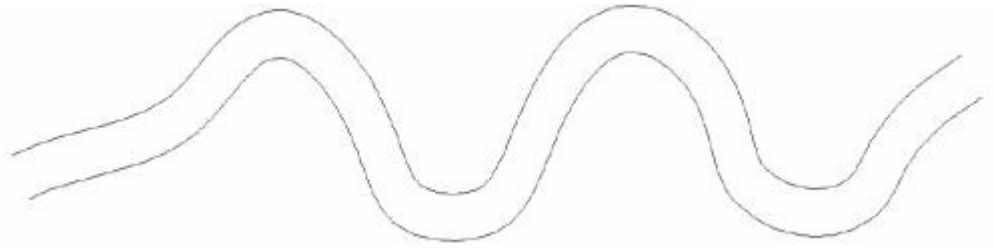
(b) There are three general principles governing the geomorphology of a natural stream system. First, riverine systems are dynamic. Erosion and aggradation can occur over a relatively short period of time (as sudden as one storm event) and can result from unstable conditions brought about by changing hydrologic or sediment-supply conditions (either natural or human induced). However, because all systems are dynamic, normal progression of a stream is not always a result or a symptom of instability. Second, the responses resulting from changes to a channel or its watershed are complex. Morphologic responses can be anticipated but cannot always be quantitatively predicted, even by the most experienced engineers. Additionally, short reaches of streams cannot be looked at individually; a change to a short stretch or even to a single area of the stream can cause unwanted or unexpected alterations upstream or downstream of the change. Third, most geomorphic boundaries within a riverine system can be classified as thresholds. Gradual changes to a channel or its watershed will not always bring about gradual responses. Instead, gradual changes may build up to a threshold so that a small-scale occurrence, such as a moderately large flood, will seemingly cause a catastrophic result. (Simons Li and Associates, 1982)

(c) Natural streams can be classified generally into three prevailing patterns. These patterns, straight, meandering and braided, are characteristics of the responses of a system to its prevailing discharge and load.

Braided Channel



Meandering Channel



Straight Channel

(d) Straight and meandering streams are two manifestations of similar dynamics. The thalwegs in both shift from bank to bank and sediment deposition and erosion within the channel bottom establish a series of riffles and pools. Straight channels have relatively straight banks; meandering streams have sinuous banks. Straight channels are fairly rare; most natural channels have some degree of sinuosity. Although meandering and straight streams can be in quasi-equilibrium, their thalwegs, meanders and riffle-pool sequences migrate in predictable patterns if left untouched. Braided systems, unlike meandering and straight, do not have a single trunk; they have a network of branches and series of islands. The single branches usually meander to some degree. Braided channels convey low to medium flows in the series of branches; large flows intermingle into a single floodplain. Meandering and straight systems are generally more stable than braided. Braided channels tend to carve new channels and deposit islands at a relatively fast pace and be horizontally unstable. The divisions between the three classifications are imprecise and relatively indistinct. A given stream can have reaches of each classification, and given reaches can include characteristics of one or more pattern. (Ritter, 1986)

(e) Any change to a variable of a natural stream system, such as the slope or dominant discharge, can change the morphology and/or the existing stream pattern according to the three principles outlined above. These changes can be somewhat predicted; much

work has been done to establish relationships between the variables and characteristics of natural streams. Two general relationships for predicting morphological responses to changes in riverine variables are as follows:

$$Q \cong \frac{b, d, \lambda}{S} \qquad (28.32\text{-}16)$$

and

$$Qs \cong \frac{b, \lambda, \lambda}{d, P} \quad \text{(SLA, 1982)} \qquad (28.32\text{-}17)$$

Where:

Q	=	Average discharge
Qs	=	Sediment supply
b	=	Channel width
d	=	Channel depth
λ	=	Meander wavelength
S	=	Bed slope
P	=	Sinuosity

(f) An increase in mean annual discharge will generally cause an increase in channel depth, width, and meander wavelength and a decrease in bed slope. An increase in sediment supply will generally cause an increase in channel width, meander wavelength and bed slope and a decrease in sinuosity and channel width. Because the average flow rate is usually directly related to sediment supply, these relationships can become complex when both flow and sediment supply increase or flow increases and sediment supply decreases, or vice versa. Additionally, changes to one or more channel morphology characteristics can cause changes to other characteristics. An increase in slope can cause a decrease in channel depth or a decrease in meander wavelength. Further complicating these relationships are variables such as the average grain-size and type of sediment, the percentage of sediment carried as bed load, and the geology of the valley, all which can affect the responses of the stream and contribute to unexpected or seemingly counterintuitive results.

(g) A general relationship between slope, mean annual discharge and the tendency of a system to be meandering or braided has been established by Lane (1957). They found that if a stream's $SQ^{1/4}$ is less than or equal to 0.0017, it tends to be meandering. If $SQ^{1/4}$ is greater than or equal to 0.01, systems tend toward a braided pattern. Streams that have $SQ^{1/4}$ between 0.0017 and 0.01 are in an intermediate zone and can be either braided or meandering with a greater tendency to respond to flow and slope alterations with a change in river pattern. These relationships are complicated and not absolute.

(h) Some specific examples of man-induced changes to the natural stream/river systems that could cause undesired responses by channel morphology are as follows:

(1) Change in Flow. As demonstrated in the above relationships, a decrease in flow due to diversion or reservoir routing change can cause a decrease in channel width, depth, and sinuosity and an increase in slope; an increase in flow due to development can have the opposite effect. In addition to these changes, the corresponding decrease or increase of average stage of the main stem of a river can have significant effects on the streams' tributaries. If the average stage decreases, the tributaries' energy slopes will increase, increasing the ability of the tributary to transport sediment, which can cause degradation of its channel, commonly referred to as headcutting. Similarly, an increase in stage in the main stem can lead to aggradation within its tributaries. Both of these scenarios can do serious damage to the tributary channel and increase its horizontal instability. Headcutting can cause bank destabilization and failure. Aggradation can cause increased flooding potential and rerouting of the channel.

(2) Channelization. The channelization of a natural stream to allow increased conveyance often straightens channels and cuts off meanders, causing an increase in slope through the improved stretch. This can increase velocities and degradation through the stretch and then decrease slopes and increase aggradation downstream of the stretch. The increase in slope and average discharge can also cause a meandering system to tend toward a braided configuration that can lead to further horizontal and vertical instabilities. In addition, by lowering the average stage, channelization will affect the stream's tributary channels in the same manner as the first example.

(3) Construction of Dams. The construction of both large- and small-scale dams can have far-reaching effects on a stream system. Without a design approach that will allow frequent flows to travel through the dam unadulterated, some suspended sediment and most bed load will be deposited upstream of the dam. This will decrease slopes and change channel configuration upstream and release clear water and potentially cause scour and degradation in the downstream reach.

(4) Construction of Bridges and Culverts. The construction of bridges and culverts, in addition to the well-documented local scour issues, can cause more regional channel morphology problems. An undersized bridge or culvert can decrease velocity and increase average stage upstream of the bridge, causing deposition and affecting the tributaries' channels. Scour around the bridges can cause an increase in sediment supply in the channel, leading to deposition downstream.

(i) There are many additional examples of morphological problems that can be caused by manmade changes on a natural stream system. Any substantial modification to a natural channel system shall be evaluated carefully to determine the potential adverse impacts on the stream system both upstream and downstream of the proposed modification.

(Res. 40-08 (§ 805.1), 3-19-08)

§ 28.32.130. Channel restoration.

The practice of channel restoration is becoming more common in the United States as the negative effects of urbanization, channelization, and other hydraulic "improvements" have taken their toll on the sediment balance, channel stability, biological habitats, and the aesthetic and recreational benefits of the impacted rivers and streams.

Although it may not be feasible to restore a disturbed stream/river system back to its original condition, channel restoration projects can help expedite the natural channel recovering process and help to recreate an environment that closely resembles the original configuration of the stream system. Channel/river restoration projects typically involve reconnection of the floodplain back to its channel, establishment of wetland areas around the channel, restoration of meanders, point-bars and riffle-pool sequences, and recreation of the chemical and biological complexity that exists in the natural channel system. Benching, allowing for a low-flow meandering channel with terraced banks above the low-flow channel, is a popular technique that allows for expansive riparian plant and wildlife habitat, recreation opportunities, and unique flood control options. Channel restoration usually involves a significant degree of both planting and seeding native, wetland, and self-sustainable vegetations within the channel and along the banks.

A design team comprised of hydraulic engineers, fluvial geomorphologists, biologists and botanists who are highly knowledgeable of the system should be involved in the channel restoration design process. Furthermore, due to the advantage of irregular alignments and channel cross-sections, the construction phase shall be carefully managed and overseen to ensure that the design is fully incorporated into the final improvement.

(Res. 40-08 (§ 805.2), 3-19-08)

§ 28.32.140. General design criteria for improved open channels.

GJMC § 28.32.140 through 28.32.260 present general design standards that apply to all improved channels. GJMC § 28.32.270 provides specific design criteria for natural and alluvial bed channels. GJMC § 28.32.280 through 28.32.320 provide specific design criteria for fixed-bed type channels that include: grass-lined channels, wetland bottom channels, riprap-lined channels, concrete-lined channels, and channels with other types of linings.

Depending on the local conditions, the specific requirements for a particular type channel may be more strict than the general criteria outlined in this chapter. In addition, unique and unusual site conditions may require additional design analysis be performed to verify the suitability of the proposed channel design for the project site.

(Res. 40-08 (§ 806), 3-19-08)

§ 28.32.150. Channel type selection.

Six general different types of open channels were presented in GJMC § 28.32.100. In general, the use of concrete-lined and riprap-lined channels is discouraged. The selection of a channel type was presented in general terms in GJMC § 28.32.100(g). The following multi-

disciplinary factors shall be used if selecting the channel that is most suitable for a specific site:

(a) Hydraulic Factors.

(1) Slope of thalweg.

(2) Right-of-way.

(3) Capacity needed.

(4) Basin sediment yield.

(5) Topography.

(6) Ability to drain adjacent lands.

(b) Structural Factors.

(1) Cost.

(2) Availability of material.

(3) Areas for wasting excess excavated material.

(4) Seepage and uplift forces.

(5) Shear stresses.

(6) Pressures and pressure fluctuations.

(7) Momentum transfer.

(c) Environmental Factors.

(1) Neighborhood character.

(2) Neighborhood aesthetic requirements.

(3) Need for new green areas.

(4) Street and traffic patterns.

(5) Municipal or county policies.

(6) Wetland mitigation.

(7) Wildlife habitat.

(8) Water quality enhancement.

(d) Sociological Factors.

(1) Neighborhood social patterns.

(2) Neighborhood children population.

(3) Pedestrian traffic.

(4) Recreational needs.

(e) Maintenance Factors.

(1) Life expectancy.

(2) Repair and reconstruction needs.

(3) Maintainability.

(4) Proven performance.

(5) Accessibility.

(f) Regulatory Factors.

(1) Federal regulations.

(2) State regulations.

(3) Local regulations.

(Res. 40-08 (§ 806.1), 3-19-08)

§ 28.32.160. Hydraulic capacity.

All new open channels shall be designed, at a minimum, to safely confine and convey the runoff from the 100-year design event.

(Res. 40-08 (§ 806.2), 3-19-08)

§ 28.32.170. Manning roughness coefficient.

Selection of an appropriate channel roughness value for a given channel section is important for the hydraulic capacity analysis and design of open channel. The roughness value can vary significantly depending on the channel type and configuration, density and type of vegetation, depth of flows, and other hydraulic properties.

Tables 28.32.040(b), 28.32.040(c), 28.32.040(d) and 28.32.040(e) show recommended values for the Manning roughness coefficient for various channel types and conditions. Manning roughness coefficients for riprap channels shall be computed based on the criteria outlined in GJMC § 28.32.040.

(Res. 40-08 (§ 806.3), 3-19-08)

§ 28.32.180. Uniform flow.

Open channel drainage systems shall be designed assuming uniform flow conditions. GJMC § 28.32.040 presents the uniform flow equation and methods for calculating uniform flow.

(Res. 40-08 (§ 806.4), 3-19-08)

§ 28.32.190. Vertical and horizontal alignment.

Open channels shall have a minimum longitudinal gradient of 0.5 percent whenever practical. Flatter grades may be approved with prior consultation with Mesa County or applicable governing agencies. Open channels with grades flatter than 0.5 percent shall have provisions for the drainage of nuisance low flows.

Horizontal alignment changes of two degrees or less may be accomplished without the use of a circular curve for subcritical flow designs (Fr<1.0, see GJMC § 28.32.060). Curves must be used for supercritical flow designs (Fr>1.0), no matter the degree of change in horizontal alignment. Curved channel alignments shall have superelevated banks in accordance with GJMC § 28.32.080.

Spiral transition curves shall be used upstream and downstream of curves for supercritical channel designs with reverse curves or horizontal alignments with consecutive circular curves. Spiral curves may also be used to reduce required superelevation allowances and cross-wave disturbances.

(Res. 40-08 (§ 806.5), 3-19-08)

§ 28.32.200. Maximum permissible velocity.

The design of open channels shall be governed by maximum permissible velocity. This design method assumes that a given channel section will remain stable up to a maximum permissible velocity; provided, that the channel is designed in accordance with the standards presented in this manual. Table 28.32.200 presents the maximum permissible velocities for several types of natural, improved, unlined, and lined channels.

Regardless of these maximum permissible velocities, the channel section shall be designed to remain stable at the final design flow rate and velocity. The design flow may not always be based on the highest flow velocity. Therefore, best practice is to confirm channel section stability during events smaller than the design flow. This may be accomplished by evaluating flows of specific more frequent storm events (e.g., 10-year, two-year, etc.), or testing successive fractions (e.g., one-half, one-quarter, and further if necessary) of the design flow. However, only calculations for the full design flow are required to be submitted for review.

Additional geotechnical and geomorphologic investigation and analyses may be required for natural channels or improved unlined channels to verify that the channel will remain stable based on the maximum design velocities.

STORMWATER MANAGEMENT MANUAL

MAXIMUM PERMISSIBLE MEAN CHANNEL VELOCITY

MATERIAL / LINING	MAXIMUM PERMISSIBLE MEAN VELOCITY (FPS)
NATURAL AND IMPROVED UNLINED CHANNELS	
Erosive Soils:	
Loams, Sands, Noncolloidal Silts	3.0
Less Erosive Soils:	
Clays, Shales, Cobbles, Gravel	5.0
FULLY-LINED CHANNELS	
Unreinforced Vegetation	5.5
Loose Riprap	
Angular Rock	15.0
Semi-Angular Rock	12.0
Rounded Rock	See Note #4
Grouted Riprap	15.0
Gabions	15.0
Soil Cement	15.0
Concrete	20.0

NOTES:

1. For composite lined channels, us the lowest of the maximum mean velocities for the materials used in the composite lining.
2. Deviations from the above values are only allowed with appropriate engineering analysis and/or suitable agreements for maintenance responsibilities.
3. Maximum permissible velocities based upon non-clear water conditions.
4. Suitability of rounded rock as loose riprap material shall be determined by rock particle resistance to movement as a result of shear forces as calculated with a factor of safety of 1.5.

Revision	Date
ORIGINAL ISSUE	3/27/08

WRC ENGINEERING INC.

REFERENCE:
NATURAL-MODIFIED FROM FORTIER AND SCOBEY, 1926
FULLY LINED-VARIOUS RESOURCES

TABLE 28.32.200

(Res. 40-08 (§ 806.6), 3-19-08)

§ 28.32.210. Subcritical and supercritical flow.

Flow can be classified as critical, subcritical, or supercritical according to the level of energy in the flow. This energy is commonly expressed in terms of a Froude number (Fr) and critical depth (d_c). GJMC § 28.32.050 discusses the characteristics of critical flow and describes methods for determining Froude number and critical depth. All channel design submittals shall include the calculated Froude number (Fr) and critical depth (d_c) for each unique reach of channel to identify the flow state and verify compliance with these criteria.

Flow at or near the critical state (Fr=1.0 or $d=d_c$) is unstable. As a result, minor factors such as channel debris have the potential to cause severe and acute changes in flow depth. Whenever practicable, channels shall be designed to convey their design flow following the flow energy limitations described in Table 28.32.210. When necessary to convey flows at or near critical state (0.86<Fr<1.13), flow instabilities may be accommodated by providing additional freeboard.

Table 28.32.210: Limitations on Flow Energy for Rectangular and Trapezoidal Channels

Design Flow Condition	Froude Number
Subcritical	Fr<0.86
Supercritical	Fr>1.13

In rare cases, the specific energy relationship of a cross-section might result in a situation where flows less than the design flow may have a greater depth than the depth calculated for the design flow. The design engineer shall check supercritical channel designs to evaluate whether the channel will maintain freeboard requirements (GJMC § 28.32.220) during flows less than the design flow (see suggested method in GJMC § 28.32.200).

(Res. 40-08 (§ 806.7), 3-19-08)

§ 28.32.220. Freeboard.

(a) In the context of this manual, freeboard is the additional height of a flood control facility (e.g., channel, levee, or embankment) measured above the design water surface elevation. In this way, the freeboard will provide a factor of safety when designing open channels.

(b) Open channel facilities conveying a design flow of less than 10 cfs shall have a minimum freeboard of 0.5 feet. Open-channel facilities conveying a design flow of 10 cfs or more shall have a design freeboard based on a minimum freeboard of 1.0 foot, with allowances for velocity, superelevation, standing waves, and/or other water surface disturbances such as slug flow. GJMC § 28.32.060 and 28.32.070 provide design methods for calculating these allowances. Equation 28.32-18 and Equation 28.32-19 describe the minimum design freeboard for subcritical and supercritical flow design, respectively:

$$(h_{fr})_{SUBCRITICAL} = \max\left(1.0,0.5 + \frac{v^2}{2g} + \frac{Cv^2W}{rg} + \Delta y\right) \quad (28.32\text{-}18)$$

$$(h_{fr})_{SUPERCRITICAL} = 1.0 + 0.025vd^{1/3} + \frac{Cv^2W}{rg} + \Delta y \quad (28.32\text{-}19)$$

Where:

h_{fr}	=	minimum required freeboard (ft.);
v	=	flow velocity (ft./s);
g	=	gravitational acceleration (32.2 ft./s^2);
$\frac{Cv^2W}{rg}$	=	superelevation allowance (ft.), see GJMC § 28.32.080; and
Δy	=	allowances for other hydraulic phenomenon (ft.), (e.g., standing waves, slug flow – see GJMC § 28.32.070(e)).

(c) Superelevation allowance is a function of flow velocity, channel geometry, and channel alignment. Applying transition curves to the alignment may reduce the required superelevation allowance. GJMC § 28.32.080 discusses the calculations of superelevation allowance in more detail. The superelevation allowance shall be applied to both banks of the channel. The superelevation allowance shall be applied to channel bends in the following manner:

(1) Begin at a point 5.0 times the characteristic wave length of the design flow ($5L_w$), measured from the downstream tangent point of the curve, with no superelevation allowance.

(2) Taper uniformly to the full superelevation allowance at a point 3.0 times the characteristic wave length of the design flow ($3.0L_w$), measured from the downstream tangent point of the curve.

(3) Maintain the full superelevation allowance through the curve.

(4) Continue the top of bank elevation level from the upstream tangent point of the curve to its intersection with the normal top of bank.

(d) Equation 28.32-20 and Equation 28.32-21 describe the characteristic wavelengths for subcritical and supercritical flow, respectively.

$$(L_w)_{SUBCRITICAL} = 2W \quad (28.32\text{-}20)$$

$$(L_w)_{SUPERCRITICAL} = 2W\sqrt{F_r^2 - 1} \quad (28.32\text{-}21)$$

The freeboard under the lowest chord of bridge deck (i.e., the soffit elevation) shall be a minimum of 1.0 foot during the 100-year design event. In cases where the bridge has been designed to withstand hydraulic forces of floodwaters and impact from large floating debris, the water surface elevation upstream of the bridge shall maintain a freeboard of at least 1.0 foot below the roadway crest and the finished floors of structures within the zone influenced by the bridge headwater.

This manual only describes Mesa County's and the City of Grand Junction's minimum freeboard requirements for open channel design. Major drainageways involving road crossings or other types of crossings, streams that the Federal Emergency Management Agency (FEMA) has mapped as special flood hazard areas, might have significantly different freeboard requirements.

(Res. 40-08 (§ 806.8), 3-19-08)

§ 28.32.230. Flow transitions.

Channel transitions occur in open channel design whenever there is a change in channel slope or shape and at junctions with other open channels or storm drains. Properly designed flow transitions mimic the expansion or contraction of natural flow boundaries as best as possible, as well as minimize surface disturbances from cross-waves and turbulence. Drop structures and hydraulic jumps are special transitions where excess energy is dissipated by design. Transitions in open channels are generally designed for either subcritical or supercritical flow transitions.

Hydraulic jumps shall be designed to take place only within energy dissipation or drop structures, and not within an erodible channel. Subcritical transitions shall satisfy the minimum transition lengths described in GJMC § 28.32.060. Supercritical transitions shall satisfy the minimum transition lengths described in GJMC § 28.32.070. Special transitions such as drop structures and hydraulic jumps shall satisfy the specifications described in GJMC § 28.32.340.

(Res. 40-08 (§ 806.9), 3-19-08)

§ 28.32.240. Access and safety.

(a) Access. Any easement encompassing a channel shall be wide enough to provide for the channel structure and adequate maintenance access. Easements shall be placed on one side of lot or ownership lines in new developments and in existing developments where conditions permit.

(1) The minimum width of any channel easement shall be the top width of channel plus four feet on each side of channel.

(2) Channels with a top width of less than 40 feet require a minimum 12-foot-wide service road parallel to one side of the channel and a four-foot-wide access on the opposite side, whenever practicable.

(3) Channels 40 feet or more in top width require service roads on both sides of the channel that are a minimum of 12 feet wide, whenever practicable.

In all cases, vehicular access to the channel facility must be provided at intervals of 1,000 feet or less, whenever practical. Access easements must be at least 12 feet wide, with a maximum grade of 10 percent.

Access ramps shall slope down in the down-gradient direction whenever practicable. Access ramps designed for personnel access shall have a maximum slope of 10 percent. When designed to accommodate vehicular traffic, maintenance access ramps shall be designed to Mesa County or the local jurisdiction private road standards, whichever is applicable.

(b) Safety. Specific safety requirements shall be determined on a case-by-case basis in consultation with Mesa County or the applicable local jurisdiction. As a minimum, guardrails or other approved traffic barriers as described in the Mesa County Road and Bridge Specifications shall be provided when a channel is located next to traffic and according to the AASHTO official guidance.

Fencing or access barriers, as required by the governing agency, are required for channels abutting residential developments, schools, parks, and pedestrian walkways as follows:

(1) Fencing is required for all concrete-lined or riprapped channels where the design frequency storm produces a velocity that exceeds 5.0 feet per second or 2.0 feet in depth. Fencing is also required when velocity times the depth exceeds 10.0 within 5.0 feet of the flow water's edge.

(2) Fencing or access barriers required for all unlined alluvial-bed, grass-lined, and wetland-bottom channels with side slopes steeper than 4H:1V where the design frequency storm produces a velocity that exceeds 5.0 feet per second or 2.0 feet in depth. Fencing is also required when velocity times the depth exceeds 10.0 within 5.0 feet of the flow water's edge.

Gates shall be provided for maintenance and emergency access at regular intervals, with 20-foot-wide gates placed 1,000 feet on center and four-foot gates placed 500 feet on center or portion thereof. Fencing or access barriers shall be located at a minimum of six inches inside the easement boundary lines unless otherwise approved.

(Res. 40-08 (§ 806.10), 3-19-08)

§ 28.32.250. Environmental permitting.

Open channel facilities are often located within or adjacent to sensitive environmental areas. The design engineer must investigate which permits might be necessary from various agencies, such as the U.S. Army Corps of Engineers (e.g., GJMC § 28.16.140 through 28.16.190, wetland permit). It is important that the final permits and/or permit conditions

allow for the future and perpetual maintenance of a channel facility without the necessity of returning to a permitting agency for regular maintenance activities.

(Res. 40-08 (§ 806.11), 3-19-08)

§ 28.32.260. Maintenance.

Where failure of an open-channel facility might cause flooding of a public road or structure, the facility shall have an operation and maintenance plan. These operation and maintenance plans shall specify regular inspection and maintenance at specific time intervals (e.g., annually before the wet season) and/or maintenance indicators when maintenance will be triggered (e.g., vegetation more than six inches in height). Operation and maintenance plans shall ensure that vegetation is removed or maintained on a regular basis to maintain the function of the facility.

Flood control channels require lifetime maintenance. The project owner and design engineer shall consult with Mesa County and the local jurisdiction to determine which maintenance mechanism is required for a particular project. At a minimum, privately owned and maintained detention facilities shall have a recorded easement agreement with a covenant binding on successors or other mechanism acceptable to Mesa County and the local jurisdiction.

(Res. 40-08 (§ 806.12), 3-19-08)

§ 28.32.270. Design criteria for natural and alluvial-bed (erodible) channels.

Natural open channels are important drainage elements that contribute to the image and livability in an urban environment. The areas around open channels may have other uses that facilitate trails, open space areas, and wildlife habitat.

(a) Typical Open Channel Design Sections for Natural Channels. Typical open channel design sections for natural channels are presented in Figure 28.32.270. The selection of a design section for a natural channel is generally dependent on the value of developable land versus the cost to remove the land from a floodplain. The costs for removal depend on the rate of flow, slope, alignment and depth of the channel as well as material and fill costs for construction of the encroachment. The design section discussed herein varies from no encroachment to the level of encroachment at which point an improved channel (unlined or lined) becomes more economical or is required to adequately protect the proposed development. The design standards of natural channels are the same for both major and minor drainageways.

For natural channel sections, the engineer shall identify, through stable channel (normal depth) calculations, the stability or instability of the channel to contain the major storm flows. If this analysis demonstrates that either bank erosion outside of the designated flow path (easement and/or right-of-way) or channel degradation is likely to occur, then an analysis of the magnitude and extent of the erosion may be necessary. In such a condition, the design engineer shall meet with the local official to determine:

(1) What additional analysis will be prepared to estimate the potential extent of lateral and vertical channel movement;

(2) What is the estimate of the potential risk to the proposed development from channel degradation and/or bank failure;

(3) What solutions and/or remedies are available which can mitigate the potential risk to the proposed development; and

(4) What improvements and/or reduction in encroachment in or adjacent to the subject channel will be required to allow approval of the subject development.

(b) General Design Considerations and Evaluation Techniques for Natural Channels.

(1) The channel and overbank areas shall have adequate conveyance capacity for the major storm runoff.

(2) Natural channel segments with a calculated flow velocity greater than the allowable flow velocity shall be analyzed for erosion potential with a suitable methodology using standard engineering practice. Additional erosion protection may be required.

(3) The water surface profiles shall be defined so that the 100-year floodplain can be delineated.

(4) Filling of the floodplain fringe may reduce valuable storage capacity and may increase downstream runoff peaks, and therefore shall be avoided.

(5) Erosion control structures, such as drop structures or check dams, may be required to control flow velocities for both the minor storm and major storm events.

(6) Plan and profile information (i.e., HEC-2 or HEC-RAS output) for both existing and proposed floodplain site conditions shall be prepared.

(7) The engineer shall verify, through stable channel (normal depth) calculations, the suitability of the floodplain to contain the flows. If this analysis demonstrates erosion outside of the designated flow path (easement and/or right-of-way), an analysis of the equilibrium slope and degradation or aggregation depths is required and suitable improvements identified.

With many natural channels, erosion control structures may need to be constructed at regular intervals to decrease the thalweg slope and to minimize erosion. However, these channels shall be left in as near a natural state as possible. For that reason, extensive modifications shall not be pursued unless they are found to be necessary to avoid excessive erosion with substantial deposition downstream.

The usual rules of freeboard depth, curvature, and other rules, which are applicable to artificial channels, do not apply for natural channels. There are significant advantages that occur if the designer incorporates into his planning the overtopping of the channel and localized flooding of adjacent areas, which remain undeveloped for the purpose of being inundated during the major runoff peak.

If a natural channel is to be modified or encroached upon for a development, then the applicant shall meet with the agencies with jurisdiction over the channel to discuss the design concept and to obtain the requirements for planning, design analysis, and documentation. Channel stability analysis must be based on peak runoff rates from the long-term projected, urbanized watershed tributary to the channel.

(c) Natural Unencroached Channels. Natural encroached channels are defined as channels where overlot grading from the development process does not encroach into the 100-year floodplain of a given channel. Although the development does not alter the flow carrying capacity of the floodplain, the development must be protected from movement of the floodplain boundaries due to erosion and scour. Therefore, the designer needs to identify locations susceptible to erosion and scour and provide a design that reinforces these locations to minimize potential damage to the proposed development. For natural channels with velocities that exceed stable velocities, erosion protection may include the construction of buried grade control/check structures to minimize head-cutting and subsequent bank failures.

(d) Natural Encroached Channels. Natural encroached channels are defined as channels where the development process has encroached into the 100-year floodplain fringe. This definition includes both excavation and/or fill in the floodplain fringe. The designer shall prepare a design that will minimize damage to the development from movement of the floodplain boundaries due to erosion and scour. Consideration of erosion protection is similar to that for unencroached channels with emphasis on protection of the fill embankment.

(e) Bank-Lined Channels. Bank-lined channels are channels where the banks will be lined but the channel bottom will remain in a natural state with minimal regrading. The concerns with bank-lined channels are to minimize scour of the channel bottom at the bank lining interface as well as maintaining a stable natural channel. The designer shall prepare a design that addresses scour depths at the lining interface to assure that the lining extends below this depth to avoid undermining of the lining.

(f) Partially Lined Channels. Partially lined channels are defined as channels in which half of the channel is lined and the other half is left in a natural or unimproved condition. The concerns with partially lined channels are twofold. First, the improvement and lining of one side of the channel will cause changes to the hydraulic parameters of the unlined section which could increase erosion and scour in the unlined section. Second, floods which occur during the temporary condition may damage the improved channel section and require avoidable costly repairs.

Partially lined channels will only be allowed if:

(1) The bottom paving is bonded, or there is another mechanism in place to pay for the bottom paving once the channel is completed.

(2) Erosion in the unlined section is addressed to the satisfaction of the local official.

(3) Scour below the lining is addressed to the satisfaction of the local official.

The analysis and design shall show that the proposed temporary channel does not adversely impact the hydraulic parameters and stability of the unlined section in a significant way.

(g) Bio-Engineered Channels. Bio-engineering is an applied science that integrates structural, biological and ecological principles to construct living structures (plant communities) for erosion, sediment, and flood control purposes. In many instances, bio-engineered channel stabilization measures can be safely utilized to supplement other stabilization measures. Successful application of bio-engineered stabilization measures depends upon accurate diagnosis of the causes of channel stability problems, rather than just treating visible problem areas. The references section of this manual (Chapter 28.72 GJMC) provides useful resources on bio-engineered solutions for natural channel stabilization.

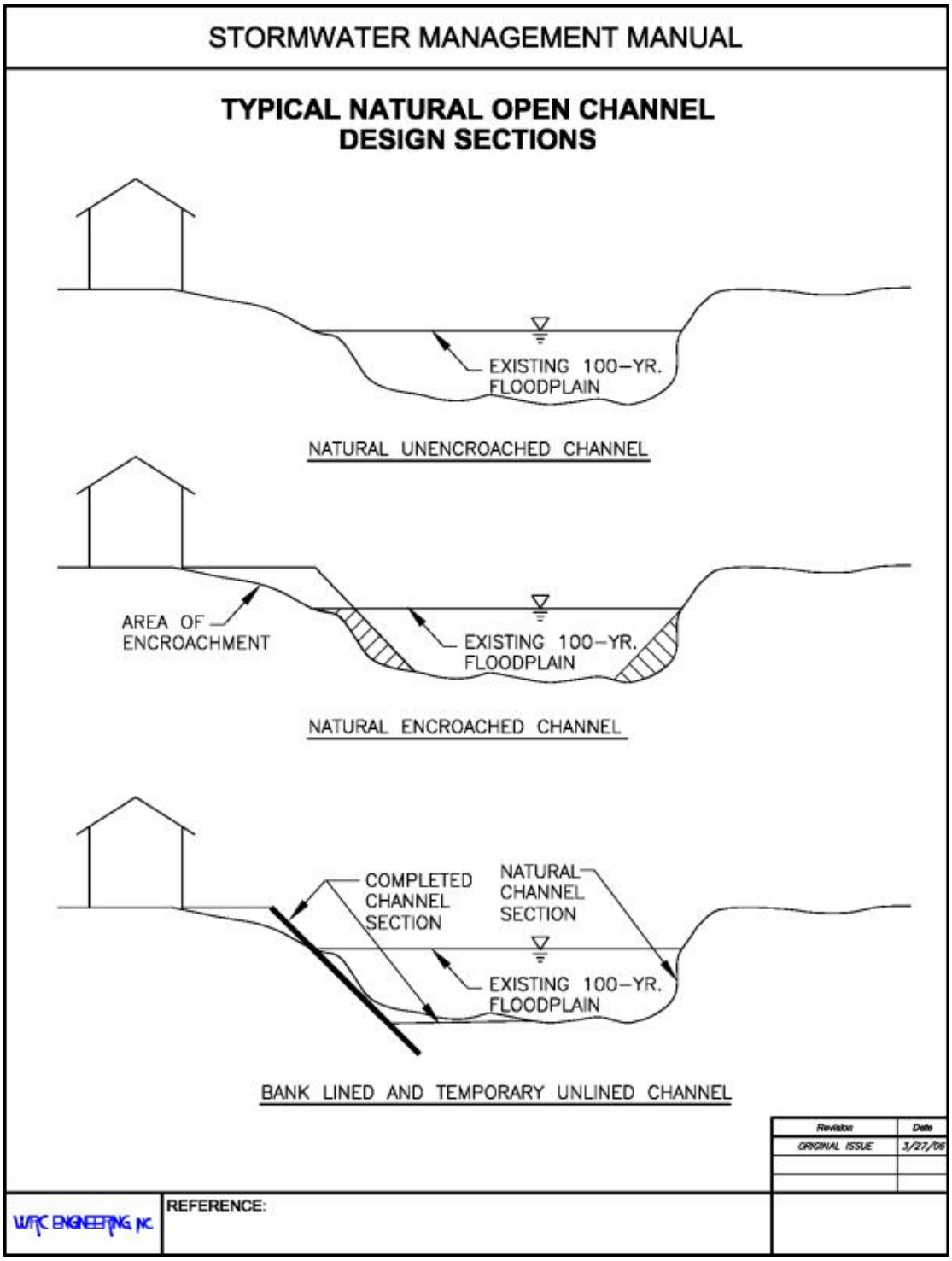


FIGURE 28.32.270

(Res. 40-08 (§ 807), 3-19-08)

§ 28.32.280. Grass-lined channels.

Grass-lined channels are desirable artificial channels from an aesthetic point of view. The engineer shall design grass-lined channels in accordance with the criteria presented herein, and any special considerations due to project site specific requirements.

Applicable design parameters include:

(a) Longitudinal Channel Slopes. In a grass-lined channel, slopes are determined by the maximum permissible velocity requirements. A minimum longitudinal gradient of 0.5 percent shall be provided whenever practical.

(b) Roughness Coefficients. ables 28.32.040(d) and 28.32.040(e) present roughness coefficients for grass-lined channels. The design engineer is to assume a mature channel that has substantial vegetation with minimal maintenance.

(c) Trickle and Low-Flow Channels. After urbanization, because of lawn irrigation return flows and runoff from directly connected impervious areas, it is not uncommon to see dry waterways having a continuous flow. A trickle channel is required on all urban grass-lined channels. Properly designed earth trickle channels are acceptable. Because of low maintenance and limited infiltration, concrete trickle channels are also acceptable. In the case of larger streams and rivers, a low-flow channel may be more appropriate than a trickle channel.

(1) Trickle Channels. Trickle channels are recommended for grass-lined channels with a 100-year design flow less than or equal to 200 cfs. The trickle channel capacity shall convey five percent of the 100-year design flow rate or five cfs, whichever is greater. There is no freeboard requirement for trickle channels. The flow capacity of the main channel shall be determined without considering the flow capacity of the trickle channel. Care shall be taken to ensure that low flows enter the trickle channel without flow paralleling the trickle channel or bypassing inlets to the channel.

Trickle channels are not typically required for swales and other minor drainageways and grass-lined channels conveying a 100-year peak runoff of 20 cfs or less. For these smaller channels, the design engineer shall evaluate the factors such as drainage slope, flow velocity, soil type, and upstream impervious area, and specify a trickle channel when needed based on their engineering judgment.

(i) Concrete Trickle Channel. Concrete trickle channels help minimize erosion, silting, and excessive plant growth. Figure 28.32.280 illustrates a typical concrete trickle channel. The concrete trickle channel shall have a minimum depth of six inches. A Manning roughness coefficient value of n equals 0.015 will be used to design the concrete trickle channel.

(ii) Rock-Lined Trickle Channel. Rock-lined trickle channels shall have a minimum depth of 12 inches, with the Manning roughness coefficient determined as described in GJMC § 28.32.170. The minimum stone size for rock-lined trickle channels shall be six inches.

(2) Low-Flow Channels. Low-flow channels are used to contain relatively frequent flows within a recognizable channel section. Low-flow channels are recommended for channels with a 100-year flow greater than 200 cfs, and at a minimum have the capacity to convey the two-year flow event with no freeboard. The overall flow capacity of the channel shall include the capacity of the low-flow channel.

Low-flow channels shall have a minimum depth of 12 inches. The maximum side slopes of the low-flow channel shall be 2.5H:1V. The main channel depth limitations (subsection (e) of this section) do not apply to the low-flow channel area of the overall channel cross-section.

(d) Bottom Width. The bottom width selected shall be based on factors such as possible wetland mitigation requirements, constructability, channel stability, maintenance requirements, and multi-use purposes.

The minimum channel bottom width shall be 5.0 feet for channels with a concrete trickle channel, 20 feet in channels with a riprap trickle channel, and 30 feet in channels with a low-flow channel.

(e) Flow Depth and Freeboard. Swales and grass-lined channels conveying a 100-year flow less than or equal to 10 cfs shall have a minimum freeboard of six inches. Grass-lined channels conveying larger discharges shall meet the minimum freeboard requirements outlined in GJMC § 28.32.220.

The recommended design depth of flow for a grass-lined channel (outside the low-flow channel area) is 5.0 feet for a 100-year flow of 1,500 cfs or less whenever practical. Excessive depths shall also be avoided in channels with greater design flows to the maximum extent practicable. GJMC § 28.32.220 discusses access and safety for open channels, including thresholds for flow depth and velocity.

(f) Side Slopes. Side slopes of a grass-lined channel shall be not steeper than 3H:1V.

(g) Grass Lining. Satisfactory performance of a grass-lined channel depends on constructing the channel with the proper shape and preparing the area in a manner to provide conditions favorable to vegetative growth. Between the time of seeding and the actual establishment of the grass, the channel is unprotected and subject to considerable damage unless interim erosion protection is provided. See Chapter 28.6 GJMC, Construction Site Stormwater Runoff Control, for requirements.

The grass lining for channels may be seeded or sodded with a grass species that is adapted to the local climate and will flourish with minimal irrigation. Channel vegetation is usually established by seeding. In the more critical sections of some channels, it may be required to provide immediate protection by transplanting a complete sod cover. All seeding, planting, and sodding shall conform to local landscape recommendations.

(h) Horizontal Channel Alignment and Bend Protection. The potential for erosion increases along the outside bank of a channel bend due to the acceleration of flow velocities on

the outside part of the bend. Thus, it is often necessary to provide supplemental erosion protection at bends in natural or grass-lined channels.

The minimum radius for channels with a 100-year runoff of 20 cfs or less shall be 25 feet. For channels carrying larger flows, horizontal channel alignment shall be limited based on the presence of erosion protection.

No channel bend protection is required along bends where the radius is greater than two times the top width of the 100-year water surface. Channels without bend protection shall have a radius of curvature greater than two times the 100-year flow top width or 100 feet, whichever is greater.

When erosion protection is provided, the minimum radius of curvature shall be 1.2 times the 100-year flow top width, or 50 feet, whichever is greater.

Erosion protection shall extend downstream from the end of the bend a distance that is equal to the length of the bend measured along the channel centerline.

(i) Maintenance. Grass-lined channels shall be maintained to ensure that vegetation is removed or maintained on a regular basis to maintain the function of the facility. The project owner shall ensure that appropriate mechanism is in place to provide maintenance for the lifetime of the facility.

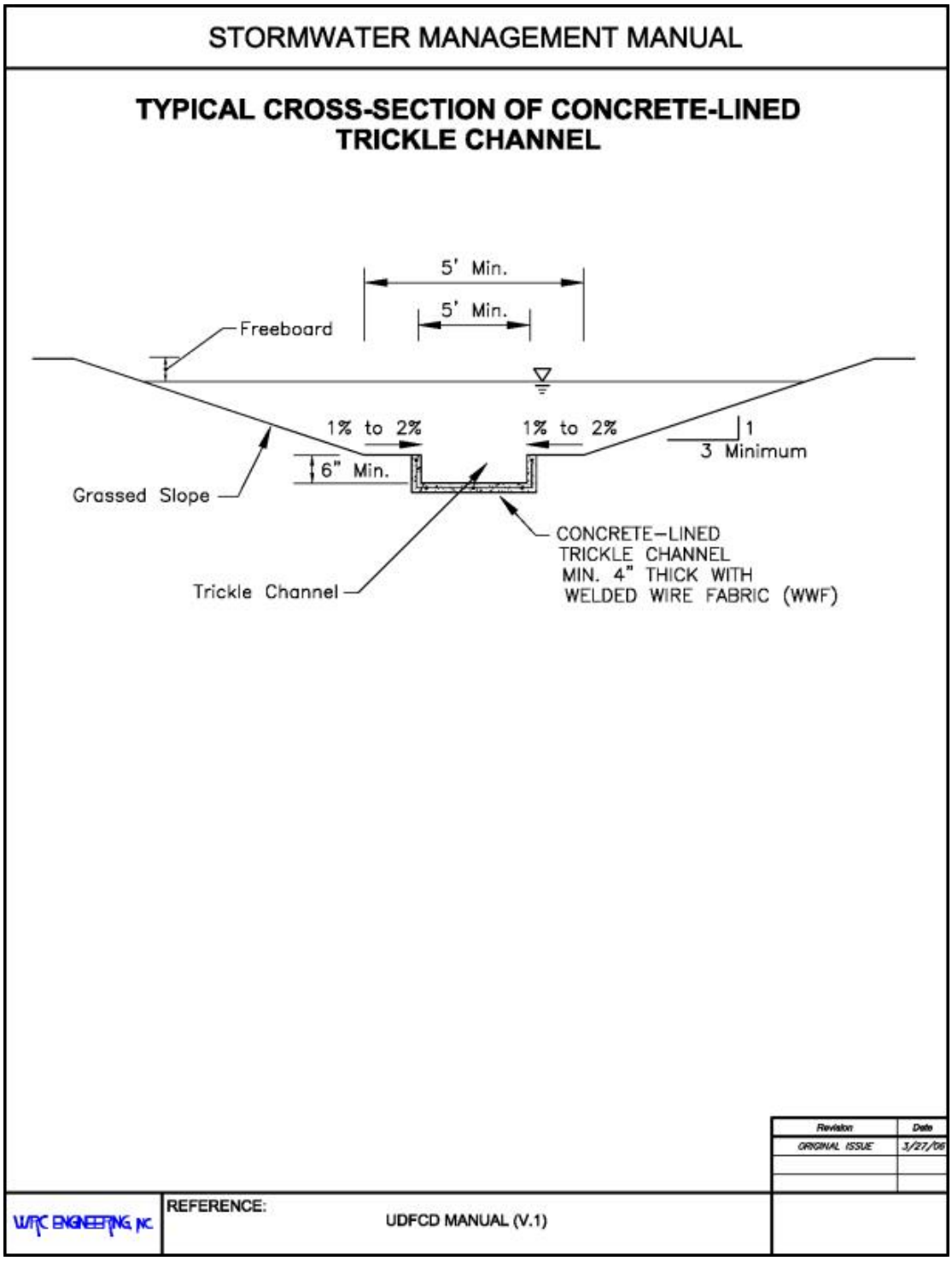


FIGURE 28.32.280

(Res. 40-08 (§ 808), 3-19-08)

§ 28.32.290. Wetland-bottom channel.

This section presents minimum design criteria for wetland-bottom channels. The design engineer shall design wetland-bottom channels in accordance with the criteria presented herein, and any special considerations for a particular design situation.

Under certain circumstances, such as when existing wetland areas are affected or natural channels are modified, the Corps of Engineers Section 404 permitting process may mandate the use of channels with wetland vegetation. In other cases, a wetland bottom channel may better suit individual site needs if used to mitigate wetland damages somewhere else or if used to enhance urban runoff quality. Wetland-bottom channels are similar to grass-lined channels, except that wetland vegetation growth is encouraged by eliminating the concrete-lined trickle channel and flattening longitudinal slope so that low flows have low velocities.

There are potential benefits associated with a wetland bottom channel, such as wildlife and water quality enhancement as the base flows move through the marshy vegetation.

(a) Longitudinal Channel Slope. The longitudinal channel slope shall be set to the maximum permissible velocity criteria provided in Table 28.32.200 is not violated. To prevent channel degradation, the channel slope shall be determined assuming there is not wetland vegetation on the bottom (i.e., "new channel"). In addition to the velocity requirements, the Froude number for the new channel condition shall be less than 0.7.

(b) Roughness Coefficients. The channel shall be designed for two flow roughness conditions. As previously mentioned, a Manning's roughness coefficient assuming there is no growth in the channel bottom is used to set the channel slope. This is referred to as the new channel condition. The mature channel condition assumes that wetland vegetation in the channel bottom has been established. The required channel depth including freeboard is determined assuming mature channel conditions.

A composite Manning's roughness coefficient shall be used for the new channel condition design and the mature channel condition design. The composite Manning's roughness coefficient is determined by the following equation (Chow, 1959):

$$n_c = \frac{\left(n_0^2 P_0 + n_w^2 P_w\right)^{0.5}}{\left(P_0 + P_w\right)} \qquad (28.32\text{-}22)$$

Where:

n_c = Manning's roughness coefficient for the composite channel (Dimensionless)

n_0 = Manning's roughness coefficient for areas above the wetland area (Dimensionless)

n_w = Manning's roughness coefficient for the wetland area (Dimensionless)

P_o = Wetland perimeter of channel cross-section above the wetland area (feet)

P_w = Wetland perimeter of the wetland channel bottom (feet)

For grass-lined areas above the wetland area, use a Manning's roughness coefficient n_0 equals 0.035. Manning's roughness coefficients for the wetland area (n_w) can be obtained from Figure 28.32.290.

(c) Low-Flow and Trickle Channel. Concrete trickle channels are not permitted in wetland bottom channels. Low-flow channels may be used when the 100-year flow exceeds 1,000 cfs. The design of the low-flow channel shall be according to GJMC § 28.32.280(c)(2).

(d) Bottom Width. The following design factors shall be considered in selecting an appropriate channel bottom width:

(1) Wetland mitigation requirements.

(2) Constructability.

(3) Channel stability and maintenance.

(4) Multi-use purpose.

(5) Low-flow channel width.

(e) Flow Depth and Freeboard. Typically, the maximum design depth of flow (outside of the low-flow channel area) should not exceed 5.0 feet for a 100-year flow of 1,500 cfs or less. For greater flows, excessive depths shall be avoided to minimize high velocities and for public safety considerations.

Wetland bottom channels shall meet the minimum freeboard requirements outlined in GJMC § 28.32.220.

(f) Side Slopes. Side slopes shall not be designed steeper than three horizontal to one vertical.

(g) Grass-Lining. The side slopes may be grass-lined according to the guidelines provided previously in GJMC § 28.32.280(g).

(h) Channel Bend Protection. Channel bends shall be designed according to the criteria discussed previously in GJMC § 28.32.280(h).

(i) Channel Crossings. Whenever a wetland bottom channel is crossed by a road, railroad or a trail requiring a culvert or a bridge, a drop structure shall be provided immediately downstream of such a crossing. This will help reduce the silting-in of the crossing with sediments. A one-foot to two-foot drop is recommended. The designer shall determine the hydraulics of the crossing and the drop structure and design the structures to ensure the stability of the channel.

(j) Life Expectancy. Wetland bottom channels are expected to fill with sediment over time. This occurs because the bottom vegetation traps some of the sediments carried by the flow. The life expectancy of such a channel will depend primarily on the land use of the tributary watershed and could range anywhere from 20 to 40 years before major channel dredging is needed. However, life expectancy can be dramatically reduced, to as little as two to five years, if land erosion in the tributary watershed is not controlled. Therefore, land erosion practices need to be strictly controlled during new construction

within the watershed and all facilities need to be built to minimize soil erosion in the watershed to maintain a reasonable economic life of a wetland bottom channel.

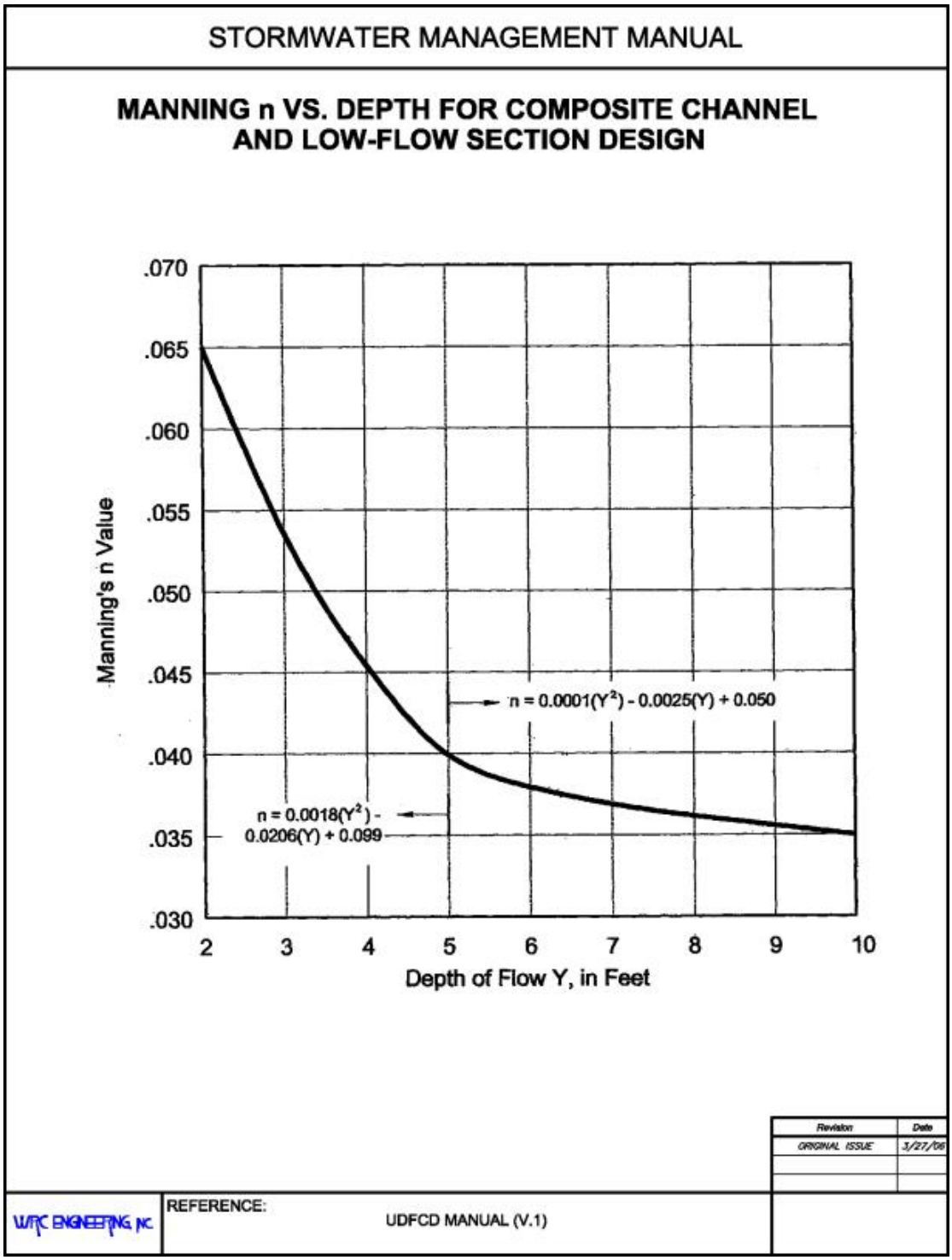


FIGURE 28.32.290

(Res. 40-08 (§ 809), 3-19-08)

§ 28.32.300. Design criteria – Riprap-lined channels.

This section presents minimum design criteria for riprap-lined channels. The engineer shall design riprap-lined channels in accordance with the criteria presented herein, and any special considerations arising out of a particular design situation.

Riprap-lined channels are defined as channels in which riprap is used for lining of the channel banks and the channel bottom to control erosion. Design standards for riprap-lined channels shall also be used for transitions and bends when lined with riprap. Riprap is used to control erosion in both channel banks and beds, transition sections upstream and downstream of hydraulic structures, at bends, and bridges.

Loose or grouted riprap is cost effective for short channel reaches. Riprap lining might be appropriate for (1) flows that produce channel velocities in excess of allowable values; (2) channels where side slopes need to be steeper than 3:1; (3) at channel bends and transitions; and (4) low-flow channels.

Specific design parameters for riprap-lined channels include:

(a) Longitudinal Channel Slope. The maximum permissible velocity for riprap-lined channels is presented in Table 28.32.200. In steeper terrain, drop structures may be used to achieve the desired design velocities.

(b) Roughness Coefficients. The Manning's roughness coefficient, n, for hydraulic computations may be estimated for loose riprap using the following equation.

$$n = .0395(d_{50})^{1/6} \qquad (28.32\text{-}23)$$

Where:

d_{50} = mean stone size (feet)

This equation (Anderson, 1968) does not apply to grouted riprap (n equals 0.023 to 0.030) or to very shallow flow (hydraulic radius is less than or equal to two times the maximum rock size) where the roughness coefficient will be greater than indicated by the formula.

(c) Low-Flow Channel. The design criteria for the low-flow channel are discussed in GJMC § 28.32.280(c)(2).

(d) Bottom Width. The following design factors shall be considered in selecting an appropriate channel bottom width.

(1) Constructability;

(2) Channel stability and maintenance;

(3) Multi-use purpose;

(4) Trickle/low-flow channel width.

(e) Flow Depth. As preliminary criteria, the design depth of flow for the major storm runoff flow shall not exceed 7.0 feet in areas of the channel cross-section outside the low-flow or trickle channel.

(f) Side Slopes. Due to stability, safety, and maintenance considerations, riprap-lined side slopes shall be two horizontal to one vertical or flatter.

(g) Toe Protection. Where only the channel sides are to be lined, additional riprap is needed to provide for long-term stability of the lining. In this case, the riprap blanket shall extend a minimum of three feet below the proposed channel bed, and the thickness of the blanket below the proposed channel bed shall be increased to a minimum of three times d_{50} to accommodate possible channel scour during floods. If the velocity exceeds the permissible velocity requirements of the soil comprising the channel bottom, a scour analysis shall be performed to determine if the toe requires additional protection.

(h) Beginning and End of Riprap-Lined Channel. At the upstream and downstream termination of a riprap lining, the thickness shall be increased 50 percent for at least three feet to prevent undercutting. Depending on the site-specific conditions, concrete cutoff walls at both ends may be necessary.

(i) Loose Riprap Lining. Loose riprap, or simply riprap, refers to a protective blanket of large loose angular stones that are usually placed by machine to achieve a desired configuration. The term loose riprap has been introduced to differentiate loose stones from grouted riprap.

Many factors govern the size of the rock necessary to resist the forces tending to move the riprap. For the riprap itself, this includes the size and weight of the individual rock, the shape of stones, the gradation of the particles, the blanket thickness, the type of bedding under the riprap, and slope of the riprap layer. Hydraulic factors affecting riprap include the velocity, current direction, eddy action, and waves. Figure 28.32.300(a) provides typical cross-sections for riprap-lined channels.

Experience has shown that riprap failures generally result from undersized individual rocks in the maximum size range, improper gradation of the rock which reduces the interlocking of individual particles and improper bedding for the riprap which allows leaching of channel particles through the riprap blanket.

(1) Riprap Material. Rock used for loose riprap, grouted riprap, or wire enclosed riprap shall be hard, durable, angular in shape, and free from cracks, overburden, shale and organic matter. Neither breadth nor thickness of a single stone shall be less than one-third of its length and rounded stone shall be avoided. Rock having a minimum specific gravity of 2.65 is preferred; however, in no case shall the specific gravity of the individual stones be less than 2.50.

Classification and gradation for riprap are shown in Table 28.32.300(a) and are based on a minimum specific gravity of 2.50 for the rock. Because of its relatively small size and weight, riprap Class 150 must be buried with native topsoil and revegetated to protect the rock from vandalism.

Riprap lining requirements for a stable channel lining are based on the following relationship which resulted from model studies by Smith and Murray (Smith, 1965)

$$d_{50} = \frac{0.05 v^2 S^{0.34}}{(S_s - 1)^{1.332}} \quad (28.32\text{-}24)$$

Where:

d_{50}	=	Rock size for which 50 percent of riprap by weight is smaller (feet)
V	=	Mean channel velocity (fps)
S	=	Longitudinal channel slope (feet/feet)
S_s	=	Specific gravity of rock (minimum S_s = 2.50) (dimensionless)

The riprap blanket thickness shall be at least 2.0 times d_{50} and shall extend up the side slopes to an elevation of the design water surface plus the calculated freeboard.

(2) Bedding Requirements. Long-term stability of riprap erosion protection is strongly influenced by proper bedding conditions. A large percentage of all riprap failures is directly attributable to bedding failures. Gradations for granular riprap bedding are shown in Table 28.32.300(b).

STORMWATER MANAGEMENT MANUAL

GRADATION OF LOOSE RIPRAP

STONE SIZE d50[1] (INCHES)	% OF MATERIAL SMALLER THAN TYPICAL STONE[2]	TYPICAL STONE DIMENSIONS[3] (INCHES)	TYPICAL STONE WEIGHT[4] (POUNDS)
6	70–100	12	85
	50–70	9	35
	35–50	6	10
	2–10	2	0.4
9	70–100	15	160
	50–70	12	85
	35–50	9	35
	2–10	3	1.3
12	70–100	21	440
	50–70	18	275
	35–50	12	85
	2–10	4	3
18	100	30	1280
	50–70	24	650
	35–50	18	275
	2–10	6	10
24	100	42	3500
	50–70	33	1700
	35–50	24	650
	2–10	9	35

[1] d50 = NOMINAL STONE SIZE
[2] BASED ON TYPICAL ROCK MASS
[3] EQUIVALENT SPHERICAL DIAMETER
[4] BASED ON A SPECIFIC GRAVITY = 2.5

Revision	Date
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WRC ENGINEERING, INC.

REFERENCE: COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2005

TABLE 28.32.300(a)

STORMWATER MANAGEMENT MANUAL

GRADATION FOR GRANULAR RIPRAP BEDDING

PERCENTAGE PASSING DESIGNATED SIEVES

U.S. STANDARD SIEVE SIZE (INCHES)	COARSE AGGREAGATE (1 ½" TO #4)	FINE AGGREGATE (#4 TO #100)
2	100	–
1 1/2	–	–
1	95–100	–
3/4	–	–
1/2	25–60	–
3/8	–	100
#4	0–10	95–100
#8	0–5	80–100
#16	–	50–85
#30	–	25–60
#50	–	10–30
#100	–	2–10

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WRC ENGINEERING INC.

REFERENCE: COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2005

TABLE 28.32.300(b)

Properly designed bedding provides a buffer of intermediate sized material between the channel bed and the riprap to prevent movement of soil particles through the voids in the riprap. Three types of bedding are in common use:

generic single layer granular bedding, granular bedding based on the T-V (Terzughi-Vicksburg) methodology, and filter fabric.

(i) Granular Bedding – Generic Design. The gradation of a single layer bedding specification is based on the assumption that said bedding will generally protect the underlying soil from displacement during a flood event. The single layer bedding design does not require any soil information, but in order to be effective covering a wide range of soil types and sizes, this method requires a greater thickness than the T-V method.

A single 12-inch layer of said granular bedding can be used except at drop structures. At drop structures, filter fabric must be added below the 12-inch layer of granular bedding.

(ii) Granular Bedding – T-V Design. The T-V design establishes an optimum granular bedding gradation for a specific channel soil. Since this method designs the granular bedding for a particular soil, the allowable granular bedding thickness may be much less than the generic design.

The specifications for the T-V reverse filter method relate the gradation of the protective layer (filter) to that of the bed material (base) by the following inequalities:

$$D_{15(filter)} \leq 5d_{85(base)} \quad (28.32\text{-}25)$$

$$4d_{15(base)} \leq D_{15(filter)} \leq 20d_{15(base)} \quad (28.32\text{-}26)$$

$$D_{50(filter)} < 25d_{50(base)} \quad (28.32\text{-}27)$$

Where the capital "D" refers to the filter grain size and the lower case "d" to the base grain size. The subscripts refer to the percent by weight which is finer than the grain size denoted by either "D" or "d." For example, 15 percent of the filter material is finer than $D_{15(filter)}$ and 85 percent of the base material is finer than $d_{85(base)}$.

When the T-V method is used, the thickness of the resulting layer of granular bedding may be reduced to six inches. However, if a gradation analysis of the existing soils shows that a single layer of T-V method designed granular bedding cannot bridge the gap between the riprap specification and the existing soils, then two or more layers of granular bedding shall be used. The design of the bedding layer closest to the existing soils shall be based on the existing soil gradation. The design of the upper bedding layer shall be based on the gradation of the lower bedding layer. The thickness of each of the two or more layers shall be four inches.

(iii) Filter Fabrics. Filter fabric is not a complete substitute for granular bedding. Filter fabric provides filtering action only perpendicular to the fabric and has only a single equivalent pore opening between the channel bed and the riprap. Filter fabric has a relatively smooth surface which provides less resistance to stone movement. As a result, it is recommended that the use of filter fabric in place of granular bedding be restricted to slopes no steeper than 2.5 horizontal to one vertical, and that such filter fabric only replace the bottom layer in a multi-layer T-V method granular bedding design. The granular bedding shall be placed on top of the filter fabric to act as a cushion when placing the riprap. Tears in the fabric greatly reduce its effectiveness so that direct dumping of riprap on the filter fabric is not allowed and due care must be exercised during construction. Nonetheless, filter fabric has proven to be an adequate replacement for granular bedding in many instances. Filter fabric provides adequate bedding for channel linings along uniform mild sloping channels where leaching forces are primarily perpendicular to the fabric.

At drop structures and sloped channel drops, where seepage forces may run parallel with the fabric and cause piping along the bottom surface of the fabric, special care is required in the use of filter fabric. Seepage parallel with the fabric may be reduced by folding the edge of the fabric vertically downward about two feet (similar to a cutoff wall) at 12-foot intervals along the installation, particularly at the entrance and exit of the channel reach. Filter fabric has to be lapped a minimum of 12 inches at roll edges with upstream fabric being placed on top of downstream fabric at the lap.

Fine silt and clay has been found to clog the openings in filter fabric. This prevents free drainage which increases failure potential due to uplift. For this reason, a granular filter is often more appropriate bedding for fine silt and clay channel beds.

(j) Grouted Riprap Lining. Grouted riprap provides a relatively impervious channel lining which is less subject to vandalism than loose riprap. Grouted riprap requires less routine maintenance by reducing silt and trash accumulation and is particularly useful for lining low-flow channels and steep banks. The appearance of grouted riprap is enhanced by exposing the tops of individual stones and by cleaning excess grout from the projecting rock with a wet broom prior to curing. Figure 28.32.300(b) provides a typical cross-section for a grouted riprap lining.

(1) Riprap Material. The rock used for grouted riprap is different from the standard gradation of riprap in that the smaller rock has been removed from the groundwater to allow larger void spaces and, therefore greater penetration by the grout. The riprap specifications are shown on Table 28.32.300(c). Riprap smaller than Class 400 shall not be grouted.

(2) Bedding Material. The bedding material requirements are the same as for loose riprap.

(3) Cutoff Trench. As the riprap layer is placed, a cutoff trench shall be excavated around the rock section at the top of the slope and at the upstream and downstream edges. The trench shall be, at a minimum, the full depth of the riprap

and bedding layer and at least one foot wide. This trench is filled with grout to prevent water from undermining the grouted rock mass.

(4) Grout. After the riprap has been placed to the required thickness and the trench excavated, the rock is sprayed with clean water which cleans the rock and allows better adherence by the grout. The rock is then grouted using a low pressure (less than 10 psi) grout pump with a two-inch maximum diameter hose. Using a low pressure grout pump allows the work crew time to move the hose and vibrate the grout. Vibrating the grout with a pencil vibrator assures complete penetration and filling of the voids. After the grout has been placed and vibrated, a small hand broom or gloved hand is used to smooth the grout and remove any excess grout from the rock. The finished surface is sealed with a curing compound.

The grout shall consist of six sacks (564 pounds) of cement per cubic yard, and the aggregate shall consist of 30 percent of 3/8-inch coarse gravel and 70 percent natural sand. The grout shall contain 7.5 percent plus or minus 1.5 percent air entrainment, have a 28-day compressive strength of at least 2,000 psi, and have a slump of seven inches plus or minus two inches. Fiber reinforcement shall be used such as 1.5 pounds per cubic yard of Fibermesh or an approved equivalent amount. A maximum of 25 percent fly ash may be substituted for the cementations material.

(k) Channel Bend Protection. When riprap protection is required for a straight channel, increase the rock size by one category (e.g., Class 300 to Class 400) through bends. The minimum radius for a riprap-lined bend is 1.2 times the top width and in no case less than 50 feet. Riprap protection shall extend downstream from the end of the bend a distance that is equal to the length of the bend measured along the channel centerline.

STORMWATER MANAGEMENT MANUAL

CLASSIFICATION AND GRADATION OF ROCK FOR GROUTED RIPRAP

STONE SIZE d50 (INCHES)	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)
d50=24"(TYPE HG)	100	30
	50–70	24
	0–5	18
d50=18"(TYPE HG)	70–100	21
	50–70	18
	0–5	12

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WTC ENGINEERING, INC.

REFERENCE: COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2005

TABLE 28.32.300(c)

(l) Transition Protection. Scour potential is amplified by turbulent eddies in the vicinity of rapid changes in channel geometry such at transitions and bridges. For these locations, the riprap lining thickness shall be increased by one size category.

Protection shall extend upstream from the transition entrance at least 5.0 feet and extend downstream from the transition exit at least 10 feet. See GJMC § 28.32.060 and 28.32.070 for further discussions on transitions.

(m) Concrete Cutoff Walls. Transverse concrete cutoff walls may be required for riprap-lined channels where a resulting failure of the riprap lining may seriously affect the health and safety of the public. The designer shall consult with the local officials prior to design of riprap-lined channels to determine if concrete cutoff walls are required as well as their sizing and spacing, if required.

(n) Riprap-Lined Channels on Steep Slopes. Achieving channel stability on steep slopes usually requires some type of channel lining. The only exception is a channel constructed in durable bedrock.

On mild slopes, the water velocity is slow enough and the depth of flow is large enough (relative to the riprap size) that a reasonable estimate of the resistance to flow can be made. On steep channels, the riprap size required to stabilize the channel is on the same order of magnitude or greater than the flow depth, which invalidates the Manning's relation. Since the resistance to flow is unknown, an estimate of the velocity needed for the design of the riprap cannot be accurately estimated.

A graphically based methodology was developed for the U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement (SIMONS, 1989) to design riprap-lined channels on steep slopes (supercritical flow). This methodology was based on a study by Bathurst, 1979, that analyzed the hydraulics of mountain rivers where roughness elements are on the same order of magnitude as the depth of flow. Using the resistance equation developed by Bathurst, the velocity can be estimated for a given riprap size. The velocity is then used to predict the stability of the riprap.

This procedure shall be used for all riprap-lined channels whose depth of flow is equal to or less than d_{50} as computed initially using Equation 28.32-24.

(1) Rock Size. Five sets of design curves (Figures 28.32.300(c) through 28.32.300(g)) have been developed from Bathurst's relationship to simplify riprap design for steep channels. The design curves were developed for channels with two to one side slopes and bottom widths of zero feet, six feet, 10 feet, 14 feet, and 20 feet. The curves were terminated at the point where flow velocity exceeded 15 fps. A median rock diameter could be determined that would be stable at higher flows and velocities; however, rock durability at velocities greater than 15 fps becomes of greater concern.

For a given flow, channel slope, and channel width, Figures 28.32.300(c) through 28.32.300(g) will provide the median riprap size. When the channel slope is not provided by one of the design curves, linear interpolation is used to determine the riprap size. This is done by extending a horizontal line at the given flow through the curves with slopes bracketing the design slope. A curve at the design slope is then estimated by visual interpolation. The design D_{50} size is then chosen at the point that the flow intercepts the estimated design curve. Linear interpolation can

also be used to estimate the D_{50} size for bottom widths other than those supplied in the figures.

For practical engineering purposes, the D_{50} size specified for the design shall be given in 0.25-foot increments. The final minimum design size is determined using Table 28.32.300(d).

(2) Riprap Gradation for Steep Slopes. Table 28.32.300(e) provides ratios used to determine the D_{10}, D_{20}, and D_{max} rock sizes from the D_{50} rock size determined in subsection (n)(1) of this section. It is important to establish a smooth gradation from the largest to the smallest sizes to prevent large voids between rocks.

STORMWATER MANAGEMENT MANUAL

DESIGN D_{50} VALUES FOR STEEP CHANNELS

D_{50} DETERMINED FROM DESIGN CURVE (FT)	MINIMUM DESIGN D_{50} (FT)
< 0.25	0.25
0.26 - 0.50	0.50
0.51 - 0.75	0.75
0.76 - 1.00	1.00
1.01 - 1.25	1.25
1.26 - 1.50	1.50
1.51 - 1.75	1.75
1.76 - 2.00	2.00
2.01 - 2.25	2.25
2.26 - 2.50	2.50
2.51 - 2.75	2.75
2.76 - 3.00	3.00

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WRC ENGINEERING, INC.

REFERENCE:

TABLE 28.32.300(d)

STORMWATER MANAGEMENT MANUAL

RIPRAP GRADATION FOR STEEP SLOPES

$$\frac{D_{MAX}}{D_{50}} = 1.25$$

$$\frac{D_{50}}{D_{20}} = 2.0$$

$$\frac{D_{50}}{D_{10}} = 3.0$$

Revision	Date
ORIGINAL ISSUE	1/27/06

WRC ENGINEERING, INC. REFERENCE: SIMONS, 1989

TABLE 28.32.300(e)

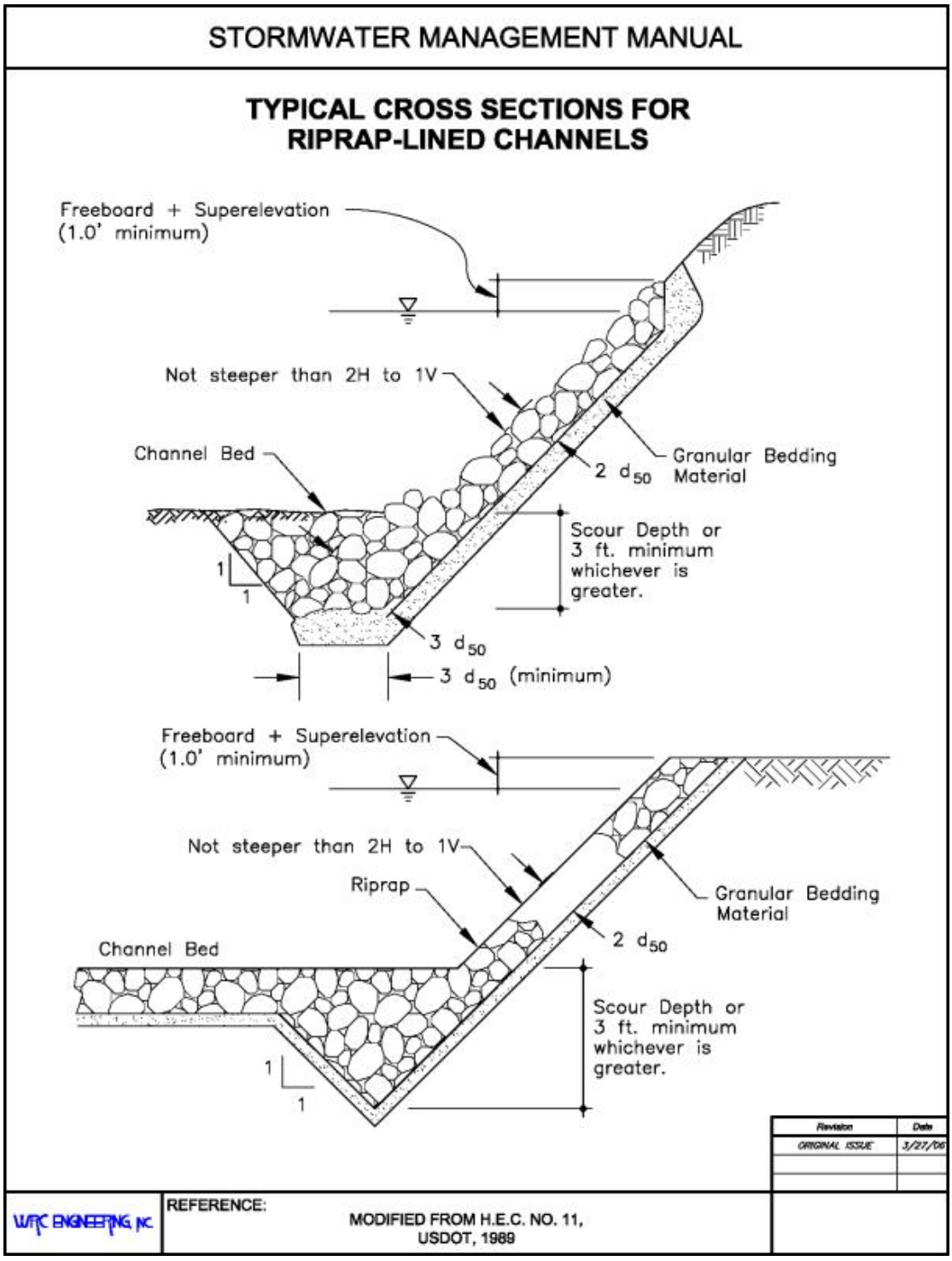
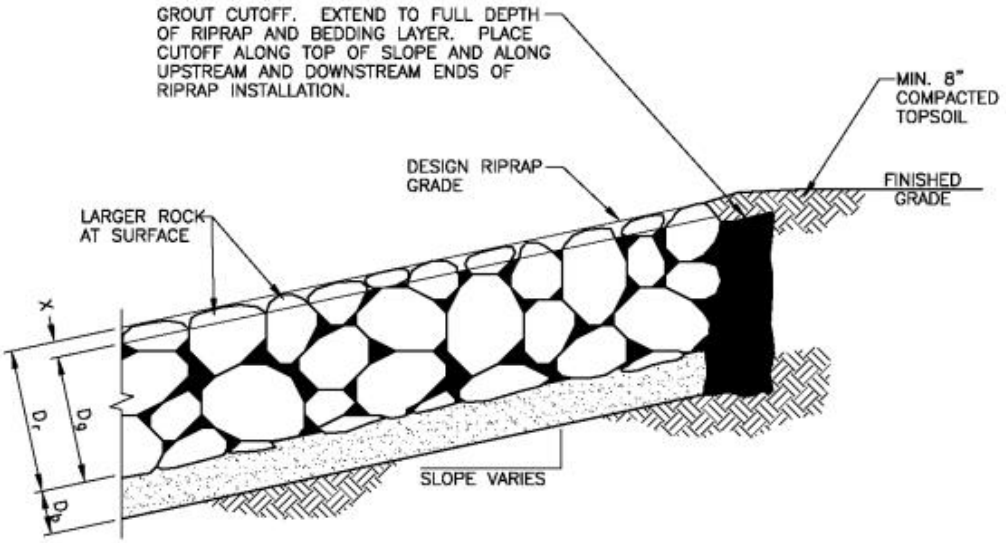


FIGURE 28.32.300(a)

STORMWATER MANAGEMENT MANUAL

TYPICAL CROSS SECTION FOR GROUTED RIPRAP LINING



LEGEND:

D_b = DEPTH OF BEDDING MATERIAL

D_g = DEPTH OF GROUT LAYER

D_r = DEPTH OF RIPRAP LAYER

X = DEPTH FROM RIPRAP SURFACE TO GROUT SURFACE

NOTES:

1. FINAL PLACEMENT OF RIPRAP TO BE APPROVED BY ENGINEER PRIOR TO GROUTING.
2. BEFORE GROUTING, CLEAN ALL DIRT AND MATERIALS FROM ROCK THAT COULD PREVENT THE GROUT FROM BONDING TO ROCK.
3. PLACE GROUT BY INJECTION METHODS AND USE A PENCIL VIBRATOR TO FILL VOIDS TO THE SPECIFIED GROUT DEPTH. CLEAN EXCESS GROUT FROM ALL EXPOSED SURFACES. PROVIDE A BROOM FINISH FOR GROUT SURFACE.
4. THE CONTRACTOR SHALL CONTROL GROUT MIX AND PLACEMENT PROCEDURES TO ACHIEVE THE SPECIFIED THICKNESS, PENETRATION AND GRADE OF THE GROUT LAYER.

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URS ENGINEERING, INC.

REFERENCE: UDFCD, 1990

FIGURE 28.32.300(b)

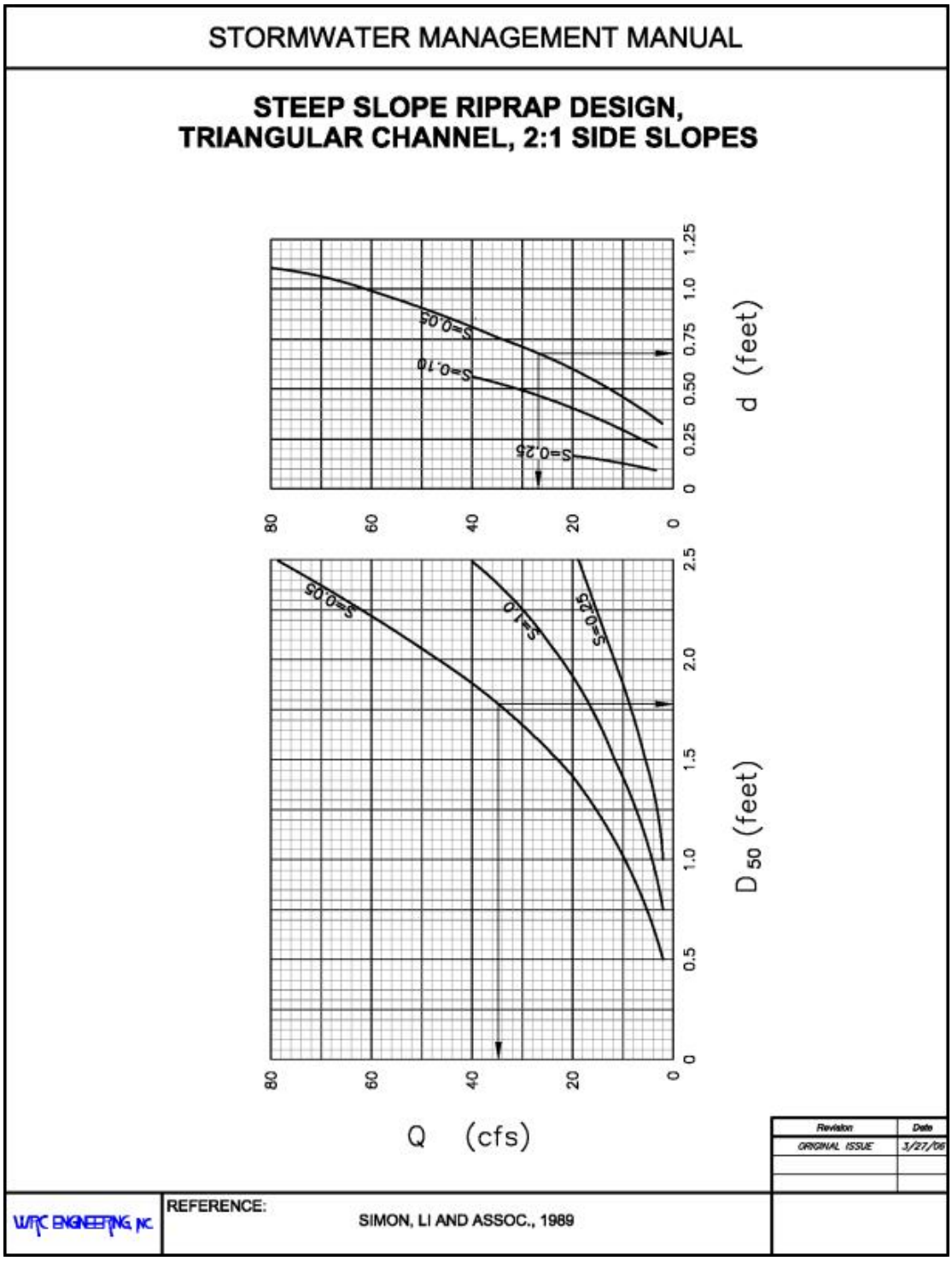


FIGURE 28.32.300(c)

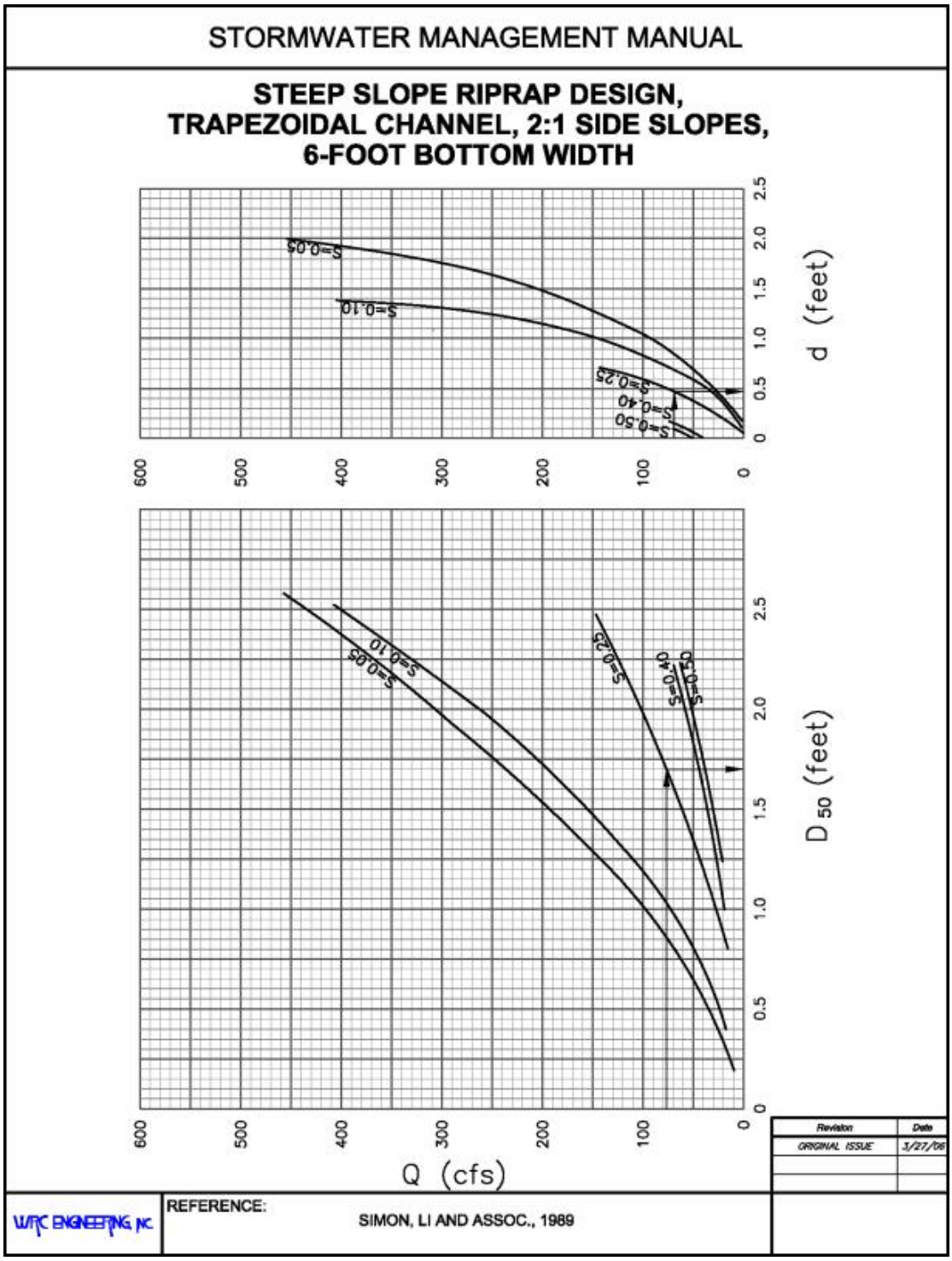


FIGURE 28.32.300(d)

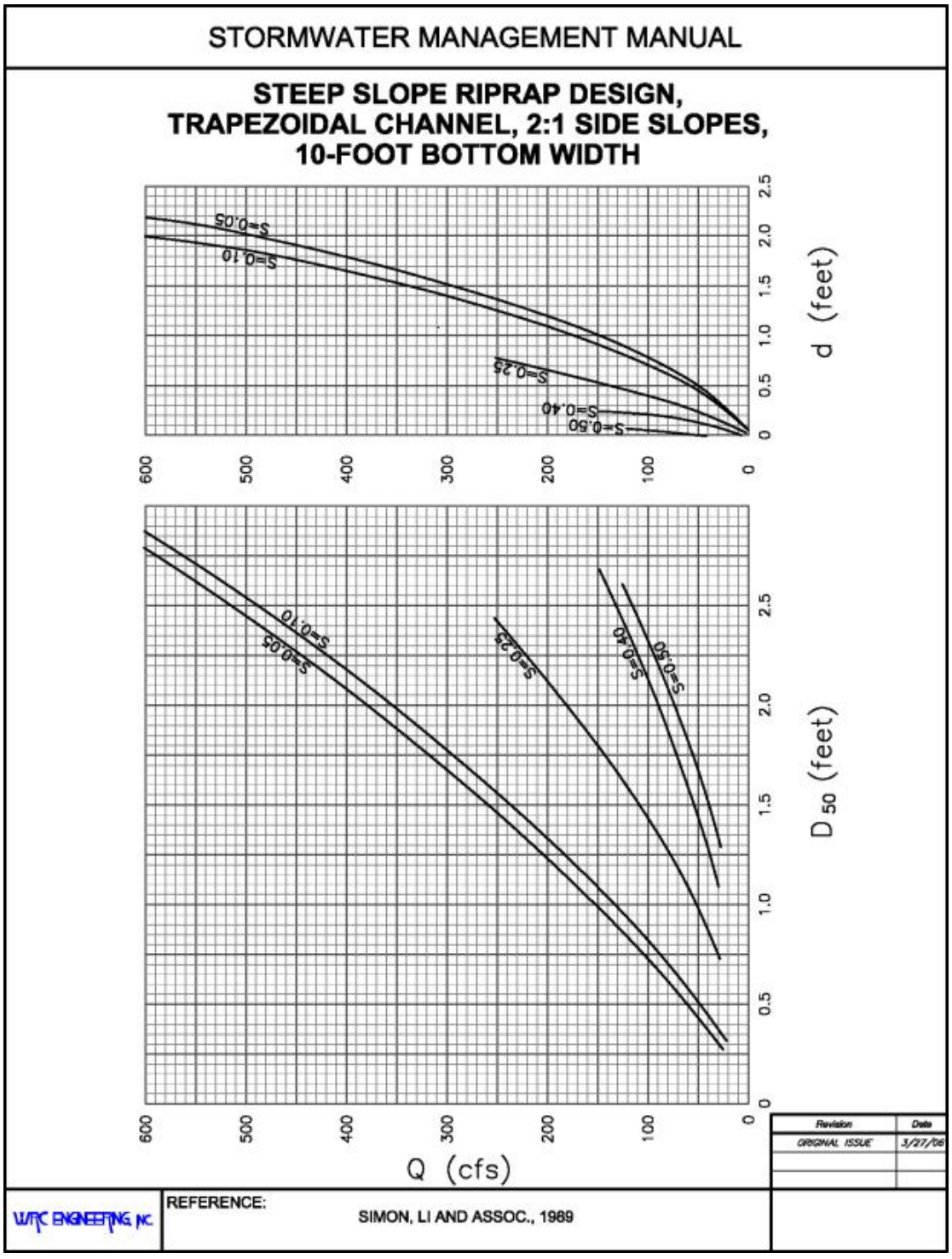


FIGURE 28.32.300(e)

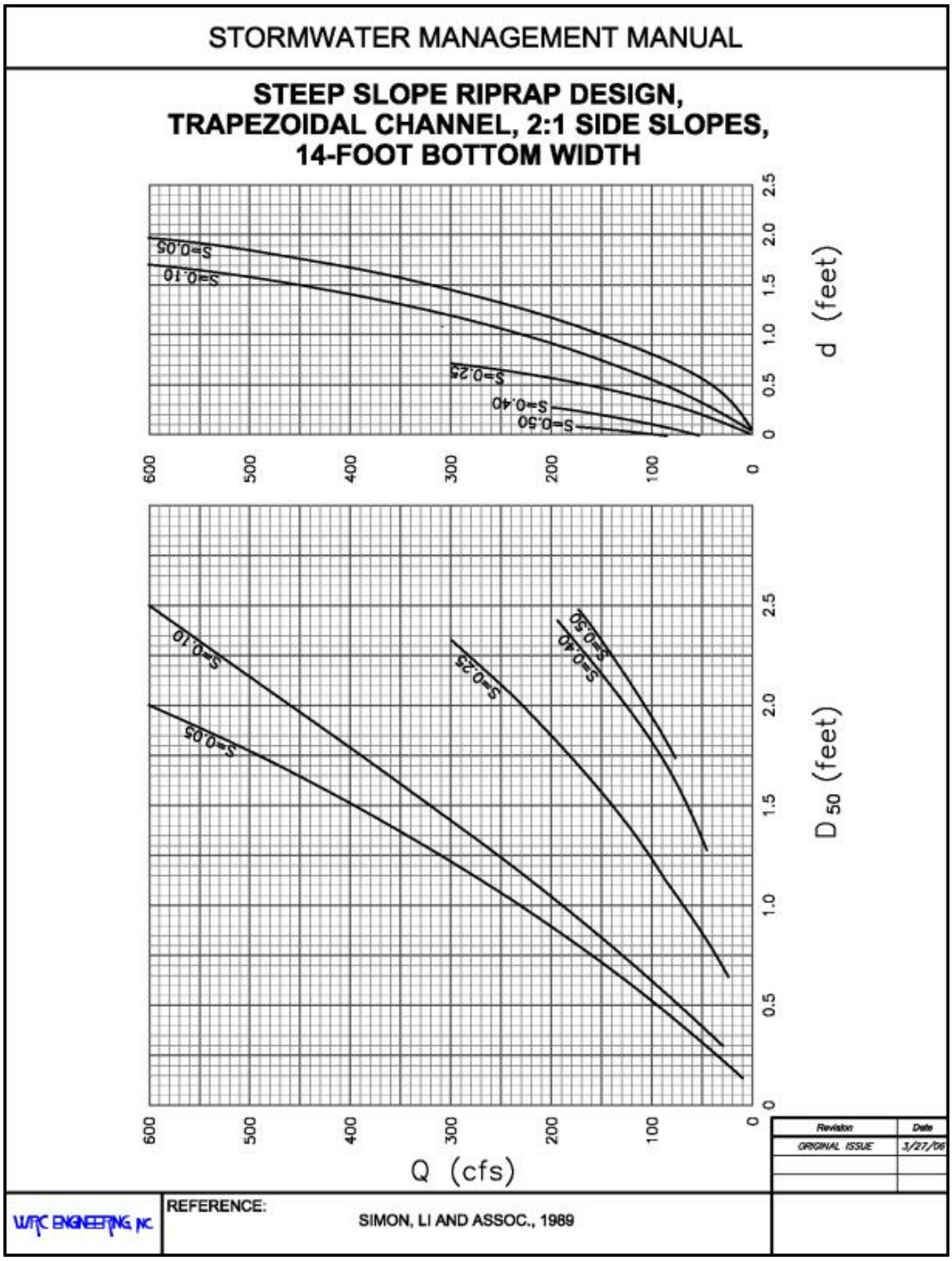


FIGURE 28.32.300(f)

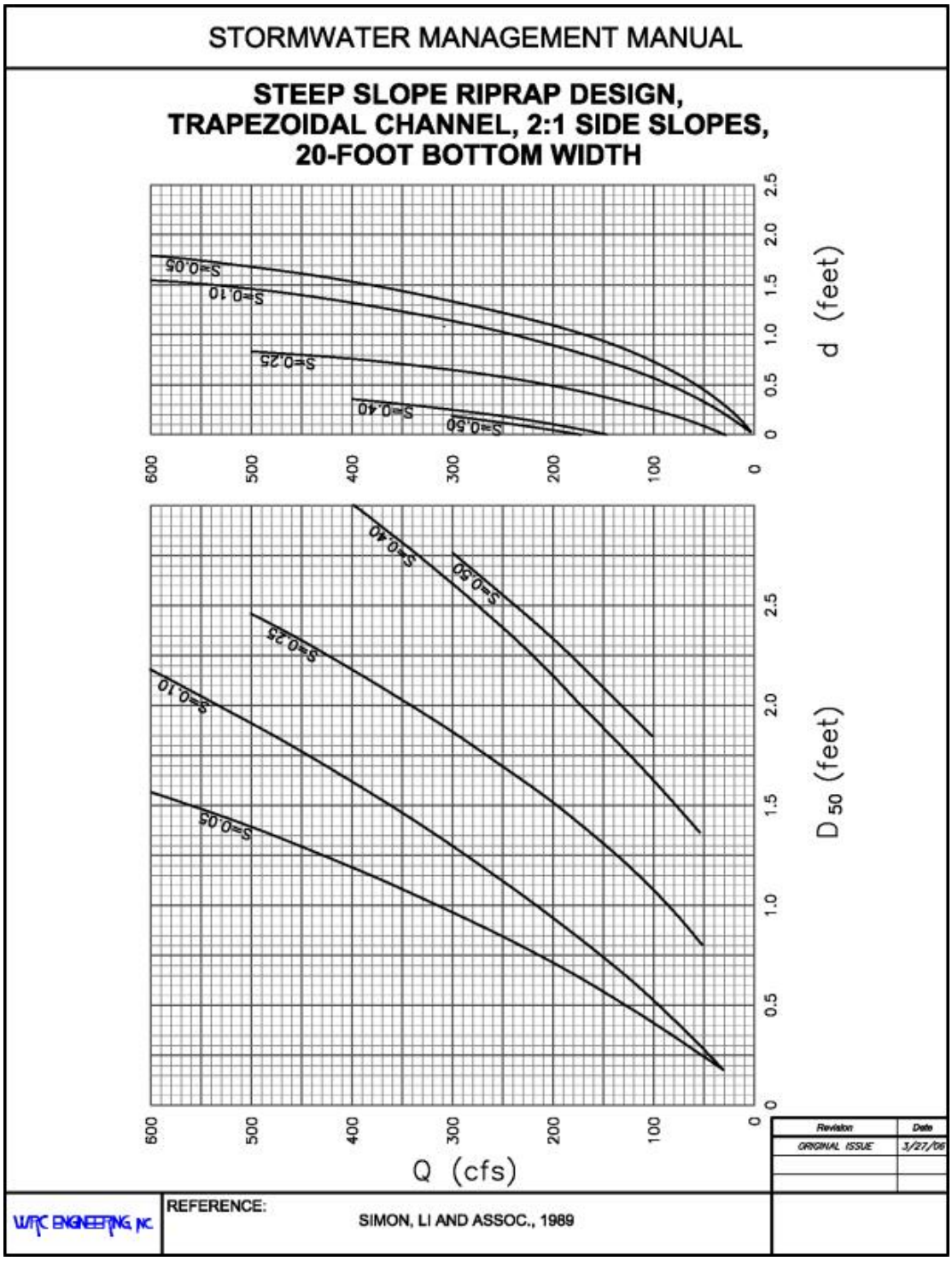


FIGURE 28.32.300(g)

(3) Riprap Thickness for Steep Slopes. For riprap linings on steep slopes, a thickness of 1.25 times the median rock size is recommended. The maximum resistance to the erosive forces of flowing water occurs when all rock is contained within the

riprap layer thickness. Oversize rocks that protrude above the riprap layer reduce channel capacity and reduce riprap stability.

(4) Riprap Placement on Steep Slopes. Improper placement is another major cause of failure in riprap-lined channels. To prevent segregation of rock sizes, riprap shall be dumped directly from trucks from the top of the embankment, and draglines with orange peel buckets, backhoes, and other power equipment to place riprap with minimal handwork.

(5) Freeboard. Figures 28.32.300(c) through 28.32.300(g) also provide the depth of flow for a given flow rate, channel slope, and channel dimensions. The minimum required freeboard is given by Equation 28.32-18 for subcritical flow or 28.32-19 for supercritical flow. The velocity can be estimated by dividing the flow rate by the area of flow.

(6) Bedding Requirements on Steep Slopes. Either a granular bedding material or filter fabric may be used on steep slopes according to the requirements previously specified in subsection (i) of this section.

(Res. 40-08 (§ 810), 3-19-08)

§ 28.32.310. Design criteria – Concrete-lined channels.

This section presents minimum design criteria for concrete-lined channels. The design engineer is responsible for confirming that a channel design meets these criteria, the general open channel criteria outlined in GJMC § 28.32.140 through 28.32.260, and any specific considerations due to project specific site requirements.

Applicable design parameters include:

(a) Longitudinal Channel Slope. Concrete-lined channels have the ability to accommodate supercritical flow conditions and thus can be constructed almost on any naturally occurring slope. The maximum slope is determined by the maximum permissible velocity shown in Table 28.32.200.

(b) Roughness Coefficients. See figures presented in Tables 28.32.040(b) through 28.32.040(d) for appropriate Manning roughness coefficient for concrete-lined channels. For subcritical flow for concrete-lined channels, check the Froude number using a Manning roughness coefficient of 0.011.

(c) Low-Flow Channel. The bottom of the concrete-lined channel shall be sloped to confine the low flows to the middle or one side of the channel. Low-flow channels are defined in GJMC § 28.32.280(c)(2).

(d) Bottom Width. The bottom width of the concrete-lined channel shall be a minimum of 4.0 feet.

(e) Flow Depth. There are no flow depth requirements for concrete-lined channels.

(f) Side Slopes. Vertical or flatter side slopes may be designed for concrete-lined channels.

(g) Concrete-Lining Section.

(1) Thickness. Concrete-lined channels shall have a minimum thickness of six inches for flow velocities less than 30 feet per second (fps). For flow velocities of 30 fps and greater, the minimum thickness shall be seven inches.

(2) Concrete Joints. The following design standards, found to work in similar conditions, are suggested. Alternatives will be considered on a case-by-case basis.

(i) Channels shall be continuously reinforced without transverse joints. Expansion/contraction joints (without continuous reinforcement) shall only be installed where the new concrete lining is connected to a rigid structure or to an existing concrete lining which is not continuously reinforced. The design of the expansion joint shall be coordinated with local officials.

(ii) Longitudinal joints, where required, shall be constructed on the sidewalls at least 1.0 foot vertically above the channel invert.

(iii) All joints shall be designed to prevent differential movement.

(iv) Construction joints are required for all cold joints and where the lining thickness changes. Reinforcement shall be continuous through the joint and the concrete-lining shall be thickened at the joint.

(3) Concrete Finish. The surface of the concrete lining shall be provided with a wood float finish unless the design requires additional finishing treatment.

Excessive working or wetting of the finish shall be avoided if additional finishing is required.

(4) Concrete Curing. It is suggested that concrete-lined channels be cured by the application of a liquid membrane-forming curing compound (white pigmented) upon completion of the concrete finish. All curing shall be completed in accordance with the standard specifications of the local government agency.

(5) Reinforcement Steel.

(i) Steel reinforcement shall be at a minimum grade 40 deformed bars. Wire mesh shall not be used.

(ii) Ratio of longitudinal steel area to concrete cross-sectional area shall be greater than 0.0905 but not less than a No. 4 rebar placed at 12-inch spacing. The longitudinal steel shall be placed on top of the transverse steel.

(iii) Ratio of transverse steel area to concrete cross-sectional area shall be greater than 0.0025 but not less than a No. 4 rebar placed at 12-inch spacing.

(iv) Reinforcing steel shall be placed near the center of the section with a minimum clear cover of three inches adjacent to the earth.

(v) Additional steel shall be added as needed. If a retaining wall structure is used, the structure shall be designed by a registered structural engineer with structural design calculations submitted for review and approval.

(6) Earthwork. As a minimum, the following areas shall be compacted to at least 90 percent of maximum density as determined by ASTM 1557 (Modified Proctor). Additional requirements may be required by the geotechnical report.

(i) The 12 inches of subgrade immediately beneath concrete lining (both channel bottom and side slopes).

(ii) Top 12 inches of maintenance road.

(iii) Top 12 inches of earth surface within 10 feet of concrete channel lip.

(iv) All fill material.

(7) Bedding. A geotechnical report shall be submitted which addresses the required bedding necessary for the specific concrete section under consideration.

(8) Underdrain and Weepholes. A transverse concrete cutoff shall be installed at the beginning and end of the concrete-lined section of channel and at a maximum spacing of 90 feet. The concrete cutoffs shall extend a minimum of 3.0 feet below the bottom of the concrete slab and across the entire width of the channel lining. Longitudinal cutoffs, a minimum of 3.0 feet in depth, at top lining are required to ensure integrity of the concrete lining.

If the channel is continuously reinforced without transverse joints then a concrete cutoff is required to be incorporated into the expansion/concrete joint.

(h) Special Consideration for Supercritical Flow. Supercritical flow in an open channel in an urbanized area creates hazards which the designer shall take into consideration. Careful attention shall be taken to ensure against excessive waves which may extend down the entire length of the channel from only minor obstructions. Imperfections at joints may rapidly cause a deterioration of the joints, in which case a complete failure of the channel can readily occur. In addition, high velocity flow entering cracks or joints creates an uplift force by the conversion of velocity head to pressure head which can damage the channel lining.

Generally, there should not be a drastic reduction in cross-section shape, and diligent care shall be taken to minimize the change in wetted area of the cross-section at bridges and culverts. Bridges and other structures crossing the channel shall be anchored satisfactorily to withstand the full dynamic load which might be imposed upon the structure in the event of major debris plugging.

The concrete lining shall be protected from hydrostatic uplift forces, which are often created by a high-water table or momentary inflow behind the lining from localized flooding. Generally, an underdrain will be required under and/or adjacent to the lining. The underdrain shall be designed to be free draining. With supercritical flows, minor downstream obstructions do not create any backwater effect. Backwater computation methods are applicable for computing the water-surface profile or the energy gradient in channels having a supercritical flow; however, the computations shall proceed in a downstream direction. The designer shall take care to ensure against the possibility of unanticipated hydraulic jumps forming in the channel.

(Res. 40-08 (§ 811), 3-19-08)

§ 28.32.320. Design criteria – Other channel linings.

Other channel linings include all channel linings that are not discussed in the previous sections. These include composite-lined channels, which are channels in which two or more different lining materials are used (i.e., riprap bottom with concrete side slope lining). They also include gabions, soil cement linings, synthetic fabric and geotextile linings, preformed block linings, reinforced soil linings, and flood walls (vertical walls constructed on both sides of an existing floodplain). The wide range of composite combinations and other lining types does not allow a discussion of all potential linings in this manual. For these linings not discussed in this manual, supporting documentation will be required to support the use of the desired lining. A guideline of some of the items which should be addressed in the supporting documentation is as follows:

(a) Structural integrity of the proposed lining.

(b) Interfacing between different linings.

(c) The maximum velocity under which the lining will remain stable.

(d) Potential erosion and scour problems.

(e) Access for operations and maintenance.

(f) Long-term durability of the product under extreme meteorological and soil conditions.

(g) Ease of repair of damaged section.

(h) Past case history (if available) of the lining system in other arid areas.

(i) Potential groundwater mitigation issues (i.e., weepholes, underdrains, etc.).

These linings will be allowed on a case-by-case basis. Mesa County and/or other jurisdictions may reject the proposed lining system in the interest of operation, maintenance, and protecting the public safety.

(Res. 40-08 (§ 812), 3-19-08)

§ 28.32.330. Design standards for minor artificial drainageways.

A minor drainageway is defined as a channel/drainageway with a contributing tributary area of less than 160 acres. Additional flexibility and less stringent standards may be allowed for minor drainageways. Only the differences in a channel type's design as a minor drainageway versus that of a major drainageway are presented in this section.

(a) Freeboard. For grass, concrete and riprap-lined swales and drainageways with a 100-year flow of equal to or less than 10 cfs, the minimum freeboard requirement is six inches.

(b) Curvature (Horizontal). For grass, wetland bottom, concrete and riprap-lined swales and drainageways, the minimum radius with a 100-year runoff of 20 cfs or less shall be 25 feet.

(c) Trickle Channel. For grass, concrete and riprap-lined swales and drainageways, with 100-year runoff peaks of 20 cfs or less, trickle channel requirements will be evaluated

for each case. Trickle channels help preserve swales crossing residential property. Factors to be considered when establishing the need for trickle channels are: drainage slope, flow velocity, soil type, and upstream impervious area.

(Res. 40-08 (§ 813), 3-19-08)

§ 28.32.340. Channel appurtenances.

Presented in this section are the design standards for appurtenances to improved channels. All improved channels shall be designed to include these appurtenances.

(a) Maintenance Access Road. A maintenance access road with a minimum passage width of 12 feet shall be provided along the entire length of all improved channels with 100-year design capacity equal to or greater than 50 cfs. For such channels with less than 50 feet in top width, one maintenance access shall be provided as part of the channel improvements. For channels with greater than 50 feet in top width, the maintenance road shall be located in or within 10 feet horizontal distance from the bottom of the channel or on both sides of the channel top.

For channels with the maintenance access road at or near the channel bottom, ramps to said road shall be provided at a maximum 10 percent slope. Said ramps shall slope down in the down gradient direction of the channel.

(b) Safety Requirements. The following safety requirements are required for concrete-lined channels. Similar safety requirements may be required for all other channels.

(1) A six-foot-high galvanized-coated chain link or comparable fence shall be installed to prevent unauthorized access. The fence shall be located at the edge of the right-of-way or on the top of the channel lining. Gates, with top latch, shall be placed at major access points or 1,320-foot intervals, whichever is less.

(2) Ladder-type steps shall be installed not more than 1,200 feet apart and shall be staggered on alternating sides of the channel to provide a ladder every 600 feet. The bottom rung shall be placed approximately 12 inches vertically above the channel invert.

(c) Culvert Outlet Protection. If the flow velocity at a culvert or storm sewer outlet exceeds the maximum permissible velocity for the local soil or channel lining, channel protection is required. This protection usually consists of an erosion resistant reach, such as riprap and stilling basin, to provide a stable reach at the outlet in which the exit velocity is reduced to a velocity allowable in the downstream channel.

The following basin sizing procedure shall be used for culvert sizes less than or equal to 36 inches in diameter or equivalent open area and outlet velocities less than 15 fps. For larger culverts or outlet velocities greater than 15 fps, the outlet protection design provided for in USDOT, 1983 shall be used.

(1) Basin Configuration. The length of the outlet protection (L_a) is determined using the following empirical relationships that were developed for the U.S. Environmental Protection Agency (USEPA, 1976):

$$L_a = \frac{1.8Q}{D_o^{3/2}} + 7D_o, \text{ for } TW < \frac{D_o}{2} \quad (28.32\text{-}28)$$

and

$$L_a = \frac{3Q}{D_o^{3/2}} + 7D_o, \text{ for } TW \geq \frac{D_o}{2} \quad (28.32\text{-}29)$$

Where:

D_o	=	Maximum inside culvert width (feet);
Q	=	Pipe discharge (cfs);
TW	=	Tailwater depth (feet)

Where there is no well defined channel downstream of the apron, the width, W, of the outlet and of the apron (as shown in Figure 28.48.150(a)) shall be as follows:

$$W = 3D_o + 0.4L_a, \text{ for } TW \geq \frac{D_o}{2} \quad (28.32\text{-}30)$$

and

$$W = 3D_o + L_a, \text{ for } TW < \frac{D_o}{2} \quad (28.32\text{-}31)$$

The width of the apron at the culvert outlet shall be at least three times the culvert width.

Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the lining shall extend at least 1.0 foot above the tailwater elevation and at least two-thirds of the vertical conduit dimension above the invert.

The apron side slopes shall be 2:1 or flatter, and the bottom grade shall be level.

(2) Rock Size. The median stone diameter, d_{50}, is determined from the following equation:

$$d_{50} = 0.02\frac{(Q)^{4/3}}{TW(D_o)} \quad (28.32\text{-}32)$$

Existing scour holes may be used where flat aprons are impractical. Figure 28.32.340(a) shows a general design of a scour hole. The stone diameter is determined using the following equations.

$$d_{50} = \frac{0.0125(Q)^{4/3}}{TW(D_o)}, \text{ for } y = \frac{D_o}{2} \quad (28.32\text{-}33)$$

Also,

$$d_{50} = \frac{0.0082(Q)^{4/3}}{TW(D_o)}, \text{ for } y = D_o \quad (28.32\text{-}34)$$

Where

y = depth of scour hole below culvert invert

The other riprap requirements are as indicated in the previous sections for channel lining.

(d) Low-Flow Grade Control Structures.

(1) Introduction. With the advent of floodplain management programs, developers and local governments frequently decided to preserve the floodplain. Since urbanization causes more frequent and sustained flows, the trickle/low-flow channel becomes more susceptible to erosion even though the overall floodplain may remain stable and able to resist major flood events.

Erosion of the low-flow channel, if left uncontrolled, can cause degradation and destabilization of the entire floodplain. Low-flow check structures are designed to provide control points and establish stable bed slopes within the base flow channel. The check structures can be small versions of the drop structures described in GJMC § 28.36.030 through 28.36.060 or in many instances simply control sills across the floodplain. Low-flow check structures are not appropriate in instances such as completely incised floodplains or very steep channels.

In addition, low-flow structures inherently permit a considerable amount of sediment to be transported downstream as urbanization takes place, which negatively impacts stormwater quality. Therefore, complete channel stabilization using drop structures in conjunction with channel bed and bank stabilization at the time of development may be required.

(2) Drop Structure Grade Control Structures. The grouted sloping boulder drop structure and the vertical riprap drop structure designs can be adapted for use as check structures. The analysis steps are the same with the additional consideration of (i) stable bed slope for the unlined trickle or low-flow channel and (ii) potential overflow erosion during submergence of the check structure and where flow converges back from the main channel sides or below the check structure.

The basic design steps for this type of structure include the following:

(i) Determine a stable slope and configuration for the low-flow zone. For unlined channels, discharges from full floodplain flow to the dominant discharge shall first be considered. The dominant discharge is more fully explained in sediment transport texts such as Simons, Li and Associates (1982).

(ii) The configuration of the low-flow zone, and number and placement of the check structures, has to be reviewed. Typically, the floodplain slope is steeper, often on the order of critical conditions. If the checks are widely spaced, the trickle channel depth can be quite deep downstream of the check, leading to concentration of higher flows into the trickle channel and the check. A good rule of thumb is to not have the trickle channel more than two feet deep at the crest of the check, or more than four feet deep below the check structure (relative to the overbank).

(iii) A hydraulic analysis shall be performed using the discharge that completely fills the check structure at its crest (the primary design flow).

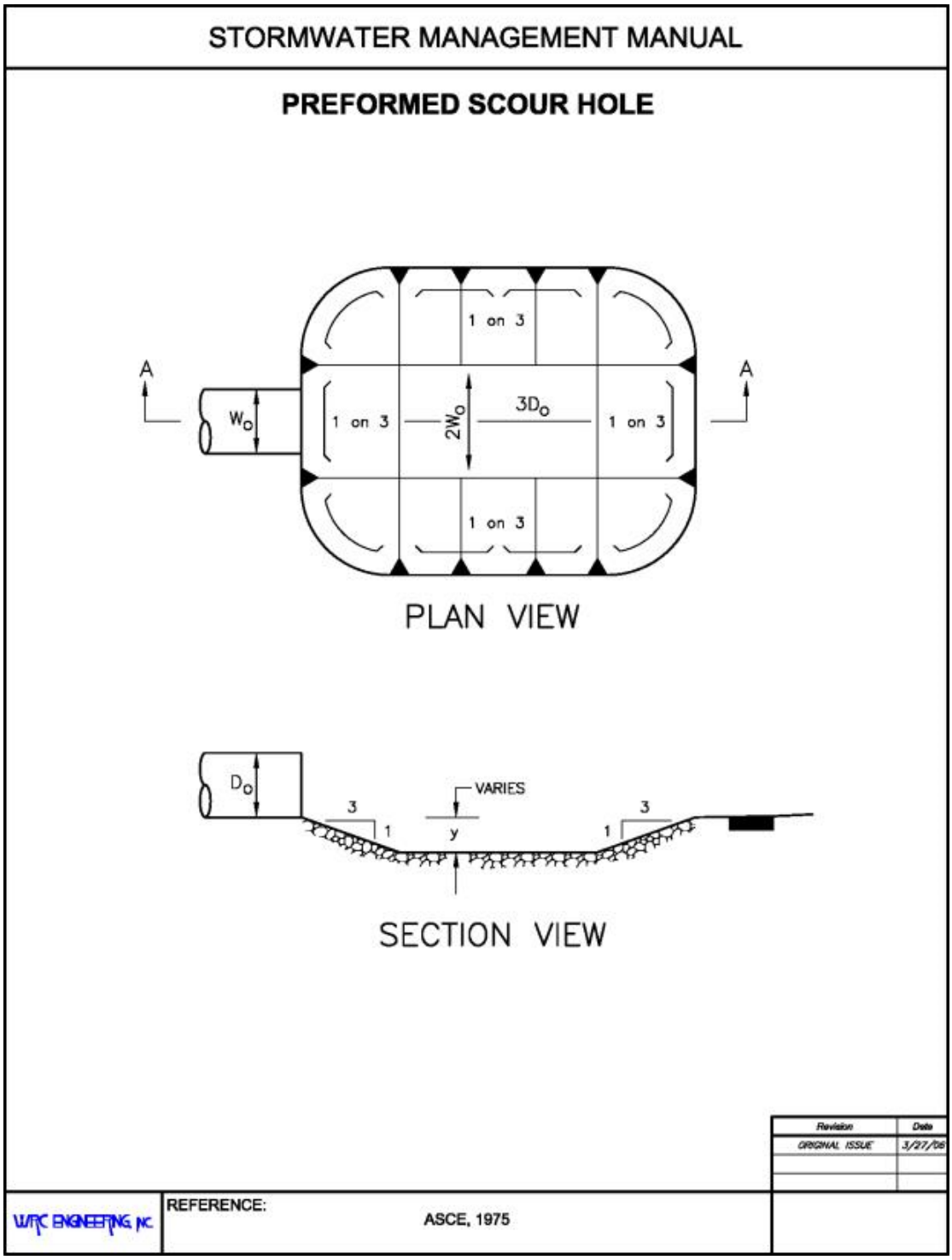


FIGURE 28.32.340(a)

(iv) The secondary design flow is that flow which causes the worst condition for lateral overflow around the abutments and back into the basin or trickle channel below. The goal is to have the check structure survive such an event with minimal or reasonable damage to the floodplain below. The best

approach is to estimate unit discharges, velocities and depths along overflow paths. The unit discharges can be estimated at the crest or critical section for the given total flow. Estimating the overflow path around the check abutment is difficult and requires practical judgment. Slopes can be derived for the anticipated overflow routes and protective measures devised such as grouted rock.

(v) Seepage control is also important, as piping and erosion through or around these structures is a frequent problem. It is advisable to provide a cutoff which extends laterally at least 5.0 to 10 feet into undisturbed bank at minimum and has cutoff depth appropriate to the profile dimensions of the check.

Additional information related to design of drop structures can be found in GJMC § 28.36.030 through 28.36.060.

(3) Control Sill Grade Control Structures. Another type of check structure that can be used to stabilize low-flow channels within wide, relatively stable floodplains is the control sill shown in Figure 28.32.340(b). The sill can be constructed by filling an excavated trench with concrete, if soil conditions are acceptable for trenching, or forming a simple wall if a trench will not work.

The sill crosses the low-flow channel and shall extend a significant distance into the adjacent floodplain on both sides. The top of the sill conforms to the top of the ground at all points along its length. Riprap or other erosion control methods can then be added as erosion occurs.

The basic design steps are:

(i) Determine a stable slope as described above.

(ii) Determine spacing of the sills based on the difference in slope between the natural and projected stable slope and the amount of future drop to be allowed (not to exceed three feet).

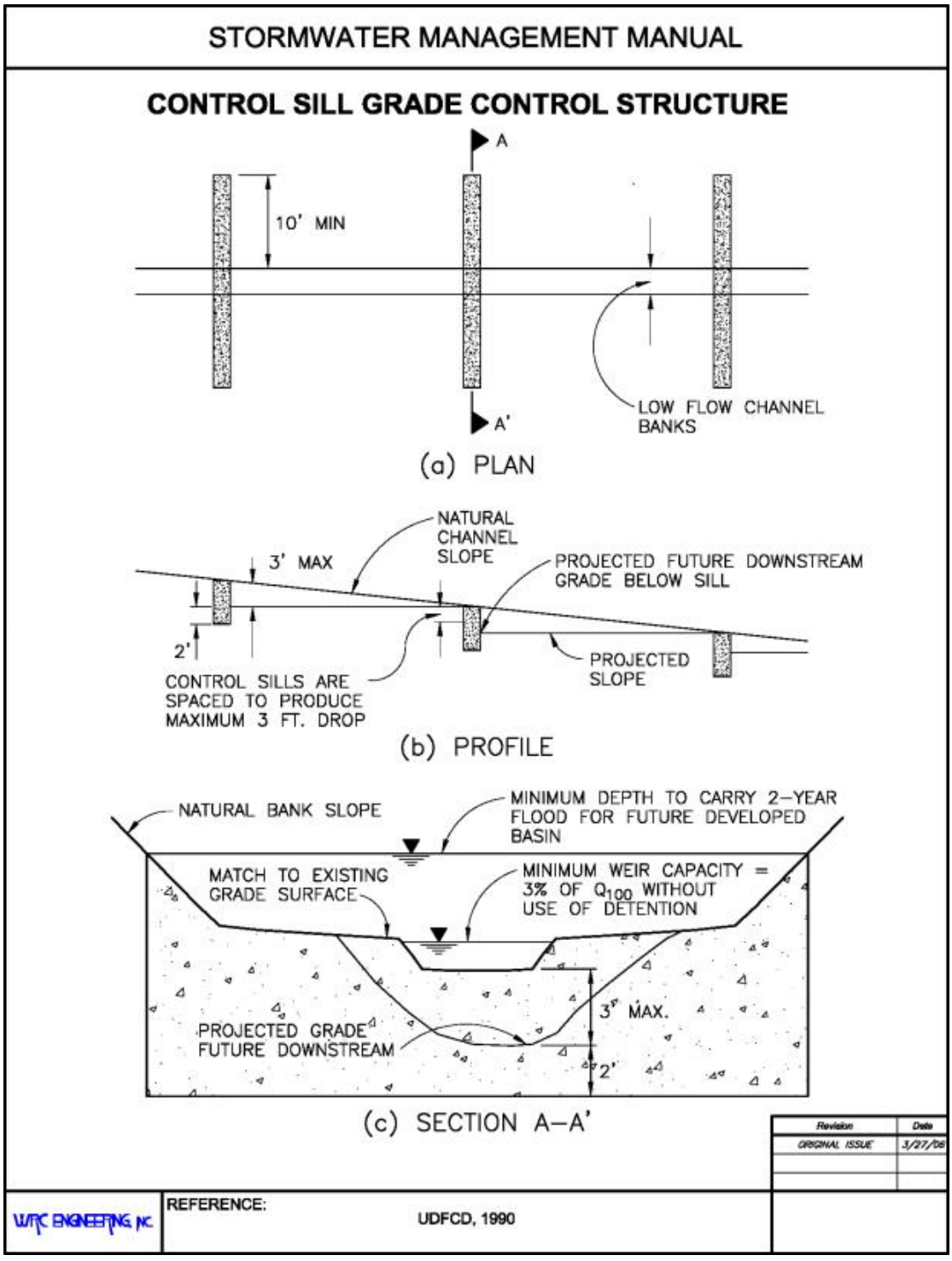


FIGURE 28.32.340(b)

(Res. 40-08 (§ 814), 3-19-08)

§ 28.32.350. Example application.

(a) An open channel is to be constructed for Doe Creek downstream of John Boulevard and north of Rose Subdivision.

Assume the following conditions for this problem.

Q_{100} = 191 cfs
Invert elevation downstream of John Boulevard = 4,918
Invert elevation downstream of Rose Subdivision = 4,917
Channel improvement length = 900 feet

Due to aesthetics and sufficient right-of-way, a grass-lined channel should be constructed.

Side slope = z = 3
Bottom width = b = 10 feet
n = 0.035 for grass-lined channel

Since the 100-year, 24-hour flow is less than 200 cfs, a trickle channel should be constructed in the proposed channel bottom.

(b) Solution.

(1) Step 1. Determine the depth of water during a 100-year flow event.

$$\text{Slope} = \frac{4{,}918 - 4{,}917}{900} = 0.0011 \text{ feet/foot}$$

The Manning equation can be rewritten so that the depth of flow, y, in a trapezoidal channel is on one side of the equation.

$$\frac{(by = zy^2)}{(b = 2y(1 = z^2)^{1/2})^{2/3}}^{5/3} = \frac{(Q)}{(S^{1/2})} \frac{(n)}{(1.49)}$$

Solving by trial and error,

Y = 3.7 feet

(2) Step 2. Calculate the water velocity in the proposed channel during a 100-year flow event using the Manning equation.

$$V = \frac{1.49}{n} S^{1/2} R^{2/3}$$

$$= \left(\frac{1.49}{0.035}\right) * (0.0011)^{1/2} * \left(\frac{(10 + 3 * 3.7) * 3.7}{10 + 2 * 3.7 * \left(1 + 3^2\right)^{1/2}}\right)^{2/3}$$

= 2.5 fps

Since the water velocity of the proposed channel (2.5 fps) is less than the maximum permissible water velocity in a grass-lined channel, a grass-lined channel can be used at this location.

(3) Step 3. Design the trickle channel.

Assume dimensions for a concrete trickle channel:

Bottom width = 5 feet
Depth = 1 foot
Side slopes = vertical

The capacity of the trickle channel is:

$$Q = \left(\frac{1.49}{n}\right)(S^{1/2})(R^{2/3})(A)$$

$$Q = \left(\frac{1.49}{n}\right)(S^{1/2})\left(\frac{by}{b+2y}\right)^{2/3}(by)$$

$$Q = \left(\frac{1.49}{0.015}\right) * (.0011)^{1/2} * ((5*1)/(5+(2*1)))^{2/3} * (5*1)$$

Q = 13.16 cfs

(4) Step 4. Verify that trickle channel has sufficient capacity.

The minimum capacity of the trickle channels is:

$$\text{Min. } QT_c = 0.05 * Q_{100}$$

$$\text{Min. } Q_c = 9.6\text{cfs}$$

Since the capacity of the proposed trickle channel (13.2 cfs) is greater than the required capacity (9.6 cfs), the proposed trickle channel is adequate.

(5) Step 5. Determine the freeboard required for the proposed channel.

$$F_b = 0.5 + \frac{V^2}{2g}$$

$$F_b = 0.5 + \frac{(.5)^2}{2 * 32.2} = 0.6 \text{ feet,}$$

but minimum = 1.0 foot.

Therefore use Fb = 1.0 foot.

(6) Step 6. The cross-section of the proposed channel is shown in Figure 28.32.350.

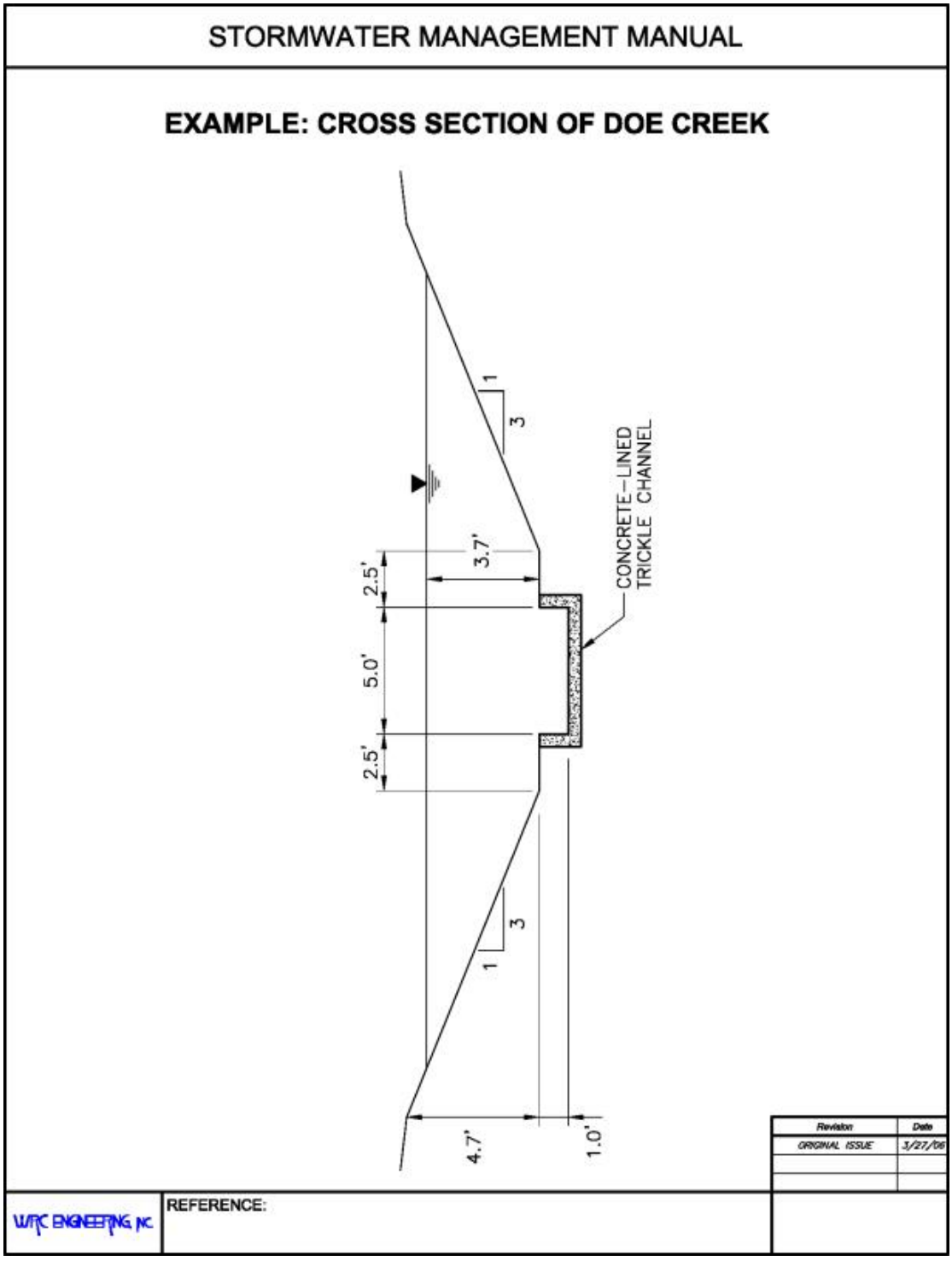


FIGURE 28.32.350

(Res. 40-08 (§ 815), 3-19-08)

Chapter 28.36
Additional Hydraulic Structures

§ 28.36.010. Introduction.

