



STANDARD CONSTRUCTION SPECIFICATIONS FOR WATER MAINS

EAST LARIMER COUNTY WATER DISTRICT

August 15, 2025



TABLE OF CONTENTS

DIVISION 01—GENERAL REQUIREMENTS

01 11 00	.....	Summary
01 33 00	.....	Submittals
01 42 17	.....	Definitions, Abbreviations, and Acronyms
01 45 16	.....	Quality Requirements
01 61 10	.....	Approved Product List
01 74 00	.....	Cleaning
01 78 39	.....	Record Documents

DIVISION 03—CONCRETE

03 30 00	.....	Cast-in-Place Concrete
03 40 00	.....	Precast Concrete

DIVISION 09—FINISHES

09 90 00	Painting and Coating
----------	-------	----------------------

DIVISION 21—FIRE SUPPRESSION

21 11 20	Fire Service Lines
----------	-------	--------------------

DIVISION 31—EARTHWORK

31 23 25	.....	Controlled Low Strength Material Backfill
31 23 35	.....	Trenching, Backfilling, and Compacting

DIVISION 32—EXTERIOR IMPROVEMENTS

32 01 10	Pavement Repair and Resurfacing
----------	-------	---------------------------------

DIVISION 33—UTILITIES

33 05 06	.....	Testing Piping System
33 05 08	.....	Pipe Boring and Jacking
33 05 10	.....	Tapping Sleeves and Valves
33 05 20	.....	Ductile Iron Pipe, Fittings, and Couplings
33 05 29	.....	Plastic Pressure Pipe
33 13 00	.....	Disinfection of Water Lines
33 14 10	.....	Water Distribution System
33 14 18	.....	Service Lines, Meters, and Appurtenances
33 14 20	.....	Valves
33 14 22	.....	Hydrants



Standard Construction Specifications for Water Mains– Version History

Version Number (Date)	Purpose/Change	Author
05/21/2025	Overhaul/reissue/reformat from previous version (March 2020). Adopted Construction Specifications Institute (CSI) format for organizing and formatting.	DKM
08/15/2025	Appended Specifications 01 61 10, Section 2.09.F.7 and 33 14 18, Section 2.09.G, for Fire Service Assembly Meter. Modified Specification 33 14 18, Section 2.09.F. to clarify cover manufacturers and removed table of meter vault sizes. Fixed TOC spec sections for DIP and PVC.	DKM



SECTION 01 11 00 SUMMARY

PART 1 - GENERAL

1.01. SCOPE

A. The purpose of these Standard Specifications for the Construction of Water Mains (Specifications) is to present the East Larimer County Water District's (District) specifications and information needed for the design and construction of 6- inch through 12-inch water lines, water service lines, and all appurtenances associated with these water lines and services as designed and constructed for new development. Criteria for design are presented in the District's Water Distribution System Design Criteria Manual (Design Criteria Manual). This document and the Design Criteria Manual are to be used by Owners, Developers, Consultants, Design Engineers, and Contractors as criteria, standards, and specifications for the design and construction of said water lines, services, and appurtenances.

1. In the case of water lines larger than 12 inches, the Owner, or its representative, shall submit project-specific design drawings and construction specifications to the District for review and acceptance.

B. Version in Effect

1. The most recent version of the Specifications shall be in effect at the time of construction of any water lines, water services, and appurtenances, regardless of the date of Construction Drawing approval.
2. Other standards and specifications referenced throughout these Specifications shall mean the most recent version of the Specifications.

C. These Specifications are intended to be sufficiently detailed to provide adequate definition of the work to be performed and to ensure the quality of that work.

D. The Contractor shall be thoroughly familiar with the provisions and the content of these Specifications.

1. These Specifications are composed of written material specifications and Standard Construction Details drawings. The interpretation of any section or of differences between sections shall be made solely by the District.
2. When a conflict occurs between or within standards, individual specifications, or drawings, an interpretation shall be made solely by the District.

1.02. SPECIFICATION DOCUMENTS

A. Acronyms

1. Reference Section 01 42 13 – Abbreviations and Acronyms.

B. Definitions



1. Reference Section 01 42 16 – Definitions.

C. Interpretation

1. These Specifications contain many command sentences which are directed at the Contractor unless otherwise stated.
2. The Contractor shall request clarification in writing to the District of all apparent conflicts within these Specifications and/or between these Specifications and other controlling project documents such as the Construction Drawings. The District will not be responsible for any explanations, interpretations, or supplementary data provided by others.

1.03. COORDINATION WITH THE DISTRICT

- A. The Contractor is responsible for coordinating the Work with the District.
- B. Connections to existing pipelines:
 1. All connections shall be made at a time authorized by the District that will least interfere with service to existing District customers.
 2. Only the District shall operate existing valves, hydrants, curb stops, and other control units, including those used for filling and testing.
 3. Reference Section 33 14 10 – Water Distribution System.

1.04. WORK SEQUENCE

- A. The Owner shall deliver to the District the required number of Construction Drawings a minimum of 48 hours prior to start of the Work. Final Construction Drawings as delivered to the District must be accepted or approved by all entities with jurisdiction over the Work.
- B. The Contractor shall coordinate the sequence of construction activities, considering work by others, easement requirements, local, state, and federal permit requirements, and District requirements for construction sequencing.

1.05. QUALITY CONTROL

- A. Inspection
 1. The District Inspector shall make periodic checks to verify the quality and progress of the Work. The District Inspector has full authority to reject any portion of the Work deemed to not comply with the Construction Drawings or meet the Specifications, Standard Construction Detail Drawings, or general industry standards for quality and workmanship.
 2. The District Inspector, District Engineer, District authorized agents, and representatives of the District, shall be provided with safe access to the work whenever it is in preparation or progress. The Contractor shall provide for such access and for inspection, including maintenance of temporary and permanent access.



3. Materials and equipment rejected by the District shall be identified and marked for removal, removed, and disposed of by the Contractor.

1.06. PERMITS

- A. The Contractor or Owner shall be responsible for obtaining all permits necessary for the installation of the Work.
- B. Road access, cuts, or crossing permit(s) as required for the Work shall be the responsibility of and obtained by the Contractor or Owner. If any agency requires the District to acquire such permits, the Contractor or Owner shall coordinate that permitting with the District and be responsible for all fees and costs required by the permitting agency and all District costs associated with the permitting.

1.07. ACCEPTANCE OF WORK

A. Preliminary Acceptance

1. The District will issue Preliminary Acceptance after all Work has been completed and proper documentation of such has been submitted to the full satisfaction of the District Inspector and District Engineer.
2. The Contractor shall coordinate a final inspection of the Work with the District Inspector.
3. Cost of Work: The Owner shall deliver to the District a verification of the total cost of the Work prior to the issuance of Preliminary Acceptance.
4. Record Drawings: Record Drawings, completed to the full satisfaction of the District, shall be delivered to the District in PDF and AUTOCAD format at a minimum of one week prior to the issuance of preliminary acceptance.
5. A punch list will be created during the final inspection and the Contractor must complete all punch list work to the satisfaction of the District Inspector. Preliminary Acceptance will be issued by the District after all punch list items have been completed.
6. The Warranty Period shall begin at the date of the issue of the Preliminary Acceptance. During this warranty period, the Contractor shall repair any defects in the work and maintain the work area.

B. Final Acceptance

1. At the close of the two-year warranty period and upon satisfactory correction of any deficiencies noted, the District shall inspect the Work and if, at the sole discretion of the District, determined to be acceptable to the District, issue Final Acceptance of the Work. Upon issuance of Final Acceptance, all installed infrastructure shall become the sole property and responsibility of the District.

1.08. NOTIFICATIONS

- A. Preconstruction Meeting: The Contractor shall schedule a preconstruction meeting with the District a minimum of 48 hours (working days, exclusive of holidays and weekends) prior to the start of any Work.



- B. The Contractor shall be responsible for contacting 811 for utility locates.
- C. The Contractor shall give the District a minimum of 24 hours (working days, exclusive of holidays and weekends) notice prior to commencing any construction or testing activities.

1.09. SAFETY AND PROTECTION

- A. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to the following:
 - 1. The Contractor's employees and other persons who may be affected.
 - 2. The Work and materials or equipment to be incorporated therein whether in storage on or off the site.
 - 3. Other property at the site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures, utilities not designated for removal, and relocation or replacement during construction.
- B. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

1.10. SPECIAL REQUIREMENTS

- A. Easements and Rights-of-Way:
 - 1. Permanent Use Areas: The Owner shall be responsible for acquiring all permanent easements, rights-of-way, or other permission document as may be required for the permanent placement of any District infrastructure.
 - 2. Temporary or Construction Use Areas: The Owner shall be responsible for acquiring all construction (temporary) easements, rights-of-way, or other permission document as may be required for the construction of any District infrastructure.
 - 3. Requirements of Easements: The Owner and/or its Contractor shall be responsible for meeting all requirements of any easement (permanent or temporary), right-of-way, or other permission documents as may be required for the construction of the District infrastructure.
 - 4. Construction Limits: The Owner/Contractor is solely responsible for properly identifying the Project construction limits (i.e., easement, right-of-way, or other limits of access as granted), marking, and assuring all activity associated with the Project is within those construction limits.
- B. Design
 - 1. Owner's Consultant shall be responsible for the complete design of the District water lines and associated appurtenances.



2. All design and permitting costs shall be the responsibility of the Owner. District costs incurred outside of the design review (i.e., legal fees, easements, permitting, etc.) shall be fully reimbursed by the Owner before the District will accept the Construction Drawings.
 3. Construction Drawings shall be stamped by a registered Colorado Professional Engineer.
- C. The Contractor shall pothole and verify location of all existing utilities prior to commencing construction to avoid conflicts.
1. Any utility damaged by the Contractor shall be repaired or replaced by the Contractor at no expense to the District.
- D. Any employee(s) of the Contractor, or any Contractor-assigned sub-contractor, who does not perform work in a proper and skillful manner, shall, at the written request of the District, be removed from the project by the Contractor and shall not be on the Project without written approval of the District.
1. Should the Contractor fail to furnish skilled and experienced personnel or proper personnel for the successful performance of the work, the District may request, and the Contractor shall remove identified individuals, or the District may request, and the Contractor shall suspend the work by written notice until compliance is achieved.
- E. All items and Work not covered by these Specifications shall be discussed with the District, and the Contractor shall receive approval from the District, in writing, prior to commencing the Work.
- F. All Work must receive Preliminary Acceptance by the District prior to being placed in service.
- G. Landscaping Adjacent to District Water Lines
1. No landscaping (bushes, shrubs, trees, or other plantings) that has a mature height of over three (3) feet shall be placed within ten (10) feet of any District water line or appurtenance (distribution main, service line, fire hydrant, meter, etc.) or within any District easement.
 2. Bushes or shrubs with a mature height of less than three (3) feet shall be placed a minimum five (5) feet from any District water line or appurtenance.
 3. The District shall have the right to remove any landscaping that violates these standards at any time such landscaping is discovered and shall not be required to replace the removed landscaping.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



SECTION 01 33 00 SUBMITTALS

PART 1 - GENERAL

1.01. DESCRIPTION

A. General Submittals

1. This Section specifies the general method and requirements of submissions applicable to the Project Work-related Submittals which can include Shop Drawings and Samples.
2. Submit general submittals in accordance with this Section.
3. The use of Contract Drawing reproductions for shop drawings is subject to rejection.
4. Clearly indicate the specification section and drawing number to which each submittal is referenced.

