**SECTION 01043**
**COORDINATION AND CONTROL OF THE WORK**

## PART 1: GENERAL

1.1 SCOPE

A) This section includes coordination and control of the work.

## PART 2: PRODUCTS

None

## PART 3: EXECUTION

3.1 FIELD RECORD PLANS

A) Contractor shall maintain one complete set of plans at the construction site whereon he will record any approved deviations in construction from the approved plans. Prior to final payment, the Contractor shall provide the following record information on a clean set of drawings which shall be submitted to the Engineer or Ute Water Conservancy District:

1) Water Mainline - Station and depth of all fittings, valves and service taps.

2) Water Services - Length from mainline and side tie to property pin.

3) Existing Utilities - Station locations, size, material and depth at crossings.

3.2 CONFORMITY WITH DRAWINGS AND ALLOWABLE DEVIATIONS

A) Finished surfaces in all cases shall conform to lines, grades, cross sections and dimensions shown on the Final For Construction drawings. Deviations from the approved drawings and working drawings will in all cases be determined by the Engineer and authorized in writing.

3.3 PROTECTION OF EXISTING FACILITIES

A) The Contractor shall protect from damage due to his construction operations, all existing facilities including but not limited to survey monuments, fence lines,

trees, underground utilities, drainage facilities, landscaping, roadway surfaces etc., which are not specifically designated for removal or alteration.

B) The locations of these facilities as shown on the plans were derived from the best information available. However, the completeness and accuracy of these locations as shown is not guaranteed. It shall be the responsibility of the Contractor to verify the existence and locations of underground facilities in advance of construction.

C) Any existing facilities not designated for removal or alteration, which are damaged by the Contractor's operations shall be restored or replaced to an "in kind" or better condition at the expense of the Contractor.

D) The Contractor shall notify all public and private utility companies serving in the area in advance of construction, so underground utility locations can be confirmed and existing facilities relocated if necessary to facilitate construction. Make excavations and borings ahead of work, as necessary, to determine the exact location of interfering utilities or underground utilities.

## 3.4 PROTECTION OF PROPERTY

A) Protect all public and private property, insofar as it may be endangered by operations and take every reasonable precaution to avoid damage to such property.

B) Restore and bear the cost of any public or private improvement, facility, or structure within the right-of-way or easement which is damaged or injured directly or indirectly by or on account of any act, omission, or neglect in the execution of the work and which is not designated for removal but visibly evident or correctly shown on the plans. Restore to a condition substantially equivalent to that existing before such damage or injury occurred, by repairing, rebuilding, or otherwise affecting restoration thereof, or if this is not feasible, make a suitable settlement with the Owner of the damaged property, all at no expense to the Owner.

C) Give reasonable notice to occupants of buildings on property adjacent to the work to permit the occupants to remove vehicles, trailers, and other possessions as well as salvage or relocate plants, trees, fences, sprinkler systems, or other improvements in the right-of-way which are designated for removal or which might be destroyed or damaged by work operations.

D) Review with Engineer the location, limits and methods to be used prior to clearing work. Clearing and grubbing shall be performed in strict compliance with all local, State and Federal laws.

E) The Contractor shall be responsible for the protection of public and private property adjacent to the work and shall exercise due caution to avoid damage to such property.

F) Trees, lawns, and shrubbery that are not to be removed shall be protected from damage or injury. If damaged or removed because of the Contractor's operations, they shall be restored or replaced in as nearly the original condition and location as is reasonably possible. Lawns shall be reseeded after replacement of topsoil and covered with suitable mulch except as noted otherwise.

G) The costs to the Contractor for protecting, repairing, removing, replacing, or restoring existing improvements not required as a part of this work shall be incidental to other bid items.

## 3.5 REMOVAL OF DEFECTIVE OR UNAUTHORIZED WORK

A) All work which does not conform to the requirements of these Contract Documents shall be considered as unacceptable. Immediately remove unacceptable and defective work found to exist prior to acceptance of or final payment for the work. Replace with work and materials which conform to the Contract Documents, or remedy otherwise in an approved manner. This provision shall have full effect regardless of the fact that the unacceptable work may have been done or the defective materials used with the full knowledge of the Inspector.

## 3.6 HOURS OF WORK

A) Construction working hours shall be from 7:00 A.M. to 6:00 P.M. local time, Monday through Friday, excluding Federal, State and local holidays, unless otherwise approved by the Owner and Engineer.

## 3.7 RESTORATION AND CLEANUP

A) Periodically, or as directed by the Engineer, as the work progresses, and immediately after completion of the work, clean up and remove all refuse, debris, equipment, and unused materials of any kind resulting from the work. Upon failure to do so within 72 hours after directed, the work may be done by the Owner or third party and the cost thereof be deducted from any payment due the Contractor.

B) As a condition precedent to final acceptance of the project, remove all equipment and temporary structures, and all rubbish, waste and general clean up the right-of-way and premises to conform substantially to conditions as they existed before the commencement of work, as approved.

## 3.8 FINAL INSPECTION

A) When all construction work on the project is complete and all extra work bills, forms and documents required under the Contract are submitted, notify the Engineer in writing. Engineer will make an inspection of the project and project records within 15 days of receiving said notice. If, at such inspection, all construction provided for and ordered under the Contract is found completed and satisfactory and all certificates, bills, forms, and documents have been properly submitted, such inspection shall constitute final inspection.

B) If work is found unsatisfactory, or if all certificates, bills, forms and documents have not been properly submitted, the Engineer will so notify the Contractor. After corrections are made, or all certificates, bills, forms, or documents are properly submitted, notify the Engineer in writing. Engineer will make another inspection within five (5) days after such notice, and if all work is satisfactory, then this inspection shall constitute the final inspection.

## 3.9 WARRANTY BOND

A) The Contractor shall be responsible for a period of one year after written acceptance of improvements by Approving Agencies for all workmanship and materials furnished for the improvements or under the Contract. Prior to final payment, Contractor shall provide a one-year warranty bond. One-year period to begin upon Approving Agencies final acceptance of all work. The bond shall be in a form acceptable to Owner and Approving Agency.

## 3.10 VERBAL AGREEMENTS

A) No verbal agreement or conversation with any officer, agent or employee of the Owner, either before or after execution of the Agreement, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Agreement. Any such verbal agreement or conversation shall be considered as unofficial information and in no way binding upon the Owner.

## 3.11 COOPERATION OF CONTRACTOR

A) The Contractor shall conduct his operations so as to interfere as little as possible with those of the Owner, other Contractors, utilities, or any public authority on or near the work. The Owner reserves the right to perform other work by Contract or otherwise; to permit other public bodies, public utility companies and others to do work on or near the project during progress of the work. If a conflict arises, the Owner shall determine when and how the work shall proceed.

B) Claims for delay or inconvenience due to operations of such other parties on work indicated or shown on the drawings will not be allowed.

## 3.12 MANDATORY PROJECT SUPERINTENDENT

A) The Contractor shall designate one person as primary project superintendent to oversee and coordinate construction. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications, thoroughly experienced in the type of work being performed. If the Contractor is a joint venture, designate one person from the joint venture organization, with these qualifications, to act as project superintendent. This person's work time shall be devoted exclusively to this project to ensure that work coordination, quality and timelines are met.

B) For short periods of time during the performance of minor or incidental portions of the work, the Contractor may designate another person to act for the superintendent. This designation shall be in writing, stating the person's name, duration of appointment and scope of authority. The acting superintendent shall be available to the Engineer at all times for contact by telephone or radio.

C) Failure to provide the superintendence required by these provisions is sufficient cause for termination of the Contract, or other action the Engineer may deem to be appropriate.

## 3.13 EMERGENCY MAINTENANCE SUPERVISOR

A) The Contractor shall submit to the Owner/Engineer the names, addresses and telephone numbers of two employees responsible for performing emergency maintenance and repairs when the Contractor is not working. These employees shall be designated, in writing by the Contractor, to act as his representatives and shall have full authority to act on his behalf.

3.14 CONDUCT

A) The Contractor and his men shall at all times be civil and courteous around private citizens and property owners. If ever directed to leave private property by the property owner or his representative, the Contractor and his personnel shall do so immediately. If any property owner or his representative makes demands, the Contractor is to remain courteous and report the matter to the Engineer. No foul language, obscene gestures, or rudeness directed to private citizens will be tolerated. Radios and personal stereos will not be permitted. If, in the Engineer's opinion, the Contractor or any of his men fail to conduct themselves as stipulated or follow the direction of the Engineer, the Engineer shall bar the offending individual from the project. His order shall be final.

3.15 TRESPASS

A) The Contractor will be solely responsible for any trespass upon private property or injury thereto resulting from or in connection with his operations. He will be liable for any claims made because of his trespass or his deposit of debris of any kind on private property.

3.16 USE OR POSSESSION PRIOR TO FINAL COMPLETION

A) The Owner or his agents shall have the right to take possession of or use for his own benefit any completed or partially completed part of the work. Such possession or use shall not be deemed an acceptance of the occupied portion of the project. While the Owner is in such possession, the Contractor shall be relieved of the responsibility for injury or damage to the said completed portion of the work other than that resulting from the Contractor's fault or negligence. Continued operation or use of facilities being rehabilitated shall not be construed as use or possession prior to final completion.

B) Prior to the Owner or his agents taking possession of or using any completed or partially completed part of the work, written notice shall be given by the Engineer to the Contractor at least 24 hours in advance of the Owner actually assuming possession.

3.17 UNAUTHORIZED WORK

A) Work done beyond the lines shown on the drawings or ordered, work done without required inspection, except as herein provided, or any extra work done without authority will be considered as unauthorized and will not be paid for under the provisions of these Contract Documents. Work so done may be ordered

removed at the Contractor's expense. Work done without lines and grades being given may also be considered as unauthorized and will be subject to rejection.

## 3.18 SUBSURFACE DATA

A) All information obtained by Engineer regarding subsurface conditions and groundwater elevations will be available for inspection at the office of the Engineer upon request.

B) Logs of test holes, test pits, soils reports, groundwater levels, and other supplementary subsurface information are offered as the best available information of underlying materials and conditions at the locations actually tested. The Owner will not be liable for any loss sustained by the Contractor as a result of any variance between conditions contained in or interpretations of test reports and the actual conditions encountered during progress of the work.

C) Contractor shall examine the site and available records. The submission of a Proposal shall be conclusive evidence that the Bidder has investigated and is satisfied as to the subsurface conditions to be encountered as to the character, quality, and quantities of work to be performed and materials to be furnished, and as to the requirements of the Contract Documents.

## 3.19 TEMPORARY WATER

A) The Contractor shall provide all water, required to construct and protect the work until the work is placed in service by the Owner for beneficial use of the Owner.

B) The source for temporary water shall be from the Owner's distribution system as approved by the Owner.

## 3.20 BARRICADES

A) The Contractor must provide and maintain proper barricades, fences, signal lights, flares or watchmen to properly protect the work, equipment, persons, animals and property against injury.

B) In areas of public travel and/or on all approaches leading to this work, all barricades and obstructions shall be illuminated at night. All lights for this purpose shall be kept burning from sunset to sunrise.

C) Temporary traffic control devices and facilities shall be furnished, erected and maintained in accordance with all Local and State requirements.

## 3.21 MAINTAINING TRAFFIC

A) Where Contract work is within streets or other public thoroughfares, the Contractor shall so plan and schedule his work as to cause as little interference with general public traffic. Street surfaces shall be maintained and kept clean where construction work under this Contract has been performed until inspection and acceptance of all such work.

B) Access of fire, police and ambulance vehicles to property abutting and adjacent to such thoroughfares shall be maintained whether or not permission has been granted to restrict other traffic. The Contractor shall obtain all permits from Municipal, County, State or other authority having jurisdiction over traffic in thoroughfares, and shall comply with all regulations and directions of such authority concerning erecting barricades and detouring movement of traffic.

C) The Contractor shall maintain the roads for operating personnel, deliveries of operating supplies, normal maintenance vehicles and other equipment incidental to the operation and maintenance of the Owner's facility.

## 3.22 DISPOSAL OF DEBRIS

A) All debris resulting from construction operations, i.e., packaging, waste materials, damaged equipment, etc., shall be trucked from the site by the Contractor and disposed of at an approved off site location.

B) The Contractor shall police the hauling of debris to ensure that all spillage from haul trucks is promptly and completely removed.

C) All debris shall be disposed of in accordance with Federal, State and City rules and regulations.

D) Excavated materials not suitable or not required for backfill or embankment shall be deposited on one or both of the following waste sites:

1) Waste sites designated in the Contract Documents.

2) Waste sites provided by the Contractor.

E) All costs for disposing of this excess material shall be incidental to other items of work contained in the Proposal unless otherwise specified.

F) Either type of waste site shall be operated in such a manner as to meet all safety and health requirements of State and local agencies. Sites, operations, or the

result of such operations, which create a nuisance problem, or which result in damage to public or private properties will not be permitted.

G) Permits for dumping on sites designated in the Contract Documents will be provided by the Owner. Contractor shall obtain permits for other sites at no expense to Owner. Furnish copies of issued permits to Engineer prior to commencing filling operations.

## 3.23 SANITARY REGULATIONS

A) Toilet accommodations shall also be maintained for the use of the employees on the work. The accommodations shall be in approved locations, properly screened from public observance and shall be maintained in a strictly sanitary manner.

B) The Contractor shall obey and enforce all other sanitary regulations and orders and shall take precautions against infectious diseases.

C) The Contractor shall maintain at all times, satisfactory sanitary conditions around all parts of the work all in accordance with all Federal, State and Local ordinances, regulations and requirements.

## 3.24 DUST CONTROL

A) The Contractor shall apply water or dust palliative, or both, for the alleviation or prevention of dust nuisance caused by his operations. Dust control operations shall be performed by the Contractor at the time(s) as required or as ordered by the Owner. Failure of the Owner to issue such order will not relieve the Contractor of this responsibility.

B) The Contractor shall comply with all Federal, State and Local ordinances, regulations and requirements.

C) Unless otherwise specified, no direct payment will be made for any such work performed or material used to control dust under these Contract Documents.

## 3.25 SMOKE PREVENTION

A) Strict compliance with all ordinances regulating the production and emission of smoke will be required and the Contractor shall accept full responsibility for all damage that may occur to property as a result of negligence in providing required control. The Contractor shall comply with all Federal, State and local regulations.

## 3.26 CONTROL OF NOISE

A) The Contractor shall eliminate noise to as great an extent as possible at all times. Air compressors shall be equipped with silencers and the exhaust of all gasoline motors and other power equipment shall be provided with mufflers. In the vicinity of hospitals, libraries and schools, precautions shall be taken to avoid noise and other nuisance. The Contractor shall require strict observances of all pertinent ordinances and regulations.

## 3.27 USE OF EXPLOSIVES

A) The use of explosives shall not be permitted.

## 3.28 WEATHER CONDITIONS

A) In the event of temporary suspension of the work or during inclement weather, or whenever the Engineer shall direct, the Contractor shall carefully protect (and cause his Subcontractors to similarly protect) all work and materials against damage or injury from the weather.

B) If, in the opinion of the Engineer, any work or materials have been damaged by reason of failure on the part of the Contractor or any of his Subcontractors to so protect his work, such materials shall be removed and replaced at the expense of the Contractor.

## 3.29 FAIR EMPLOYMENT PRACTICES ACT

A) The Contractor agrees that neither he nor his Subcontractors will discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to his hire, tenure, terms, conditions or privileges of employment, or any matter directly or indirectly related to employment, because of his race, color, religion, national origin or ancestry.

B) Breach of this covenant shall be regarded as a material breach of this Contract.

## 3.30 CONSTRUCTION ACCESS

A) The Contractor shall be responsible for design, construction and maintenance of any and all structures required for access to the site for construction or delivery of materials, including but not limited to construction access roads. The Owner's responsibility to provide access easements or right-of-ways to the construction site shall not be interpreted as relieving the Contractor of his responsibilities under this section.

## PART 4: SPECIAL PROVISIONS

### 4.1 MEASUREMENT AND PAYMENT

A) When not listed in the proposal, all "COORDINATION AND CONTROL OF THE WORK" costs will be considered incidental work for which no separate payment will be made.

### 4.2 COORDINATION OF WORK

A) The Contractor shall cooperate with the Owner's field representative for coordination and expeditious execution of his work in relation to total project work required.

### 4.3 TECHNICAL REQUIREMENTS

A) All materials and workmanship shall conform to all Federal, State and Local codes and the technical specifications contained herein.

B) All materials and workmanship for facilities in street right-of-way or easements shall conform to approving agencies' construction specifications. The Contractor must review the construction specifications and take these requirements into consideration in the preparation of his bid.

END OF SECTION

**SECTION 01090**
**REFERENCE STANDARDS**

## PART 1: GENERAL

1.1 SCOPE

A) This Section includes reference standards.

1.2 DESIGNATION OF ASSOCIATIONS, INSTITUTIONS, SOCIETIES AND STANDARDS

A) Whenever in these Specifications reference is made to Associations, Institutions, Societies or Standards, they will be designated as follows:

| | |
|---|---|
| **AASHTO** | American Association of State Highway and Transportation Officials |
| **ACI** | American Concrete Institute |
| **ADA** | American Disability Act |
| **AGA** | American Gas Association |
| **AIA** | American Institute of Architects |
| **AISC** | American Institute of Steel Construction |
| **AISI** | American Iron and Steel Institute |
| **ANSI** | American National Standards Institute |
| **API** | American Petroleum Institute |
| **APWA** | American Public Works Association |
| **AREA** | American Railway Engineering Association |
| **ASA** | American Standards Association |
| **ASCE** | American Society of Civil Engineers |
| **ASME** | American Society of Mechanical Engineers |
| **ASTM** | American Society for Testing and Materials |
| **AWPA** | American Wood Preservers Association |
| **AWS** | American Welding Society |
| **AWWA** | American Water Works Association |
| **BLIS** | Bureau of Labor and Industries Standards |
| **BLM** | Bureau of Land Management |
| **CDOT** | Colorado Department of Transportation |
| **CISPI** | Cast Iron Soil Pipe Institute |
| **COE** | Corps of Engineers |
| **CRSI** | Concrete Reinforcing Steel Institute |
| **DEQ** | Department of Environmental Quality |

| | |
|---|---|
| **CDPHE** | Colorado Department of Public Health and the Environment |
| **EPA** | Environmental Protection Agency |
| **FHWA** | Federal Highway Administration |
| **FS** | Federal Standards |
| **IRI** | Industrial Risk Insurance |
| **ISA** | Instrument Society of America |
| **ISO** | Insurance Service Office |
| **ITE** | Institute of Traffic Engineers |
| **MUTCD** | Manual of Uniform Traffic Control Devices |
| **NBS** | National Bureau of Standards |
| **NEC** | National Electrical Code |
| **NESC** | National Electric Safety Code |
| **NEMA** | National Electrical Manufacturer's Association |
| **NFPA** | National Fire Protection Association |
| **NLMA** | National Lumber Manufacturer's Association |
| **OSHA** | Occupational Safety and Health Administration |
| **PCA** | Portland Cement Association |
| **SSPC** | Steel Structures Painting Council |
| **UBC** | Uniform Building Code |
| **UFC** | Uniform Fire Code |
| **UL** | Underwriter's Laboratories, Inc. |
| **UPC** | Uniform Plumbing Code |
| **USBM** | United States Bureau of Mines |
| **WWPA** | Western Wood Products Association |

Wherever specific standard numbers are indicated, i.e., ASTM C-150, it shall be understood to mean the latest revision thereof.