This chapter presents criteria regulating the design and construction of certain hydraulic structures commonly encountered in Mesa County at storm drain and culvert outlets as well as in open channels that are intended to convey storm runoff. Many of the structures discussed herein vary widely in physical and hydraulic parameters, and are thus presented with general design criteria only. The designer is referred to the applicable references for further detail on the hydraulic theory and design processes for these structures.

Many of the structures discussed in this chapter are highly visible and easily accessible to the general public. In some cases, these structures may attract onlookers who are unaware of the inherent dangers associated with their operation. Therefore, it is imperative that the design of such structures incorporate posted warnings, pedestrian barriers, fences, and/or other safety apparatuses. It is recommended that the designer consult with Mesa County and/or other local jurisdictions to coordinate the planning and design of the structures in this chapter.

(Res. 40-08 (§ 901), 3-19-08)

§ 28.36.020. Channel drop structures.

The design of open channels for conveyance of stormwater runoff is governed by the maximum permissible velocities for a given channel type. These velocities, presented in Chapter 28.32 GJMC, Open Channels, are primarily related to the erosive potential of nonclear stormwater flow. In some locations, such as those adjacent to schools or parks, it may be advisable to further reduce design velocities to diminish safety risks to children. Drop structures are used at locations where the use of channel lining materials is undesirable or does not sufficiently reduce design velocity in the channel (see Chapter 28.32 GJMC for the design of lined channels). A properly designed drop structure will effectively reduce the design slope in a channel segment and dissipate the energy produced by the drop without adverse erosive effects to the channel bed.

Control sill grade control structures, or low-flow check structures, are used for velocity and grade control in wide, relatively stable floodplains and wetland areas. These structures are addressed in GJMC § 28.32.340(d)(3).

The first three structures addressed in this section are typically selected for drops of 5.0 feet or less, but may be used in series (stepped drops). The vertical riprap drop structure (hard drop basin) is limited to 3.0 feet per drop for safety reasons. For larger single drops, the straight drop spillway, the baffled apron, or one of the structures found in GJMC § 28.36.070 through 28.36.100 may be employed.

(Res. 40-08 (§ 902), 3-19-08)

§ 28.36.030. Grouted sloping boulder (GSB) drop structure.

The GSB drop structure has recently become one of the most commonly installed drop structures in both new construction and channel retrofit situations. Relatively good hydraulic

effectiveness and generally pleasing aesthetics likely contribute to this trend. However, the local availability of rock that meets the size and quality requirements for this structure weighs heavily on the economic viability of GSB drops. Much of the design data presented herein is attributed to the *Urban Drainage Criteria Manual* for the Denver-area UDFCD.

The excess energy created by the invert drop is dissipated in two ways in a GSB structure. The additional channel roughness of the grouted boulders themselves is secondary in energy dissipation to the hydraulic jump formed in the drop basin downstream. However, improper design or construction of the grouted boulders, including faulty rock or grout selection and placement, may result in sweepout of the hydraulic jump due to excessive velocity in the drop basin.

The GSB structure is intended for use only in grass-lined channels with upstream velocities within the limits set forth in Chapter 28.32 GJMC. With some variation in design (as outlined in this chapter), GSB structures may be used with channels containing or not containing a trickle channel or a low-flow channel.

Plans, profiles, sections, and details of typical GSB structures are found in Figures 28.36.030(a), 28.36.030(b), 28.36.030(c), 28.36.030(d), 28.36.030(e), and 28.36.030(f). Design of these structures involves five components: Rock and grout, upstream channel and approach apron, the drop face, the drop basin, and the exit apron. Seepage concerns are addressed in the design of the approach apron and associated cutoff wall.

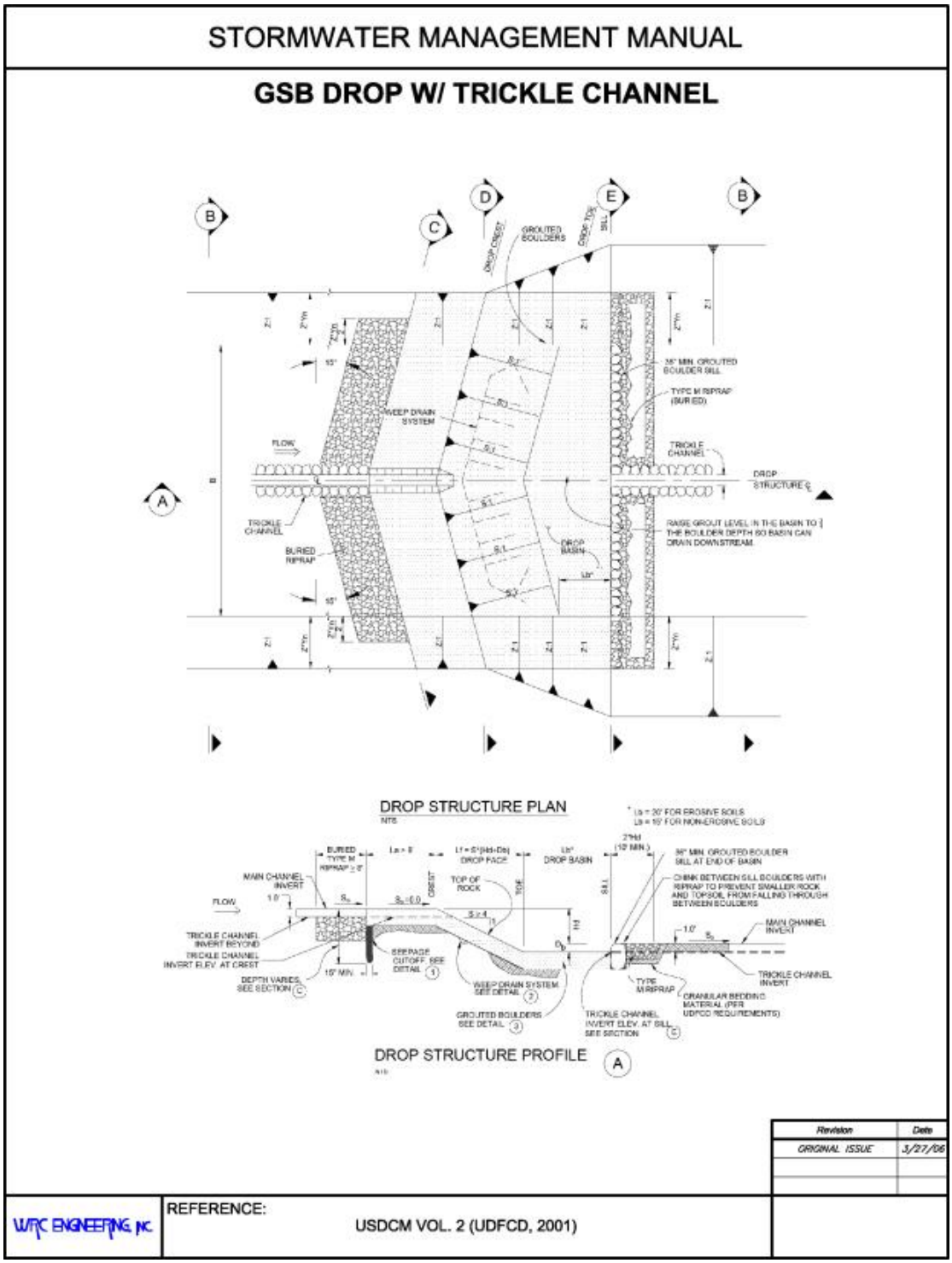


Figure 28.36.030(a)

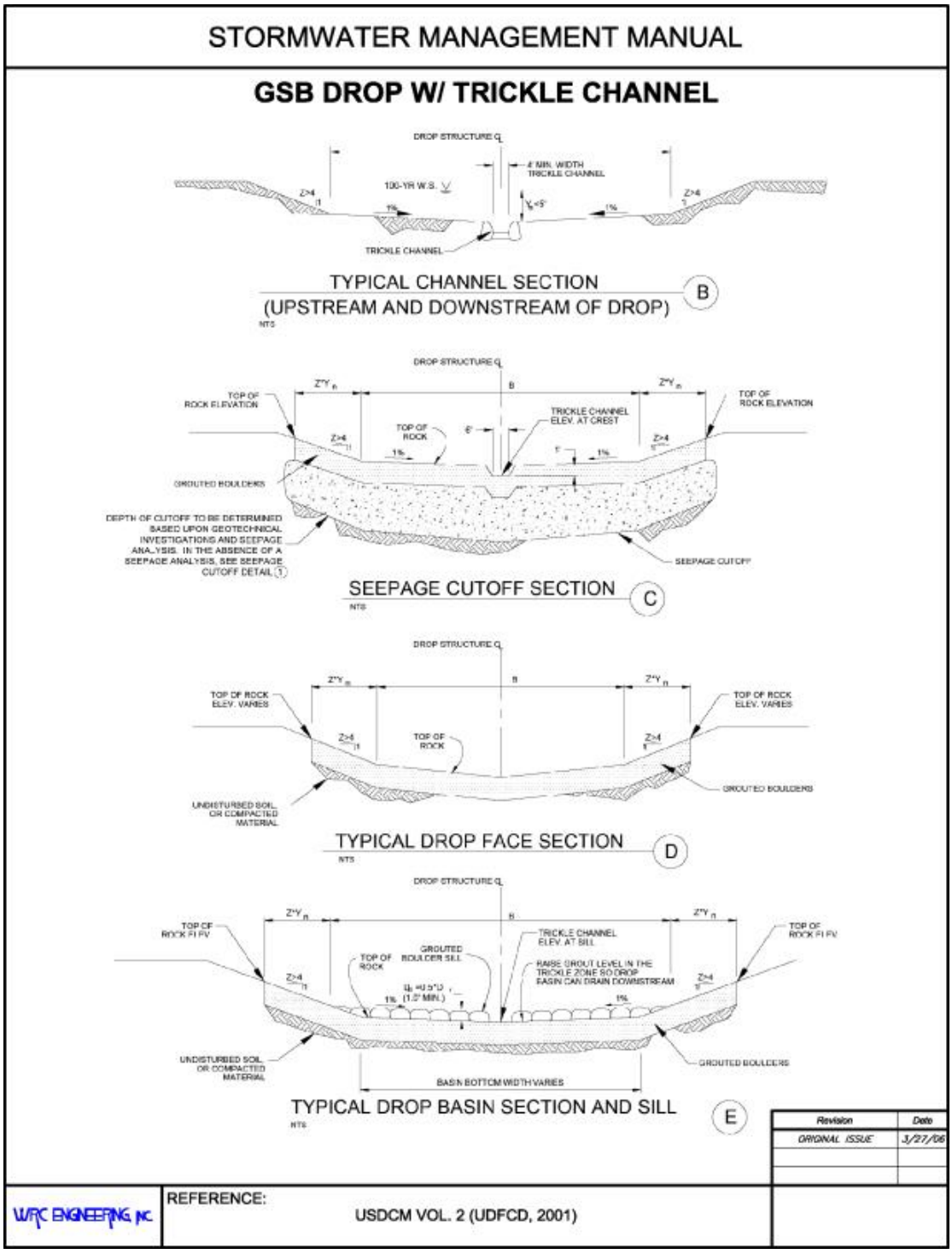


FIGURE 28.36.030(b)

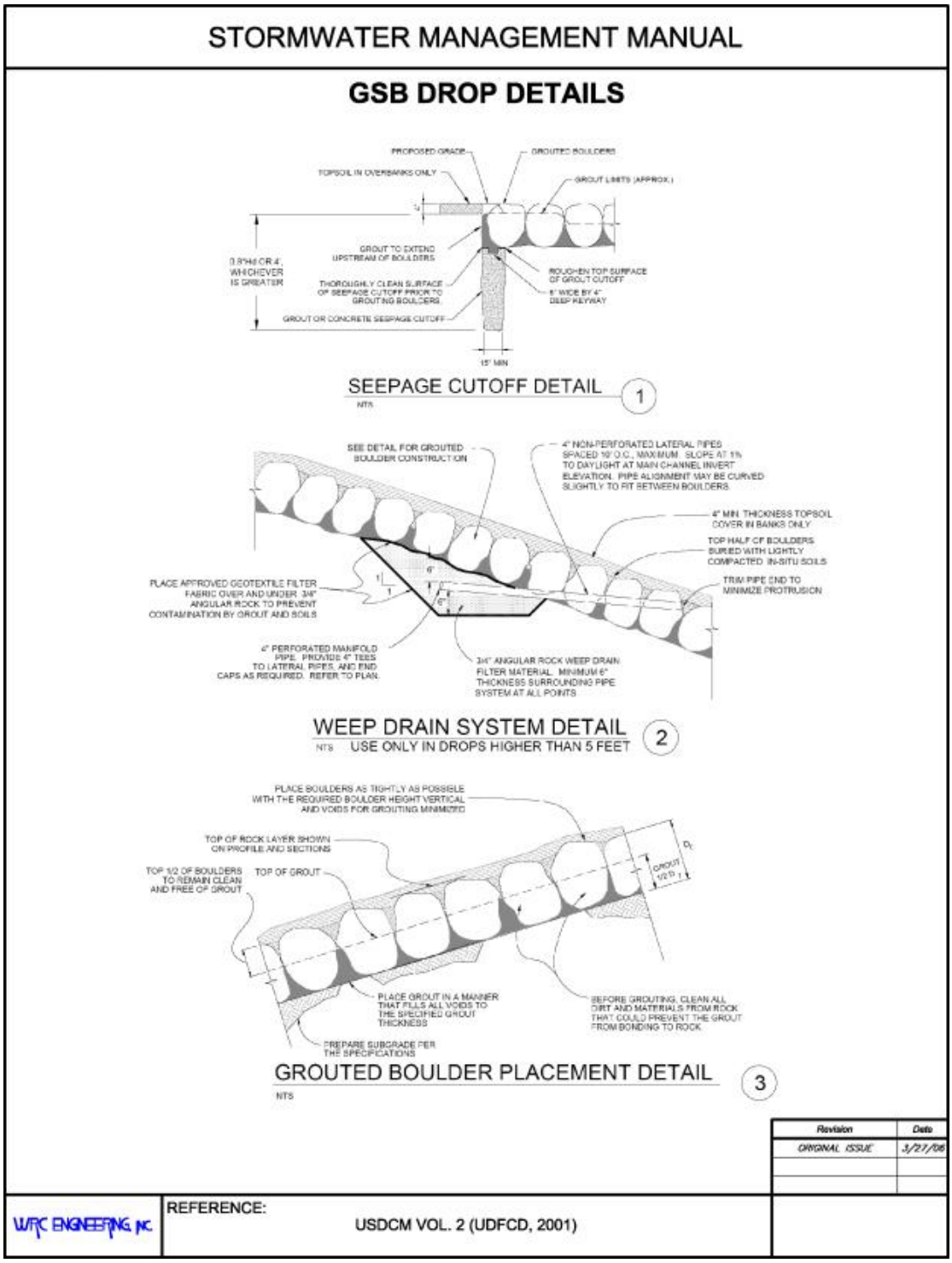
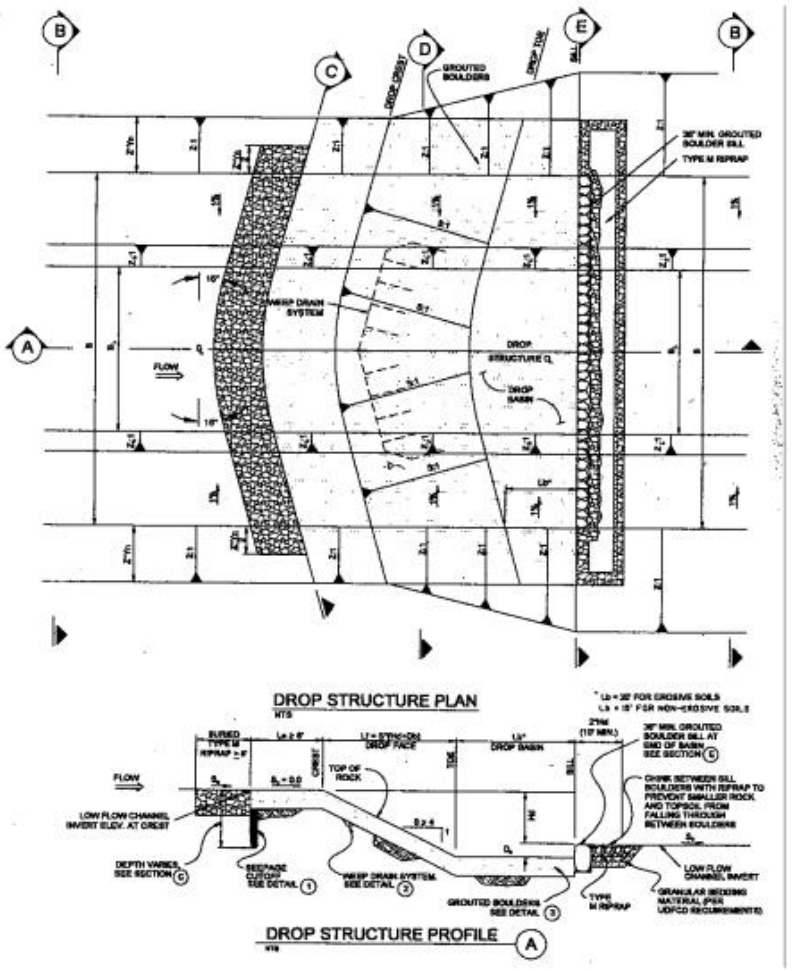


FIGURE 28.36.030(c)

STORMWATER MANAGEMENT MANUAL

GSB DROP W/ LOW-FLOW CHANNEL



Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING, INC.

REFERENCE: USDCM VOL. 2 (UDFCD, 2001)

FIGURE 28.36.030(d)

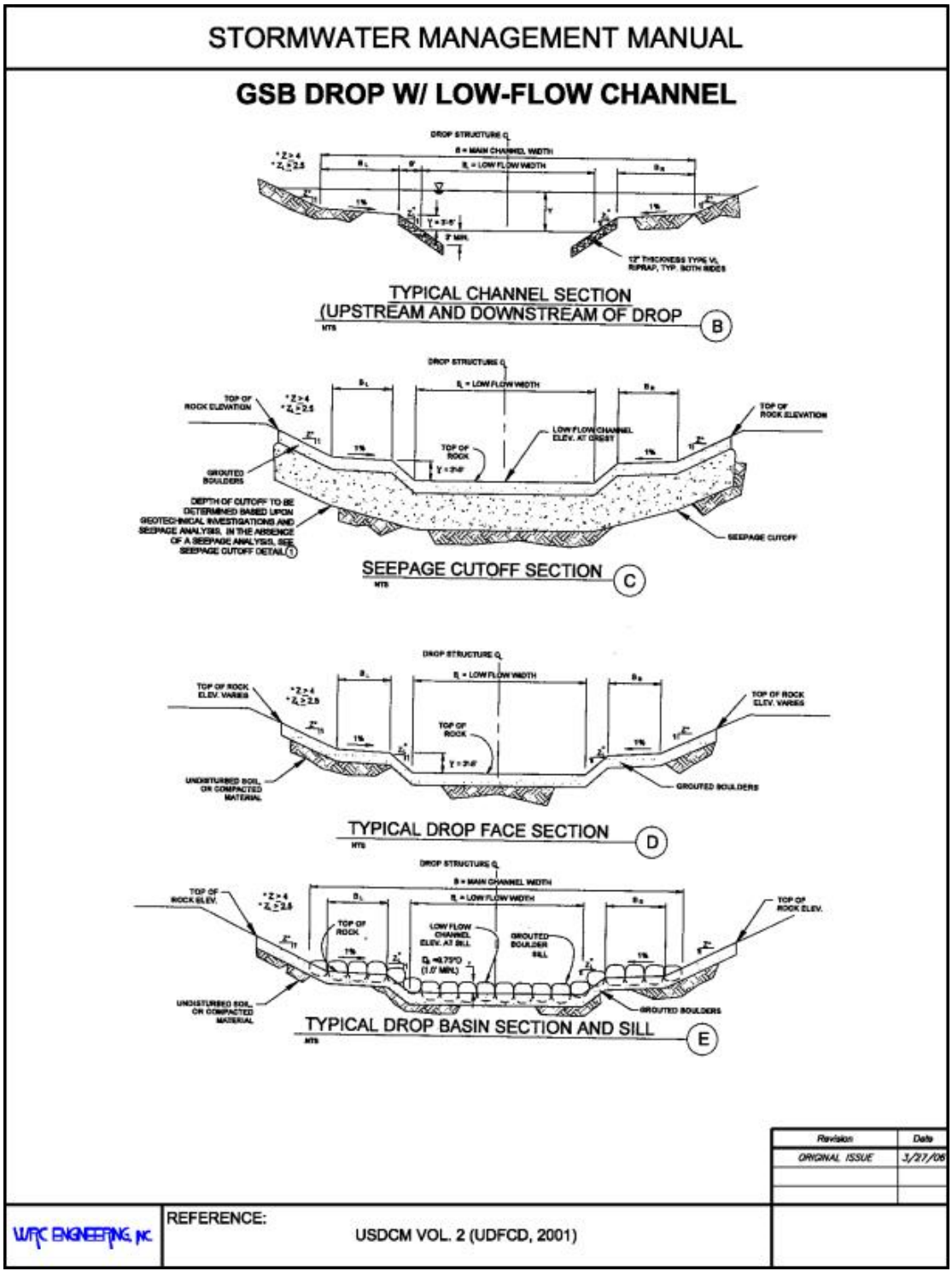


FIGURE 28.36.030(e)

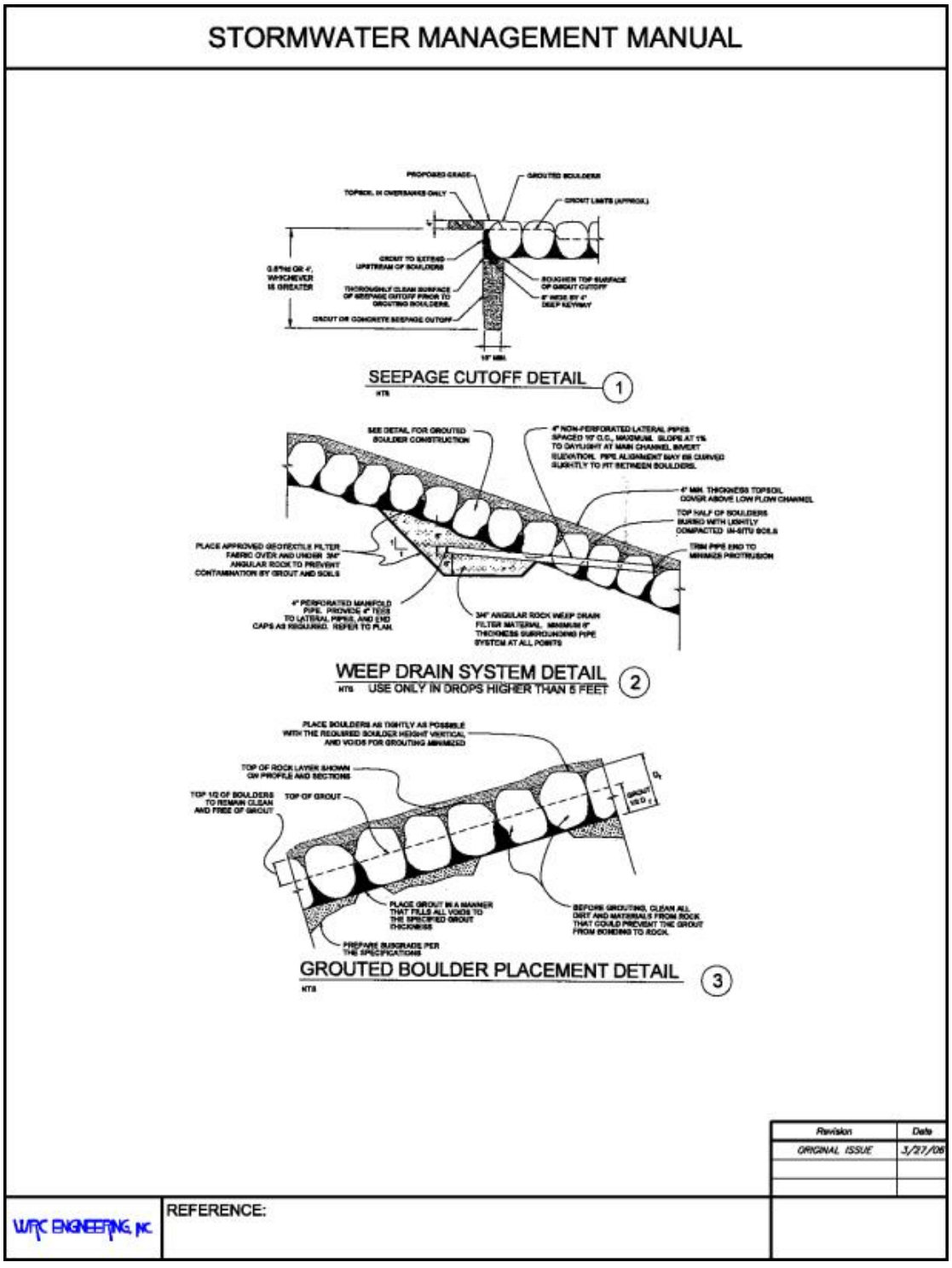


FIGURE 28.36.030(f)

(a) Rock and Grout. Grouted boulders must be placed upstream of, and along, the crest of the drop, in the drop face and basin, and along the sill at the end of the basin.

Boulder sizing is based upon the critical velocity, V_{c1}, in the channel upstream from the drop structure. If a trickle channel or low-flow channel is present, the maximum critical velocity of that channel and the main channel is used to find the rock-sizing parameter:

$$R_p = \frac{V_{c1} S^{0.17}}{(G_{s,rock} - 1)^{0.66}} \quad (28.36\text{-}1)$$

Where:

R_p = Rock-Sizing Parameter
V_{c1} = Maximum Upstream Critical Velocity (fps)
S = Longitudinal Slope (ft./ft.)
$G_{s,rock}$ = Specific Gravity of Rock = 2.55 unless otherwise certified by quarry

This parameter is used in Table 28.36.030(a) to find minimum boulder dimension, D_r.

Table 28.36.030(a): Grouted Sloping Boulder (GSB) Drop Structure Rock Sizing

Rock Sizing Parameter, R_p	Minimum Boulder Dimension, D_r
Less than 4.50	18 inches
4.50 to 4.99	24 inches
5.00 to 5.59	30 inches
5.60 to 6.39	36 inches
6.40 to 6.99	42 inches
7.00 to 7.50	48 inches

Adapted from *USDCM* (UDFCD) Table HS-5

Note that standard riprap rock gradation is not utilized in GSB structures. Instead, the boulders are placed in one layer directly on the graded and compacted subgrade (compaction per GJMC § 28.32.310(g)(6)), as close together as is possible, and in such a manner so as not to adversely disturb the subgrade. The flattest surface of each boulder shall be oriented upward and shall be as horizontal as possible. The boulders shall be cleaned with water before grouting to improve grout-rock adherence. The boulders shall be placed by such methods that are less likely to cause breakage or significant blemishes and shall be checked for significant cracking before grouting. Damaged boulders shall be replaced before grouting.

Grout is used to fill the voids between the boulders from the subgrade to one-half of the boulder height from the subgrade. In the drop basin only, this is increased to three-

quarters of the boulder height from the subgrade to promote draining. Excessive grouting leads to a reduction in hydraulic capacity and energy dissipation, and may endanger the structural stability of the drop. Selection, mixing, placement, and finishing of grout shall comply with the specifications set forth in Table 28.36.030.

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GROUTING CRITERIA

GROUT NOTES

Material Specifications

1. All grout shall have a minimum 28-day compressive strength equal to 3200 psi.
2. One cubic yard of grout shall have a minimum of six (6) sacks of Type II Portland cement.
3. A maximum of 25% Type F Fly Ash may be substituted for the Portland cement.
4. For Type A grout, the aggregate shall be comprised of 70% natural sand (fines) and 30% $^{3}/_{8}$ -inch rock (coarse).
5. For Type B grout, the aggregate shall be comprised of $^{3}/_{4}$ -inch maximum gravel, structural concrete aggregate.
6. Type B grout shall be used in streams with significant perennial flows.
7. The grout slump shall be 4-inches to 6-inches.
8. Air entrainment shall be 5.5%-7.5%.
9. To control shrinkage and cracking, 1.5 pounds of Fibermesh, or equivalent, shall be used per cubic yard of grout.
10. Color additive in required amounts shall be used when so specified by contract.

Placement Specifications

1. All Type A grout shall be delivered by means of a low pressure (less than 10 psi) grout pump using a 2-inch diameter nozzle.
2. All Type B grout shall be delivered by means of a low pressure (less than 10 psi) concrete pump using a 3-inch diameter nozzle
3. Full depth penetration of the grout into the boulder voids shall be achieved by injecting grout starting with the nozzle near the bottom and raising it as grout fills, while vibrating grout into place using a pencil vibrator.
4. After grout placement, exposed boulder faces shall be cleaned with a wet broom.
5. All grout between boulders shall be treated with a broom finish.
6. All finished grout surfaces shall be sprayed with a clear liquid membrane curing compound as specified in ASTM C-309.
7. Special procedures shall be required for grout placement when the air temperatures are less than 40°F or greater than 90°F. Contractor shall obtain prior approval from the design engineer of the procedures to be used for protecting the grout.
8. Clean Boulders by brushing and washing before grouting.

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WRC ENGINEERING, INC.

REFERENCE: USDCM VOL. 2 (UDFCD, 2001)

TABLE 28.36.030

(b) Upstream Channel and Approach Apron. Grouted boulders shall be placed on grade with the upstream channel for a minimum of 8.0 feet upstream from the drop crest (this shall be referenced as the "approach apron"). Buried riprap shall be installed from the upstream end of the approach apron to a point at least 8.0 feet upstream along the channel flowline. The riprap shall be D_{50} = 12 inches (UDFCD Type M) and shall be installed per the criteria described in GJMC § 28.32.300. The grouted boulder approach apron shall be continuous across the width of the channel (except as described in the following paragraph) and up each bank to the elevation of the normal depth for the design flow at that location. The buried riprap shall be installed across the channel bottom and up each bank to the elevation of one-half the normal depth for the design flow at that location.

For grass-lined channels with a concrete or rock-lined trickle channel (see GJMC § 28.32.280(c)(1)), the approach apron and upstream riprap protection are discontinuous across the channel cross-section to allow the trickle channel flowline to continue unimpeded to the drop crest (see Figure 28.36.030(a)). While this is necessary to retain the effectiveness of the trickle channel in conveying base or nuisance flows, it tends to create a concentrated jet at the location of the trickle channel during higher flow periods. The additional energy introduced to the basin in these cases may be partially dissipated by the installation of large boulders or baffles in the trickle channel and/or a meandering trickle channel through the drop basin itself. These options are not shown in the GSB details (Figures28.36.030(a), 28.36.030(b), 28.36.030(c), 28.36.030(d), 28.36.030(e) and 28.36.030(f)), but are similar to the trickle channel/drop basin controls used for the vertical riprap drop structure (see Figure 28.36.030(g)).

Grouted rock is particularly susceptible to failure from undermining and the subsequent loss of the supporting bank material. (HEC-11) This refers to the high potential for seepage and piping under and around the drop structure. Since the GSB structure is rigid and essentially monolithic, seepage under the grouted boulders and the resultant transport of subgrade particles will eventually lead to structural failure. Therefore, a seepage cutoff section is required as shown in Figures 28.36.030(a), 28.36.030(b), 28.36.030(c), 28.36.030(d), 28.36.030(e) and 28.36.030(f). As noted in the details, the dimensions of the vertical cutoff shall be determined based on geotechnical investigations and seepage analysis or shall comply with the minimum cutoff criteria set forth in the appropriate figures. The seepage cutoff shall be installed prior to the placement of the grouted boulders at the drop crest, and shall include a keyway for the grout/cutoff interface as shown in the details.

(c) Drop Face. The drop face shall consist of grouted boulder "steps" of vertical dimension no greater than one-half of the minimum boulder dimension, D_r, from Table 28.36.030(a). The overall drop face slope must not exceed 4H:1V; flatter slopes are permissible and encouraged due to improved aesthetics and energy dissipation. Slopes steeper than 4H:1V may reduce structural stability.

The grouted boulders are continuous across the entire bottom width on the drop face – the trickle channel flowline equals the main channel flowline in the drop section. The grouted boulders also continue up each bank to the elevation equivalent to the downstream channel normal depth (sequent subcritical depth) plus freeboard or the channel critical depth plus 1.0 foot, whichever is greater.

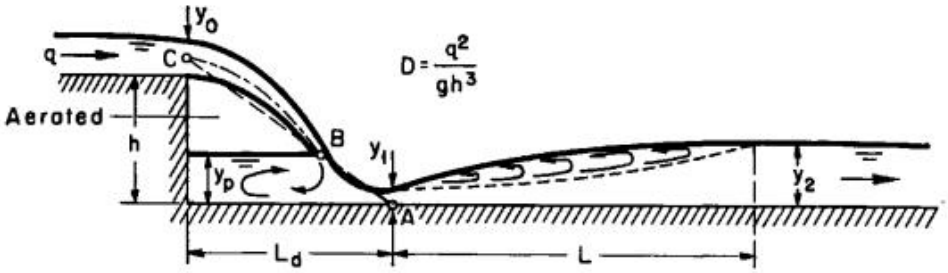
A weep drain system shall be installed behind the drop face to relieve hydrostatic pressure in drops exceeding 5.0 vertical feet. See details in Figures 28.36.030(a), 28.36.030(b), 28.36.030(c), 28.36.030(d), 28.36.030(e) and 28.36.030(f).

(d) Drop Basin. The basin area shall be constructed of continuous grouted boulders of the same dimensions as the drop face section (boulder size, crest and basin width, height of bank protection). However, the grout level is increased to three-quarters of the boulder height in the basin, and shall be sloped to drain to the centerline of the channel (or trickle channel if applicable).

The basin is depressed below the downstream channel invert by 2.0 feet for drops of 5.0 feet or less. This helps to stabilize the hydraulic jump. For drops exceeding 5.0 feet, a sequential depth analysis is necessary to determine basin depression depth (a minimum of 2.0 feet applies). Sequential depth analysis is not presented in this title; refer to a hydraulics text such as *Open-Channel Hydraulics* (Chow, 1959) for explanation.

STORMWATER MANAGEMENT MANUAL

VERTICAL RIPRAP DROP STRUCTURE (HARD DROP BASIN)
(DIMENSIONAL DEFINITIONS)



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WRC ENGINEERING, INC.

REFERENCE: OPEN-CHANNEL HYDRAULICS (CHOW, 1959)

FIGURE 28.36.030(g)

Basin length shall be a minimum of 15 feet for nonflexible downstream channel lining (concrete, grouted riprap, geosynthetic linings) and a minimum of 20 feet for downstream channels with flexible linings. A row of 36-inch or larger grouted boulders shall be placed at the downstream end of the basin. The top of this sill shall be equal to

the invert of the downstream channel. For channels with a concrete or rock-lined trickle channel, there shall be a break in the end sill of width equal to that of the trickle channel. The trickle channel shall continue downstream through the sill and exit apron with scour protection as specified in Chapter 28.32 GJMC.

(e) Exit Apron and Downstream Channel. The exit apron shall consist of buried riprap of size D_{50} = 12 inches (UDFCD Type M) and shall be installed per the criteria described in GJMC § 28.32.300. The riprap shall extend across the channel (except in the trickle channel as applicable) and up the banks to an elevation equal to the top of the adjacent grouted boulders. This riprap protection shall extend downstream from the end sill a minimum distance of twice the drop height or 10 feet, whichever is greater.

(Res. 40-08 (§ 902.1), 3-19-08)

§ 28.36.040. Vertical riprap drop structure (vertical hard drop basin).

This type of drop structure consists of an approach apron (grouted rock), a vertical concrete crest wall, a jump basin with end sill (grouted rock or concrete), and downstream channel scour protection. While an effective method for drop design, these structures shall be avoided if possible in areas of significant public use or in highly visible locations due to safety concerns and low aesthetic appeal. Vertical drop structures shall be avoided in channel reaches which may be utilized for boating or other recreation activities in or adjacent to the water. The maximum allowable drop for a vertical drop structure of this type shall be 3.0 feet.

(a) Rock and Grout. Rock used upstream of the crest wall shall have a minimum dimension of 12 inches in any direction. Rock used downstream of the drop shall have a minimum dimension of 18 inches in any direction. Grouting requirements are identical to those presented in GJMC § 28.36.030 for the GSB drop structure.

(b) Approach Apron. A grouted rock apron shall be installed across the entire bottom width (including trickle and low-flow channels) and up each bank to the elevation equal to upstream channel normal depth plus 1.0 foot. The rock shall be buried to a depth such that the top of the grout is equal to the invert of the upstream channel at every point across the channel. This approach apron shall extend upstream from the crest wall a minimum of 10 feet.

(c) Vertical Crest Wall. The concrete crest wall conforms to the upstream inverts for the trickle or low-flow channel and the main channel across the bottom width. The wall shall extend a minimum of 5.0 feet into the undisturbed banks. However, all design dimensions including minimum structural width, wall thickness, footer size and geometry, and reinforcement shall be determined using accepted structural analysis methods and determination of potential creep, heave, buoyancy and uplift due to seepage pressures, and all other considerations associated with the design of a retaining wall.

An impervious backfill material is recommended both upstream and downstream adjacent to the crest wall and footers to act as a horizontal seepage cutoff. In lieu of this material, other appliances may be employed to ensure minimized seepage around/ under the crest wall. Piping, the transport of structural supporting material away from its intended location, is a common cause of structure instability and failure.

(d) Basin. The basin is a depressed, hard-surface area which redirects the plunging flow from the crest horizontally. At lower flows, the energy dissipated by this redirection may be sufficient to return the flow to a subcritical state. However, the primary energy dissipation method for this structure is a hydraulic jump formed in the basin. When the upstream channel is composite (utilizing a trickle or low-flow channel), the approach velocity tends to be higher in the smaller sub-channel zone than in the main channel zone. Therefore, for the design flow, the basin length and downstream protection requirements may differ for the two zones. By placing large boulders (60 percent to 80 percent of critical depth in height) between the location of nappe impingement on the basin floor and a point at least 10 feet from the end sill, the required basin length for the sub-channel zone may be reduced to that of the main channel zone. Otherwise, the following calculations must be applied to both zones independently.

The drop will be treated hydraulically as a straight-drop spillway and analyzed per Chow's (1959) method:

A "drop number," D_N, must first be calculated in order to relate other associated lengths and depths:

$$D_N = \frac{q^2}{gh^3} \quad (28.36\text{-}2)$$

Where:

q	=	Discharge per Unit Width for the Subject Zone (cfs/ft.)
g	=	Gravitational Constant = 32.2 ft.^{2}/s
h	=	Effective Height of Drop (ft.)

Note that the effective drop height must include the basin depression depth. Using the drop number, the following relationships can be solved:

$$\frac{L_d}{h} = 4.30 \cdot D_N^{0.27} \quad (28.36\text{-}3)$$

$$\frac{y_p}{h} = 1.00 \cdot D_N^{0.22} \quad (28.36\text{-}4)$$

$$\frac{y_1}{h} = 0.54 \cdot D_N^{0.425} \quad (28.36\text{-}5)$$

$$\frac{y_2}{h} = 1.66 \cdot D_N^{0.27} \quad (28.36\text{-}6)$$

Where:

L_d = Drop Length (ft.)
y_p = Pool Depth Under Nappe (ft.)
y_1 = Depth Upstream of the Hydraulic Jump (ft.)
y_2 = Subcritical Sequent Depth (ft.)

See Figure 28.36.030(g) for illustration of these variables. These values assume that atmospheric pressure is maintained under the nappe, thus the designer is responsible for incorporation of aeration devices as necessary. Drop length, L_d, refers to the horizontal distance from the crest wall to the location of depth y_1, upstream of the hydraulic jump.

The basin design length, for the subject zone, is given by Equation 28.36-7:

$$L_b = L_d + D_j + 0.60 \cdot L_j \quad (28.36\text{-}7)$$

Where:

L_b = Basin Design Length (ft.)
D_j = Distance from Location of Depth y_1 to Jump (ft.)
L_j = Length of Jump $\cong 6 \cdot y_2$

The distance from the point of nappe impingement on the basin floor to the upstream end of the hydraulic jump is determined by a water surface profile analysis as presented in most hydraulic design texts.

Basin depression depth below the downstream channel invert is determined by comparing the subcritical sequent depth, y_2, with the tailwater depth in the downstream channel, y_{TW}. If y_2 exceeds y_{TW}, the jump will be swept downstream and possibly out of the basin. This situation is to be avoided since significant erosion may take place if the jump occurs in an unarmored location in the channel. If y_{TW} exceeds y_2, the jump is pushed upstream toward the wall, potentially submerging jump. Hydraulically, this is not problematic, but the structural design of the crest wall may be affected by the additional forces. Basin depression effectively adds to the tailwater depth in the downstream channel, controlling the location of jump formation. Therefore, the minimum basin depression depth, B, is the maximum of the following:

$$B = y_2 - y_{TW}$$
or
$$B = 1.5 \text{ ft} \quad (28.36\text{-}8)$$

This is the height of the end sill and downstream invert above the downstream end of the depressed basin. The end sill shall be constructed of reinforced concrete or grouted boulders of a minimum 36-inch dimension. This acts as a protected transition back to the channel invert.

(e) Downstream Channel Protection. The channel directly downstream from the end sill shall be protected for a minimum of 10 feet in the direction of flow with buried riprap of size D_{50} = 12 inches (UDFCD Type M) or grouted rock with a minimum dimension of 12 inches.

In cases where the sub-channel zone basin length is longer than the main channel zone (no additional boulders or baffles placed in the basin to dissipate the center jet), the additional protection shall extend a lateral distance equal to the bottom width of the trickle channel from each edge of the trickle channel. This results in an extended protection zone with a width equal to three times the trickle channel bottom width.

(Res. 40-08 (§ 902.2), 3-19-08)

§ 28.36.050. Straight drop spillway.

The straight drop spillway is very similar hydraulically to the vertical hard drop basin presented in GJMC § 28.36.040. The primary difference exists in the shaping of the spillway downstream from the crest to closely resemble the shape of the lower nappe, i.e., the bottom of the jet formed by the flow suddenly departing the crest. This results in a "classic" spillway shape, as used for major reservoir spillways and channel drops alike. The straight drop spillway itself is not a significant energy dissipation structure, and must be paired with an induced hydraulic jump basin as presented in GJMC § 28.36.090.

The shape of a straight drop spillway is dependent on the shape of the nappe, which varies with head over the crest and the shape of the approach to the spillway. The reader is referred to *Open-Channel Hydraulics* (Chow, 1959), *Hydraulic Design of Spillways* (USACOE, 1992), or other texts for design of these structures.

Figure 28.36.050 shows a typical straight drop spillway configuration.

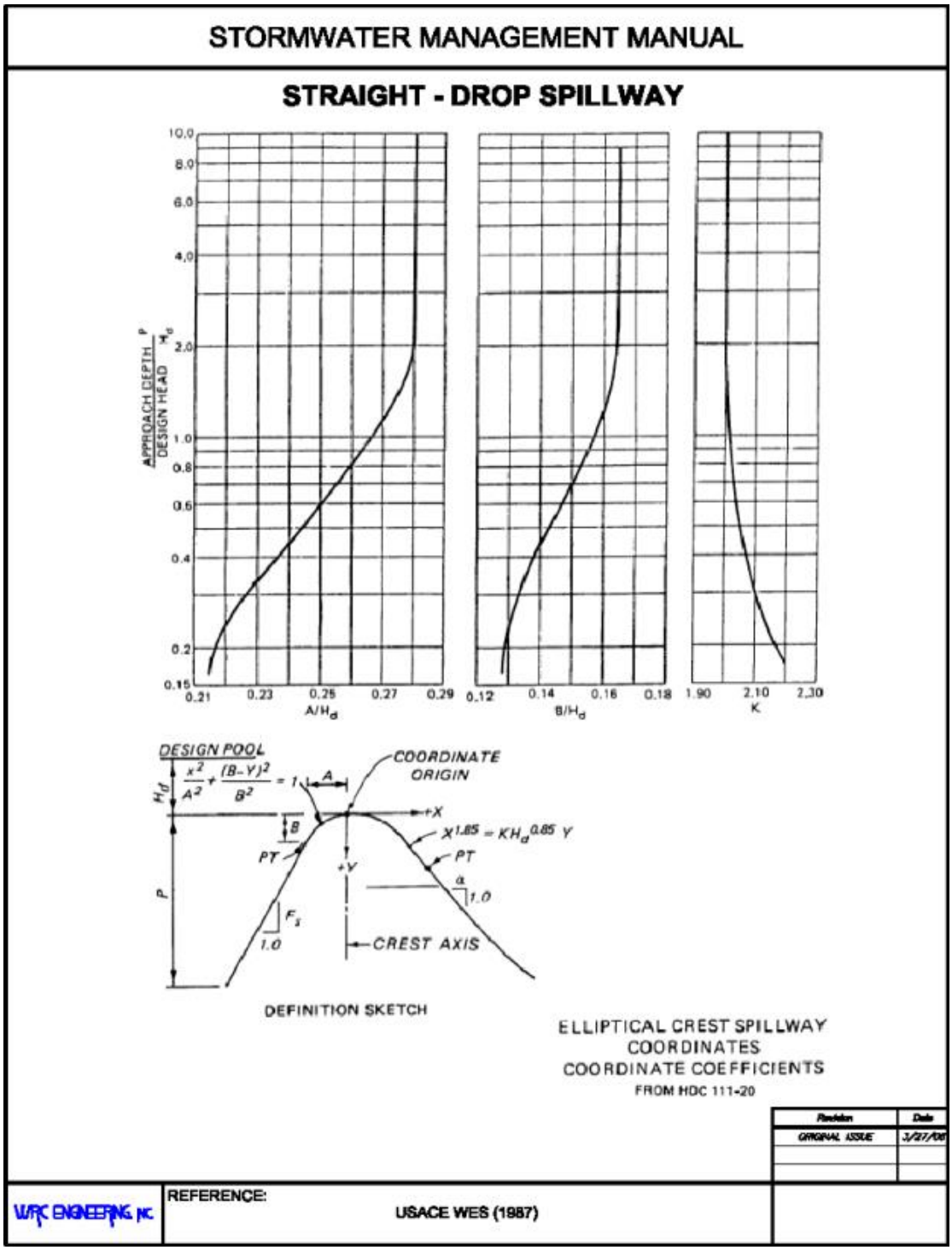


FIGURE 28.36.050

(Res. 40-08 (§ 902.3), 3-19-08)

§ 28.36.060. Baffled aprons (USBR Type IX, baffle chute drop).

The fixed costs associated with the construction of a baffled apron structure (hereafter referred to as a baffle chute drop) typically limit their use to larger drops from an economic standpoint, although the actual minimum size is limited to that length required to incorporate the minimum number of baffle rows. These drop structures are most effective at unit discharge rates between 35 and 60 cfs per foot. However, a value in this range can often be attained by altering the width of the chute. Most often, transition walls are employed to direct wider upstream channel flow to a narrower chute, decreasing the cost of the drop structure. When designed and built correctly, these structures are effective and last for many years with minimal maintenance requirements.

While the baffle chute drop can pass most sediment and debris, larger debris may become caught behind the baffles or in the narrowed chute, disabling the structure's ability to dissipate energy. This can lead to an effectively higher invert in the chute and overtopping, and can also allow the nearly unimpeded flow in the chute to exit the structure at erosive velocities. Therefore, debris-control structures are recommended upstream of the drop, and regular inspection and maintenance may be necessary.

The baffle chute drop structure does not rely on the formation of a hydraulic jump as its primary energy dissipation process. Instead, excess energy in the chute flow is dissipated by redirection over and around baffle blocks, which are arranged in offset rows to avoid the passing of high-velocity jets between the blocks. Since a hydraulic jump is not part of the design, there are no tailwater requirements for this structure. However, potential scour due to relatively high velocities at the end of the chute and in the downstream transition section necessitate a protected exit apron and/or scour hole.

Figure 28.36.060 presents an isometric view of a baffle chute drop with typical dimensional requirements. Note that this figure does not indicate structural requirements such as concrete thickness or reinforcement, footer depths and dimensions, or seepage control. These factors shall be assessed and approved by qualified professionals.

(a) Upstream Channel Transition. Typically, the design width of the baffle chute drop is less than the upstream channel width for economic and sizing reasons as well as to attain unit discharge rates in the desired range. The headwalls and/or wingwalls associated with this transition are subject to design constraints set forth in this manual and shall be designed using proper structural analysis techniques. The designer should note that the effective width of a conduit or channel is often considerably smaller than the physical width due to the separation of flow from the abutment/conduit interface.

The approach section downstream from the transition is designed to maintain an approach velocity of less than the critical velocity at the crest. Recommended approach velocities are presented in Figure 28.36.060. The concrete flow alignment apron, reaching from the abutment/conduit interface to the chute crest, shall be a minimum of 5.0 feet in length and shall be equal to the chute in width along its entire length. In certain cases, the transition section may not sufficiently reduce the specific energy of the flow to achieve the proper approach (alignment) apron velocity. In these situations, the crest may be raised by up to 12 inches above the approach apron invert.

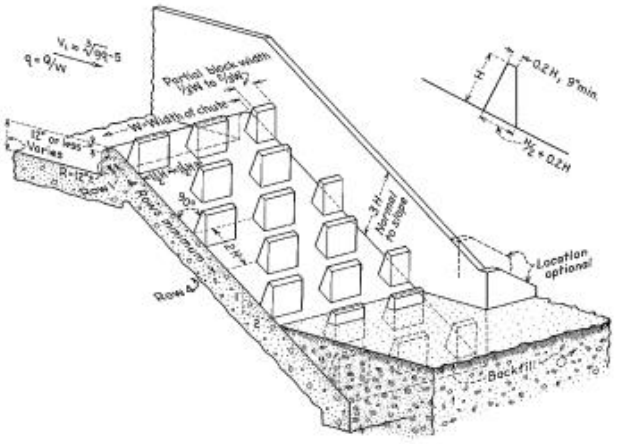
If a trickle channel is present in the upstream channel, it shall continue through the transition section and apron, and shall maintain a continuous flowline through any raised crest.

Transition and apron wall heights are determined by backwater analysis at peak flow, with a freeboard equal to or greater than that of the upstream channel.

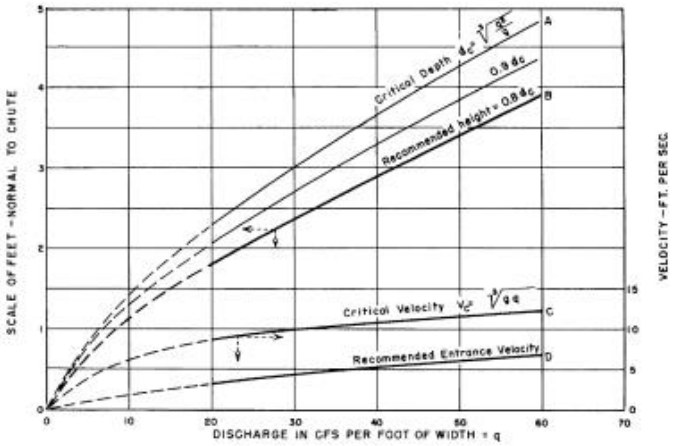
(b) Baffled Chute. The chute floor, walls, and baffles shall be constructed of reinforced concrete and shall be structurally designed to withstand all geotechnical, hydrostatic, and hydrodynamic (impact and frictional) forces imposed by the specific site conditions, including a reasonably conservative factor of safety for all loading. The chute floor shall have a slope no steeper than 2H:1V (Z:1, $Z_{MAX} = 2$). The chute walls shall be vertical and shall be tied to the floor, upstream wall or abutments, and downstream abutments with properly sized and installed steel reinforcement.

STORMWATER MANAGEMENT MANUAL

BAFFLED APRON



(A) USBR ISOMETRIC



(B) DESIGN CRITERIA

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WRC ENGINEERING INC.

REFERENCE: USDCM VOL 2 (UDFCD/USBR, 2001)

FIGURE 28.36.060

The baffle blocks shall be reinforced concrete of the dimensions shown in Figure 28.36.060. Baffle blocks shall be adequately reinforced and tied with steel reinforcement to the chute floor. A key-in interface is recommended to stabilize the

blocks on the chute floor. The block height normal to the chute floor is defined in Equation 28.36-9:

$$H = 0.8y_c \quad (28.36\text{-}9)$$

Where:

H	=	Block Height Normal to Chute Floor
y_c	=	Critical Depth at Peak Flow

There shall be at least four rows of baffle blocks. Baffle block rows shall be spaced at $Z \cdot H$ along the direction of flow, and shall be staggered such that jets of water not directly impinging on a baffle block within a two-row distance are minimized. The blocks and the spaces between the blocks shall be equal to 1.5H except where the width is limited by the chute wall. All baffle rows shall be symmetrical along the centerline of the chute. When a trickle channel exists, the top row of baffles shall be aligned such that the maximum percentage of the trickle channel flow width is not impingent upon any baffles in the first row.

Chute walls shall be at least 3H in height normal to the chute floor. Other dimensional requirements may be found in Figure 28.36.030.

Where a hard-surface exit apron is not employed, at least 1.5 rows of baffles shall be buried in riprap. This allows for the exposure of additional baffle blocks as loose rock is displaced to form a scour hole or to adapt to a lower downstream channel invert.

Downstream transition walls (headwalls and/or wingwalls) shall be of a height equal to the design normal depth in the downstream channel plus 1.0 foot of freeboard. They shall extend from the chute walls at an angle of 45 to 90 degrees for a distance necessary to contain any eddies that may form in this area.

(c) Basin/Exit Apron. There exist two primary design options for the basin downstream from the baffle chute. The first, a hard-surface basin, is used if the invert of the downstream channel is expected to remain approximately constant over the life of the drop structure. This basin is constructed of either reinforced concrete tied to the downstream end of the chute floor or grouted rock, the latter of which further dissipates energy in the flow and protects the downstream channel from excessive degradation.

Even more energy dissipation is often achieved with the installation of a preformed or nonpreformed scour hole at the chute exit. The former is a riprap-lined depressed basin that approximately imitates the dimensions of the scour hole that would form if loose rock was placed as backfill. The riprap and basin sizing requirements are found in GJMC § 28.32.340(c) and Figure 28.32.340(a). The designer may substitute the downstream design flow normal depth for D_o in the relevant equations and figures. W_o is equal to the width of the chute for the purpose of this design.

A nonpreformed scour hole is constructed by backfilling up to the existing downstream channel invert with loose rock. The loose rock shall be at least 2.0 feet deep and shall extend a minimum of 4H feet horizontally parallel to the chute. The rock backfill area shall be of such a width to reach the ends of the downstream abutment walls. Rock size is based on the riprap selection criteria set forth in Chapter 28.32 GJMC. Placement of the rock must not damage the buried baffle blocks. With sufficient operation time, the

force of the flow from the baffle chute will displace the loose rock in such a way so as to form a stable scour hole.

The scour hole options, especially the latter, tend to adapt somewhat automatically to changing conditions in the downstream channel, including a gradually lowered invert elevation. However, it is still recommended that a protective channel lining be installed in the downstream channel for an appropriate distance to allow flow to return to a nearly steady state.

(Res. 40-08 (§ 902.4), 3-19-08)

§ 28.36.070. Energy dissipation structures.

(a) The structures described in this section are similar in many ways to the channel drop structures of GJMC § 28.36.020 through 28.36.060. However, while the drop structures' primary purpose is to allow a channel to quickly change elevation without excessively increasing the specific energy of the flow in the downstream channel, these structures are designed to dissipate excess energy already present in the upstream channel. These energy dissipation structures are often employed at transitions from nonflexible channels or conduits to channels with flexible linings or other velocity restrictions. This includes culvert and storm drain outlets to open channels. They are also occasionally used at locations where the energy produced by a channel drop exceeds the limitations of the channel drop structures. As mentioned in GJMC § 28.36.050, straight-drop spillways must be paired with one of the structures in this section to dissipate the energy associated with the high-velocity flows.

(b) The structures in this section are divided into three categories:

(1) Increased roughness basins.

(2) Induced hydraulic jump basins.

(3) Impact basins.

(Res. 40-08 (§ 903), 3-19-08)

§ 28.36.080. Increased roughness basins.

Increased roughness basins are designated for use in locations where the upstream Froude number does not exceed 3.0. Further restrictions apply to each type, including maximum velocities and maximum cross-sectional flow areas. These basins include the riprap basin (preformed scour hole) and the array of drop structures introduced in GJMC § 28.36.020 through 28.36.060.

The FHWA's *Hydraulic Design of Energy Dissipators for Culverts and Channels* (HEC-14) also presents methods for the design of increased resistance devices for pipes, box culverts, and channels. These devices are intended to create a tumbling flow pattern along steep reaches of conduits and channels, thereby maintaining an allowable average velocity.

However, due to the economic advantages of other options and to the relatively flat terrain in developed portions of Mesa County, these structures are not included in this title.

(a) Riprap Basin. The riprap basin/preformed scour hole is effective for the dissipation of excess energy from upstream conduits and channels complying with the following:

(1) Maximum allowable upstream flow area must be equal to or less than the equivalent full-flow area of a 36-inch pipe.

(2) Maximum upstream flow velocity must be equal to or less than 15 feet per second at any flow depth.

The design procedure for this structure is presented in GJMC § 28.32.340(c) and Figure 28.32.340(a).

(b) Drop Structure as an Energy Dissipator. While the first two drop structures listed in GJMC § 28.36.020 through 28.36.060 are intended to dissipate only energy produced by the drop itself, they can in certain cases be used as dissipators of upstream energy. The most significant restriction is that flow in the upstream channel must be in a subcritical state before reaching the structure. The combination of a small channel drop and local energy dissipation can effectively reduce the velocity in the downstream channel.

(Res. 40-08 (§ 903.1), 3-19-08)

§ 28.36.090. Induced hydraulic jump basins.

Induced hydraulic jump basins are commonly used for large and small projects alike. They are highly effective at utilizing the hydraulic jump phenomenon to dissipate excess energy and return the flow to a subcritical depth. While the space required for these structures is relatively large, they are typically less expensive than impact-type basins on a unit-discharge basis. Five distinct induced hydraulic jump basin designs are presented herein. The designer shall incorporate adequate seepage controls as part of the design of all structures. Riprap protection shall be provided for an appropriate distance downstream of all structures in this section where the receiving channel has a flexible lining.

(a) CSU Rigid Boundary Basin. The Colorado State University Rigid Boundary Basin (CSU RBB) utilizes offset rows of baffles (roughness elements) to force supercritical flow from a conduit into a hydraulic jump. The only basin in this category to be designed as entirely on-grade, the CSU RBB is useful for locations with restrictive vertical alignment criteria. However, the upstream Froude number is restricted to a value of 3.0. Figures 28.36.090(a) and 28.36.090(b) present sketches and data for the design of this structure.

The design procedure for the CSU RBB is presented in HEC-14, Chapter VII-A.

(b) USBR Type II Basin. This basin utilizes chute blocks and a dentated sill to induce a hydraulic jump in the basin. An isometric sketch of this basin is presented in Figure 28.36.090(c). Unlike the CSU rigid boundary basin, the USBR Type II basin does not allow for subcritical upstream flow by forcing the flow through critical depth prior to the jump basin. Therefore, this basin requires an upstream Froude number between 4.0 and 14.0. The required tailwater depth for this basin varies with the Froude number per

Figure 28.36.090(d), in which the solid "design curves" incorporate the required 10 percent factor of safety. This basin is intended for rectangular sections only, thus transitions may be required upstream of the structure. The design procedure herein is intended for unit discharge rates of up to 500 cfs per foot width. The incoming chute to the basin can be of any slope, but slopes greater than 2:1 shall incorporate a radius curve to allow for a smooth transition to the basin floor. Sequent depths for a free hydraulic jump, USBR Type II basin, and USBR Type III basin are shown in Figure 28.36.090(e).

The design procedure for the USBR Type II Basin is presented in HEC-14, Chapter VII-D.

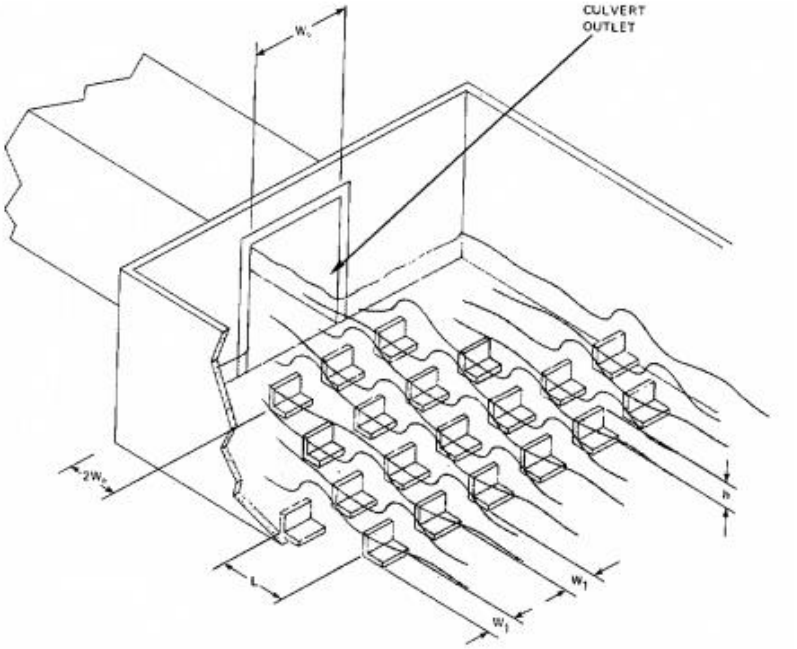
(c) USBR Type III Basin. This basin utilizes chute blocks, baffle piers, and a solid end sill (no dentates) to induce a hydraulic jump in the basin. An isometric sketch of this basin is presented in Figure 28.36.090(f). This basin requires an upstream Froude number between 4.5 and 17.0. This can in part be controlled by the height and slope of the upstream chute, but the designer shall be aware that lower basin elevations can cause the jump to move upstream and submerge the chute, negating its ability to increase the influent Froude number. The required tailwater depth for this basin is at least full conjugate depth as indicated in Figure 28.36.090(d). This basin is intended for rectangular sections only, thus transitions may be required upstream of the structure.

The USBR Type III basin is limited to a unit discharge rate of 200 cfs per foot width, but can handle velocities up to 50 or 60 feet per second. The design is intended to effectively initiate and shorten the hydraulic jump, thereby reducing the space requirements for the structure. However, the baffle piers, which are essential for controlling the jump, must be carefully designed to comply with the procedure outlined below. The incoming chute to the basin can be of any slope, but slopes greater than 2:1 shall incorporate a radius curve to allow for a smooth transition to the basin floor.

The design procedure for the USBR Type III Basin is presented in HEC-14, Chapter VII-E.

STORMWATER MANAGEMENT MANUAL

CSU RIGID BOUNDARY BASIN
(ISOMETRIC)



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REFERENCE: HYDRAULIC DESIGN OF ENERGY DISSIPATORS FOR CULVERTS AND CHANNELS (HEC-14) (1983)

FIGURE 28.36.090(a)

STORMWATER MANAGEMENT MANUAL

CSU RIGID BOUNDARY BASIN (PROFILE)

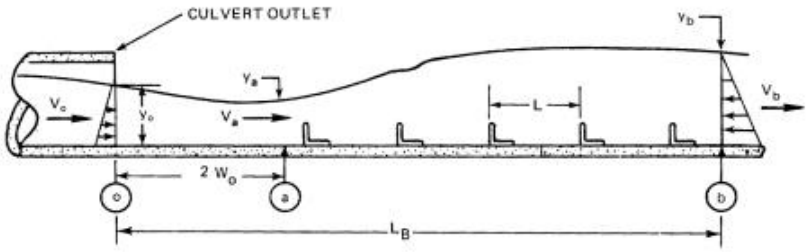

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FIGURE 28.36.090(b)

STORMWATER MANAGEMENT MANUAL

USBR TYPE II BASIN

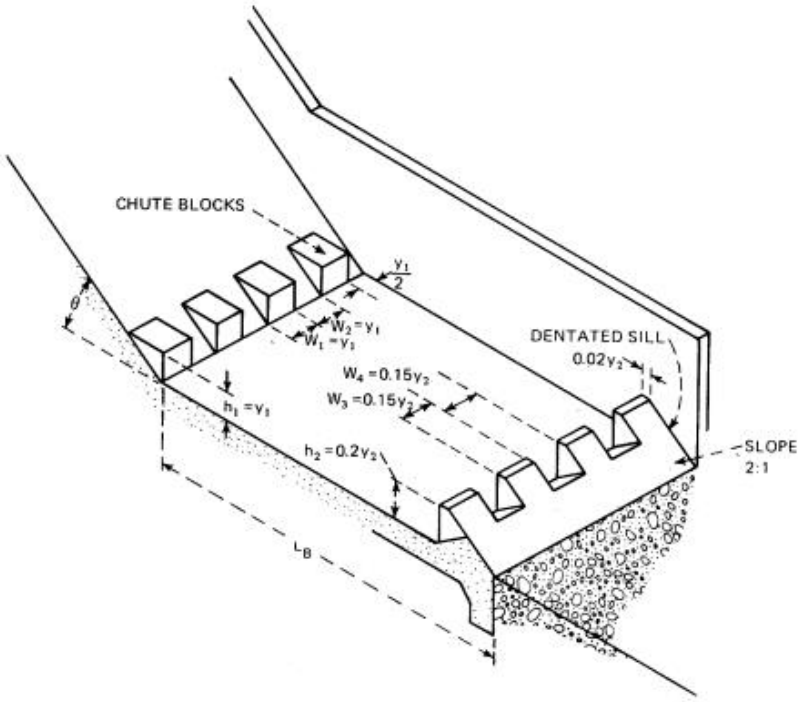

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FIGURE 28.36.090(c)

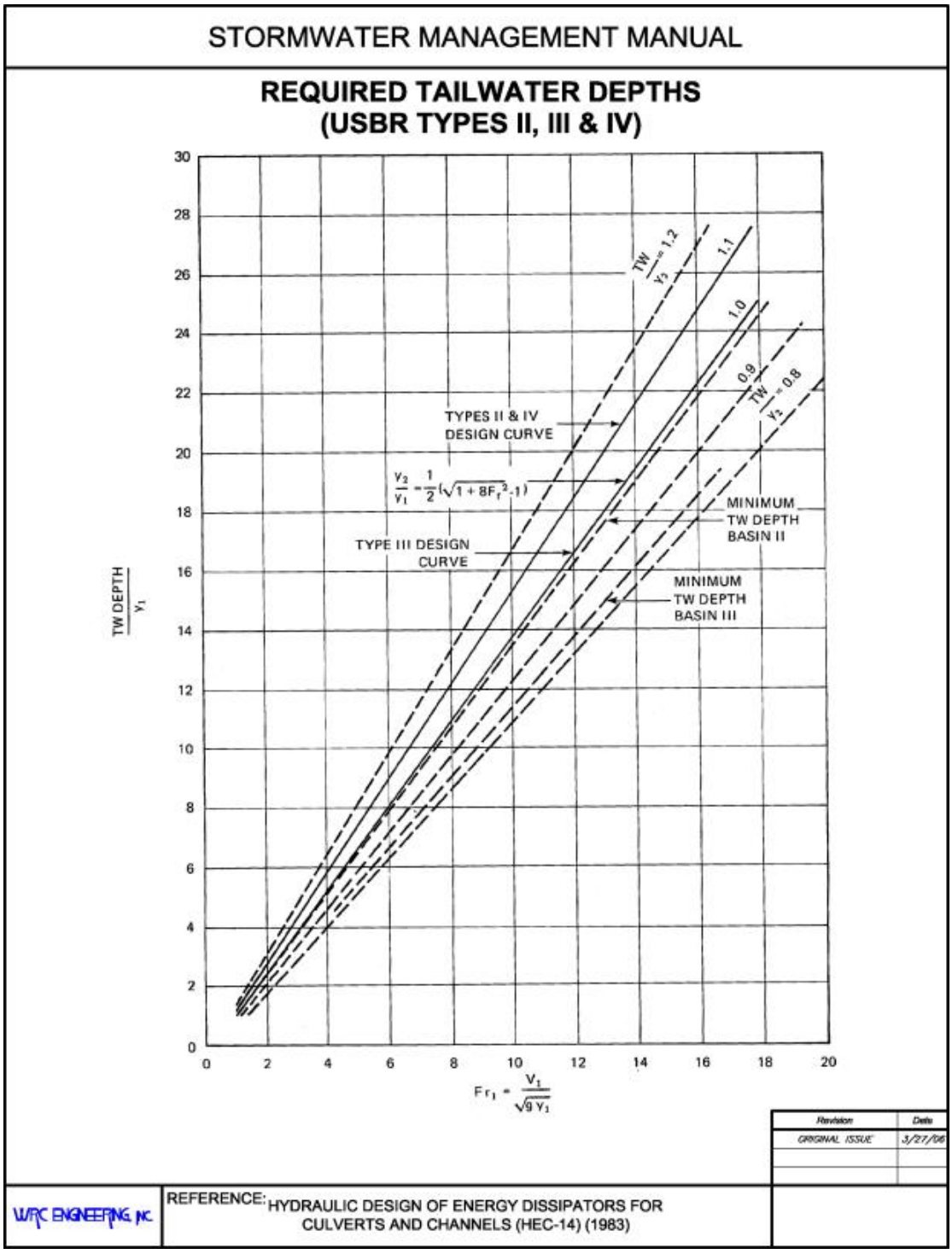

FIGURE 28.36.090(d)

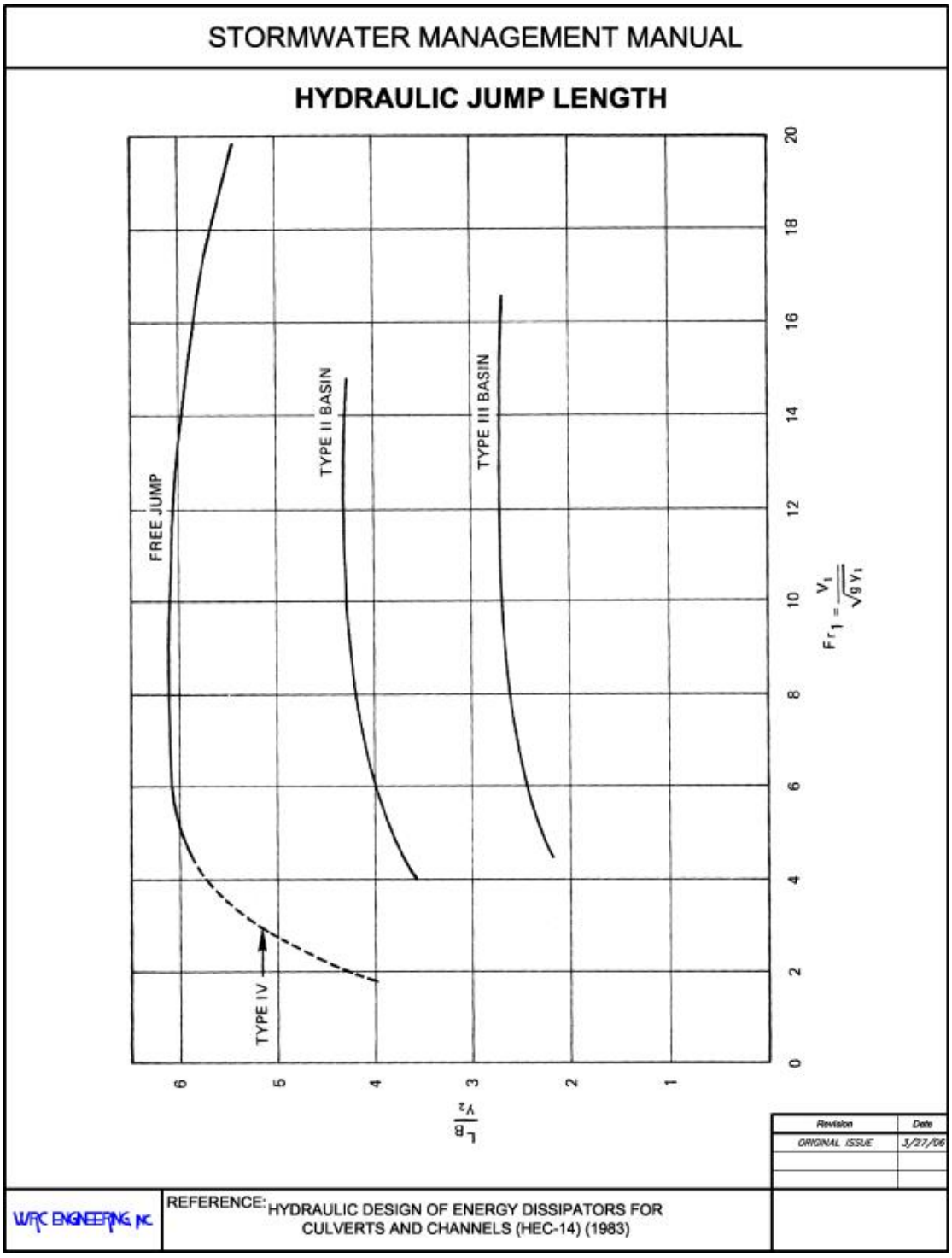

FIGURE 28.36.090(e)

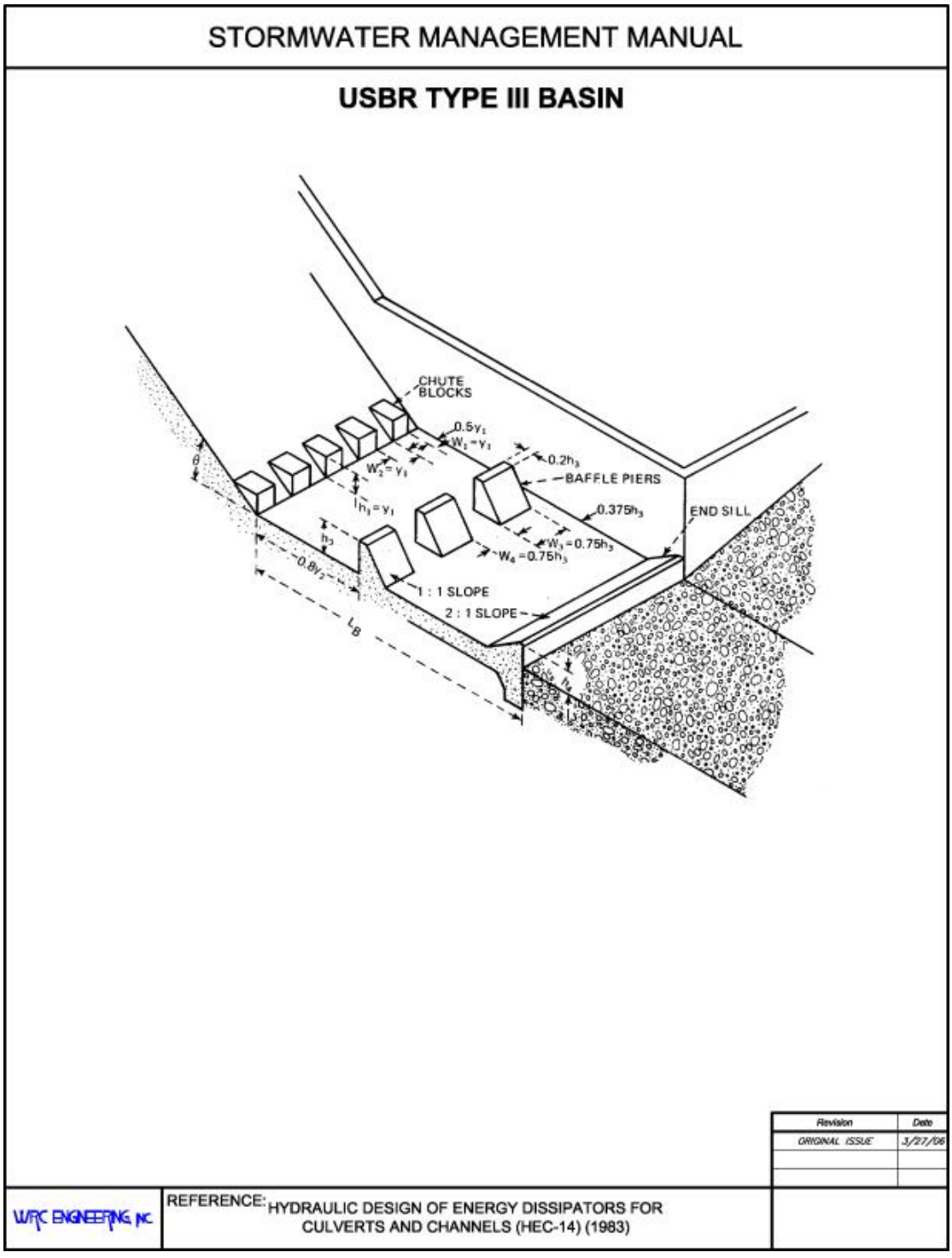

FIGURE 28.36.090(f)

(d) USBR Type IV Basin. At locations where the upstream flow is supercritical but still in the relatively low range of Froude numbers, the USBR Type IV basin can be employed. Designated for Froude numbers between 2.5 and 4.5, the jump is defined by Chow (1959) as an "oscillating jump." This type of hydraulic jump can produce potentially

destructive downstream wave action, so the recommended tailwater depth for this structure is higher than that for the Type III basin.

Like the Type II basin, this structure utilizes chute blocks and an end sill. However, the end sill in this case is solid, not dentated. This basin is intended for rectangular sections only, thus transitions may be required upstream of the structure. An isometric sketch with general dimensions is presented in Figure 28.36.090(g).

The design procedure for the USBR Type IV basin is presented in HEC-14, Chapter VII-F.

(e) SAF Stilling Basin. The Saint Anthony Falls (SAF) stilling basin is similar to the USBR Type III Basin in that it utilizes chute blocks, baffle piers (floor blocks), and an end sill to induce and maintain a steady hydraulic jump in the basin. Also similar to the Type III, it produces a jump that is significantly shorter than a natural hydraulic jump (approximately 80 percent of the length), thereby reducing the required length of the basin and downstream protection.

Plan and profile views of the SAF basin are provided in Figure 28.36.090(h). Note that the basin itself may be laterally flared to better fit the downstream channel. This flare is labeled as z (longitudinal):1 (lateral), wherein the variable z is limited to values equal to or greater than 2.0. However, all side walls, headwalls, and wingwalls shall be vertical.

The SAF Basin may be used at the base of straight-drop spillways, at culvert and storm drain outlets, and in canals. It is required that flow entering the basin be supercritical, but this can usually be achieved by proper upstream chute design. The allowable range of Froude numbers for this structure is 1.7 to 17.0.

The design procedure for the SAF stilling basin is presented in HEC-14, Chapter VII-G.

STORMWATER MANAGEMENT MANUAL

USBR TYPE IV BASIN

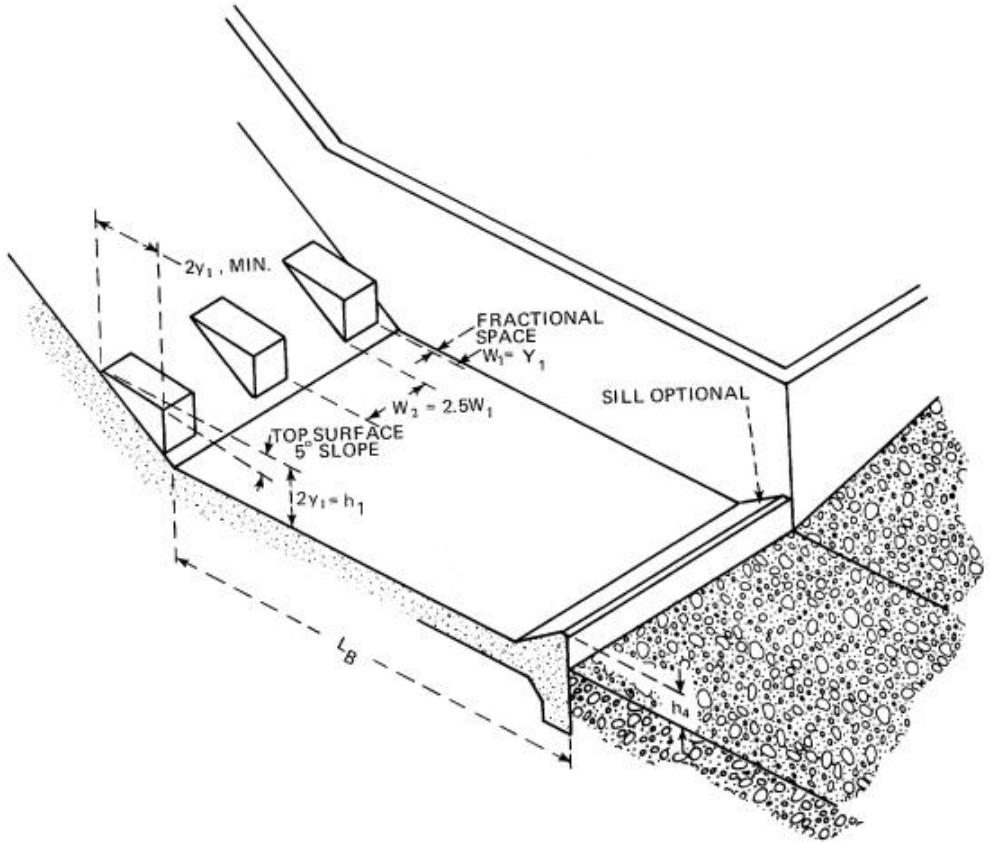

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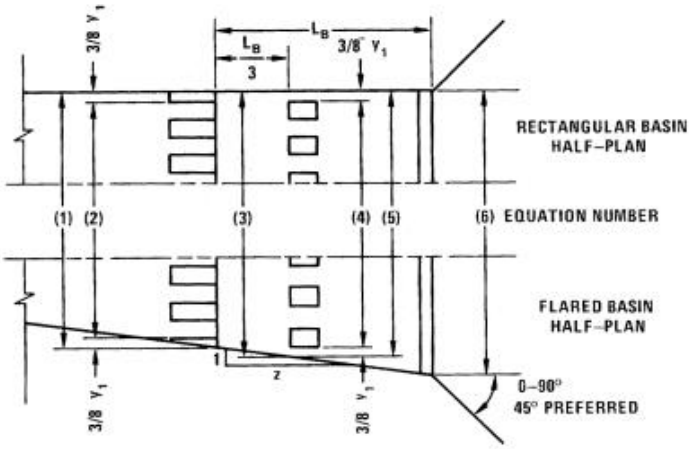
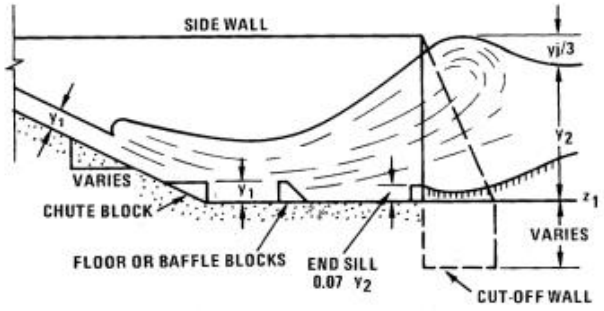
FIGURE 28.36.090(g)

STORMWATER MANAGEMENT MANUAL

SAF STILLING BASIN





(1) W_B = BASIN WIDTH UPSTREAM
(2) n BLOCKS AT 3/4 Y_1 ±
(3) 0.40 W_{B2} ≤ AGGREGATE BLOCK WIDTH ≤ 0.55 W_{B2}
(4) n BLOCKS AT 3/4 Y_1 $\frac{W_{B2}}{W_B}$ ±
(5) $W_{B2} = W_B + 2L_B/3z$
(6) $W_{B3} = W_B + 2L_B/z$

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REFERENCE: HYDRAULIC DESIGN OF ENERGY DISSIPATORS FOR CULVERTS AND CHANNELS (HEC-14) (1983)

FIGURE 28.36.090(h)

(Res. 40-08 (§ 903.2), 3-19-08)

§ 28.36.100. Impact basins.

Impact basins dissipate energy by causing the high-velocity flow to encounter an obstruction, redirecting the flow in directions other than the influent path. This action effectively negates a large percentage of the velocity head that would otherwise potentially cause damage to the downstream channel. While these structures tend to be costly on a unit-discharge basis, they require far less space than many other dissipation options. Three types of impact basins are presented in this section.

The designer of the energy dissipators discussed herein is responsible for ensuring adequate structural design, including the analysis of all forces incident on the structure, calculation of creep and overturning potential, and design and installation of seepage controls. Necessary seepage controls may include cutoff walls, liners, weep drains, and/or other devices. The designer is referenced to applicable texts concerning subgrade compaction, concrete mixing, steel reinforcement, calculation of external forces, and retaining wall design.

(a) Contra Costa Energy Dissipator. This structure is intended for use with small to medium culverts with medium to high velocity flows. It is also designed to operate with minimal tailwater, although some tailwater improves the dissipator's performance. Tailwater depth is limited to one-half of the culvert height. The Contra Costa dissipator is best for locations where the design flow depth at the culvert outlet is less than the culvert height. Therefore, culvert effluent depth is limited to one-half of the culvert height. The Froude number of the culvert outlet flow is limited to a maximum of 3.0.

The Contra Costa energy dissipator is a concrete structure designed to be placed in a trapezoidal channel with side slopes of 1:1 and a bottom width between one and three times the culvert height ($D \leq W \leq 3D$). If a natural channel exists at the structure location, the structure width shall conform to that channel, with a maximum width of 3D. The structure consists of two continuous baffles of different heights across the basin floor as well as a vertical end sill. All parts of the structure shall be reinforced concrete and shall be tied to the downstream end of the culvert with steel reinforcement bars if possible. Profile and section views with dimensional definitions are provided in Figure 28.36.100(a).

The design procedure for the Contra Costa energy dissipator is presented in HEC-14, Chapter VIII-A.

(b) Hook-Type Energy Dissipator. The hook-type dissipator, also called aero-type, is used at culvert outlets with Froude numbers in the range of 1.8 to 3.0. Each dissipator utilizes three hook structures in the basin that redirect a portion of the high-velocity flow up and back into the basin flow. This action creates a large amount of turbulence, thereby dissipating some of the excess energy in the flow. At Froude numbers exceeding about 3.0, the dissipation effects are greatly diminished.

This energy dissipation structure is designed to use either of two basin configurations. The first type contains vertical wingwalls at the culvert exit which are warped smoothly to side slopes of 1.5:1 at the end sill (see Figure 28.36.100(b)). The second configuration is a trapezoidal channel with a constant cross-section throughout the basin (see Figure 28.36.100(d)). Hook details for the two configurations are found in Figures 28.36.100(c) and 28.36.100(e), respectively.

The design procedure for the Hook-Type Energy Dissipator is presented in HEC-14, Chapter VIII-B.

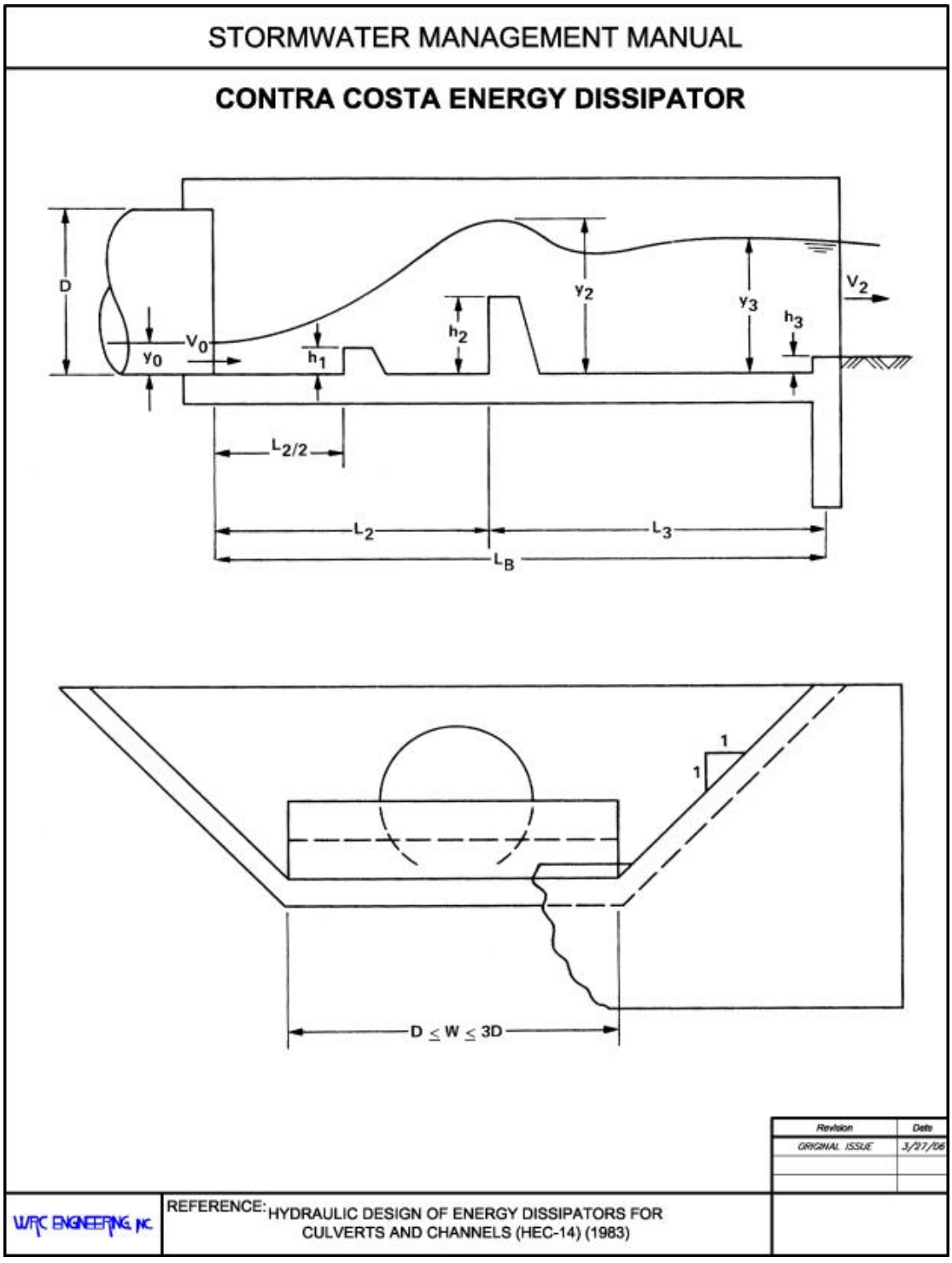


FIGURE 28.36.100(a)

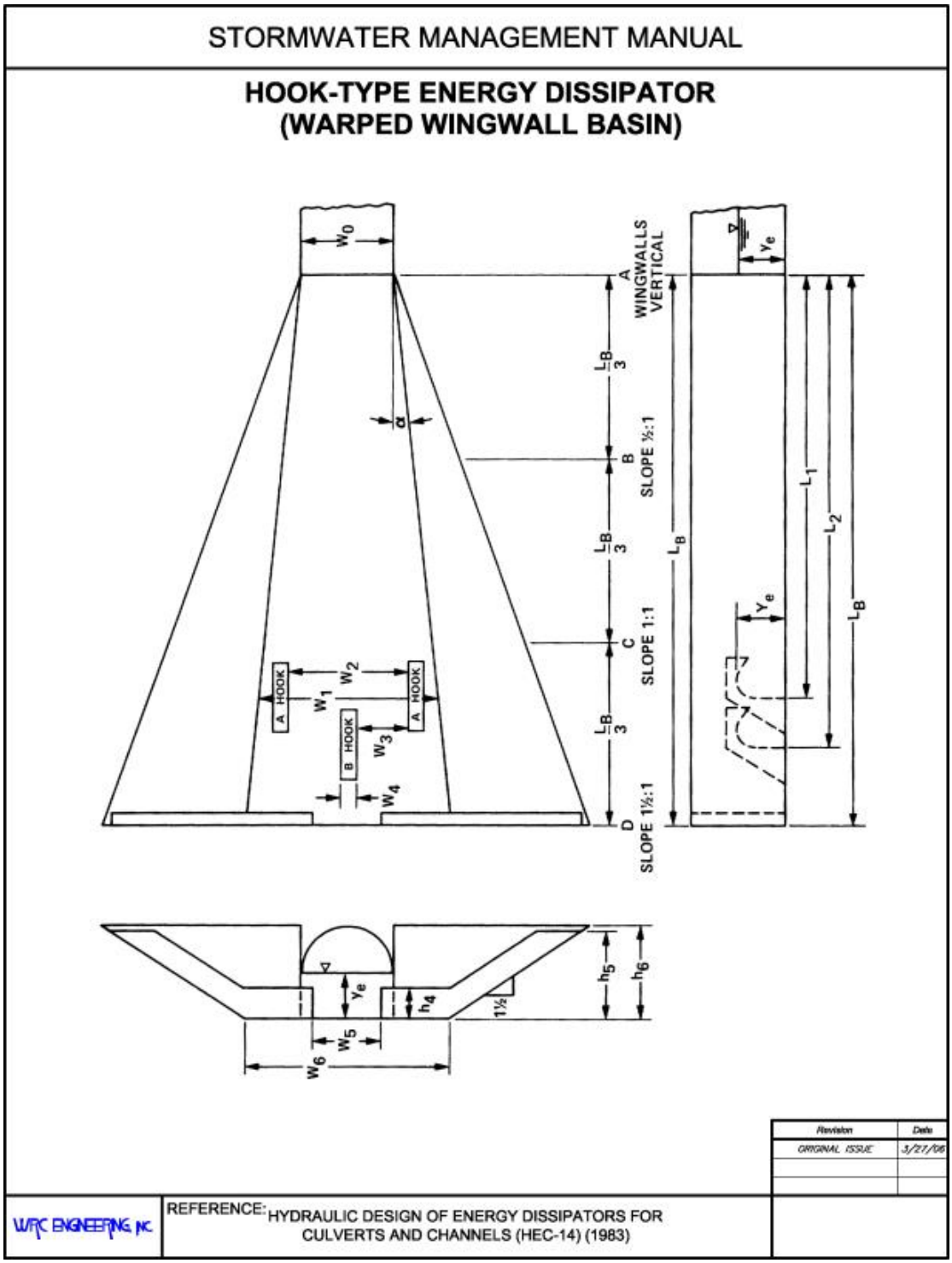
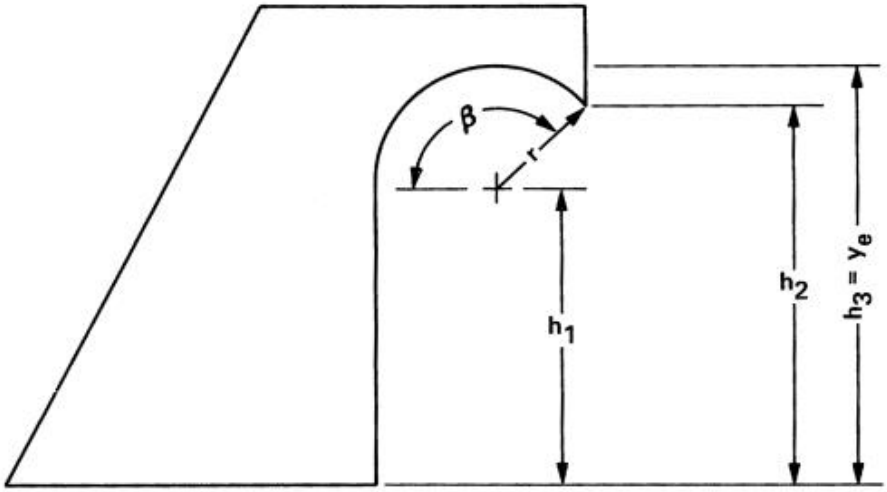


FIGURE 28.36.100(b)

STORMWATER MANAGEMENT MANUAL

HOOK-TYPE ENERGY DISSIPATOR
(HOOK DETAIL - WARPED WINGWALL BASIN)



$h_3 = y_e$

$h_2 = 1.28\, h_1$

$h_1 = y_e / 1.4$

$\beta = 135^o$

$r = 0.4\, h_1$

HOOK FOR WARPED WINGWALL BASIN

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FIGURE 28.36.100(c)

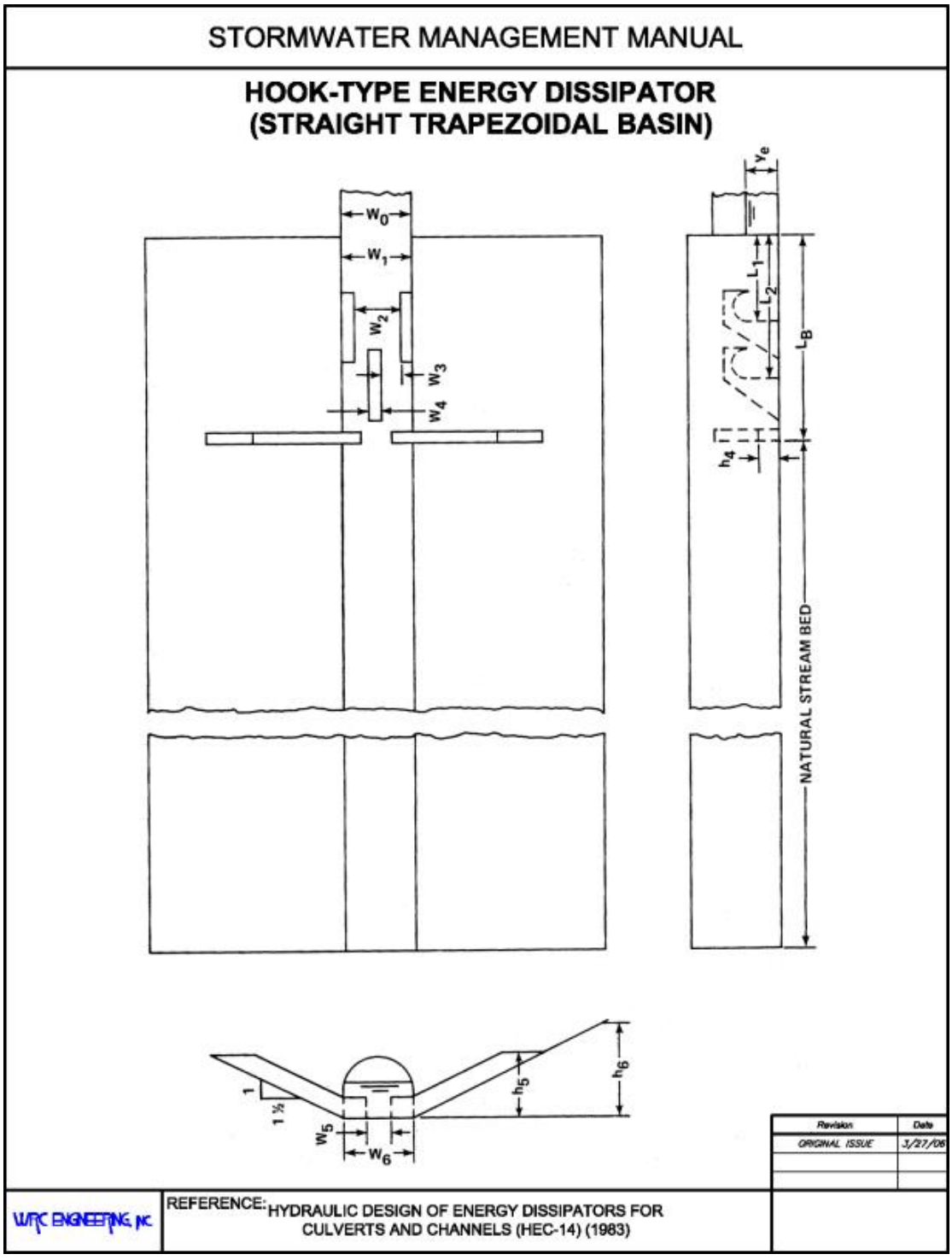
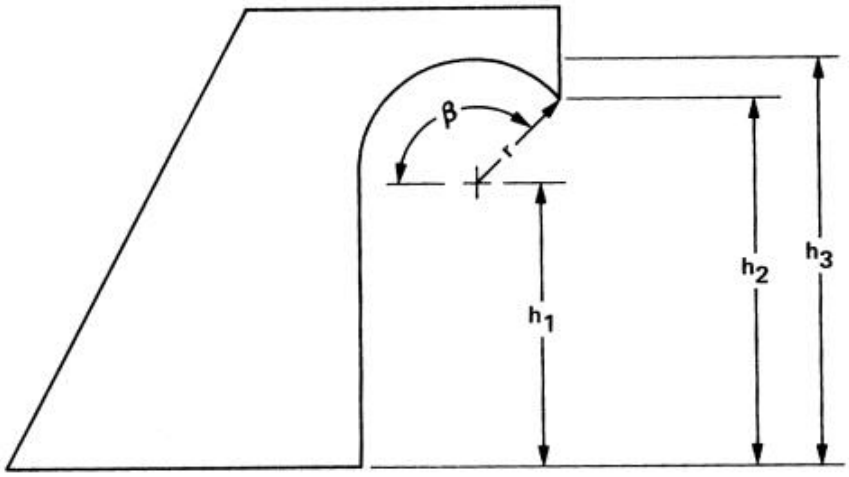


FIGURE 28.36.100(d)

STORMWATER MANAGEMENT MANUAL

HOOK-TYPE ENERGY DISSIPATOR
(HOOK DETAIL - STRAIGHT TRAPEZOIDAL BASIN)



$h_2 = y_e$

$h_1 = 0.78\, y_e$

$h_3 = 1.4\, h_1$

$r = 0.4\, h_1$

$\beta = 135^o$

HOOK FOR STRAIGHT TRAPEZOIDAL BASIN

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REFERENCE: HYDRAULIC DESIGN OF ENERGY DISSIPATORS FOR CULVERTS AND CHANNELS (HEC-14) (1983)

FIGURE 28.36.100(e)

(c) Impact-Type Energy Dissipator (USBR Type VI). Also called the baffle-wall energy dissipator or baffled outlet, this structure is compact and highly effective for the control of high-energy flows exiting a conduit or rectangular channel section. Consisting of a vertical-walled basin with a single large vertical hanging baffle, energy is dissipated by

impact with the baffle and secondarily by eddies formed in the basin. At the design flow, this structure dissipates energy more effectively than a hydraulic jump (See Figure 28.36.100(g)), and has no minimum tailwater depth. However, its debris-handling capability and maximum tailwater depth limit (discussed later) limit the locations at which the structure can be used. Further limitations include a maximum discharge of 400 cfs per structure and a maximum upstream velocity of 50 feet per second. This latter value is intended to minimize damage to the baffle due to cavitation. Where these limits are exceeded, two or more structures may be built adjacent to one another to accommodate the excess flow.

For upstream conduits with a slope greater than 15 percent and for all open channels, it is recommended that there be a horizontal section from the outlet brink to a point at least four conduit widths upstream. Rectangular upstream channels shall have sidewalls of a height equal to or greater than the walls of the dissipator basin and shall always have a zero longitudinal slope for a minimum of three channel widths upstream from the entrance to the basin.

Figure 28.36.100(f) presents the configuration and necessary dimensions for the design of the USBR Type VI structure. Note that the optional notches near the edges of the basin are included to create concentrated jets for self-cleaning purposes.

One of the most important design features of this structure is its ability to pass the entire design discharge over the top of the baffle. This is important to prevent upstream flooding in the case of complete clogging of the area under the baffle. However, this flow configuration is not nearly as effective and shall not be relied upon as an alternative energy dissipation method. Therefore, the debris and ice buildup potential at a given location shall be analyzed prior to selection of this structure as the energy dissipator for that outlet.

While some tailwater (up to $h_3+h_2/2$) improves the performance of the dissipator, depths over this height shall be avoided. Significant degradation of performance occurs with tailwater depths greater than h_3+h_2, thus the USBR Type VI structure shall not be installed in these conditions.

The design procedure for the impact-type energy dissipator is presented in HEC-14, Chapter VIII-C.

STORMWATER MANAGEMENT MANUAL

IMPACT -TYPE ENERGY DISSIPATOR
(USBR TYPE VI)

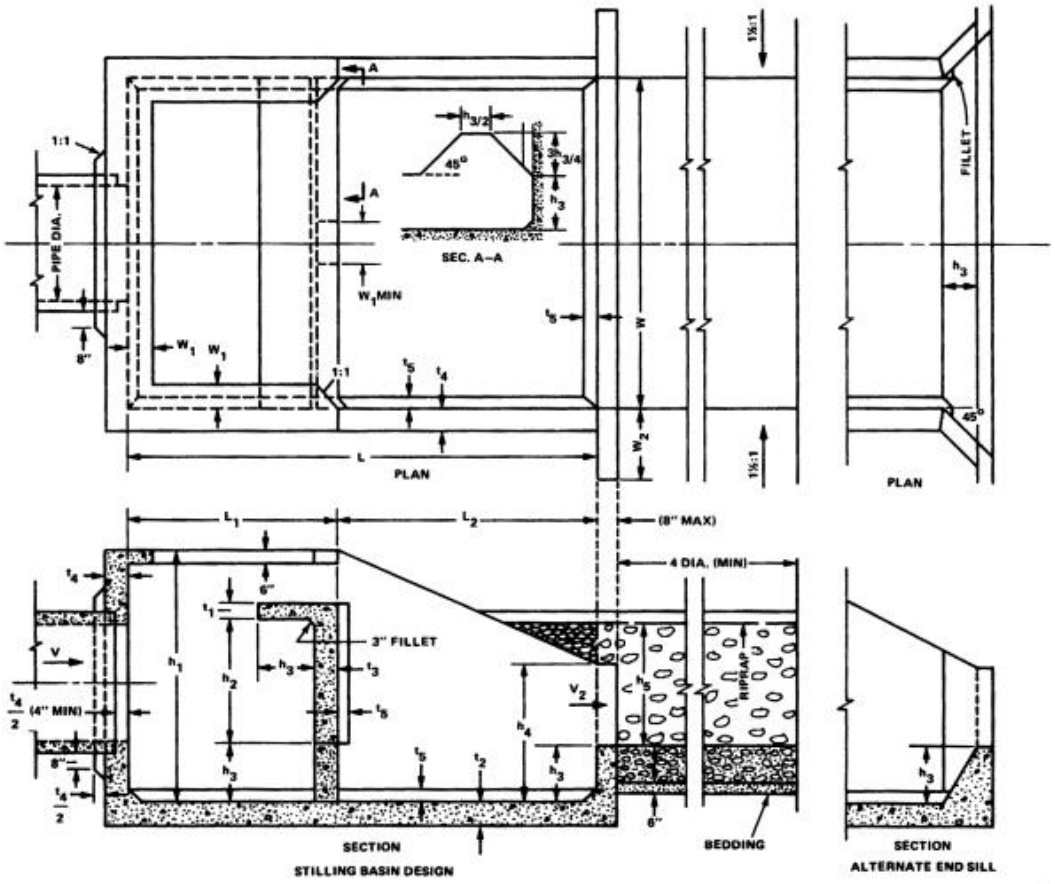

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FIGURE 28.36.100(f)

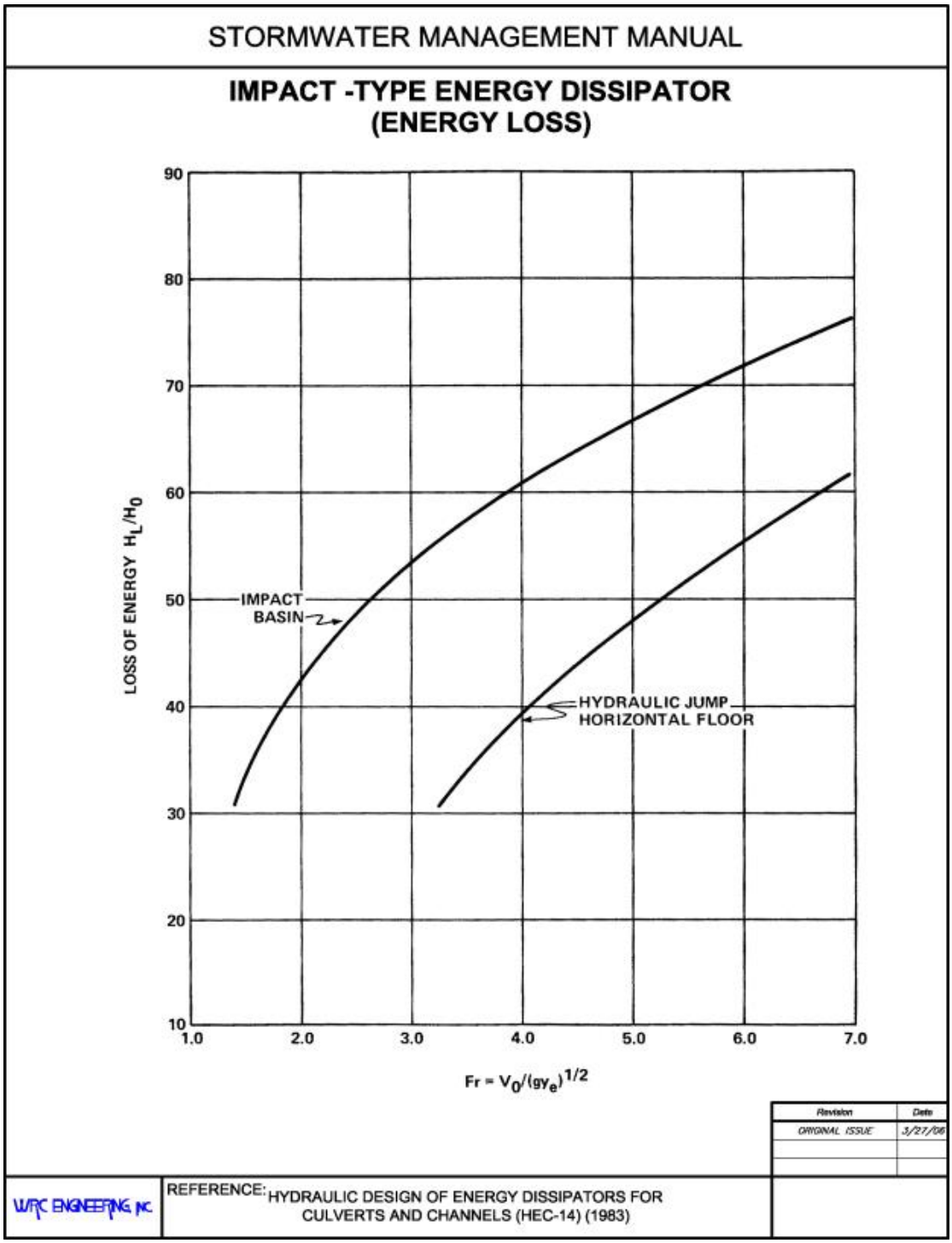

FIGURE 28.36.100(g)

(Res. 40-08 (§ 903.3), 3-19-08)

§ 28.36.110. Overbank prevention structures and wasteways.

Every channel has a maximum allowable flow depth which, when exceeded, may cause damage to the banks and eventually failure of the channel. Occasionally, overflow from a storm drainage system enters an irrigation canal (this shall be avoided unless specific consent is granted by the owner/operator of the canal). In these situations, it is typically necessary to remove the overflow from the canal at some downstream location. The structures in this section are intended to remove excess water from a channel to maintain a specified water surface elevation or to allow the water in a channel section to be drained. The latter may be necessary to inspect, maintain, or repair the channel, or in the event of an embankment failure, to redirect some of the escaping flow to an acceptable location.

Wasteway is the term commonly applied to the channel to which the main channel excess flow is diverted. A wasteway shall have the capacity to convey the maximum flow that can be diverted through all diversion structures located upstream, and shall deliver the excess flow to an acceptable disposal point.

Two types of diversion structures which can act as overbank prevention structures are presented herein: the side-channel spillway and the gated turnout.

(Res. 40-08 (§ 904), 3-19-08)

§ 28.36.120. Side-channel spillways.

A side-channel spillway is the most effective structure for automatic removal of excess flow in a channel since its capacity increases with depth over its crest. The spillway crest is usually parallel to the channel alignment except at terminal wasteways (at the end of a canal). Typically, the spillway crest is set approximately 0.2 feet above the normal design depth for the channel to allow for normal wave action. The length of the spillway is then controlled by the required overflow discharge capacity and the maximum allowable water surface elevation in the channel. A standard rule of thumb is to ensure no more than 50 percent encroachment on the freeboard of the channel banks in the vicinity of the spillway. A detailed procedure for the design of a side-channel spillway turnout and wasteway is not presented in this manual due to the infrequent application of such a structure in stormwater runoff designs. However, Equation 28.36-10 is the basic design equation for the side-channel spillway (suppressed rectangular weir):

$$Q = 3.33 L_c H^{3/2} \qquad (28.36\text{-}10)$$

Where:

Q	=	Design Flow over the Spillway (cfs)
L_c	=	Crest Length (ft.)
H	=	Height of Channel Water Surface over Crest (ft.)

(Res. 40-08 (§ 904.1), 3-19-08)

§ 28.36.130. Gated turnouts.

To allow for manual release of water from a channel for the purpose of water level control, maintenance access, et cetera, gated turnouts are often installed at wasteways. It is common practice to include at least one gated turnout at any side-channel spillway location for flushing and additional water level control. Again, specific design procedures are not presented, but the general orifice equation is given:

$$Q = CA\sqrt{2gh} \qquad (28.36\text{-}11)$$

Where:

Q	=	Design Flow through Gate (cfs)
C	=	Orifice Coefficient ≅ 0.6
h	=	Height of Water Surface Over Gate Centerline (ft.)
A	=	Area of Orifice ($ft.^2$)
g	=	Gravitational Constant (32.2 $ft./s^2$)

(Res. 40-08 (§ 904.2), 3-19-08)

§ 28.36.140. Pipe appurtenances.

GJMC § 28.36.150 through 28.36.170 present appurtenances for use in conjunction with pipe systems, specifically those designed for the transport of stormwater.

(Res. 40-08 (§ 905), 3-19-08)

§ 28.36.150. Pipe collars.

Pipe collars are transverse fins that extend from the pipe into the surrounding earth and function as barriers to percolating water and burrowing rodents (USBR 1974). Due to the relative smoothness and impermeability of pipe, percolated water tends to collect and move along the soil adjacent to a pipe's outer wall. This action, typically called piping, tends to transport soil particles away from the pipe, potentially causing the pipe to experience structural problems. Failure of the backfill and ultimately the pipe itself can lead to hydraulic failure of the pipe system as well as the failure of surface structures such as roadways and buildings.

While percolation is expected around many storm drains and culverts, especially near pipe inlets, those with higher (5H:1V or greater) percolation gradients are often candidates for pipe collars. The percolation gradient is the slope of a line from an inlet water surface to a point of relief for the percolated water. The difference in water surface elevations between the upstream end of the percolation path and the point of relief is ΔH_{perc}. Lane's weighted creep method is used to determine a percolation factor (weighted-creep ratio), which is compared to the allowable ratio for the soil type at a given site. First, determine the weighted-creep length:

$$L_{wc} = y_{steep} + (x_{mild}/3) + 2(L_{sc}) \quad (28.36\text{-}12)$$

Where:

L_{wc}	=	Weighted creep length (ft.)
y_{steep}	=	Vertical path distance along the structure (steeper than 45°) (ft.)
x_{mild}	=	Horizontal path distance along the structure (flatter than 45°) (ft.)
L_{sc}	=	Percolation path distance that shortcuts the soil (ft.)

Then determine the percolation factor, R_{wc} to 1:

$$R_{wc} = \frac{L_{wc}}{\Delta H_{perc}} \quad (28.36\text{-}13)$$

Table 28.36.150 presents minimum recommended weighted-creep ratios for a range of soil types:

Table 28.36.150: Lane's Minimum Recommended Weighted-Creep Ratios

Material	Minimum Ratio
Very fine sand or silt	8.5:1
Fine sand	7.0:1
Medium sand	6.0:1
Course sand	5.0:1
Fine gravel	4.0:1
Medium gravel	3.5:1
Course gravel w/cobbles	3.0:1
Boulders w/some cobbles and gravel	2.5:1
Soft clay	3.0:1
Medium clay	2.0:1
Hard clay	1.8:1
Very hard clay/Hardpan	1.6:1

Adapted from USBR 1974, Untitled Table, Page 364

Where the weighted-creep ratio calculated in Equation 28.36-13 does not exceed the applicable recommended ratio from Table 28.36.150, or does not exceed 2.5:1, pipe collars shall be installed.

Figure 28.36.150 presents basic dimensions for pipe collar fittings on reinforced concrete pipe (RCP) and corrugated metal pipe (CMP).

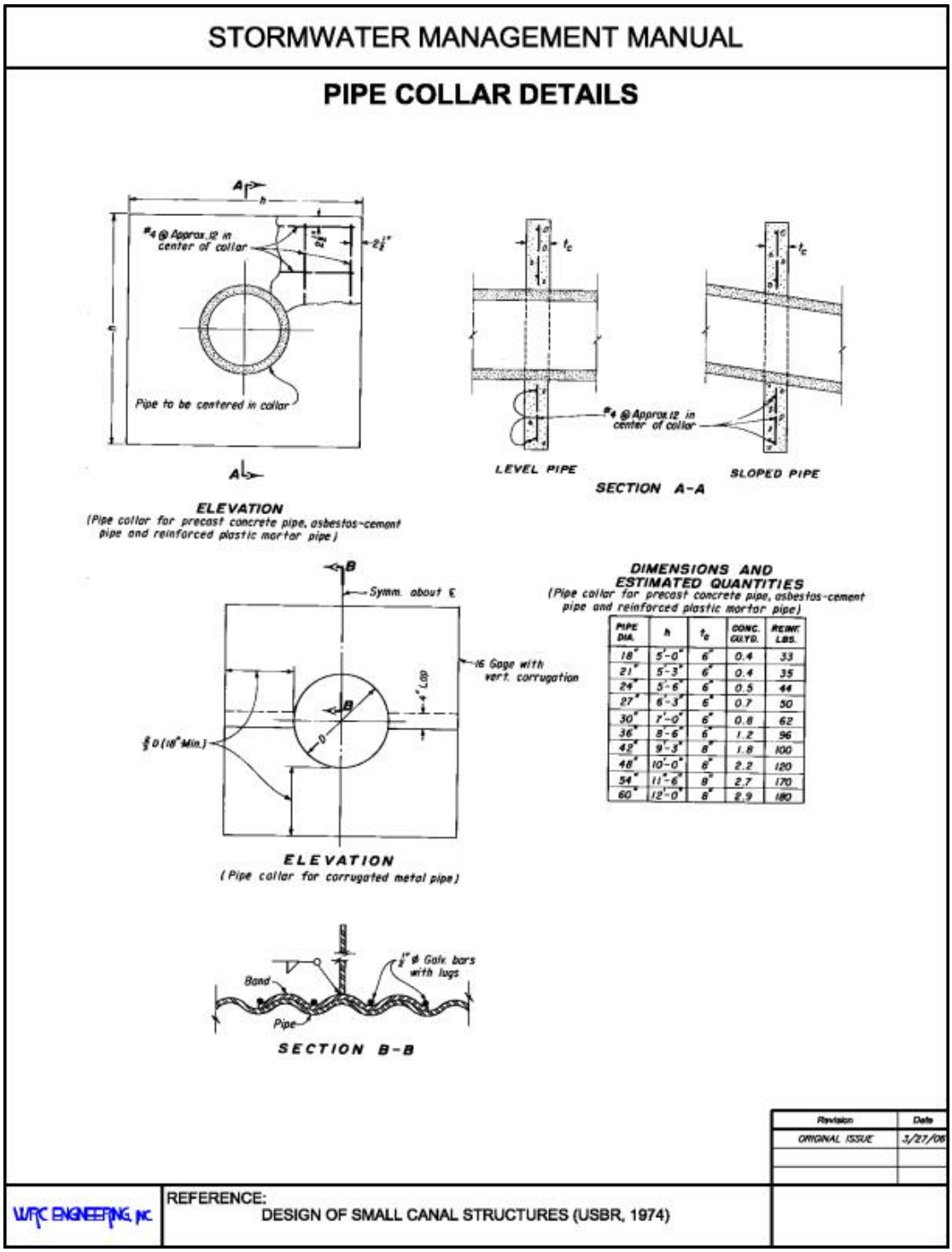

FIGURE 28.36.150

(Res. 40-08 (§ 905.1), 3-19-08)

§ 28.36.160. Thrust blocks at pipe bends.

Every horizontal or vertical pipe bend in a storm drain, culvert, inverted siphon or other pipe structure shall be analyzed for stability. As the momentum of flow changes around a bend, forces are exerted on the bend that must be countered by the pipe walls, soil pressure, pipe joints, and friction. When the dynamic thrust exceeds the allowable force on any of these resistance devices, a thrust block is installed at the bend. A thrust block typically consists of a rough block of concrete poured around the outside of a pipe bend in direct contact with the outer wall of the pipe.

The thrust force on a pipe bend is calculated by vector components (x, y, and z) to simplify the process. In the equations below, "x" represents the horizontal direction of flow upstream of the bend, "y" represents the horizontal direction of flow normal to "x," and "z" represents the vertical direction along which gravity acts. Equations 28.36-14 through 28.36-16 are adapted from Roberson et al., 1998, using conservation of momentum to find reaction forces. Pipe cross-sectional area and internal pressure are assumed to be constant through the bend, with pressure assumed to equal the surcharge depth above the pipe crown, if applicable.

$$F_{R_x} = \frac{\rho}{g} Q\left(V_{2_x} - V_{1_x}\right) + pA(\cos\theta - 1) \quad (28.36\text{-}14)$$

$$F_{R_y} = \frac{\rho}{g} Q\left(V_{2_y} - 0\right) - pA \cdot \sin\theta \quad (28.36\text{-}15)$$

$$F_{R_z} = \frac{\rho}{g} Q\left(V_{2_z} - 0\right) - W_{bend} - W_{water} \quad (28.36\text{-}16)$$

Where:

F_R	=	Reaction force required to hold bend in place, lbf
ρ	=	Density of water ≅ 62.4 lbs/ft^3
Q	=	Flow rate in pipe, cfs
V_{1x}	=	Average pipe velocity upstream of the bend, fps
V_{2x}	=	$V_{1x} \cos\theta$, $V_{2y} = V_{1x} \sin\theta$, $V_{2z} = V_{1x} \sin\theta$
p	=	Internal pipe pressure, psf
g	=	Gravitational constant, 32.17 ft./s^2
A	=	Cross-sectional flow area of pipe, sf
θ	=	Total bend angle (vertical or horizontal)
W_{bend}	=	Weight of the pipe in the bend, lbs.
W_{water}	=	Weight of the water in the bend, lbs.

Subscripts 1 and 2 indicate conditions just upstream and just downstream of the bend.

In addition to soil bearing pressure, force on a bend is resisted by friction between the pipe and the soil. A sliding coefficient of 0.35 is recommended for purposes of calculating the friction force (USBR 1974).

Where calculations indicate that sliding or displacement of a horizontal bend may occur, a thrust block is installed to increase the effective bearing area on the soil such that the load is adequately dispersed. Vertical bends may require an anchor block to provide additional weight to resist the resultant vertical force. Calculation of resisting forces for a vertical bend may include full pipe weight and anchor block weight, but shall not include the weight of earth cover on the bend. This allows for safe operation of the pipe even with reduction or removal of cover material (USBR 1974).

(Res. 40-08 (§ 905.2), 3-19-08)

§ 28.36.170. Valves.

References for this section include USBR, 1974 and Linsley and Franzini, 1964.

(a) Drain (Blow-Off) Valves. A blow-off valve is intended to allow for the draining of a structure that typically will otherwise not fully drain. Most commonly used in long inverted siphons, blow-off valves may be gravity-fed, pumped, or a combination of both, depending on the invert of the discharge pipe. The design and installation of blow-off valves and related pipes shall incorporate pressure-rated joints and provisions for operation and maintenance access.

(b) Pressure Relief Valves. Pressure relief valves are used to exhaust excess air pressure from a pipeline to protect the pipe from bursting and to remove large volumes of entrapped air that may significantly impact the hydraulic capacity of the pipe. The valves are set to open at a predetermined pressure so as to allow for a sealed pipeline under normal operating pressures.

These valves are commonly utilized in smaller pressure pipelines such as water supply lines to limit the effects of hydraulic transients (water hammers), but are occasionally used in stormwater systems. Inverted siphons (GJMC § 28.52.030) often require a venting system to prevent blowback of air entrained in the water, although an open air vent (no valve) is usually an acceptable solution given an exhaust point that is well above the hydraulic grade line.

An air venting system of some type is required at all locations where the crown of a pipe is higher than the crown elevations upstream and downstream from that point.

(c) Air Inlet Valves. Air inlet valves operate in a similar fashion to pressure relief valves, but instead allow air into a pipeline to avoid internal pressure to drop too far below atmospheric pressure. As water drains from a sealed pipeline, a partial vacuum is created that can collapse or severely damage the pipe. Air inlet valves operate either by a float (water level) control or by opening at a set pressure difference like a pressure relief valve.

High points in a pipeline shall always be designed with an air venting system to avoid extreme positive or negative internal pressures as compared to atmospheric pressure.

(Res. 40-08 (§ 905.3), 3-19-08)

Chapter 28.40
Storm Drain Systems

§ 28.40.010. Introduction.

(a) Storm drains are used to convey runoff in locations where streets or other drainage facilities exceed their designated capacity or are otherwise unable to drain. The most common method for the introduction of water into a storm drain is the street inlet, discussed in Chapter 28.44 GJMC. However, water may also enter the system via grated area inlets, culvert-type inlets (typically for the conveyance of drainage-channel flow into the drain), pump stations, or other entry points. The design of a storm drain system is dependant on topography, street rights-of-way and drainage easements, the need to convey flows from multiple locations, existing and proposed structures and utilities, outfall locations, local hydrology, and regional and local design criteria.

(b) Typically, storm drains are sized to convey the peak runoff from the minor storm in excess of the contributing street flow capacity. This means the upper end of a storm drain branch will usually be located at the first inlet encountered by runoff in a given sub-watershed. As discussed in Chapter 28.44 GJMC, the first inlet will either be located at the point where street flow from the design storm exceeds street capacity for that storm (on-grade inlet) or where there is a vertical sag in the street (sump inlet). In some cases, however, street inlets discharge their intercepted flow to drainage facilities other than a storm drain (e.g., a drainage channel). Storm drains shall be sized to carry the maximum difference between street capacity and peak runoff for any given design storm. This could be the difference between the major storm peak runoff and the allowable street capacity for the major storm, or it could be the difference between the minor storm runoff and allowable street capacity for the minor storm. This is discussed further in GJMC § 28.40.160 through 28.40.190.

(c) Occasionally, inlets and storm drains must be sized to convey the entire major storm event flow. Two examples of this situation follow:

(1) Locations where street flow is not in the desired direction and there is no other feasible drainage solution (such as closed basins – natural ponding areas).

(2) Locations where the standard allowable major storm street capacities do not apply, such as negative slopes outside the curb but within the right-of-way.

(d) Peak runoff values are found using the methods set forth in Chapters 28.24 and 28.28 GJMC.

(Res. 40-08 (§ 1001), 3-19-08)

§ 28.40.020. Storm drain design criteria.

GJMC § 28.40.020 through 28.40.060 present certain parameters relating to the design and construction of storm drain systems in Mesa County.

(Res. 40-08 (§ 1002), 3-19-08)

§ 28.40.030. Storm drain design criteria – Allowable capacity.