1.02. SUBMITTAL REQUIREMENTS

A. Make submittals promptly in such sequence as to cause no delay in the Work. Schedule submission a minimum of 14 calendar days prior to the preconstruction meeting and before approved submittals will be needed. The Contractor shall initiate transmission of submittals. The District will return submittals and/or resubmittals within 14 calendar days of receipt.

B. Submittals shall contain the following:

1. The date of submission and the date(s) of any previous submission.
2. The Project title and/or number.
3. The names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
4. Identification of the product with the specification section number.
5. A letter from each supplier stating that the product meets the requirements if the specifications state any exceptions or and approved equal is being submitted.
6. Field dimensions clearly identified as such.
7. Relationship to adjacent or critical features of the Work or materials as relevant.
8. Identification of deviations from contract documents or specifications.
9. Identification of revisions on resubmittals.



C. The Contractor's stamp, initialed or signed, shall certify Contractor's review of submittal, verification of products, field measurements, field construction criteria, and coordination of the information within the submittal that the product meets the requirements of the Work and of the Specifications.

D. Shop Drawings

1. Include the following pertinent information for each submittal:

- a. Field dimensions clearly identified as such.
- b. Applicable standards, such as ASTM or local jurisdiction requirements.
- c. Manufacturer's standard drawings, schematics, and diagrams.
 - i. Clearly mark each copy to identify pertinent products and models and to describe exactly which parts apply to the equipment being furnished.
 - ii. Delete information not applicable to the Work.
- d. All pertinent information required by each section for each submittal shall be highlighted in yellow and/or circled with a cloud outline.

E. Samples

1. If requested, samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product with integrally related parts and attachment devices and the full range of color, texture, and pattern.
2. Number of Samples
 - a. Submit three (3) which will be retained by the District, unless required otherwise by individual specification sections.

1.03. SUBMITTAL FORMAT

- A. Submittals (including shop drawings if required) shall be made in electronic format unless specified otherwise by the District.
- B. Electronic submittals shall be in Adobe Acrobat Portable Document Format (PDF). Use the latest version available at the time of construction.
- C. Electronic files that contain more than 10 pages in PDF format shall contain internal bookmarking from an index page to major sections of the document. PDF files shall be set to open "Bookmarks and Page" view.
- D. PDF files shall be set up to print legibly at 8.5" by 11" or 11" by 17". No other paper sizes will be accepted.
- E. Submit new electronic files for each resubmittal.
- F. Each submittal shall have a transmittal form which will be the cover sheet for each submittal. Every page in a submittal shall be numbered in sequence.
- G. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with all pertinent data, capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports. Present a sufficient level of detail for assessment of compliance with the District specifications.



- H. Submittals shall be numbered sequentially. The submittal numbers shall be clearly noted on the transmittal cover sheet. Original submittals shall be assigned an alphanumeric submittal number followed by the specification section to which the submittal pertains. Resubmittals shall bear the number of the alphanumeric system of the original submittal followed by the subsequent letter of the alphabet to represent that it is a subsequent submittal of the original. For example, if the original submittal for cast-in-place concrete, “001A-033000-Cast-in- Place Concrete” requires a resubmittal, the first resubmittal will bear the designation “001B-033000-Cast-in-Place Concrete;” the second resubmittal will bear the designation “001C-033000-Cast-in-Place Concrete,” and so on.
- I. Disorganized submittals that do not meet the requirements above will be returned without review as a rejected submittal.

1.04. DISPOSITION OF SUBMITTALS

- A. The District or authorized representative will review and comment on submittals and may use the following dispositions:
 - 1. **NO EXCEPTION TAKEN** - Signified material or equipment represented by the submittal conforms with the design concept and complies with the information given in the Specifications. The Contractor is to proceed with fabrication or procurement of the items and with related Work.
 - 2. **MAKE CORRECTIONS NOTED** - Signified material or equipment represented by the submittal conforms with the design concept and complies with the information given in the Specifications. The Contractor is to proceed with the Work in accordance with the notations.
 - 3. **REVISE AND RESUBMIT** - Signified material or equipment represented by the submittal conforms with the basic design concept; however, it does not comply with the information given in the Specifications. The Contractor is to submit a revised submittal responsive to the notations marked on the returned submittal and to the information in the Specifications.
 - 4. **REJECTED** - Signifies material or equipment represented by the submittal does not conform with the design concept to comply with the information given in the Specifications and is not acceptable for use in the Work. The Contractor is to submit material or equipment responsive to the Specifications.
 - 5. **SUBMIT SPECIFIED ITEM** - Signifies material or equipment represented by the submittal is not the item specified in the Specifications and is not to be incorporated into the Work. The Contractor is to submit only the material or equipment specified in the Specifications.
 - 6. **RECORD INFORMATION ONLY** - Disposition indicates no review by the District was necessary; the submittal was solely for the purposes of the Project record.

1.05. RESUBMITTALS

- A. Clearly identify each correction or change made.



- B. Resubmittals will be reviewed and returned in the same review period as for the original submittal.
- C. It is considered reasonable that the Contractor shall make a complete and acceptable submittal by the second submission of a submittal item.

1.06. DISTRIBUTION

- A. Distribute reproduction or copies of Submittals, Shop Drawings, and Samples that carry the District's stamp of acceptance to the Contractor's personnel, the job site file, the project record document file, the subcontractors, the suppliers, the manufacturers, and other affected parties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



SECTION 01 42 17 DEFINITIONS, ABBREVIATIONS, AND ACRONYMS

PART 1 - GENERAL

1.01. DEFINITIONS

- A. Agreement: A written document that formulates a general understanding or arrangement between two or more parties to perform the Work.
- B. Approved Equal: Material, equipment, or other substitution to that as specified in these Specifications, or other controlling project documents, that is approved to being equal by the District (reference Section 01 45 16 – Quality Requirements).
- C. As-Built Drawings: The Contractor’s mark-ups (in red ink or ‘redlined’) to the Construction Drawings that document on-site changes to the waterline construction which deviate from the Construction Drawing (reference Section 01 78 39 – Record Documents).
- D. Construction Drawings: Detailed drawings, including water line plan, profile, and detail sheets of proposed utility improvements, as accepted by the District.
- E. Consultant (or Design Engineer): The partnership, corporation, or individual who is registered as a professional engineer, according to Colorado statutes, and who is hired by the Owner and is empowered to act as their agent.
- F. Contract (or Construction Contract): A legally binding set of documents typically between a Contractor that is performing the Work and the Owner that is requiring the work, which includes cost and payment terms, schedule, scope, specific tasks to be performed, and any other contract terms required by one of the two parties.
- G. Contractor (or Owner’s Contractor, or Developer’s Contractor): The corporation, association, partnership, or individual who has entered into an Agreement or Contract with the Owner or Developer to perform the Work.
- H. Contract Documents: The written documents that define the roles, responsibilities, and Work under the Construction Contract and are legally-binding on the parties (Owner and Contractor).
- I. Design Criteria Manual: Refers to the most current version of District’s Water Distribution System Design Criteria Manual that presents information needed for the design and construction of 6- inch through 12-inch water lines, water service lines, and all appurtenances associated with these water lines and services as designed and constructed for new development. This document, along with the Specifications and Standard Construction Detail Drawings, are to be used by Owners, Developers, Consultants, Design Engineers, and Contractors as the District’s criteria, standards, and specifications for the design and construction of said water lines, services, and appurtenances.
- J. District: The East Larimer County Water District.



- K. District Engineer: The engineer of the District or its authorized representative.
- L. District Inspector: Authorized representative of the District who is assigned to make inspections of the Work for conformance to the District Specifications, criteria and requirements.
- M. Final Acceptance: Acceptance of the Work by the District following the Warranty Period.
- N. Leakage: The quantity of water that must be added to the pipeline to maintain a pressure of within 5 psi of the specified test pressure after the air has been expelled and the pipe has been filled with water (reference Section 33 05 06 – Testing Piping Systems).
- O. Notice of Award: A formal document usually issued by the Owner to notify the Contractor that it is the successful proposer and is awarded the Contract.
- P. Owner: The developer, corporation, association, partnership, or individual who proposes to install water lines, services and associated appurtenances within the District service area and, as applicable, has entered into an Agreement or Contract with the District to install water system infrastructure.
- Q. Preliminary Acceptance: Initial acceptance by the District of Work and start of the Warranty Period.
- R. Project: Project refers to the Owner’s proposed development, waterlines or appurtenances, and/or any other proposed water infrastructure improvement that are intended to become part of the District water system after completion of construction and Final Acceptance of the Work.
- S. Project Drawings (or Contract Drawings): Contract drawings, along with other documents like Specifications and project manuals, are part of the Contract Documents, visually depicting the Project's design and construction requirements, outlining what the Contractor is to build or install.
- T. Provide: To furnish and install complete in place.
- U. Record Drawings: Drawings prepared by the Project’s Design Engineer that reflect on-site changes the Contractor noted in the As-Built Drawings (reference Section 01 78 39 – Record Drawings).
- V. Remove: To remove and dispose of per applicable regulatory requirements.
- W. Shall: A mandatory condition.
- X. Shop Drawings: Detailed plans, usually contained within a submittal (reference Section 01 33 00 – Submittals) created by contractors, fabricators, and engineers that provide precise technical information, including dimensions, materials, and assembly instructions, for the manufacturing, fabrication, assembling, and installation of specific project components.
- Y. Specifications: Refers to the most current version of the District’s Standard Specifications for the Construction of Water Mains (this document) that presents information needed for the design and construction of 6- inch through 12-inch water



lines, water service lines, and all appurtenances associated with these water lines and services as designed and constructed for new development. These Specification, along with the Design Criteria Manual and the Standard Construction Detail Drawings, are to be used by Owners, Developers, Consultants, Design Engineers, and Contractors as the District's criteria, standards, and specifications for the design and construction of said water lines, services, and appurtenances.

- Z. Squeegee: Bedding material specified in these Specifications per CDOT Section 703 Specifications for Coarse Aggregates No. 8 used for pipes, service lines, and precast concrete products.
- AA. Standard Construction Detail Drawings: Refers to the most current version of the District's Standard Construction Detail Drawings that present information needed for the design and construction of 6- inch through 12-inch water lines, water service lines, and all appurtenances associated with these water lines and services as designed and constructed for new development. These drawings, along with the Design Criteria Manual and the Specifications, are to be used by Owners, Developers, Consultants, Design Engineers, and Contractors as the District's criteria, standards, and specifications for the design and construction of said water lines, services, and appurtenances.
- BB. Standard Street Specifications: The current City of Fort Collins, Larimer County, or State Department of Transportation design criteria for streets, as project location dictates.
- CC. Warranty Period: The Contractor shall warrant all work associated with the waterline installation including, but not limited to the materials, installation workmanship, and surface or subsurface restoration for a period of two (2) years from the date of Preliminary Acceptance.
- DD. Washed Gravel (3/4-Inch): Bedding material specified in these Specifications per CDOT Section 703 Specifications for Coarse Aggregates No. 67 used for meter vaults, prefabricated manholes with open floors, and for fire hydrants.
- EE. Water Service Line (or Service Line, or Service): All pipe, fittings, and appurtenances used to convey water from the District water line to the individual customer's water meter.
- FF. Work: The entire completed construction or the various separately identifiable parts required to be furnished and installed. Work is the result of performing services, furnishing the labor, and furnishing and incorporating materials and equipment into the construction to provide a complete and operable system.

