SET NO. _____

PROJECT MANUAL

BID SET

CITY OF GRAND JUNCTION

12TH ST AND WELLINGTON AVE SANITARY SEWER REPLACEMENT

AUGUST 2024

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CITY OF GRAND JUNCTION

12TH ST AND WELLINGTON AVE SANITARY SEWER REPLACEMENT

JVA, Inc.
817 Colorado Avenue, Suite 301
Glenwood Springs, CO 81601

JVA Job No. 240394.ENV

AUGUST 2024

PROJECT MANUAL

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CITY OF GRAND JUNCTION
12TH & WELLINGTON SEWER REPLACEMENT

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1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work will include all necessary labor, supervision, equipment, tools and materials for the removal and replacement of an existing sanitary sewer system. Work includes but is not limited to: removal of exist road base, asphalt, concrete, gravity sewer pipe, and manholes; removal and resetting of exist landscaping and fences; protection of exist buildings and utility poles; bypass pumping; installation of approximately 680 linear feet of gravity sewer pipe (including crossing exist conflicting utilities) and manholes; connections to existing system; asphalt patching; installation of aggregate base course, concrete crub ramps, concrete dumpster pads and completion of all associated site work relating to the project.

B. Contractor shall furnish and pay for all materials, equipment, supplies, appurtenances; provide all construction equipment and tools; and perform all necessary labor and supervision

C. Contractor shall coordinate the progress of the Work including coordination between trades, subcontractors, suppliers, public utilities and subsequent water treatment plant contractor performing work on site and Owner to insure the progress of Work

D. It is the intent of this contract that Work proceed in the most expeditious manner possible

E. Construct the Work under contract indicated in the Bid Form

F. The cross-referencing of specification sections under the heading "Related Sections" and elsewhere within each specification section is intended as an aid to the Contractor and shall not relieve the Contractor from his responsibility to coordinate the Work under the Contract Documents. Listings of cross-references are not intended to be comprehensive. The omission of a cross-reference to an additional or related requirement shall not relieve the Contractor of his obligation to provide a complete Project.

1.3 WORK BY OTHERS

A. Construct work to allow for work by others. Coordinate construction schedule with the Owner.

1.4 CONTRACTOR USE OF SITE AND PREMISES

A. Contractor shall limit use of the premises for Work and will use the designated staging area for field offices, equipment, and material storage. Areas have been designated on the Drawings for contractor s use

B. Coordinate use of premises under direction of Engineer and/or Owner

C. Assume full responsibility for the protection and safekeeping of equipment and products stored on site under this Contract

D. Contractor may use only those areas indicated on the Drawings for storage and such additional areas as Engineer may designate

E. Contractor should plan for normal workdays, Monday through Friday, within the hours of 7:00 am to 7:00 pm. Other work hours and days may be allowed by [Town, City, District] and Engineer upon 48 hours written notice.

1.5 OWNER USE OF SITE AND PREMISES

A. Owner shall coordinate with Contractor the entrance into work site for work performed under the Contract Documents to ensure Contractor s health and safety plans are followed

B. Existing facility to remain operational during construction. All access maintained.

1.6 WORK SEQUENCE AND WORK RESTRICTIONS

A. Construct work to allow for work by others. Coordinate construction schedule with the Owner.

B. Provide open access for Owner to property at all times during construction. Maintain minimum width clearance for access of City and Contractor personnel and emergency vehicles at all times.

C. Contractor shall submit a detailed CPM format schedule outlining all steps required to assure complete and satisfactory construction, testing, and startup of work. Address all work sequence and constraints described in this Section.

D. Sewer service interruptions will not be permitted outside of business hours
   1. Schedule each outage with Engineer and Owner
      a. Number of outages to be kept to a minimum

E. Sequences other than those specified will be considered by Engineer, provided they afford equivalent continuity of operations.

1.7 EASEMENTS AND RIGHT-OF-WAY

A. Construction access to the site is indicated on the Drawings by public roads. Access across private property is strictly prohibited.

B. Work will be performed in the dedicated street Right-of-Way, utility easement, and on Owner's property.

C. Construction Area Limits
   1. Confine construction operations to the immediate vicinity of the location indicated on Drawings and in accordance with the Owner.
   2. Areas not designated for access roads, parking areas, storage areas, existing facilities areas, and construction areas, Contractor shall not trespass in or on these areas.
      a. Contractor shall be responsible for keeping all their personnel out of areas not designated for Contractor use except in case of isolated Work located within these areas for which the Contractor shall coordinate with Owner and shall not proceed with such work without Owner approval.
   3. Contractor shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to cause the least possible damage to property and existing vegetation and landscaping.
      a. Responsibility for protection and safekeeping of materials and equipment on or near the work site shall be entirely that of the Contractor and no claim shall be made against the Owner for any reason.
      b. If the Owner needs access to the sites occupied by stored materials or equipment, Contractor shall provide access.

D. On Private Property

1. Do not enter for material delivery or occupy for any purpose with personnel, tools, equipment, construction materials, or excavated materials, any private property outside the designated construction easement without written permission of the owner and tenant.

E. Within Street Right-of-Way and Utility Easement
   1. Perform all work and conduct all operations of Contractor, his employees, and his subcontractors in accordance with the requirements of the City and/or Mesa County.

1.8 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Protect, shore, brace, support, and maintain underground conduits, drains, and other underground construction uncovered or otherwise affected by construction operations

B. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, street lighting and/or signage, embankments, culverts, location or character, which may be caused by transporting equipment, materials, or personnel to or from the Work or any part or site thereof, whether by him or his subcontractors

C. Make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, any damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage

1.9 PROTECTION OF WORK AND FACILITIES

A. Contractor shall be solely responsible for the protection of Work until final acceptance

B. Contractor shall protect all and any previously performed Work, work in progress or completed by others, and existing facilities from damage during the performance of Work in the area

1.10 MAINTENANCE OF TRAFFIC

A. Conduct Work to interfere as little as possible with public travel, whether vehicular or pedestrian
   1. Whenever it is necessary to cross, close, or obstruct private roads, driveways, multi use paths, and walks, provide and maintain suitable and safe detours, or other temporary expedients for accommodation of private travel
      a. Submit traffic control plans for work within right-of-ways for approval by City of Grand Junction Engineering and Transportation Department prior to commencing any work.
   2. Maintenance of traffic is not required if Contractor obtains written permission from the owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point

1.11 BARRICADES AND LIGHTS

A. Protect streets, roads, highways, and other public thorough fares which are closed to traffic by effective barricades with acceptable warning and directional signs

B. Locate barricades at the street intersecting public thoroughfare on each side of the blocked section

C. Provide suitable barriers, signs, and lights to the extent required to adequately protect the public

D. Provide similar warning signs and lights at obstructions such as material piles and equipment

E. Illuminate barricades and obstructions with warning lights from sunset to sunrise

F. Store materials and conduct work to cause the minimum obstruction to the other contracts

G. Install and maintain barricades, signs, lights, and other protective devices in conformity with applicable statutory requirements including the Manual of Uniform Traffic Control Devices and as required by Mesa County and/or CDOT.

1.12 LINES, GRADES AND SURVEY

A. Construct all Work to the lines, grades, and elevations indicated on the Drawings
   1. The Owner may employ a separate surveyor to perform a verification survey to check final layout and grades.
   2. Contractor is responsible for correcting all incorrect grades or grades not meeting specified tolerances

B. Engineer has established basic horizontal and vertical control points in the Drawings
   1. Use these points as datum for the Work
   2. Provide such competent personnel and tool, stakes, and other materials as Engineer may require in establishing or designating control points, in establishing construction easement boundaries, or in checking layout survey, and measurement work performed by Contractor

C. Provide all survey, layout, and measurement work required
   1. Work performed by a qualified professional engineer or registered land surveyor acceptable to Engineer
   2. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction
      a. Make no changes or relocations without prior written notice to Engineer
      b. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations
      c. Require surveyor to replace Project control points which may be lost or destroyed
      d. Establish replacements based on original survey control

3. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means
    a. Temporary project benchmark
    b. Stakes for grading, fill and topsoil placement
    c. Utility slopes and invert elevations
4. From time to time, verify layouts by the same methods
5. Maintain a complete, accurate log of all control and survey work as it progresses
6. On request of Engineer, submit documentation to verify accuracy or field engineering work

1.13 REGULATORY REQUIREMENTS

A. Comply with all federal, state, and local laws, regulations, codes, and ordinances applicable to the Work.

B. References in the Contract Document to local codes shall mean the codes in effect in the City of Grand Junction and Mesa County according to the jurisdiction in which the Work is performed.

C. Other standards and codes which apply to the Work are designated in the specific technical specifications.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01020

GEOTECHNICAL REPORT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reports of explorations and tests of subsurface conditions at the project site.

1.2 RELATED SECTIONS

A. Section 01010 Summary of Work

B. Section 02300 Earthwork

1.3 INVESTIGATION

A. Soil and subsurface investigations were not conducted at the site.

B. Bidders are expected to examine soils investigation data and to make their own investigation of the site on or prior to the bid date.

1.4 INTERPRETATION

A. Soil investigation data is provided only for information and the convenience of bidders. Owner and Engineer disclaim any responsibility for the accuracy, true location, and extent of the soils investigation that has been prepared by others. They further disclaim responsibility for interpretations of that data by bidders, as in projecting soil-bearing values, rock profiles, soil stability and the presence, and level and extent of underground water.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01035

MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. The Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on a JVA Field Order Form.

B. The Contractor may request additional information or clarification by using and submitting a Request for Information (RFI).

1.3 WORK CHANGE DIRECTIVE (WCD)

A. Owner-Initiated Work Change Directive: A written statement to the Contractor issued on or after the Effective Date of the Agreement and signed by the Owner and recommended by the Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.
   1. Within 7 days of receipt of a Work Change Directive Form, submit an estimate of cost necessary to execute the change to the Engineer for the Owner’s review.
      a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

1.4 CHANGE ORDER (CO)

A. Owner-Initiated Change Order: The Engineer will issue a detailed Change Order Form indicating any changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. The Change Order Form issued by the Engineer is for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
2. Within 7 days of receipt of a Change Order Form, submit an estimate of cost necessary to execute the change to the Engineer for the Owner's review.
    a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

B. There will be no Contractor initiated Change Orders, the Contractor may only request additional information or clarification by using and submitting a Request for Information (RFI), on the Contractor s RFI form. Additional forms may be obtained from the Engineer, and Contractor-Initiated Proposals may also be provided.

C. Upon the Owner's and the Engineer s approval and signature from the Contractor the Change Order Form becomes valid

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General requirements

B. Coordination

C. Field engineering

D. Alteration project procedures

E. Preconstruction conference

F. Progress meetings

G. Requests for information

1.2 RELATED SECTIONS

A. Section 01010 Summary of Work

B. Section 01340 Shop Drawings and Product Data

C. Section 01700 Contract Closeout

1.3 GENERAL REQUIREMENTS

A. Refer to General Conditions for Owner meetings and other requirements

B. Engineer will schedule and administer pre-construction meeting according to agenda
   1. Prepare agenda for meetings including items required by Owner and Contractor
   2. Notify Contractor and Owner 4 days in advance of meeting date
   3. Preside at meeting

C. Contractor will schedule and administer site mobilization and weekly progress meetings. Contractor will also be responsible for coordination, field engineering, alteration, project procedures, cutting and patching procedures outlined herein. If work progress does not warrant a meeting, all parties can mutually agree to postpone meeting.
   1. Arrange for the attendance of Contractor's agents, employees, subcontractors, and suppliers as appropriate to the agenda

2. Record the minutes; include all significant proceedings and decisions
3. Reproduce and distribute copies of minutes within one week after each meeting
    a. To all participants in the meetings
    b. To Engineer
    c. To Owner
4. Owner and other inspecting parties such as the geotechnical engineer/technician as well as plant operators may attend meetings
5. Engineer will attend weekly meetings either via phone or on site

D. Representatives of contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents

1.4 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later by others.

B. Verify that utility requirement characteristics of operating equipment are compatible with available utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment, and coordinate preparation of grading and other requirements for installation utility work by others.

C. Coordinate completion and clean-up of Work of separate Sections in preparation for final completion and for portions of Work designated for Owner s use

D. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner’s activities.

1.5 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of Colorado and acceptable to the Engineer and Owner.

B. Contractor will locate and protect survey control and reference points.

C. Control datum for survey is that established by Owner provided survey and shown on Drawings.

D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.6 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.

C. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer.

D. Where a change of plane of 1/4-inch or more occurs, submit recommendation for providing a smooth transition for Engineer review.

E. Patch or replace portions of existing surfaces, which are damaged, lifted, or showing other imperfections.

F. Finish surfaces as specified in individual product sections.

1.7 PRECONSTRUCTION CONFERENCE

A. Engineer will schedule a conference after Notice of Award

B. Location: On site

C. Attendance
1. Owner's Representative
2. Engineer and his professional consultants
3. Geotechnical Engineer
4. Contractor's Project Manager
5. Contractor's Superintendent
6. Major Subcontractors
7. Others as Appropriate

D. Agenda:
1. Execution of Owner Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors and suppliers, list of products, Schedule of Values, and Construction Project Schedule in critical path format.
5. Designation of personnel representing the parties in Contractor, Owner, and the Engineer.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, cost proposal requests, Change Orders and Contract closeout procedures.
7. Construction scheduling and updates.
8. Scheduling activities of Geotechnical Engineer, equipment manufacturers representatives, and other field tests

9. Critical work sequencing
10. Major equipment deliveries and priorities
11. Procedures for maintaining Record Documents
12. Construction facilities, controls and construction aids
13. Temporary utilities provided by Owner
14. Safety and first-aid procedures
15. Security and housekeeping procedures
16. Procedures for testing

1.8 PROGRESS MEETINGS

A. Contractor will schedule and administer meetings throughout progress of the Work at weekly intervals. If work progress does not warrant meeting, all parties can mutually agree to postpone the weekly meeting.

B. Location of the Meetings: The project field office of the Contractor, or other locations arranged for by Contractor, convenient to all parties

C. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within one week to Contractor, Owner, participants, and those affected by decisions made.

D. Attendance
1. Owner's Representative
2. Engineer, and his professional consultants as needed
3. Contractor's Superintendent
4. Subcontractors as appropriate to the agenda
5. Suppliers as appropriate to the agenda
6. Others, as appropriate

E. Suggested Agenda
1. Review Minutes of Previous meetings
2. Review Unresolved issues from Last Meeting
3. Review of Work Progress
4. Field Observations, Problems, Conflicts and Decisions
5. RFI Review
6. Review of Submittals Schedule and Status of Submittals
7. Schedule
    a. General Schedule Issues
    b. Review of off-site fabrication and delivery schedules
    c. Planned progress during succeeding work period (3-week Look ahead)
    d. Maintenance of construction project schedule
    e. Corrective measures to regain project schedules
8. Maintenance of Quality and Work Standards
9. Change Orders

10. New PR s
11. Accepted Change Orders
12. Pay Requests
13. Other Business

1.9 REQUESTS FOR INFORMATION (RFI)

A. The Contractor shall prepare and submit an RFI upon the discovery of the need for interpretation of the Contract Documents or additional information.
   1. Only the Contractor shall submit RFIs to the Engineer.
   2. RFIs shall be submitted on Engineer s RFI form. Engineer will provide a template for the Contractor upon request.

B. RFI shall include:
   1. Project Name
   2. Engineer Job Number
   3. Date
   4. Name of Contractor
   5. Name of Engineer
   6. RFI number, numbered sequentially
   7. Related specification section number, title, and related paragraphs, as needed
   8. Drawing number and detail references, as needed
   9. Field conditions
   10. Contractor s proposed solution. If the Contractor s solution(s) affect contract times or contract price, Contractor shall state the effects on the RFI.
   11. Contractor s signature
   12. Relevant attachments including but not limited to drawings, descriptions, measurements, photos, product data, and shop drawings

C. Electronically Submitted RFIs
   1. Contractor shall submit one (1) complete RFI file in Adobe Acrobat PDF format

D. Engineer s Response
   1. Engineer will review each RFI, determine action required, and respond.
   2. Engineer will review and respond to each RFI within seven (7) working days
   3. If Engineer receives an RFI after 1:00 P.M. local time, the RFI will be considered as received the following working day.
   4. Engineer will not respond to RFIs requesting approval of submittals, approval of substitutions, coordination and information already indicated in Contract Documents, adjustment in contract time or contract amount, or erroneous RFIs.
   5. Engineer may respond to RFIs on related issues with a single response.
   6. If Engineer requests additional information as a result of the RFI, any further action or RFIs submitted by the Contractor will restart a new seven (7) day review period.
   7. Contractor shall submit any request for change of contract time or contract price utilizing proper Change Order forms.

E. Contractor shall log and track all RFIs submitted organized by RFI number. 1. RFI log shall be submitted at each progress meeting 2. RFI log shall include:
    a. Project name
    b. Name, address, and phone number of Contractor
    c. Contractor representative name
    d. RFI number
    e. RFI description
    f. RFI submittal date
    g. RFI response date
    h. Related Change Order number, as needed

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01200

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

B. This information is supplemental to the requirements as stated in the General Conditions.

1.2 SUMMARY

A. This Section includes additional administrative and procedural requirements necessary to prepare and process Applications for Payment. Refer to General Conditions for most requirements of the Owner.
   1. Unit Prices for administrative requirements governing use of unit prices
   2. Construction Progress Schedules

1.3 DEFINITIONS

A. Unit Price: An amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services.

1.4 PROCEDURES FOR UNIT PRICES

A. Unit bid prices, as quoted in the Bid Form, shall be in full compensation for labor, materials, equipment, rentals, freight, applicable taxes, overhead, profit and incidentals to complete all work for each pay item; and for all risk, loss, damage, or expense of whatever nature arising from the nature of the work or the prosecution thereof.

B. Work or materials that are essential to the work, but for which there are no pay items, will not be measured and paid for separately, but shall be included in other items of work.

C. Prices include all necessary material, for a complete installation, insurance, applicable taxes, overhead, and profit
   1. Bid Item No. 1: Concrete Encasement
      a. Description: No separate measurement for payment will be made for any labor, equipment, materials, and incidental work required for this item. The measurement for payment for this item will be the total number listed in the bid schedule. The unit price will include all of Contractor s costs which are not specifically measured and paid for under other bid items. This bid item includes but is not limited to the following items installed or conducted in accordance with

the Drawings and Specifications or as otherwise directed by Engineer: locating and protecting all existing aboveground and underground utilities, items, materials, and surfaces along and around the item; adjusting location of any existing small utilities and valves; furnishing, transporting, and installing all materials including any sheeting and/or bracing required for support trenches; furnishing all new materials and labor required to install improvements; installation of all materials as indicated, including all required surface and subgrade preparation; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

b. Unit of Measurement: Per actual number of linear feet of concrete encasement installed. Payment will be based on units completed and accepted of the Work required by this bid item.

2. Bid Item No. 2: Ø4" Gravity Sewer Pipe (SDR 35 PVC)
   a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings or Specifications or as otherwise directed by Engineer: locating and protecting all existing above and below ground utilities and connections along and around the item; excavating, backfilling, and compaction of excavations with suitable material(s); furnishing, transporting, and installing all pipe and materials as indicated; adjusting location of existing small utilities and valves; tapping and/or connecting to pipes or structures and repairing all structures as necessary; furnishing, transporting, and installing special fittings or items not otherwise provided for elsewhere in the Drawings and Specifications; furnishing, transporting, and installing jointing materials including O-rings, gaskets, bolts, joint restraints, connecting bands, and other miscellaneous items; removing and replacing surfacing materials, as required; crushing and abandoning in place any existing clay sanitary sewer mains to appropriate sizes as to not hinder backfilling and compaction of new sanitary sewer bedding; excavating, including exploratory excavation; constructing the specific bedding including the furnishing, placing, and compacting of flow fill, sand, gravel, and rock; supporting trenches as required; disposing of debris, pipe, excess excavated material, and damaged materials as required; video inspection; testing; inspecting; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
   b. Unit of Measurement: Per actual number of linear feet of gravity sewer pipe installed. Payment will be based on units completed and accepted of the Work required by this bid item.
3. Bid Item No. 3: Ø8" Gravity Sewer Pipe (SDR 35 PVC)
   a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of

Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings or Specifications or as otherwise directed by Engineer: locating and protecting all existing above and below ground utilities and connections along and around the item; excavating, backfilling, and compaction of excavations with suitable material(s); furnishing, transporting, and installing all pipe and materials as indicated; adjusting location of existing small utilities and valves; tapping and/or connecting to pipes or structures and repairing all structures as necessary; furnishing, transporting, and installing special fittings or items not otherwise provided for elsewhere in the Drawings and Specifications; furnishing, transporting, and installing jointing materials including O-rings, gaskets, bolts, joint restraints, connecting bands, and other miscellaneous items; removing and replacing surfacing materials, as required; crushing and abandoning in place any existing clay sanitary sewer mains to appropriate sizes as to not hinder backfilling and compaction of new sanitary sewer bedding; excavating, including exploratory excavation; constructing the specific bedding including the furnishing, placing, and compacting of flow fill, sand, gravel, and rock; supporting trenches as required; disposing of debris, pipe, excess excavated material, and damaged materials as required; video inspection; testing; inspecting; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

b. Unit of Measurement: Per actual number of linear feet of gravity sewer pipe installed. Payment will be based on units completed and accepted of the Work required by this bid item.

4. Bid Item No. 4: 8” x 4” Sewer Service Connection
   a. Description: The measurement for payment for this item will be on a per-each basis, complete in place, in accordance with the Drawings or Specifications or as otherwise directed by Engineer. The unit price will include all of Contractor s costs. This bid item includes but is not limited to the following items: locating and protecting all existing utilities along and around the item; adjusting location of any existing small utilities and valves; furnishing, transporting, and installing all materials including any sheeting and/or bracing required for support trenches; installing connection to new sanitary sewer pipes using a full body wye; bypass conveyance of existing sewer flows during construction; excavating, including exploratory excavation; backfilling, and compacting, including imported backfill material and flowfill; removing pavement, base course, subbase material, sod, and other surfacing material outside of the prescribed trench width which is not paid for under another section of this Specification; protecting aboveground and underground utilities and service connections; disposing of debris, pipe, excess excavated material, and damaged materials; testing; inspecting; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

b. Unit of Measurement: Per actual number of sanitary sewer service connections completed. Payment will be based on units completed and accepted of the Work required by this bid item.

5. Bid Item No. 5: Sanitary Sewer Basic Manhole (48 I.D.)
   a. Description: The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: furnishing, transporting, and installing all materials including sheeting and/or bracing, concrete, reinforcing steel, precast cones or tops, brick, mortar, plastic joint sealant, grout, manhole steps, ring and cover, and water tight manhole frame with bolted lid where required; constructing and shaping the base invert including all pipe incorporated within the manholes; constructing required connections including any pipe required; rock and muck excavation and backfill with suitable material(s); excavating, backfilling, and compacting, including imported backfill material if no suitable on-site material is available; removing pavement, base course, subbase material, sod, and other surfacing material outside of the prescribed trench width which is not paid for under another section of this Specification; furnishing and installing protective coatings; protecting aboveground and underground utilities; adjusting to final grade; disposing of debris, concrete, excess excavating material, and damaged materials; testing; inspecting; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
   b. Unit of Measurement: Per actual number of manholes installed. Payment will be based on units completed and accepted of the Work required by this bid item.
6. Bid Item No. 6: Manhole Barrel Section (D>5') (48" I.D.)
   a. Description: The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: furnishing, transporting, and installing all materials including sheeting and/or bracing, concrete, reinforcing steel, precast sections, brick, mortar, plastic joint sealant, grout, manhole steps; constructing required connections including any pipe required; rock and muck excavation and backfill with suitable material(s); excavating, backfilling, and compacting, including imported backfill material if no suitable on-site material is available; removing pavement, base course, subbase material, sod, and other surfacing material outside of the prescribed trench width which is not paid for under another section of this Specification; furnishing and installing protective coatings; protecting aboveground and underground utilities; disposing of debris, concrete, excess excavating material, and damaged materials; testing; inspecting; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

b. Per actual number of vertical linear feet of manhole barrel sections installed. Payment will be based on units completed and accepted of the Work required by this bid item.

7. Bid Item No. 7: Clearing and Grubbing
   a. Description: The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to: completing the clearing and grubbing, including tree, shrub and brush removal not covered under another bid item; disposing of materials off-site in accordance with the Drawings and Specifications and any applicable local, state or federal requirements; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
   b. Unit of Measurement: Per the actual number of square feet (surface area) cleared and grubbed. Payment will be made upon completion and acceptance of the Work required by this bid item.
8. Bid Item No. 8: Removal of Concrete
   a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; demolishing, hauling, and disposing of existing concrete materials to be demolished as required; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
   b. Unit of Measurement: Per square feet (surface area) of actual driveways, slabs, Vpans, curb ramps, intersection corners, aprons, landscape borders, and concrete walls demolished and removed. Payment will be based on units completed and accepted of the Work required by this bid item.
9. Bid Item No. 9: Removal of Asphalt Mat (Full Depth)
   a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; demolishing, hauling, and disposing of existing asphalt materials to be demolished as required; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
   b. Unit of Measurement: Per square foot (surface area) of actual asphalt cut and removed. Payment will be based on units completed and accepted of the Work required by this bid item.

10. Bid Item No. 10: Removal of Asphalt Mat (Planing, Thickness Varies)
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; demolishing, hauling, and disposing of existing asphalt materials to be demolished as required; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per square foot (surface area) of actual asphalt milled and removed. Payment will be based on units completed and accepted of the Work required by this bid item.
11. Bid Item Nos. 11: Removal of Pipe
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; demolishing, hauling, and disposing of existing sewer pipe materials to be demolished as required; disposing of debris, excess excavated material, and damaged materials as required; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per the actual number of linear feet of sewer pipe demolished and removed. Payment will be based on units completed and accepted of the Work required by this bid item.
12. Bid Item No. 12: Removal of Manhole
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; demolishing, hauling, and disposing of existing manhole materials to be demolished as required; disposing of debris, excess excavated material, and damaged materials as required; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per the actual number of manholes demolished and removed. Payment will be based on units completed and accepted of the Work required by this bid item.

13. Bid Item No. 13: Erosion and Sediment Control
    a. Description: No separate measurement for payment will be made for any labor, equipment, materials, and incidental work required for this item. The lump sum price will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: furnishing and installing all materials including concrete washout areas, inlet protection, outlet protection, silt fence, curb socks, sediment control logs, vehicle tracking control, and any other materials required to complete the Work; providing all materials, fabricating, and installing erosion and sediment control measures; excavation and backfill, as required for installation; providing and installing all ancillary erosion control items specified in the Drawings, and all other means and methods specified in the erosion control drawings; obtaining required permits; inspecting; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage completed and accepted of the work required by this bid item. One-third of the lump sum price for this item will be paid after twenty-five percent (25%) of the original Contract amount has been earned; the second third will be paid after fifty percent (50%) of the original Contract amount has been earned; and the final third upon final acceptance of the Project.
14. Bid Item No. 14: Reset Landscape Ground Cover
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; removing and stockpiling existing landscape ground cover and underlying weed barrier as shown on the Drawings and directed by Owner; clean up; resetting landscape ground cover and underlying barrier previously removed and stockpiled; providing additional materials as needed to restore landscaping to original conditions prior to construction; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per the actual number of square feet (surface area) of landscape ground cover and underlying weed barrier removed and reset. Payment will be based on units completed and accepted of the Work required by this bid item.
15. Bid Item No. 15: Reset Rock Landscaping
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of

Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; removing and stockpiling existing rock landscaping as shown on the Drawings and directed by Owner; clean up; resetting landscape rock landscaping previously removed and stockpiled; providing additional materials as needed to restore landscaping to original conditions prior to construction; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

b. Unit of Measurement: Per the actual number of square feet (surface area) of rock landscaping. Payment will be based on units completed and accepted of the Work required by this bid item.

16. Bid Item No. 16: Seeding (20 lbs/ac)
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the number of acres of seeding as listed in the bid schedule. The unit price will include all of Contractor s costs which are not specifically measured and paid for under other bid items. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: locating and protecting all existing aboveground and underground utilities, items, materials, and surfaces along and around the work area; adjusting location of any existing small utilities and valves; reseeding all areas disturbed by the Work per the seed mix requirements as specified on the Construction Documents including seed bed preparation, fertilization, seeding, and all other costs not included under other bid items; cleanup; inspecting; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per the actual number of acres (surface area) of seeding completed. Payment will be based on units completed and accepted of the Work required by this bid item.
17. Bid Item No. 17: Type A imported backfill material.
    a. No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor’s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: subgrade preparation; delivery, placement, compaction, and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section. This is to be used when native material is found to be unacceptable for compaction or is too wet to achieve optimal compaction.

b. Unit of measurement: Per actual number of tons of backfill material installed. Payment will be based on units completed and accepted of the Work required by this bid item.