As described in GJMC § 28.40.010 and 28.40.160 through 28.40.190, a storm drain is designed to convey up to the entire design storm for all sub-watersheds tributary to it. The design of pressure-flow, or surcharged, storm pipes is allowed under certain restrictions as specified in this chapter. These include the calculation of energy grade lines (EGLs) and hydraulic grade lines (HGLs) indicating all hydraulic losses due to friction, junctions, and other structures and phenomena. The EGL for the storm drain design flow must at no time or location exceed the manhole rim or inlet throat elevation. More restrictive local criteria may apply; it is the responsibility of the designer to select the most restrictive of all applicable design criteria. Note that calculation of EGL and HGL is mandatory on all projects for the drainage plan submittal.

For the purpose of completing a conceptual storm drain system design, calculation of an EGL and HGL is not required. In these cases, the initial design methods presented in GJMC § 28.40.170 (using open-channel hydraulics as presented in GJMC § 28.40.080) are considered sufficient. The specific requirements for a conceptual drainage report are detailed in GJMC § 28.12.030 through 28.12.050.

(Res. 40-08 (§ 1002.1), 3-19-08)

§ 28.40.040. Storm drain design criteria – Allowable velocity.

Minimum velocities are required in storm drains to reduce sedimentation and promote positive drainage through the pipe at all depths. A minimum design-flow velocity of 2.5 feet per second is required for standard (positive-slope) storm drains. Table 28.40.040 provides required slope values needed to maintain this minimum velocity for different pipe sizes and roughness factors.

While concrete pipe itself “can carry clear water of extremely high velocities without eroding” (ACPA, 1996), there exist numerous other factors that indicate the need for a maximum velocity in storm drains. Among these are the use of other pipe materials and shapes, expected flow conditions, and the “type and quality of construction of joints, manholes, and junctions” (Washoe County, 1996). Therefore, storm drains shall have a maximum design-flow velocity of 15 feet per second. Note that maximum outfall velocities are more restrictive to protect those areas from extensive erosion. See Chapter 28.32 GJMC, Open Channels; Chapter 28.36 GJMC, Additional Hydraulic Structures; and Chapter 28.48 GJMC, Culverts and Bridges, for details.

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SLOPES REQUIRED FOR V=2.5 FPS AT FULL AND HALF-FULL FLOW

Pipe Diameter (Inches)	Required Slopes to Maintain Minimum Velocity (V = 2.5 fps) at Full and Half-Full Flow					
	n = 0.012	n = 0.013	n = 0.014	n = 0.015	n = 0.022	n = 0.025
8	0.283%	0.332%	0.385%	0.442%	0.951%	1.228%
10	0.210%	0.247%	0.286%	0.328%	0.706%	0.912%
12	0.165%	0.193%	0.224%	0.257%	0.554%	0.715%
15	0.122%	0.144%	0.167%	0.191%	0.411%	0.531%
18	0.096%	0.113%	0.131%	0.150%	0.322%	0.416%
21	0.078%	0.092%	0.106%	0.122%	0.263%	0.339%
24	0.065%	0.077%	0.089%	0.102%	0.220%	0.284%
27	0.056%	0.066%	0.076%	0.087%	0.188%	0.243%
30	0.049%	0.057%	0.066%	0.076%	0.163%	0.211%
33	0.043%	0.050%	0.058%	0.067%	0.144%	0.186%
36	0.038%	0.045%	0.052%	0.059%	0.128%	0.165%
42	0.031%	0.036%	0.042%	0.048%	0.104%	0.135%
48	0.026%	0.030%	0.035%	0.041%	0.087%	0.113%
54	0.022%	0.026%	0.030%	0.035%	0.075%	0.096%
60	0.019%	0.023%	0.026%	0.030%	0.065%	0.084%
66	0.017%	0.020%	0.023%	0.027%	0.057%	0.074%
72	0.015%	0.018%	0.021%	0.024%	0.051%	0.066%
78	0.014%	0.016%	0.018%	0.021%	0.046%	0.059%
84	0.012%	0.014%	0.017%	0.019%	0.041%	0.053%
90	0.011%	0.013%	0.015%	0.018%	0.038%	0.049%
96	0.010%	0.012%	0.014%	0.016%	0.035%	0.045%
102	0.009%	0.011%	0.013%	0.015%	0.032%	0.041%
108	0.009%	0.010%	0.012%	0.014%	0.030%	0.038%
114	0.008%	0.010%	0.011%	0.013%	0.028%	0.036%
120	0.008%	0.009%	0.010%	0.012%	0.026%	0.033%
126	0.007%	0.008%	0.010%	0.011%	0.024%	0.031%
132	0.007%	0.008%	0.009%	0.011%	0.023%	0.029%
138	0.006%	0.007%	0.009%	0.010%	0.021%	0.028%
144	0.006%	0.007%	0.008%	0.009%	0.020%	0.026%

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WRC ENGINEERING, INC. REFERENCE: ADAPTED FROM ACPA

TABLE 28.40.040

(Res. 40-08 (§ 1002.2), 3-19-08)

§ 28.40.050. Storm drain design criteria – Pipe roughness.

Roughness effects tend to vary with changes in flow depth and installation inconsistencies. To simplify design and ensure consistency, this manual specifies roughness values and does not permit the use of pipe manufacturers' values. Table 28.40.050 provides a range of Manning's *n* values for many pipe materials and configurations as developed by Chow in 1959 and Normann in 1985 (adapted from tables found in HDS-4 and HEC-22). For purposes of storm drain design, hydraulic roughness shall be specified by the largest Manning's *n* value in the provided range.

The designer may choose to use a higher Manning's *n* value if conditions warrant.

STORMWATER MANAGEMENT MANUAL

MANNING'S ROUGHNESS COEFFICIENTS FOR STORM DRAIN CONDUITS

Type of Conduit	Interior Wall Description	Manning's n
Concrete Pipes	Smooth	0.011-0.013
Concrete Boxes		
Wood forms	Smooth	0.012-0.014
Steel forms	Smooth	0.012-0.013
Spiral-Rib Metal Pipes	Smooth	0.012-0.013
Corrugated Metal Pipes and Boxes		
Annular Corrugations	68mm x 13mm (2-2/3" x 1/2") corrugations	0.022-0.027
Helical Corrugations	68mm x 13mm (2-2/3" x 1/2") corrugations	0.011-0.023
	150mm x 25mm (6" x 1") corrugations	0.022-0.025
	125mm x 25mm (5" x 1") corrugations	0.025-0.026
	75mm x 25mm (3" x 1") corrugations	0.027-0.028
Structural Plate Corrugations	230mm x 64mm (9" x 2-1/2") corrugations	0.033-0.037
	150mm x 50mm (6" x 2") corrugations	0.033-0.035
Corrugated Polyethylene (HDPE)	Smooth	0.009-0.015
	Corrugated	0.018-0.025
Polyvinyl Chloride (PVC)	Smooth	0.009-0.012
Cast-Iron Pipe, uncoated		0.013
Steel Pipe		0.009-0.013
Vitrified Clay Pipe		0.012-0.014
Vitrified Clay Liner Plates		0.015
Cemented Rubble Masonry Walls		
Concrete Floor and Top		0.017-0.022
Natural Floor		0.019-0.025
Brick		0.014-0.017
Laminated Treated Wood		0.015-0.017

Note: The Manning's n values indicated in this table were obtained in the laboratory and are supported by the provided references. Actual field values for older existing pipelines may vary depending on the effects of abrasion, corrosion, deflection, and joint conditions. (HDS-4) The designer should take into account these potential issues when selecting roughness values.

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ORIGINAL ISSUE	3/27/06

URS ENGINEERING, INC.	REFERENCE: ADAPTED FROM HDS-4 & HEC-22	

TABLE 28.40.050

(Res. 40-08 (§ 1002.3), 3-19-08)

§ 28.40.060. Storm drain design criteria – System layout.

The layout of a storm drain system is dependent on topography, hydrology, surface hydraulics, easements and rights-of-way, existing structures and utilities, outfall locations, and other factors. General criteria for the design of a storm drain layout follow.

(a) Vertical Alignment.

(1) Minimum and maximum cover are determined by the size, material, and class of pipe, as well as the characteristics of the cover material and the expected surface loading. The designer shall consult the appropriate data sources, to include:

(i) Colorado Department of Transportation *Standard Specifications for Road and Bridge Construction*, Section 700 (Materials Details).

(ii) *Concrete Pipe Design Manual* (ACPA).

(iii) *Handbook of Steel Drainage and Highway Construction Products* (AISI).

(iv) Pipe manufacturer specifications.

(v) Other applicable references.

Storm drains crossing under railroads and highways must comply with any cover requirements specified for culverts (Chapter 28.48 GJMC).

(2) Pipes installed under any driving or parking area shall be designed for H-20 minimum live load. (City of Grand Junction *Standard Specifications for Construction of Underground Utilities – Waterlines, Sanitary Drain, Storm Drains, Underdrains and Irrigation Systems*).

(3) Storm drain mains (any storm drain to which laterals connect) shall have a minimum cover of 36 inches over the top of the pipe. This minimum includes any pavement thickness, but does not replace the minimum cover and compaction requirements designated by local standards and the application of valid structural loading computations.

(b) Horizontal Alignment.

(1) Storm drain bends, whether completed using the pulled-joint method, bend pipe, or radius (curved) pipe, shall be avoided where possible. Bends are not allowed for storm drain pipe of less than 48-inch diameter. Table 28.40.060(a) shows the maximum allowed deflection for pulled-joint construction.

Table 28.40.060(a): Maximum Allowed Deflection for Pulled-Joint Construction

Pipe Diameter or Span (inches)	Allowed Deflection (Pull) Per Joint
48 – 54	5/8
60 – 78	3/4
84 – 102	7/8
108 – 144	1

(2) Per the *City of Grand Junction General Utility Details*, storm drain manholes shall be located at the centerline of a traffic lane. Storm drain mains are to be located on the south or west side of a roadway, and must have a minimum horizontal clearance of 6.0 feet from the roadway centerline to the storm drain centerline. In cases where the sanitary drain main is not located at the street centerline, the designer shall consult with the appropriate local jurisdiction to determine the required horizontal and vertical clearances.

Maximum allowable spacing between manholes is presented in subsection (d) of this section and Table 28.40.060(b).

(c) Utility Clearances. The designer shall consult with the most recent versions of the following documents to ensure compliance with the most restrictive (largest) utility clearance values applicable to the subject location:

(1) City of Grand Junction *Standard Specifications for Construction of Underground Utilities – Waterlines, Sanitary Drains, Storm Drains, Underdrains and Irrigation Systems*.

(2) City of Grand Junction *Standard Details for Construction of Streets, Storm Drains, and Utilities*.

(3) City of Grand Junction *Transportation Engineering Design Standards* (TEDS) Manual, GJMC Title 29.

(4) Any utility clearance requirements set forth by a local jurisdiction or special district.

Pipe encasement may be required in some locations where minimum utility clearances are unable to be met. Standards for the design and installation of casing pipe and concrete encasement can be found in the *General Utility Details* of the City of Grand Junction *Standard Details for Construction of Streets, Storm Drains, and Utilities*.

(d) Manholes. Manholes are necessary to provide maintenance and inspection access to the storm drain. When designed correctly, they also provide more hydraulically efficient pipe junctions and other transitions. All manhole lids must bear the words “storm water” for identification purpose.

(1) For storm drain pipes of less than 48-inch diameter, a manhole must be located at all changes in main-line pipe size or grade, junctions where a lateral joins the main-line alignment at a higher elevation (vertical drops), main-line vertical drops (drop manhole), and main-line direction changes or bends. Manholes located at storm drain bends shall be located at either tangent intersection or within the bend itself.

(2) Pipes of 48 inches or larger diameter do not necessarily require manholes at all locations specified above. However, manholes in addition to those required by standard maximum spacing may be stipulated by local jurisdiction.

(3) Table 28.40.060(b) indicates maximum spacing for manholes. Noncircular pipes shall be converted to equivalent diameters based on pipe area.

Table 28.40.060(b): Maximum Manhole/Accessible Junction Spacing	
Equivalent Pipe Diameter	**Maximum Allowable Manhole Spacing**
Less than 48 inches	400 feet
48 inches or larger	600 feet

(Res. 40-08 (§ 1002.4), 3-19-08)

§ 28.40.070. Storm drain hydraulics.

GJMC § 28.40.080 through 28.40.100 present the hydraulic methods used to calculate storm drain capacities and thereby to design a storm drain system. The actual design process is presented in GJMC § 28.40.160 through 28.40.190. The majority of the methods in this section are adapted from those presented in *HEC-22 (Urban Drainage Design Manual)* and *HDS-4 (Introduction to Highway Hydraulics)*.

(Res. 40-08 (§ 1003), 3-19-08)

§ 28.40.080. Gravity-flow analysis.

Initial storm drain design is completed by selecting pipe sizes based on "just full" capacity. This means that the drain capacity is calculated using open-channel (nonpressurized) flow computations. Starting at the uppermost reach of the storm drain (at the first inlet), the designer applies Manning's equation (Equation 28.40-1) for each segment of drain. A segment is a reach of pipe with a junction, transition, grade change, horizontal bend, or pipe size change at each end.

$$Q_f = \frac{1.49}{n} A_f R_f^{2/3} S_o^{1/2} \qquad (28.40\text{-}1)$$

Where:

Q_f = Full Flow Discharge (cfs)

n = Manning's Roughness Coefficient (see GJMC § 28.40.050)

A_f = Full Flow Area = $\frac{\pi D^2}{4}$ for circular pipes

R_f = Full Flow Hydraulic Radius = D/4 for circular pipes (ft.)

S_o = Pipe Slope ($S_o = S_f$ for full flow) (ft./ft.)

D = Pipe Diameter (feet)

Equation 28.40-2 is a form of Manning's that can be used to directly solve for the minimum required pipe diameter for circular pipes. The designer shall always round up to the nearest available pipe size, keeping in mind that minor losses in the pipe may decrease available

capacity. Initial pipe size, D_i (ft.), is based on the peak design flow for that pipe segment, Q_P (cfs).

$$D_i = \left[\frac{2.16nQ_P}{S_o^{1/2}}\right]^{3/8} \quad (28.40\text{-}2)$$

For noncircular pipes, Equation 28.40-2 provides the equivalent diameter based on flow area.

To better account for energy losses that will occur in the system, the designer may choose to calculate preliminary head losses through inlet and manhole junctions. Application of these approximate losses will allow for better estimation of required pipe sizes during the initial design process, expediting the preliminary and final design phases. *HEC-22* presents the following equation and table for the calculation of approximate junction head loss:

$$H_{ah} = K_{ah}\left(\frac{V_o^2}{2g}\right) \quad (28.40\text{-}3)$$

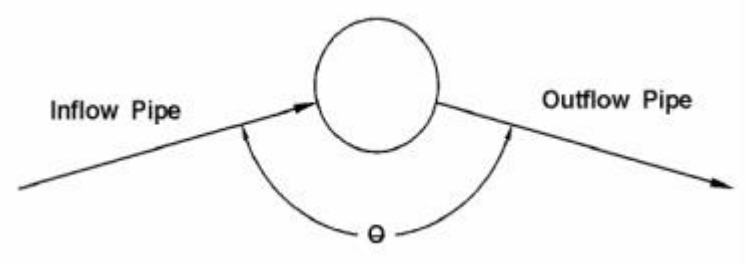
Where:

H_{ah} = Preliminary Junction Head Loss Estimate (ft.)
K_{ah} = Head Loss Coefficient from Table 28.40.080
V_o = Flow Velocity = Q_P/A_f (fps)
g = Gravitational Constant = 32.2 ft.^{2}/sec.

Table 28.40.080: Preliminary Head Loss Coefficients (for Conceptual/Initial Design ONLY)

Structure Configuration	Coefficient, K_{ah}
Inlet – Straight Run	0.5
Inlet – Angled Through (θ)	
90°	1.5
60°	1.25
45°	1.1
22.5°	0.7
Manhole – Straight Run	0.15
Manhole – Angled Through (θ)	
90°	1
60°	0.85

Table 28.40.080: Preliminary Head Loss Coefficients (for Conceptual/Initial Design ONLY)	
Structure Configuration	**Coefficient, K_{ah}**
45°	0.75
22.5°	0.45



From HEC-22, Table 7-5a and Figure 7-4.

Figures 28.40.080(a) through 28.40.080(d) present relative velocities and flows for circular, elliptical (horizontal and vertical), and arch pipe under gravity-flow conditions. Similar charts for box sections can be found in the Concrete Pipe Design Manual and other design aids.

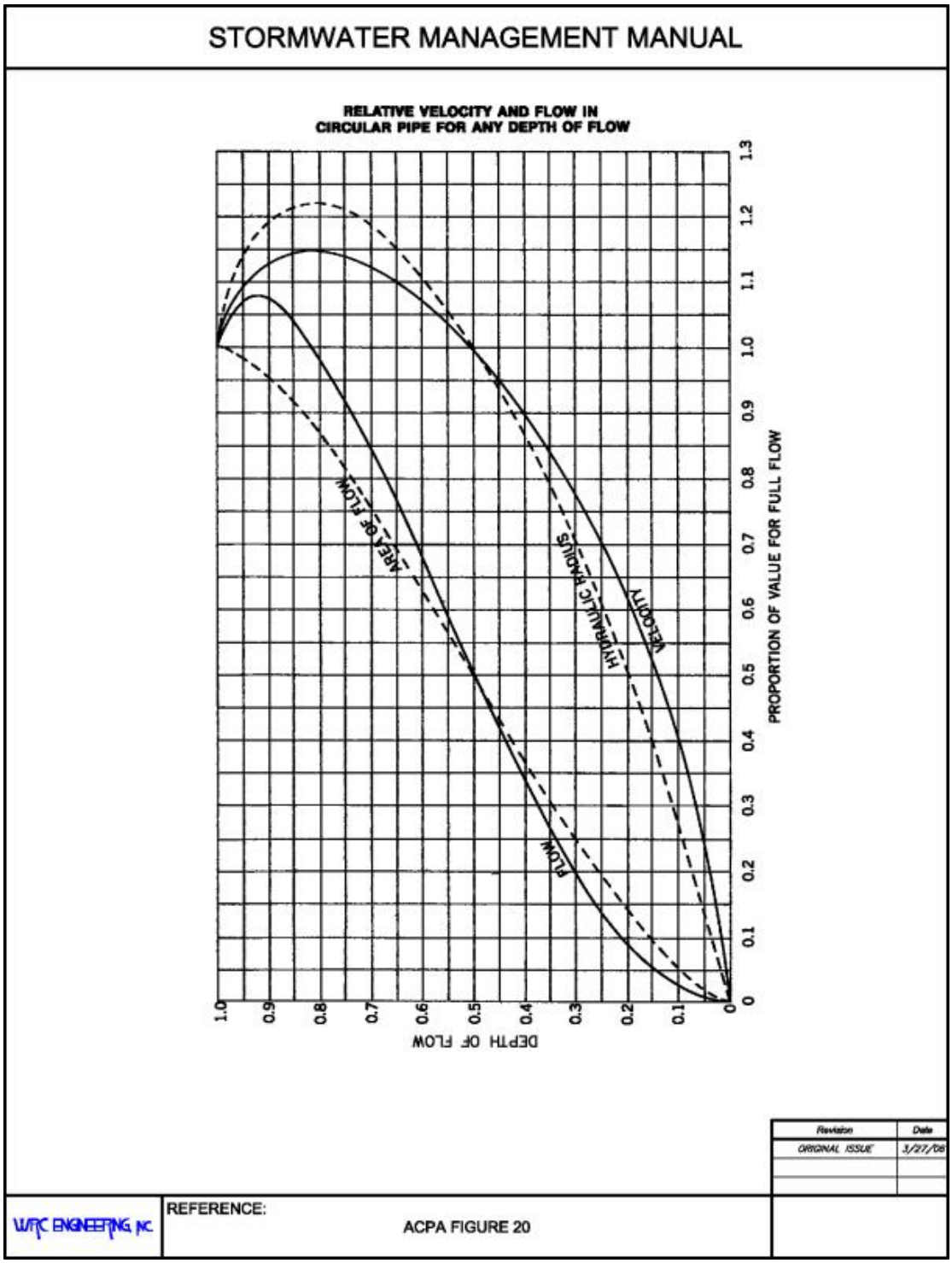


FIGURE 28.40.080(a)

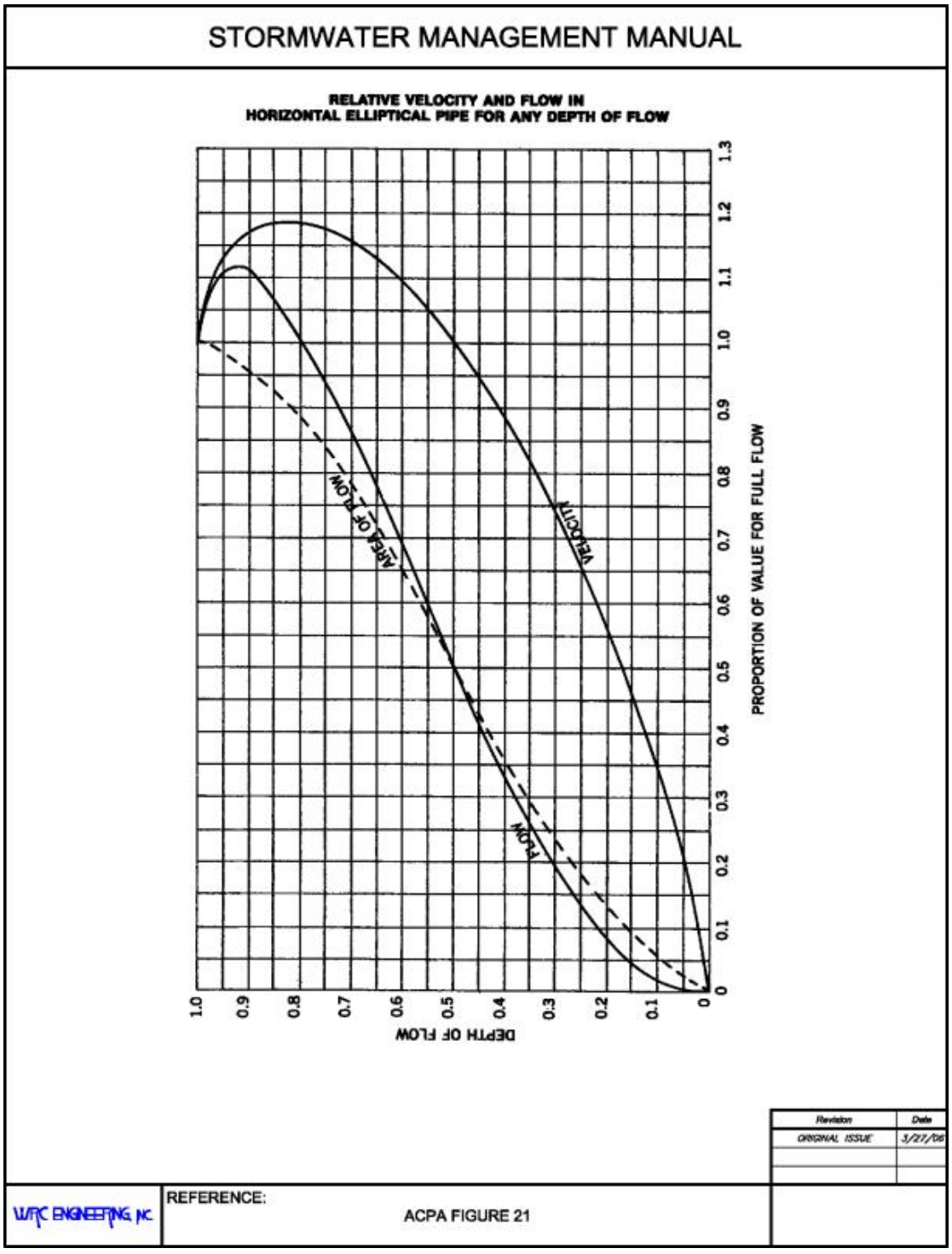


FIGURE 28.40.080(b)

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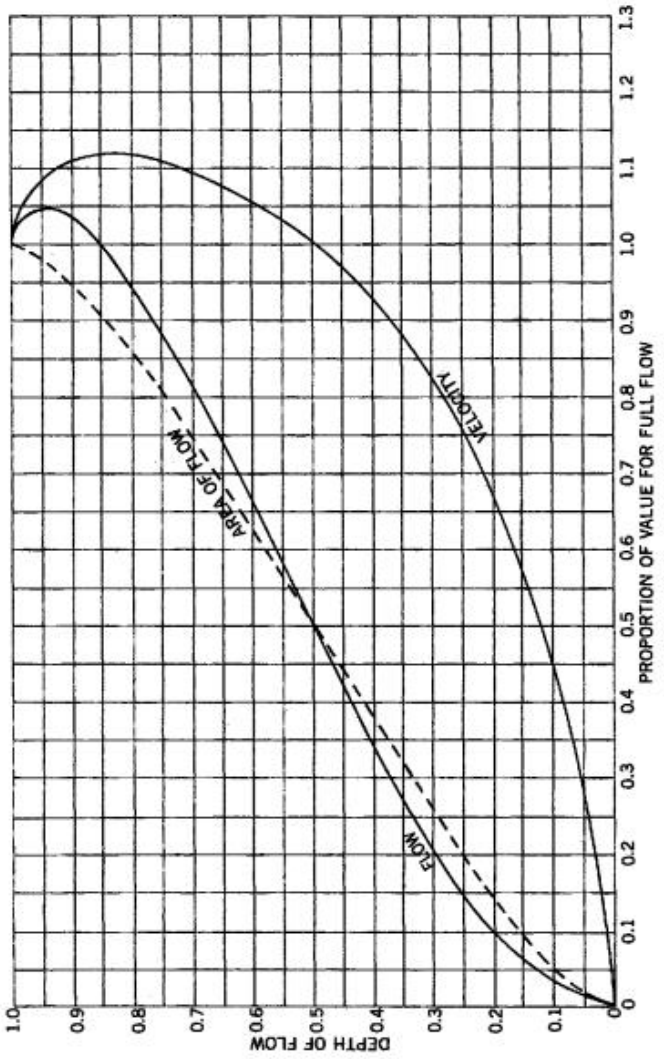
RELATIVE VELOCITY AND FLOW IN
VERTICAL ELLIPTICAL PIPE FOR ANY DEPTH OF FLOW



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WRC ENGINEERING, INC.

REFERENCE: ACPA FIGURE 22

FIGURE 28.40.080(c)

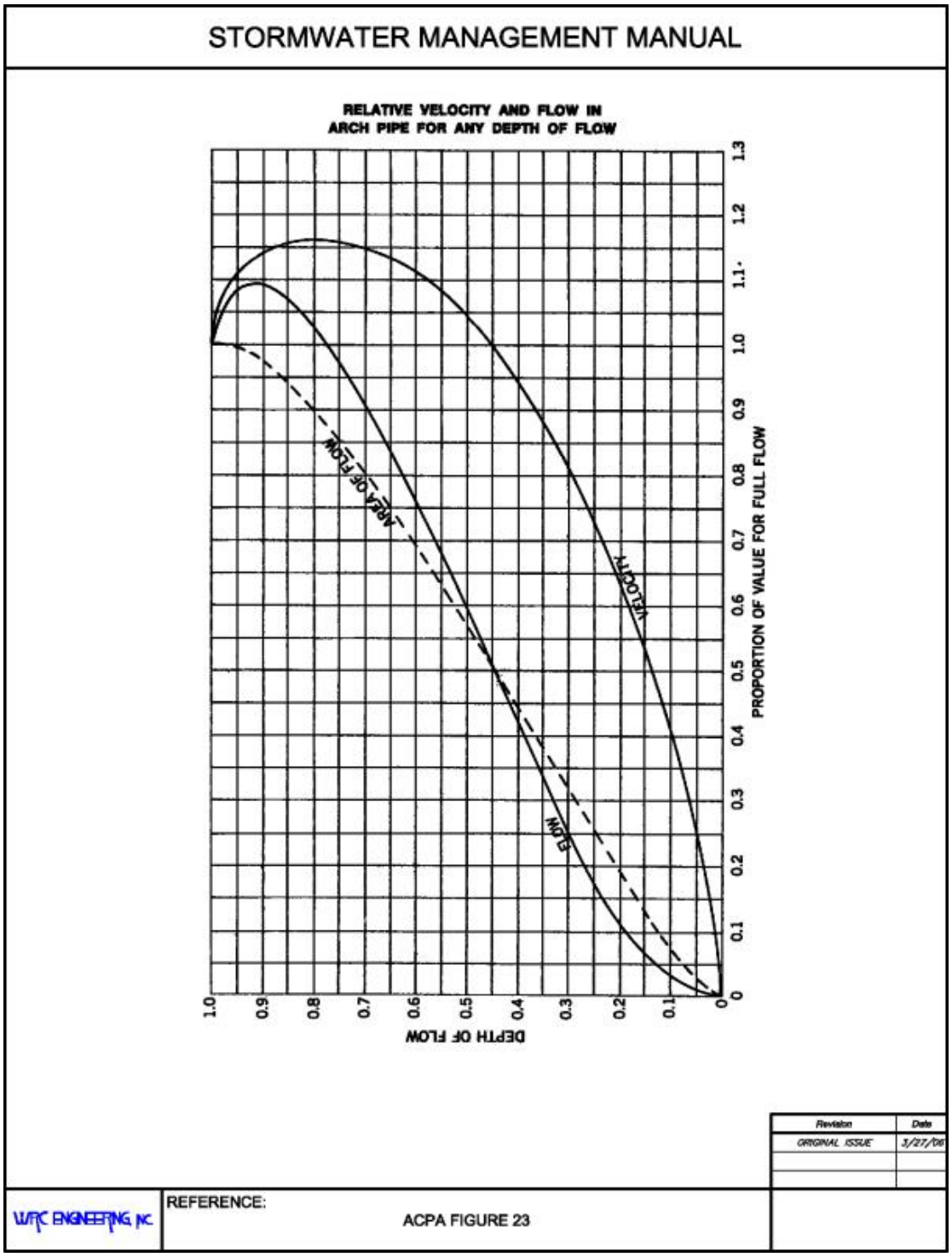

FIGURE 28.40.080(d)

(Res. 40-08 (§ 1003.1), 3-19-08)

§ 28.40.090. Pressure-flow analysis.

Following the initial "just-full" storm drain design, the system is analyzed using energy-momentum theory to account for specific energy losses. This method allows for the calculation of hydraulic and energy grade lines (HGL and EGL) for a given storm drain line by starting with the water surface elevation of the outfall and working upstream, accounting for all losses due to pipe friction, manholes, transitions, bends, junctions, and pipe entrances and exits. In cases where pressure flows exist, certain limitations exist on the maximum elevation of the EGL in relation to the ground surface (finished grade). Compliance with minimum and maximum flow velocities is based on peak design flow in the final selected pipe size for each segment. See GJMC § 28.40.020 through 28.40.060 for specific design criteria.

Energy-momentum theory is based upon the concept that energy, typically expressed in hydraulics as "head" in a linear dimension such as feet, is conserved along a given conduit segment. For a segment where A is the upstream end and B is downstream, the steady-flow energy equation can be expressed as:

$$z_A + \frac{p_A}{\gamma} + \frac{V_A^2}{2g} + h_p = z_B + \frac{p_B}{\gamma} + \frac{V_B^2}{2g} + \sum h_L \qquad (28.40\text{-}4)$$

Where:

z	=	Invert Elevation above any Horizontal Datum (ft.)
p	=	Fluid Pressure lbf/ft.^{2}
γ	=	Specific Weight of Water ≅ 62.4 lbf/ft.^{3}
V	=	Flow Velocity (fps)
h_P	=	Head Added by a Pump (if applicable) (ft.)
Σh_L	=	Sum of Head Losses in Segment A – B as calculated per the methods prescribed in this section

Each term in Equation 28.40-4, and thus the sum of the formula, has a linear dimension (e.g., feet). Each term represents the hydraulic head contributed to the total energy head by that term. For instance, the third term, $V^2/2g$, is the velocity head. The EGL elevation at a given point is equal to:

$$EGL = z + \frac{p}{\gamma} + \frac{V^2}{2g} \qquad (28.40\text{-}5)$$

and the HGL elevation is simply the EGL minus the velocity head:

$$HGL = EGL - \frac{V^2}{2g} \text{ and conversely, } EGL = HGL + \frac{V^2}{2g} \qquad (28.40\text{-}6)$$

In cases where outfall water surface is equal to or higher than the outlet flow elevation, the EGL and HGL are assumed to be equal, i.e., velocity is zero at the downstream point where calculations start. However, if the outfall water surface is lower than the outlet pipe flow elevation, the latter value is used as the outlet HGL. Note that the outfall water surface elevation used must be determined coincident with the time of peak flow from the storm drain.

The HGL at the next structure (e.g., manhole) is determined by the equations presented in Table 28.40.090(a). The equations are separated by HGL at the pipe inlet downstream of the manhole and the pipe outlet at the inlet to the manhole. For nonsurcharged flow (less than 80 percent pipe depth), the free water surface at the pipe inlet (downstream end of the manhole) is added to head loss across the manhole to find the pipe outlet HGL (upstream end of the manhole).

Table 28.40.090(a): Equations for Determining HGL

Surcharge Conditions	Outlet Submergence	HGL in Manhole/Junction	At	Equation Number
$d_n/D > 0.80$	N/A	$= HGL_{Pipe\ Outlet} + h_f + h_{minor}$	Pipe Inlet (D/S from MH)	28.40-7
$d_n/D > 0.80$	N/A	$= HGL_{Pipe\ Inlet} + h_{mh}$	Pipe Outlet (U/S from MH)	28.40-8
$d_n/D \leq 0.80$	Unsubmerged	$= WSE_{Pipe\ Inlet}$	Pipe Inlet (D/S from MH)	28.40-9
$d_n/D \leq 0.80$	Unsubmerged	$= WSE_{Pipe\ Inlet} + h_{mh}$	Pipe Outlet (U/S from MH)	28.40-10
$d_n/D \leq 0.80$	Submerged	= Larger of Equations 28.40-7 and 28.40-9 OR = Larger of Equations 28.40-8 and 28.40-10		

Where:

d_n	=	Normal Flow Depth in Pipe (feet)
$HGL_{Pipe\ Outlet}$	=	Larger of Tailwater Elevation, Flow Depth Elevation at Pipe Outlet, and HGL at Next Downstream Pipe Inlet
$WSE_{Pipe\ Inlet}$	=	Free Water Surface Elevation at Pipe Inlet
h_f, h_{mh}, h_{minor}	=	Head Losses as Described in This Section

Occasionally, design flow through a pipe may be not only gravity-flow (nonsurcharged) but also supercritical. Pipe losses (h_f and h_{minor}) in a supercritical pipe section are not carried upstream. (HEC-22)

In locations where two adjoining pipe segments flow in supercritical conditions, manhole losses are also ignored for that line. The designer shall be careful to include these losses where only one of the pipes on the line under investigation contains supercritical flow.

Inlet pipes to a manhole must occasionally have an invert significantly above that of the outlet pipe. In locations where the outlet pipe water surface elevation (or HGL if pressure flow) is below the invert of an inlet pipe, that inlet pipe is treated as an outfall pipe. In this

case, the outfall water surface elevation is always lower than the pipe outlet water level, so the latter elevation is used for the initial HGL of the new upstream reach. The outflow pipe from the manhole in such a situation acts as a culvert under either inlet or outlet control. See Chapter 28.48 GJMC and/or FHWA *Hydraulic Design of Highway Culverts (HDS-5)* for information regarding the computation of an HGL at the manhole and calculation of head loss due to a culvert inlet.

The following subsections prescribe methods for determining the energy losses induced by pipe friction, manholes, and other structures (minor pipe losses) that may be encountered by storm drain flows.

(a) Pipe Friction Losses. Pipe friction is a significant source of energy dissipation in storm drains, whether in gravity-flow or pressure-flow conditions. For the former, friction slope (S_f) can be assumed to be equal to the slope of the pipe invert (S_o). For pipes with a surcharge flow condition ($d_n/D > 0/80$), Equations 28.40-11 and 28.40-12 define friction slope (units for variables are the same as in Equation 28.40-1 when using English units).

$$S_f = \frac{n^2 V_{avg}^2}{K_Q R^{4/3}} \qquad (28.40\text{-}11)$$

Where:

K_Q = 2.21 (English Units)
K_Q = 1.0 (S.I. Units)

$$S_f = \left[\frac{Q_{avg} n}{K_Q D^{8/3}}\right]^2 \qquad (28.40\text{-}12)$$

Where:

K_Q = 0.46 (English Units)
K_Q = 0.312 (S.I. Units)

Equation 28.40-11 is a form of the Chezy-Manning formula, and is based on average velocity in the pipe segment. Since flow rate and cross-sectional area typically remain constant through one segment of pipe, average velocity can be assumed to equal flow rate divided by flow area. Where flow rate and/or pipe size changes within one segment (such as at a pipe transition without a manhole or a no-access junction), this velocity is the average of those calculated at the ends of the pipe segment (Linsley, 1992). Equation 28.40-12 is based on the average flow rate in the pipe segment.

Once the friction slope is known, pipe friction head loss is calculated by multiplying the friction slope by the pipe segment length:

$$h_f = S_f L \qquad (28.40\text{-}13)$$

(b) Manhole Junction Losses. This subsection details the energy-loss method used by the HYDRAIN program (FHWA) as presented in HDS-4 for calculation of approximate head loss through a manhole. This method applies to any junction of two or more pipes accessible by a manhole. The approximate head loss coefficient values presented in Table 28.40.080 are replaced by the values computed herein.

For each manhole, the designer must first calculate the initial head loss coefficient (K_o) and all applicable coefficient correction factors (C_x). The adjusted head loss coefficient (K) and head loss in the manhole (h_{mh}) are then computed.

$$h_{mh} = K\left(\frac{V_o^2}{2g}\right) \quad (28.40\text{-}14)$$

$$K_o = 0.1\frac{b}{D_o}(1-\sin\theta)+1.4\left(\frac{b}{D_o}\right)^{0.15}\sin\theta \quad (28.40\text{-}15)$$

$$K_o = 0.1\frac{b}{D_o}(1-\sin\theta)+1.4\left(\frac{b}{D_o}\right)^{0.15}\sin\theta \quad (28.40\text{-}16)$$

Where:

θ	=	Angle Between Inflow and Outflow Pipes ($\leq 180°$)
b	=	Manhole of Junction Diameter (at water level)
D_o	=	Outlet Pipe Diameter

The coefficient correction factors are calculated using the equations presented below and are applied to the initial head loss coefficient per Equation 28.40-15. Note that some correction factors do not apply to all manhole configurations. These nonapplicable factors are set to unity.

(1) C_D – Correction Factor for Pipe Diameter. This applies to pressure flow when the ratio of water depth in the manhole above the outlet pipe invert to outlet pipe diameter is greater than 3.2. $d_{mho}/D_o > 3.2$.

$$C_D = \left(\frac{D_o}{D_i}\right)^3 \quad (28.40\text{-}17)$$

Where:

D_o	=	Outlet Pipe Diameter
D_i	=	Inlet Pipe Diameter

(2) C_d – Correction Factor for Flow Depth. This applies to gravity flow and low-pressure flow when the ratio of water depth in the manhole above the outlet pipe invert to outlet pipe diameter is less than 3.2. $d_{mho}/D_o < 3.2$.

$$C_d = 0.5\left(\frac{d_{mho}}{D_o}\right)^{0.6} \quad (28.40\text{-}18)$$

Where:

D_{mho} = Water Depth in Manhole Above Outlet Pipe Invert
D_o = Outlet Pipe Diameter

For purposes of this calculation, water depth in the manhole is approximated as the vertical distance from the outlet pipe invert to the HGL at the upstream end of the outlet pipe.

(3) C_Q – Correction Factor for Relative Flow. This applies to manholes with three or more pipes entering the structure at similar elevations (one of these pipes will be the outlet pipe). This correction factor does not apply to the effects of inflow pipes with flowlines far enough above the outlet pipe to qualify as plunging flow (see Equation 28.40-20 and explanation, this section).

$$C_Q = (1 - 2\sin\theta)\left(1 - \frac{Q_i}{Q_o}\right)^{0.75} + 1 \quad (28.40\text{-}19)$$

Where:

θ = Angle Between the Inflow Pipe of Interest and the Outflow Pipe
Q_i = Flow in the Inflow Pipe of Interest
Q_o = Flow in the Outflow Pipe

The "pipe of interest" is the inlet pipe to the manhole on the line being investigated. This factor accounts for streamline interference by flow from other pipes entering the manhole. See Figure 28.40.090(a) for an illustration of the relative flow effect.

(4) C_p – Correction Factor for Plunging Flow. This applies to manholes with an inflow pipe of interest that is affected by plunging flow from another inflow pipe with a higher flowline. The factor does not apply to the line with the pipe that is discharging the plunging flow, and only applies when the height of the plunging-flow pipe flowline above the outlet pipe center exceeds the manhole water depth above the outlet pipe invert: $h > d_{mho}$

$$C_p = 1 + 0.2\left(\frac{h}{D_o}\right)\left(\frac{h - d_{mho}}{D_o}\right) \quad (28.40\text{-}20)$$

Where:

h	=	Vertical Distance of Plunging Flow (height of plunging flow pipe flowline above center of outlet pipe)
d_{mho}	=	Water Depth in Manhole Above Outlet Pipe Invert
D_o	=	Outlet Pipe Diameter

A common application of this correction factor occurs at locations where inlets convey intercepted flow directly (vertically) to the storm drain main line (drop inlets) or where laterals enter a manhole well above the main line invert.

(5) C_B – Correction Factor for Benching. This applies to all flow conditions. See Figure 28.40.090(b) and Table 28.40.090(b) for proper correction factor selection.

Table 28.40.090(b): Benching Correction Factors

	Outlet Pipe Conditions	
Bench Type (see Figure 28.40.090(b))	**Fully Submerged, Pressure Flow***	**Unsubmerged, Free Surface Flow****
Flat or Depressed	1	1
Benched: 1/2 Pipe Diameter	0.95	0.15
Benched: 1 Pipe Diameter	0.75	0.07
Improved Bench	0.4	0.02

Adapted from *Mesa County SWMM* 1996, Figure "H-4"
*Applies for $d_{mho}/D_o \geq 3.2$
**Applies for $d_{mho}/D_o \leq 1.0$

As can be seen in Table 28.40.090(b), benching in manholes significantly reduces head loss due to outlet inefficiency, especially in unsubmerged conditions. Note that in this case, the submerged pressure-flow factors do not apply until flow depth in the manhole has exceeded 3.2 times the outlet pipe diameter. Therefore, for depths between free surface (gravity) flow and full pressure-flow conditions ($1.0 > d_{mho}/D_o < 3.2$), the designer shall use a linear interpolation to compute the benching correction factor.

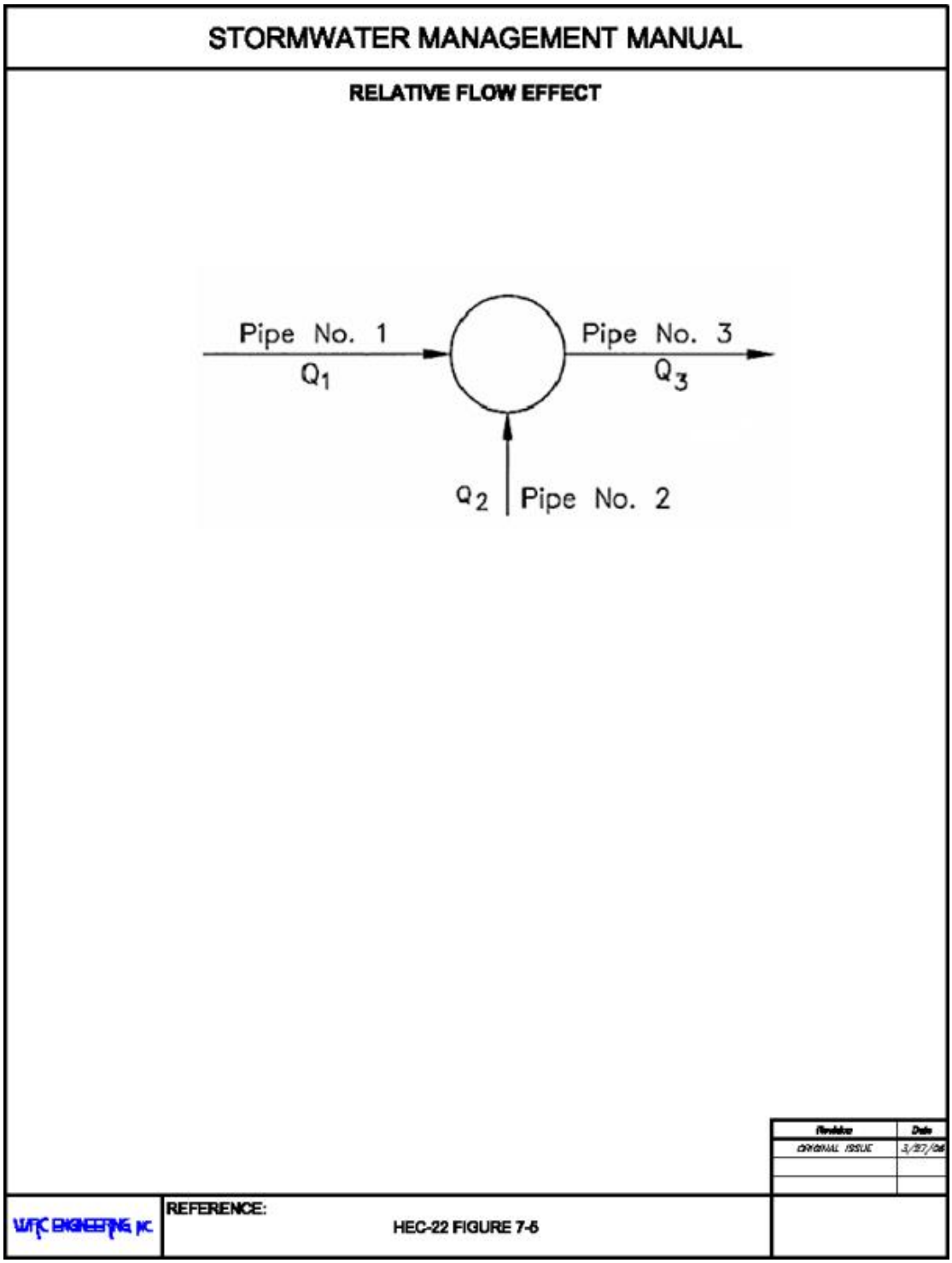

FIGURE 28.40.090(a)

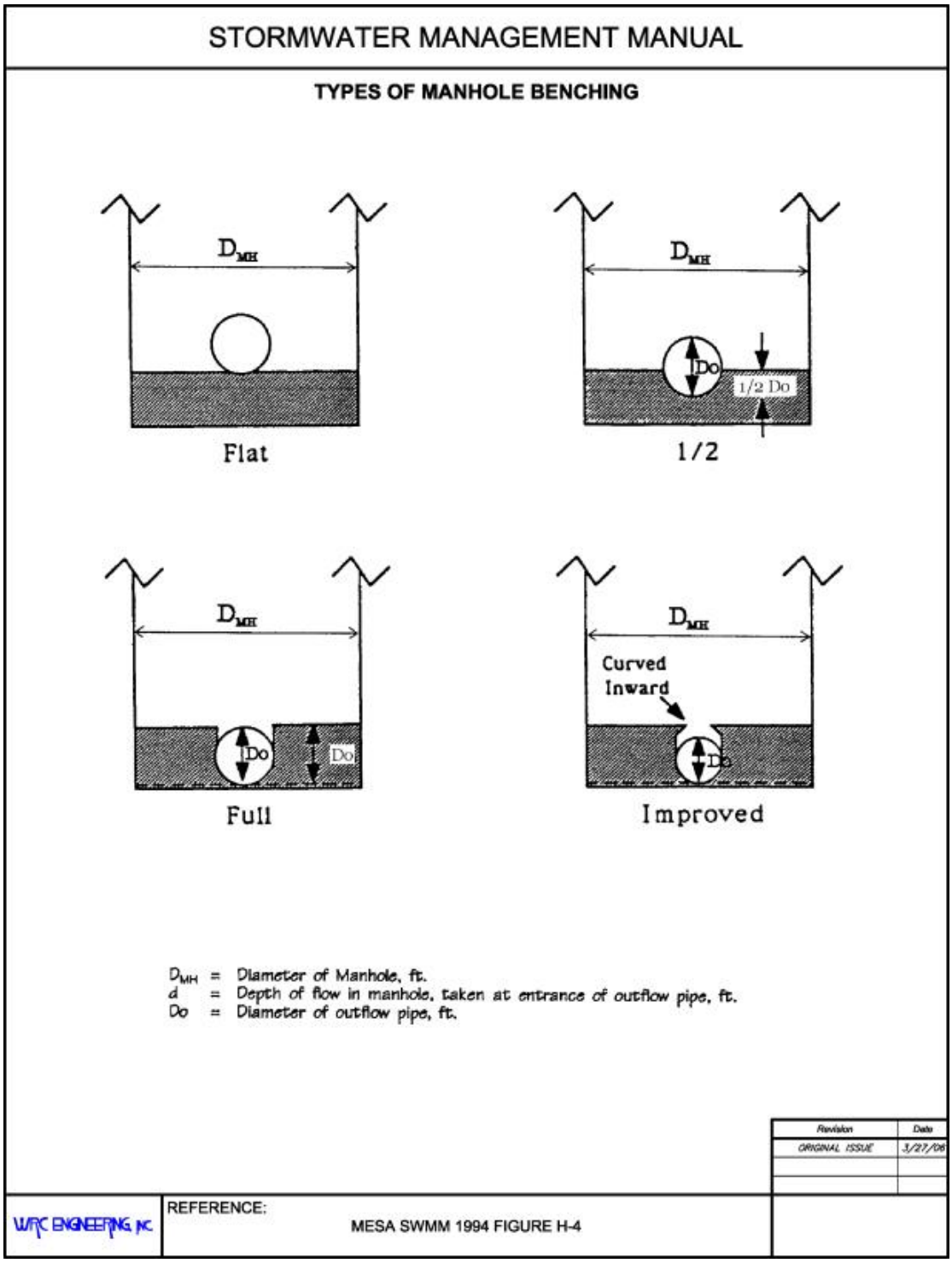

FIGURE 28.40.090(b)

(c) Minor Pipe Losses. This subsection describes the methods used in Mesa County for the calculation of head losses caused by pipe transitions (expansions or contractions), bends (curved drains), no-access junctions, on-grade inlets, and exits (outlets). The minor losses are added together for a given pipe segment per Equation 28.40-21:

$$h_{minor} = \sum h_{L,minor} = h_e + h_c + h_b + h_j + h_i + h_o \quad (28.40\text{-}21)$$

(1) h_e and h_c – Transition Losses. Transition losses occur when pipe size is changed at a location other than a manhole. Expansions may be necessary due to changes in flow rate or slope. Contractions are locations where pipe size is decreased, and are allowed only through a variance. Methods for head loss calculation through a pipe contraction are included in this title.

The calculation of head loss through a transition differs for nonpressure flow and pressure flow.

(i) Nonpressure Flow Transitions.

$$h_e = K_e\left(\frac{V_1^2}{2g} - \frac{V_2^2}{2g}\right) \quad (28.40\text{-}22)$$

$$h_c = K_c\left(\frac{V_2^2}{2g} - \frac{V_1^2}{2g}\right) \quad (28.40\text{-}23)$$

Where:

K_e	=	Expansion Coefficient (see Table 28.40.090(a)(1))
K_c	=	Contraction Coefficient (see Table 28.40.090(a)(2))
K_c	=	$0.5 \cdot K_e$ for Gradual Contractions
V_1	=	Velocity Upstream of the Transition
V_2	=	Velocity Downstream of the Transition

(ii) Pressure-Flow Transitions.

$$h_e = K_{ep}\left(\frac{V_1^2}{2g}\right) \quad (28.40\text{-}24)$$

$$h_c = K_{cp}\left(\frac{V_2^2}{2g}\right) \quad (28.40\text{-}25)$$

Where:

K_{ep}	=	Expansion Coefficient (see Table 28.40.090(b)(1), (2))
K_{cp}	=	Contraction Coefficient (see Table 28.40.090(b)(3))
V_1	=	Velocity Upstream of the Transition
V_2	=	Velocity Downstream of the Transition

See Figure 28.40.090(c) for illustration of the "Angle of Cone" variable used in Tables 28.40.090(a) and 28.40.090(b).

STORMWATER MANAGEMENT MANUAL

TRANSITION COEFFICIENTS FOR GRAVITY-FLOW CONDITIONS

TABLE 26.40.090(a)(1) – VALUES OF K_e FOR GRAVITY FLOW IN PIPE EXPANSIONS (FHWA 1996)

D_2/D_1	Angle of Cone						
	10°	20°	45°	60°	90°	120°	180°
1.5	0.17	0.40	1.06	1.21	1.14	1.07	1.00
3	0.17	0.40	0.86	1.02	1.06	1.04	1.00

TABLE 26.40.090(a)(2) – VALUES OF K_e FOR GRAVITY FLOW IN SUDDEN PIPE EXPANSIONS (LINSLEY AND FRANZINI 1964)

D_2/D_1	K_c
0.2	0.5
0.4	0.4
0.6	0.3
0.8	0.1
1	0

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TABLE 28.40.090(a)

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TRANSITION COEFFICIENTS FOR PRESSURE-FLOW CONDITIONS

TABLE 26.40.090(b)(1) – VALUES OF K_e FOR PRESSURE FLOW IN GRADUAL PIPE EXPANSIONS

D_2/D_1	Angle of Cone										
	2°	6°	10°	15°	20°	25°	30°	35°	40°	50°	60°
1.1	0.01	0.01	0.03	0.05	0.10	0.13	0.16	0.18	0.19	0.21	0.23
1.2	0.02	0.02	0.04	0.09	0.16	0.21	0.25	0.29	0.31	0.35	0.37
1.4	0.02	0.03	0.06	0.12	0.23	0.30	0.36	0.41	0.44	0.50	0.53
1.6	0.03	0.04	0.07	0.14	0.26	0.35	0.42	0.47	0.51	0.57	0.61
1.8	0.03	0.04	0.07	0.15	0.28	0.37	0.44	0.50	0.54	0.61	0.65
2.0	0.03	0.04	0.07	0.16	0.29	0.38	0.46	0.52	0.56	0.63	0.68
2.5	0.03	0.04	0.08	0.16	0.30	0.39	0.48	0.54	0.58	0.65	0.70
3.0	0.03	0.04	0.08	0.16	0.31	0.40	0.48	0.55	0.59	0.66	0.71
inf	0.03	0.05	0.08	0.16	0.31	0.40	0.49	0.46	0.60	0.67	0.72

TABLE 26.40.090(b)(2) – VALUES OF K_e FOR PRESSURE FLOW IN SUDDEN PIPE EXPANSIONS

D_2/D_1	Velocity, V_1, in feet Per Second												
	2.0	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0	15.0	20.0	30.0	40.0
1.2	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.08
1.4	0.26	0.26	0.25	0.24	0.24	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.20
1.6	0.40	0.39	0.38	0.37	0.37	0.36	0.36	0.35	0.35	0.34	0.33	0.32	0.32
1.8	0.51	0.49	0.48	0.47	0.47	0.46	0.46	0.45	0.44	0.43	0.42	0.41	0.40
2.0	0.60	0.58	0.56	0.55	0.55	0.54	0.53	0.52	0.52	0.51	0.50	0.48	0.47
2.5	0.74	0.72	0.70	0.69	0.68	0.67	0.66	0.65	0.64	0.63	0.62	0.60	0.58
3.0	0.83	0.80	0.78	0.77	0.76	0.75	0.74	0.73	0.72	0.70	0.69	0.67	0.65
4.0	0.92	0.89	0.87	0.85	0.84	0.83	0.82	0.80	0.79	0.78	0.76	0.74	0.72
5.0	0.96	0.93	0.91	0.89	0.88	0.87	0.86	0.84	0.83	0.82	0.80	0.77	0.75
10.0	1.00	0.99	0.96	0.95	0.93	0.92	0.91	0.89	0.88	0.86	0.84	0.82	0.80
∞	1.00	1.00	0.98	0.96	0.95	0.94	0.93	0.91	0.90	0.88	0.86	0.83	0.81

D_2/D_1	Velocity, V_1, in Meters Per Second												
	0.6	0.9	1.2	1.5	1.8	2.1	2.4	3.0	3.7	4.6	6.1	9.1	12.2
1.2	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.08
1.4	0.26	0.26	0.25	0.24	0.24	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.20
1.6	0.40	0.39	0.38	0.37	0.37	0.36	0.36	0.35	0.35	0.34	0.33	0.32	0.32
1.8	0.51	0.49	0.48	0.47	0.47	0.46	0.46	0.45	0.44	0.43	0.42	0.41	0.40
2.0	0.60	0.58	0.56	0.55	0.55	0.54	0.53	0.52	0.52	0.51	0.50	0.48	0.47
2.5	0.74	0.72	0.70	0.69	0.68	0.67	0.66	0.65	0.64	0.63	0.62	0.60	0.58
3.0	0.83	0.80	0.78	0.77	0.76	0.75	0.74	0.73	0.72	0.70	0.69	0.67	0.65
4.0	0.92	0.89	0.87	0.85	0.84	0.83	0.82	0.80	0.79	0.78	0.76	0.74	0.72
5.0	0.96	0.93	0.91	0.89	0.88	0.87	0.86	0.84	0.83	0.82	0.80	0.77	0.75
10.0	1.00	0.99	0.96	0.95	0.93	0.92	0.91	0.89	0.88	0.86	0.84	0.82	0.80
∞	1.00	1.00	0.98	0.96	0.95	0.94	0.93	0.91	0.90	0.88	0.86	0.83	0.81

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TABLE 28.40.090(b)
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TABLE 26.40.090(b)(3) – VALUES OF K_e FOR PRESSURE FLOW IN GRADUAL PIPE CONTRACTIONS

D_2/D_1	Velocity, V_1, in feet Per Second												
	2.0	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0	15.0	20.0	30.0	40.0
1.1	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.06
1.2	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.10	0.11
1.4	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.19	0.20
1.6	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	0.24
1.8	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.33	0.32	0.32	0.32	0.29	0.27
2.0	0.38	0.38	0.37	0.37	0.37	0.37	0.36	0.36	0.35	0.34	0.33	0.31	0.29
2.2	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.38	0.37	0.37	0.35	0.33	0.30
2.5	0.42	0.42	0.42	0.41	0.41	0.41	0.40	0.40	0.39	0.38	0.37	0.34	0.31
3.0	0.44	0.44	0.44	0.43	0.43	0.43	0.42	0.42	0.41	0.40	0.39	0.36	0.33
4.0	0.47	0.46	0.46	0.46	0.45	0.45	0.45	0.44	0.43	0.42	0.41	0.37	0.34
5.0	0.48	0.48	0.47	0.47	0.47	0.46	0.46	0.45	0.45	0.44	0.42	0.38	0.35
10.0	0.49	0.48	0.48	0.48	0.48	0.47	0.47	0.46	0.46	0.45	0.43	0.40	0.36
∞	0.49	0.49	0.48	0.48	0.48	0.47	0.47	0.47	0.46	0.45	0.44	0.41	0.38

D_2/D_1	Velocity, V_1, in Meters Per Second												
	0.6	0.9	1.2	1.5	1.8	2.1	2.4	3.0	3.7	4.6	6.1	9.1	12.2
1.1	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.06
1.2	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.10	0.11
1.4	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.19	0.20
1.6	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	0.24
1.8	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.33	0.32	0.32	0.32	0.29	0.27
2.0	0.38	0.38	0.37	0.37	0.37	0.37	0.36	0.36	0.35	0.34	0.33	0.31	0.29
2.2	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.38	0.37	0.37	0.35	0.33	0.30
2.5	0.42	0.42	0.42	0.41	0.41	0.41	0.40	0.40	0.39	0.38	0.37	0.34	0.31
3.0	0.44	0.44	0.44	0.43	0.43	0.43	0.42	0.42	0.41	0.40	0.39	0.36	0.33
4.0	0.47	0.46	0.46	0.46	0.45	0.45	0.45	0.44	0.43	0.42	0.41	0.37	0.34
5.0	0.48	0.48	0.47	0.47	0.47	0.46	0.46	0.45	0.45	0.44	0.42	0.38	0.35
10.0	0.49	0.48	0.48	0.48	0.48	0.47	0.47	0.46	0.46	0.45	0.43	0.40	0.36
∞	0.49	0.49	0.48	0.48	0.48	0.47	0.47	0.47	0.46	0.45	0.44	0.41	0.38

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TABLE 28.40.090(b)
(PAGE 2 of 2)

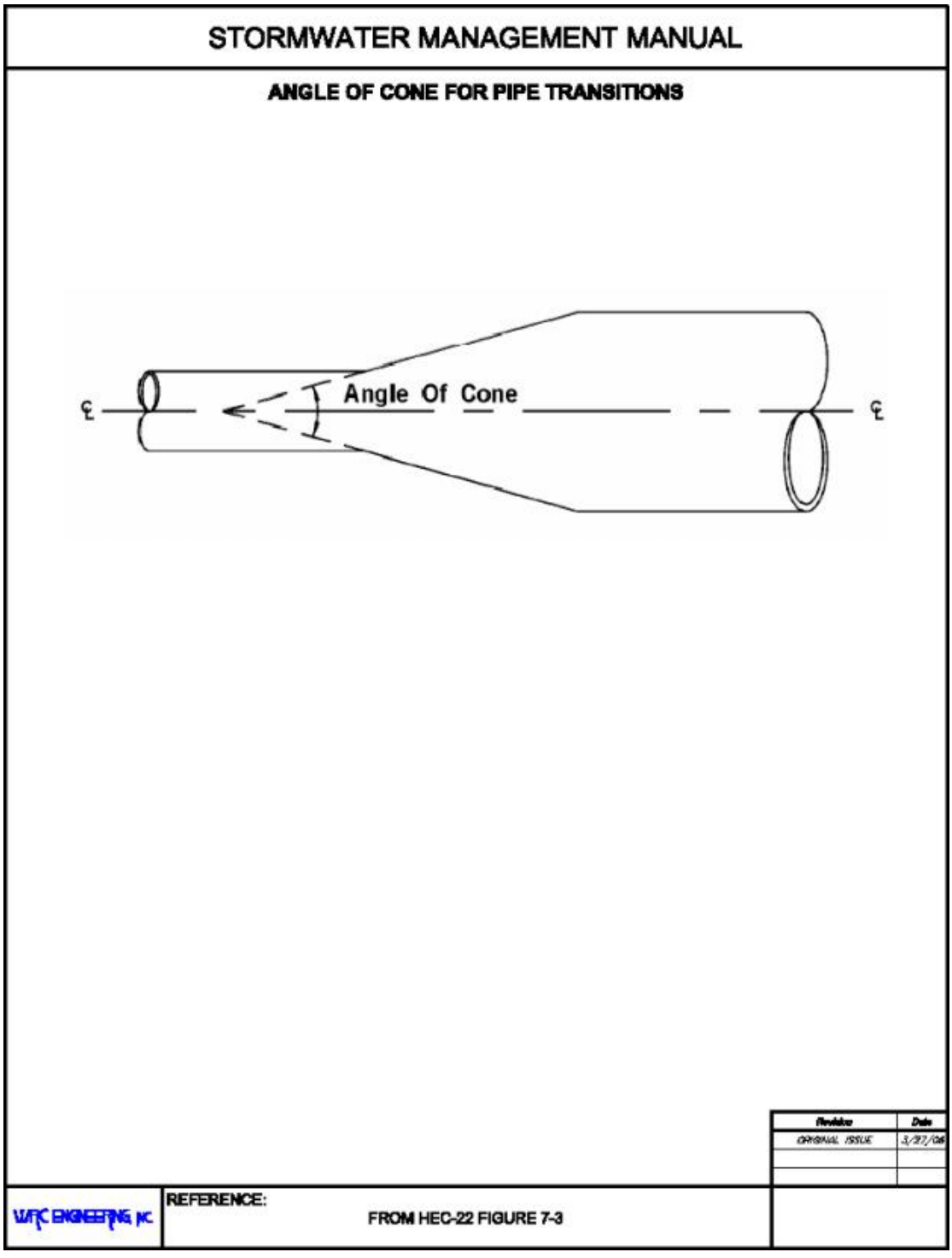


FIGURE 28.40.090(c)

(2) h_b – Bend Losses (Curved Drains). The minor loss that accompanies a storm drain bend can be approximated by:

$$h_b = 0.0033 \cdot (\Delta) \left(\frac{V^2}{2g} \right) \quad (28.40\text{-}26)$$

Where:

Δ = Angle of Curvature (degrees)

This equation does not apply to bends located at manholes. Head losses due to manhole bends and deflections are addressed in subsection (b) of this section.

(3) h_j – No-Access Junctions. This term applies to head loss associated with locations where a lateral pipe connects to a larger trunk pipe without the use of a manhole structure. While these junctions are not recommended for trunk pipes of less than 48 inches in diameter, it is sometimes physically or economically inefficient to place a manhole at every junction location. At locations where more than one lateral joins the main line (trunk), a manhole is required. The head loss at no-access junctions is related to the relative flows and velocities of all three pipes, the angle between the lateral and trunk pipes, and the cross-sectional area of the trunk pipe.

$$h_j = \frac{(Q_o V_o) - (Q_i V_i) - (Q_L V_L \cos\theta)}{0.5 \cdot g \cdot (A_o + A_i)} + h_{vi} - h_{vo} \quad (28.40\text{-}27)$$

Where:

Q_o, Q_i, Q_L	=	Outlet, Inlet and Lateral Flow Rates
V_o, V_i, V_L	=	Outlet, Inlet and Lateral Velocities
h_{vo}, h_{vi}	=	Outlet and Inlet Velocity Heads = $V^2/2g$
A_o, A_i	=	Outlet and Inlet Cross-Sectional Areas
θ	=	Angle of Lateral with Respect to Outflow Pipe

(4) h_i – On-Grade Inlets (Culvert-Type Inlets). In some locations, water may enter a storm drain system from a drainage channel, overflowing pond, or other conveyance with a flowline approximately equal to that of the storm drain inlet. These storm drain entrances are hydraulically equivalent to culvert inlets, thus the coefficient K_i in Equation 28.40-28 is equal to the culvert entrance loss coefficient K_e provided in Chapter 28.48 GJMC, Table 28.48.110. (Note that K_e represents the expansion loss coefficient in this chapter.)

$$h_i = K_i \left(\frac{V^2}{2g} \right) \quad (28.40\text{-}28)$$

Where:

K_i = On-Grade Inlet Coefficient (see Table 28.48.110)

(5) h_o – Outlets (Pipe Exits). This term applies to pipe outlets other than those which exit to a manhole. Outlet losses are always associated with a storm drain system outfall to an open channel, detention/retention basin, or other receiving waters. Outlets that discharge into a body of water with essentially zero velocity in the direction of the storm drain exit lose all velocity (one velocity head). This includes outlets perpendicular to an open channel and all submerged outlets. The storm drain flow is also assumed to lose all velocity when it discharges to open air and plunges to the receiving waters.

$$h_o = \frac{V_o^2}{2g} - \frac{V_d^2}{2g} \quad (28.40\text{-}29)$$

Where:

V_o = Flow Velocity at Storm Drain Exit

V_d = Flow Velocity (in the direction of storm drain flow) in Receiving Waters

Allowable storm drain velocities often differ from those for open channels. Chapters 28.32, 28.36 and 28.48 GJMC present criteria for the proper design of outlets to open channels, including the design of riprap and other energy dissipation structures to reduce channel scour potential.

(Res. 40-08 (§ 1003.2), 3-19-08)

§ 28.40.100. Computer hydraulic modeling.

Since the storm drain system design process tends to be somewhat iterative, computer programs are now commonly used to develop and/or model proposed and existing storm drainage networks. Numerous hydrologic modeling programs now exist that can often achieve more accurate results due to hydrograph routing capabilities. Many of these hydrologic programs also include hydraulic simulation modules based on hydrologic computations and system parameters. The tediousness of creating hydrographs for every convergence and divergence point in the system is avoided by using these programs, and hydrograph timing consistency is vastly improved. Other more simple programs are stand-alone hydraulic calculators, and are useful if peak flows have been previously determined.

HGL and EGL calculations may be prepared using computer software subject to review by the local jurisdiction. At this time, a list of approved or disapproved public or proprietary computer programs for hydrologic and hydraulic modeling is not maintained. However, the designer is urged to use sound professional judgment to select the program(s) that are most applicable to local design standards and the requirements of the given project. It is recommended that the designer consult with the local development review engineer before using any software that is newly released or has not already been broadly accepted by the engineering community.

(Res. 40-08 (§ 1003.3), 3-19-08)

§ 28.40.110. Construction standards.

GJMC § 28.40.120 through 28.40.150 outline standards for the construction of storm drain systems as based on the most recent versions of all reference publications. The designer is responsible for procuring and complying with the most current version of each applicable reference document. For hydraulic design, the most restrictive criteria among said references and this manual are to be used.

(Res. 40-08 (§ 1004), 3-19-08)

§ 28.40.120. Storm drain pipe.

(a) Minimum Size. Minimum pipe sizes are required in order to allow for maintenance and inspection and to reduce the effects of expected sedimentation and debris build-up. All storm drain pipes within the public right-of-way shall have a minimum diameter of 18 inches. For noncircular pipes, these minimum diameters represent equivalent diameters based on cross-sectional areas.

(b) Maximum Size. There is no maximum pipe size specified. However, the designer shall consider the possibility of utilizing multiple barrels (pipes) where physically and economically advisable.

(c) Pipe Material and Shape. All storm drain pipes shall comply with the Grand Junction Standard Specifications for construction of underground utilities, as well as the most recent revision of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction (CDOT).

Public storm drain mains (to which laterals are connected) may be circular, elliptical, arch, or box (rectangular – concrete only) pipe of reinforced concrete pipe, corrugated aluminized steel, corrugated aluminum, corrugated polymer coated galvanized steel, corrugated or profile wall polyethylene, or polyvinyl chloride. However, pipe material and shape shall be selected based on not only hydraulic capacity, but also "the ability of a pipeline to maintain full cross-sectional area and function without [excessive] cracking, breaking, or undergoing excessive deflection" (Mesa County SWMM, 1996). The designer should be aware that local jurisdictions may have varied regulations for allowable pipe materials.

(d) Joint Fillers, Sealants, and Gaskets. All pipe joint fillers, sealing compounds, and gaskets, and the installation thereof, shall be governed by the specifications set forth in Section 705 of the CDOT Standard Specifications. Rubber gaskets shall be used at pipe section joints where greater than 5.0 feet of pressure head is expected in the design storm. This is equivalent to locations where the HGL elevation is 5.0 feet higher than the pipe crown.

(e) Backfill Loading. Backfill and cover requirements for storm drain pipe are discussed in GJMC § 28.40.060.

(f) Pipe Bedding. Specifications for pipe trenching, bedding, and backfill may be obtained from the City of Grand Junction *General Utility Details and Standard Storm Drain Details*.

(Res. 40-08 (§ 1004.1), 3-19-08)

§ 28.40.130. Manholes.

Construction details for a standard storm drain manhole are provided in the City of Grand Junction *Standard Storm Drain Details*. Nonstandard manhole designs shall meet the design and construction criteria set forth in Section 604 of the CDOT *Standard Specifications*. The EGL for all design flows must be at or below the manhole rim. Locking manhole covers are not permitted.

(Res. 40-08 (§ 1004.2), 3-19-08)

§ 28.40.140. Inlets.

Chapter 28.44 GJMC describes the selection and placement criteria for storm drain inlets in Mesa County. Construction details for street inlets can be found in the City of Grand Junction Standard Storm Drain Details.

Culvert-type inlets, such as those directing ditch flows into a storm drain, are required to include a special end section to increase capacity and reduce erosive potential. See Chapter 28.48 GJMC for culvert inlet design criteria.

(Res. 40-08 (§ 1004.3), 3-19-08)

§ 28.40.150. Outlets.

Storm drain outlets typically discharge to a drainage channel, a natural stream or river, or a detention/retention basin. In order to increase storm drain capacity and reduce erosion potential, outlets are required to include a special end section equivalent to those required for culvert outlets per Chapter 28.48 GJMC.

Due to the erosive potential of high-velocity storm drain flow on unlined channels and detention/retention basins, a riprap apron and/or an energy-dissipation structure shall be constructed at all storm drain outlets per requirements set forth in Chapter 28.48 GJMC.

(Res. 40-08 (§ 1004.4), 3-19-08)

§ 28.40.160. Storm drain system design.

Prior to starting storm drain design, the allowable minor and major street capacities must be determined and inlets preliminarily sized and located. In most cases, the storm drain design flow at a given point is equal to the cumulative minor storm runoff exceeding the minor storm street flow capacity to that point. However, since the street and storm drain must cumulatively carry the major storm event flow without exceeding the major storm street capacity, the storm drain must occasionally be sized to carry the runoff exceeding that capacity. Furthermore, in locations where a vertical sag exists in the street (sump inlets) and no overflow path exists for the major storm flow, the storm drain must be sized to accept the entire major storm flow minus street ponding allowances. Note that the latter two cases require that the inlets be resized to accommodate the larger flows.

(Res. 40-08 (§ 1005), 3-19-08)

§ 28.40.170. Initial storm drain design.

The following step-by-step procedure is for the initial layout and sizing of a storm drain. The results of this process must be validated by the procedures set forth in GJMC § 28.40.180 before the system can be deemed a viable design. However, this design may be used for conceptual drainage report submittals per GJMC § 28.12.030 through 28.12.050.

(a) Choose a system layout based on street rights-of-way and other drainage easements, developed topography, utility locations, and likely cost and performance. This layout shall include preliminary inlet and manhole locations, if any.

(b) Complete hydrologic analysis of the project area per Chapters 28.24 and 28.28 **GJMC.** Compute peak flow in each street (see Chapter 28.44 GJMC) starting at the upper end of the project area and working downstream. Typically, the runoff from multiple streets will converge at a point, so all streets that are tributary to that point must be completed before moving on downstream. An inlet shall be located wherever the minor storm peak street flow exceeds the allowable capacity for that street and at all sump locations.

(c) Initial storm drain sizing starts at the uppermost inlet for each street, with individual street storm drains combining where appropriate. The design flow for a given storm drain segment is based on the sum of all flow from upstream pipes and the larger of the major or minor street flow exceeding the respective street capacity at the inlet just upstream from that segment.

(d) Using gravity-flow analysis (Manning's open channel flow) as presented in GJMC § 28.40.080, including approximate junction head losses, compute required pipe size and slope for each pipe segment. In many locations, storm drain slope will be limited by topography or other design criteria including cover and utility clearance requirements, so slopes are often held constant during the initial design phase. It may be prudent to increase pipe size and/or slope at locations where the preliminary energy loss coefficient may not apply and significant energy losses may occur, such as large or complex pipe junctions and major pipe bends. Pipe size shall not be decreased in a downstream direction except in special situations.

(Res. 40-08 (§ 1005.1), 3-19-08)

§ 28.40.180. Preliminary/final storm drain design.

Following the completion of an initial storm drain system design, the preliminary/final design may begin. The level of hydraulic analysis presented in this section shall be met before the design may be included in any final drainage reports (see GJMC § 28.12.060 through 28.12.110).

(a) The hydraulics for each system are recomputed using the energy-momentum theory presented in GJMC § 28.40.090, starting at each system's outfall point. All applicable energy losses must be included in the calculations, including head loss due to manhole/junction chambers, pipe transitions and bends, no-access junctions, and entrances/exits.

(b) The HGL and EGL shall be calculated and plotted for each end of each pipe segment and each side of all locations of additional energy loss listed in Step 1. The EGL shall be limited to a maximum elevation of manhole rim or inlet throat at all locations along the storm drain.

While many designers may choose to utilize computer software to model storm drain systems, smaller projects are still often completed by hand. Hand calculations are also useful for spot-checking of computer outputs to ensure that software is functioning properly. For this reason, Standard Form 3 in Chapter 28.68 GJMC is provided to assist in tabulation of storm drain hydraulic calculations. Figure 28.40.180 is Standard Form 3 showing input corresponding to the example design application presented herein.

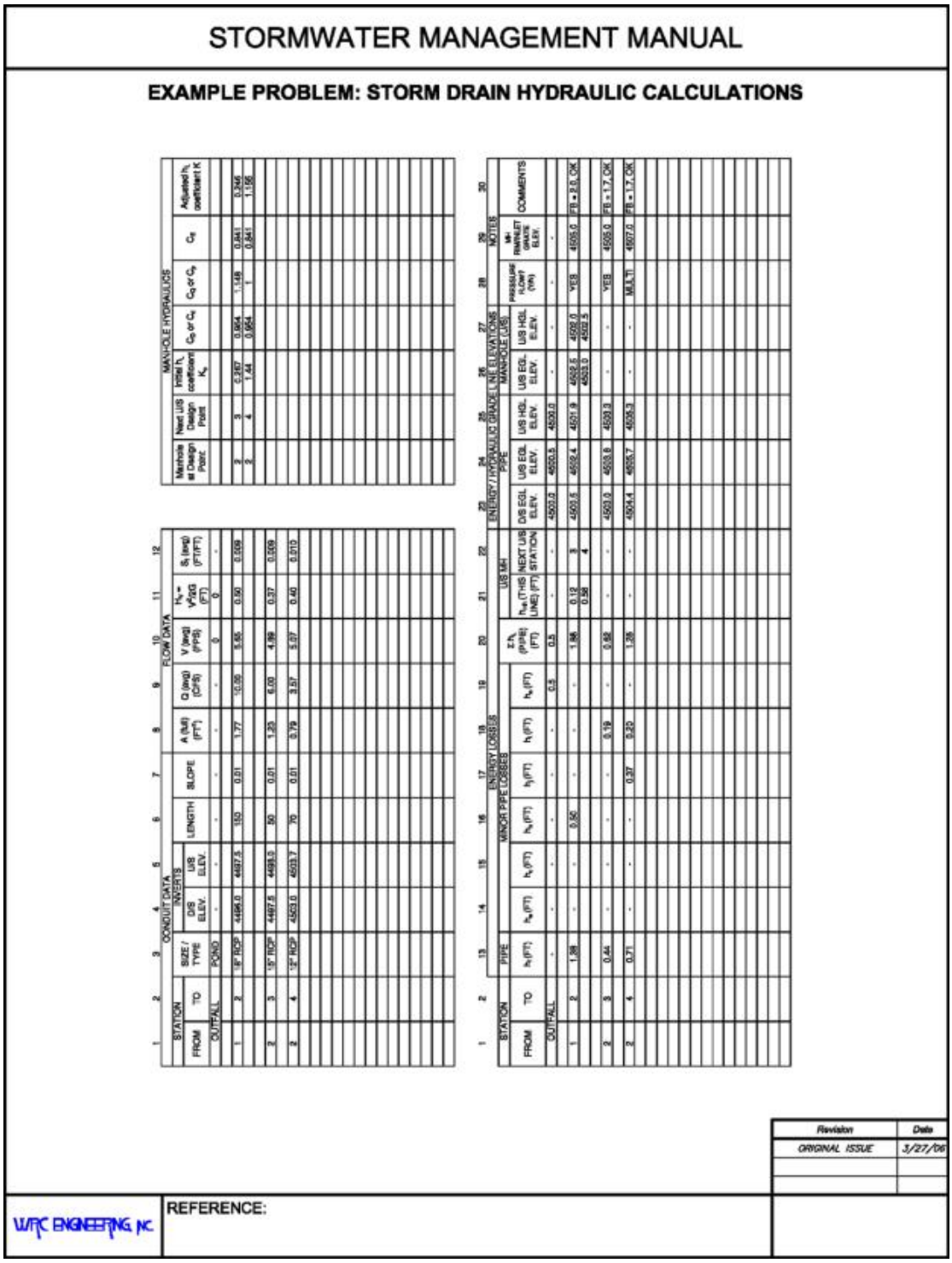


FIGURE 28.40.180

(Res. 40-08 (§ 1005.2), 3-19-08)

§ 28.40.190. Example design application.

This section presents an example of energy and hydraulic grade line computation through a simple storm drain system. It is assumed that initial design has previously been completed, the results of which are shown in Figure 28.40.190.

(a) Problem: Compute both the energy grade line (EGL) and hydraulic grade line (HGL) at Design Points 1 through 4 for the system shown in Figure 28.40.180 and check for locations where the EGL reaches any manhole rim or inlet throat.

(b) Solution:

(1) Step 1. Utilizing Standard Form 3 to organize data and calculations, enter "OUTFALL" in the STATION column for the first row. The "pipe" in this case is just the outlet itself, so calculate h_o and enter it in column 19.

$$h_o = \frac{V_o^2}{2g} - \frac{V_d^2}{2g} = \frac{(10\text{cfs}/1.77\text{sf})^2}{2g} - \frac{0^2}{2g} = 0.50'$$

The outfall water surface elevation, 4,500.0 feet, exceeds the crown elevation of the outlet pipe, 4,496.0 feet plus 1.5 feet equals 4,497.5 feet, so the pipe is flowing full at this point (outlet control). The outfall pool has no velocity component in the direction of the outlet pipe, so the EGL equals the HGL and water surface elevation (column 23). The U/S EGL (column 24) in this case represents the point just inside the outlet:

$$EGL_1 = EGL_0 + h_o = 4500.0' + 0.50' = 4500.5'$$

$$HGL_1 = EGL_1 - H_{v,1-2} = 4500.5' - \frac{(10\text{cfs}/1.77\text{sf})^2}{2g} = 4500.0'$$

(2) Step 2. Enter stations 1 and 2 in columns 1 and 2 of the next row, as well as all known pipe and flow data. Since the pipe was already shown to be flowing full under outlet control, velocity (column 10) is:

$$V_{avg} = Q_{avg}/A_{full} = 10/1.77 = 5.65\text{fps}$$

Velocity head (column 11) and friction slope (column 12) are:

$$H_v = \frac{V^2}{2g} = \frac{5.65^2}{2g} = 0.50'$$

$$S_f = \left[\frac{Q_{avg} \cdot n}{0.46 \cdot D^{8/3}}\right]^2 = \left[\frac{10 \cdot 0.013}{0.46 \cdot 1.5^{8/3}}\right]^2 = 0.009$$

Pipe friction head loss is then found and entered in column 13:

$$h_f = S_f \cdot L = 0.009 \cdot 150' = 1.38'$$

The drain schematic (Figure 28.40.190) also indicates a 30-degree bend in this pipe reach. Head loss due to the bend is entered in column 16:

$$h_b = 0.0033\Delta\left(\frac{V^2}{2g}\right) = 0.0033 \cdot 30 \cdot 0.50'$$

These total to 1.88 feet lost in the pipe reach (column 20), not including losses from the manhole at Design Point 2.

(3) Step 3. At this point, columns 23, 24, and 25 can be entered. The downstream EGL is in this case simply equal to the upstream EGL (column 24) from the first row. The upstream EGL and HGL are:

$$EGL_{U/S,pipe} = EGL_1 + \Sigma h_{L,pipe} = 4500.5' + 1.88' = 4502.4'$$
$$HGL_{U/S,pipe} = EGL_{U/S,pipe} - H_v = 4502.4' - 0.50' = 4501.9'$$

(4) Step 4. The calculation of losses through a manhole is completed per the procedure presented in GJMC § 28.40.090(b), and is dependent on the line being investigated. To find the maximum HGL in a manhole, losses for each line must be calculated and compared. The manhole at Design Point 2 has two inlet pipes, and thus two lines. The line to Station 3 is completed first:

$$K_o = 0.1\frac{b}{D_o}(1-\sin\theta) + 1.4\left(\frac{b}{D_o}\right)^{0.15}\sin\theta = 0.1\frac{4}{1.5}(1-\sin 180^\circ) + 1.4\left(\frac{4}{1.5}\right)^{0.15}\sin 180^\circ = 0.267$$

- Apply C_D? → If $d_{mho}/D_o > 3.2$ → 4.4/1.5 = 2.9 → No (1.0)
- Apply C_d? → If $d_{mho}/D_o < 3.2$ → Yes

  $$C_d = 0.5\left(\frac{d_{mho}}{D_o}\right)^{0.6} = 0.5\left(\frac{4.4}{1.5}\right)^{0.6} = 0.954$$

- Apply C_Q? → If one or more other inlet pipes at manhole does not qualify as plunging flow. Plunging flow if $h_{2-4} > d_{mho}$ → (4503.0'-4497.5-1.5/2) = 4.75 > 4.4 → plunging flow exists → No (1.0)
- Apply C_p? → Yes (see C_Q)

$$C_p = 1 + 0.2\left(\frac{h}{D_o}\right)\left(\frac{h - d_{mho}}{D_o}\right) = 1 + 0.2\left(\frac{4.75}{1.5}\right)\left(\frac{4.75 - 4.4}{1.5}\right)$$

$$C_p = 1.148$$

- Apply C_B? → Yes (always)
  Use Table 1007 and linearly interpolate with $d_{mho}/D_o = 2.9$.
  $C_B = 0.841$.

Now apply the correction factors to the initial head loss coefficient:

$$K_{2-3} = K_o C_D C_d C_Q C_p C_B = 0.267 \cdot 1.0 \cdot 0.954 \cdot 1.0 \cdot 1.148 \cdot 0.841 = 0.246$$

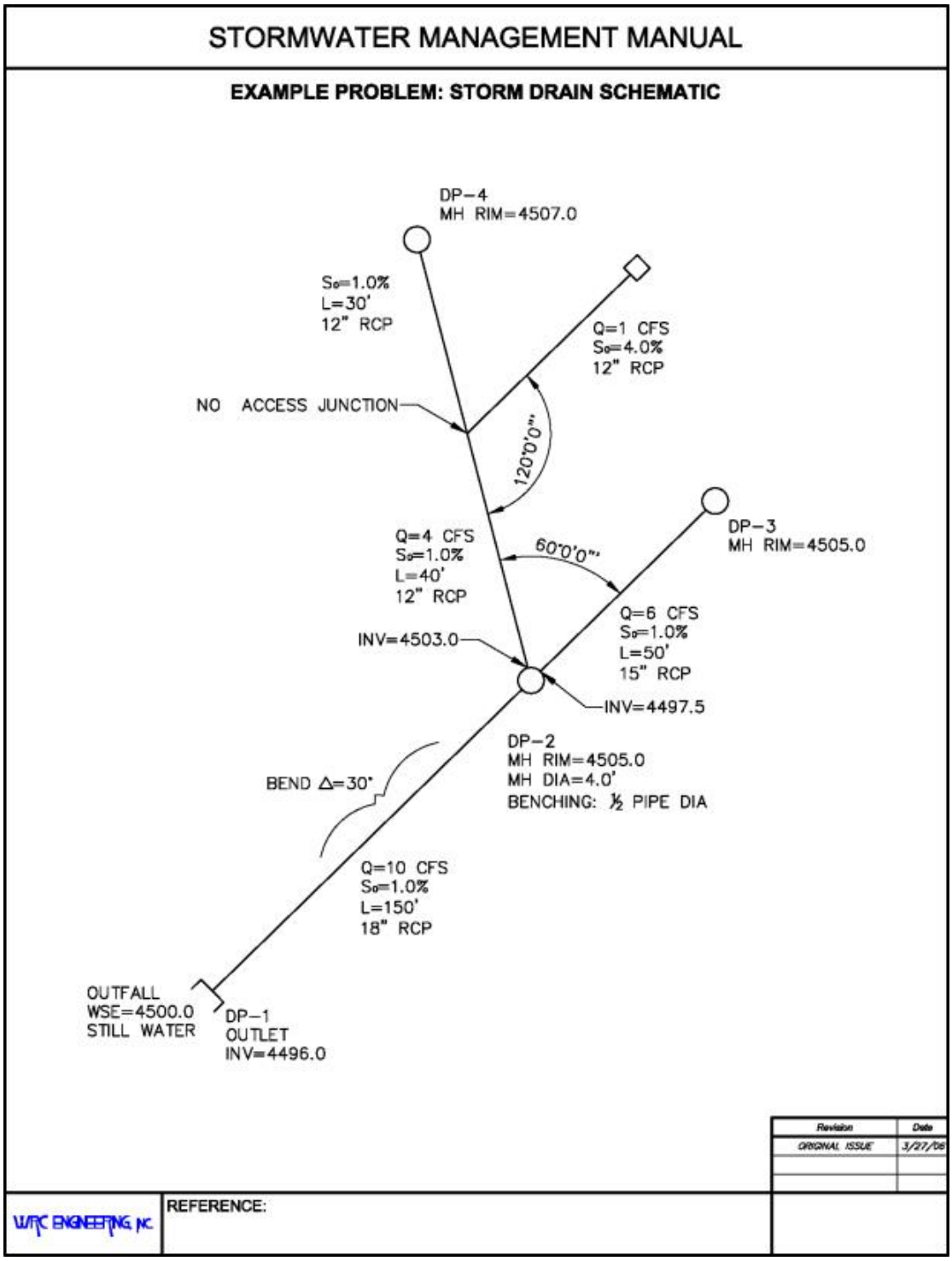


FIGURE 28.40.190

Then apply the corrected head loss coefficient to find the estimated head loss through the manhole (on this line):

$$h_{mh,2-3} = K\left(\frac{V_o^2}{2g}\right) = 0.246(0.50) = 0.12'$$

Note that the velocity used here is the average velocity in the outlet pipe from the manhole. This value is entered in column 21, and station number "3" in column 22 of the same row.

We now use the same procedure to find the head loss through the same manhole on the other line (2-4). While manhole diameter (b) and outlet pipe diameter (D_o) are the same as before, this pipe enters the manhole at a different angle and a different (invert) elevation:

$$K_o = 0.1\frac{b}{D_o}(1-\sin\theta)+1.4\left(\frac{b}{D_o}\right)^{0.15} \quad \sin\theta = 0.1\frac{4}{1.5}(1-\sin 120°)+1.4\left(\frac{4}{1.5}\right)^{0.15} \quad \sin 120° = 1.440$$

- Apply C_D? → If $d_{mho}/D_o > 3.2$ → 4.4/1.5 = 2.9 → No (1.0)
- Apply C_d? → If $d_{mho}/D_o < 3.2$ → Yes

  $$C_d = 0.5\left(\frac{d_{mho}}{D_o}\right)^{0.6} = 0.5\left(\frac{4.4}{1.5}\right)^{0.6} = 0.954$$

- Apply C_Q? → If one or more other inlet pipes at manhole does not qualify as plunging flow. This pipe plunges to pipe 2-3, and no other pipes enter this manhole. → No (1.0)
- Apply C_p? → This correction factor is applied only to account for the effects of plunging flow by another pipe on the subject pipe. No pipe plunges to this pipe. → No (1.0)
- Apply C_B? → Yes (always)

  Use Table 1007 and linearly interpolate with $d_{mho}/D_o = 2.9$.

  $C_B = 0.841$.

$$K_{2-4} = K_o C_D C_d C_Q C_p C_B = 1.440 \cdot 1.0 \cdot 0.954 \cdot 1.0 \cdot 1.0 \cdot 0.841 = 1.155$$

and

$$h_{mh,2-4} = K\left(\frac{V_o^2}{2g}\right) = 1.155(0.50) = 0.58'$$

This value is entered in column 21 in the row directly below that containing the 0.12' value. Station "4" is entered in the same row, column 22.

(5) Step 5. The estimated manhole losses on each line (each row) are then added to the upstream EGL (column 24) and HGL (column 25) to get the EGL and HGL at the upper end of the manhole. The larger pair governs:

$$EGL_{U/S,mh,2-3} = EGL_{U/S,pipe(1-2)} + h_{mh,2-3} = 4502.4' + 0.12' = 4502.5'$$
$$HGL_{U/S,mh,2-3} = EGL_{U/S,mh,2-3} - H_{vo} = 4502.5' - 0.50' = 4502.0'$$
$$EGL_{U/S,mh,2-4} = EGL_{U/S,pipe(1-2)} + h_{mh,2-4} = 4502.4' + 0.58' = 4503.0'$$
$$HGL_{U/S,mh,2-4} = EGL_{U/S,mh,2-4} - H_{vo} = 4503.0' - 0.50' = 4502.5'$$

The hydraulic and energy grade line elevations for line 2-4 are used for the manhole freeboard check – the design storm maximum EGL is 4503.0 feet, and the manhole rim at Design Point 2 is at 4505.0 feet. The rim is above the EGL, so the design is acceptable to this point.

(6) Step 6. We now move to analysis of the upper pipe reaches, starting with the pipe between Design Points 2 and 3. As before, fill in known and computed data in columns 1 through 9. Average velocity in the pipe depends on flow conditions, so we must determine outlet conditions. The downstream EGL for this pipe is the larger of the following:

$$EGL_{D/S,pipe(2-3)} = EGL_{mh(2)} = 4503.0'$$
For full flow ($d > 0.80D$):
$$EGL_{D/S,pipe(2-3)} = Invert_{D/S,pipe(2-3)} + D + H_{v(2-3)} = 4497.5' + 1.25' + 0.37' = 4499.1'$$
For partial flow ($d < 0.80D$):
$$EGL_{D/S,pipe(2-3)} = Invert_{D/S,pipe(2-3)} + d_n + H_{v(2-3)} = 4497.5' + 0.95' + 0.56' = 4499.0'$$

The first value, 4503.0 feet, is entered in column 23. The downstream HGL, then, is 4503.0 feet – H_v = 4503.0 – 0.37 equals 4502.6 feet, which is above the crown of pipe 2-3. Therefore, the pipe will be assumed to flow full under outlet control. Average velocity under full flow is 4.89 fps, resulting in a velocity head of 0.37 feet. Friction slope is:

$$S_f = \left[\frac{Q_{avg} \cdot n}{0.46 \cdot D^{8/3}}\right]^2 = \left[\frac{6 \cdot 0.013}{0.46 \cdot 1.25^{8/3}}\right]^2 = 0.009$$

This results in pipe friction head loss of:

$$h_f = S_f \cdot L = 0.009 \cdot 50' = 0.44'$$

(7) Step 7. Since there is no known incoming pipe to the manhole at Design Point 3, we will not apply the full energy loss method as before. Instead, we can assume that the outlet pipe from the manhole will act as a culvert, with inlet losses as calculated below:

$$h_i = K_i\left(\frac{V^2}{2g}\right) = 0.5(0.37) = 0.19'$$

The value for K_i was taken from Table 28.48.110, assuming a square-edged headwall on concrete pipe. The value of h_i is entered in column 18, and the sum of h_f and h_i is entered in column 20. This is then added to the downstream EGL value in column 23 to find the upstream EGL elevation (column 24):

$$EGL_{U/S,pipe} = EGL_{D/S,mh} + \Sigma h_{L,pipe} = 4503.0' + 0.44' + 0.19' = 4503.6'$$
$$HGL_{U/S,pipe} = EGL_{U/S,pipe} - H_v = 4503.6' - 0.37' = 4503.3'$$

The manhole rim elevation of 4,505.0 feet is above the EGL of 4,503.6 feet, so this reach is acceptable.

(8) Step 8. In a new row, enter stations "2" and "4" in columns 1 and 2. Enter data in columns 1 through 9. The full-pipe gravity-flow discharge for this reach is 3.56 cfs per Manning's equation, so pressure-flow conditions must exist to convey the four cfs design flow. However, there is a no-access junction 40 feet from Design Point 2 to which one cfs of the total four cfs is attributed. Above this junction, the main pipe is carrying three cfs under gravity-flow conditions. The following table organizes the computation of average values for the reach:

Reach	Length (ft.)	Flow (cfs)	Flow Area (sf)	Velocity (fps)
Downstream	40	4	0.79	5.06
Upstream	30	3	0.59	5.08

Length-weighted averages for flow and velocity are needed for head loss calculations:

$$Q_{avg} = Q_{D/S}\frac{L_{D/S}}{L_{total}} + Q_{U/S}\frac{L_{U/S}}{L_{total}} = 4\frac{40}{70} + 3\frac{30}{70} = 3.57cfs$$
$$V_{avg} = V_{D/S}\frac{L_{D/S}}{L_{total}} + V_{U/S}\frac{L_{U/S}}{L_{total}} = 5.06\frac{40}{70} + 5.08\frac{30}{70} = 5.07fps$$

These values are entered in columns 9 and 10, respectively. Velocity head and friction slope (columns 11 and 12) are based on these averages:

$$H_v = \frac{V^2}{2g} = \frac{5.07^2}{2g} = 0.40'$$

$$S_f = \left[\frac{Q_{avg}\cdot n}{0.46\cdot D^{8/3}}\right]^2 = \left[\frac{3.57\cdot 0.013}{0.46\cdot 1.0^{8/3}}\right]^2 = 0.010$$

(9) Step 9. Determine the friction and minor pipe losses. Friction head loss (column 13) is:

$$h_f = S_f \cdot L = 0.010 \cdot 70' = 0.71'$$

Head loss at the no-access junction (column 17) is calculated as:

$$h_j = \frac{(Q_o V_o) - (Q_i V_i) - (Q_L V_L \cos\theta)}{0.5 \cdot g \cdot (A_o + A_i)} + \frac{V_i^2}{2g} - \frac{V_o^2}{2g}$$

$$h_j = \frac{(4 \cdot 5.06) - (3 \cdot 5.08) - (1 \cdot 6.40 \cos 120^\circ)}{0.5 \cdot g \cdot (0.79 + 0.59)} + \frac{5.08^2}{2g} - \frac{5.06_i^2}{2g} = 0.37'$$

Like the manhole at Design Point 3, we will treat the outlet pipe from this manhole as a culvert inlet with a square-edged headwall (column 18):

$$h_i = K_i\left(\frac{V^2}{2g}\right) = 0.5(0.40) = 0.20'$$

Total pipe losses (column 20), then, are:

$$\Sigma h_{L,pipe(2-4)} = h_f + h_j + h_i = 0.71' + 0.37' + 0.20' = 1.28'$$

(10) Step 10. Find the downstream and upstream EGLs and HGLs.

Downstream EGL (column 23) is the larger of:

$$EGL_{D/S,pipe(2-4)} = EGL_{mh(2)} = 4503.0'$$
$$EGL_{D/S,pipe(2-4)} = Invert_{D/S,pipe(2-4)} + D + H_{v(2-4)} = 4503.0' + 1.0' + 0.40' = 4504.4'$$

Upstream EGL (column 24) is:

$$EGL_{U/S,pipe(2-4)} = EGL_{D/S,pipe(2-4)} + \Sigma h_{L,pipe(2-4)} = 4504.4' + 1.28' = 4505.7'$$
$$HGL_{U/S,pipe(2-4)} = EGL_{U/S,pipe(2-4)} - H_v = 4505.7' - 0.40' = 4505.3'$$

The manhole rim elevation of 4,507.0 feet is above the EGL of 4,505.7 feet, so this reach is acceptable.

(Res. 40-08 (§ 1005.3), 3-19-08)

Chapter 28.44
Streets

§ 28.44.010. Introduction.

This chapter presents criteria regulating the design of public streets for storm flow drainage and allowable encroachment of these flows within public street rights-of-way. Also included herein are criteria for the selection and placement of storm drain inlets as required to conform to maximum allowable street ponding. All design submittals involving the utilization of public streets for the conveyance of storm flows shall be reviewed based upon the criteria in this chapter.

(Res. 40-08 (§ 1101), 3-19-08)

§ 28.44.020. Streets as part of the drainage system.

The primary function of public streets is the movement of traffic. Therefore, use of streets as part of the drainage system must be limited in order to minimize interference with traffic functions. Street inundation and ponding limits are specified in this chapter in order to limit this potential interference. However, due to the nature of the storms typical to Mesa County, and the resulting ephemeral interference with traffic movement, these limits are not highly restrictive.

Streets typically convey runoff collected not only on the street surface itself, but often from some portion of the surrounding area as well. As an integral part of the drainage system, streets must be capable of conveying some portion of said runoff to a primary drainage conveyance facility such as a storm drain or open channel drainage system. The maximum allowable capacity of a street is based upon its cross-sectional configuration, longitudinal slope, and the maximum allowed ponding depth. Where the calculated minor storm event flow depth exceeds this maximum depth, inlets must be used to reduce street flow. During a major storm event, streets become emergency runoff channels, routing floodwaters away from structures as much as possible. During such an event, many streets will be inundated to a degree such that they are impassable to most vehicles.

(Res. 40-08 (§ 1102), 3-19-08)

§ 28.44.030. Drainage impacts on traffic and streets.

A number of factors may affect traffic movement and the streets themselves when used for drainage purposes. Five of these factors are discussed in the following sections.

(Res. 40-08 (§ 1103), 3-19-08)

§ 28.44.040. Sheet flow.

Rainfall on the paved surface of a street must flow overland (sheet flow) until it reaches a channel. In this case, the channel will be either a curb-and-gutter or a roadside ditch. Ignoring the effects of street inundation due to upgradient runoff, the depth of sheet flow will be near zero at the street crown, increasing in the direction of the collection channel (i.e., the gutter).

Sheet flow can interfere with traffic movement by increasing the risk of hydroplaning or splashing. Hydroplaning is a phenomenon in which one or more of a vehicle's tires lose significant contact with the pavement and become supported by a thin layer of water. This water acts as a lubricant between the pavement and the vehicle, and can cause loss of vehicle control. The potential for hydroplaning increases with vehicle speed and with the depth of water on the road surface, so extra attention shall be paid to this issue during the design of arterial and highway-type roadways. Sheet flow depths can be decreased by increasing the street cross-slope.

Splashing is also dependent on vehicle speeds and water depth, and can interfere with traffic movement by reducing driver visibility. Again, increasing street cross-slope may help to reduce sheet flow depths and splashing potential. In general, a two percent cross slope is desirable to promote swift removal of runoff and reduce sheet flow depths while minimizing potential vehicle side-slippage from ice buildup during winter months.

(Res. 40-08 (§ 1103.1), 3-19-08)

§ 28.44.050. Gutter flow.

Where curb-and-gutter is utilized, all runoff tributary to a street will be directed to, and flow in, a gutter until it reaches a storm drain inlet or other primary conveyance. Generally, flow width will increase in the downstream direction due to an ever-increasing tributary area (and thus higher flows), eventually spreading into the traffic lane(s) and to the street crown. It is important to take into account the gutter flow width and its effect upon traffic movement. For streets where on-street parking is allowed (e.g., residential streets), gutter flow may spread at least to the inner edge of the parking lane without interfering with moving traffic. However, where no street parking is allowed, flow spreading beyond the actual gutter almost immediately reaches a travel lane. Drivers tend to avoid even partially inundated lanes if possible, causing traffic congestion and occasionally vehicular collisions. However, some interference with traffic movement is allowable and expected, even during the minor storm. The duration of such interference is to be minimized wherever possible. Emergency vehicles must be able to travel all streets without encountering extensive (potentially vehicle-disabling) ponding depths. These depths are defined in GJMC § 28.44.090 as maximum total gutter depths for the minor storm event.

(Res. 40-08 (§ 1103.2), 3-19-08)

§ 28.44.060. Temporary ponding and localized cross flow.

Grade changes and street crowns at intersections can cause storm runoff to flow at depths greater than the intended design depth and to flow at greater depths for longer durations than anticipated. This localized, temporary ponding poses a high safety risk, especially on roads with higher speed limits (e.g., arterials). Because the ponding is localized, drivers may not be aware of the obstruction and vehicles may enter the ponded area at high speeds (see reference to hydroplaning, GJMC § 28.44.040). Even if traffic is moving at low speeds, vehicles encountering a deeper ponded area may stop entirely to avoid entering such an area or may experience engine stalling while attempting to cross such an area. Both of these scenarios have the effect of reducing or halting traffic movement. Therefore, street and drainage design must incorporate measures to control the depths at locations where temporary ponding may

occur through the use of grading changes or additional inlets. For streets with high traffic volumes, it may be necessary to take steps to effectively eliminate any temporary ponding in order to avoid extensive interference with traffic movement.

Cross flow occurs as a result of a number of scenarios that cause significant flow depths other than that which is the result of sheet flow to travel across traffic lanes. The most common location to encounter this phenomenon is at intersections where gutter flow from the cross-street spills across the intersection. Where allowable, a concrete V-pan may be utilized to control these flows (see City of Grand Junction Standard Details for Construction of Streets, Storm Drains and Utilities, Revised July 2005, page C-12). Localized cross flow can have the same negative effects on vehicular safety and traffic movement as general temporary ponding. Therefore, careful consideration shall be given to potential cross flow locations during design to minimize its effects, especially for streets with higher speed limits and/or higher traffic volume.

(Res. 40-08 (§ 1103.3), 3-19-08)

§ 28.44.070. Pavement deterioration effects.

Utilization of streets for drainage of storm runoff can have a significant effect on roadway maintenance and repair and can, in certain cases, contribute to the structural failure of the roadway pavement. The latter situation may occur if water is able to penetrate the pavement and reach the subgrade. Subgrade saturation and/or material washout will eventually cause subgrade failure, leading to pavement failure and an unsafe/unstable road surface. These locations of distress are caused by other factors such as weathering, overweight vehicles, temperature and temperature changes, heavy traffic, machinery, pavement quality, subgrade inconsistencies, and pavement age. Water flow across undamaged pavement will not typically penetrate to the subgrade. Therefore, consistent roadway maintenance not only affects the efficiency of the street as a drainage system component, but can also reduce the likelihood of roadway failure due to the effects of ponding water.

Although undamaged pavement surfaces for the most part keep water from penetrating through to the subgrade, it is possible for some water to seep through with time. Street designs shall incorporate measures to decrease the duration for which a given section of pavement is submerged to minimize this seepage.

A common practice used to reduce the problem of bituminous surface deterioration is to seal-coat or overlay the existing pavement surface. While this method does effectively reduce pavement deterioration, it reduces the available street flow area with each layer added to the surface. To minimize this effect, it is recommended that the surface be scarified whenever possible before new layers of pavement are added.

(Res. 40-08 (§ 1103.4), 3-19-08)

§ 28.44.080. Sedimentation and debris.

Sediment and debris buildup may occur on streets in any area where flow velocities tend to decrease such as near grade changes and inlets. Sediment and debris buildup can have a significant impact on the flow capacities of gutters and streets, causing increased flow width and thus increased interference with traffic movement.

Locations where significant deposits may occur shall be identified for maintenance purposes to include street sweeping and inlet cleanout as necessary. Inlets shall be designed to function properly based on expected sediment and debris clogging as specified later in this chapter.

Localized sedimentation issues due to construction activities shall be controlled per the criteria presented in Chapter 28.6 GJMC.

(Res. 40-08 (§ 1103.5), 3-19-08)

§ 28.44.090. Street classification and allowable flow depth and velocities.

(a) Streets are classified according to estimated traffic volume and right-of-way width. The City of Grand Junction and Mesa County have adopted the Transportation, Engineering, and Design Standards (TEDS) manual (GJMC Title 29), including standard drawings and details for the construction of streets and location for utilities. While these drawings and details were developed and are maintained by the Grand Junction Department of Public Works and Utilities (Engineering Division), they have been adopted by the Mesa County Board of Commissioners (TEDS Chapter 1, p.1). Eight street classifications are specified therein, but some of these have been grouped together in this manual due to similar hydraulic characteristics. The rural roadway street type is not presented in this chapter since it utilizes a roadside ditch and culverts instead of curb-and-gutter. See Chapter 28.32 GJMC for open channel design criteria.

(b) The local jurisdictions within Mesa County have adopted the policy that streets can be used to convey storm runoff subject to the limits established by this manual. For the minor storm event:

(1) Flow depths must not exceed 0.5 feet at the gutter flowline;

(2) Must not exceed curb height (varies); and

(3) Flow velocities must not exceed 8.0 feet per second.

(c) Street flow depth from the major storm event must not exceed 1.0 foot from the gutter flowline and the flow velocity must not exceed 8.0 feet per second.

(d) Figures 28.44.090(a) and 28.44.090(b) show typical half-street sections and two-year storm event inundation limits for each street classification group. Note that the cross-sections shown include geometric assumptions made for hydraulic computation purposes and do not precisely reflect the approved standard street details.

(e) Calculations for flow capacity and velocity in a given street section are based upon these maximum depths and the assumption that any area not within the street right-of-way would not contribute to the capacity of the street system (called “ineffective flow area”). Therefore, for calculation purposes, it is assumed that an infinitely high vertical wall of zero roughness exists at the right-of-way boundary, and any flow area outside this boundary is not considered in analysis. Due to the potential for a single street cross-section to have different half-street cross-sections, all street capacity calculations are to be completed on a half-street basis. Therefore, the same vertical-wall assumption applies to the street centerline as to the right-of-way where the calculated flow width exceeds the half-street width.

(f) At street sag locations, pipes and/or channels must be provided to facilitate compliance with maximum ponding depths for both minor and major storm events as described above. Maintenance access must be provided for these facilities, including permanent easements.

(g) Not inclusive of median spill gutters, the standard concrete details include two curb types, vertical and drive-over (mountable). The vertical curb configuration may be constructed monolithically with or without a sidewalk, and has a height of six inches. This configuration or an approved alternative design must be used for streets with an A.D.T. value of more than 1,000 (Standard Street Details, Page ST-05). A cross-section detail of the vertical curb and gutter is found in Figure 28.44.090(c). The drive-over, or mountable, curb configuration may only be used for residential streets with an A.D.T. value of less than 1,000 (Standard Street Details, Page ST-05). The total vertical height from the gutter flowline to the top of the curb is 4.5 inches, resulting in a lower maximum minor storm event water surface elevation for streets utilizing this gutter type. It does, however, reduce the need for driveway ramps, which are often a major contributor to the reduction of residential gutter capacity. Figure 28.44.090(d) is a detail of the standard mountable curb.

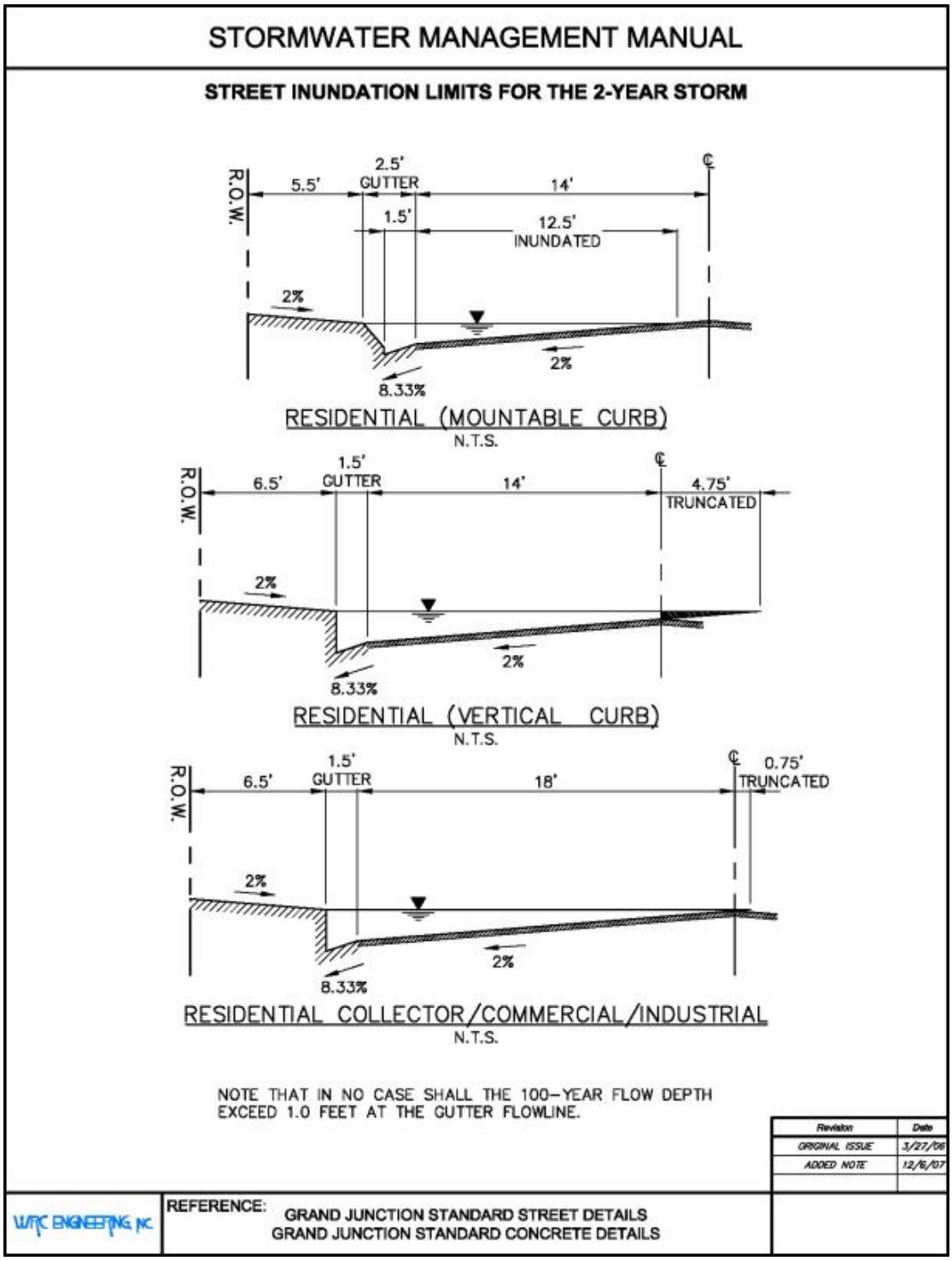


FIGURE 28.44.090(a)

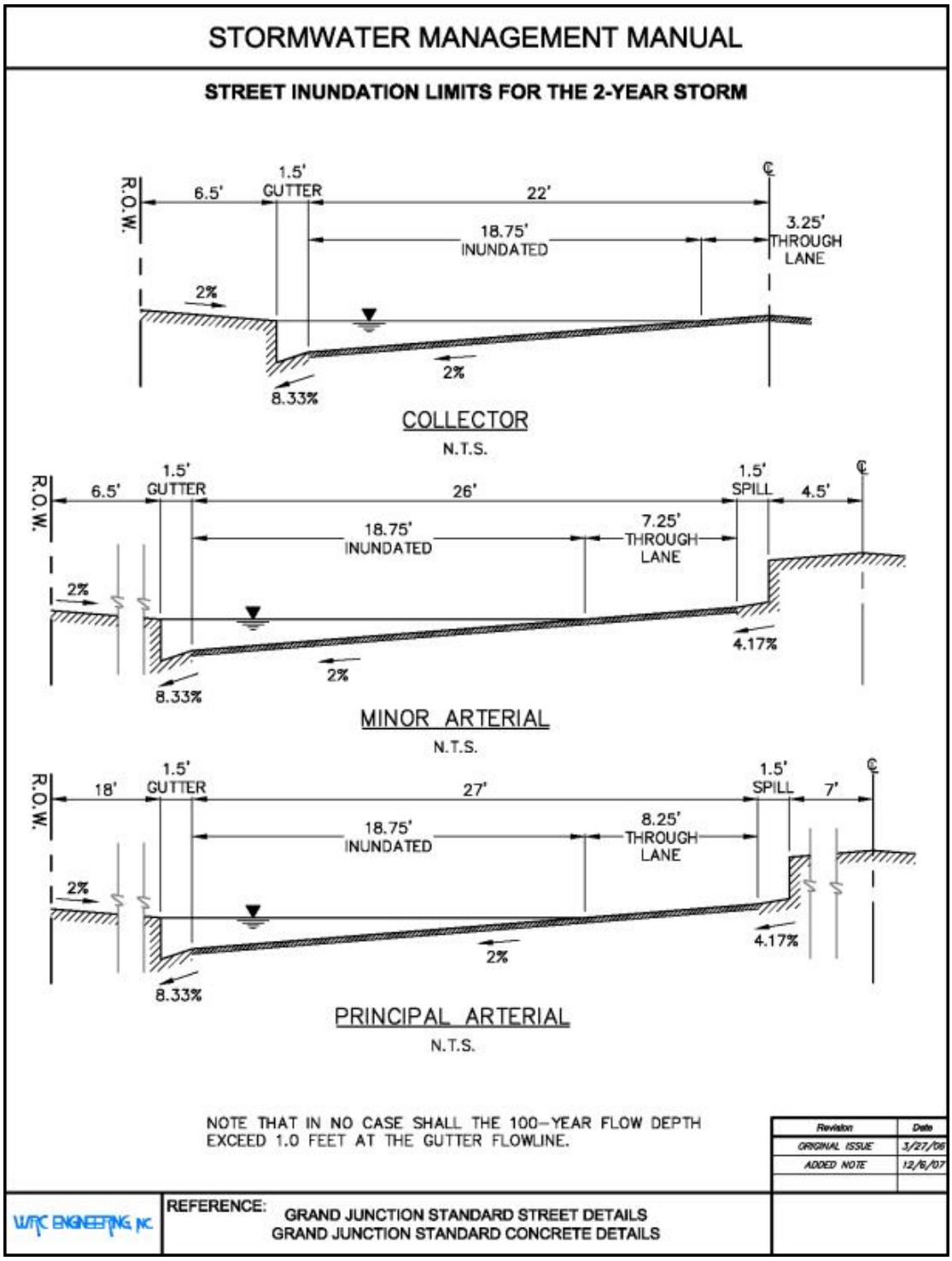
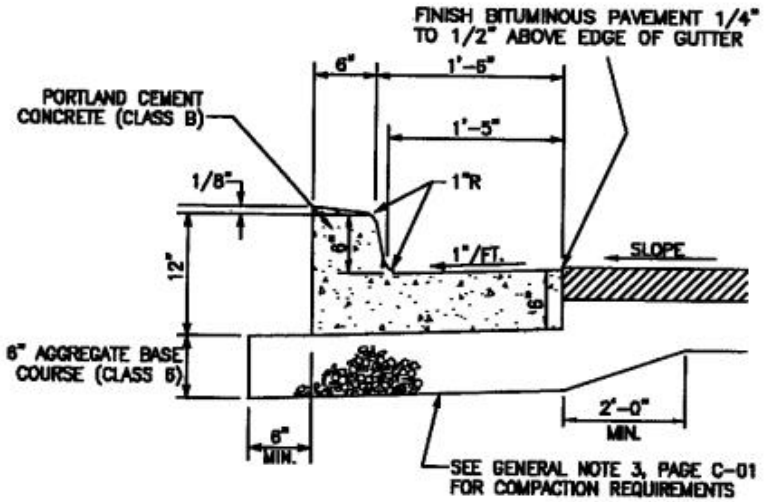


FIGURE 28.44.090(b)

STORMWATER MANAGEMENT MANUAL

VERTICAL CURB/GUTTER DETAIL



STANDARD CURB AND GUTTER

Revision	Date
ORIGINAL ISSUE	3/27/08

WRC ENGINEERING, INC.

REFERENCE: GRAND JUNCTION STANDARD CONCRETE DETAILS

FIGURE 28.44.090(c)

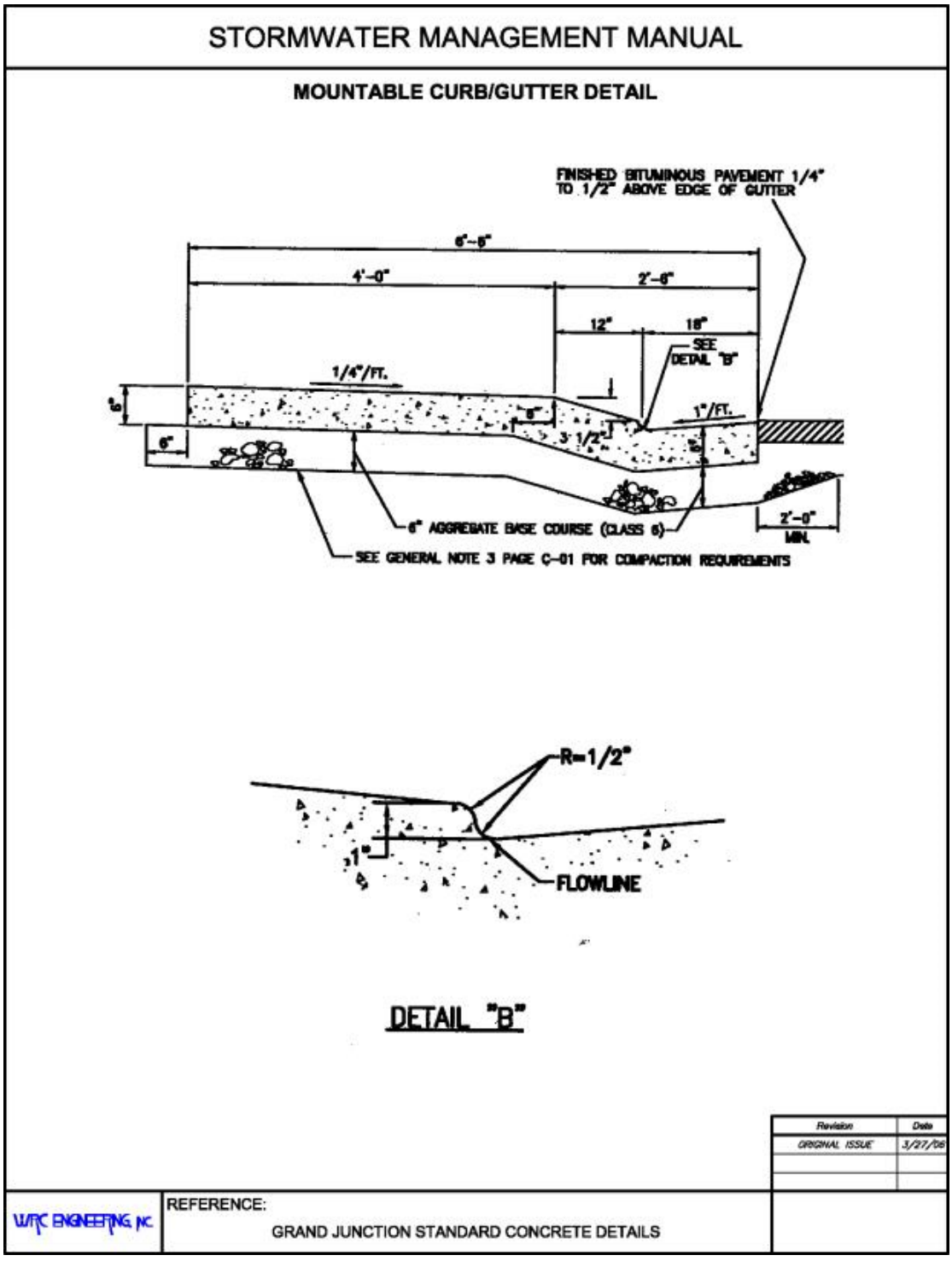


FIGURE 28.44.090(d)

(Res. 40-08 (§ 1104), 3-19-08)

§ 28.44.100. Street hydraulic capacity evaluation.

(a) Gutter and street flow can generally be assumed to be uniform for the purpose of hydraulic evaluation and design, but as street flow depth increases, flow width increases at a much faster rate. This wide, relatively shallow flow has the effect of decreasing the hydraulic radius, rendering the standard Manning's equation somewhat inaccurate. The Federal Highway Administration (FHWA) presents a modified form of the equation in Section 5.3.2 of *Introduction to Highway Hydraulics*, taken from HEC-12:

$$Q_S = \frac{K_u}{n} S_X^{5/3} S_L^{1/2} T_S^{8/3} \qquad (28.44\text{-}1)$$

Where:

Q_S	=	Street Flow Capacity (not including gutter) (cfs)
n	=	Manning's Roughness Coefficient
K_u	=	0.56 for English units
K_u	=	0.376 for S.I. units
S_X	=	Street Cross Slope (ft./ft.)
S_L	=	Street Longitudinal Slope (ft./ft.)
T_S	=	Flow Top Width (not including gutter) (ft.)

(b) For streets with a single cross slope for the gutter and street section, Equation 28.44-1 will suffice for determining total gutter/street flow capacity if the T_S term is replaced by *T = Total Flow Top Width (including gutter, inside curb)*. However, the standard concrete details indicate the use of composite cross slopes for all streets – the gutter has a steeper cross slope than the street. In these cases, the above equation specifies capacity in the flow area between the edge of pavement (not including the gutter itself) and the edge of flow. Note that the result of the same equation as applied to any flow area beyond the street centerline must be subtracted from the total capacity (see Figure 28.44.090(a)). The total flow capacity in the street and the gutter is calculated as:

$$Q = \frac{Q_S}{1 - E_o} - Q_{S,\text{Outside Street Centerline}} \qquad (28.44\text{-}2)$$

$$E_o = 1 / \left[1 + \frac{S_W / S_X}{\left[1 + \frac{S_W / S_X}{(T/W) - 1} \right]^{8/3} - 1} \right] \qquad (28.44\text{-}3)$$

Where:

S_W	=	Gutter Cross Slope (ft./ft.)
S_X	=	Street Cross Slope (ft./ft.)

T = Top Width (inside curb) (ft.)

W = Gutter Width (ft.)

(c) Figures 28.44.100(a) through 28.44.100(f) show calculated half-street flow capacities for each street classification group based on longitudinal street slope and flow depth. The HEC-12 equation (Equation 28.44-1) was used to determine most flow capacities for these charts except in cases where the flow width does not exceed gutter width. Where gutter flow does not encroach on the street surface, it is assumed that the width to depth ratio is not large enough to warrant the utilization of the HEC-12 modified Manning's equation. Instead, the standard form is used in these cases:

$$Q = \frac{1.49}{n} A \cdot R^{2/3} \cdot S_L^{1/2} \quad (28.44\text{-}4)$$

Where:

Q = Flow Capacity (cfs)

S_L = Street Longitudinal Slope (ft./ft.)

R = Hydraulic Radius (ft.) = A/P

A = Cross-Sectional Flow Area (sf)

P = Wetted Perimeter (ft.)

(d) Major storm event flow depth may exceed curb height, thus the flow area behind the curb – between the curb and the right-of-way – must also be considered in the calculation of total street capacity. The flow in this area is found using Equation 28.44-1, replacing T_S with T_B = Flow Top Width (behind curb). Note that the truncation procedure described above must also be applied here if the calculated top width extends beyond the right-of-way boundary. Therefore, the total flow between the curb and street centerline, Q_B, is:

$$Q_B = Q_{B,Gross} - Q_{B,Outside\ Street\ Right\text{-}of\text{-}Way} \quad (28.44\text{-}5)$$

(e) Total street capacity, then, is the sum of the resulting values from Equations 28.44-2 and 28.44-5. The HEC-12 procedure has certain limitations and includes certain assumptions. The most applicable of these are listed below.

(1) One value for Manning's roughness n must be used for the entire cross-section. This can be a composite value derived from multiple roughness segments in the cross-section.

(2) The HEC-12 method ignores any roughness characteristics of the vertical segment of the curb. The energy-dissipating effect of this portion is considered to be negligible when compared to the wide bottom sections.

(3) The vertical curb shown in Figure 28.44.100(g) actually slopes back away from the street by one inch while rising six inches. This slope is ignored by the HEC-12 equations. The gutter width is assumed to include this extra one inch with a

vertical segment of six-inch height at this point. See Figure 28.44.100(g) for detail.

(4) The standard concrete details indicate that the edge of the roadway pavement shall be one-quarter inch to one-half inch above the edge of the concrete gutter. The HEC-12 method is unable to account for this directly, and the hydraulic effects are assumed to be negligible, so this is ignored.

(f) Two of the provided standard street capacity charts, Figures 28.44.100(a) and 28.44.100(f), were not prepared using the procedure described above. Both residential streets with mountable curbs (Figure 28.44.100(a)) and principal arterials (Figure 28.44.100(f)) have a more complex cross-section than the HEC-12 method can accurately model. The former is due to the alternate curb-and-gutter configuration, and the latter has a required median to which the flow can spread, adding another flow-control surface to the cross-section. Therefore, Haestad Methods' FlowMaster computer program was used to model these sections and prepare capacity charts. The program uses the Cox open-channel weighting method to determine composite roughness and utilizes the standard form of Manning's equation to compute discharge.