1.02. ABBREVIATIONS AND ACRONYMS

- A. Abbreviations for Trade Organizations and Government Agencies: Following is a list of construction industry organizations and government agencies to which references may be made:
 - 1. AASHTO: American Association of State Highway and Transportation Officials.



2. ACI: American Concrete Institute.
3. ANSI: American National Standards Institute.
4. API: American Petroleum Institute.
5. APWA: American Public Water Works Association.
6. ASME: American Society of Mechanical Engineers.
7. ASTM: American Society for Testing and Materials.
8. AWPA: American Wood Products Association.
9. AWS: American Welding Society
10. AWWA: American Water Works Association.
11. CDOT Standards: Colorado Department of Transportation (Standard Specifications for Road and Bridge Construction).
12. CDPHE: Colorado Department of Public Health and Environment.
13. DIPRA: Ductile Iron Pipe Research Association.
14. FM: Factory Mutual (for Fire Protection).
15. ISO: International Organization for Standardization.
16. MSS: Manufacturers Standardization Society.
17. NACE: National Association of Corrosion Engineers (NACE).
18. NFPA: National Fire Protection Association.
19. NEC: National Electrical Code.
20. NEMA: National Electric Manufacturers Association.
21. NSF: National Sanitation Foundation.
22. SSPC: Society for Protective Coatings.
23. UL: Underwriters Laboratory.

B. Other Abbreviations and Acronyms

1. CAD: Computer Aided Design, Computer Assisted Design, or Computer Assisted Drafting.
2. CTS: Copper Tubing Size.
3. CLSM: Controlled Low Strength Material, or Cementitious Low Strength Material.
4. ELCO: East Larimer County Water District.
5. FNPT: Female National Pipe Thread.
6. HDPE: High Density Polyethylene (Pipe).
7. IPS: Iron Pipe Size.



8. MJ: Mechanical Joint.
9. O&M: Operation and Maintenance (Manual).
10. PVC: Poly Vinyl Chloride (Pipe).
11. SDR: Size Dimension Ratio (Pipe).
12. UHMW: Ultra High Molecular Weight (Polyethylene).
13. VOC: Volatile Organic Compound.
14. WOG: Water, Oil, Gas.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



SECTION 01 45 16 QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers Quality Control and Quality Assurance requirements.
- B. The Contractor is responsible for controlling the quality of Work, including Work of its subcontractors and suppliers and for assuring the quality specified in these Specifications is achieved.
- C. The District reserves the right to perform Quality Assurance on the Work being performed by the Contractor and its subcontractors and suppliers.

1.02. CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to the District for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the District for a decision before proceeding.

1.03. REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit the following certified written reports specified in other Sections as relevant:
 - 1. Date of issue.
 - 2. Project title.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Name(s) of individual(s) making tests and inspections and name and signature of laboratory inspector.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of project and Specification Section.
 - 8. Complete test or inspection data, test and inspection results, and interpretation of test results.



9. Record of temperature and weather conditions at time of sample taking and testing and inspection.
 10. Comments or professional opinion on whether tested or inspected Work comply with the Specifications or Contract Documents requirements, and any recommendations on retesting and/or reinspection.
- B. Permits, Licenses, and Certificates: As may be requested by the District for its records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents required for compliance with standards and regulations bearing on performance of the Work.

1.04. MATERIALS AND EQUIPMENT

- A. The Contractor shall furnish all materials, equipment, labor, and all other facilities and incidentals necessary for the execution, disinfection, testing, and completion of the work and shall comply with manufacturer's printed instructions for Contractor supplied and owner furnished materials, regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation.
- B. All materials and equipment shall be of good quality and new, except as otherwise provided in these Specifications.
 1. When requested by the District, the Contractor shall furnish satisfactory evidence (including manufacturer's certification) as to the kind and quality of materials and equipment, and compliance with these specifications.
 - a. The District shall test any manufacturer's materials it deems necessary.
 - b. It is the Contractor's sole responsibility to ensure the manufacturer's materials meet these Specifications.
- C. All materials and equipment shall be installed and used in accordance with the instructions of the applicable manufacturer, fabricator, supplier or distributor, except as otherwise provided in these Specifications.
- D. The specification of materials and equipment shall be understood to be representative of the quality of performance, operation, and construction acceptable to the District.
 1. The District shall evaluate all written requests for product substitution.
 - a. Such requests shall include detailed product literature and a description of benefits which might be achieved by this substitution.
 - b. The acceptance or rejection of proposed product substitutions shall be at the sole discretion of the District.
- E. In approving materials or equipment for installation, the District assumes no responsibility for failure of the materials or equipment or injury or claims resulting from failure of the materials or equipment to comply with applicable national, state, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship.

1.05. QUALITY ASSURANCE



- A. All work shall be performed as specified and in accordance with the latest revisions of the applicable codes and standards or as required by local jurisdiction, federal, state, and local codes, regulations, and ordinances.
- B. Contractor Responsibilities: The Contractor shall perform quality control tests and inspections over construction and installation processes to verify that the Work complies with requirements, whether specified or not.
 1. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality and comply with manufacturers' instructions, including each step in sequence.
 2. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
 3. The Contractor shall engage a qualified testing agency to perform quality-control services.
 - a. The Contractor shall submit a certified written report of each quality- control service.
 - b. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Specifications or Contract Documents will be paid by the Contractor.
- C. The Contractor shall provide adequately trained, competent, disciplined, suitably qualified personnel to lay out the work and perform the construction.
- D. All equipment and material installed shall be, as appropriate, plumb, level, square, straight or of otherwise high-quality workmanship and per the accepted Construction Drawings. The District Inspector shall have sole authority to determine if the Work meets acceptable standards of workmanship.
- E. The construction standards, tests and methods outlined in these Specifications are considered adequate to produce the product desired by the District.
 1. The District may evaluate alternative methods of construction upon written request.
 - a. Requests for alternative methods of construction shall include detailed descriptions of the equipment, methods and controls needed for the alternative, and a description of the benefits which might be achieved by this substitution.
- F. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the District to supersede or void that responsibility.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION



3.01. TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections (reference Paragraph 1.03.A.).

3.02. REPAIR AND PROTECTION

A. On completion of testing, inspecting, sampling, and similar services, repair impacted construction and restore substrates and finishes.

1. Provide repair materials and comply with installation requirements specified in other Specification Sections, match existing substrates and finishes and/or comply with other jurisdiction's requirements (e.g., road repair).

2. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Repair and protection are the Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION



SECTION 01 61 10 APPROVED PRODUCTS LIST

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section lists the required manufacturers and/or products referred to in the following sections of East Larimer County Water District (ELCO) Standard Construction Specifications for Water Mains. This is to be used as a summarized list (alphabetized) of approved products and manufacturers. The District's Specifications, Design Criteria, and Standard Construction Detail Drawings shall be reviewed in conjunction with this list.
- B. An "Approved equal" is determined by the District or authorized representative.

1.02. APPROVED MATERIALS LIST REVIEW PROCEDURES

- A. The District reviews this list yearly for modifications and removals.
- B. To have products or materials added to this list, see the Approved Materials List Review Procedures at the end of this Section.

PART 2 - PRODUCTS

2.01. SECTION 03 40 00 – PRECAST CONCRETE

- A. Premixed Non-Shrinking Grout
 - a. Master Builders, Inc., Masterflow.
 - b. Sika Corp., SikaGrout.
 - c. Approved equal.
- B. Job-Mixed Grout
 - a. Master Builders, Inc., Embecco.
 - b. Sika Corp., SikaGrout.
 - c. Approved equal.
- C. Ring and Cover
 - a. Neenah Foundry Co., R 1706
 - b. Approved equal.
- D. Steps
 - a. M.A. Industries, Inc., PS 2 PFS.
 - b. Neenah Foundry Co., R 1981.
 - c. Approved equal.
- E. Preformed Plastic Gaskets
 - a. Henry Co., Ram Nek.



- b. Henry Co. Co. Rub'r-Nek.
- c. Hamilton Kent Manufacturing Co., Kent Seal.
- d. Approved equal.

F. Pipe Penetration Seals

- a. Thunderline Corp., Link-Seal.
- b. Approved equal.

2.02. SECTION 09 90 00 – PAINTING AND COATING

A. Each of the following manufacturers can supply the coating systems specified:

- a. Carboline.
- b. International.
- c. PPG.
- d. Sherwin Williams.
- e. Tnemec.

2.03. SECTION 31 23 35 – TRENCHING, BACKFILLING, AND COMPACTING

A. Stabilization Material

1. Geotextile Fabric

- a. TenCate, Mirafi.
- b. Approved equal.

2.04. SECTION 33 05 08 – PIPE BORING AND JACKING

A. Accessories

1. Casing Seals

- a. CCI Pipeline Systems, Model ESW.
- b. Pipeline Seal and Insulator, Inc., Model W.
- c. Approved equal.

2. Casing Spacers

- a. CCI Pipeline Systems, Model CSS.
- b. PowerSeal Pipeline Products Corp., Model 4810.
- c. Approved equal.

2.05. SECTION 33 05 10 – TAPPING SLEEVES AND VALVES

A. Tapping Sleeves

- a. Ford Meter Box Co., Model FAST, FTSS, or FTSAS with MJ Adapter Outlet.
- b. PowerSeal Pipeline Products Corp., Model 3490 MJ.
- c. Romac Industries Inc., Model SST III, SS MJ outlet.
- d. Approved equal.

B. Tapping Valves

- a. American Flow Control, Series 2500 RW.



- b. Clow Valve Co., C515 MJ Tap.
- c. Kennedy Valve Co., C515 7000 Series.
- d. Mueller Co., T2361.

2.06. SECTION 33 05 20 – DUCTILE IRON PIPE, FITTINGS, AND COUPLINGS

A. Ductile Iron Pipe

- a. American Ductile Iron Pipe Co.
- b. McWane Ductile.
- c. U.S. Pipe.
- d. Approved equal.

B. Fittings

- a. American Ductile Iron Pipe Co.
- b. McWane Ductile.
- c. Sigma Corp.
- d. Star Pipe Products.
- e. Tyler Pipe & Coupling.
- f. U.S. Pipe.
- g. Approved equal.

C. Nuts and Bolts

- a. Star Pipe Products, “Star Blue Coated T-Bolts and Nuts” (for fluoropolymer coated items).
- b. Farwest Corrosion Control Co., MARS Zinc Cap (for zinc anode caps).
- c. Approved equal.