## PART 2: PRODUCTS

None

## PART 3: EXECUTION

None

## PART 4: SPECIAL PROVISIONS

### 4.1 MEASUREMENT AND PAYMENT

A) When not listed in the proposal, all "REFERENCE STANDARDS" costs will be considered incidental work for which no separate payment will be made.

END OF SECTION

# SECTION 01300
# CONSTRUCTION SUBMITTALS

## PART 1: GENERAL

1.1 SCOPE

A) This section includes requirements for construction submittals.

1.2 COORDINATION OF SUBMITTALS

A) All submittals to the Owner's Representative, with the exception of the laboratory test certificates, shall be made only by the Contractor. Direct submittals from subcontractor or suppliers will not be accepted.

B) All submittals shall reference the Specification item that it covers, the Contractor's name, the Contract title and location, and the date of submission. Submittal shall also indicate whether the information is for the Owner's Representative's review and approval, for record purposes or for the fulfillment of the operation and maintenance requirements.

C) Prior to Submitting Information to the Engineer:

1) The Contractor shall carefully review the correctness and thoroughness of the material, verify all field measurements, and coordinate all aspects of each item being submitted.

2) The Contractor shall verify his review by affixing his stamp of approval and signature to each page of each required copy of the submittal.

## PART 2: PRODUCTS

2.1 GENERAL

A) Three Categories of Information Are Normally Required:

1) Information for record.

2) Information for the Engineer's review and approval.

3) Operation and maintenance information.

B) All submittals shall be tailored to the project by highlighting appropriate information and/or deleting or crossing out non-applicable information. All options furnished shall be so indicated.

C) Manufacturers submitting proposals for equipment which will require changes to the design shown on the drawings or specified herein shall also include detailed information on structural, electrical, mechanical and other miscellaneous changes or modifications required to adapt their equipment to the design shown.

2.2 INFORMATION FOR RECORD

A) Laboratory Certificates: Certificates shall include the results of tests by an independent laboratory for comparison to Specification requirements, mix design data and approval, plan inspection reports and certification, and other required information from the laboratory. All information submitted shall be signed by an authorized agent of the laboratory.

B) Licenses and Permits: The Contractor shall obtain all licenses and permits required by Local, State and Federal laws and submit copies of them to the Engineer.

C) Installation and Calibration Certificates: Certificates shall be submitted for equipment as indicated in the individual sections. These certificates shall indicate manufacturer's satisfaction with the installation, the accuracy of calibration and alignment, and the operation of the equipment. Such certificates must be signed by an authorized agent of the manufacturer.

D) Manufacturers' Literature: Literature indicating the compliance of the product with the Specifications shall be included with all submittals. This shall include catalogs and other descriptive bulletins. Relevant portions of the literature shall be clearly identified by highlighting or under lining.

E) Manufacturers' or Suppliers' Certificates: Certificates shall state that the products have been sampled and tested in accordance with the proper industrial and governmental standards and meet the requirements of the Contract Documents. Certificates shall be signed by an authorized agent of the manufacturer.

F) Design Data: Design data shall include the calculations, supporting theories, safety factors and assumptions used in designing the product.

G) Samples: Samples shall be provided as required in the individual sections. Samples shall be of the precise material proposed to be furnished. The number of samples and sample size shall be of the industry standard unless otherwise stated in the individual sections.

H) Substitutions: Submittals for substitute materials or equipment shall include but not be limited to manufacturer's literature, design criteria, dimensions and installation instruction. The submittal shall also include any certifications or test results required to demonstrate that the proposed materials or equipment meets the requirements of the specifications and is equivalent or better than the specified materials or equipment.

## 2.3 INFORMATION FOR THE ENGINEER'S REVIEW AND APPROVAL

A) Construction Schedules: Unless otherwise specified, construction schedules shall include:

1) Prior to starting construction of this Contract, the Contractor shall submit through the Engineer for the Owner's review four (4) copies of a schedule, in the form of a bar chart, of the proposed operations. The schedule shall be complete and show in detail the manner in which he proposes to complete the work within the specified time. The schedule shall include purchase lead time and delivery schedule for major equipment. The Engineer will distribute copies of the approved schedule to the Owner, the Contractor and the Owner's Representative.

2) The Contractor shall update the construction schedule monthly to show the work completed and any changes in the schedule.

B) Shop Drawings: Shop drawings shall include the following along with any special requirements listed in the individual Specification Sections:

1) Scaled details

2) Scaled dimensional drawings

3) Sectional assembly drawings

4) Fabrication information

5) Installation instructions and drawings

6) Wiring schematics with termination point identification

7) Motor information, Electric Motors

8) Piping schematics

9) Materials of construction

10) Manufacturer's name and model

11) Manufacturer's catalog data

C) The Contractor shall indicate on the submittals all variances from the Specifications.

2.4 OPERATION AND MAINTENANCE INFORMATION

A) The Contractor shall furnish four (4) copies of information for all equipment requiring maintenance.

B) This information will be accepted only if properly identified with Contract Section Numbers and only after revised, where necessary, to conform to the Owner's Representative notes on previous submittals that have been "Approved as Noted." Manuals shall be tailored to suit the specified equipment provided.

C) Submittals shall include but not be limited to the following:

1) Descriptive literature, bulletins or other data covering the equipment or system.

2) Complete list of equipment and appurtenances included with the system, complete with manufacturer and model number.

3) Utility requirements.

4) General arrangement drawing.

5) Sectional assembly.

6) Dimension print.

7) Materials of construction.

8) Certified performance curve.

9) Performance guarantee.

10) Parts list with assembly drawings.

11) Recommended spare parts list with part and catalog number.

12) Lubrication recommendations and instructions.

13) Schematic wiring diagrams.

14) Schematic piping diagrams.

15) Description of associated instrumentation.

16) Drive dimensions and data.

17) Operating instructions.

18) Maintenance instructions including trouble shooting guidelines, lubrication and preventive maintenance instructions with task schedule.

19) Special tools and equipment required for operation and maintenance.

20) Description of equipment controls.

21) Pump seal data

22) Assembly, installation, alignment, adjustment and checking instructions.

23) Confirmation of all corrections noted on shop drawings "Approved as Noted."

24) Suppliers name, address and telephone number along with manufacturers job number and/or Purchase order number.

D) All manuals shall be tailored to the project by high lighting appropriate information and/or deleting or crossing out non-applicable information. All options furnished shall be indicated.

E) Manuals shall be printed on heavy, first quality paper, 8-1/2" x 11" size with standard three hole punching. Large manuals shall be submitted in three ring binders. Drawings shall be reduced to 11" x 17". Where reduction is not possible,

larger drawings shall be folded separately and placed in envelopes which are bound into the manual. A Table of Contents and index tabs shall be furnished for all manuals containing data for three or more items of equipment.

F) Equipment shall not be considered substantially complete until all associated O & M submittals are accepted by the Engineer.

G) Field modifications to equipment during installation shall be included in the manual so that the manual reflects as-built conditions. Revisions to the manual may be submitted for incorporation into the manual where appropriate. However, the Engineer reserves the right to return all four manuals for revision to reflect as-built conditions.

2.5 OTHER SUBMITTALS

A) Other submittals are required under various sections of these Specifications.

## PART 3: EXECUTION

3.1 GENERAL

A) Delivery prior to approval of any material or equipment for which submittals are required will be at the Contractor's risk. Material or equipment for which submittals are required shall not be incorporated into the work until after the submittals have been reviewed and approved.

B) Any material or equipment on-site which is rejected by the Owner's Representative after review of submittals shall be removed from the job site by the Contractor within two (2) working days of notification of rejection.

3.2 DISTRIBUTION

A) Distribution of submittals shall be as follows unless otherwise directed in the individual Sections:

1) Information for Record - The Contractor or the laboratory shall submit one (1) copy of all test certificates, licenses, permits and installation and calibration certificates directly to the Owner's Representative.

2) Information for Engineer's Review and Approval

a) The Contractor shall submit to the Owner's Representative four (4) copies of all documents requiring review.

b) The Owner's Representative will review the submittals with reasonable promptness for their compliance with the design concept and the Contract Documents.

c) If the submittals are found insufficient three copies will be returned to the Contractor for correction. The Contractor shall than resubmit four (4) copies of the corrected information.

d) Upon acceptance, the Owner's Representative will distribute marked copies as follows:

(1) One (1) copy - Owner's Representative

(2) Two (2) copies – Contractor

(3) One (1) copy - Engineer

## PART 4: SPECIAL PROVISIONS

4.1 MEASUREMENT AND PAYMENT

A) When not listed in the proposal, all "CONSTRUCTION SUBMITTAL" costs will be considered incidental work for which no separate payment will be made.

END OF SECTION

**SECTION 01350**
**COMMON PRODUCT REQUIREMENTS**

## PART 1: GENERAL

1.1 SCOPE

A) This section includes several product requirements common to most products.

B) This section defines the minimum requirements of these common traits. The requirements specified herein apply to all products furnished under the Contract except where modified in other sections or otherwise recommended by the manufacturer.

1.2 SUBMITTALS

A) Submittals shall be in accordance with the requirements of these Contract Documents and shall include:

1) Manufacturer's certification that all materials and products which will come in contact with potable water meet the requirements of the specifications contained herein.

## PART 2: PRODUCTS

2.1 GENERAL

A) Whenever any material, article, device, product, or fixture is indicated or specified by patent or proprietary name, by name of manufacturer, or by catalog number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the material or process desired. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers where fully suitable in design, and shall be deemed to be followed by the words "or approved equal". The decision relative to equality shall be by the Engineer and Owner, and shall be final.

B) All material incorporated into the project shall be new and previously unused, unless the express approval for items is received from the Owner.

2.2 MATERIALS IN CONTACT WITH POTABLE WATER

A) All materials or products specified in these Contract Documents or required to complete the work which will come in contact with or which will be used on material or products which will come in contact with potable water shall conform to all State and Federal Requirements.

B) All materials or products as specified above shall meet the requirements of the National Sanitation Foundation Standard 61 (NSF/ANSI 61), Drinking Water System Components - Health Effects, latest revision.

C) Whenever any material or product is indicated or specified by patent or proprietary name, name of manufacturer or model number, such specification is used for the purpose of establishing a standard of quality and facilitating the description of the material or process desired. Such specification of a particular product shall not be construed as acceptability under the above listed criteria. It shall be the Contractor's responsibility to provide certification as required above or provide an equal quality product for which certification can be provided."

D) Any material or product installed without certification that it conforms to requirements as specified above shall be removed and replaced by the Contractor at no additional cost to the Owner.

## PART 3: EXECUTION

3.1 DELIVERY, HANDLING AND STORAGE OF PRODUCTS, MATERIALS, EQUIPMENT

A) Unless otherwise specified in the individual sections, the Contractor shall deliver, handle and store materials and equipment in accordance with the requirements of the manufacturer and the following:

1) Delivered materials and equipment shall be in the manufacturer's original, unopened packaging with labels intact and legible.

2) Delivered materials should be in sufficient quantity to allow continuity of work.

3) The delivered materials and equipment shall be stored on clean raised platforms in conformance with the manufacturer's requirements.

4) The materials and equipment shall be protected from the weather, dust, mud, oil, moisture and other elements that are detrimental to the material or equipment.

5) Materials and equipment shall be protected against damage by construction traffic.

6) Materials and equipment that are damaged or do not conform to the Specifications shall be removed immediately from the project site.

7) Storage of materials, equipment and incidentals shall comply with all Local, State and Federal ordinances, regulations and requirements.

8) Emulsions and paints shall be stored in temperatures above 40°C or according to the manufacturer's requirements.

B) Materials, equipment and articles to be incorporated into the work shall be stored so as to facilitate inspection and in such manner as to ensure the preservation of their quality and fitness for the work. Stocked materials, even though approved before storage, shall be subject to test and shall meet requirements of the Specifications at the time they are to be used in the work.

C) Where construction is in roads, streets, etc., that portion of the right-of-way not required for public travel may be used for storage purposes, unless otherwise prohibited, and for placing of the Contractor's plant and equipment. Any other additional space required for construction facilities or storage of materials and equipment shall be provided by the Contractor at his expense.

D) The Contractor will confine his equipment, the storage of materials and equipment and the operations of his workmen to areas permitted by law, ordinances, permits or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with materials or equipment.

## PART 4: SPECIAL PROVISIONS

### 4.1 MEASUREMENT AND PAYMENT

A) When not listed in the proposal, all "COMMON PRODUCT REQUIREMENTS" costs will be considered incidental work for which no separate payment will be made.

END OF SECTION

**SECTION 02226**
**TRENCH EXCAVATION AND BACKFILL**

## PART 1: GENERAL

1.1 SCOPE

A) This section includes all trench excavation, backfill and related work for the construction of the designated pipelines, service lines, hydrant assemblies, appurtenances, and other incidental work.

B) Trench Excavation and Backfill Includes:

1) Clearing, grubbing, grading, excavation, fill, backfill, trenching, excess excavation, bedding, pipe zone and borrow material, and surface restoration that may be required to complete the work.

2) Furnishing, placing and use of sheeting, shoring and sheet piling necessary in excavating to prevent widening or sloughing of the trench which could be hazardous to human safety, the pipe or appurtenances being installed, existing utilities and structures, or any other existing facility.

3) Performing all pumping and fluming necessary to keep the trenches free from water. The method of dewatering shall provide for a completely dry foundation at the final lines and grades of the excavation and be in accordance with NPDES and CDPHE's permitting requirements.

4) If the bottom of the excavation is soft or unstable and cannot satisfactorily support the pipe or structure in the opinion of the Engineer, a further depth and width shall be excavated and refilled with material as directed by the Engineer.

5) Providing for uninterrupted flow of existing drains and sewers and the temporary disposal of water from other sources during the progress of the work.

6) Supporting and protecting all structures, pipes, conduits, culverts, posts, poles, wires, fences, buildings and other public and private property adjacent to the work.

7) Removing and replacing existing sewers, culverts, pipelines and bulkheads where necessary.

8) Removal and proper disposal of all surplus or excess excavated material from the jobsite.

9) Performing all backfilling, grading and compaction to the limits specified or ordered by the engineer.

10) Restoring all property damaged as a result of the work included under this section.

C) The Work includes obtaining and transporting suitable fill material from off-site when on-site material is not available.

D) The Work includes transporting surplus excavated material not needed for backfill at the location where the excavation is made, to other parts of the work where filling is required, or disposal of all surplus on other sites provided by the Contractor or as directed by the Owner.

1.2 LABORATORY SERVICES

A) Owner will provide for the backfill compaction testing services as described below.

1) Sieve analysis (ASTM C136): One test for each select material source and type:

a) Selected bedding and pipe zone backfill material.

b) Crushed rock aggregate base course material.

c) Pit run aggregate material.

2) Backfill Compaction:

a) One moisture density curve (AASHTO T180) for each size and type of material used for backfill. The maximum dry weight and optimum moisture content shall be indicated. The cost of all retests required due to any unauthorized change in backfill material shall be borne by the Contractor.

b) Test consolidated backfill material in trenches around pipes for conformance with specified "compaction requirements," contained herein:

(1) Where tests indicate insufficient values, perform additional tests as required by the Owner's representative. Testing shall continue until specified values have been attained by additional compaction effort.

(2) Retests shall be referenced to the corresponding failing test. The cost of all retests shall be borne by the Contractor.

1.3 CONSTRUCTION WITHIN ROADWAY AND RAILROAD RIGHT-OF-WAYS

A) Permits: the contractor shall be responsible for ensuring that all permits required for construction are obtained.

B) Contractor shall provide bonds and insurance as required by affected agency prior to proceeding with any work.

C) Notification: the Contractor shall give written notice to appropriate officials of the affected Federal or State Highway Department, City, County or railroad at least five days, not including weekends and holidays, before starting construction within highway or railroad right-of-ways and as required under other roadways.

1.4 SUBMITTALS

A) Submittals shall be in accordance with the requirements of these Contract Documents and shall include:

1) When excess excavated material is disposed of at locations off the project site, the contractor shall obtain and submit written permission from the Owner of the property upon which the material is to be placed.

2) Executed copy of permit(s) to dispose of material specified under this section.

1.5 PROTECTION

A) Test Pits: The Contractor shall dig such exploratory test pits as may be necessary in advance of excavation to determine the exact location and elevation of subsurface structures, pipelines and conduits which are likely to be encountered and shall make acceptable provision for their protection, support, and maintenance in operation.

B) Sheeting, Shoring and Bracing

1) The Contractor shall furnish and install adequate sheeting, shoring, and bracing to maintain safe working conditions, and to protect newly built work and all adjacent and neighboring structures from damage by settlement.

2) Bracing and sheeting shall conform to the recommendations in the Occupational Safety and Health Administration Standards for Construction (OSHA). A trench box may be used in lieu of sheeting and bracing as permitted by OSHA. Unless otherwise approved, all trench support materials shall be removed in a manner that will prevent caving of the sides and movement or damage to the pipe.

3) Bracing shall be arranged so as not to place a strain on portions of completed work until the construction has proceeded far enough to provide ample strength. Sheeting and bracing may be withdrawn and removed at the time of backfilling, but the Contractor shall be responsible for all damage to newly built work and adjacent and neighboring structures.

4) All sheeting, shoring and bracing shall be of Contractor's design and shall be in accordance with all Federal, State and Local codes and requirements.