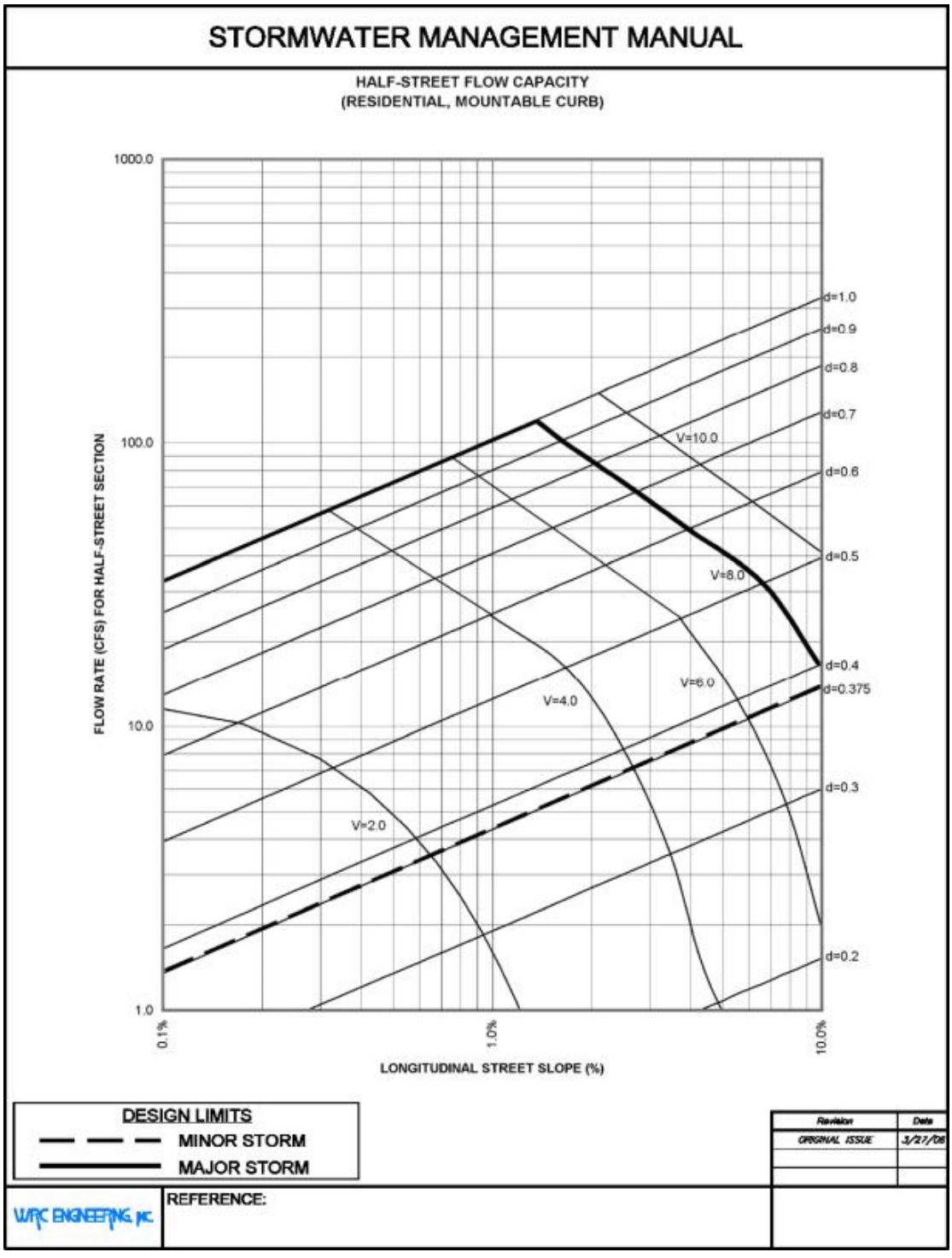


FIGURE 28.44.100(a)

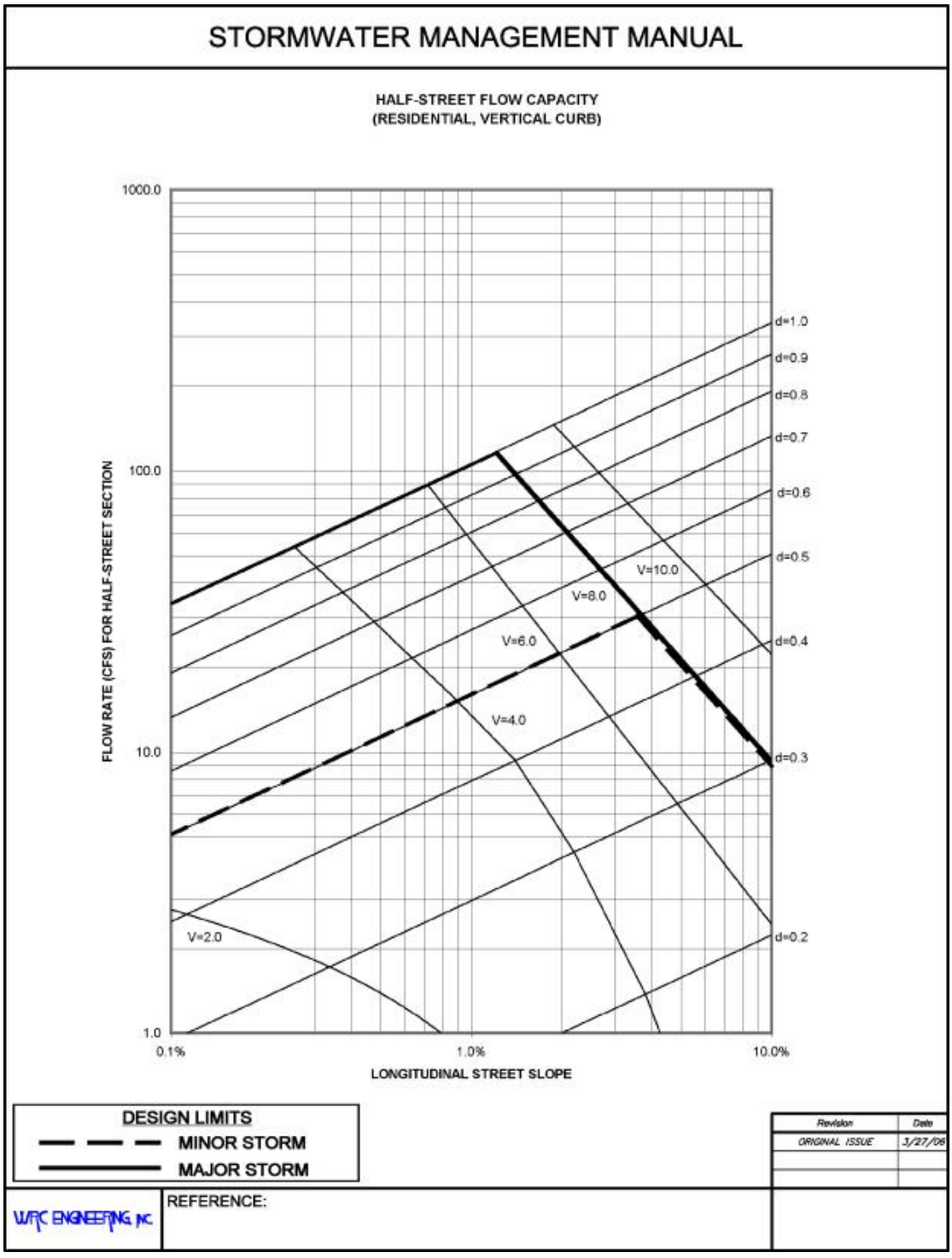


FIGURE 28.44.100(b)

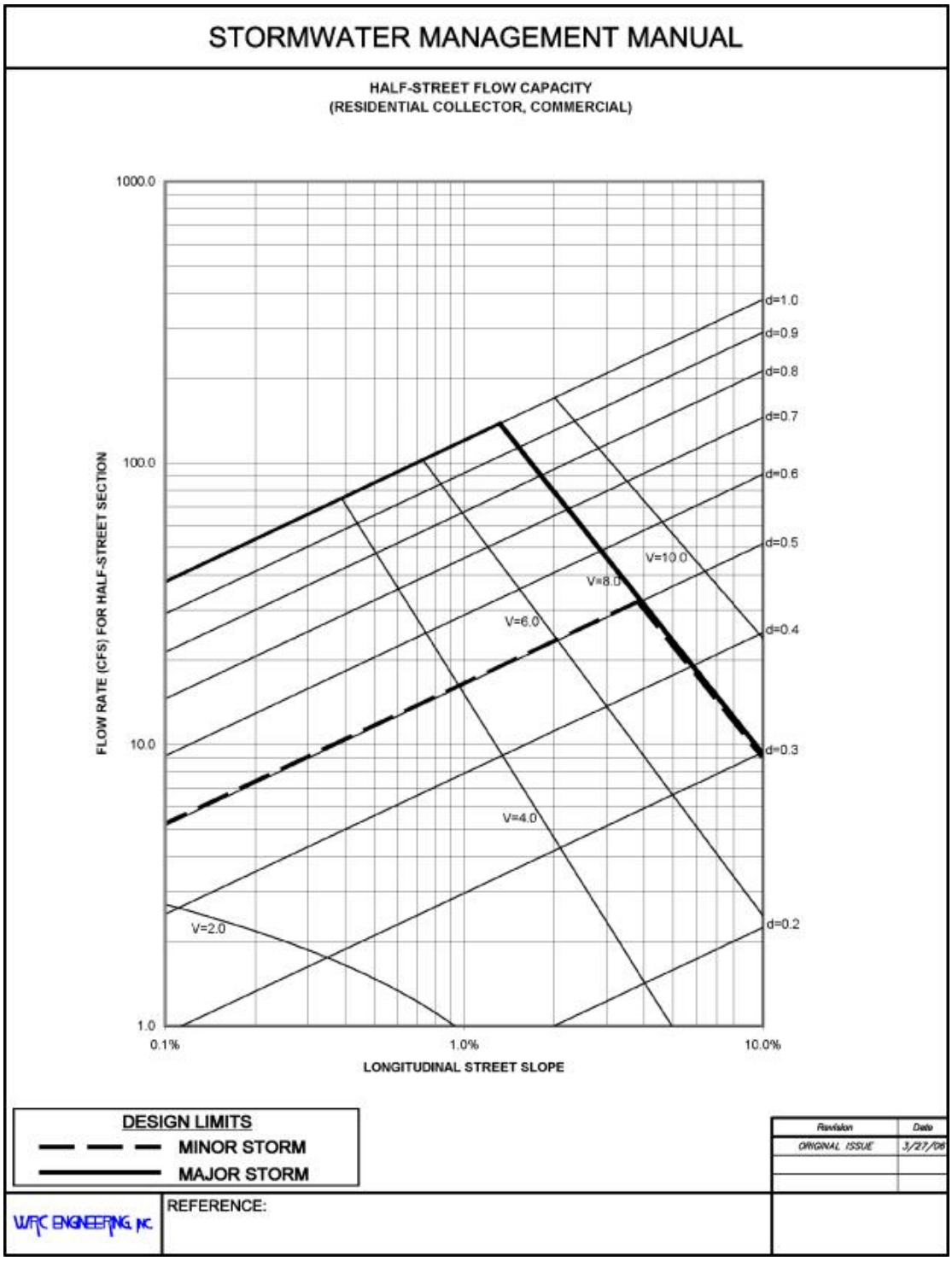


FIGURE 28.44.100(c)

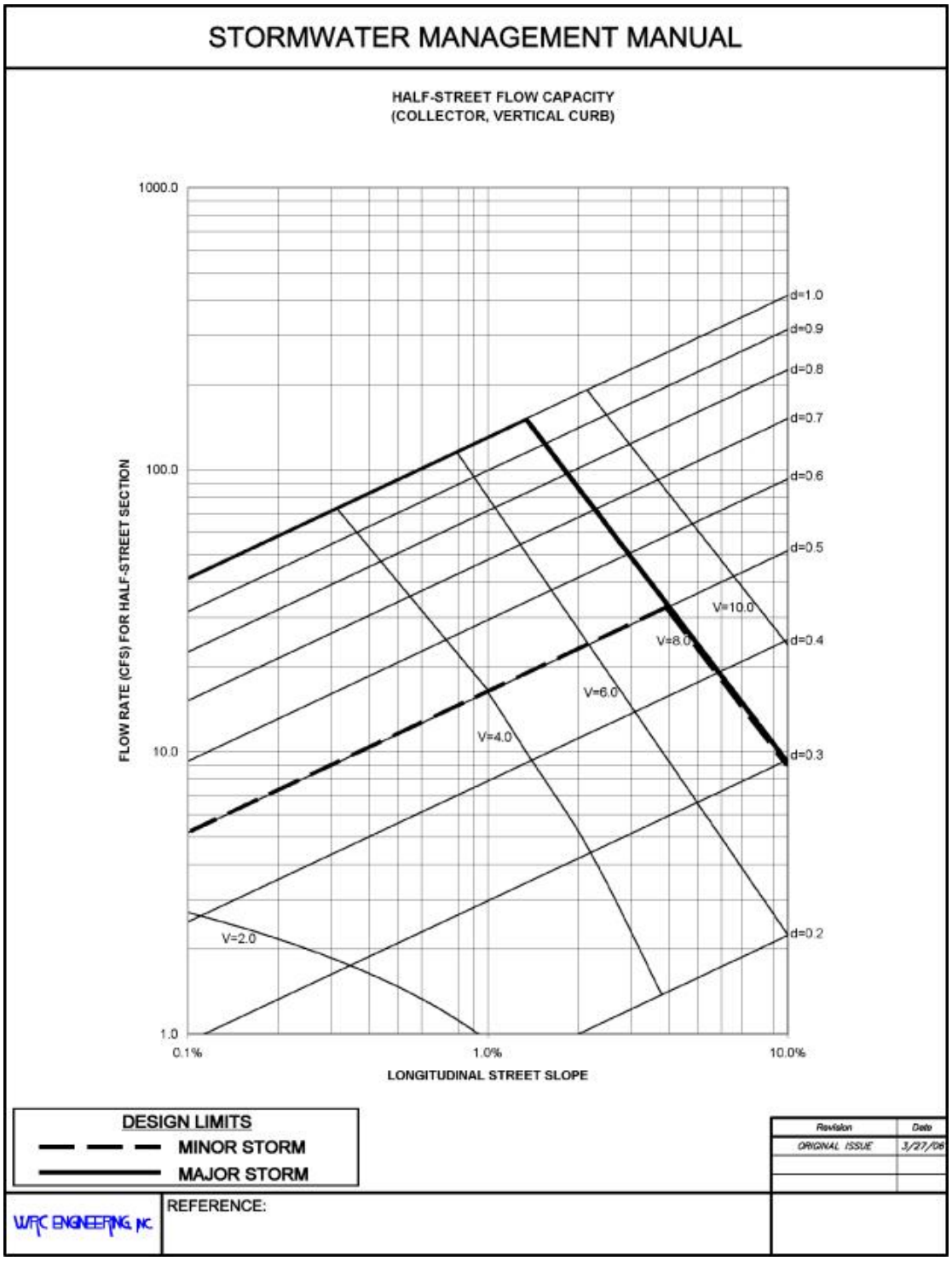


FIGURE 28.44.100(d)

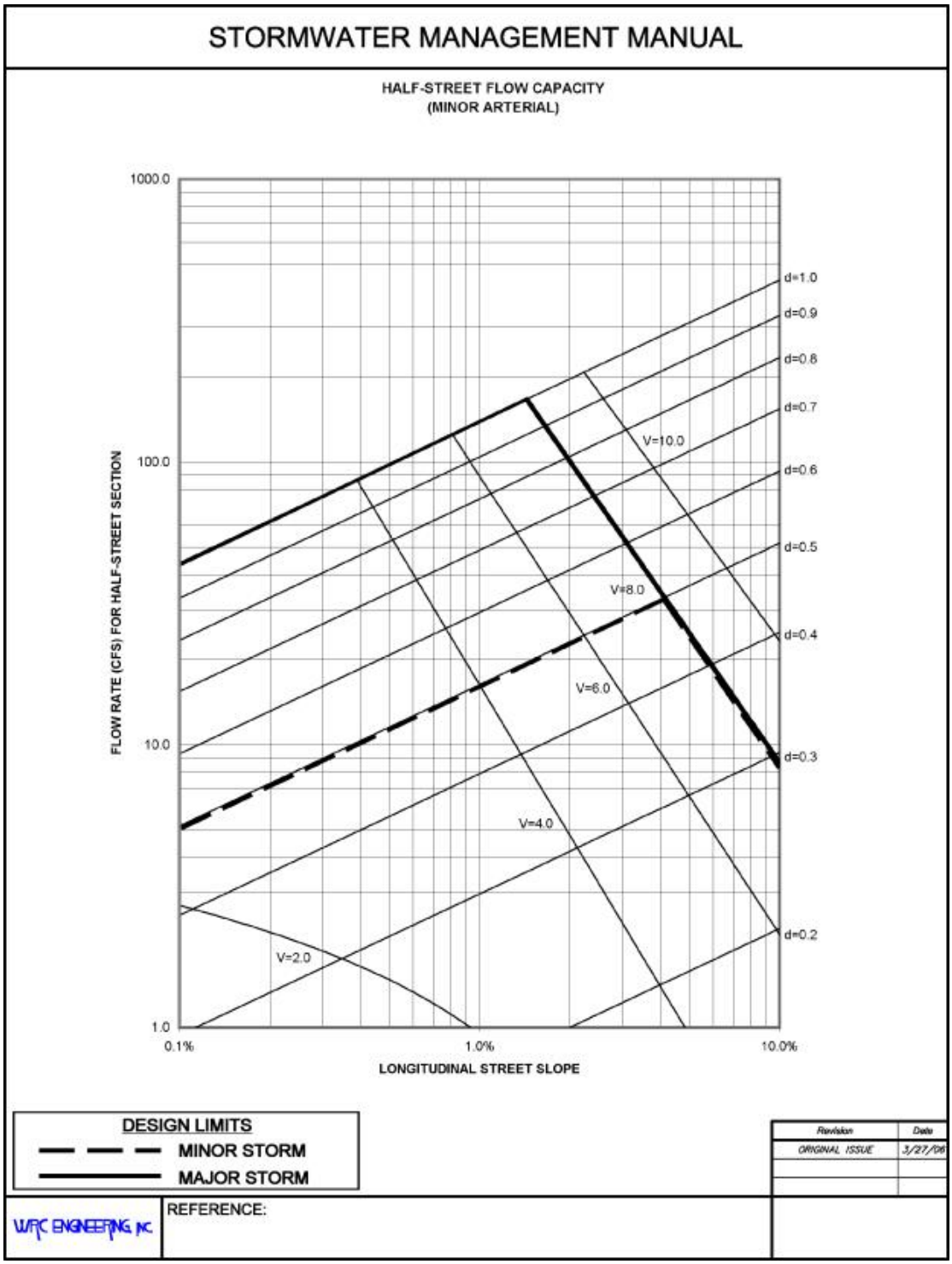


FIGURE 28.44.100(e)

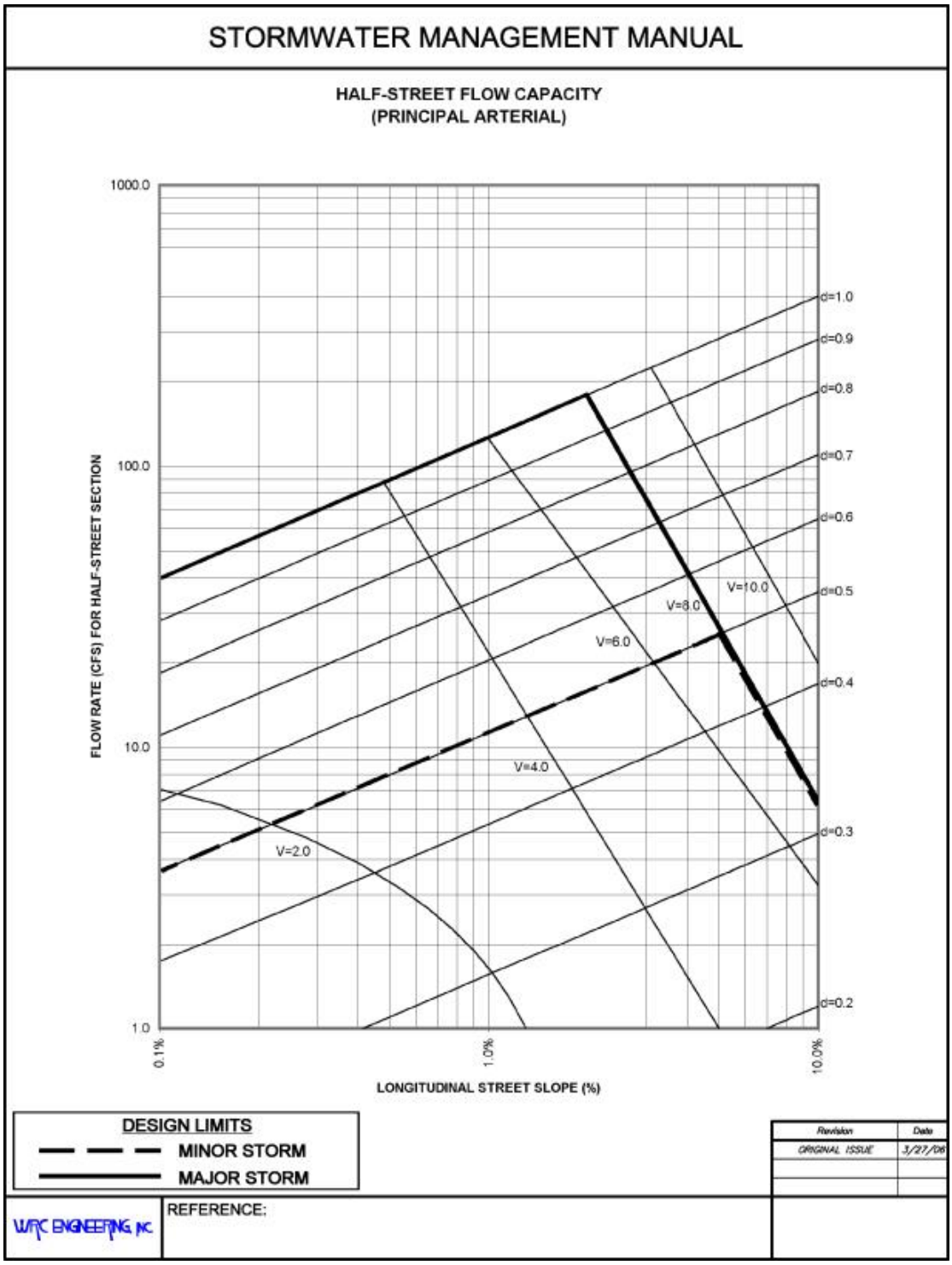


FIGURE 28.44.100(f)

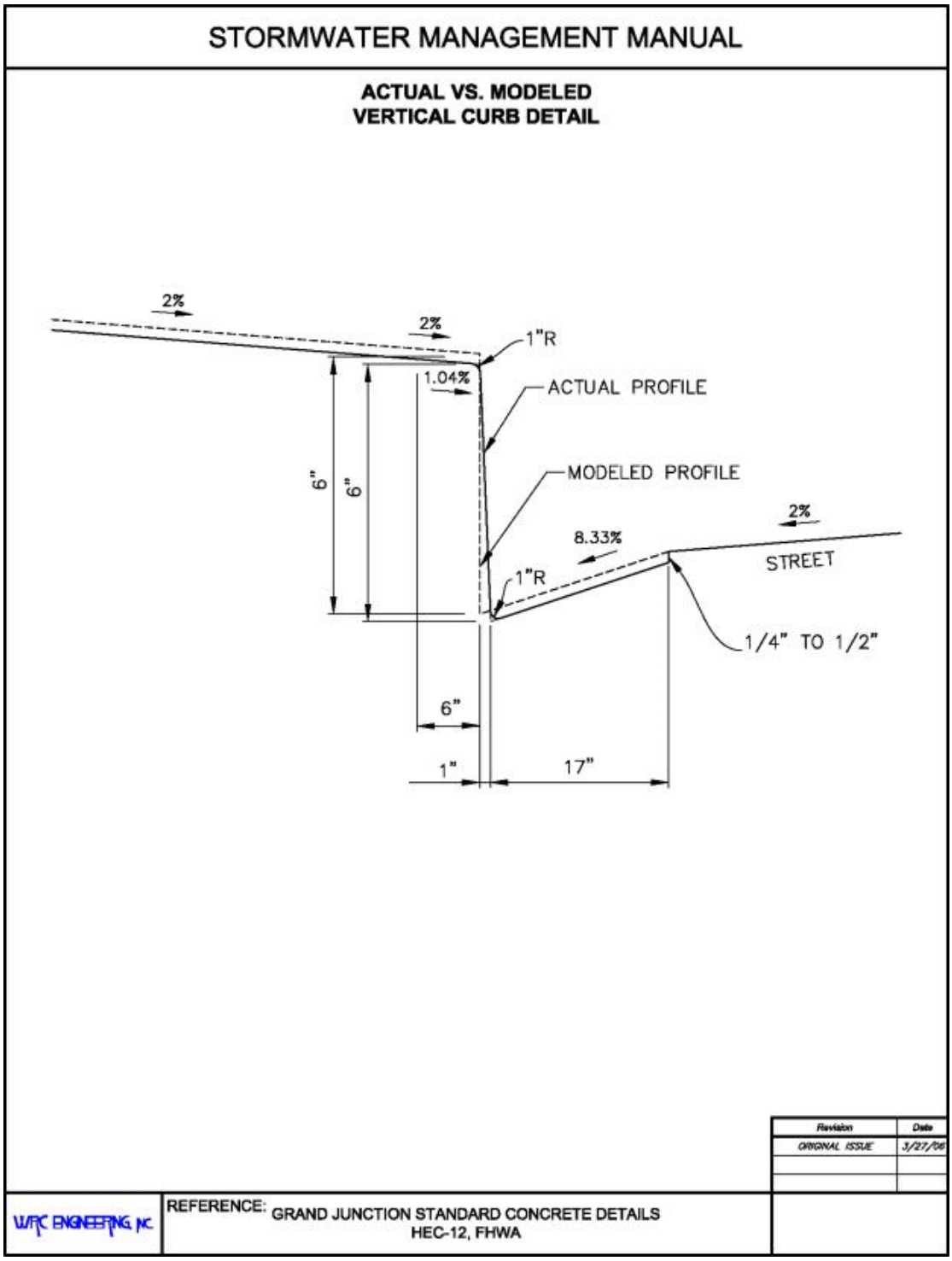


FIGURE 28.44.100(g)

(g) Certain assumptions were made in the creation of the street capacity charts to minimize the required number of figures and to simplify the design process. However, it is the responsibility of the designer to ensure that each assumption is valid for a specific design.

(1) A Manning's roughness value of n = 0.016 was assumed for all flow surfaces encountered within the street right-of-way when using the HEC-12 method. Varying values of n were used to construct the FlowMaster cross-sections, but composite roughness values were not significantly different from 0.016 for the two special cases.

(2) A street cross slope of 2.0 percent was assumed for all streets.

(3) A gutter cross slope of 8.33 percent was assumed for all gutters.

(4) Velocity curves are provided on the capacity charts for reference only – the designer is responsible for the calculation of actual gutter velocities.

(h) In cases where these assumptions may not be valid, such as designs incorporating the use of nonstandard street sections, the designer shall utilize the equations presented above to determine allowable street capacity.

(i) The maximum allowable gutter velocity is 8.0 feet per second. Velocities exceeding this value can create safety issues, cause erosive damage to the street and other surfaces, and reduce the effectiveness of storm drain inlets.

(Res. 40-08 (§ 1105), 3-19-08)

§ 28.44.110. Storm inlet selection, sizing, and location.

(a) Wherever street and gutter capacity exceeds allowable values based on flow spread, velocity, or depth, some or all of the runoff must be intercepted and diverted to an alternate flow path such as a storm drain or designated runoff channel. The most common method of interception is by the utilization of storm drainage inlets, of which there are four major types:

(1) Curb-opening inlets;

(2) Grate inlets;

(3) Combination inlets (curb-opening and grate);

(4) Slotted drain inlet.

(b) The slotted drain inlet is not recommended due to its high susceptibility to clogging, and may only be used where specifically approved by a local jurisdiction. All inlets must be labeled with "NO DUMPING – DRAINS TO RIVER." Isometric-view examples of the first three types are shown in Figure 28.44.110.

(c) Inlets may either be located on a continuous grade – where flow not intercepted by the inlet will pass to another location – or in a sag portion of a street's vertical alignment (or any other sump location). Computation of inlet capacity involves several factors including type of inlet, location (on-grade or in a sump), grate type (if applicable), inlet geometry, flow width and depth, and both longitudinal and cross slopes.

(d) Methods and rationale utilized in this chapter for the calculation of inlet capacities are based on those presented in HEC-12 (1984). However, HEC-12 contains a nomograph for finding grate splash-over velocity, and here we use an empirical formula for this

value (Guo, Storm Water System Design, CE 5803, University of Colorado at Denver, 1999). Additionally, clogging must be considered in the selection and location of inlets, and will be addressed in GJMC § 28.44.140.

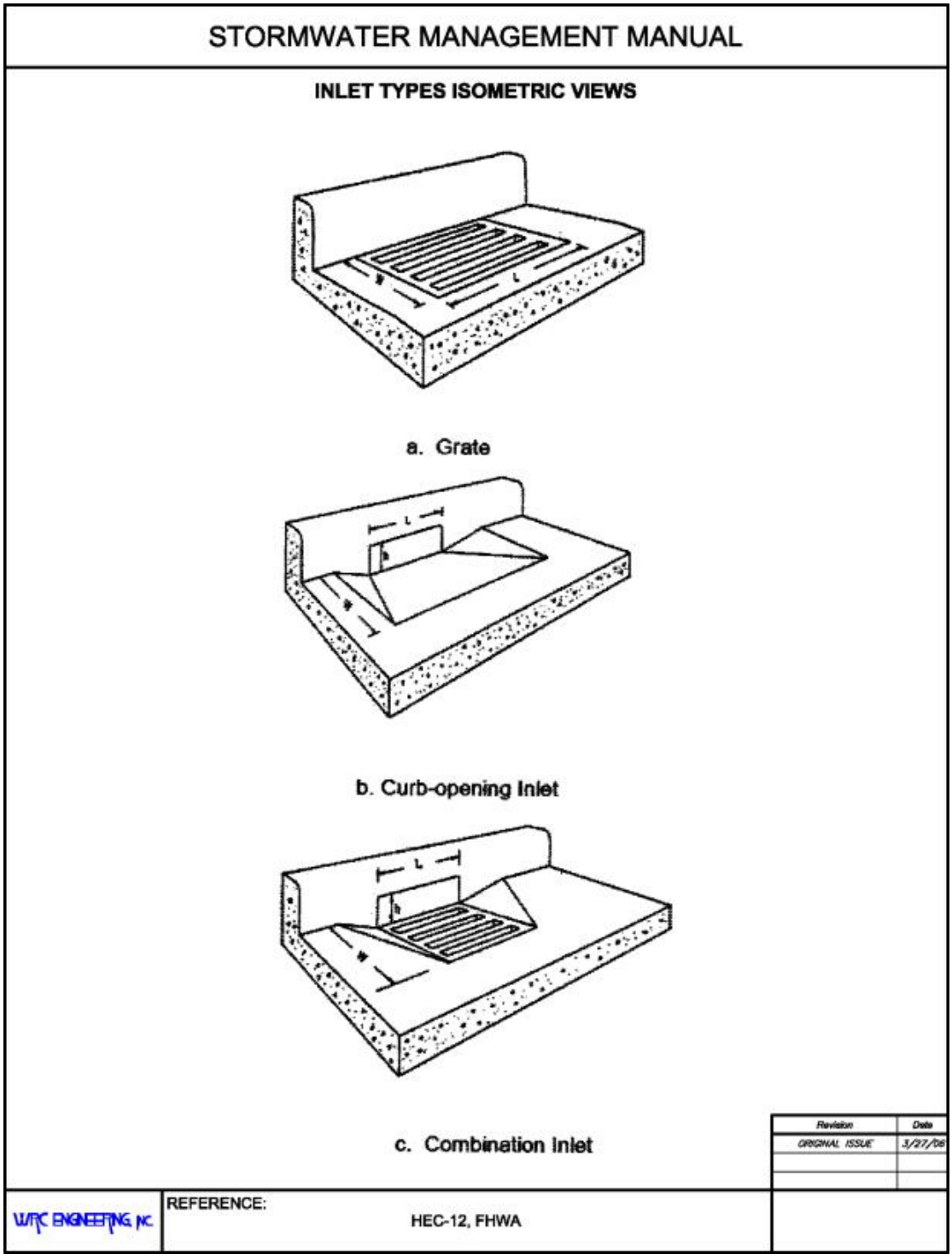


FIGURE 28.44.110

(Res. 40-08 (§ 1106), 3-19-08)

§ 28.44.120. Hydraulic capacity of inlets on a continuous grade.

Gutter velocities exceeding a "splash-over" velocity and flow widths greater than grate widths typically result in interception efficiencies of less than 100 percent for an on-grade inlet. Inlet efficiency, E, is defined as:

$$E = Q_i/Q \tag{28.44-6}$$

Where:

Q_i = Intercepted Flow Rate
Q = Gutter Total Flow Rate

Flow which is not intercepted by the inlet is called bypass flow, Q_b:

$$Q_b = Q - Q_i \tag{28.44-7}$$

The interception efficiency of an inlet is affected by different factors for different inlet types. Grate inlets are most sensitive to the amount of water flowing directly over the grate (frontal flow) and the velocity of flow in the gutter. Curb-opening inlets vary primarily with inlet length, depth of flow, and both longitudinal and cross slopes of the gutter and street. Combination inlets where the curb opening and grate inlets are of similar length and are installed adjacently have been shown to have essentially the same interception capacity as the same grate configuration acting without a curb opening. However, curb-opening inlets have greater debris-handling capabilities than grates, and therefore combination inlets typically experience significantly less grate clogging than would be experienced if the curb-opening was excluded. A "sweeper inlet" is a type of combination inlet that utilizes a segment of curb opening upstream from the grated portion. This configuration has the highest debris-removal efficiency, and therefore lowest clogging rate, of all types listed here. Total capacity is the sum of the flow intercepted by the curb opening located upstream of the grate(s) and that intercepted by the grated portion of the combination inlet.

(a) Grate Inlets. Grand Junction Standard Storm Drain Details (Page D-05, 2005) lists storm drain grate types which have been approved for use. The four primary types for use on streets are Types R, L, V, and D in single, double, and triple-inlet configurations, and are included in the inlet capacity charts provided herein. Page D-05 also contains two important notes concerning the selection of grates:

(1) Use Type R or Type D grate where inlet is located in sump condition.

(2) Use Type V or Type L where gutter flow is from one direction only.

Type V and Type L grates are vane grates, which are more efficient for on-grade locations, but are very inefficient for sump conditions. Therefore, local jurisdictions do not allow the use of grate Types V and L for locations where sump conditions may exist. However, these types are recommended for on-grade locations where bicycle traffic is expected.

The FHWA and others have extensively researched the hydraulic characteristics of the seven grate types listed in Table 28.44.120. The approved grate types were each matched to the FHWA grate type most closely matching in geometry and apparent hydraulic functionality. These assumed pairings are indicated in Table 28.44.120.

The total rate of intercepted flow by a grate inlet (or standard combination inlet) is the sum of the intercepted frontal flow and the intercepted side flow. Frontal flow, Q_w is that portion of the total gutter flow which has a flow width equal to or less than the grate width. Total frontal flow is found using the following HEC-12 equation:

$$Q_w = Q\left[1-\left(1-\left(W/T\right)\right)^{2.67}\right] \quad (28.44\text{-}8)$$

Where:

Q_W = Total Frontal Flow (cfs)
Q = Total Gutter Flow (no behind-curb flow) (cfs)
W = Width of Grate (ft.)
T = Total Top Width of Flow (ft.)

Total side flow is that portion of total gutter flow which is between the inner edge of the grate(s) and the street centerline, and is the remainder of the total flow between the curb and the centerline:

$$Q_s = Q - Q_w \quad (28.44\text{-}9)$$

Where:

Q_s = Total Side Flow

To find the ratio of intercepted frontal flow (Q_{wi}) to total frontal flow (Q_w), R_f, one must first find the splash-over velocity, V_o, for the selected grate type. This function was developed empirically by Guo (1999):

$$V_o = \alpha + \beta L_e - \gamma L_e^2 + \eta L_e^3 \quad (28.44\text{-}10)$$

Where:

L_e = Effective Unit Grate Length (see Equation 28.44-24)
$\alpha, \beta, \gamma, \eta$ = Splash Velocity Constants (see Table 28.44.120)

Table 28.44.120: Splash Velocity Constants

Type of Grate	Assumed Equivalent	α	β	γ	η
Bar P-1-7/8	Type D	2.22	4.03	0.65	0.06

Table 28.44.120: Splash Velocity Constants

Type of Grate	Assumed Equivalent	α	β	γ	η
Bar P-1-1/8	Not used	1.76	3.12	0.45	0.03
Vane Grate	Type L,V	0.3	4.85	1.31	0.15
45-Degree Bar	Not used	0.99	2.64	0.36	0.03
Bar P-1-7/8-4	Not used	0.74	2.44	0.27	0.02
30-Degree Bar	Not used	0.51	2.34	0.2	0.01
Reticuline	Type R	0.28	2.28	0.18	0.01

Adapted from Guo, *Storm Water System Design*, 1999.

Splash-over velocity is an experimentally-derived value at which frontal flow begins to bypass the grate essentially because water does not spend enough time over the inlet to allow it to fall through the grate. As previously mentioned, this value varies per grate type – some grates tend to better capture higher velocity flows. This allows the designer to calculate the HEC-12 frontal flow interception ratio:

$$R_f = Q_{wi}/Q_w = 1.0 - 0.09(V - V_o) \quad \text{where } V \geq V_o, \text{ otherwise } R_f = 1.0 \qquad (28.44\text{-}11)$$

Due to the primarily longitudinally-flowing nature of street and gutter flow, the interception ratio of side flow is typically minimal, and in some jurisdictions is ignored altogether. This ratio, $R_{s,}$ is defined as:

$$R_s = Q_{si}/Q_s = \frac{1}{1 + \frac{0.15 \cdot V^{1.8}}{S_X \cdot L_e^{2.3}}} \qquad (28.44\text{-}12)$$

Where:

Q_{si} = Intercepted Side Flow (cfs)
V = Gutter Flow Velocity (fps)
S_x = Street Cross Slope
L_e = Effective Length of Grate(s) (ft.) (see Equation 28.44-24, GJMC § 28.44.140)

Total intercepted flow (Q_i), then, is found using Equation 28.44-13:

(28.44-13)

$$Q_i = Q_{wi} + Q_{si} = R_f \cdot Q_w + R_s \cdot Q_s$$

Total capture efficiency (E) for a grate inlet can be found using:

$$E = R_f(Q_w / Q) - R_s(Q_s / Q) \quad \text{(28.44-14)}$$

Inlet clogging due to the buildup of debris and sediment can adversely affect the interception capacity of an inlet. A clogging factor must be applied to find the design value for Q_i. See GJMC § 28.44.140 for an explanation of the calculation of clogging factors.

Included in Figures 28.44.120(b) through 28.44.120(k) are inlet capacity charts for all street types and curb-and-gutter and inlet configurations considered by this manual. Figure 28.44.120(a) is a legend for these figures. The capacity curves are specific to grate type, inlet type, and whether the subject inlet is single, double, or triple length. All curves include appropriate clogging factors per GJMC § 28.44.140. Inlet capacity values calculated from the provided equations may be used if they do not exceed the values provided in the inlet capacity charts.

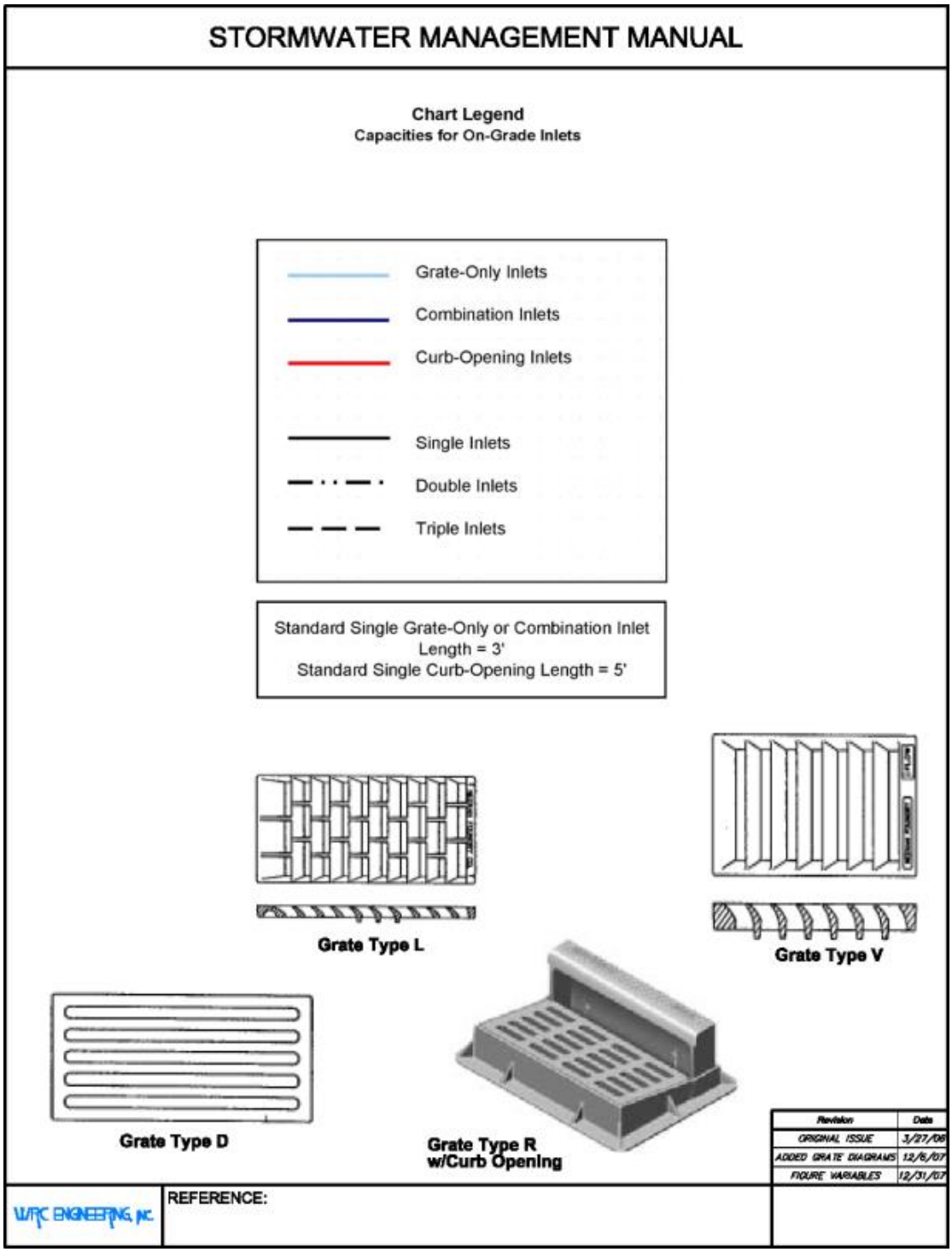


FIGURE 28.44.120(a)

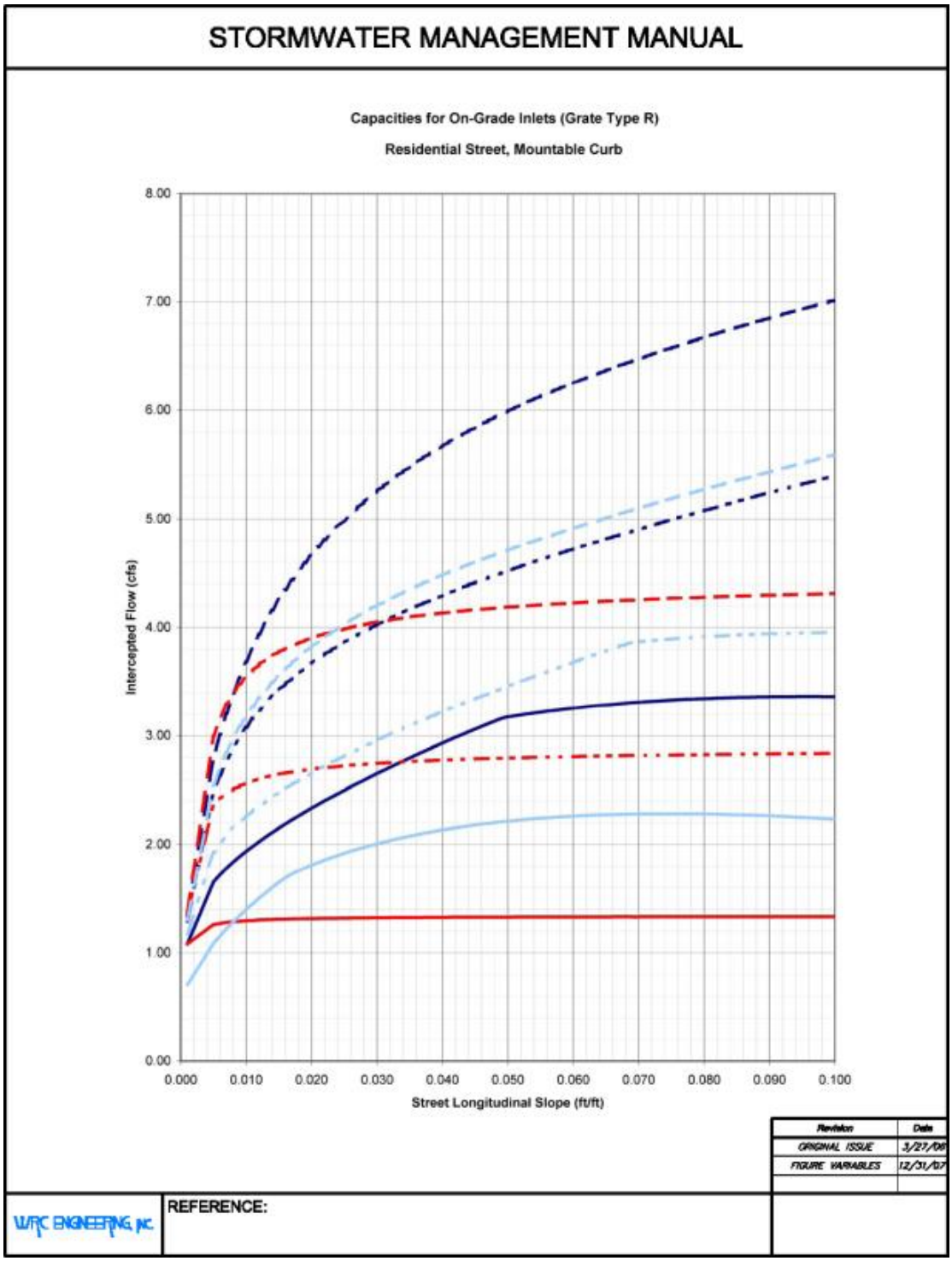


FIGURE 28.44.120(b)

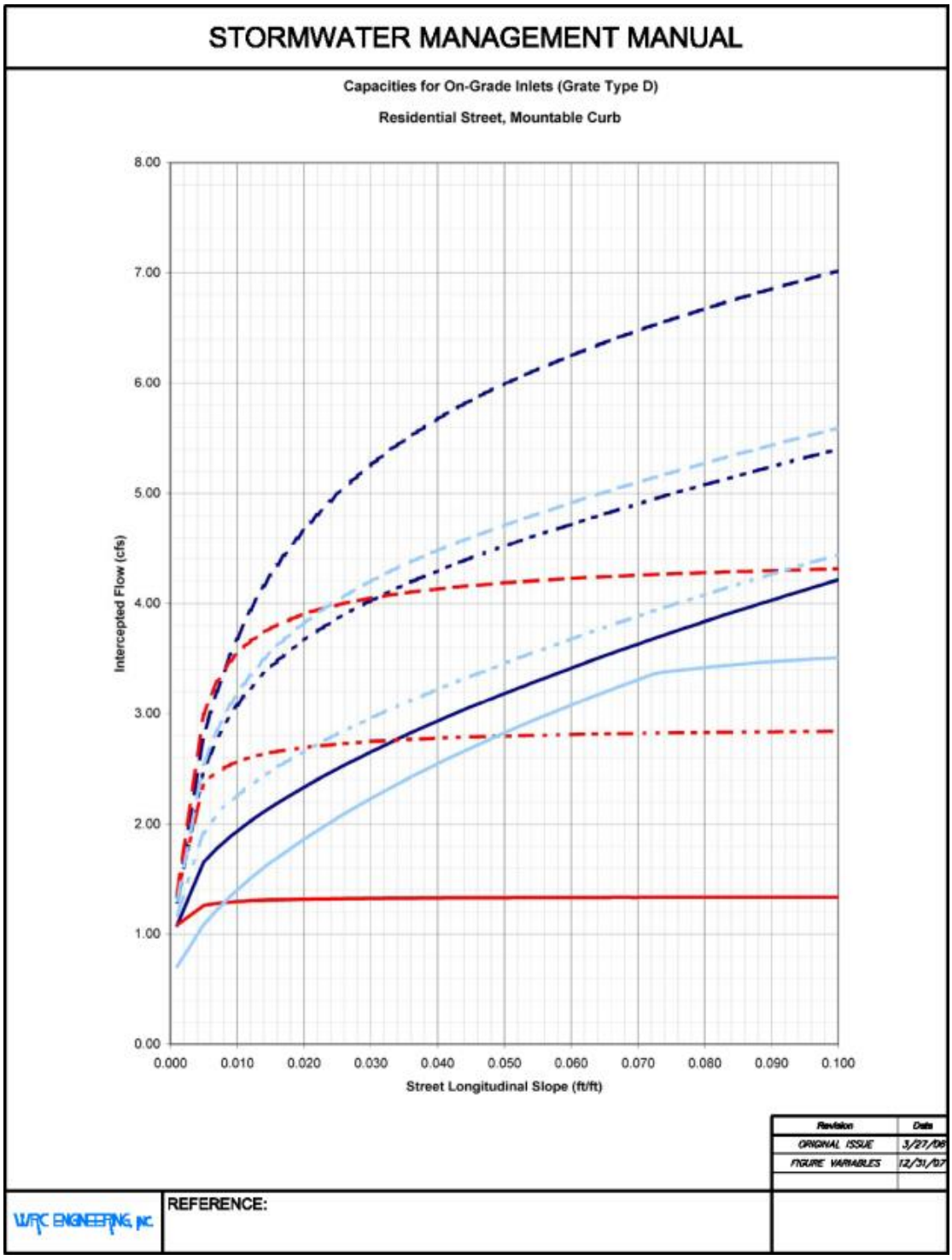


FIGURE 28.44.120(c)

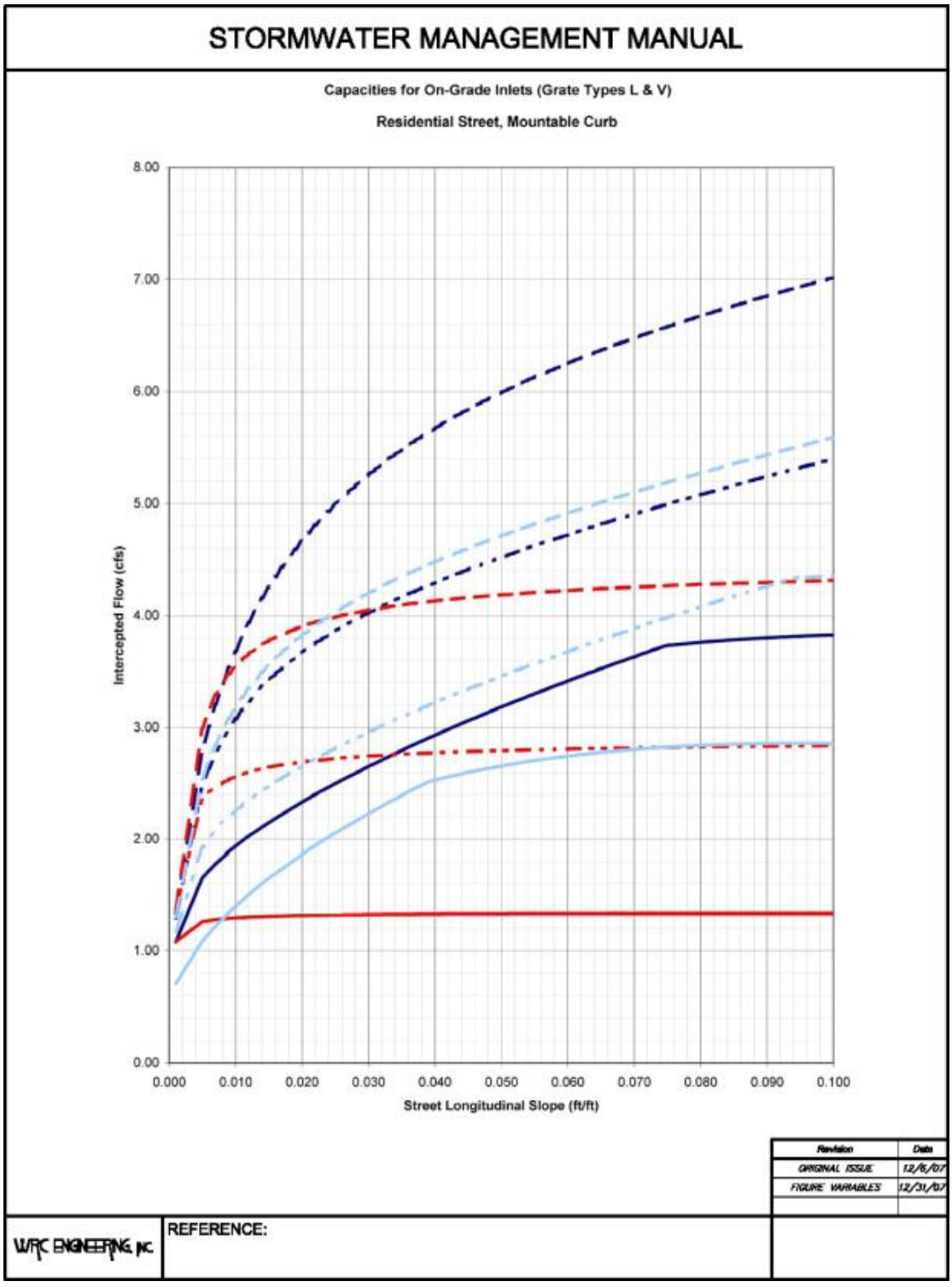


FIGURE 28.44.120(d)

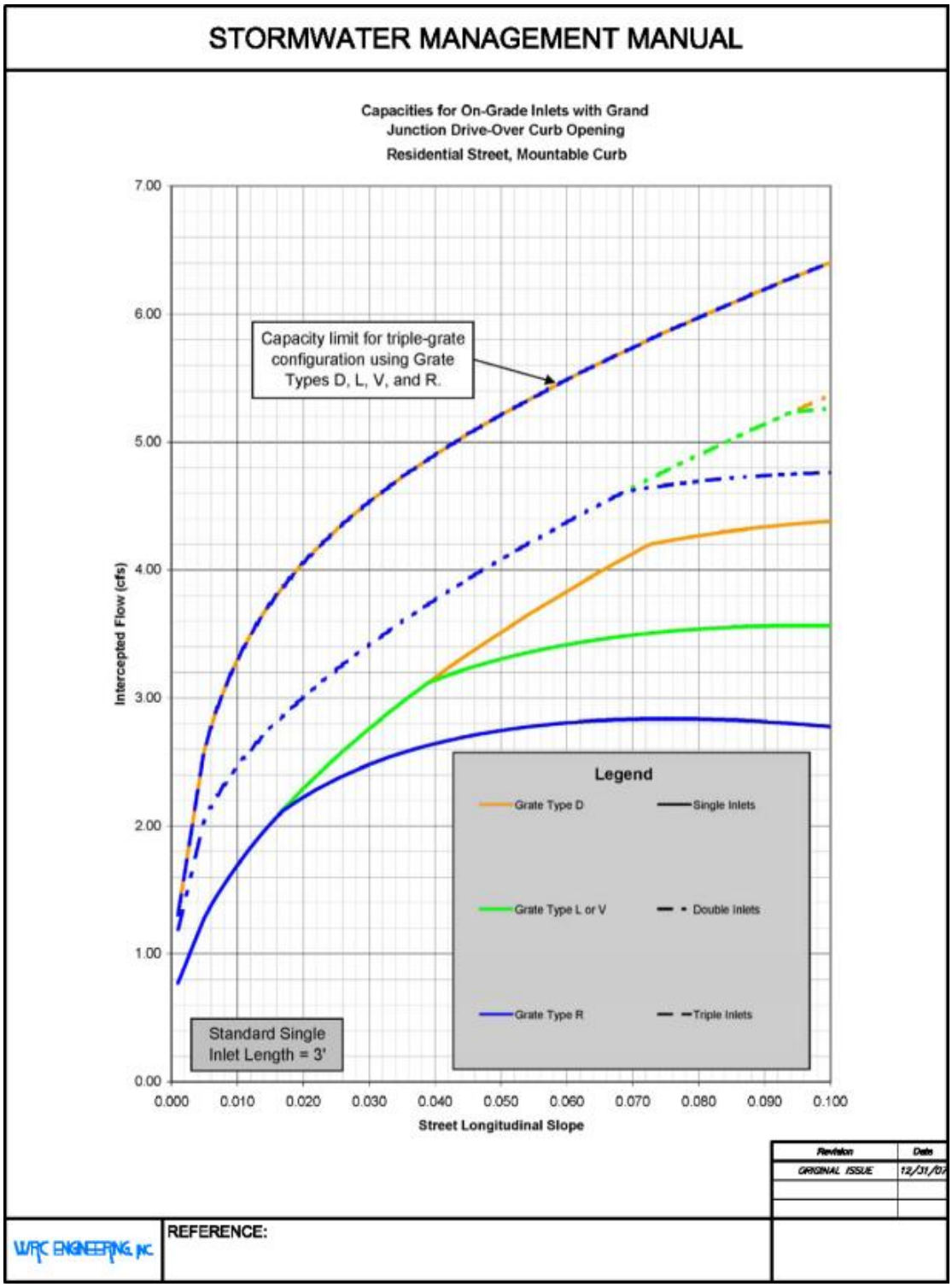


FIGURE 28.44.120(e)

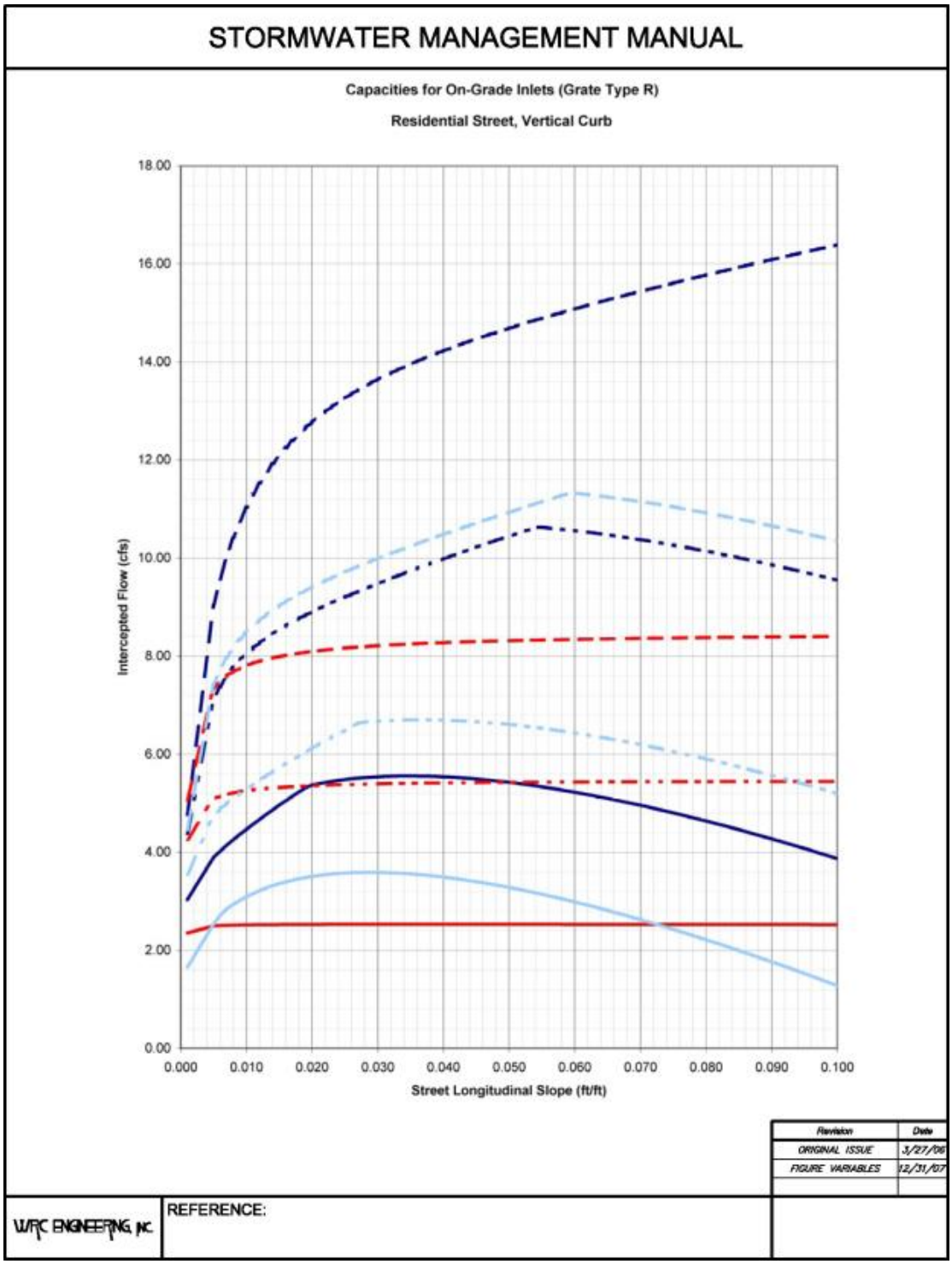


FIGURE 28.44.120(f)

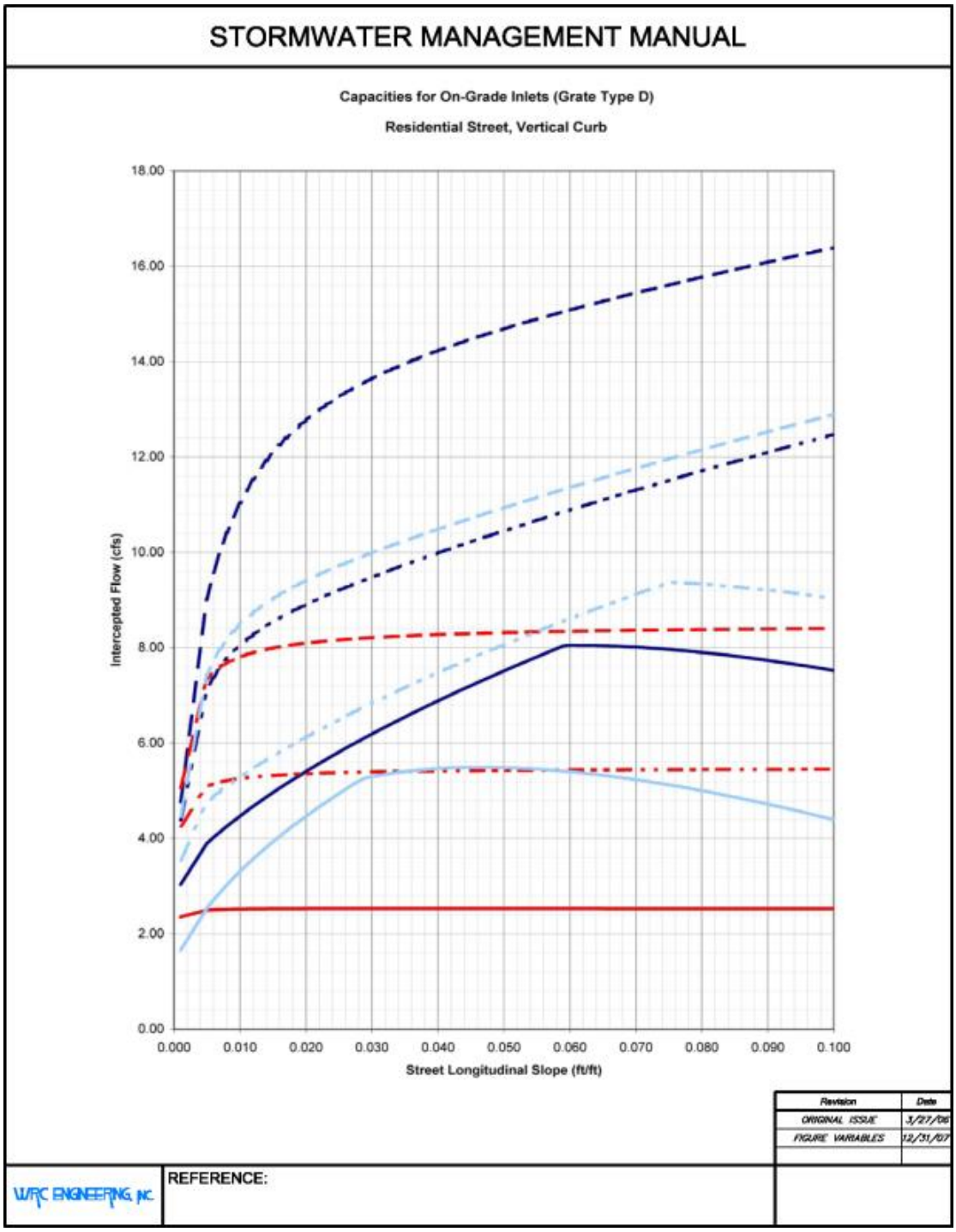


FIGURE 28.44.120(g)

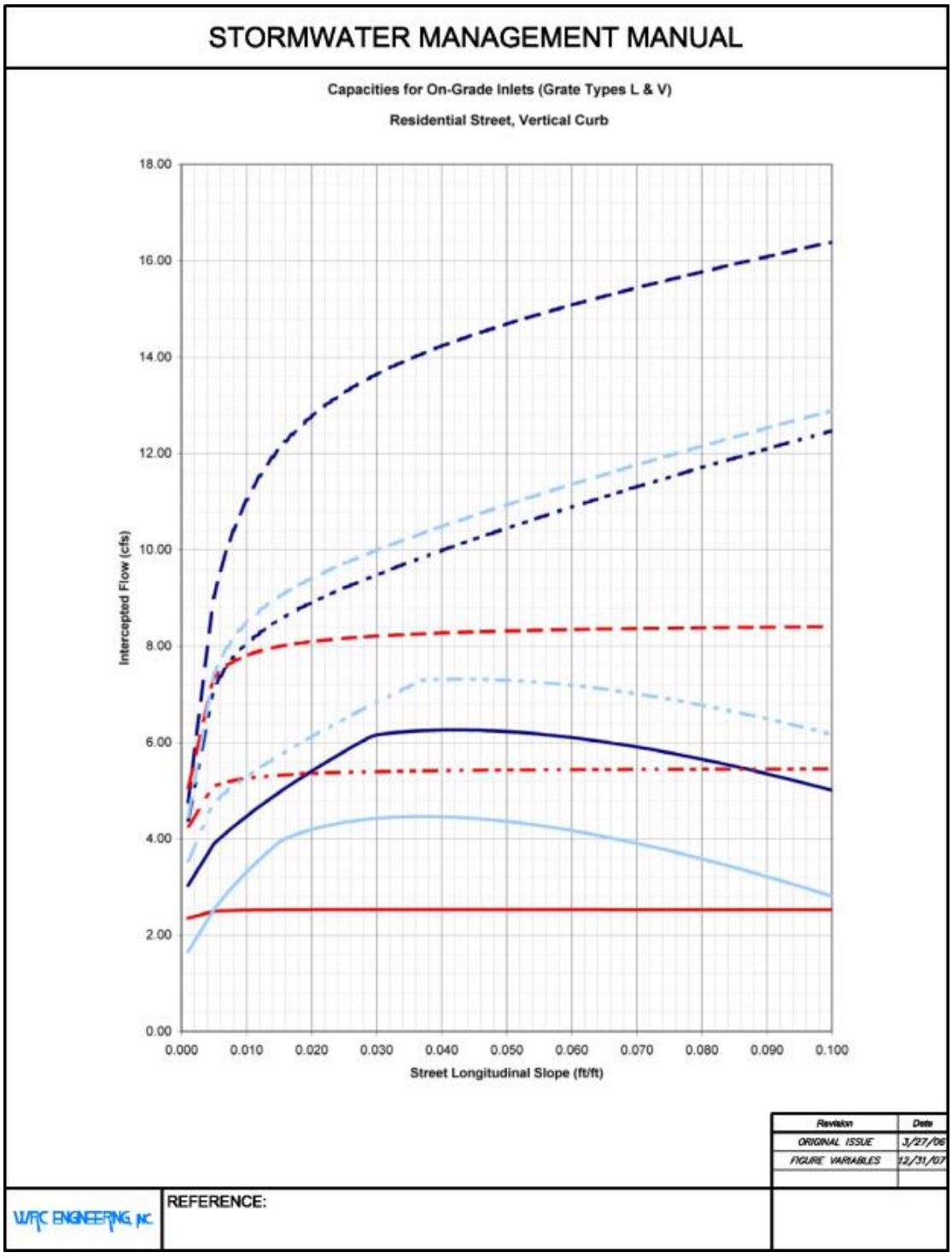


FIGURE 28.44.120(h)

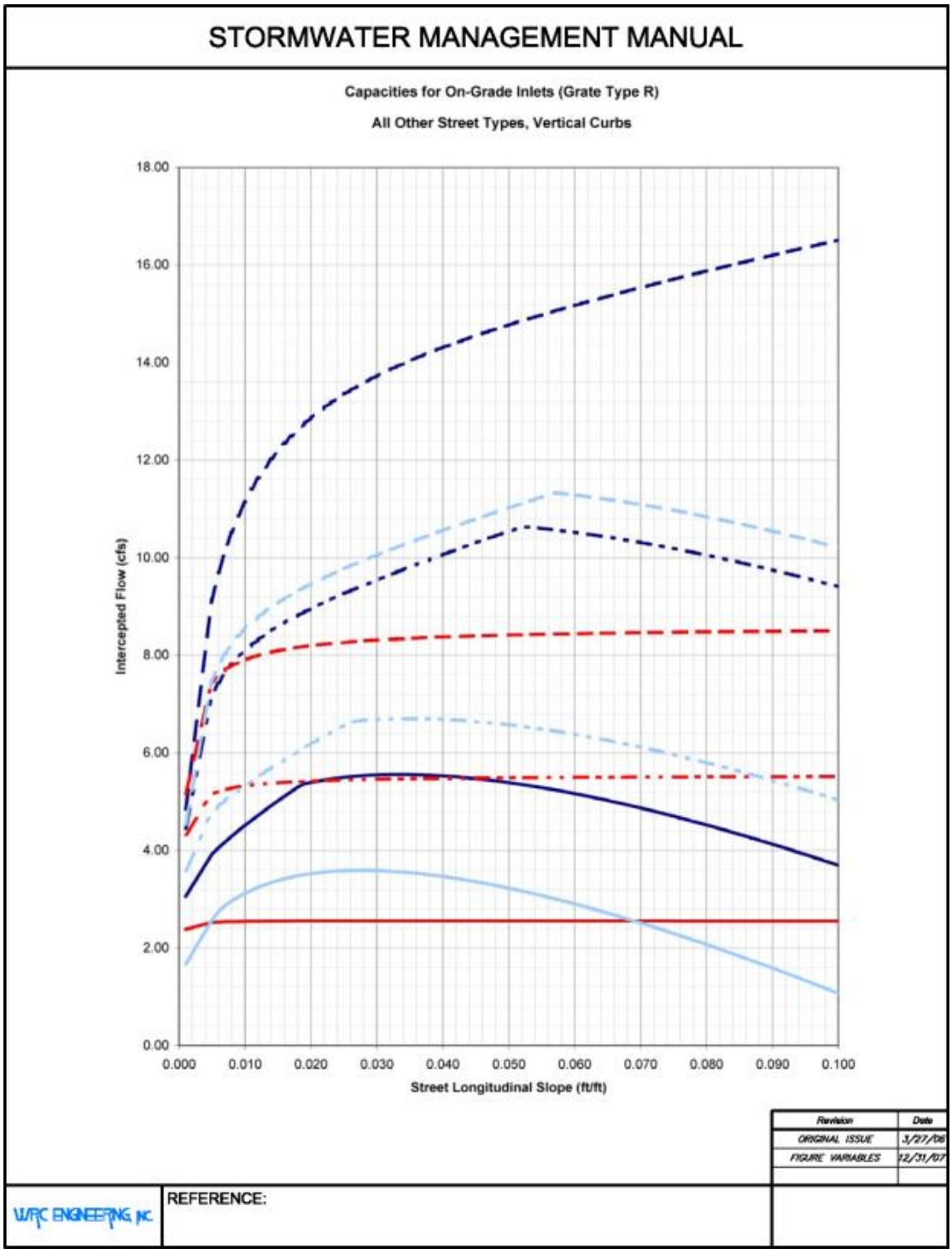


FIGURE 28.44.120(i)

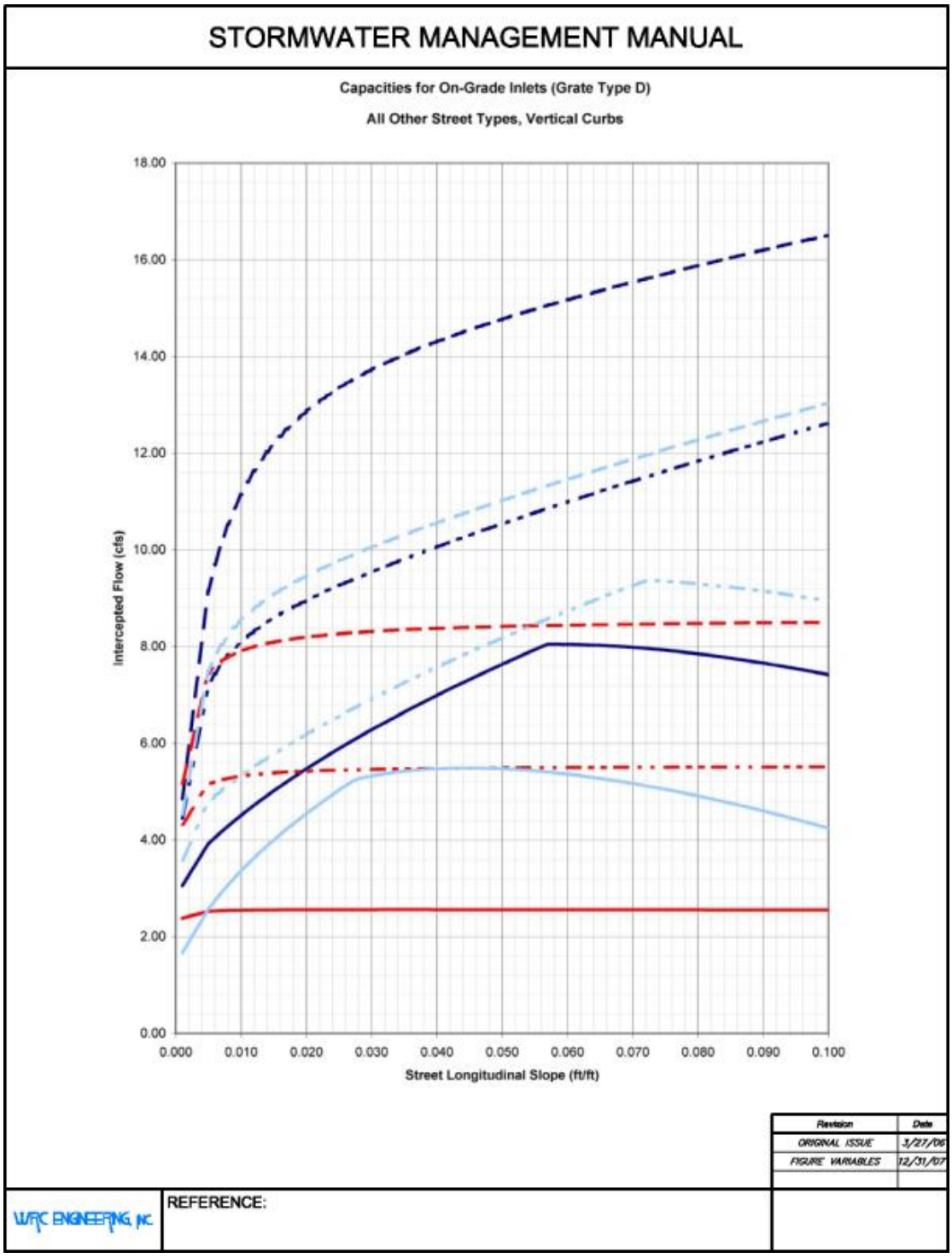


FIGURE 28.44.120(j)

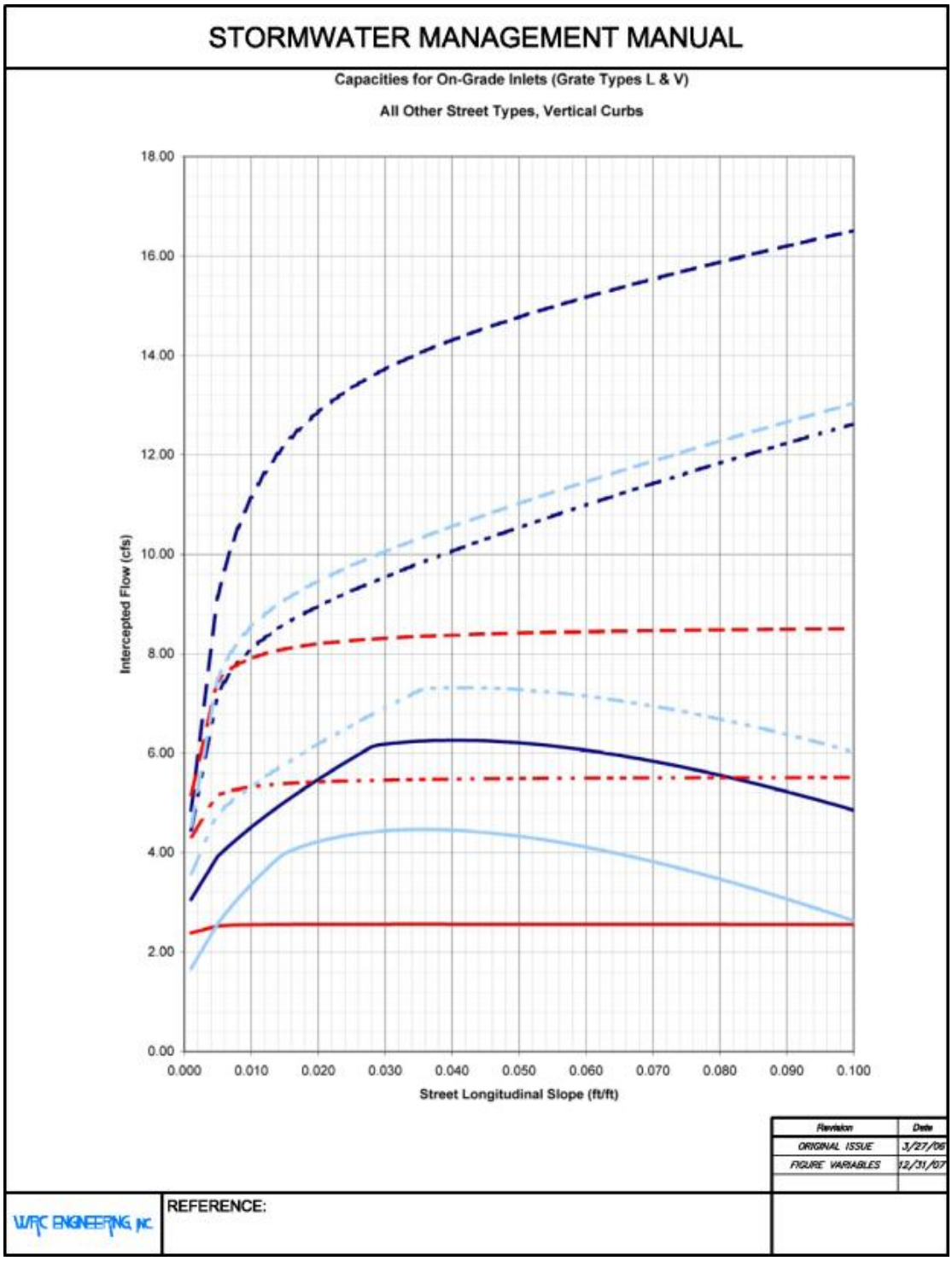


FIGURE 28.44.120(k)

(b) Curb-Opening Inlets. The interception capacity of a curb-opening inlet on a continuous grade is dependent on inlet length, flow depth, and the longitudinal and cross slopes of the street. To determine the capture efficiency of a curb-opening inlet, one must first

calculate the length that would be required for 100 percent interception of the gutter flow at that location (L_T):

$$L_T = 0.6Q^{0.42}S_L^{0.3}\left(\frac{1}{n \cdot S_e}\right)^{0.6} \quad (28.44\text{-}15)$$

$$S_e = S_X + \left(a/W\right)E_o \quad (28.44\text{-}16)$$

Where:

Q	=	Total Gutter Flow (cfs)
S_L	=	Longitudinal Street Slope
n	=	Manning's Roughness Coefficient
S_e	=	Equivalent Cross Slope
S_X	=	Street Cross Slope
a	=	Gutter Depression Below Street Slope (ft.)
W	=	Gutter Width (ft.)
E_o	=	Defined by Equation 28.44-3

The efficiency of a curb-opening inlet is calculated using Equation 28.44-17, where effective length L_e is defined in Equation 28.44-24 (GJMC § 28.44.140):

$$E = 1 - \left[1 - \left(L_e / L_T\right)\right]^{1.8} \quad \text{where } L_e < L_T, \text{ otherwise } E = 1.0 \quad (28.44\text{-}17)$$

Included in Figures 28.44.120(b) through 28.44.120(k) are inlet capacity charts for all street types, grate types, inlet types and curb-and-gutter configurations considered by this manual. Each figure is specific to the type of grate used. The capacity curves for all on-grade inlets are specific to a single inlet length of 5.0 feet for curb-opening-only inlets and 3.0 feet for both grate-only and combo inlets. Figure 28.44.120(e) is the inlet capacity chart for the Grand Junction Drive-Over inlet with its own legend. It assumes the curb height is 4.5 inches, the flow line of the frame and grate is one inch below normal gutter flow line, and the vertical opening is set at one inch in height. Curves are provided for single, double, or triple length. All curves include appropriate clogging factors per GJMC § 28.44.140. Inlet capacity values calculated from the provided equations may be used if they do not exceed the values provided in the inlet capacity charts.

(c) Combination Inlets. Per the introduction to this section, combination inlets are assumed to have the capacity of the same inlet with the grate(s) acting alone except in the case of "sweeper inlets." However, the designer shall note the reduced clogging susceptibility of the combination inlet when compared with a grate-only configuration noted in GJMC § 28.44.140.

(d) Slotted Drain Inlets. Slotted drains are effective for intercepting flow over a wide section, such as sheet flow across the pavement of a street. However, these inlets are highly susceptible to clogging, and are only allowed as specifically approved by a local jurisdiction. Methods for the design of such inlets can be found in HEC-12 and HEC-22.

(Res. 40-08 (§ 1106.1), 3-19-08)

§ 28.44.130. Hydraulic capacity of inlets in sump conditions.

A sag or sump condition occurs in a location where water that flows into the area must pond to some depth before any of the flow can escape the area via channel or overland flow. Unlike inlets on a continuous grade, those in a sump condition are not designed to bypass a portion of the flow incident to the inlet location. This means that these inlets must have the capacity to effectively capture all of the runoff that ponds in the sump and to maintain acceptable ponding depths.

These requirements, along with an increased potential for inlet clogging due to low flow velocities, necessitate special provisions for the design of sump inlets. A secondary flow path must be provided to maintain a reasonable ponding depth in the case of inlet failure (near-complete clogging, for instance). The preferred secondary flow path is a designated emergency overflow weir and channel, which must be located within an accessible drainage easement and must be protected from erosive effects as necessary by pavement or riprap. If no easement is available at the inlet location, flanker inlets must be installed in the same gutter on each side of the primary inlet. Flanker inlets are located upgradient 10 to 50 feet from the primary sump inlet. The two flanker inlets shall have a combined design capacity equal to or greater than that of the primary inlet.

Local jurisdictions recommend the use of combination inlets in sumps due to their higher capacity and lower clogging tendency. Curb-opening inlets are also allowable, but grate-only inlets and slotted-drain inlets are not allowed for use in sump conditions.

Per GJMC § 28.44.120(a), Type L and Type V grates are prohibited for use with inlets located in sumps. Mesa County and the City of Grand Junction have approved grate Types D and R for inlets in these locations.

The hydraulic capacity of an inlet in a sump condition is dependent on the configuration of the inlet and the depth of the ponded water. At small depths, the flow into the inlet is by weir flow, transitioning to orifice flow at increasing depths. These depths are defined in Table 28.44.130.

The gross capacity of an inlet operating as a weir is defined by Equation 28.44-18:

$$Q_i = C_w L_w d^{1.5} \qquad (28.44\text{-}18)$$

Where:

Q_i = Inlet Capacity (cfs)

L_W = Weir Length (ft.)
d = Flow of Ponding Depth (ft.)
C_W = Weir Discharge Coefficient (see Table 28.44.130)

The gross capacity of an inlet operating as an orifice is defined by Equation 28.44-19:

$$Q_i = C_o A_o (2 \cdot g \cdot d_o)^{0.5} \quad (28.44\text{-}19)$$

Where:

Q_i = Inlet Capacity (cfs)
A_o = Orifice Open Area (sf)
g = 32.2 ft./s^2
d_o = Depth to Orifice Centroid (ft.)
C_o = Orifice Discharge Coefficient (see Table 28.44.130)

Table 28.44.130: Discharge Coefficients and Variable Definitions for Inlets in a Sump Condition

Type of Inlet	C_w	C_o	Weir	Orifice	L_w
Grate	3	0.67	$d < 1.79(A_o / L_w)$	$d > 1.79(A_o / L_w)$	2w+L
Curb-Opening	3	0.67	$d < h$	$d > 1.4h$	L
Depressed Curb-Opening	2.3	0.67	$d < h + a$	$d > 1.4h$	2w+L

Where:

A_o = Orifice Open Area (sf)
L_W = Weir Length (ft.)
d = Flow or Ponding Depth
w = Grate Width (ft.)
L = Inlet Length (ft.)

It is important to note that the capacity of a combination inlet in a sump is defined by the capacity of the grate portion only when operating as a weir (the curb opening is ineffectual and thus ignored), but is defined by the cumulative capacity of the grate and curb opening when operating as an orifice. Any curb opening length extending beyond the ends of the grates may be included in the weir length.

For any given inlet, a certain range of depths will result in transitional flow, where neither the weir equation nor the orifice equation accurately models flow through the inlet. Linsley (1992) states that where transition conditions exist, “the capacity is intermediate between that of an orifice and a weir.” For design purposes, the capacity for depths in the transitional range is based on the lesser of the results of Equations 28.44-18 and 28.44-19.

Local inlet depression increases the capacity of inlets, especially those in sumps, by increasing the depth over the inlet without increasing street flow depth. Local depression loses effectiveness for curb-opening inlets of 12-foot length or greater, so the "Curb-Opening" information from Table 28.44.130 shall be used for these. Figure 28.44.130 contains two tables with maximum inlet capacities for inlets with a two-inch local depression and without depression (level with curb flow line). The first capacity table is for the standard six-inch vertical curb configuration (applies to most streets in Mesa County) and the second table contains values for the 4.5-inch mountable (drive-over) curb. All capacities listed in Figure 28.44.130 include a clogging factor per GJMC § 28.44.140.

STORMWATER MANAGEMENT MANUAL

Maximum Inlet Capacities
Sump or Sag Condition

	INLET TYPE	6-INCH VERTICAL CURB					
		SINGLE		DOUBLE		TRIPLE	
		2-YR	100-YR	2-YR	100-YR	2-YR	100-YR
2-INCH CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	9.8	12.4	14.7	20.1	19.6	27.8
	COMBINATION INLET (TYPE R GRATES)	9.8	11.1	14.7	18.8	19.6	26.5
	CURB-OPENING INLET CAPACITY	7.7	10.3	12.7	20.6	15.0	30.9
NO CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	6.4	9.3	9.5	14.2	12.7	19.1
	COMBINATION INLET (TYPE R GRATES)	5.1	8.1	9.5	13.0	12.7	17.9
	CURB-OPENING INLET CAPACITY	4.1	6.5	8.3	13.1	12.4	19.6

	INLET TYPE	4.5-INCH MOUNTABLE CURB					
		SINGLE		DOUBLE		TRIPLE	
		2-YR	100-YR	2-YR	100-YR	2-YR	100-YR
2-INCH CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	7.2	10.8	10.8	16.8	14.4	22.7
	COMBINATION INLET (TYPE R GRATES)	7.2	9.4	10.8	15.4	14.4	21.4
	CURB-OPENING INLET CAPACITY	5.6	8.0	9.3	16.0	11.0	23.9
NO CURB-OPENING DEPRESSION	COMBINATION INLET (TYPE D GRATES)	4.1	7.8	6.2	10.9	8.3	14.1
	COMBINATION INLET (TYPE R GRATES)	4.1	6.5	6.2	9.7	8.3	12.8
	CURB-OPENING INLET CAPACITY	2.3	4.2	4.7	8.5	7.0	12.7

See Chart Legend (Figure 26.44.120(a)) for standard inlet lengths.

Inlet capacities shown above are based upon the following:
1. Type D grate used for calculation is Neenah model R-3577.
2. Type R grate used for calculation is Neenah model R-3289-C.
3. Angled- and curved-vane grates are not allowed for sump or sag design conditions.
4. Capacities shown are based upon maximum ponding depths for the 2-year and 100-year storm events:
   a. 2-year event maximum ponding depth: curb height
   b. 100-year event maximum ponding depth: 1.0 foot
5. Combination inlets are preferred for sump or sag conditions. Curb-opening inlets without grates are allowed.
6. Grate-only inlets are not allowed for sump or sag conditions.

Revision	Date
ORIGINAL ISSUE	3/27/06
REVISED CALCULATIONS	12/20/07

WRC ENGINEERING, INC.

REFERENCE: HEC-12, FHWA
WATER-RESOURCES ENGINEERING, LINSLEY (1992)
GRAND JUNCTION STANDARD DETAILS

FIGURE 28.44.130

(Res. 40-08 (§ 1106.2), 3-19-08)

§ 28.44.140. Inlet clogging considerations.

Inlets are always susceptible to clogging when water flows to them. Low flows can carry leaves and finer sediments and deposit them at the inlet, while higher flows can deposit larger debris. The latter is of most concern since it is often too large to be washed down the inlet, even with heavy storm flows. Proper inlet design and timely maintenance including street sweeping, visual inspection of inlets, and removal of large debris are essential to the proper operation of inlets. The clogging factors listed in Table 28.44.140 are based on the assumption that routine maintenance is performed on all drainage structures.

Table 28.44.140 contains the assumed clogging factors for different inlet types. A value of zero percent indicates that no clogging is expected, and a value of 100 percent indicates that the inlet shall be considered completely clogged or is not allowed in the specified conditions.

Table 28.44.140: Clogging Factors for Single Inlets

Type of Inlet	On-Grade	Sag/Sump $d \leq 0.5$ ft.	Sag/Sump $d > 0.5$ ft.
Grate	50%	100%	100%
Curb-Opening	20%	20%	20%
Combination (Grate Portion)	0%	0%	50%
Combination (Curb-Opening Portion)	100%	100%	0%

In the case of multiple (double or triple) inlets, the continuous (linear) application of some of these factors would result in the inability to capture 100 percent of the flow incident to the subject inlet. Although on-grade inlets are rarely designed to capture 100 percent of gutter flow from the minor storm event, inlet design lengths may become unnecessarily long to achieve the desired flow interception rate. It is reasonable to assume that a majority of the sediment and debris is deposited at the inlet by the first few minutes of significant storm flow, possibly before the peak flow occurs at that inlet. Also, the majority of clogging tends to more greatly affect the upgradient segments of a multi-unit inlet. For instance, the first grate of a triple inlet may become 50 percent clogged, while the third grate experiences only 10 percent clogging. This phenomenon was generalized by Guo in *Design of Grate Inlets with a Clogging Factor* (2000) using a decay equation and empirically-derived decay factors. It may be applied to inlets on a continuous grade and inlets in sump conditions.

$$C = \frac{1}{N}\left(C_o + eC_o + e^2C_o + \ldots + e^{N-1}C_o\right) = \frac{C_o}{N}\sum_{i=1}^{i=N} e^{i-1} \qquad (28.44\text{-}20)$$

Where:

C = Multiple-Unit Clogging Factor (decimal)
C_o = Single-Unit Clogging Factor (decimal)

N	=	Number of Units
e	=	Decay Ratio
e	=	0.5 for grates, 0.25 for curb-opening inlets

This adjusted clogging factor can be applied to the sump-inlet capacity equations (Equations 28.44-18 and 28.44-19) by replacing the variables for weir length L_w with effective weir length (L_{we}) from Equation 28.44-21 and orifice area A_o with effective opening area (A_{oe}) from Equation 28.44-22. The clogging factor may also be applied directly to the gross flow capacities from Equations 28.44-18 and 28.44-19 using Equation 28.44-23.

$$L_{we} = (1 - C)L_w \quad (28.44\text{-}21)$$

$$A_{oe} = (1 - C)A_o \quad (28.44\text{-}22)$$

$$Q_i(net) = (1 - C)Q_i \quad (28.44\text{-}23)$$

To apply the clogging factor to an on-grade inlet, the designer must first find the effective length (L_e) – that portion of the inlet length which is considered unclogged.

$$L_e = (1 - C)L \quad (28.44\text{-}24)$$

This value is used in the computation of splash-over velocity in Equation 28.44-10, side-flow interception ratio in Equation 28.44-12, and curb-opening efficiency in Equation 28.44-17.

(Res. 40-08 (§ 1106.3), 3-19-08)

§ 28.44.150. Grate selection and rating.

Selection of grates for on-grade and sump inlets must be consistent with GJMC § 28.44.120(a) and the page titled “Approved Storm Drain Inlets” (D-05) of the City of Grand Junction Standard Details. The designer is urged to obtain any grate rating data available from the manufacturer of the selected grate. This data may be used to cross-check the values obtained using the methods presented in this manual and/or to obtain interception and capacity values. However, in the latter case, it is imperative that the designer still incorporate all clogging/safety factors that apply to the inlet design per local jurisdictions’ requirements.

(Res. 40-08 (§ 1106.4), 3-19-08)

§ 28.44.160. Inlet location and spacing.

Inlets shall be placed at any location where ponding water may encroach on street traffic beyond the allowable limits. These limits are defined by gutter flow depth during the minor storm event (GJMC § 28.44.090). An inlet location is determined using an iterative process:

(a) Determine a preliminary location for the inlet based on street configuration and estimated runoff to the gutter.

(b) If the inlet is in a sump, location is essentially fixed during the remainder of the design process. The inlet shall be sized to maintain ponding depths smaller than those required by local jurisdictions. If the required inlet size becomes excessively large, the designer is urged to install additional inlets upgradient from the sump.

(c) For inlets on a grade, the designer must find the flow characteristics at the selected preliminary inlet location to determine whether the inlet needs to be placed further upstream or may be moved downstream based on maximum flow depth for the minor storm event.

(d) The designer shall take into account the change in tributary area to the inlet associated with any upstream or downstream movement.

(e) A typical design interception efficiency of an on-grade inlet is 70 to 80 percent. As mentioned previously, on-grade inlets designed to capture 100 percent of the minor storm runoff tend to be significantly less effective both hydraulically and economically.

(f) The designer shall include any carryover (bypass) flow from an upstream inlet when calculating the flow at a downstream inlet. Although the peak runoff to an inlet may not coincide with the peak carryover flow from an upstream inlet, these two peak flows shall be added to find the total peak flow to the downstream inlet.

Maximizing the use of sump inlets tends to increase the overall efficiency of the inlet system, and inlets must be installed at all street sags (vertical curve low points) and at all sumps formed by intersections except where other drainage provisions have been made. Therefore, it is suggested that sump inlets are located prior to the placement of any on-grade inlets during the design process.

(Res. 40-08 (§ 1106.5), 3-19-08)

Chapter 28.48
Culverts and Bridges

§ 28.48.010. Introduction.

The purpose of this chapter is to provide information for the hydraulic design of culverts and bridges. The methodology of culvert and bridge design presented in this chapter is intended for those with a good understanding of basic hydrologic and hydraulic methods and with experience in the design of hydraulic structures. The experienced designer is assumed to be able to understand the variety of flow conditions which are possible in these complex hydraulic structures and make appropriate adjustments.

Culverts and bridges are used to convey surface water through or beneath engineered structures such as highways, railroads, or other embankments. The size, alignment, and

support structures of a culvert or bridge will directly affect the carrying capacity of the drainage system. Inadequate culvert or bridge capacity can force water out of the conveyance system, flood an alternate path, and cause damage away from the channel.

In addition to the hydraulic function, culverts and bridges must carry construction, highway, railroad, or other traffic and earth loads. Therefore, culvert and bridge design involves both hydraulic and structural design considerations. The hydraulic aspects of culvert and bridge design are covered in this chapter.

A careful approach to culvert and bridge design is essential, both in new land development and retrofit situations, because culverts and bridges often significantly influence upstream and downstream flood risks, floodplain management, and public safety.

(Res. 40-08 (§ 1201), 3-19-08)

§ 28.48.020. Culvert hydraulics.

This chapter presents the general procedures for hydraulic design and evaluation of culverts. The user is assumed to possess a basic knowledge of culvert hydraulics and is encouraged to review the technical literature on the subject.

The information and references necessary to design culverts according to the procedure given in this chapter can be found in the Federal Highway Administration (FHWA) Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5 (HDS-5). Research by the National Bureau of Standards sponsored and supported by the FHWA resulted in a series of reports providing a comprehensive analysis of culvert hydraulics under various flow conditions. These data were used to develop culvert design aids, called nomographs. These nomographs are the basis for the culvert design process. The more commonly used nomographs from HDS-5 are provided in this chapter. HDS-5 is the required method for design of culverts in Mesa County and in the City of Grand Junction and shall be used for all situations not covered in this chapter.

Inlet and outlet control are the two basic types of flow in culverts. Under inlet control, the flow through the culvert is controlled by the headwater on the culvert and the inlet geometry. Under outlet control, the flow through the culvert is controlled primarily by culvert slope, roughness, and tailwater elevation.

When designing a culvert, the designer must evaluate both inlet and outlet control conditions for the given design constraints (e.g., discharge, headwater, tailwater, outlet velocity, etc.). The control condition which produces the greater energy loss for the design condition determines the appropriate control to use for the culvert design. Culvert hydraulic calculations shall be performed using rating nomographs and/or culvert hydraulic analysis programs.

(Res. 40-08 (§ 1202), 3-19-08)

§ 28.48.030. Required design information.

(a) Discharge. Culverts are required where natural or manmade channels are crossed by roads or streets. The amount of channel flow which crosses over the road shall be minimized to protect the road embankment and pavement from erosion damage as well

as to protect vehicles and pedestrians from dangerous flow depths and velocities. The policy of Mesa County and the City of Grand Junction shall be to require culvert crossings of streets within the following limitations:

Right-of-Way Width	Minimum Capacity (Recurrence Interval)
Major and minor arterial highways/greater than or equal to 80 feet	100-year (No Overflow)
Collector and local streets/less than 80 feet	100-year (See Note)

Note: A dipped overflow section may be allowed by the local jurisdiction if the maximum velocity does not exceed six feet per second and the maximum depth does not exceed 1.0 foot at the street crown.

All other culverts not crossing streets shall be designed to convey the 100-year flow unless otherwise approved by the local jurisdiction. In all cases 1.0 foot of freeboard must be maintained between the lowest point of the drive lane and the minor stormwater surface elevation. See GJMC § 28.16.150 for additional discussion.

(b) Headwater. Energy is required to force flow through a culvert. This energy takes the form of an increased water surface elevation on the upstream side of the culvert. The depth of the upstream water surface measured from the invert at the culvert entrance is referred to as headwater. The maximum headwater for the 100-year design flow shall be 1.5 times the culvert diameter or culvert rise dimension.

A considerable volume of water may be ponded upstream of a culvert installation under high fills or in areas with flat ground slopes. The pond which is created may attenuate flood peaks under such conditions. This peak discharge attenuation may justify a reduction in the required culvert size, provided it is in compliance with applicable floodplain regulations.

(c) Tailwater. Tailwater is defined as the depth of water downstream of the culvert measured from the outlet invert. Tailwater may be caused by an obstruction in the downstream channel or by the hydraulic resistance of the channel. Backwater calculations from the downstream control point are required to precisely define tailwater. When appropriate, normal depth approximations may be used instead of backwater calculations.

(d) Outlet Velocity. Since a culvert usually constricts the available channel area, flow velocities in the culvert are likely to be higher than in the channel. These increased velocities can cause streambed scour and bank erosion in the vicinity of the culvert outlet. Minor problems can occasionally be avoided by increasing the barrel roughness.

The design of culverts shall include an analysis of the channel stability at the outlet to be governed by a maximum permissible mean velocity. This design method assumes that a given channel section will remain stable up to a maximum permissible velocity. Table 28.32.200 in Chapter 28.32 GJMC, Open Channels, presents the maximum permissible velocities for several types of natural, improved, unlined, and lined channels. In the case of unlined channels, velocities exceeding the values shown shall

require outlet protection. Velocities shall not exceed the values given for lined channels. See GJMC § 28.48.150 for specific erosion protection requirements.

(Res. 40-08 (§ 1202.1), 3-19-08)

§ 28.48.040. Inlet control.

Inlet control occurs when the culvert barrel is capable of conveying more flow than the inlet will accept. This is controlled at the entrance by the depth of headwater, cross-sectional area, inlet edge configuration, and/or barrel shape. Under inlet control, the culvert barrel usually flows partially full. The control section of a culvert operating under inlet control is located just inside the entrance. Critical depth occurs at or near this location, and the flow regime immediately downstream is supercritical. Hydraulic characteristics downstream of the inlet control section do not affect the culvert capacity.

Inlet control for culverts may occur in two ways, unsubmerged or submerged. In an unsubmerged condition, the headwater is not sufficient to submerge the top of the culvert and the culvert slope is supercritical, shown in Figure 28.48.040(a) (Urban Drainage and Flood Control District). In this situation, the culvert inlet acts like a weir.

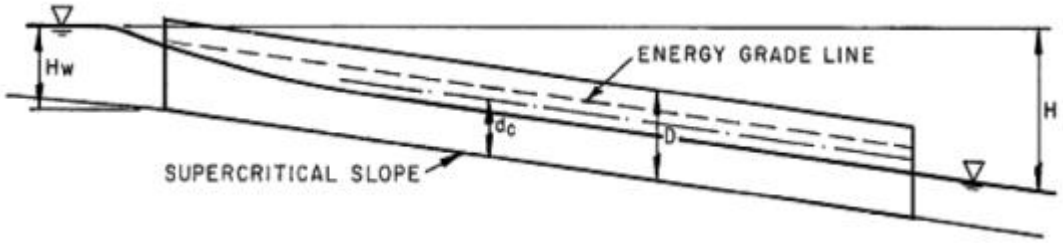


Figure 28.48.040(a): Inlet Control – Unsubmerged Inlet

In a submerged condition, the headwater submerges the top of the culvert but the pipe does not flow full, shown in Figure 28.48.040(b) (Urban Drainage and Flood Control District). In this situation, the culvert inlet acts like an orifice.

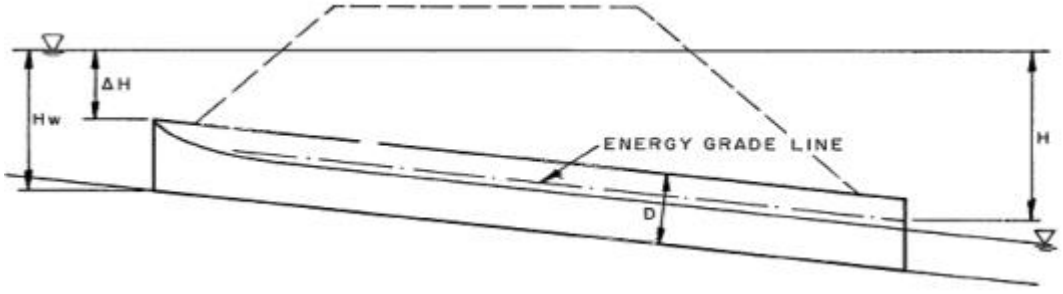


Figure 28.48.040(b): Inlet Control – Submerged Inlet

For a culvert operating with inlet control, the upstream water surface elevation and the inlet geometry represent the major flow controls. Roughness, slope, and length of the culvert

barrel and outlet conditions, including tailwater, are not factors in determining culvert hydraulic performance.

(Res. 40-08 (§ 1202.2), 3-19-08)

§ 28.48.050. Outlet control.

Outlet control flow occurs when the culvert barrel is not capable of conveying as much flow as the inlet opening will accept. The control section for the outlet control flow in a culvert is located at the barrel exit or further downstream. Either subcritical or pressure flow exists in the culvert barrel under these conditions. All of the geometric and hydraulic characteristics of the culvert play a role in determining its capacity. These characteristics include all of the factors governing inlet control, the water surface elevation at the outlet, and the slope, length, and hydraulic roughness of the culvert barrel.

Outlet control will govern if the headwater and/or tailwater are/is high enough, the culvert slope is relatively flat, and the culvert relatively long. Outlet control will exist under two conditions. The first and least common is that where the headwater is insufficient to submerge the top of the culvert, and the culvert slope is subcritical, shown in Figure 28.48.050(a) (Urban Drainage and Flood Control District).

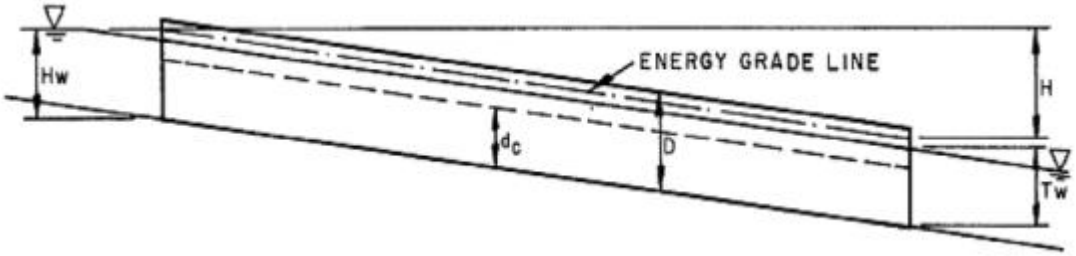


Figure 28.48.050(a): Partially Full Conduit

The most common condition exists when the culvert is flowing full, shown in Figure 28.48.050(b) (Urban Drainage and Flood Control District).

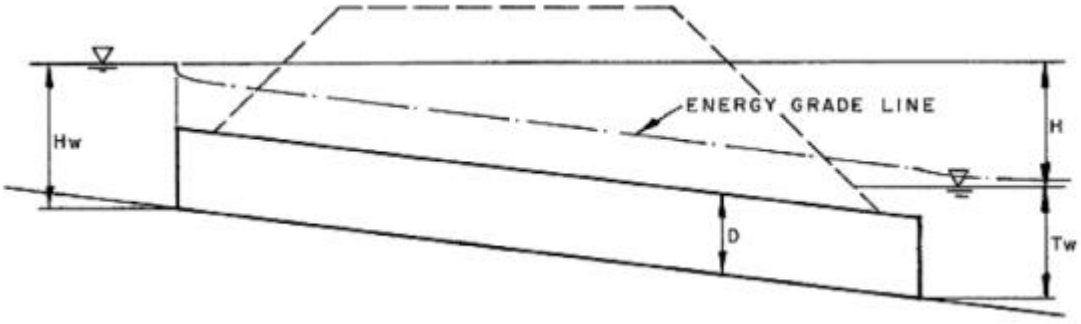


Figure 28.48.050(b): Full Conduit

Under outlet control, culverts may flow full or partly full depending on various combinations of the above factors. Performance of a culvert under outlet control may be affected by culvert length, roughness, and tailwater depth.

(Res. 40-08 (§ 1202.3), 3-19-08)

§ 28.48.060. Culvert sizing and design.

All culverts shall be designed and constructed using the standards in GJMC § 28.48.070 through 28.48.170. The analysis and design shall consider design flow, culvert size and material, upstream channel and entrance configuration, downstream channel and outlet configuration, and erosion protection.

(Res. 40-08 (§ 1203), 3-19-08)

§ 28.48.070. Size and material.

Culverts shall be constructed from reinforced concrete, or acceptable polymers. For material other than concrete, documentation must be submitted for review which shows that the subject pipe material has a design equal to that of concrete and that the interior lining, if any, will maintain the design Manning's roughness coefficient, *n*, for the life of the pipe material. The minimum pipe size shall be a 12-inch diameter round pipe or shall have an equivalent 12-inch diameter round cross-sectional area for other shapes. Corrosion resistance shall be evaluated and determined as specified in Section 624 of the Colorado Department of Transportation *Standard Specifications for Road and Bridge Construction*, 2005.

(Res. 40-08 (§ 1203.1), 3-19-08)

§ 28.48.080. Location.

Culvert location is an integral part of the total design. The designer shall identify all live stream crossings, springs, low areas, gullies, and impoundment areas created by the new embankment for possible culvert locations. Culverts shall be located on existing stream alignments and aligned to give the stream a direct entrance and direct exit. Abrupt changes in direction at either end may retard the flow and make a larger structure necessary. If possible, a culvert shall have the same alignment as its channel. If this is not practical and the water must be turned into the culvert, headwalls, wingwalls, and aprons shall be used as protection against scour and to provide an efficient inlet.

Where the natural alignment would result in an exceptionally long culvert, modification to the natural alignment may be necessary. Since such modifications will change the natural stability of the channel, an investigation into other options is recommended. Although the economic factors are important, the hydraulic effectiveness of the culvert must be given major consideration.

Roadway alignment also affects culvert design. The vertical alignment of roadways may define the maximum culvert diameter that can be used. Low vertical clearance may require the use of elliptical or arched culverts, or the use of a multiple-barrel culvert system. All culverts shall have a minimum of 1.5 feet of cover from top of asphalt (or gravel for gravel road) to outside top of pipe. Culverts for which less than 1.5 feet of cover is available will

require additional structural analysis and other provisions (i.e., full depth concrete paving to compensate for the loss of proper cover).

(Res. 40-08 (§ 1203.2), 3-19-08)

§ 28.48.090. Culvert Design Form.

The Culvert Design Form, shown in Figure 28.48.090, has been formulated to guide the user through the design process. Summary blocks are provided at the top of the form for the project description and the designer's identification. Summaries of hydrologic data are also included. At the top right is a small sketch of the culvert with blanks for inserting important dimensions and elevations.

The central portion of the design form contains lines for inserting the trial culvert description and calculating the inlet and outlet control headwater elevations. Space is provided at the lower center for comments and at the lower right for a description of the culvert barrel selected.

The first step in the design process is to summarize all known data for the culvert at the top of the Culvert Design Form. This information will have been collected or calculated prior to performing the actual culvert design. The next step is to select a preliminary culvert material, shape, size, and entrance type. The user then enters the design flow rate and proceeds with the inlet control calculations.

The Culvert Design Form is also included in Chapter 28.68 GJMC as Standard Form 4.

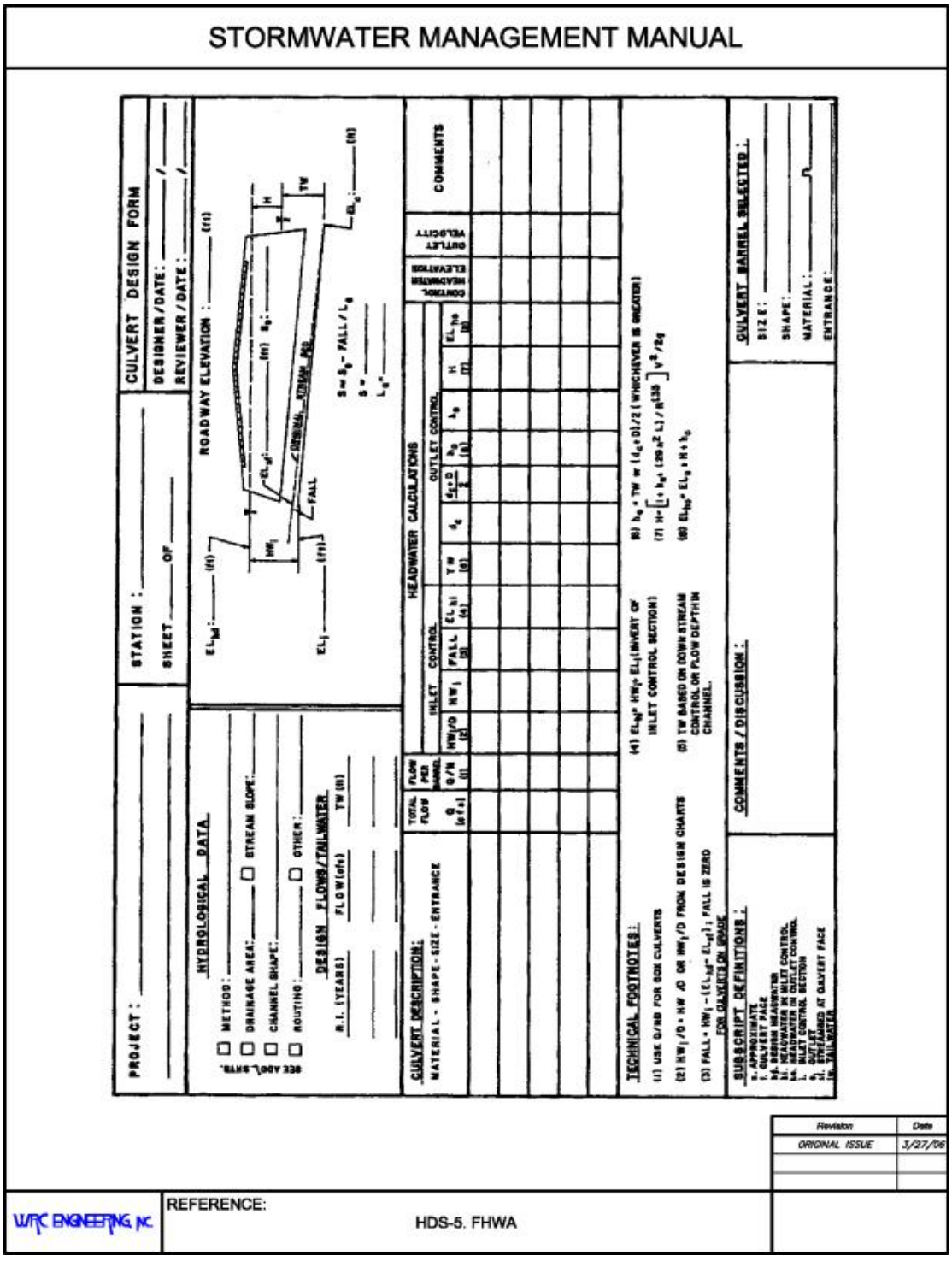


FIGURE 28.48.090

(Res. 40-08 (§ 1203.3), 3-19-08)

§ 28.48.100. Inlet control calculation.

The inlet control calculations determine the headwater elevation required to pass the design flow through the selected culvert configuration in inlet control. The approach velocity head may be included as part of the headwater, if desired. Inlet control nomographs are used in the design process. Inlet control nomographs for typical configurations are included at the end of this section, Figures 28.48.100(b) through 28.48.100(e). For all other situations, refer to the FHWA's HDS-5. For the following discussion, refer to the schematic inlet control nomograph shown in Figure 28.48.100(a).

(a) Step 1. Locate the selected culvert size (point 1) and flow rate (point 2) on the appropriate scales of the inlet control nomograph. For box culverts, the flow rate per foot of barrel width is used.

(b) Step 2. Using a straightedge, carefully extend a straight line from the culvert size (point 1) through the flow rate (point 2) and mark a point on the first headwater/culvert height (*HW/D*) scale (point 3). The first *HW/D* scale is also a turning line.

(c) Step 3. Each scale represents a different inlet type. If another *HW/D* scale is required, extend a horizontal line from the first *HW/D* scale to the desired scale and read the result.

(d) Step 4. Multiply *HW/D* by the culvert height, *D*, to obtain the required headwater depth, *HW*, from the invert of the control section to the energy grade line. If the approach velocity is neglected, *HW* equals the required headwater depth, HW_i. If the approach velocity is included in the calculations, deduct the approach velocity head from *HW* to determine HW_i.

(e) Step 5. Calculate the required depression (FALL) of the inlet control section below the stream bed as follows:

$$HW_d = EL_{hd} - EL_{sf} \quad (28.48\text{-}1)$$

$$FALL = HW_i - HW_d \quad (28.48\text{-}2)$$

Where:

HW_d	=	design headwater depth (ft.)
EL_{hd}	=	design headwater elevation (ft.)
EL_{sf}	=	elevation of the stream bed at the face (ft.)
HW_i	=	required headwater depth (ft.)

Possible results and consequences of this calculation are:

(1) If the FALL is negative or zero, set FALL equal to zero and proceed to step 6.

(2) If the FALL is positive, the inlet control section invert must be depressed below the streambed at the face by that amount. If the FALL is acceptable, proceed to step 6.

(3) If the FALL is positive and greater than is judged to be acceptable, select another culvert configuration and begin again at step 1.

(f) Step 6. Calculate the inlet control section invert elevation as follows:

$$EL_i = EL_{sf} - FALL \quad (28.48\text{-}3)$$

where EL_i is the invert elevation at the face of a culvert or at the throat of a culvert with a tapered inlet.

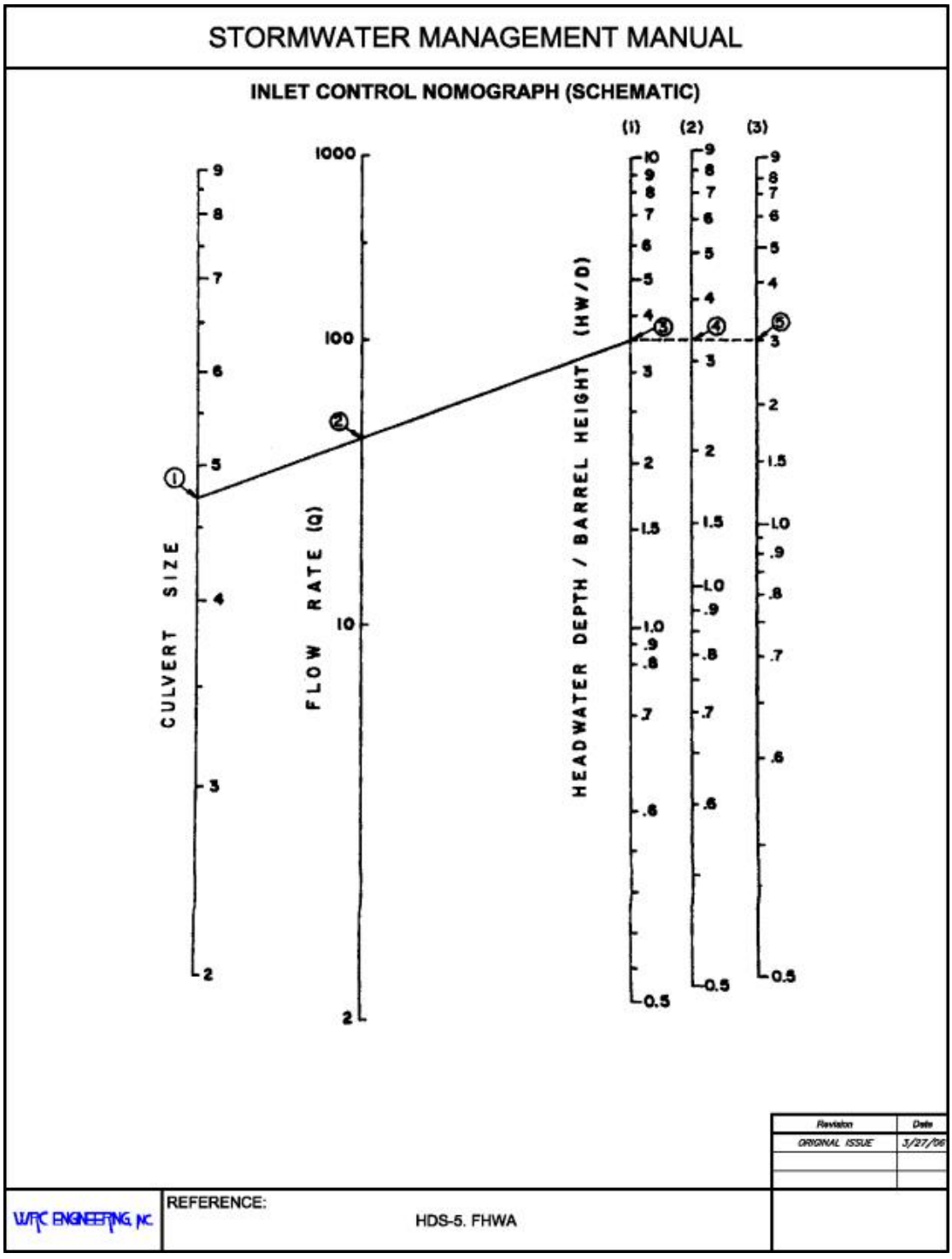


FIGURE 28.48.100(a)

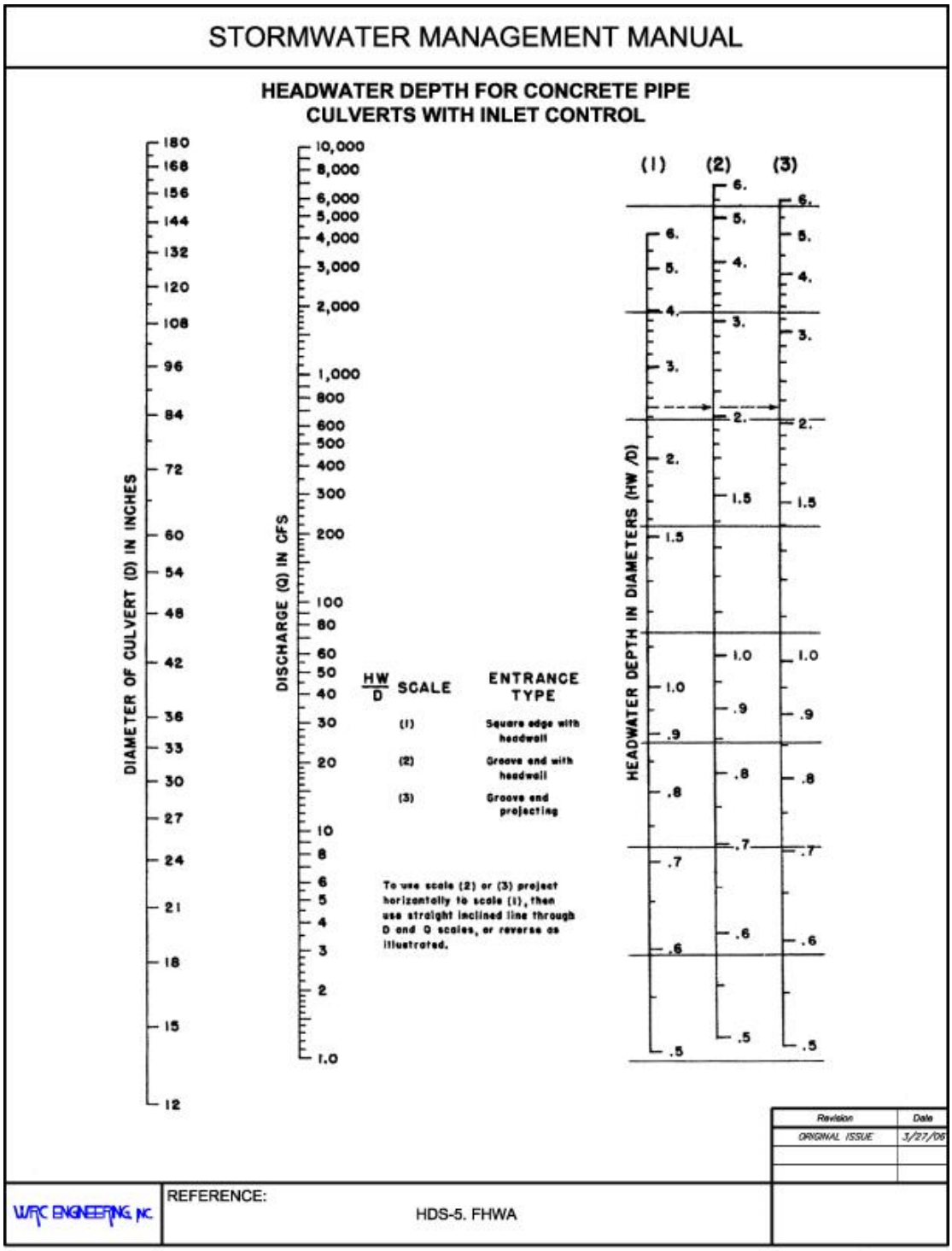


FIGURE 28.48.100(b)

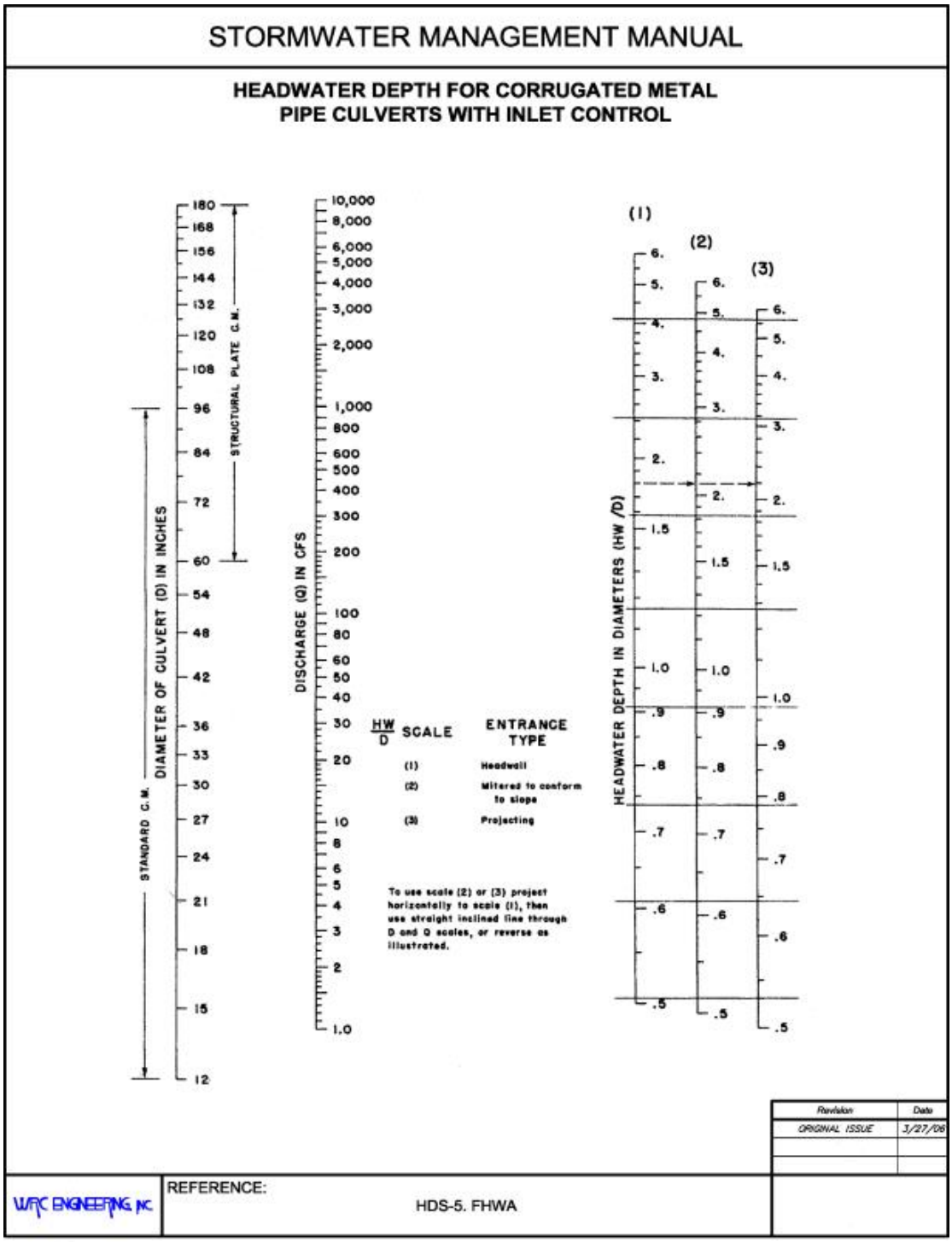


FIGURE 28.48.100(c)

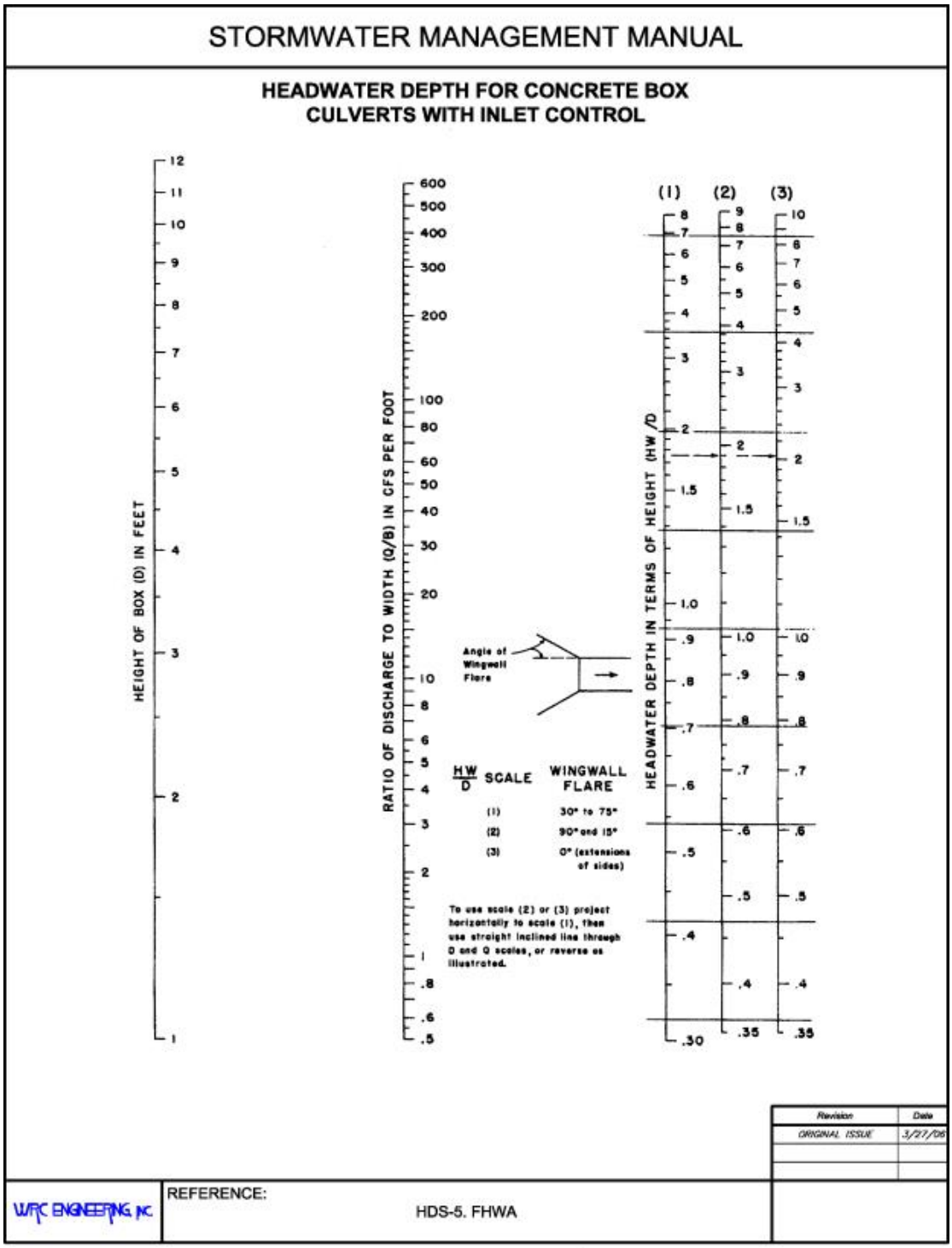


FIGURE 28.48.100(d)

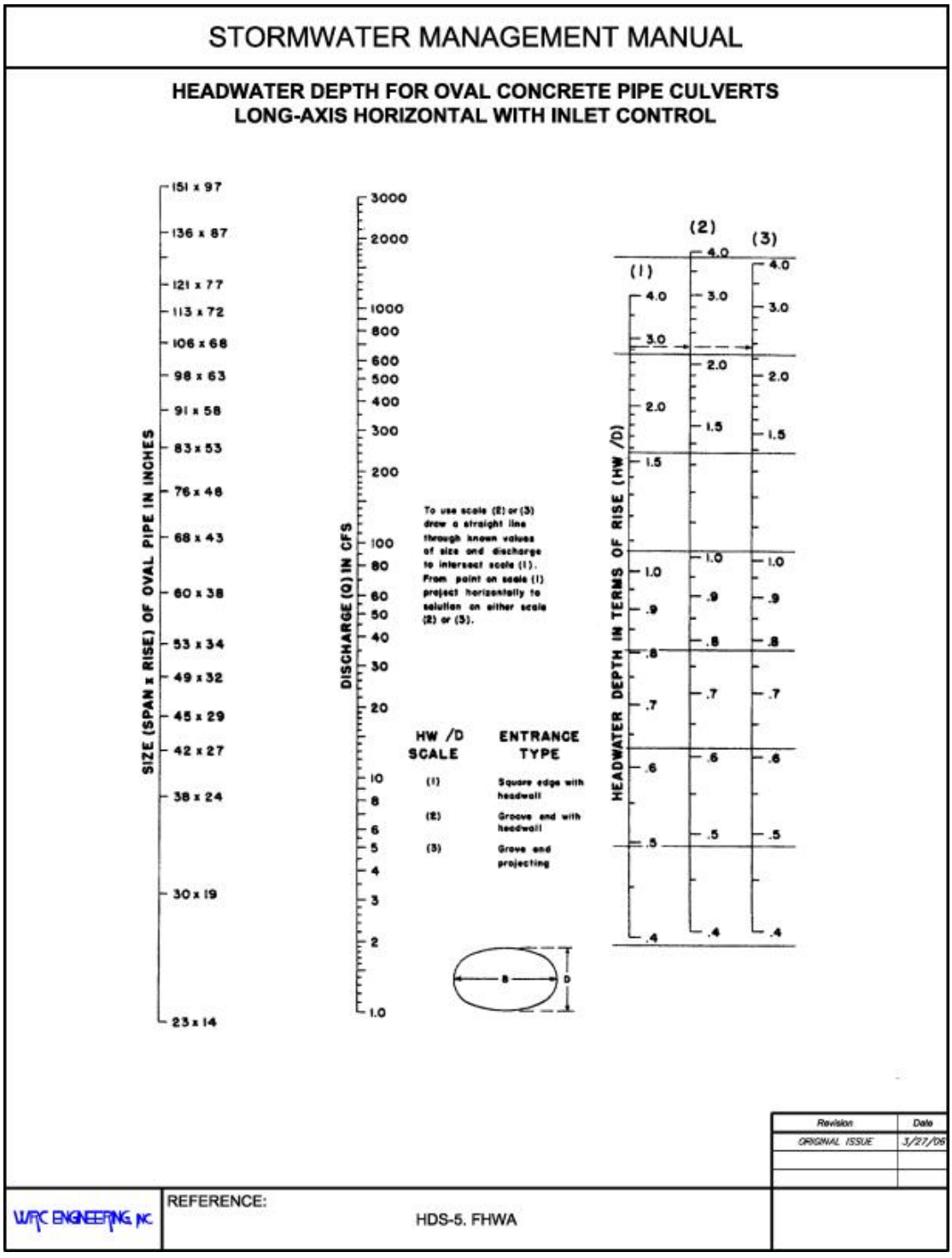


FIGURE 28.48.100(e)

(Res. 40-08 (§ 1203.4), 3-19-08)

§ 28.48.110. Outlet control calculation.