D. Couplings

1. Non-Restrained

- a. PowerSeal Pipeline Products Corp., PowerMax 3506/3506LB (2 through 16 inches).
- b. Romac Industries Inc., Macro HP (2 through 12 inches).
- c. Romac Industries Inc., XR501 (4 through 12 inches).
- d. Approved equal.

2. Restrained

- a. Romac Industries Inc., Model Alpha.
- b. Romac Industries Inc., Model 400RG.
- c. Approved equal.

3. Flanged Coupling Adaptor

- a. EBAA Iron Sales Inc., 2100 Megaflange.
- b. Romac Industries Inc., Model FCG.
- c. Romac Industries Inc., Model RFCA (Restrained DIP).
- d. Romac Industries Inc., Model RFCA-PVC (Restrained PVC).
- e. Approved equal.

E. Restrained Joints



1. Push-On Joints
 - a. EBAA Iron Sales Inc., 1700 Megalug.
 - b. Ford Meter Box Co., Uniflange Series, UFR 1390-C.
 - c. Romac Industries Inc., 600 Series, Style 611.
 - d. Sigma Corp, One-Lok.
 - e. Star Pipe Products, Stargrip, Series 3100.
 - f. Approved equal.
2. Mechanical Joints
 - a. EBAA Iron Sales Inc., 1100 Megalug.
 - b. Ford Meter Box Co., Uniflange, 1400 Series.
 - c. Romac Industries Inc., GripRing.
 - d. Sigma Corp., One-Lok.
 - e. Star Pipe Products, Stargrip, Series 3000.
 - f. Approved equal.

2.07. SECTION 33 05 29 – PLASTIC PRESSURE PIPE

A. Plastic Pressure Pipe

- a. Diamond Plastics Corp.
- b. JM Eagle Inc.
- c. North American Pipe Company.
- d. Approved equal.

B. Fittings and Couplings – Restrained Joints

1. Push-On Joints
 - a. EBAA Iron Sales Inc., Megalug, Series 1600.
 - b. Ford Meter Box Co., Uniflange Series UFR 1390-C.
 - c. Romac Industries Inc., 600 Series Style 611.
 - d. Sigma Corp., One-Lok.
 - e. Star Pipe Products, Stargrip, Series 4100.
 - f. Approved equal.
2. Mechanical Joints
 - a. EBAA Iron Sales Inc., 2000PV Megalug or 2000SV Megalug.
 - b. Ford Meter Box Co., Uniflange Series 1500.
 - c. Romac Industries Inc., GripRing.
 - d. Sigma Corp., One-Lok.
 - e. Star Pipe Products, Stargrip, Series 4000.
 - f. Approved equal.

2.08. SECTION 33 14 10 – WATER DISTRIBUTION SYSTEM

A. Metal Surface Protective Coating – Spray-On Rubberized Coating for Bolts

- a. NAPA, Mac's Rubberized Undercoat.
- b. TiteSeal Rubberized Undercoating.
- c. Approved equal.



B. Tracer Wire and Accessories

1. Direct Bury Installations

- a. Copperhead Industries, HS-CCS HDPE 30-mil.
- b. Performance Wire & Cable Inc.
- c. Pro-line Safety Products Company.
- d. Approved equal.

2. Trenchless Installations

- a. Performance Wire and Cable, Inc., Solid SS /45 mil HD-HMWPE.
- b. Approved equal.

C. Water Line Marking Tape

- a. Pro-Line Safety Products, Detectable Underground Marking Tape.
- b. Approved equal.

D. Cathodic Protection Systems and Accessories

1. Anodes

- a. Northtown Company, SuperMAG Product No. H-MG-60 HP.
- b. Approved equal.

2. Weld Seals

- a. Royston Roy Bound 747 (for primer).
- b. Royston Handy Cap (for seal).
- c. Approved equal.

3. Adaptor Sleeves

- a. ThermOweld.
- b. Approved equal.

4. Test Stations

- a. Handley Industries Inc., 2-inch Cathodic Test Stations.
- b. Approved equal.

E. Stainless Steel Repair Clamps

- a. Ford Meter Box Co., Model FS1/FS2.
- b. PowerSeal Pipeline Products Corp., Model 3122AS.
- c. Romac Industries Inc., Model SS1/SS2.
- d. Approved equal.

F. Connections to Existing Pipe

1. For connection to existing PVC, ductile iron, or cast-iron pipe (solid sleeves, restrained):

- a. EBAA Iron Sales Inc., 3800 Mega-Coupling.
- b. EBAA Iron Sales Inc., Series 1100CH.
- c. Approved equal.



2. For connection to existing asbestos-cement (AC) pipe:
 - a. For normal AC pipe: Romac Industries Inc., XR501 coupling.
 - b. For Simplex AC pipe: Romac Industries Inc., MACRO coupling.
 - c. Approved equal.

2.09. SECTION 01 11 00 – SERVICE LINES, METERS, AND APPURTENANCES

A. 3/4 Inch Through 2 Inch Services – Tapping Saddles

- a. A.Y. McDonald Mfg. Co., 3855 Series.
- b. Ford Meter Box Co., 202 Series.
- c. Mueller Co., BR2 Series.
- d. Approved equal.

B. Corporation Stops

- a. A.Y. McDonald Mfg. Co., Series 74701BQ.
- b. Mueller Co., B-25008N.
- c. Approved equal.

C. Couplings for Copper Service Lines

- a. A.Y. McDonald Mfg. Co., 74701BQ Series.
- b. Ford Meter Box Co., C44 d (where "d" equals the diameter of the service).
FB1000.
- c. Mueller Co., 25008N.
- d. Approved equal.

D. Curb Stops

- a. A.Y. McDonald Mfg. Co., 76102Q (Q CTS Compression X FNPT ends).
- b. Ford Meter Box Co., B66 series.
- c. Mueller Co., B-25172N.
- d. Approved equal.

E. Valve Boxes for Curb Stops

- a. A.Y. McDonald Mfg. Co., 5700 Arch Pattern.
- b. Casting Inc. Series 6500 Screw Type.
- c. Approved equal.

F. Meter Pits and Vaults

1. 3/4- Inch and 1-Inch Single Meter Pits
 - a. DFW Plastics Inc.
 - b. Sigma Corp.
 - c. Approved equal.
2. 3/4-Inch and 1-Inch Single Meter Pit Cover – Frames and Lids
 - a. Castings Inc., CI 7020 with 3” inner drop lid INLP3.
 - b. Approved equal.
3. 3/4- Inch and 1-Inch Dual Meter Pits



- a. DFW Plastics Inc.
 - b. Sigma Corp.
 - c. Approved equal.
4. 3/4-Inch and 1-Inch Dual Meter Pit Cover – Frames and Lids
 - a. Castings Inc., CI 7016 with plastic inner frost lid.
 - b. Approved equal.
 5. 1-1/2 Inch and 2 Inch Meter Pits, Cover
 - a. Trumbull Manufacturing, Inc.
 - b. Approved equal
 6. 3 Inch and Larger Meter Vaults, Cover
 - a. Trumbull Manufacturing, Inc.
 - b. Approved equal
 7. 4-Inch and 6-Inch Fire Series Assembly, Meter
 - a. Recordall, Fire Series Assembly (FSAA), Cold Water Meter & Strainer with Turbine Bypass.
 - b. No substitution allowed.
- G. Single Meter Setters
1. A.Y. McDonald Mfg. Co., Dual Check Setters:
 - a. 31-2-09 WDQQ-33 = 5/8"x3/4" (730series)
 - b. 31-4-09 WDQQ-44 = 1". (730 series)
 - c. 31-3-09 WDQQ-33 = 3/4".
 - d. B612-WDFP-665 = 1-1/2". 720B-612WNQQ-665
 - e. B712-WDFP-775 = 2". 720B-712WNQQ-775
 2. Approved equal.
- H. Dual Meter Setters (3/4-Inch)
1. U-Branch (1"x3/4"x3/4")
 - a. A.Y. McDonald Mfg. Co., Model 5182-048.
 - b. Approved equal.
 2. Angle ball valve
 - a. A.Y. McDonald Mfg. Co., Model 5139-181.
 - b. Approved equal.
 3. Dual check valve
 - a. A.Y. McDonald Mfg. Co., Model 5134-053.
 - b. Approved equal.
- I. Dual Meter Setters (1-Inch)
1. U-Branch (1-1/2"x1"x1")
 - a. A.Y. McDonald Mfg. Co., Model 5182-455.



- b. Approved equal.
- 2. Angle ball valve
 - a. A.Y. McDonald Mfg. Co., Model 5149-185.
 - b. Approved equal.
- 3. Dual check valve
 - a. A.Y. McDonald Mfg. Co., Model 5134-055.
 - b. Approved equal.

2.10. SECTION 33 14 20 – VALVES

A. Gate Valves

- a. American Flow Control, Series 2500.
- b. Clow Valve Co., AWWA C509.
- c. M & H Valve Company, AWWA C509.
- d. Mueller Co., Model 2361 or 2362.
- e. US Pipe.
- f. Approved equal.

B. Butterfly Valves

- a. Clow Valve Co., AWWA C504.
- b. DeZurich, AWWA C504.
- c. M & H Valve Company, Style 4500.
- d. Mueller, Co., Lineseal.
- e. Henry Pratt Co., Model 2FII or Triton XR-70.
- f. Val-Matic, Series 2000.
- g. Approved equal.

C. Valve Boxes

- a. Casting Inc., CI-550 Series #6 Base.
- b. East Jordan Iron Works, Model 8550.
- c. Approved equal.

D. Air Relief/Vacuum Relief Valves

- a. A.R.I., Flow Control Accessories, Combination Air Valve, Model D-040.
- b. APCO – Dezurik, Combination Air Release Valve Model ASU.
- c. Approved equal.

E. Check Valves

- a. American Flow Control, Series 52 SC.
- b. G.A. Industries, Inc., 250 D with renewable bronze seat.
- c. Mueller Co., AWWA C508.
- d. Approved equal.

F. Ball Valves

- a. Conbraco Industries, Apollo.
- b. Nibco Inc.



- c. Watts, lead free model.
- d. Approved equal.

2.11. SECTION 33 14 22 – Hydrants

A. Acceptable Hydrant Manufacturers

- a. American Flow Control, Waterous Pacer WB-67-250X.
- b. Mueller Co., Super Centurion 250, Model A423.
- c. No substitution allowed.

PART 3 - EXECUTION (NOT USED)



APPROVED MATERIALS LIST REVIEW PROCEDURES

The District will review and revise its Standard Construction Specifications on an annual basis. Contractors, suppliers, and manufacturers that desire to have alternate materials included in the annual revision must submit such material by the third Friday of November to the ELCO Operations Manager.

East Larimer County Water District
Attn. Operations Manager
232 South Link Lane, P.O. Box 2044
Fort Collins, Colorado 80524

It shall be at the District's sole discretion to accept or reject any proposed alternate material. The updated Approved Products List will be posted within the District's revised Standard Construction Specifications.