C) Removal of water

1) The contractor shall at all times during construction provide and maintain ample means and devices with which to remove promptly and dispose of properly all water entering the excavations or other parts of the work and shall keep said excavations dry until the pipelines to be placed therein are completed. In water bearing sand, well points and/or sheeting shall be supplied, together with pumps and other appurtenances of ample capacity to keep the excavation dry as specified.

2) The contractor shall dispose of water from the work in a suitable manner without damage to adjacent property or structures.

3) Water shall not be allowed to rise until concrete has set for a minimum of 24 hours. Water shall not be allowed to rise unequally against an unsupported structure.

4) Contractor shall provide silt fences, straw bales, and/or sedimentation basins as required to clarify waters prior to discharge in accordance with Federal, State and Local requirements.

1.6 DEFINITIONS

A) Classification of Excavated Materials

1) Unclassified Native Material shall be defined as all material not classified as rock excavation or unsuitable material that is removed from the trench by required excavation.

2) Rock Excavation shall be defined as follows:

a) Rock excavation shall consist only of that solid bedrock or ledge rock and boulders over two (2) cubic yards in volume which cannot be removed by a D8K (or approved equal) with four barrel hydraulics and dual rippers or 90,000 pound class Excavator (P.C. 400 Komatsu or 235 Caterpillar or approved equal) with single shank ripper on back of bucket, which shall not be more than thirty-six inches (36") in width, but which requires systematic drilling, blasting or the use of rock splitters pneumatic hammers and wedges. All D8K's and 90,000 pound class Excavators shall be in excellent operating condition and operated by personnel competent to operate like machinery.

b) Removal of existing concrete and asphaltic surfaces does not qualify as rock excavation.

3) Unsuitable Materials

a) Unsuitable material shall be defined as all material that is either too wet, contains grass, roots, brush or other vegetation, large rocks or is classified under ASTM D 2487 as PT, OH, CH, MH or OL and materials which cannot be compacted to achieve the required percentage of maximum density for the intended use shall not be used in the work.

B) Trench Backfill Zones

1) Pipe embedment zone - The area from 4-inches under the pipe to 1/6 the outside pipe diameter distance above the bottom of pipe for the width of the trench.

2) Pipe zone - The area from the top of the pipe embedment zone to 6-inches above the pipe for the width of the trench.

3) Trench backfill zone - The area from 6-inches above the pipe to bottom line of surface restoration for the width of the trench.

C) Trench Classifications

1) Class I Trench - Class I trench shall have select granular material in all three zones for backfill material. For use under paved or graveled roadways, road shoulders, gravel and paved driveways, or as directed by the Engineer. The type of material required for each backfill zone shall be as follows:

| **Class I Trench** | |
|---|---|
| **Backfill Zone** | **Backfill Material** |
| Pipe Embedment Zone | Type B or C |
| Pipe Zone | Type A, B or C |
| Trench Backfill Zone | Type A and/or E<br>*(Top 12-inch under asphalt must be Type A)* |

2) Class II Trench - Class II trench shall have select granular material in the pipe embedment and pipe zones and suitable native excavated material in the trench backfill zone to 6-inches below finish grade. The top 6-inches shall be select aggregate base course material as specified. For use under gravel roads, driveways, road shoulders and future or current paved areas, or as directed by the Engineer.

| **Class II Trench** | |
|---|---|
| **Backfill Zone** | **Backfill Material** |
| Pipe Embedment Zone | Type B or C |
| Pipe Zone | Type A, B or C |
| Trench Backfill Zone | Type A and D<br>*(Top 6-inch must be Type A)* |

3) Class III Trench - Class III trench shall have select granular material in the pipe embedment zone and native excavated material in the pipe zone and trench backfill zone. For use under unimproved open areas or under gravel roads, road shoulders and driveways or future paved areas with the top surface of select aggregate base course material to the depth specified or shown on the drawings or as directed by the Engineer.

| **Class III Trench** | |
|---|---|
| **Backfill Zone** | **Backfill Material** |
| Pipe Embedment Zone | Type B or C |
| Pipe Zone | Type D |
| Trench Backfill Zone | Type A and D<br>*(Type A surface depth as specified)* |

4) Class IV Trench - Class IV trench shall have unclassified native excavated material in the pipe embedment and pipe zones and unclassified native excavated material in the backfill zone for backfill material. For use under unimproved open rural area or as directed by the Engineer.

| **Class IV Trench** | |
|---|---|
| **Backfill Zone** | **Backfill Material** |
| Pipe Embedment Zone | Type D |
| Pipe Zone | Type D |
| Trench Backfill Zone | Type D |

## PART 2: PRODUCTS

2.1 SELECTED GRANULAR BACKFILL MATERIAL REQUIREMENTS

A) Selected backfill material shall consist of well-graded pit run, sand or crushed rock or screenings, meeting the following requirements:

1) Type A: 3/4-inch crushed rock aggregate base course material that meets the gradation requirements of CDOT for class 6 aggregate base course.

| **Type A - Class 6 CDOT Aggregate Base Course** | |
|---|---|
| **Sieve Size** | **Total Percent Passing by Weight** |
| 3/4 - inch | 100 |
| No. 4 | 30-65 |
| No. 8 | 25-55 |
| No. 200 | 3-12 |

2) Type B: Selected bedding and pipe zone backfill material shall be 3/4-inch minus screened rock durable and free from slaking or decomposition under action of alternate wetting and drying. The material shall meet the following gradation requirements:

| **Type B – ¾-inch Minus Screened Rock** | |
|---|---|
| **Sieve Size** | **Total Percent Passing by Weight** |
| 3/4 - inch | 100 |
| No. 4 | 15 maximum |

3) Type C: 3/8-inch minus crusher screenings for bedding material with one hundred percent (100%) passing the 3/8-inch sieve and fifty percent (50%) or less passing the No. 8 sieve.

| **Type C – 3/8-inch Minus Crusher Screenings** | |
|---|---|
| **Sieve Size** | **Total Percent Passing by Weight** |
| 3/8 - inch | 100 |
| No. 8 | 50 maximum |

4) Type D: All materials considered as suitable for fill and backfill obtained from the required excavation meeting the requirements of paragraphs 2.1 and 2.2 herein.

5) Type E: Pit run aggregate that is relatively uniformly graded having a maximum rock size of 8-inches and no more than 20% by weight passing the No. 200 sieve size.

| **Type E – Pit Run Aggregate 8-inch minus** | |
|---|---|
| **Sieve Size** | **Total Percent Passing by Weight** |
| 8 - inch | 100 |
| No. 200 | 20 maximum |

2.2 UNCLASSIFIED NATIVE MATERIAL

A) Excavated material free of vegetable matter, large rocks and debris.

B) Excavated material approved by the Engineer for use as backfill in designated trench backfill zones.

C) Individual particles no larger than 8 inches in diameter within trench backfill zone and no larger than 2 inches in diameter within embedment and pipe zones.

2.3 FOUNDATION STABILIZATION

A) Gravel or crushed aggregate with 100% passing the 1.5-inch sieve size or Engineer approved clean, well-graded granular material.

B) Excavation Below Grade: Where the excavation is carried beyond or below the lines and grades shown on the plans or staked, the Contractor shall, at his own expense, refill all such excavated space with required pipe bedding material.

C) Unstable Trench Bottom: Where the excavation is found to consist of muck, organic matter or any other material that the Engineer determines to be unsuitable for supporting the pipe, an additional depth shall be excavated as directed by the Engineer and replaced with an approved granular stabilization material. Payment shall be made on the unit price provided in the bidding schedule.

## PART 3: EXECUTION

### 3.1 PREPARATION

A) The site of an open cut excavation shall be first cleared of all obstructions preparatory to excavation. Wherever paved or surfaced streets are cut, saw wheel or approved cutting devices shall be used. Width of pavement cut shall not be less than 12-inches greater than trench width. All cut or broken pavement shall be removed from site during excavation.

B) The Contractor shall maintain street traffic at all times and erect and maintain barricades, warning signs, traffic cones, and other safety devices during construction in accordance with Manual of Uniform Traffic Control Devices (MUTCD) to protect the traveling public. Provide flagmen as required during active work in roadway areas.

C) Intent of specifications is that all streets, structures, and utilities be left in condition equal to or better than original condition. Where damage occurs and cannot be repaired or replaced, Contractor shall purchase and install new material which is satisfactory to Owner. Plans and/or specifications cover and govern replacement and restoration of foreseeable damage.

D) The operations shall be confined to the work limits provided. Avoid encroachment on, or damage to, private property or existing utilities unless prior arrangements have been made with copy of said arrangement submitted to Engineer.

### 3.2 TRENCHING

A) Excavation for trenches in which pipelines are to be installed shall provide adequate space for workmen to place and join the pipe properly, but in every case the trench shall be kept to a minimum width. The width of trench at the top of the

pipe shall not exceed the limits specified in Section 02667 or as shown on the drawings.

B) Excavation shall be to the depth necessary for placing of granular bedding material under the pipe as shown on the drawings. If over digging occurs, the trench bottom shall be filled to grade with compacted granular bedding material.

C) Unless otherwise permitted by the Engineer, trenching operations shall not be performed beyond the distance which will be backfilled and compacted the same day.

D) In general, backfilling shall begin as soon as the conduit is in approved condition to receive it and shall be carried to completion as rapidly as possible. New trenching shall not be started when earlier trenches need backfilling or the surfaces of streets or other areas need to be restored to a safe and proper condition.

E) Where the excavation activities require the removal of portions of an abandoned pipeline, 2,500 psi concrete plugs shall be installed in the open ends of the pipe. Concrete plugs to be a minimum one and one-half (1-1/2) times the diameter of the pipe.

F) Water facilities, including pipe, fittings, valves, meter services, hydrants, and other appurtenances or at least every 50 linear feet shall not be installed without line and grade stakes approved by Ute Water Inspector. Line and grade for water mains shall be established under the direct supervision of a PLS.

## 3.3 EXCAVATION OF UNSUITABLE MATERIALS

A) Unsuitable materials existing below the contract bottom limits for excavation shall be removed only as directed by the Engineer. Such excavation shall be conducted at a time when the engineer is present and shall not exceed the vertical and lateral limits as prescribed by the engineer.

B) Where soft subgrade is encountered in which satisfactory stability cannot be obtained by moisture control and compaction, the unstable material shall be excavated to the depth required by the Engineer.

C) Backfill with foundation stabilization material compacted in layers not exceeding 12-inches depth to required density and compaction.

## 3.4 DISPOSAL OF UNSUITABLE AND SURPLUS MATERIAL

A) All excavated materials which are unsuitable for use in backfilling trenches or around structures, and materials excavated that are in excess of that required for backfilling and for constructing fills and embankments as shown on the drawings, shall be disposed of by the Contractor at own expense and at disposal sites provided by him as may be required.

B) Surplus or excess excavated material shall be disposed of at designated spoil sites in a legal manner, in full compliance with applicable codes and ordinances.

## 3.5 ROCK EXCAVATION

A) Where the bottom of the trench encounters ledge rock and/or boulders and large stones which meet the definition of "rock" as described herein, said rock shall be removed to provide additional clearance below the pipe zone as shown in the Contract Documents.

B) Excavations below subgrade in rock shall be backfilled to subgrade with approved bedding material and thoroughly compacted as shown in the Contract Documents.

C) Contractor to excavate and remove the overburden exposing the rock surface, allowing the Engineer to profile the excavated trench for rock measurement. The profiling of the exposed rock surface shall be done prior to commencement of rock removal activities.

D) Blasting for excavation shall be permitted with approval by the Engineer and only after securing approval(s) from federal, state, and other authorities having jurisdiction.

## 3.6 REMOVAL OF CONCRETE CURBS & SIDEWALKS

A) Where trench excavation requires removal of concrete curbs and/or sidewalks, the curbs and/or sidewalks shall be sawcut as required and removed at a tooled joint unless otherwise authorized by the Engineer.

B) The intention of this requirement is to facilitate the replacement of curbs and sidewalks to the joint pattern of the existing and surrounding curbs and/or sidewalks. The sawcut lines for concrete sidewalk and curb cuts shown on the drawings are schematic and not intended to show the exact alignment of such cuts.

## 3.7 BACKFILL AND COMPACTION

A) General

1) Backfill Immediately: All trenches and excavations shall be backfilled immediately after pipe is laid therein, unless otherwise directed by the Engineer. Under no circumstances shall water be permitted to rise in un-backfilled trenches after pipe has been placed.

2) Backfilling with Excavated material: Where specified or directed, material excavated in connection with the work shall be used for backfilling, in accordance with the type of trench classification shown on the contract drawings. No material shall be used for backfilling that contains stones, rock or pieces of masonry greater than 8-inches within the trench zone or greater than 2-inches within the pipe and embedment zones. No material shall be used for backfilling that contains frozen earth, debris, organic material, or marl.

3) In no case shall backfill material deposited by machinery be allowed to fall directly on the pipe and in all cases the bucket shall be lowered so that the shock of the falling backfill material will not cause damage.

4) All backfill material shall be placed with moisture-density control in accordance with the typical trench detail shown on the Standard Detail Sheets. All approved backfill material shall be adjusted to within two percent (2%) of the optimum moisture content prior to its placement in the trench. Jetting or water soaking trenches to achieve compaction of the backfill will not be permitted except when the backfill consists of gravel or other granular material having less than twenty percent (20%) by weight passing a No. 200 sieve.

5) During initial backfilling, the contractor shall take all necessary precautions to prevent movement or distortion of the pipe or structure being backfilled. Pipe zone material shall be placed and compacted in even lifts on both sides of the pipe to above the top of the pipe. Above the pipe bedding and pipe zone the earth backfill material shall be placed full width in uniform layers not more than twelve (12) inches thick. Each layer shall be compacted to the required density with approved mechanical or hand tamping equipment.

B) <u>Embedment Zone</u>

1) Pipe embedment material shall be placed in the trench, compacted and shaped to provide continuous support for the pipe between joints or fittings.

2) Bell holes shall be provided for all joints or fittings as required to permit assembly.

3) Pipe shall be laid directly on the embedment materials; embedment material particle size must be limited to less than 2-inch in diameter.

C) Pipe Zone

1) Backfill shall be placed in uniform layers on both sides of the pipe. Each layer shall be placed, then carefully and uniformly tamped to the specified density so as to eliminate the possibility of lateral displacement of the pipe.

2) Care shall be taken to ensure that the material under the haunches of the pipe is sufficiently compacted with handheld tamping bars supplemented by walking in and slicing material under the haunches with a shovel to ensure voids are completely filled.

3) Pipe zone material particle size must be limited to less than 2-inch in diameter.

D) Trench Backfill Zone

1) After the backfill has been placed and compacted around the pipe and structures to a height of 6-inches over the top as specified above, the remainder of the trench may be backfilled appropriately with proper equipment.

2) The backfill material shall be deposited in horizontal layers not exceeding 12-inches thick, and each layer shall be thoroughly compacted to the specified density by approved methods before the succeeding layer is placed.

E) Backfilling Under Existing Conduits

1) Where it is necessary to undercut or replace existing utility conduits and/or service lines, the excavation beneath such lines shall be backfilled the entire length with granular bedding material tamped in place in 6-inch layers to the required density. The granular bedding shall extend outward from the spring line of the conduit a distance of 2 feet on either side and thence downward at its natural slope.

F) Backfilling Under Pavement and Walks

1) Where any pavement, driveway, parking lot, curb and gutter, or walk is to be placed over a backfill area, granular material shall be used. The material

shall be placed and compacted to the required density in accordance with the specification contained herein.

## 3.8 COMPACTION REQUIREMENTS

A) Compaction requirements for Type I, Type II and Type III trench shall be as follows:

1) Compaction of the pipe embedment and pipe zones shall be achieved by mechanical compaction in horizontal lifts or other approved method to ninety percent (90%) of the maximum dry density per AASHTO T99 test method.

2) Compaction of the trench backfill zone shall be achieved by mechanical compaction in horizontal lifts or other approved method to ninety-five percent (95%) of the maximum dry density per AASHTO T99 test method.

B) Compaction requirements for Type IV trench shall be as follows except under gravel roads, driveways, road shoulders or future or current paved areas which shall be compacted in accordance with paragraphs A.1 and A.2 above.

1) Compaction of the pipe embedment and pipe zones shall be achieved by mechanical compaction in horizontal lifts or other approved method to eighty percent (80%) of the maximum dry density per AASHTO T99 test method.

2) Compaction of the trench backfill zone shall be achieved by mechanical compaction in horizontal lifts or other approved method to eighty-five percent (85%) of the maximum dry density per AASHTO T99 test method.

## 3.9 COMPACTION TESTS

A) Trenches shall be backfilled and consolidated in layers, as specified, to the existing ground surface. All backfill shall be frequently tested to insure that the required density is being attained. Contractor shall contact governing agency to determine their requirements for compaction testing, however, the minimum requirements for compaction testing shall be as follows:

1) For every 300 lineal feet of trench and each branch or section of trench less than 300 feet in length, at least one compaction test shall be performed for each two foot vertical lift of backfill material placed. The first test shall be taken approximately two feet above the top of pipe and the last test shall be at the pavement subgrade or 6 inches below the ground surface in unpaved

areas. Compaction tests shall be taken at random locations along the trench and wherever poor compaction is suspected. If any portion of the backfill placed fails to meet the minimum density specified, the area shall be defined by additional tests if necessary and the material in the designated area shall be removed and replaced to the required density at the Contractor's expense.

2) All compaction testing shall be performed by a certified testing laboratory. The cost of the testing shall be borne by the Owner. It shall be the Contractor's responsibility to assist in coordinating the testing and to make necessary excavations in order to accommodate compaction tests at all locations designated.

B) The initial test series for each type of backfill material shall be continued until the method of consolidation employed has proven to attain the required compaction. Any change in the proven method of consolidation will not be permitted unless approved by the Owner's Representative.

C) Subsequent tests or series of tests shall be in locations and at depths ordered by the Engineer.

D) The cost of all retests shall be borne by the Contractor.

3.10 SURFACE RESTORATION AND CLEAN UP

A) Surface restoration shall conform to these Contract Documents where applicable. Restore ground surfaces to original conditions and elevations unless otherwise specified or directed.

B) Clean up and remove all excess materials, construction materials, debris from construction, etc. Replace or repair any fences, mailboxes, signs, landscaping, or other facilities removed or damaged during construction. Replace all lawns, topsoil, shrubbery, flowers, etc., damaged or removed during construction. Contractor to be responsible for seeing that lawns, shrubs, etc. Remain alive. Leave premises in condition equal to or better than original condition before construction.