The outlet control calculations result in the headwater elevation required to convey the design discharge through the selected culvert in outlet control. The approach and downstream velocities may be included in the design process, if desired. Critical depth charts and outlet control nomographs are used in the design process. Critical depth charts and outlet control nomographs for typical configurations are included at the end of this section, Figures 28.48.110(a) through 28.48.110(g). For all other situations, refer to the FHWA's HDS-5. For illustration, refer to the schematic critical depth chart and outlet control nomograph shown in Figures 28.48.110(h) and 28.48.110(i), respectively.

(a) Determine the tailwater depth, TW, above the outlet invert at the design flow rate. This is obtained from backwater or normal depth calculations, or from field observations.

(b) Enter the appropriate critical depth chart, Figure 28.48.110(h), with the flow rate and read the critical depth, d_c. The critical depth, d_c, cannot exceed the culvert diameter, D.

The d_c curves are truncated for convenience when they converge. If an accurate d_c is required for $d_c > .9D$ consult the *Handbook of Hydraulics* or other hydraulic reference.

(c) Calculate $(d_c + D)/2$.

(d) Determine the depth from the culvert outlet invert to the hydraulic grade line, h_o.

h_o = TW or $(d_c + D)/2$, whichever is larger.

(e) From Table 28.48.110, obtain the appropriate entrance loss coefficient, K_e, for the culvert inlet configuration.

(f) Determine the head losses through the culvert barrel, H, using the outlet control nomograph, Figure 28.48.110(i).

(1) Required Manning's *n* values are presented in Table 28.40.050 of Chapter 28.4 GJMC, Storm Drain Systems. If the Manning's *n* value given in the outlet control nomograph is different than the required Manning's *n* for the culvert, adjust the culvert length using the formula:

$$L_1 = L(n_1/n)^2 \qquad (28.48\text{-}4)$$

Where:

L_1	=	adjusted culvert length (ft.)
L	=	actual culvert length (ft.)
n_1	=	desired Manning's *n* value
n	=	Manning's *n* value from the outlet control chart

(2) Using a straightedge, connect the culvert size (point 1) with the culvert length on the appropriate k_e scale (point 2). This defines a point on the turning line (point 3).

(3) Again using the straightedge, extend a line from the discharge (point 4) through the point on the turning line (point 3) to the head loss, *H*, scale. *H* is the energy loss through the culvert, including entrance, friction, and outlet losses.

Careful alignment of the straightedge is necessary to obtain good results from the outlet control nomograph.

(g) Calculate the required outlet control headwater elevation, EL_{ho}.

$$EL_{ho} = EL_o + H + h_o \quad (28.48\text{-}5)$$

where EL_o is the invert elevation at the outlet.

(h) If the outlet control headwater elevation exceeds the design headwater elevation, a new culvert configuration must be selected and the process repeated. Generally, an enlarged barrel will be necessary since inlet improvements are of limited benefit in outlet control.

STORMWATER MANAGEMENT MANUAL

ENTRANCE LOSS

Type of Structure and Design of Entrance	Coefficient K_e
• Pipe, Concrete	
Projecting from fill, socket end (groove-end)	0.2
Projecting from fill, sq. cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = D/12)	0.2
Mitered to conform to fill slope	0.7
* End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side- or slope-tapered inlet	0.2
• Pipe, or Pipe-Arch, Corrugated Metal	
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls square-edge	0.5
Mitered to conform to fill slope, paved or unpaved slope	0.7
* End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side- or slope-tapered inlet	0.2
• Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of D/12 or B/12 or beveled edges on 3 sides	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of D/12 or beveled top edge	0.2
Wingwall at 10° to 25° to barrel	
Square-edged at crown	0.5
Wingwalls parallel (extension of sides)	
Square-edged at crown	0.7
Side- or slope-tapered inlet	0.2

*Note: "End Sections conforming to fill slope," made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests they are equivalent in operation to a headwall in both inlet and outlet control. Some end sections, incorporating a closed taper in their design have a superior hydraulic performance. These latter sections can be designed using the information given for the beveled inlet.

Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING INC.

REFERENCE:

TABLE 28.48.110

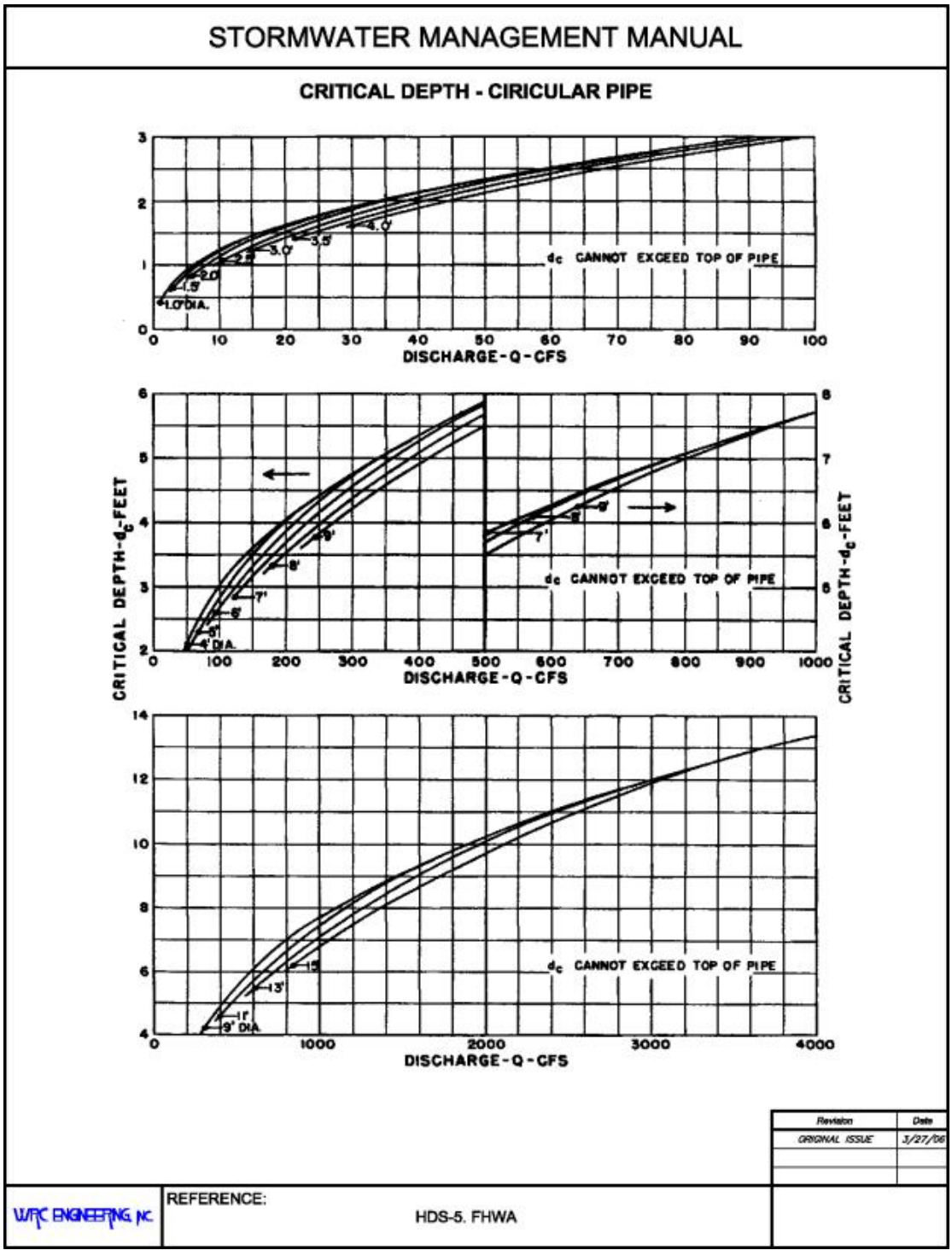


FIGURE 28.48.110(a)

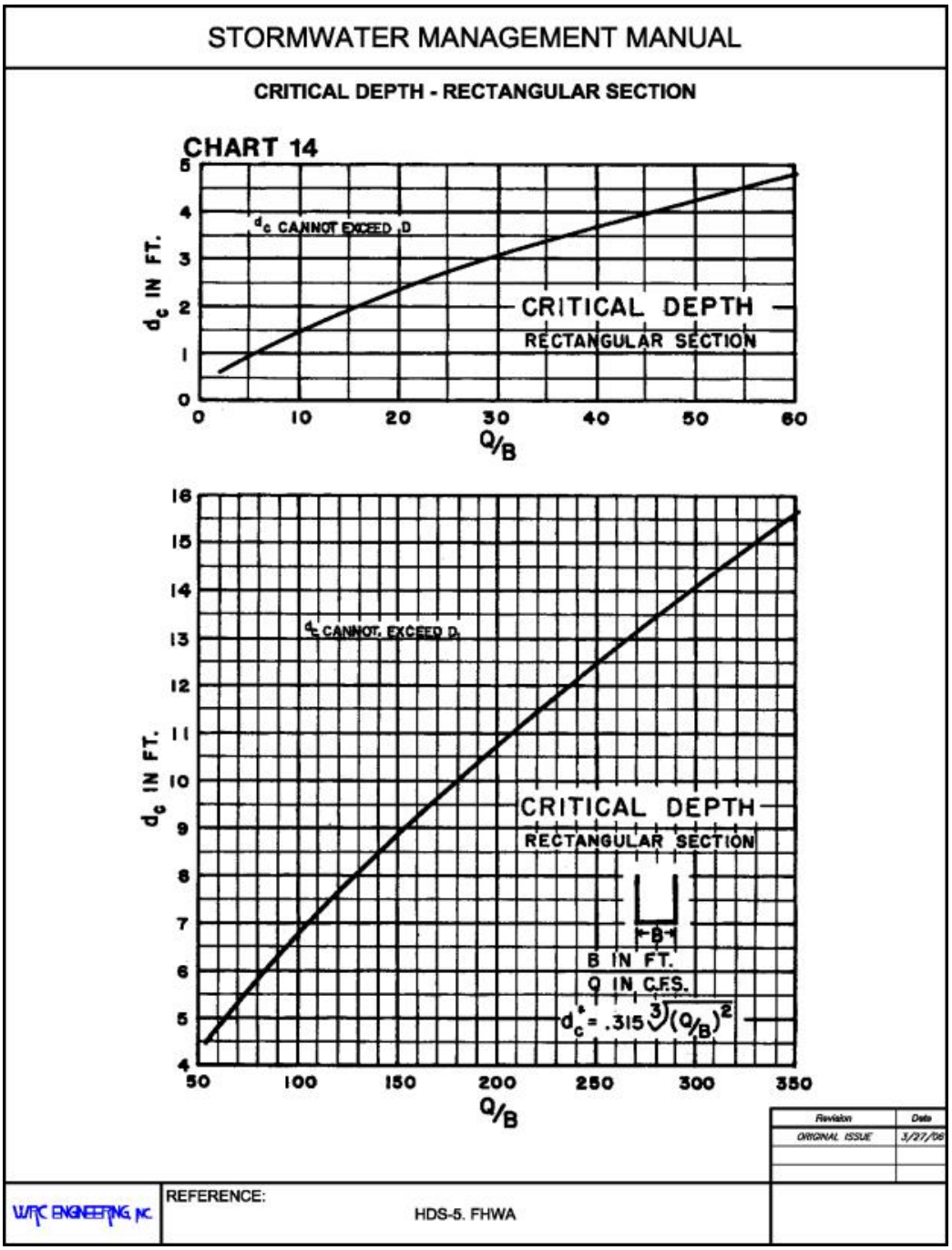


FIGURE 28.48.110(b)

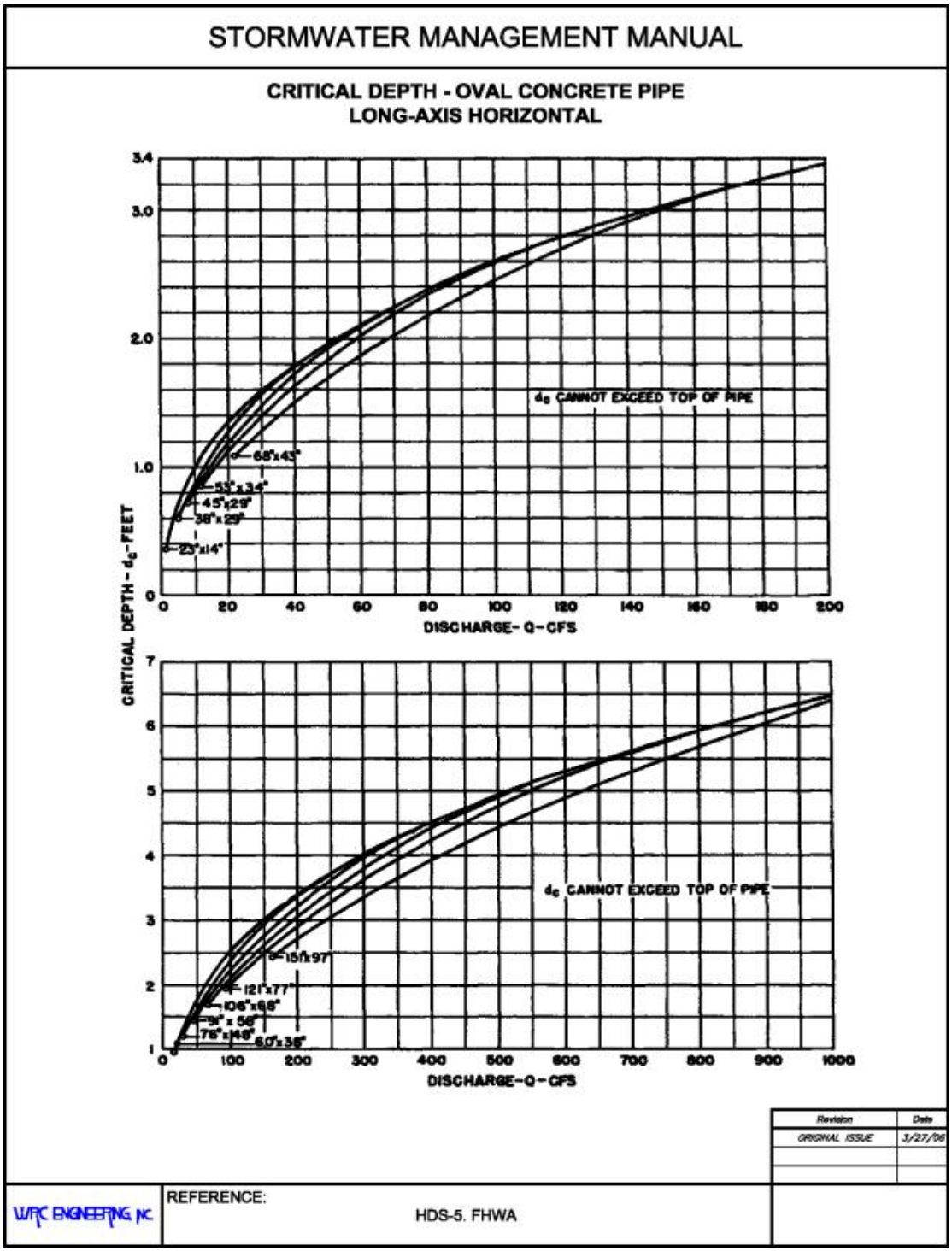


FIGURE 28.48.110(c)

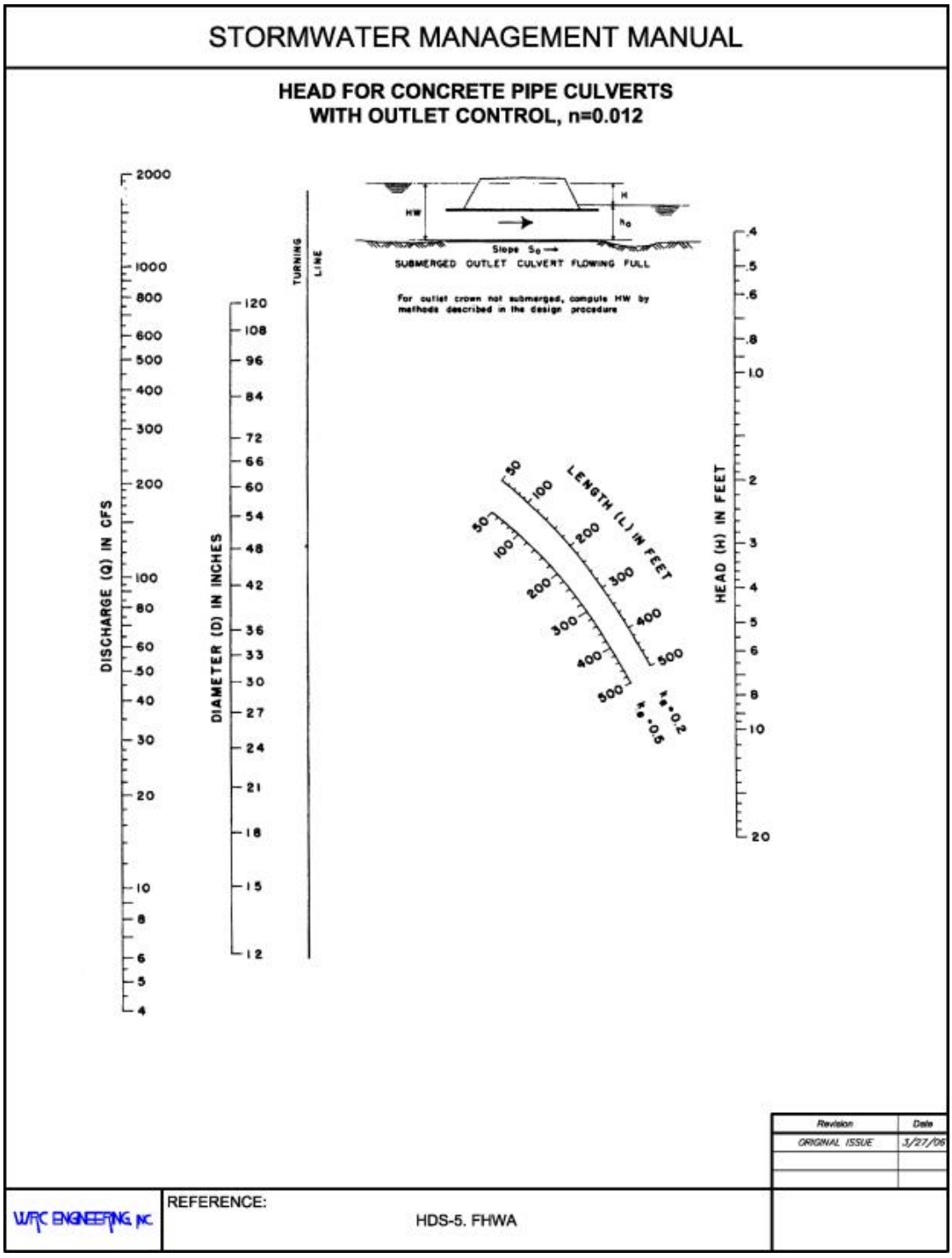


FIGURE 28.48.110(d)

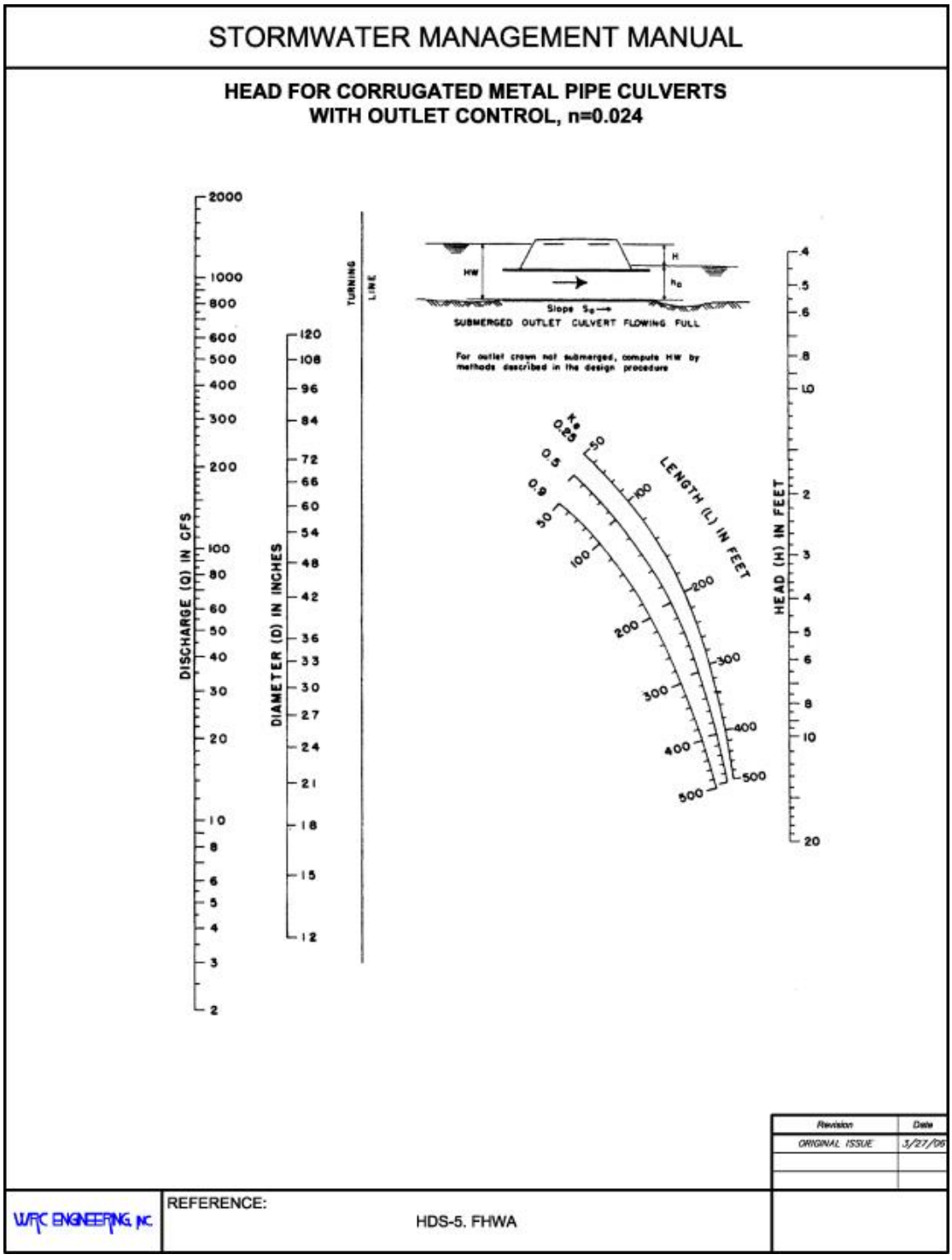


FIGURE 28.48.110(e)

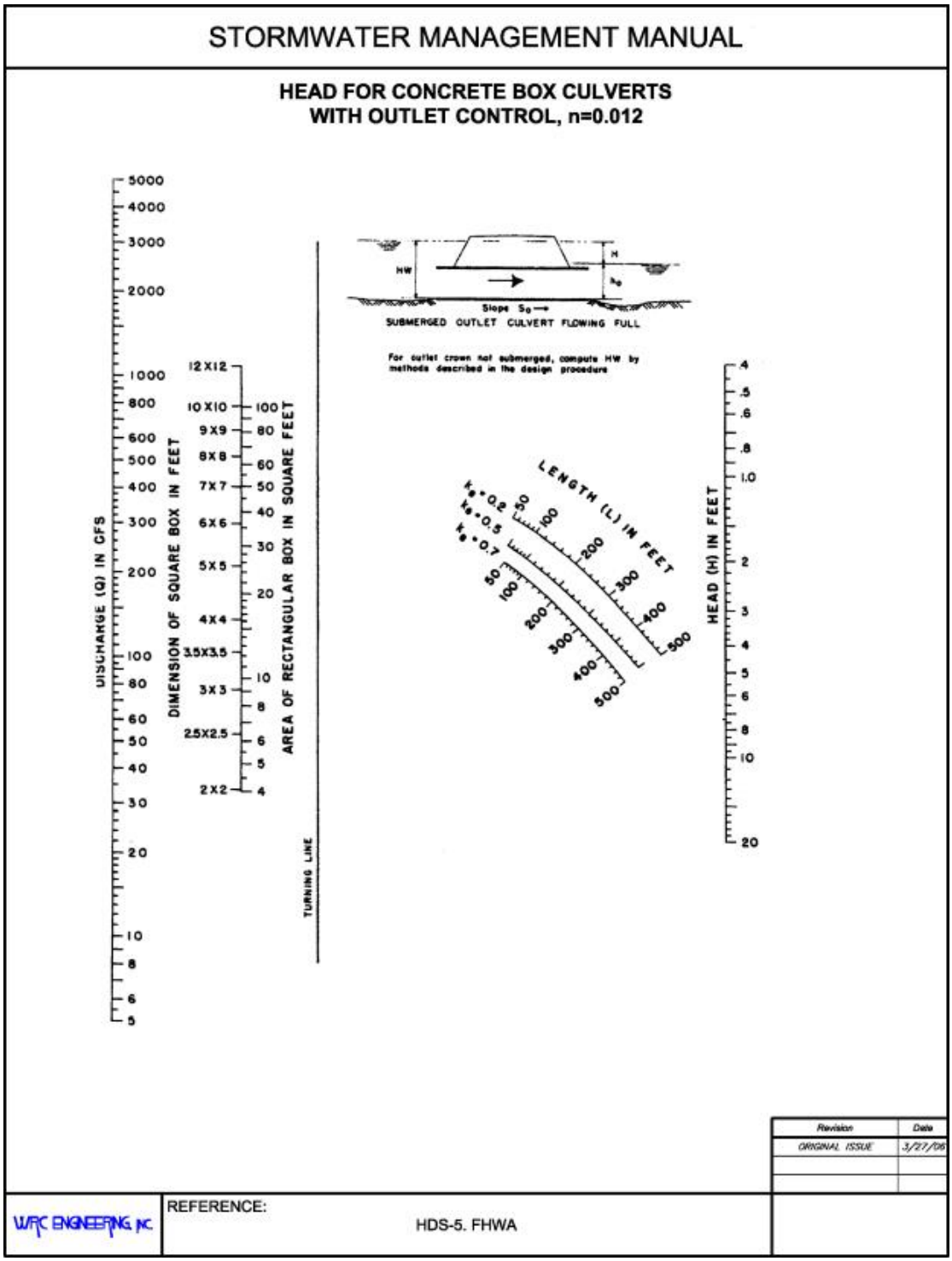


FIGURE 28.48.110(f)

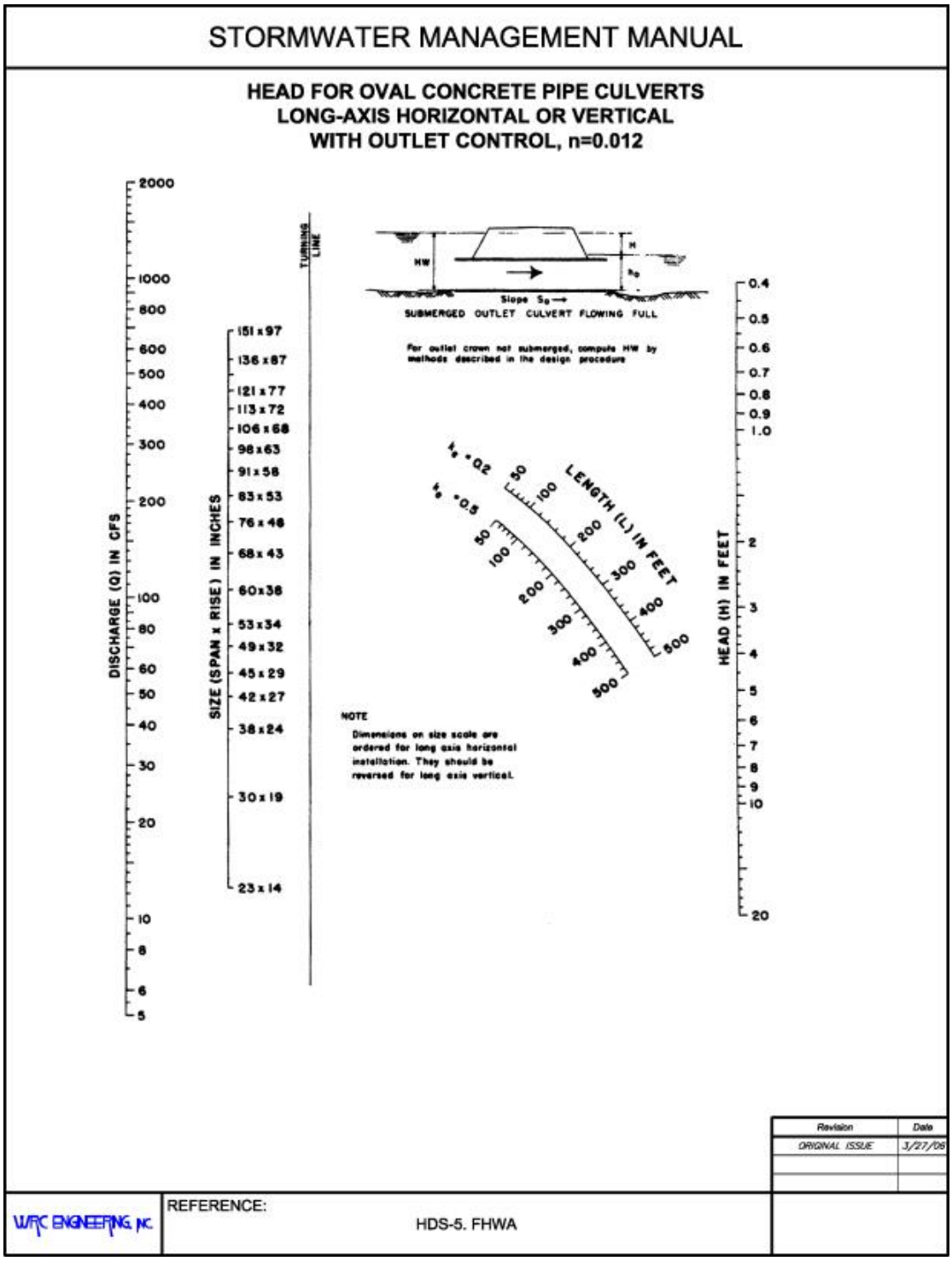


FIGURE 28.48.110(g)

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CRITICAL DEPTH CHART (SCHEMATIC)

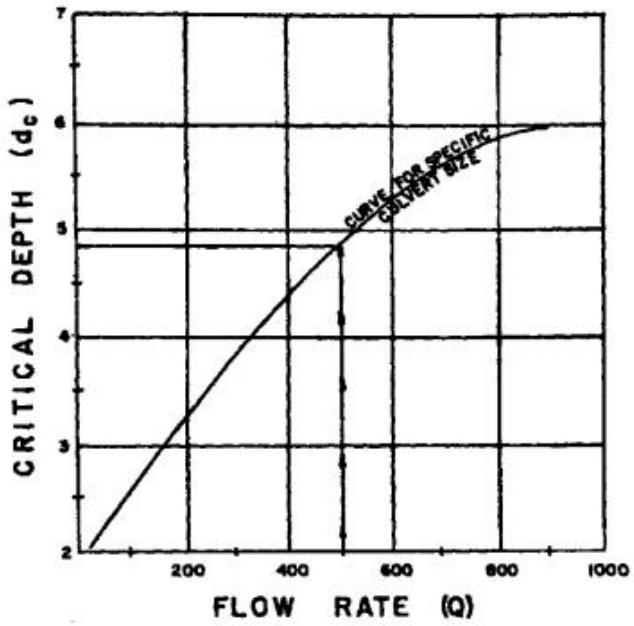

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FIGURE 28.48.110(h)

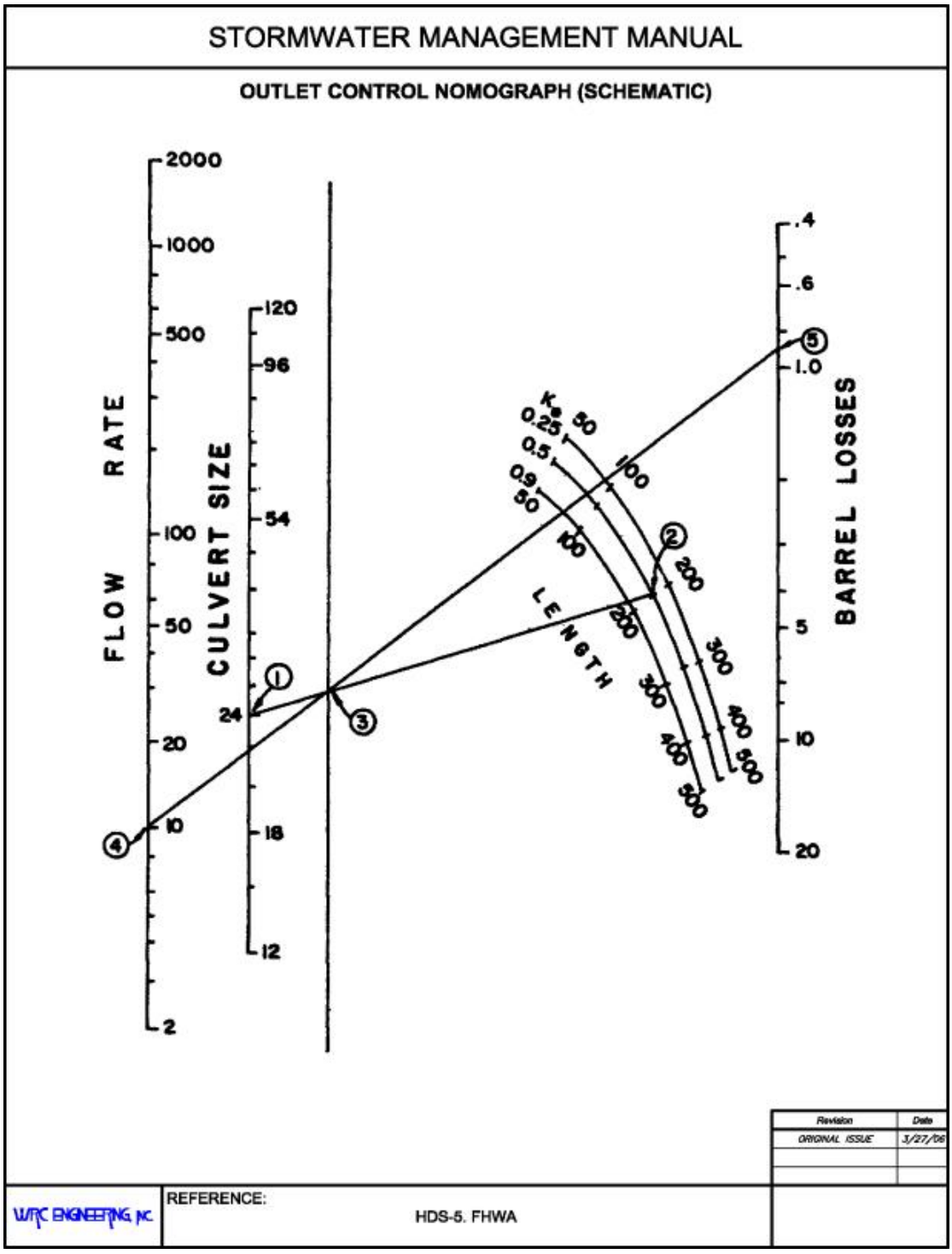

FIGURE 28.48.110(i)

(Res. 40-08 (§ 1203.5), 3-19-08)

§ 28.48.120. Evaluation of results.

Repeat the design process until an acceptable culvert configuration is determined. If the culvert selected will not fit the site, return to the design process and select another culvert. Compare the headwater elevations calculated for inlet and outlet control. The higher of the two is designated the controlling headwater elevation. The culvert can be expected to operate with that higher headwater for at least part of the time.

If outlet control governs and the headwater depth is less than 1.2*D*, it is possible that the barrel flows partly full through its entire length. In this case, caution shall be used in applying the approximate method of setting the downstream elevation based on the greater of tailwater or $(d_c + D)/2$. If an accurate headwater is necessary, backwater calculations shall be used to check the result from the approximate method. If the headwater depth falls below 0.75*D*, the approximate method shall not be used.

Due to problems arising from topography and other considerations, the actual design of a culvert installation is more difficult than the simple process of sizing culverts. However, the process presented herein shall be followed to ensure that some special problem is not overlooked. Several combinations of entrance types, invert elevations, and pipe diameters shall be tried to determine the most economic design that will meet the conditions imposed by topography and engineering.

(Res. 40-08 (§ 1203.6), 3-19-08)

§ 28.48.130. Outlet velocity calculation.

The outlet velocity is calculated as follows:

(a) If the controlling headwater is based on inlet control, determine the normal depth and velocity in the culvert barrel. The velocity at normal depth is assumed to be the outlet velocity.

(b) If the controlling headwater is in outlet control, determine the area of flow at the outlet based on the barrel geometry and the following:

(1) Critical depth if the tailwater is below critical depth.

(2) Tailwater depth if the tailwater is between critical depth and the top of the barrel.

(3) Height of the barrel if the tailwater is above the top of the barrel.

(Res. 40-08 (§ 1203.7), 3-19-08)

§ 28.48.140. Computer applications.

Although the nomographs discussed in this chapter are still used, engineers are increasingly designing culverts using computer applications. Among these applications are the FHWA's HY8 Culvert Analysis and numerous proprietary applications. If a computer application other than HY8 is to be used, the designer must first submit documentation of the program to the local jurisdiction for approval.

(Res. 40-08 (§ 1203.8), 3-19-08)

§ 28.48.150. Outlet protection.

Table 28.32.310 in Chapter 28.32 GJMC, Open Channels, presents maximum permissible mean channel velocities. For unlined channels, erosion protection in the form of a horizontal riprap lined apron is required for all culvert outlets when the outlet velocity exceeds the values presented in Table 28.32.310. The length of the apron, L_a, is determined using the following empirical relationships that were developed for the U.S. Environmental Protection Agency:

$$L_a = \frac{1.8Q}{D_0^{3/2}} + 7D_0, \text{ for } TW < \frac{D_0}{2} \quad (28.48\text{-}6)$$

and

$$L_a = \frac{3Q}{D_0^{3/2}} + 7D_0, \text{ for } TW > \frac{D_0}{2} \quad (28.48\text{-}7)$$

Where:

D_0	=	maximum inside culvert width (ft.)
Q	=	pipe discharge (cfs)
TW	=	tailwater depth (ft.)

Where there is no well-defined channel downstream of the apron, the width, W, of the apron shall be as follows, as shown in Figure 28.48.150(a):

$$W = 3D_0 + 0.4L_a, \text{ for } TW \geq \frac{D_0}{2} \quad (28.48\text{-}8)$$

and

$$W = 3D_0 + L_a, \text{ for } TW < \frac{D_0}{2} \quad (28.48\text{-}9)$$

The width of the apron at the culvert outlet shall be at least three times the culvert width.

Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the lining shall extend at least 1.0 foot above the tailwater elevation and at least two-thirds of the vertical conduit dimension above the invert.

The side slopes shall be 2:1 or flatter, the bottom grade shall be level, and there shall be overfall at the end of the apron or culvert.

The median stone diameter required, d_{50}, is determined from the following equation:

$$d_{50} = \frac{0.02(Q)^{4/3}}{TW(D_0)} \quad (28.48\text{-}10)$$

Preformed scour holes may be used where flat aprons are impractical. Figure 28.48.150(b) shows a general design of a scour hole. The stone diameter is determined using the following equations:

$$d_{50} = \frac{0.0125(Q)^{4/3}}{TW(D_0)}, \text{ for } y = \frac{D_0}{2} \quad (28.48\text{-}11)$$

and

$$d_{50} = \frac{0.0082(Q)^{4/3}}{TW(D_0)}, \text{ for } y = D_0 \quad (28.48\text{-}12)$$

where y = depth of scour hole below culvert invert.

When riprap is not an option or is unavailable, the engineer has other natural and manmade materials available for use in erosion protection. Other options include gabions, concrete, recycled concrete, shotcrete, masonry, geotextiles, and woody plants. Outlet protection measures other than riprap may be used if first approved by the local jurisdiction.

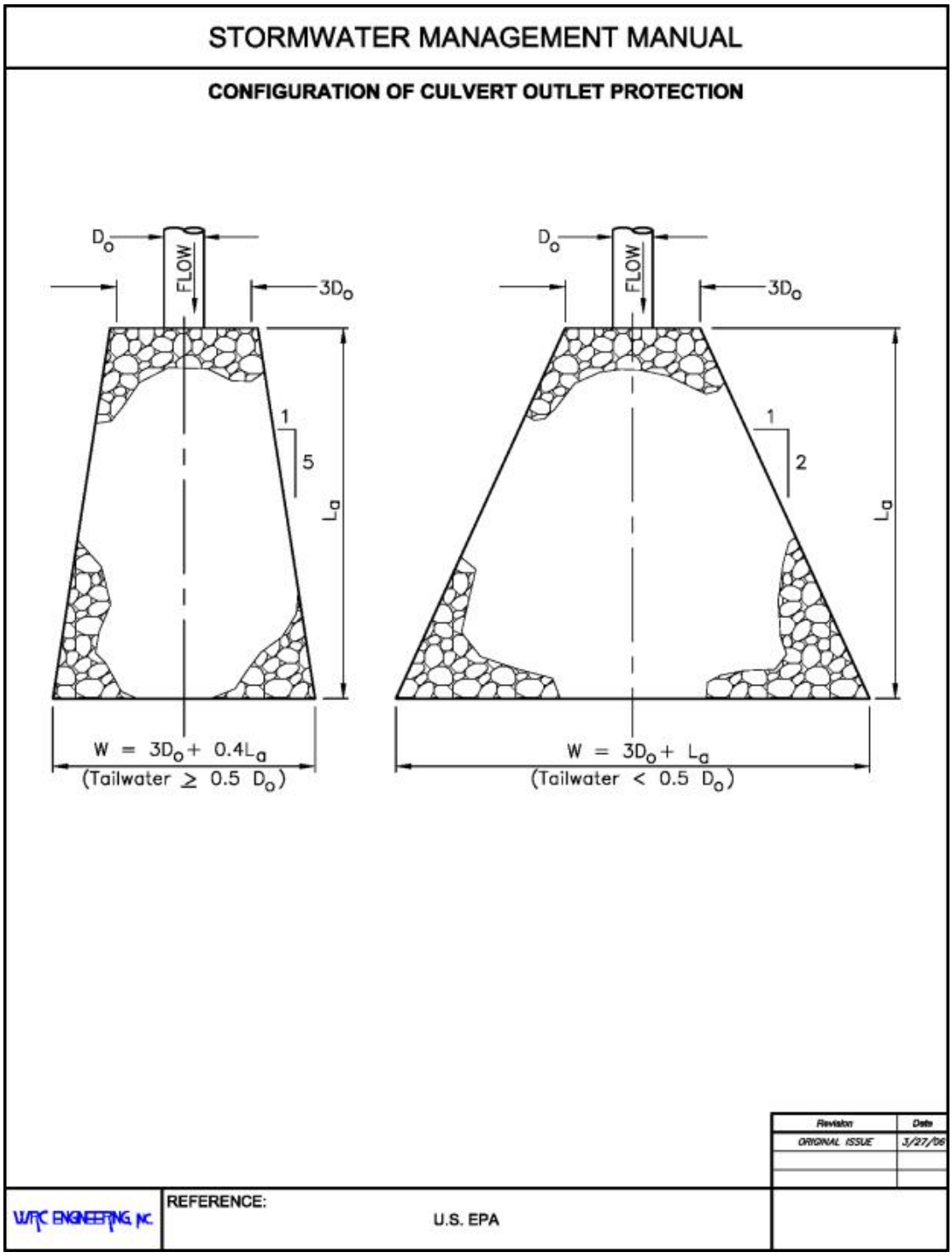

FIGURE 28.48.150(a)

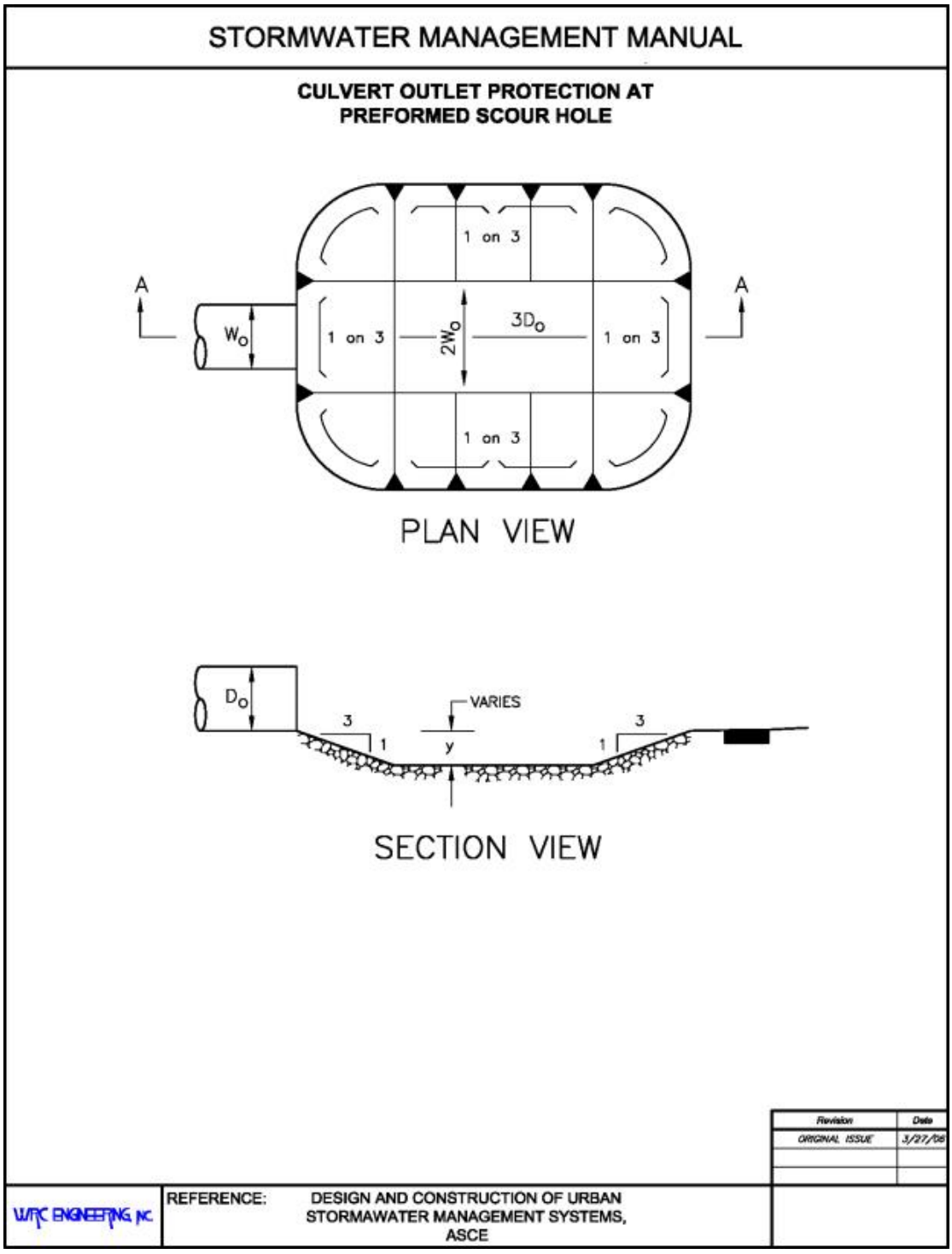

FIGURE 28.48.150(b)

(Res. 40-08 (§ 1203.9), 3-19-08)

§ 28.48.160. Trash/safety racks.

(a) The use of typical gratings at inlets to culverts and long underground pipes shall be considered on an individual basis. While there is a sound argument for the use of gratings for safety reasons, field experience has clearly shown that when the culvert is operating during heavy runoff, normal gratings often become clogged and the culvert is rendered ineffective. A general rule of thumb is that if it will be possible to see daylight from one side of the culvert to the other, a trash/safety rack will not be needed. At entrances to longer culverts, a trash rack is necessary. Engineering judgment shall be used to determine if trash/safety racks will be used. Factors which may influence whether or not trash/safety racks will be used include the following:

(1) Tributary land use (urban, rural, forest).

(2) Location (urban/rural).

(3) Design flow.

(4) Size of culvert.

(5) Anticipated debris loading.

(6) Performance of nearby existing structures.

(b) Trash/safety racks shall be required for all culverts located adjacent to schools, parks, playgrounds, and other recreational facilities where the pipe alignment or length does not allow for an unobstructed view through the culvert. Where it is found that trash/safety racks are needed, the open area through the grate at the design water surface shall be four times the design flow area of the culvert.

(Res. 40-08 (§ 1203.10), 3-19-08)

§ 28.48.170. Culvert inlets.

One of the most important considerations in the design of a culvert is the inlet configuration. Since the natural channel is usually wider than the culvert barrel, the culvert inlet edge represents a flow contraction and may be the primary flow control. The provision of a more gradual flow transition will lessen the energy loss and thus create a more hydraulically efficient inlet condition. The inlet type can also increase the overall structural integrity by retaining fill slope and preventing inlet scour with subsequent undermining of the culvert. All culverts shall be designed either with headwalls and wingwalls or flared-end sections at the inlet and outlet.

A multitude of different inlet configurations are utilized on culvert barrels. These include both prefabricated and constructed-in-place installations. Commonly used inlet configurations include projecting culvert barrels, cast-in-place concrete headwalls, precast or prefabricated end sections, and culvert ends mitered to conform to the fill slope. Structural stability, aesthetics, erosion control, and fill retention are considerations in the selection of various inlet configurations.

(Res. 40-08 (§ 1204), 3-19-08)

§ 28.48.180. Projecting inlets.

Projecting inlets vary greatly in hydraulic efficiency and adaptability to requirements with the type of pipe material used. The primary advantage of projecting inlets is relatively low cost. Corrugated metal pipe projecting inlets have limitations which include low efficiency and susceptibility to damage. A projecting entrance of corrugated metal pipe is equivalent to a sharp-edged entrance with a thin wall and has an entrance coefficient of approximately 0.9, Table 28.48.110. Bell-and-spigot concrete pipe or tongue-and-groove concrete pipe with the bell end or grooved end used as the inlet section are quite efficient hydraulically, having an entrance coefficient of approximately 0.2, Table 28.48.110. For concrete pipe that has been cut, the entrance is square-edged, the entrance coefficient is approximately 0.5, Table 28.48.110.

(Res. 40-08 (§ 1204.1), 3-19-08)

§ 28.48.190. Inlets with headwalls.

Headwalls may be used for a variety of reasons, including increasing the efficiency of the inlet, providing embankment stability, and providing embankment protection against erosion. The relative efficiency of the inlet varies with the pipe material used. Corrugated metal pipe in a headwall is essentially a squared-edged entrance with an entrance coefficient of approximately 0.5. The entrance losses may be reduced by rounding the entrance. For tongue-and-groove or bell-end concrete pipe, little increase in hydraulic efficiency is realized by adding a headwall. The primary reasons for using headwalls are embankment protection and ease of maintenance.

Wingwalls are used where the side slopes of the channel adjacent to the entrance are unstable and where the culvert is skewed to the normal channel flow. Little increase in hydraulic efficiency is realized with the use of wingwalls, regardless of the pipe material used and, therefore, the use shall be justified for reasons other than an increase in hydraulic efficiency.

(Res. 40-08 (§ 1204.2), 3-19-08)

§ 28.48.200. Tapered inlets.

Inlet configuration is one of the prime factors influencing the performance of a culvert operating under inlet control. Inlet edges can cause severe contraction of the flow, as in the case of a thin edge, projecting inlet. In a flow contraction, the effective cross-sectional area of the barrel may be reduced to about one-half of the actual available barrel area. As the inlet configuration is improved, the flow contraction is reduced, thus improving the performance of the culvert.

A tapered inlet is a flared culvert inlet with an enlarged face section and a hydraulically efficient throat section. Tapered inlets improve culvert performance by providing a more efficient control section (the throat). However, tapered inlets are not recommended for use on culverts flowing under outlet control because the simple beveled edge is of equal benefit. The two most common improved inlets are the side-tapered inlet and the slope-tapered inlet. FHWA's HDS-5 provides guidance on the design of improved inlets.

(Res. 40-08 (§ 1204.3), 3-19-08)

§ 28.48.210. Bridge hydraulics.

Bridges are required across nearly all open channels sooner or later and, therefore, sizing the bridge openings is of great importance. Open channels with improperly designed bridges will either have excessive scour or deposition or not be able to carry the design flow. Confining flood waters by bridges can cause excessive backwater resulting in flooding of upstream property, backwater damage suits, overtopping of roadways, costly maintenance, or even loss of a bridge. Bridge openings shall be designed to have as little effect on the flow characteristics as reasonable, consistent with good design and economics.

(Res. 40-08 (§ 1205), 3-19-08)

§ 28.48.220. Hydraulic analysis.

The hydraulic analysis procedures described in this chapter are suitable, although methods such as FHWA HY-4 or HEC-RAS are acceptable as well. If a computer application other than HY-4 or HEC-RAS is to be used, the designer must first submit documentation of the program to the local jurisdiction for approval. The preliminary assessment approach described below is presented in greater detail in the FHWA *Hydraulics of Bridge Waterways*.

(Res. 40-08 (§ 1205.1), 3-19-08)

§ 28.48.230. Expression of backwater.

A practical expression for backwater has been formulated by applying the principle of conservation of energy between the point of maximum backwater upstream from the bridge and a point downstream from the bridge at which normal stage has been reestablished, as shown in Section 4 of Figure 28.48.230. The expression is reasonably valid if the channel in the vicinity of the bridge is reasonably uniform, the gradient of the bottom is approximately constant between Sections 1 and 4, there is no appreciable erosion of the bed in the constriction due to scour, and the flow is subcritical.

The expression for computation of backwater upstream from the bridge constricting the flow is as follows:

$$h_1^* = (K^*)\left(\frac{(V_{n2})^2}{2g}\right) + \propto 1\left[\left(\frac{A_{n2}}{A_4}\right)^2 - \left(\frac{A_{n2}}{A_1}\right)^2\right]\frac{V_{n2}^2}{2g} \qquad (28.48\text{-}13)$$

Where:

h_1^*	=	total backwater (ft.)
K^*	=	total backwater coefficient
$\propto 1 = \frac{qv^2}{QV_1^2}$	=	kinetic energy coefficient
A_{n2}	=	gross water area in constriction measured below normal stage ($ft.^2$)

V_{n2}	=	average velocity in constriction or Q/A_{n2} (ft./s). The velocity V_{n2} is not an actual measurable velocity but represents a reference velocity readily computed for both model and field structures
A_4	=	water area at Section 4 where normal stage is reestablished ($ft.^2$)
A_1	=	total water area at Section 1 including backwater ($ft.^2$)
g	=	acceleration constant (32.2 $ft./sec^2$)

To compute backwater by Equation 28.48-13, it is necessary to obtain the approximate value of h^*_1 by using the first part of the equation:

$$h_1^* = \left(K'\right)\left(\frac{V_{n2}^2}{2g}\right) \qquad (28.48\text{-}14)$$

The value of A_1 in the second part of Equation 28.48-13, which depends on h^*_1, can then be determined. This part of the expression represents the difference in kinetic energy between Sections 4 and 1, expressed in terms of the velocity head $V^2_{n2}/2g$. Equation 28.48-13 may appear cumbersome, but it was set up as shown to permit omission of the second part when the difference in kinetic energy between Sections 4 and 1 is small enough to be insignificant in the final result.

To permit the designer to readily recognize cases in which the kinetic energy term may be ignored, the following guides are provided:

$M > 0.7$, where M = bridge opening ratio

$V_{n2} < 7$ ft/s

$$\left(K'\right)\left(\frac{V_{n2}^2}{2g}\right) < 0.5 \text{ ft}$$

If values meet all three conditions, the backwater obtained from Equation 28.48-14 can be considered sufficiently accurate. Should one or more of the values not meet the conditions set forth, it is required to use Equation 28.48-13 in its entirety. The use of the guides is further demonstrated in the examples given in FHWA *Hydraulics of Bridge Waterways* that shall be used in all bridge design work.

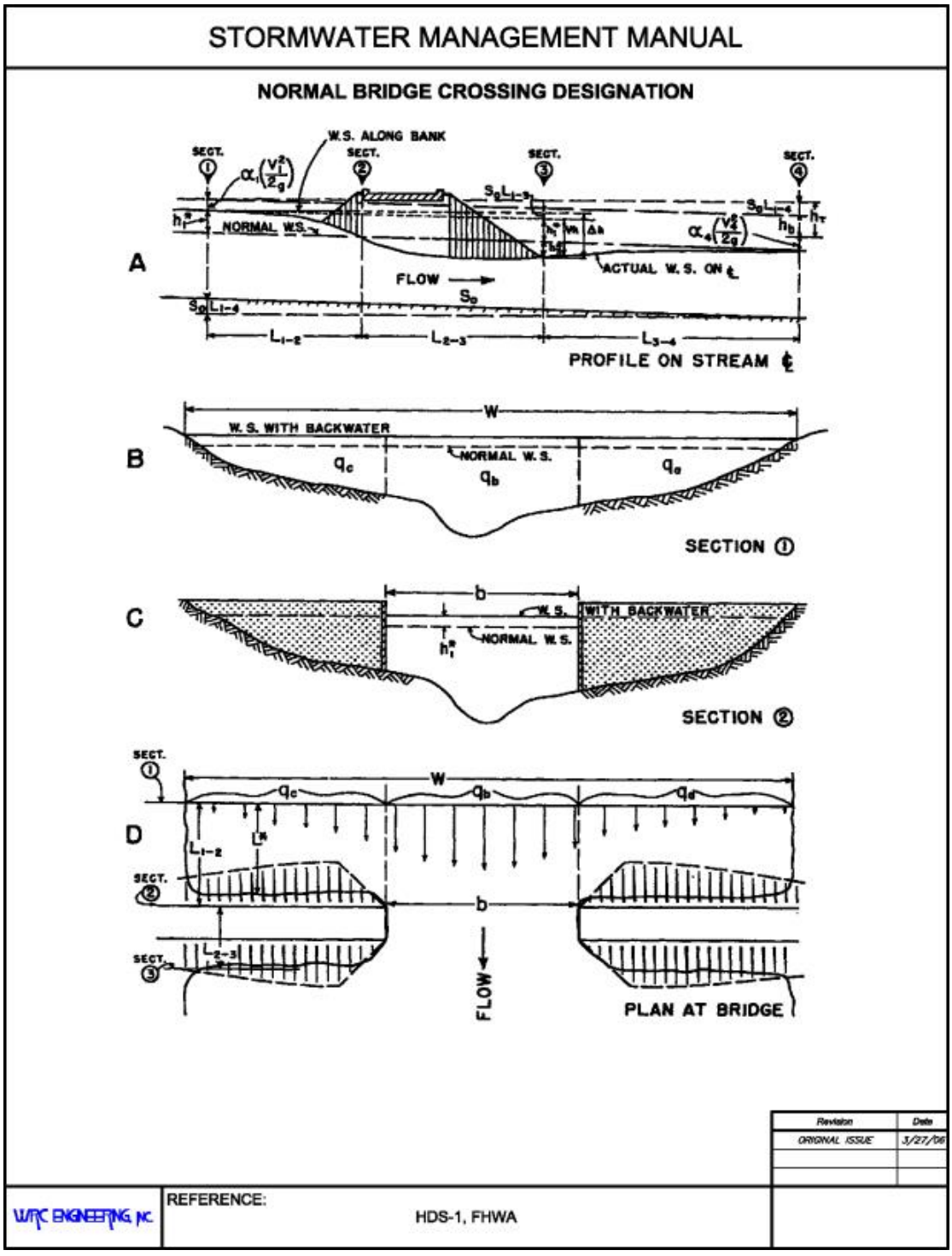

FIGURE 28.48.230

(Res. 40-08 (§ 1205.2), 3-19-08)

§ 28.48.240. Backwater coefficient.

The value of the overall backwater coefficient K*, which was determined experimentally, varies with the following:

(a) Stream constriction as measured by the bridge opening ratio, M.

(b) Type of bridge abutment: wingwall, spill through, etc.

(c) Number, size, shape, and orientation of piers in the constriction.

(d) Eccentricity or asymmetric position of bridge with respect to the floodplain.

(e) Skew (bridge crosses floodplain at other than 90-degree angle).

The overall backwater coefficient K* consists of a base curve coefficient, K_b, to which are added incremental coefficients to account for the effect of piers, eccentricity, and skew. The value of K* is primarily dependent on the degree of constriction of the flow but also changes to a limited degree with the other factors.

(Res. 40-08 (§ 1205.3), 3-19-08)

§ 28.48.250. Effect of M and abutment shape (base curves).

Figure 28.48.250(a) shows the base curves for backwater coefficient, K_b, plotted with respect to the opening ratio, M, for several wingwall abutments and vertical wall type. Note how the coefficient K_b increases with channel constriction. The several curves represent different angles of wingwalls as can be identified by the accompanying sketches. The lower curves represent the better hydraulic shapes.

Figure 28.48.250(b) shows the relation between the backwater coefficient, K_b, and M for spill-through abutments for three embankment slopes. A comparison of the three curves indicates that the coefficient is little affected by embankment slope. Figures 28.48.250(a) and 28.48.250(b) are “base curves” and K_b is referred to as the “base curve coefficient.” The base curve coefficients apply to normal crossings for specific abutment shapes but do not include the effect of piers, eccentricity, or skew.

STORMWATER MANAGEMENT MANUAL

BASE CURVES FOR WINGWALL ABUTMENTS

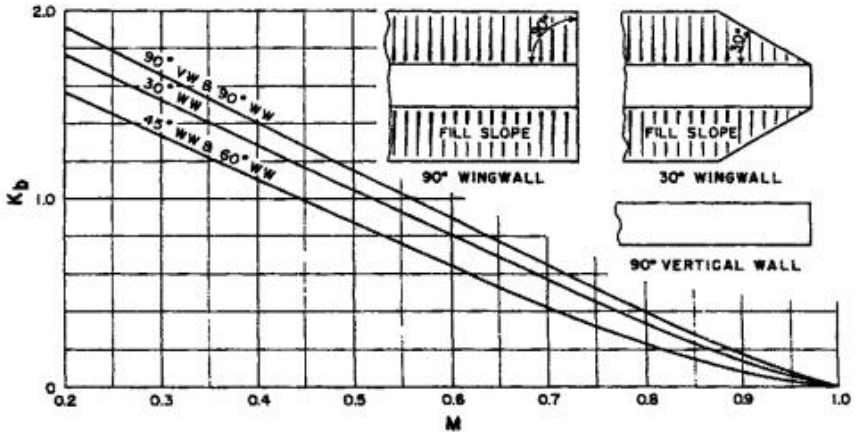

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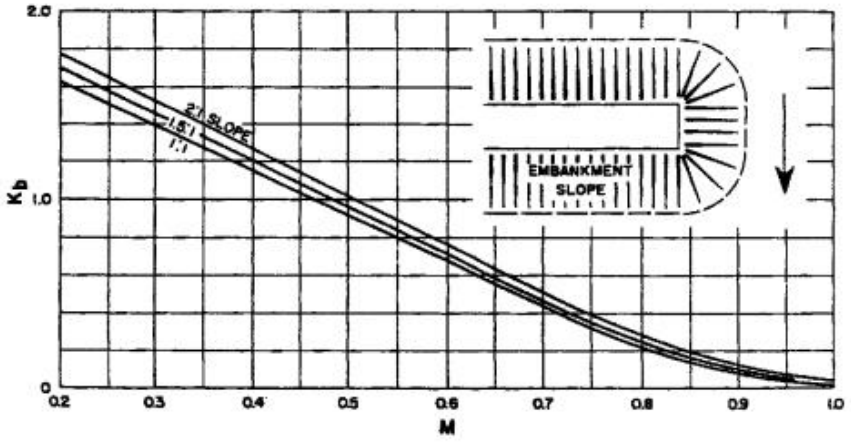
FIGURE 28.48.250(a)

STORMWATER MANAGEMENT MANUAL

BASE CURVES FOR SPILLTHROUGH ABUTMENTS



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REFERENCE: HDS-1, FHWA

FIGURE 28.48.250(b)

(Res. 40-08 (§ 1205.4), 3-19-08)

§ 28.48.260. Effect of piers (normal crossings).

The effect on the backwater from introduction of piers in a bridge constriction has been treated as an incremental backwater coefficient designated ΔK_p, which is added to the base curve coefficient when piers are a factor. The value of the incremental backwater coefficient, ΔK_p, is dependent on the ratio that the area of the piers bears to the gross area of the bridge opening; the type of piers (or pilings in the case of pile bents); the value of the bridge opening ratio, M; and the angularity of the piers with the direction of flood flow. The ratio of the water area occupied by piers, A_p, to the gross water area of the constriction, A_{n2}, both based on the normal water surface, has been assigned the letter J. In computing the gross water area, A_{n2}, the presence of piers in the constriction is ignored. The incremental backwater coefficient for the more common types of piers and pile bents can be obtained from Figure 28.48.260. The procedure is to enter Chart A, Figure 28.48.260, with the proper value of J and read ΔK and obtain the correction factor σ from Chart B, Figure 28.48.260, for opening ratios other than unity. The incremental backwater coefficient is then:

$$\Delta K_p = \Delta K \sigma \qquad (28.48\text{-}15)$$

The incremental backwater coefficients for piers can, for all practical purposes, be considered independent of diameter, width, or spacing but shall be increased if there are more than five piles in a bent. A bent with 10 piles shall be given a value of ΔK_p about 20 percent higher than those shown for bents with five piles. If there is a good possibility of trash collecting on the piers, it is advisable to use a value greater than the pier width to include the trash. For a normal crossing with piers, the total backwater coefficient becomes:

$$K^* = K_b \text{ (Figures 28.48.250(a) or 28.58.250(b)} + \Delta K_p \text{ (Figure 28.48.260)} \qquad (28.48\text{-}16)$$

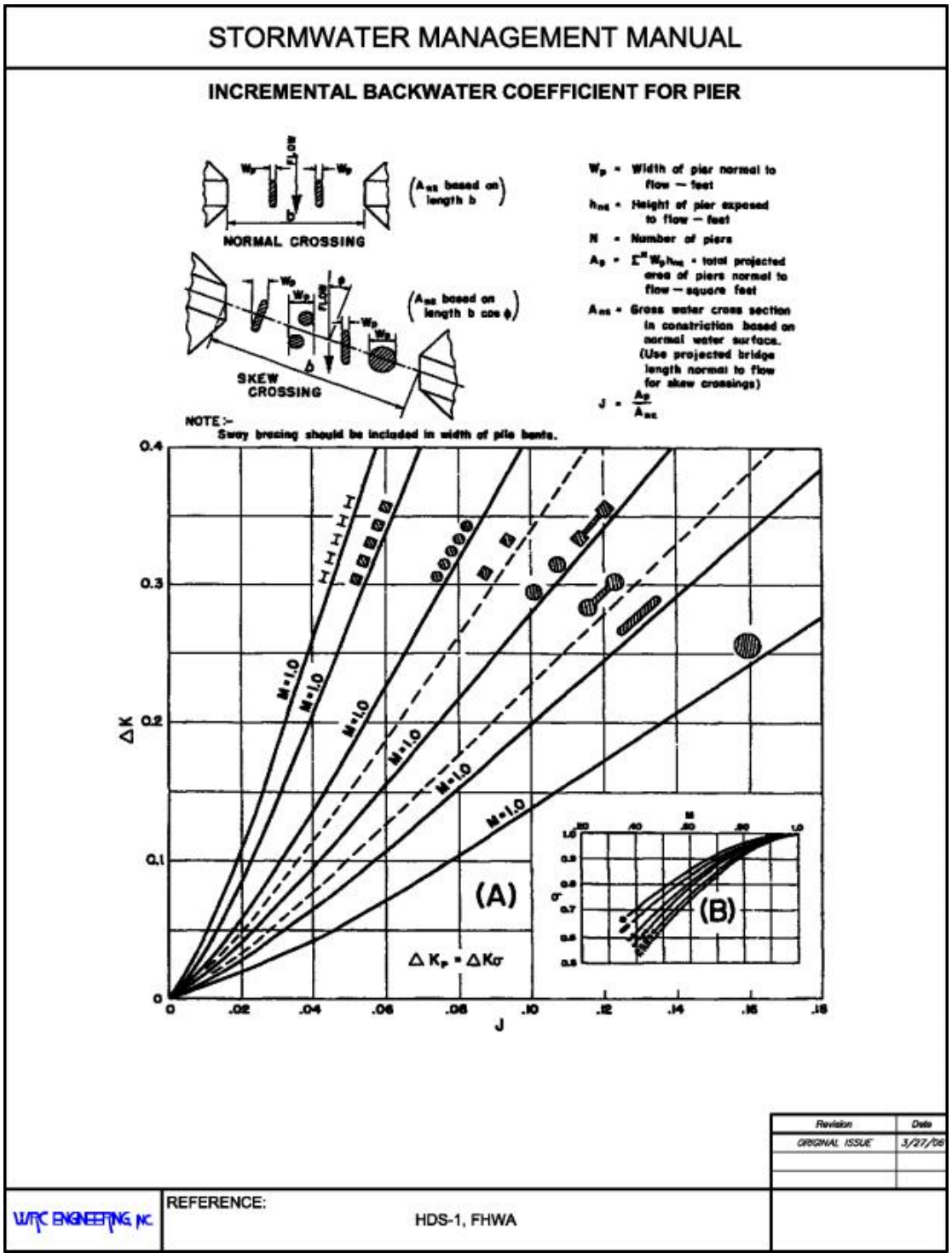


FIGURE 28.48.260

(Res. 40-08 (§ 1205.5), 3-19-08)

§ 28.48.270. Bridge sizing and design.

The method of planning for bridge openings must include water surface profiles and hydraulic gradient analyses of the channel for the 100-year event. Once this hydraulic gradient is established without the bridge, the maximum reasonable effect on the channel flow by the bridge shall be determined.

(a) Bridge Design Standards. All bridges shall be designed to pass the 100-year design flow and meet all applicable floodplain regulations. The 100-year water surface elevation within the bridge shall be a minimum of 1.0 foot below the bridge low chord.

Where bridge abutments and foundations are located below the 100-year water surface elevation, concrete wingwalls at angles of 40 degrees to 60 degrees shall be tied to the existing side slopes to prevent erosion behind the abutments.

Where supercritical flow exists in a lined channel, the bridge shall have no influence on the flow. There shall be no encroachment into the 100-year water surface elevation.

The design and supporting calculations for both private bridges and low water crossings shall be prepared and certified by a Colorado Registered Professional Engineer.

(b) Design Procedure. The following is a brief step-by-step outline for determination of backwater produced by a bridge constriction:

(1) Determine the magnitude and frequency of the discharge for which the bridge is to be designed.

(2) Determine the stage of the stream at the bridge site for the design discharge.

(3) Plot representative cross-section of stream for design discharge at Section 1. If the stream is essentially straight and the cross-section substantially uniform in the vicinity of the bridge, the natural cross-section of the stream at the bridge site may be used for this purpose.

(4) Subdivide the above cross-section according to marked changes in depth of flow and roughness. Assign values of Manning's roughness coefficient, *n*, to each subsection. Typical roughness coefficients can be found in Table 28.32.040(d) of Chapter 28.32, Open Channels. Careful judgment is necessary in selecting these values.

(5) Compute conveyance and then discharge in each subsection.

(6) Determine the value of the kinetic energy coefficient.

(7) Plot the natural cross-section under the proposed bridge based on normal water for design discharge and compute the gross water area, including area occupied by piers.

(8) Compute the bridge opening ratio, *M*, observing modified procedure for skewed crossings.

(9) Obtain the value of K_b from the appropriate base curve.

(10) If piers are involved, compute the value of J and obtain the incremental coefficient, ΔK_p.

(11) If eccentricity is severe, compute the value of eccentricity and obtain the incremental coefficient, ΔK_e.

(12) If a skewed crossing is involved, observe proper procedure in previous steps, then obtain the incremental coefficient, ΔK_s, for proper abutment type.

(13) Determine the total backwater coefficient, K*, by adding incremental coefficients to the base curve coefficient, K_b.

(14) Compute the backwater by Equation 28.48-13.

(15) Determine the distance upstream to where the backwater effect is negligible.

Detailed steps illustrated by examples are presented in FHWA *Hydraulics of Bridge Waterways*.

(Res. 40-08 (§ 1206), 3-19-08)

§ 28.48.280. Example application – Culvert sizing.

(a) Problem. Determine the culvert size necessary to convey the 100-year discharge in Doe Creek beneath John Boulevard. The results of the analysis are shown in the Culvert Design Form of Figure 28.48.280(a).

Top of road elevation = 4,928 ft.
Culvert inlet elevation = 4,920 ft.
Culvert outlet elevation = 4,918 ft.
Culvert length = 200 ft.
Inlet – Groove end with headwall and wingwalls at 45 degrees
Outlet – Groove end with headwall and wingwalls at 45 degrees
Flow = 191 cfs
Tailwater depth = 4 ft.

(b) Solution.

(1) Step 1. Assume a reinforced concrete pipe diameter and determine the headwater to depth ratio for inlet control from Figure 28.48.100(b). Assume a reinforced concrete pipe diameter of five feet. Given are a 100-year design flow of 191 cfs and a grooved end with headwall inlet configuration.

HW/D = 1.28 See Figure 28.48.280(b)

(2) Step 2. Calculate the required headwater depth assuming inlet control conditions. Multiply the pipe diameter times the headwater to depth ratio.

Headwater = HW_i = D*(HW/D) = 5.0*1.28 = 6.4 ft.

(3) Step 3. Calculate the required headwater elevation assuming inlet control conditions.

FALL = 0, since the culvert invert is at grade

$HW_i = HW_d$

$EL_i = EL_{sf}$

$EL_{hd} = EL_i + HW_i = 4{,}920 + 6.4 = 4{,}926.4$ ft.

(4) Step 4. Estimate the critical depth, d_c, in the culvert from Figure 28.48.110(a).

$d_c = 3.9$ ft. (see Figure 28.48.280(c))

(5) Step 5. Since the tailwater depth is less than the culvert diameter, compute the estimated water depth at the culvert outlet assuming the tailwater does not control the outlet conditions.

Outlet Depth = $(d_c + D)/2 = (3.9+5.0)/2 = 4.5$ ft.

(6) Step 6. Determine the flow depth at the culvert outlet, h_o. The estimated depth is the maximum value of the tailwater depth and the water depth assuming no tailwater.

4.5 ft. > 4.0 ft., therefore $h_o = 4.5$ ft.

(7) Step 7. Estimate the head, H, for outlet control conditions from Figure 28.48.110(d).

H = 2.6 ft. (see Figure 28.48.280(d))

(8) Step 8. Calculate the required outlet control headwater elevation, EL_{ho}.

$EL_{ho} = EL_o + H + h_o = 4{,}918 + 2.6 + 4.5 = 4{,}925.1$ ft.

(9) Step 9. Determine if the culvert is under inlet control or outlet control and provide the resulting control headwater elevation and depth.

$EL_{hd} > EL_{ho}$ (4,926.4 > 4,925.1), the culvert is under inlet control

Control Headwater Elevation = 4,926.4

HW = 6.4 ft.

(10) Step 10. Calculate the outlet velocity by an appropriate method and determine the amount of outlet protection needed, see GJMC § 28.48.150.

v = 10.0 ft./s

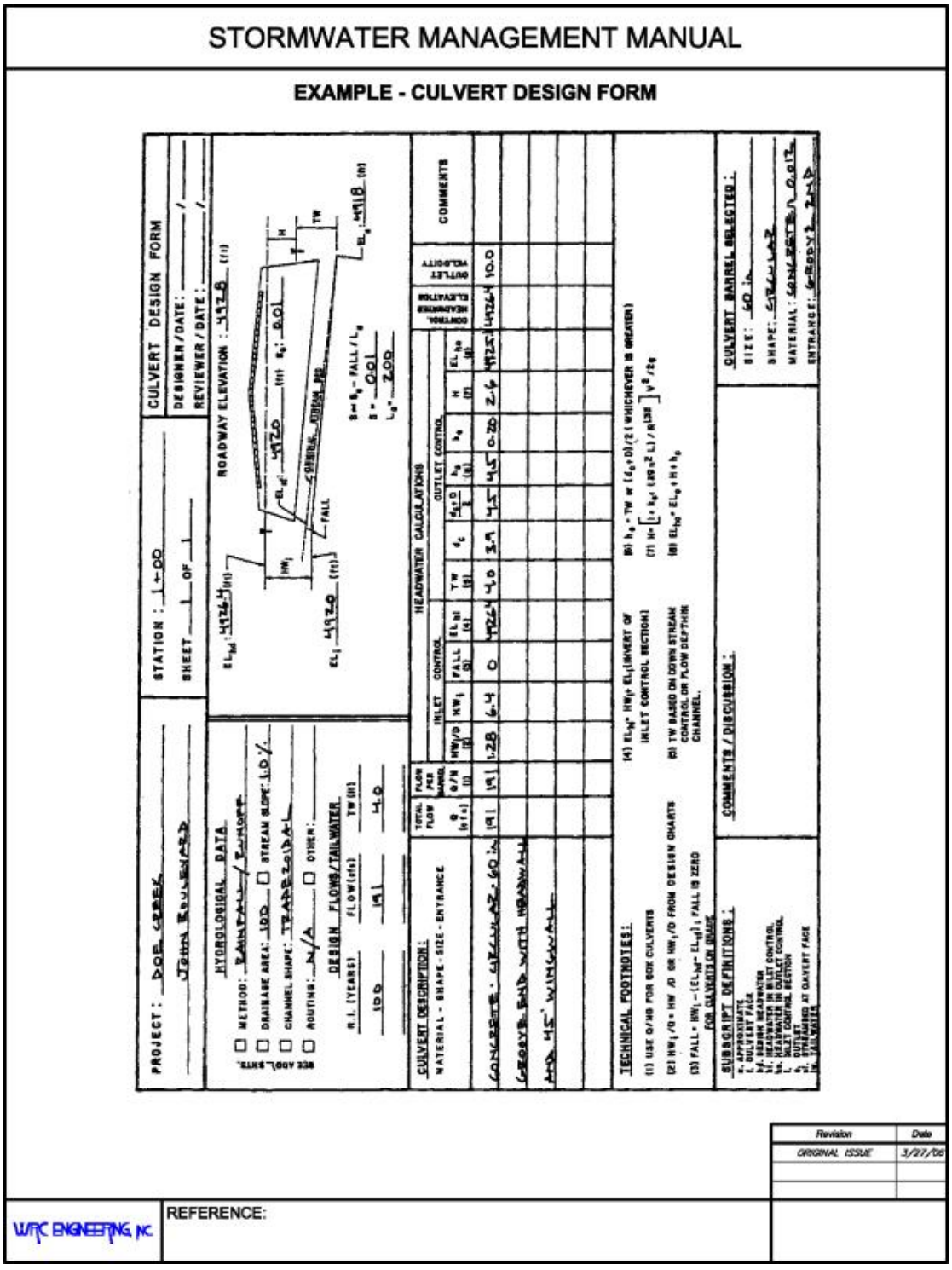


FIGURE 28.48.280(a)

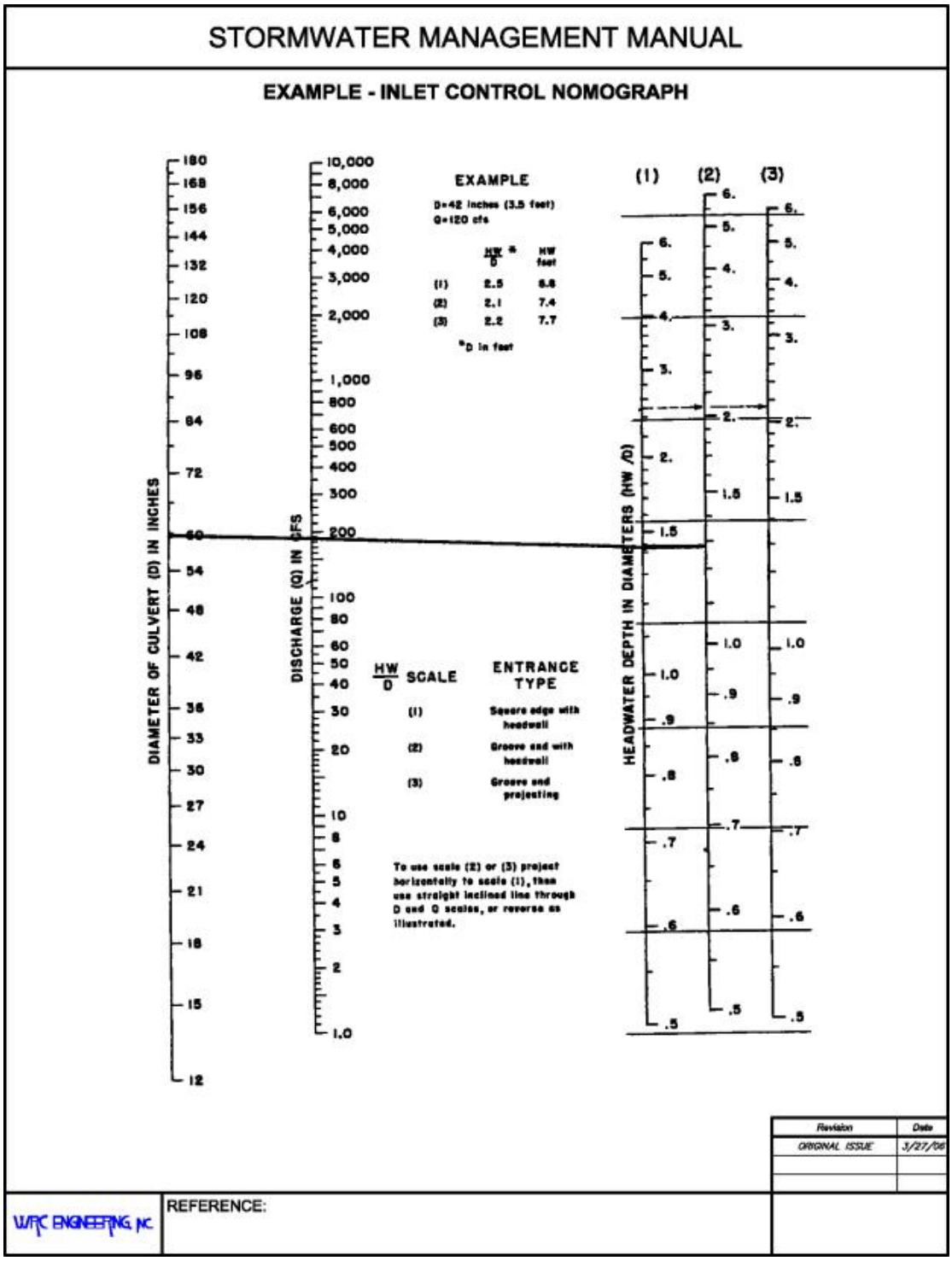


FIGURE 28.48.280(b)

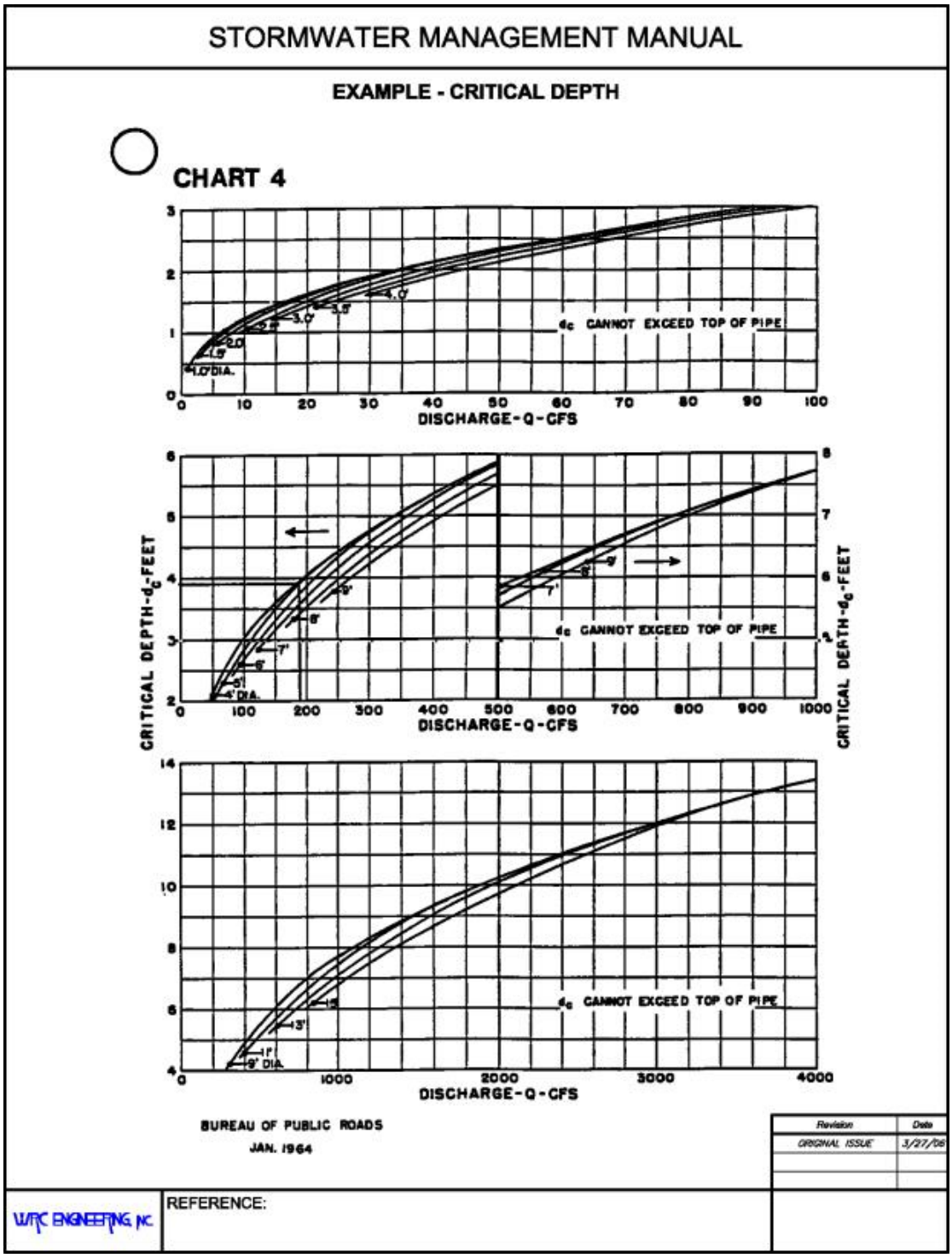


FIGURE 28.48.280(c)

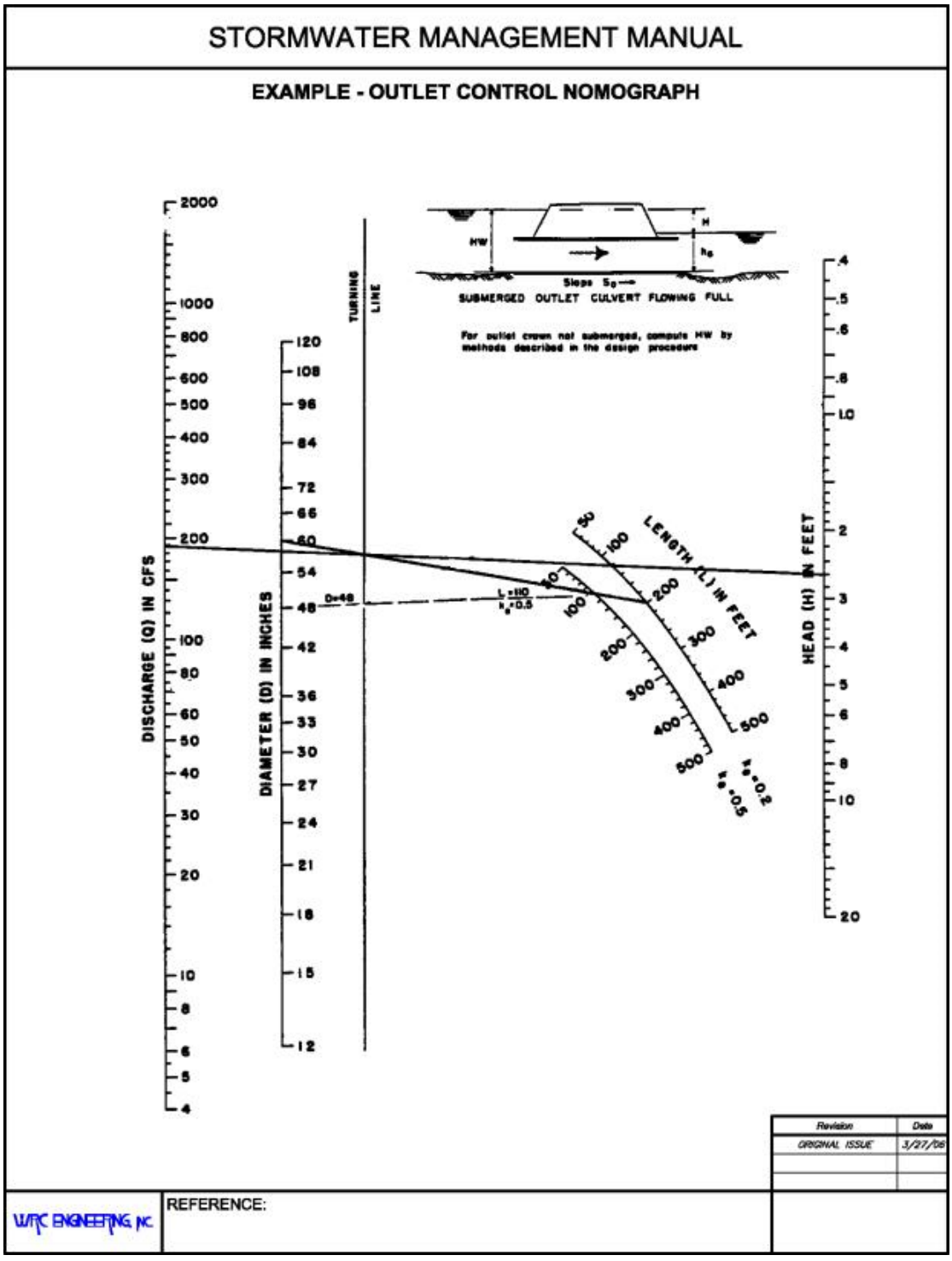


FIGURE 28.48.280(d)

(Res. 40-08 (§ 1207), 3-19-08)

Chapter 28.52
Irrigation/Drainage Structures

§ 28.52.010. Introduction.

A large number of agricultural irrigation facilities exist in Mesa County, and many have historically intercepted runoff from rural and agricultural areas with little consequence. However, the development (urbanization) of these areas results in storm runoff of much higher peak flows and larger total volumes. In addition, water quality of the runoff is often adversely impacted by this urbanization. As a result, the traditional practice of utilizing irrigation ditches, drains, and reservoirs for stormwater control must be reexamined on a case-by-case basis.

It is recommended that the designer/engineer, when faced with a specific irrigation/drainage structures interface, to review in detail GJMC § 28.16.200 through 28.16.230. Only after a thorough review and understanding of this chapter, and with coordination with the parties involved, shall the user proceed with the specific tasks that need to be performed. Further, the designer/engineer is cautioned to verify that damage to downstream properties will not occur by bypassing of storm runoff.

(Res. 40-08 (§ 1301), 3-19-08)

§ 28.52.020. Irrigation ditch crossings (cross-drainage structures).

It is common for a storm drainage system to encounter irrigation ditches, canals, or even conduits, especially in agricultural areas. Mesa County contains a large percentage of agricultural lands, thus the interaction of storm runoff systems and agricultural irrigation structures is common, especially for new developments. Storm drains are often buried with sufficient cover to completely avoid an interaction with existing irrigation structures. However, it may occasionally be necessary to install storm drain pipe by boring or jacking to avoid disruption of the irrigation flow. Where the invert of a drainage channel is low enough in relation to the irrigation structure, it may be possible to utilize a standard culvert design for the crossing (see Chapter 28.48 GJMC).

In locations where stormwater flow is in an open channel or relatively shallow pipe at an intersection with an irrigation structure, other options must be considered. In certain (rare) cases, it is allowable for stormwater flow to enter an irrigation canal and then be removed (see side-channel spillways in GJMC § 28.36.120) at another location. Otherwise, stormwater flow shall be kept separate from irrigation conveyances as reasonably possible. Two methods for completing this task are presented in GJMC § 28.52.030 and 28.52.040: inverted siphons and overchutes. Overchutes include both flumes and pipe overchutes for the conveyance of stormwater over another channel.

(Res. 40-08 (§ 1302), 3-19-08)

§ 28.52.030. Inverted siphons.

(a) An inverted siphon consists of a closed conduit used to convey water under an obstruction such as an irrigation structure or roadway where the use of a continuous-slope conduit would interfere with said obstruction. Sometimes called “sag pipes,” the

conduit drops to an invert low enough to pass under the obstruction then rises to the channel invert at the downstream end. This infers pressure pipe flow, with successful operation being dependent on sufficient head at the upstream end to overcome the rise as well as pipe losses in the siphon section.

(b) Transitions are recommended for the upstream and downstream ends of all siphons to reduce head losses and to prevent excessive erosion. Entrance head losses reduce the effective head on the inverted siphon, thereby requiring larger upstream depths to achieve the same flow through the conduit. Concrete inlet and outlet transitions are required for siphons which:

(1) Cross railroads or State/federal highways.

(2) Are 36 inches in diameter or larger and cross a road.

(3) Are used with an unlined channel and the pipe velocity exceeds 3.5 feet per second.

(c) In locations where the siphon may be affected by groundwater flow, it may be necessary to include pipe collars to reduce piping effects. Cutoff walls may also be necessary depending on site conditions.

(d) It is recommended that the design of long inverted siphons include a blowoff structure at the low point of the alignment to allow for draining of the system (see GJMC § 28.36.170(a)). These can be designed for operation by pumping or gravity draining. Shorter siphons can usually be easily drained by pumping from either end of the structure.

(e) Pipe used for inverted siphons shall be pressure-rated as required per design, shall utilize rubber gaskets (may use other joint connection devices in addition), and shall comply with the applicable pipe selection criteria set forth in GJMC § 28.40.120.

(f) It is good design practice to include features in the design of an inverted siphon to minimize the risk of flooding due to the failure of the siphon to properly convey the channel flow. These features may include, but are not limited to:

(1) Increased freeboard in the upstream channel in the vicinity of the siphon.

(2) The use of multiple barrels to allow for at least partial operation if one barrel fails.

(3) The installation of a wasteway (and associated side-channel spillway) to limit the depth of water in the upstream channel.

(g) Inverted siphons pose a significant risk to human and animal safety. Specific features must be included in the design of these structures to help alleviate these risks. It is recommended that the location and safety features of any proposed inverted siphon be discussed with Mesa County and any local jurisdictions early in the design process. At some locations, a jurisdiction may disallow the use of these structures where they pose excessive or unwarranted risk to the public.

(h) The design procedure for an inverted siphon is as follows (USBR 1974):

(1) Determine an initial system layout with all known elevations and lengths. Pipe slopes between the inlet/outlet transitions and the main section of the siphon are limited to a maximum slope of 2:1. All siphon pipes shall have a slope of at least 0.005.

(2) Determine the type of inlet and outlet structures required (transitions, headwalls, etc.).

(3) Determine the type of pipe to be used. This is typically pressure-rated reinforced concrete pipe.

(4) Select initial pipe size based on the table in Figure 28.52.030(a). This is based on design flow, transitions used, and the subjective length of the siphon. Presented with the table are maximum permissible pipe velocities for different siphon lengths and transition types. Siphons are considered to be relatively short if they are crossing under a road or a canal. Only flows of up to 99 cfs are included in Figure 28.52.030(a) since it is typically more economical to consider a bridge at flows of 100 cfs or higher. However, multiple barrels may be utilized to convey larger flows.

(5) Using the design flow rate and the properties of the initially selected pipe, determine the velocity head in the pipe (H_{vp}) and the friction slope (S_f). Using the normal depth in the upstream channel, find the velocity head (H_{v1}).

(6) Determine the additional freeboard required (FB_{add}) for the 50 feet of channel upstream of the structure:

$$FB_{add} = 0.5\,(\text{Normal Canal Bank Freeboard}) \qquad (28.52\text{-}1)$$

(7) Invert elevations of the transitions are set to allow for an adequate hydraulic seal at the inlet (to minimize hydraulic loss) and to avoid submergence at the outlet. Due to the sloping pipe inlet, the effective diameter is larger than the pipe diameter:

$$D_i = \frac{D}{\cos\alpha} \qquad (28.52\text{-}2)$$

Where:

D_1	=	Effective Inlet Diameter (feet)
D	=	Siphon Pipe Diameter (feet)
α	=	Slope of Inlet (α_1) or Outlet (α_2) Pipe (degrees)

Required hydraulic seal is based on the difference in velocity heads between the upstream channel and the pipe:

$$H_{seal} = 1.5 \cdot \Delta H_v = 1.5(H_{vp} - H_{v1}) \quad (28.52\text{-}3)$$

Where:

H_{seal}	=	Hydraulic Seal Required at Inlet, Min. 0.25' (feet)
H_{vp}	=	Velocity Head in the Pipe ($V^2/2g$) (feet)
H_{v1}	=	Velocity Head in the Upstream Channel (feet)

Throughout the remainder of this process, the designer is referred to Figure 28.52.030(a) for the locations of Stations A through H and J. Note that the siphon in Figure 28.52.030(a) is crossing under a roadway. In this section, the focus is on irrigation canal crossings, so the cover requirements may differ from those in the figure. Siphons crossing under a channel with flexible lining shall have a minimum of 2.0 feet of cover, and those crossing under a canal with concrete or other nonflexible lining shall have a minimum cover of six inches.

Table 28.52.030 presents equations for finding invert elevations at Stations A through H:

Table 28.52.030: Inverted Siphon Invert Elevation Equations

Station (see Figure 28.52.030(a))	Invert Elevation
A	Channel IE @ 10' U/S from the U/S transition
C	NWS Elev. @ Sta. A – H_{seal} + D_i
B	Minimum: Channel IE @ U/S end of transition
	Maximum: IE Sta. C + p_{inlet}
G	Channel IE @ 10' D/S from the D/S transition
H	Channel IE @ 10' D/S from the D/S transition
F	IE @ Sta. G – p_{outlet}

Where:

IE	=	Invert Elevation (feet)
NWS	=	Normal Water Surface (Design Flow) (feet)
p	=	Difference in invert elevations between the ends of the transitions (Sta. B and C or F and G) (feet)
p_{inlet}	≤	3/4D (feet)
p_{outlet}	≤	1/2D (feet)

The invert elevations of Stations D, J, and E are determined by cover requirements and pipe slope.

(8) Determine the total amount of hydraulic head available ($H_{profile}$) across the siphon profile:

$$H_{profile} = NWS@Sta.\ A - NWS@Sta.\ H \quad (28.52\text{-}4)$$

(9) Determine the approximate head loss across the preliminary profile, as well as a 10 percent factor of safety as included in Equation 28.52-5:

$$H_L = 1.1(h_i + h_f - h_b + h_o) \quad (28.52\text{-}5)$$

Where:

H_L	=	Head loss across siphon profile (with 10% F.S.) (feet)
h_i	=	Inlet transition head loss = $0.4\Delta H_v$ (feet)
h_f	=	Pipe friction losses = Pipe Length × S_f (feet)
h_b	=	Bend losses (See Equation 28.40-26) (feet)
h_o	=	Outlet transition head loss = $0.7\Delta H_v$ (feet)
ΔH_v	=	$(H_{vp} - H_{v1})$

For the siphon to function properly, the total head loss H_L must not exceed the available head across the profile, $H_{profile}$.

(10) Headwall height above the transition invert is dependent on backfill height and required freeboard. In many cases, the top elevation of the headwall is equal to the top of wall elevation at the cutoff, Station B. (The wall height there is determined by adding standard channel freeboard to the additional freeboard calculated in Equation 28.52-1.)

(11) Transition dimensions C, B, and cutoff depth e, and wall thickness tw are defined by Figure 28.52.030(b) (USBR 1974). Transition length L shall be at least three times the pipe diameter D.

(12) For most siphons, forces exerted on the pipe bends are not great enough to warrant additional structural considerations. However, for large pipes, high heads, poor foundation conditions, and large deflection angles, thrust blocks and other appurtenances shall be considered. (USBR 1974)

(13) The locations of Stations C and F are determined by the width of the obstruction and the siphon pipe slope requirements. Using the new locations for Stations C and F, determine new locations for Stations A, B, G, and H, and recompute invert elevations as applicable.

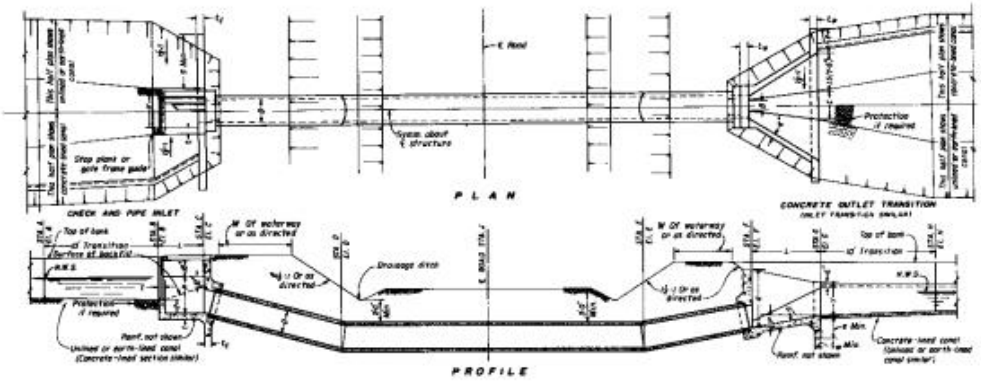
(14) Recompute total head loss (Equation 28.52-5) and verify that the final siphon profile is viable.

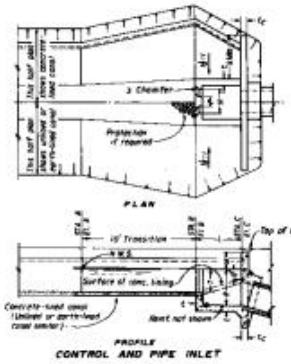
(15) Erosion protection may be required upstream and/or downstream from the siphon transitions. See Chapter 28.32 GJMC. Pipe collars may be necessary to reduce the effects of piping due to percolation along the outer wall of the pipe. A blowoff (drain) valve may be warranted for longer pipes. See Section 906 for criteria regarding these appurtenances.

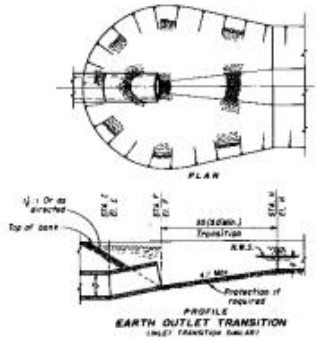
(16) Air vents, pressure-release valves, or air jumper pipes may be necessary to relieve air pressure in the siphon pipe, especially under less-than-capacity flows. A hydraulic jump can occur in the pipe, causing blowback and significantly reducing the capacity of the siphon. The aforementioned appurtenances allow for the release of trapped air from the pipe. See GJMC § 28.36.170 for criteria regarding these appurtenances.

STORMWATER MANAGEMENT MANUAL

INVERTED SIPHON







PIPE DIAMETER SELECTION DATA							
MAX. V=3.5 fps (EARTH TRANSITION)		MAX. V=5.0 fps (CONC. TRANSITION)		MAX. V=10.0 fps (CONC. TRANSITION)		PIPE	
Q (cfs)		Q (cfs)		Q (cfs)			
FROM	INCLUSIVE	FROM	INCLUSIVE	FROM	INCLUSIVE	DIA. (INCHES)	AREA (SQ. FT.)
0	2.7	0	3.8	0	7.9	12	0.785
2.7	4.3	3.8	6.1	7.9	12.5	15	1.227
4.3	6.2	6.1	8.8	12.5	17.7	18	1.767
6.2	8.4	8.8	12.0	17.7	24.1	21	2.405
8.4	11.0	12.0	15.7	24.1	31.4	24	3.142
11.0	13.9	15.7	19.9	31.4	39.8	27	3.976
13.9	17.2	19.9	24.5	39.8	49.1	30	4.909
17.2	20.9	24.5	29.7	49.1	59.4	33	5.940
20.8	24.7	29.7	35.3	59.4	70.7	36	7.069
24.7	29.0	35.3	41.5	70.7	83.0	39	8.296
29.0	33.7	41.5	48.1	83.0	96.2	42	9.621
33.7	38.7	48.1	55.2			45	11.045
38.7	44.0	55.2	62.8			48	12.566
44.0	49.7	62.8	70.9			51	14.186
49.7	55.7	70.9	79.5			54	15.904
55.7	62.0	79.5	88.6			57	17.721
62.0	68.7	88.6	98.2			60	19.635
68.7	75.8					63	21.648
75.8	83.2					66	23.758
83.2	90.9					69	25.967
90.9	99.0					72	28.274

NOTES

Locations of vertical V:1's at S and E are to be considered approximate only and may be adjusted to fit actual laying length of pipe
Stations and elevations refer to invert unless otherwise shown

Revision	Date
ORIGINAL ISSUE	3/27/08

WRC ENGINEERING, INC.

REFERENCE: DESIGN OF SMALL CANAL STRUCTURES (USBR, 1974)

FIGURE 28.52.030(a)

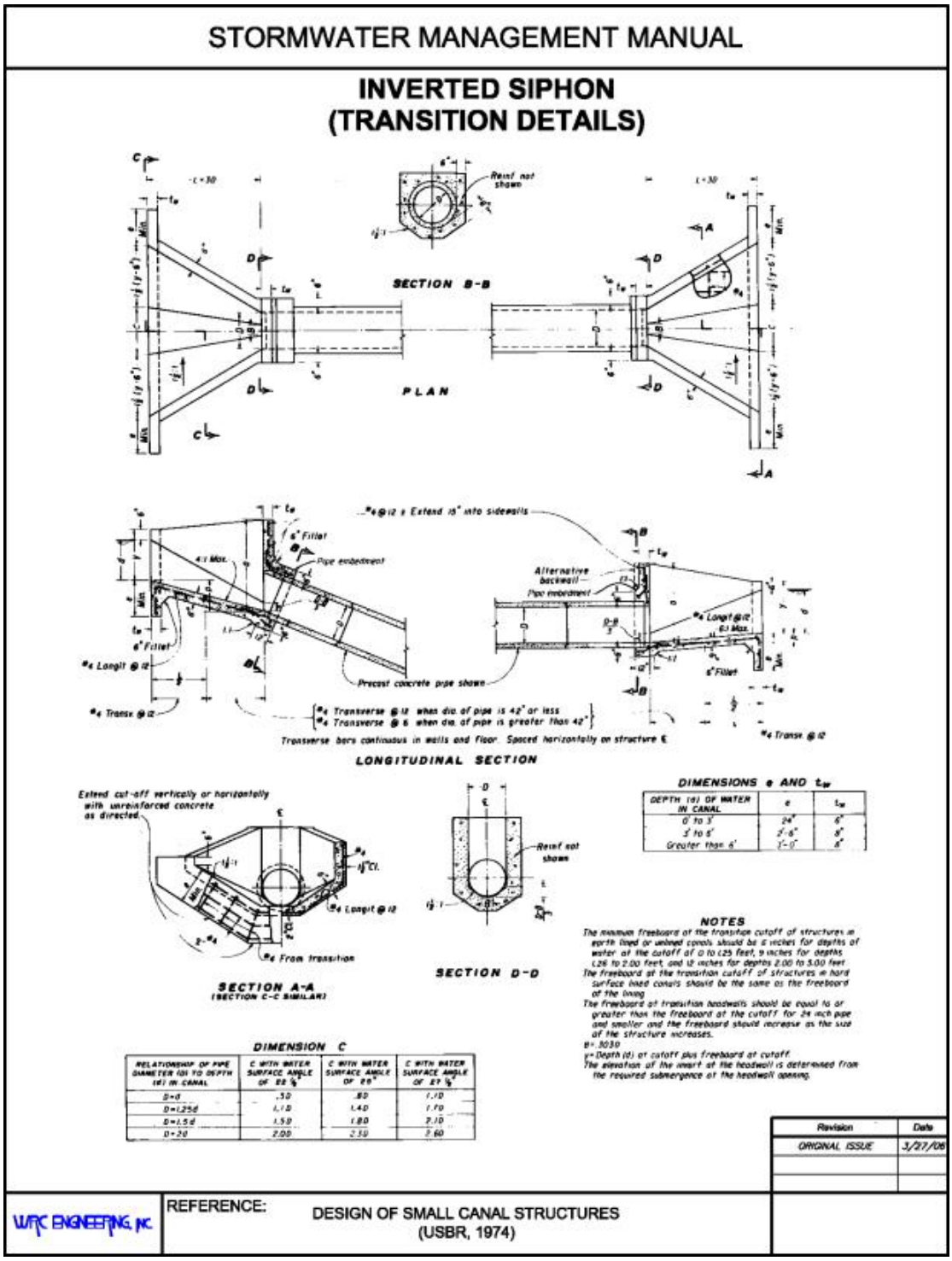


FIGURE 28.52.030(b)

(Res. 40-08 (§ 1302.1), 3-19-08)

§ 28.52.040. Overchutes (flumes and pipe overchutes).

The term "overchutes" refers to cross-drainage structures that pass over the normal water surface elevation of the drainage being crossed. While typically used to convey stormwater (or other) across an irrigation canal or natural drainageway, other obstructions such as roads and railroad tracks occasionally require these structures. Where the obstruction being crossed conveys anything other than water (such as vehicles), clearance to the overchute must be considered. The designer shall ensure that an overchute installed at a waterway will not adversely impact the design capacity of that waterway. This includes a minimum clearance of 1.0 foot over the normal water surface of the waterway.

Overchutes can be open-channel structures (flumes) or pipes, depending on site conditions. Rectangular concrete flume sections are typically used for larger cross-drainage (e.g., stormwater) flows and for areas where debris is expected to prohibit the use of pipes. Figure 28.52.040(a) presents a typical plan and profile for a rectangular concrete flume overchute. For smaller cross-drainage flows, pipe overchutes are typically employed for economic reasons. See Figure 28.52.040(b) for typical plans and profiles for two pipe overchute types. Note that welded steel pipe is specified for the suspended section of each due to the additional forces and exposure to which those sections are subjected. Both Figures assume that the obstruction being crossed is an existing trapezoidal canal.

(a) Flume Overchutes. The design of a flume overchute ("chute") is as follows (USBR 1974):

(1) The chute invert slope is dependent upon the selected method of energy dissipation at the chute outlet. Some, such as a stilling basin, best function with supercritical influent. Others, such as a baffled apron drop (GJMC § 28.36.060), require subcritical flow at the entrance. Also, a wider, shallower flume section will require a smaller depth at the inlet pool and will more easily satisfy freeboard requirements. Therefore, the most economical flume section may not be the most efficient overall.

Where supercritical flow is desired, the following equations are used to determine critical slope:

$$d_c = \frac{q^{2/3}}{g^{1/3}} \qquad (28.52\text{-}6)$$

$$A_c = b \cdot d_c \qquad (28.52\text{-}7)$$

$$V_c = \frac{Q}{A_c} \qquad (28.52\text{-}8)$$

$$H_{v_c} = \frac{V_c^2}{2g} \qquad (28.52\text{-}9)$$

$$E_{s_c} = d_c + H_{v_c} \quad (28.52\text{-}10)$$

$$S_c = \left[\frac{nV_c}{1.49 \cdot R^{2/3}}\right]^2 \quad (28.52\text{-}11)$$

Where:

d_c	=	Critical depth (feet)
q	=	Flow per unit width (cfs/ft.)
A_c	=	Critical area (sf)
V_c	=	Critical velocity (fps)
H_{vc}	=	Velocity head (critical flow) (feet)
E_{sc}	=	Specific energy (critical flow) (feet)
S_c	=	Critical slope (ft./ft.)
n	=	Manning's roughness = 0.015
R	=	Hydraulic radius (feet)

The chute invert slope shall be at least 20 percent greater than critical slope (S_c) for the selected cross-section to avoid unstable flow that occurs around critical flow.

Where subcritical flow is desired, the slope shall be set appreciably less than critical slope as defined by Equation 28.52-11.

Normal depth at design flow in the flume shall be a minimum of 1.0 foot below the top of the flume wall for all nonpiped overchutes. Normal depth shall be based upon a Manning's roughness coefficient of 0.015 for the purpose of this criterion.

(2) Determine the required pool depth at the inlet transition, d_o. Equation 28.52-12 assumes that velocity in the inlet pool is zero:

$$d_o = d_c + H_{v_c} + 0.3 \cdot H_{v_c} \quad (28.52\text{-}12)$$

Provide 2.0 feet of freeboard above the pool depth in the channel upstream from the overchute, and 1.0 foot of freeboard above the pool depth in the flume from the inlet pool to the suspended portion.

(3) The chute wall height across the suspended portion of the flume shall be equal to the maximum depth in the chute plus 1.0 foot of freeboard.

(4) Determine the flow depth at the downstream end of the chute using the Bernoulli Equation iteratively on d_2:

$$E_{s_2} + h_f = E_{s_1} + S_o L \quad (28.52\text{-}13)$$

Where:

E_{s2}	=	D/S Specific Energy = $d_2 + H_{v2}$ (feet)
h_f	=	Friction Loss (feet)
E_{s1}	=	U/S Specific Energy = $d_1 + H_{v1}$ (feet)
S_oL	=	Vertical Drop across Chute (feet)

(5) A stilling basin or other energy dissipation structure shall be included as necessary per GJMC § 28.36.020 through 28.36.060 and 28.36.070 through 28.36.100.

(b) Pipe Overchutes. The design of a pipe overchute is as follows (USBR 1974):

(1) The invert of the inlet transition is limited by the following:

(i) At least 1.0 foot of clearance shall be provided between the irrigation canal water surface and the pipe, where applicable. Larger clearances may be required for other types of obstructions.

(ii) 2.0 feet of bank freeboard shall be provided above the maximum water surface in the upstream channel.

(iii) Inlet losses reduce the effective capacity of the pipe. Therefore, it is recommended that the inlet opening be submerged by a minimum of $1.5H_{v(pipe)}$ to offset this loss and maintain one full velocity head in the pipe.

(2) Determine inlet/outlet control:

For inlet control, the required depth at the inlet (d_i) for a discharge of Q through the pipe is determined using Equation 28.52-14:

$$d_i = \frac{Q^2}{2gC^2A^2} \quad (28.52\text{-}14)$$

Where:

C	=	Orifice discharge coefficient = 0.6
d_i	=	Depth (feet)
Q	=	Flow rate (cfs)
A	=	Cross-sectional area of pipe (sf)
q	=	Gravitational constant, 32.2 ft./s^2

Under outlet control, the required head for discharge Q is equal to the head losses through the pipe:

$$d_i = \sum H_L = h_i + h_f + h_o \quad (28.52\text{-}15)$$

Where:

H_L	=	Head loss across pipe (feet)
h_i	=	Inlet head loss (feet)
h_f	=	Pipe friction losses = Pipe length × S_f (feet)
h_o	=	Outlet transition head loss (feet)

(3) Pipe overchutes shall be designed with a maximum full pipe velocity of 10 feet per second for concrete transition outlets or 12 feet per second for baffled outlets.

(4) Pipe diameter is determined by:

$$D = 1.13\sqrt{\frac{Q}{V}} \quad (28.52\text{-}16)$$

The minimum recommended diameter for an overchute pipe for the purpose of conveying stormwater is 24 inches. Depending on expected sediment and debris loads, some sites may necessitate larger minimum diameters.

(5) Structural and reinforcement requirements are not specified herein as they are outside the scope of this manual. Support piers shall be located so as to minimize potential adverse effects on the operation of the obstruction being crossed.

(6) An energy dissipation structure and/or other erosion protection shall be installed downstream of the overchute as applicable per Chapter 28.32 GJMC, GJMC § 28.36.020 through 28.36.060 and 28.36.070 through 28.36.100, and Chapter 28.48 GJMC.