It is the District's preference that all materials and equipment be made in America. Contractors, suppliers, and manufacturers desiring to submit materials for approval, review, and inclusion in these Specifications shall submit at a minimum the following information:

- Manufacturer's standard drawings, schematics, diagrams and brochures.
- Description of the material, part or equipment to be considered.
- Supplemental standard information to provide information specifically applicable to the material or equipment.
- Detailed operation, maintenance, and disassembly information for maintenance if applicable.
- Manufacturer's name, type, model number, and warranties of material or equipment.
- Applicable standards, (ASTM, AWWA, ANSI, etc.).
- The District may request samples of parts and materials be shipped for review, trial, and testing at the requestor's expense.
- Contractors, suppliers and manufacturers may be asked to visit the District for a review and discussion in person.
- Drawings, catalogs, or parts thereof, manufacturer's specifications and data, instructions, performance characteristics, capacities, and other information specified or necessary.
- Descriptive literature for painting and coating systems.
- Description of where parts may be ordered, where manufactured, and anticipated time for delivery.
- Contact information of local municipalities that also use the product.

END OF SECTION



SECTION 01 74 00 CLEANING

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section includes cleaning during construction and final cleaning of the water infrastructure on completion of the Work.
- B. The Contractor is responsible for all site maintenance and clean up during construction activity and disposing of excess and waste material from the Project.
- C. Site cleanup shall be executed continuously during the progress of the work and at the completion of the work.

1.02. CLEANING DURING CONSTRUCTION

- A. During execution of Work, the Contractor shall be responsible for maintaining the water infrastructure material as stored and installed in a clean condition so as to facilitate filling, flushing, testing and acceptance by the District.

1.03. FINAL CLEANING

- A. At the completion of Work and prior to testing and inspection for Preliminary Acceptance, the Contractor shall remove all temporary structures and materials, equipment, and appurtenances not required as a part of or appurtenant to the completed Work.

PART 2 - PRODUCTS

2.01. EQUIPMENT

- A. The Contractor is responsible for supplying all material and equipment necessary to meet the requirements of this Section.
- B. All equipment and materials shall be new.

PART 3 - EXECUTION

3.01. GENERAL

- A. Construction materials shall be neatly stored.
- B. Containers shall be provided for the collection of waste materials and debris.
 - 1. Containers shall be stored out of the right-of-way.
- C. Volatile waste shall be stored in clearly marked, covered metal containers and removed daily.



- D. Construction material, equipment, waste containers, construction buildings, parking, etc., shall only be allowed within the limits of the construction easement.
 - 1. Any off-site storage of construction material, equipment, waste containers, construction buildings, parking, etc. shall be allowed only after the Contractor has obtained the written permission of the property owner.
- E. Upon completion of the construction, the job site shall be restored to its original condition.
 - 1. The Contractor shall restore any land that will not be paved with asphalt or concrete to its original condition or as dictated by easements or other controlling documents.
 - a. All topsoil shall be restored to its original quality.
 - b. Any areas which are stripped of vegetation prior to or during construction shall be reseeded with seed mix approved by property owner as directed by easements or other controlling documents.
 - 2. All exterior paved surfaces shall be broom cleaned and left in good repair.

3.02. DISPOSAL

- A. To maintain an orderly site, waste material and debris shall be removed periodically.
- B. Volatile waste shall be removed daily.

END OF SECTION



SECTION 01 78 39 RECORD DOCUMENTS

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This section describes the requirements related to maintaining and submitting record documents.

1.02. DOCUMENTS

- A. Maintain one set of the following at the Contractor's on-site facility:
 - 1. Documents and samples called for in the Contract Documents.
 - 2. Quality Control and Quality Assurance Field Test Records.
 - 3. Certificates of Compliance.
 - 4. Redlined Construction Drawings (As-Built Drawings) and Specifications.
 - 5. Reviewed Shop Drawings/Product Data.
 - 6. Permits.

PART 2 - PRODUCTS

2.01. AS-BUILT DRAWINGS

- A. Accurate As-Built Drawings shall be maintained by the Contractor and provided to the Consultant for creation of Record Drawings prior to Preliminary Acceptance of the Work.
- B. As-Built Drawings shall identify, in legible redline marking, on-site construction conditions that vary from the design drawings and shall include, at minimum:
 - 1. Installed dimensions, elevations, and details that differ from those shown on the Construction Drawings including but not limited to:
 - a. Changes which are made by modification.
 - b. Details which are not in the original Construction Drawings.
 - c. Horizontal and vertical locations of underground utilities and appurtenances, and where possible, referenced to permanent surface improvements.
 - d. Depths of various elements of work in relation to project datum.
 - 2. As-Built Survey Information:
 - a. Pipeline Line and Grade: The Contractor's surveyor shall record, at minimum, horizontal position (x-y coordinates) and line and grade of pipeline(s) installed and deliver this information as as-built survey data for inclusion in Record Drawings.



- b. Other Appurtenances: The Contractor's surveyor shall record location information (vertical and horizontal) of all other appurtenances installed below and above grade which shall include but not be limited to water infrastructure items such as fittings, valves (and valve boxes), air-vac vaults, vent pipes and curb stops/meter pits.
- C. Each sheet of the As-Built Drawings shall be labeled "AS-BUILT DRAWING" in neat, large-printed letters.
- D. As-built information shall be recorded concurrently with construction progress.
- E. Maintenance of As-Built Drawings During Construction:
 - 1. Project As-Built Drawings shall be stored apart from other documents used for construction.
 - 2. Project As-Built Drawings shall be maintained in a clean, dry, legible condition and in good order.
- F. Submittal of As-Built Survey Information and Drawings:
 - 1. As-built survey information shall be submitted to the water line design engineer for incorporation into the Record Drawings.
 - 2. As-Built Drawings shall be submitted to the District for review and acceptance as a complete set of drawings showing District infrastructure (regardless of whether changes occurred during construction) with a transmittal letter (reference Paragraph 3.01.).
 - 3. Following acceptance by the District of the As-built drawings, the Consultant shall use the As-Built survey and drawing information, and all other information created during the Project and its construction, to create the Project Record Drawings.

2.02. RECORD DRAWINGS

- A. Project Record Drawings shall be prepared by the Owner's Consultant and shall reflect as-built conditions as shown on the As-Built Drawings, as-built survey data, and all other as-built information created during the Project and its construction.
 - 1. Plan and profile drawings shall be redrawn (in CAD) to reflect significant as-built changes in alignment or grade.
 - 2. As-built alignment and grades shall be noted on Record Drawings or redrawn in red text or linework or other suitable method(s) to clearly identify changed conditions.
- B. Each sheet of the Record Drawings shall be labeled "RECORD DRAWING" in neat, large-printed letters.
- C. Each sheet of the Record Drawings shall be stamped by a Colorado registered professional engineer (P.E.).
- D. Submittal of Record Drawings



1. Owner's Consultant shall deliver Record Drawings to the District in hard copy and electronic format (pdf, CAD, and GIS) acceptable to the District as follows (reference Paragraph 3.01.):
 - a. One hard copy in 24" x 36" format if requested by District
 - b. One hard copy in 11" x 17" format if requested by District
 - c. One Adobe PDF set (electronic)
 - d. CAD and GIS georeferenced files of all lines, appurtenances, property lines (as per recorded plat), easements, road curb lines, and any other line work deemed necessary by the District in as-built locations.
 - e. Coordinate system shall be as follows:
 - i. Horizontal Datum: Colorado State Plane North Zone NAD 83.
 - ii. Vertical Datum: NAVD 88.
- E. Project As-Built and Record Drawings in a complete and acceptable format must be received by the District a minimum of one week before Preliminary Acceptance is requested.

PART 3 - EXECUTION

3.01. DELIVERY OF AS-BUILT AND RECORD DRAWINGS

- A. Accompany any submittal with transmittal letter containing the following:
 1. Date, Project Title, Project Number (as applicable).
 2. Contractor's name, address, and telephone number.
 3. Index containing title and number of each Record Drawing (or Document).
 4. Signature of the Contractor and/or Contractor's authorized representative.
- B. Deliver to the District or District's designated representative.

END OF SECTION



SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers cast in place concrete for thrust restraints (or blocks), encasements, cut-off walls, protective pads, and concrete fills, including forms, reinforcing steel, finishing and curing, and other appurtenant work.

1.02. RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03 40 00 – Precast Concrete.

1.03. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:

1. Federal, state, and local codes, regulations, and ordinances.
2. ACI 306 – Guide to Cold Weather Concrete.
3. ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement.
4. ASTM A615 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
5. ASTM A617 – Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.
6. ASTM C33 – Concrete Aggregates.
7. ASTM C94 – Ready-Mixed Concrete.
8. ASTM C150 – Portland Cement.
9. ASTM C206 – Finishing Hydrated Lime.
10. ASTM C494 – Chemical Admixtures for Concrete.
11. ASTM C618 – Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

PART 2 - PRODUCTS

2.01. CONCRETE



- A. Mix Design: All concrete shall have a mix design that demonstrates a minimum compressive strength of 3,000 psi at 28 days.
- B. Submittals: Submit the concrete mix design if requested by the District.

2.02. MATERIALS

A. Cement

- 1. All cement shall be Portland Cement.
- 2. Portland Cement shall conform to ASTM C150 Type 1/II.

B. Aggregates

- 1. All fine and coarse aggregate shall conform to ASTM C33.

C. Water

- 1. All water shall be free from objectionable quantities of silt, organic matter, alkali, salts, and other impurities or conform to ASTM C94.

D. Admixtures

- 1. An air-entraining agent may be used in all concrete.
 - a. All air-entraining agents shall conform to ASTM C260.
- 2. A water-reducing admixture may be used if approved by the District.
 - a. A water reducing admixture shall conform to ASTM C494, for Type A or Type D chemical admixture.
 - b. The water reducing admixture shall not contain any calcium chloride.
 - c. The water reducing admixture shall be compatible with the cement being used.

E. Accelerators

- 1. Accelerators shall conform to ASTM C494 and ACI 306.
 - a. If calcium chloride is used as an accelerator, the amount used should not exceed 2%, by weight, of the cementitious material.
 - b. Calcium chloride shall be in solution prior to adding it to the batch process.

F. Fly-Ash

- 1. When fly-ash is used in concrete, the cement replacement shall not exceed 20%.
 - a. Class C or Class F fly-ash shall conform to ASTM C618.

G. High-Early Strength Concrete

- 1. The Contractor may use high-early strength concrete for scheduling purposes with prior approval from the District.
- 2. Provide specific methods for curing to limit temperature and shrinkage cracking caused by higher heat of hydration caused by high-early strength concrete.

- H. The Contractor shall be responsible for any difficulties arising or damages occurring because of the selection and use of any of the above materials.



2.03. CONCRETE REINFORCEMENT

- A. All deformed reinforcing bars shall conform to ASTM A615 or ASTM A617.
 - 1. All bars shall be either Grade 40 or Grade 60.
- B. All welded steel wire fabric shall conform to ASTM A185.

PART 3 - EXECUTION

3.01. GENERAL

- A. Concrete shall have a maximum allowable water/cement ration of 0.50 by weight.
 - 1. The water/cement ration may be increased to 0.56 by weight if a water-reducing agent is used (reference Paragraph 2.02.D.2.).