C) Immediately after any section of a completed pipeline has been tested and approved by the Owner or Engineer, the Contractor shall replace all paved surfaces removed or damaged by his operation. All pavement replacement shall be in accordance with the typical trench detail shown on the standard detail sheets, and in accordance with any permit requirements impose by the City, County or State.

D) Unless otherwise approved, all asphalt pavements removed shall be replaced with hot mixed bituminous pavement and all aggregate base course material shall be Colorado Department of Transportation, Class 6 Aggregate Base Course. Paved surfaces shall be restored to their original line and grade and finished to match adjacent undisturbed surfaces. If Contractor is unable to replace asphalt pavement with hot mixed bituminous pavement, then temporary cold asphalt pavement shall be used. Contractor will be responsible for maintaining the cold asphalt pavement until it can be replaced with hot mixed bituminous pavement. All costs for temporary pavement, maintaining temporary pavement, an replacing asphalt pavement with hot mixed bituminous pavement shall be considered to be included in the bid price for pavement replacement.

E) All curbs, gutters, sidewalks, gutter pans, driveways and other concrete street hardware within the right-of-way shall be replaced by a licensed specialty Contractor with a permit issued by the office of the City Engineer. All concrete shall be Colorado Department of Transportation, Class B unless otherwise noted.

## PART 4: SPECIAL PROVISIONS

### 4.1 MEASUREMENT AND PAYMENT

A) When not listed in the proposal, all trench excavation and backfill costs will be considered incidental work for which no separate payment will be made.

B) When listed in the proposal, payment for work specified under this section will be made at the prices listed in the proposal and as outlined below. Quantities to be computed by the engineer from measurement of actual work completed and accepted.

C) Trench Excavation

1) Paid for on a linear foot basis for each size and classification of trench at the prices named in the proposal. Length will be measured horizontally along pipe actually installed without deducting for fittings and appurtenances.

D) Foundation Stabilization

1) Paid for on a cubic yard basis at the prices named in the proposal. Length and width will be measured horizontally along foundation stabilization material actually installed.

2) Depth measured to be actual depth installed below bottom of bedding. The average depth will be used with measurement intervals of 25 feet along centerline of trench.

3) No payment will be made for unauthorized foundation stabilization.

E) Rock Excavation

1) Payment for unforeseen rock conditions shall be made after negotiations to determine a unit price based on the best and safest method selected and approved by the engineer for the rock removal.

2) Rock excavation will be paid for on a cubic yard basis and or at the prices named in the Proposal. Measurement will be as outlined below.

a) The length will be the entire horizontal distance measured along the centerline of the trench.

b) The width for measurement purposes shall be 12 inches greater than the maximum outside diameter of the pipe.

c) The measurement for depth will be the vertical distance from the top of the rock to the depth shown on the plan. The depth will be measured at intervals of 25 feet along the centerline of the trench and the average depth between measuring points will be the depth used for computing the depth of rock.

F) Measurement and payment for rock excavation will be in addition to the payment for trench excavation and backfill. Payment for rock excavation shall include full compensation for all work necessary to excavate the rock material. Price indicated also includes the cost for embedment and pipe zone materials.

G) Asphalt Cement (AC) Pavement Cuts

1) When not listed in the proposal, all pavement cuts to be considered incidental to work for which no separate payment will be made.

2) When listed in the Proposal, payment for work specified under this section will be made at the prices listed in the Proposal. Quantities to be computed by the Owner's Representative for measurement of actual work completed and accepted.

H) Payment indicated shall include complete compensation for all labor, equipment, materials and incidentals involved in the work specified herein. No additional compensation will be considered unless allowed and submitted in accordance with sections VIII and XIII of the General Conditions.

END OF SECTION

**SECTION 02501**
**TRENCH SURFACE RESTORATION**

## PART 1: GENERAL

1.1 SCOPE

A) This section includes all surface restoration and related work for the construction of the designated pipelines and other work as required for the completion of the project.

B) Surface restoration includes, but is not limited to, the following:

1) Restoration of all surfaces disturbed during construction including asphalt concrete (AC) pavement, concrete, gravel, lawns, topsoil, trees, shrubbery, flowers, fences, mailboxes, signs, landscaping, etc.

2) Surfaces shall be restored in-kind unless otherwise shown on the drawings or directed by the Engineer.

3) Maintenance of all surfaces until final surface restoration is completed. Temporary AC pavement cold patching may be required for all street crossings which are not permanently restored within seven (7) days of excavation depending on the permit requirements of governing agency.

4) Depth, type and compaction of materials shall be equal to original surfaces unless otherwise specified herein or shown on the drawings.

1.2 CLASSIFICATIONS

A) Class A: Asphalt concrete pavement restoration for State Highway, County Roads or City streets, whichever is the governing agency in the area of the work. Also asphalt concrete driveways.

B) Class B: Gravel Road restoration.

C) Class C: Gravel shoulder restoration including graveled driveways.

D) Class D: Concrete driveways, sidewalks, curbs and gutter restoration.

E) Class E: Unimproved or open areas restoration.

## PART 2: PRODUCTS

### 2.1 AGGREGATE BASE COURSE MATERIAL (ROAD BASE)

A) Aggregate Base Course Material or Road Base used for surface restoration shall be material meeting the requirements of the Colorado Department of Transportation (CDOT), Mesa County or the City of Grand Junction, whichever is the governing agency in the area of the work.

### 2.2 TOPSOIL

A) Native topsoil shall be removed and stockpiled to be used for topsoil replacement when possible. Where imported topsoil is required, it shall be clean sandy loam, free from sulfates or alkali.

B) Depth of topsoil shall be determined by actual existing field conditions or as directed by the Engineer.

### 2.3 ASPHALT CONCRETE (AC) PAVEMENT

A) AC pavement shall conform to the requirements of CDOT, Mesa County or the City of Grand Junction, whichever is the governing agency in the area of the work.

### 2.4 PORTLAND CEMENT CONCRETE

A) All concrete shall conform to the requirements of CDOT, Mesa County or the City of Grand Junction, whichever is the governing agency in the area of the work.

### 2.5 GRASS SEED AND MULCH

A) Grass seed and mulch shall conform to the requirements of CDOT, Mesa County or the City of Grand Junction, whichever is the governing agency in the area of the planting, except as modified herein.

B) Seed mixtures shall be compatible with the immediately surrounding vegetation.

C) Seed mix to be approved by the Engineer prior to application.

2.6 GRASS SOD

A) Grass sod shall be certified nursery grade cultivated grass sod with a strong fibrous root system, free of stones and burned or bare spots, and compatible with the immediately surrounding grass.

## PART 3. EXECUTION

3.1 GENERAL

A) The intent of this specification is that cleanup activities and surface restoration work immediately follow the installation of pipe, construction of structures, etc. This is imperative so as to impact activities by the property owner, or other users, as little as possible.

B) Trench backfill and subgrade shall meet compaction requirements as set forth in the applicable sections contained herein prior to proceeding with surface restoration work.

C) All workmanship for AC pavement surface restoration shall conform to the standard requirements of CDOT, Mesa County or the City of Grand Junction, whichever is the governing agency and in accordance with the project permit requirements for Asphalt Concrete Pavement replacement and patching.

D) The Contractor shall notify the Engineer a minimum of 24 hours in advance of performing any AC pavement surface restoration work. No AC pavement surface restoration work shall be performed when weather conditions, in the Engineers opinion, are not suitable for placement of AC pavement.

E) All workmanship for concrete restoration shall conform to the standard requirements of CDOT, Mesa County or the City of Grand Junction.

F) In areas designated for Class E surface restoration, topsoil shall be removed and stored at an approved location prior to excavation.

3.2 PROTECTION

A) No heavy construction vehicle shall operate on any pavement, curbing or walk.

B) Concrete Curbing and Walks:

1) No concrete shall be mixed, transported, placed or finished when the temperature of the base, subgrade or air is below 40°F or whenever, in the opinion of the Engineer, the temperature may fall below 40°F within twenty four (24) hours after the concrete has been placed.

2) The Contractor shall take such precautions as are necessary to protect newly placed concrete from rain.

3) The Contractor shall protect newly placed concrete from freezing for no less than seven (7) days.

3.3 CLASS A SURFACE RESTORATION - Asphalt Concrete Pavement and Driveways

A) Asphalt concrete pavement restoration shall conform to all standards and requirements of the Colorado Department of Highways (CDOT), Mesa County or City, whichever is the governing agency in the area of the work.

B) The wearing course shall match the existing pavement in thickness, line and grade but in no case shall the pavement thickness be less than three (3) inches placed in two (2) lifts.

3.4 CLASS B SURFACE RESTORATION - Gravel Roads

A) Surface restoration shall conform to all standards and requirements of Mesa County or City, whichever is the governing agency in the area of the work.

B) The wearing course shall match the existing road surface in thickness, line and grade, but in no case shall the gravel thickness be less than four (4) inches.

3.5 CLASS C SURFACE RESTORATION - Gravel Shoulders and Driveways

A) Gravel shoulder restoration shall conform to all standards and requirements of the Colorado Department of Highways (CDOT), Mesa County or City, whichever is the governing agency in the area of the work.

B) Gravel driveway restoration shall conform to the same requirements as gravel shoulder restoration or as directed by the Engineer. The gravel thickness shall not be less than six (6) inches.

C) Gravel shoulders and driveways shall be compacted by mechanical means to ninety five percent (95%) of the maximum dry density per AASHTO T-180 unless otherwise directed by the Engineer.

3.6 CLASS D SURFACE RESTORATION - Concrete Driveways, Walks, Curb and Gutter

A) Concrete driveways, sidewalks, curb and gutter restoration shall conform to all standards or requirements of the Colorado Department of Highways (CDOT), Mesa County or City, whichever is the governing agency in the area of the work.

B) Concrete surface restoration shall also conform to drawing details and specifications, Paragraph 3.08, contained herein. Where there is a difference between the agencies requirements and these specifications, the most stringent requirement shall take precedence.

C) The supporting aggregate base course shall be not less than six (6) inches thick and shall be compacted by means of mechanical compaction to ninety five percent (95%) of the maximum dry density per AASHTO T-180.

3.7 CLASS E SURFACE RESTORATION - Unimproved or Open Areas

A) Surface restoration shall conform to all standards and requirements of the governing agency.

B) Surface restoration shall also conform to drawing details and specifications contained herein.

C) Compact to density of existing in place materials by mechanical means unless otherwise directed by the Engineer.

D) Contractor shall replace trees, shrubbery, flowers, ground cover in kind to match existing as approved by the Engineer.

E) Re-Seeding:

1) All areas to be seeded shall be made substantially clear and free of weeds, briars, sticks, loose stones greater than 1-inch, and all other debris detrimental or toxic to the growth of grass.

2) The surface soil in all areas to be seeded shall be in a condition favorable for the germination and growth of grass seed. A minimum of 1/2-inch and maximum of 1-1/2 inches of surface soil shall be in a loose condition.

3) Soil preparation operations shall be directional along the contours of the areas involved.

4) Seed shall be applied at a time approved by the Engineer when conditions are favorable for germination.

F) Re-Sodding:

1) Provide a finish grade such that the top of installed and fresh-cut mature grass will be level with all adjoining sidewalks and curbs. Add or remove topsoil as necessary to achieve proper finish grade.

2) All areas to be sodded shall be made substantially clear and free of weeds, briars, sticks, loose stones greater than 1-inch, and all other debris detrimental or toxic to the growth of grass.

3) The surface soil in all areas to be sodded shall be in a condition favorable for the growth of grass. A minimum of 1/2-inch and maximum of 1-1/2 inches of surface soil shall be in a loose condition.

4) Lay sod perpendicular to direction of slope with alternating joints. Fit sod pieces tightly together: no joints and overlapping; hand tamp firmly and evenly.

5) Top dress lightly with topsoil to fill depressions and joints between strips; leave finished sodding smooth and free of lumps and depressions.

6) Roll sod to ensure the root system is bound to the soil.

7) Sod shall be applied at a time approved by the Engineer when conditions are favorable for growth.

## 3.8 CONCRETE CURBING, WALKS AND DRIVEWAYS

A) All soil subgrade under driveways, curbs, curb and gutter and walks shall be compacted in accordance with the requirements of the applicable sections contained herein.

B) All curbs, sidewalks and driveways shall conform to the lines, grades and thicknesses of existing structures, but in no case shall the thickness be less than sixteen (16) inches for Type "C" curbs, four (4) inches for sidewalks, and six (6) inches for driveways and driveway aprons.

C) A minimum 6-inches of 3/4-inch aggregate base course and granular material leveling course shall be provided under all curbs, sidewalks and driveways.

D) Unless otherwise authorized by the Engineer, sidewalks and/or curbs shall be constructed to match the joint pattern of the existing and surrounding sidewalks and/or curbs.

## PART 4: SPECIAL PROVISIONS

### 4.1 MEASUREMENT AND PAYMENT

A) When not listed in the Proposal, all "SURFACE RESTORATION" costs will be considered incidental work for which no separate payment will be made.

B) When listed in the Proposal, payment for work specified under this section to be made at the units and prices named in the Proposal for each class of surface restoration, complete and acceptable to the Engineer.

C) Length to be measured horizontally along center line of the trench to the nearest foot without deducting for structures, valves, etc.

D) Restoration of concrete curbing and walks shall be considered incidental to the restoration of the street to which it is adjacent unless otherwise listed in the proposal.

E) Cutting of AC pavement costs, when not listed in the Proposal, will be considered incidental work for which no separate payment will be made. However, in no case will payment be made for duplicate cuts where over-excavation, inadequate backfill compaction or less than prompt repaving results in the need for new cuts.

F) Payment indicated to include complete compensation for all labor, equipment, materials and incidentals required for completion of the work. No additional compensation to be allowed.

END OF SECTION

**SECTION 02667**
**WATER DISTRIBUTION SYSTEM**

## PART 1: GENERAL

### 1.1 SCOPE

A) This section includes the construction of water distribution system facilities including: buried pressure piping and fittings; valves; fire hydrants; water services and meters; and appurtenances as shown on the drawings or as required to complete the work.

B) Work under this section shall include, but not be limited to the following:

1) Installation of all buried pipe, fittings, joint restraints, valves, fire hydrant assemblies and service connection assemblies.

2) Installing connections to all existing and/or new facilities and provide temporary services as required.

3) Disinfecting, dechlorinating, flushing, and pressure testing new pipelines and appurtenances for a complete and operable system.

### 1.2 QUALITY CONTROL

A) Laboratory Services: Water quality testing services shall be provided by the Ute Water Conservancy District.

B) Field Inspection:

1) All new water distribution system facility installations shall be inspected by a Representative of the Ute Water Conservancy District. Inspection shall begin at the beginning of construction and continue through the testing, disinfection and flushing operations. Any defective work discovered after installation shall be removed and correctly replaced in a manner satisfactory to the Engineer, or Ute Water Districts Representative at the Contractor's expense.

2) All defective materials shall be suitably marked and removed from the job site before the end of the following day.

C) Final Inspection and Acceptance: The acceptance of all water facilities by the Ute Water Conservancy District will be based on the following:

1) Submittal of satisfactory results of required test (such as pressure test, leakage tests, disinfection tests, compaction tests, etc.) certified by an Engineer or approved by a certified testing laboratory.

2) Passing a final inspection of the work by the Ute Water Conservancy District.

3) Submittal of "As-Built" construction drawings.

4) Restoration of all non-public surface disturbance.

5) Restoration of all surface disturbance within the public right-of-way to the satisfaction of the City, County or State.

6) Contractor shall warrant the work for a period of one year from the date of acceptance against defects in material and workmanship.

1.3 SUBMITTALS

A) Submittals shall be in accordance with the requirements of these Contract Documents and shall include the following:

1) Material, size and pressure class schedule of all pipe, pipe fittings and appurtenances.

2) Special joint details and any special provisions required for assembly.

3) Manufacture's literature for each size and type of pipe, fitting and valve and fire hydrant.

4) A certificate from the pipe, valves and fittings manufacturer stating that the materials have been sampled and tested in accordance with the provisions of and meet the requirements of the designated specification.

## PART 2: PRODUCTS

2.1 PIPE

A) General

1) All pipe shall be intended for use with potable water. Components in contact with potable water shall be certified to comply with NSF/ANSI 61, Drinking Water System Components – Health Effects, and a copy of the NSF/ANSI

61 certification shall be provided to Ute Water Conservancy District and the pipe bear the NSF hallmark.

B) Ductile Iron (DI) Pipe

1) All ductile iron pipe shall be designed, manufactured, tested, inspected, and marked in accordance with AWWA C150, AWWA C151 and Manual M41.

2) Standard pipe outside diameters (ODs) conform to the ductile iron and cast iron sizing system, referred to as cast iron or CIOD.

3) Ductile iron pipe shall be minimum Pressure Class 350 or minimum Special Thickness Class 52, unless otherwise shown or specified.

4) Ductile iron pipe shall have a nominal laying length of 18-feet or 20-feet. Random lengths are not acceptable.

5) Ductile iron pipe shall have standard thickness cement-mortar linings in accordance with AWWA C104.

6) Ductile iron pipe outside coatings shall be asphaltic, shop-applied standard thickness of 1-mil minimum, continuous and smooth, neither brittle when cold or sticky when exposed to the sun, and strongly adherent to the pipe in accordance with AWWA C151.

7) Ductile iron pipe shall be UL listed and a copy shall be provide to Ute Water Conservancy District.

8) Ductile iron pipe shall have cathodic bonding joint assemblies installed by the pipe manufacturer prior to delivery.

9) All ductile iron pipe and ductile iron pipe fittings, including buried fire hydrant sections shall be polyethylene encased conforming to AWWA C105.

10) Push-on joint type ductile iron pipe shall have a single, continuous molded, rubber-ring gasket in an annular recess in the pipe or fitting socket; designed and shaped properly to lock in place against displacement in accordance with AWWA C111. Joint accessories for push-on joint type pipe shall be provided by the manufacturer of the pipe for compatibility.