18. Bid Item No. 18: Aggregate Base Course (Class 6) 6" Thick
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: furnishing and installing Class II aggregate base with CDOT Class VI gradation; site grading to establish grade prior to placement of aggregate base course; subgrade preparation; removing debris and excess materials; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per actual number of tons of aggregate base course installed. Payment will be based on units completed and accepted of the Work required by this bid item.
19. Bid Item No. 19: Hot Bituminous Pavement Patching, 4" Thick (two 2" lifts)
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: furnishing all new materials and labor required to install improvements; installation of all materials as indicated, including all required surface and subgrade preparation; tack coat; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per actual number of square feet (surface area) of asphalt road surface paved. Payment will be based on units completed and accepted of the Work required by this bid item.
20. Bid Item No. 20: Cold Patch Asphalt
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor's costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: saw cutting and patching or repairing existing asphalt and concrete as required to install improvements; furnishing all new materials and labor required to install improvements; installation of all materials as indicated, including all required surface and subgrade preparation; tack coat; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

b. Unit of Measurement: Per actual number of square feet (surface area) of cold patch installed. Payment will be based on units completed and accepted of the Work required by this bid item.

21. Bid Item No. 21: Concrete Curb (6 Wide, 6” High)
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: furnishing all new materials and labor required to install improvements; installation of all materials as indicated, including all required surface and subgrade preparation; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per actual number of linear feet of concrete curb installed. Payment will be based on units completed and accepted of the Work required by this bid item.
22. Bid Item No. 22: Concrete Flatwork (Commercial)
    a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the total number listed in the bid schedule and will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: saw cutting existing asphalt and concrete as required to install improvements; furnishing all new materials and labor required to install improvements; installation of all materials as indicated to match existing depth of concrete, including all required surface and subgrade preparation; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
    b. Unit of Measurement: Per actual number of square yards (surface area) of concrete drive installed. Payment will be based on units completed and accepted of the Work required by this bid item.
23. Bid Item No 23: Portable Sanitary Facility
    a. Description: The lump sum price will include all of Contractor s costs associated with the procurement, maintenance, and staging of the portable sanitary facility; protecting all existing aboveground utilities, items, materials, and surfaces along and around the portable sanitary facility and providing all other related and necessary labor, equipment, and materials for the use of the portable sanitary facility not covered by other items in this section.
    b. Unit of Measurement: No separate measurement for payment will be made for this item. It shall be paid for at the Contract Price based upon the percentage of project completed and accepted of the work required by this bid item.
24. Bid Item No. 24: Construction Surveying and As-Built Drawings

a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The lump sum price will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: all construction surveying, locating, referencing, calculating, and staking necessary for the construction of the Work record drawings, and creation of As-Built Drawings in accordance with the Drawings and Specifications and in conformance with the CDOT Survey Manual. In addition to Items I and II in the General Contract Conditions, Section 54, AsBuilt record information will be provided to, and approved by City staff prior to Final Acceptance of the Project. Information to be provided must be in electronic format (e.g. AutoCAD and/or survey files) along with a PDF set of As-Built drawings. As-Built electronic files must contain information suitable for the City to maintain Utility records to the standards set forth in the new Colorado 811 One Call/Subsurface Utility Law (effective August 8, 2018) and standards as described in the American Society of Civil Engineers (ASCE) Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data (ASCE 38-02). Electronic information for As-Built records shall include, but is not limited to, verification of all horizontal and vertical changes in pipe alignments, elbows, tees, manholes, valves, control structures, service taps, service pipe (horizontal and vertical deflections to ROW line, meter pits, or clean-outs, whichever is closer), beginning and ending of slip-lined segments, tie-in or connection to existing infrastructure, etc. Distance between As-Built data points along pipe alignment is dependent on the amount of deflection used to install the pipe in the field. There must be sufficient point data to create a plan and profile of all infrastructure accurate to within eighteen inches (18) of the physical structures anywhere along the project. The cost for surveying all fittings, both sewer and water, shall be incidental to the project cost and will not be paid for separately.

b. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage completed and accepted of the work required by this bid item. One-third of the lump sum price for this item will be paid after twenty-five percent (25%) of the original contract amount has been earned; the second third will be paid after fifty percent (50%) of the original contract amount has been earned; and the final third upon final acceptance of the project.

25. Bid Item No. 25: Mobilization/Demobilization

a. Description: No separate measurement for payment will be made for any labor, equipment, materials, and incidental work required for this item. The lump sum price will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: preparing and installing temporary fencing around project work and staging areas, and any other fencing/security items as deemed necessary by Contractor and not covered by another bid item; establishing Contractor s staging area, construction trailers,

offices, buildings, other necessary facilities, and temporary power and communications; obtaining permits; providing required bonds and insurance; preparing the project schedule. Item also includes demobilization at the completion of the project including the removal of the Contractor s equipment, supplies, temporary facilities, excess materials, and cleaning up the site; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

b. Unit of Measurement: The total bid amount for mobilization and demobilization shall not exceed eight percent (8%) of the total bid price. Bids received that exceed this amount may be grounds for rejection of the total bid. No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage completed and accepted of the work required by this bid item. Fifty percent (50%) of the lump sum price will be paid at the time of the first monthly progress payment; an additional thirty percent (30%) will be paid when one-half of the original Contract amount is earned. The remaining twenty percent (20%) will be paid upon final acceptance of the Project.

26. Bid Item No. 26: Traffic Control

a. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The lump sum price will include all of Contractor s costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: preparing, implementing, adjusting as necessary, and maintaining the approved Traffic Control Plan in accordance with the Drawings and Specifications and accepted Traffic Control Plan; temporary traffic lights; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

b. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage completed and accepted of the work required by this bid item. One-third of the lump sum price for this item will be paid after twenty-five percent (25%) of the original Contract amount has been earned; the second third will be paid after fifty percent (50%) of the original Contract amount has been earned; and the final third upon final acceptance of the Project.

D. Measurement and Payment: Refer to bid form and 1.5 (A) of this Section for establishment of unit prices

E. Owner reserves the right to reject Contractor s measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner’s expense, by an independent surveyor.

1.5 APPLICATION FOR PAYMENTS

A. General

1. Submit itemized payment request as required in General Conditions together with Schedule of Values and other submittals as specified herein
2. Contractor shall not "project" work completed beyond the date of Application for Payment submittal for the purpose of payment request

B. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the Owner.
   1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements

C. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement

D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
   2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application

E. Transmittal
   1. Submit copy of each Application for Payment to the Engineer by means ensuring receipt within 24 hours
   2. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Engineer

F. Initial Application for Payment
   1. Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following: a. List of subcontractors
      b. List of principal suppliers and fabricators
      c. Schedule of Values
      d. Contractor's Construction Schedule (preliminary if not final)
      e. Schedule of principal products
      f. List of Contractor's staff assignments
      g. Copies of building permits
      h. Copies of authorizations and licenses from governing authorities for performance of the Work
      i. Certificates of insurance and insurance policies
      j. Performance and payment bonds, if required

G. Application for Payment at Substantial Completion

1. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of Work
    a. Administrative actions and submittals that shall precede or coincide with this application include:
        i) Occupancy permits and similar approvals ii) Warranties (guarantees) and maintenance agreements iii) Test/adjust/balance records iv) Maintenance instructions
        v) Meter readings vi) Start-up performance reports
        vii)Change-over information related to Owner's occupancy, use, operation and maintenance
        viii) Final cleaning
        ix) Application for reduction of retainage, and consent of suretyx) Advice on shifting insurance coverages
    b. List of incomplete Work, recognized as exceptions to Engineer s Certificate of Substantial Completion

H. Application for Final Payment
1. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.
2. Application for Final Payment will not be considered until the following have been accomplished:
    a. Completion of Project closeout requirements
    b. Completion of items specified for completion after Substantial Completion
    c. Assurance that unsettled claims will be settled
    d. Assurance that Work not complete and accepted will be completed without undue delay
    e. Transmittal of required Project construction records to Owner
    f. Proof that taxes, fees and similar obligations have been paid
    g. Removal of temporary facilities and services
    h. Removal of surplus materials, rubbish and similar elements

1.6 PROCEDURES FOR THE CONSTRUCTION PROGRESS SCHEDULE

A. Coordination: coordinate preparation and updates of Contractor s Construction Schedule with the preparation of Schedule of Values.
1. Correlate line items in the Construction Schedule with required project tasks, including the following:
    a. Mobilization/demobilization
    b. Permits and regulatory requirements
    c. Submittals
    d. Equipment
    e. O&M Manuals
    f. Work breakdown of major project work

g. Major subcontractors work
h. Startup and commissioning
i. Training
j. Substantial completion
k. Final completion
l. Milestones and operational shutdown requirements

B. Utilize the Critical Path Method (CPM) type construction schedule to establish preliminary progress schedule and track Work progress
   1. After acceptance by Engineer of preliminary Progress Schedule submitted per requirements of General Conditions, set preliminary Progress Schedule as the Construction Baseline Schedule
   2. Update and submit the construction progress schedule on a monthly basis with the pay application
      a. Monthly submittal should indicate progress of tasks, changes to baseline schedule logic, work additions such as change orders, milestone and contract date changes
      b. Submit two (2) color print copies, 11 x 17 size, and one Adobe pdf copy
      c. Upon request provide copy of project schedule CPM data file

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

A. Provide a list of unit prices as indicated in Section 00310 Bid Form

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submission of all shop drawings and product data as required by the Contract Documents for all equipment and materials to be furnished under this contract unless specifically indicated otherwise

1.2 RELATED SECTIONS

A. Section 01600 Materials and Equipment

B. Section 01730 Operations and Maintenance Data

C. Specification Division 2

1.3 SUBMITTALS

A. Definitions
   1. Technical submittals: Shop drawings, product data and samples prepared by Contractor, subcontractors, suppliers, or manufacturers
      a. Shall be submitted by the Contractor to Engineer for approval for the use of Equipment and Materials to complete the Work or as needed to describe the following:
         i) Operation and maintenance
         ii) Technical properties iii) Installation
      b. Shop drawings: Custom prepared data for the Project and Work including performance and capacity curves, diagrams, bills of material, instructions, and other information
      c. Product data: Non-custom prepared printed information for the Project and Work on materials and products
      d. Samples: Fabricated and non-fabricated tangible samples of products and material
         i) Used for visual inspection and testing and analysis
   2. Informational submittals: Reports, administrative informational submittals, certification and guarantees not including and defined as shop drawings, samples and product data
      a. Reports: Include laboratory reports and tests, technical procedures and records and design analysis
      b. Administrative informational submittals: Submittals necessary for administrative records such as construction photographs, work records, schedules, standards, record project data, safety data, and similar information submittals

c. Certification: Includes manufacturer or supplier certificates and guarantees

B. General Requirements
   1. Quality
      a. Shall be of suitable quality for legibility and reproduction purposes
      b. Shall be useable for reproduction yielding legible hard copy
      c. Submittals not conforming to specified requirements herein and as specified in Divisions 2 through 16 shall be subject to rejection by Engineer and upon Engineer request, Contractor shall resubmit documents that are in conformance
   2. Dimensions
      a. English units shall be provided on submittals
      b. Metric units are acceptable in addition to English units
      c. English units shall govern
   3. Form of submittals
      a. Submittals shall be transmitted in electronic format as specified herein
      b. Scanned submittals are acceptable
      c. Electronic project documents and submittals shall be transmitted in the following format:
         i) Native electronic format, nonproprietary ii) Adobe PDF produced from native electronic format
      d. Filename:
         i) Shall be consistent for the initial and any subsequent submission revisions for a single submittal
         ii) Contractor shall use a consistent naming convention for all submittals
            a) Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)
   4. Non-conforming submittals shall be subject to rejection by Owner and/or Engineer
   5. Submittal completion requirements
      a. Submittals shall include design criteria, dimensions, construction materials and all other information specified for a complete submittal to facilitate Engineer review of the submittal information adequately
      b. In the event various drawings are included a submittal for a class of Equipment, Contractor shall annotate clearly which parts apply to furnished Equipment i) Information not pertaining to the submittal shall be clearly annotated. Highlighting of such information will cause rejection of the submittal by the Engineer
      c. Contract Drawings
         i) Copies or portions thereof will not be allowed as acceptable fabrication or erection drawings
         ii) In the event Contract Drawings are used by the Engineer for erection drawings to annotate information on erection or identify reference details, Engineer title block and professional seal shall be removed and replaced with the Contractor s title block on the Contract Drawing(s). Contractor shall revise such erection drawings for subsequent revisions by the Engineer to Contract Drawings

C. Preparation
   1. Shop Drawings
      a. Drawings shall be presented in a clear and thorough manner:
      b. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings
      c. Identify equipment by reference to equipment name and tag number shown on Contract Drawings
      d. Scale and Measurements: Make drawings accurate to a scale with sufficient detail to show the kind, size, arrangement and function of component materials and devices
      e. Minimum sheet size: 8.5" by 11"
      f. Fabrication drawing size: 11" by 17" or 24" by 36"
   2. Product Data
      a. Clearly mark each copy to identify pertinent products or models submitted for review
      b. Identify equipment by reference to equipment name and P&ID number
      c. Catalog cut sheets: Cross-out or hatch irrelevant data

D. Technical Submittals: Shop Drawings and Product Data Submittal Requirements 1. Shop Drawings and Product Data shall include the following, at a minimum:
      a. Specifications of manufacturer(s)
      b. Equipment parts and catalogs
      c. Bills of materials, material lists, and schedules
      d. Shop erection and fabrication drawings
      e. Drawings shall include equipment dimensions, weights, installation location requirements, plates required, main components, support details, anchor bolt details/sizes/locations, support base sizes, baseplate sizes, spacing and clearance requirements for installation, erection, operation and maintenance disassembly
      f. Electrical requirements:
         i) Shall include schematic diagrams including one-line diagrams, terminal block numbers, internal wiring diagrams, external connections, controls, and any other information as requested in individual specification sections
      g. List of spare parts
      h. Instruction and Operation and Maintenance (O&M) manuals
         i) As specified herein and in Specification Section 01730
      i. Manufacturer s performance testing of equipment
      j. Concrete mix design data and information
      k. Performance characteristics and capacities
      l. External connections, anchorages, and supports required
      m. Other drawings, parts, catalogs, specifications, samples, or data necessary for the Engineer to determine conformance with Contract Documents
   2. Samples Office samples shall be of sufficient size and quantity to clearly illustrate:
      a. Functional characteristics of the product, with integrally related parts and attachment devices

b. Full range of color, texture and pattern
c. Comply with requirements identified in individual specification sections

E. Construction Schedule: Designate in the construction schedule, or in a separate coordinated shop drawing schedule, the dates for submission and the dates that reviewed Shop Drawings and Product Data will be needed, if accelerated review is requested

F. Field samples and Mock-ups:
1. Contractor shall erect, at the Project Site, at a location acceptable to the Engineer and Owner
2. Size or area: as specified in the respective specification section
3. Fabricate each sample and mock-up complete and finished
4. Remove mock-ups at conclusion of Work or when acceptable to Engineer

1.4 CONTRACTOR RESPONSIBILITIES

A. Review shop drawings and product data prior to submission for accuracy and completeness of each submission

B. Approve and stamp each submission before submitting to Engineer

C. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Catalog numbers and similar data
4. Conformance with specifications and identification of all deviations
5. Confirm assignment of unit responsibility

D. Prior to each submission, carefully review and coordinate all aspects of each item being submitted

E. Verify that each item and the corresponding submittal conform in all respects with specified requirements of the Work and of the Contract Documents with respect to means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto

F. Make submissions promptly in accordance with Construction Schedule, and in such sequence as to cause no delay in the Work or in the work of any other Contractor

G. Limit requirement for accelerated submittal review by Engineer to no more than 10% percent of total number of submittals
1. Accelerated submittal review period: less than 14 calendar days

H. Notify Engineer in writing, at time of submission, of any deviations in the submittals from Contract Document requirements:
1. Identify and tabulate all deviations in transmittal letter
2. Indicate essential details of all changes proposed, including modifications to other facilities that may be a result of the deviation

3. Include required piping and wiring diagrams

1.5 SUBMISSION REQUIREMENTS

A. Make submissions far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmissions, and for placing orders and securing delivery

B. In scheduling, allow fourteen (14) calendar days for review by Engineer following receipt of submission in Engineer's office:
   1. Time required to mail submissions or resubmissions is not considered a part of review period

C. Submittal Naming and Numbering
   1. Assign a unique number to include all shop drawings, product data and other information required for individual specification sections, beginning with #001.
   2. Resubmissions shall have the original number with a letter, starting with "A". If the first submittal required resubmission, it would be labeled #001A.
   3. Each specification section may still have more than one submittal number for later submissions (i.e., Preliminary O&M Manuals, Final O&M Manuals, etc.) 4. Contractor shall use a consistent naming convention for all submittals

D. Quantity of Submittals Required
   1. Shop Drawings and Product Data:
      a. Initial submittal:
         i) Electronic One (1) copy to Engineer
      b. Resubmittal:
         i) Electronic One (1) copy to Engineer
      c. Final Submittal for Distribution
         i) One (1) electronic copy to Engineer
      d. As constructed document submittals
         i) Electronic One (1) copy to Engineer and one (1) copy to Owner
   2. Samples
      a. Initial submittal:
         i) Submit three (3) of each sample unless specified otherwise in individual specification section
      b. Resubmittal:
         i) Submit three (3) to Engineer
      c. One (1) sample of approved sample submittal will be returned to Contractor
   3. Informational submittals
      a. Technical reports and administrative submittals
         i) Electronic One (1) copy to Engineer ii) Paper: Three (3) copies to Engineer
      b. Certificates and guarantees:
         i) Electronic One (1) copy to Engineer ii) Paper: Three (3) copies to Engineer
      c. Test reports
         i) Paper

a) Owner: Two (2) copies
b) Engineer: One (1) copy
c) Contractor: Two (2) copies
d) Manufacturer/supplier: One (1) copy

~~4. Instruction and O&M manuals~~
~~a. In accordance to Specification Section 01730~~

~~5.~~ At no additional cost to the Owner and whether or not submittals are copyrighted, the Owner may copy and use for staff training and/or internal operations any submittals approved for final distribution as well as required by this Contract

E. Submittal Transmittal Requirements
1. Accompany each submittal with a letter of transmittal showing all information required for identification and checking
2. Shall include:
   a. Drawing numbers and titles
   b. Revision number
   c. Electronic filename
   d. Deviations from Contract Documents: As specified herein
   e. Submittals unidentifiable will be returned for proper identification
   f. Date

F. Submittals Requirements
1. Submittal number
2. Date of submission and dates of any previous submissions
3. Project title and number
4. Owner Contract identification number if applicable 5. Names of:
   a. Contractor
   b. Supplier
   c. Manufacturer
6. Identification of the product, with the specification section number
7. Field dimensions, clearly identified as such
8. Relation to adjacent or critical features of the Work or materials 9. Applicable standards, such as ASTM or Federal Specification numbers 10. Identification of deviations from Contract Documents:
   a. If Contractor proposes to provide material or equipment of Work which deviates from the Project Manual, Contractor shall indicate so under deviations on the transmittal form accompanying the submittal copies
   b. Identify all requested deviations as specified and on the copies of Specifications and Drawings required by paragraph below.
11. Confirmation of compliance with Contract Documents and, if applicable, identification of deviations from Contract Documents:
   a. Provide the following documents to demonstrate compliance with the contract specifications:

i) A copy of the relevant Drawing(s) with all addendum updates that apply to the equipment in various Divisions marked to show specific changes necessary for the equipment proposed in the Contractor s submittal
   a) If no changes are required, the Drawing(s) shall be clearly marked No Changes Required
   b) Failure to include copies of relevant Drawing(s) with the submittal, whether changes are required or not, shall be cause for rejection of the entire submittal with no further review by Engineer
   c) Relevant Drawing(s) include as a minimum the control diagrams, process and instrumentation diagrams (P&IDs), and Process (P) drawings. ii) A copy of each pertinent specification section with all addendum updates included, all referenced and applicable specifications sections, with their respective addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements:
   a) If deviations from the specifications are indicated and, therefore requested, by the Contractor, the submittal shall be accompanied by a detailed, written justification for each deviation
   b) Failure to include a copy of the marked up specification sections, along with justification for any requested deviations to the specification requirements, with the submittal shall be cause for rejection of the entire submittal with no further review by Engineer

12. Identification of revisions on resubmissions
13. An 8" by 4" blank space for Contractor's and Engineer's stamps
14. Stamp cover sheet of each submittal as identified in letter of transmittal
15. Contractor's stamp: Initialed or signed, certifying review and approval of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Use stamp to include wording similar to the following:

This submittal has been reviewed by [*Name of Contractor*] and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and *Contractor*]programs incidental thereto. [*Name of* also warrants that this submittal complies with contract documents and comprises no deviations thereto: Section No: Submittal No: Date: By:

G. For equipment that is provided directly by manufacturer without specification provide:
   1. Shop drawings: Illustrate complete assembly of products; foundation, installation and anchor requirements; dimensions and total weights of each, electrical wiring diagrams

2. Product data: Provide manufacturer s literature including general assembly, materials of construction, model and type, detailed data describing parts and accessories, sufficient data to verify compliance with specifications
3. Manufacturer s installation instructions: Provide detailed connection requirements and startup instructions
4. Manufacturer s field report: Indicate personnel present and actual start-up procedures that were performed by manufacturer s representative
5. Field report and test results shall be submitted to the Engineer by the Contractor

H. Submittal Log:
1. Maintain an accurate submittal log for duration of the Work showing current status of all submissions
2. Show submittal number, section number, section title, submittal description, dates and disposition of submittal
3. Make submittal log available to Engineer for Engineer's review upon request

I. Unless specified otherwise, make submissions in groups to facilitate efficient review and approval:
1. Include all associated items from individual specification sections to assure that all information is available for checking each item when it is received
2. Submit a complete initial submittal including all components when an item consists of components from several sources
3. Partial submittals may be rejected as not complying with provisions of the Contract
4. Engineer will not be held liable for delays due to poorly organized or incomplete submissions
5. Do not include items from more than one specification section for any one submittal number

J. Contractor may require subcontractors to provide drawings, setting diagrams and similar information to help coordinate the Work, but such data shall remain between Contractor and his subcontractors and will not be reviewed by Engineer unless specifically called for within the Contract Documents

K. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having System Responsibility

1.6 DISPOSITION OF SHOP DRAWINGS, PRODUCT DATA, AND INFORMATION SUBMITTALS

A. "No Exceptions Taken": Approved with No Corrections Noted
1. One copy sent to Owner
2. One copy sent to Resident Project Representative
3. One copy retained in Engineer's file
4. Remaining copies returned to Contractor for his use
   a. One copy to be kept on file at Contractor's office at job site
   b. Remaining copies for Contractor's office file, suppliers, or subcontractors

5. No corrections or comments noted on the submittal or on a Submittal Response Summary Sheet
6. Issues or miscellaneous comments pertaining to other related items of the Work may be included in transmittal letter 7. Resubmission not required

B. "Exceptions Noted": Approved with Corrections Noted
1. One copy sent to Owner
2. One copy sent to Resident Project Representative
3. One copy retained in Engineer's file
4. Remaining copies returned to Contractor for his use
   a. One copy to be kept on file at Contractor's office at job site
   b. Remaining copies for Contractor's office file, suppliers or subcontractors
   c. Copies of submittal data in operation and maintenance manuals to be revised according to corrections
5. Comply with corrections or comments as noted on the submittal or on a Submittal Response Summary Sheet
6. Resubmission not required

C. "Revise And Resubmit": Incorrect information provided or Significant Information Still Required
1. One copy sent to Resident Project Representative
2. One copy retained in Engineer's file
3. All remaining copies returned to Contractor for revision and re-submittal
4. Copy of transmittal letter and/or Submittal Response Summary Sheet sent to Owner. A "No Exceptions Taken" or "Exceptions Noted" submittal it will be forwarded to Owner after review per above disposition requirements
5. Submittal is either: incorrectly annotated; specific comments need to be addressed and incorporated in re-submittal; and/or additional information may be required as noted on the submittal or on a Submittal Response Summary Sheet
6. Submitted information may not include or address specific item required per the specification as identified on the submittal or on a Submittal Response Summary Sheet
7. Specific information related to identified item may be required for final approval of submittal
8. Resubmission of entire submittal may be required or resubmission of specific item may be required as identified on the submittal or on a Submittal Response Summary Sheet

D. "Rejected": Returned for Correction
1. One copy sent to Resident Project Representative
2. One copy retained in Engineer's file
3. All remaining copies returned to Contractor
4. Copy of transmittal letter and/or Submittal Response sent to Owner
5. Contractor required to resubmit complete submittal package in accordance with Contract Documents

6. Submittal does not comply with provisions of Contract Documents as noted on the submittal or on a Submittal Response Summary Sheet 7. Resubmission required

E. Receipt Acknowledged : For Reference Purposes Only, or for Record Copy:
1. Applicable to manufacturer or Contractor provided calculations and other miscellaneous documentation no subject to Engineer review and approval
2. One copy sent to Resident Project Representative
3. One copy retained in Engineer's file
4. One copy returned to Contractor
5. Copy of transmittal letter sent to Owner
6. Remaining submittal copies destroyed
7. Detailed review and comment by Engineer not required
8. Resubmission not required

1.7 DISPOSITION OF SAMPLES

A. "No Exceptions Taken": Approved with No Corrections Noted
1. One sample sent to Owner
2. One sample sent to Resident Project Representative
3. One sample retained in Engineer's file
4. Acknowledgement: Copy of transmittal letter sent to Contractor
5. Resubmission not required

B. "Exceptions Noted": Approved with Corrections Noted
1. One sample sent to Owner
2. One sample sent to Resident Project Representative
3. One sample retained in Engineer's file
4. Acknowledgement: Copy of transmittal letter sent to Contractor
5. Work performed or products furnished to comply with exceptions noted in acknowledgement
6. Resubmission not required

C. "Rejected": Returned for Correction
1. One sample retained in Engineer's file
2. Remaining samples sent to Contractor for resubmittal and compliance with the Contract Documents as noted in transmittal letter
3. Copy of transmittal letter sent to Owner
4. Resubmission required

1.8 RESUBMISSION REQUIREMENTS

A. Make any corrections or changes in submittals required by Engineer and resubmit until approved

B. Transmit each resubmission under new letter of transmittal. Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)

C. Shop Drawings and Product Data

1. Revise initial drawings or data and resubmit as specified for the initial submittal

2. Indicate any changes which have been made other than those requested by Engineer D. Samples: Submit new samples as required for initial submittal

E. Reimbursement of Resubmission Review Costs:

1. Review of first submittal and one resubmittal will be performed by Engineer at no cost to Contractor
2. Cost for review of subsequent resubmissions will be directly paid by Contractor
3. Engineer will document work-hours required for review and costs for Engineer review will be deducted from payments due Contractor as Change Order deducts
4. Charges for review of resubmissions will include Engineer at maximum rate of $150 per hour and administrative staff at maximum rate of $75 per hour

1.9 PROJECT RECORD SUBMITTALS

A. After completion of the Work and prior to final payment, Contractor shall furnish record documents and final approved shop drawings and samples (as-constructed shop drawings and samples) in the number of copies specified herein.

1. Contractor shall provide additional copies of final approved shop drawings and samples for insertion in Equipment instruction and O&M manuals as required
2. All copies shall be clearly marked Project Record

1.10 ENGINEER'S DUTIES

A. Review submittals with reasonable promptness and in accordance with approved submission schedule provided that each submittal has been called for by the Contract Documents and is stamped by Contractor as indicated above

1. No extensions of time are allowed due to Engineer s delay in reviewing submittals unless all the following criteria are met:
   a. Contractor has notified Engineer in writing that timely review of particular submittal in question is critical to the progress of the Work and Contractor has identified the requested submittal return date.
   b. Engineer has failed to return submittal within 21 days of receipt of the submittal or receipt of said notice, whichever is later
   c. Contractor demonstrates that delay in progress of the Work was directly attributable to Engineer s failure to return submittal within 21 days
2. No extensions of time are allowed due to delays in progress of the Work caused by rejection and subsequent resubmission of data, including multiple resubmissions

3. Engineer s review shall not extend to means, methods, techniques, sequences, construction operations, and safety precautions and programs incidental thereto. No information regarding these items will be reviewed whether or not included in submittals
4. In the event that Engineer will require more than 21 calendar days to perform review, Engineer shall so notify Contractor

B. Review drawings and data submitted only for general conformity with Contract Documents
   1. Engineer s review of drawings and data returned marked No Exceptions Taken or Exceptions Noted does not indicate a thorough review of all dimensions, quantities, and details of material, equipment device or items shown
   2. Engineer s review does not relieve Contractor of responsibility for errors, omissions or deviations nor responsibility for compliance with the Contract Documents

C. Assume that no shop drawing or related submittal comprises a deviation to the Contract Documents unless Contractor advises Engineer otherwise in writing which is acknowledged by Engineer in writing:
   1. Consider and review only those deviations from the Contract Documents clearly identified as such on the submittal and tabulated on the Contractor s transmittal sheet.