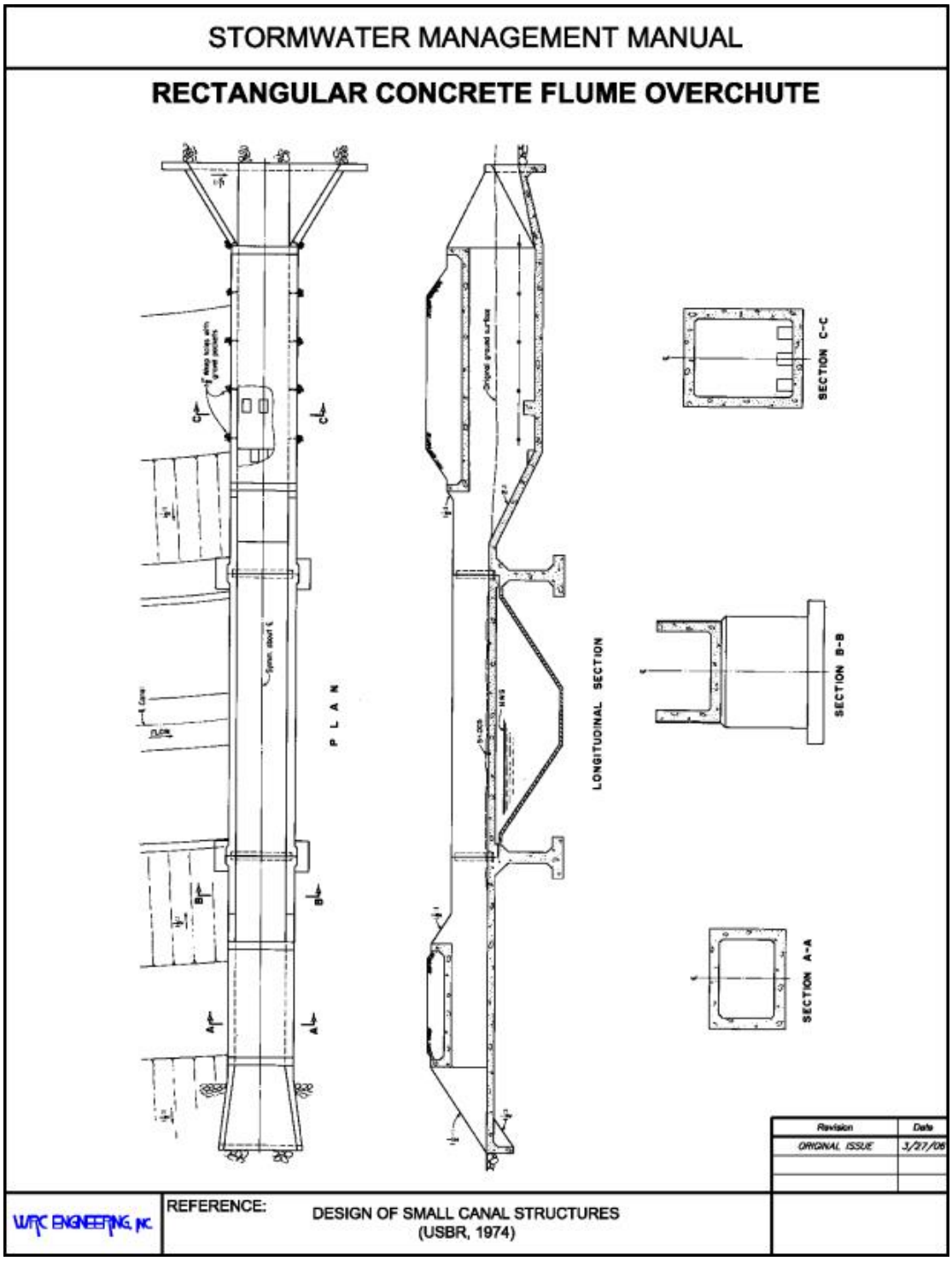


FIGURE 28.52.040(a)

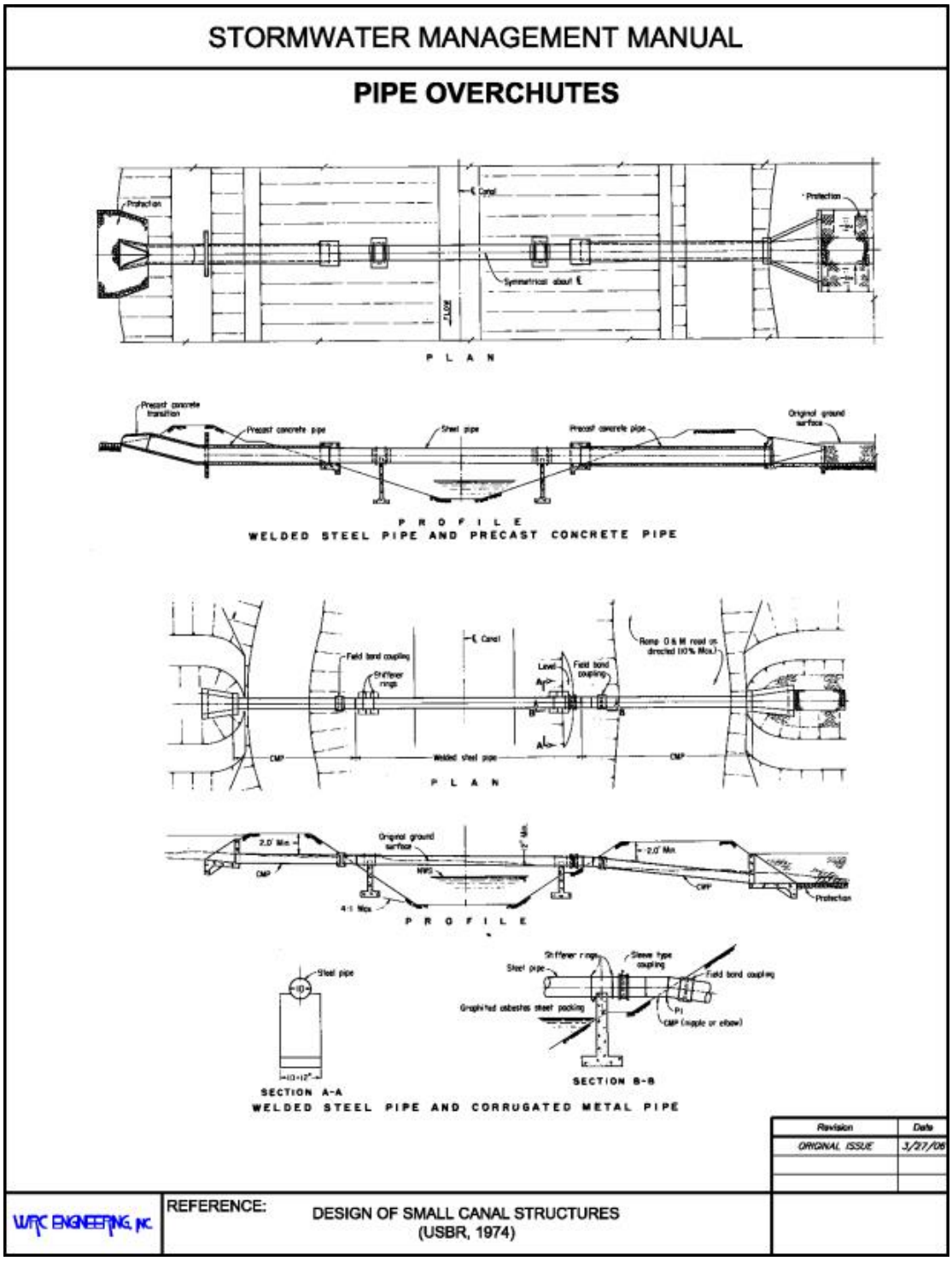


FIGURE 28.52.040(b)

(Res. 40-08 (§ 1302.2), 3-19-08)

Chapter 28.56
Detention and Retention

§ 28.56.010. Introduction.

The main purpose of a detention basin is to store runoff and reduce peak discharge by allowing flow to be discharged later at a controlled rate, and within a reasonable time. This controlled discharge rate is based on either limited downstream capacity (regional and local facilities) or on a limit on the increase in flows over predevelopment conditions (local facilities only). Detention has been shown to be very beneficial in controlling flood peaks in an urbanized area. Use of detention includes local detention such as in-channel or within a parking lot, and regional detention, such as a large recreational lake or reservoir and off-line detention facilities. Regional and local detention facilities are more fully discussed below. Policy regarding detention and extended detention (retention) is found in GJMC § 28.16.090 and 28.16.100.

It is important that any extended detention (retention) be supported by valid water rights that allows for retention without impacting any vested water rights on the stream system.

(Res. 40-08 (§ 1401), 3-19-08)

§ 28.56.020. Detention versus retention.

Stormwater storage reservoir types are numerous, but they essentially fit into one of two categories: detention or retention. The words “pond” and “basin” are used interchangeably when used in connection with both detention and retention reservoirs. A detention basin or pond detains water temporarily, releasing water through a pipe or channel by means of a weir, orifice, or pump. Because of its ability to release flow during inflow, the overall volume of storage required for a given storm event is reduced. Another advantage of the detention basin is the positive means of outflow, resulting in fewer problems with long-term ponding. A retention basin or pond retains water without any initial release during inflow. Once the storm event is over, pond drainage may occur due to evaporation and percolation into the soil. In some instances, retention basins may also involve a gated pipe or pump which is closed or inoperative during the storm event. However, if a gated pipe or pump is an available or desirable option, it would normally be advantageous to release water during stormwater inflow, which would change the basin from a retention basin to a detention basin. The difference in detention and retention basins is depicted in Figure 28.56.020.

The words “pond” and “basin” may be used to refer to reservoirs that remain dry outside of storm events, or store water for other purposes, e.g., irrigation, recreation, aesthetics, etc., in addition to receiving stormwater during storm events. Words “wet” and “dry” are used as prefixes to describe the condition of ponds and basins. However, a wet pond and dry basin each have a specific meaning.

Wet ponds may be desirable compared to dry basins in some circumstances. It may be that ample storage volume exists to provide an aesthetic, recreational, or irrigation pond below the required reservoir volume. Use of irrigation storage facilities for stormwater detention purposes must be reviewed by the appropriate jurisdiction(s) on a case-by-case basis. It is required that the stormwater reservoir volume provided must be in addition to the maximum expected base storage (irrigation or wet pond) volume. This is depicted in Figure 28.56.020.

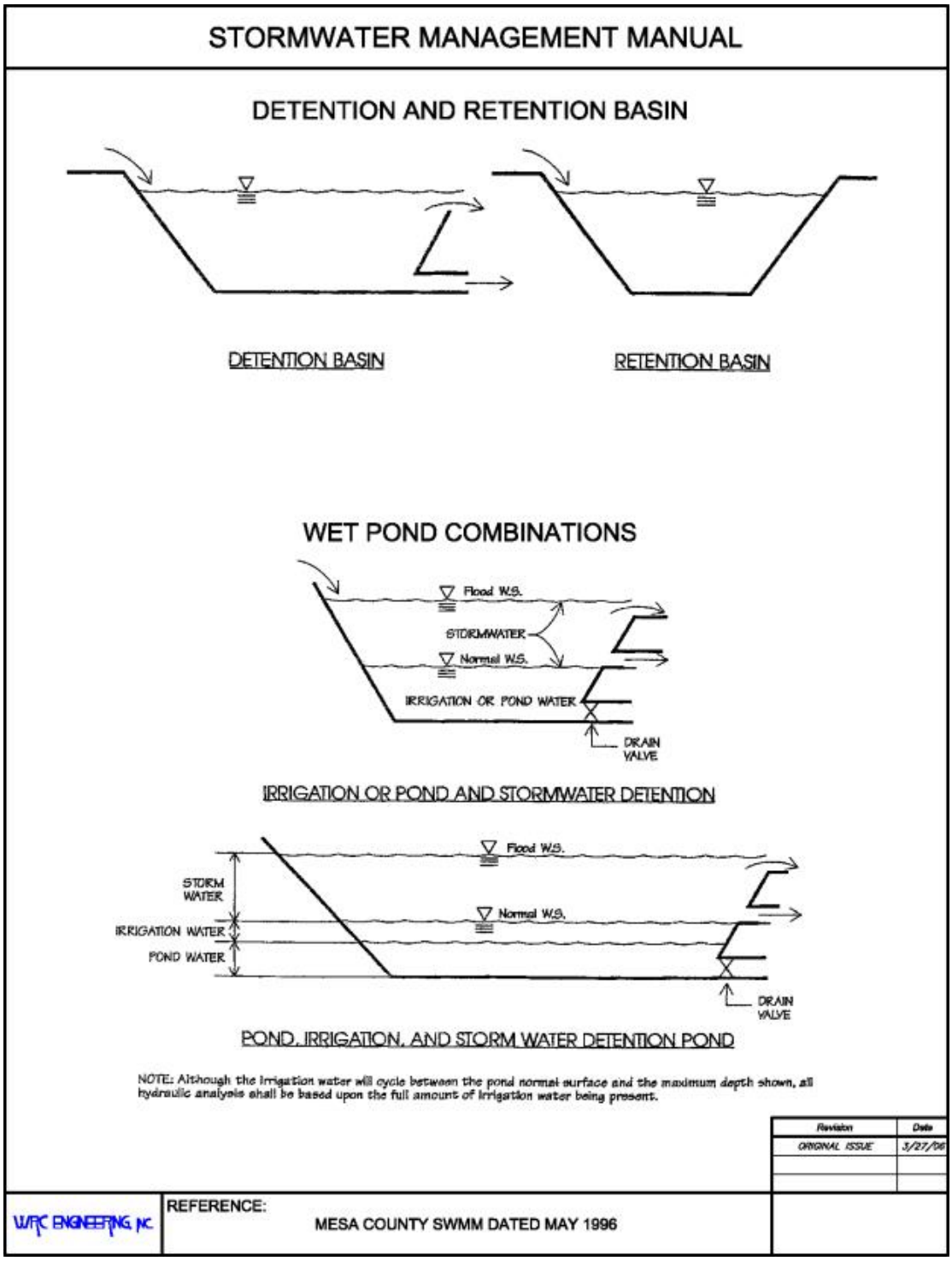


FIGURE 28.56.020

(Res. 40-08 (§ 1402), 3-19-08)

§ 28.56.030. Local detention facilities.

Local detention facilities are usually designed by and financed by developers or local property owners. The facilities are intended to allow development by protecting a site from existing flooding conditions or to protect downstream property from increased runoff caused by development. Two classes of local facilities are defined below.

(a) Local Minor Facilities. Local minor detention facilities are defined as serving a single development with a hydrologic basin smaller than or equal to 20 acres and are designed to mitigate the impact of increased runoff due to development. The outlet capacity is generally based on predevelopment hydrology, and the detention structures are generally small (0.01 to one acre-foot). Detention storage volume may be provided as small landscaped or turfed basins, parking lot storage, or a suitable combination of all.

(b) Local Major Facilities. Local major detention facilities are defined as serving more than a single development or serving hydrologic basins greater than 20 acres in size. These facilities may serve dual functions. They typically reduce existing flooding problems to allow more development and/or control increased runoff caused by additional development. These facilities may store significant flood volumes and will generally be funded by the developer. They may handle both off-site and on-site flows. Due to their larger size, these basins are designed much the same as regional detention facilities.

(Res. 40-08 (§ 1403.1), 3-19-08)

§ 28.56.040. Regional detention facilities.

Regional detention facilities are those identified in the current Grand Valley Stormwater Master Management plan or as designated by local jurisdiction. Generally, these facilities control flow on major drainageways, are large in size, and are owned and maintained by public agencies. The purpose of these facilities is to significantly reduce downstream flows in order to maximize the capacity of existing systems and maintain flows at or below historic rates.

(Res. 40-08 (§ 1403.2), 3-19-08)

§ 28.56.050. Drainage fee in lieu of detention.

The developer may be given the option of paying a drainage fee in lieu of providing adequate detention facilities. Such an option may be considered only if the developer completes an engineering analysis to show that all downstream facilities have adequate capacity to handle the undetained flows from the proposed development. If such option is allowed, this does not waive the requirements for drainage planning submittal requirements as outlined in Chapter 28.12 GJMC.

(Res. 40-08 (§ 1404), 3-19-08)

§ 28.56.060. Drainage fee basis.

(a) For stormwater management purposes, charges assessed to existing and new development to offset cost of providing drainage facilities and services are typically categorized as an impact fee or a utility fee.

(b) An impact fee is based on the cost of upgrading drainage services within a watershed, shared among all new developments within the watershed. The basis for sharing costs can be as simple as the size of the water tap and as complex as calculating imperviousness of the property then making adjustments for various best management practices, such as detention. An impact fee is a one-time charge against new development.

(c) A utility fee is based on the cost of upgrading and maintaining drainage services within a watershed to meet current standards or level-of-service. A utility fee is often assessed to all properties, developed or not, and often is limited to providing maintenance of the system and minor capital improvements. Utility fees are normally charged on a monthly basis.

(d) Since the local jurisdiction charge is a fee in lieu of detention for new development, it is considered a limited impact fee. Reasonableness tests applied to impact fees include:

(1) The system impact fee shall be related to the amount of drainage improvements needed to meet local standards.

(2) The impact fee shall only cover capital and related (i.e., engineering, construction administration, etc.) costs for improvements.

(Res. 40-08 (§ 1404.1), 3-19-08)

§ 28.56.070. Drainage fee calculation.

(a) The formula used by local jurisdictions to calculate drainage fee is of the form:

$$\text{Drainage Fee (\$)} = B(C_D - C_H)A^{0.7} \qquad (28.56\text{-}1)$$

Where:

B	=	Fee constant (established annually by City Council of local jurisdiction)
C_D	=	100-year runoff coefficient (expressed as a decimal) based on developed land use conditions
C_H	=	100-year runoff coefficient (expressed as a decimal) based on pre-developed land use conditions
A	=	Area of development (acres)

Assigning B = $14,000, A = 1 acre, C_D = 0.60 and C_H = 0.51, based on SCS Type C soils, and an imperviousness of two percent pre-developed and 50 percent developed, the fee in lieu of detention would be $1,260.

(b) The equation used in Mesa County and the other local jurisdictions takes into account key factors for a fee in lieu of detention, such as:

(1) The fee is based on area.

(2) The fee takes into account imperviousness by using the rational method C values.

(3) The fee takes into account the difference between pre- and post-development runoff rates, which is the main function of on-site detention.

(c) The constant B needs to closely reflect the actual cost of providing detention, and must be changed with time as the need arises. Local jurisdictions will review this figure annually and make appropriate recommendations for its adjustment.

(Res. 40-08 (§ 1404.2), 3-19-08)

§ 28.56.080. Detention for management of stormwater quality.

In addition to the primary purpose of detention and retention facilities to reduce peak flows, they can be adapted to enhance stormwater quality.

The outlet for a detention basin can be designed to allow for a slower rate of release and thus provide time for particulate pollutants to settle out of the stormwater. Such basins are called extended detention basins (EDB). It is recommended that an EDB outlet be designed to completely drain a full basin in 48 hours, allowing for the removal of a significant portion of insoluble pollutants with proper operation and maintenance.

A retention pond (RP) is a sedimentation facility designed to have a permanent water pool. This pool of water is mixed with stormwater during storm runoff events from frequently occurring storms and allows for sedimentation and thus water quality enhancement to occur.

For frequently occurring storms, both EDBs and RPs capture the total runoff as a surcharge. However, in the case of RPs, the stormwater is allowed to mix with the permanent pool water as it rises above the permanent pool level. All surcharged water above the permanent pool level is to be released over 48 hours. Details related to the design of EDBs and RPs can be found in Chapter 28.6 GJMC, Construction Site Stormwater Runoff Control, and Chapter 28.64 GJMC, Post-Construction Stormwater Management.

For the 100-year detention, the water quality volume is considered to be a part of the volume required for detention purposes.

(Res. 40-08 (§ 1405), 3-19-08)

§ 28.56.090. Design storm criteria.

Peak runoff from a site may not be increased in the 10- and 100-year storms due to development. The site runoff may be a composite of detention/retention basin release/ overflow and direct runoff, both of which must be considered. If direct runoff is allowed from the site, the sum of the direct runoff plus the release from the detention basin must not exceed the historic rate. This is depicted in Figure 28.56.090 and discussed further in GJMC § 28.56.240.

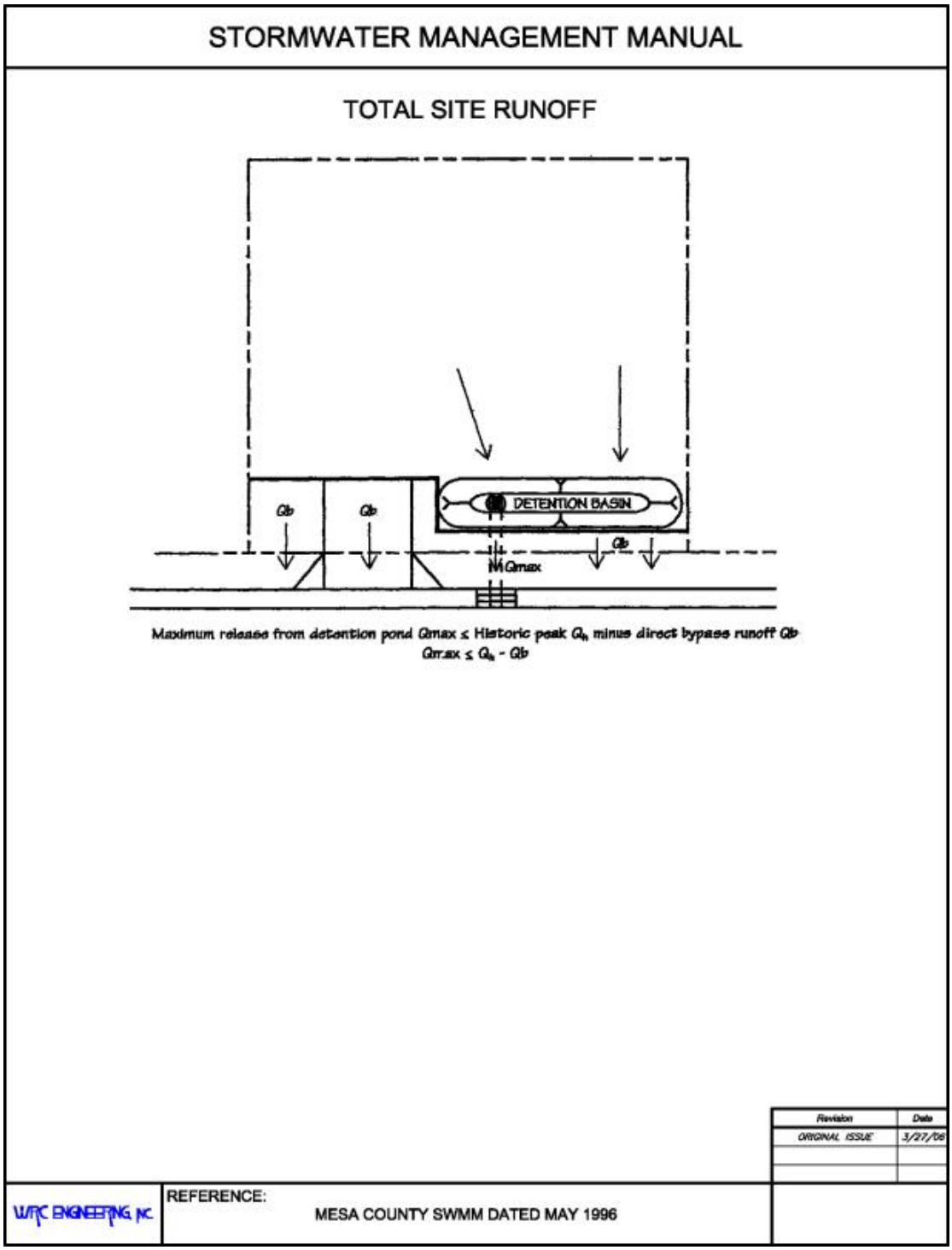


FIGURE 28.56.090

(Res. 40-08 (§ 1406.1), 3-19-08)

§ 28.56.100. Geometric requirements.

For proper function and safety considerations, geometric requirements shall be as shown on Figure 28.56.100.

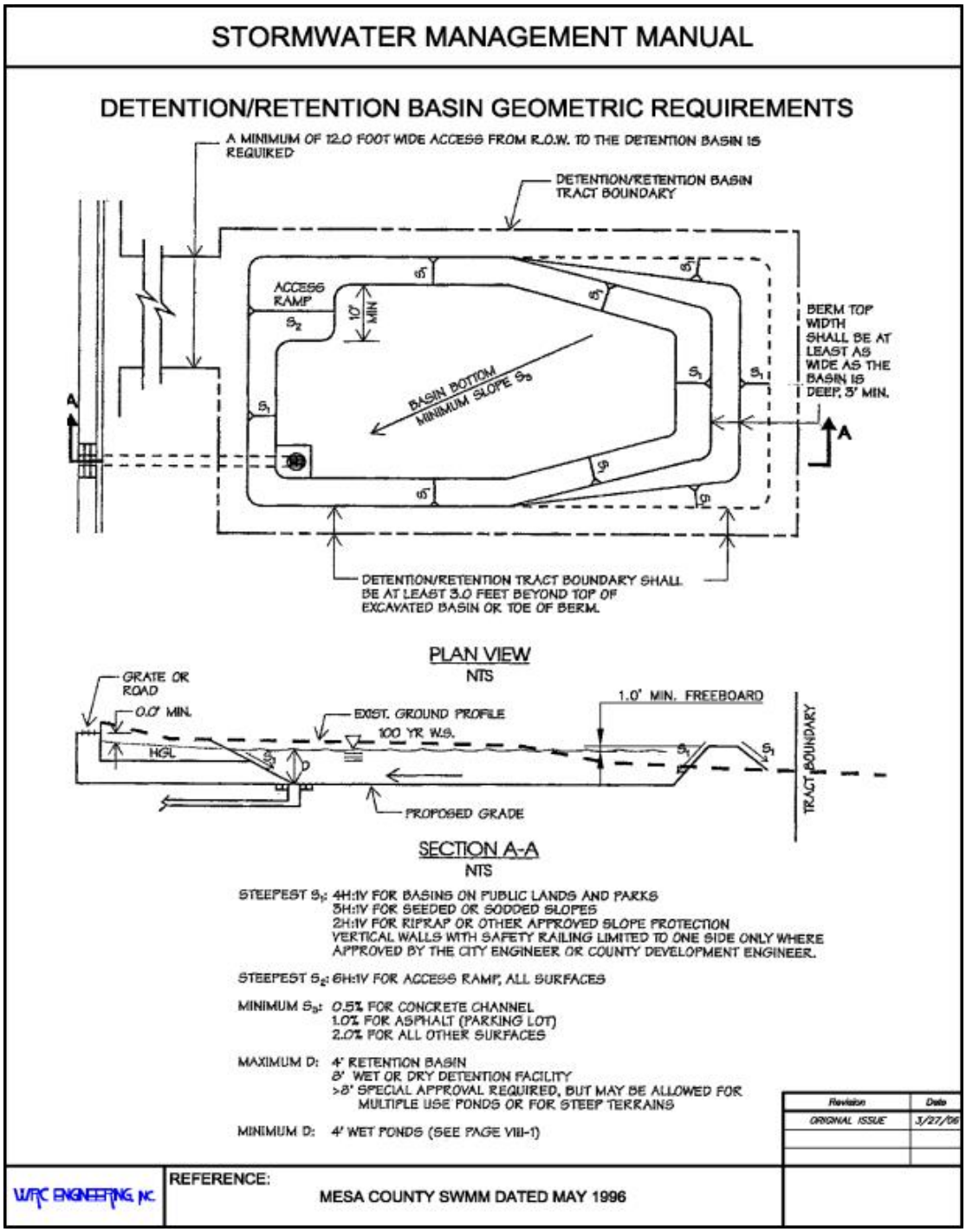


FIGURE 28.56.100

(Res. 40-08 (§ 1406.2), 3-19-08)

§ 28.56.110. Dry basin bottom drainage.

Most drainage conveyance systems are designed to divert even minor nuisance flows to stormwater storage facilities. For dry basins, this can present an aesthetic and maintenance problem. Conveyance facilities to a dry basin shall be capable of transporting flow to the outlet facility rather than causing a soggy bog condition that cannot be properly maintained. Facilities conveying trickle or nuisance flows, such as from irrigation sprinklers, shall be adequate to convey at least 0.5 cfs. Reference is made to Figures 28.56.110(a) and 28.56.110(b).

The outlet facility for a retention basin would be a dry well or riprap filled dissipation pit. For a detention basin, the nuisance flows shall be conveyed to the basin outlet.

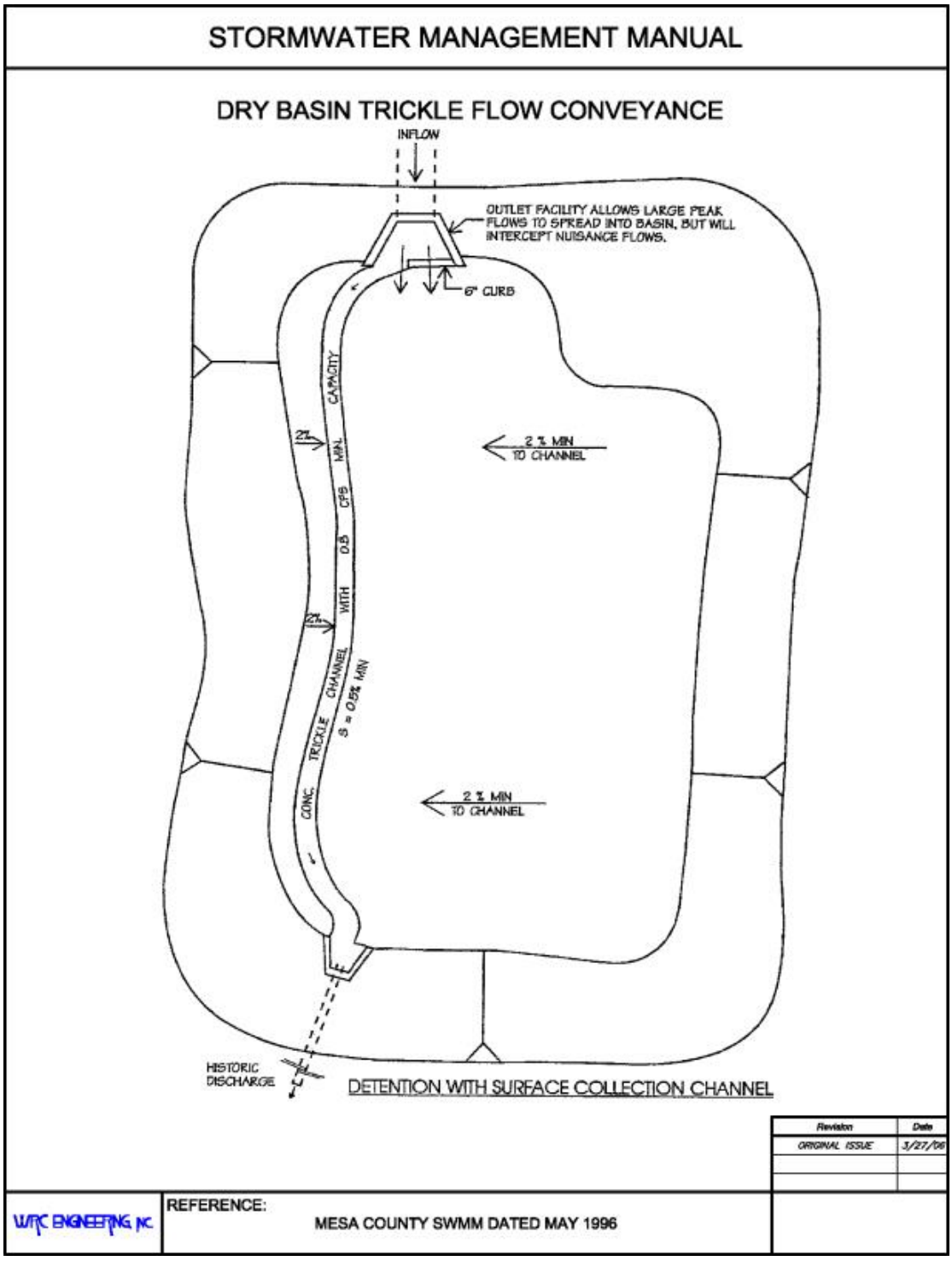


FIGURE 28.56.110(a)

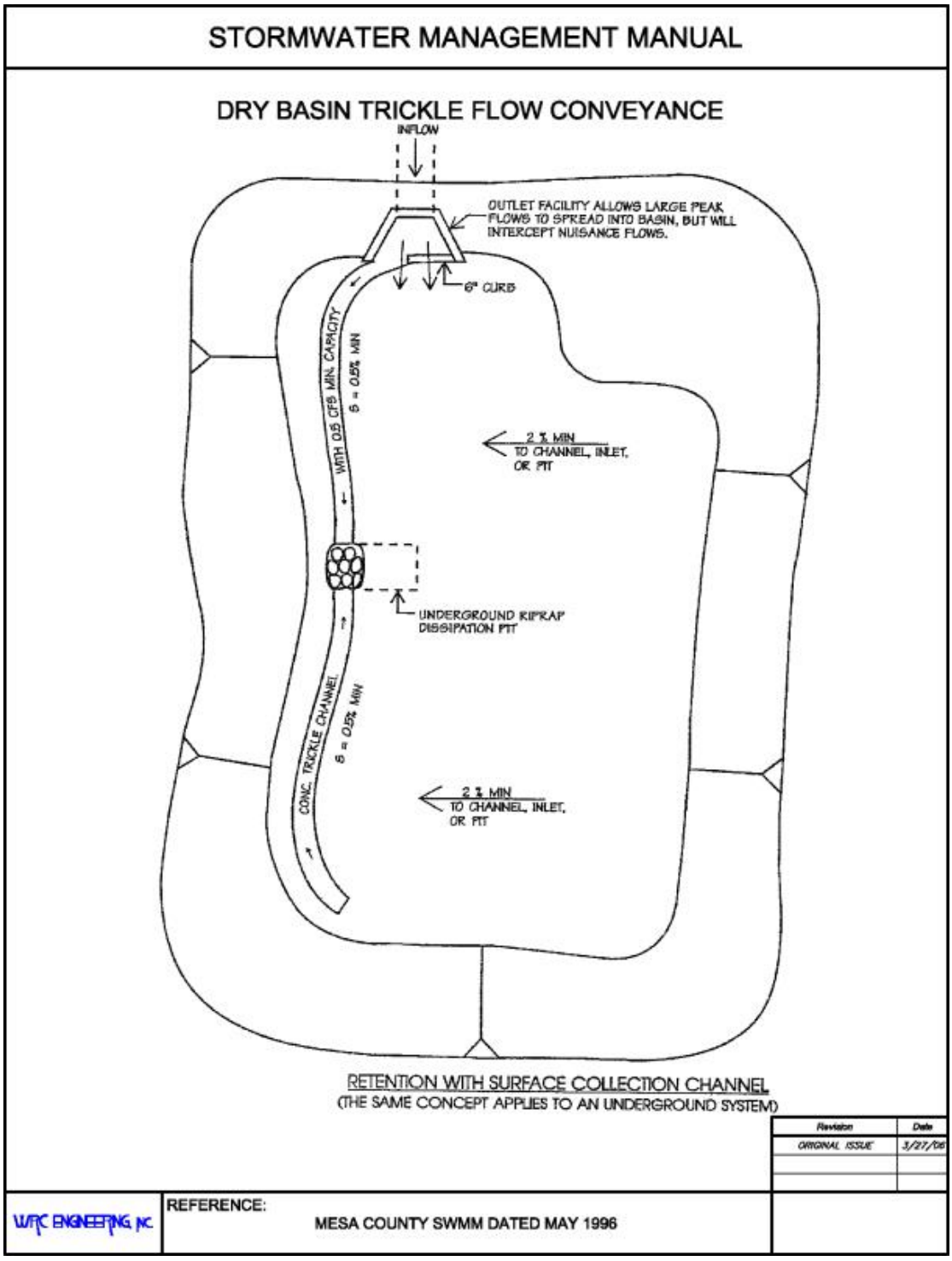


FIGURE 28.56.110(b)

(Res. 40-08 (§ 1406.3), 3-19-08)

§ 28.56.120. Accessibility and maintenance.

All reservoirs or ponds which serve more than a single lot or site must be provided with a detention/retention tract dedicated for maintenance access. Maintenance of required volume and inflow and outflow works is necessary for the facility to function as required. Dedicated rights-of-way and/or easements must be provided as required in GJMC § 28.16.020(b).

(Res. 40-08 (§ 1406.4), 3-19-08)

§ 28.56.130. Calculating storage volume available.

Storage volume shall be calculated by the methods shown prescribed in Figure 28.56.130.

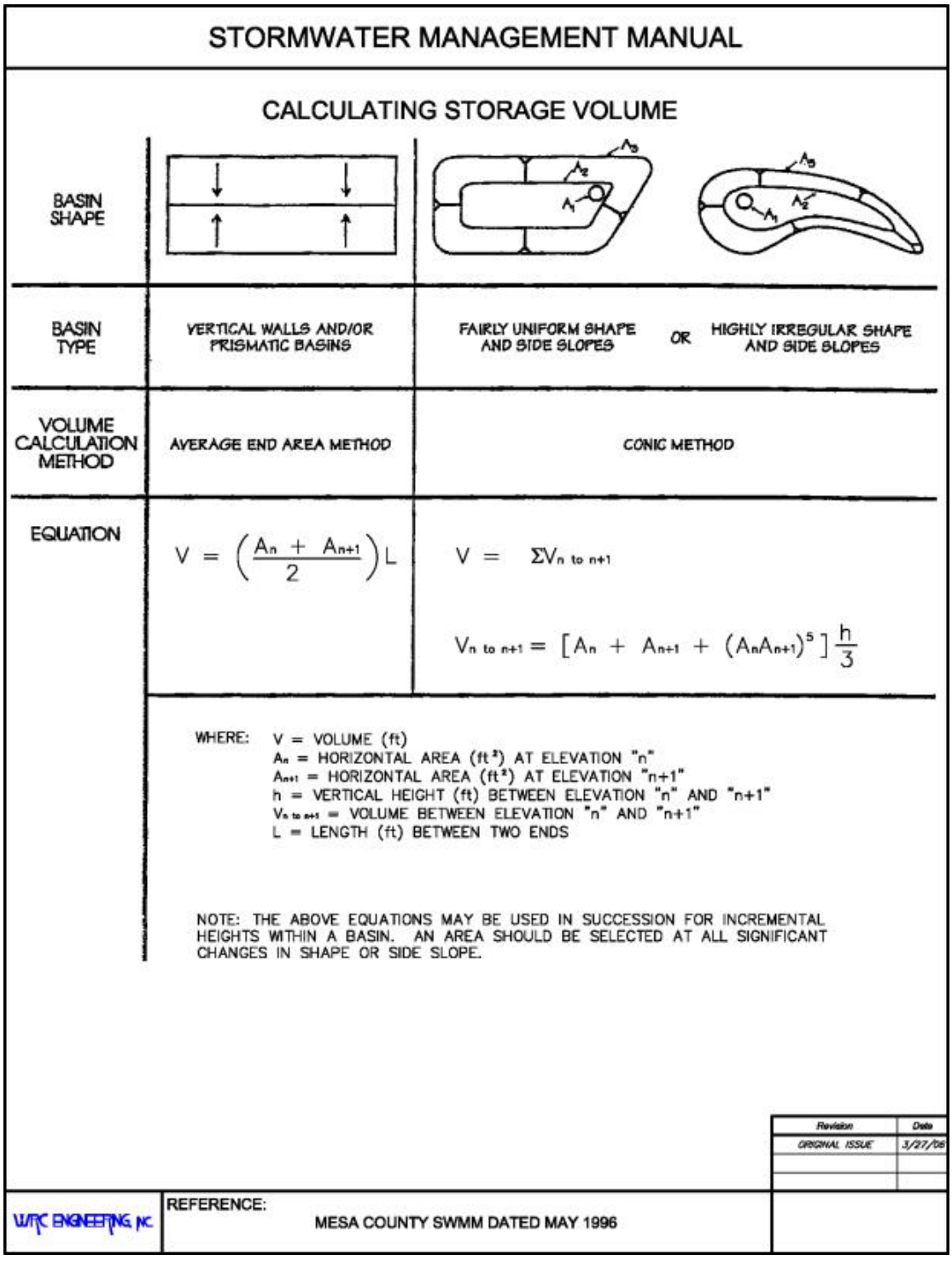


FIGURE 28.56.130

(Res. 40-08 (§ 1406.5), 3-19-08)

§ 28.56.140. Groundcover and landscaping.

After final grading, the slopes and bottom of each detention and retention basin shall be protected from erosion by seeding and mulching, sodding or other approved groundcover and shall be in accordance with jurisdictional specifications.

The planting of trees and shrubs on the slopes of stormwater basins is also encouraged. Temporary and/or permanent irrigation systems shall be provided as required for the type of groundcover and landscape installed and approved.

(Res. 40-08 (§ 1406.6), 3-19-08)

§ 28.56.150. Freeboard requirements.

The minimum required freeboard for open space detention/retention facilities is 1.0 foot above the computed 100-year water surface elevation.

(Res. 40-08 (§ 1406.7), 3-19-08)

§ 28.56.160. State Engineer's Office.

Any dam constructed for the purpose of storing water, with a surface area, volume, or dam height as specified in § 37-87-105, C.R.S., as amended, shall require the approval of the plans by the State Engineer's Office. All detention and retention storage areas shall be designed and constructed in accordance with these criteria. Those facilities subject to State statutes shall be designed and constructed in accordance with the criteria of the State.

(Res. 40-08 (§ 1406.8), 3-19-08)

§ 28.56.170. Embankment protection.

Whenever a detention pond uses an embankment to contain water, the embankment shall be protected from catastrophic failure due to overtopping. Overtopping can occur when the pond outlets become obstructed or when a larger than 100-year storm occurs. Failure protection for the embankment may be provided in the form of a buried heavy riprap layer on the entire downstream face of the embankment or a separate emergency spillway having a minimum capacity of twice the maximum release rate for the 100-year storm. Structures shall not be permitted in the path of the emergency spillway or overflow. The invert of the emergency spillway shall be set equal to or above the 100-year water surface elevation.

(Res. 40-08 (§ 1406.9), 3-19-08)

§ 28.56.180. Inlet and outlet design.

The outlet from the detention basin shall consist of a short (maximum 25 feet) length(s) of CAP or RCP with an 18-inch minimum diameter. Multiple pipe outlets may be required to control different design frequencies. The invert of the lowest outlet pipe shall be set at the lowest point in the detention pond or at the top of the minimum pool, if present. The outlet pipe(s) shall discharge into a standard manhole or into a drainageway with proper erosion protection for the proposed structure. If an orifice plate is required to control the release rates,

the plate(s) shall be hinged to open into the detention pipes to facilitate back flushing of the outlet pipe(s).

Inlet to the detention pipes can be by way of surface inlets and/or by a local private storm sewer system.

(Res. 40-08 (§ 1406.10), 3-19-08)

§ 28.56.190. Off-site flows.

It is rarely the case that a new development comprises an entire drainage basin. Instead, developments are most often located within a larger drainage basin. This means that unless the new development is located at the very upstream edge of a drainage basin, it will most likely receive sheet flow, if not concentrated flow, from off-site areas. Developers must look not only at the new development but also at the surrounding topography to determine just how much off-site area drains to the new development site.

For drainage design of new developments, there are two considerations for accommodating off-site storm runoff. These are peak runoff rates from off-site areas and routing of off-site storm runoff relative to the new development.

(a) Peak Storm Runoff Rates.

(1) Undeveloped Off-Site Areas. Runoff rates from off-site areas that are undeveloped but have a comprehensive development plan (comp plan) in place will be calculated using imperviousness values in Table 28.28.020 for the land use or surface characteristic specified by the comp plan. Runoff rates from off-site areas that are undeveloped and do not have a comp plan in place will be calculated using an imperviousness of 45 percent as specified in Table 28.28.020 (or as specified by the local jurisdiction).

(2) Developed Off-Site Areas. Runoff rates from off-site areas that are developed should be determined by calculating the actual imperviousness of the area using approved drainage reports, aerial photography, and field investigations. If this information is not available, imperviousness shall be determined based on general land use or surface characteristic as shown in Table 28.28.020.

The reduction of peak runoff rates from detention shall only be assumed for developments that are confirmed to have detention facilities and shall be subject to approval by the local jurisdiction. The discharge rates from these detention facilities shall be assumed to be those rates approved in the final drainage report for each off-site upstream area having detention facilities.

(b) Routing of Off-Site Storm Runoff. There are two methods by which off-site flows can be routed relative to the new development. These are routing around the new development and routing through the new development.

(1) Routing Around the New Development. Ideally the new development will be graded so off-site storm runoff is routed around the development based on peak rates determined in subsection (a) of this section. If this method is chosen, off-site flows must be routed to their historic path immediately downstream of the new

development. Concentrated flows draining to the development should be maintained as concentrated flows downstream of the development and sheet flows should be maintained as sheet flow.

(2) Routing Through the New Development. If the site cannot be graded to accommodate rerouting off-site flows, the development's detention pond must be sized to account for any off-site flow that comes into the new development and drains to the new detention pond. It is possible that routing off-site runoff through the new detention pond will significantly alter the volume and outlet requirements of the new detention pond.

The effects of routing storm runoff from off-site areas through the new detention pond shall be determined by hydrograph routing methods. A hydrograph of the off-site area, assuming ultimate development conditions without detention, shall be generated to achieve a total volume of runoff. The developed condition hydrograph shall then be truncated at the allowable release rate and extended in time such that the total runoff volume is the same. This modified hydrograph is a reasonable representation of the ultimate development runoff that is routed through a detention pond within the off-site development.

The modified off-site hydrograph is then added to the developed conditions hydrograph for the new development (assuming no on-site detention). This composite hydrograph shall then be routed through the new detention pond to verify that the release rates from the new detention pond meet allowable release rates. In this instance, the allowable release rate is the sum of the allowable release rates from both the off-site area and the new development. The design of the detention pond may require iteration on the detention volume and outlet configuration to achieve the required results.

(Res. 40-08 (§ 1406.11), 3-19-08)

§ 28.56.200. Retention.

Retention will only be considered on a case-by-case basis with the following minimum requirements:

(a) Retention basins must drain within 48 hours of all storm events up to the 100-year storm event, beginning either at the start of the storm or when runoff first reaches the basin. Total runoff volume shall be determined by calculating imperviousness then converting this to a curve number (CN) following the procedures in Chapter 28.28 GJMC. Using the CN, excess precipitation for the design storm is determined using procedures described in GJMC § 28.28.070. The design storm shall be the 24-hour precipitation amount of 2.01 inches multiplied by a factor of 1.5.

(b) The design of the retention basin must be supported by vertical hydraulic conductivity data for subsurface soil and/or rock obtained via an appropriate engineering test such as a tri-axial cell test, a permeameter test, or a vertical conductivity aquifer test conducted by a qualified geotechnical engineer familiar with the Mesa County soils and geology. Test data shall then be used in an appropriate calculation to determine the required size of the retention basin and the time required for complete infiltration of the 100-year

storm event. One of the following models shall be used to demonstrate the design meets all criteria:

(1) Hydrus-2D (U.S. Dept. of Agriculture, Agricultural Research Service).

(2) SEEP/W (GeoSlope International, Inc.).

(3) Equivalent model (upon approval of local jurisdiction).

(c) When using vertical hydraulic conductivity data in these calculations, a saturated K-value shall only be used when it has been demonstrated that the infiltration media over the entire length of the infiltration path are saturated. If the infiltration path is characterized by unsaturated conditions, a partially saturated K-value shall be used for infiltration calculations.

(d) Measures that minimize sediment from entering and clogging the pond surface shall be implemented. These include pre-sediment basins and/or frequent sediment removal. Depth of storage shall be minimized and surface area shall be maximized for infiltration purposes. The wetted sides of the pond shall not be included in the area used to calculate infiltration releases.

(e) An emergency overflow from the retention area shall be provided with a minimum capacity of the 100-year peak inflow rate. The overflow path shall be carefully selected and analyzed for capacity and downstream impact. The overflow shall be located at the maximum retention volume water surface. A minimum of 1.0 foot of freeboard shall be provided above the maximum retention volume water surface.

(f) An operation maintenance plan shall be developed and be part of the development agreement that includes monitoring and reporting requirements and penalties for noncompliance. This plan may include pumping to meet the drain time requirements and should consider that there may be power outages during a major storm.

(Res. 40-08 (§ 1406.12), 3-19-08)

§ 28.56.210. Hydrologic design methods and criteria.

The hydrologic design of detention facilities is based on the type of facility (regional vs. local) and the method used to estimate the runoff (HEC-1 vs. the rational method). If HEC-1 is used, a full hydrograph is available for traditional storage routing. If the rational method is used, only a peak flow rate is available. GJMC § 28.52.220 through 28.56.250 discuss the procedures for these two methods. Note that the procedures used to calculate storm runoff are described in Chapter 28.28 GJMC.

(Res. 40-08 (§ 1407), 3-19-08)

§ 28.56.220. HEC-1 method.

The HEC-1 method may be used to develop inflow hydrographs for hydrologic basins of any size, and may be used for both local and regional facilities. The inflow hydrographs shall be based on ultimate development conditions.

This program can calculate a hydrograph for any location in the hydrologic basin. The data input file must be structured so that the proposed detention basin site is a hydrograph-routing or hydrograph-combining point.

(a) Detention Basin Outflow Limitations. The controlled outlet capacity has direct influence on the required size of the basin. The outflow limitation can be based on either the existing undeveloped peak flow from the hydrologic basin or on limitations in the capacity of the downstream conveyance system (based on a hydrologic analysis of local conditions). The outflow limitation for local facilities is stated in GJMC § 28.16.090. The design maximum outlet capacity of a regional facility must be coordinated with the local jurisdiction.

(b) Hydrologic Calculation Method. After the inflow hydrograph has been calculated and the outflow limits have been determined, the required storage volume can be estimated. Separate methods for calculating required storage are used depending on the method used to estimate the inflow hydrograph.

In order to calculate the required storage volume at a particular detention basin site, the following information must be available or prepared:

(1) Inflow hydrograph;

(2) Outlet capacity limitation;

(3) Proposed outlet discharge versus elevation data for the proposed basin site;

(4) Proposed storage vs. elevation data for the proposed basin site;

(5) Proposed drain time for the proposed basin site.

(c) The HEC-1 computer program can be used to determine the required storage volume and outflow limitation based on a reservoir routing procedure. Initial estimates of outlet size are made and the program is run. The output is reviewed and changes are made to the outlet configuration as needed until the desired degree of flood peak attenuation and acceptable drain time is achieved.

(Res. 40-08 (§ 1407.1), 3-19-08)

§ 28.56.230. Rational method.

The minimum required volume shall be determined using the HEC-1 method or the following equations. These empirical equations were developed as part of the UDFCD hydrology research program and modified to reflect rainfall conditions in Mesa County. The equations are based on a computer modeling study and represent average conditions.

One of the most difficult aspects of storm drainage is obtaining consistent results between various methods for estimating detention requirements. These equations provide consistent and more effective approaches to the sizing of on-site detention ponds. The equations presented in this section may be used for hydrologic basins with a total area of less than 160 acres, per the rational method restrictions set forth in GJMC § 28.28.100(c). The use of these

equations in the design of regional detention facilities must be approved by Mesa County or the applicable local jurisdiction.

(a) Minimum Detention Volumes.

$$V = KA \quad (28.56\text{-}2)$$

For the 100-year,

$$K_{100} = (1.78P - 0.002P^2 - 3.56)(X_{100}/900) \quad (28.56\text{-}4)$$

For the 10-year,

$$K_{10} = (0.95P - 1.90)(X_{10}/1{,}000) \quad (28.56\text{-}6)$$

Where:

V = required volume for the 100- or 10-year storm (acre-feet)
P = Developed basin imperviousness (percent)
A = Tributary area (acres)
X = Mesa County and the other local jurisdictions adjustment factor per Table 28.56.230(a)

Table 28.56.230(a): Detention – Volume Adjustment Factor

Ultimate Development Percent Imperviousness	X_{100}	X_{10}
< 50%	0.42	0.26
≥ 50%	0.48	0.38

(b) Allowable Release Rates. The maximum release rates at the ponding depths corresponding to the 10- and 100-year volumes are as follows:

Table 28.56.230(b): Allowable Release Rates for Detention Ponds (cfs/acre)

Control Frequency	Soil Group		
	A	B	C
10-year	0.05	0.09	0.12
100-year	0.25	0.43	0.5

The predominant soil group for the total basin area tributary to the detention pond shall be used for determining the allowable release rate. Information on the soils in Mesa County can be found in published SCS soil surveys.

(Res. 40-08 (§ 1407.2), 3-19-08)

§ 28.56.240. Compensating detention analysis.

(a) If any storm runoff will be discharged from the property without first being routed through a detention pond, on-site detention facilities are to be designed using the compensating detention procedure. The total of all undetained area shall not exceed five percent or 5,000 square feet, whichever is less.

(b) Compensating detention is based on the following assumptions:

(1) The 10- and 100-year peak discharge from the property from detained and undetained area when added together will be no greater than allowable discharge. Therefore, the more undetained release of storm runoff from the site, the less the detention pond is permitted to release, which requires proportionally larger detention volume.

(2) Regardless of the method used, the volume of the detention pond must be adjusted to result in reduced discharge rates. For the HEC-1 method, the detention volume is determined using actual runoff hydrographs and storage routing based on the outlet configuration. For the rational method, the increase in volume is accomplished by simply computing the volume based on the entire property area, not just the area tributary to the detention pond. This is a reasonable assumption given the five percent area or 5,000 square feet size limitation on undetained area.

(c) The compensating detention procedure is given in six steps below. The following procedure applies to both the HEC-1 and rational method methods for determining detention volumes, except as specifically noted otherwise.

(1) Step 1. If the undetained area is less than five percent of the total project area or 5,000 square feet, whichever is less, continue. If not, then the undetained area must either be reduced in size or the site layout revised to be in compliance with the SWMM.

(2) Step 2. Determine the allowable release rate for the 10- and 100-year flood events based on the pre-project site conditions using the entire site area. See Table 28.56.230(b).

(3) Step 3. Determine the post-project runoff rates for the 10- and 100-year floods for the undetained area only.

(4) Step 4. Determine the adjusted allowable release rates by subtracting the runoff rates from the post-project, undetained area from the allowable release rates in Step 2.

(5) Step 5. Determine minimum required 100-year and 10-year storage volumes for the area tributary to the detention pond. If using the rational method, the storage volume is determined using the equations in GJMC § 28.56.230 based on the entire project area, not just the area tributary to the detention pond.

(6) Step 6. Determine the final outlet configuration that results in the adjusted allowable release rates at the computed detention volumes for the entire site.

(Res. 40-08 (§ 1407.3), 3-19-08)

§ 28.56.250. Over-detention analysis.

Over-detention is defined as detaining developed conditions peak flows to the point that release rates are lower than pre-developed conditions. Over-detention is sometimes required to meet capacity limitations of downstream drainage facilities. Specific over-detention requirements are identified in basin-wide or watershed master plans or by the local jurisdiction within which the detention pond is proposed.

Over-detention requirements are unique for each basin or watershed and are often based on a detailed hydrologic investigation using hydrograph methods to generate peak flows and route the flows through the drainage system. Simplified detention volume and release rate methods are not appropriate, and over-detention volume and release rate requirements shall be determined using a hydrograph analysis in accordance with the SWMM requirements.

(Res. 40-08 (§ 1407.4), 3-19-08)

§ 28.56.260. Hydraulic design of outlet works.

Hydraulic design data for sizing of detention facilities outlet works is as follows:

(a) Weir Flow. The general form of the equation for horizontal crested weirs is:

$$Q = CL(H)^{3/2} \quad (28.56\text{-}5)$$

Where:

Q	=	discharge (cfs)
C	=	weir coefficient (see Table 28.56.260)
L	=	horizontal length (feet)
H	=	total energy head (feet)

Another common weir is the v-notch, whose equation is as follows:

$$Q = 2.5 \tan(\Theta/2)H5/2 \quad (28.56\text{-}6)$$

Where:

θ	=	angle of the notch at the apex (degrees)

When designing or evaluating weir flow, the effects of submergence must be considered. A single check on submergence can be made by comparing the tailwater to the headwater depth. The example calculation for a weir design on Figure 28.56.100 illustrates the submergence check.

(b) Orifice Flow. The equation governing the orifice opening and plate is the orifice flow equation:

$$Q = C_d A (2gh)^{1/2} \quad (28.56\text{-}7)$$

Where:

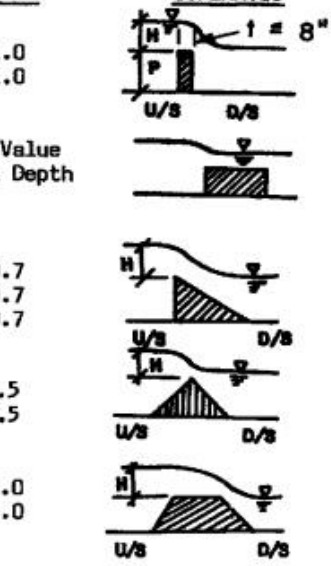
Q	=	Flow (cfs)
C_d	=	Orifice coefficient
A	=	Area ($ft.^2$)
g	=	Gravitational constant = 32.2 $ft./sec^2$
h	=	Head on orifice measured from center of the opening (ft.)

An orifice coefficient (C_d) value of 0.65 shall be used for sizing of squared edged orifice openings and plates.

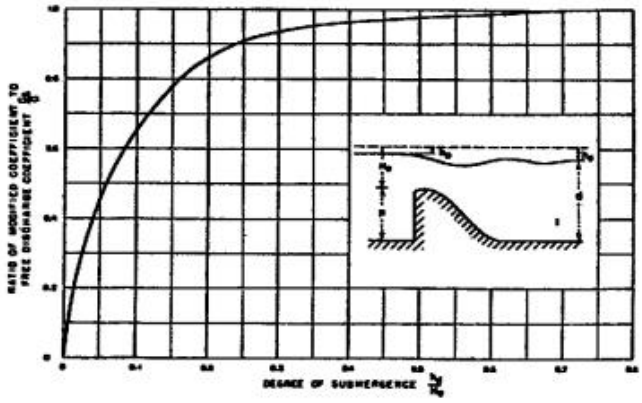
STORMWATER MANAGEMENT MANUAL

WEIR FLOW COEFFICIENTS

SHAPE	COEFFICIENT	COMMENTS	SCHEMATIC
Sharp Crested	-		
Projection Ratio (H/P = 0.4)	3.4	H< 1.0	
Projection Ratio (H/P = 2.0)	4.0	H> 1.0	
Broad Crested			
W/Sharp U/S Corner	2.6	Minimum Value	
W/Rounded U/S Corner	3.1	Critical Depth	
Triangular Section	-		
A) Vertical U/S Slope	-		
1:1 D/S Slope	3.8	H>0.7	
4:1 D/S Slope	3.2	H>0.7	
10:1 D/S Slope	2.9	H>0.7	
B) 1:1 U/S Slope	-		
1:1 D/S Slope	3.8	H>0.5	
3:1 D/S Slope	3.5	H>0.5	
Trapezoidal Section			
1:1 U/S Slope, 2:1 D/S Slope	3.4	H>1.0	
2:1 U/S Slope, 2:1 D/S Slope	3.4	H>1.0	
Road Crossings			
Gravel	3.0	H>1.0	
Paved	3.1	H>1.0	



ADJUSTMENTS FOR TAILWATER



Revision	Date
ORIGINAL ISSUE	3/27/08

WRC ENGINEERING INC.

REFERENCE: KING & BRATER, HANDBOOK OF HYDRAULICS, 1963
DESIGN OF SMALL DAMS, USBR, 1977

TABLE 28.56.260

(Res. 40-08 (§ 1408), 3-19-08)

Chapter 28.60

Construction Site Stormwater Runoff Control

§ 28.60.010. Introduction.

All persons engaged in land disturbance for new development, disturbing 1.0 acres or more, or development disturbing less than 1.0 acres that is part of a larger common plan of development or sale, shall implement the following measures to prevent the discharge of pollutants to the stormwater system to the maximum extent practicable:

(a) Obtain a permit from the Water Quality Control Division (WQCD) for Stormwater Discharges Associated with Construction Activity, called "stormwater construction permit." A condition of the permit requires the preparation and implementation of a stormwater management plan (SWMP) to control the discharge of pollutants resulting from construction activity.

Information required by the WQCD for a stormwater management plan is included in this chapter and shall be referred to as the "construction SWMP." The construction SWMP must include appendices with the WQCD permit application, text and graphics identifying erosion control measures to be implemented during construction, and be certified by a qualified erosion control specialist.

Exemptions to the requirement for a SWMP for projects that disturb less than five acres may be granted by the WQCD when the rainfall erosivity factor (R-factor) is less than a value of five. See website at:

http://www.cdphe.state.co.us/wq/PermitsUnit/wqcdpmt.html

However, the exemptions do not relieve the owner/operator from meeting discharge limitations described in GJMC § 28.60.030(a).

(b) For development within the designated urbanized area of unincorporated Mesa County (see Figure 28.16.110), obtain a Mesa County stormwater construction permit. Application for the Mesa County stormwater construction permit may be submitted concurrent with the application for the WQCD stormwater construction permit, but the WQCD permit must be received by the County before approval of the County permit. Within the City of Fruita and the Town of Palisade, contact the Engineering or Planning Department for requirements.

(c) For development within the City of Grand Junction, obtain a Grand Junction stormwater construction permit. Application for the Grand Junction stormwater construction permit may be submitted concurrent with the application for the WQCD stormwater construction permit, but the WQCD permit must be received by the City of Grand Junction before approval of the Grand Junction permit. Development within the City of Grand Junction does not need a Mesa County permit.

(d) Provide measures to control erosion and sedimentation within the on-site major drainageway(s), in accordance with Chapter 28.32 GJMC, Open Channels.

(e) Implement post-construction BMPs to control the discharge of pollutants after construction is completed, in accordance with Chapter 28.64 GJMC, Post-Construction Stormwater Management.

(Res. 40-08 (§ 1501), 3-19-08)

§ 28.60.020. Colorado discharge permit.

(a) Stormwater Discharge Permit. The Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment (CDPHE) has direction and authority to administer the Federal stormwater permit program (i.e., NPDES Phase I and Phase II) as part of the Colorado Water Quality Control Act (§ 25-8-101, C.R.S. et seq.). The terms and conditions of the permit have set forth minimum requirements for stormwater management programs for municipalities that address water quality from significant development or redevelopment, from construction sites and from other activities. Programs include:

(1) Public Education and Outreach on Stormwater Impacts. Prepare and distribute education materials to the community or conduct outreach activities about impacts of stormwater discharges on water bodies.

(2) Public Involvement/Participation. Conduct and document public meetings related to implementation of the stormwater management programs.

(3) Illicit Discharge Detection and Elimination. Detect and prohibit illicit discharges through regulatory measures.

(4) Construction Sites Stormwater Runoff Control. Develop, implement, and enforce a program to reduce pollutants in any stormwater runoff to the MS4 from construction activities that result in a land disturbance of greater than or equal to 1.0 acres. This permit condition is the basis for requirements identified in this chapter of the manual.

(5) Post-Construction Stormwater Management in New Development and Redevelopment. Develop, implement, and enforce a program to reduce pollutants in any stormwater runoff to the MS4 from all new development and significant redevelopment. This permit condition is the basis for requirements identified in Chapter 28.64 GJMC.

(6) Pollution Prevention/Good Housekeeping for Municipal Operations. Develop and implement an operation and maintenance program that includes an employee training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations.

Additional information can be found at the CDPHE website address:
http://www.cdphe.state.co.us/cdphehom.asp

(b) Mesa County Permittees. Mesa County, the City of Grand Junction, the Grand Junction Drainage District, and the Town of Palisade, who are members of the 5-2-1 Drainage Authority, each have obtained a permit to discharge stormwater under the Colorado Discharge Permit System (CDPS, COR-090031, COR-090077, COR-090006, and COR-090005, respectively). Other jurisdictions within Mesa County may be subject to

these regulations in the future and the manual user is encouraged to contact their local jurisdiction for more information.

(c) Stormwater Management Manual. Information presented in this manual meets, in part, requirements for the following programs: Illicit Discharge Detection and Elimination, Construction Sites Stormwater Runoff Control, and Post-Construction Stormwater Management in New Development and Redevelopment. The CDPS Phase II Stormwater Discharge Permit includes requirements for MS4s to control erosion and sedimentation from construction activities and has identified:

(1) Procedures for site planning.

(2) Requirements for selection, implementation, installation and maintenance of best management practices (BMPs).

(3) Procedures for site inspection and enforcement.

Requirements and procedures for these items are addressed by this manual.

(Res. 40-08 (§ 1502), 3-19-08)

§ 28.60.030. Standards and requirements – Stormwater discharge limitations.

All stormwater discharges from construction sites disturbing 1.0 acres or more shall meet the following standards:

(a) Stormwater discharges from construction activities shall not cause, have the reasonable potential to cause, or measurably contribute to an exceedance of any water quality standard, including narrative standards for water quality.

(b) Concrete wash water shall not be discharged to State waters or to storm sewer systems. On-site permanent disposal of concrete washout waste is not authorized. Discharge to the ground of concrete washout waste that will subsequently be disposed of off-site is authorized.

Discharges to the ground of concrete washout water from washing of tools and concrete mixer chutes may be authorized; provided, that:

(1) The source is identified in the construction SWMP;

(2) BMPs are included in the construction SWMP to prevent pollution of groundwater; and

(3) These discharges do not leave the site as surface runoff or to surface waters.

(c) Bulk storage structures for petroleum products and other chemicals shall have adequate protection so as to contain all spills and prevent any spilled material from entering State waters.

(d) All site wastes must be removed from the site for disposal in licensed disposal facilities. No building material wastes or unused building materials shall be buried, dumped, or discharged at the site. All site wastes must be properly managed to prevent potential pollution of State waters.

(e) Off-site vehicle tracking of sediments shall be minimized.

(f) Land disturbances shall be conducted in a manner to effectively reduce accelerated soil erosion and sedimentation.

(g) Discharges to the ground of water from construction dewatering activities may be authorized; provided, that:

(1) The source is groundwater and/or groundwater combined with stormwater that does not contain pollutants in concentrations exceeding the State groundwater standards in Regulations 5 CCR 1002-41 and 42;

(2) The source is identified in the construction SWMP;

(3) BMPs are included in the construction SWMP; and

(4) These discharges do not leave the site as surface runoff or to surface waters.

(Res. 40-08 (§ 1503.1), 3-19-08)

§ 28.60.040. Standards and requirements – Minimum BMP requirements.

The stormwater management plan (SWMP) prepared for the WQCD as a condition of the stormwater construction permit shall include as a minimum both structural and nonstructural measures. Facilities must select, install, implement, and maintain appropriate BMPs following good engineering, hydrologic and pollution control practices. BMPs implemented at the site must be adequately designed to provide control for all potential pollutant sources associated with construction activity to prevent pollution or degradation of State waters. The primary goal of the construction SWMP is to reduce erosion at the source, followed by trapping eroded materials before they leave the site. The construction SWMP shall include, as a minimum, the following (see GJMC § 28.60.110 for detailed construction SWMP requirements):

(a) BMPs are required to control erosion at the source, such as those that stabilize earth disturbances with vegetation or mulch after grading is substantially complete on any portion of the site not otherwise permanently stabilized. Typical examples include surface roughening (Symbol SR, Figure 28.60.040(a)), mulching (Symbol MU, Figure 28.60.040(b)) and vehicle tracking control (Symbol VTC, Figure 28.60.040(c)). Other control methods not shown include installation of blankets, straw wattles, tackifiers, netting, and matting.

(b) BMPs are required to trap sediment before it leaves the site or enters the municipal storm sewer system, whichever comes first. Such BMPs shall be installed prior to initiating earth disturbances. Typical examples include check dams (Symbol CD, Figure 28.60.040(d)), inlet protection (Symbol IP, Figure 28.60.040(e)), sediment basin (Symbol SB, Figure 28.60.040(f)), and silt fence (Symbol SF, Figure 28.60.040(g)).

(c) BMPs are required to prevent spills of petroleum products and other chemicals and contain storm runoff from construction wastes to a designated area, if applicable. See GJMC § 28.64.140, BMPs for industrial and commercial activities, for examples.

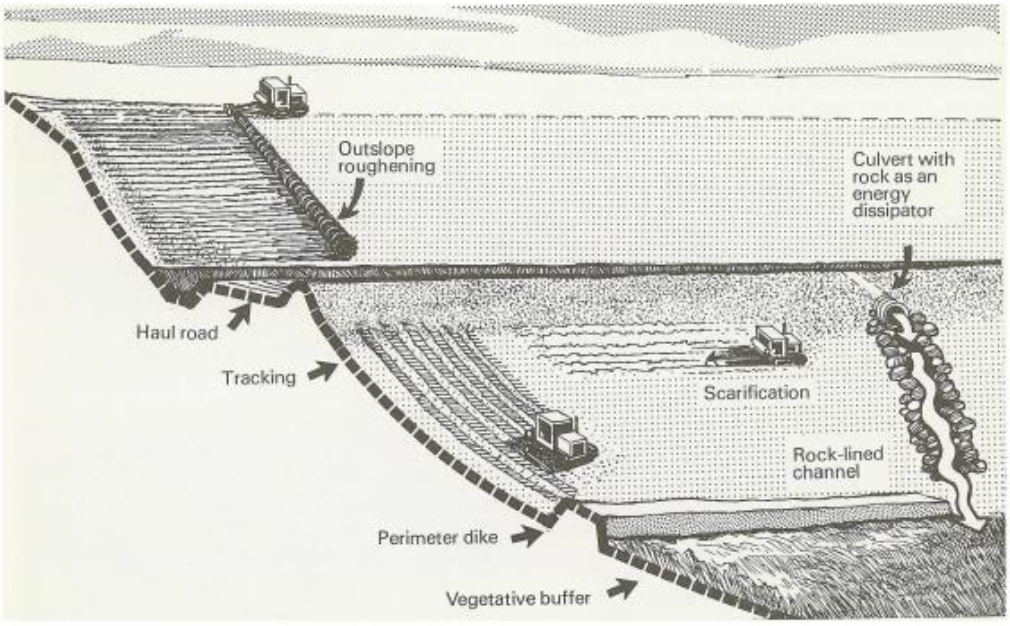
(d) Construction sequencing for all BMPs is required to reduce the duration a disturbed area is exposed. Temporary disturbed areas shall be exposed no longer than 30 days. Disturbed areas that are to be permanently stabilized shall be exposed no longer than seven days.

(e) BMPs are required to capture and retain runoff from equipment washing operations, such as cleaning of concrete trucks. See GJMC § 28.46.140, BMPs for industrial and commercial activities, for examples.

(f) Program and schedule for regular inspection and maintenance of BMPs.

STORMWATER MANAGEMENT MANUAL

SURFACE ROUGHENING



Notes:
1. Roughen soil surface with depressions from 2- to 4-inches deep and spaced 4- to 6-inches apart' using chisel or ripping equipment. For slopes 2:1 or greater, use track dozer working perpendicular to slope.
2. Roughen slope after final grading. Roughening of ridges and depressions shall follow along slope contours.
3. Additional treatments may be necessary.

Revision	Date
ORIGINAL ISSUE	3/27/06

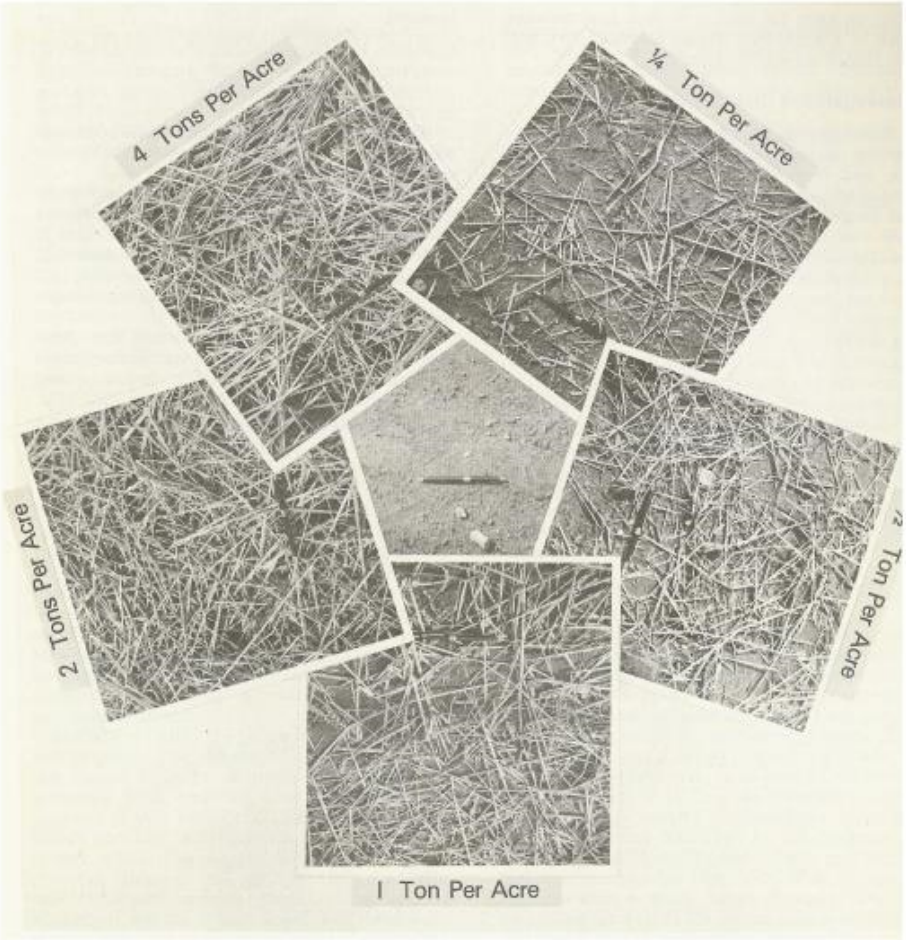
WRC ENGINEERING, INC.

REFERENCE: *EPA 1976. EROSION AND SEDIMENT CONTROL SURFACE MINING IN THE EASTERN U.S. PLANNING*

FIGURE 28.60.040(a)

STORMWATER MANAGEMENT MANUAL

MULCHING



1. All disturbed areas must be mulched or seeded and mulched within 14–days after final grade is reached on any portion of the site not otherwise permanently stabilized. All mulching and seeding must meet local jurisdiction requirements.
2. Mulch shall be clean, weed– and seed–free, long stemmed grass hay or cereal grain straw with 50% or more by weight being ten inches or greater.
3. Mulch shall be anchored by mechanical crimping, with tackifier, or with nets.
4. Hydraulic mulching limited to areas where slopes are steeper than 3:1 or access is too difficult.
5. Mulch shall be applied at a 1–ton per acre or greater rate.

Revision	Date
ORIGINAL ISSUE	3/27/96

WRC ENGINEERING INC.

REFERENCE: *EPA 1976. EROSION AND SEDIMENT CONTROL SURFACE MINING IN THE EASTERN U.S. PLANNING*

FIGURE 28.60.040(b)

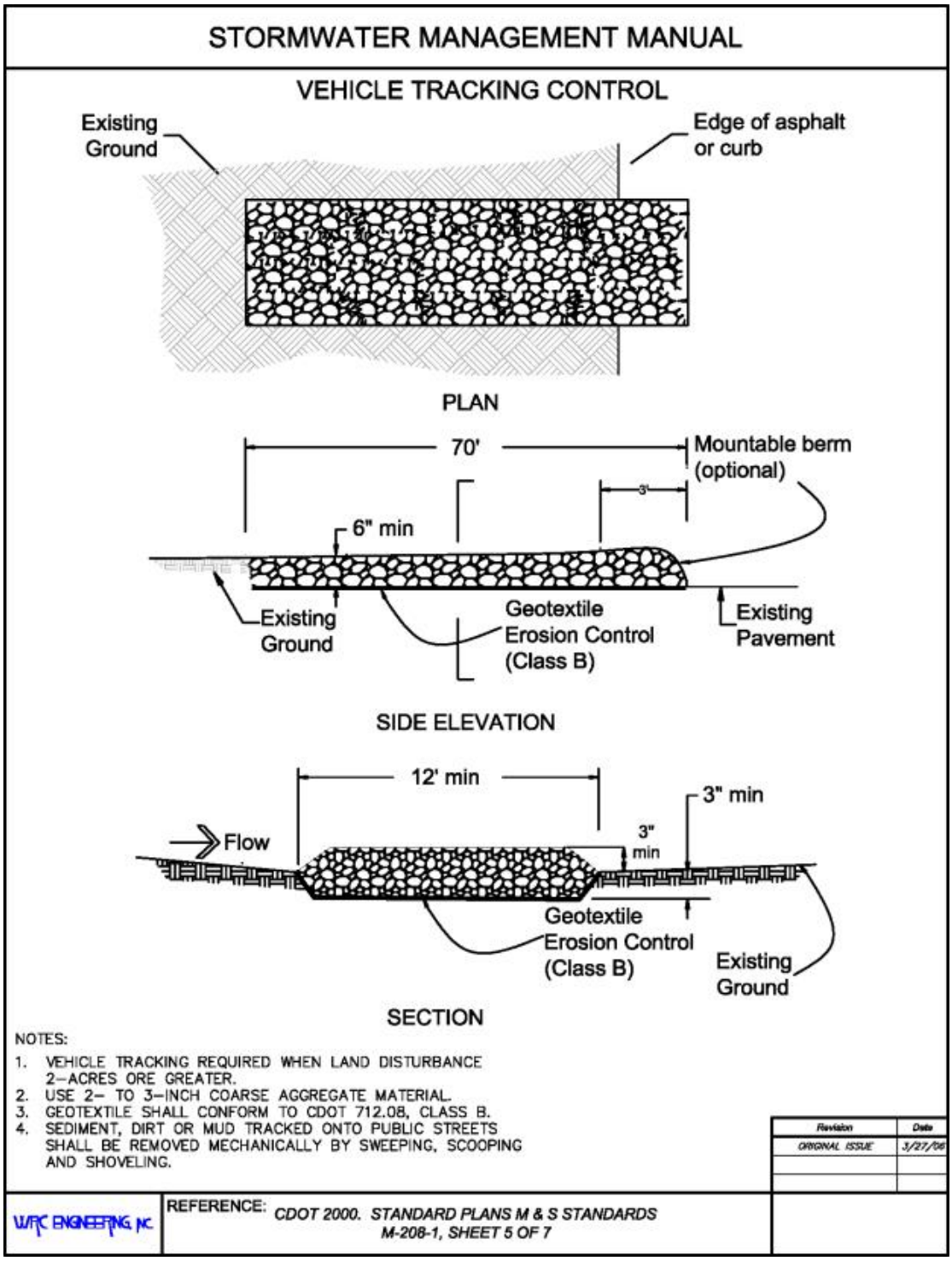
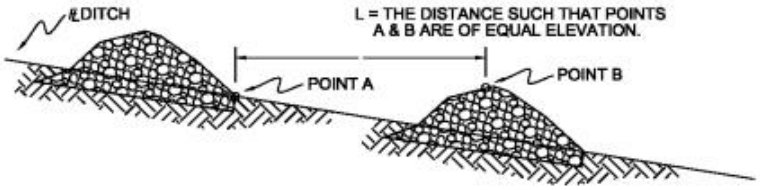


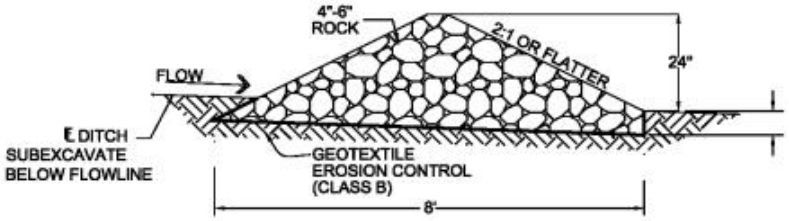
FIGURE 28.60.040(c)

STORMWATER MANAGEMENT MANUAL

CHECK DAM (RIPRAP)



PROFILE VIEW ALONG DITCH FLOWLINE



PROFILE

RIPRAP CHECK DAM

Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING, INC.

REFERENCE: CDOT 2000. STANDARD PLANS M & S STANDARDS M-208-1, SHEET 4 OF 7

FIGURE 28.60.040(d)

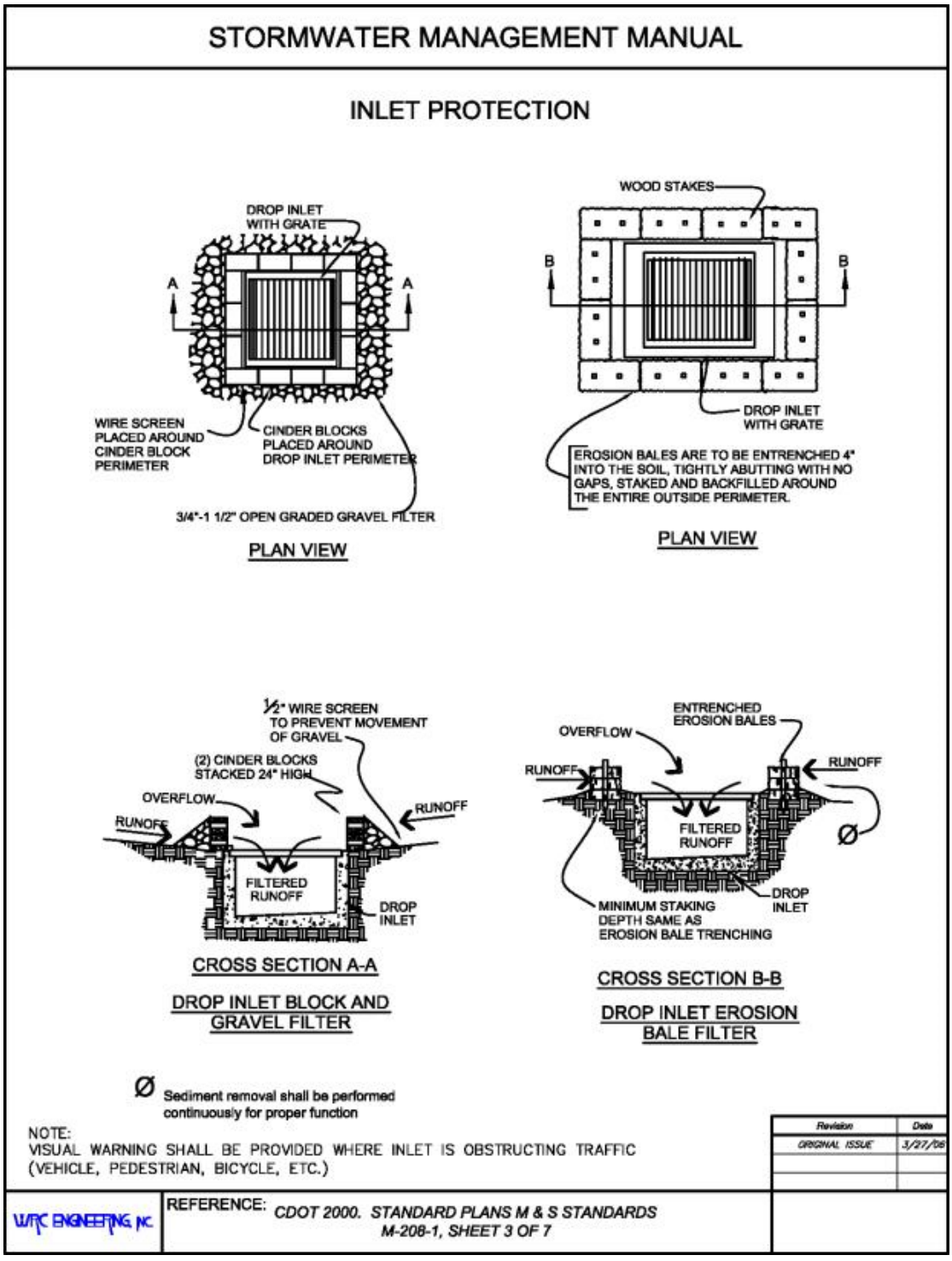


FIGURE 28.60.040(e)

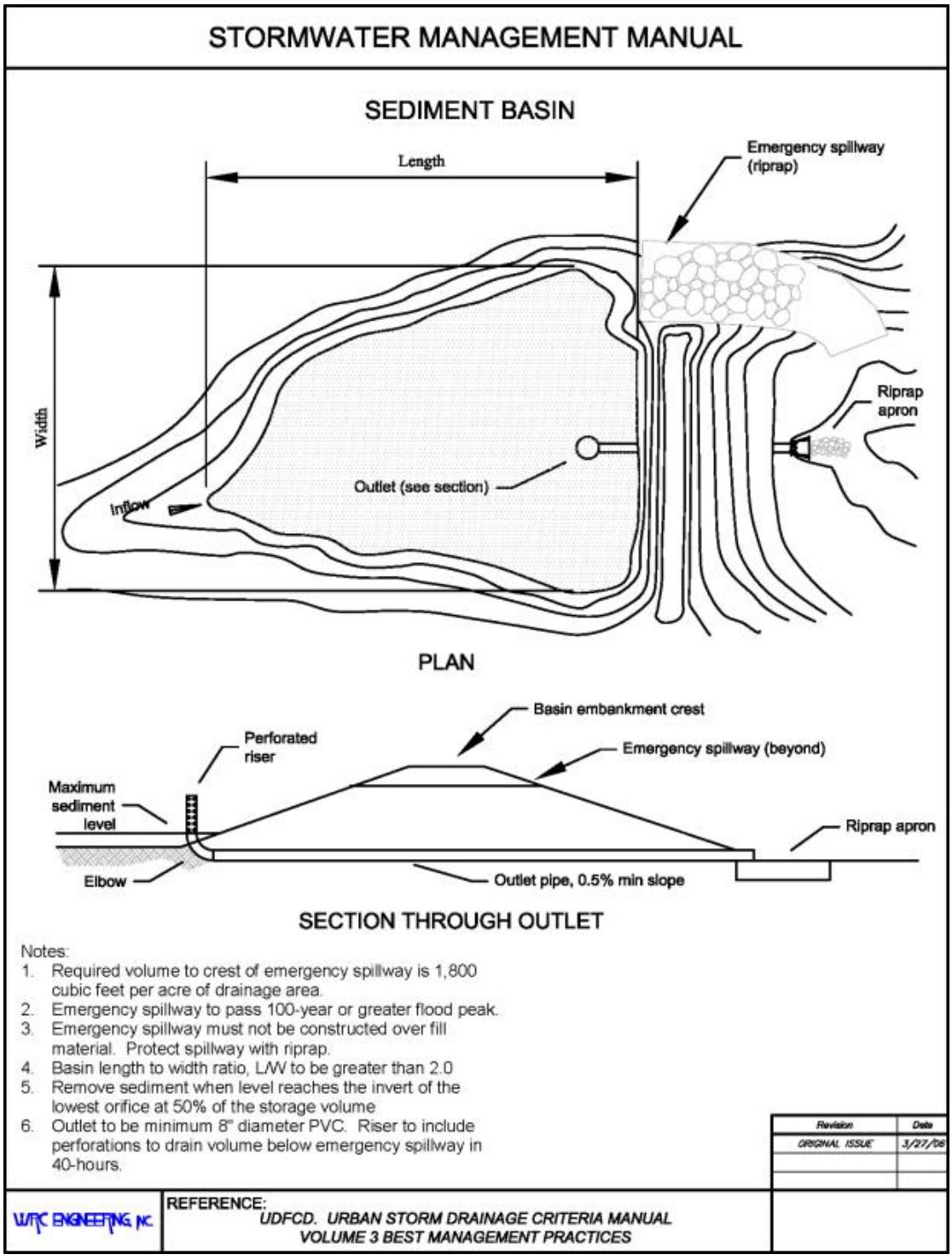


FIGURE 28.60.040(f)

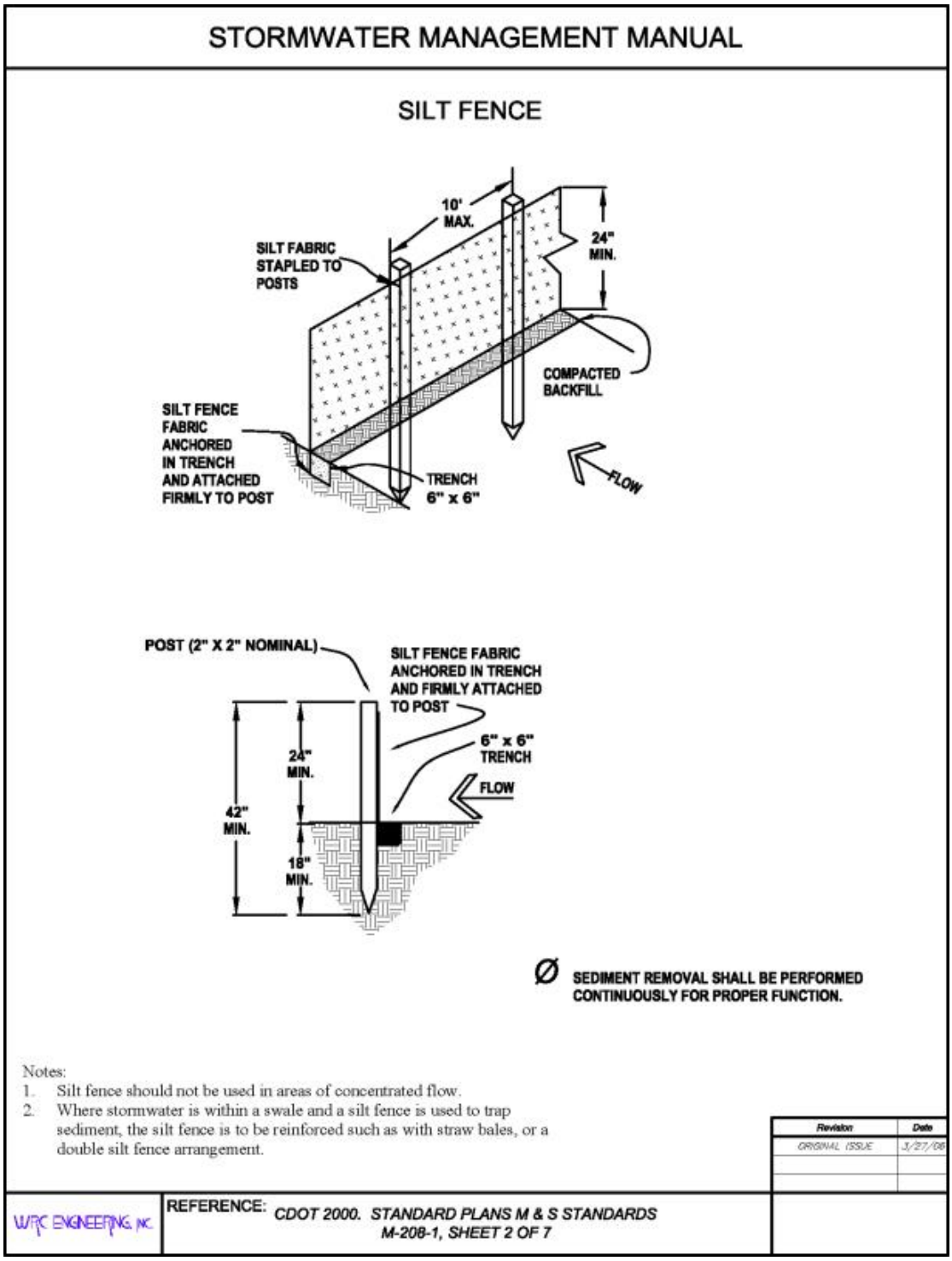


FIGURE 28.60.040(g)

(Res. 40-08 (§ 1503.2), 3-19-08)

§ 28.60.050. Standards and requirements – Acceptable BMPs.

Criteria for selection and design of BMPs can be found in the following documents:

(a) Colorado Department of Transportation 2002. Erosion Control and Stormwater Quality Guide. This document is available in .pdf format at:

http://www.dot.state.co.us/environmental/envWaterQual/wqms4.asp

CAD drawings for BMPs are also available at CDOT website.

(b) Urban Drainage and Flood Control District (UDFCD) 1999. Urban Storm Drainage Criteria Manual, Volume 3 – Best Management Practices. This can be found at:

http://www.udfcd.org/downloads/down_critmanual.htm

(c) EPA 2002. Consideration in the Design of Treatment Best Management Practices (BMP) to Improve Water Quality. EPA 600 R-03/103. This document is available in .pdf form at the following website:

http://www.epa.gov/ORD/NRMRL/pubs/600r03103/600r03103chp5.pdf

(d) City of Grand Junction August 2005. Standard Contract Documents for Capital Improvement Projects. This document is available in .pdf form at:

http://www.gjcity.org/citydeptwebpages/publicworksandutilities/engineering/standardcontractdocuments.htm.

(e) The BMPs presented in the documents referenced above shall be used in the preparation of the construction SWMP (See GJMC § 28.60.110), except as modified as follows. Use of alternate BMPs not specified above is subject to approval by the local jurisdiction.

(1) Where stormwater is within a swale and a silt fence is used to trap sediment, the silt fence is to be reinforced such as with straw bales, or a double silt fence arrangement.

(2) Straw bales to trap sediment shall not be used when stormwater is concentrated in a swale, or a channel (see Chapter 28.32 GJMC).

See Figures 28.60.050(a) and 28.60.050(b) for list of construction BMPs and map symbols for the erosion control plan.

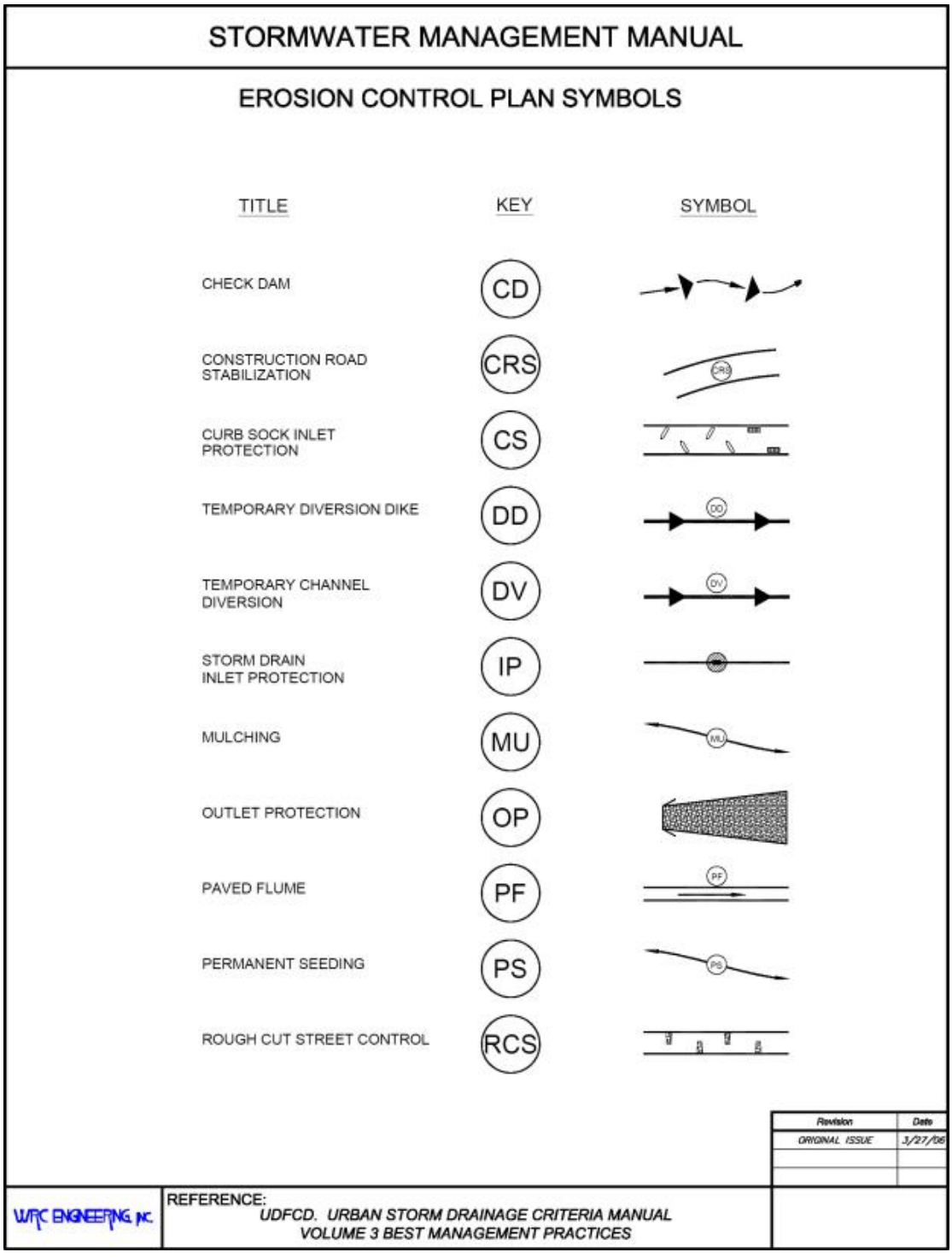


FIGURE 28.60.050(a)

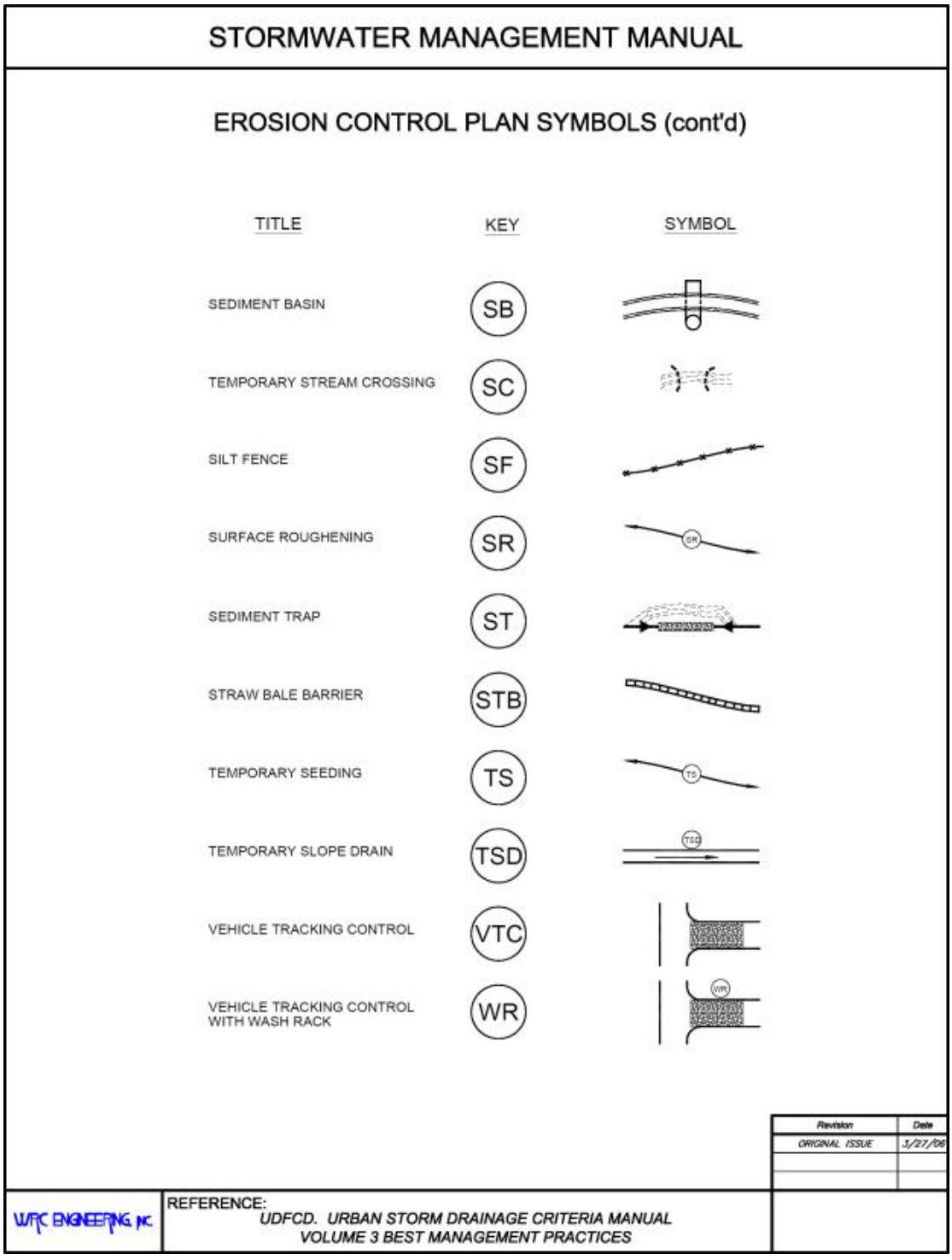


FIGURE 28.60.050(b)

(Res. 40-08 (§ 1503.3), 3-19-08)

§ 28.60.060. Stormwater permit.

(a) Mesa County. The construction SWMP shall be reviewed in accordance with this chapter of the manual and a stormwater construction permit will be issued after:

(1) The WQCD issues a permit for stormwater discharges associated with construction activity. Note that the application to the WQCD may occur before the application to the County, but the WQCD permit must be received by the County before the County will approve the construction SWMP and issue a construction stormwater permit. The County permit is not needed within the City of Grand Junction limits.

(2) Approval of the construction stormwater management plan, which includes written and graphical descriptions of construction erosion control measures, and a certification (see GJMC § 28.60.110).

(3) Submittal of proper collateral, if required.

(4) Written notice from construction stormwater permit holder that initial construction BMPs will be installed prior to any land disturbance.

(b) City of Grand Junction. The construction SWMP shall be reviewed in accordance with this chapter of the manual and a Grand Junction construction stormwater permit will be issued after:

(1) The WQCD issues a permit for stormwater discharges associated with construction activity. Note that the application to the WQCD may occur before the application to the City, but the WQCD permit must be received by the City before the City will approve the construction SWMP and issue a construction stormwater permit.

(2) Approval of the construction stormwater management plan, which includes written and graphical descriptions of construction erosion control measures, and a certification (see GJMC § 28.60.110).

(3) Submittal of proper collateral, if required.

(4) Written notice from construction stormwater permit holder that initial construction BMPs will be installed prior to any land disturbance.

(5) In addition, the City may require a construction stormwater permit if the development disturbs less than 1.0 acres and if:

(i) The City determines that the development is on steep slopes, may contribute to a violation of water quality standards, or may be a significant source of pollutants; or

(ii) The development is in close proximity to a wetland, water body or waterway.

(c) Other Jurisdictions. The City of Fruita, the Town of Palisade, and the Grand Junction Drainage District do not require a separate construction related permit, but the owner/operator must obtain a stormwater construction permit from the WQCD, which requires

preparation of a construction stormwater management plan. A copy of the WQCD stormwater permit shall be provided to the local jurisdiction.

(Res. 40-08 (§ 1504), 3-19-08)

§ 28.60.070. Stormwater permit variance/exception.

Variances/exceptions from stormwater permitting may be granted for the following conditions (check with local jurisdictions). The variance/exception from permitting does not relieve the owner/operator from meeting discharge limitations described in GJMC § 28.60.030, Standards and requirements – Stormwater discharge limitations, or from those in Chapter 13.28 GJMC within the City's jurisdiction.

(a) Land disturbance activities in areas where the topography would prohibit runoff from leaving the site or entering a waterway.

(b) Agricultural and silviculture activities such as home gardening and tilling a field for weed control.

(c) Maintenance activities, such as regrading a dirt road, relandscaping a lawn, cleaning out roadside ditches, and other land disturbances that do not alter original line and grade, hydraulic capacity or original purpose.

(d) Repaving a roadway, providing that underlying and/or surrounding soil is not cleared, graded, excavated or otherwise disturbed.

(e) For small construction activity (i.e., from one to five acres of earth disturbance) based on the rainfall erosivity factor (i.e., the R Factor) (see Colorado Discharge Permits System Regulation No. 61 @ 61.3(2)(f)(ii)(B)) and duration of the exposed disturbance. To obtain a waiver from the CDPS construction general permit, the applicant must submit calculations to the WQCD (see "Policy on the State Approved Method for Calculating the Rainfall Erosivity Factor") which can be obtained in .pdf form by searching for "erosivity factor" in the website:

http://www.cdphe.state.co.us/index.html

(f) The following activities provided the land disturbance is less than one acre and are not part of a larger common plan of development or sale:

(1) Grading or an excavation below finished grade for basements, footings, retaining walls, or other structures on plots unless otherwise required by the International Building Code.

(2) A sidewalk or driveway authorized by a valid permit.

(3) Gravel, sand, or soil removal as authorized.

(Res. 40-08 (§ 1505), 3-19-08)

§ 28.60.080. Inspection and enforcement – Mesa County.

Upon approval of the construction SWMP (See GJMC § 28.60.060, Stormwater permit), a stormwater permit will be issued to the applicant, which requires:

(a) Inspector. The owner/operator shall retain a qualified erosion control specialist to perform inspections of the BMPs in the construction SWMP and determine if the construction is in accordance with the construction SWMP.

(b) Inspections. The site perimeter, all disturbed areas, material and/or waste storage areas that are exposed to precipitation, discharge locations, and locations where vehicles access the site shall be inspected for evidence of, or the potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system, or discharging to State waters. All erosion and sediment control practices identified in the construction SWMP shall be evaluated to ensure that they were properly installed and are being maintained and operated correctly.

(c) Inspection Frequency. The inspector shall perform inspections at least once every 14 days and within 24 hours after the end of a precipitation or snowmelt event that causes surface erosion on the site.

(d) Inspection Reporting. The inspector shall prepare inspection reports and submit a copy of all inspection reports and any changes to the construction SWMP to Mesa County within five working days of the inspection. Inspection results shall be logged on forms provided, site conditions noted, and any changes to the construction SWMP shall be documented.

The permittee shall keep a record of inspections. Inspection reports must identify any incidents of noncompliance with the terms and conditions of this permit. Inspection records must be retained for three years from expiration or inactivation of permit coverage. At a minimum, the inspection report must include:

(1) The inspection date;

(2) Name(s) and title(s) of personnel making the inspection;

(3) Location(s) of discharges of sediment or other pollutants from the site;

(4) Location(s) of BMPs that need to be maintained;

(5) Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;

(6) Location(s) where additional BMPs are needed that were not in place at the time of inspection;

(7) Deviations from the minimum inspection schedule as provided in subsection (c) of this section;

(8) Description of corrective action for subsections (d)(3) through (6) of this section, dates corrective action(s) taken, and measures taken to prevent future violations, including requisite changes to the construction SWMP, as necessary; and

(9) After adequate corrective action(s) has been taken, or where a report does not identify any incidents requiring corrective action, the report shall contain a signed statement indicating the site is in compliance with the permit to the best of the signer's knowledge and belief.

(e) Changes to Construction SWMP. The permittee shall amend the construction SWMP:

(1) When there is a change in design, construction, operation, or maintenance of the site, which would require the implementation of new or revised BMPs; or

(2) If the construction SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with construction activity; or

(3) When BMPs are no longer necessary and are removed.

(4) Construction SWMP changes shall be made prior to changes in the site conditions, except as allowed for in the paragraph below. Construction SWMP revisions may include, but are not limited to: potential pollutant source identification; selection of appropriate BMPs for site conditions; BMP maintenance procedures; and interim and final stabilization practices. The construction SWMP changes may include a schedule for further BMP design and implementation; provided, that if any interim BMPs are needed to comply with the permit, they are also included in the construction SWMP and implemented during the interim period.

Construction SWMP changes addressing BMP installation and/or implementation are often required to be made in response to changing conditions, or when current BMPs are determined ineffective. The majority of construction SWMP revisions to address these changes can be made immediately with quick in-the-field revisions to the construction SWMP. In the less common scenario where more complex development of materials to modify the construction SWMP is necessary, construction SWMP revisions shall be made in accordance with the following requirements:

(i) The construction SWMP shall be revised as soon as practicable, but in no case more than 72 hours after the change(s) in BMP installation and/or implementation occur at the site; and

(ii) A notation must be included in the construction SWMP prior to the site change(s) that includes the time and date of the change(s) in the field, an identification of the BMP(s) removed or added, and the location(s) of those BMP(s).

(f) Substantial Completion. For construction sites that are substantially complete but where final stabilization is not complete, additional inspections shall be conducted at no less than once a month until final stabilization is achieved. These inspections shall include the perimeter of the site, disturbed areas, and material storage areas exposed to precipitation for evidence of, or potential for, the discharge of pollutants to the drainage system.

(g) Final Completion. For construction sites where final stabilization has been achieved, the inspector shall:

(1) Provide certification from the engineer of record that the stormwater volume capacity of any detention site has been restored to the design condition prior to turning over maintenance responsibility to an owners' association.

(2) Submit to the County the final inspection report, final construction SWMP, and certification that the project is completed in accordance with the construction SWMP.

The construction stormwater permit will be released after final stabilization has taken place, as certified by the qualified erosion control specialist.

(h) Enforcement. Mesa County will audit 10 percent of all construction sites to verify that inspections have been conducted, that the construction SWMP is current and is addressing erosion and sedimentation concerns.

If Mesa County determines that inspections are not being conducted in accordance with this manual, they will notify the inspector and the permit holder by mail, and will require the deficiencies be corrected within the stated time frame. If deficiencies are not corrected within 30 days of the first notice of a deficiency, enforcement measures for the stormwater permit, such as required changes to the construction SWMP, stop work orders, and fines, will be implemented, in accordance with requirements of the Land Development Code.

(Res. 40-08 (§ 1506.1), 3-19-08)

§ 28.60.090. Inspection and enforcement – City of Grand Junction.

Inspection and enforcement of construction BMPs will be performed by the City in accordance with Chapter 13.28 GJMC and as amended.

Upon approval of the construction SWMP (See GJMC § 28.60.060, Stormwater permit), a stormwater permit will be issued to the applicant, which requires:

(a) Inspection Frequency. The owner/operator shall inspect all BMPs at least once every 14 days, and after any precipitation or snowmelt event that causes surface erosion. The owner/operator must provide consent to the City for the City to inspect any BMP without advance notice or permission from the owner/operator.

(b) Inspections. Inspections shall include proper installation and maintenance of all BMPs, the perimeter of the site, disturbed areas, and material storage areas exposed to precipitation and shall be conducted for evidence of, or potential for, the discharge of pollutants to the drainage system.

(c) Inspection Reporting. Inspection results shall be logged on forms provided, site conditions noted, and any changes to the construction SWMP shall be documented. Based upon inspections performed by the owner/operator or by authorized City

personnel, modifications to the construction SWMP shall be necessary if at any time the specified BMPs do not meet the objectives of Chapter 13.28 GJMC.

The permittee shall keep a record of inspections. Inspection reports must identify any incidents of noncompliance with the terms and conditions of this permit. Inspection records must be retained for three years from expiration or inactivation of permit coverage. At a minimum, the inspection report must include:

(1) The inspection date;

(2) Name(s) and title(s) of personnel making the inspection;

(3) Location(s) of discharges of sediment or other pollutants from the site;

(4) Location(s) of BMPs that need to be maintained;

(5) Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;

(6) Location(s) where additional BMPs are needed that were not in place at the time of inspection;

(7) Deviations from the minimum inspection schedule as provided in subsection (a) of this section;

(8) Description of corrective action for subsections (c)(3) through (6) of this section, dates corrective action(s) taken, and measures taken to prevent future violations, including requisite changes to the construction SWMP, as necessary; and

(9) After adequate corrective action(s) has been taken, or where a report does not identify any incidents requiring corrective action, the report shall contain a signed statement indicating the site is in compliance with the permit to the best of the signer's knowledge and belief.

(d) Changes to Construction SWMP. If major modification to the construction SWMP is required, such as addition or deletion of a sediment basin, the owner/operator shall meet and confer with authorized City personnel to determine the nature and extent of modification(s). Minor modifications necessary to meet the objectives of Chapter 13.28 GJMC and as amended may be performed without City authorization. All approved modification(s) shall be completed in a timely manner. All modification(s) shall be recorded on the owner/operator's copy of the construction SWMP. In the case of an emergency, the contractor shall implement conservative BMPs and follow up with City personnel the next working day.

The permittee shall amend the construction SWMP:

(1) When there is a change in design, construction, operation, or maintenance of the site, which would require the implementation of new or revised BMPs; or

(2) If the construction SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with construction activity; or

(3) When BMPs are no longer necessary and are removed.

(4) Construction SWMP changes shall be made prior to changes in the site conditions, except as allowed for in the paragraph below. Construction SWMP revisions may include, but are not limited to: potential pollutant source identification; selection of appropriate BMPs for site conditions; BMP maintenance procedures; and interim and final stabilization practices. The construction SWMP changes may include a schedule for further BMP design and implementation; provided, that if any interim BMPs are needed to comply with the permit, they are also included in the construction SWMP and implemented during the interim period.

Construction SWMP changes addressing BMP installation and/or implementation are often required to be made in response to changing conditions, or when current BMPs are determined ineffective. The majority of construction SWMP revisions to address these changes can be made immediately with quick in-the-field revisions to the construction SWMP. In the less common scenario where more complex development of materials to modify the construction SWMP is necessary, construction SWMP revisions shall be made in accordance with the following requirements:

(i) The construction SWMP shall be revised as soon as practicable, but in no case more than 72 hours after the change(s) in BMP installation and/or implementation occur at the site; and

(ii) A notation must be included in the construction SWMP prior to the site change(s) that includes the time and date of the change(s) in the field, an identification of the BMP(s) removed or added, and the location(s) of those BMP(s).

(e) Substantial Completion. For construction sites that are substantially complete but where final stabilization is not complete, additional inspections shall be conducted at no less than once a month until final stabilization is achieved. These inspections shall include the perimeter of the site, disturbed areas, and material storage areas exposed to precipitation for evidence of, or potential for, the discharge of pollutants to the drainage system.

(f) Final Completion/Inactivation. For construction sites where final stabilization has been achieved, the inspector shall:

(1) Provide certification from the engineer of record that the stormwater volume capacity of any detention site has been restored to the design condition prior to turning over maintenance responsibility to an owners' association.

(2) Submit to the City the final inspection report, final construction SWMP, and certification that the project is completed in accordance with the construction SWMP.

(3) Provide a copy of the CDPHE inactivation notice for construction stormwater discharge general permit certification.

The construction stormwater permit will be released after final stabilization has taken place, as certified by the qualified erosion control specialist.

(g) Enforcement. The City of Grand Junction has the right to enter the premises at any time to investigate if the discharger is complying with all the requirements of the construction SWMP, in accordance with GJMC § 13.28.040.

(h) Upset Condition. An upset condition determination constitutes an affirmative defense to an action brought for noncompliance when the terms of the construction SWMP are met. An owner/operator who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the cause(s) of the upset can be identified;

(2) The facility or operation was at the time being properly operated;

(3) Notice of the upset was submitted as required in GJMC § 13.28.020(d); and

(4) Remedial measures were complied with as required.

In any enforcement proceeding, the one seeking to establish the occurrence of an upset has the burden of proof.

(Res. 40-08 (§ 1506.2), 3-19-08)

§ 28.60.100. Inspection and enforcement – Other municipalities.

Contact the City of Fruita, the Town of Palisade, and the Grand Junction Drainage District to determine inspection and enforcement requirements.

(Res. 40-08 (§ 1506.3), 3-19-08)

§ 28.60.110. Construction SWMP.

The construction SWMP shall be prepared by a qualified erosion control specialist in accordance with good hydrologic and pollution control practices. A current copy of the construction SWMP must be on the site at all times.

The construction SWMP shall identify potential sources of pollution (including sediment) which may reasonably be expected to affect the quality of stormwater discharges associated with construction activity. The construction SWMP shall also describe and ensure the implementation of BMPs which will be used to reduce the pollutants in stormwater discharges associated with construction activity. Construction operations must implement the provisions of the construction SWMP.

A checklist of items required for the construction SWMP is provided in Tables 28.60.110(a) and 28.60.110(b). The construction SWMP shall include the items in GJMC § 28.60.120 through 28.60.180, at a minimum.

STORMWATER MANAGEMENT MANUAL

CONSTRUCTION STORMWATER MANAGEMENT PLAN CHECKLIST

Instructions: Applicant to identify with a "check-mark" if information is provided. If applicant believes information is not required, indicate with "n/a" and provide a brief explanation. The local jurisdiction will determine if information labeled "n/a" is required and whether information must be submitted.

1) A site description including:
- __ A description of the nature of the construction activity.
- __ The proposed sequence for major activities.
- __ Estimates of the total area of the site and the area of the site that is expected to undergo clearing, excavation or grading.
- __ A summary of any existing data used in the development of the site construction plans or Construction SWMP that describe the soil or existing potential for soil erosion.
- __ A description of the existing vegetation at the site and an estimate of the percent vegetative ground cover. Photos of the existing vegetation may be useful to determine if final stabilization has occurred.
- __ The location and description of all potential pollution sources, including ground surface disturbing activities, vehicle fueling, storage of fertilizers or chemicals, etc.
- __ The location and description of any anticipated non-stormwater components of the discharge, such as uncontaminated springs, landscape irrigation return flow, and construction dewatering.
- __ The name of the receiving water(s) and the size, type and location of any outfall(s). If the discharge is to a municipal separate storm sewer, the name of that system, the location of the storm sewer discharge, and the ultimate receiving water(s).

2) A site map with:
- __ Construction site boundaries
- __ All areas of soil disturbance
- __ Areas of cut and fill
- __ Areas used for storage of building materials, soils or wastes
- __ Location of any dedicated asphalt or concrete batch plants
- __ Location of BMPs needed to address pollutant sources identified in Section 1507.3 (b)
- __ Location of springs, streams, wetlands and other surface waters
- __ Stormwater discharge locations

3) A description of all control measures that reflect the potential pollutants sources identified at the facility. The description of stormwater management controls shall address the following components, at a minimum:
- __ Construction SWMP Administrator
- __ Identification of Potential Pollutant Sources including:
  - __ all disturbed and stored soils
  - __ vehicle tracking of sediments
  - __ management of contaminated soils
  - __ loading and unloading operations
  - __ outdoor storage activities (building materials, fertilizers, chemicals, etc.)
  - __ vehicle and equipment maintenance and fueling
  - __ significant dust or particulate generating processes
  - __ routine maintenance activities involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.
  - __ on-site waste management practices (waste piles, liquid wastes, dumpsters, etc.)
  - __ concrete truck/equipment washing, including the concrete truck chute and associated fixtures and equipment
  - __ dedicated asphalt and concrete batch plants
  - __ non-industrial waste sources such as worker trash and portable toilets
  - __ other areas or procedures where potential spills can occur

Revision	Date
ORIGINAL ISSUE	3/27/06
REVISED	2/20/08

WRC ENGINEERING, INC. REFERENCE:

TABLE 28.60.110(a)

STORMWATER MANAGEMENT MANUAL

CONSTRUCTION STORMWATER MANAGEMENT PLAN CHECKLIST
(continued)

Instructions: Applicant to identify with a "check-mark" if information is provided. If applicant believes information is not required, indicate with "n/a" and provide a brief explanation. The local jurisdiction will determine if information labeled "n/a" is required and whether information must be submitted.

4) A description of all Best Management Practices (BMPs) for Stormwater Pollution Prevention including:

___ Structural Practices for Erosion and Sediment Control
___ Non-Structural Practices for Erosion and Sediment Control
___ Phased BMP Implementation
___ Materials Handling and Spill Prevention
___ Dedicated Concrete or Asphalt Batch Plants
___ Vehicle Tracking Control
___ Waste Management and Disposal, Including Concrete Washout
___ Groundwater and Stormwater Dewatering
___ Construction SWMP Administrator
___ Construction SWMP Administrator
___ Construction SWMP Administrator

5) The Construction SWMP shall clearly describe the practices used to achieve final stabilization of all disturbed areas at the site

6) The plan shall include a description of procedures to inspect and maintain in good and effective operating condition the vegetation, erosion and sediment control measures.

7) The Construction Stormwater Management Plan shall be certified.

8) The plan shall include the estimated total cost (purchase, installation and maintenance) of the required temporary soil erosion and sediment control measures to determine surety or bonding requirements for the proposed plan.

Revision	Date
ORIGINAL ISSUE	3/27/08
REVISED	2/20/08

WRC ENGINEERING, INC. | REFERENCE:

TABLE 28.60.110(b)

(Res. 40-08 (§ 1507), 3-19-08)

§ 28.60.120. Site description.

Each plan shall provide a description of the following:

(a) A description of the nature of the construction activity.

(b) The proposed sequence for major activities.

(c) Estimates of the total area of the site, and the area of the site that is expected to undergo clearing, excavation or grading.

(d) A summary of any existing data used in the development of the site construction plans or construction SWMP that describe the soil or existing potential for soil erosion.

(e) A description of the existing vegetation at the site and an estimate of the percent vegetative ground cover. Photos of the existing vegetation may be useful to determine if final stabilization has occurred.

(f) The location and description of all potential pollution sources, including ground surface disturbing activities, vehicle fueling, storage of fertilizers or chemicals, etc.

(g) The location and description of any anticipated nonstormwater components of the discharge, such as uncontaminated springs, landscape irrigation return flow, and construction dewatering.

(h) The name of the receiving water(s) and the size, type and location of any outfall(s). If the discharge is to a municipal separate storm sewer, the name of that system, the location of the storm sewer discharge, and the ultimate receiving water(s).

(Res. 40-08 (§ 1507.1), 3-19-08)

§ 28.60.130. Site map.

Each plan shall provide a generalized site map or maps which indicate:

(a) Construction site boundaries.

(b) All areas of soil disturbance.

(c) Areas of cut and fill.

(d) Areas used for storage of building materials, soils or wastes.

(e) Location of any dedicated asphalt or concrete batch plants.

(f) Location of BMPs needed to address pollutant sources identified in GJMC § 28.60.140.

(g) Location of springs, streams, wetlands and other surface waters.

(h) Stormwater discharge locations.

(Res. 40-08 (§ 1507.2), 3-19-08)

§ 28.60.140. Stormwater management controls.

The construction SWMP must include a description of all stormwater management controls that will be implemented as part of the construction activity to control pollutants in stormwater discharges. The appropriateness and priorities of stormwater management controls in the construction SWMP shall reflect the potential pollutants sources identified at the facility.

The description of stormwater management controls shall address the following components, at a minimum:

(a) Construction SWMP Administrator. The construction SWMP shall identify a specific individual(s), position or title responsible for developing, implementing, maintaining, and revising the construction SWMP. The activities and responsibilities of the administrator shall address all aspects of the facility's construction SWMP.

(b) Identification of Potential Pollutant Sources. All potential pollutant sources, including materials and activities, at a site must be evaluated for the potential to contribute pollutants to stormwater discharges. The construction SWMP shall identify and describe those sources determined to have the potential to contribute pollutants to stormwater discharges, and the sources must be controlled through BMP selection and implementation, as required in subsection (c) of this section.

At a minimum, each of the following sources and activities shall be addressed in the construction SWMP. If the source or activity does not have the potential to contribute pollutant, it must be indicated in the construction SWMP:

(1) All disturbed and stored soils;

(2) Vehicle tracking of sediments;

(3) Management of contaminated soils;

(4) Loading and unloading operations;

(5) Outdoor storage activities (building materials, fertilizers, chemicals, etc.);

(6) Vehicle and equipment maintenance and fueling;

(7) Significant dust or particulate generating processes;

(8) Routine maintenance activities involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.;

(9) On-site waste management practices (waste piles, liquid wastes, dumpsters, etc.);

(10) Concrete truck/equipment washing, including the concrete truck chute and associated fixtures and equipment;

(11) Dedicated asphalt and concrete batch plants;

(12) Nonindustrial waste sources such as worker trash and portable toilets; and

(13) Other areas or procedures where potential spills can occur.

(c) Best Management Practices (BMPs) for Stormwater Pollution Prevention. The construction SWMP shall identify and describe appropriate BMPs, including, but not limited to, those required by subsections (c)(1) through (8) of this section, that will be implemented at the facility to reduce the potential of the sources identified in subsection (b) of this section to contribute pollutants to stormwater discharges. The construction SWMP shall clearly describe the installation and implementation specifications for each BMP identified in the construction SWMP to ensure proper implementation, operation and maintenance of the BMP.

(1) Structural Practices for Erosion and Sediment Control. The construction SWMP shall clearly describe and locate all structural practices implemented at the site to minimize erosion and sediment transport. Practices may include, but are not limited to: straw bales, wattles/sediment control logs, silt fences, earth dikes, drainage swales, sediment traps, subsurface drains, pipe slope drains, inlet protection, outlet protection, gabions, and temporary or permanent sediment basins.

(2) Nonstructural Practices for Erosion and Sediment Control. The construction SWMP shall clearly describe and locate, as applicable, all nonstructural practices implemented at the site to minimize erosion and sediment transport. Description must include interim and permanent stabilization practices, and site-specific scheduling for implementation of the practices. The construction SWMP should include practices to ensure that existing vegetation is preserved where possible. Nonstructural practices may include, but are not limited to: temporary vegetation, permanent vegetation, mulching, geotextiles, sod stabilization, slope roughening, vegetative buffer strips, protection of trees, and preservation of mature vegetation.

(3) Phased BMP Implementation. The construction SWMP shall clearly describe the relationship between the phases of construction, and the implementation and maintenance of both structural and nonstructural stormwater management controls. The construction SWMP must identify the stormwater management controls to be implemented during the project phases, which can include, but are not limited to, clearing and grubbing; road construction; utility and infrastructure installation; vertical construction; final grading; and final stabilization.

(4) Materials Handling and Spill Prevention. The construction SWMP shall clearly describe and locate all practices implemented at the site to minimize impacts from procedures or significant materials that could contribute pollutants to runoff. Such procedures or significant materials could include: exposed storage of building materials; paints and solvents; fertilizers or chemicals; waste material; and equipment maintenance or fueling procedures. Areas or procedures where potential spills can occur must have spill prevention and response procedures identified in the construction SWMP.

(5) Dedicated Concrete or Asphalt Batch Plants. The construction SWMP shall clearly describe and locate all practices implemented at the site to control stormwater pollution from dedicated concrete batch plants or dedicated asphalt batch plants covered by this certification.

(6) Vehicle Tracking Control. The construction SWMP shall clearly describe and locate all practices implemented at the site to control potential sediment

discharges from vehicle tracking. Practices must be implemented for all areas of potential vehicle tracking and can include: minimizing site access, street sweeping or scraping, tracking pads, graveled parking areas, requiring that vehicles stay on paved areas on site, wash racks, contractor education, and/or sediment control BMPs, etc.

(7) Waste Management and Disposal, Including Concrete Washout.

(i) The construction SWMP shall clearly describe and locate the practices implemented at the site to control stormwater pollution from all construction site wastes (liquid and solid), including concrete washout activities. Designated concrete washouts shall be identified in the field with signage.

(ii) The practices used for concrete washout must ensure that these activities do not result in the contribution of pollutants associated with the washing activity to stormwater runoff.

(iii) GJMC § 28.60.030(b) authorizes the conditional discharge of concrete washout water to the ground. The construction SWMP shall clearly describe and locate the practices to be used that will ensure that no washout water from concrete washout activities is discharged from the site as surface runoff or to surface waters.

(iv) Because pH is a pollutant of concern for washout activities, the soil must have adequate buffering capacity to result in protection of the groundwater standard, or a liner/containment must be used. The following management practices are recommended to prevent an impact from unlined pits to groundwater:

(A) The use of the washout site should be temporary (less than one year); and

(B) The washout site should not be located in an area where shallow groundwater may be present, such as near natural drainages, springs, or wetlands.

(8) Groundwater and Stormwater Dewatering.

(i) The construction SWMP shall clearly describe and locate the practices implemented at the site to control stormwater pollution from the dewatering of groundwater or stormwater from excavations, wells, etc.

(ii) GJMC § 28.60.030 authorizes the conditional discharge of construction dewatering to the ground. For any construction dewatering of groundwater not authorized under a separate CDPS discharge permit, the construction SWMP shall clearly describe and locate the practices to be used that will ensure that no groundwater from construction dewatering is discharged from the site as surface runoff or to surface waters.

(Res. 40-08 (§ 1507.3), 3-19-08)

§ 28.60.150. Final stabilization and long-term stormwater management.

The construction SWMP shall clearly describe the practices used to achieve final stabilization of all disturbed areas at the site, and any planned practices to control pollutants in stormwater discharges that will occur after construction operations have been completed at the site. The designs of post-construction BMPs, which are described in Chapter 28.64 GJMC, Post-Construction Stormwater Management, are included with the final drainage report (see GJMC § 28.12.060 through 28.12.100, final drainage report).

Final stabilization practices for obtaining a vegetative cover shall include, as appropriate: seed mix selection and application methods; soil preparation and amendments; soil stabilization practices (e.g., crimped straw, hydro mulch or rolled erosion control products); and appropriate sediment control BMPs as needed until final stabilization is achieved; etc.

Final stabilization is reached when all ground surface disturbing activities at the site have been completed, and uniform vegetative cover has been established on all remaining pervious soil surfaces with an individual plant density of at least 70 percent of pre-disturbance levels and equivalent permanent, physical erosion reduction methods (buildings, asphalt, concrete, etc.) have been employed. This does not mean that 70 percent of total surface area of the site has been converted to impervious surfaces.

(Res. 40-08 (§ 1507.4), 3-19-08)

§ 28.60.160. Inspection and maintenance.

The plan shall include a description of procedures to inspect and maintain in good and effective operating condition the vegetation, erosion and sediment control measures and other protective measures identified in the construction SWMP. GJMC § 28.60.080 through 28.60.100 describe inspection requirements.

(Res. 40-08 (§ 1507.5), 3-19-08)

§ 28.60.170. Certification.

The construction stormwater management plan shall include the following certification:

I hereby certify that the Construction Stormwater Management Plan for the construction of (name of Development) was prepared by me (or under my direct supervision) in accordance with the provisions of the *Stormwater Management Manual* for the owner/operators of (name of Development). I understand that the (Identify permitting agency) does not and will not assume liability for facilities designed by others.

_____ _____

Erosion Control Specialist Date

(Res. 40-08 (§ 1507.6), 3-19-08)

§ 28.60.180. Estimated BMP costs.

The plan shall include the estimated total cost (purchase, installation and maintenance) of the required temporary soil erosion and sediment control measures to determine surety or bonding requirements for the proposed plan. Provide quantities and unit costs.