11) Mechanical joint type ductile iron pipe, only where indicated on the drawings, is a bolted joint of the stuffing-box type that consist of (1) a fabricated or cast bell provided with an exterior flange having bolt holes or slots, a socket with annular recesses for sealing gasket and plain end of pipe

or fitting; (2) a pipe or fitting plain end; (3) a sealing gasket; (4) follower gland with bolt holes; and (5) tee-head bolts and hexagonal nuts.

a) Tee-head bolts and hexagonal nuts shall be made of corrosion-resistant, high-strength low-alloy steel meeting the minimum characteristic values, strength, and dimensions of AWWA C111 such as Cor-Blue or approved equal.

b) Mechanical joint restraints, required for mechanical joint fittings, shall be required for mechanical joint pipe where indicated on the drawings, specified herein.

12) Restrained joint ductile iron pipe where shown on the drawings to be positively restrained push-on joint pipe capable of being deflected after assembly. Joint accessories for restrained joint type pipe shall be provided by the manufacturer of the pipe for compatibility.

a) Acceptable restrained joint ductile iron pipe products include: TR Flex and Flex-Ring pipe as well as Field Lok, Sure Stop, and Fast-Grip gasket systems.

13) Rubber gaskets shall be made of vulcanized styrene butadiene rubber (SBR). Reclaimed or natural rubber shall not be used. Gaskets shall be free from porous areas, foreign material, and other defects that make them unfit for the use intended. Quality control tests shall be available upon request.

14) A thin film of nontoxic, water soluble, NSF/ANSI 61 approved gasket lubricant shall be applied to the inside surface of the gasket and the spigot end of the pipe.

15) Flange joint pipe including flanged spools, only where shown on the drawings, shall meet the additional requirements of AWWA C115 suitable for the pressure specified.

a) Gaskets shall be full face, synthetic rubber, and 1/8-inch thick conforming to flange dimensions, pipe manufacturer's requirements and AWWA C111/C115. For diameters 14-inch and larger 1/8-inch ring type compressed fiber, non-asbestos gaskets are required.

b) Flange bolts, washers, and nuts shall be stainless steel. Flange bolts shall be in accordance with ASTM A193, Grade B8 with heavy hex nuts in accordance with ASTM A194, Grade 8. Strain hardened stainless steel washers type 304.

(1) All stainless steel bolts shall receive a coating of food-grade NSF/ANSI 61, non-conductive, anti-seize on the threads prior to installation.

16) Approved manufacturers of ductile iron pipe:

| **Manufacturers** |
|---|
| American Cast Iron Pipe Company |
| McWane Ductile |
| U.S. Pipe and Foundry Company/Griffin Pipe Products |

17) Ductile iron pipe installed shall be manufactured domestically in the US.

C) Polyvinyl Chloride (PVC) Pressure Pipe

1) 2-inch Through 3-inch PVC Pipe and PVC Fittings

a) PVC pressure pipe 2-inch through 3-inch in diameter shall be Schedule 40 with socket type solvent weld joints meeting the requirements of ASTM D 1785 and NSF/ANSI 61.

b) Nominal pipe lengths shall be 20 feet. Random lengths are not acceptable.

c) PVC Fittings shall be Schedule 40 socket type solvent weld meeting the requirements of ASTM D 2466 and NSF/ANSI 61. Threaded type PVC adapters, caps, and 90° bends shall be Schedule 80.

d) Solvent cement shall be regular- or medium-bodied, high-strength, low VOC as recommended by manufacturer under this specification.

(1) Approved manufacturers of solvent cement:

| **Manufacturer** | **Product** |
|---|---|
| IPS Corporation | 700, 702, 710 (2-inch only), 704, 705, 721 |

e) Primer for all solvent weld joints shall be premium, fast acting, industrial strength, low VOC for wet and/or quick set applications.

(1) Approved manufacturers of primer:

| **Manufacturer** | **Product** |
|---|---|
| IPS Corporation | Weld-On P-75 Wet ‘R Dry |

2) 4-inch Through 24-inch PVC Pipe

a) PVC pressure pipe 4-inch through 24-inch in diameter shall be manufactured in accordance with AWWA C900 and NSF/ANSI 61.

b) Pipe joints shall be made using an integral bell with an elastomeric gasket push-on type joint.

c) Standard pipe outside diameters (ODs) conform to the ductile iron and cast iron sizing system, referred to as cast iron or CIOD.

d) Minimum pressure class or dimension ratio (DR) of PVC pipe shall be DR18 unless otherwise indicated.

e) Pipe shall have a nominal laying length of 20-feet. Random lengths are not acceptable.

f) Restrained joint PVC pipe where shown on the drawings to be positively restrained non-metallic push-on joint pipe shall have coupling and locking splines; or integral bell and locking spline; or fusible type pipe.

g) Approved manufacturers of PVC pipe including restrained joint PVC pipe:

| **Manufacturers** |
|---|
| Diamond Plastics Corporation |
| IPEX |
| JM Eagle |
| North American Pipe Corporation |
| Underground Solutions |
| Vinyltech Corporation |

## 2.2 PIPE FITTINGS

### A) General

1) All fittings shall be intended for use with potable water. Components in contact with potable water shall be certified to comply with NSF/ANSI 61, Drinking Water System Components – Health Effects, and a copy of the NSF/ANSI 61 certification shall be provided to Ute Water Conservancy District and the pipe bear the NSF hallmark.

2) All fittings shall be ductile iron (DI) in accordance with AWWA C110 or AWWA C153 as specified herein except as otherwise specified for PVC fittings for 2- through 3-inch.

3) All DI fittings shall have mechanical joint (MJ) ends as specified herein, except as noted below or shown on the drawings.

   a) DI Tees shall be flanged with a flanged by mechanical joint (FLxMJ) valve bolted directly to the tee or as shown on the drawings.

      (1) If as shown on the drawings, only one of two branches include a FLxMJ valve, an adapter shall be provided as specified herein.

      (2) If size 2- and 3-inch pipe line is installed off a tee, use IP tapped companion flange, stainless steel nipple (4" minimum length) and IP threaded gate valve.

4) Standard coating system shall be asphaltic coating with cement-mortar lining or fusion-bonded epoxy inside and outside as additionally specified herein or except as otherwise shown on the drawings.

   a) Ductile iron fittings outside coatings shall be petroleum-asphaltic coating approximately 1 mil thick, shop-applied, continuous and smooth, neither brittle when cold or sticky when exposed to the sun, and strongly adherent to the fitting.

   b) Ductile iron fittings inside linings shall be cement-mortar linings in accordance with ANSI/AWWA C104/A21.4. At the manufacturer's option, moist cement-mortar linings can be given a seal coat of asphaltic material for curing the cement mortar.

   c) Fusion-bonded epoxy ductile iron fittings shall be in accordance with ANSI/AWWWA C116/A21.16 and shall be applied to the interior and

exterior surfaces. DI caps, plugs, and sleeves not normally cement mortar lined shall have fusion-bonded epoxy interior and exterior.

5) All ductile iron pipe and ductile iron pipe fittings, including buried fire hydrant sections shall be polyethylene encased conforming to AWWA C105.

6) Acceptable manufacturers of DI fittings include:

| **Manufacturers** |
|---|
| American Cast Iron Pipe Company |
| McWane Ductile (TR Flex Restrained Joint DI Fittings) |
| Sigma Corporation |
| Star Pipe Products |
| Tyler Union |
| U.S. Pipe and Foundry Company/Griffin Pipe Products |

7) Ductile iron fittings installed shall be manufactured domestically in the US.

B) Mechanical Joint Fittings

1) All MJ bends, tees, reducers, sleeves, offsets, caps and plugs, adapters, combinations thereof, and other miscellaneous fittings 3-inches through 16-inches in diameter shall be ductile iron compact fittings in conformance with AWWA C153.

2) All MJ bends, tees, reducers, sleeves, offsets, caps and plugs, adapters, combinations thereof, and other miscellaneous fittings greater than 16-inches in diameter shall be ductile iron fittings in conformance with AWWA C110.

3) Unless other specified, the minimum working pressure for all MJ ductile iron fittings 3-inches through 24-inch in diameter shall be 350 psi.

4) Unless otherwise specified, the minimum working pressure for all MJ ductile iron fittings 30-inch through 48-inch in diameter shall be 250 psi.

5) Mechanical joint type DI fittings are a bolted joint of the stuffing-box type that consist of (1) a fabricated or cast bell provided with an exterior flange having bolt holes or slots, a socket with annular recesses for sealing gasket and plain end of pipe or fitting; (2) a pipe or fitting plain end; (3) a sealing gasket; (4) follower gland with bolt holes; and (5) tee-head bolts and hexagonal nuts.

a) Mechanical joint restraints shall be manufactured of DI in accordance with ASTM A 536. MJ restraints are incorporated into the design of the follower gland often known as a retainer gland with dimensions such that it can be used with standardized MJ bell and tee-head bolts in accordance with AWWA C111, C110 and C153.

b) Restraint mechanism shall consist of numerous individually activated gripping surfaces to maximize restraint capability. The gripping surfaces shall be wedges that are designed to spread the bearing surfaces on the pipe. Twist-off nuts, sized the same as tee-head bolts, shall be used to ensure the proper actuating of restraining devices. When the nut is sheared off, a standard hex nut shall remain.

c) MJ restraint device shall have a pressure rating equivalent to the fitting with a safety factor of 2 and are specifically designed for use with PVC pipe or DI pipe.

d) The use of MJ restraint devices in lieu of concrete thrust blocks for restraint is limited to applications specified herein or as shown on the drawings.

e) External coatings shall be shop-applied suitable for direct bury service.

f) Acceptable manufacturers of MJ restraints for PVC Pipe include:

| **Mechanical Joint Restaint – PVC Pipe** | |
|---|---|
| **Manufacturers** | **Models** |
| EBAA Iron, Inc | Megalug Series 2000 PV |
| Ford Meter Box Company | UFR 1500 |
| Romac Industries | PVC RomaGrip |
| Sigma Corporation | One-Lok SLCE |
| Smith-Blair | Cam-Lock for PVC |
| Star Pipe Products | StarGrip Series 4000 |
| Tyler Union | TufGrip Series 2000 |

g) Acceptable manufacturers of MJ restraints for DI Pipe include:

| **Mechanical Joint Restaint – DI Pipe** | |
|---|---|
| **Manufacturers** | **Models** |
| EBAA Iron, Inc | Megalug Series 1100 PV |
| Ford Meter Box Company | UFR 1400 |
| Romac Industries | DI RomaGrip |
| Sigma Corporation | One-Lok SLDE |
| Smith-Blair | Cam-Lock for DI |
| Star Pipe Products | StarGrip Series 3000 |
| Tyler Union | TufGrip Series 1000 |

6) Mechanical joint restraints for PVC Pipe and DI Pipe installed shall be manufactured domestically in the US.

7) Rubber gaskets shall be made of vulcanized styrene butadiene rubber (SBR). Reclaimed or natural rubber shall not be used. Gaskets shall be free from porous areas, foreign material, and other defects that make them unfit for the use intended. Quality control tests shall be available upon request.

8) A thin film of nontoxic, water soluble, NSF/ANSI 61 approved gasket lubricant shall be applied to the inside surface of the gasket and the spigot end of the pipe.

C) Flanged Fittings

1) All flange-joint bends, tees, reducers, adapters, combinations thereof, and other miscellaneous fittings including flange spool pieces 3-inches through 48-inches in diameter shall be ductile iron fittings in conformance with AWWA C110.

a) Gaskets shall be full face, synthetic rubber, and 1/8-inch thick conforming to flange dimensions, pipe manufacturer's requirements and AWWA C111/C115. For diameters 14-inch and larger 1/8-inch ring type compressed fiber, non-asbestos gaskets are required.

b) Flange bolts, washers, and nuts shall be stainless steel. Flange bolts shall be in accordance with ASTM A193, Grade B8 with heavy hex nuts in accordance with ASTM A194, Grade 8. Strain hardened stainless steel washers type 304.

(1) All stainless steel bolts shall receive a coating of food-grade NSF/ANSI 61 anti-seize on the threads prior to installation.

2) Unless otherwise specified, the minimum working pressure for all flanged ductile iron fittings shall be 250 psi.

D) Plain End Fittings

1) Plain end bends, tees, reducers, combinations thereof, and other miscellaneous fittings including spool pieces 3-inches through 48-inches in diameter shall be ductile iron designed to mate with the mechanical joint AWWA C110/C153 and push-on joint connections AWWA C111.

E) Tapping Sleeve

1) Tapping sleeves, in combination with resilient seat wedge gate valves and specialty equipment, are used to install cut-in type connections to existing water facilities with or without interruption performed by Ute Water Conservancy District.

2) Tapping sleeves shall meet the requirements of AWWA C223 with the additional requirements. Tapping sleeves shall be stainless steel meeting or exceeding the requirements of ASTM A 240 type 304 UNS. The stainless steel surface shall be descaled and passivated in accordance with ASTM A967 or ASTM A380.

3) The outlet shall be heavy gauge stainless steel; the outlet flange shall be ASTM A536, Grade 65-45-12 ductile iron with ANSI Class 125 and 150 drilling and recessed to accept tapping valve specified herein.

a) Bolts, nuts and washers shall be 304 stainless steel; heavy hex nuts coated to prevent galling.

b) Flange gasket shall be virgin styrene butadiene rubber (SBR) suitable for potable water meeting the NSF 61 requirements.

4) Tapping sleeves 4- through 8-inch pipe size shall be rated for a working pressure of 250 psi and 10- through 24-inch pipe size shall be rated for a working pressure of 200 psi.

5) Acceptable manufacturers of tapping sleeves are:

| **Manufacturers** | **Model** |
|---|---|
| Ford Meter Box Company | FAST, FTSS DI Flange |
| Mueller Co | H-304 DI Flange |
| Romac Industries | Model SST, SST III DI Flange |
| Smith-Blair | Model 662,664 DI Flange |

## 2.3 COUPLINGS AND ADAPTERS

A) Couplings and adapters shall be limited in their application to connection of proposed pipe facilities to existing and proposed waterline facilities, temporary installations, and where specifically called for in the Contract Documents or approved by Engineer.

B) Couplings to ensure a permanent watertight plain end connection to proposed pipe facilities shall be DI mechanical joint type solid sleeve couplings described in these specifications herein and includes approved manufacturers.

C) Couplings to ensure a permanent watertight plain end connection to existing pipe facilities to accommodate a reasonable OD variance shall be a reducing or transition bolted sleeve-type coupling in accordance with AWWA C219 and in accordance with AWWA Manuals M11 and M41 for design.

1) End rings and center sleeves shall be coated in accordance with AWWA C210 or C213 with a minimum DFT of 12 mils suitable for direct bury.

2) Bolts, heavy hex nuts, and washers (when used) shall be similar materials to minimize the possibility of galvanic corrosion. The manufacturer of the fitting shall supply proper bolts, nuts, and washers along with information as to the recommended torque to which the bolts shall be tightened.

3) Acceptable manufacturers and models of bolted sleeve couplings:

| **Manufactures** | **Models** |
|---|---|
| Dresser | Style 38, Style 138 |
| Ford Meter Box Company | Style FC1, FC2 |
| Hymax | Grip, Hymax 2 |
| Romac Industries | XR501, Macro HP, Style 400 |
| Smith-Blair | 400 Series |

D) Bolted, split sleeve couplings, restrained and nonrestrained, in accordance with AWWA C227 for use on plain end welded steel pipe only as approved by Ute Water Conservancy District.

E) Flanged adapters are a restrained adapter flange coupling device designed to connect plain end pipe to a flanged pipe, valve or fitting. A flange adapter is a ductile iron or steel body with a flanged end and mechanical joint end and shall be used in lieu of threaded or welded flanges on plain end ductile or PVC pipe unless approved in writing by Ute Water Conservancy District. Specification requirements are described herein.

1) Acceptable manufacturers and models of flange adapters:

| **Manufactures** | **Models** |
|---|---|
| EBAA Iron, Inc | Megaflange Series 2100 |
| Ford Meter Box Company | RFAP, RFAD |
| Romac Industries | RFCA, RFCA-PVC |
| Smith-Blair | Flange Lock |

## 2.4 VALVES

A) General

1) All valves and appurtenances shall have the name, monogram, or initials of the manufacturer cast thereon. They shall be built and equipped for the type of operation as specified herein or as shown on the drawings. Valves shall be suitable for frequent operation and for long periods of inactivity. Valves shall be suitable for flows in either direction. Components shall be suitable for exposure to chloraminated water.

2) Where requested by the Contractor and approved by the Engineer, additional valves may be installed by the Contractor to facilitate installation, testing, or connection to existing pipe work. Unless otherwise specified in writing by the Engineer, such valves requested by the Contractor shall be provided at no additional cost to the Owner.

3) All buried valves shall be supplied with a 2-inch square operating nut. Operating nut shall be 1-5/16 -inch square at the top, 2-inch square at the base and 1-3/4 - inches high. Extension stems shall be provided for buried valves when the operating nut is four (4) feet or more below finished grade. Extension stem shall extend to within twelve (12) inches of the ground surface and shall be provided with spacers which will center the stem in the valve box.

4) At the minimum, joint restraints will be required at the valve; additional joint restraints maybe required at adjacent joints depending on proximity to the valve, test pressure and line size, with the approval of the Engineer.

5) Unless otherwise specified, all valves shall have a minimum pressure rating that will accommodate maximum pressure which will be experienced during hydrostatic leakage testing.

B) Valve Boxes (VB)

1) A cast iron valve box and lid shall be provided for each underground valve. Valve boxes shall be 2-piece, slip type sized for the type of valve and depth of bury. The use of extensions in preparation of final grade shall not be acceptable.

2) The valve box lid shall have the word "water" permanently cast on the top.

3) Valve box parts shall be made of gray cost iron in accordance with ASTM A 48, Class 35B. Aluminum alloy as a casting material is not acceptable.

4) Valve boxes shall be heavy duty 564A, with formed top to receive insert type traffic-rated cover.

5) All parts of valve boxes, bases, and covers shall be coated by dipping in black bituminous paint.

C) Gate Valves (GV)

1) Gate valves shall be resilient seated wedge gate valves designed and manufactured in accordance with AWWA C509 or AWWA C515, as applicable, with the following additional requirements.

2) Gate valves shall be iron body, resilient seated gate valves, fully bronze-mounted with non-rising stems. Valve bodies shall be designed to allow for the lifting of the valves by the bonnet flange, gland flanges, or other appurtenances.

3) Valve stems shall be made of bronze in accordance with ASTM B 763, Copper Alloy No.C99500 or stainless steel in accordance with ASTM A 276, Type 304, Type 316, or AISI 420. The stems shall consist of two O-rings.