D. Review informational submittals for indications of Work or Material deficiencies and will respond to Contractor regarding such deficiencies

E. Return submittals to Contractor for distribution or for resubmission

F. Transmit, unreviewed, to Contractor all copies of submittals received directly from suppliers, manufacturers and subcontractors

G. Transmit, unreviewed, to Contractor all copies of submittals not called for by the Contract Documents or which have not been approved by Contractor

H. Engineer will not review uncalled-for shop drawings or product data except by special arrangement

I. Affix stamp and indicate approval for submittal or resubmission requirements with the following stamp:

JVA, Inc. Received: _____

☐ No Exceptions Noted ☐ Exceptions Noted

☐ Revise and Resubmit ☐ Rejected

JVA's review is limited to general conformance with the design intent as expressed in the Construction Documents. Notations and comments made on the product submittal or shop drawing during this review do not relieve the Contractor from compliance with the Construction Documents, as well as applicable laws, codes, and regulations. Review of a specific item shall not be construed to include review of an assembly of which the item is a component. The Contractor is responsible for dimensions and quantities to be confirmed and correlated at the job site; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences, and procedures of construction; coordination of the Work with that of all other trades; and performing all Work in a safe and satisfactory manner.

By: _____ Date: _____ 10/21

1.11 SUBMITTAL SCHEDULE

A. Unless indicated otherwise, provide all submittals required by individual sections of the Contract Documents to establish compliance with the specified requirements.

B. Contractor to produce schedule of submittals for Engineer review

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Construction record photographs prior to commencing and during the course of the Work

1.2 RELATED SECTIONS

A. Section 01010 Summary of Work

B. Section 01700 Contract Closeout: Project Record Documents

1.3 PHOTOGRAPHY REQUIRED

A. Take photographs of the existing conditions prior to commencing work to document existing conditions

B. Take photographs on the date on which each scheduled Application for Payment is due. Intent is for digital photos to be kept as project record

C. CD of Digital photos become the property of Owner

1.4 COSTS OF PHOTOGRAPHY

A. Pay all costs for specified photography and printing
   1. Parties requiring additional photography or prints will pay for them directly

1.5 DELIVERY OF PHOTOS

A. Submit digital photos to the Engineer with monthly pay requests or within 20 days of photo date

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 TECHNIQUE

A. Factual Presentation

B. Correct Exposure and Focus

1. High resolution and sharpness
2. Maximum depth-of-field
3. Minimum distortion

3.2 VIEWS REQUIRED

A. Photograph from locations to adequately illustrate the condition of construction and the state of the Project
   1. Photographic survey of the existing site
      a. Show all areas to be modified
      b. Show all areas in which Contractor will conduct operations or store equipment
   2. Weekly photographs
      a. Minimum of eight (8) views weekly until final acceptance
      b. Views as designated by the Engineer or Owner

3.3 PHOTOGRAPH REQUIREMENTS FOR PROGRESS SITE PHOTOGRAPHS

A. Responsibility
   1. Site photographs for Owner record of construction progress shall be the responsibility of the Contractor
   2. Contractor shall be responsible for site photographs including the existing and progress of Work

B. Photographs shall include, but not limited to, the following:
   1. Existing site: Photographs of existing site conditions before site work commences
      a. Number of views shall be sufficient to cover the existing site conditions
   2. Progress of work: Shall include photographs from clearing throughout construction
      a. Number of views shall be sufficient to cover progress in Work and shall include a minimum of eight (8) different views
   3. After completion of Work: Shall be sufficient to show completed and finished Work

C. Digital images
   1. Provide images in uncompressed JPEG format
   2. Minimum resolution: 1500 x 2200
   3. Submitted digital images shall not be cropped

D. Identify each digital image file
   1. Name of project
   2. Orientation and description of view
   3. Date and time of exposure

3.4 ADDITIONAL PHOTOGRAPHS

A. Contractor shall provide additional photographs upon the request of the Engineer

B. Additional photographs may include, but not limited to, the following:

1. Publicity photographs
2. Special events at Project site
3. Major phase of Work
4. Substantial Completion
5. Follow-up investigations for on-site events such as construction damage or losses
6. Additional record photographs during final acceptance

3.5 PROJECT RECORD

A. Submit CD of all photos, grouped by date

B. Engineer will distribute, after review
   1. One copy of each view to Owner
   2. One copy of each view to Engineer's file
   3. One copy of each view returned to Contractor for inclusion in Project Record Document

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance / Control of installation

B. Inspection and testing laboratory services

C. Qualification of laboratory

D. Laboratory duties

E. Limitations of authority of testing laboratory

F. Contractor’s responsibilities

G. Field testing

H. Testing and services schedule

1.2 RELATED SECTIONS

A. Section 01010 - Summary of Work

B. Section 01340 - Shop Drawings, Product Data, and Samples

C. Section 01600 - Material and Equipment

1.3 REFERENCES

A. Conform to reference standard by date of issue current on date of Contract Documents

B. Obtain copies of standards when required by Contract Documents

C. Where specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding

D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Provide copies of written reports for materials, equipment or systems as scheduled at the end of this section. Reference each report by respective section number.

C. Laboratory Test Reports: Provide written reports of each test and inspection to Engineer. Each report shall include:
   1. Date issued
   2. Project title and number
   3. Testing laboratory name, address and telephone number
   4. Name and signature of laboratory inspector
   5. Date and time of sampling or inspection
   6. Record of temperature and weather conditions
   7. Date of test
   8. Identification of product and specification section
   9. Location of sample or test in the Project
   10. Type of inspection or test
   11. Results of tests and compliance with Contract Documents
   12. Interpretation of test results when requested by Engineer

D. Shop Test Reports: Provide reports detailing results of tests and certification from manufacturer to verify compliance with specifications

E. Field Test Reports: Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests.

1.5 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality

B. Comply fully with manufacturer’s instructions, including each step in sequence

C. Should manufacturer’s instructions conflict with Contract Documents, request clarification from Engineer before proceeding

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship

E. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement

F. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract

G. Certification of products: Respective sections of specifications

H. Laboratory tests required and standards for testing: Respective sections of specifications

1.6 INSPECTION AND TESTING LABORATORY SERVICES

A. Owner will employ and pay for the services of a testing agency to perform specified laboratory testing of materials where the technical specifications specifically obligate the Owner to provide the services
   1. It is the Contractor s responsibility to initiate and coordinate all required tests and inspections including conformance with requirements of all applicable public agencies and authorities. Contractor will be responsible for coordinating the testing requirement with testing agency and provide the testing agency no less than two (2) working days advance notification to schedule tests.
   2. Employment of the testing agency shall in no way relieve Contractor’s obligations to perform the Work of the Contract
   3. Contractor shall employ and pay for the services of a testing agency to perform all specified services and testing not specifically identified in the technical specifications to be provided by Owner related to the design of mixes, products and equipment, to Engineer’s review of proposed materials and equipment before, during and after incorporation in the Work and to retest materials and equipment which fail original tests

B. Retesting required because of non-conformance to specified requirements shall be performed by the same testing agency on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting inspection or testing charges from the Contract Sum/Price

1.7 QUALIFICATION OF TESTING AGENCY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories

B. Meet basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable

C. Authorized to operate in the State in which the Project is located

1.8 TESTING AGENCY DUTIES

A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice

B. Perform specified inspections, sampling, and testing of materials and methods of construction
   1. Comply with specified standards
   2. Ascertain compliance of materials with requirements of Contract Documents

C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products

1.9 LIMITATIONS OF AUTHORITY OF TESTING AGENCY

A. Testing Agency Is Not Authorized To
   1. Release, revoke, alter or enlarge on requirements of Contract Documents
   2. Approve or accept any portion of the Work
   3. Owner employed testing agency shall not perform any duties of the Contractor

1.10 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory and testing agency personnel and provide access to Work

B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete and other material mixes which require control by the testing laboratory

D. Furnish copies of product test reports as required

E. Furnish Incidental Labor and Facilities
   1. To provide access to Work to be tested
   2. To obtain and handle samples at the project site or at the source of the product to be tested
   3. To facilitate inspections and tests
   4. For storage and curing of test samples

F. Cooperate with testing agency; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested
   1. Notify Engineer and testing agency 24 hours prior to expected time for operations requiring services to allow for scheduling of tests and laboratory assignment of personnel
   2. Make arrangements with testing agency and pay for additional samples and tests required for Contractor's use

1.11 FIELD TESTING

A. Owner shall pay all costs associated with standard field testing of materials as detailed in these specifications. Contractor] shall pay all costs for testing of piping and equipment as detailed in these specifications. Owner s testing agency will take concrete samples, cure and break samples and report results. Owner's testing agency will also provide compaction testing and proctors for backfill operations. Contractor shall pay for all retesting due to tests indicating failed conditions.

B. Provide all required materials, labor, equipment, water, and power required for testing

C. Perform all tests in presence of Engineer and provide one copy of field test results to Engineer same day of tests

D. Repair with no additional compensation all materials and equipment which fail during testing

1.12 LABORATORY TESTING AND SERVICES SCHEDULE

A. Testing laboratory services shall be provided for, but shall not be limited to, the following:

Specification Section	**Type of Material, Equipment, or System**	**Owner (O) or Contractor (C) Provided**
02300	Earthwork	O
02740	Asphalt Mixes	O
02750	Concrete Mixes	O

1.13 FIELD TESTING AND SERVICES SCHEDULE

A. Field testing shall be provided for, but shall not be limited to, the following:

Specification Section	**Type of Material, Equipment, or System**	**Owner (O) or Contractor (C) Provided**
02300	Earthwork	O
02530	Sanitary Sewerage System	C
02540	CIP Thermosetting Resin Pipe - Mains	C
02740	Flexible Paving	O
02750	Rigid Paving	O
02770	Service Lateral and Connection Seals	C

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heating, ventilating, telephone service, water and sanitary facilities

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Staging Facilities: Access roads, parking areas, progress cleaning, project signage, storage and temporary buildings.

1.2 GENERAL REQUIREMENTS

A. Furnish, install and maintain all temporary utilities to assure continuous service required for the Work, except as allowed herein, and remove on completion of Work. Modify and extend systems, as work progress requires.

B. Furnish, install and maintain all construction aids required for the Work, except as allowed herein, and remove on completion of the Work

C. Furnish, install and maintain fences and barriers as required for protection of the public, property and the Work

D. Contractor may use existing roadways for access and parking only where designated by Owner.

E. Products may be new or used, but must be serviceable, adequate for the intended purpose, and must not violate the requirements of any applicable codes or standards

F. Clean and repair damage caused by temporary installations or use of temporary facilities. Grade and seed all disturbed areas not detailed on the drawings for other treatment

G. Provide contractor information sign posted at accessible location with contractor name and emergency phone contact information.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies
   1. Comply with applicable Federal and State rules and regulations, local codes and ordinances

2. Comply with utility company requirements

1.4 TEMPORARY ELECTRICITY

A. Contractor shall pay all costs associated with power service to the field offices and pay all costs for energy used.

B. Arrange for and pay all costs associated with temporary power service either from the local utility or a portable engine-generator

C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at the site. Provide flexible power cords as required

D. Provide main service disconnect and over current protection at convenient location

E. Pay all costs for installation and removal of temporary electrical service

1.5 TEMPORARY LIGHTING

A. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes as required

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required

C. Maintain lighting and provide routine repairs

1.6 TEMPORARY WATER SERVICE

A. Potable water does exist on the site. Provide and pay for all temporary potable water piping and hoses to bring to Contractor s construction facilities and drinking water stations. Install a meter at a location approved by the Owner.

B. Provide all drinking water required by construction personnel and Owner’s representatives. Pay all costs for temporary water service.

1.7 TEMPORARY SANITARY FACILITIES

A. Provide sanitary facilities at staging area
1. As required by laws and regulations
2. Not less than 1 facility

B. Service, clean and maintain facilities and enclosures

1.8 CONSTRUCTION AIDS

B.

C.

A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work: scaffolds staging, ladders, stairs, ramps, runways, platforms, railways, hoists, cranes, chutes and other such facilities and equipment

   Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements by Owner

   Completely remove temporary materials, equipment, and services at completion of the Project

D. Clean, repair damage caused by installation or by use of temporary facilities
   1. Remove foundations and underground installations for construction aids
   2. Grade the areas for the site affected by temporary installations to required elevations and slopes and clean the area and seed unless specified as shown on the drawings to be different

1.9 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition

B. Provide suitable barriers as required for public protection of Owner's employees

C. Protect non-owned vehicular traffic, stored materials, site and structures from damage

D. Install facilities of a neat and reasonable uniform appearance, structurally adequate for the required purposes

E. Relocate barriers as required by progress of construction

F. Completely remove barriers, including foundations, when construction has progressed to the point that they are no longer needed

G. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes and clean the area

1.10 TEMPORARY FENCING

A. Construction: Commercial grade chain link fence

B. Provide additional fencing to protect stored materials & products or to insure public safety and the safety of Owner's employees

C. Provide Owner two (2) keys to lock(s)

D. The site of the work is fenced

1.11 STORMWATER MANAGEMENT

A. Refer to SWMP in the drawings and comply with all conditions of CDPHE Stormwater Discharge Permit. Contractor responsible for both permit filing and any required reporting.

B.

C.

Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment as necessary.

Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform work in phases and restore areas where work is complete.

1.12 FUGITIVE DUST PERMIT

A. Comply with all conditions of CDPHE Fugitive Dust Permit. Contractor responsible for both permit filing and any required reporting.

B. Contractor to pay for all metered water used in dust abatement

1.13 CONSTRUCTION DEWATERING

A. Comply will all conditions and requirements of CDPHE Construction Dewatering Permit. The Contractor shall be responsible for any permit filing and reporting necessary.

1.14 EROSION AND SEDIMENT CONTROL

A. Provide erosion and sediment control in accordance with Section 02730.

1.15 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage

C. Protect finished driving surfaces, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects

D. Prohibit construction traffic from entering future landscaped areas after grades have been established and topsoil restored

1.16 SECURITY

A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft

B. Coordinate with Owner’s security program

1.17 ACCESS ROADS

A. Maintain existing roads accessing public thoroughfares to construction staging area.

Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow

Provide and maintain access to existing fire hydrants free of obstructions

D. Provide means of removing mud from vehicle wheels before entering public paved streets as required by SWMP and Owner

1.18 PARKING

A. Paved and unpaved surfaces adjacent to the staging area can accommodate construction personnel until the designated building staging area has been established

B. If staging area space is not adequate, provide additional off-site parking at location designated by Owner

1.19 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition

B. Remove waste materials, debris, and rubbish from site periodically and dispose off-site in accordance with local and state regulations. Due to high winds experienced at the site, waste removal must be done immediately after it is generated

1.20 FIELD OFFICES AND SHEDS

A. Existing facilities at the site shall not be used for field offices or storage

B. Fire protection equipment. Contractor shall provide and maintain fire extinguishers and active fire hydrants where indicated, maintain fire lanes to hydrants, and provide other equipment as necessary for proper fire protection during construction. Such equipment shall be for fire protection only.

1.21 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated

C. Clean and repair damage caused by installation or use of temporary work

PART 2 PRODUCTS (NOT APPLICABLE)

B.

C.

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01550 CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching

B. Work included in this Section
   1. Cutting and patching not required to be performed as part of the work of other sections
   2. Cutting and patching existing work altered or disturbed to accommodate new construction
   3. Cutting and patching existing work damaged or defaced during new construction as required to restore to existing or better condition at the time of award of Contract
   4. Cutting and patching required to:
      a. Install or correct non-coordinated work
      b. Remove and replace defective and non-conforming work
      c. Remove samples of installed work for testing

C. Contractor shall be responsible for all cutting, and patching, including attendant excavation and backfill, required to complete the Work or to:
   1. Uncover portions of the Work to provide for installation of ill-timed work
   2. Remove and replace defective work
   3. Remove and replace work not conforming to requirements of Contract Documents
   4. Remove samples of installed work as specified for testing

1.2 DEFINITIONS

A. Cutting includes cutting into nominally completed or existing construction including, but not limited to, the following, in order to provide for the coordination of Work, installation of Work, uncovering of other facilities and structures for access or inspection, or obtaining samples for testing or other similar purposes
   1. Concrete
   2. Steel
   3. Wood
   4. Miscellaneous metal structures
   5. Piping and pavement

B. Patching includes the repair required to restore cut materials to original or better condition

C. Submittals
   1. Submit a proposal describing procedures in advance of the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

a. Extent: For each occurrence, describe the cutting and patching required, show how it will be performed and indicate the reason(s) it cannot be avoided
b. In-place construction changes: Describe anticipated results and include changes to structural elements and operating components in addition to changes in building s appearance and other significant visual elements
c. Products: List products to be used and firms or entities that will perform the Work
d. Dates: Indicate when cutting and patching will be performed
e. Utility services and mechanical and electrical systems:
    i) List services and systems that cutting and patching procedures will disturb or affect
    ii) List services and systems that will be relocated and that will be temporarily out of service
    iii) Indicate how long services and systems will be disrupted
f. Structural elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure
g. Approval by Engineer:
    i) Obtain approval of cutting and patching proposal before cutting and patching ii) Approval does not waive right to later require removal and replacement of unsatisfactory work

D. Quality Assurance
1. Structural work requirements: Do not cut and patch structural elements in a manner that would reduce their load-carrying or load-deflection ratio
    a. Obtain Engineer approval of cutting and patching proposal before cutting and patching the following structural elements:
        i) Bearing and retaining walls, foundation construction, and structural concrete and structural steel
        ii) Lintelsiii) Timber and primary wood framing iv) Structural decking and stair systems
        v) Equipment supports, piping, ductwork, vessels, and equipment vi) Miscellaneous structural metals
2. Operational limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance or decreased operational life or safety a. Obtain Engineer approval of cutting and patching proposal before cutting and patching the following operating elements or safety related systems: i) Primary operational systems and equipment ii) Air, smoke, water, moisture, or vapor barriers
    iii) Membrane and flashings
    iv) Fire protection, control, communication, or electrical wiring systemsv) Noise and vibration control elements and systems
3. Visual requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Engineer s opinion, reduce the building s aesthetic qualities, or result in visual evidence of cutting and patching

a. Retain the original installer or fabricator throughout construction phases to cut and patch the following categories of exposed work, if possible, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm: i) Concrete finishes ii) Pre-formed metal panels
iii) Painting iv)
Wall covering
v) HVAC enclosures, cabinets, or covers vi)
Firestopping

E. Warranty
1. For existing warranties, Contractor shall replace, patch, and repair material and/or surfaces cut and/or damaged by methods and with materials in order to not void any warranties required or existing

PART 2 PRODUCTS

A. Materials
1. Use materials identical to existing materials unless not available
a. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials matching existing adjacent surfaces to the fullest extent possible with regard to visual effect
b. Before proceeding, Contractor shall obtain approval of the Engineer
c. Use materials whose installed performance will equal or surpass that of existing materials

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered

B. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work

C. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with the work until the Engineer has provided further instructions

3.2 PREPARATION

A. Provide devices and methods to protect other portions of the Project from damage

B. Provide temporary support of Work to be cut where required

C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water
   1. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations

D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas

E. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them

F. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes

G. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay

B. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition
   1. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer s recommendations
      a. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use
      b. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces
      c. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill
      d. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting
      e. Provide fire-safe seals to maintain fire rating at all penetrations
   2. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances
      a. Where feasible, inspect and test patched areas to demonstrate integrity of the installation

b. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing
c. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance
d. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat
e. Patch, repair or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance
f. Replace concrete walkways to nearest construction joint

3. Plaster Installation: Comply with manufacturer s instructions and install thickness and coats as indicated

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements governing Contractor s selection of products for use in Project and for Work including, but not limited to, the following:
   1. Definitions
   2. General Requirements for Materials and Equipment
   3. Environmental Conditions
   4. Submittals
   5. Quality Assurance and Qualifications
   6. System Responsibility
   7. Transportation and Shipment
   8. Delivery, Storage and Handling
   9. Maintenance Materials
   10. Warranty
   11. Equipment and Product Selection and Identification
   12. Examination, Installation, Adjusting and Cleaning

1.2 RELATED SECTIONS

A. Section 01010 Summary of Work

B. Section 01340 Shop Drawings, Product Data, and Samples

C. Section 01400 Quality Control

D. Section 02300 Earthwork

E. Section 02370 Erosion and Sedimentation Control

F. Section 02530 Sanitary Sewer System

G. Section 02740 Flexible Paving

H. Section 02750 Rigid Paving

I. Section 02920 Seeding

1.3 REFERENCES

A. American Bearing Manufacturers Association (AFBMA)
   1. Std 9-90 Load Ratings and Fatigue Life for Ball Bearings

2. Std 11-90 Load Ratings and Fatigue Life for Roller Bearings

B. American Gear Manufacturer Association (AGMA)

C. ANSI B1.1-89 Unified Screw Threads

D. ANSI B 1.20. 1-83-Pipe Threads, General Purpose (Inch)

E. ANSI B16.1-89-Cast Iron Pipe Flanges and Flanged Fittings, Class 125

F. ANSI B18.2.1-81-Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Log Screws

G. ANSI B18.2.2-87-Square and Hex Nuts

H. NSF/ANSI 60-2012 Drinking Water Treatment Chemicals Health Effects

I. NSF/ANSI 61-2012 Drinking Water System Components Health Effects

J. Hazardous (Classified) Locations: Conform to requirements of NFPA70 Articles 500 through 504

1.4 DEFINITIONS

A. Definitions used in this specification section are not intended to change the meaning of other terms used in the Contract Documents, such as specialties, systems, structure, finished, accessories, and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry

B. Products: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term product includes the terms material , equipment , system , and terms of similar intent

C. Named products: Items identified by manufacturer s product name, including make or model number of other designation, shown or listed in the manufacturer s published product literature that is current as of date of Contract Documents

D. Foreign products: Distinguished from domestic products are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens or, nor living within, the United States and its possessions are also considered to be foreign products

E. Materials: Products substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the Work

F. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping

G. Special tools, instruments, devices, or accessories: Any tools, instruments, devices or accessories required for repair, adjustment or maintenance of equipment which are designed especially for the equipment in question or which are not normally kept in stock by local tool suppliers

H. Responsible manufacturer: Unless otherwise specified, responsible manufacturer shall be manufacturer of driven equipment. Agents, representatives or other entities who are not a direct component of manufacturing corporation will not be acceptable as a substitute for manufacturer's corporation in meeting this requirement

1.5 GENERAL REQUIREMENTS

A. The section applies to all equipment provided under this contract

B. The requirements of detailed specifications take precedence over this section in the event of an apparent conflict

C. Provide all new equipment and materials, except as specified or required by testing

D. Equipment and materials removed from existing structure: Do not use in completed Work except where specifically indicated or specified

E. Contractor to coordinate equipment with other parts of the Work, including verification or compatibility of structures, piping, wiring and equipment components

F. Contractor is responsible for all alterations in the Work to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or specifications:
   1. The arrangement of equipment shown on the Drawings is based upon information available to the Owner at the time of the design and is not intended to show exact dimensions unique to a specific manufacturer
   2. More than one manufacturer has been used for mechanical layout and design to accommodate all named manufacturer's
   3. The Drawings are, in part, diagrammatic, and some features of the illustrated equipment installation may require revision to meet actual equipment installation requirements as provided by the Contractor
   4. Structural supports, foundations, connected piping, valves and electrical conduit specified may have to be altered as coordinated by the Contractor during the submittal process to accommodate the actual equipment provided by the Contractor
   5. No additional payment will be made to the Contractor for such revisions and alterations

G. Do not use any material or equipment for any purpose other than that for which is designed or specified

H. Equipment lists presented in these specifications and as specified on the Drawings are included for the convenience of the Engineer and Contractor and are not to be considered

as complete listings of all equipment, devices and material to be provided under this contract:

1. Contractor shall prepare his own material and equipment take-off lists as necessary from the contract Drawings, addenda and this project manual to meet the requirements of this project

1.6 ENVIRONMENTAL CONDITIONS

A. Project work includes an existing sanitary sewer where dilute concentrations of corrosive or hazardous gasses, high humidity, and other constituents may be expected to be present

B. Minimum Design Criteria:
1. Altitude: 4,500 feet above mean sea level 2.
Outdoor air temperature: 10 to 100 degrees F 3.
Relative Humidity:
   a. Summer time: 60 percent
   b. Winter time: 30 percent

1.7 SUBMITTALS

A. Provide submittals in accordance with Section 01340 Shop Drawings, Product Data, and Samples

B. Submittals for products are specified in Section 01340 Shop Drawings, Product Data, and Samples and in Divisions 2 through 16

C. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having system responsibility

D. Provide a copy of this specification section with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements.

E. Provide Certificate of System Responsibility

1.8 QUALITY ASSURANCE AND QUALIFICATIONS

A. Source limitations and interchangeability: To the fullest extent possible, provide products of the same kind from a single source

B. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer s or producer s nameplate or trademarks on exposed surface of products that will be exposed to view in occupied spaces or on the exterior
   1. Labels: Locate required product labels and stamps on concealed surfaces, or where required for observation after installation, on inconspicuous, accessible surfaces.

2. Equipment nameplates: Provide a permanent nameplate on each item of service connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. Nameplate shall contain, but not limited to, the following information and other essential operating data:

    a. Name of product and manufacturer
    b. Model and serial number
    c. Capacity
    d. Speed
    e. Ratings
    f. Operating and power characteristics
    g. Labels of tested compliance with codes and standards
3. Refer to additional requirements specified in Divisions 2 through 16

C. Installers Qualifications:
1. Equipment and material: Installed and placed in service by or under guidance of qualified personnel having knowledge and experience necessary for proper results
2. Where Contractor's or subcontractor's employees are not properly qualified, use personnel such as factory authorized field representative of equipment supplier

1.9 SYSTEM RESPONSIBILITY

A. Equipment systems made up of two or more components shall be provided as a single system by the responsible manufacturer. Unless otherwise specified, the Contractor shall assign system responsibility to, and obtain each system from the manufacturer of the driven equipment. The manufacturer shall design and provide all components of the system to enhance proper operation, compatibility of all components, ease of construction and efficient maintenance. The responsible manufacturer shall coordinate selection and design of all system components such that all equipment is compatible and operates properly to achieve the performance requirements specified. The Contractor is responsible to the Owner for performance of all systems as provided in the General and Special Conditions.

B. Nothing in this provision shall be construed as relieving the Contractor of overall responsibility for the Work of this Contract and the performance of all systems as specified under paragraphs 00700 Standard General Conditions, Article 13

1.10 TRANSPORTATION AND SHIPMENT

A. Shipment preparation: Contractor shall require manufacturers and suppliers to prepare equipment and materials for shipment in a manner to facilitate unloading and handling, and to protect against damage or unnecessary exposure in transit and storage, for contractor supplied equipment. Provisions for protection shall include the following:
1. Crates or other suitable packaging materials
2. Covers and other means to prevent corrosion, moisture damage, mechanical, injury, and accumulation of dirt in motors, electrical equipment, and machinery

3. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel
4. Grease packing or oil lubrication in all bearings and similar items

B. Marking
1. Each item of equipment and material shall be tagged or marked as identified in the delivery schedule or on submittals

2. Complete packing lists and bills of material shall be included with each shipment.
3. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked

1.11 DELIVERY, STORAGE, AND HANDLING

A. Delivery
1. Arrange deliveries of equipment and materials in accordance with construction schedules, in ample time to facilitate inspection prior to installation and to avoid delay of Work. Coordinate to avoid conflict with work and conditions at the site
2. Deliver products in undamaged condition, in manufacturer's sealed, weather tight, original container or packaging, with identifying labels intact and legible, all in accordance with manufacturer's instructions and recommendations using means and methods that will prevent damage, deterioration, and loss, including theft
3. Control delivery schedules to minimize long-term storage at the Site and to prevent overcrowding of construction spaces. Coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss
4. Products delivered to Work site shall be in undamaged condition, in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing
5. Mark deliveries of component parts of equipment to identify the equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units
6. Immediately on delivery, inspect shipment to ensure:
    a. Product complies with requirements of Contract Documents and reviewed Submittals
    b. Quantities are correct
    c. Containers and packages are intact and labels are legible
    d. Equipment and materials are properly protected and undamaged
7. Include complete packing lists and bills of material with each shipment including equipment identification number assigned by Drawings and Specifications of this Contract
8. Deliver anchor bolts together with templates sufficiently early to permit setting when structural concrete is placed

B. Storage
   1. If there is no interior space available from the Owner for storage of delivered equipment and material at the project site:
      a. Provide adequate facilities for storage in accordance with Section 01500
      b. Provide off-site storage and protection when site does not permit on-site storage or protection and if acceptable to Owner in accordance with the General Conditions
   2. Submit and maintain insurance for equipment and materials at off-site storage
   3. Requests for payment of stored equipment and materials by the Contractor may be rejected if storage facilities do not conform to these specifications or manufacturer's written recommendations.
   4. Store equipment and materials immediately on delivery, and protect until completion of the Work. Store in accordance with manufacturer s instructions with seals and labels intact and legible
   5. Store equipment and materials in a manner that will not endanger the supporting construction
   6. Store equipment and materials that are subject to damage by elements in weathertight enclosures
   7. Maintain temperature and humidity within ranges required by manufacturer
   8. Protect motors, electrical equipment, plumbing fixtures, and machinery of all kinds against corrosion, moisture deteriorations, mechanical injury, and accumulation of dirt or other foreign matter
   9. Protect electrical equipment, controls, and insulation against moisture, water, and dust damage
   10. Immediately after delivery and inspection, connect and operate continuously all space heaters furnished in electrical equipment
   11. Protect exposed-machined surfaces and unpainted iron and steel as necessary with suitable rust-preventive compounds
   12. Protect bearings and similar items with grease packing or oil lubrication
   13. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation
   14. Exterior storage:
      a. Provide substantial platforms, blocking, or skids to support fabricated products aboveground and to prevent soiling or staining. Cover products subject to discoloration or deterioration from exposure to elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation
      b. Store loose granular materials on solid surface areas to prevent mixing with foreign matter
      c. Provide surface drainage to prevent flow or ponding of rainwater
   15. Equipment and materials shall not show any pitting, rust, decay or other deleterious effects of storage prior to final acceptance of Work
   16. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to ensure products are maintained under specified conditions and free from damage or deterioration

a. Prepare stored materials lists with schedules of maintenance activities and frequency of activities required to maintain the quality of the equipment and the warranty from the manufacturer
b. List dates and activities of storage requirements such as rotating moveable parts
c. Update lists weekly and include in progress meeting agenda

17. Protect painted surfaces against impact, abrasion, discoloration or other damage:
    a. Repaint any damaged areas with manufacturer provided touch-up paint
18. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation
19. Installed products stored prior to start-up:
    a. Equipment and materials shall not show any pitting, rust, decay or other deleterious effects of storage when installed in the Work
    b. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations, dust, dirt, water and paint. Remove when no longer needed

C. Handling
1. Provide equipment and personnel necessary to unload and handle equipment and materials, by methods to prevent damage or soiling to equipment and materials or packaging
2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points
3. Provide additional protection to surrounding surfaces as necessary to prevent damage

D. Maintenance of storage
1. Inspect stored equipment and materials on a scheduled basis
2. Verify that storage facilities comply with manufacturer s product storage requirements, including environmental conditions continually maintained
3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents
4. For mechanical and electrical equipment in long-term storage, provide manufacturers service instructions to accompany each item, with notice of enclosed instructions on exterior of package. Service equipment on a regularly scheduled basis.