(Res. 40-08 (§ 1507.7), 3-19-08)

§ 28.60.190. Permit transfer requirements.

When a portion of a permitted site is sold to a new owner or operator, a permit certification must be in place that is held by the new owner/operator of the sold area. This may be accomplished in one of the following ways:

(a) Coverage under the Existing Certification. Activities at the sold area may be covered under an existing permit for the project if the current permittee has contractual responsibility and operational control to address the impacts that construction activities at the sold area may have on stormwater runoff (including implementation of the construction SWMP for the sold area). Therefore, a legally binding agreement must exist assigning this responsibility to the permit holder on behalf of the new owner/operator for the sold area. It is necessary to notify the local jurisdiction in such case. Documentation of the agreement must be available upon request and the construction SWMP must be maintained to include all activities covered by the permit.

Example: Developer Dan sells a lot to Builder Bob. Developer Dan is currently covered under a permit that covers a larger area, which includes the sold lot. Developer Dan and Builder Bob may enter into a contract that assigns the responsibility for permit coverage and stormwater management to Developer Dan for Builder Bob's lot. Developer Dan is also responsible for making sure his construction SWMP includes the activities on the lot. Developer Dan's permit will continue to cover construction activities on Builder Bob's lot.

(b) New Certification Issued – Reassignment. A new permit may be issued to the new owner/operator of the sold area. The existing permittee and the new owner/operator must complete the reassignment form to remove the sold area from the existing permit and cover it under a new permit issued to the new owner/operator of the sold area. Both entities must have their construction SWMP in place that accurately reflects their current covered areas and activities.

Example: Developer Dan sells a lot to Builder Bob. Developer Dan is currently covered under a permit that covers a larger area, which includes the sold lot. For this example, Developer Dan and Builder Bob must jointly submit the reassignment form. Builder Bob will be issued a new permit for his lot and the lot will be removed from Developer Dan's permit coverage. Prior to submittal of the reassignment form, Developer Dan must revise his construction SWMP to reflect the changes in his covered area and activities, and Builder Bob must develop his own construction SWMP to cover the area and activities for which he will obtain coverage. The reassignment form and associated instructions can be found in Chapter 28.68 GJMC, Standard Forms. The form and instructions can also be found at the CDPHE website:

http://www.cdphe.state.co.us/wq/PermitsUnit/stormwater/construction.html

under the "construction reassignment form" link.

(c) Amend Existing Permit Certifications. In some cases, both parties (the original owner/operator and the new owner/operator of an area undergoing transfer of ownership) will already be permit holders for their portions of the overall project (i.e., at least two permits are issued for the project and cover both the party wishing to reassign coverage and the party wishing to accept coverage). When an additional area is transferred between the two parties, the permittees may amend their permits instead of completing the reassignment form. Both parties must separately provide a letter to the local jurisdiction that includes the revised information, removing the applicable area(s) from the original owner/operator's permit certification, and adding the area(s) to the new owner/operator's permit certification. The requests must cite both permit numbers. (Note: this request may be submitted jointly if it is signed by both entities.) This option will likely be used in cases where a developer and an owner/operator have already submitted a reassignment form, as discussed in subsection (b) of this section, where an initial transfer of lots has occurred, and then additional lots are transferred at a later date. Both entities must have a construction SWMP in place that accurately reflects their current covered areas and activities.

Example: Developer Dan sells a lot to Builder Bob. Developer Dan is currently covered under a permit that covers a larger area, which includes the sold lot. In addition, Builder Bob also holds a permit for other portions of the development which he already owns, and Builder Bob wishes to cover his new lot under this permit. Developer Dan submits a request to remove the lot from his permit and provides Builder Bob's permit number that the lot will now be under which that lot will be covered. Builder Bob also submits a request to modify his permit to add the lot, and provides Developer Dan's permit number under which the lot was previously covered. Developer Dan and Builder Bob must revise their construction SWMP to reflect the changes in their covered area and activities.

(d) Sale of Residence to Homeowner. For residential construction only, when a residential lot has been conveyed to a homeowner and all criteria in subsections (d)(1) through (d)(5) of this section are met, coverage under this permit is no longer required and the conveyed lot may be removed from coverage under the permittee's certification. At such time, the permittee is no longer responsible for meeting the terms and conditions of this permit for the conveyed lot, including the requirement to transfer or reassign permit coverage. The permittee remains responsible for inactivation of the original certification.

(1) The lot has been sold to the homeowner(s) for private residential use;

(2) The lot is less than 1.0 acres of disturbed area;

(3) All construction activity conducted by the permittee on the lot is completed;

(4) A certificate of occupancy (or equivalent) has been awarded to the home owner; and

(5) The construction SWMP has been amended to indicate the lot is no longer covered by permit.

Lots not meeting all of the above criteria require continued permit coverage. However, this permit coverage may be transferred or reassigned to a new owner or operator as described in subsections (a) through (c) of this section.

(Res. 40-08 (§ 1508), 3-19-08)

§ 28.60.200. Checklist.

A checklist for the construction SWMP is provided in Tables 28.60.110(a) and 28.60.110(b). This checklist contains recommended report outline and contents for the construction SWMP. A copy of the completed checklist shall be bound with the construction SWMP.

Applicant is to identify with a check mark ("✓") if information is provided with the appropriate submittal. If applicant believes information is not required, indicate with "n/a." The submittal will be reviewed to determine if information is required and whether information must be submitted.

(Res. 40-08 (§ 1509), 3-19-08)

Chapter 28.64
Post-Construction Stormwater Management

§ 28.64.010. Introduction.

All persons engaged in new development and redevelopment of property that disturbs 1.0 acres or more shall implement post-construction BMPs to control the discharge of pollutants after construction is completed, in accordance with the provisions of this manual. Post-construction BMPs, which includes both structural and nonstructural measures, shall be identified in the final drainage report (see GJMC § 28.12.060 through 28.12.100, final drainage report). For requirements during construction, see Chapter 28.6 GJMC, Construction Site Stormwater Runoff Control.

(Res. 40-08 (§ 1601), 3-19-08)

§ 28.64.020. Standards for best management practices (BMPs) – Minimum structural BMPs requirements.

BMPs for significant development and redevelopment capture and detain stormwater in best management practices, called volume capture devices. These BMPs are designed to capture and temporarily detain a large percentage of runoff events and runoff volumes then release the runoff over a six- to 40-hour period, which allows sufficient time for settling of pollutants. Volume capture BMPs are widely used by communities throughout the United States and are considered a standard of practice.

The following BMPs meet the minimum water quality capture volume (WQCV) requirements for on-site or regional stormwater quality facilities:

Figure 28.64.020(a), Porous Pavement Detention (with under-drain only);

Figure 28.64.020(b), Porous Landscape Detention (with under-drain only);

Figure 28.64.020(c), Extended Detention Basin;

Figure 28.64.020(d), Sand Filter Extended Detention Basin;

Figure 28.64.020(e), Constructed Wetland Basin;

Figure 28.64.020(f), Retention Basin;

Figure 28.64.020(g), Grass Swale.

Examples of these BMPs can be found in:

(a) *Urban Drainage and Flood Control District (UDFCD) 1999*. Urban Storm Drainage Criteria Manual (USDCM), Volume 3 – Best Management Practices. This document is available at:

http://www.udfcd.org/usdcm/vol3.htm.

(b) *Water Environment Federation (WEF) and American Society of Civil Engineers (ASCE) 1998*. Urban Runoff Quality Management. *WEF Manual No. 23, ASCE Manual No. 87*.

(c) *EPA 2002. Consideration in the Design of Treatment Best Management Practices (BMP) to Improve Water Quality. EPA 600 R-03/103*. This document is available in .pdf form at the following website:

http://www.epa.gov/ORD/NRMRL/pubs/600r03103/600r03103chp5.pdf

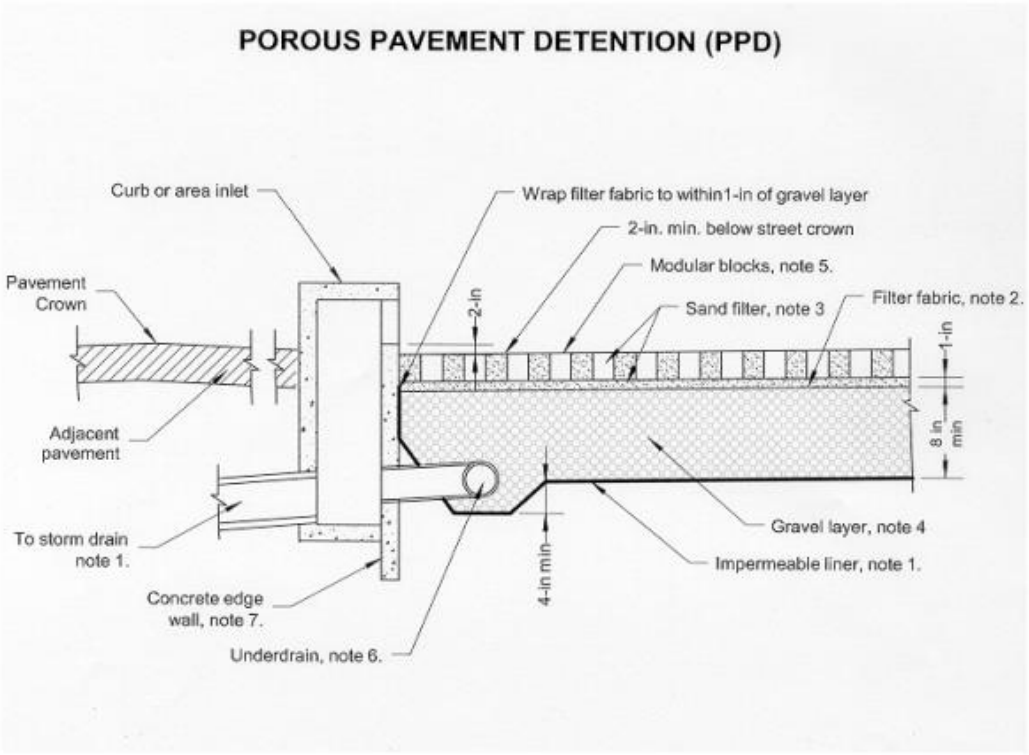
Portions of the USDCM Volume 3 that are required to design an extended detention basin to include water quality requirements are in Chapter 28.8 GJMC. Each designer should note that all UDFCD documents are updated continuously, and it is the designer's responsibility to check for these updates to ensure use of the most up-to-date data. Each designer should also note that some equations in this manual have been modified from those in Volume 3 to be specific to Mesa County. Equations in this manual shall govern.

Use of alternate BMPs not specified above is subject to approval by the local jurisdiction. Figure 28.64.020(h) offers a schematic for determining the best BMP options for individual sites.

When new development is served by a regional stormwater quality facility designed in accordance with this chapter and stormwater from the development is discharged to an open conveyance system before reaching the regional facility, on-site BMPs must also be provided. If the new development discharges to the regional stormwater quality facility through a storm drain, then this additional requirement does not apply.

STORMWATER MANAGEMENT MANUAL

POROUS PAVEMENT DETENTION (PPD)



NOTES:

1. PPD MUST INCLUDE AN UNDER-DRAIN SYSTEM THAT DISCHARGES TO A SURFACE DRAINAGE AND A 16 MIL IMPERMEABLE LINER. INFILTRATION NOT PERMITTED.
2. FILTER FABRIC(GEO-TEXTILE) SHALL MEET THE FOLLOWING: ASTM D-4751-AOS US STD SIEVE #30 TO #70; ASTM D-4632 - MIN. GRAB STRENGTH OF 100-LBS; ASTM D-4491 - MIN. PERMITTIVITY OF 1.5/SEC.
3. SAND FILTER TO BE ASTM C33 SAND.
4. GRAVEL LAYER TO BE AASHTO #4 WITH ALL FRACTURED FACES(CDOT SECTION 703, #4 COURSE AGGREGATE).
5. MODULAR BLOCK WITH OPEN SURFACE AREA OF 40% OR GREATER FOR VOID SPACE. SURFACE OF BLOCKS TO BE PLACED AT 0% GRADE IN ALL DIRECTIONS.
6. UNDER-DRAIN TO BE 4" MIN. DIAMETER, WITH 0.2% MIN. SLOPE, AT 20-FT MAXIMUM, ON CENTERS.
7. CONSTRUCT CONCRETE EDGE-WALL AROUND PERIMETER OF PPD, MIN. 6-IN THICK AND 18-IN DEEP.

Revision	Date
ORIGINAL ISSUE	3/27/06

WRC ENGINEERING, INC.

REFERENCE: *UDFCD. URBAN DRAINAGE CRITERIA MANUAL VOLUME 3 BEST MANAGEMENT PRACTICES*

FIGURE 28.64.020(a)

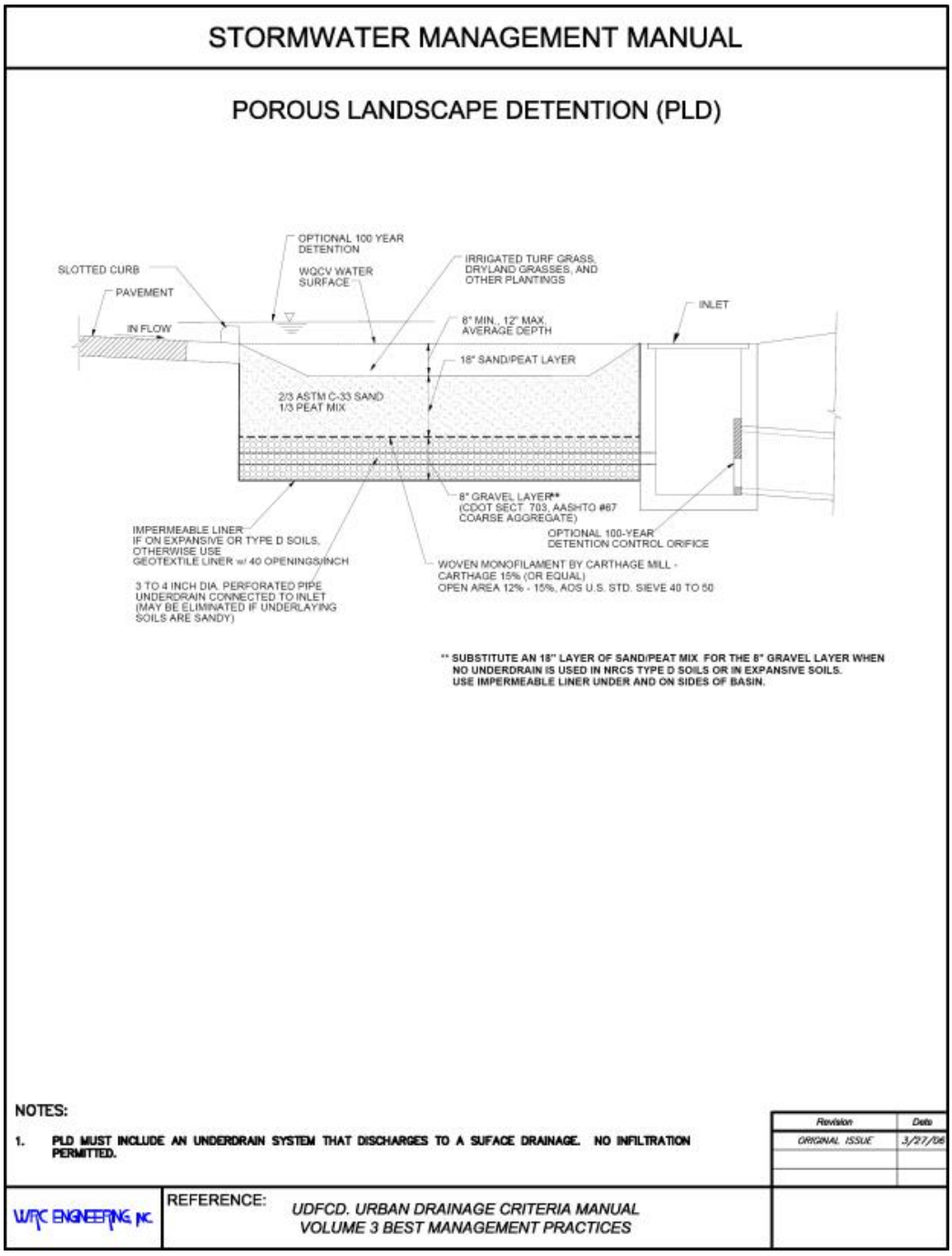


FIGURE 28.64.020(b)

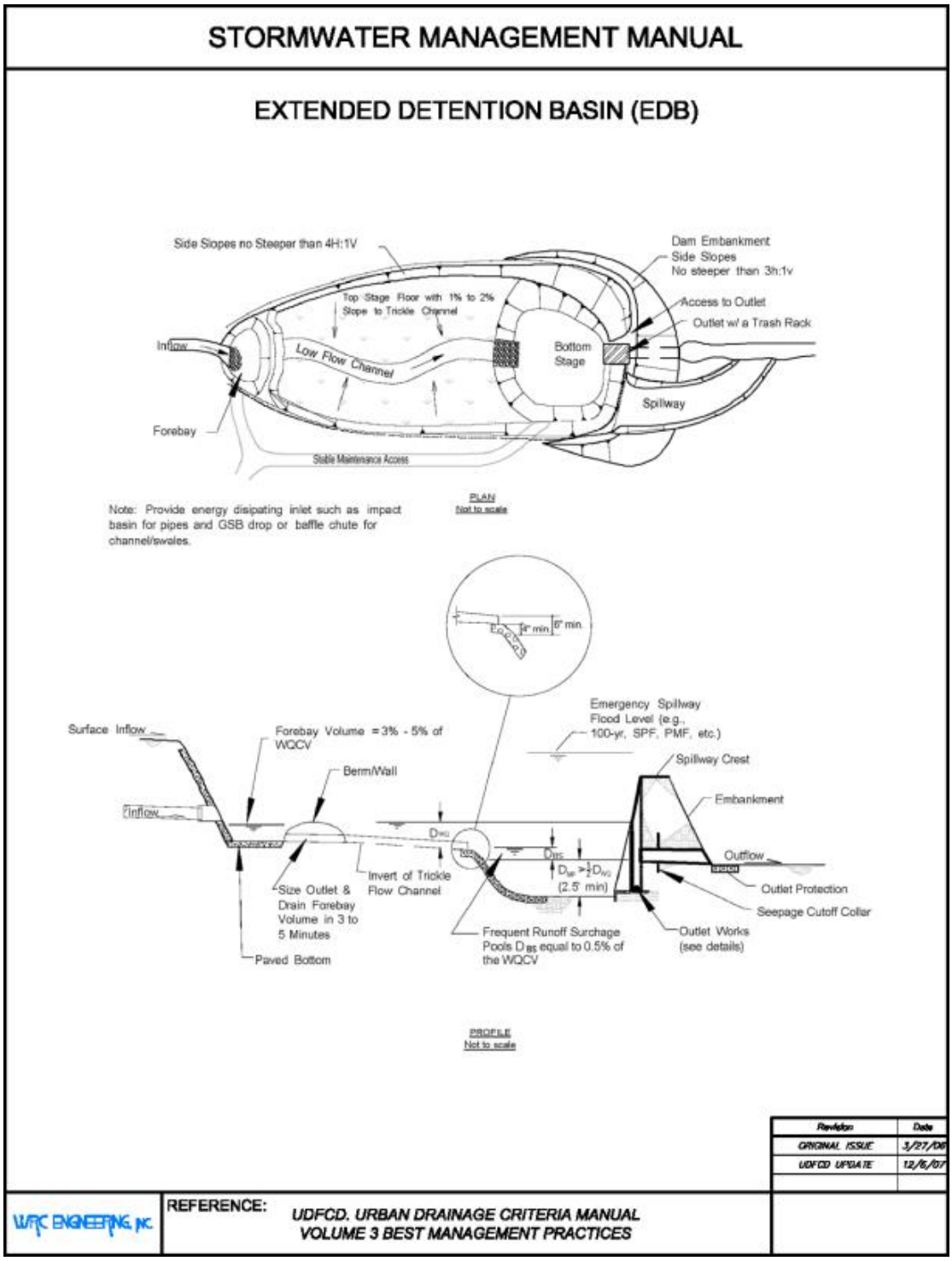


FIGURE 28.64.020(c)

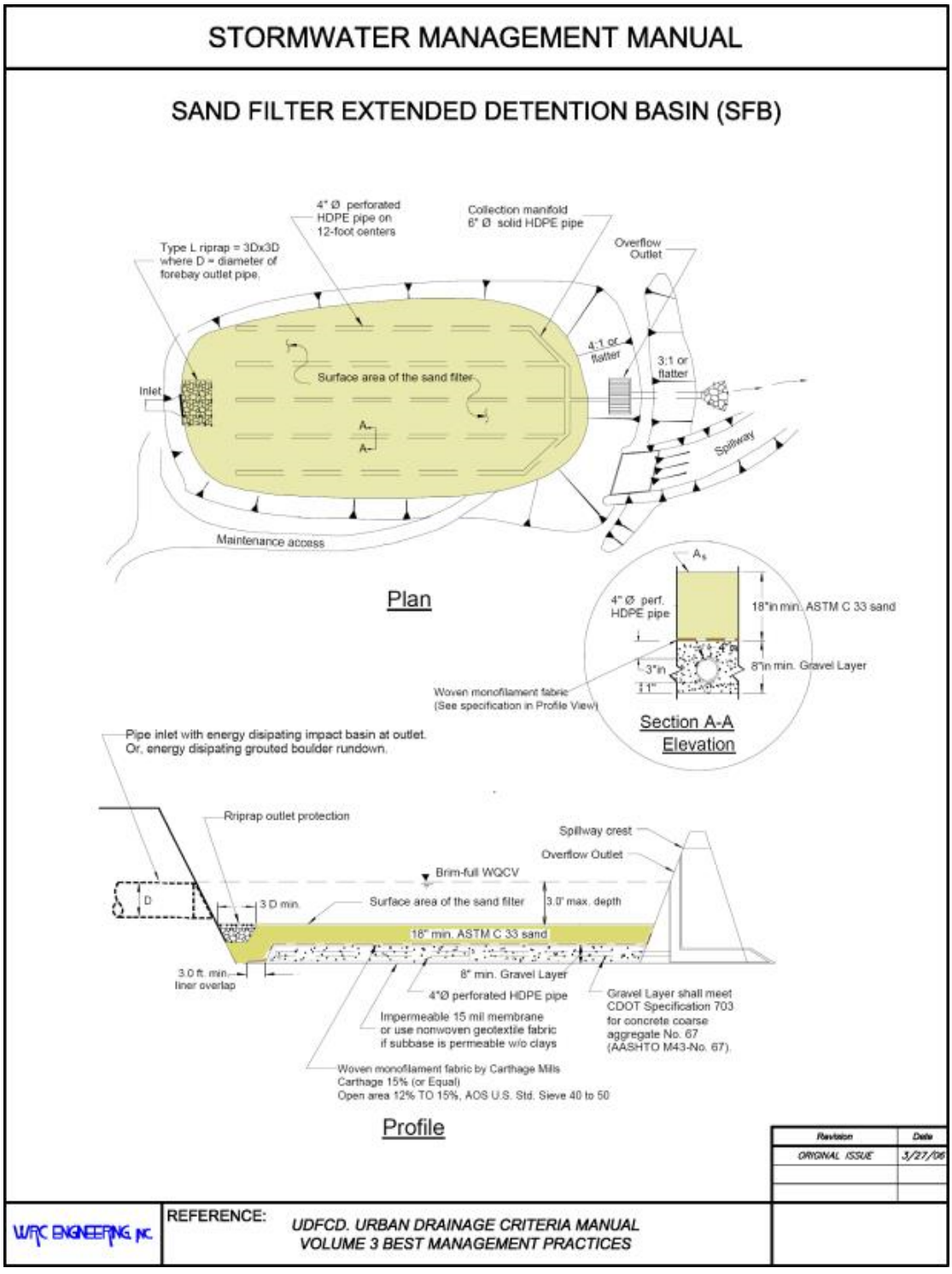


FIGURE 28.64.020(d)

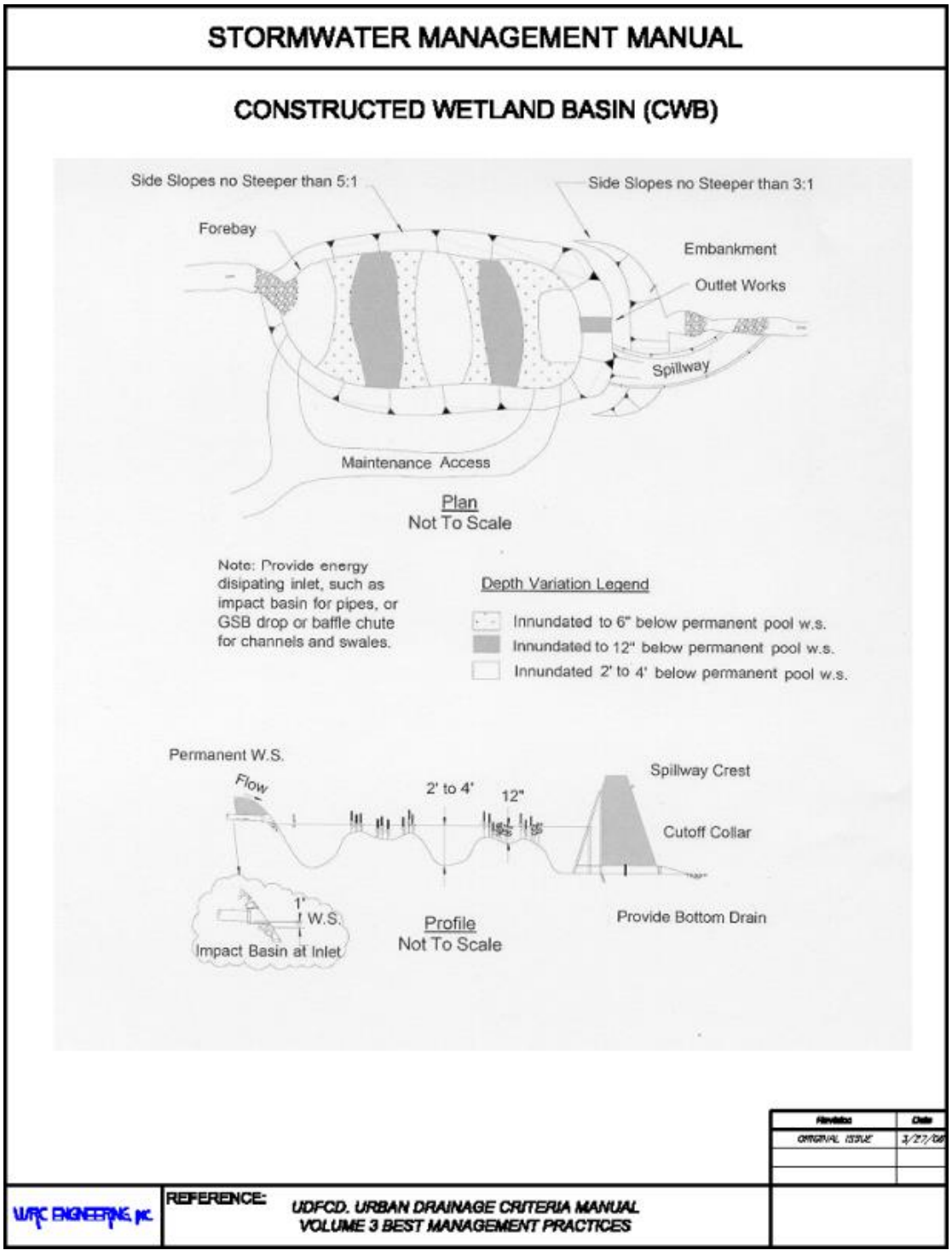


FIGURE 28.64.020(e)

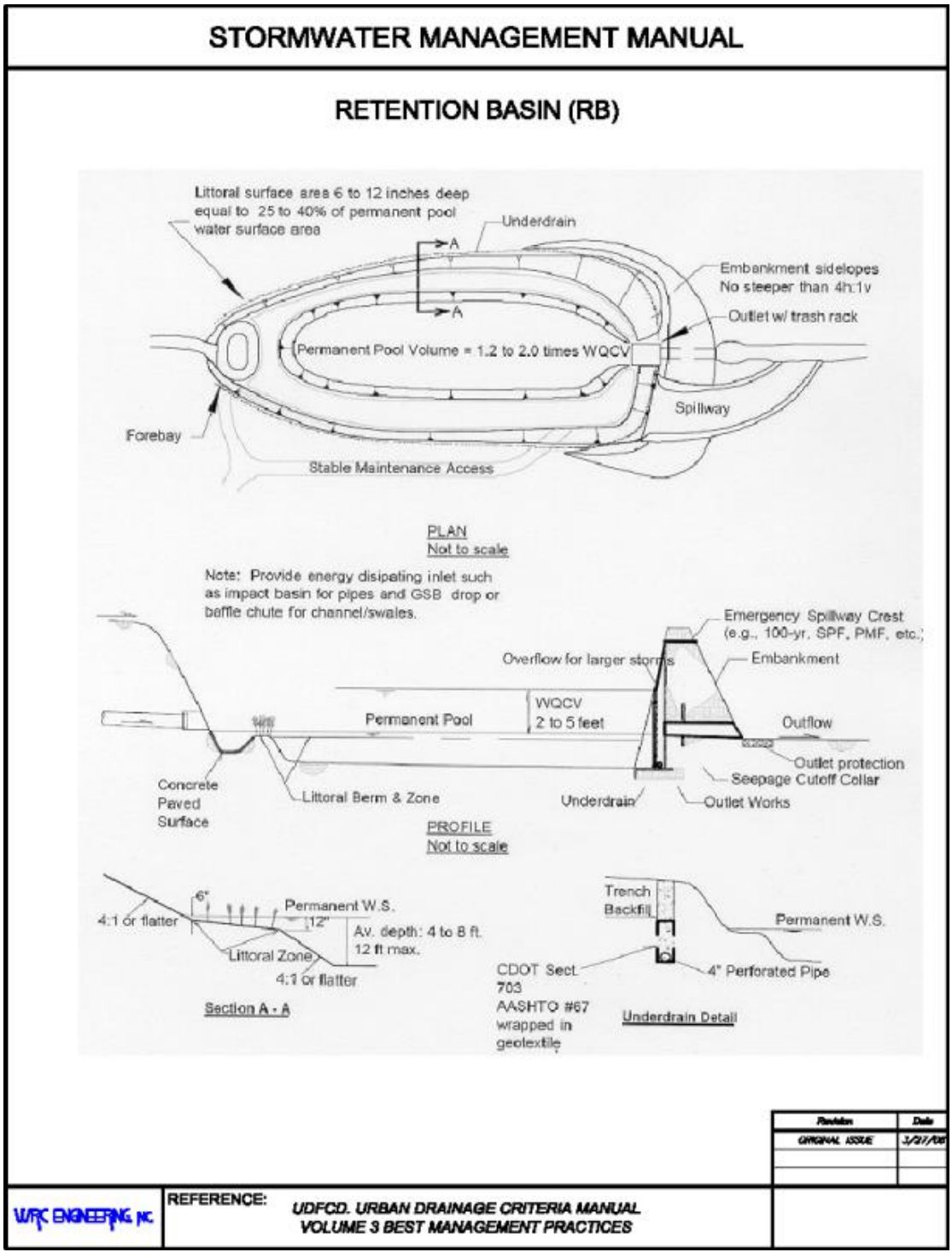


FIGURE 28.64.020(f)

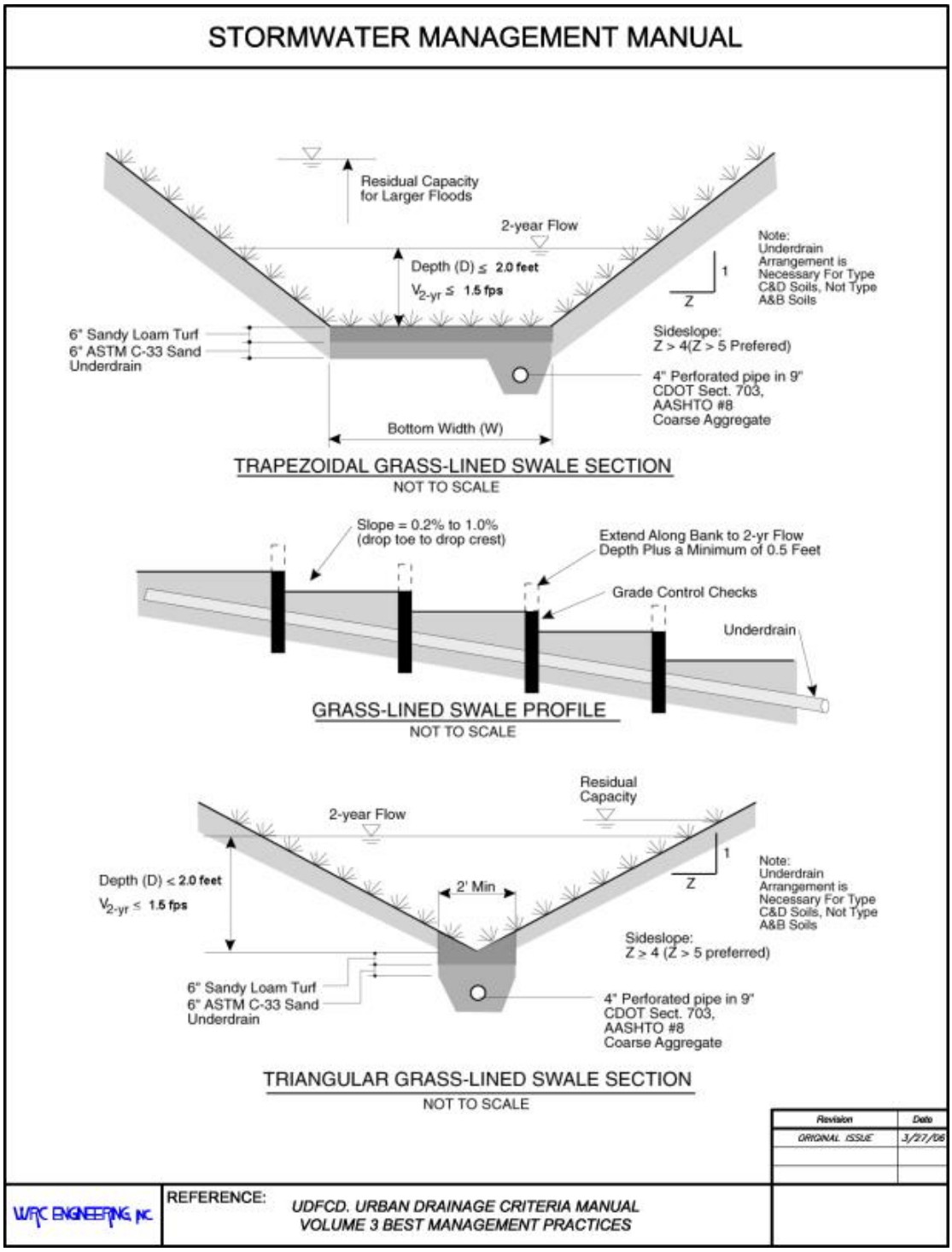


FIGURE 28.64.020(g)

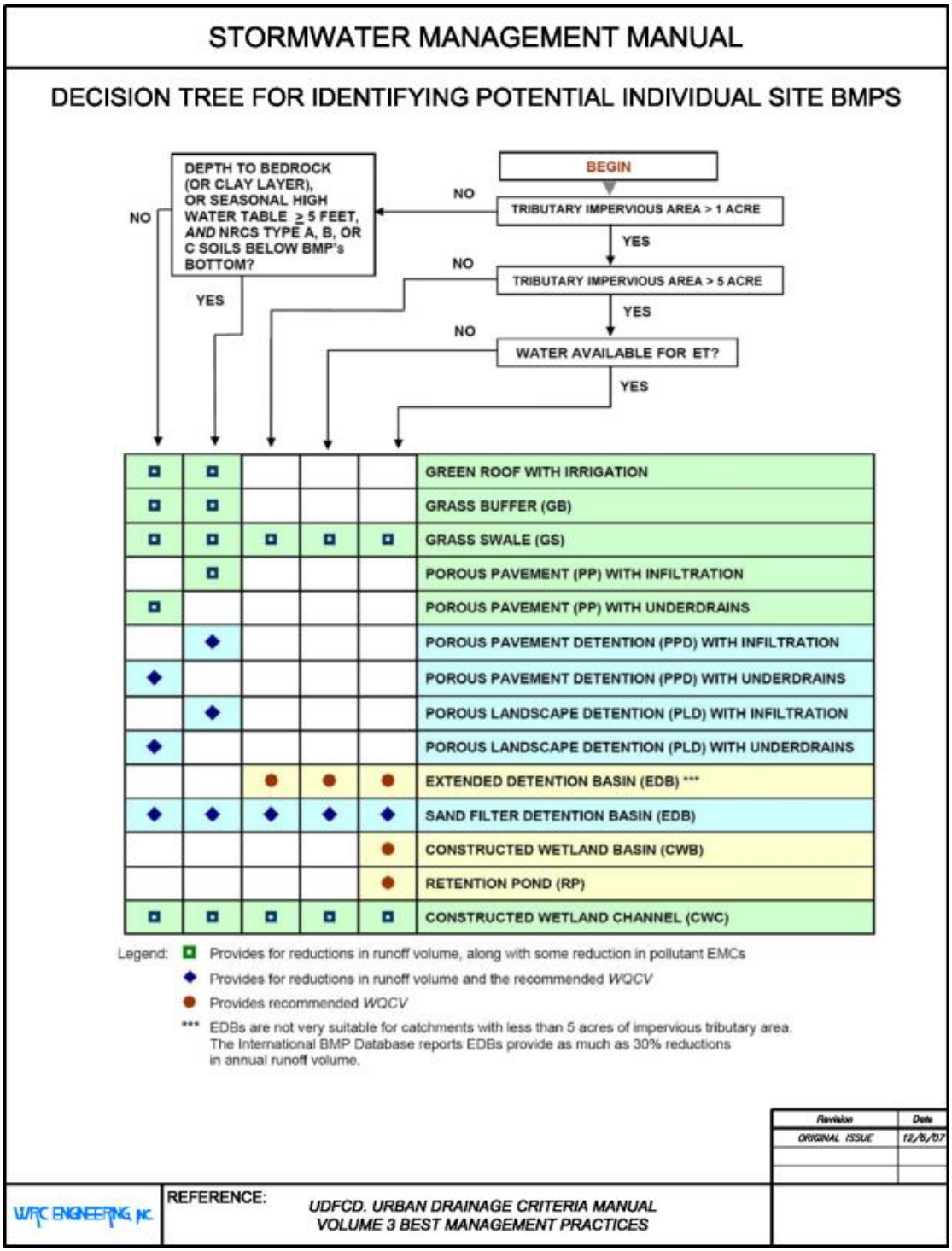


FIGURE 28.64.020(h)

(Res. 40-08 (§ 1602.1), 3-19-08)

§ 28.64.030. Standards for best management practices (BMPs) – Aesthetic requirements.

When storm runoff will be treated by an extended detention basin (dry), a retention pond with a permanent pool (wet), or constructed wetlands, the facility shall be designed with the intent of improving appearance in accordance with requirements under Chapter 28.56 GJMC, Detention and Retention.

(Res. 40-08 (§ 1602.2), 3-19-08)

§ 28.64.040. Standards for best management practices (BMPs) – Proprietary BMPs.

Proprietary systems which meet the requirements of this chapter and have continued inspection/operation and maintenance guarantees in place are allowed provided:

(a) Clear evidence must be provided why WQCV cannot be provided on the ground surface using volume-capture BMPs, and why the use of a subsurface proprietary device is the best choice for the site, considering factors such as initial installation, maintenance, and ability to assure long-term function.

(b) Proprietary BMPs are limited to commercial, new development and redevelopment sites with an area less than five acres tributary to the proprietary BMP. If greater than five acres, a variance or deviation may be requested as described in GJMC § 28.08.070.

(c) The proprietary device(s) must provide volume control based on a drain time of no less than six hours or be a supplement to other BMPs which meet these requirements.

(d) A binding, long-term inspection/operation and maintenance plan, including monitoring and reporting, and demonstration of adequate funding for such maintenance, must be provided.

(Res. 40-08 (§ 1602.3), 3-19-08)

§ 28.64.050. Standards for best management practices (BMPs) – Considerations in BMPs selection.

Because of unique conditions in Mesa County, there are important considerations in the selection and design of BMPs. For example:

(a) Vegetation. Vegetation for stabilization is preferred over rock or other hardscape. Native vegetation and grasses that require little water will satisfy this requirement. However, BMPs that rely on vegetation that requires more water than nature provides must include a supplemental irrigation source to maintain adequate plant growth. BMPs such as grass swales and buffers can be supplemented through potable sources and landscape irrigation systems. However, wetlands, wetland ponds, and extended detention basins also require supplemental water sources that include watershed runoff and/or larger scale, irrigation-water sources to maintain vegetation.

(b) Infiltration. Due to the nature of the soils in Mesa County, BMPs that rely specifically on infiltration into the groundwater are discouraged, since some pollutants in the soils can also be leached into the groundwater and eventually to surface waters. However, specific requirements for some BMPs, such as wet-ponds, wetlands, and filtration

systems which may result in infiltration, have been modified to require a liner and collection system to minimize or prevent infiltration.

(c) Maintenance Agreement and Guarantee. All drainage and water quality facilities must be designed to facilitate maintenance (see GJMC § 28.16.120, Drainage facilities maintenance) and maintenance agreements shall be entered into between a landowner and the local jurisdiction.

Additional guidance on design, site selection, maintenance and other considerations can be found in:

(1) *Urban Drainage and Flood Control District (UDFCD) 1999*. Urban Storm Drainage Criteria Manual, Volume 3 – Best Management Practices. This document is available in .pdf form at the following website:

http://www.udfcd.org/usdcm/vol3.htm.

(2) City and County of Denver 2004. *Water Quality Management Plan 2004*. This document is available in .pdf form at the following website:

http://www.denvergov.org/WMDWaterQuality/77516706template3jump.asp

See Chapter 6 Stormwater Quality BMP Implementation Guidelines, Part 4 – BMP Fact sheets.

(Res. 40-08 (§ 1602.4), 3-19-08)

§ 28.64.060. Standards for best management practices (BMPs) – Local modifications to minimum structural BMPs.

(a) Structural BMPs which typically employ micro-pools, namely extended detention basins, may be modified to omit the micro-pool should the local jurisdiction be concerned about negative side effects. Micro-pools were initially added to the standard design for extended detention basins because:

(1) They seemed to develop whether or not they were intended; and

(2) Some data suggested pollutant removal, particularly of nutrients, would improve.

(b) However, the West Nile Virus outbreak in 2003, several outbreaks of algae growth during the drought of 2002, and the increased operation and maintenance requirements that come with micro-pools prompted many communities to forgo their use completely. Given the very dry climate of Mesa County, micro-pools may be considered an optional feature of the extended detention basin (EDB) without compromising the standard of practice for stormwater quality control.

(c) The use of a micro-pool may be considered more appropriate when the:

(1) EDB has a more reliable source of water than solely stormwater runoff;

(2) EDB serves an area greater than 160 acres; and

(3) Permanent pool can be maintained as an aesthetic feature rather than a nuisance.

(Res. 40-08 (§ 1602.5), 3-19-08)

§ 28.64.070. Final drainage report.

A final drainage report shall be prepared which includes a narrative, calculations and drawings showing location and sizes of permanent BMPs used to control the discharge of pollutants to the MS4 system after construction. Requirements for a final drainage report are described in Chapter 28.12 GJMC, Drainage Planning Submittal Requirements.

(Res. 40-08 (§ 1603), 3-19-08)

§ 28.64.080. Water quality capture volume.

Water quality capture volume (WQCV) requirements for structural BMPs can be determined using the following sources. For this manual, equations developed by the UDFCD were used and adjusted for the Mesa County area.

(a) Urban Drainage and Flood Control District (UDFCD) 2002. *Urban Storm Drainage Criteria Manual, Volume 3 – Best Management Practices*. This document can be obtained in .pdf form at the following website:

http://www.udfcd.org/usdcm/vol3.htm

(b) EPA 2002. *Consideration in the Design of Treatment Best Management Practices (BMP) to Improve Water Quality. EPA 600 R-03/103*. This document can be obtained in .pdf form at the following website:

http://www.epa.gov/ORD/NRMRL/pubs/600r03103/600r03103chp5.pdf

(c) Water Environment Federation (WEF) and American Society of Civil Engineers (ASCE) 1998. *Urban Runoff Quality Management*. WEF Manual No. 23, ASCE Manual No. 87.

(Res. 40-08 (§ 1604), 3-19-08)

§ 28.64.090. Directly connected impervious area.

The procedures described in Chapter 28.24 GJMC, Rainfall, and in Chapter 28.28 GJMC, Storm Runoff, are intended for the design of drainages and flood control facilities that prevent damage to property and help protect human life. These procedures show that the depth of rainfall produced from a design storm can vary with location and that runoff is a function of total imperviousness.

Post-construction BMPs focus more on the smaller events that deliver frequent flow pulses and pollutant loads to receiving waters. The runoff volume for smaller events is especially sensitive to the impervious area that is hydraulically connected to the stormwater runoff system. The impervious portion of a watershed determines the runoff volume that needs to be used for the design of water quality facilities, and the percentage of impervious surface therefore becomes important in the design of structural BMPs.

The methodology for calculating basin imperviousness is presented in Chapter 28.28 GJMC, Storm Runoff. This procedure needs to be modified, however, when using the practice of minimizing directly connected impervious areas in combination with extended detention basins, retention ponds, wetlands, and other practices dependent on a design water quality capture volume. See UDFCD Urban Storm Drainage Criteria Manual (USDCM) Volume 3 Best Management Practices for calculation details.

(Res. 40-08 (§ 1604.1), 3-19-08)

§ 28.64.100. Water quality capture volume.

All structural BMPs recommended in this manual are based on the eightieth percentile storm event. Specific guidance for finding the needed WQCV for each BMP type's design section can be found in the USDCM Volume 3 chapter on Structural BMP. This WQCV varies with the type of BMPs used and is based on the time it takes to fully drain the brim-full WQCV, which varies from six hours to 40 hours, depending on the BMPs. WQCV can be determined using the following relationships:

$$WQCV = K \{a(0.91*I^3 - 1.19*I^2 + 0.78*I)\}$$

Where:

WQCV is in watershed inches

K = Adjustment to equation for Mesa County area = $d_6/0.43$

a = Adjustment for BMPs drain time

I = Watershed imperviousness as a decimal

d_6 = Depth of average runoff-producing storm

BMP Drain Time (hrs)	Value of "a"
6	0.7
12	0.8
24	0.9
40	1

The average runoff-producing storm value, d_6 = 0.28 inches, was obtained from Driscoll, et al. 1989. *Analysis of Storm Event Characteristics for Selected Rainfall Gages Throughout the United States*. The value 0.43 is for the Denver metropolitan area, for which the original WQCV equation was derived (UDFCD 1999). Therefore, K = 0.28/0.43 = 0.65, which indicates that the Mesa County area requires approximately 35 percent less WQCV than along the front range.

Determine the required storage volume in acre-feet as follows:

Required storage = [WQCV/12]* Area

Where:

Required storage = Required storage volume, in acre-feet

Area = Tributary watershed area, in acres

Required storage volume shall be based on 120 percent of calculated WQCV to allow for sediment accumulation.

The local jurisdictions recognize that some sites cannot be graded in a reasonable manner so that the entire site drains to the detention basin. If at least 95 percent of the site drains to the detention pond, then local jurisdiction may accept the design, provided the WQCV is based on 100 percent of the site draining into the detention pond.

(Res. 40-08 (§ 1604.2), 3-19-08)

§ 28.64.110. Nonstructural BMPs – General information.

For existing and new development areas, nonstructural BMPs shall be applied where considered appropriate by the local jurisdiction based on applicable regulations or industry standards. Also, the requirement to prepare and implement permanent BMPs described in the final drainage report in accordance with good drainage policy and criteria (i.e., this manual) constitute nonstructural BMPs. Examples of nonstructural BMPs include the following controls or management of activities:

- Disposal of Household Waste and Toxics
- Pesticides, Herbicides and Fertilizer Use
- Illicit Discharge
- Spill Prevention and Response
- Preventative Maintenance
- Painting Operations
- Outside Materials Storage
- Outside Manufacturing
- Stormwater Pollution Prevention Education
- Vehicle Washing
- Above Ground Storage Tanks
- Good Housekeeping
- Loading and Unloading
- Fueling
- Exposure Minimization
- Storm Drain Stenciling

Management and control of these activities will occur over time as part of the various program requirements under the CDPS permit.

(Res. 40-08 (§ 1605.1), 3-19-08)

§ 28.64.120. Nonstructural BMPs – Spill prevention and response.

Presented below is a list of steps to minimize spill occurrence and response measures to address spills that do occur.

(a) Develop procedures to prevent/mitigate spills to storm drain systems. Standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

(b) Post “No Dumping” signs with a phone number for reporting illegal dumping and disposal.

(c) Conduct routine cleaning, inspections, and maintenance.

(1) Sweep and clean storage areas consistently at a designated frequency (e.g., weekly, monthly). Do not hose down areas to storm drains.

(2) Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Reuse, recycle, or properly dispose of any collected liquids or soiled absorbent materials.

(3) Check tanks (and any containment sumps) frequently for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

(4) Check for external corrosion of material containers, structural failures, spills and overfills due to operator error, failure of piping system, etc.

(5) Inspect tank foundations, connections, coatings, and tank walls and piping system.

(d) Properly store and handle chemical materials.

(1) Designate a secure material storage area that is paved with portland cement concrete, free of cracks and gaps, and impervious in order to contain leaks and spills.

(2) Do not store chemicals, drums, or bagged materials directly on the ground. Place these items in secondary containers.

(3) Keep chemicals in their original containers, if feasible.

(4) Keep containers well labeled according to their contents (e.g., solvent, gasoline).

(5) Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, and poisonous).

(6) Prominently display required labels on transported hazardous and toxic materials (per U.S. DOT regulations).

(e) Utilize secondary containment systems for liquid materials.

(1) Surround storage tanks with a berm or other secondary containment system.

(2) Slope the area inside the berm to a drain.

(3) Drain liquids to the sanitary sewer if available. Do not discharge wash water to sanitary sewer until contacting the local authority to find out if pretreatment is required.

(4) Pass accumulated stormwater in petroleum storage areas through an oil/water separator.

(5) Use catch basin filtration inserts.

(f) Protect materials stored outside from stormwater. Construct a berm around the perimeter of the material storage area to prevent uncontaminated stormwater from adjacent areas from coming in contact with runoff from the stored material.

(g) Secure drums stored in an area where unauthorized persons may not gain access to prevent accidental spillage, pilferage, or any unauthorized use.

(h) Identify key spill response personnel.

(i) Adopt a hazardous materials response plan, which includes a set of planned responses to hazardous materials emergencies that include:

(1) Description of the facility, owner and address, activities and chemicals present;

(2) Facility map;

(3) Notification and evacuation procedures;

(4) Cleanup instructions;

(5) Identification of responsible departments.

(j) Clean up leaks and spills immediately.

(1) Place a stockpile of spill cleanup materials where they will be readily accessible (e.g., near storage and maintenance areas).

(2) Utilize dry cleaning methods to clean up spills to minimize the use of water. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.

(3) Do not hose down or bury dry material spills. Sweep up the material and dispose of properly.

(4) Clean up chemical materials with absorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove and dispose the adsorbent materials promptly.

(5) For larger spills, a private spill cleanup company or hazmat team may be necessary.

(k) Reporting.

(1) Report spills that pose an immediate threat to human health or the environment to local agencies.

(2) Establish a system for tracking incidents. The system shall be designed to identify: types and quantities (in some cases) of wastes, patterns in time of occurrence (time of day/night, month, or year), mode of dumping (abandoned containers, midnight dumping from moving vehicles, direct dumping of materials, accidents/spills), and responsible parties.

(l) Training. Educate employees about spill prevention and cleanup.

(1) Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.

(2) Educate employees on aboveground storage tank requirements.

(3) Train all employees upon hiring and on an annual basis.

(4) Train employees responsible for aboveground storage tanks and liquid transfers on adopted spill plan.

(m) Stencil Storm Drains. Storm drain system signs act as highly visible source controls that are typically stenciled directly adjacent to storm drain inlets. Stencils shall read "No Dumping: Drains to River."

(Res. 40-08 (§ 1605.2), 3-19-08)

§ 28.64.130. Inspection and enforcement.

(a) Mesa County. Post-construction BMPs shall be inspected by the engineer of record during construction, and record drawings of completed drainage facilities shall be submitted to the County along with certification that the facilities were constructed in accordance with approved plans (see GJMC § 28.12.120, Record drawings and acceptance). The County will audit a portion of the record drawings to verify completeness.

Maintenance of all drainage facilities shall be performed by the owner, in accordance with GJMC § 28.16.120, Drainage facilities maintenance, and required by maintenance agreement, GJMC § 28.64.050(c). The County requires that all facilities be inspected annually by a qualified erosion control specialist to verify maintenance activities and that inspection reports be provided to the County, who will audit 10 percent of all inspections. The County will provide necessary forms for inspection. Failure to properly maintain drainage facilities may result in enforcement actions, in accordance with the Land Development Code.

(b) City of Grand Junction. Inspection and enforcement of permanent BMPs will be performed in accordance with the stormwater pollution prevention ordinance, Chapter 13.28 GJMC.

(1) Structural BMPs located on property shall be owned, operated, inspected and maintained by the owner(s) of the property and those persons responsible for the property on which the BMPs are located. The legal responsibility to maintain the BMPs shall be included in property owners' association (POA) declarations, incorporation articles, bylaws and/or development agreements for commercial sites. As a condition of approval of the BMPs, the owner and those persons responsible for the property shall also agree to maintain the BMPs to their design capacity unless or until the City shall relieve the property owner of that responsibility in writing. Drainage easements for inspection, installation, operation, repair and maintenance along with easements required to access and inspect the BMP(s) and to perform routine maintenance as necessary to ensure proper functioning of the stormwater BMPs shall be dedicated to the City. The

building of any structures on such easements is prohibited. Any agreement arising out of or under Chapter 13.28 GJMC may be recorded as directed by the City Manager in the office of the Grand Junction City Clerk and/or the Mesa County land records.

(2) The City may issue annual notices to POAs as well as to commercial and industrial sites to ensure inspections and maintenance of permanent BMPs are performed properly.

(c) Other Municipalities. Contact the City of Fruita, the Town of Palisade, and the Grand Junction Drainage District to determine inspection and enforcement requirements.

(Res. 40-08 (§ 1606), 3-19-08)

§ 28.64.140. BMPs for industrial and commercial activities.

This section contains guidance for BMPs that control illicit discharges from industrial and commercial activities that come in contact with precipitation and result in contaminated stormwater discharges to the MS4. Owners of industrial or commercial activities that may come in contact with precipitation shall prepare a stormwater management plan (SWMP) approved by the local jurisdiction and implement best management practices, as described herein. Owners shall also be required to obtain a discharge permit from the Industrial Permits Unit of the CDPHE prior to receiving plan approval.

(Res. 40-08 (§ 1607), 3-19-08)

§ 28.64.150. Industrial and commercial activities.

(a) Federal regulations define an illicit discharge as "...any discharge to an MS4 that is not composed entirely of stormwater..." with some exceptions. These exceptions include discharges from CDPS-permitted industrial sources and discharges from fire-fighting activities and certain municipal activities. Illicit discharges are considered illicit because MS4s are not designed, or allowed by law, to accept, process, or discharge such nonstormwater wastes.

(b) Typical illicit stormwater discharges may contain fuel, oil, solvents, degreasing agents, waste automotive fluids, acids, lubricants, caustic fluids, paint, paint thinners and solvents, dust from sanding and grinding, sand blasting residue, metal and wood shavings, industrial chemicals, herbicides, lawn products, hazardous wastes, sediment, dirt, toxic substances, trash and other pollutants. Example commercial and industrial activities where these illicit discharges may occur, if allowed to come in contact with precipitation, include:

(1) Manufacturing.

(2) Material handling, including loading and unloading.

(3) Vehicle and equipment maintenance, storage, parking, and washing.

(4) Waste containment.

(5) Painting.

(6) Material and product storage.

(7) Fueling areas.

(Res. 40-08 (§ 1607.1), 3-19-08)

§ 28.64.160. Best management practices.

BMPs to control illicit discharges from commercial and industrial activities can be grouped into source controls and treatment practices. Source controls are measures that prevent an illicit discharge from occurring (i.e., spill prevention), while treatment practices remove pollutants from stormwater prior to leaving the site, which is the classical definition of structural practices.

(a) Source Controls. Source controls include:

(1) Prevention. Practices that eliminate or reduce the amount and the chance of pollutants being generated on the site. This category includes good housekeeping practices, such as employee training, signage, and labeling.

(2) Exposure Minimization. Practices that eliminate or minimize the chances of stormwater runoff coming in contact with pollutants. Simply covering the activity greatly reduces, if not eliminates the possibility of an illicit discharge.

Source control BMPs for industrial and commercial activities are listed on Figure 28.64.160(a). This information can be found at the following webpage:

http://www.pweng.slco.org/pdf/imatrix.pdf

Then by clicking on the source control BMPs, a one-page fact sheet can be obtained which describes the application, the criteria, limitations, and targeted pollutants.

For additional information regarding industrial stormwater discharges, refer to UDFCD Urban Drainage Criteria Manual, Volume 3 Best Management Practices (USDCM). This document is available in .pdf form at:

http://www.udfcd.org/usdcm/vol3.htm

(b) Treatment Practices. Treatment practices involve cleaning up or recovering a substance after it has been released or spilled, which is the last line of defense after the pollutant has been released on site. Treatment practices are considered a last resort and shall be used only when source control options are not practical. GJMC § 28.64.020 through 28.64.060, standards for best management practices, describe the preferred treatment options.

For small sites where oil spills are probable, such as parking lots, industrial yards, etc., a treatment device referred to as an oil/water separator may be required. General information on oil/water separators can be found at the following:

http://www.pweng.slco.org/pdf/imatrix.pdf

then click on “OWS” in the “Treatment Control BMPs to Consider” table.

Where oil/water separators are being considered, the following limitations are recommended:

(1) The tributary area must be small (i.e., less than one acre) and essentially 100 percent impervious.

(2) The site grading and drainage must be designed to minimize the area to the maximum extent practicable.

(3) Oil/water separators shall precede all other stormwater treatment BMPs and be located off-line from the stormwater conveyance or detention system.

(4) Oil/water separators shall be either the coalescing plate/media type, filter-type, or other type system with the following sizing requirements:

(i) Peak flow rate is based on the mean storm intensity of 0.044 inches per hour with provisions for diversion of larger storm events.

(ii) Include a forebay to collect floatable and larger settleable solids with a surface area of not less than 20 square feet per 10,000 square feet of tributary area.

(iii) Remove droplets 90 microns and larger with a rise-rate of 0.033 feet per minute. Limited data from petroleum-storage-terminal discharges suggest that 80 percent of droplets are greater than 90 microns.

(iv) If coalescing plates are used, they shall be separated by no less than three-quarters inches and be angled from 45 to 60 degrees from the horizontal.

(5) Provide access to all chambers for monitoring and maintenance.

(6) Requires a formal operations and maintenance agreement between the local jurisdiction and the property owner be in force.

Two examples of proprietary products that can separate oil and water are shown on Figures 28.64.160(b) and 28.64.160(c). Reference to any proprietary product does not imply endorsement of the product by the local jurisdictions, but is meant to demonstrate that different products are available. Figure 28.64.160(b) shows an example of a precast concrete vault which includes a coalescing media. The media attracts oil droplets and increases the oil droplet size allowing more oil to rise to the surface than a system that relies on gravity alone. Figures 28.64.160(c) shows an example of a system that relies on the filtering mechanism to remove oil droplets. Both systems also capture coarse sediment, floatables and trash.

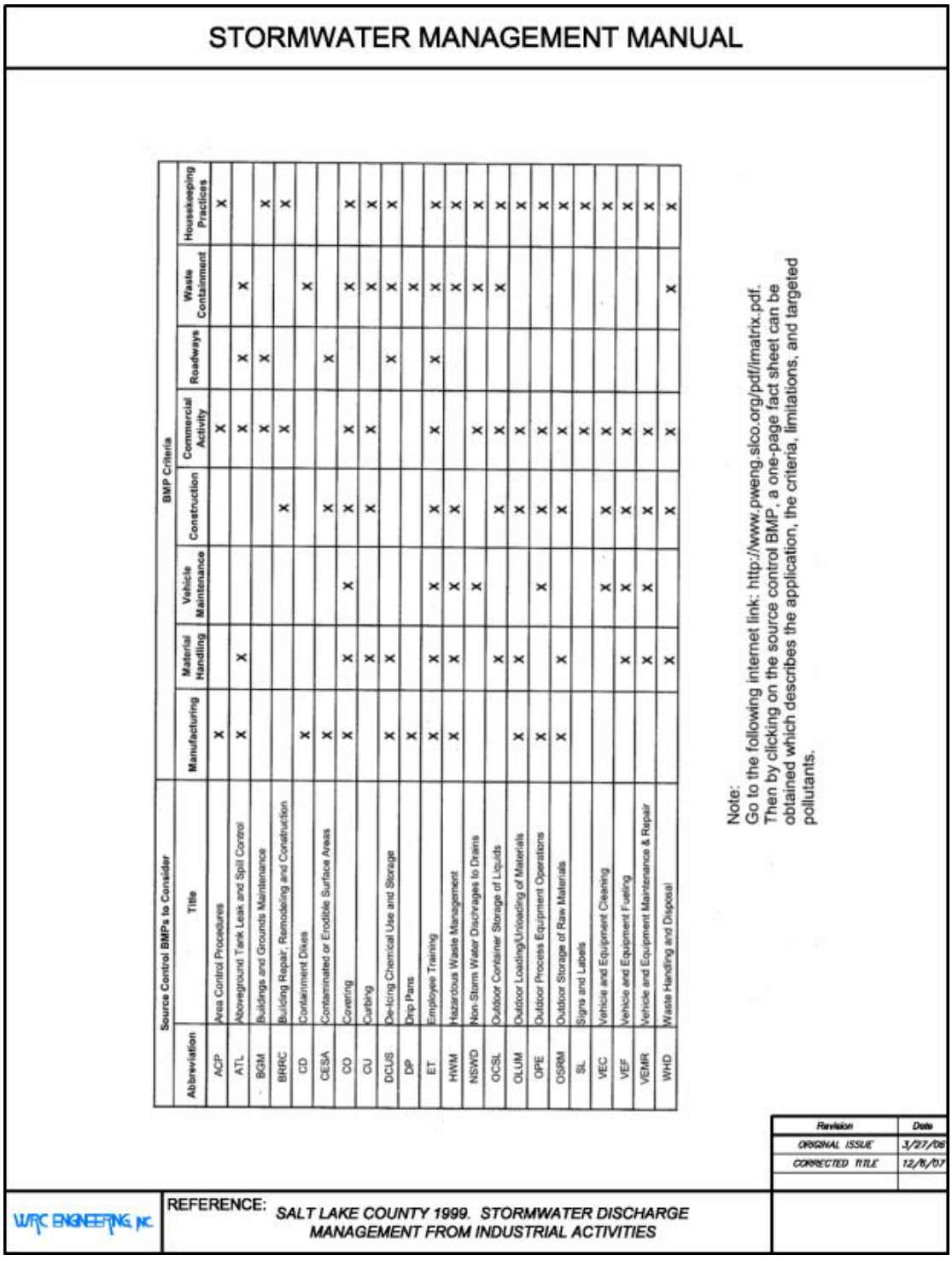


FIGURE 28.64.160(a)

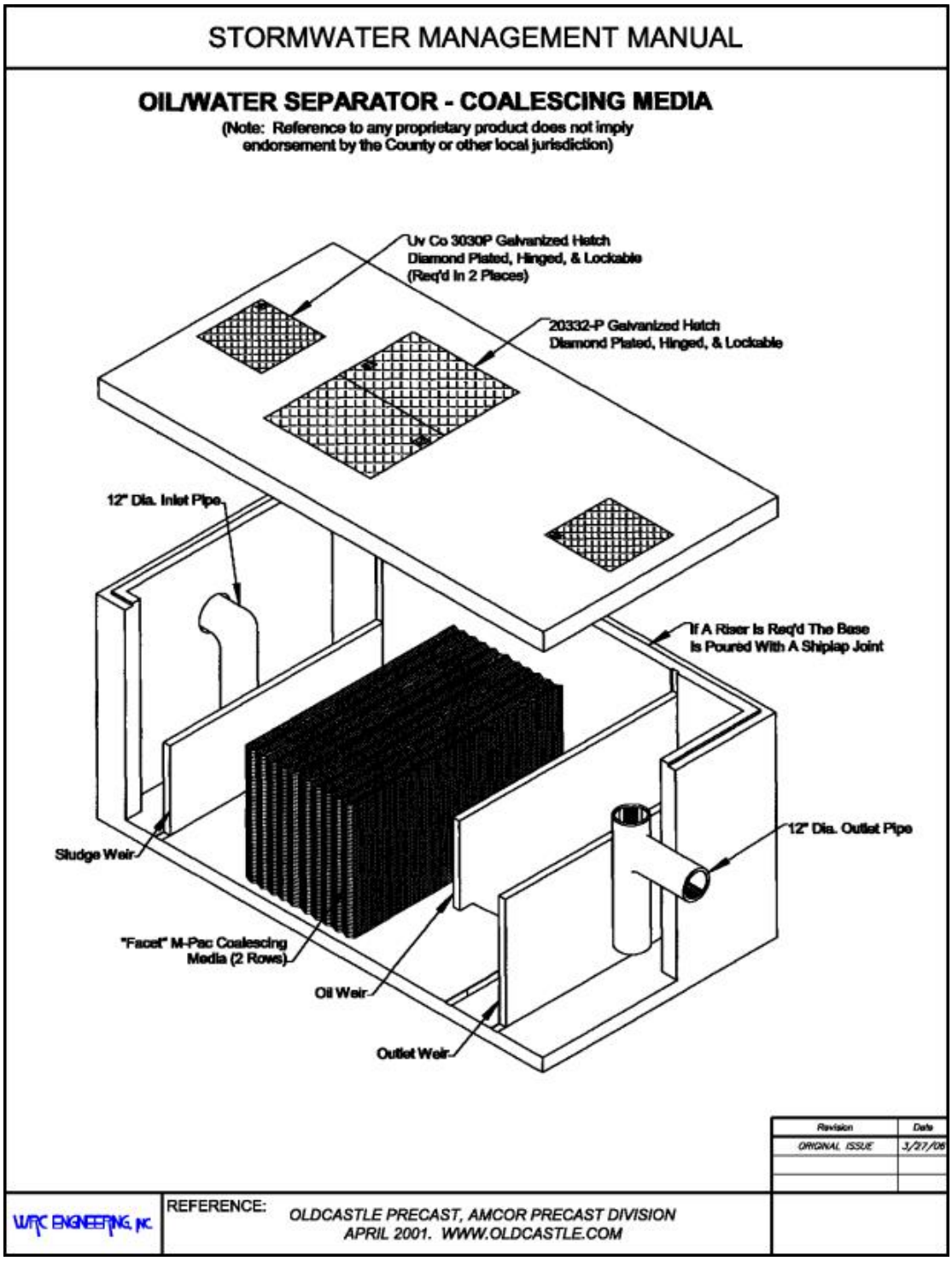


FIGURE 28.64.160(b)

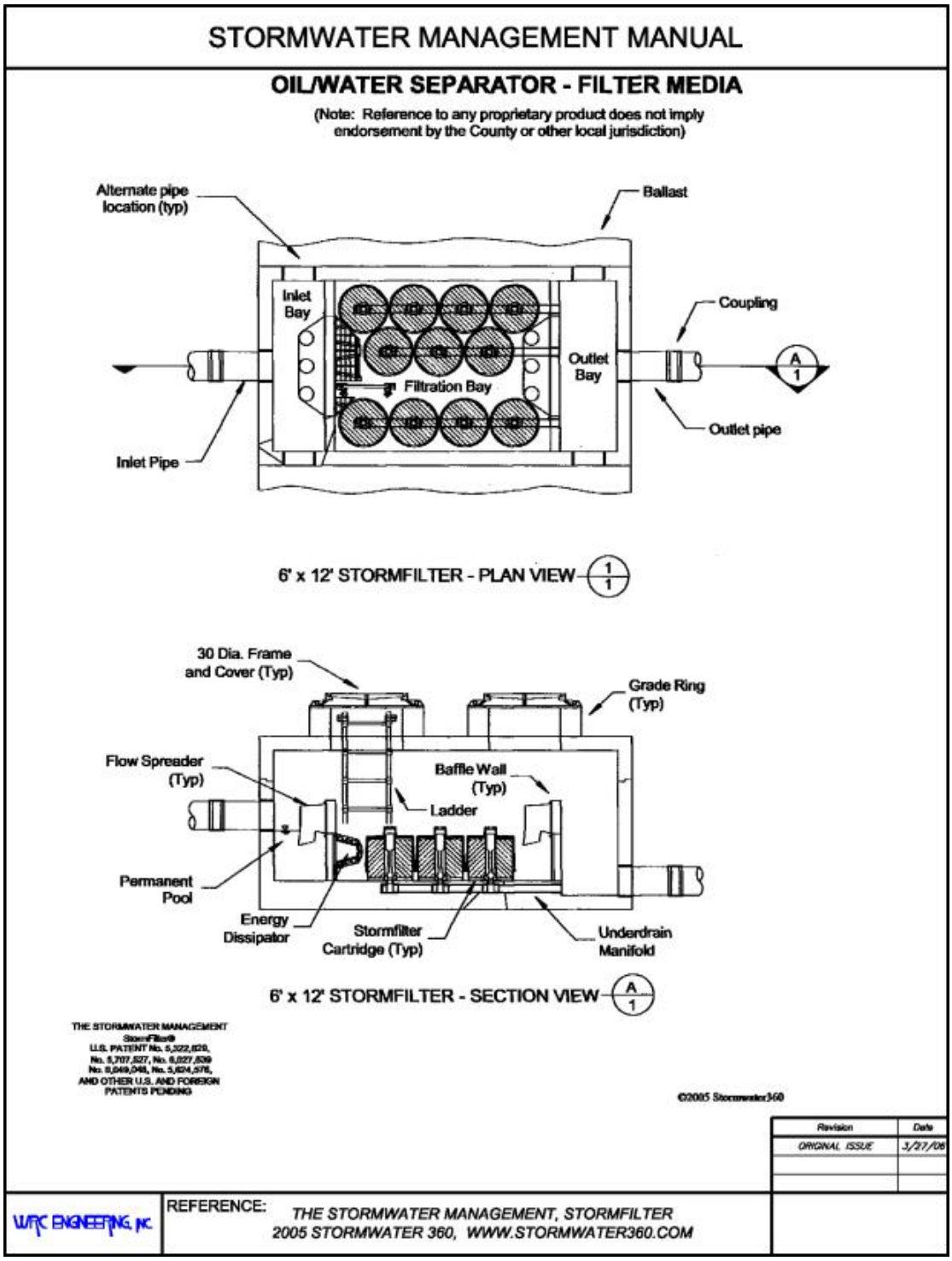


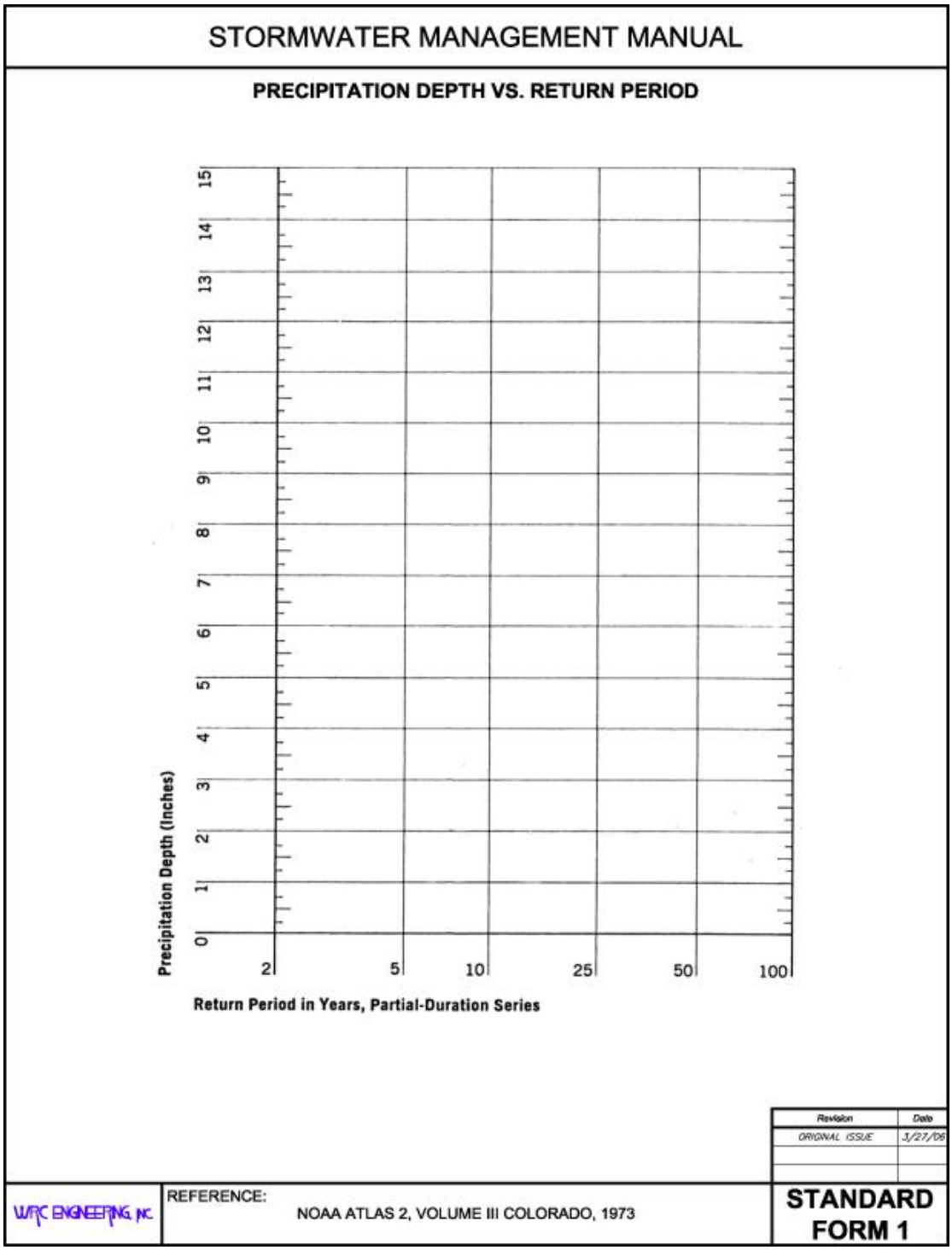
FIGURE 28.64.160(c)

(Res. 40-08 (§ 1607.2), 3-19-08)

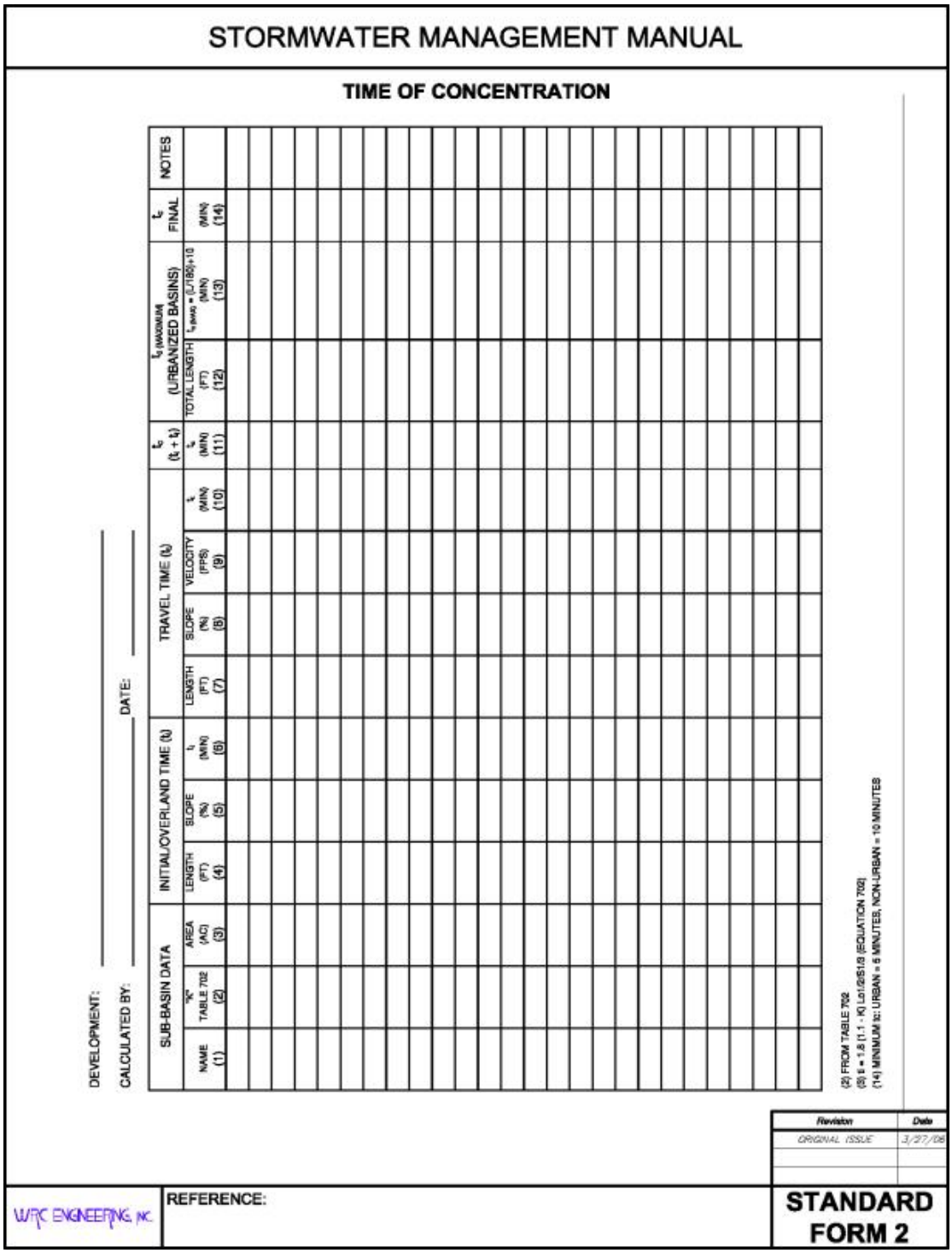
Chapter 28.68
Standard Forms

§ 28.68.010. Hydrologic and hydraulic design forms.

(a) Standard Form 1 – Precipitation Depth vs. Return Period.



(b) Standard Form 2 – Time of Concentration.


STORMWATER MANAGEMENT MANUAL

TIME OF CONCENTRATION

DEVELOPMENT: _____ DATE: _____

CALCULATED BY: _____

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				t_c (t_i + t_t)		t_c (MAXIMUM (URBANIZED BASINS)		t_c FINAL	NOTES
NAME (1)	"K" TABLE 702 (2)	AREA (AC) (3)	LENGTH (FT) (4)	SLOPE (%) (5)	t_i (MIN) (6)	LENGTH (FT) (7)	SLOPE (%) (8)	VELOCITY (FPS) (9)	t_t (MIN) (10)	t_c (MIN) (11)	TOTAL LENGTH (FT) (12)	$t_{c\ MAX} = (L/180)+10$ (MIN) (13)	(MIN) (14)	

(2) FROM TABLE 702
(9) $t_t = 1.8\ (1.1 - K)\ L\sqrt{(}S)/S)$ (EQUATION 702)
(14) MINIMUM t_c: URBAN = 5 MINUTES, NON-URBAN = 10 MINUTES

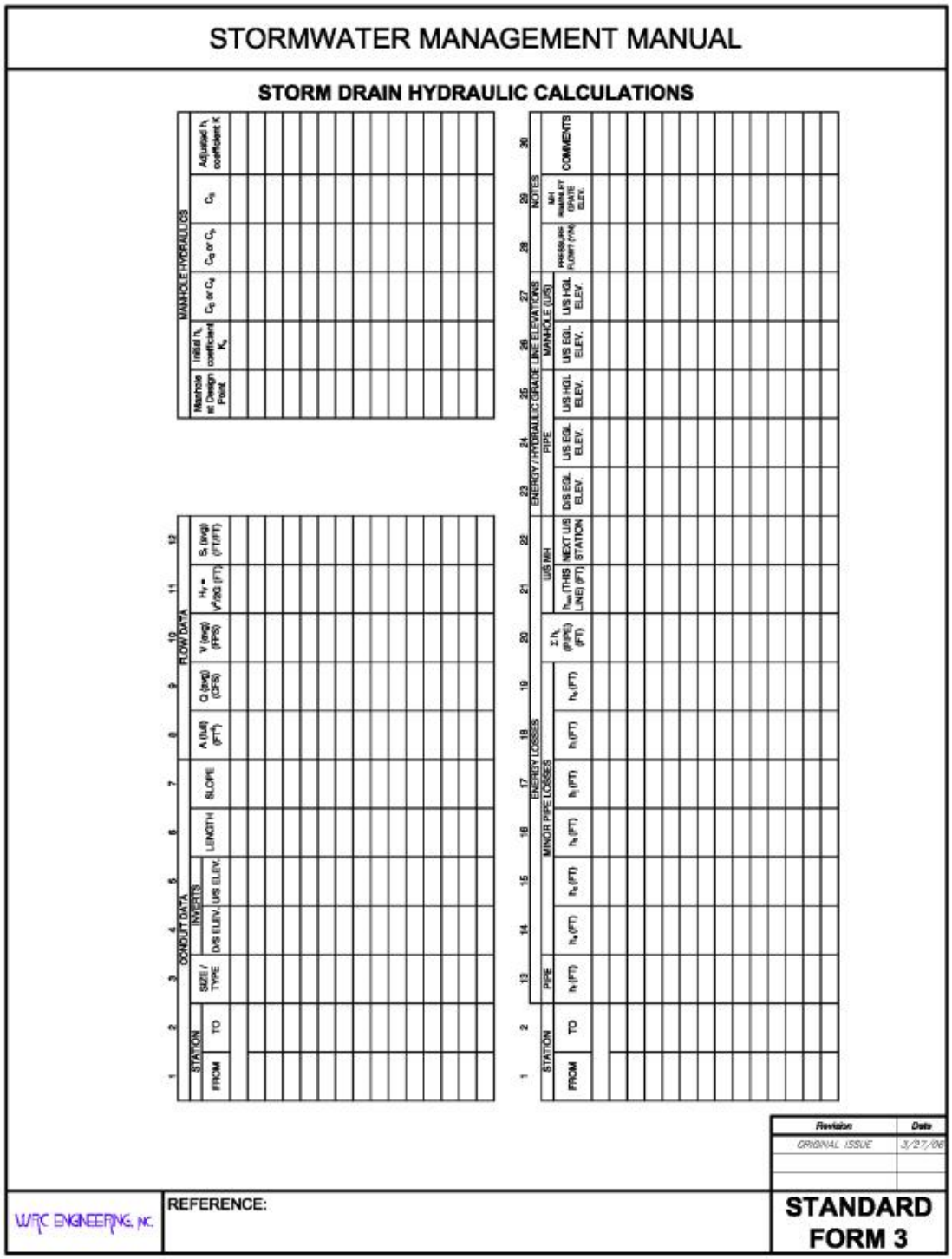
Revision	Date
ORIGINAL ISSUE	3/27/08

WRC ENGINEERING, INC.

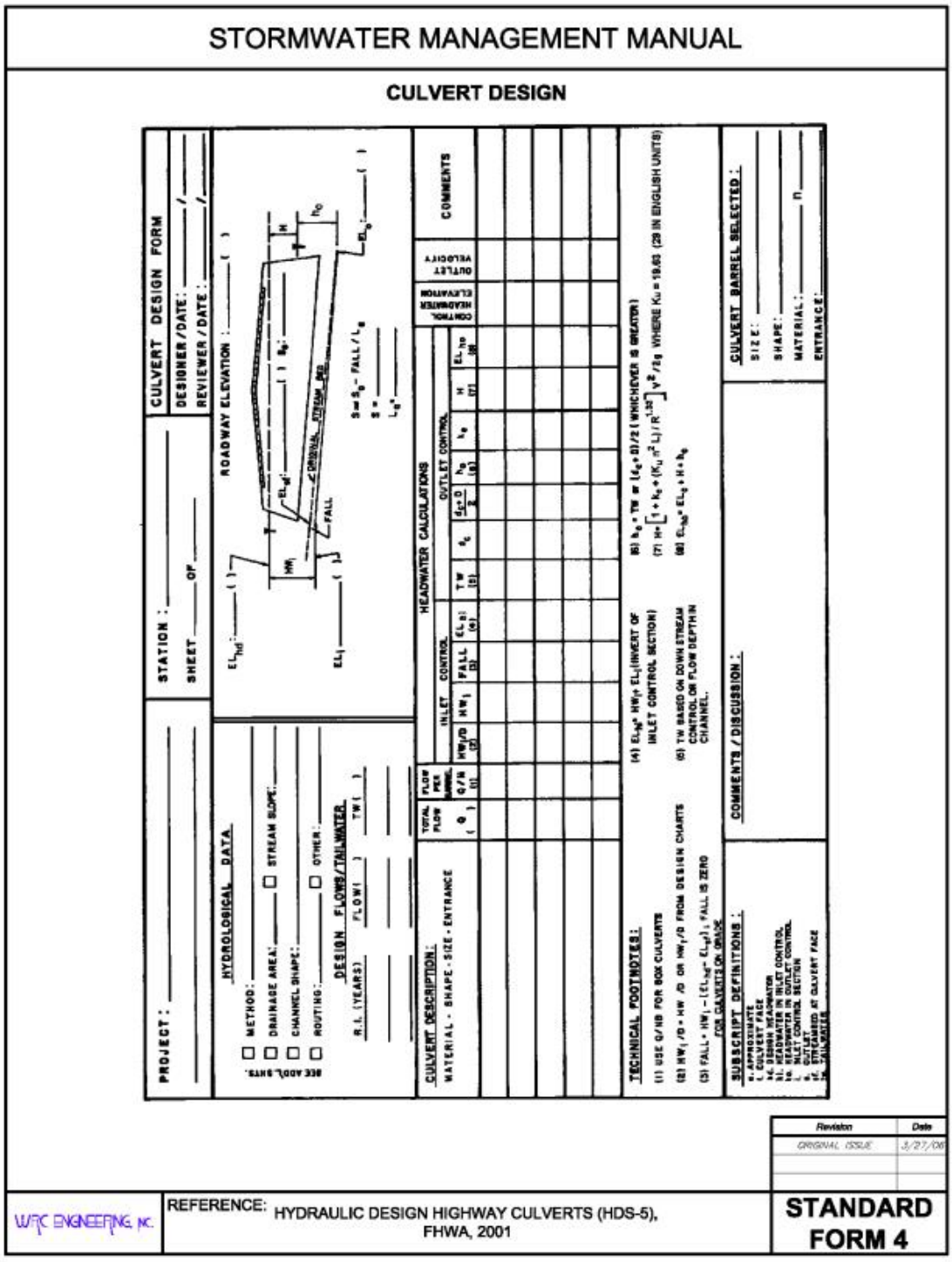
REFERENCE:

STANDARD FORM 2

(c) Standard Form 3 – Storm Drain Hydraulic Calculations.



(d) Standard Form 4 – Culvert Design.



(Res. 40-08 (§ 1700), 3-19-08)

§ 28.68.020. Stormwater permit applications and report forms.

(a) Mesa County Engineering Division Stormwater Construction Permit.

Permit No. _____

Mesa County
Engineering Division
Stormwater Construction Permit

Please print or type. All items must be completed accurately and in their entirety or the application will be deemed incomplete and the application returned. Processing of the application will not begin until all information is received. **Review of a complete permit application will be completed within twenty calendar days.** Original signature for Part 7 is required.

A Stormwater Construction Permit is required, within the urbanized area, for all land disturbance activities equal to or greater than 1 one (1) acre or for land disturbance activities less than one (1) acre that are part of a larger common plan of development or sale that would disturb one (1) acre or more.

1. Name and address of the Permittee:

Property Owner: _____
Mailing Address: _____
City, State and Zip Code: _____
Phone Number ( ) _____
Legally Responsible Person (application signer) E-mail Address: _____

Project Site Contact (familiar with facility): _____
Title _____ Phone Number ( )_____
Site Contact E-mail Address: _____

2. List, in addition to the permittee, any site personnel along with their contact information, who will have the authority to make modifications to the Construction Stormwater Management Plan.

Name: _____Phone Number ( )_____
Name: _____Phone Number ( )_____
Name: _____Phone Number ( )_____
Name: _____Phone Number ( )_____

3. Location of the project site:

Street Address (or cross streets): _____
Name of plan, project, or development: _____
Current Mesa County Assessor's Tax parcel number: _____

4. Area of the project site:

Total area of project site (acres):_____
Area of project site to undergo disturbance (acres):_____
Total disturbed area of Larger Common Plan of Development or Sale, if applicable (i.e., total including all phases, filings, lots, and infrastructure not covered by this application.): _____

Last edited 2/12/2007

Permit No. _____

5. Nature of the construction activities:

Check the appropriate box(es) or provide a brief description that indicates the general nature of the construction activities. (The full description of activities must be included in the Stormwater Management Plan.)

☐Single Family Residential Development
☐Multi-Family Residential Development
☐Commercial Development
☐Highway/Road Development (not including roadways associated with commercial or residential development)
☐Utility
☐Other Describe: _____

_____

6. Anticipated construction schedule:

Construction Start Date: ____/____/____ (month day year) Final Stabilization Date: ____/____/____ (month day year)

7. Acknowledgement Certificate:

By signing below, the Permittee hereby applies for a Mesa County Stormwater Construction Permit for the aforementioned property and certifies as follows:

a) To the best of my knowledge, the information provided herein is correct; and is consistent with the development plans approved by the planning and/or building departments.
b) A Construction Stormwater Management Plan for the disturbed area on the project site was prepared and submitted in accordance with the Stormwater Management Manual (SWMM) and the applicable Mesa County Land Development Code.
c) I certify that I am legally authorized to sign on behalf of and bind the above-listed entity.

The Stormwater Construction Permit is granted with the explicit understanding that it is the Permittee's responsibility to:

a) Comply with all requirements of the SWMM and applicable Mesa County Land Development Code.
b) Allow Mesa County or it's designee reasonable access to the project site to conduct regular site inspections.
c) Immediately cease land-disturbing and all other construction activities upon receipt of a written Stop Work Order from an authorized representative of Mesa County.
d) Comply with any and all directives of Mesa County contained in any Notice of Violation pertaining to the project site issued to the Permittee by Mesa County.

Last edited 2/12/2007

Permit No. _____

By signing below the Permittee agrees as follows:

a) If the Construction Stormwater Management Plan is submitted lacking the required information outlined in the SWMM, the Construction Stormwater Management Plan will be returned to the Permittee for revisions.
b) If the Permittee becomes insolvent or declares bankruptcy, such that the requirements of this Permit are not being met, Mesa County may perform any and all necessary corrective actions, at the sole and absolute discretion of Mesa County, to provide sufficient remedies to correct project site deficiencies.
c) Mesa County may issue a Stop Work Order and/or a Notice of Violation and/or may revoke this Permit or pursue any other legal remedies available if Mesa County determines the Permittee is not in compliance with the SWMM, Stormwater Construction Permit, and applicable Mesa County Land Development Code, or the Permittee fails to take all corrective action requested within the time specified on any Stop Work Order or Notice of Violation issued to the Permitte by Mesa County.
d) That in addition to other remedies, a violation of the Permit shall constitute a violation of the Land Development Code; and
e) Any approval obtained from Mesa County does not absolve the need to comply with requirements of Sections 7 and 9 of the Endangered Species Act of 1973, 16 U.S.C. 11531, et seq., as amended, or with any other applicable federal, state, or local laws or regulations.

_____

Signature of Legally Responsible Person (submission must include original signature) Date Signed

_____

Name (printed) Title

7. Approval

Mesa County Approval:_____

Date: _____

Last edited 2/12/2007

Permit No. _____

Instructions

1. **Name and address of the Permittee:** The Permittee must be the current property owner of the project. An authorized agent may submit a permit application if, the agent is legally authorized to sign on behalf of and bind the Permittee. A project site contact is necessary to provide Mesa County a person to contact on the site in regards to inspections and compliance issues.
2. The Construction Stormwater Management Plan is a working document and field changes are expected. List the names of site personnel along with their contact information, who will have the authority to make modifications to the Construction Stormwater Management Plan.
3. **Location of Project Site:** Indicate the street address or cross streets, if a street address is not available, name of plan, project, or development, and current Mesa County Assessor's Tax Parcel number.
4. **Area of Project Site:** Indicate the total area of the project site in acres, and the area of project site to undergo disturbance. Disturbance includes any activity that disturbs the soil on the site, including: grading, clearing, excavation activities, areas receiving overburden (e.g. stockpiles), demolition areas, and areas with equipment/vehicle traffic and storage that disturb vegetative cover.
5. **Nature of Construction Activities:** Either check the appropriate box or boxes, or if the given descriptions do not fit the project, provide a brief description that indicates the general nature of the construction activities for which permit coverage is being requested. A more detailed description of the project must be included in the Construction Stormwater Management Plan.
6. **Anticipated Construction Schedule:** Provide the current estimated start and final stabilization dates for the construction project as follows:
   a) Construction Start Date - This is the day you expect to begin disturbing soils, including grubbing, stockpiling, excavating, demolition, and grading activities.
   b) Final Stabilization Date - in terms of permit coverage, this is when the site is finally stabilized. This means that all disturbed areas have been either built on, paved, or a uniform vegetative cover has been established. **Permit coverage must be maintained until that time.** Even if the Permittee is only doing one part of the project, the estimated completion date must be for the overall project. If permit coverage is still required once the Permittee's part is completed, the permit certification may be transferred or reassigned to a new responsible entity(s).
7. Acknowledgement Certificate: The Permittee must be the property owner of the project site. The application must be signed by the Permittee to be considered complete. In all cases, it shall be signed as follows:
   a) In the case of corporations, by a principal executive officer of at least the level of vice-president or his or her duly authorized

Last edited 2/12/2007

Permit No. _____

representative, if such representative is responsible for the overall operation of the facility from which the discharge described in the application originates.

b) In the case of a partnership, by a general partner.
c) In the case of a sole proprietorship, by the proprietor.
d) In the case of a municipal, state, or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

Last edited 2/12/2007

(b) Mesa County Stormwater Construction Permit Field Inspection Report.

DRAFT MESA COUNTY STORMWATER CONSTRUCTION PERMIT FIELD INSPECTION REPORT

(1) Date of Inspection

(2) Property Owner

(3) Site Contact Name (print)

(4) Inspector Name (print)

(5) Project Name

(6) Permit No.

(7) Reason for Inspection :

- ❑ Required Maximum 14 Calendar Day Inspection
- ❑ Required 30 Calendar Day Inspection for Completed Projects
- ❑ Required Storm Event Inspection
- ❑ Complaint:_____
- ❑ Other:_____

(8) CONSTRUCTION SITE ASSESSMENT

- ❑ Construction site perimeter contained. Offsite tracking minimized.
- ❑ Disturbed areas contained.
- ❑ Estimate disturbed area at the time of the inspection. _____ Acres
- ❑ Areas used for material and waste storage and fueling contained.

(9) CSWMP MANAGEMENT

- ❑ Does site have current CSWMP Yes / No
- ❑ Changes noted & dated on the plans? Yes / No
- ❑ Contents of CSWMP:
  - ❑ Site Description Yes / No
  - ❑ Site Map Yes / No
  - ❑ Description of BMPs during construction activities Yes / No
  - ❑ Materials Handling & Spill Prevention Yes / No
- ❑ Contents of CSWMP (Cont.)
  - ❑ Final Stabilization Yes / No
  - ❑ Other Controls Yes / No
  - ❑ Inspection & Maintenance Yes / No
  - ❑ Certification Yes / No

BEST MANAGEMENT PRACTICES (BMPs)

(10) BMP Type	(11) Practice Req/Used		(12) Reason	(13) Maintenance/ Sediment Removal Required Y/N	(14) Course of Action	(15) Date for Action to be Completed
EROSION CONTROL						
Seeding						
Mulching						
Blankets						
Check Dams						
Earth Berms						
Diversion						
Embankment Protector						
Outlet Protection						
Surface Roughening						
Other:						
Other:						

PAGE 1 OF 4

(10) BMP Type	(11) Practice Req/Used		(12) Reason	(13) Maintenance/ Sediment Removal Required Y/N	(14) Course of Action	(15) Date for Action to be Completed
SEDIMENT CONTROL						
Inlet Protection						
Erosion Bales						
Silt Fence						
Sediment Trap/Basin						
Stabilized Construction Entrance						
Dewatering Structure						
Other:						
MATERIALS HANDLING AND SPILL PREVENTION, WASTE MANAGEMENT AND GENERAL POLLUTION PREVENTION						
Stockpile Management						
Materials Delivery and Storage						
Spill Prevention and Control						
Concrete Washout						
Concrete Saw Water Containment						
Solid Waste						
Sanitary Waste						
Maintenance and Fueling						
Street Sweeping Vacuuming						
Other:						
Other:						

Comments:

PAGE 2 OF 4

(16) **INSPECTIONS AND MAINTENANCE PROGRAM**	
❑ Inspection occurring at least every 14 calendar days.	Course of Action:
❑ Inspections occurring after storm events that result in runoff.	Course of Action:
❑ Inspections occurring at least every 30 calendar days since project completion.	Course of Action:
❑ Inspection reports retained at the construction project site.	Course of Action:
❑ Corrective measures completed within 7 calendar days of inspection.	Course of Action:
CERTIFICATION **I certify this Stormwater Construction Permit Field Inspection Report is complete and accurate.**	
Inspector Signature	Date

PAGE 3 OF 4

Stormwater Management Plan Field Inspection Report Instructions

1. **Date of Inspection:** Indicate the date the inspection was completed on.
2. **Property Owner:** Indicate the name of the property owner.
3. **Site Contact:** Indicate the main contact for the site.
4. **Inspector Name**: Indicate the name of the Inspector completing the inspection.
5. **Project Name**: Indicate the name of the project for which the report is being completed.
6. **Permit No.**: Indicate the permit number issued with the approval of the permit.
7. **Reason for Inspection**: Indicate the purpose for the inspection. The types of inspections include the following:
   - "Required 14 Calendar Day Inspection". These inspections are required at least every 14 calendar days during the life of the construction project.
   - "Required 30 Day Inspection for Completed Projects". These inspections are required at least every 30 calendar days following the completion of the construction project where final stabilization has not been achieved.
   - "Required Storm Event Inspection". These inspections are required after a storm event that results in runoff.
   - Inspection as a response to a complaint.
   - Inspection for any other reason.

   The first three types of inspections are required to comply with Mesa County Construction Stormwater Permit and the Colorado Discharge Permit System General Permit for Stormwater Discharges Associated with Construction Activity (CDPS General Permit).
8. **Construction Site Assessment**: Inspect the noted areas of the construction site and indicate with a "✔" the items which apply.
   - "Construction site perimeter contained". Are the appropriate BMPs in place and offsite sediment tracking minimized? Is there any evidence of pollutants entering a storm drainage system?
   - "Disturbed areas contained". Are the appropriate BMPs implemented to minimize erosion or sediment tracking from the disturbed areas? Is there any evidence of pollutants entering a storm drainage system? Provide an estimate of the disturbed area at the time of the inspection.
   - "Areas used for material and waste storage and fueling contained". Are the appropriate BMPs implemented to prevent and contain spills? Are wastes removed from the site and disposed of properly? Are the storage areas located at least 50 feet from a watercourse? Is there any evidence of pollutants entering a storm drainage system?
9. **CSWMP Management**:
   - Indicate if the Construction site has a current and update CSWMP, by circling yes or no.
   - Indicate if the required contents of the CSWMP are included, by circling yes or no on each line.
   - Indicate whether changes have been made to the CSWMP during construction and whether the changes have been documented and dated.
10. **BMP**: The BMPs shown may not be a complete list of what is required by the CSWMP. Cross out the BMPs not required by the CSWMP and add the BMPs that are required. Additional sheets can be inserted to show all the BMPs required by the CSWMP.
11. **Practice Req/Used**: This column can be used as follows:
    - If the BMP is required by the CSWMP and implemented, indicate by placing a "✔" in both the "Req" and "Used" columns.
    - If the BMP is required by the CSWMP, but not implemented, indicate by placing a "✔" in the "Req" column. Indicate the reason for the change in column (14), "Reason".
    - If the BMP has been added to the CSWMP, indicate with a "✔" in the "Used" column. Indicate the reason for the change in column (14), "Reason".
12. **Reason**: Indicate the reason(s) for the deletion, addition, and modification of BMP(s) to the SWMP.
13. **Maintenance/Sediment Removal Required**: Indicate whether maintenance and sediment removal are required with a Yes or No. If maintenance and sediment removal are required, indicate what the action plan is in column (15), "Course of Action".
14. **Course of Action**: If maintenance and/or sediment removal is required, describe the action plan.
15. **Date for Action to be Completed**: Indicate the date for which the course of action will be completed. The course of action must be completed in a timely manner, but in no case more than 7 days after the inspection.
16. **Inspections and Maintenance**: Evaluate the inspection and maintenance aspect of the construction project and check all that applies with an "✔". To comply with Mesa County Construction Stormwater Permit and the CDPS General Permit, all of the items identified must be adhered to.

PAGE 4 OF 4

(c) Mesa County Post-Construction Stormwater Controls and Best Management Practices Operations and Maintenance Agreement.

MESA COUNTY
POST-CONSTRUCTION STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 200__, by and between _____, (hereinafter the "Landowner"), and Mesa County, Colorado (hereinafter "County");
WITNESSETH

RECITALS

The Landowner is the owner of certain real property described by a recorded deed in the land records of Mesa County, Colorado, Deed Book _____ at Page _____, the "Property";

The Landowner is developing the Property;

The County, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the County and the protection and maintenance of water quality require that on-site stormwater Best Management Practices be constructed and maintained on the Property.

For the purposes of this agreement, the following definition shall apply:

BMP – "Best Management Practice;" activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge and to otherwise meet the purposes of the Municipal Stormwater Pollution Prevention Ordinance, including but not limited to infiltration trenches, seepage pits, filter strips, bioretention, wet ponds, permeable paving, grassed swales, forested buffers, sand filters and detention basins.

State of Colorado BMP definition: schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, waste disposal, or drainage from material storage. Another definition from the State of Colorado: physical, structural, and/or managerial practices that, when used singly or in combination, prevent or reduce pollution of stormwater.

The County requires, through the implementation of this Agreement, that Post-Construction Storm Water Management BMPs as required by the Final Drainage Report, Stormwater Management Manual, and the Land Development Code be constructed and adequately operated and maintained by the Landowner, his successors and assigns;

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein and the following terms and conditions, the parties hereto agree as follows:

DRAFT

1. The BMPs shall be constructed by the Landowner in accordance with the plans and specifications shown and described in the Final Drainage Report.

2. The Landowner shall operate and maintain the BMP(s) as shown and described on the Final Drainage Report in good working order acceptable to the County and in accordance with the specific maintenance requirements noted on the Final Drainage Report. Inspections of the BMP(s) shall be performed on an annual basis to ensure good working order of the BMP(s) with the inspection results sent to the County. Inspections must be performed by a qualified person, either a professional engineer or a person with training in the inspections of these BMP(s).

3. The Landowner hereby grants permission to the County, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper identification to the Land Owner if requested, to inspect the BMP(s) whenever it deems necessary. The County shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMP(s) as shown and described on the Final Drainage Report in good working order acceptable to the County, the County or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain and/or reconstruct said BMP(s). This provision shall not be construed to allow the County to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the County is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the County.

5. In the event the County, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the County for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the County.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its administrators, assigns, and other successors in interests, shall release the County's employees and designated representatives from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or County. In the event that a claim is asserted against the County, its designated representatives or employees, the County shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the County's employees or designated representatives shall be

DRAFT

allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

This Agreement shall be recorded in the Mesa County, Colorado land records and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs and any other successors in interests, in perpetuity.

ATTEST:

This section will be different based on whether the owner is an individual or an entity!

WITNESS the following signatures and seals:

(SEAL) For Mesa County:

_____

(SEAL) For the Landowner:

_____

ATTEST:

_____ (Mesa County)

County of Mesa, Colorado

I, _____, a Notary Public in and for the County and State aforesaid, whose commission expires on the _____ day of _____, 20__, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day of _____, 20__, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS _____ day of _____, 200_.

_____ _____

NOTARY PUBLIC **(SEAL)**

DRAFT

(d) City of Grand Junction Storm Water Construction Permit Application.

CITY OF Grand Junction COLORADO	**Storm Water Construction Permit Application**	Permit Number _____ Date Submitted_____ Final Stabilization Date _____

COMMUNITY DEVELOPMENT DEPARTMENT
250 N. 5TH STREET GRAND JUNCTION, COLORADO 81501
GENERAL INFORMATION (970) 244-1430 (FAX) 970-256-4031 www.gjcity.org

A Storm Water Construction Permit is required for all land disturbance activities equal to or greater than one (1) acre OR for land disturbance activities less than one (1) acre that are part of a larger common plan of development or sale that would disturb one (1) acre or more.

NOTE: This permit is separate from any permits required by the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division under the Colorado Discharge Permit System.

(1) Project Information:		
Project Name:		City Project Number:
Address/Location:		Current Mesa County Assessor's Tax Parcel Number:
Existing Land Use:		Proposed Land Use:
(2) Contact Information:		
(a) Project Owner:		
Contact Person:		Company:
Address:		
Phone:		Email:
Fax:	Mobile:	Pager:
(b) Contractor (Site contact familiar with project)		
Contact Person:		Company:
Address:		
Phone:		Email:
Fax:	Mobile:	Pager:
(c) Other:		
Contact Person:		Company:
Address:		
Phone:		Email:
Fax:	Mobile:	Pager:
(3) Construction Site Operator (Permittee):		
Name: (Print)	Check One: ☐ Phone; ☐ Mobile; ☐ Pager:	Number: _____

(4) List, in addition to the permittee, any site personnel along with their contact information, who will have authority to make modifications to the Construction Stormwater Management Plan (CSWMP):

Name:	Check One: ☐ Phone; ☐ Mobile; ☐ Pager:	Number: _____
Name:	Check One: ☐ Phone; ☐ Mobile; ☐ Pager:	Number: _____
Name:	Check One: ☐ Phone; ☐ Mobile; ☐ Pager:	Number: _____

(5) Project Information:

Total area of project (acres): _____	Area of project to undergo disturbance (acres): _____	Total disturbed area of larger common plan or development or sale if applicable (acres): _____

(6) Nature of Construction Activities:

Check the appropriate box(es) or provide a brief description that indicates the general nature of the construction activities. (The full description of activities and construction phases must be included in the Construction Storm Water Management Plan.) ☐ Single Family Residential ☐ Multi-Family Residential ☐ Commercial / Industrial

☐ Utility ☐ Highway / Road ☐ Other (describe): _____

Brief Description of Project:

(7) Project Schedule:

Expected project start date: _____	Expected project completion date: _____	Expected final stabilization date: _____

(8) Acknowledgement Certificate:

By signing below, I hereby apply for a City of Grand Junction Storm Water Construction Permit for the aforementioned property and certify that I agree to follow this permit including but not limited to applicable conditions in the Storm Water Management Manual (SWMM) and the project-specific Construction Storm Water Management Plan (CSWMP).

_____ _____
Signature of Legally Responsible Person (submission must include original signature) Date Signed

_____ _____
Name (printed) Title

***** FOR OFFICE USE ONLY *****

CDPHE Stormwater Discharge Permit Received: ☐ No ☐ Yes, _____ date received; Permit No. _____	City Approval: _____ Date: _____
Stormwater Management Plan (CSWMP) and drawings received: ☐ No ☐ Yes, _____ date received	Total Performance Security collected: $ _____ Date Paid: _____ Method of Payment: _____
Sediment/Erosion Control Plan Sheet Drawings Received: ☐ No ☐ Yes, _____ date received;	File Number: _____ Security date of expiration: _____ DIA period of performance: _____

(e) Reassignment of Permit Coverage.

STATE OF COLORADO

NOTICE OF REASSIGNMENT OF PERMIT COVERAGE
FOR A PORTION OF A PERMITTED AREA
AND GENERAL PERMIT APPLICATION
GENERAL PERMIT FOR
STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY

This form is to be used when a permittee under the State of Colorado General Permit for Stormwater Discharges Associated with Construction Activity (the Construction General Permit) no longer has control of a specific portion of a permitted site through either ownership or contract, and wishes to transfer coverage of that portion of the site to a second party that does not currently have coverage under the Construction General Permit. **If both parties currently have permit coverage, refer to the Alternative Options section for additional guidance.** This application covers Large Construction Sites (disturbing 5 or more acres) and Small Construction Sites (disturbing at least 1 but less than 5 acres). Sites that are part of a larger common plan of development or sale that will disturb at least 1 acre are also included. A "common plan of development or sale" is a site where multiple separate and distinct construction activities may be taking place at different times on different schedules, but still under a single plan. This includes phased projects, projects with multiple filings or lots, and projects in a contiguous area that may be unrelated but still under the same contract

The following actions will be triggered by completion and submittal of this form:

- The Permit certification in Item II.A will be amended to no longer include the area described in Items I.B and I.C. **The current permittee will not receive a revised certification**. The corrected information will be placed in the permit file. If the current permittee requires notification of the Water Quality Control Division's (the Division's) receipt of this information, it is up to the permittee to request verification of delivery from the carrier (i.e., by sending certified mail).
- A new permit certification under the General Permit for Stormwater Discharges Associated with Construction Activity will be issued to the *new permittee* listed in Part I. A new permit certification and permit materials will be sent to the attention of the legally responsible person for the new permittee (Item I.i. on the form).

Alternative Options: To transfer the entire permit certification, the Notice of Transfer of Permit Coverage form must be used instead. Also, if both parties are currently permit holders for portions of the overall project (i.e., at least two permit certifications are issued for the project and cover both the party wishing to reassign coverage and the party wishing to accept coverage), and it is not desired that a new permit certification be issued, the permittees may amend their permit certifications instead of completing this form. For additional instructions, please refer to the guidance on "Amending Your Permit Certification" in the Stormwater Fact Sheet for Construction, available from the Division's web site at www.cdphe.state.co.us/wq/PermitsUnit.

Applicant Liability: For the area described for which permit coverage is to be reassigned (Part I.b of the form), permit coverage and liability will be assigned to the new permit applicant, regardless of ownership or contract, until the certification is transferred, amended, inactivated, or expired. (Note that even though the new permittee will be liable for permit compliance for the reassigned area, if the new permittee does not meet the definition of owner or operator as discussed in the "Who May Apply" section below, the entity(s) that does could be held liable for operating without the necessary permit coverage.) The permittee may amend their application in writing to cease coverage for a portion of a site that the permittee no longer either owns or is under contract for. Information on the procedures that must to be used for such amendments will be supplied with the permit certification.

A more detailed explanation is available in the Stormwater Fact Sheet for Construction, available from the Division's web site at www.cdphe.state.co.us/wq/PermitsUnit. **The Division strongly recommends that entities involved with sites where multiple owners/operators exist review this information.**

Who May Apply For and Maintain Permit Coverage: The applicant must be a legal entity that meets the definition of either the owner and/or operator of the construction site, in order for this application to legally cover the activities occurring at the site. The applicant must have day-to-day supervision and control over activities at the site and implementation of the Stormwater Management Plan (SWMP) discussed in Item I.h of the instructions. Although it is acceptable for the applicant to meet this requirement through the actions of a contractor, as discussed in the examples below, the applicant remains liable for violations resulting from the actions of their contractor. Examples of acceptable applicants include:

- **Owner or Developer**- An owner or developer who is operating as the site manager or otherwise has supervision and control over the site, either directly or through contract with an entity such as those listed below.
- **General Contractor or Subcontractor** - A contractor with contractual responsibility and operational control (including SWMP implementation) to address the impacts construction activities may have on stormwater quality.
- **Other Delegated Agents/Contractors** - Other agents, such as a consultant acting as construction manager under contract with the owner or developer, with contractual responsibility and operational control to address the impacts construction activities may have on stormwater quality (including SWMP implementation).

An entity engaged in construction activities may be held liable for operating without the necessary permit coverage if a site does not have a permit certification in place that is issued to either an owner and/or operator. For example, if a site, or portion of a site, is sold or contractors change, so that the site's permit certification is then held by a permittee that is no longer either the owner or operator (such as the previous owner or contractor), that permit certification will no longer cover the new operator's activities, and a new certification must be issued, or the current certification transferred.

A separate permit certification is not needed for subcontractors, such as utility service line installers, whose activities result in earth disturbance, but where the permittee or their contractor is identified as having the operational control to address the impacts their activities may have on stormwater quality.

Stormwater Management Plan (SWMP): Both the current permittee and the new applicant must develop and maintain SWMPs that accurately reflect the activities and BMPs for the areas for which they will have permit coverage. The **current permittee** must already have a SWMP in place as required by their permit coverage, but must revise this plan to account for the changes in their covered area and activities. As discussed in Item I.h. of the instructions, the **new applicant** must also develop a SWMP for their covered area, prior to submittal of this form. Although the new applicant may utilize the current permittee's SWMP, if available, in development of their own SWMP, it must be modified and maintained to accurately reflect the new applicant's activities. Appendix A of the General Permit Application and Stormwater Management Plan Guidance for Stormwater Discharges Associated with Construction Activity (available from the Division's web site at www.cdphe.state.co.us/wq/PermitsUnit) contains the requirements for the SWMP. Failure by either entity to maintain a SWMP in accordance with this guidance is a violation of the permit. Additional guidance for multi owner/operator development is also available in the Stormwater Fact Sheet for Construction, also available from the Division's web site.

Application Due Dates: At least **ten days** prior to the requested effective date for the coverage reassignment, the owner or operators of the construction activities shall submit this form to the Water Quality Control Division (the "Division"). This form may be reproduced, and is also available from the Division's web site at www.cdphe.state.co.us/wq/PermitsUnit.

Permit Fee: The new permittee does not send any payment with this form. They will be billed once they are covered under a permit. Current permit fees can be obtained from the Division's web site at www.cdphe.state.co.us/wq/PermitsUnit.

Application Completeness: All items of the form must be completed accurately and in their entirety or the application will be deemed incomplete, and processing of the form will not begin until all information is received. (Do not include a copy of the Stormwater Management Plans for either the current or new permittee, unless requested by the Division.) One original copy of the completed form (**no faxes or e-mails**), signed by both the new permittee and the current permittee, shall be submitted, only to:

Colorado Department of Public Health and Environment
Water Quality Control Division
WQCD-Permits
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Note: Partial applications will not be accepted.

If you have questions on completing this application, you may contact the Division at cdphe.wqstorm@state.co.us or (303) 692-3517.

REASSIGNMENT FORM

INSTRUCTIONS

PART I - (To be completed by the New permit applicant.)

Part I of the application is to be filled out by the new permit applicant who will be assuming permitting liability for the reassigned portion of the original applicant's site. The **effective date** when the area addressed in the form will be reassigned must be provided at the beginning of Part I. The effective date must be at least ten days following the receipt of this form by the Division. It will be the effective date of the new permit certification issued to the new applicant in Part I.

Item I.a.: Provide the name and address of the new permit applicant, including the company name, local contact, phone number, and mailing address. Indicate whether the applicant is the owner, developer or contractor.

Item I.b.:. Provide the street address of the site that will be covered under the new certification and removed from the current certification. If an exact address is not available you may use an approximate address, the nearest intersection or boundary streets including directional identifiers (e.g., "S. of Park St. between 5th Av and 10th Av.", or "W. side of C.R. 21, 3.25 miles N. of Hwy 10") or other identifying information. For the approximate center point of the property, the longitude/latitude, to the nearest 15 seconds, **must** be included. The latitude and longitude must be provided as either degrees, minutes, and seconds, or in decimal degrees with three decimal places. This information may be obtained from a variety of sources, including:

- Surveyors or engineers for the project should have, or be able calculate, this information.
- EPA maintains a web-based siting tool as part of their Toxic Release Inventory program that uses interactive maps and aerial photography to help users get latitude and longitude. The siting tool can be accessed at: www.epa.gov/tri/report/siting_tool/index.htm
- U.S. Geological Survey topographical map, available at area map stores.
- Using a Global Positioning System (GPS) unit to obtain a direct reading.

Item I.c.: One of these two items **must** be provided:

- Legal Description of the entire site covered by the application that must include subdivision(s), block(s), and lot(s) (providing the metes and bounds or just the township/section/range, is not adequate). This information should be available for subdivided properties from documents submitted to or maintained by the city or county, such as the subdivision plat or deed. If this information is not available, a map must be submitted. **– or –**
- Site Map that defines the boundaries of the site being applied for. The level of detail that must be provided will depend on the nature of the project and must be adequate so that it can be determined during a field audit what construction activities are covered under the issued certification. For typical developments within a specific surveyed property, a map clearly showing the property boundaries should be obtainable. For projects located in areas with adjacent construction areas that will not be covered by the application (such as multi-lot developments with multiple owners/operators), this detail is essential. However, for projects such as road or utility projects, where providing this detail may not be feasible or necessary to distinguish the project from adjacent activities, a less detailed map showing the approximate area is adequate. Maps must have a minimum scale of 1:24000 (the scale of a USGS 7.5 minute map). Maps must be folded to 8½ x 11 inches. Do not submit grading plans or other blueprints as the site map.

Item I.d.: Provide both the total area of the construction site that will be covered under the new certification, and the area that will undergo disturbance, in acres. **Note**: aside from clearing, grading and excavation activities, disturbed areas also include areas receiving overburden (e.g., stockpiles), demolition areas, and areas with heavy equipment/vehicle traffic and storage that disturb existing vegetative cover.

Item I.e.: Either check the appropriate box or boxes, or if the given descriptions do not fit the project, provide a brief description that indicates the general nature of the construction activities for which permit coverage is being requested. A more detailed description of the project must be included in the Stormwater Management Plan (see Item I.i.).

Item I.f.: Provide the current estimated completion date for the construction project to be covered under the new certification. In terms of permit coverage, the completion date is when the site is finally stabilized. This means that all disturbed areas have been either built on, paved, or a uniform vegetative cover has been established. **Permit coverage must be maintained until that time.** If permit coverage is still required once your part is completed, the permit must be transferred to a new responsible entity.

Item I.g.: Identify the receiving water. Receiving waters are any waters of the State of Colorado. These include any and all surface waters that are contained in or flow in or through the State of Colorado (except for water withdrawn for use until use and treatment have been completed). This definition includes all water courses, even if they are usually dry. If stormwater from the construction site enters a ditch or storm sewer system, identify that system and indicate the ultimate receiving water for the ditch or storm sewer. **Note:** a stormwater discharge permit does not allow a discharge into a ditch or municipal storm sewer system without the approval of the owner/operator of that system if such approval is otherwise needed.

Item I.h.: The certification of completion of a Stormwater Management Plan (SWMP) **must** be signed by the applicant or their authorized agent. Appendix A of the General Permit Application and Stormwater Management Plan Guidance for Stormwater Discharges Associated with Construction Activity (available form www.cdphe.state.co.us/wq/PermitsUnit) contains the requirements for the SWMP during the period of construction (as listed in the general permit). Submittal of the SWMP is **not** required, however it must be developed and implemented and kept at the construction site. The Division reserves the right to request the SWMP at any time.

Item I.i.: The applicant must be either the owner and/or operator of the construction site. Refer to page i of the instructions for additional information. The application **must be signed** to be considered complete. In all cases, it shall be signed as follows:

a) In the case of corporations, by a principal executive officer of at least the level of vice-president or his or her duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge described in the application originates.
b) In the case of a partnership, by a general partner.
c) In the case of a sole proprietorship, by the proprietor.
d) In the case of a municipal, state, or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

This certification includes an acknowledgment that the applicant understands that the permit coverage, and therefore the applicant's liability, will be for the entirety of the portion of the construction project described and applied for, until such time as the application is amended or the certification is transferred, inactivated, or expired.

PART II - (To be completed by the Current permittee.)

Part II of the application, starting on page 3 of the form, is to be completed by the **current** permittee. The information provided in Part II.b should be revised from the original application to take into account the changes in the site based on reassignment of the applied-for area. Refer to the instructions for I.c and I.d above for information on providing location and construction activity description information.

NOTICE OF
REASSIGNMENT OF PERMIT COVERAGE
and GENERAL PERMIT APPLICATION

STORMWATER DISCHARGES ASSOCIATED WITH
CONSTRUCTION ACTIVITY (Permit No. COR-030000)

For Agency Use Only **C O R - 0 3** ____ ____ ____ ____

Date Received: ___ ___ / ___ ___ / ___ ___ ___ ___
Day Month Year

9A

Please print or type. All items must be completed accurately and in their entirety or the application will be deemed incomplete and processing of the permit/reassignment will not begin until all information is received. Please refer to the instructions for information about the required items. Original signatures of the new permit applicant and the current permittee are **required.**

Part I of the application beginning below is to be filled out by the new permit applicant that will be assuming permitting liability for the reassigned portion of the original applicant's site. **Part II** of the application, starting on page 3 of the form, is to be completed by the current permittee. **Both Parts I (pages 1 and 2) and II (page 3) must be completed.**

PART I - To be completed by the New permit applicant:

I hereby accept the reassignment of permit coverage for the area described in this application. I have reviewed the terms and conditions of this permit and the Stormwater Management Plan and accept full responsibility, coverage and liability.

This reassignment will be effective on: __ __ / __ __ / __ __ __ __
month day year

I.a. Name and address of the new permit applicant:

Company Name _____

Mailing Address _____

City, State and Zip Code _____

Phone No. (____) _____ Who is applying? Owner □ Developer □ Contractor □

Local Contact (familiar with facility) _____

Title _____ Phone Number (____) _____

Local Contact E-mail Address (if available) _____

Legally Responsible Person (application signer) E-mail Address _____

I.b. Location of the area to be covered under the new permit certification:

Street Address (or Cross Streets) _____

City (if unincorporated, so indicate) _____ County _____

Name of plan, project, or development _____

Latitude/Longitude – use one of the following formats:

Latitude ___ ___ / ___ ___ / ___ ___ Longitude ___ ___ ___ / ___ ___ / ___ ___ (e.g., 39°42'11'', 104°55'57'')
degrees minutes seconds degrees minutes seconds

-or-

Latitude ___ ___ . ___ ___ ___ Longitude ___ ___ ___ . ___ ___ ___ (e.g., 39.703°, 104.933°')
degrees (to 3 decimal places) degrees (to 3 decimal places)

I.c. Legal Description (subdivision, block, and lot) or Map Indicating Site Location/Boundaries:

If a map is attached to provide this information, this must be indicated below. Maps must be folded to 8½ x 11 inches.
Map Attached? □ Yes, skip to item 4 □ No; include legal description **per Instructions** (use separate sheet if needed):

Subdivision(s), Lot(s), Block(s): _____

_____

6/2005/ reassign Page 1 of 3 **Form Continued on Next Page**

I.d. Area of the construction site:

Total area of project site (acres) _____

Area of project site to undergo disturbance (acres) _____

I.e. Nature of the construction activity:
Check the appropriate box(s) or provide a brief description that indicates the general nature of the construction activities. (The full description of activities must be included in the Stormwater Management Plan.)

☐ Single Family Residential Development

☐ Multi-Family Residential Development

☐ Commercial Development

☐ Other, Describe: _____

_____

I.f. Anticipated Final Stabilization Date: __ __ / __ __ / __ __ __ __
month day year

I.g. The name of the receiving stream(s). (If discharge is to a ditch or storm sewer, also include the name of the ultimate receiving water): _____

STOP! A Stormwater Management Plan must be completed prior to signing the following certifications!

I.h. Stormwater Management Plan Certification (new applicant):

"I certify under penalty of law that a **complete Stormwater Management Plan, as described in Appendix A of the General Permit Application and Stormwater Management Plan Guidance for Stormwater Discharges Associated with Construction Activity, has been prepared for my activity**. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the Stormwater Management Plan is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for falsely certifying the completion of said SWMP, including the possibility of fine and imprisonment for knowing violations."

_____

Signature of Legally Responsible Person (submission must include original signature) Date Signed

_____

Name (printed) Title

I.i Signature of Applicant (legally responsible person - new applicant)

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

"I understand that submittal of this application is for coverage under the State of Colorado General Permit for Stormwater Discharges Associated with Construction Activity **for the entirety of the construction site/project described and applied for, until such time as the application is amended or the certification is transferred, inactivated, or expired**."

_____

Signature of Legally Responsible Person (submission must include original signature) Date Signed

_____

Name (printed) Title

6/2005/ reassign Page 2 of 3 **Form Continued on Next Page**

PART II – Amendment to the current permit certification
To be completed by the Current permittee:

II.a. Current Permit Certification Information

Certification Number: **COR-03** ___ ___ ___ ___ Check if this is a new name, address, etc.

Permittee (Company) Name: _____ ☐

Permittee Address: _____ ☐

_____

Local Contact: _____ ☐

Phone No. (_____) _____ ☐

E-mail Address (if available) _____ ☐

Name of plan, project, or development _____ ☐

II.b. Revised Site Information

Legal Description or Map Indicating Site Boundaries: (Subdivision, block, and lot, or similar information clearly identifying the site area that retains coverage under the current certification. If a map is attached to provide this information, this must be indicated below. Maps must be folded to 8½ x 11 inches.)
Map Attached? ☐ Yes ☐ No; include legal description **per Instructions** (use separate sheet if needed):

Subdivision(s), Lot(s), Block(s): _____

_____

Check the appropriate box(s) or provide a brief description that indicates the general nature of the construction activities. (The full description of activities must be included in the Stormwater Management Plan.)

☐ Single Family Residential Development
☐ Multi-Family Residential Development
☐ Commercial Development
☐ Other, Describe: _____

_____

II.c. Certification for Reassignment

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in Part II of this application and all attachments in reference to Part II and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

"As the permittee currently covered by the above-referenced certification, I hereby agree to reassign the permit coverage for the area and activity described in Items I.b. and I.c., and all responsibilities thereof, from the above-referenced permit certification to the new permittee listed in Part I of this form."

_____
Signature of Legally Responsible Person (submission must include original signature) Date Signed

_____
Name (printed) Title Title

6/2005 /reassign Page 3 of 3

(f) Grand Junction Post-Construction Stormwater Control Operations and Maintenance Agreement.

POST-CONSTRUCTION STORMWATER CONTROL OPERATIONS AND MAINTENANCE AGREEMENT

THIS AGREEMENT is made and entered into this _____ day of _____, 20____, by and between _____, (hereinafter the "Landowner"), and the City of Grand Junction, Colorado (hereinafter "Municipality");

RECITALS

The Landowner is the owner of the following real property:

hereinafter referred to as "the Property."

The Landowner is developing the Property;

The Municipality and the Landowner, on behalf of all successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site stormwater Best Management Practices be constructed and maintained on the Property.

For the purposes of this agreement, the following definitions shall apply:

BMP – "Best Management Practice;" activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge and to otherwise meet the purposes of the Municipal Stormwater Pollution Prevention Ordinance, including but not limited to infiltration trenches, seepage pits, filter strips, bioretention, wet ponds, permeable paving, grassed swales, forested buffers, sand filters and detention basins.

As part of the approval of the development of the property, the Municipality will review and approve a Final Drainage Report which will implement Post-Construction Storm Water Management BMPs required by the Municipal Stormwater Pollution Prevention Ordinance.

The purpose of this Agreement is to insure the adequate maintenance, operation and repair of the storm water management facilities, in perpetuity, by the owners of the property served by these facilities.