3.02. PLACING

- A. Concrete shall not be placed if the air temperature is less than 40 degrees Fahrenheit, or greater than 90 degrees Fahrenheit.
 - 1. The temperature of the mix shall not be less than 50 degrees Fahrenheit, nor more than 90 degrees Fahrenheit at the time of the placement.
 - 2. If heated water and/or an accelerator is used, the above temperature restrictions may be waived if approved by the District.
 - a. Water shall not be heated to a temperature exceeding 150 degrees Fahrenheit.

3.03. CURING

- A. Finished concrete shall be protected for a minimum of three days after placement and maintained at a minimum temperature of 50 degrees Fahrenheit during that period.
 - 1. The Contractor is responsible for protecting the concrete from traffic and the elements.
 - a. Backfill may be placed over thrust blocks as soon as the concrete has set, but compaction will not be allowed for a minimum of 24 hours after the concrete is placed.

END OF SECTION



SECTION 03 40 00 PRECAST CONCRETE

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers precast concrete products and accessories for meter pits, meter vaults, prefabricated manholes, and vaults for air relief and vacuum relief valves.

1.02. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. All precast concrete parts shall be handled, stored, and protected in a manner which will prevent damage to materials.

1.03. SUBMITTALS

A. Shop Drawings:

1. Show dimensions, joint locations, and connection details.
2. Show wall block out locations and dimensions (vents, doors, penetrations required for electrical and mechanical conduits, pipe, or equipment).

B. Material Information:

1. Concrete
 - a. The concrete mix design shall be stamped and sealed by a Professional Engineer registered in the State of Colorado.
 - b. Compressive strength reports.
 - c. Product data for the mix constituents including cement, supplementary cementitious materials, admixtures, and aggregates.
 - d. Product data for materials and methods.
2. Sealer for exterior surfaces, including product data with mixing/application instructions.
3. Reinforcing steel.
4. Embedded steel items.
5. Steel connection plates and devices.
6. Steel fasteners.
7. Joint sealants.
8. Vents.

C. Engineered Calculations

1. Calculations and Technical Data: Proposed details and design calculations for stresses in all critical sections of precast members for all loading conditions including transportation, handling, and erection.



2. Project fastener/connection calculations.
 3. Prepared, stamped, and signed by a Professional Engineer registered in the State of Colorado.
 4. Meet the design requirements of ACI 318.
- D. Manufacturer's Installation Recommendations.
- E. Precast Concrete Manufacturer's Qualifications.
1. Experience record on production of precast concrete with information on precasting plant that will indicate capability to satisfactorily perform the Work.
 2. Evidence of current PCI plant certification.
 3. Reference Paragraph 1.04.
- 1.04. QUALITY ASSURANCE
- A. The Precaster shall have 5 years of experience producing precast concrete products of quality specified. The Professional Engineer shall be registered in the State of Colorado to stamp calculations and Shop Drawings.
- B. Precast plant shall be PCI certified with current certification.
- C. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
1. Federal, state, and local codes, regulations, and ordinances.
 2. ASTM C150 – Portland Cement.
 3. ASTM C144 – Aggregate for Masonry Mortar.
 4. ASTM C207 – Hydrated Lime for Masonry Purposes.
 5. ASTM C478 – Circular Precast Reinforced Concrete Manhole Sections.
 6. ASTM C497 – Standard Test Methods for Concrete Pipe, Concrete Box Sections, Manhole Sections, or Tile.
 7. AASHTO M198 – Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets.
- D. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

PART 2 - PRODUCTS

2.01. PRECAST CONCRETE PRODUCTS

- A. Barrels and flat slab tops of manholes and vaults shall conform to and be designated as ASTM C478 and shall be made with Type I/II Cement.



1. Flat slab tops will be used on all vaults and meter vaults unless otherwise approved by the District.
- B. Concrete and Reinforcing Materials.
 1. Reference Section 03 30 00 – Cast-in-Place Concrete.
 2. Minimum reinforcement for bases of manholes and vaults shall consist of welded wire fabric, 4 x 4, W4 x W4.
 3. Minimum reinforcement for base beams, supporting manholes or vaults, shall consist of three (3) No. 5 bars longitudinally and No. 4 bars at 12-inch centers transversely.
- C. Grout shall be one of the following:
 1. Sand-Cement grout using the following ratio of ingredients:
 - a. One part Portland Cement, conforming to ASTM C150, Type II.
 - b. Two parts sand, conforming to ASTM C144.
 - c. One-half part hydrated lime, conforming to ASTM C207, Type S.
 2. Premixed non-shrinking grout.
 - a. Acceptable types and manufacturers:
 - i. Master Builders, Inc., Masterflow.
 - ii. Sika Corp., SikaGrout.
 - iii. Approved equal.
 3. Job-mixed grout using the following ratio of ingredients:
 - a. One part Portland Cement, conforming to ASTM C207, Type II.
 - b. One part sand, conforming to ASTM C144.
 - c. One part shrinkage correcting aggregate.
 - d. Acceptable types and manufacturers:
 - i. Master Builders, Inc., Embeco.
 - ii. Sika Corp., SikaGrout.
 - iii. Approved equal.
- D. Ring and Cover
 1. Acceptable manufacturers and models:
 - a. Neenah Foundry Co., R 1706
 - b. Approved equal.
- E. Steps
 1. All steps shall be impact resistant copolymer polypropylene plastic molding around 1/2-inch diameter and grade 60 reinforcing steel conforming to ASTM C478.
 2. All steps shall be spaced 12 inches apart on-center.
 3. Acceptable manufacturers and models:
 - a. M.A. Industries, Inc., PS 2 PFS.



- b. Neenah Foundry Co., R 1981.
- c. Approved equal.

F. Preformed Plastic Gaskets.

- 1. All preformed plastic gaskets shall conform to AASHTO M198.
- 2. Preformed plastic gaskets size:
 - a. 1-1/2 inches for manholes up to 60-inch diameter.
 - b. 2 inches for manholes above 60-inch diameter.
- 3. Acceptable manufacturers and models:
 - a. Henry Co., Ram Nek.
 - b. Henry Co. Co. Rub'r-Nek.
 - c. Hamilton Kent Manufacturing Co., Kent Seal.
 - d. Approved equal.
- 4. Gaskets shall not be set if the outside air temperature is less than 10 degrees Fahrenheit.
 - a. Gaskets may be set when the air temperature is below the minimum allowable if the gasket is preheated.

G. Pipe Penetration Seals

- 1. Cored penetrations
 - a. Install penetration seal assemblies at all pipe penetration locations.
 - i. Penetration seal: EPDM.
 - b. Accepted Manufacturers
 - i. Thunderline Corp., Link-Seal.
 - ii. Approved equal.
- 2. “Doghouse” style penetrations
 - a. Insulating spray-foam sealant.

PART 3 - EXECUTION

3.01. PREPARATION

A. Trenching, Backfilling, and Compaction.

- 1. Reference Section 31 23 35 – Trenching, Backfilling, and Compacting.

3.02. METER PIT MANHOLE AND VAULT CONSTRUCTION

A. Meter pit manholes and vaults shall be installed at the locations indicated on the approved Construction Drawings or as directed by the District to accommodate field conditions.

B. The manhole section or vault shall be set plumb.

- 1. Precast adjustment rings shall be used to bring the ring and cover to grade.



- C. Manhole and vault sections shall be joined to lids using preformed flexible plastic gasket material.
 - 1. All joint surfaces shall be kept clean, dry, and warm during installation.
- D. All lifting holes and other imperfections shall be filled with mortar.
- E. The ring, cover, and precast adjustment rings shall be installed.

3.03. INSTALLATION

- A. Install all precast members in accordance with the manufacturer's recommendations.
- B. Repair damaged galvanized steel surfaces as specified in Section 09 90 00 – Painting and Coating.
- C. Coat non-galvanized interior and exterior steel plates and connection members as specified in Section 09 90 00 – Painting and Coating.

3.04. QUALITY CONTROL

- A. Construction tolerances of precast members shall be within the manufacturer's recommended range of values for wall plumbness, roof slope, and panel closures.
- B. Level and plumb installation.
- C. Final grade match per standard detail.

END OF SECTION



SECTION 09 90 00 PAINTING AND COATING

PART 1 - GENERAL

1.01. DESCRIPTION

A. This Section includes materials and application of painting and coating systems for the following surfaces:

1. Exposed metal.
2. Buried metal.

1.02. QUALITY ASSURANCE

A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:

1. Federal, state, and local codes, regulations, and ordinances.
2. American National Standards Institute (ANSI).
3. National Association of Corrosion Engineers (NACE).
4. Society for Protective Coatings (SSPC).

1.03. SUBMITTALS

A. Submit manufacturer's certification that products meet the referenced standards and show the following information:

1. Percent solids by volume.
2. Minimum and maximum recommended dry-film thickness per coat for prime, intermediate, and finish coats.
3. Recommended surface preparation.
4. Recommended thinners.
5. Statement verifying that the specified prime coat is recommended by the manufacturer for use with the specified intermediate and finish coats.
6. Application instructions including recommended equipment and temperature limitations.
7. Curing requirements and instructions.
8. Submit certificate identifying the type and gradation of abrasives used for surface preparation.
9. Submit material safety data sheets for each coating.

B. Reference Section 01 33 00 – Submittals.



PART 2 - PRODUCTS

2.01. PAINTING AND COATING SYSTEMS INDEX

A. The following index lists the various painting and coating systems by service and generic type:

System No.	Title	Generic Coating
Exposed Metal Coating System		
10	Exposed Metal, Corrosive Environment	High-build epoxy (two-coat system) with polyurethane topcoat
18	Exposed Metal, Organic Zinc Primer for Shop Coating and Field Touch-Up	Organic Zinc
Buried Metal Coating System		
21	Buried Metal	Epoxy

B. These systems are specified in detail in the following paragraphs. For each coating, the required surface preparation, prime coat, intermediate coat (if required), topcoat, and coating thicknesses are described. Mil thicknesses shown are minimum dry-film thicknesses.

2.02. MANUFACTURERS

- A. Use a nationally recognized manufacturer of paints and protective coatings that are regularly engaged in the production of such materials for essentially identical service conditions.
- B. Each of the following manufacturers can supply the coating systems specified herein:
1. Carboline.
 2. International.
 3. PPG.
 4. Sherwin Williams.
 5. Tnemec.

2.03. EXPOSED METAL COATING SYSTEMS

- A. System No. 10 – Exposed Metal, Corrosive Environment
1. Type: High-build epoxy intermediate coat having a minimum volume of solids of 60 percent with an inorganic zinc prime coat and a pigmented polyurethane finish coat having a minimum volume solids of 52 percent.
 2. Service conditions: For use with metal structures or pipes subjected to water condensation, chemical fumes, such as hydrogen sulfide; salt spray; and chemical contact.
 3. Surface Preparation: As required by the coating manufacturer.
 4. For potable water service, use NSF/ANSI 61 approved epoxy.