E. Protection after installation
1. Provide substantial coverings as necessary to protect installed equipment and materials from damage from subsequent construction operations 2. Remove when no longer needed or as specified

1.12 MAINTENANCE MATERIALS

A. Spare Parts:
1. Store spare parts, wherever required by detailed technical specification sections, in accordance with the provisions of this paragraph

2. Tag all spare parts with permanent, labeled tags or packaging by equipment designation number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate)
3. Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping
4. Unless otherwise specified, spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box:
   a. Provide box with a hinged wooden cover and locking hasp
   b. Hinges to be strap type
   c. Paint the box and identify with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts"

5. Prepare and provide a neatly typed inventory of spare parts taped to the underside of the box cover

1.13 WARRANTY

A. Warranty all equipment and materials against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, leakage, breakage or other failure

B. Unless otherwise specified, for all equipment and materials provide manufacturer’s warranty for a period of 2 years from the date of Substantial Completion

C. Warranties that begin at the time of shipment, delivery or within a limited time period from date of shipment or delivery or any other qualification that does not conform to the definition of Substantial Completion are not acceptable

D. Cost of all manufacturer warranties are considered as part of the Bid price

PART 2 PRODUCTS

2.1 MATERIALS

A. Suitable for the intended service conditions

B. Structural and miscellaneous fabricated steel in equipment shall conform to American Institute of Steel Construction (AISC) standards, except as otherwise specified

2.2 FABRICATION

A. Design, fabricate, and assemble in accordance with the best modern manufacturing and shop practices

B. Manufacture parts to standard sizes and gages

C. Two or more items of the same type shall be identical by the same manufacturer and interchangeable

2.3 EQUIPMENT AND PRODUCT SELECTION

A. General product requirements: Provide products that comply with the Contract Document, are undamaged, and unless otherwise indicated or specified, are new at time of installation
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect
   2. Standard products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects

   3. Continued availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced product for which the manufacturer has published assurances that the product and its parts shall be available to the Owner at a later date. A reasonable doubt regarding such future availability will be grounds for rejection of products other than named products
   4. As specified in each applicable Specification Sections, Drawings, codes, standards, and regulatory agencies
   5. Fabricated products:
      a. Design, fabricate, and assemble products in accordance with best engineering and shop practices
      b. Manufacture like parts of duplicate units to standard interchangeable sizes and gauges. Two or more items of same kind shall be identically made by the same manufacturer
      c. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically accepted in writing by Owner
      d. Ensure that material or equipment are not used for any purpose other than that for which it is designed or is specified
      e. Labels and nameplates shall be provided where required by regulatory agencies or in accordance to state identification and essential operation data
   6. Provide products of the same kind from a single source to the fullest extent possible

2.4 EQUIPMENT AND PRODUCT IDENTIFICATION

A. Nametags: Identify all valves, instruments, devices, with the equipment tag designation numbers and prefix and suffix letters as specified and/or shown on the Process and Instrumentation Drawings (P&IDs). Identification shall also be in accordance with Section 01080 Identification Systems.

B. Nameplates: Identify all pumps and equipment with the equipment tag designation numbers and prefix and suffix letters as specified and/or shown on the Process and Instrumentation Drawings (P&IDs):
   1. Provide engraved or machine stamped non-corrosive metal nameplate fastened to the pump or equipment base plate with screws or drive pins of the same material
   2. Nameplate material shall not corrode or discolor in moist or salt water spray atmosphere
   3. Name plates indicate the following:
      a. Manufacturer
      b. Date of manufacture
      c. Name of product
      d. Model and size
      e. Serial Number
      f. Capacity: Rating in gpm or SCFM (if a fan or blower) and feet of head or inches water column
      g. Impeller or wheel diameter (if a fan)
      h. Impeller diameter

      i. Operating and power characteristics
      j. As specified herein and in Divisions 2 through 16 4. Motor Nameplates:
      a. All motors for pumps and other equipment having motors shall be identified as specified elsewhere under this Section and in Divisions 2 through 16

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install any equipment showing such effects. Replace damaged equipment with identical new equipment

3.2 INSTALLATION

A. Install all equipment, accessories and materials in accordance with the manufacturer's written recommendations unless otherwise specified in the individual equipment detailed technical specifications

B. Each product shall be securely anchored in place except as required for proper movement and performance

C. Each product shall be located and aligned with other Work

D. Manufacturer s Instructions

1. Contractor shall obtain and distribute hard copies and electronic copies of manufacturer s instructions and recommendations to parties involved in installation including a copy to Engineer
2. Maintain one (1) set of complete instructions at job site during installation and until completion
3. Handle, install, connect, clean, conditions, and adjust products in accordance with such instructions and in conformity with specified requirements

3.3 ADJUSTING

A. Perform all required adjustment tests, operation checks, and other startup activities required

3.4 CLEANING

A. Perform under provisions of Section 01700 Contract Closeout

B. Repaint all painted surfaces which are damaged prior to final equipment acceptance to Owner's satisfaction

C. Clean exposed surfaces and protect as necessary and required to prevent any damage or deterioration at the time of Substantial Completion

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Substantial completion

B. Final acceptance

C. Project record documents

D. Closeout procedures

E. Final cleaning

F. Final adjustment of accounts

G. Final application for payment

1.2 RELATED SECTIONS

A. Section 00700 General Conditions

B. Section 01500 Construction Facilities and Temporary Controls

C. Section 01340 Shop Drawings and Product Data

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Prior to requesting inspection for certification of Substantial Completion, complete the following and list exceptions in the request:
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the Work claimed as Substantially Complete
      a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price
      b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete Work, and reasons the Work is not complete. All items remaining outstanding on the Contractor’s punch list shall include a projected date of completion and/or correction with an explanation of why such item is not presently completed
   2. Advise Owner of pending insurance changeover requirements

3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents
4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases
5. Submit record drawings, instruction books and operating manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information
6. Deliver tools, spare parts, extra stock, and similar items
7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions
8. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes

B. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare the Certificate of Substantial Completion following inspection or advise Contractor of construction that must be completed or corrected before the certificate will be issued
   1. Engineering will repeat inspection when requested and assured by Contractor that the Work is Substantially Complete.
   2. Results of the completed inspection will form the basis of requirements for final acceptance

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
   1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required
   2. Submit an updated final statement, accounting for final additional changes to the Contract Price
   3. Submit a certified copy of Engineer s final inspection list of items to be completed or corrected, endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by Engineer.
   4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the Date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work
   5. Submit consent of surety to final payment
   6. Submit evidence of final, continuing insurance coverage complying with insurance requirements

B. Reinspection Procedure: Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer.
   1. Upon completion of reinspection, Engineer will prepare a certificate of final acceptance. If the Work is incomplete, Engineer will advise Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance
   2. If necessary, reinspection will be repeated, but at the expense of the Contractor who will reimburse the Owner for these services by the Engineer

1.5 PROJECT RECORD DOCUMENTS

A. General
   1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours
   2. Maintain on site, one set of the following record documents; record actual revisions to the Work:
      a. Contract Drawings
      b. Specifications
      c. Addenda
      d. Change Orders and other Modifications to the Contract
      e. Reviewed shop drawings, product data, and samples
      f. Field test reports
      g. Construction photographs
   3. Store Record Documents and samples separate from documents used for construction
      a. Provide files and racks for storage of documents
      b. Provide locked cabinet or secure storage space for samples

B. Record Drawings
   1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings
   2. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown
   3. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings
   4. Give particular attention to concealed elements that would be difficult to measure and record at a later date
      a. Record information concurrently with construction progress
      b. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "Project Record" in neat, large, printed letters
      c. Mark new information that is important to Owner but was not shown on Contract Drawings or Shop Drawings

d. Note related Change Order numbers where applicable
e. Organize record drawing sheets into manageable sets. Bind sets with durablepaper cover sheets; print suitable titles, dates, and other identification on the cover of each set
f. Upon completion of the Work, submit record drawings to Engineer for Owner's records

5. Contract Drawings and approved Shop Drawings: Legibly mark each item to record actual construction, including:
   a. Measured depths of elements of foundation in relation to finish grade or first floor datum
   b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvement
   c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
   d. Field changes of dimensions and details
   e. Changes made by Addenda or Change Order(s), if any
   f. Details not on original Contract Drawings
   g. References to related Shop Drawings and Modifications

C. Record Specifications: Maintain one complete copy of the Project Manual including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction
   1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
   2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
   3. Note related record drawing information and product data.
   4. Upon completion of the Work, submit record Specifications to Engineer for Owner's records

D. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and specifications.
   1. Mark record documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.
   2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
   3. Upon completion of markup, submit complete set of record product data to Engineer for Owner's records
   4. Legibly mark and record at each Product section description of actual Products installed, including the following:
      a. Manufacturer's name, product model, number, trade name and supplies
      b. Product substitutions or alternates utilized

c. Changes made by Addenda, field order or change order

E. Record Samples Submitted: Immediately prior to Substantial Completion, Contractor shall meet with Engineer and Owner's personnel at the Project Site to determine which Samples are to be transmitted to Owner for record purposes. Comply with Owner's instructions regarding packaging, identification, and delivery to Owner.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records, and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to Engineer for Owner's records

G. Maintenance Manuals: Contractor shall organize operation and maintenance data as specified in Section 01730

H. Submit documents to Engineer with claim for final Application for Payment

I. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes

J. Make documents and samples available at all times for inspection by Engineer

K. Label each document "Project Record" in neat, large printed letters

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLOSEOUT PROCEDURES

A. General
   1. Comply with requirements stated in the Owner's General Conditions of the Contract and in these specifications for administrative procedures in closing out the Work
   2. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection
   3. Provide submittals to Engineer/Owner that are required by governing or other authorities
   4. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due

B. Operation and Maintenance Instructions: Arrange for each installer of Equipment that requires regular maintenance to meet with Owner's personnel at Project Site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's

representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals
2. Record documents
3. Spare parts, materials and tools
4. Lubricants and fuels
5. Identification systems
6. Control sequences
7. Hazards, hazardous chemicals data sheets
8. Cleaning
9. Warranties and bonds
10. Maintenance agreements and similar continuing commitments

C. As part of instruction for operating Equipment, demonstrate the following procedures:
   1. Startup
   2. Shutdown
   3. Emergency operations
   4. Noise and vibration adjustments
   5. Safety procedures
   6. Economy and efficiency adjustments
   7. Effective energy utilization

3.2 FINAL CLEANING

A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
   1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion
      a. Remove labels that are not permanent labels
      b. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition
      c. Wipe surfaces of mechanical and electrical Equipment. Remove excess lubrication and other substances
   2. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction
   3. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Site and dispose of lawfully.
      a. Where extra materials of value remaining after completion of associated Work become Owner's property. Dispose of these materials as directed by Owner

3.3 CONTRACTOR'S CLOSEOUT SUBMITTALS

A. Evidence of Payment and Release of Liens: As specified in the General Conditions

B. Final inspection reports by all regulatory agencies demonstrating the agencies' final approval

C. At Contract close-out, deliver Record Documents to Engineer for the Owner

D. Accompany Submittal with Transmittal Letter in Duplicate, Containing
   1. Date
   2. Project title and number
   3. Contractor's name and address
   4. Title and number of each Record Document
   5. Signature of Contractor or his authorized representative

3.4 FINAL ADJUSTMENTS OF ACCOUNTS

A. Submit a Final Statement of Accounting to Engineer

B. Statement Shall Reflect All Adjustments to the Contract Sum
   1. The original Contract Sum
   2. Additions and deductions resulting from
      a. Previous Change Orders
      b. Deductions for uncorrected Work
      c. Deductions for liquidated damages
      d. Deductions for reinspection payments
      e. Other adjustments
   3. Total Contract Sum, as adjusted
   4. Previous payments
   5. Sum remaining due

3.5 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions of the Contract

END OF SECTION

SECTION 02220 DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Demolition, removal, salvage and disposal of existing site features, piping, structures and materials where indicated on the drawings and as specified in this section

B. Demolition and removal of concrete foundations, sidewalks, concrete and asphaltic paving

1.2 RELATED SECTIONS

A. Section 01500 Construction Facilities and Temporary Controls

B. Section 02300 Earthwork

C. Section 02950 - Seeding

1.3 SUBMITTALS

A. Permits and Certificates.
   1. Permits and notices authorizing demolition
   2. Certificates of severance of utility service
   3. Permit for transport and disposal of debris

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1 specifications

B. Accurately record actual locations of capped utilities and subsurface obstructions

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable State and local codes for demolition of structures, safety of adjacent structures, dust control, and disposal

B. Obtain required permits from authorities

C. Notify affected utility companies before starting work and comply with their requirements

D. Do not close or obstruct roadways, sidewalks, or hydrants without written permission from Owner

E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials

1.6 SCHEDULING

A. Schedule and submit under provisions of Division 1 specifications

B. Provide detailed descriptions for demolition and removal procedures

C. Notify Engineer and Owner of any demolition work one (1) week prior to commencement

D. Coordinate all demolition work with Engineer and Owner

PART 2 PRODUCTS

2.1 SALVAGE OF MATERIALS

A. Remove and return to Owner the following Equipment and Materials:
   1. Manhole rings and covers

B. All existing construction and items not salvaged to Owner shall be considered waste and shall become the property of Contractor for off-site disposal

C. Remove and reinstall as indicated on Drawings and herein the following Equipment and Materials:
   1. Landscape ground cover and any underlying weed barriers

2.2 HANDLING AND STORAGE

A. Contractor shall carefully disassemble Equipment and Materials that are to be reused and returned to Owner in such a way to avoid any damage. Contractor shall store such Equipment and Materials in such a way to avoid any damage, corrosion, or staining

2.3 FILL MATERIALS

A. Fill Material: Use on site fill material under provisions of Section 02300 and in accordance with Geotechnical recommendation

PART 3 EXECUTION

3.1 INSPECTION

A. Verify areas to be demolished are unoccupied and discontinued in use

B. Do not commence work until conditions are acceptable to Engineer and Owner

C. Existing conditions of Equipment and Materials, structures, surfaces, or properties that could be misinterpreted as damaged as a result of demolition work shall be photographed and filed with Owner and Engineer prior to commencement of Work

3.2 PREPARATION

A. Provide, erect, and maintain temporary barriers, enclosures, security fences and shoring at demolition locations in accordance with Division 1 and other related specifications to protect personnel

B. Protect existing structures and utilities which are not to be demolished

C. Provide temporary wiring and connections to maintain existing telephone, electrical, instrumentation and control systems in service during construction

D. Protect existing electrical and controls equipment and cabinets from dust and debris intrusion. Set up temporary barriers to preclude dust from being introduced into cabinets and equipment. Additionally, seal all cabinets and equipment while demolition is occurring. Control and or turn off existing heating and ventilation systems that will introduce or distribute dust and debris from the demolition operations.

E. Mark location of existing utilities

3.3 GENERAL REQUIREMENTS

A. Sprinkle Work with water to minimize dust where applicable. Provide hoses and water connections for this purpose.

B. Do not use water to extent causing flooding, contaminated runoff, or icing

C. Remove demolished material from the site

D. Repair damage to adjacent structures

E. Remove existing exposed piping and electrical wiring and conduit to be abandoned to structural surface, cut flush, and finish to match existing surfaces

F. Remove buried piping, wiring, and conduit to be abandoned as required for the Work. Plug the remainder flush.

3.4 DISPOSAL

A. Do not store or burn waste materials on-site

B. Transport demolition debris to designated off-site disposal area

C. If hazardous materials are encountered during demolition work, Contractor shall comply with applicable regulations and laws regarding the removal, handling, and protection of environment and human health

3.5 CONNECTION TO EXISTING CONSTRUCTION

A. Cut and remove portions of existing construction as necessary to allow for proper installation of new construction Equipment and Materials

B. Shore and brace existing structures to maintain safe structure conditions and until permanent structures and supports are completed
   1. Contractor shall repair all damage in result of installation of shoring and bracing

C. Cap, seal or abandon pipe and cable as indicated on Drawings and specified herein

3.6 CLEANUP AND REPAIR

A. Contractor shall remove tools, equipment and demolished materials from Site upon completion of demolition work
   1. Remove protections
   2. Interior areas shall be broom clean
   3. Inspect and clean all electrical control cabinets, interior and exterior, exposed to dust and debris during the demolition process

B. Contractor shall repair demolition performed in excess of that required or indicated
   1. Surfaces and structures to remain shall be repaired to the existing conditions prior to commencement of demolition work

3.7 SITE DEMOLITION

A. Disconnect, remove, cap and identify designated utilities within demolition area

B. Remove asphalt paving, parkway, and other concrete work to facilitate construction. Remove concrete to nearest joint beyond demolition area.

C. Remove sanitary sewer items where shown on the Drawings.

D. Backfill areas excavated caused as a result of demolition, in accordance with Section 02300

E. Rough grade and compact areas affected by demolition to maintain site grades and contours as shown on drawings

F. Remove demolished materials from site

G. Do not burn or bury materials on site, unless otherwise directed by Owner. Leave site in clean condition.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, and Division One and other related specification sections apply to work of this section.

1.2 SECTION INCLUDES

A. Clearing, grubbing and site preparation

B. Removal and disposal of debris

C. Handling, storage, transportation, and disposal of excavated material

D. Sheeting, shoring, bracing and protection work

E. Pumping and dewatering as required or necessary

F. Backfilling

G. Pipe embedment

H. Construction of fills and embankments

I. Trench Stabilization

J. Final grading

K. Slope Stabilization

L. Appurtenant work

1.3 RELATED SECTIONS

A. Section 02370 Erosion and Sedimentation Control

B. Section 02530 Sanitary Sewer System

C. Section 02740 Flexible Paving

D. Section 02750 Rigid Paving

E. Section 02950 Seeding

1.4 REFERENCES

A. City of Grand Junction Engineering Division Standard Specifications for Construction of Underground Utilities Waterlines, Sanitary Sewers, Storm Drains, Underdrains, and Irrigation Systems

B. City of Grand Junction Engineering Division Standard Specifications for Road and Bridge Construction

C. American Association of State Highway and Transportation Officials (AASHTO)

D. American Society for Testing and Materials (ASTM):
   1. C33 Concrete Aggregates
   2. C136 Sieve Analysis of Fine and Coarse Aggregates
   3. D698 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12-Inch Drop
   4. D1241 Material for Soil Aggregate Subbase, Base and Surface Courses
   5. D1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
   6. D4253 Test Methods for Maximum Index Density of Soils and Unit Weight of Soils Using a Vibratory Table
   7. D4254 Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
   8. D4318 Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
   9. D6938 Test Method for In-Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth)

E. American Concrete Institute (ACI):
   1. 229 Controlled Low-Strength Materials

F. Council of American Building Officials/American National Standards Institute (CABO/ANSI):
   1. A117.1 Accessible and Useable Buildings and Facilities Standards

G. Colorado Department of Transportation (CDOT)

H. Occupational Safety and Health Administration (OSHA):
   1. Part 1926 Safety and Health Regulations for Construction

1.5 SUBMITTALS

A. Submit under provisions of Division One specifications.

B. Product Data: Submit on all products or materials supplied herein

C. Test Reports: Indicate supplier, sieve analysis, optimum moisture content and density in accordance with ASTM D698 if appropriate for crushed rock or gravel, pipe embedment and material for fills and embankment

1.6 REGULATORY REQUIREMENTS

A. Burning will not be allowed on-site. Comply with all applicable codes, regulations, and laws.

B. Comply with applicable requirements of CABO/ANSI A117.1 for accessibility requirements related to walks, ramps, parking areas, drives, curb ramps, etc.

C. Obtain and comply with all requirements of City of Grand Junction and CDPHE Stormwater and/or Groundwater Discharge Permits, as required.

D. For public improvements only, in the event of a conflict between municipal standards and this specification, municipal standards for products and installation will govern.

E. Excavation work will be performed in compliance with City of Grand Junction and current OSHA requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent structures and surrounding areas from damage during excavation, filling, and backfilling

B. Protect work from erosion or other similar types of damage until the project has been accepted. Leave protection in place for subsequent contractors use.

C. Do not backfill or construct fills during freezing weather. Backfill or construct fills only when temperature is 35 F and rising

D. Do not use frozen materials, snow, or ice in any backfill or fill area

E. Do not backfill or construct fill on frozen surfaces

F. Protect excavated material from becoming frozen

G. Do not backfill or construct fills or embankments during periods of heavy rainfall or precipitation when soil moisture conditions will not allow proper compaction to be achieved

H. Do not remove trees from outside excavation or fill areas unless authorized by the Owner; protect from permanent damage by construction activities

I. Provide temporary bridges for roadways, walkways, driveways, etc.

1.8 QUALITY ASSURANCE

A. All imported material to be free of hazardous and organic wastes, clean as defined by EPA, and approved for its intended use by the Owner or project Geotechnical Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

A. General - Soil materials, whether from sources on or off the site must be approved by the Geotechnical Engineer as suitable for intended use and specifically for required location or purpose.

B. Classification of Excavated Materials:
   1. No classification applies. Remove and handle all excavated materials regardless of its type, character, composition, condition, or depth. This includes all material that is not classified as rock excavation as described in Paragraph 2.1.B.2 Rock Excavation is included herein.
   2. Rock excavation shall be conducted according to Part 103.11 of the City of Grand Junction Standard Specifications for the Construction of Underground Utilities.
   3. Waste Materials:
      a. Waste materials are considered unacceptable materials for compaction or placement fill. Site fills will not include environmental pollutants, hazardous substances or waste, hazardous products or by-products.
      b. Transport and properly dispose of any rubble and waste materials found in excavation off the Owner s property
      c. If hazardous, transite or asbestos containing materials are found in excavation, stop work immediately and notify the Owner within one hour of discovery. Comply with special handling requirements.

C. Fills and Embankments
   1. To the maximum extent practical use excess earth from onsite excavation for fills and embankments.
   2. Free from rocks or stones larger than 12 inch in greatest dimension and free from brush, stumps, logs, roots, debris, and organic and other deleterious materials
   3. Fill and embankment material must be acceptable to Engineer
   4. No rocks or stones larger than 6 inch in upper 18 inches of fill or embankment. Where allowed, distribute rocks and stones through the fill to not interfere with compaction.

D. Imported Fill for Fills and Embankments:
   1. The Contractor is responsible for obtaining additional material for fills and embankments as necessary to meet the requirements shown on the Drawings.
   2. Imported fill conforming to the following:
      a. Gradation (percent finer by weight ASTM C136): 3 100% passing, No. 4 Sieve 50-100% passing, and No. 200 Sieve 35% passing (maximum)
      b. Liquid Limit: 35 (maximum), Plasticity Index: 15 (maximum), Group Index: 10 (maximum)

E. Topsoil
   1. Topsoil is defined as fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of rocks, stumps, stones larger than 2 inches in any dimension, and other extraneous or toxic matter harmful to plant growth for areas to be seeded or planted. Coordinate testing requirements with Owner.
   2. Clean topsoil free of plants and seeds will be spread to 4-inch minimum depth or as specified by Drawings, whichever is greater.

F. Grubbings
   1. Grubbings are defined as the first 1 inch of surface vegetation and topsoil consisting of primarily existing grass groundcover free of roots, brush, and other objectionable material and debris.
   2. Reuse grubbing and surface topsoil containing plants and seeds in designated revegetation areas only.

G. Pipe Embedment: Graded gravel
   1. Comply with City of Grand Junction requirements for pipe bedding for public utilities.

H. Compacted Trench Backfill
   1. Comply with City of Grand Junction requirements for backfilling pipe.

I. Coarse Base Rock
   1. Granular material, maximum 3 inches, less than 10% passing 1-inch sieve.
   2. Free of trash, clay and dust

J. Road Base
   1. Will meet ASTM specification for Class II aggregate base and CDOT Class 6 gradation

Sieve Size	Percent Passing by Weight
3/4"	90-100
No. 4	30-65
No. 8	22-55
No. 200	3-12

2.2 ACCESSORIES

A. Controlled Low Strength Material (Flow Fill)
   1. Comply with City of Grand Junction requirements and ACI 229 for the use of flowable fill within the right-of-way or for public utility trench backfill.
   2. Product will be a lean, sand-cement slurry, flowable fill or similar material with a 28-day unconfined compressive strength between 50 and 200 psi.

B. Non-woven geotextile fabric
   1. Needle-punched nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Product

must be inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids. Product must meet AASHTO M288-06 Class 3 for elongation > 50%.

a. Mirafi 140N or accepted substitution

PART 3 EXECUTION

3.1 EXAMINATION

A. Field verify the location of all underground utilities, pipelines and structures prior to excavation

3.2 PERFORMANCE GENERAL

A. Contractor to verify quantities of cuts and fills and perform all earthwork required to meet the grades as shown on the Drawings, including but not limited to, additional import or export required to handle compaction, building and pavement subgrade preparation, and pipe bedding.

B. Perform work in a safe and proper manner with appropriate precautions against hazard

C. Provide adequate working space and clearances for work performed within excavations and for installation and removal of utilities

D. Contain all construction activity on the designated site and within the limits of work. Cost of restoration offsite will be the responsibility of the Contractor

E. Maintain service to pipelines and utilities indicated on Drawings during construction

3.3 PREPARATION

A. Clearing and Grubbing
   1. Clear all site areas within the limits of work of grasses, roots, brush, and other objectionable material and debris.
   2. Strip subgrade for fills and embankments of surface vegetation, sod, tree stumps and organic topsoil. Strip and stockpile all on-site material meeting the topsoil definition for all areas receiving grading where shown on Drawings
   3. Remove all waste materials from site and dispose. Stockpile all acceptable grubbings for reuse in revegetation areas.
   4. Remove and dispose of tree stumps and roots over 3 inches in diameter to a minimum depth of 18 inches below the natural surface or 5 feet below finished surface level, whichever is lower.
   5. Remove debris including all demolished trees, underbrush, stumps, roots and other combustible materials from site and dispose of off-site; on-site burning is not permitted

6. Backfill all excavated depression include grub holes with approved material

B. Preservation of Trees
   1. Do not remove trees outside fill or excavated areas, except as authorized by Engineer
   2. Protect trees and their roots within the drip line that are to remain from permanent damage by construction operation
   3. Trim standing trees in conflict with construction operations as directed by Owner and Engineer.

C. Topsoil Stripping
   1. Strip onsite material meeting the topsoil definition to minimum depth of 4 inches from areas to receive grading as shown on Drawings.
   2. Stockpile topsoil in areas designated by Owner and indicated on Drawings where it will not interfere with construction operations and activities and existing facilities
   3. At the completion of work in each area, place and grade topsoil to maintain gradient as indicated and required. Roughen surface as required for erosion control.