The Landowner desires to subject and place upon the Property the covenants and servitudes set forth herein which shall run with the Property and be binding on all parties having any right, title, or interests in the Property or any part thereof, their heirs, personal representatives, successors and assigns, and shall inure to the benefit of each owner thereof.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein and the following terms and conditions, the parties hereto agree as follows:

1. The BMPs shall be constructed by the Landowner in accordance with the plans and specifications shown and described in the Final Drainage Report.

2. The Landowner shall operate and maintain in perpetuity the BMP(s) as shown and described on the Final Drainage Report in good working order as reasonably determined by the Municipality and in accordance with the specific maintenance requirements noted on the Final Drainage Report. The Landowner shall cause the BMP(s) to be inspected annually by a Qualified Erosion Control Specialist to ensure good working order and shall send a report from said inspection to the Municipality annually, on or before December 31st of each year.

3. The Landowner hereby grants a perpetual easement to the Municipality, its authorized agents and employees, to enter upon the Property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. The Municipality shall make reasonable efforts to notify the Landowner prior to entering the Property.

4. In the event the Landowner fails to operate and maintain the BMP(s) as shown and described on the Final Drainage Report in good working order as reasonably determined by the Municipality, the Municipality or its representatives may enter upon the Property and take action to maintain and/or repair and/or reconstruct said BMP(s). It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all reasonable expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMP(s) by the Landowner. This Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Municipality may conduct routine inspections of the BMP(s) to verify their continued adequate functioning. The Municipality may also inspect the BMP(s) in the event of reported or suspected failure to function adequately. These inspection activities shall not absolve the Landowner of its obligation to maintain the BMPs in perpetuity or to provide the Municipality with the required Landowner inspection report.

8. This Agreement shall not be interpreted or deemed to limit the authority, privilege or right of the Municipality pursuant to any duly enacted ordinance of the Municipality, charter provision, statute or any duly granted federal or state water discharge permit.

9. Notifications and reports made under this Agreement shall be provided to the City at:

Mr. Chris Spears
Street Systems Supervisor
250 N 5th Street-
Grand Junction, CO 81501

and to the Landowner at:

This Agreement shall be recorded in the Mesa County, Colorado land records and shall, once recorded, constitute a covenant running with the Property and shall be an equitable servitude binding on present and subsequent owners of the Property in whole or in part, and their administrators, executors, assigns, heirs and successors in interest, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL) For the City of Grand Junction:

_____

(SEAL) For the Landowner:

_____

ATTEST:

_____ (City of Grand Junction)

County of Mesa, Colorado

I, _____, a Notary Public in and for the County and State aforesaid, whose commission expires on the _____ day of _____, 20__, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day of _____, 20__, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS _____ day of _____, 200_.

_____ _____

NOTARY PUBLIC **(SEAL)**

(g) City of Grand Junction Stormwater Construction Permit Field Inspection Report.

CITY OF GRAND JUNCTION
STORMWATER CONSTRUCTION PERMIT
FIELD INSPECTION REPORT

(1) Date of Inspection

(2) Property Owner

(3) Site Contact Name (print)

(4) Inspector Name (print)

(5) Project Name

(6) Permit No.

(7) Reason for Inspection :

- ❑ Required Maximum 14 Calendar Day Inspection
- ❑ Required 30 Calendar Day Inspection for Completed Projects
- ❑ Required Storm Event Inspection
- ❑ Complaint:_____
- ❑ Other:_____

(8) **CONSTRUCTION SITE ASSESSMENT**

- ❑ Construction site perimeter contained. Offsite tracking minimized.
- ❑ Disturbed areas contained.
- ❑ Estimate disturbed area at the time of the inspection. _____ Acres
- ❑ Areas used for material and waste storage and fueling contained.

(9) **CSWMP MANAGEMENT**

- ❑ Does site have current CSWMP Yes / No
- ❑ Contents of CSWMP:
  - ❑ Site Description Yes / No
  - ❑ Site Map Yes / No
  - ❑ Description of BMPs during construction activities Yes / No
  - ❑ Materials Handling & Spill Prevention Yes / No
- ❑ Changes noted & dated on the plans? Yes / No
- ❑ Contents of CSWMP (Cont.)
  - ❑ Final Stabilization Yes / No
  - ❑ Other Controls Yes / No
  - ❑ Inspection & Maintenance Yes / No
  - ❑ Certification Yes / No

BEST MANAGEMENT PRACTICES (BMPS)

(10) BMP Type	(11) Practice Req/Used		(12) Reason	(13) Maintenance/ Sediment Removal Required Y/N	(14) Course of Action	(15) Date for Action to be Completed
EROSION CONTROL						
Seeding						
Mulching						
Blankets						
Check Dams						
Earth Berms						
Diversion						
Embankment Protector						
Outlet Protection						
Surface Roughening						
Other:						
Other:						

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(10) BMP Type	(11) Practice Req/Used		(12) Reason	(13) Maintenance/ Sediment Removal Required Y/N	(14) Course of Action	(15) Date for Action to be Completed
SEDIMENT CONTROL						
Inlet Protection						
Erosion Bales						
Silt Fence						
Sediment Trap/Basin						
Stabilized Construction Entrance						
Dewatering Structure						
Other:						
MATERIALS HANDLING AND SPILL PREVENTION, WASTE MANAGEMENT AND GENERAL POLLUTION PREVENTION						
Stockpile Management						
Materials Delivery and Storage						
Spill Prevention and Control						
Concrete Washout						
Concrete Saw Water Containment						
Solid Waste						
Sanitary Waste						
Maintenance and Fueling						
Street Sweeping Vacuuming						
Other:						
Other:						

Comments:

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(16) INSPECTIONS AND MAINTENANCE PROGRAM	
❑ Inspection occurring at least every 14 calendar days.	Course of Action:
❑ Inspections occurring after storm events that result in runoff.	Course of Action:
❑ Inspections occurring at least every 30 calendar days since project completion.	Course of Action:
❑ Inspection reports retained at the construction project site.	Course of Action:
❑ Corrective measures completed within 7 calendar days of inspection.	Course of Action:
CERTIFICATION **I certify this Stormwater Construction Permit Field Inspection Report is complete and accurate.**	
Inspector Signature	Date

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Stormwater Management Plan Field Inspection Report Instructions

1. **Date of Inspection:** Indicate the date the inspection was completed on.
2. **Property Owner:** Indicate the name of the property owner.
3. **Site Contact:** Indicate the main contact for the site.
4. **Inspector Name**: Indicate the name of the Inspector completing the inspection.
5. **Project Name**: Indicate the name of the project for which the report is being completed.
6. **Permit No.**: Indicate the permit number issued with the approval of the permit.
7. **Reason for Inspection**: Indicate the purpose for the inspection. The types of inspections include the following:
   - "Required 14 Calendar Day Inspection". These inspections are required at least every 14 calendar days during the life of the construction project.
   - "Required 30 Day Inspection for Completed Projects". These inspections are required at least every 30 calendar days following the completion of the construction project where final stabilization has not been achieved.
   - "Required Storm Event Inspection". These inspections are required after a storm event that results in runoff.
   - Inspection as a response to a complaint.
   - Inspection for any other reason.

   The first three types of inspections are required to comply with Mesa County Construction Stormwater Permit and the Colorado Discharge Permit System General Permit for Stormwater Discharges Associated with Construction Activity (CDPS General Permit).
8. **Construction Site Assessment**: Inspect the noted areas of the construction site and indicate with a "✔" the items which apply.
   - "Construction site perimeter contained". Are the appropriate BMPs in place and offsite sediment tracking minimized? Is there any evidence of pollutants entering a storm drainage system?
   - "Disturbed areas contained". Are the appropriate BMPs implemented to minimize erosion or sediment tracking from the disturbed areas? Is there any evidence of pollutants entering a storm drainage system? Provide an estimate of the disturbed area at the time of the inspection.
   - "Areas used for material and waste storage and fueling contained". Are the appropriate BMPs implemented to prevent and contain spills? Are wastes removed from the site and disposed of properly? Are the storage areas located at least 50 feet from a watercourse? Is there any evidence of pollutants entering a storm drainage system?
9. **CSWMP Management**:
   - Indicate if the Construction site has a current and update CSWMP, by circling yes or no.
   - Indicate if the required contents of the CSWMP are included, by circling yes or no on each line.
   - Indicate whether changes have been made to the CSWMP during construction and whether the changes have been documented and dated.
10. **BMP**: The BMPs shown may not be a complete list of what is required by the CSWMP. Cross out the BMPs not required by the CSWMP and add the BMPs that are required. Additional sheets can be inserted to show all the BMPs required by the CSWMP.
11. **Practice Req/Used**: This column can be used as follows:
    - If the BMP is required by the CSWMP and implemented, indicate by placing a "✔" in both the "Req" and "Used" columns.
    - If the BMP is required by the CSWMP, but not implemented, indicate by placing a "✔" in the "Req" column. Indicate the reason for the change in column (14), "Reason".
    - If the BMP has been added to the CSWMP, indicate with a "✔" in the "Used" column. Indicate the reason for the change in column (14), "Reason".
12. **Reason**: Indicate the reason(s) for the deletion, addition, and modification of BMP(s) to the SWMP.
13. **Maintenance/Sediment Removal Required**: Indicate whether maintenance and sediment removal are required with a Yes or No. If maintenance and sediment removal are required, indicate what the action plan is in column (15), "Course of Action".
14. **Course of Action**: If maintenance and/or sediment removal is required, describe the action plan.
15. **Date for Action to be Completed**: Indicate the date for which the course of action will be completed. The course of action must be completed in a timely manner, but in no case more than 7 days after the inspection.
16. **Inspections and Maintenance**: Evaluate the inspection and maintenance aspect of the construction project and check all that applies with an "✔". To comply with Mesa County Construction Stormwater Permit and the CDPS General Permit, all of the items identified must be adhered to.

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(Res. 40-08 (§ 1700), 3-19-08)

Chapter 28.72
References

§ 28.72.010. References.

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(Res. 40-08 (§ 1800), 3-19-08)

Chapter 28.76
Drainage Law

§ 28.76.010. Introduction.

The materials contained in this chapter are not intended to be an exhaustive presentation of each area of law which is discussed. The purpose is to familiarize the design professionals with these areas to enable them to better perform engineering duties and tasks contained in this title. These materials should not be used in place of a consultation with an attorney and no liability is being assumed with respect to the use of these materials for such purpose.

An important lesson which has been learned is that stormwater does not respect arbitrary jurisdictional boundaries. Stormwater does not respect the various rights and liabilities of adjacent land owners as it flows through depressions, gullies, and washes seeking refuge. However, engineers are presented with the enormous task of attempting to control the drainage of water while at the same time maintaining the integrity of natural flow paths and existing legal relationships arising from land ownership. The goal of maintaining both natural flow paths and existing legal relationships is not easily achieved. However, this goal can be more easily achieved if the engineer is familiar with the basic legal framework against which legal relationships will be adjudicated.

This chapter includes a brief description and citing of applicable State and local laws. The contents rely heavily on a similar section included in the Colorado Floodplain and Stormwater Criteria Manual prepared for the Colorado Water Conservation Board. The reader is encouraged to read the Drainage Law section of the UD&FCD's Drainage Criteria Manual, which represents the genesis for the update by the Colorado Water Conservation Board.

The user of this manual is encouraged to check the applicability of the laws and court cases included herein at the time of its use. Applicable statutes, ordinances, court cases and other local laws change with time. The materials contained herein should be reviewed periodically and updated as deemed appropriate.

(Res. 40-08 (Appx. A § A101), 3-19-08)

§ 28.76.020. Historical evolution of surface water drainage law.

It is important for the engineer to be aware of the development of the historical principles and theories involved in drainage law. There are three common early doctrines which were followed in the United States: The doctrines were the common enemy doctrine, civil law rule, and the rule of reasonable use.

(a) The Common Enemy Doctrine. The common enemy doctrine is a harsh rule which is still followed in some states. Stated in its extreme form, the common enemy doctrine provides that as an incident to property use each landowner has an unqualified right, by operations on the land, to fight off surface waters as necessary without being required to take into account the consequences to other land owners, who have the duty and right to protect themselves as best they can.

Surface water was thus regarded as a common enemy which each property owner could fight off or control by any means such as retention, diversion, repulsion or altered

conveyance. Thus, there was no cause of action even if some injury occurred to the adjoining parcel.

All jurisdictions originally following this harsh rule have either modified the rule or adopted the civil law rule or reasonable use.

(b) Civil Law Rule. Courts later recognized the rule of water drainage law which is basically diametrically opposed to the common enemy doctrine. The civil law rule recognizes a natural servitude for natural drainage between adjoining lands, so that the lower owner must accept the surface water which naturally drains onto its land, but on the other hand, the upper owner has no right to change the natural system of drainage to increase the burden on the lower parcel. This rule caused problems with allowing development because virtually almost any development has a tendency to increase the flow either in quantity or velocity.

According to the civil law rule, if the quantity or velocity of water flow were increased, the natural flow on the downstream property would be changed and would be in violation of the civil law rule. Thus, with the evolution of drainage law the courts sought to modify the law to consider the competing interests of adjoining land owners and allocate the burden of risk associated with development.

The civil law rule analyzes drainage problems in terms of property law concepts such as servitudes and easements. It did not consider tort law analysis of what is reasonable.

(c) Reasonable Use Rule. The rule of reasonable use was developed as an alternative between the civil law rule and the common enemy doctrine. The courts attempted to balance the hardships created in attempting to control surface waters and relevant factors in the relationship between the competing rights/liabilities of adjoining land owners.

The rule was apparently developed to provide flexibility in avoiding harsh results which often occurred in applying both the common enemy doctrine and the civil law rule to various factual situations.

Under the reasonable use rule, a property owner can legally make reasonable use of its land, even though the flow of surface waters is altered and causes some harm to others. However, liability occurs when the property owners' harmful interference with the flow of surface water is "unreasonable." A balancing test is utilized to determine whether a landowner's use of his property is unreasonable. The analysis involves three basic questions:

(1) Was there reasonable necessity for the property owner to alter the drainage to make use of his land?

(2) Was the alteration done in a reasonable manner?

(3) Does the utility of the actor's conduct reasonably outweigh the gravity of harm to others?

(Res. 40-08 (Appx. A § A102), 3-19-08)

§ 28.76.030. Legal principles.

This section has been reproduced from the Colorado Floodplain and Stormwater Criteria Manual prepared for the Colorado Water Conservation Board.

(a) The owner of upstream property possesses a natural easement on land downstream for drainage of surface water flowing in its natural course. The upstream property owner may alter drainage conditions so long as the water is not sent down in a manner or quantity to do more harm to the downstream land than formerly. Bittersweet Farms, Inc. v. Zimbelman, 976 P.2d 326 (Colo. App. 1998).

(b) For purposes of determining liability in a negligence action, the duty of a public entity shall be determined in the same manner as if it were a private party. Leake v. Cain, 720 P.2d 152 (Colo. 1986).

(c) A natural watercourse may be used as a conduit or outlet for the drainage of lands, at least where the augmented flow will not tax the stream beyond its capacity and cause flooding of adjacent lands. Ambrosio v. Pearl-Mack Construction Co., 351 P.2d 803 (Colo. 1960).

(d) Ditch corporations that own ditches owe a duty to those property owners through which their ditches pass to maintain their ditches using ordinary care so as to prevent damage to adjoining real property. Oliver v. Amity Mut. Irrigation Co., 994 P.2d 495 (Colo. App. 1999).

(e) Construction or enlargement of jurisdictional dams or reservoirs is subject to approval by the Colorado State Engineer, which includes consideration of requiring their spillways to be capable of passing the inflow design flood generated by 100 percent of the probable maximum precipitation. A "jurisdictional dam" is defined as a dam that impounds water above the elevation of the natural surface of the ground creating a reservoir with a capacity of more than 100 acre-feet or creating a reservoir with a surface area exceeding 20 acres at the high waterline or exceeding 10 feet in height measured vertically from the elevation of the lowest point of the natural surface of the ground where that point occurs along the longitudinal centerline of the dam up to the flow line crest of the emergency spillway of the dam. Rules 4 and 5 of the Department of Natural Resources, Division of Water Resources, Office of the State Engineer, Rules and Regulations for Dam Safety and Dam Construction.

(f) The boundaries of the floodplain should be accurately determined and based on a reasonable standard. Mallett v. Mamarooneck, 125 N.E. 2d 875 (N.Y. 1955).

(g) Adoption of a floodplain regulation to regulate flood-prone areas is a valid exercise of police power and is not a taking as long as the regulation does not go beyond protection of the public's health, safety, morals, and welfare. Hermanson v. Board of County Commissioners of Fremont, 595 P.2d 694 (Colo. App. 1979).

(h) The adoption by a municipality of floodplain ordinances to regulate flood-prone areas is a valid exercise of police power and is not a taking. Morrison v. City of Aurora, 745 P.2d 1042 (Colo. App. 1987).

(i) A zoning ordinance is not unconstitutional because it prohibits a landowner from using or developing his land in the most profitable manner. It is not required that a landowner

be permitted to make the best, maximum or most profitable use of his property. Baum v. City and County of Denver, 363 P.2d 688 (Colo. 1961) and Sundheim v. Board of County Commissioners of Douglas County, 904 P.2d 1337 (Colo. App. 1995).

(j) The safest approach to avoiding liability in regard to drainage and flood control improvements is to assume that the defense of a design error will not protect a governmental entity from a lawsuit and liability for injury to property or person. Scott v. City of Greeley, 931 P.2d 525 (Colo. App. 1996) and § 24-10-106(1)(e) and (f), C.R.S.

(k) A dangerous condition constitutes an unreasonable risk to the health or safety of the public, which is known to exist or which in the exercise of reasonable care should have been known to exist and which condition is proximately caused by the negligent act or omission of the public entity in constructing or maintaining such facility. § 24-10-103, C.R.S.

(l) Under the Colorado Governmental Immunity Act (CGIA), a drainage and flood control facility is considered to be a sanitation facility and thus not protected by the defense that the facility caused damage solely because the design of the facility was inadequate. §§ 24-10-106 (f) and 24-10-103, C.R.S. and Burnworth v. Adams County, 826 P.2d 368 (Colo. App. 1991).

(m) Under the CGIA, a governmental entity will be liable for the negligent operation and maintenance of any drainage and flood control facility. §§ 24-10-106 (f) and 24-10-103, C.R.S. and Burnworth v. Adams County, 826 P.2d 368 (Colo. App. 1991).

(n) Under the CGIA, a governmental entity will not be liable for its failure to upgrade, modernize, modify, or improve the design or construction of a drainage or flood control facility. § 24-10-103(1) C.R.S.

(o) In imposing conditions upon the granting of land use approvals, no local government shall require an owner of private property to dedicate real property to the public or pay money to a public entity in an amount that is determined on an individual and discretionary basis, unless there is an essential nexus between the dedication or payment and a legitimate local government interest and the dedication or payment is roughly proportional both in nature and extent to the impact of the proposed use or development of such property. This law does not apply to any legislatively formulated assessment, fee, or charge that is imposed on a broad class of property owners by a local government. § 29-20-203 C.R.S.

(p) Public entities that own dams or reservoirs are not subject to strict liability for damages caused by water escaping from their dams or reservoirs. Further, those public entities have no duty to ensure that waters released from an upstream reservoir because of a dam failure would be contained by their facilities or would bypass those facilities without augmentation. Kane v. Town of Estes Park, 786 P.2d 412 (Colo. 1990).

(q) A professional engineer is required not only to serve the interests of his or her employer/client but is also required, as his or her primary obligation, to protect the safety, health, property, and welfare of the public. Rule I 2 of The Colorado Rules of Professional Conduct of the State Board of Registration for Professional Engineers and Professional Land Surveyors.

(r) Where a municipality imposes a special fee upon owners of property for purposes of providing a service and where the fee is reasonably designed to defray the cost of the service provided by the municipality, such a fee is a valid form of governmental charge within the legislative authority of the municipality. Bloom v. City of Fort Collins, 784 P.2d 304 (Colo. 1989).

(Res. 40-08 (Appx. A § A103), 3-19-08)

§ 28.76.040. Local governments – Drainage responsibilities and powers.

Local governments bear the greatest responsibility for stormwater management. They can best determine the community needs and approaches through local regulation. Local governments, however, are constrained by their resources and the powers permitted them.

Various legal methods for managing stormwaters are authorized by enabling legislation. Zoning ordinances and subdivision regulations are the most important methods available to local governments, followed by building regulations and building codes. Stormwater management may also be carried out by drainage districts, local governments having home rule powers, such as the cities of Grand Junction and Fruita, and by government agencies having authority to regulate floodplains.

The inherent police powers of a municipality enable it to enact ordinances that provide for the protection of public's health, safety, morals, or general welfare. These powers are exercised when specific ordinances are enacted to address drainage issues.

Statutory powers also grant municipalities, counties, and State governments powers to provide directly or through special districts and authorities to construct, operate, and maintain a variety of public improvements including streets and sidewalks, water and sewage, storm drainage, and other facilities affecting stormwater quality and development in flood-prone areas.

(Res. 40-08 (Appx. A § A104), 3-19-08)

§ 28.76.050. Applicable drainage laws.

(a) Municipalities.

(1) § 31-23-301, C.R.S. – Authorizes municipalities to adopt regulations to promote public health, safety and general welfare of its citizenry.

(2) §§ 31-15-701, 31-15-714 C.R.S. – Grants powers to municipalities to engage in public improvements.

(3) § 31-15-711(1)(a), C.R.S. – Allows municipalities to engage in activities to alter or change the natural channel of watercourses.

(4) §§ 31-25-501, 31-25-508, C.R.S. – Authorizes public improvements – Special improvement districts in municipalities.

(5) §§ 31-25-601, 31-25-604, C.R.S. – Allows municipalities to set up improvement districts with taxing powers for the purpose of constructing public improvements.

(6) §§ 31-35-401, 31-35-417, 31-35-401(6), C.R.S. – Allows municipalities to operate, maintain and finance facilities to include waters from storm, flood, or surface drainage.

(7) City of Fruita Land Use Code (Title 17) Section 17.45 – Floodways, Floodplains, Drainage and Erosion.

(b) Counties.

(1) §§ 30-20-401, 30-20-402, C.R.S. – Authorizes County to construct water and sewerage facilities for County's own use or private and public users.

(2) §§ 30-20-501, 30-20-504, C.R.S. – Authorizes creation of public improvement districts within any county as taxing units and for the purpose of implementing public improvements.

(3) §§ 30-20-601, 30-20-603, C.R.S. – Authorizes a county by resolution to construct local improvements.

(4) §§ 30-30-101, 30-28-105, C.R.S. – Authorizes the board of county commissioners of each county for flood control purposes only.

(5) §§ 37-20-101, 37-33-109, C.R.S. – Authorizes owner of agricultural lands subject to drainage problems from the same general system to petition the board of county commissions to set up a drainage district.

(6) Mesa County Land Development Code.

(i) Section 7.7, Drainage.

(ii) Section 7.12, Irrigation Canals and Laterals.

(iii) Section 7.13, Floodplain Regulations.

(c) State.

(1) §§ 24-65-101, 24-65-105, C.R.S. – Creates the Colorado Land Use Commission with authority to assist counties and municipalities in developing guidelines for developing land uses and construction control within designated floodways.

(2) § 29-1-204.2, C.R.S. – Allows for establishment of a drainage authority by any combination of municipalities, special districts, or other political subdivisions by entering into a contract with each other.

(3) §§ 37-60-101, 37-60-106, C.R.S. – Creates Colorado Water Conservation Board for the purpose of water conservation and flood prevention. The board has the duty to "designate and approve storm or floodwater runoff channels or basins, and to make such designations available to legislative bodies of cities and incorporated town, … and counties of the state." (§ 30-60-123, C.R.S.)

(4) §§ 30-28-111, 31-23-301, C.R.S. (§ 24-65.1-403, C.R.S.) – Provides that no floodplains shall be designed by any local government until such description has been first approved by the Colorado Water Conservation Board.

(5) § 29-1-201, C.R.S. – In 1974, Section 2 of Article VI of the State Constitution was amended to permit and encourage improvements to make the most efficient and effective use of their powers and responsibilities by cooperating and contracting with other governments.

(6) Water Quality Control Commission Regulations 93 (5CCR 1002-93, last date May 31, 2004) and 94 (SCR 1002-94, last date May 31, 2004).

(d) Federal (NPDES). On November 16, 1990, the EPA issued regulations on the control of stormwater from municipal and industrial stormwater discharges. The National Pollutant Discharge Elimination System (NPDES) includes stormwater management and discharge requirements and regulations, and is a part of the Federal Clean Water Act. The stormwater management regulation was developed to reduce the amount of pollutants entering streams, lakes and rivers as a result of runoff from residential, commercial and industrial areas. Regulations are found in 40 CFR 122.26, and are industry specific. Mesa County, City of Grand Junction and Grand Junction Drainage District have obtained permits to discharge stormwater under the Colorado Discharge Permit System (COR–090031). The County's CDPS Phase II Discharge Permit includes requirements to control erosion and sedimentation from construction activities.

(Res. 40-08 (Appx. A § A105), 3-19-08)

§ 28.76.060. Special matters – Irrigation ditches.

In situations in which an irrigation ditch intersects a drainage basin, the irrigation ditch does not have to take underground waters diverted by a tile drain. However, the surface drainage must be accepted if the irrigation ditch is constructed in such a way that surface water would naturally flow into it. Clark v. Beauprez, 151 Colo. 119, 377 P.2d 105 (1962) (between private parties, the owner of an irrigation ditch can prevent an upstream landowner from diverting waters from their natural course into the irrigation ditch); City of Boulder v. Boulder and White Rock Ditch & Reservoir Company, 73 Colo. 426, 216 P. 553 (1923) (where an irrigation ditch was constructed in a natural drainageway into which surface water would naturally flow, the ditch owners could not complain merely on the grounds that the city, in building storm sewers, collected the surface water and accelerated its flow and precipitated or discharged it at some particular point in the line of the ditch instead of spreading it out at different places of entrance).

In urbanizing areas, the conflict between the natural flow of surface water and irrigation ditches which bisect many drainage basins continues to be a difficult condition to resolve, taking into consideration the rights and liabilities of upstream property owners and irrigation ditch owners. Innumerable natural drainageways have been blocked by irrigation ditches, although they were constructed long before the basin became urbanized. This special area of urban drainage points to the need for good land use requirements, as well as identification of potential problem areas.

§ 7-42-108, C.R.S. provides in part that:

Every ditch corporation organized under the provisions of law shall be required to keep its ditch in good condition so that the water shall not be allowed to escape from the same to the injury of any mining claim, road, ditch, or other property.

This provision of Colorado law was recently interpreted in the case of Oliver v. Amity Mut. Irrigation Co., 994 P.2d 495 (Colo. App. 1999). In this case, the ditch company was being sued for damages to property resulting from a break in the bank of the ditch company's ditch. The court held that the statute imposed a duty of ordinary care, such as a person of average prudence and intelligence would use, under like circumstances to protect his or her own property. The court went on to state that, in order for the ditch company to fulfill its statutory duty, it had to prevent erosion of the ditch bank, keep the ditch free of sediment and debris, and control the amount of water flowing through its ditch, among other things, keeping the spillway at the intersection of its ditch and another free of obstructions. Finally, the court concluded that, although a ditch company is not liable for damages caused solely by an act of God, the company may not escape liability if its negligence contributed to or cooperated with an act of God to cause the damage.

In conclusion, those that own ditches owe a duty to those property owners through which their ditches pass to maintain their ditches, using ordinary care so as to prevent damage to the adjoining real property.

(Res. 40-08 (Appx. A § A106.1), 3-19-08)

§ 28.76.070. Special matters – Ditch owner's duty to maintain, use and manage their ditches.

In the Colorado Supreme Court case of Roaring Fork Club, L.P. v. St. Jude Company 36 P. 3d 1229 (Colo. 2001) the Court recognized that as early as Colorado's territorial legislatures, legislators recognized that our arid climate required the creation of a right to appropriate and convey water across the land of another so that lands not immediately proximate to water could be used and developed. Because of this importance of ditches, the holder of ditch easements has the right to inspect, operate, maintain, and repair the ditch. In addition, the owners of land upon which these ditches are located cannot damage the ditch or unreasonably inhibit the owner's ability to maintain the ditch. Thus, the owner of a ditch may go on the land of another for the purpose of cleaning out the waterway and making repairs. Additionally, the Colorado legislature has required ditch owners to undertake a host of duties in relation to ditch upkeep. The rights of ditch owners are so dominant that the Court held that the owner of property burdened by a ditch easement has no right to move or alter the easement without consent of the benefited owner unless he first obtains a declaration of a court that such alterations will cause no damage to the benefited owner.

(Res. 40-08 (Appx. A § A106.2), 3-19-08)

§ 28.76.080. Special matters – Water quality.

Stormwater runoff is a major nonpoint source of water pollution. In urbanizing areas, where land-disturbing activities are numerous, stormwater washes soil and sediment into surface waters causing increased levels of turbidity and eutrophication, threatening fish and wildlife, and blocking drainage. In developed areas, runoff carries with it the pollutants from surfaces over which it runs, including oil, litter, chemicals, nutrients and biological wastes, together with soils eroded from downstream channels of the flow.

It is reasoned that water quality control should be an integral part of any drainage or stormwater management program, since stormwater management techniques are often

consistent with water quality objectives. However, this special area, as related to urban drainage, has not been researched adequately enough so as to provide the facts upon which a cost-effective approach could integrate water quality objectives with plans for surface drainage improvements. See City of Boulder v. Boulder and White Rock Ditch & Reservoir Company, 73 Colo. 426, 216 P. 553, 555 (1923).

(Res. 40-08 (Appx. A § A106.3), 3-19-08)

§ 28.76.090. Special matters – Economic loss rule – Duty of care.

In the case of BRW, Inc. et al. v. Dufficy & Sons, Inc. 99 P. 3d 66 (Colo. 2004), the Colorado Supreme Court addressed the economic loss rule as it applies to contractual relationships. It holds that courts must focus on the contractual relationship between and among the parties when there is a claim of economic loss as a result of a construction contract. Thus it is not enough to simply allege negligence in a construction claims case. There must be a contractual relationship between the parties in order to sustain a claim based upon an economic loss. The Court reasoned that the economic loss rule applies in construction cases in order to permit the court to enforce expectancy interests of the parties so that they can reliably allocate risks and costs during their bargaining and to encourage the parties to build the cost considerations into the contract because they will not be able to recover economic damages in tort. Therefore, it should be assumed that in order to successfully pursue a claim in economic loss in a construction contract, there must be a contractual relationship, either express or implied, between the parties and the provisions of that contract must address the obligation that is being alleged was breached.

(Res. 40-08 (Appx. A § A106.4), 3-19-08)

§ 28.76.100. Special matters – Water rights and drainage improvements.

Although infrequently raised, the issue of the impact of drainage improvements on existing water rights in Colorado should be considered, evaluated and addressed as part of any drainage improvement planning. The Water Right Determination and Administration Act of 1969 provides remedies for water right owners who are impacted by the action of others.

In the case of The Board of County Commissioners of the County of Arapahoe et al. v. Crystal Creek Homeowners' Association et al. 14 P. 3d 325 (Colo. 2000) the Colorado Supreme Court affirmed its earlier holding in the case of Pueblo West Metro. Dist v. Southeastern Colo. Water Conservation Dist. 689 P. 2d 594 that the capture and storage of flood waters may be a beneficial use underlying an appropriation of water. Therefore, these cases confirm that the capture and storage of flood water is a permitted use under the statutory water rights scheme in Colorado thus establishing the need to obtain a recognized water right if a drainage or flood control facility will impact the availability of water and thus other water rights holders.

(Res. 40-08 (Appx. A § A106.5), 3-19-08)

§ 28.76.110. Special matters – Governmental entity not liable for refusal to issue certificate of occupancy of residence constructed in a floodplain.

In the case of Patzer v. City of Loveland 2003 Colo. App. LEXIS 1506 (Colo. App. 2003), the City of Loveland was sued by a construction company who had received a building permit for a residence based upon its engineer's report. After the residence was completed, the City refused to issue a certificate of occupancy due to the fact that the City's engineering report, completed after the building permit was issued, showed that the residence encroached into the 100-year floodplain. Although the City eventually issued the certificate of occupancy, the Court held that the issuance of a building permit is an exercise of the City's police powers which include the regulation of flood control. Further, that a building permit contains no agreement, consideration, or promise that a certificate of occupancy would be issued. Therefore, the City could not be held liable for breach of contract. Finally, the Court went on to hold that the Governmental Immunity Act protected the City from a claim of negligent misrepresentation. Thus, the construction company received no relief from the Court.

(Res. 40-08 (Appx. A § A106.6), 3-19-08)

§ 28.76.120. Special matters – Any legislatively formulated assessment, fee or charge that is imposed on a broad class of property owners by a local government is not considered taking of property.

In the case of Marshall B. Krupp, et al. v. The Breckenridge Sanitation District, et al. 19 P. 3d 687 (Colo. 2001), the Court was asked to address Colorado's regulatory takings statute and the statute's explicit declination to apply the Nollan/Dolan tests to "any legislatively formulated assessment, fee, or charge that is imposed on a broad class of property owners by a local government." The Krupp case arose when the Breckenridge Sanitation District legislatively assessed a fee on all building projects within the district. The Krupps challenged the assessment of the fee on their new residential townhouse project on the basis that it amounted to an unconstitutional taking of property. The Colorado Supreme Court held that a legislatively created, generally applicable service fee is not subject to a takings analysis under Nollan/Dolan. Therefore, once a fee such as that in this case is assessed by way of a legislative act of the governmental entity it virtually cannot be challenged as being unconstitutional.

(Res. 40-08 (Appx. A § A106.7), 3-19-08)

§ 28.76.130. Special matters – Governmental immunity in regard to irrigation and drainage ditches used as part of stormwater drainage system.

In the Colorado Supreme Court cases of City of Colorado Springs v. Powell 48 P. 3d 561 (Colo. 2002) and in the companion case of City of Longmont v. Henry-Hobbs 50 P. 3d 906 (Colo. 2002) the Court held that irrigation and drainage ditches used as part of a stormwater drainage system are considered "sanitation facilities" under the Colorado Governmental Immunity Act. Since those ditches are covered under the CGIA, a governmental entity that uses those ditches for drainage or flood control will be held legally responsible, within the limits of the CGIA, for their negligent design or negligent maintenance. In a final holding of the Court, the Court clearly stated that it was not holding that all irrigation ditches are sanitation facilities.

In the 2003 session of the Colorado General Assembly, House Bill 03-1288 was passed and signed by the Governor. That Act specifically addressed the City of Colorado Springs and City of Longmont cases and noted that those cases may have significantly expanded the potential liability of governmental entities providing utility services to the public. The Act specifically redefined the word "maintenance" to mean "the act or omission of a public entity or public employee in keeping a facility in the same general state of repair or efficiency as initially constructed or in preserving a facility from decline or failure. 'Maintenance' does not include any duty to upgrade, modernize, modify, or improve the design or construction of a facility." The purpose of this section of the Act was to clarify that governmental entities do not have an affirmative duty to improve the design or construction of a facility.

The Act went on to redefine what a "public sanitation facility" is and is not. In describing what a "public sanitation facility" is not, the Act reads as follows: "'Public sanitation facility' does not include: a public water facility; a natural watercourse even if dammed, channelized, or containing stormwater runoff, discharge from a storm sewer, or discharge from a sewage treatment plant outfall; a drainage, borrow, or irrigation ditch even if the ditch contains stormwater runoff or discharge from storm sewers; a curb and gutter system; or other drainage, flood control, and stormwater facilities." Therefore, after this Act became effective on July 1, 2003, governmental entities were again protected from liability under the CGIA for negligent design and maintenance of a drainage facility which includes an irrigation ditch.

(Res. 40-08 (Appx. A § A106.8), 3-19-08)

§ 28.76.140. Special matters – Concerning interference with the flow of water in ditch.

§ 37-89-101, C.R.S. was amended in the 2001 session of the Colorado General Assembly and provides that anyone who "interferes with the flow of water in any drainage ditch" shall be legally responsible for full restitution for the actual damages that were sustained as a result of that interference.

(Res. 40-08 (Appx. A § A106.9), 3-19-08)

Chapter 28.80
Excerpts From UDSCD Volume 3

§ 28.80.010. Excerpts from UDSCD Volume 3.

6.0 EXTENDED DETENTION BASIN (EDB)—SEDIMENTATION FACILITY

6.1 Description

An extended detention basin (EDB) is a sedimentation basin designed to totally drain dry sometime after stormwater runoff ends. It is an adaptation of a detention basin used for flood control. The primary difference is in the outlet design. The EDB uses a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. The EDB's drain time for the brim-full water quality capture volume (i.e., time to fully evacuate the design capture volume) of 40 hours is recommended to remove a significant portion of fine particulate pollutants found in urban stormwater runoff. Soluble pollutant removal can be somewhat enhanced by providing a small wetland marsh or ponding area in the basin's bottom to promote biological uptake. The basins are considered to be "dry" because they are designed not to have a significant permanent pool of water remaining between storm runoff events. However, EDB may develop wetland vegetation and sometimes shallow pools in the bottom portions of the facilities.

6.2 General Application

An EDB can be used to enhance stormwater runoff quality and reduce peak stormwater runoff rates. If these basins are constructed early in the development cycle, they can also be used to trap sediment from construction activities within the tributary drainage area. The accumulated sediment, however, will need to be removed after upstream land disturbances cease and before the basin is placed into final long-term use. Also, an EDB can sometimes be retrofitted into existing flood control detention basins.

EDBs can be used to improve the quality of urban runoff coming from roads, parking lots, residential neighborhoods, commercial areas, and industrial sites and are generally used for regional or follow-up treatment. Referring to Figure ND-8 in the earlier chapter, EDBs are most applicable for catchments with a tributary impervious area of 10 acres of more. They can be used as an onsite BMP that works well with other BMPs, such as upstream onsite source controls and downstream infiltration/filtration basins or wetland channels. If desired, a flood routing detention volume can be provided above the water quality capture volume (*WQCV*) of the basin.

6.3 Advantages/Disadvantages

6.3.1 General

An EDB can be designed to provide other benefits such as recreation and open space opportunities in addition to reducing peak runoff rates and improving water quality. They are effective in removing particulate matter and the associate heavy metals and other pollutants. As with other BMPs, safety issues need to be addressed through proper design.

6.3.2 Physical Site Suitability

Normally, the land required for an EDB is approximately 0.5 to 2.0 percent of the total tributary development area. In high groundwater areas, consider the use of retention ponds (RP) instead in order to avoid many of the problems that can occur when the EDB's bottom is located below the seasonal high water table. Soil maps should be consulted, and soil borings may be needed to establish design geotechnical parameters.

6.3.3 Pollutant Removal

The pollutant removal range of an EDB was presented in Table SQ-6 in the STORMWATER QUALITY MANAGEMENT chapter of this volume. Removal of suspended solids and metals can be moderate to high, and removal of nutrients is low to moderate. The removal of nutrients can be improved when a small shallow pool or wetland is included as part of the basin's bottom or the basin is followed by BMPs more efficient at removing soluble pollutants, such as a filtration system, constructed wetlands or wetland channels.

The major factor controlling the degree of pollutant removal is the emptying time provided by the outlet. The rate and degree of removal will also depend on influent particle sizes. Metals, oil and grease, and some nutrients have a close affinity for suspended sediment and will be removed partially through sedimentation.

6.3.4 Aesthetics and Multiple Uses

Since an EDB is designed to drain very slowly, its bottom and lower portions will be inundated frequently for extended periods of time. Grasses in this frequently inundated zone will tend to be stressed, with only the species that can survive the specific environment at each site eventually prevailing. In addition, the bottom will be the depository of all the sediment that settles out in the basin. As a result, the bottom can be muddy and may have an undesirable appearance to some. To reduce this problem and to improve the basin's availability for other uses (such as open space habitat and passive recreation), it is suggested that the designer provide a lower-stage basin as suggested in the Two Stage Design procedure. As an alternative, a retention pond (RP) could be used, in which the settling occurs primarily within the permanent pool.

6.4 Design Considerations

Whenever desirable and feasible, incorporate the EDB within a larger flood control basin or as a part of a full-spectrum detention facility. Also, whenever possible try to accommodate within the basin other urban uses such as passive recreation and wildlife habitat. If multiple uses are being contemplated, consider using a multiple-stage detention basin to limit inundation of passive recreational areas to one or two occurrences a year. Generally, the area within the *WQCV* is not well suited for active recreation facilities such as ballparks, playing fields, and picnic areas. These are best located above the *WQCV* pool level.

Figure EDB-1 shows a representative layout of an EDB. Although flood control storage can be accomplished by providing a storage volume above the water quality storage, how best to accomplish this is not included in this discussion. Whether or not flood storage is provided, all embankments should be protected from catastrophic failure when runoff exceeds the design event. The State Engineer's regulatory requirements for larger dam embankments and storage volumes must be followed whenever regulatory height and/or volume thresholds are exceeded. Below those thresholds, the engineer should design the embankment-spillway-outlet system so that catastrophic failure will not occur.

Perforated outlet and trash rack configurations are illustrated in the TYPICAL STRUCTURAL BMP DETAINS AND SPECIFICATIONS chapter. Figure EDB-3 equates the *WQCV* that needs to be emptied over 40 hours, to the total required area of perforations per row for the standard configurations shown in that section. The chart is based on the rows being equally spaced vertically at 4-inch centers. This total area of perforations per row is then used to determine the number of uniformly sized holes per row (see detail in the TYPICAL STRUCTURAL BMP DETAINS AND SPECIFICATIONS chapter). One or more perforated columns on a perforated orifice plate integrated into the front of the outlet can be used; however, the fewer the number of columns, the better, maximizing the size of the orifice. Using least number of columns and the largest possible orifice, reduces clogging possibilities. Other types of outlets may also be used, provided they control the release of the *WQCV* in a manner consistent with the drain time requirements and are approved in advance by the District.

Although the soil types beneath the pond seldom prevent the use of this BMP, they should be considered during design. Any potential exfiltration capacity should be considered a short-term characteristic and ignored in the design of the *WQCV* because exfiltration will decrease over time as the soils clog with fine sediment and as the groundwater beneath the basin develops a mound that surfaces into the basin. At the same time, the findings by the International BMP Database team suggest that an EDP can reduce annual runoff volume by about 30% and this finding can help justify the annual pollutant load reductions when assessing the performance of this facility.

High groundwater should not preclude the use of an EDB. Groundwater, however, should be considered during design and construction, and the outlet design must account for any upstream base flows that enter the basin or that may result from groundwater surfacing within the basin itself.

Stable, all weather access to critical elements of the pond, such as the inlet, outlet, spillway, and sediment collection areas must be provided for maintenance purposes.

6.5 Design Procedure and Criteria

The following steps outline the design procedure and criteria for an EDB.

1. Basin Storage Volume

Provide a storage volume equal to 120 percent of the *WQCV* based on a 40-hour drain time, above the lowest outlet (i.e., perforation) in the basin. The additional 20 percent of storage volume provides for sediment accumulation and the resultant loss in storage volume.

A. Determine the *WQCV* tributary catchment's percent imperviousness. Account for the effects of DCIA, if any, on Effective Imperviousness. Using runoff volume reduction practices in the tributary catchment and Figure ND-1, determine the reduction in impervious area to use with *WQCV* calculations.

B. Find the required storage volume (watershed inches of runoff):

Determine the Required *WQCV* (watershed inches of runoff) using Figure EDB-2, based on the EDB's 40-hour drain time.

Calculate the Design Volume in acre-feet as follows:

$$Design\ Volume = \left(\frac{WQCV}{12}\right) * Area * 1.2$$

In which:

Area	=	The watershed area tributary to the extended detention pond
1.2 factor	=	Multiplier of 1.2 to account for the additional 20% of required storage for sediment accumulation

2. Outlet Works

The Outlet Works are to be designed to release the *WQCV* (i.e., not the "Design Volume") over a 40-hour period. Refer to the TYPICAL STRUCTURAL BMP DETAINS AND SPECIFICATIONS chapter for schematics pertaining to structure geometry; grates, trash racks, and screens; outlet type: orifice plate or perforated riser pipe; cutoff collar size and location; and all other necessary components.

For a perforated outlet, use Figure EDB-3 to calculate the required area per row based on *WQCV* and the depth of perforations at the outlet. See the TYPICAL STRUCTURAL BMP DETAINS AND SPECIFICATIONS chapter to determine the appropriate perforation geometry and number of rows. The lowest perforations should be set at the water surface elevation of the outlet micro-pool. The total outlet area is calculated by multiplying the area per row by the number of rows.

Minimized the number of columns and maximize the perforation hole diameter when designing outlets to reduce chances of clogging by accepting the orifice site that will empty the *WQCV* in 36 to 44 hours.

3. Trash Rack

Provide a trash rack of sufficient size to prevent clogging of the primary water quality outlet. Size the rack so as not to interfere with the hydraulic capacity of the outlet. Using the total outlet area and the selected perforation diameter (or height), Figures 6, 6a or 7 in the TYPICAL STRUCTURAL BMP DETAINS AND SPECIFICATIONS chapter will help to determine the minimum open area required for the trash rack.

Use one-half of the perforated plate's total outlet area to calculate the trash rack's size. This accounts for the variable inundation of the outlet orifices. Figures 6 and 6a were developed as suggested standardized outlet designs for smaller sites.

4. Basin Shape

Shape the pond whenever possible with a gradual expansion from the inlet and a gradual contraction toward the outlet, thereby minimizing short circuiting. It is best to have a basin length to width ratio between 2:1 to 3:1. To achieve this, it may be necessary to modify the inlet and outlet points through the use of pipes, swales or channels to accomplish this.

Always maximize the distance between the inlet and the outlet.

5. Two-Stage Design

A two-stage design with a pool that fills often with frequently occurring runoff minimizes standing water and sediment deposition in the remainder of the basin. The two stages are as follows:

A. Top Stage: The top stage should be one or more feet deep with its bottom sloped at 1 to 2 percent toward the trickle flow channel.

B. Bottom Stage: The dry weather water surface of the active surcharge volume of the bottom stage should be 0.5 feet or more below the bottom of the top stage, but no less than 4-inches below the invert of the upstream trickle channel, and store no less than 0.5 percent of the *WQCV*.

Provide a permanent micro-pool below the active storage volume of the lower stage in front of the outlet. The pool should be 1/2 the depth of the top stage depth described above, or 2.5 feet, whichever results in the larger depth.

6. Low-Flow Channel

Conveys low flows from the forebay to the bottom stage. To provide a maintainable trickle-flow channel, lining its bottom with concrete is recommended. Otherwise line its sides with buried Type VL soil riprap and bottom with concrete. Make it at least 4-inches deep if concrete lined sides and 8-inches if buried riprap sides are used. At a minimum provide capacity equal to twice the release capacity at the upstream forebay outlet.

7. Basin Side Slopes

Basin side slopes should be stable and gentle to facilitate maintenance and access. Side slopes should be no steeper than 4:1 and the use of flatter slopes is recommended; the flatter, the better and safer.

8. Dam Embankment

Design the embankment not to fail during a 100-year and larger storms. Embankment slopes should be no steeper than 3:1, preferably 4:1 or flatter, and planted with turf forming grasses. Poorly compacted native soils should be excavated and replaced. Embankment soils should be compacted to at least 95 percent of their maximum density according to ASTM D 698-70 (Modified Proctor). Spillway structures and overflows should be designed in accordance with local drainage criteria and should consider UDFCD drop-structure design guidelines.

9. Vegetation

Bottom vegetation provides erosion control and sediment entrapment. Pond bottom, berms, and side sloping areas may be planted with native grasses or with irrigated turf, depending on the local setting and needs.

10. Access

All weather stable access to the bottom, forebay, and outlet works area shall be provided for maintenance vehicles. Grades should not exceed 10 percent, and a solid driving surface of gravel, rock, concrete, gravel-stabilized turf, or Type VL soil riprap should be provided.

11. Inlet

Dissipate flow energy at pond's inflow point(s) to limit erosion and promote particle sedimentation. Inlets should be designed in accordance with UDFCD drop structure criteria, impact basin outlet details, or other types of energy dissipating structures.

12. Forebay Design

Provides an opportunity for larger particles to settle out in the inlet in an area that has a solid surface bottom to facilitate mechanical sediment removal. A rock berm or concrete-wall should be constructed between the forebay and the main EDB. The forebay volume of the permanent pool should be about 3 to 5 percent of the design *WQCV*. A pipe throughout the berm to convey water the main body of the EDB should be offset from the inflow streamline to prevent short circuiting and should be sized to drain the forebay volume in 3 to 5 minutes, respectively. The floor of the forebay should be concrete or grouted boulder lined to define sediment removal limits.

13. Flood Storage

Combining the water quality facility with a flood control facility is recommended. The 5-year, 10-year, 100-year, or other floods may be detained above the *WQCV*. See Section 1.5.5 of the BMP PLANNING FOR NEW DEVELOPMENT AND SIGNIFICANT REDEVELOPMENT chapter of this volume for further guidance.

14. Multiple Uses

6.6 Design Example

Design forms that provide a means of documenting the design procedure are included in the DESIGN FORMS chapter. A completed form follows as a design example.

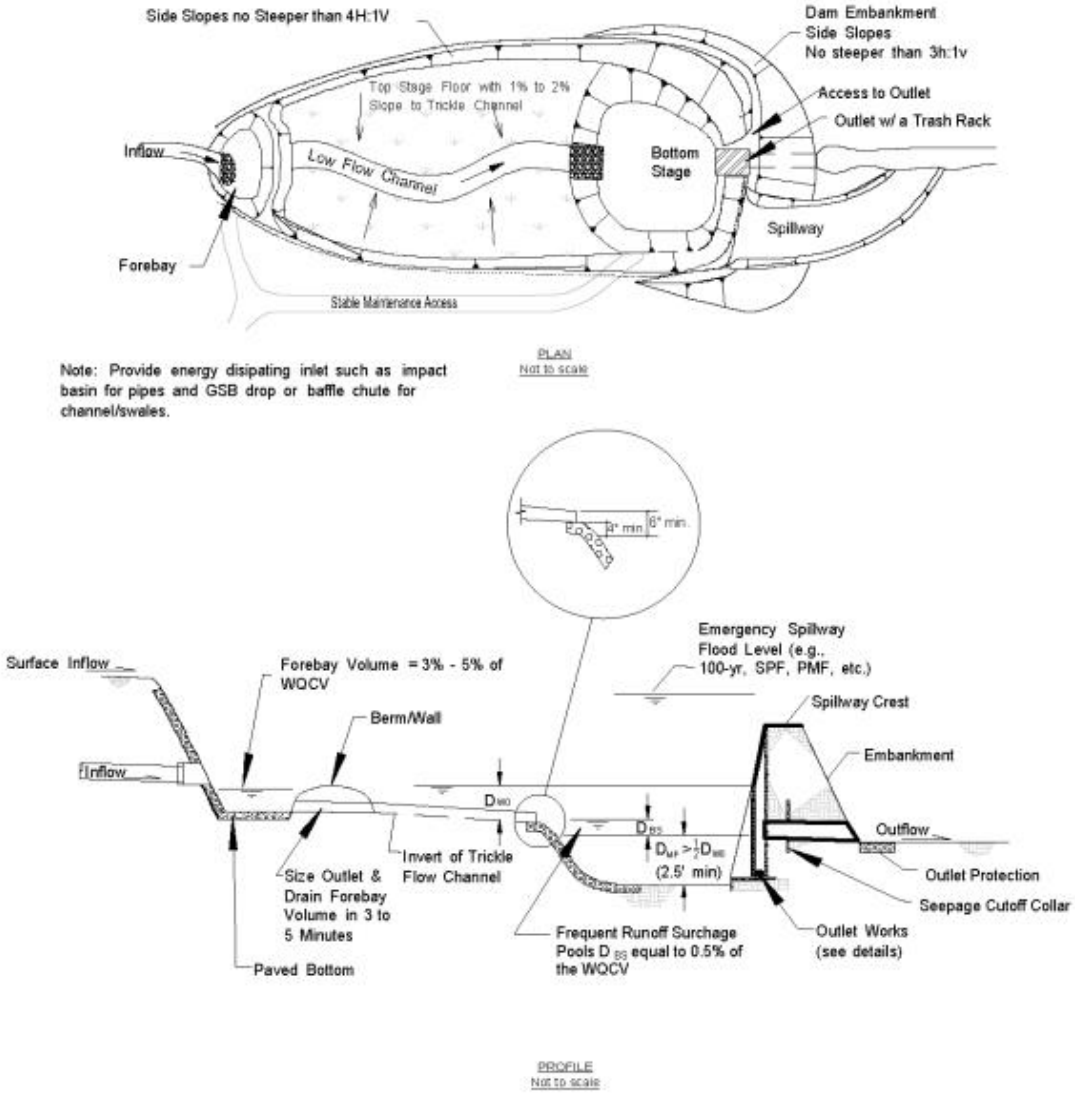


Figure EDB-1 –Extended Detention Basin (EDB) – Plan and Sections

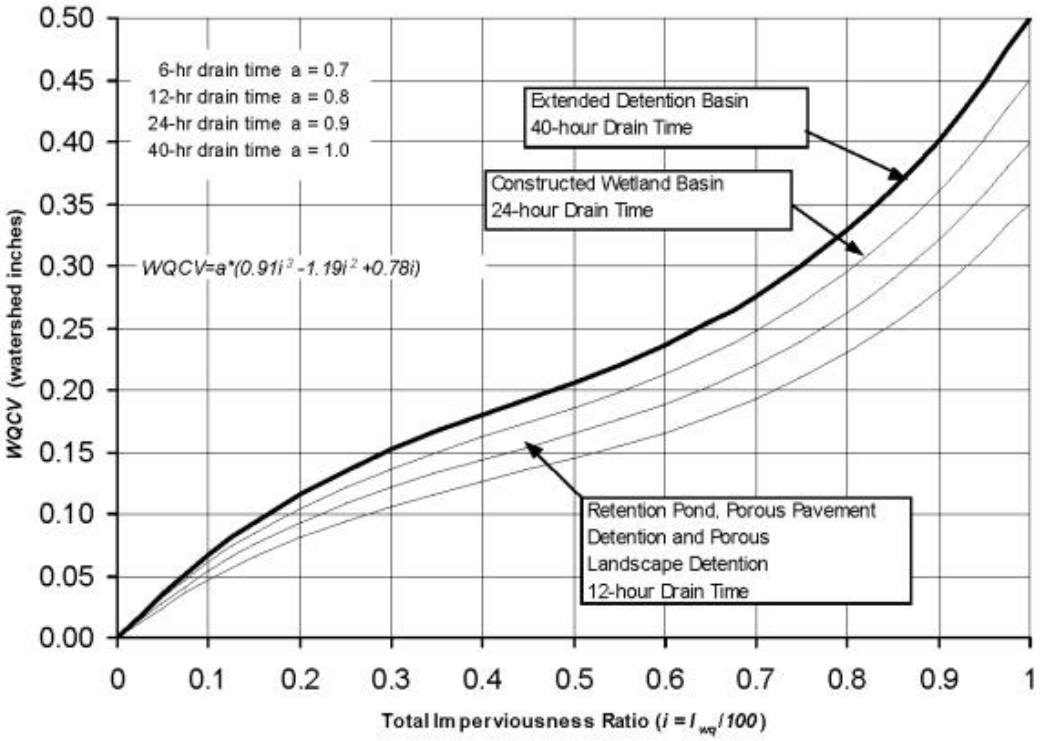


Figure EDB-2—Water Quality Capture Volume (*WQCV*), 80th Percentile Runoff Event

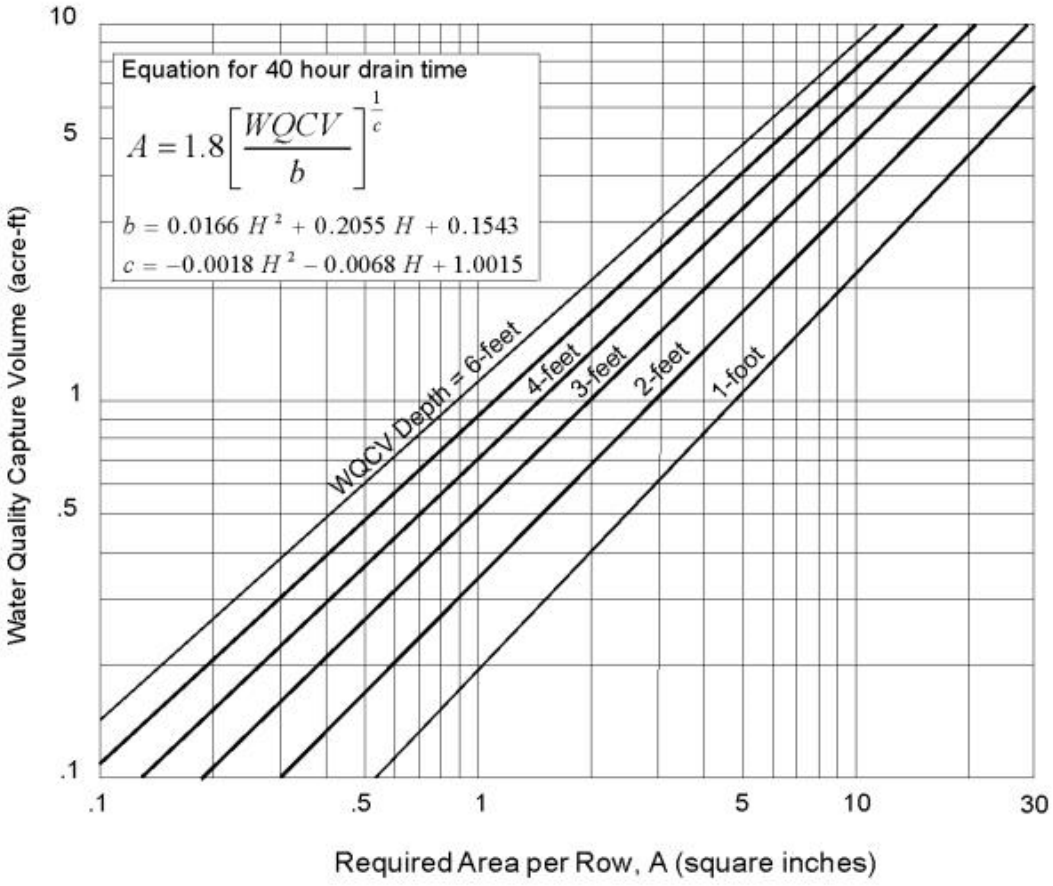


Figure EDB-3—Water Quality Outlet Sizing: Extended Detention Basin (Dry) With 40-hour Drain Time for Capture Volume

(Equation on this figure valid only for WQCV Depth H ≤ 6 feet)

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Sheet 1 of 3

Designer:	Joseph Stormwater
Company:	BLWH, Inc.
Date:	October 1, 2005
Project:	Sleepy Acres Residential and Commenrcial Getaway
Location:	40th Latitude, Colorado.

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 60.00 % i = 0.60
B) Contributing Watershed Area (Area)	Area = 45.000 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i))	WQCV = 0.24 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 1.0627 acre-feet
2. Outlet Works	
A) Outlet Type (Check One)	X Orifice Plate Perforated Riser Pipe Other:
B) Depth at Outlet Above Lowest Perforation (H)	H = 2.50 feet
C) Recommended Maximum Outlet Area per Row, (A_o)	A_o = 1.7 square inches
D) Perforation Dimensions: i) Circular Perforation Diameter or ii) Width of 2" High Rectangular Perforations	D = 1.500 inches W = inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc = 1 number
F) Actual Design Outlet Area per Row (A_o)	A_o = 1.8 square inches
G) Number of Rows (nr)	nr = 8 number
H) Total Outlet Area (A_{ot})	A_{ot} = 13.3 square inches
3. Trash Rack	
A) Needed Open Area: A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t = 424 square inches
B) Type of Outlet Opening (Check One)	X ≤ 2" Diameter **Round** 2" High **Rectangular** Other:
C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a):	
i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} = 15 inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} = 60 inches

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Sheet 2 of 3

Designer:	Joseph Stormwater
Company:	BLWH, Inc.
Date:	October 1, 2005
Project:	Sleepy Acres Residential and Commenrcial Getaway
Location:	40th Latitude, Colorado.

iii) Type of Screen (Based on Depth H), Describe if "Other"	X S.S. #93 VEE Wire (US Filter) Other:
iv) Screen Opening Slot Dimension, Describe if "Other"	X 0.139" (US Filter) Other:
v) Spacing of Support Rod (O.C.) Type and Size of Support Rod (Ref.: Table 6a-2)	1.00 inches TE 0.074 in. x 0.50 in.
vi) Type and Size of Holding Frame (Ref.: Table 6a-2)	0.75 in. x 1.00 in. angle
D) For 2" High **Rectangular Opening** (Refer to Figure 6b):	
I) Width of Rectangular Opening (W)	W = inches
ii) Width of Perforated Plate Opening (W_{conc} = W + 12")	W_{conc} = inches
iii) Width of Trashrack Opening ($W_{opening}$) from Table 6b-1	$W_{opening}$ = inches
iv) Height of Trash Rack Screen (H_{TR})	H_{TR} = inches
v) Type of Screen (based on depth H) (Describe if "Other")	Klemp™ KPP Series Aluminum Other:
vi) Cross-bar Spacing (Based on Table 6b-1, Klemp™ KPP Grating). Describe if "Other"	inches Other:
vii) Minimum Bearing Bar Size (Klemp™ Series, Table 6b-2) (Based on depth of WQCV surcharge)	
4. Detention Basin length to width ratio	1.20 (L/W)
5 Pre-sedimentation Forebay Basin - Enter design values	
A) Volume (3% to 5% of Design Volume from 1D) (3% - 5% of Design Volume (0.0319 - 0.0531 acre-feet.)	0.0400 acre-feet
B) Surface Area	0.025 acres
C) Connector Pipe Diameter (Size to drain this volume in 5-minutes under inlet control)	4 inches
D) Paved/Hard Bottom and Sides	X yes/no

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Sheet 3 of 3

Designer:	**Joseph Stormwater**
Company:	**BLWH, Inc.**
Date:	**October 1, 2005**
Project:	**Sleepy Acres Residential and Commenrcial Getaway**
Location:	**40th Latitude, Colorado.**

6. Two-Stage Design - See Figure EDB-1	
A) Top Stage (Depth D_{WQ} = 2' Minimum) Top Stage Storage: no less than 95.74% of Design Volume (1.0174 acre-feet.)	D_{WQ} = 2.00 feet Storage= 1.1000 acre-feet
B) Bottom Stage Depth (D_{BS} = 0.33' Minimum Below Trickle Channel Invert) Bottom Stage Storage: no less than 0.5% of Design Volume (0.0053 acre-feet.) Storage = A * Depth Above WS To Bottom Of Top Stage	D_{BS} = 0.33 feet Storage= 0.0055 acre-feet Surf. Area= 0.017 acres
C) Micro Pool (Minimum Depth = the Larger of 0.50 * Top Stage Depth (1 ') or 2.5 '	Depth= 2.60 feet
D) Total Volume: Vol_{tot} = Storage from 5A + 6A + 6B (Must be > Design Volume in 1D, or 1.0627 acre-feet.)	Vol_{tot} = 1.1455 acre-feet
7. Basin Side Slopes (Z, horizontal distance per unit vertical) Minimum Z = 4, Flatter Preferred	Z = 5.00 (horizontal/vertical)
8. Dam Embankment Side Slopes (Z, horizontal distance) per unit vertical) Minimum Z = 3, Flatter Preferred	Z = 4.00 (horizontal/vertical)
9. Vegetation (Check the method or describe "Other")	_____ Native Grass X Irrigated Turf Grass _____ Other: _____

Notes: _____

Extended Detention Basin (EDB)

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Sheet 1 of 3

Designer: _____
Company: _____
Date: _____
Project: _____
Location: _____

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = _____ % I = _____
B) Contributing Watershed Area (Area)	Area = _____ acres
C) Water Quality Capture Volume (WQCV) (WQCV = 1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))	WQCV = _____ watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = _____ acre-feet
2. Outlet Works	
A) Outlet Type (Check One)	_____ Orifice Plate _____ Perforated Riser Pipe _____ Other: _____
B) Depth at Outlet Above Lowest Perforation (H)	H = _____ feet
C) Recommended Maximum Outlet Area per Row, (A_o)	A_o = _____ square inches
D) Perforation Dimensions: i) Circular Perforation Diameter or ii) Width of 2" High Rectangular Perforations	 D = _____ inches W = _____ inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc = _____ number
F) Actual Design Outlet Area per Row (A_o)	A_o = _____ square inches
G) Number of Rows (nr)	nr = _____ number
H) Total Outlet Area (A_{ot})	A_{ot} = _____ square inches
3. Trash Rack	
A) Needed Open Area: A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t = _____ square inches
B) Type of Outlet Opening (Check One)	_____ ≤ 2" Diameter **Round** _____ 2" High **Rectangular** _____ Other: _____
C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a):	
i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} = _____ inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} = _____ inches

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Sheet 2 of 3

Designer: _____
Company: _____
Date: _____
Project: _____
Location: _____

iii) Type of Screen (Based on Depth H), Describe if "Other"	_____ S.S. #93 VEE Wire (US Filter) _____ Other: _____
iv) Screen Opening Slot Dimension, Describe if "Other"	_____ 0.139" (US Filter) _____ Other: _____
v) Spacing of Support Rod (O.C.) Type and Size of Support Rod (Ref.: Table 6a-2)	_____ inches
vi) Type and Size of Holding Frame (Ref.: Table 6a-2)	
D) For 2" High **Rectangular Opening** (Refer to Figure 6b):	
I) Width of Rectangular Opening (W)	W = _____ inches
ii) Width of Perforated Plate Opening (W_{conc} = W + 12")	W_{conc} = _____ inches
iii) Width of Trashrack Opening ($W_{opening}$) from Table 6b-1	$W_{opening}$ = _____ inches
iv) Height of Trash Rack Screen (H_{TR})	H_{TR} = _____ inches
v) Type of Screen (based on depth H) (Describe if "Other")	_____ Klemp™ KPP Series Aluminum _____ Other: _____
vi) Cross-bar Spacing (Based on Table 6b-1, Klemp™ KPP Grating). Describe if "Other"	_____ inches _____ Other: _____
vii) Minimum Bearing Bar Size (Klemp™ Series, Table 6b-2) (Based on depth of WQCV surcharge)	
4. Detention Basin length to width ratio	_____ (L/W)
5 Pre-sedimentation Forebay Basin - Enter design values	
A) Volume (3% to 5% of Design Volume from 1D)	_____ acre-feet
B) Surface Area	_____ acres
C) Connector Pipe Diameter (Size to drain this volume in 5-minutes under inlet control)	_____ inches
D) Paved/Hard Bottom and Sides	_____ yes/no

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Sheet 3 of 3

Designer: _____
Company: _____
Date: _____
Project: _____
Location: _____

6. Two-Stage Design - See Figure EDB-1 A) Top Stage (Depth D_{WQ} = 2' Minimum) Top Stage Storage (no less than 94% of Design Volume) B) Bottom Stage Depth (D_{BS} = 0.33' Minimum Below Trickle Channel Invert) Bottom Stage Storage (no less than 0.5% of Design Volume from 1D) Storage = A * Depth Above WS To Bottom Of Top Stage C) Micro Pool (Minimum Depth = the Larger of 0.50 * Top Stage Depth or 2.5 Feet) D) Total Volume: Vol_{tf} = Storage from 5A + 6A + 6B (Must be greater than the Design Volume in 1D.)	D_{WQ} = _____ feet Storage= _____ acre-feet D_{BS} = _____ feet Storage= _____ acre-feet Surf. Area= _____ acres Depth= _____ feet Vol_{tf} = _____ acre-feet
7. Basin Side Slopes (Z, horizontal distance per unit vertical) Minimum Z = 4, Flatter Preferred	Z = _____ (horizontal/vertical)
8. Dam Embankment Side Slopes (Z, horizontal distance) per unit vertical) Minimum Z = 3, Flatter Preferred	Z = _____ (horizontal/vertical)
9. Vegetation (Check the method or describe "Other")	_____ Native Grass _____ Irrigated Turf Grass _____ Other: _____

Notes: _____

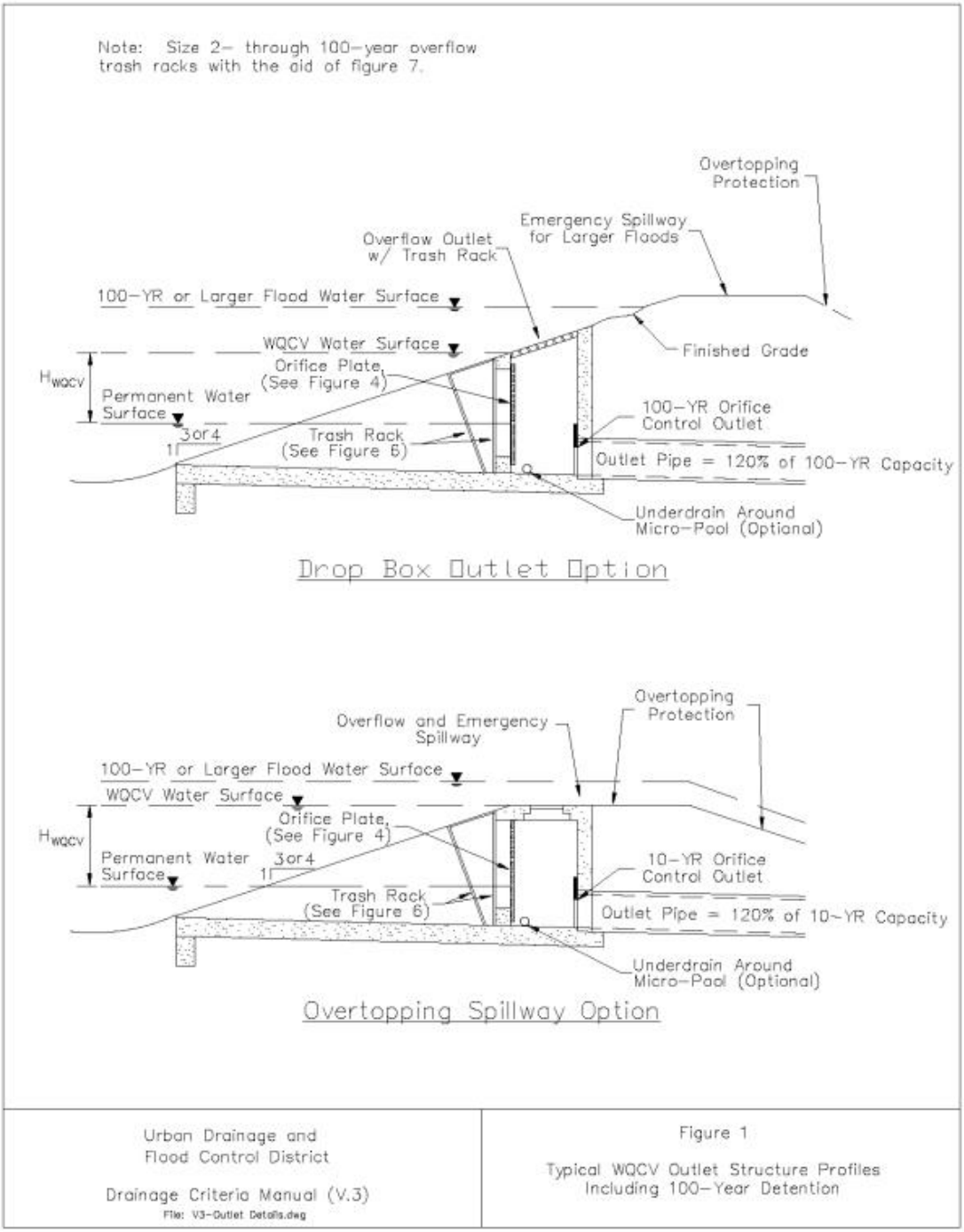


Figure 1—Typical WQCV Outlet Structure Profile, Including 100-year Detention.

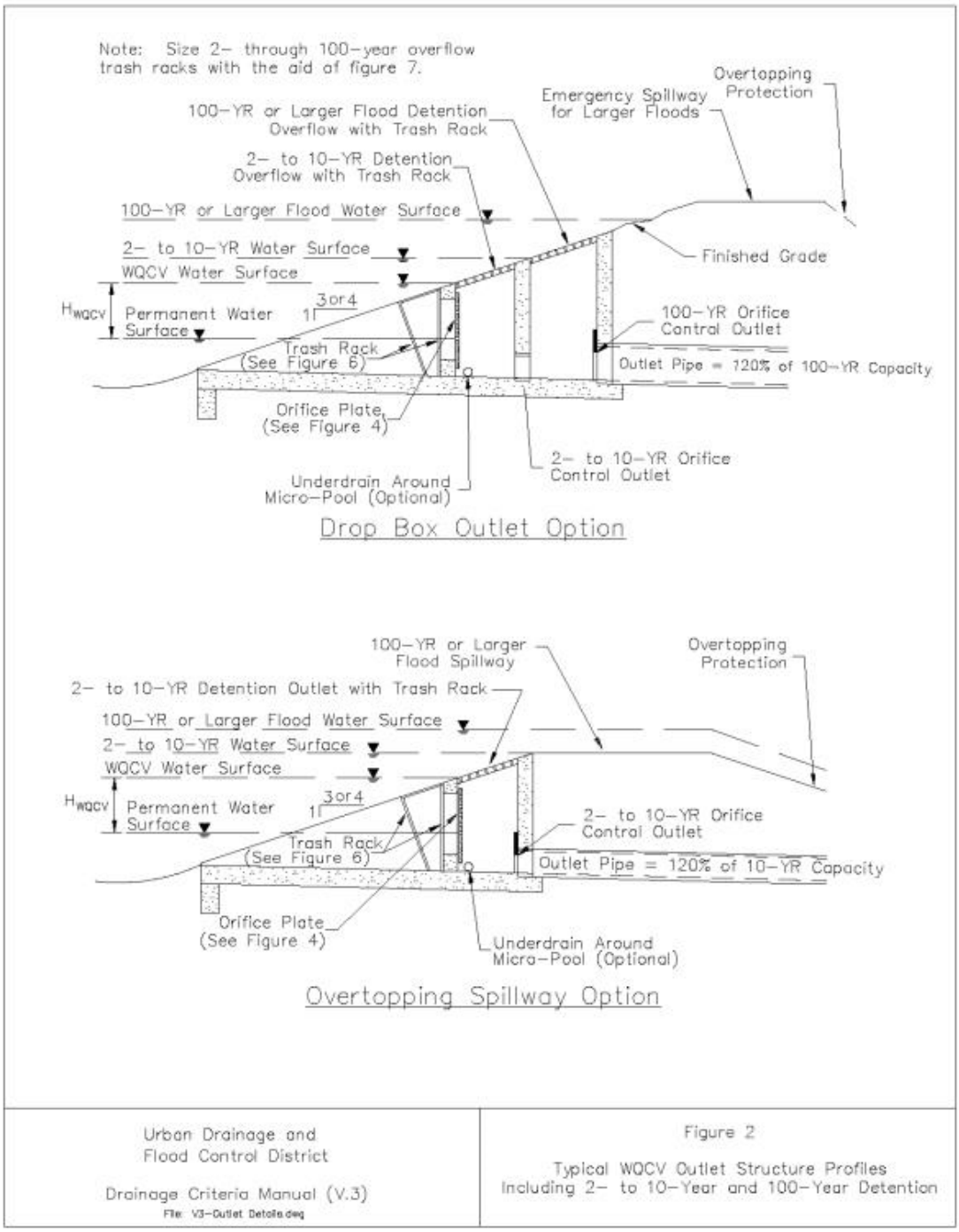


Figure 2—Typical WQCV Outlet Structure Profile, Including 2- to 10-year and 100-year Detention.

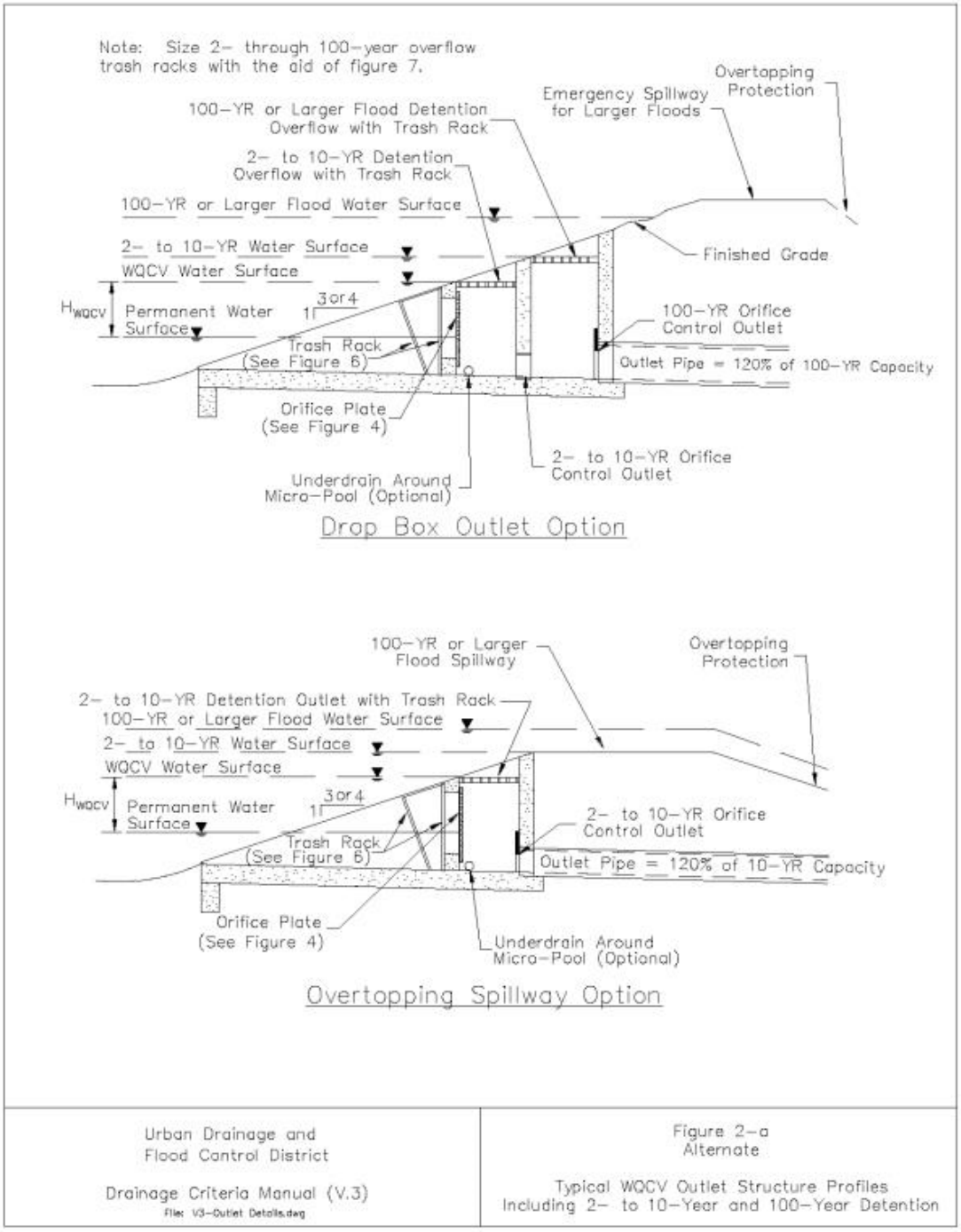


Figure 2-a—Typical WQCV Outlet Structure Profile, Including 2- to 10-year and 100-year Detention.

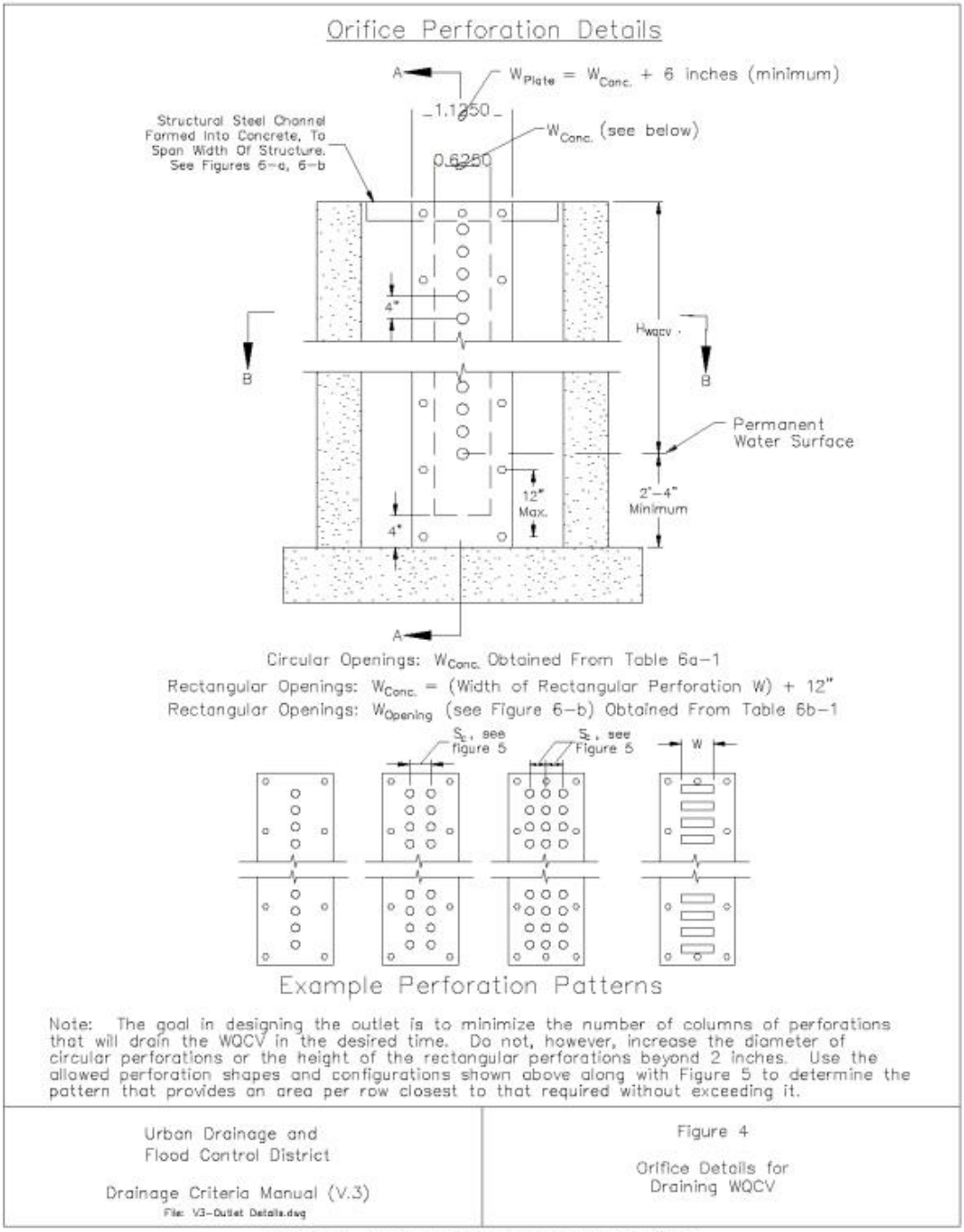
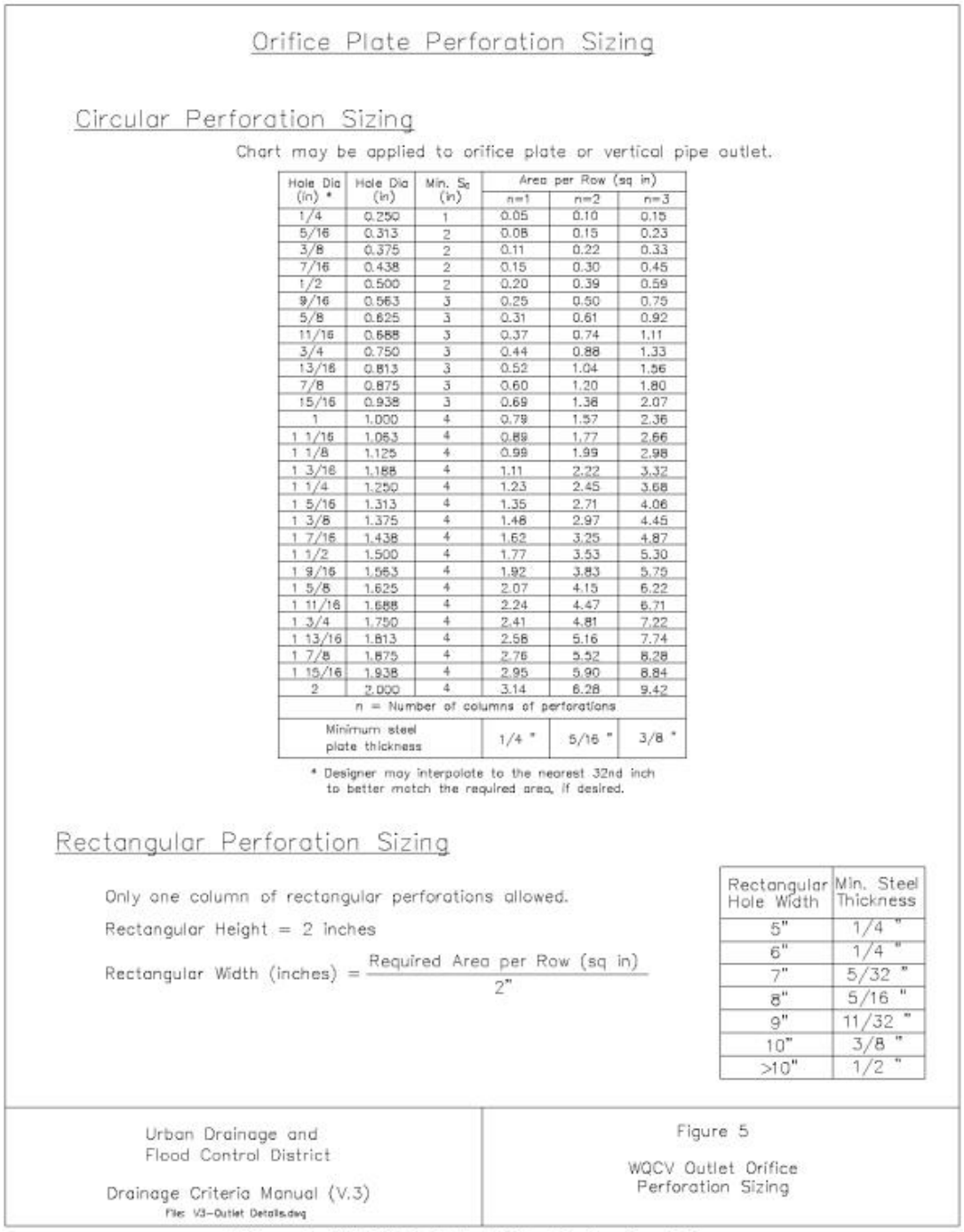


Figure 4—Orifice Details for Draining WQCV.



Orifice Plate Perforation Sizing

Circular Perforation Sizing

Chart may be applied to orifice plate or vertical pipe outlet.

Hole Dia (in) *	Hole Dia (in)	Min. S_c (in)	Area per Row (sq in)		
			n=1	n=2	n=3
1/4	0.250	1	0.05	0.10	0.15
5/16	0.313	2	0.08	0.15	0.23
3/8	0.375	2	0.11	0.22	0.33
7/16	0.438	2	0.15	0.30	0.45
1/2	0.500	2	0.20	0.39	0.59
9/16	0.563	3	0.25	0.50	0.75
5/8	0.625	3	0.31	0.61	0.92
11/16	0.688	3	0.37	0.74	1.11
3/4	0.750	3	0.44	0.88	1.33
13/16	0.813	3	0.52	1.04	1.56
7/8	0.875	3	0.60	1.20	1.80
15/16	0.938	3	0.69	1.38	2.07
1	1.000	4	0.79	1.57	2.36
1 1/16	1.063	4	0.89	1.77	2.66
1 1/8	1.125	4	0.99	1.99	2.98
1 3/16	1.188	4	1.11	2.22	3.32
1 1/4	1.250	4	1.23	2.45	3.68
1 5/16	1.313	4	1.35	2.71	4.06
1 3/8	1.375	4	1.48	2.97	4.45
1 7/16	1.438	4	1.62	3.25	4.87
1 1/2	1.500	4	1.77	3.53	5.30
1 9/16	1.563	4	1.92	3.83	5.75
1 5/8	1.625	4	2.07	4.15	6.22
1 11/16	1.688	4	2.24	4.47	6.71
1 3/4	1.750	4	2.41	4.81	7.22
1 13/16	1.813	4	2.58	5.16	7.74
1 7/8	1.875	4	2.76	5.52	8.28
1 15/16	1.938	4	2.95	5.90	8.84
2	2.000	4	3.14	6.28	9.42
n = Number of columns of perforations					
Minimum steel plate thickness			1/4 "	5/16 "	3/8 "

* Designer may interpolate to the nearest 32nd inch to better match the required area, if desired.

Rectangular Perforation Sizing

Only one column of rectangular perforations allowed.

Rectangular Height = 2 inches

$$\text{Rectangular Width (inches)} = \frac{\text{Required Area per Row (sq in)}}{2"}$$

Rectangular Hole Width	Min. Steel Thickness
5"	1/4 "
6"	1/4 "
7"	5/32 "
8"	5/16 "
9"	11/32 "
10"	3/8 "
>10"	1/2 "

Urban Drainage and Flood Control District

Drainage Criteria Manual (V.3)

File: V3-Outlet Details.dwg

Figure 5

WQCV Outlet Orifice Perforation Sizing

Figure 5—WQCV Outlets Orifice Perforation Sizing.

Orifice Plate Perforation Sizing

Circular Perforation Sizing

This table may be used to size perforation in a vertical plate of riser pipe.

Hole Dia. (in.) *	Hole Dia. (in.)	Min. S_c (in.)	Area per Row (sq. in.)		
			n = 1	n = 2	n = 3
1/4	0.250	1	0.05	0.10	0.15
5/16	0.313	2	0.08	0.16	0.24
3/8	0.375	2	0.11	0.22	0.33
7/16	0.438	2	0.15	0.30	0.45
1/2	0.500	2	0.20	0.40	0.60
9/16	0.563	3	0.25	0.50	0.75
5/8	0.625	3	0.31	0.62	0.93
11/16	0.688	3	0.37	0.74	1.11
3/4	0.750	3	0.44	0.88	1.32
13/16	0.813	3	0.52	1.04	1.56
7/8	0.875	3	0.60	1.20	1.80
15/16	0.938	3	0.69	1.38	2.07
1	1.000	4	0.79	1.58	2.37
1 1/16	1.063	4	0.89	1.78	2.67
1 1/8	1.125	4	0.99	1.98	2.97
1 3/16	1.188	4	1.11	2.22	3.33
1 1/4	1.250	4	1.23	2.46	3.69
1 5/16	1.313	4	1.35	2.70	4.05
1 3/8	1.375	4	1.48	2.96	4.44
1 7/16	1.438	4	1.62	3.24	4.86
1 1/2	1.500	4	1.77	3.54	5.31
1 9/16	1.563	4	1.92	3.84	5.76
1 5/8	1.625	4	2.07	4.14	6.21
1 11/16	1.688	4	2.24	4.48	6.72
1 3/4	1.750	4	2.41	4.82	7.23
1 13/16	1.813	4	2.58	5.16	7.74
1 7/8	1.875	4	2.76	5.52	8.28
1 15/16	1.938	4	2.95	5.90	8.85
2	2.000	4	3.14	6.28	9.42
n = Number of columns of perforations					
Minimum steel plate thickness			1/4"	5/16"	3/8"
* Designer may interfere to the nearest 32nd inch to better match the needed area if desired.					

Rectangular Perforation sizing

Use only one rectangular column whenever two 2;inch diameter circular perforations cannot provide needed outlet area.

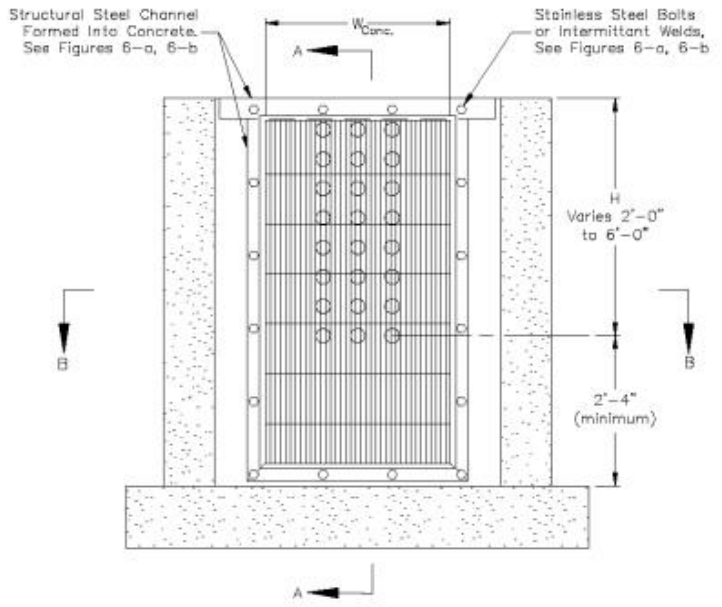
Rectangular Height = 2-inches

Rectangular Width = Required Area per Row / 2"

Rectangular hole Width	Min. Steel Thickness
5"	1/4 "
6"	1/4 "
7"	5/32 "
8"	5/16 "
9"	11/32 "
10"	3/8 "
> 10"	1/2 "

Figure 5—WQCV Outlets Orifice Perforation Sizing.

Note: Vertical WQCV Trash Racks are shown in Figures 6, 6-a, and 6-b for suggested standardized outlet design. Adverse-Slope Trash Rack design may be used for non-standardized designs, but must meet minimum design criteria.



Elevation

WQCV Trash Racks:

1. Well-screen trash racks shall be stainless steel and shall be attached by intermittant welds along the edge of the mounting frame.
2. Bar grate trash racks shall be aluminum and shall be bolted using stainless steel hardware.
3. Trash Rack widths are for specified trash rack material. Finer well-screen or mesh size than specified is acceptable, however, trash rack dimensions need to be adjusted for materials having a different open area/gross area ratio (R value)
4. Structural design of trash rack shall be based on full hydrostatic head with zero head downstream of the rack.

Overflow Trash Racks:

1. All trash racks shall be mounted using stainless steel hardware and provided with hinged and lockable or boltable access panels.
2. Trash racks shall be stainless steel, aluminum, or steel. Steel trash racks shall be hot dip galvanized and may be hot powder painted after galvanizing.
3. Trash Racks shall be designed such that the diagonal dimension of each opening is smaller than the diameter of the outlet pipe.
4. Structural design of trash rack shall be based on full hydrostatic head with zero head downstream of the rack.

Urban Drainage and Flood Control District Drainage Criteria Manual (V.3) File: V3-Outlet Details.dwg	Figure 6 Suggested WQCV Outlet Standardized Trash Rack Design

Figure 6—Suggested WQCV Outlets Standardized Trash Rack Design.

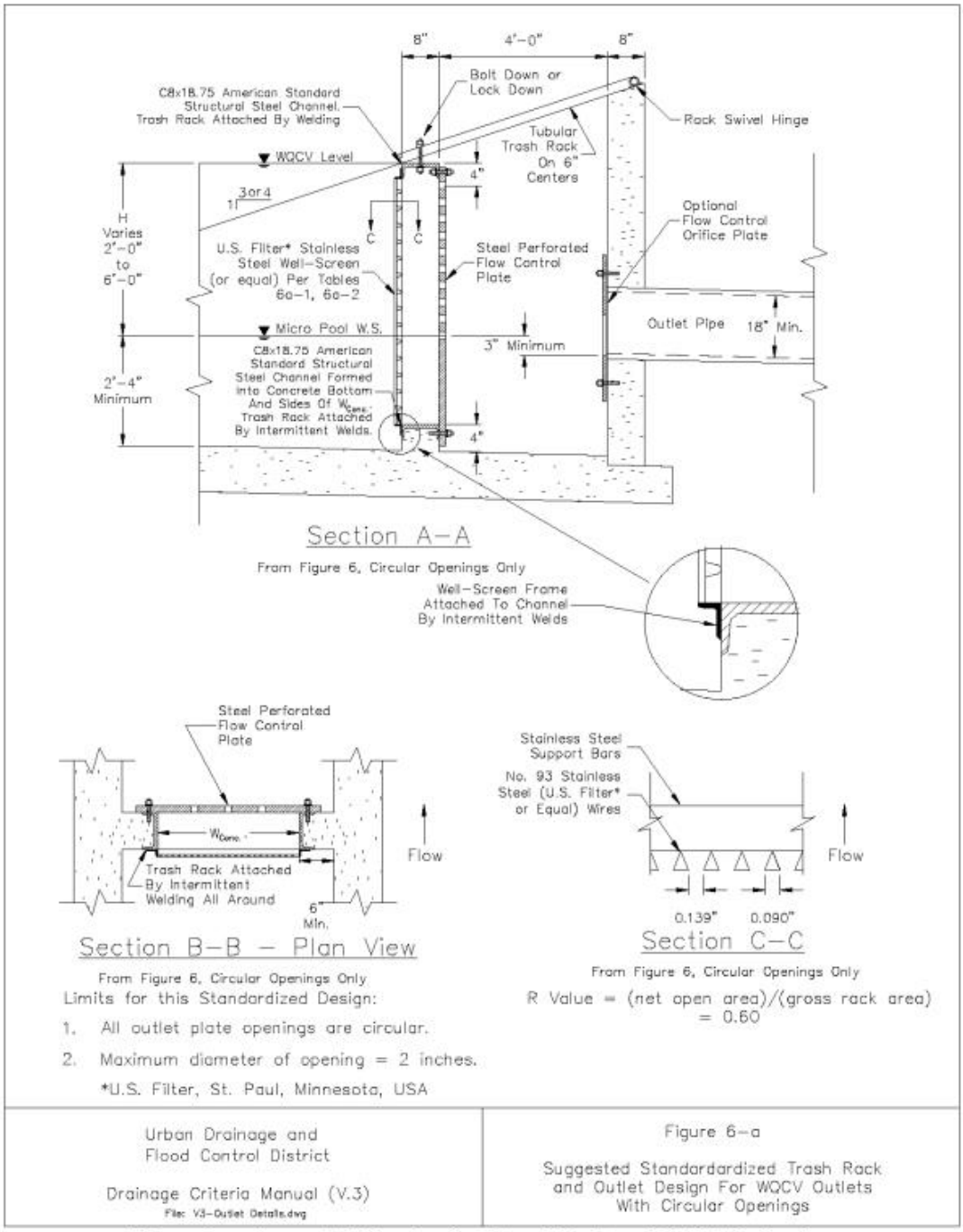


Figure 6-a—Suggested Standardized Trash Rack and Outlet Design for WQCV Outlets With Circular Openings.

Table 6a-1—Trash Rack Mounting Opening Widths per Column of Circular Perforations

(2" diameter maximum)

Minimum Width ($W_{opening}$) of Opening for a VEE Wire™ Screen Trash Rack.

Requires a minimum water depth below the lowest perforation of 2'-6".

See Figure 6-a for Explanation of Terms.

Maximum Dia. of Circular Opening (inches)	Width of Trash Rack Opening ($W_{conc.}$) Per Column of Holes as a Function of Water Depth H Above Lowest Perforation					
	H=2.0'	H=3.0'	H=4.0'	H=5.0'	H=6.0'	Maximum Number of Columns
≤ 0.25	3 in.	3 in.	3 in.	3 in.	3 in.	14
≤ 0.50	3 in.	3 in.	3 in.	3 in.	3 in.	14
≤ 0.75	3 in.	6 in.	6 in.	6 in.	6 in.	7
≤ 1.00	6 in.	9 in.	9 in.	9 in.	9 in.	4
≤ 1.25	9 in.	12 in.	12 in.	12 in.	15 in.	2
≤ 1.50	12 in.	15 in.	18 in.	18 in.	18 in.	2
≤ 1.75	18 in.	21 in.	21 in.	24 in.	24 in.	1
≤ 2.00	21 in.	24 in.	27 in.	30 in.	30 in.	1

NOTE: Minimum width of opening in the concrete shall not be less than 9 inches whenever above table indicated otherwise. Always minimize number of columns of perforations used.

Table 6a-2—Standardized WQCV Outlet Design Using Circular Openings

(2" diameter maximum)

Johnson VEE Wire™ Stainless Steel Screen[1] (or equal) Trash Rack Design Specifications.

Max. Width of Opening	Screen #93 VEE Wire Slot Opening	Support Rod Type	Support Rod, On-Center, Spacing	Total Screen Thickness	Carbon Steel Frame Type
9"	0.139"	#156 VEE	3/4"	0.31"	3/8" x 1.0 flat bar
18"	0.139"	TE .074"x.50"	1"	0.655"	3/4" x 1.0 angle
24"	0.139"	TE .074"x.75"	1"	1.03"	1.0" x 1 1/2" angle
27"	0.139"	TE .074"x.75"	1"	1.03"	1.0" x 1 1/2" angle
30"	0.139"	TE .074"x1.0"	1"	1.155"	1 1/4" x 1 1/2" angle
36"	0.139"	TE .074"x1.0"	1"	1.155"	1 1/4" x 1 1/2" angle
42"	0.139"	TE .074"x1.0"	1"	1.155"	1 1/4" x 1 1/2" angle

[1] Johnson Screens, St. Paul, Minnesota USA (1-800-833-9473)

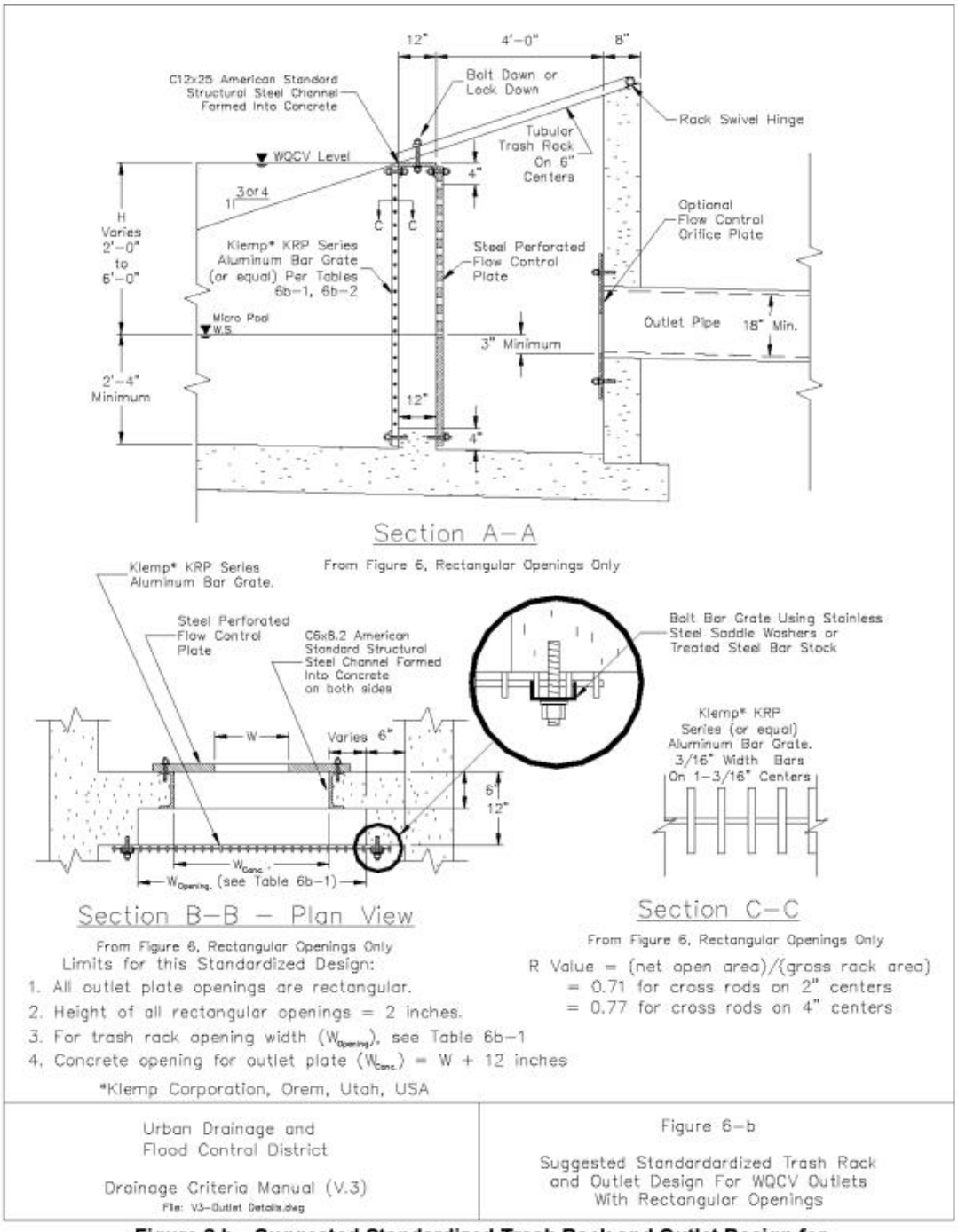


Figure 6-b—Suggested Standardized Trash Rack and Outlet Design for WQCV Outlets With Rectangular Openings.

Table 6b-1—Standardized WQCV Outlet Design Using 2" High Rectangular Openings.
Minimum Width ($W_{opening}$) of Opening for an Aluminum Bar Grate Trash Rack.
Requires a minimum water depth below the lowest perforation of 2'-4".
See Figure 6-b for Explanation of Terms.

Maximum Width W of 2" Height Rectangular Opening (inches)	Minimum Width of Trash Rack Opening ($W_{opening}$) as a Function of Water Depth H Above Lowest Perforation					
	H=2.0 ft.	H=3.0 ft.	H=4.0 ft.	H=5.0 ft.	H=6.0 ft.	Spacing of Bearing Bars, Cross Rods
2	2.0 ft.	2.5 ft.	2.5 ft.	2.5 ft.	3.0 ft.	1-3/16", 2"
≤ 2.5	2.5 ft.	3.0 ft.	3.0 ft.	3.5 ft.	3.5 ft.	1-3/16", 2"
≤ 3.0	3.0 ft.	3.5 ft.	3.5 ft.	4.0 ft.	4.0 ft.	1-3/16", 2"
≤ 3.5	3.5 ft.	4.0 ft.	4.5 ft.	4.5 ft.	5.0 ft.	1-3/16", 2"
≤ 4.0	3.5 ft.	4.5 ft.	5.0 ft.	5.0 ft.	5.5 ft.	1-3/16", 2"
≤ 4.5	4.0 ft.	4.5 ft.	5.0 ft.	5.5 ft.	5.5 ft.	1-3/16", 4"
≤ 5.0	4.0 ft.	5.0 ft.	5.5 ft.	6.0 ft.	6.0 ft.	1-3/16", 4"
≤ 5.5	4.5 ft.	5.5 ft.	6.0 ft.	6.5 ft.	7.0 ft.	1-3/16", 4"
≤ 6.0	5.0 ft.	6.0 ft.	6.5 ft.	7.0 ft.	7.5 ft.	1-3/16", 4"
≤ 6.5	5.5 ft.	6.5 ft.	7.0 ft.	7.5 ft.	8.0 ft.	1-3/16", 4"
≤ 7.0	6.0 ft.	7.0 ft.	7.5 ft.	8.5 ft.	8.5 ft.	1-3/16", 4"
≤ 7.5	6.0 ft.	7.5 ft.	8.5 ft.	9.0 ft.	9.5 ft.	1-3/16", 4"
≤ 8.0	6.5 ft.	8.0 ft.	9.0 ft.	9.5 ft.	10.0 ft.	1-3/16", 4"
≤ 8.5	7.0 ft.	8.5 ft.	9.5 ft.	10.0 ft.	N/A	1-3/16", 4"
≤ 9.0	7.5 ft.	9.0 ft.	10.0 ft.	N/A	N/A	1-3/16", 4"
≤ 9.5	8.0 ft.	9.5 ft.	N/A	N/A	N/A	1-3/16", 4"
≤ 10.0	8.5 ft.	10.0 ft.	N/A	N/A	N/A	1-3/16", 4"
≤ 10.5	8.5 ft.	N/A	N/A	N/A	N/A	1-3/16", 4"
≤ 11.0	9.0 ft.	N/A	N/A	N/A	N/A	1-3/16", 4"
≤ 11.5	9.5 ft.	N/A	N/A	N/A	N/A	1-3/16", 4"
≤ 12.0	10.0 ft.	N/A	N/A	N/A	N/A	1-3/16", 4"

Table 6b-2—Standardized WQCV Outlet Design Using 2" High Rectangular Openings.
Klemp™ KRP Series Aluminum Bar Grate[l] (or equal) Trash Rack Design Specifications.

Water Depth Above Lowest Opening, H	Minimum Bearing Bar Size, Bearing Bars Aligned Vertically
2.0 ft.	1" x 3/16"

Table 6b-2—Standardized WQCV Outlet Design Using 2" High Rectangular Openings. Klemp™ KRP Series Aluminum Bar Grate[1] (or equal) Trash Rack Design Specifications.	
Water Depth Above Lowest Opening, H	**Minimum Bearing Bar Size, Bearing Bars Aligned Vertically**
3.0 ft.	1-1/4" x 3/16"
4.0 ft.	1-3/4" x 3/16"
5.0 ft.	2" x 3/16"
6.0 ft.	2-1/4" x 3/16"

[1] Klemp Corporation, Orem, Utah, USA

DESIGN EXAMPLE:

Given: A WQCV outlet plate with one column of 2 inch high by 6.5 inch wide rectangular openings.

Water Depth H = 4.5 feet above the lowest opening of and 2.5 feet below the lowest perforation.

Find: The dimensions for an aluminum bar grate trash rack.

Solution: Using Table 6b-1 for openings having a width of 6.5 inches and Water Depth H = 5 feet (i.e., rounded up from 4.5 feet). The minimum width of the concrete opening at the trash rack, $W_{opening}$, is 7'-6".

From Fig's 4 and 5, the total width of concrete opening at the orifice plate, $W_{conc.}$, is 6.5" + 12" = 18.5 inches (say 19 inches). Suggest setting the total width of the orifice plate at 26 inches.

Total minimum height of the rack structure (adding the 2-feet below the lowest row of openings to the water depth of 4.5 feet and adding 3 inches for all support channel flanges around the perimeter of the grate gives us the following total dimensions for the trash rack:

Width = 8'-0"

Height = 7'-0"

From Tables 6b-1 and 6b-2, select the ordering specifications for W = 6.5" and H = 5.0 feet or less, a 8'-0" wide by 7'-0" high trash rack using Klemp Corporation aluminum bar grate (or equal) with 2"x3/16" bearing bars spaced on 1-3/16" centers and cross rods spaced on 4" centers. Bearing bars are to be aligned vertically.

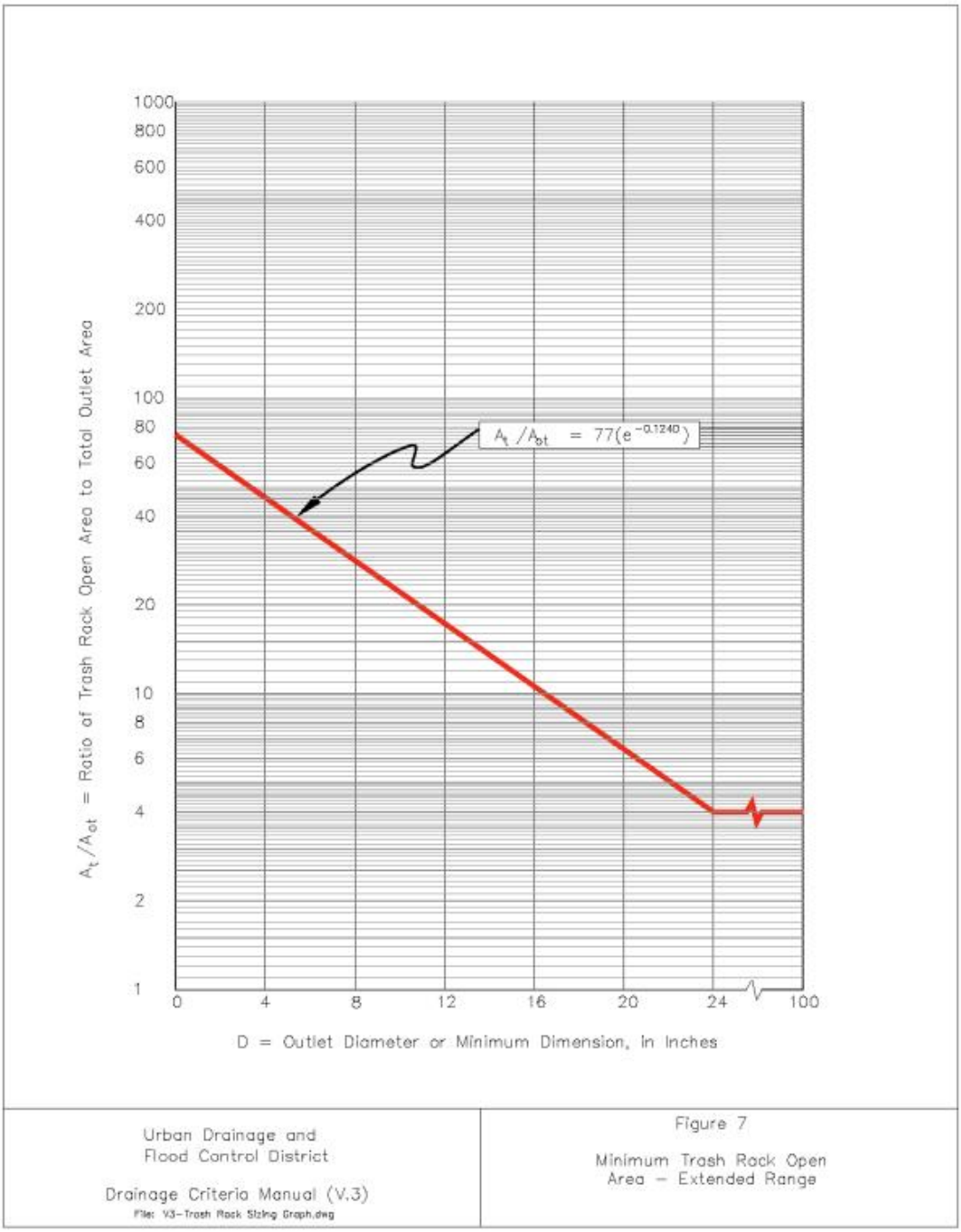


Figure 7—Minimum Trash Rack Open Area – Extended Range.

SUGGESTED TECHNICAL SPECIFICATIONS

This section contains suggested technical specifications for some of the designs contained in this *Manual*. These specifications may not contain many of the provisions typically seen in construction specifications such as pay item definitions and bid items. The intent that these suggested technical specifications is for the engineer to incorporate the technical portions into specific project specifications after reviewing and, if the site conditions dictate, modify them to best fit the specific site conditions of the project. When modifying these suggested specifications the engineer should maintain the general technical requirements recommended in these technical specifications.

Special Note and Disclaimer:

This information is intended for use by the design professional competent to evaluate its significance and limitation and who will accept the responsibility for its proper application. The Urban Drainage and Flood Control District and its employees disclaim any and all responsibility for any use of the information supplied herein and it is the responsibility of the user to apply and modify these guidelines as needed to meet specific site and design needs.

December 2004

Table 1—Typical Notes For EDB, RP and CWB Outlet Structures

1.	**The details shown herein** are conceptual design in nature. Preparation of final design plans that address details of structural adequacy, excavation, foundation preparation, concrete work, reinforcing steel, backfill, metalwork, and appurtenances, including preparation of technical specifications, are the responsibility of the design engineer in charge of the project.
2.	**Alternate designs** to the typical outlet structures shown herein may be considered; however, alternate designs must address the hydraulic and trash handling functional features and intent for the structures shown in this *Manual*.
3.	**Wingwalls** shown herein are designed to have the structure to be backfilled to be flush with the side slopes of the basin. The use of this geometry is recommended and permits the structure to blend into the landscape most aesthetically. Other geometries may be considered, however they need to be developed with full consideration of public safety, aesthetics, maintainability, and function. The superiority of these designs should be demonstrated to be equal to or better than the design concepts shown in this *Manual*.
4.	**Permanent Water Surface** refers to the water surface of the micro-pool for Extended Detention Basins and the permanent pool for Constructed Wetland Basins and Retention Ponds.
5.	**Perforated orifice plate** shown herein is used to provide the specified drain time of the WQCV. To reduce clogging potential, it is recommended that the largest possible circular opening be selected to minimize the number of columns. The intent is to have an outlet that empties the WQCV in the time specified (e.g., 12-, 24- or 40-hours), and being within –3% to 5% of this time is considered acceptable. See Figure 4 for orifice design information.

Table 1—Typical Notes For EDB, RP and CWB Outlet Structures	
6.	**Vertical Trash Rack** option is preferred; however, an Adverse-Slope Trash Rack is also acceptable. Both help to shed the accumulated trash as the water level after the storm recedes. The use of a Continuous-Slope Trash Rack for WQCV outlets is not recommended. See Figure 6 for trash rack design information.
7.	**Drainage or flood control detention** above the WQCV may be sized for any storm event specified by local stormwater criteria and not only to the 2- or 10-year events shown herein.
8.	**Underdrains** along the perimeter of the permanent pool, including a shutoff valve, are recommended for Constructed Wetland Basins and Retention Ponds to help dewater the pool for rehabilitative maintenance.
9.	**When the outlet designs differ from those shown herein:**
a)	Provide needed orifices that are distributed over the vertical height of the WQCV, with the invert of the lowest orifice located at 2' 6", or more above the bottom of the micro-pool and above the bottom of Retention Ponds and Constructed Wetland Basins.
b)	Provide full hydraulic calculations demonstrating that the outlet will provide the minimum required drain time of the Water Quality Capture Volume for the BMP type being used.
c)	Outlet openings (orifices) shall be protected by trash racks having a minimum net open area specified in Fig 7. All opening dimensions shall be less than any dimension of outlet openings.
d)	Trash racks shall be manufactured from stainless steel or aluminum alloy structurally designed to not fail under a full hydrostatic load on the upstream side and assuming zero backwater depth on the downstream side.
Urban Drainage and Flood Control District Drainage Criteria Manual (V.3)	**Typical Outlet Structure General Notes for Extended Detention Basin, Retention Pond and Constructed Wetland Basin Outlets**

(Res. 40-08 (Appx. B), 3-19-08)

Chapter 28.84
Cross-Reference Table

§ 28.84.010. Cross-reference table.

The following table provides cross-references section numbers of the adopted stormwater manual with their current GJMC citations. Thus, Section 101 of the stormwater manual appears in this code as GJMC § 28.04.010.

Stormwater Manual Section	GJMC
101	§ 28.04.010

Stormwater Manual Section	GJMC
102	§ 28.04.020
103	§ 28.04.030
104	§ 28.04.040
105	§ 28.04.050
106	§ 28.04.060
201	§ 28.08.010
202	§ 28.08.020
203	§ 28.08.030
204	§ 28.08.040
205	§ 28.08.050
206	§ 28.08.060
207	§ 28.08.070
208	§ 28.08.080
209	§ 28.08.090
300	§ 28.12.010
301	§ 28.12.020
302	§ 28.12.030
302.1	§ 28.12.040
302.2	§ 28.12.050
303	§ 28.12.060
303.1	§ 28.12.070
303.2	§ 28.12.080
303.3	§ 28.12.090
303.4	§ 28.12.100
303.5	§ 28.12.110
304	§ 28.12.120
305	§ 28.12.130
401	§ 28.16.010
402	§ 28.16.020
403.1	§ 28.16.030

Stormwater Manual Section	GJMC
403.2	§ 28.16.040
403.3	§ 28.16.050
403.4	§ 28.16.060
403.5	§ 28.16.070
403.6	§ 28.16.080
403.7	§ 28.16.090
403.8	§ 28.16.100
403.9	§ 28.16.110
403.1	§ 28.16.120
403.11	§ 28.16.130
404.1	§ 28.16.140
404.2	§ 28.16.150
404.3	§ 28.16.160
404.4	§ 28.16.170
404.5	§ 28.16.180
404.6	§ 28.16.190
405	§ 28.16.200
405.1	§ 28.16.210
405.2	§ 28.16.220
405.3	§ 28.16.230
406	§ 28.16.240
601	§ 28.24.010
601.1	§ 28.24.020
601.2	§ 28.24.030
602.1	§ 28.24.040
602.2	§ 28.24.050
602.3	§ 28.24.060
603	§ 28.24.070
604	§ 28.24.080
605	§ 28.24.090

Stormwater Manual Section	GJMC
701	§ 28.28.010
702	§ 28.28.020
703	§ 28.28.030
703.1	§ 28.28.040
703.2	§ 28.28.050
704	§ 28.28.060
704.1	§ 28.28.070
704.2	§ 28.28.080
704.3	§ 28.28.090
705	§ 28.28.100
706	§ 28.28.110
707	§ 28.28.120
708	§ 28.28.130
801	§ 28.32.010
802	§ 28.32.020
803	§ 28.32.030
803.1	§ 28.32.040
803.2	§ 28.32.050
803.3	§ 28.32.060
803.4	§ 28.32.070
803.5	§ 28.32.080
803.6	§ 28.32.090
804	§ 28.32.100
805	§ 28.32.110
805.1	§ 28.32.120
805.2	§ 28.32.130
806	§ 28.32.140
806.1	§ 28.32.150
806.2	§ 28.32.160
806.3	§ 28.32.170

Stormwater Manual Section	GJMC
806.4	§ 28.32.180
806.5	§ 28.32.190
806.6	§ 28.32.200
806.7	§ 28.32.210
806.8	§ 28.32.220
806.9	§ 28.32.230
806.1	§ 28.32.240
806.11	§ 28.32.250
806.12	§ 28.32.260
807	§ 28.32.270
808	§ 28.32.280
809	§ 28.32.290
810	§ 28.32.300
811	§ 28.32.310
812	§ 28.32.320
813	§ 28.32.330
814	§ 28.32.340
815	§ 28.32.350
901	§ 28.36.010
901	§ 28.36.020
902.1	§ 28.36.030
902.2	§ 28.36.040
902.3	§ 28.36.050
902.4	§ 28.36.060
903	§ 28.36.070
903.1	§ 28.36.080
903.2	§ 28.36.090
903.3	§ 28.36.100
904	§ 28.36.110
904.1	§ 28.36.120

Stormwater Manual Section	GJMC
904.2	§ 28.36.130
905	§ 28.36.140
905.1	§ 28.36.150
905.2	§ 28.36.160
905.3	§ 28.36.170
1001	§ 28.40.010
1002	§ 28.40.020
1002.1	§ 28.40.030
1002.2	§ 28.40.040
1002.3	§ 28.40.050
1002.4	§ 28.40.060
1003	§ 28.40.070
1003.1	§ 28.40.080
1003.2	§ 28.40.090
1003.3	§ 28.40.100
1004	§ 28.40.110
1004.1	§ 28.40.120
1004.2	§ 28.40.130
1004.3	§ 28.40.140
1004.4	§ 28.40.150
1005	§ 28.40.160
1005.1	§ 28.40.170
1005.2	§ 28.40.180
1005.3	§ 28.40.190
1101	§ 28.44.010
1102	§ 28.44.020
1103	§ 28.44.030
1103.1	§ 28.44.040
1103.2	§ 28.44.050
1103.3	§ 28.44.060

Stormwater Manual Section	GJMC
1103.4	§ 28.44.070
1103.5	§ 28.44.080
1104	§ 28.44.090
1105	§ 28.44.100
1106	§ 28.44.110
1106.1	§ 28.44.120
1106.2	§ 28.44.130
1106.3	§ 28.44.140
1106.4	§ 28.44.150
1106.5	§ 28.44.160
1201	§ 28.48.010
1202	§ 28.48.020
1202.1	§ 28.48.030
1202.2	§ 28.48.040
1202.3	§ 28.48.050
1203	§ 28.48.060
1203.1	§ 28.48.070
1203.2	§ 28.48.080
1203.3	§ 28.48.090
1203.4	§ 28.48.100
1203.5	§ 28.48.110
1203.6	§ 28.48.120
1203.7	§ 28.48.130
1203.8	§ 28.48.140
1203.9	§ 28.48.150
1203.1	§ 28.48.160
1204	§ 28.48.170
1204.1	§ 28.48.180
1204.2	§ 28.48.190
1204.3	§ 28.48.200

Stormwater Manual Section	GJMC
1205	§ 28.48.210
1205.1	§ 28.48.220
1205.2	§ 28.48.230
1205.3	§ 28.48.240
1205.4	§ 28.48.250
1205.5	§ 28.48.260
1206	§ 28.48.270
1207	§ 28.48.280
1301	§ 28.52.010
1302	§ 28.52.020
1302.1	§ 28.52.030
1302.2	§ 28.52.040
1401	§ 28.56.010
1402	§ 28.56.020
1403.1	§ 28.56.030
1403.2	§ 28.56.040
1404	§ 28.56.050
1404.1	§ 28.56.060
1404.2	§ 28.56.070
1405	§ 28.56.080
1406.1	§ 28.56.090
1406.2	§ 28.56.100
1406.3	§ 28.56.110
1406.4	§ 28.56.120
1406.5	§ 28.56.130
1406.6	§ 28.56.140
1406.7	§ 28.56.150
1406.8	§ 28.56.160
1406.9	§ 28.56.170
1406.1	§ 28.56.180

Stormwater Manual Section	GJMC
1406.11	§ 28.56.190
1406.12	§ 28.56.200
1407	§ 28.56.210
1407.1	§ 28.56.220
1407.2	§ 28.56.230
1407.3	§ 28.56.240
1407.4	§ 28.56.250
1408	§ 28.56.260
1501	§ 28.60.010
1502	§ 28.60.020
1503.1	§ 28.60.030
1503.2	§ 28.60.040
1503.3	§ 28.60.050
1504	§ 28.60.060
1505	§ 28.60.070
1506.1	§ 28.60.080
1506.2	§ 28.60.090
1506.3	§ 28.60.100
1507	§ 28.60.110
1507.1	§ 28.60.120
1507.2	§ 28.60.130
1507.3	§ 28.60.140
1507.4	§ 28.60.150
1507.5	§ 28.60.160
1507.6	§ 28.60.170
1507.7	§ 28.60.180
1508	§ 28.60.190
1509	§ 28.60.200
1601	§ 28.64.010
1602.1	§ 28.64.020

Stormwater Manual Section	GJMC
1602.2	§ 28.64.030
1602.3	§ 28.64.040
1602.4	§ 28.64.050
1602.5	§ 28.64.060
1603	§ 28.64.070
1604	§ 28.64.080
1604.1	§ 28.64.090
1604.2	§ 28.64.100
1605.1	§ 28.64.110
1605.2	§ 28.64.120
1606	§ 28.64.130
1607	§ 28.64.140
1607.1	§ 28.64.150
1607.2	§ 28.64.160
1700	§ 28.68.010
1700	§ 28.68.020
1800	§ 28.72.010
Appx. A § A101	§ 28.76.010
Appx. A § A102	§ 28.76.020
Appx. A § A103	§ 28.76.030
Appx. A § A104	§ 28.76.040
Appx. A § A105	§ 28.76.050
Appx. A § A106.1	§ 28.76.060
Appx. A § A106.2	§ 28.76.070
Appx. A § A106.3	§ 28.76.080
Appx. A § A106.4	§ 28.76.090
Appx. A § A106.5	§ 28.76.100
Appx. A § A106.6	§ 28.76.110
Appx. A § A106.7	§ 28.76.120
Appx. A § A106.8	§ 28.76.130

Stormwater Manual Section	GJMC
Appx. A § A106.9	§ 28.76.140
Appx. B	§ 28.80.010

(Res. 40-08, 3-19-08)

Title 29

TRANSPORTATION ENGINEERING DESIGN STANDARDS (TEDS)