4) Valves shall be suitable for frequent operation and for long periods of inactivity. Operating pressure for 3-inch through 12-inch shall be 200 psi and 14-inch through 16-inch shall be 150 psi; valves shall be drip-tight, zero leakage past the seat under rated pressure differential.

5) The bonnet gland bolts and nuts shall be in accordance with ASTM F 593, Type 304 stainless steel. The hot-dip galvanized process is not acceptable.

6) Flanged and mechanical joint end connections as indicated on the drawings. Flanges shall be sized and drilled in accordance with ANSI B16.1, Class 125; machined and finished in accordance with AWWA C207. Mechanical joint ends shall be as described in these specifications and AWWA C111.

7) Ferrous surfaces, except machined or bearing surfaces, shall be prepared in accordance with SSPC SP10. These interior and exterior surfaces shall be epoxy coated in accordance with AWWA C550.

8) Each valve shall be successfully operated and hydrostatic tested in accordance with AWWA C509 or AWWA C515 at the manufacture's plant.

9) The manufacturer shall provide affidavit of compliance in accordance with the AWWA Standard.

10) Acceptable manufacturers of resilient seated gate valves are:

| **Manufacturers** |
|---|
| American AVK |
| Clow Valve Co. |
| Kennedy Valve |
| Mueller Co |
| US Pipe Valve & Hydrant |

D) Tapping Valves

1) Tapping valves shall be resilient seated wedge gate valves specified herein and in accordance with AWWA C509 or AWWA C515 furnished with a tapping sleeve flanged end connection on one end of the valve.

2) The tapping sleeve flanged end connection on the fitting side shall have a machined projection on the flange to mate with a machined recess on the outlet flange of the tapping sleeve fitting.

3) The outlet end shall conform in dimensions to the AWWA Standards for hub or mechanical joint end, except that the outside of the hub shall have a large flange for attaching a drilling machine. The seat opening of the valves shall be larger than normal size to permit full diameter cuts.

4) Acceptable manufacturers of resilient seated gate valves are:

| **Manufacturers** |
|---|
| American AVK |
| Clow Valve Co. |
| Kennedy Valve |
| Mueller Co |
| US Pipe Valve & Hydrant |

E) Butterfly Valves (BFV)

1) Butterfly valves shall be rubber seated butterfly valves designed and manufactured in accordance with AWWA C504 except as herein modified.

2) Valves shall be suitable for throttling service, frequent operation, and long periods of inactivity. Valves shall operate with flows in either direction. Components shall be suitable for exposure to chloraminated water.

3) Butterfly valves shall be iron body rubber seated, rated for a differential pressure of 250 psi and a flow velocity of 16 ft/sec. Class 250B valves shall be ductile iron bodies. Valves shall be short-body. Unless specified otherwise, valves shall be intended for direct-bury use.

4) Butterfly valves shall be supplied with 2-inch square operating nut and open standard counter-clockwise. The type and class of valves shall be specified.

5) Unless otherwise specified or shown on the drawings, valves shall have flanged end or mechanical end as specified herein. Flanges shall be Class 125, flat faced, dimensions and drilling per ANSI B16.1 with full-sized bolt holes through the flange except where the shaft passes through the body. Flange gaskets and hardware as specified herein.

6) Butterfly valves shall be furnished with manual actuators designed and sized per AWWA M49 to meet torque requirements for the maximum differential pressure rating; actuators shall be sufficient to seat, unseat, and rigidly hold the disc in any position. The gearing of the actuator shall be totally enclosed and sealed with lubricant for a temperature range of -10°F to 150°F.

7) Interior and exterior surfaces except stainless steel, machined or bearing surfaces, and flange faces shall be shop-coated with an epoxy coating conforming to the requirements of ANSI/AWWA C550 to a minimum dft of 8 mil with NSF/ANSI 61 certification provided.

8) Acceptable manufacturers of resilient seated butterfly valves are:

| **Manufacturers** |
|---|
| DeZurik |
| Kennedy Valve |
| M&H Valve Co |
| Mueller Co |
| Pratt |
| Val-Matic |

F) Air Release Valves (ARV)

1) Air release valves shall be combination air-release and air vacuum valves designed and manufactured in accordance with AWWA M51 and AWWA C512.

2) Valves shall be capable of venting large quantities of air while filling pipeline systems; automatically releasing small pockets of air that accumulate during system operation; and admitting large quantities of air into pipeline system when internal system pressure drops below atmospheric pressure. Valves shall be suitable for frequent operation and long periods of inactivity. Components shall be suitable for exposure to chloraminated water.

3) Valves shall be a single body design capable of 300 psi maximum working pressure. Materials for valve construction shall comply with the requirements of the Safe Drinking Water Act for potable water.

4) Valve sizes, locations, and details shall be in accordance with the drawings. Valves shall be installed in a vertical position in an underground concrete manhole or concrete vault as applicable.

5) Valves, 1-inch and 2-inch shall be furnished with NPT inlets and 3-inch through 6-inch shall be furnished with flanged inlets that conform to the dimensions and drilling of ANSI B16.1, Class 125. A ¼-inch minimum NPT in the bottom of the valve body shall be provided.

6) Internal and external ferrous surfaces, except machined or bearing surfaces shall be prepared in accordance with SSPC SP10. These surfaces shall then be epoxy coated in accordance with AWWA C550 and NSF 61 compliant.

7) Acceptable manufacturers of combination air-release and air vacuum valves are:

| **Manufacturers** |
|---|
| APCO |
| GA Industries |
| Val-Matic |

## 2.5 SERVICE LINE PIPE, VALVES, FITTINGS AND TAPPING SADDLES

### A) General

1) All service brass and bronze goods in contact with potable water shall be manufactured in accordance with AWWA C800 using lead-free copper alloy.

2) Components in contact with potable water must comply with the latest requirements of the Federal Safe Drinking Water Act, NSF/ANSI 61 and a copy of the certification shall be provided if requested.

### B) Service Line Pipe

1) Water service line pipe shall be seamless copper water tube in accordance with ASTM B 88, furnished in coils, annealed, Type K Copper UNS No.12200, in accordance with AWWA C800.

2) Water service line pipe sizes include: ¾-inch, 1-inch, 1 ¼-inch, 1 ½-inch, and 2-inch nominal diameters. Unless otherwise shown on the drawings, service line pipe shall be 3/4-inch.

3) Acceptable manufacturers of water service line pipe are:

| **Manufacturers** |
|---|
| Cambridge-Lee Industries |
| Cerro Flow Products |
| CMC Howell Metal |
| Mueller Industries |
| Wieland Copper |

4) Water service line pipe shall be manufactured domestically.

C) Corporation Stops

1) Corporation (corp) stops are valves attached to all service saddles at the main. Corp stops shall be brass fittings with full-way bore with inlets for AWWA iron pipe threads and compression outlets to adapt to copper pipe.

2) Acceptable manufacturers of corporation stops are:

| **Manufacturers** | **Models** |
|---|---|
| A.Y. McDonald | Ball Model 74704BQ |
| Ford Meter Box Co | Ball FB1100-x-Q-NL |
| Mueller Co. | Type300 Ball Model B-25028N |

D) Service Saddles

1) Service saddles (tapping saddles) are fittings that attach circumferentially to the water main to provide for attachment of a corporation stop.

2) DI and AC pipe service saddles shall be double bronze strapped tapping saddles with AWWA iron pipe threads.

a) Acceptable manufacturers of DI and AC pipe service saddles are:

| **Manufacturers** | **Models** |
|---|---|
| A.Y. McDonald | 3826 |
| Ford Meter Box Co | 202B-xxx-TAP IP Thread<br>202BS-xxx-TAP IP Thread<br>202BSD-xxx-TAP IP Thread |
| Mueller Co | BR2B IP Thread<br>BR1S IP Thread<br>BR2S IP Thread |

3) PVC pipe service saddles shall be stainless steel strapped bronze tapping saddles with AWWA iron pipe threads; saddles shall provide full support around the circumference of the pipe, have a bearing area of sufficient width along the pipe axis so that the pipe will not be distorted when the saddle is tightened.

a) Acceptable manufacturers of C900 PVC pipe (4-inch through 24-inch) service saddles are:

| **Manufacturers** | **Models** |
|---|---|
| A.Y. McDonald | 3846, 3856 |
| Ford Meter Box Co | 202BS-xxx-TAP IP Thread<br>202BSD-xxx-TAP IP Thread |
| Mueller Co | BR2S IP Thread<br>BR2W IP Thread |
| Romac Industries | 202BS IP Thread |

b) Acceptable manufacturers PVC pipe saddles (2-inch through 3-inch)

| **Manufacturers** | **Models** |
|---|---|
| A.Y. McDonald | |
| Ford Meter Box Co | FS300W-xxx-Tap IP Thread<br>F1-xxx-xxx-IPx |
| Mueller Co | 500/510 Series IP Servi-Seal |
| Romac Industries | SS1 IP Tap Repair Clamp |
| Smith-Blair | Full Circle Repair Clamp w/IP Tap Service |

E) <u>Brass and Bronze Goods</u>

1) Where connecting to existing water service lines, Contractor shall supply all required fittings to make connections, plug services and blow offs.

2) Fittings are generally no-lead (no more than 0.25% total lead content) brass; typically with compression style ends.

3) Couplings

| **Manufacturers** | **Types** | **Models** |
|---|---|---|
| A.Y. McDonald | Coupling CTS | 74758-22 |
| Ford Meter Box Co | | |
| Mueller Co | Coupling 3 part union | H-15403N |

4) Branch wye fittings for gang services shall be brass MIP x CTS manufactured by A.Y. McDonald, Ford Meter Box, and Mueller Co.

5) Threaded pipe nipples shall be brass or stainless steel with IP thread.

6) Plugs and caps shall be brass with IP thread.

## 2.6 WATER METERS

A) All meter pit assemblies, including cones and lids, yokes and water meters, shall be provided by the Ute Water Conservancy District.

1) Meter pits generally include concrete pit rings; CI cone, CI frost lid and CI top lid drilled to accept radio read meters. Cast iron goods shall be thoroughly cleaned and coated with a black bituminous paint.

2) Yokes are copper with brass valves and goods; ends will have a CTS compression inlet with a FIP outlet.

## 2.7 FIRE HYDRANTS

A) General

1) All fire hydrants shall conform to local fire district requirements unless otherwise required.

2) Dry-barrel fire hydrants shall be designed and manufactured in accordance with AWWA M17 and AWWA C502 with the following additional requirements or exceptions.

B) Fire hydrants shall be designed for a minimum working pressure of 150 psi.

C) Fire hydrants shall be the three-way type with one pumper nozzle and two hose nozzles located on the same horizontal plane at least 18-inches above the ground line.

1) Hose nozzles (2) shall be 2 ½-inch nominal diameter ports with 7 ½-inch threads per inch (2.5-7.5 NH), National Standard in accordance with NFPA Standard 1963. Hose nozzle caps shall be furnished with security chains; the end shall be securely attached to the upper barrel section of the fire hydrant.

2) Pumper nozzle (1) shall be 4 ½-inch nominal diameter port; nozzle dimensions as specified herein. Pumper nozzle caps shall be furnished with security chains; the end shall be securely attached to the upper barrel section of the fire hydrant.

a) Grand Junction Fire District and Grand Junction Rural Fire District:

(1) Threads per inch (tpi) shall be 4.

(2) Outside (major) diameter of male thread is 5.282 inches.

(3) Diameter of root (minor) male thread is 4.932 inches.

(4) Pitch diameter is 5.12 inches.

b) Lower Valley Fire District:

(1) An integral 5-inch quick, universal ¼ turn hose to hydrant connection (commonly referred to as a Storz Nozzle) and metal cap which can be opened by a standard hex nut hydrant wrench shall be factory-installed from the manufacturer.

3) Hydrants shall have a main valve opening of 5 ¼-inches, compression type that closes with water pressure. The components of the main valve assembly shall be designed so that removal of the assembly from the barrel may be accomplished without excavation.

4) Hydrant base shall be provided with a mechanical joint inlet to accommodate 6-inch DI or C900 PVC pipe complete as specified herein.

5) Hydrants shall be equipped with traffic features that include a breakaway flange or lug system with a shaft coupling that prevents damage to the barrel section upon impact.

6) The upper and lower operating rods shall be stainless steel. The operating nut shall be bronze or DI, pentagon shaped with a finished height of 1 1/8-inch. The dimensions from point-to-flat shall be between 1 ¼-inch and 1 3/8-inch, top to the bottom of the nut, respectively.

7) A stop nut located in the hydrant bonnet on the operating shaft shall prevent the over travel of the main valve when it is being opened.

8) The hydrant shall open by turning the operating nut left or counter-clockwise and shall have an arrow on the top of the bonnet to designate the direction of opening.

9) The upper exposed section of the fire hydrant shall be thoroughly cleaned and painted with a prime coat of a rust inhibitive primer followed by a 10 mil DFT shop coat of heavy duty enamel paint. The paint color:

a) Grand Junction Fire District and Grand Junction Rural Fire District:
Bonnet shall be “OSHA Safety Yellow”
Body shall be “OSHA Safety Green”

b) All other Fire Districts fire hydrants shall be painted "OSHA Safety Red"

10) Exposed exterior surfaces below the bury line shall be coated with asphalt varnish in accordance with AWWA C502. Interior of the hydrant shall be coated with an epoxy coating in accordance with AWWA C502 and NSF 61. The hydrant shoe and connecting gland shall be lined and coated with fusion-bonded epoxy in accordance with AWWA C502.

11) Fire hydrants shall be oriented so as to optimize access to nozzles; pumper nozzle shall generally face the street, or as directed by the Engineer.

12) Ute Water standard detail for fire hydrant assemblies require concrete thrust blocks as shown regardless of the use of joint restraints.

13) Acceptable manufacturers of fire hydrants:

| **Manufacturers** | **Model** |
|---|---|
| Kennedy Valve | Guardian K81-D |
| Mueller Co | Super Centurion |

## 2.8 BACKFILL AND BEDDING MATERIAL

A) Unless otherwise shown on the drawings or specified herein, all pipe bedding materials shall be in conformance with the applicable trench excavation and backfill specifications contained herein.

## 2.9 CONCRETE

A) Concrete for thrust blocks or pipe anchorage shall be Portland Cement concrete with minimum compressive strength at 28 days of 3000 psi.

B) High early concrete specified in the Contract Documents shall achieve compressive strength of 2,500 psi in 24 hours minimum.

C) Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60; hooked epoxy-coated rebar shall be used for concrete overbends. A fiber mesh additive, in lieu of reinforcing steel, to concrete is acceptable for most thrust block installations with approval from Ute Water's Engineer.

2.10 TRACER WIRE

A) A continuous insulated minimum 10 gauge solid copper tracer wire shall be supplied with all pipe with 2-inch wide PVC tape.

B) Tracer wire shall have blue 0.03-inch thick high molecular weight polyethylene (HMWPE) insulation suitable for direct burial applications.

C) Additional wire shall be installed as necessary to allow the tracer wire to be looped up at all fire hydrants and air vents at underground vaults.

2.11 BLOWOFF ASSEMBLY

A) A Blowoff Assembly is required for evacuating air and flushing water facilities. Blowoff assemblies generally include: service saddles, valves, and pipe according to the Standard Details and sized according to the schedule provided in specifications herein.

1) A Type B Blowoff Assembly for installations where the main is to be permanently dead-ended, such as a cul-de-sac.

2) A Type A Blowoff Assembly for installations where the main is to be temporarily dead-ended, such as the boundary of a subdivision filing, a Type A Blowoff shall be installed unless a fire hydrant, which can serve additionally as a blowoff, is located at the main's temporary end.

## PART 3: EXECUTION

3.1 PRODUCT HANDLING, UNLOADING, AND STORAGE

A) Care shall be taken during transporting and all handling to avoid damaging pipe and appurtenances. Loading and unloading shall be accomplished with the material under control at all times and under no circumstances shall the material be dropped. Material shall be securely wedged and restrained during transportation and supported on blocks when stored in the shop or field. Manufacturer's recommendations shall be carefully followed during material handling and storage.

B) The Contractor shall be responsible for unloading and loading materials at the jobsite. Slings (other than nylon straps), hooks, or pipe tongs shall be padded and used to properly prevent damage to pipe and appurtenances.

C) Store all pipe on a flat surface so that the blocking will support the barrel evenly; if possible, pipe and appurtenances shall be handled in unit packages with proper

supports. When unit packages are stacked, care shall be exercised to ensure the height of the stack does not result in instability that could cause stack collapse, pipe damage, or personal injury. Generally, stack height should not exceed eight (8) feet.

D) Plastic pipe, if stored outside for long periods of time shall be covered with an opaque material to protect it from sunlight. Gaskets shall be protected from excessive exposure to heat, direct sunlight, oil, grease or other contaminants.

E) Lower all pipe and fittings into trench in a manner to prevent damage to pipe or fittings. Heavy impact may cause a slight longitudinal indentation in the outside of PVC pipe and a crack on the inside. This may result in a split as soon as the pipe is placed under pressure. Any pipe that has been impacted shall be examined closely for this type of damage. Any observed gouges or scratches that extend 10 percent or more into the pipe wall shall justify rejection of that pipe.

F) All pipe and appurtenances are subject to inspection on delivery. Neither inspection nor failure to provide inspection shall relieve the Contractor of the responsibility to provide materials meeting the requirements of the Contract Documents. Materials not conforming to the requirements of these specifications and AWWA Standards shall be made satisfactory or replaced.

## 3.2 SURVEYING

A) Water facilities, including pipe, fittings, valves, meter services, hydrants, and other appurtenances shall not be installed without line and grade stakes approved by Ute Water Inspector. Line and grade for water mains shall be established under the direct supervision of a PLS.

B) The correct alignment and elevation of water mains, as shown on the approved drawings, is the responsibility of the PE. Approval by Ute Water Inspector does not relieve the PLS of responsibility of field errors.

C) If a water main is to be extended in an existing street and if the PE that prepared the plans can show the ground line is to remain unchanged, grade stakes shall not be required. The water main shall be installed with 54-inch of cover.

## 3.3 INSPECTION

A) The installation of new facilities shall be inspected and approved by Ute Water.

B) Ute Water personnel are not responsible for Contractor jobsite safety compliance or the enforcement of applicable safety regulations and standards.

C) Ute Water requires compliance with these specifications, especially with regard to the quality of workmanship and approved materials.