D. Waste and Debris
   1. Stockpile all acceptable grubbing for reuse in native revegetation areas
   2. Remove and dispose of all waste materials and debris from clearing, grubbing, stripping and demolition off site

E. Stockpiles
   1. Segregate materials suitable for the following:
      a. Topsoil
      b. Embankments and fills
      c. Backfill
      d. Spoils and waste only
   2. No excavation will be deposited or stockpiled at any time so as to endanger stability of banks or structures, health of trees and shrubs to be protected, or portions of the Work, either by direct pressure or indirectly by overloading banks contiguous to the operation
   3. Stockpile soil materials away from edge of excavations
   4. Do not obstruct or prevent access to roads, driveways, ditches, natural drainage channels, and utility control devices
   5. If in result of adjacent structures, easement limitations, or other restrictions sufficient storage is not available within Project limits, Contractor will arrange for off-site areas for stockpiling and for moving material to and from the storage area at no additional cost to the Owner

3.4 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

A. Excavation and backfill operations will be performed in such a manner to prevent cave-ins of excavations or the undermining, damage or disturbing of existing utilities and structures or of new work.

B. Backfill will be placed and compacted so as to prevent future settlement or damage to existing utilities and structures and new work

C. Any excavations improperly backfilled or where settlement occurs will be reopened to the depth required then refilled with approved materials and compacted, and the surface restored to the required grade and condition, at no additional costs to the Owner

D. Any damage due to excavation, backfilling, or settlement of the backfill, or injury to persons or damage to property occurring as a result of such damage will be the responsibility of the Contractor. All costs to repair such damage, in a manner satisfactory to the Engineer, will be borne by the Contractor at no additional expense to the Owner

3.5 DEWATERING

A. General
   1. All dewatering activities in accordance with all federal, state, and local regulations regarding site drainage, dewatering, and erosion and sediment control including permitting requirements
   2. Design and provide dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic head from the bottom and/or sides. Design system to prevent differential hydrostatic head, which would result in floating out soil particles in a manner, termed as a quick or boiling condition. System will not be dependent solely upon sumps and/or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation s stability
   3. Provide and maintain adequate dewatering equipment including power supply, if necessary, to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the Work
   4. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow all Work to be installed in a dry condition
   5. Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary to these purposes, lower water level in advance of excavation, utilizing wells, wellpoints, jet educators, or similar positive methods
   6. Keep each excavation dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result
   7. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12 inches below the bottom of the excavation
   8. Design, furnish, install, test, operate, monitor and maintain dewatering system of sufficient scope, size and capacity to control hydrostatic pressures and to lower,

control, remove, and dispose of groundwater and permit excavation and construction to proceed on dry, stable subgrades

9. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property
10. Maintain all drainage pipes, keep clean and free of sediment during construction and final cleanup

11. Open pumping with sumps and ditches will be allowed, provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes
12. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head
13. Dewatering to surface waterways requires Colorado Department of Public Health and Environment dewatering permit. Contractor must obtain dewatering permit and comply with discharge requirements therein, including water treatment prior to discharge, if necessary

B. Design
   1. Contractor will be responsible for the accuracy of the Drawings, design data, and operational records required
   2. Contractor will be solely responsible for the design, installation, operation, maintenance, and any failure of any component of the system

C. Damages
   1. Contractor will be responsible for and will repair without cost to the Owner any damage to work in place, or other contractor s equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation including, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor s negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system
   2. Remove sub grade materials rendered unsuitable by excessive wetting and replace with approved backfill material at no additional cost to the Owner

D. Maintaining Excavation in Dewatered Condition
   1. Dewatering will be a continuous operation. Interruptions due to power outages, or any other reason will not be permitted
   2. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction and/or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance
   3. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not

satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner

4. System maintenance will include supervision by personnel skilled in the operation, maintenance, and replacement of system components, and any other work required to maintain excavation in dewatered condition

E. System Removal
   1. Remove dewatering equipment from the site, including related temporary electrical service
   2. Wells will be removed or cut off a minimum of 3 feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction

3.6 SHEETING, SHORING AND BRACING

A. Bracing and sheeting of trenches shall be conducted according to Part 103.4 of the City of Grand Junction Standard Specifications for the Construction of Underground Utilities.

B. All sheeting, shoring and bracing in accordance with OSHA and IBC requirements

C. Prevent undermining and damage to all structures, buildings, underground facilities, pavements and slabs

D. Contractor will responsible for obtaining all required permits or easements for encroachments into the public right-of-way and for coordinating any encroachments onto adjacent properties.

E. If sheet pile cut off walls are required, submit design calculations, stamped by a Colorado licensed Professional Engineer

F. Contractor will be solely responsible for proper design, installation, operation, maintenance, and any failure of any system component
   1. Engineer review of Contractor s design and data does not relieve the Contractor from full responsibility for errors or from the entire responsibility for complete and adequate design and performance of the sheeting, shoring and bracing system

G. Provide proper and substantial sheeting, shoring, and bracing, in accordance with OSHA Standards as required, to prevent caving or sliding, to protect workmen and the Work, and to protect existing structures and facilities

H. Design, furnish, build, maintain and subsequently remove, to extent required a system of temporary supports for cut and cover, open cut, temporary bypass road, or trench excavations, including bracing, dewatering, and all associated items to support the sides and ends of excavations where excavation slopes may endanger in-place or proposed improvements, extend beyond construction right-of-ways or as otherwise specified or indicated in the Drawings

1. Design and build sheeting, shoring, and bracing to withstand all loads that might be caused by earth movement or pressure
2. Design and build sheeting, shoring and bracing to be rigid, maintain shape and position under all circumstances.

I. Design excavation support system and components for the following to allow safe and expeditious construction of permanent structures without movement/settlement of the ground and to prevent damage to or movement of adjacent buildings, structures, other improvements and underground facilities

1. To support lateral earth pressures
2. Loads from utilities, traffic, construction, buildings and surcharge loads

J. Provide sheeting, shoring and bracing equipment and materials onsite prior to start of excavation in each section, making adjustments as required to meet unexpected conditions

K. Contractor will make his own assessment of existing conditions including adjacent property, the possible effects of his proposed temporary works and construction methods, and will select and design support systems, methods, and details as will assure safety to the public, adjacent property, and the completed Work.

L. Employ caution in areas of underground facilities, which will be exposed by hand or other excavation methods acceptable to Owner or Engineer.

M. Space and arrange sheeting and bracing as required to exclude adjacent material and according to the stability of excavation slopes

N. Do not pull trench sheeting before backfilling

O. Do not brace sheeting left in place against the pipe, but support it in a manner that precludes concentrated loads or horizontal thrusts on pipe

P. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment is completed

Q. Damages
1. Contractor will document and all existing damage to adjacent facilities and submit written documentation to Owner and Engineer prior to performing any excavation. Documentation will include written description of existing damages, measurements, diagrams, maps and associated photographs
2. Repair all damage resulting from excavation and remove and place any existing structure or underground facility damaged during shoring and sheeting and all undermined pavements with Owner-approved equal, concrete or asphalt, at no cost to the Owner.

3.7 TRENCH STABILIZATION

A. Trenches with sloping sides shall be conducted according to Part 103.5 of the City of Grand Junction Standard Specifications for the Construction of Underground Utilities.

B. Thoroughly compact and consolidate subgrades for concrete structures, precast structures, and utility trench bottoms so they remain firm, dense and intact during required construction activities

C. Remove all mud and muck during excavation

D. Reinforce subgrades with crushed rock or gravel if they become mucky during construction activities

E. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on Drawings

F. Allow no more than ‰ inch depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon

G. Scarify trench subgrade to a depth of 6 to 8 inches before compaction

3.8 PAVEMENT OVEREXCAVATION AND SUBGRADE PREPARATION

A. Excavate subgrade for asphalt pavement areas per the lines, grades, and dimensions indicated on Drawings within a tolerance of plus or minus 0.10 foot. Excavate subgrade for concrete pavement areas per the lines, grades, and dimensions indicated on Drawings within a tolerance of plus or minus 0.05 foot.

B. Overexcavate and scarify existing soil as required under pavement areas, slabs, curbs and walks to meet the moisture and compaction specifications herein to depth shown on Drawings.

C. Extend subgrade preparation a minimum of one foot beyond back of proposed pavement, slabs, curbs and walks.

D. Extend subgrade preparation a minimum of two feet beyond back of proposed structure foundation limit.

E. Proof roll with a pneumatic tire equipment with a minimum axle load of 18 kips per axle a maximum of 24 hours prior to paving to locate any soft spots that exhibit instability and deflection beyond subgrade tolerances listed above. Areas that are observed to have soft spots in the subgrade, where deflection is not uniform or is excessive as determined by the Geotechnical Engineer, will be ripped, scarified, dried or wetted as necessary and recompacted to the requirements for density and moisture at the Contractor s expense. After recompaction, these areas will be proof rolled again and all failures again corrected at the Contractor s expense.

F. If the Contractor fails to place the sub base, base course, or initial pavement course within 24 hours or the condition of the subgrade changes due to weather or other conditions, proof rolling and correction will be performed again at the Contractor s expense.

3.9 COMPACTION

A. Place backfill and fill materials in layers not more than 8 inches loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure as described herein.

C.[

D. Percentage of Maximum Dry Density Requirements: Moisture treat and compact soil to not less than the following percentages of maximum dry density and to within the specified moisture content range of optimum moisture content according to ASTM D698 as follows:

Surface Improvement	Compaction %	Moisture Content
Structures	98%	-2 to +2
Paved Areas	95%	-2 to +2
Utility Trenches	95%	-2 to +2
Lawns or Unpaved Areas	90%	-2 to +2
Public Right-of-way	Per municipal standards	

1. Do not deposit or compact tamped or otherwise mechanically compacted backfill if frozen or if in water.
2. Take particular care to compact backfill which will be beneath slabs, pipes, drives, roads, parking areas, curb, gutters, or other surface construction.

3.10 DISPOSAL OF EXCESS EXCAVATED MATERIALS

A. Use excess excavated materials in fills and embankments as indicated on the Drawings to the extent needed. Coordinate with Owner and Engineer on locations for excess material placement.

B. The Contractor is responsible for disposing of all excess excavated materials from the site to a location approved by the Owner or Engineer and permitted with the local authorities.

C. Remove debris, junk, broken concrete, broken asphalt, rock, stones, stumps, logs, roots, and other unsuitable material from the site and dispose of it.

3.11 BLASTING

A. Blasting or other use of explosives is not permitted without City of Grand Junction approval

3.12 TRENCH EXCAVATION

A. Establish alignment and grade or elevation from offset stakes provided by the Contractor s surveyor.

B. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the Drawings

C. Comply with pipe specification sections regarding vertical and horizontal alignment and maximum joint deflection

D. Measure pipe cover depth vertically from top of pipe to finished ground or surface elevation

E. Do not open more trench in advance of pipe laying than is necessary to expedite the work; not more than 200 feet

F. Total length of open trench will be limited to 200 feet unless otherwise approved by the Engineer

G. Except where tunneling or boring is indicated on the Drawings, specified, required by jurisdictional agency or permitted by Engineer, excavate trenches by open cut from the surface

H. Limiting trench widths
   1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, embedment
   2. If needed to reduce earth loads to prevent sliding, cut banks back on slopes which extend not lower than 1 foot above the top of the pipe
   3. Stipulated minimum clearances are minimum clear distances, not minimum average distances
   4. Maximum trench width from six inches above the top of pipe to trench bottom is the pipe outside diameter plus 24 inches
   5. Limiting trench widths and permissible clearances from 6 inches above top of pipe to trench bottom for installed pressure and non-pressure piping

Pipe Size (inch)	Minimum Trench Width	Maximum Trench Width
3	1 6	2 6
4	1 6	2 6
6	1 6	2 6
8	1 8	2 8
10	2 0	3 0
12	2 0	3 0
16	2 8	3 8
18	3 0	4 0

24	3 6	4 6
36	4 6	5 0

6. If the width of the lower portion of the trench exceeds the maximum permitted, provide special pipe embedment, or concrete encasement as required by loading conditions
7. No excessive trench widths will be allowed to avoid the use of sheeting or shoring and bracing

I. Trench Side Walls
1. Will be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with applicable rules and regulations established for construction by the federal, state, and local ordinances and regulations
2. Sheet and brace where necessary and as specified herein
3. Excavate without undercutting

J. Trench Bottom
1. Will be thoroughly protected and maintained when suitable natural materials are encountered
2. Will be thoroughly compacted and in approved condition prior to placing gravel bedding, if required
3. Where in earth, trench bottoms for 6 inches and smaller pipe may be excavated below pipe subgrade and granular embedment provided or the trench may be graded to provide uniform and continuous support between bell holes or end joints of the installed pipe at the Contractor's option
4. Whenever so directed by Engineer, excavate to such depth below grade as Engineer directs and bring the trench bottom to grade with such material approved by Engineer
5. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined
6. PVC pipe will not be laid directly on trench bottom

K. Mechanical excavation
1. Do not use where its operation would damage buildings, culverts, or other existing property, structures, or utilities above or below ground; hand excavate only in such areas
2. Use mechanical equipment of a type and design which can be operated to provide the following:
   a. Rough trench bottom to a controlled elevation
   b. Uniform trench widths and vertical sidewalls are obtained from 1 foot above the top of the installed pipe to the bottom of the trench
   c. Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls
3. Do not undercut trench sidewalls
4. Recompact trench bottom disturbed by bucket teeth prior to placement of embedment material

L. Except as otherwise required, excavate trenches below the underside of pipes as indicated in the Drawings to provide for installation of granular embedment pipe foundation material

M. Whenever so directed by Engineer, excavate to such depth below grade as Engineer directs and bring the trench bottom to grade with such material as Engineer may direct

N. For unstable soils, provide concrete or other bedding as directed by Engineer

O. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined

P. Cuts in existing surface construction
   1. No larger than necessary to provide adequate working space
   2. Cut a clean groove not less than 1‰ inch deep along each side of trench or around perimeter of excavation area

   3. Remove pavement and base pavement to provide shoulder not less than 6 feet wide between cut edge and top edge of trench
   4. Do not undercut trenches, resulting in bottom trench width greater than top widths
   5. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation
   6. Remove pavement for connections to existing lines or structures only to the extent required for the installation
   7. Replace the pavements between saw cuts to match original surface construction

3.13 PIPE EMBEDMENT

A. Embed pipes above and below the bottom of pipe as indicated on the Drawings and as specified herein

B. Granular embedment
   1. Spread and surface grade granular embedment to provide continuous and uniform support beneath pipe at all points between pipe joints.
      a. Level bottom layer at proper grade to receive and uniformly support pipe barrel throughout length
      b. Barrel of pipe will have a bearing for its full length
   2. Form depressions under each joint to permit the proper jointing. No part of joint will be in contact with trench when pipe is placed in position
   3. After grading, aligning, and placing pipe in final position, and shoring home, deposit and compact sufficient embedment under and around each side of the pipe to hold the pipe in proper position and alignment during subsequent operations
   4. Place and compact embedment material uniformly and simultaneously on both sides of pipe to prevent displacement
   5. Complete embedment promptly after jointing operations and approval to proceed by Engineer

6. Granular embedment compaction by slicing with shovel or vibrating
    a. Maximum uncompacted thickness of layers: 6 inch
7. Compacted embedment will be compacted to 90 percent maximum density per ASTM D1557
    a. Maximum uncompacted depth thickness of horizontal layers: 8 inch

C. Arch and concrete encasement
1. Include in locations indicated on Drawings or where over-width trench conditions need correction as approved by Engineer
2. Install and form as indicated on Drawings or as specified
3. Concrete will have a 28-day minimum 3,000 psi compressive strength

D. Do not backfill until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems

3.14 TRENCH BACKFILL

A. Backfilling will be conducted in a continuous manner to prevent damage to the pipe and its coating and kept as close to the pipe laying operation as possible. Backfilling procedures will be in accordance with additional requirements, if any, of local authorities or private right-of-way agreements.

B. Compacted backfill
1. Provide full depth of trench above embedment at all locations
2. Beneath pavements, surfacing, driveways, curbs, gutters, walks or other surface construction or structures
3. In street or highway shoulders
4. Beneath fills and embankments

C. Where the trench for one pipe passes beneath the trench of another pipe, compact the backfill for the lower trench to the bottom of the upper trench

D. Site excavated materials
1. Place job excavated materials in 8 inches maximum uncompacted thickness, uniform layers
2. Increased layer thickness may be permitted for incohesive material if Contractor demonstrates to Engineer's satisfaction that specified compacted density will be achieved
3. Use methods and equipment appropriate to the material to be compacted to prevent transmission of damaging shocks to pipe
4. Thoroughly compact each layer to meet the moisture and compaction specifications herein.

E. Graded gravel
1. Deposit in uniform layers of 9 inches maximum uncompacted thickness

2. Compact with suitable vibrating roller or platform vibrator to not less than 70 percent relative density per ASTM D4253/D4254

F. Uncompacted backfill
   1. Compaction of backfill above pipe embedment in locations other than those specified, is required only to prevent future settlement
   2. May be placed by any method acceptable to Engineer which will not impose excessive concentrated or unbalanced loads, shock, or impact on, and will not result in displacement of installed pipe
   3. Until compacted depth over conduit exceeds 3 feet, do not drop fill material over 5 feet. Distance may be increased 2 feet for each additional 1 foot of cover

G. Finish the top portion of backfill with at least 4 inches of topsoil or as specified by landscaping specifications, whichever is greater, corresponding to, or better than, that underlying adjoining turf areas.

H. Trench backfill within the public right-of-way will conform to municipal street and utility standards.

I. Trench backfills through unimproved areas should be restored to previous conditions and left 3 above adjacent grades to allow for settlement. Seed all disturbed areas according to erosion control and landscape specifications.

J. Protection of trench backfill
   1. Where trenches are constructed in ditches or other water courses, protect backfill from erosion
   2. Install ditch checks where the ditch grade exceeds 1 percent
      a. Minimum depth: 2 feet below the original ditch or water course bottom for the full bottom width
      b. Minimum width: 18 inches into the side slopes
      c. Minimum thickness: 12 inches

3.15 DRAINAGE MAINTENANCE

A. Do not backfill trenches across roadways, drives, walks or other trafficways adjacent to drainage ditches or water courses prior to backfilling the trench on the upstream side of the trafficway to prevent impounding water after pipe is laid

B. Backfill so that water does not accumulate in unfilled or partially filled trenches

C. Remove materials deposited in roadway ditches or other water courses crossed by the trench line immediately after backfilling is completed and restore ditches and water courses to original section, grade, and contours

D. Do not obstruct surface drainage any longer than necessary

E. Provide and maintain temporary bridges and other structures across unfilled trenches as required to maintain traffic

F. Provide adequate storm flow conveyance through the site at all times during construction to avoid flooding of any buildings or adjacent property. Provide overland drainage routing when storm sewer inlets are not fully functioning due to erosion and sediment control measures.

3.16 FINAL GRADING

A. After completion of all other outside work and after backfilling is completed and settled, bring to grade at the indicated elevations, slopes and contours, all areas being graded on site

B. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work

C. Grade all surfaces for effective drainage, provide a 2 percent minimum slope except as otherwise shown on the Drawings

D. Provide a smooth transition between adjacent existing grades and new grades

E. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances

F. Slope grades to direct water away from buildings and prevent ponds from forming where not intended

G. Finish subgrades at lawns and unpaved areas to required elevations within a tolerance of plus or minus one (1) inch

H. Finish grades will be no more than 0.1 foot above or below those indicated

I. Finish all ditches, swales and gutters to drain readily

J. Coordinate final subgrade depth with finish landscape treatment and required topsoil depths

K. Topsoil
    1. Clean topsoil, free of plants and seed will be spread to 4-inch minimum depth.
    2. Reuse grubbings and surface topsoil containing plants and seeds in designated revegetation areas only.

3.17 SLOPE AND CHANNEL STABILIZATION

A. Cover channel banks, slopes, bottom and thalweg (water flowline at lowest point in channel) with erosion control fabric mat where grade is steeper than 4H to 1V and where indicated on the Drawings

B. Lay fabric smoothly on surface, bury top end of each section in 6-inch deep excavated topsoil trench. Provide 6-inch overlap minimum of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil

C. Secure outside edges and overlaps at 48 inch intervals with 4-inch to 6-inch U-shaped type pins or wooden stakes depending on ground condition

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches

F. Maintain integrity of erosion control fabric

G. Prior to laying fabric, seed disturbed areas under provisions of related seeding specification sections or as specified on Drawings.

3.18 SETTLEMENT

A. Warranty for settlement of all fills, embankments, and backfills is stipulated in the General Conditions from final completion of Contract under which Work is performed

B. Repair or replace within 30 days after notice by Engineer or Owner

3.19 FIELD QUALITY CONTROL

A. Provide under provisions of General Conditions and Division One Specifications

B. Coordinate testing with Owner. Owner will employ testing agency for field testing to determine compliance of in-place and backfill materials and compaction in accordance with the specifications, and to verify design bearing capacities.

C. It is the Contractor s responsibility to initiate, coordinate and accommodate all required tests and inspections including conformance with requirements of all applicable public agencies and authorities. Contractor will be responsible for coordinating the testing requirement with testing agency and provide the testing agency 48-hour advance notification to schedule tests.

D. Fills and Embankment Testing
1. Two moisture-density relationship tests, ASTM D698, on each type of fill material
2. One in-place compaction test for each 5,000 square feet every 1.5 feet of vertical lift of material placed
3. Additional in-place compaction tests at the discretion of the Owner

E. Pipe Embedment and Backfill Testing

1. Two moisture-density relationship tests, ASTM D698, or two relative density tests, ASTM D4253/D4254, as appropriate for each type of embedment on backfill material proposed, except granular embedment material
2. One in-place compaction test every 200 lineal feet of trench in the compacted embedment zone and at every 1.5 feet of vertical lift of backfill materials, per ASTM D6938
3. One in-place compaction test near top of trench for trench depth of 2 feet or less, per ASTM D6938 4. Additional in-place compaction tests at the discretion of the Owner

F. Pavement and Structural Subgrade Testing
1. At a minimum, two moisture-density relationship tests, ASTM D698, or two relative density tests, ASTM D4253/D4254, as appropriate and adequate for each type backfill material proposed.
2. Perform tests for each footing, concrete site feature, and drainage structure subgrade. Perform tests at every 100 linear feet of subgrade of foundation walls, retaining walls, and every 150 feet for curbing, pans, drainage features, walks, etc. (or portions thereof). Perform tests every 2,000 square feet required of building slab area, exterior slabs and pavement/flatwork areas (with no less than 3 tests). Test at subgrade and at every vertical lift of backfill materials placed.
3. Additional in-place compaction tests at the discretion of the Owner

G. Inspection and approval
1. A qualified Geotechnical Engineer will inspect the natural soil at bottom of excavations for structures

2. Do not prepare subgrade or place concrete until Geotechnical Engineer s inspection has taken place and any resulting recommendations of the Geotechnical Engineer have been fulfilled or until the inspection has been waived by the Geotechnical Engineer
3. Prior to placement of structural fill, overexcavated foundations subgrades will be observed and tested by a qualified Geotechnical Engineer to ensure suitable bearing materials exist
4. Geotechnical Engineer will provide a letter to Engineer to confirm the presence of suitable subgrade material and properly placed fill materials by Contractor in accordance with Drawings and geotechnical report.

H. Retesting of failed compaction will be performed by Geotechnical Engineer for Owner, but paid for the Contractor

END OF SECTION

SECTION 02370

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This work consists of temporary measures needed to control erosion and water pollution. These temporary measures will include, but not be limited to, berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains, and other erosion control devices or methods. These temporary measures shall be installed at the locations where needed to control erosion and water pollution during the construction of the project and during site restoration, and as directed by ENGINEER, and as shown on the drawings.

B. The Erosion Control Plan presented in the drawings serves as a minimum for the requirements of erosion control during construction. Contractor has the ultimate responsibility for providing adequate erosion control and water quality throughout the duration of the project. Therefore, if the provided plan is not working sufficiently to protect the project areas, then Contractor shall provide additional measures as required to obtain the required protection.

1.2 RELATED SECTIONS [DELETE OR ADD SECTIONS AS NEEDED.]

A. Section 01500 Construction Facilities and Temporary Controls

B. Section 02220 Demolition

C. Section 02300 Earthwork

D. Section 02740 Flexible Paving

E. Section 02750 Rigid Paving

F. Section 02950 Seeding

1.3 REFERENCES AND STANDARDS

A. City of Grand Junction Engineering Division Standard Specifications for Construction of Underground Utilities Waterlines, Sanitary Sewers, Storm Drains, Underdrains, and Irrigation Systems

B. City of Grand Junction Engineering Division Standard Specifications for Road and Bridge Construction

C. CDOT Colorado Department of Transportation

D. UDFCD Urban Drainage and Flood Control District

E. CDPHE Colorado Department of Public Health and Environment

1.4 SUBMITTALS

A. Submit under provisions of Division One specifications.

B. Submit the following information:
   1. Erosion Control Plan,
   2. Construction schedule for Erosion Control per Article Scheduling,
   3. Sequencing Plan per Article Scheduling,
   4. All applicable permits for Erosion Control.

C. Product data: Submit on all products or materials supplied herein.

1.5 REGULATORY REQUIREMENTS

A. Obtain and comply with all requirements of City of Grand Junction and CDPHE Stormwater and/or Groundwater Discharge Permits, as required.

B. 401 Construction Dewatering Industrial Wastewater Permit (Construction Dewatering Permit 401):
   1. Contractor shall apply for and obtain a Construction Dewatering Permit 401 from the Colorado Department of Public Health and Environment.
   2. All costs for this permit shall be the responsibility of Contractor.
   3. This permit requires that specific actions be performed at designated times.
   4. Contractor is legally obligated to comply with all terms and conditions of the permit including testing for effluent limitations.
   5. Contractor shall allow the Colorado Department of Public Health and Environment or other representatives to enter the site to test for compliance with the permit.
   6. Non-compliance with the permit can result in stoppage of all work.

C. In the event of conflict between these requirements and erosion and pollution control laws, rules, or regulations of other Federal, State, or local agencies, the more restrictive laws, rules, or regulations shall apply.

1.6 SCHEDULING

A. Sequencing Plan:
   1. Contractor shall submit a sequencing plan for approval for erosion control in conformance with Contractor s overall Construction Plan for approval by Owner

2. Changes to the Erosion Control Sequencing Plan may be considered by Owner only if presented in writing by the Contractor.

B. Temporary Erosion Control:
   1. When so indicated in the Contract Documents, or when directed by Owner. Contractor shall prepare construction schedules for accomplishing temporary erosion control work including all maintenance procedures.
   2. These schedules shall be applicable to clearing and grubbing, grading, structural work, construction, etc.

C. Contractor shall submit for acceptance the proposed method of erosion control on haul roads and borrow pits and a plan for disposal of waste material.

D. Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Temporary erosion control measures shall then be used to correct conditions that develop during construction.

E. Work shall not be started until the erosion control schedules and methods of operations have been accepted.

PART 2 PRODUCTS

2.1 MATERIALS

A. Comply with all applicable municipal or local Municipal Separate Storm Sewer System (MS4) requirements.

B. All materials shall be submitted for approval prior to installation.

C. Natural or biodegradable materials shall be reasonably clean, free of deleterious materials, and certified weed free. Materials may include, but are not limited to, hay bales, straw, fiber mats, fiber netting, wood cellulose, fiber fabric, gravel.

D. Grass Seed:
   1. Temporary grass cover (if required) shall be a quick growing species, suitable to the area, in accordance with local criteria and permit requirements, which will provide temporary cover, and not compete with the grasses sown for permanent cover.
   2. All grass seed shall be approved by Owner and Engineer and in accordance with local regulations prior to installation.

E. Fertilizer and soil conditioners shall be approved by Owner and in accordance with local regulations prior to installation.

F. Silt Fence Fabric: woven polypropylene
   1. Mirafi 100X, "Envirofence"

2. Or accepted substitution

[

G. Temporary Slope Stabilization Mat (short term): 1.5 pound photodegradable polypropylene top and bottom nets, 100% straw fiber matrix, with a longevity of 12 months.
   1. North American Green S150
   2. Or accepted substitution

H. Temporary Slope Stabilization Mat (extended term): 3.0 pound UV-stable polypropylene top net, 1.5 pound photodegradable polypropylene bottom net, 70% straw/30% coconut fiber matrix with a longevity of 24 months.
   1. North American Green SC150
   2. Or accepted substitution

I. Biodegradable Slope Stabilization Mat (short term): 9.3 pound leno-woven biodegradable jute top net, 7.7 pound woven biodegradable jute bottom net, 100% straw fiber matrix with a longevity of 12 months. 1. North American Green S150BN
   2. Or accepted substitution

J. Biodegradable Slope Stabilization Mat (extended term): 9.3 pound leno-woven biodegradable jute top net, 7.7 pound woven biodegradable jute bottom net, 70% straw/30% coconut fiber matrix with a longevity of 18 months.
   1. North American Green SC150BN
   2. Or accepted substitution

K. Permanent Channel Stabilization Mat [flow velocities between 9.5 (unvegetated) and 15 (vegetated) fps]: 5.0 pound UV-stable polypropylene top and bottom nets, 24 pound UVstable polypropylene corrugated center net, 70% straw/30% coconut fiber matrix.
   1. North American Green SC250
   2. Or accepted substitution

L. Permanent Channel Stabilization Mat [flow velocities between 10.5 (unvegetated) and 20 (vegetated) fps]: 8.0 pound UV-stable polypropylene top and bottom nets, 24 pound UVstable polypropylene corrugated center net, 100% coconut fiber matrix.
   1. North American Green SC350
   2. Or accepted substitution

M. Permanent Channel Stabilization Mat [flow velocities between 12.5 (unvegetated) and 25 (vegetated) fps]: 24 pound UV-stable polypropylene top and bottom nets, 24 pound UVstable polypropylene corrugated center net, 100% polypropylene fiber matrix.
   1. North American Green P550
   2. Or accepted substitution

PART 3 EXECUTION

3.1 GENERAL

A. All temporary and permanent erosion and sediment control practices will be maintained and repaired as needed to ensure continued performance of their intended function.