5. Prime Coat
 - a. Self-curing, two-component inorganic zinc-rich coating recommended by the manufacturer for overcoating with a high-build epoxy finish coat. Minimum zinc content shall be 12 pounds per gallon.
 - b. Apply the manufacturer's recommended number of coats to attain the specified minimum coating thickness.
 6. Intermediate Coat (If Required by Manufacturer)
 - a. Apply the manufacturer's recommended number of coats to attain the specified minimum coating thickness.
 7. Finish Coat
 - a. Apply the manufacturer's recommended number of coats to attain the specified minimum coating thickness.
 - b. Two-component pigmented acrylic or aliphatic polyurethane recommended by manufacturer for overcoating a high-build epoxy coating.
- B. System No. 18 – Organic Zinc Primer for Shop Coating and Field Touch-Up
1. Type: Organic zinc primer having a minimum zinc content of 14 pounds per gallon.
 2. Service conditions: For use as a shop-applied primer or field touch-up primer over inorganic zinc prime coatings on exposed metal.
 3. Surface preparation: As required by the coating manufacturer.
 4. Coating shall be of the two- or three-component converted epoxy, epoxy phenolic, or urethane type. Organic zinc primer shall be manufactured by the prime coat manufacturer.
 5. Apply the manufacturer's recommended number of coats to attain the specified minimum coating thickness.

2.04. BURIED METAL COATING SYSTEMS

- A. System No. 21 – Buried Metal
1. Type: High solids epoxy or phenolic epoxy having a minimum volume of solids of 80 percent (ASTM D2697).
 2. Service conditions: Buried metal, such as valves, flanges, bolts, nuts, structural steel, and fittings.
 3. Surface preparation: As required by the coating manufacturer.
 4. Apply the manufacturer's recommended number of coats to attain the specified minimum coating thickness.
 5. For potable water service, use NSF/ANSI 61 approved epoxy.

PART 3 - EXECUTION



3.01. WEATHER CONDITIONS

- A. Follow the coating manufacturer’s recommendations with respect to weather, temperature, wind, humidity, etc.

3.02. SURFACE PREPARATION PROCEDURES

- A. Follow the coating manufacturer’s recommendations for all surface preparation.
- B. Relevant surface preparation shall conform with the coating manufacturer’s requirements or SSPC specifications as follows:

Description	SSPC Specification
Solvent Cleaning	SP-1
Hand Tool Cleaning	SP-2
Power Tool Cleaning	SP-3
White Metal Blast Cleaning	SP-5
Commercial Blast Cleaning	SP-6
Brush-Off Blast Cleaning	SP-7
Pickling	SP-8
Near-White Blast Cleaning	SP-10
Power Tool Cleaning to Bare Metal	SP-11
Surface Preparation and Cleaning of Steel and other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating	SP-12
Surface Preparation of Concrete	SP-13

3.03. COATING STAINLESS STEEL

- A. Follow the manufacturer’s recommendations for coating stainless steel.
- B. When loading shipment to the project site, use spacers and other protective devices to separate items to prevent damaging the shop-primed surfaces during transit and unloading.
- C. Handle shop-primed items with care during unloading, installation, and erection operations to minimize damage. Do not place or store shop-primed items on the ground or on top of other work unless ground or work is covered with a protective covering or tarpaulin.

3.04. FIELD TOUCH-UP OF SHOP-APPLIED COATS

- A. Follow the coating manufacturer’s recommendations for all field touch-ups.
- B. Remove oil and grease surface contaminants on metal surfaces along with dust, dirt, salts, moisture, chalking primers, or other surface contaminants that will affect the adhesion or durability of the coating system. Remove loose or peeling primer and other surface contaminants. Remove rust, scaling, or primer damaged by welding or during shipment, storage, and erection.

3.05. PAINTING SYSTEMS



- A. All materials of a specified painting system, including primer, intermediate, and finish coats, shall be produced by the same manufacturer. Thinners, cleaners, driers, and other additives shall be as recommended by the coating manufacturer for the coating system.
- B. Deliver paints to the jobsite in the original, unopened containers.

3.06. PAINT STORAGE AND MIXING

- A. Store and mix materials only in areas designated for that purpose. The area shall be well-ventilated with precautionary measures taken to prevent fire hazards. Post “No Smoking” signs. Storage and mixing areas shall be clean and free of rags, waste, and scrapings. Tightly close containers after each use.
- B. Prepare multiple-component coatings using all the contents of the container for each component as packaged by the coating manufacturer. Do not use partial batches. Do not use multiple-component coatings that have been mixed beyond their pot life. Provide small quantity kits for touch-up painting and for painting other small areas.

3.07. PROCEDURES FOR THE APPLICATION OF COATINGS

- A. Follow the recommendations of the coating manufacturer, including the selection of spray equipment, brushes, rollers, cleaners, thinners, mixing, drying time, temperature and humidity of application and safety precautions.
- B. Use a different shade or tint on succeeding coating applications to indicate coverage where possible.
- C. Do not use thinners unless recommended by the coating manufacturer. If thinning is allowed, do not exceed the maximum allowable amount of thinner per gallon of coating material.
- D. Apply primer immediately after blast cleaning and before any surface rusting occurs, or any dust, dirt, or any foreign matter has accumulated.
- E. Before applying subsequent coats, allow the primer and intermediate coats to dry for the minimum curing time recommended by the manufacturer.

3.08. PROTECTION OF SURFACES NOT BE PAINTED

- A. Remove, mask, or otherwise protect hardware, fixtures, aluminum surfaces, vehicles, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Mask openings in motors to prevent paint and other materials from entering the motors.

3.09. DRY-FILM THICKNESS TESTING

- A. Measure coating thickness specified for carbon steel surfaces with a magnetic-type dry-film thickness gauge in accordance with SSPC PA-2. Measure coating thickness specified for stainless steel, aluminum, and copper surfaces with an eddy-current type thickness gauge per ASTM D1400.



- B. Test the finish coat of metal surfaces (except zinc primer and galvanizing) for holidays and discontinuities with an electrical holiday detector, low-voltage, wet-sponge type.
- C. Check each coat for the correct dry-film thickness. Do not measure within eight hours after application of the coating.

3.10. REPAIR OF IMPROPERLY COATED SURFACES

- A. If any item has an improper finish color or insufficient film thickness, clean and topcoat the surface with the specified paint material to obtain the specified color and coverage. Sandblast or power-sand visible areas of chipped, peeled, or abraded paint, feathering the edges. Then prime and finish coat in accordance with the manufacturer's recommendations. Work shall be free of runs, bridges, shiners, laps, or other imperfections.

3.11. CLEANING

- A. During the progress of the work, remove discarded materials, rubbish, cans, and rags at the end of each day's work.
- B. Upon completion of painting work, remove masking tape, tarps, and other protective materials, using care not to damage finished surfaces.

END OF SECTION



SECTION 21 11 20 FIRE SERVICE LINES

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers the installation of fire service lines. Fire service lines are water service mains that are dedicated for the purpose of fire protection only as in connection from a District water main to a building fire standpipe, fire sprinkler system, etc.

1.02. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
1. Federal, state, and local codes, regulations, and ordinances.
 2. American National Standard Institute (ANSI).
 3. American Water Works Association (AWWA).
 4. American Society for Testing and Materials (ASTM).
 5. American Society of Mechanical Engineers (ASME).
 6. National Fire Protection Association (NFPA).
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.03. CONDITIONS

- A. Fire service lines shall be connected to the District distribution system by an installed tee (requiring shutdown of the existing distribution system main by District personnel if the main is in service).
- B. The connection of the fire service line to the District water main will include a control valve at the tee.
1. District Ownership: District ownership and maintenance for a connected fire service line ends with and includes this control valve.
 2. Property Owner Responsibility: Ownership and responsibility of the fire service line beyond the control valve shall remain the perpetual responsibility of the property owner.
- C. All fire service lines shall incorporate a backflow prevention device.
1. Reference District's Cross-Connection Control and Backflow Prevention Manual (available on District's website).



PART 2 - PRODUCTS

2.01. PIPE

A. Reference Section 33 14 10 – Water Distribution System.

2.02. VALVES

A. Reference Section 33 14 20 – Valves.

2.03. FIRE HYDRANTS

A. Reference Section 33 14 22 – Hydrants.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. The Owner's Contractor shall perform installation of the tee connection and control valve for all fire service line connections to the District water main.
- B. Installation, inspection and testing of the fire service line from the control valve into the property shall be the full responsibility of the Owner in accordance with applicable codes and standards as required by local fire jurisdiction (reference Paragraph 1.02).
 - 1. All newly constructed fire service lines must be flushed, chlorinated, and dechlorinated. Bacteriological testing must be performed, and results must pass before pressure testing and placing of the District water main(s) into service.
 - a. Reference Section 33 13 00 – Disinfection of Water Lines.
 - b. Reference District Standard Construction Details drawings.

END OF SECTION



SECTION 31 23 25 CONTROLLED LOW STRENGTH MATERIAL BACKFILL (FLOWFILL)

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers all work necessary to furnish and install Controlled Low Strength Material (CLSM) (Flowfill) when approved for the installation of cut-off walls along a water line trench or other locations as may be required and/or approved by District or required by local jurisdiction for trench backfill under roads.
- B. Cut-Off Walls or Other Locations as Required: For all cut-off wall installation, the specifications below apply.
- C. Trench Backfill Under Roads: Flowfill shall comply with the road jurisdiction's requirements or specifications.

1.02. RELATED WORK

- A. Section 31 23 43 – Trenching, Backfilling, and Compacting.

1.03. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
 - 1. Federal, state, and local codes, regulations, and ordinances.
 - 2. ASTM C33 – Concrete Aggregates.
 - 3. ASTM C94 – Ready Mixed Concrete.
 - 4. ASTM C150 – Portland Cement.
 - 5. ASTM C168 – Fly Ash.
 - 6. ASTM C494 – Chemical Admixtures for Concrete.
 - 7. ASTM D4832 – Standard Test Method for Preparation and Testing of Soil-Cement Slurry Test Cylinders.
 - 8. ASTM PS 28 – Provisional Standard Test Method for Flow Consistency of Controlled Low Strength Material.
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

PART 2 - PRODUCTS

2.01. MATERIALS



A. General

1. The CLSM shall consist of a mixture of sand, coarse aggregate, cement, and water. Fly ash and approved admixtures may be used to obtain the required properties of the mix. The mix shall have good workability and flowability with self-compacting and self-leveling characteristics. Proportions of the mix shall be as follows:

CLSM Mix Proportions	
Component	Amount
Cement	30 lbs
Fly Ash	30 lbs
Fine Aggregate	1,845 lbs
Coarse Aggregate	1,700 lbs
Water	325 lbs

B. Flowable Fly Ash

1. May be used as follows if approved by the District Engineering:

Material	Pounds/Cubic Year
Class C Fly Ash	200 to 400
Class F Fly Ash	1,600 to 1,800
Water	800 (96 gallons or as needed)

C. Cement

1. All cement used shall be Type II Portland cement which shall conform to ASTM C150.

D. Fly Ash

1. Fly ash may be either Class C or Class F and conform to ASTM C618.

E. Aggregates

1. Fine aggregate: All fine aggregates shall conform to the grading and quality requirements of ASTM C33.
2. Coarse Aggregate: Coarse aggregate shall conform to the grading and quality requirements of ASTM C33 for size No. 57 or No. 67.