D) The Contractor shall give at least 2 days' notice to Ute Water's Engineer (970-242-7491) prior to the start of construction. Construction is not allowed within the 2-day notification period.

## 3.4 TRENCHING

A) Comply with federal regulations for the protection of workers and the safety of the general public according to AWWA M3.

B) Trench excavation shall proceed in advance of pipe installation only so far as can be backfilled the same day, or as permitted by the Contract Documents.

C) The discharge from any trench dewatering pumps or directional drilling operations shall be discharge to natural drainage channels, storm sewers, or containment reservoirs as approved by regulatory authorities having jurisdiction and in a manner that prevents property damage, erosion, or siltation.

D) Where necessary to prevent caving or trench instability, trench excavations in unstable soils shall be adequately supported with steel sheeting or trench boxes. Before sheeting is withdrawn, or trench boxes moved forward, they shall be raised, in place, just above the pipe crown to safely allow the Contractor to completely fill any voids left in the pipe zone.

E) Unless otherwise specified herein or shown on the drawings, the width of the trench at the top of the pipe shall permit the pipe to be laid and joined properly and to allow the backfill to be placed in accordance with the Contract Documents. Trench widths are based on the nominal pipe diameter plus the distance from each side of the pipe to the face of the trench (or the back of the sheeting or trench box, if used). As a guide:

1) For pipe twenty-four (24)-inches in diameter or less, trench width shall not exceed width of the pipe plus nine (9) inches on each side.

2) For pipe greater than twenty-four (24)-inches in diameter, trench width shall not exceed width of the pipe plus fifteen (15) inches on each side.

F) Unless otherwise directed or called for on the drawings, all pipe trenches shall be excavated below the proposed pipe invert as required to accommodate the depths of pipe bedding material as scheduled on the drawings.

G) When excavation in rock, meeting the definition of rock as defined in Section 02226, is necessary, said rock shall be removed to provide additional clearance below the pipe zone as shown in the Contract Documents.

H) Blasting for excavation shall be permitted with approval by the Engineer and only after securing approval(s) from federal, state, and other authorities having jurisdiction.

I) Trees, shrubs, fences, and all other property and surface structures shall be protected during construction, unless their removal is shown in the Contract Documents. All properties that have been disturbed shall be restored as completely as practical to their original condition.

J) When material is found to include ashes, cinders, refuse, organic material, or other unsuitable material, this material shall be removed with approval from the Engineer according to the Contract Documents.

K) When the bottom of the trench consists of material that is unstable as determined by Ute Water's Engineer to such a degree that removal is impractical, a foundation for the pipe or appurtenance shall be constructed according to the Contract Documents

## 3.5 ALIGNMENT AND GRADE

A) Waterlines shall be laid and maintained on lines and grades established in the Contract Documents. Fittings, valves, hydrants, and appurtenances shall be installed at the required locations, unless field conditions warrant otherwise and these changes are approved in accordance with the Contract Documents.

B) Prior to excavation, an investigation shall be conducted to determine the location of existing underground utilities, structures, conflicts, and potential for corrosive soil conditions. Special precautions shall be taken when the water main being installed crosses or is adjacent to a facility that is cathodically protected.

C) Generally, waterlines shall be installed at a depth of bury of 54-inches measured from the top of pipe to finish grade unless specifically approved by the Engineer.

D) When waterlines are designed to be laid in a straight line and/or at a specific grade, the deviation from line and grade shall not be in excess of 0.2 feet horizontally for line and 0.1 feet vertically for grade.

E) Variations from the bury depth may be necessary to avoid underground obstructions. A minimum of six (6) inches of clearance shall be maintained

between the pipe and obstructions unless federal, state, and other local regulations require otherwise or as deemed necessary to prevent future damage.

## 3.6 UTILITY CONFLICTS

A) The Contractor shall be responsible for exposing potential utility conflicts far enough ahead of pipeline construction to make necessary adjustments in grade and alignment of the new work within the recommended limits of pipe and fitting deflection and/or the lines and grades stated in the Contract Documents.

B) The Contractor shall be responsible for informing the Engineer of the need for a grade and/or alignment adjustment.

C) The Contractor shall not deviate from the design line and grade stated in these Contract Documents without the approval of the Engineer.

## 3.7 SANITARY SEWER CROSSINGS

A) The physical relationship between water lines and sanitary sewers shall conform to requirements of the Colorado Department of Public Health and Environment (CDPHE). The minimum horizontal spacing between sewer lines and water lines shall be ten (10) feet measured center line to center line.

B) Where sewer lines and water lines cross, the sewer pipe shall be a minimum of eighteen (18) inches clear distance vertically below the water line. If this clear distance is not feasible, the crossing must be constructed so as to protect the water line. Minimum protection shall be as follows:

1) When sewer crosses over water pipe, no matter what the separation distance, the sewer line shall be concrete encased with reinforced concrete to a distance of 10-feet on each side of the waterline as shown on the Standard Detail Drawing.

2) When the sewer crosses under the water pipe with less than 18-inches separation the sewer line shall be concrete capped to springline a distance of 10-feet on each side of the waterline as shown on the Standard Detail Drawing.

C) In all cases, suitable backfill or other structural protection shall be provided to preclude settling and/or failure of the sewer or water piping, especially the higher pipe.

D) Contractor shall contact Engineer when sewer lines are found within the above described zone. Engineer may field verify the need for concrete encasement of

sewer lines. Contractor shall install ductile iron sewer lines only after direction from the Engineer.

## 3.8 OPERATION OF EXISTING VALVES

A) The Owner will operate or supervise the operation of all existing valves during the course of the work. The Contractor shall not operate any existing valve unless specifically instructed to do so by the Engineer or the Owner.

B) The Contractor shall be responsible for coordination of the work with the Owner to provide for the timely operation of existing valves. Owner will require advance notice necessary to coordinate service outage notifications to customers.

C) The Contractor shall coordinate and perform the work so as not to require the Owner's personnel to operate any valves outside of the Owner's normal work hours.

## 3.9 SANITARY PRACTICES DURING INSTALLATION

A) Pipe shall not be laid in standing water. Precautions shall be taken to prevent dirt, debris, or other foreign materials from entering the pipe during all phases of construction. Tools, rags, and other materials shall be kept out of the pipe at all times.

B) At the end of each day, or at other times when the trench site is left unattended, the open ends of the pipe shall be sealed with a water tight plug to prevent trench water and foreign materials from entering the pipe. If water is in the trench, the seal shall remain in place as long as water is able to enter the pipe.

## 3.10 PIPE INSTALLATION

A) Pipe shall be laid and joined one length at a time to the required line and grade. Pipe shall be placed with the bell end facing the direction of laying unless otherwise specified.

B) Where pipe is laid on grades in excess of fifteen percent (15%), the bells shall face upgrade. Where pipe is laid on grades in excess of twenty percent (20%), pipe anchorage systems shall be required.

C) The outside of the spigot and the inside of the bell shall be cleaned immediately before the pipe or fittings are installed. If the pipe contains dirt or other foreign matter, the interior of the pipe shall be cleaned as necessary to remove the material prior to installation.

D) As the pipe is placed in the trench, bell holes shall be dug and the pipe supported on bedding materials the full length of the barrel.

E) Where required, lubricate the outer surface of the rubber gaskets and the spigot end of the pipe using approved lubricant meeting the requirements of the Federal Safe Drinking Water Act, NSF/ANSI 61.

F) Assemble the pipe in accordance with the manufacturer's recommendations. Regardless of the method used to assemble the pipe, the pipe shall be kept in alignment during installation of the spigot into the bell end or the fitting.

G) The spigot and the bell shall be aligned and pushed until the reference line on the spigot is flush with the end of the bell. Pushing shall be done in a smooth, steady motion. Pipe that is not furnished with a depth mark shall be marked prior to the assembly to ensure the spigot end is inserted to the full depth of the joint.

H) When it is necessary to deflect pipe from a straight line in either horizontal or vertical plane, the amount of deflection listed by the manufacturer shall be limited to 75% of those values.

I) After each length of pipe is installed in the trench, the pipe shall be secured in place with approved backfill material tamped under and along sides to prevent movement. Additional backfill material shall be placed and compacted in suitable lift layers to the height shown on the plans and details or as directed. The remainder of the trench shall be backfilled as specified and called for in the Contract Documents.

J) Pipe ends shall be kept clear of backfill at all times.

K) Wherever piping passes through walls, a wall casting pipe or sleeve shall be installed unless otherwise shown on the drawings.

## 3.11 FITTING INSTALLATION

A) All connections shall be made in strict accordance with manufacturer's recommendations.

B) The connection of pipe with plain ends of the same diameter in new construction shall be accomplished with ductile iron, mechanical joint solid sleeve couplings unless otherwise approved by the Engineer.

C) Contractor shall use the correct rubber gaskets with the ductile iron bell or fitting, and specifically designed for the pipe OD equivalent used.

D) Mechanical Joint Fittings

1) The outside of the spigot, the inside of the bell, and the rubber gasket shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter.

2) Lubrication and additional cleaning shall be provided by brushing both the gasket and plain end with soapy water or a thin film of nontoxic, water soluble, NSF/ANSI 61 approved lubricant just prior to slipping the gasket on the plain end.

3) The gland shall be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket or bell end. The rubber gasket shall be placed on the spigot end with the thick edge toward the gland.

4) Pipe shall be pushed in until the spigot end fully penetrates the bell. The gasket shall then be pressed into place evenly within the bell around the entire joint. The DI gland shall be moved along the pipe into position for bolting. Bolts shall be inserted and nuts shall first be screwed finger tight with the final tightening to be done to the Manufacturer's specifications with a torque-limiting wrench.

5) Pipe equipped with locking gaskets providing mechanical joint restraint shall be installed according to the Manufacturer's recommendation. The bell end of the locking gasket pipe shall be spray-painted safety red.

6) Nuts spaced 180 degrees apart shall be tightened alternately to produce equal pressure on the gland.

E) Flanged Fittings

1) When installing flanged fittings, care shall be taken to ensure flanged mating faces and gaskets are clean and free of dirt and foreign matter.

2) Flanged faces should bear uniformly on the gasket, and the bolts should be tightened according to the manufacturer's requirements for torque and generally in a progressively crisscrossed pattern.

3) The flange shall be assembled and installed in accordance with the recommendations and instructions of the Coupling Manufacturer.

4) Stainless steel bolts shall receive a coating of food-grade NSF/ANSI 61 anti-seize on the threads prior to installation.

F) Couplings

1) When installing bolted sleeve-type couplings, care shall be taken to ensure connecting pipe ends, couplings, and gaskets are clean and free of dirt and foreign matter with special attention given to the contact surfaces of pipe, gaskets, and couplings.

2) The couplings shall be assembled and installed in accordance with the recommendations and instructions of the Coupling Manufacturer.

3) Coupling bolts shall be tightened to secure a uniform annular space between the end rings. The body of the pipe and the bolts shall be tightened approximately the same amount. Diametrically opposite nuts shall be tightened progressively and evenly. Final tightening shall be done to the Coupling Manufacturer's specifications with a torque-limiting wrench.

3.12 CUTTING PIPE

A) General

1) Cutting pipe for insertion of valves, fittings, or closure pieces shall conform to all safety recommendations of the manufacturer of the cutting equipment. Cutting shall be done in a safe, professional manner to prevent damage to the pipe.

2) Where new or existing pipe requires cutting in the field it shall be done in a manner to leave a smooth end at right angles to the pipe centerline. The pipe shall be marked around its entire circumference prior to cutting.

3) After cutting and dressing or beveling, the reference mark on the spigot shall be accurately relocated and marked at the proper distance from the end as recommended by the manufacturer. The reference mark may be located by using a factory marked end of the same size as a guide.

B) Ductile Iron Pipe

1) Ductile iron pipe selected for cutting should be field-gauged. A mechanical joint gland inserted over the barrel might serve as a convenient indicator for this purpose. Pipe can be selected by measuring with a tape in accordance with the manufacturer's recommendations.

2) Ductile iron pipe may be cut using an abrasive pipe saw, rotary wheelcutter, guillotine pipe saw, milling wheel saw, or oxyacetylene torch only if recommended by the pipe manufacturer.

3) Existing gray-iron pipe may be cut using a hydraulic squeeze cutter, abrasive pipe saw, rotary wheelcutter, guillotine pipe saw, milling wheel saw.

4) Cut ends and rough edges of the pipe shall be ground smooth as required. For push-on joint connections, the cut end shall be beveled by methods recommended by the manufacturer. The width and general appearance of the bevel shall closely resemble the bevel on an original pipe end.

5) Any lining or coating damaged during the cutting process, as determined by the Engineer, shall be cause for removing the damaged section by recutting the pipe or for rejecting the pipe altogether.

C) PVC Pipe

1) Circular saws, handsaws, or similar equipment may be used for cutting PVC pipe.

2) For push-on joint connections, the cut end shall be beveled. Factory finished beveled end may be used as a guide to determine the angle and length of taper. The end may be beveled using a plastic pipe beveling tools which will cut the correct taper automatically. A portable type sander or abrasive disc may also be used to bevel the pipe end.

3) For PVC pipe connection commonly found to ductile iron fittings, valves, hydrants, or other appurtenances, the insertion depth of these joints are significantly less than those of PVC pipe. Before assembly or insertion, the spigot end shall be squarely cut, deburred, and given only a slight outer bevel. If the pipe spigot end has the factory bevel, the factory bevel shall be removed or shortened to ensure that the gasket will be in full contact with the nonbeveled portion of the pipe.

D) Asbestos Cement (AC) Pipe

1) Methods of AC pipe cutting that produce a smooth square-cut end, without damage to the pipe, and that do not produce airborne particles, shall be employed. Abrasive discs are prohibited unless they are equipped with local exhaust ventilation and a high-efficiency particulate air (HEPA) filter dust collection system.

2) Contractor shall dispose of demolished materials off-site in accordance with applicable laws, ordinances, rules, and regulations. Upon request, provide the original disposal manifest to the Ute Water Conservancy District.

## 3.13 POLYETHYLENE ENCASEMENT

A) All ductile iron pipe, ductile iron pipe fittings, valves, appurtenances including buried fire hydrant sections shall be polyethylene encased conforming to AWWA C105.

B) Polyethylene film shall be fitted to the contour of the ductile iron pipe, fittings and appurtenances creating a snug, but not tight encasement, preventing contact between the pipe, fitting and the surrounding backfill. Lumps of clay, mud, cinders, etc., on the pipe surface shall be removed prior to installation of the polyethylene encasement.

C) Repair cuts, tears, punctures, or damage to polyethylene with adhesive tape or with a short length of polyethylene sheet, or with a tube cut open, wrapped around the pipe to cover the damaged area and secured in place.

D) Provide openings in encasement for service connections, blowoffs, air valves, and similar appurtenances by cutting an 'X' in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut and any other damage areas with tape.

E) Exercise care to prevent damage to the polyethylene encasement when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, and stones that could damage the polyethylene.

## 3.14 CATHODIC PROTECTION

A) Cathodic protection and electrical insulation shall be installed as required by Contract Documents. Care shall be taken to electrically insulate between dissimilar materials and at service line connections to metallic water mains.

B) Contractor shall install the cathodic bonding joint assemblies provided by the ductile iron pipe manufacturer across ductile iron pipe joints. Additional protection and care to ensure these assemblies don't damage the polyethylene encasement shall be provided; may include overlaying several layers of PVC tape to the bonding joint assemblies.

C) After the assembly of cathodic protection and electrical insulation joints are complete, Ute Water will test the assembly. The Contractor shall make necessary repairs until the joint passes the test.

## 3.15 CONNECTION TO EXISTING, IN-SERVICE MAINS

A) The Contractor must provide at least 2 business days' notice to the District prior to connecting to existing mains so that the District can notify customers of a planned outage. The fire department having jurisdiction for the affected area shall be notified 2 days in advance of service interruptions.

B) A normal outage shall be a maximum of 8 hours. If an outage is to be longer than 8 hours, the work shall be done in a manner that minimizes the inconvenience to customers, such as working at night in a continuous operation until service is restored.

C) Immediately prior to installation, all fittings, valves and appurtenances, including tool surfaces which will come in contact with potable water, shall be thoroughly cleaned by washing with potable water and then swabbed or sprayed with a minimum one percent (1%) solution of chlorine in accordance with the requirements of AWWA C651.

D) Cut-In Connections

1) All valves shall be operated by or under the supervision of a Ute Water District Representative.

2) Prior to taking any waterline out of service, the Contractor shall assemble all personnel, equipment, and materials necessary to complete the work, completely assemble all fitting assemblies and check components for compatibility with the existing waterline, and accomplish all excavation that is required to make the connection in as short of time possible or within a time period approved by the Ute Water District Representative.

3) Ute Water does not guarantee the water tightness of its valves on existing facilities. If existing valves leak, Ute Water will assist in reducing the leakage; however, the Contractor shall use appropriate methods to work with the resulting leakage.

4) In situations where an existing pipe joint is found adjacent to a proposed connection and the Engineer determines that construction operations may compromise the joint, the Contractor shall remove the existing pipe between the joint and the new work as directed by the Engineer, and replace that section with new materials.

E) Tapping Sleeves

1) Tapping sleeves or tees shall be spaced to provide clearance between the completed services lines and meter pits/vaults, fire hydrants, and similar underground structures. Minimum manufacturer spacing requirements between tapping sleeves and pipe or fitting joints shall be provided.

2) Contractor shall fully support the weight of the tapping tee, associated valve and the existing pipeline. Under no circumstances shall the weight of the tapping unit be supported by the existing pipe. Pipe which is damaged due to failure of the Contractor to follow this requirement shall be replaced at no additional cost to the Owner.

## 3.16 BLOWOFF ASSEMBLY

A) Install a Type B Blowoff Assembly for installations where the main is to be permanently dead-ended, such as a cul-de-sac according to Standard Details and sized according to the schedule provided in specifications herein.

B) Install a Type A Blowoff Assembly for installations where the main is to be temporarily dead-ended, such as the boundary of a subdivision filing; unless a fire hydrant, which can serve additionally as a blowoff, is located at the main's temporary end. Construct blowoff according to Standard Details and sized according to the schedule provided in specifications herein.

## 3.17 PIPE ANCHORAGE

A) Pipe anchorage systems shall be installed as shown on the drawings or as specified herein.