B. Owner will monitor Contractor s erosion control methods. If the overall function and intent of erosion control is not being met, Owner will require Contractor to provide additional measures as required to obtain the desired results.

C. The erosion control features installed by Contractor shall be adequately maintained by Contractor until the project is accepted.

3.2 PROTECTION OF ADJACENT PROPERITES

A. Properties adjacent to the site of a land disturbance shall be protected from sediment deposition.

B. In addition to the erosion control measures required on the drawings, perimeter controls may be required if damage to adjacent properties is likely, and may include, but is not limited to:
   1. Vegetated buffer strip around the lower perimeter of the land disturbance.
      a. Vegetated buffer strips may be used only where runoff in sheet flow is expected and should be at least twenty (20) feet in width.
   2. Sediment barriers such as straw bales, erosion logs, and silt fences.
   3. Sediment basins and porous landscape detention ponds.
   4. Combination of above measures.

3.3 CONSTRUCTION

A. Stabilization of Disturbed Areas:
   1. Temporary sediment control measures shall be established within five (5) days from time of exposure or disturbance.
   2. Permanent erosion protection measures shall be stablished within five (5) days after final grading of areas.

B. Stabilization of Sediment and Erosion Control Measures:
   1. Sediment barriers, perimeter dikes, and other measures intended to either trap sediment or prevent runoff from flowing over disturbed areas shall be constructed as a first step in grading and be made functional before land disturbance takes place.
   2. Earthen structures such as dams, dikes, and diversions shall be stabilized within five (5) days of installation.
   3. Stormwater outlets shall also be stabilized prior to any upstream land disturbing activities.

C. Stabilization of Waterways and Outlets:

1. All onsite stormwater conveyance channels used by Contractor for temporary erosion control purposes shall be designed and constructed with adequate capacity and protection to prevent erosion during storm and runoff events.
2. Stabilization adequate to prevent erosion shall also be provided at the outlets of all pipes and channels.

D. Storm Sewer Inlet Protection: All storm sewer inlets which are made operable during construction or which drain stormwater runoff from a construction site shall be protected from sediment deposition by the use of filters.

E. Construction Access Routes:
1. Wherever construction vehicles enter or leave a construction site, a Stabilized Construction Entrance is required.
2. Where sediment is transported onto a public road surface, the roads shall be cleaned thoroughly at the end of each day.
3. Sediment shall be removed from roads by shoveling or sweeping and be transported to a sediment controlled disposal area.
4. Street washing shall be allowed only after sediment is removed in the manner described above.

3.4 DISPOSITION OF TEMPORARY MEASURES

A. All temporary erosion and sediment control measures shall be disposed of within thirty (30) days after final site stabilization is achieved or after the temporary measures are no longer needed as determined by Owner

B. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion.

C. Substantial Completion of Erosion Control Measures:
1. At the time specified in the Contract Documents, and subject to compliance with specified materials and installation requirements, Contractor shall receive a Substantial Completion Certificate for temporary erosion control measures.
2. Maintenance of Erosion Control Measures after Substantial Completion: Contractor shall be responsible for maintaining temporary erosion control measures as specified in the drawings and Contract Documents until such time as work has been accepted by Ownerand as specified in Division 1 for Closeout Procedures.

PART 4 MEASUREMENT FOR PAYMENT

4.1 LUMP SUM

A. Contractor shall include in the bid price for erosion and sedimentation control work a minimum of all items shown on the Erosion Control Plan, as required by City of Grand

Junction, and any additional items that may be needed to control erosion and water pollution throughout all phases of the project.

END OF SECTION

SECTION 02530 SANITARY SEWERAGE SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Polyvinyl chloride (PVC) non-pressure pipe for gravity sanitary sewer with all jointing materials, fittings, and other appurtenances required for a complete installation

B. All precast manholes complete with steps, ring and cover as required

1.2 RELATED SECTIONS

A. Section 02300 Earthwork

1.3 REFERENCES

A. City of Grand Junction Engineering Division Standard Specifications for Construction of Underground Utilities Waterlines, Sanitary Sewers, Storm Drains, Underdrains, and Irrigation Systems

B. American Society for Testing and Materials (ASTM):
1. A48 Standard Specification for Gray Iron Castings
2. A126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
3. A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
4. A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
5. A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
6. C33 Standard Specification for Concrete Aggregates
7. C150 Standard Specification for Portland Cement
8. C443 Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
9. C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
10. C497 Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
11. C913 Standard Specification for Precast Concrete Water and Wastewater Structures
12. C923 Standard Specification for Resilient Connectors Between Reinforced Concrete manhole Structures, Pipes, and Laterals
13. C1227 Standard Specification for Precast Concrete Septic Tanks
14. C1619 Standard Specification for Elastomeric Seals for Joining Concrete
15. C1821 Standard Practice for Installation of Underground Circular Precast Manhole Structures

16. D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
17. D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
18. D1330 Standard Specification for Rubber Sheet Gaskets
19. D1351 Standard Specification for Thermoplastic Polyethylene Insulation for Electrical Wire and Cable
20. D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC)
21. D1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
22. D2122 Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
23. D2240 Standard Test Method for Rubber Property Durometer Hardness
24. D2321 Standard Specification for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
25. D2466 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
26. D2774 Standard Specification for Underground Installation of Thermoplastic Pressure Piping
27. D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
28. D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
29. D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
30. D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
31. D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
32. D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
33. D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
34. F412 Standard Terminology Relating to Plastic Piping Systems
35. F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
36. F714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
37. F679 Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
38. F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing
39. F2164 Standard Specification for Field Leak Testing of Polyethylene (PE) and

Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

C. American Water Works Association (AWWA):
   1. C104 Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
   2. C105 Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
   3. C111 Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
   4. C115 Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Grey-Iron Threaded Flanges
   5. C150 Standard for Thickness Design of Ductile-Iron Pipe
   6. C151 Standard for Ductile-Iron Pipe, Centrifugally Cast
   7. C504 Standard for Rubber-Seated Butterfly Valves
   8. C512 Standard for Air Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
   9. C600 Standard for Installation of Ductile Iron Mains and Their Appurtenances
   10. C900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
   11. C905 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution
   12. M23 PVC Pipe: Design and Installation D.

Occupational Safety and Health Administration (OSHA)

A. American Welding Society (AWS):
   1. D1.1 Structural Welding Code Steel

B. National Association of Corrosion Engineers (NACE):
   1. SP0169 Control of External Corrosion on Underground or Submerged Metallic Piping Systems
   2. SP0286 Electrical Isolation of Cathodically Protected Pipelines

C. Plastics Pipe Institute (PPI):
   1. TR-4 HDB / HDS / SDB / PDB / MRS Ratings for Thermoplastic Piping Materials or Pipe
   2. TR-33 Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe
   3. Handbook of Polyethylene Pipe
   4. Polyethylene Piping Systems Field Manual for Municipal Water Applications
   5. Material Handling Guide

1.4 SUBMITTALS

A. Submit under provisions of Division 1 Specifications

B. Shop Drawings: Provide piping layout and assembly drawings with fitting dimensions. Provide sufficient information to verify compliance with specifications

C. Product Data: Provide manufacturer's catalog information with dimensions, material and assembled weight.
   1. Pipe materials
   2. Special, fitting, and coupling details
   3. Gasket materials
   4. Valves
   5. Laying and installation schedule
   6. Specifications and data sheets
   7. Affidavits of compliance for protective shop coatings and linings

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements and applicable standards. Provide prior to shipment.

E. Test Reports: Submit reports of field exfiltration/infiltration, mandrel and lamp tests under provisions of Division 1 Specifications

F. TV Inspection Files: Submit videos and reports

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1 Specifications

B. Accurately record actual locations of piping mains, valves, connections, invert elevations, and any mapped or unmapped utilities

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with City of Grand Junction, CDPHE Stormwater and/or Groundwater Discharge Permit, notes on the drawings and as specified herein.

B. Manufacturers shall be experienced in the design and manufacturing of materials specified herein for a minimum period of 5 years

C. All PVC pipe, regardless of diameter, shall be supplied by a single manufacturer

D. Perform Work in accordance with the Colorado Department of Public Health and Environment (CDPHE) and Mesa County

E. Contractor shall conduct visual inspection before installation

F. Provide manufacturer's name and pressure rating marked on piping and valves

G. Provide piping complete with all fittings, jointing materials, supports, joint restraint system, and necessary appurtenances for watertight, fully operational sewer lines

1.7 REGULATORY REQUIREMENTS

A. Conform to all municipal codes and ordinances, laws and regulations of Mesa County, City of Grand Junction, CDPHE, the notes and details on the drawings and as specified herein, and CDPHE Stormwater Management and/or Construction Dewatering Permit

B. In case of apparent conflict, CDPHE requirements govern over these specifications

C. Contractor, not Owner, shall prepare, submit, pay, and otherwise obtain all necessary permits from all appropriate entities

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1 Specifications

B. During loading, transporting and unloading, exercise care to prevent damage to material
   1. Use nylon slings only
   2. Do not drop pipe or fittings
   3. Do not roll or skid against pipe already on ground
   4. Repair any damage done to coating or lining
   5. Handle per manufacturer's recommendations
   6. Store rubber gaskets in cool dark location
   7. Store all material on wood pallets or timbers

C. Shop coated materials shall be handled, transported, stored and shipped in a manner that will prevent damage to the coating and lining. Coating or lining damaged in handling or other operations shall be repaired to the approval of and at no additional cost to the Owner

D. Any damage to the pipe or the protective coating from any cause during the installation of the pipeline and before final acceptance by the Engineer shall be repaired in accordance with these Specifications and at no additional cost to the Owner

E. Pipe
   1. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation
   2. PVC pipe has reduced flexibility and impact resistance as temperatures approach and drop below freezing. Extra care should be used in handling PVC pipe during cold weather
   3. Do not store PVC pipe uncovered in direct UV light
   4. Pipe stored along the trench side shall be suitably supported off the ground to avoid damage to the coating

F. Valves
   1. Prepare valves for shipping as follows:

a. Ensure that valves are dry and internally protected against rust and corrosion
b. Protect vales against damage to threaded ends, flange faces, and weld ends
c. Seal valve ends to prevent entry of foreign materials into valve body
d. Set valves in best position for handling
e. Set valves closed to prevent damage

2. Deliver and store valves and accessories in shipping containers with labeling in place 3. Storage: Use the following precautions for valves during storage:
a. Do not remove end protectors unless necessary for inspection; then reinstall for storage
b. Protect valves from weather by storing indoors or support valves off ground or pavement in watertight enclosures when outdoor storage is necessary

G. Precast Concrete Structures
1. Transport and handle precast concrete units with equipment to protect from dirt and damage
2. Do not place precast concrete units in position which will cause damage
3. Handle precast concrete structures by means of lifting inserts. Do not move from manufacturer s yard until curing is complete.

1.9 JOB CONDITIONS

A. All work which requires the interruption of active sanitary sewer service lines must be completed as quickly as possible in order to minimize inconvenience to customers and risk to the City of Grand Junction and coordinated as specified in Division 1

B. Underground Obstructions
1. Underground Obstructions known to Engineer are shown on Drawings
a. Locations shown may prove inaccurate and other obstructions not known to Engineer may be encountered
b. Contractor shall field locate and verify all obstructions where or not shown on the Drawings
2. Notify each utility owner and request utility be field located by surface reference at least 48 hours prior to trenching or excavation
3. Expose and verify size, location and elevation of underground utilities and other obstructions where conflicts might exist sufficiently in advance to permit changes in the event of a conflict
a. Notify Engineer and Owner in case of a conflict
b. In case of a conflict, the proposed work may be changed by Engineer
4. Maintain, protect, and support by shoring, bracing or other means existing utilities and appurtenances

PART 2 PRODUCTS

2.1 PIPE, MANHOLES, AND ACCESSORIES

A. Comply with the *City of Grand Junction Standard Specifications for Construction of Underground Utilities*.

2.2 SOIL MATERIALS

A. Furnish pipe bedding and cover as specified in Section 02300

PART 3 EXECUTION

3.1 INSPECTION

A. Examine pipe and fittings and do not use individual sections containing cracks, dents, abrasions, and other defects

3.2 INSTALLATION OF PVC GRAVITY SANITARY SEWER PIPE (NON-PRESSURE)

A. Trenching, Pipe Embedment, Backfill, and Compaction: See Section 02300

B. Install pipe in accordance with ASTM D2321 as modified herein or on the drawings

C. Cutting
   1. Cut and bevel ends in accordance with manufacturer's standard recommendations
   2. Machine cut ends smooth and square to proper dimensions
   3. Do not cut with a cold chisel, iron pipe cutter, flame or any other method that may fracture the pipe or leave ragged, uneven edges
   4. Remove burrs and wipe off all dust and dirt from jointing surfaces

D. Pipe Laying
   1. Inspect pipe and accessories for cracks and other defects before lowering into trench
   2. Repair or replace any defective, damaged or unsound pipe
   3. Remove all dirt and foreign material from the inside of pipe before laying
   4. Check bedding for firmness and uniformity of surface immediately before laying each section of pipe
   5. Carefully lower pipe, fittings, valves, and accessories into the trench with derricks, ropes, and other suitable equipment to prevent damage
   6. Do not dump or drop pipe or accessories into trench
   7. Lay to lines and grades indicated on drawings or as specified
      a. Lay piping beginning at a low point of system, true to line and grade with unbroken continuity of invert.
      b. Closely joint to form a smooth flow line
      c. Place bell end or groove ends of piping facing upstream
      d. Maximum length of pipe that can be used without exceeding the allowable deflection at a coupling shall be determined
      e. Maximum deflection at flexible couplings as recommended by the manufacturer
      f. Maximum deflection at a joint: As recommended by the manufacturer, but not more than 3-1/2 inches

8. Utilize implements, tools, and facilities as recommended by the manufacturer
9. Keep pipe clean during and after laying
10. Close all open ends with watertight expandable type sewer plugs or test plugs
11. Remove and relay any pipe which has floated
12. Do not lay pipe when
    a. There is water in the trench
    b. Trench conditions are unsuitable
    c. Weather conditions are unsuitable
13. Use acceptable adaptors at manhole and structure connections to provide a watertight seal and flexibility; provide a short length of pipe outside each connection
14. Protect from lateral displacement by placing and compacting bedding material under provisions of Section 02300

E. Jointing
1. Assemble in accordance with the manufacturer's instructions
2. Wipe clean pipe ends, gasket and gasket groove before inserting gasket
3. Apply lubricant furnished by the pipe manufacturer to the gasket and the outside of the spigot end
4. Utilize an assembly tool as recommended by the manufacturer to center the sleeve over the spigot end
5. Insert the spigot end to the reference mark
6. Check gasket location after assembly with a suitable gage
    a. Gasket locations to be the distance from the sleeve and recommended by the coupling manufacturer for their full circumference
    b. If not within the required limits, disassemble and reassemble the joint

F. Fittings
1. Install utilizing standard methods
2. Lower into trench with rope or other means to prevent damage
3. Attach rope around the exterior
4. Do not attach rope through the interior
5. Carefully connect to pipe or other facility
6. Check joint to insure a sound and proper joint

G. Water Line and Sanitary Sewer Crossings
1. Whenever possible lay water mains over sanitary sewers to provide vertical separation of at least 18-inches between invert of water main and crown of sewer.
2. If above separation cannot be met, provide one continuous length of watertight sewer pipe 20 feet long centered on water main with joints between different pipes encased in 6-inch minimum of concrete and extending 6-inches either side of joint or encase sewer pipe in 6-inches of concrete completely around pipe, for not less than 10 feet either side of water main.
3. Water Mains Passing Under Sewers: If vertical separation less than 18-inches provide structural support for sewer

3.3 MANHOLE PREPARATION

A. Verify items provided by other section of Work are properly sized and located

B. Verify that built-in items are in proper location, ready for roughing into Work

C. Verify excavation for manholes is correct

D. Excavation, Backfill, Subgrade Compaction: Refer to Section 02300 for requirements

E. Rock Subbase
   1. Remove water and place 6-inch minimum depth
   2. Vibrate for compaction
   3. Level top to accept precast sections with uniform bearing all around
   4. If material below vault is unsuitable, excavate as directed by the Engineer and backfill to grade with 1-1/2 inch minus rock and compact

3.4 PLACING MANHOLE

A. Place manhole sections plumb and level, trim to correct elevations

B. Clean ends of sections and place double mastic gasket

C. Fill inside and outside of joint completely with non-shrink grout and trowel smooth

D. Cure non-shrink grout using approved methods outlined in Division 3 Specifications.

E. Set cover rings and covers level without tipping, to correct elevations or set cover rings and covers with slight tip to match cross slope of finished surface where directed by Engineer

F. Completed manholes shall be rigid and watertight

G. Coordinate with other sections of work to provide correct size, shape, and location

3.5 PREFORMED GASKETS

A. Remove and replace manhole sections which have chipped or cracked joints

B. Thoroughly clean section joints

C. Install gasket in conformance with manufacturer’s recommendations

D. Only use primer furnished by gasket manufacturer

3.6 MANHOLE INVERT

A. Place concrete in bottom of manhole and form smooth transition. Trowel smooth and brush for non-skid finish. Slope bench 1 inch per foot for drainage to invert.

B. Invert shape to conform to radius of pipe it connects

C. Remove all rough sections or sharp edges which tend to obstruct flow or cause material to snag. Remove all grout droplets from invert

D. Construct in conformance with standard drawings

3.7 MANHOLE RINGS AND COVERS

A. Place rings in bed of non-shrink grout on top of manholes and apply Ramnek as needed.

B. Ensure no infiltration will enter manhole at this location

C. Carry non-shrink grout over flange of ring and apply Ramnek as needed.

D. Set top of ring flush with all surfaces subject to foot and vehicular traffic or as required by the City og Grand Junction

E. Set manhole ring and cover 1/4-inch to 1/2-inch below roadway surface

F. Use precast grade rings for height adjustment of manhole ring and cover

3.8 CONNECTION TO EXISTING MANHOLES

A. Maintain flow at all times

B. Prior approval of proposed method for maintaining flow must be obtained from Engineer

C. Cover area around new pipe with non-shrink grout and or waterstop gasket to ensure a watertight structure

D. Make connection during low flow periods

3.9 FIELD QUALITY CONTROL PIPE

A. General
   1. Utilize pressures, media and pressure test durations as specified on Piping Schedules
   2. Isolate equipment which may be damaged by the specified pressure test conditions
   3. Perform pressure test using calibrated pressure gauges and calibrated volumetric measuring equipment to determine leakage rates. Select each gauge so that the specified test pressure falls within the upper half of the gauge's range. Notify Engineer 24 hours prior to each test
   4. Completely assemble and test new piping systems prior to connection to existing pipe systems
   5. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior to final acceptance
   6. Provide all necessary equipment and perform all work required in connection with the tests and inspections

7. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination

B. Testing methods and criteria

1. Ductile iron pipe systems: Test ductile iron pipe in accordance with the latest version of AWWA C600. Per AWWA C600, the allowable leakage in gallons per hour from buried ductile iron pipe systems shall be less than the length of pipeline tested in feet, times the nominal diameter of the pipe in inches, times the square root of the average test pressure during the leakage test in pounds per square inch (gauge), divided by 133,200. The duration of each leakage test shall be two hours. The equation for computing the allowable leakage is:

   i) $L = (SDP^{0.5})/133,200$

   Where:
   L = allowable leakage, in gallons per hour
   S = length of the pipe tested, in feet
   D = nominal diameter of the pipe, in inches
   P = average test pressure during the leakage test, in psi

2. Polyethylene (PE) pressure pipe systems: Test PE pressure pipe in accordance with the latest version of ASTM F2164. For PE pipe, pressurize the test section to the system test pressure and maintain this pressure for four hours by adding make-up water. After this initial expansion phase, reduce the test pressure by 10 PSI and stop adding make-up water. If the test pressure remains steady (within 5% of the target value) for one hour, no leakage is indicated
3. Unless otherwise specified, the allowable leakage in gallons per hour from other buried liquid piping systems shall be less than the length of pipeline tested in feet, times the nominal diameter of the pipe in inches, times the square root of the average test pressure during the leakage test in pounds per square inch (gauge), divided by 133,200. The duration of each leakage test shall be two hours. The equation for computing the allowable leakage is:

   i) $L = (SDP^{0.5})/133,200$

   Where:
   L = allowable leakage, in gallons per hour
   S = length of the pipe tested, in feet
   D = nominal diameter of the pipe, in inches
   P = average test pressure during the leakage test, in psi

4. The following liquid piping systems shall have zero allowable leakage at the specified test pressure throughout the specified duration: a. Exposed piping
   b. Buried insulated piping
   c. Buried or exposed piping carrying liquid chemicals
5. Hydrostatic pressure testing

a. For buried piping: Perform testing after backfill and proper compaction of trenches. Where lines are installed under roadways and parking areas, perform tests after completion of final grade preparation and prior to application of surface courses. Notify Engineer at

least 48 hours prior to testing. Provide temporary restraints for expansion joints for additional pressure load under test. Isolate equipment in piping system with rated pressure lower than pipe test pressure by valves or blind flanges 6. Low pressure air test

a. Check pneumatic plugs for proper sealing
b. Place plugs in line at each manhole and inflate to 25 PSIG
c. Introduce low pressure air into sealed line segment until air pressure reaches 4 PSIG greater than ground water that may be over the pipe. Use test gauge conforming to ANSI B40.1 with 0 to 15 PSI scale and accuracy of 1 percent of full range
d. Allow 2 minutes for air pressure to stabilize
e. After stabilization period (3.5 PSIG minimum pressure in pipe) discontinue air supply to line segment
f. Acceptable time for loss of 0.5 PSIG of air pressure in plastic pipe shall be:

	Minimum Time for 0.5 PSIG Loss in Plastic Pipe (minutes: seconds)								
Pipe Size	≤100 Feet	150 Feet	200 Feet	250 Feet	300 Feet	350 Feet	400 Feet	450 Feet	500 Feet
4 Inch	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6 Inch	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12	3:34
8 Inch	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42	6:20
10 Inch	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54	9:53
12 Inch	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50	14:14
15 Inch	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02	22:16
18 Inch	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51	32:03
21 Inch	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16	43:38
24 Inch	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17	56:59
27 Inch	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54	72:07
30 Inch	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07	89:02

NOTE: If there has been no (zero psi) drop after 1 hour of testing, the test section shall be accepted and the test completed

h. For pipe lengths not shown in the above table, use the two nearest pipe lengths to estimate the minimum time necessary for a 0.5 PSIG loss
i. For concrete pipe 24" and smaller refer to ASTM C-924 for acceptable test procedures and times
j. For concrete pipe 24" and larger refer to ASTM C-1103 for acceptable test procedures and times

7. Hydrostatic Exfiltration/Infiltration Test
   a. Hydrostatic Exfiltration Test (groundwater level is below the top of pipe)
      i) Allowable Leakage rate: 50 gallons per IN diameter per mile of pipe per day
   b. Hydrostatic Infiltration Test (groundwater level is above the top of pipe)
      i) Allowable leakage rate: 50 gallons per IN diameter per mile of pipe per day
8. Notify Engineer of the date and time for each pipe test 1 week prior to actual testing

C. Exfiltration/Infiltration Test
   1. Perform an exfiltration test on each reach of sanitary service and sewer pipe between manholes or discharge
      a. Test the first reach prior to backfilling and before installing any of the remaining pipe
      b. Provide all necessary piping between the reach to be tested and the water supply, together with all required materials and equipment
      c. Methods used, scheduling, and duration of tests shall be acceptable to Engineer
      d. Air testing may be allowed: Submit complete information to Engineer for review describing the proposed test method including the method of testing manholes before beginning testing
   3. Procedure
      a. Block off all manhole openings except those connecting with the reach under test
      b. Fill the line
         i) Average depth: 10 feet above invert except as required by manhole depth ii) Maximum depth at lower end: 25 feet above crown iii) Minimum depth at upper end: 5 feet above crown
      c. Add and measure water as required to maintain a constant level
         i) Maximum exfiltration/infiltration: 0.039 gallons per inch of nominal diameter per hour per 100 feet of pipe.
         ii) Manholes considered section of 48-inch pipe
         iii) Maintain test for at least 2 hours or as long as necessary, in the inspector s opinion, to locate all leaks
   4. Repair and retest any reach which exceeds the allowable exfiltration/infiltration

D. Infiltration
   1. At any time prior to expiration of the correction period, infiltration exceeds 0.039 gallons per inch of nominal diameter per 100 feet per hour, locate the leaks and make repairs

E. Dielectric Testing Methods and Criteria
   1. Provide electrical check between metallic non-ferrous pipe or appurtenances and ferrous elements of construction to assure discontinuity has been maintained
   2. Wherever electrical contact is demonstrated by such test, locate the point or points of continuity and correct the condition
   3. Check the integrity of each cadwelding connection using a light hammer blow at a 45 degree angle

F. Pipe Deflection Test
   1. No sooner than 30 days after placement and compaction of backfill, but prior to placement of permanent surface materials, clean and mandrel each line to detect obstructions (deflections, joint offsets, lateral pipe intrusions, etc.)
   2. Use a rigid mandrel with diameter of at least 95 percent of the pipes specified average inside diameter and a length of the mandrel circular portion at least equal to the nominal pipe diameter

3. Maximum allowable deflection is 5 percent of the base internal diameter. Mandrel outside diameters in inches are as follows:

Pipe Size	Base I.D.	Mandrel O.D.
8	7.764	7.38

4. Pull the mandrel through the pipe by hand
5. Relay or replace all pipe exceeding the 5 percent deflection at no additional cost to the Owner
6. Retest repaired sections
7. Maximum allowable deflection at end of one year correction period, 7-1/2 percent of the base internal diameter tested in the same manner. Uncover and repair sections exceeding the allowable deflection

G. TV Inspection will be provided as requested by Owner and approved by the Engineer at the expense of the Contractor. Digital video files to be provided with reach noted, footage, inverts, and manhole number at each end, and pipe size and type [

H. All sewer lines shall be inspected visually to verify accuracy of alignment and freedom from debris and obstructions. The full diameter of the pipe should be visible when viewed between consecutive manholes. The method of test can be photography, closed circuit television or visually lamping with mirrors and lights.

I. Lamp Test
1. Each section between manholes will be lamped by Contractor in the presence of engineer
2. A true circle will be required in the lamp tests to indicate a properly constructed sewer line
3. Repair any sections not passing the lamp test at Contractor s expense.

3.10 FIELD QUALITY CONTROL MANHOLES

A. Test all manholes:
1. Vacuum test:
a. Plug all inlets and outlets in such a manner as to prevent displacement of plugs
b. Install and operate vacuum tester head assembly in accordance with equipment specifications and manufacturer instructions
c. Attach the vacuum pump assembly to the proper connection on the test head assembly. Ensure that vacuum inlet/outlet valve is closed
d. Inflate sealing element to twice the pressure test to be used. Do not over inflate
e. Start vacuum pump assembly engine and allow preset RPM to stabilize
f. Open vacuum inlet/outlet valve and evacuate manhole to 5-inches Hg (mercury)
g. Close vacuum inlet/outlet valve, disconnect vacuum pump and monitor vacuum. Record time for vacuum to drop from initial 5 inches Hg to 4 inches Hg.
h. Acceptance for 5 foot diameter manhole is when the time to drop from 5 inches Hg to 4 inches Hg meets or exceeds requirements as defined below:

Maximum Allowable Vacuum Drop		
Manhole Depth Rim to Invert	**Manhole Diameter in feet**	**Time for Vacuum to Drop 1 inch Hg**
10 feet or less	5	150 seconds
10 feet to 15 feet	5	180 seconds
15 feet to 25 feet	5	210 seconds

i. Adjust time to drop from 5 inches Hg to 4 inches Hg for other manhole diameters as follows:
   i) 4 foot diameter manhole: Subtract 30 seconds from time shown above ii) 6 foot diameter manhole: Add 30 seconds to time shown above
j. Repair all manholes that fail leakage test and retest until manhole passes test at no additional cost
k. If joint mastic or gasket is displaced during vacuum test, disassemble manhole and replace seal
l. If the manhole fails the initial test, necessary repairs shall be made with a nonshrink grout while the vacuum is still being drawn, Retesting shall proceed until a satisfactory test is obtained.

2. All testing shall be witnessed by Engineer. Contractor shall provide a minimum of 48 hours notice to Engineer prior to testing.

3.11 CLEANUP AND RESTORATION

A. Restore pavements, curbs and gutters, utilities, and other improvements to condition equal to or better than before work began and to satisfaction of Engineer.