B) All plugs, caps, tees, and bends of 11-1/4° or more on waterlines that are 4-inches in diameter or larger shall be securely anchored by concrete thrust blocking or restrained joints as approved by the Engineer. The use of threaded tie back rods for thrust restraint shall not be used unless specifically shown on the drawings or directed by the Engineer.

C) Thrust blocks shall be installed where specified herein, shown on the drawings, or as directed by the Engineer. Installation shall be in conformance with drawing details and the following:

1) All concrete thrust blocks shall be placed using forms as necessary to allow access to the bolt circles after the placement of the thrust blocking concrete. The bearing surface shall be placed so that the pipe and fitting joints will be accessible for repair. Concrete shall in no case extend around more than one-half the circumference of the fitting at any point.

2) A plastic sheet or other similar protection shall be placed between the concrete and any portions of the valve, fitting, or nuts and bolts with which the concrete comes in contact. Do not encase pipe joints or cover bolt circles with concrete.

3) Concrete thrust blocking shall be placed between undisturbed earth and the fittings to be anchored. If, in the opinion of the Engineer, the undisturbed earth against which the bearing surface will be established is compromised by adjacent trenches or excavations, the Contractor shall excavate additional material as required to establish a new bearing surface that is consistent with the size, configuration, and location of the piping.

4) Newly installed water mains and fire service lines shall not be hydrostatically tested until field-placed concrete has been allowed to set undisturbed for a minimum of 24 hours.

## 3.18 SERVICE TAPS

A) Service pipe and fittings shall conform to plan details. Installation shall be in accordance with pipe manufacturer's recommendations.

B) All service connections for DI and PVC pipe shall be saddle tapped. Direct tap type services shall not be allowed.

C) Strictly adhere to the Manufacturer’s requirements to field cut or bore to maximize the opening through the service tap and corporation stop.

## 3.19 WATER METERS

A) All meter pit assemblies, including cones and lids, yokes and water meters, shall be provided by the Ute Water Conservancy District and installed by Contractor according to the Standard Details.

B) All meter pit assemblies shall be as indicated on plans, field staked for location, and on the property serviced. All meter pit assemblies shall be constructed so that the cast iron lid is at an elevation 0.1-feet above final grade without unnecessary grade ring risers.

## 3.20 FIRE HYDRANTS

A) Installation shall be in accordance with AWWA C600 and constructed where indicated on plans, field staked for location and grade or directed by the Engineer.

B) Hydrants shall be set a minimum of three (3) feet behind the curb/sidewalk or within the utility corridor right-of-way unless otherwise shown or directed. Hydrants shall stand true and plumb with a minim horizontal clearance of 3-feet.

C) Fire hydrants shall be set so that the elevation of the bury line is within ± 2-inches of final grade; doing so should locate the center of the safety breakaway flange a minimum of 2 inches and a maximum of 6 inches above finished curb, sidewalk or finished grade.

D) Where utility conflicts may require changes in grade, Contractor shall pothole existing utilities far enough in advance to allow the proper height hydrants to be planned and installed.

E) Hydrants set too high or too low shall be removed and replaced with an appropriate hydrant by the Contractor at no additional cost. The use of extension kits manufactured specifically for the fire hydrant make and model to raise low hydrants must be approved by the Engineer in advance.

## 3.21 VALVE AND VALVE BOX INSTALLATION

A) Valve installation shall be in accordance with AWWA C600 and applicable sections contained herein. A valve box shall be supplied for each valve, conforming to plan requirements and at locations shown on plans or staked in field.

B) Valve boxes shall be centered over the valve and installed plumb, with the cover flush with the finished grade. Valve boxes shall be set so they do not transmit shock or stress to the valves.

C) Backfill shall be placed around the valve boxes and thoroughly compacted in conformance with the compaction requirements for the adjacent backfill, and in a manner that will not damage or displace the valve box from proper alignment or grade. Misaligned valve boxes shall be excavated, plumbed and backfilled at Contractor's expense.

D) Valve boxes shall be kept free of rocks and debris at all times.

E) Tracer wire, only as indicated on the Contract Documents or as required by the Ute Water Inspector, shall be looped up at valve boxes.

## 3.22 AIR RELEASE VALVES (ARV)

A) By design, the location of ARVs is along the highpoint of the pipeline. The ARV should be installed as close as possible to the pipeline; as practical, minimize lay length of appurtenances to maximize the clearance between the ARV and the vault.

B) The concrete manhole or vault shall be founded firmly on grade beams of adequate surface bearing area to support the structure. Field modify as necessary to maintain clearance between the vault and pipeline to accommodate possible settlement without potentially bearing on the pipeline.

C) Construct manhole or vault to ensure manhole cover is flush with final grade without unnecessary manhole risers.

## 3.23 INSTALLATION OF TRACER WIRE

A) Tracer wire shall be installed with all pipe and secured with 2-inch wide PVC tape to the top of the pipe at about 8 foot intervals.

B) When splicing tracer wire to connect a new roll of wire or to connect wire from lateral water lines, the wire shall be tied together in an overhand knot, the end of the insulation strip off to expose at least 3/4" of bare wire, the wire twisted together and then a silicone-filled wire nut screwed over the end to completely cover and seal the exposed wire.

C) Tracer wire shall be brought up at all fire hydrants, vent pipe and, as directed, looped up into at least one valve box at valve clusters

D) Contractor, at his expense, will be responsible for testing the tracer wire to ensure that there is complete continuity of signal. The continuity of the tracer wire shall be tested in each direction from a valve box or fire hydrant with an electronic locator. Any areas that do not show continuity will be fixed at the Contractor's expense.

## 3.24 CLEANING POTABLE WATER MAINS

A) All water mains shall be cleaned in accordance with AWWA C651 and as specified herein.

B) Minimum Blowoff Assembly size for water mains shall be as shown in the following table:

| Water Line Size | Minimum Blowoff Size |
|---|---|
| 2- to 3-inch | 1-inch |

| | |
|---|---|
| 4- to 8-inch | 2-inch |
| 10- to 16-inch | 4-inch |
| 18- to 20-inch | 6-inch |
| Larger than 20-inch | 8-inch (or as directed) |

C) Prior to completion of pressure and leakage testing and prior to being placed into service, all new water mains and repaired portions or extensions of existing mains shall be disinfected by chlorination by the Contractor in accordance with AWWA C651 except as may be modified herein.

## 3.25 DISINFECTING POTABLE WATER MAINS

A) All water mains shall be disinfected in accordance with the requirements of AWWA C651 except as modified herein.

B) All new water lines shall be disinfected by introducing chlorinated water from a water truck or other means, approved by the Engineer, into the new line. Initial (high) chlorine residual shall not be less than 50 ppm. The use of chlorine tablets glued into the pipe with permatex will not be allowed.

1) Dry chlorine powder, that has 68% Calcium Hypochlorite as the active ingredient, or liquid chlorine bleach, that has 5% by weight chlorine, shall be used at the rate as set forth:

a) Dry chlorine powder shall be mixed at the rate of 0.62 pounds of powder per 1000 gallons of water.

b) Liquid chlorine bleach shall be mixed at the rate of one gallon per 1000 gallons.

c) The amount of chlorinated water required for various sizes of water lines is shown in the following table:

| Pipe Diameter (inch) | Cross-Sectional Pipe Area ($ft^2$) | Volume per 100 feet of Pipe (gallons) |
|---|---|---|
| 2 | 0.02 | 16 |
| 3 | 0.05 | 37 |
| 4 | 0.09 | 66 |
| 6 | 0.20 | 147 |
| 8 | 0.35 | 261 |
| 10 | 0.55 | 408 |
| 12 | 0.79 | 588 |

| | | |
|---|---|---|
| 18 | 1.77 | 1322 |
| 24 | 3.14 | 2350 |
| 30 | 4.91 | 3672 |

2) Powdered chlorine or liquid chlorine bleach shall be thoroughly mixed with clean water in a water truck or other storage container. After mixing the solution shall be tested to insure that it is at least a 50ppm chlorine residual. If there is not at least a 50ppm residual more powdered chlorine or liquid chlorine bleach shall be added to bring the residual up to 50ppm. The chlorine residual shall be tested using a commercially available chlorine residual tester that measures concentrations above 10ppm.

3) After the water line has been completed and before making connections to services or other water mains, except those shown on the drawings, water line shall be slowly loaded with chlorinated water from a potable or disinfected water truck or tank until all air has been expelled. Air shall be bled from all service lines and fire hydrant laterals to ensure adequate disinfection of all lines, valves, fittings and appurtenances.

C) The dosage of chlorinating agent shall be of the amount to produce a minimum chlorine residual of 50 mg/L of free chlorine at all points in the line. Tests with the DPD method shall be made at selected points to determine the residual.

D) Where the Contractor chooses to use other methods for disinfecting the water line he shall submit a detailed plan to the Engineer, for Engineer's approval, indicating methods of introducing chlorine to the water line, methods for flushing the line and the means by which heavily chlorinated water will be disposed of.

E) Chlorinated water shall be retained in the lines for sufficient time to accomplish the desired disinfection but not less than 24 hours. All valves and hydrants in the line shall be operated during the retention period. At the end of this 24 hour period, the treated water in all portions of the main shall have a residual of not less than 25 mg/L free chlorine.

F) Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into lines adjoining the new line. Check valves may be used if desired.

G) Water mains taken out of service for inspection, repair, or other activities may or may not require disinfection and sampling, depending on the risk as determined by the Engineer and Inspector.

H) The Contractor shall furnish required materials and apparatus and perform the work of disinfection. If additional taps and open trenches at points of connection are required, the Contractor shall bear the responsibility of making taps and maintaining open trenches until a satisfactory analysis has been obtained.

## 3.26 CLEARING THE MAIN OF HEAVILY CHLORINATED WATER

A) Following chlorination, all heavily chlorinated water shall be flushed into a water truck from the lines at their extremities until the replacement water throughout the lines shall, upon test, have a chlorine residual of no more than that of the existing system to which the new line is connected.

B) Heavily chlorinated water that is in the water truck shall be disposed of in accordance with all Federal, State and Local laws and regulations. The environment into which the chlorinated is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will enter any stream, storm drain, or any drainage feature, then a neutralizing chemical shall be applied to the chlorinated water prior to discharge from the water truck.

C) The table below shows the neutralizing chemicals that can be used and their respective dosages, in pounds, per 1000 gallons of water:

| Residual Chlorine (ppm) | Sulfur Dioxide ($SO_2$) | Sodium Bisulfite ($NaHSO_3$) | Sodium Sulfite ($Na_2SO_3$) | Sodium Thiosulfate ($Na_2S_2O_3$-$5H_2O$) |
|---|---|---|---|---|
| 1 | 0.008 | 0.012 | 0.014 | 0.012 |
| 2 | 0.017 | 0.025 | 0.029 | 0.024 |
| 5 | 0.042 | 0.063 | 0.073 | 0.060 |
| 10 | 0.083 | 0.125 | 0.146 | 0.120 |
| 25 | 0.21 | 0.313 | 0.365 | 0.30 |
| 50 | 0.42 | 0.625 | 0.73 | 0.60 |

## 3.27 FLUSHING AND CLEANING

A) After all of the heavily chlorinated water has been removed from the new water line, fire hydrants and service lines, the main shall be flushed to remove all dirt and debris that may be in the line. Contractor shall flush the line to obtain a minimum velocity of at least 2.5 fps in the line.

B) Upon completion of flushing Ute Water Conservancy District will obtain water samples for laboratory analysis to test for the presence of coliform bacteria. Should the initial treatment prove ineffective, the chlorination shall be repeated as

set forth in Paragraph 3.25 at no additional cost to the Ute Water District until confirmed tests show acceptable results.

## 3.28 PRESSURE AND LEAKAGE TESTS

A) The Contractor shall furnish the pump, pipe connections, taps, gauges, auxiliary water container, bulkheads, plugs and other necessary equipment and perform pressure and leakage tests on all lines unless otherwise directed by the Engineer. All equipment and material that will come in contact with water entering the distribution system shall be clean and disinfected prior to use. Water shall be potable water that has only been stored in clean disinfected containers.

B) Tests shall be conducted on all pipelines or valved sections thereof. Tests on lines anchored or blocked by concrete shall not be conducted until the concrete has taken permanent set.

C) Hydrostatic leakage testing shall be performed in conformance to the applicable sections of AWWA C600 or local jurisdiction requirements, whichever is more stringent, except as modified below. Unless otherwise authorized by the Ute Water District, all hydrostatic leakage tests shall be witnessed by the Engineer or the Districts field Representative.

D) The test pressure shall be 150 lbs./sq. in., or 50 percent (50%) above the normal operating pressure, whichever is greater. Hydrostatic pressure shall be applied by pumping water from an auxiliary supply. The Contractor shall accurately determine the amount of water required to reach the initial test pressure and the amount of makeup water required to maintain the test pressure during the test period.

E) The test pressure shall be maintained for a minimum of four (4) hours and additional time as required for thorough inspection to find any leaks or defects in the water main and appurtenances. Should the pipe section fail to pass the tests, the Contractor shall find and correct failures and repeat the tests until satisfactory results are obtained at no additional cost to the Owner.

F) Where test pressure is 250 psi or less, the hydrostatic test shall be performed with the hydrant line valves open.

G) Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation stops at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation stops shall be closed and the test pressure applied. At the

conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the Owner.

H) Allowable Leakage

1) No pipe installation will be accepted if the leakage or makeup water is greater than that determined by the formula outlined below or local jurisdiction requirements, whichever is more stringent.

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

Where:

| | | |
|---|---|---|
| L | = | allowable leakage, in gallons per hour |
| S | = | length of pipe tested, in feet |
| D | = | nominal diameter of the pipe, in inches |
| P | = | average test pressure during the leakage test, in pounds per square inch (gauge) |

This formula is based on an allowable leakage of 10.49 gpd/mi./in. of nominal diameter at a pressure of 150 psi.

2) The allowable leakage in gallons per hour per 1,000 feet at various pressures and pipe sizes is shown below. In the event of discrepancies between formulas and table values, the more stringent shall apply.

| Average Test Pressure (psi) | Nominal Pipe Diameter (inch) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 | 4 | 6 | 8 | 10 | 12 | 18 | 24 |
| 250 | 0.32 | 0.43 | 0.64 | 0.85 | 1.07 | 1.28 | 1.92 | 2.56 |
| 225 | 0.30 | 0.41 | 0.61 | 0.81 | 1.01 | 1.22 | 1.82 | 2.43 |
| 200 | 0.29 | 0.38 | 0.57 | 0.76 | 0.96 | 1.15 | 1.72 | 2.29 |
| 175 | 0.27 | 0.36 | 0.54 | 0.72 | 0.89 | 1.07 | 1.61 | 2.15 |
| 150 | 0.25 | 0.33 | 0.50 | 0.66 | 0.83 | 0.99 | 1.49 | 1.99 |
| 125 | 0.23 | 0.30 | 0.45 | 0.60 | 0.76 | 0.91 | 1.36 | 1.81 |
| 100 | 0.20 | 0.27 | 0.41 | 0.54 | 0.68 | 0.81 | 1.22 | 1.62 |

3) If the pipe structure under test contains sections of various diameters, the allowable leakage shall be the sum of the computed leakage for each size. No additional leakage allowance will be given for fire hydrant assemblies.

3.29 CLEANUP

A) Cleanup and surface restoration area shall conform to the requirements contained herein and shall closely follow pipe-laying activities.

B) Contractor shall remove all excess materials, broken pavement, construction equipment, etc., within three (3) days after pipe is laid in any area.

C) Contractor shall level and resod lawn areas, grade and gravel shoulder or parking areas, and replace any signs, mailboxes, etc. which were removed or damaged.

## PART 4: SPECIAL PROVISIONS

### 4.1 MEASUREMENT AND PAYMENT

A) When not listed in the Proposal, all "WATER DISTRIBUTION SYSTEM" costs will be considered incidental work for which no separate payment will be made.

B) When listed in the Proposal, payment for work specified under this section will be made at the prices named in the Proposal for the following items installed, tested, disinfected and acceptable to the Engineer.

1) Mainline pipe to be paid for at the unit prices named in the Proposal for each size and type of pipe. Length to be measured horizontally along centerline of pipe without deducting for valves and fittings. Unless otherwise listed in the Proposal, cost of mainline pipe, fittings and appurtenances shall be included in the unit price for mainline pipe.

2) Unless otherwise listed in the Proposal, valves are to be paid for at the unit price named in the Proposal for each size and type of valve complete with valve box and cover.

3) Each fire hydrant assembly to be paid for at the unit price named in the Proposal. Payment for each fire hydrant assembly shall include hydrant, lateral pipe or spool piece, gate valve and valve box and cover, fittings, mainline tee, thrust blocking, support block and all appurtenances (including Storz Adapter as necessary), as well as excavation, backfill, compaction and surface restoration.

4) All mainline connections named in the Proposal to be paid for at the lump sum prices named in the Proposal. Unless otherwise listed in the Proposal, payment for each mainline connection shall include fittings, pipe thrust restraint and all appurtenances inclusive of valves, as well as excavation, backfill, compaction and surface restoration outside of the specified trench pay limits.

5) Each air release valve assembly to be paid for at the unit prices named in the Proposal. Unless otherwise listed in the Proposal, payment for each air release valve assembly to include service saddle or mainline tee and companion flange (as required), pipe, valves, fittings, manhole (or vault) and grade beams, manhole cover and frost lid, air vent, drain line and all appurtenances, as well as excavation, backfill, compaction and surface restoration.

6) All near and far side water service to be paid for at the unit prices named in the Proposal. Payment for each service to include fittings, pipe and all appurtenances, as well as surface preparation (saw cutting or other), excavation, backfill, compaction and surface restoration.

C) No payment to be made for pipe or valves which have not passed a hydrostatic leakage test.

D) Quantities to be computed by the Engineer from measurement of actual work completed and accepted.

E) Unless otherwise listed in the Proposal, pipe anchorage and thrust restraint systems to be considered incidental work for which no separate payment will be made.

F) Unless otherwise listed in the Proposal, blowoff assemblies for line terminations to be considered incidental work for which no separate payment will be made.

G) Unless otherwise listed in the Proposal, sanitary sewer concrete caps or encasements to be considered incidental work for which no separate payment will be made.

H) Unless otherwise listed in the Proposal, polyethylene encasement as required to be considered incidental work for which no separate payment will be made.

I) Payment indicated to include complete compensation for all labor, equipment, materials and incidentals involved in the work as listed in the Proposal and as specified under this section. No additional compensation to be allowed.

END OF SECTION