B. Deposit waste material in designated waste areas and disposal site graded and shaped.

3.12 FINAL ACCEPTANCE

A. Comply with City of Grand Junction standards and specifications for placing sewer line in service

B. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, and dirt when connected.
   1. Wire brush, if necessary, wipe clean and keep joint contact surfaces clean until connection is complete

C. Provide record drawings with manhole number, inverts, and location (x, y, z) for each service connection

D. Provide test report for tracer wire continuity

E. Provide pipe and manhole tests and results

F. Provide video files of TV inspection to Engineer in digital format

END OF SECTION

SECTION 02740

FLEXIBLE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Full depth and/or composite hot bituminous pavement (asphalt) over prepared subgrade

B. Overlay, patch and/or pavement rehabilitation applications for streets, parking lots and other miscellaneous asphalt pavement

1.2 RELATED SECTIONS

A. Section 02300 Earthwork

B. Section 02750 Rigid Paving

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):
   1. T 230: Standard Method of Test of Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures

B. American Society for Testing and Materials (ASTM):
   1. C29: Unit Weight and Voids in Aggregate
   2. C88: Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
   3. C117: Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing
   4. C128: Specific Gravity Test and Absorption of Fine Aggregate
   5. C131: Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
   6. C136: Sieve or Screen Analysis of Fine and Coarse Aggregates
   7. D70: Specific Gravity of Semi-Solid Bituminous Materials
   8. D2726: Bulk Specific Gravity of Compacted Bituminous Mixtures
   9. D2041: Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures
   10. D4462: Viscosity of Asphalts (Bitumens)
   11. D2172: Quantities Extraction of Bitumens from Bituminous Paving Mixtures
   12. D2419: Sand Equivalent Value of Soils and Fine Aggregate
   13. D290: Bituminous Mixing Plant Inspection
   14. D6373: Performance Graded Asphalt Binder
   15. D692: Course Aggregate for Bituminous Paving
   16. D1073: Fine Aggregate for Bituminous Paving Mixtures
   17. D1241: Materials for Soil-Aggregate Subbase, Base and Surface Courses
   18. D2026: Cutback Asphalt (Slow-Curing Type)

19. D2027: Cutback Asphalt (Medium-Curing Type)

20. D2028: Cutback Asphalt (Rapid-Curing Type)
21. D2950: Density of Bituminous Concrete in Place by Nuclear Methods

C. Surface Preparation Standards (SSPC):
   1. SP-2: Superior Performing Asphalt Pavement System (Superpave) Level 1 Mix Design

D. Colorado Department of Transportation

E. Colorado Asphalt Pavement Association

F. City of Grand Junction Engineering Division Standard Specifications for Road and Bridge Construction

1.4 SUBMITTALS

A. Submit under provisions of Division One Specifications

B. Record of Work: Maintain record of time and date of placement, temperature, and weather conditions, retain until completion and furnish copy to engineer.

C. Proposed Design Job Mix Formula for each mixture required by the contract. The mixture design shall be determined using AASHTO T-312 or Colorado Procedure CP-L 5115 for the Superpave Method of Mixture Design.

D. Test Reports: Proposed Design Job Mix testing shall be performed in a materials laboratory under the direct supervision of; and shall be stamped and signed by a Professional Engineer licensed in the State of Colorado practicing in this field. In addition, the General Contractor shall submit as part of the Proposed Design Job Mix, documents to verify the following:
   1. Source of materials
   2. Gradation, specific gravity, source and description of individual aggregates and the final blend
   3. Aggregate physical properties
   4. Source and Grade of the Performance Graded Binder (PG Binder)
   5. Proposed Design Job Mix aggregate and additive blending, final gradation shown on 0.45 power graph, optimum asphalt content
   6. Required mixing and compaction temperatures
   7. Mixture properties determined at a minimum of four asphalt contents and interpolated at optimum and graphs showing mixture properties versus asphalt content.
   8. Sampling and testing of asphalt concrete mixtures for quality control during paving operations
      a. Uncompacted asphalt concrete mix

i) Asphalt cement content: ASTM D2172 (AASHTO T164) ii) Maximum Specific Gravity: ASTM D2041 (AASHTO T209)

b. Compacted asphalt concrete mix
   i) Bulk density: ASTM D1188 (AASHTO T166)

c. Perform at least one test for each day's paving but not less than one test per each 4000 sf of each lift.

1.5 QUALITY ASSURANCE

A. Materials and installation shall conform to applicable portions of Colorado Department of Transportation (CDOT) and City of Grand Junction construction specifications, standards and details.

1.6 REGULATORY REQUIREMENTS

A. For work on public streets or rights-of-way conform to the requirements of City of Grand Junction construction specifications, standards and details for the construction of concrete, curbs, gutters, sidewalks, driveways, roadways, street paving, and other public right-of-way Improvements.

B. Comply with applicable requirements of CABO/ANSI A117.1 for accessibility requirements related to walks, ramps, parking areas, drives, curb ramps, etc.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle materials under provisions of Division One Specifications

B. Transport mixture from mix plant in trucks with tight, clean, smooth, non-sticking compartments. Thinly coat hauling compartments with lime-water mixture, paraffin oil or other approved release agent to prevent sticking. Petroleum distillates such as kerosene or fuel oil are not approved release agents. Elevate and drain compartment of excess solution before loading mix.

C. Cover to protect from weather and prevent loss of heat

D. Provide insulated truck beds during temperature below 50 degrees F on long distance deliveries

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply when underlying surface is muddy, frozen or wet

B. Weather conditions permit pavement to be properly placed and compacted

C. The hot mix asphalt will be placed only when both the air and surface temperatures are equal to or exceed the temperatures specified in the table below:

CDOT Table 401-3: Placement Temperature Limitations in F

Compacted Layer Thickness (Inches)	Minimum Air and Surface Temp. (Degrees F and rising)	
	Top Layer	Other Layers
1‰ or less	60	50
Compacted Layer Thickness (Inches)	**Minimum Air and Surface Temp. (Degrees F and rising)**	
>1‰ to 3	50	40
3 to 4	45	35

Note: Air temperature shall be taken in the shade. Surface is defined as the existing base on which the new pavement is to be placed.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Pavement shall be asphalt of the plant hot mix type. Materials and construction shall comply with Section 403 and 702 of the CDOT Standards and Specifications for Road and Bridge Construction.

B. Tack Coat:
   1. SS-1 or CSS-1h
   2. AASHTO M208 or M140

C. Asphaltic Cement:
   1. Superpave Performance Graded (PG) binder of PG64-22 or PG58-28 Table 702-1 of CDOT standard section 702
   2. Will not be acidic modified or alkaline modified
   3. Will not contain any used oils that have not been refined
   4. Modifiers will not be carcinogenic

D. Aggregate for Asphaltic Concrete, General
   1. Sound, angular crushed stone, crushed gravel, or crushed slag: ASTM D692
   2. Sand, stone, or slag screening: ASTM D1073
   3. Percent wear: ASTM C131, less than 45 for aggregates retained in #10 sieve

E. Base Course Aggregates for Asphaltic Concrete
   1. Uncrushed gravel may be used in mixture if it meets design criteria specified
   2. Provide uniform quality combined aggregates with a minimum sand equivalent value of 40
   3. Provide aggregate in gradations for courses to comply with Class S and SG, Colorado Department of Transportation, ASTM C136

4. A maximum of 20% Reclaimed Asphalt Pavement (RAP) will be allowed in (nonpolymer or non-rubberized) mixes, provided that all the requirements for hot bituminous pavement are met.
    a. RAP shall not be allowed in polymer modified mixes or in the permanent final lift of asphalt.

F. Surface Course Aggregates for Asphaltic Concrete
1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions

2. Provide uniform quality combined aggregate with a minimum sand equivalent value of 50
3. Provide aggregate in gradations for courses to comply with Class SX, Colorado Department of Transportation, ASTM C136.

G. Hydrated Lime for Aggregate:
1. May be added at the rate of 1% by dry weight of the aggregate and shall be included in the amount of material passing the No. 200 sieve. Hydrated lime for aggregate pretreatment will conform to ASTM C207, Type N. Residue retained on a No. 200 sieve will not exceed 10% when determined in accordance with ASTM C110. Drying of the residue in an atmosphere free from carbon dioxide will not be required.

H. Weed Control: First application, Roundup. Second application, Casoron W-50" or G-10 with colored marker dye, manufactured by Pacific Coast Borax Company or an accepted substitute of non-flammable type.

2.2 ACCESSORIES

A. Traffic Control Devices 1. Signs.
    a. Comply with City of Grand Junction standards and specifications for signs within the public right-of-way.
    b. Sign faces, posts and bases shall be in conformance with the following materials specifications. All nonstandard sign faces, posts and bases must be approved by City of Grand Junction. Private property or nonstandard signs will be maintained by the owner. Submit shop drawings for approval prior to fabrication. All signs shall conform to current M.U.T.C.D. Standards and Colorado Supplements. All signs shall be 3M-engineer grade reflective sheeting or accepted substitute.
    c. Traffic/Parking Signs: Sign blanks shall be 6061 or 5052-H38 aluminum alloy .080 inches thick. Facing shall be specified reflective sheeting with standard sign colors based on standard graphics and as shown on the plans.
2. Sign Posts.
    a. For large signs greater than 12 W x 18 H and for multiple signs of any size mounted on the same post: sign posts shall be two (2) inch by two (2) inch galvanized telespar tube.
    b. For regular single signs 12 W x 18 H or smaller: sign posts shall be one and onehalf (1-1/2) inch by one and one-half (1-1/2) inch galvanized telespar tube.

c. Galvanized telespar tube shall have 0.120-inch wall thickness, and three-eighths (3/8) inch holes drilled on one (1) inch centers, all sides over full length, ten (10) feet in length (min).

3. Sign Post Anchor Bases (Stubs). All sign post anchor bases shall be twist resistant square galvanized telespar tube post with thickness and hole pattern the same as sign posts. Use 2-1/4 by 2-1/4 anchor for large posts and 1-3/4 by 1-3/4 anchor for regular posts. Bases shall be embedded a minimum of 36 below finished grade and shall extend 3 above finished grade.
4. Signs Post Anchor Bases with concrete footing: Sign, post, base and compacted soil shall be rigid and able to withstand wind loads. Where predominantly clay soils are present which will not properly compact at sign base, install a 6 diameter by 36 deep concrete footing around signs post anchor base for all signs in landscaped areas.
5. All signs and posts shall be mounted and secured with municipal-approved vandalproof type TL-3896 drive rivets with washers, or accepted substitute.

B. Pavement Marking. Specified pavement marking materials shall be used at locations as identified below.
1. Comply with City of Grand Junction standards and specifications for pavement marking within the public right-of-way. [
2. FS TT-P-1952, Type I Alkyd, white, blue, yellow and red color paint meeting requirements of CDOT Standard Specification 708. Verify colors and extent of painting prior to painting. Unless noted on plans, evident at existing striping or instructed, provide white in color for traffic striping, parking stalls, and other control markings on internal pavement, yellow in color for traffic control markings or restricted parking or where indicated, blue in color for accessible parking stalls, and red in color for curbs where no parking is indicated. Reflectorized paint required for traffic stripes and control markings on internal drive, road or street pavements.
3. Furnish paint with a no-pick-up maximum drying time of 20 minutes, when tested according to ASTM D711 using a wet film thickness of 0.015-inch when tested and applied at 77 degrees F.

C. Wheelstops.
1. Provide precast concrete wheelstops of approved design and locations as indicated. For concrete stops, provide concrete tests showing units made from concrete having minimum 4,000 PSI 28-day compressive strength.
2. Secure in place by driving two #5 rebar 24" long through holes in units into paving and subgrade. Seal holes with sealant as specified in related joint sealant sections with sealant for exterior asphalt use.

2.3 MIXES/SOURCE QUALITY CONTROL

A. Determine full depth design mix based upon aggregates furnished
1. Test mix by independent laboratory at Contractor’s expense
2. Grade dependent on temperature during placement

3. Submit mix designs under provisions of Division One specifications for review and acceptance by Engineer

B. Submit mix design giving unit weight and to meet following requirements prior to placement of asphalt:

Property	S(75)	SX(75)
Air Voids in Mix, % (N Design)	3.5-4.5	3.5-4.5
Initial Gyrations	7	7
Design Gyrations	75	75
Hveem Stability	28 min	28 min
Voids Filled w/ Asphalt	65-80	65-80

Establish a single percentage passing each sieve size, a single percent of asphalt and a mix temperature. Maintain job mixes within following percentages of design mix:

Aggregates:	
and larger	– 6%
#4 to #8	– 5%
#30	– 4%
#200	– 2%
Asphalt Content Tolerance	– 0.3%
Discharge Mix temp	– 20˚ F

PART 3 EXECUTION

3.1 EXAMINATION

A. Establish and maintain required lines and elevations. Provide grade and location stakes under this section as required for asphaltic concrete paving work.

B. Operate heavy, rubber-tired front loader over subgrade of paved areas. Where soft spots occur, remove loose materials and replace with Class 6 road base aggregate complying with CDOT standards compacted to level of subgrade.

3.2 PREPARATION

A. Prepare subgrade under provisions of Section 02300

B. Loose and Foreign Material
1. Remove loose and foreign material from compacted subgrade surface immediately before application of paving. Clean surface with mechanical sweeper, blowers, or hand brooms, until surfaces are free from dust

C. Weed Control

1. If weeds or vegetation exist at or on the subgrade, apply Round-up at rates following manufacturer s instructions. Apply Round-up three days prior to removal of vegetation, subgrade preparation and application of Casoron as described below to allow Round-up to kill all vegetation. Remove all living and dead weeds, root balls, tree/shrub roots, vegetation, and/or any organic matter from on or in the subgrade per applicable earthwork specifications prior to subgrade preparation and paving at all areas to be paved.
2. After all fine grading, checking, shaping, and compacting of the subgrade has been completed, and just prior to placing asphalt or aggregate base course, all subgrade soil in the area to receive asphalt pavement shall be thoroughly treated with Casoron soil sterilant (in addition to Round-up and regardless of presence of existing weeds or vegetation). Casoron shall be thoroughly sprinkled to distribute the chemical through the first two or three inches of the subgrade. For all areas to be paved, apply Casoron weed control at a minimum rate per 100 square yards of 2.4 pounds for G-10 or 4.0 pounds for 50w at rates and methods recommended by manufacturer within one day of paving.
3. The Contractor shall provide all necessary protection to prevent injury to animal, fish, or plant life and property occasioned by the application of the soil sterilant. Apply on a calm, wind-free day. The Contractor will be held responsible for all application of soil sterilant or the storage of same. Protect existing and new trees and shrubs beyond the limit of paving from damage due to weed killer or soil sterilant overspray or root contact. Extra caution is required to prevent over-application of products in areas to be paved under tree canopies. Trees and shrubs damaged or killed by weed killer or sterilant application shall be replaced by the contractor at contractor s expense.
4. Do not apply within 20 feet of trees or shrubs

D. Tack Coat
1. Apply in similar manner as prime coat, except as modified
2. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphaltic concrete or portland cement concrete and surfaces
3. Apply at rate of 0.05 to 0.15 gallons per square yard of surface
4. Apply tack coat by brush to contact surfaces of curbs, gutters, catch basins, and other structures projecting into or abutting asphaltic concrete pavement
5. Allow surfaces to dry until material is at condition of tackiness to receive pavement
6. Where asphaltic concrete will adhere to surface, tack coat may be eliminated by Engineer

3.3 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
1. Mill to minimum depth of 1 ‰-inches, or as indicated on the plans.

2. Mill to a uniform finished surface free of gouges, grooves, and ridges of more than … inch depth.
3. Control rate of milling to prevent tearing of existing asphalt course.

4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Transport milled hot-mix asphalt to asphalt recycling facility.
7. Keep milled pavement surface free of loose material and dust.

3.4 RING/FRAME ADJUSTMENTS

A. Set ring/frames of subsurface structures to final grade as a part of this work.

B. Placing Ring/Frames
   1. Surround ring/frames set to elevation with a ring of compacted asphalt concrete base prior to paving
   2. Place asphalt concrete mixture up to 1-inch below top of ring/frame, slope to grade, and compact by hand tamping

C. Adjust frames to proper position to meet paving

D. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations

E. Set ring/frames to grade, flush with surface of adjacent pavement

3.5 PREPARING THE MIXTURE

A. Comply with ASTM D995 for material storage, control, and mixing and for plant equipment and operation

B. Stockpile
   1. Keep each component of the various sized combined aggregates in separate stockpiles
   2. Maintain stockpiles so that separate aggregate sizes will not be intermixed and to prevent segregation

C. Heating
   1. Heat the asphalt cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture
   2. Use lowest possible temperature to suite temperature viscosity characteristics of asphalt
   3. Do not exceed 350 degrees F

D. Aggregate
   1. Heat-dry aggregates to acceptable moisture content

2. Deliver to mixer at recommended temperature to suite penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture
3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements

E. Mix aggregate and asphalt cement to achieve 90-95 percent coated particles for base mixtures and 85-90 percent coated particles for surface mixture, per ASTM D2489

3.6 EQUIPMENT

A. Bituminous Pavers:
1. Self-propelled, spreads without tearing surfaces, equipped with an activated screed assembly, heated if necessary, controls pavement edges to true lines without use of stationary forms and capable of spreading and finishing the asphalt plant mix material in widths applicable to the typical sections and thicknesses shown in the contract documents.
2. Pavers will be equipped with automatic screed controls with sensors capable of sensing grade from an outside reference line, and maintaining the screed at the specified longitudinal grade and transverse slope. The sensor will be constructed to operate from either or both sides of the paver and will be capable of working with the following devices:
   a. Ski-type device at least 30 feet in length
   b. Short ski or short shoe
   c. At least 5,000 feet of control line and stakes
3. The controls will be capable of maintaining the screed at the specified transverse slope within plus or minus 0.1 percent.
4. Manual operation will be permitted:
   a. For constructing irregularly shaped or minor areas
   b. If the automatic controls fail or malfunction the equipment may be operated manually for the remainder of the normal working day, provided specified results are obtained. However, if specified surface tolerances cannot be achieved, paving operations will be suspended until satisfactory correction, repairs of equipment replacements are made.

B. Rolling Equipment
1. Steel-wheel roller: Self-propelled, contact pressure of 250 to 350 psi per inch of width of roller wheel, equipped with adjustable scrapers and means for keeping wheel wet to prevent mix from sticking
2. Pneumatic-tired rollers: Self-propelled, contact pressure under each tire of 85 to 110 psi, wheels spaced so that one pass will accomplish one complete coverage equal to rolling width of machine, oscillating wheels. Remove and replace immediately tires picking up fines

C. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools

3.7 PLACING THE MIX

A. Place asphalt concrete mixture on prepared surface, spread and strike-off using paving machine

B. Complete placement over full width of section on each day's run

C. Spread mixture at minimum temperature specified by CDOT Table 401-5 for the specific binder used in the asphalt mix:
   1. PG 64-22: 320 F minimum mix discharge temperature, 235 F minimum delivered mix temperature
   2. PG 58-28: 275 F minimum mix discharge temperature, 235 F minimum delivered mix temperature
   3. The maximum mix discharge temperature will not exceed the minimum discharge temperature by more than 30 F.
   4. Delivered mix temperature will be measured behind the paver screed
   5. Hot asphalt mixture will be produced at the lowest temperature with the specified temperature range:
      a. producing a workable mix and provides for uniform coating of aggregates, in accordance with AASHTO T195
      b. allowing the required compaction to be achieved

D. Inaccessible and small areas may be placed by hand

E. Conform to the grade, cross section, finish thickness, and density indicated.

F. Lift Thickness
   1. Place in multiple lifts. Place asphalt in lifts such that each compacted lift thickness is no less than 2.0 thick and no greater than 3.0 thick. Top lift to be 2 thick.
   2. Typical Lift Thickness Sequencing:

Final Asphalt Section Required (inches)	No. of Lifts	Thickness of each Lift (inches) from bottom to top lift
2	1	2
3	1	3
4	2	2-2
5	2	3-2
6	3	2-2-2
7	3	3-2-2
8	3	3-3-2
9	4	3-2-2-2
10	4	3-3-2-2
>10	Review with Engineer	

G. Paver Placing
   1. Unless otherwise directed, being placing along centerline of areas in crowned section and at high side on one-way slope and in direction of traffic flow
   2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips
   3. Complete base courses before placing surface courses
   4. Place mixture in continuous operation as practicable

H. Hand Placing

   1. Spread, tamp, and finish mixing using hand tools in areas where machine spreading is not possible as acceptable to Engineer
   2. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature

I. Joints
   1. Construct transverse joint at right angles to centerline when operations are suspended long enough for mixture to chill
   2. Construct joints to have same texture, density, and smoothness as adjacent sections of asphalt concrete course
   3. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat
   4. Offset transverse joints in succeeding courses not less than 24 inches
   5. Cut back edge of existing pavement or previously placed course to expose an even, vertical surface for full course thickness
   6. Offset longitudinal joints in succeeding courses not less than 6 inches
   7. When the edges of longitudinal joints are irregular, honeycombed or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness
   8. Wearing course constructed in even number of strips; place 1 longitudinal joint on centerline of road
   9. Wearing course constructed in odd number of strips; place the centerline of 1 strip on centerline of road

J. Gutter: Finish surface high adjacent to concrete gutter so when compacted surface is slightly higher than edge of curb and flashing

3.8 COMPACTING THE MIX

A. All paving will be compacted to 94 +/- 2% of Maximum Theoretical (RICE) density, CP51 or AASHTO T209: Maximum Specific Gravity of Bituminous Paving Mixtures, as determined by ASTM D 2950. RICE values will be used in calculating Relative Compaction according to CP-44 or AASHTO T166.

B. Provide pneumatic and steel-wheel type rollers to obtain the required pavement density, surface texture and rideability

C. Begin rolling operations when the mixture will bear weight of roller without excessive displacement and complete as quickly as possible after placement occurs.

D. Compaction operations will be continuous until the required density is achieved or the density requirements are not met and the mix temperature falls below 185˚ F or there is obvious surface distress or breakage. Minimum compaction temperatures may be adjusted according to the asphalt binder supplier recommendations. Adjusted minimum compaction temperatures must be shown on the approved mix design or on the asphalt binder supplier documentation kept on file at the jobsite.

E. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set

F. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers

G. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs

H. Do not roll centers of sections first under any circumstances

I. Breakdown Rolling
   1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge
   2. Operate rollers as close as possible to paver without causing pavement displacement
   3. Check crown, grade, and smoothness after breakdown rolling
   4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling

J. Second Rolling
   1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction
   2. Continue second rolling until mixture has been thoroughly compacted

K. Finish Rolling
   1. Perform finish rolling while mixture is still warm enough for removal of roller marks by combination of steel and pneumatic rollers
   2. Continue rolling until roller marks are eliminated and course has attained specified density, and required surface texture and surface tolerances
   3. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled and attained its maximum degree of hardness

L. Patching
   1. Remove and replace defective areas
   2. Cut-out and fill with fresh, hot asphaltic concrete

3. Remove deficient areas for full depth of course
4. Cut sides perpendicular and parallel to direction of traffic with edges vertical
5. Apply tack coat to exposed surfaces before placing new asphaltic concrete mixture
6. Compact by rolling to specified surface density and smoothness

3.9 JOINING TO EXISTING WORK

A. Cut sides vertically and apply tack coat to exposed asphalt surfaces before placing new pavement. Meet existing thickness of surface and base courses, but not less than specified for new work.

B. All joins shall be compacted to 92.0% +/- 2.0% of RICE, taken fully on each side of joint, every 200 lineal feet. RICE values shall be used in calculating Relative Compaction according to AASHTO T166.

3.10 FIELD QUALITY CONTROL

A. The Owner will engage a certified testing agency to perform field testing to determine compliance of in-place asphaltic concrete paving materials and compaction in accordance with Division One Specifications.

B. It is the Contractor s responsibility to initiate, coordinate and accommodate all required tests and inspections including conformance with requirements of all applicable public agencies and authorities. Contractor will be responsible for coordinating the testing requirement with testing agency and provide the testing agency 48-hour advance notification to schedule tests.

C. Testing Agency will test in-place pavement for density and thickness.

D. Asphalt density testing:
   1. Every one-hundred fifty (150) lineal feet per driving lane.
   2. Every 2,000 square feet of parking lot
   3. Densities shall be between ninety-two percent (92%) and ninety-six percent (96%) of the RICE unit weight

E. Contractor to verify final surfaces are of uniform texture, conforming to required grades and cross sections

F. The Contractor will core the pavement as required by the testing agency for field density tests in accordance with AASHTO T 230, Method B, or for field calibration of nuclear density equipment in accordance with ASTM D 2950.
   1. Testing agency will take not less than 4-inch diameter pavement specimens
   2. At the testing agency s discretion, cores may be required at the beginning of placement of each pavement layer or change of mixture materials or gradation.
   3. Untested areas during placement will require cores to be taken to verify compaction
   4. Contractor to repair holes from test specimens

G. For each completed course or from locations directed by the testing agency, and at a minimum, a representative asphalt pavement sample shall be taken from the first one thousand (1,000) tons, and all mix properties shall be verified. The percent voids filled with asphalt cement, Hveem stability, and Lottman shall be verified at a minimum of every ten-thousand (10,000) tons. Asphalt testing shall comply with ASTM D1559. Two copies of all test reports shall be submitted directly to the Engineer.

H. Acceptable density of in-place course materials is between 92 and 96 percent of the recorded laboratory RICE unit weight. Immediately re-compact asphaltic concrete not conforming to acceptable density. Remove and replace all sections not in conformance density requirements

I. Thickness: Variations from drawings
   1. Base course: 1/4-inch +
   2. Remove and replace paving less than minimum thickness

J. Grade Tolerance: –0.1 feet

K. Surface Smoothness
   1. Test using a 10-foot straight edge applied parallel to direction of drainage
   2. Advance straight edge five feet, maximum 1/4-inch per foot from nearest point of contact
   3. Do not permit pockets or depressions where water may pool
   4. Remove and replace areas, deficient in smoothness. Overlay corrections may be permitted only if acceptable to Engineer

L. Inspection: The work of this section is subject to the inspection and approval of the engineer and/or owner. The following inspections are required:
   1. Protection of adjacent property
   2. Staking and establishment of elevations
   3. Establishment and compaction of subgrade
   4. Placement and compaction of bituminous base course and wearing surface
   5. Final inspection
   6. Obtain approval of each element of work listed above in sequence of its completion before proceeding with the next item

3.11 CLEANING

A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of Engineer

3.12 PROTECTION OF FINISHED WORK

A. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened and in no case sooner than 6 hours

B. Provide barricades and warning devices as required to protect pavement and the general public

3.13 WARRANTY

A. Provide installer s 2-year written warranty endorsed by the contractor warranting the pavement from creeping, shoring, cracking, softening, settling, ponding and other defects due to improper placing or defective materials. Replace defective materials upon notification by the owner in accordance with the requirements of the original work.

3.14 SCHEDULE OF MIX PLACEMENT:

A. Refer to City of Grand Junction Engineering Division Standard Specifications for Road and Bridge Construction

END OF SECTION

SECTION 02750 RIGID PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Forming, jointing, placing and curing of concrete pavements, curbs, gutters, cross pans, islands and sidewalks.

1.2 RELATED SECTIONS

A. Section 02300 Earthwork

B. Section 0274 Flexible Paving

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):
   1. M171 Sheet Materials for Curing Concrete

B. American Concrete Institute (ACI):
   1. 214 Recommended Practice for Evaluating Compression Test Results of Field Concrete
   2. 301 Specifications for Structural Concrete for buildings
   3. 304 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
   4. 305/305R Hot Weather Concreting
   5. 306/306R Cold Weather Concreting
   6. 308 Standard Practice for Curing Concrete

C. American Society for Testing and Materials (ASTM):
   1. A1064 Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed for Concrete
   2. A615 Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
   3. C31 Making and Curing Concrete Test Specimens in the Field
   4. C33 Concrete Aggregates
   5. C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
   6. C94 Ready Mix Concrete
   7. C143 Test Method of Slump of Hydraulic Cement Concrete
   8. C150 Portland Cement
   9. C260 Air-Entraining Admixtures for Concrete
   10. C309/AASHTO M148 Liquid Membrane-Forming Compounds for Curing Concrete
   11. C494 Chemical Admixtures for Concrete
   12. C618 Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

13. C979 Pigments for Integrally Colored Concrete
14. C1116 Fiber Reinforced Concrete
15. D994 Preformed Expansion Joint Filler for Concrete (Bituminous Type)
16. D1751 Preformed Expansion Joint Fillers for Rigid Paving and Structural Construction
17. D1752 Preformed Sponge Rubber Cork Expansion and Recycled PVC Expansion Joint Fillers for Rigid Paving and Structural Construction
18. D6690 Joint and Crack Sealants, Hot Applied, for Concrete and Flexible Pavements
19. D7508 Polyolefin Chopped Stands for Use in Concrete

D. CABO/ANSI A117.1 for accessibility requirements related to walks, ramps, parking areas, drives, curb ramps, etc.

E. City of Grand Junction Engineering Division Standard Specifications for Road and Bridge Construction

1.4 SUBMITTALS

A. Provide under provisions of Division One Specifications

B. Product Data: Provide sufficient information on mix design and products specified to verify compliance with specifications. Provide data on joint filler admixtures and curing compounds
1. Existing data on proposed design mixes, certified and complete
2. Submit reports of field quality control testing

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301, Conform materials and installation to applicable portions of Colorado Department of Transportation, and the City of Grand Junction construction specifications, standards and details.

1.6 REGULATORY REQUIREMENTS

A. For work on public streets or rights-of-way conform to the requirements of City of Grand Junction construction specifications, standards and details for the Construction of Curbs, Gutters, Sidewalks, Driveways, Street Paving, and other public right-of-way Improvements.

B. Comply with applicable requirements of CABO/ANSI A117.1 for accessibility requirements related to walks, ramps, parking areas, drives, curb ramps, etc.

C. Obtain cementitious materials and aggregate from same source for all work

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle materials under provisions of Division One Specifications

B. Reinforcing steel: Store on supports which will keep materials from contact with the ground and cover

C. Rubber and plastic materials: Store in a cool place, do not expose to direct sunlight

D. Prepare a delivery ticket for each load of ready-mixed concrete

E. Contractor shall submit tickets for all concrete delivered to site:
   1. Quantity delivered
   2. Actual quantity of each material in batch
   3. Outdoor temp in the shade
   4. Time at which cement was added
   5. Numerical sequence of the delivery
   6. Quantity of water that can be added in the field based on mix design
   7. Free moisture in fine and coarse aggregate in percent by weight
   8. Temperature of batch

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen

B. Protect concrete from rapid loss of moisture during hot water placement

PART 2 PRODUCTS

2.1 MATERIALS

A. Form Materials
   1. Form Materials: Plywood: PS 1, waterproof resin-bonded, exterior type Douglas Fir; face adjacent to concrete Grade B or better
   2. Fiberboard: FS LL-B-810, Type IX, tempered, waterproof, screen back, concrete form hardboard
   3. Capable of supporting loads imposed by construction equipment, straight and free from warp. Clean and strong enough to resist pressure of concrete when placed and retain horizontal and vertical alignment. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete
   4. Joint filler: ASTM D1751 or D1752 type; 3/4-inch thick unless indicated otherwise

B. Reinforcement
   1. Where reinforcement is specified herein or indicated on the plans:
      a. Bars: ASTM A615, Grade 60
      b. Reinforcing Welded Wire Fabric (WWF): ASTM A1064, steel, 16 gage minimum
         i) Furnish in flat sheets
      c. Dowels: ASTM A615; 40 ksi yield, Grade 60, plain steel, unfinished finish

d. Fibrous reinforcement: Collated, fibrillated, polypropylene fibers, tensile strength 70,000 psi
   i) ASTM C1116 and ASTM D7508
   ii) Use minimum of 1.5 pounds per cubic yardiii) Fibermesh or accepted substitution

C. Weed Control: First application, Roundup. Second application, Casoron W-50" or G-10 with colored marker dye, manufactured by Pacific Coast Borax Company or an accepted substitute of non-flammable type.

2.2 ACCESSORIES

A. Curing Compound: ASTM C309, AASHTO M-148, white pigmented liquid membrane

B. Joint Sealers: Polyurethane base, elastomeric, self leveling, chemical cure, handling 50% joint movement; Sikaflex-2C-SL or accepted substitutions

C. Sheet Materials: AASHTO M171, 4 mil

D. Expansion Joint Material: 0.5-inch thick, ASTM D1751, asphalt impregnated fiber board, glass fiber or sponge, or closed cell polyethylene foam; Texmastic vinylex 3600, Sonneborn Sonoflex F, or accepted substitutions.

2.3 CONCRETE MIX

A. Comply with ASTM C94

B. Maximum Coarse Aggregate Size: 1-inch

C. Portland Cement: ASTM C150, Type II; 555 pounds minimum per cubic yard of concrete

D. Water/Cementitious Material (Cement and Fly Ash) Ratio: Less than or equal to 0.45

E. Slump: 4-inch maximum
   1. May be increased to 4.5 inches for hand work, acceptable to Engineer
   2. As low as possible consistent with proper handling and thorough compaction

F. Volumetric Air Content: 6.0%–2% after placement for 1-inch aggregate 1. Vary air content with maximum size aggregate, ASTM C94, Table 3.

G. Strength: Compressive strength as determined by ASTM C39, 4,500 psi minimum at 28 days

H. Consistency: Uniform slump, suitable for the placement conditions with aggregate floating uniformly throughout the concrete mass, flowing sluggishly when vibrated or spaded

I. Adjust mix as required to meet specifications

J. Approved fly ash may be substituted for ASTM C150 cement up to a maximum of 25 percent Class C or Class F by weight of the cementitious material content. Fly ash for concrete shall conform to the requirements of ASTM C618 with the following exceptions:
   1. The loss on ignition shall not exceed 3.0 percent
   2. The CaO in Class F fly ash shall not exceed 18 percent

K. Admixtures: Content, batching method, and time of introduction in accordance with the manufacturer's recommendations for compliance with this specification
   1. Include a water reducing admixture
   2. Calcium chloride content shall not exceed 0.05% of the cement content by weight

2.4 SOURCE QUALITY CONTROL AND TESTS

A. Provide under provisions of Division One Specifications

B. Submit proposed mix design to Engineer for review prior to commencement of work

C. Tests on cement and aggregates will be performed to ensure conformance with specified requirements

D. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads

B. Verify gradients and elevations of base are correct

C. Check completed formwork for grade and alignment to the following tolerances:
   1. Top of forms not more than 1/8-inch in 10 feet
   2. Vertical face on longitudinal axis, not more than 1/4-inch in 10 feet

3.2 PREPARATION

A. Subgrade
   1. Prepare subgrade in accordance with Section 02300
   2. Moisten subgrade to depth of 6 inches at optimal moisture not more than 12 hours prior to placement to minimize absorption of water from fresh concrete
   3. Check for soft spots by proof-rolling or other means prior to setting forms. Remove soft yielding material and replace. Compact to specifications under provisions of Section 02300
   4. Check crown and/or elevation of subgrade to assure specified thickness. Compact to specification additional material used to bring to correct elevation. Remove excess material where subgrade is too high

5. Clean subgrade of all loose materials before placement of concrete. Do not disturb area inside forms after fine grading is complete
6. Weed Control
    a. If weeds or vegetation exist at or on the subgrade, apply Round-up at rates following manufacturer s instructions. Apply Round-up three days prior to removal of vegetation, subgrade preparation and application of Casoron as described below to allow Round-up to kill all vegetation. Remove all living and dead weeds, root balls, tree/shrub roots, vegetation, and/or any organic matter from on or in the subgrade per applicable earthwork specifications prior to subgrade preparation and paving at all areas to be paved.
    b. After all fine grading, checking, shaping, and compacting of the subgrade has been completed, and just prior to placing asphalt or aggregate base course, all subgrade soil in the area to receive flexible pavement shall be thoroughly treated with Casoron soil sterilant (in addition to Round-up and regardless of presence of existing weeds or vegetation). Casoron shall be thoroughly sprinkled to distribute the chemical through the first two or three inches of the subgrade. For all areas to be paved, apply Casoron weed control at a minimum rate per 100 square yards of 2.4 pounds for G-10 or 4.0 pounds for 50w at rates and methods recommended by manufacturer within one day of paving.
    c. The Contractor shall provide all necessary protection to prevent injury to animal, fish, or plant life and property occasioned by the application of the soil sterilant. Apply on a calm, wind-free day. The Contractor will be held responsible for all application of soil sterilant or the storage of same. Protect existing and new trees and shrubs beyond the limit of paving from damage due to weed killer or soil sterilant overspray or root contact. Extra caution is required to prevent overapplication of products in areas to be paved under tree canopies. Trees and shrubs damaged or killed by weed killer or sterilant application shall be replaced by the contractor at contractor s expense.
    d. Do not apply within 20 feet of trees or shrubs

B. Frame Adjustment
    1. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement for concrete collars
    2. Set frames of structures in full grout bed to provide bearing. Set to final grade
    3. Form construction joints and blockouts as indicated on drawings

3.3 PERFORMANCE AND INSTALLATION

A. Transporting mixed concrete
    1. Transporting of mixed concrete shall conform to ACI 305R
    2. Do not exceed manufacturer s guaranteed capacity of truck agitators. Maintain the mixed concrete in a thoroughly mixed and uniform mass during handling
    3. Do not incorporate additional mixing water into the concrete during hauling or after arrival at the delivery point, unless ordered by the Engineer. If additional water is to be incorporated into the concrete, revolve the drum not less than 30 revolutions at mixing speed after the water is added and before placing concrete.

4. Furnish a water measuring device in good working condition, mounted on each transit mix truck, for measuring the water added to the mix on the site by the Engineer
5. Provide delivery ticket and comply with delivery requirements of this section

B. Forming
1. Place and secure forms to correct location, dimension, profile, and gradient
2. Install sufficient quantity of forms to allow continuous progress of work so that forms can remain in place at least 24 hours after concrete placement
3. Join neatly and mechanically tamp to assure firm placement. Assemble formwork to permit easy stripping and dismantling without damaging concrete
4. Oil forms prior to concrete placement
5. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement
6. Set dowels, expansion joints, preformed construction joints and header boards as specified or indicated on the drawings
7. Low roll or mountable curbs may be formed without the use of face form by using a straight edge and template to form curb face
8. Backfill behind forms as required to prevent water from entering subgrade

C. Reinforcement
1. Add fiber reinforcement to mix at plant prior to delivery to jobsite. Mixing shall be as recommended by the manufacturer to distribute the product evenly throughout the concrete mix
2. Place bar or WWF reinforcement at mid-height of slabs-on-grade or as shown on the drawings
    a. Install in as long lengths as possible. Lap adjoining pieces at least one full mesh and lace with wire
    b. Support with metal chairs, brick or stone is unacceptable
3. Hold all tie and marginal dowels in proper position by sufficient supports or pins
4. Mechanically install dowels or place on supports if center longitudinal joint is sawed in lieu of placing plastic strip
5. Interrupt reinforcement at expansion joints
6. Place dowels to achieve pavement and curb alignment as detailed.
7. Provide doweled joints inch at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement
8. Grease dowels on one side of joints with caps on greased end

D. Placing concrete
1. Place concrete in accordance with ACI 301
2. Lightly moisten subgrade or base course immediately before placing concrete.
3. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed
4. during concrete placement
5. Deposit concrete near final position. Minimize segregation and damage to subgrade

6. Place concrete continuously over the full width of the panel and between predetermined construction joints. Spread mechanically to prevent segregation and separation of materials
7. Consolidate concrete with vibrators and spade next to forms to remove air spaces or honeycombs
8. Do not place concrete in forms that has begun to set
9. Do not place more concrete in one day than can be finished before dark the same day
10. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor s option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified
11. Walks: Construct sidewalks with a minimum thickness of 4-inch. Tool edges to rounded profile and finish as specified or as shown on the drawings. Pitch walks 1/4inch per foot for cross drainage unless otherwise indicated

E. Cold weather concreting
1. Conform to ACI 306/306R, except as modified herein
2. Minimum concrete temp at the time of mixing

Outdoor Temp at Placement (in shade)	Concrete Temp at Mixing
Below 30□F	70□F
Between 30□F & 45□F	60□F
Above 45□F	45□F

3. Do not place heated concrete which is warmer than 80 degrees F
4. If freezing temp are expected during curing, maintain the concrete temp at or above 50 deg F for 5 days or 70 deg F for 3 days with forms in place 5. Do not allow concrete to cool suddenly

F. Hot weather concreting
1. Conform to ACI 305/305R, except as modified herein
2. At air temp of 90 degrees F and above keep concrete as cool as possible during placement and curing. Fog sprayers or special wetting agents may be required for protection
3. Do not allow concrete temperature to exceed 70 deg F at placement
4. Prevent plastic shrinkage cracking due to rapid evaporation of moisture
5. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs per sq ft per hr as determined from ACI 305, Fig 2.1.4

G. Joints
1. Provide concrete joints per CDOT Standard Details
2. Sidewalk and pavement

a. Contraction joints: At intervals not to exceed 10 feet and 1 1/2 inches deep, tooled or sawcut
b. Expansion joints: 1/2-inch premolded joints where sidewalks end at curb returns, against fixed objects, at points of sharp radius, and between sidewalk and driveway slabs. Place expansion joint at minimum of every 100 feet.
c. Construction joints: At all separate pours, and around all appurtenances such as manholes, utility poles, and other penetrations extending into and through sidewalks. Place backer rod and polyurethane sealant for entire joint length

3. Curb and Gutter
   a. Contraction joints: At intervals not to exceed 10 feet made by insertion of 1/8-inch template at right angles to curb and 1 1/2-inch deep.
   b. Expansion joints: At curb returns, against fixed objects, at points of sharp radius, between adjacent sidewalk and curb at all curb returns, between sidewalk and all driveway slabs, and along straight lengths every 200 linear feet. Install expansion joint filler between concrete sidewalks and any fixed structure. Extend expansion joint material for full depth of concrete, except stop 1/2-inch below finish surface.
   c. Construction joints: At all separate pours, place backer rod and polyurethane sealant for entire joint length.
4. Place expansion joint filler between paving components and buildings or other appurtenances at temperatures above 50 deg F. Clean all dust, debris and water from joint. Recess top of filler 1/2-inch for sealant placement.
5. Provide keyed joints as indicated in details.

H. Finishing
1. Run straight-edge over forms with sawing motion to fill all holes and depressions.
2. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
3. After floating, test surface for trueness with a 10’ straightedge. Distribute concrete as required to remove surface irregularities, and re-float repaired areas to provide a continuous smooth finish
4. Finish surfaces with a wooden or magnesium float. Plastering of surfaces is not permitted
5. Immediately after float finishing, slightly roughen the concrete surface by brooming in the direction perpendicular to the main traffic route. Use fine hair fiber-bristle broom unless otherwise directed. Coordinate the required final finish with the Engineer before application.
6. On inclined slab surfaces and steps, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic
7. Edge all outside edges of the slab and all joints with a 0.25-inch radius edging tool.
8. Work edges of gutters, back top edge of curb, and formed joints with an edging tool, and round to 0.5-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface

9. Brush with soft bristle brush to remove trowel marks and leave a uniform appearance just before concrete takes initial set.
10. Direction of Texturing:
    a. Curb and Gutter: At right angles to the curb line
    b. Sidewalk: At right angles to centerline of sidewalk.
11. Place curing compound on exposed concrete surfaces immediately after finishing. Apply under pressure at the rate of one gallon to not more than 135 square feet by mechanical sprayers in accordance with manufacturer's instructions acceptable to Engineer.

I. Joint sealing
1. Seal joints and clean concrete prior to opening to traffic.
2. Seal all expansion joints.
3. Separate concrete from other structures with 3/4-inch thick joint filler.
4. Place joint filler in concrete pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
5. Extend joint filler from bottom of pavement to within 1/4-inch of finished surface.

J. Curing and protection
1. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury
2. Have plastic sheeting, straw, burlap and/or canvas materials available at all times to protect fresh uncured surfaces from adverse weather conditions
3. Do not permit pedestrian traffic over sidewalks for 7 days minimum after finishing. Do not permit vehicular traffic over pavement for 14 days minimum after finishing or until 75 percent design strength of concrete has been achieved

3.4 FIELD QUALITY CONTROL

A. Comply with Division One Specifications - Quality Assurance: Field inspections and testing

B. It is the Contractor s responsibility to initiate, coordinate and accommodate all required tests and inspections including conformance with requirements of all applicable public agencies and authorities. Contractor will be responsible for coordinating the testing requirement with testing agency and provide testing agency 48-hour advance notification to schedule tests.

C. Tolerances
1. Division One Specifications - Quality Assurance: Tolerances
2. Maximum Variation of Surface Grade: 1/4- inch in 10 ft
3. Maximum Variation from True Alignment: 3/8-inch in 10 ft

D. Take cylinders and perform slump and air entrainment tests as required by Division One Specifications in accordance with ACI 301. Unit weight and mix temperature will also be taken

E. The first three loads will be tested for slump and air content. If any one test fails to meet requirements, that load will be rejected and tests will continue on each load until three consecutive loads meet requirements. Thereafter, five concrete test cylinders will be taken for every 75 cu yds or less cu yds of concrete placed each day

F. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents

G. One slump and air entrainment test will be taken for each set of test cylinders taken

H. Cylinders will be tested as follows: 2 at 7 days, 2 at 28 days and one at a later date, if necessary, as directed by the Engineer

I. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken

J. Thickness of fresh concrete may be checked by Owner at random. Coring will be conducted in accordance with City of Grand Junction requirements. Where average thickness of concrete is deficient in thickness by more than 0.20-inch, but not more than 1.0-inch, payment to Contractor will be adjusted based on amount indicated in schedule of values for portland cement concrete paving as specified in the following table.

CONCRETE PAVEMENT DEFICIENCY	
Deficiency in Thickness (Determined by Cores) INCHES	**Proportional Part of Contract Price Allowed**
0.00 to 0.20	100%
0.21 to 0.30	80%
0.31 to 0.40	72%
0.41 to 0.50	68%
0.51 to 0.75	57%
0.76 to 1.00	50%
Over 1.00	NONE

Note: When thickness of pavement is deficient by more than one inch, and judgment of the Engineer is that area of such deficiency should not be removed and replaced, there will be no payment for the area retained.

K. Failure of Test Cylinders or Coring Results: Engineer may order removal and replacement of concrete as required upon failure of 28-day tests or if thickness of pavement is less than 95% of specified thickness

3.5 SCHEDULE OF CONCRETE

A. See City of Grand Junction Engineering Division Standard Specifications for Road and Bridge Construction for concrete thicknesses and subgrade preparation.

3.6 SCHEDULE OF CONCRETE REINFORCEMENT

A. Fiber reinforcement required for all concrete flatwork, including curb and gutter, sidewalk and pavement
B. Rebar reinforcement required for all cross pans. Reinforce all cross pans in conformance with City of Grand Junction standards and specifications.

C. Trash pad and dumpster locations: 8-inch thick concrete with #4 rebar, 12-inches on center, each way, three inches clear on all sides

END OF SECTION

SECTION 02920

SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Soil preparation

B. Fertilization

C. Seeding methods

D. Areas to be reseeded

E. Seed Mix

F. Maintenance

G. Seed protection and slope stabilization

1.2 RELATED SECTIONS

A. Section 01500 Construction Facilities and Temporary Controls

B. Section 02300 Earthwork

C. Section 02370 Erosion and Sedimentation Control

1.3 REFERENCES

A. Federal Specification (FS) O-F-241 - Fertilizers, Mixed, Commercial

B. American Association of Nurserymen - Standardized Plant Names

C. Association of Official Seed Analysts (AOSA)

D. Colorado Department of Agriculture (CDA) Seed Act

E. Colorado Department of Transportation (CDOT) Construction Specifications

1.4 SUBMITTALS

A. Submit under Division One Specifications for products related to seeding work including but not limited to seed mixes, mulches, composts, tackifiers, fertilizers and herbicides.

B. Product Data:

1. Certified Live Seed analyses not more than 6 months old by a recognized laboratory of seed testing for grass mixtures including percent of live seed (PLS), germination, all crop seeds in excess of 1 percent, inerts and weeds
2. Manufactures guaranteed chemical analysis, name, trade name, trademark and conformance to state and local laws of all fertilizers and herbicides

1.5 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging

B. Provide a certificate of the PLS test of the grass seed intended for the project, certifying that the seed furnished is from a lot that has been tested by a recognized laboratory within the last 6 months

C. All brands furnished shall be free from such noxious seeds as Russian or Canadian Thistle, Coarse Fescue, European Birdweed, Johnson Grass, Leafy Spurge, field bindweed, kochia, or any state-listed, City of Grand Junction-listed or CDOT-listed noxious weed species

D. Any materials that have become wet, moldy or otherwise damaged in transit or in storage will not be used

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing work of this section with landscaping license from State of Colorado
1. Experienced with type, elevation, topography and scale of work specified
2. Adequate equipment and personnel to perform work

1.7 REGULATORY REQUIREMENTS

A. Comply with codes and ordinances of local regulatory agencies for fertilizer and herbicide composition and regulations of City of Grand Junction, Mesa County and the State of Colorado.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One specifications

B. All materials and products will remain in original manufacturers shipping bags or containers until they are used. All material or products will be stored in a manner to prevent them from coming into contact with water or other contaminating substance and in a manner that product effectiveness will not be impaired

C. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable

D. Commercial fertilizer or commercial herbicide: mixed in original bags or containers of the manufacturer, showing weight, chemical analysis and manufacturer name. Store in such a manner such that product effectiveness will not be impaired

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not prepare or seed frozen soils

B. Perform seeding and planting only after preceding work establishing final ground surface is completed

C. Conduct minimum of two (2) soil tests to confirm fertilizer type and application rates

1.10 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition

1.11 WARRANTY

A. All plant material and work accomplished under this section shall be guaranteed to provide a uniform stand of grass acceptable to the Owner at the end of a one (1) year time period from the completion of the Seeding and Erosion Control work

PART 2 PRODUCTS

2.1 SEED

A. In conformance with State and Federal regulations and subject to the testing provisions of the Associate of Official Seed Analysts (AOSA)

B. Seed Suppliers: Licensed Seed Dealer with Colorado Department of Agriculture

C. Provide the latest crop available in accordance with Colorado Department of Agriculture Seed Laws, Chapter 35, Article 27

D. Compensate for percentage of purity and germination by furnishing sufficient additional seed to equal the specified pure live seed product. The formula for determining the quantity of pure live seed (PLS) is as follows:

Pounds of Seed (Bulk) x Purity x Germination = Pounds of Pure Live Seed (PLS)

2.2 SEED MIX

A. Permanent seed mixes per table below:

1. Dryland seed mix shall be as follows unless otherwise approved by the City s Forestry Supervisor:

Description	PLS rates per acre (100%)	% of mix	PLS rate per species per acre
Crested Wheatgrass, Ephraim	6	20%	1.25
Western Wheatgrass, Arriba	16	20%	3.25
Smooth Brome, Lincoln	12	15%	2.0
Alkali Sacaton	0.5	10%	0.25
Viva Galleta Grass	12	10%	1.25
Orchard grass, Paiute	4	10 %	0.5
Perennial Ryegrass, Tetraploid	8	15%	1.25
Oats or Winter Wheat	add in	add in	3.0
Total		100	12.75
Drilled rate @ 12.75 lbs/acre			
Broadcast rate @ 25.5 lbs/acre			

2.3 SOIL MATERIALS

A. Select onsite topsoil: Earth material of loose friable clay loam reasonably free of admixtures of subsoil, refuse stumps, roots, rocks, brush, weeds or other material which can be detrimental to the proper development of site revegetation

2.4 ACCESSORIES

A. Soil Additives (Fertilizer)
   1. Dry fertilizers: Primary element composition by weight of 6-10-5
      a. Nitrogen (N) six (6%) percent of which fifty (50%) per-cent inorganic, phosphoric acid (P_2O_5) ten (10%) percent, and potash (K_2O) five (5%) percent
   2. Commercial fertilizer: Primary element composition by weight of 18-46-0
      a. Nitrogen, eighteen (18%) percent, of which fifty (50%) percent is organic, and phosphoric acid (P_20_5), forty-six (46%) percent
      b. These elements may be organic, inorganic, or a combination and shall be available according to the methods adopted by the Association of Official Chemists
   3. Dry, pelletized or granular, uniform in composition and a free flowing product. Do not use material which has caked, segregated, exceeded the expiration date of application, or be otherwise damaged
   4. Thoroughly mixed by the manufacturer. Clearly identify the contents of each container. Do not use materials and containers previously opened, exceeding the expiration date for application or otherwise damaged
   5. Minimum requirements for all disturbances to receive seeding:

Biological nutrient organic fertilizer (lbs/acre)*	Humate (lbs/acre)	Compost (cys/acre) All areas <2:1 [1/2 inch depth]	Spray on Amendment (lbs/acre) >2:1 slopes only
300	200	65	3,500
*Biological nutrient shall not exceed 8-8-8 (N-P-K)			

B. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass

C. Mulching Material: Straw or onsite grasses from grubbing operation, dry, free from foreign matter detrimental to plant life

PART 3 EXECUTION

3.1 GENERAL

A. Seed all areas disturbed by construction, including all areas along the roadside ditches

B. Pattern for seeding and fertilization as required by field conditions. In no case shall revegetation occur within 30 days of the application of any chemical weed control substance

C. Engineer to review grading prior to seeding

3.2 SOIL PREPARATION

A. Uniformly place and spread topsoil removed during grubbing and stored on site. Provide minimum thickness of 4 inches to meet finished grade. Key topsoil to the underlying and surrounding material by the use of harrows, rollers or other equipment suitable for the purpose

B. Apply water to the topsoil for compaction purposes in a fine spray by nozzles in such a manner that it will not wash or erode the newly placed soil

C. Exercise care during soil preparation on all embankments so as not to disturb established ground cover. Areas disturbed during the soil preparation will be fertilized and seeded at the discretion of the Engineer in accordance with these documents

3.3 FERTILIZATION

A. Do not proceed with fertilization in adverse weather and unsuitable ground conditions. Examples of these respective conditions may be wind, precipitation, frozen and untillable ground or conditions detrimental to the effectiveness of the application

B. Apply fertilizer in a manner to assure uniform distribution, light watering is acceptable for dispersion

C. In cases where work progress is stopped due to the above conditions, fertilization will begin again, when appropriate conditions exist. The application will begin again with a reasonable overlapping of the previously applied area

3.4 SEEDING METHODS

A. All seeding shall be installed either by hydroseeding or drilling method. Small areas of restoration may be broadcast seeded if directed by Engineer.

B. Do not proceed with seeding in adverse weather and unsuitable ground conditions. Examples of these respective conditions may be wind, precipitation, frozen or untillable ground or conditions detrimental to the effectiveness of the application. All seeding shall be performed between either March 1st to May 30th of the calendar year of construction unless indicated otherwise by Engineer

C. Hydroseeding:
   1. Apply seeded slurry with hydraulic seed at a rate of //160 lbs// live seed per 1,000 square feet, evenly in two intersecting directions
   2. Do not hydroseed areas in excess of that which can be mulched on same day
   3. Immediately following seeding apply mulch to a thickness of 1/8 inch
   4. Apply water with a fine sprat immediately after each area has been mulched. Saturate to four (4) inches of soil

D. Drilling:
   1. Accomplish seeding by means of an approved power drawn drill, followed by drag chains. The grass drill should be equipped with a satisfactory feeding mechanism, agitation, and double disk furrow openers. Equip drills with depth bands set to maintain a planting depth of approximately 3 to 2 inch and shall be set to space rows not more than 7 inches apart
   2. If inspections indicate that strips wider than the specified space between the rows planted have been left or other areas skipped, the Engineer will require immediate resowing of seed in such areas at the Contractor's expense. The seeding mixture shown in the Materials Section applies at a pure live seed rate per acre
   3. Immediately following seeding apply straw mulch at a rate of one (1) ton per acre
   4. Apply water with a fine spray immediately after each area has been mulched. Saturate to four (4) inches of soil depth
   5. Provide additional watering weekly until revegitation seed has germinated

3.5 AREAS TO BE RESEEDED

A. Seed all disturbed areas that are damaged or disturbed by the Contractor's activities during the entire project scope

B. Additional areas as requested by the Owner and approved by the Engineer

3.6 MAINTENANCE

A. Fertilize the seeded areas once a uniform stand of grass has been established

B. Maintain seeded areas until there is an acceptable uniform plant growth. Reseed areas that are not producing a uniform plant growth within five (5) weeks following seeding. Acceptable uniform plant growth shall be defined as that time when the scattered bare spots, not greater than 1 square foot in area, do not exceed three percent (3%) of the seeded area

C. Maintenance period - 1 year

D. Areas that are seeded late in the fall planting season which are not producing acceptable uniform plant growth, as described above, shall be reseeded during the following spring planting season. If such a condition exists, and the Contractor has diligently, in the opinion of the Engineer, pursued the performance of his work, the Owner at his option, may extend the contract completion date and reduce contract retainage. Retainage may be reduced to less than five percent (5%) of the total contract amount, but shall be at least two (2) times the estimated cost of obtaining the required growth in the indicated areas, plus areas which are susceptible to damage by winter kill, washout or other causes

E. Contractor shall control perennial weeds, thistle, spotted and napweed, spurge and other weeds during the maintenance period

3.7 SEED PROTECTION AND SLOPE STABILIZATION

A. Cover seeded slopes with erosion control fabric where grade is 4 to 1 or greater and where indicated on the Drawings and/or Section 02300 and Section 02730. Cover seed with mulch in all other areas

B. Lay fabric smoothly on surface, bury top end of each section in 6-inch deep excavated topsoil trench. Provide 6-inch overlap minimum of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil

C. Secure outside edges and overlaps at 48 inch intervals with 4-inch to 6-inch U-shaped type pins or wooden stakes depending on ground condition

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches

F. Maintain integrity of erosion control fabric until seed germination. If seed is washed out before germination, fertilize, reseed and restore affected areas

END OF SECTION