F. Water

1. The batch mixing water and mixer washout water shall conform to the requirements of ASTM C94.

G. Admixtures

1. Chemical admixtures that do not contain calcium chloride and conform to ASTM C494 for concrete may be used in the CLSM mix. All chemical admixtures shall be compatible with the cement and other admixtures in the batch.

H. CLSM Properties

1. Compressive Strength



- a. 28-day strength: Between 50 psi and 150 psi when tested in accordance with ASTM D 4832.
 - b. Minimum 24-hour strength: 10 psi.
 2. Air-Entrainment: All CLSM shall be air entrained to a total air content of 4 – 8 %.
 3. Slump: The minimum slump shall be seven 7 inches, and the maximum slump shall be 9 inches when tested in accordance with ASTM PS 28.
 4. Aggregate: Fine aggregate shall be between 50% and 60% by volume of the total aggregates in the CLSM mix.
 5. Consistency: The consistency of the CLSM slurry shall be such that the material flows easily into all openings and the area to be filled. When trenches are on a steep slope, a stiffer mix of slurry may be required to prevent CSLM from flowing down the trench. When a stiffer mix is used, vibration shall be performed to ensure that the CLSM slurry completely fills all spaces between the pipe and the lower portion of the trench.
- I. CLSM is prohibited as a temporary or permanent street surface.
 - J. No changes shall be made to the specified mix ingredients without the approval of the District.

PART 3 - EXECUTION

3.01. PLACEMENT

- A. CLSM may be used as an alternative to backfill, as directed by the District, but may not be used as a substitute for bedding material.
- B. Rodding, mechanical vibration and compaction of CLSM shall be performed to assist in consolidating the CLSM.
- C. CLSM shall be placed as closely behind pipe laying operations as possible.
- D. When required to prevent uplift, the CLSM shall be placed in two stages as required, allowing sufficient time for the initial set of the first stage before the remainder is placed.
- E. CLSM shall be deposited as nearly as practical in its final position and in no way disturb the pipe trench or cause foreign material to become mixed with the CLSM.
- F. Soil backfill shall not be placed until the CLSM has reached the initial set. If backfill is not to be placed over the CLSM within 8 hours, a concrete blanker or a 6-inch cover of moist earth shall be placed over the CLSM surface.
 1. If the air temperature is 50° F or less, the moist earth should be at least 18-inches thick.
- G. CLSM shall not be placed when the air temperature is below 40° F. or if weather conditions are unsuitable.
- H. CLSM shall not be placed when the trench bottom or walls are frozen or contain frozen materials.



END OF SECTION



SECTION 31 23 35 TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This section covers construction staking, excavation, and trenching, including subsurface drainage, dewatering, preparation of subgrades, pipe bedding, backfilling, compacting, and finish grading for underground pipelines, service lines and appurtenances.

1.02. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
1. Federal, state, and local codes, regulations, and ordinances
 2. AASHTO T 99 – Standard Method of Test for Moisture-Density Relations of Soils.
 3. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (Standard Proctor).
 4. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (Modified Proctor).
 5. ASTM D2049 – Test Method for Relative Density of Cohesionless Soils.
 6. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods.
 7. ASTM D4253 – Standard Test Methods Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 8. ASTM D4254 – Standard Test Methods Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 9. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 10. CDOT Section 703 – Aggregates.
- B. Construction Staking:
1. Construction staking shall be performed by or under the direct supervision of a Colorado licensed Professional Land Surveyor (PLS).
 2. The Contractor shall be responsible for engaging, directing, and scheduling the surveyor.



3. Staking of the work shall be at a maximum of 50-foot stations along straight runs of water line.
 4. Offsets shall be staked so that vertical and horizontal alignment may be checked.
 5. All survey data, which is developed by the Contractor or the Owner's Engineer in performing surveys which are required by the work, shall be available to the District for examination throughout the construction period.
- C. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.03. SUBMITTALS

A. Test Results

1. Submit all testing certificates and reports to the District to verify compliance with these Specifications.
2. Reference Section 01 45 16 – Quality Requirements.

1.04. MAINTENANCE AND CORRECTION

- A. The Contractor shall maintain and correct any settlement or other damage associated with the water line installation (trench or otherwise) and make necessary repairs to pavement, sidewalks, other structures, other utilities or any other damaged or impacted property during the warranty period.
- B. The Contractor may perform such maintenance and corrections by subcontract given conditions of the following:
1. If the contractor chooses to subcontract the warranty work, a copy of the subcontract shall be delivered to the District.
 2. Acceptance of a subcontractor to perform the work shall be at the sole discretion of the District.
 3. All subcontractors shall provide proof of insurance, performance bonds, or any other surety as deemed necessary by the District.

1.05. JOB CONDITIONS

A. Drainage and Groundwater

1. The Contractor shall be responsible for all dewatering operations, acquisition of all necessary permits, and follow all requirements as stipulated in any permit.
 - a. Submit copies of approved permits to the District, if requested, prior to commencement of any dewatering activities.
2. All excavations and trenches shall be kept free from excess groundwater during construction.
3. Any water which is encountered in the trench shall be removed to the extent necessary to provide a firm subgrade.



4. Surface runoff shall be diverted as necessary to keep excavations and trenches free from water during construction.
5. The excavation or trench shall be kept free from water until the structure, or pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
6. Water shall be prevented from entering any previously installed pipe.
7. The pipe under construction shall not be used for dewatering.

B. Sequencing

1. Pipeline installation shall be performed within 300 linear feet of trench excavation limit.
 - a. If construction is occurring in an open field, this distance may be amended at the District's discretion.
2. Initial trench backfill shall be performed within 50 linear feet of pipeline installation.
 - a. If construction is occurring in an open field, this distance may be amended at the District's discretion.
3. Where excavation is a hazard to vehicle or pedestrian traffic, the amount of open trench and the time duration of that opening is to be minimized.
 - a. The Contractor shall coordinate the extent and duration of road closure with the appropriate traffic department.

C. Underground Obstructions

1. It shall be the responsibility of the Contractor to field verify all existing Drawing of Record information obtained from the District.
2. The Contractor shall be responsible for all locating and potholing required to adequately identify any and all existing utilities.
3. In situations where conflicts may exist, the Contractor shall expose and verify the size, location, and elevation of underground utilities and other obstructions, sufficiently in advance of construction to permit changes to be made to the Construction Drawings.
 - a. In the case of a conflict, the Contractor shall notify the District and the affected utility company.
 - b. In the case of a conflict, the proposed work may be modified at the District's discretion.
4. Existing improvements, adjacent property, utilities, trees, and plants that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations.
5. If the Contractor removes any underground obstructions, the following shall apply:



- a. Drainage culverts may be salvaged, stored, and reused in the original location if prior approval is obtained from the property owner or appropriate agency.
- b. All other underground obstructions shall be replaced with new materials.
- c. The area in which the underground obstruction was located shall be restored to original condition or better.

PART 2 - PRODUCTS

2.01. STABILIZATION MATERIAL

- A. If the existing soil in the trench bottom is judged to be unsuitable by the District, the top 6 inches (or depth as determined adequate by the District Inspector or Engineer, or as may be recommended by a geotechnical engineer or other qualified expert) of the trench subgrade shall be removed and replaced with stabilization material.
- B. Stabilization material shall be crusher run rock conforming to ASTM D448, CDOT Section 703 Specifications for Coarse Aggregates No. 357 as defined in the table below or approved equal.

- 1. CDOT Coarse Aggregate No. 357:

Size	Percent Passing
2-1/2"	100
2"	95 – 100
1"	35 – 70
1/2"	10 – 30
#4	0 – 5

- C. Geotextile Fabric: If based on site conditions and as requested by the District Inspector and at their sole discretion, geotextile fabric shall be installed in conjunction with stabilization material. Acceptable types of filter fabric and their manufacturers are as follows:

- 1. TenCate, Mirafi.
- 2. Approved equal.

2.02. BEDDING MATERIAL

A. Pipe Bedding

- 1. All pipe 4" diameter and larger shall be bedded in uniformly graded material conforming to either of the following materials: (a) "Squeegee" per CDOT Section 703 Specifications for Coarse Aggregates No. 8 as defined in the table below; or (b) "Structural Backfill" per CDOT Section 703 Specifications for Class 1 structural backfill as defined in the table below.



a. CDOT Coarse Aggregate No. 8, “Squeegee:”

Size	Percent Passing
1/2”	100
3/8”	85 – 100
#4”	10 – 30
#8	0 – 10
#16	0 – 5

b. CDOT Class 1 Structural Backfill:

Size	Percent Passing
2”	100
#4	30 – 100
#50	10 – 60
#100	5 - 20

B. Service Line or Small Diameter Pipe Bedding

- All service lines or small diameter pipe (pipe of less than 4” nominal diameter) shall be bedded in CDOT Coarse Aggregates No. 8 “Squeegee” as specified above for Pipe Bedding (reference Paragraph 2.02.A.1.a).

C. Precast Concrete Products

- Meter pits, prefabricated manholes, and meter vaults with closed floors shall be bedded in CDOT Coarse Aggregates No. 8 “Squeegee” as specified above for Pipe Bedding (reference Paragraph 2.02.A.1.a).
- Meter vaults, air/vacuum relief valve vaults, and prefabricated manholes with open floors shall be bedded in “3/4-inch Washed Gravel” per CDOT Section 703 Specifications for Coarse Aggregates No. 67 as defined in the table below.

a. CDOT Coarse Aggregate No. 67, “3/4” Washed Gravel:”

Size	Percent Passing
1”	100
3/4”	90 – 100
3/8”	20 – 55
#4	0 – 10
#8	0 – 5

2.03. CUT-OFF WALLS (BARRIERS)

- Cut-off walls may be constructed to keep groundwater out of excavation areas and to reduce or eliminate the need for dewatering using pumping and other methods.
- If compacted soil is used for cut-off walls (e.g., “trench plugs”), it shall meet the following soil classifications:
 - SC – Clayey sands, sand-clay mixtures; or,
 - CL – Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.



- 3. CH – Inorganic clays of high plasticity; fat clays may be considered on a case-by-case basis with approval of the District.
- C. Controlled Low Strength Material (CLSM) may be used for cut-off walls with approval by the District.
 - a. Refer to Section 31 23 25 – Controlled Low Strength Material Backfill.

2.04. HYDRANT GRAVEL

- A. Refer to Section 33 14 22 – Hydrants.

2.05. TRENCH BACKFILL MATERIAL

- A. Trench backfill material shall be placed from a point 12 inches above the pipe to:
 - 1. For non-roadway areas:
 - a. 12 inches below the ground surface; or,
 - b. To the bottom elevation of topsoil being replaced.
 - 2. For roadway areas: To the bottom of the pavement subgrade.

- B. Trench backfill material shall be either soil excavated from the trench or imported soil.

- 1. Any soil used for trench backfill shall be free from frozen matter, stumps, roots, brush, other organic matter, cinders or other corrosive material, debris, and any rocks or stones which are larger than 6 inches in any dimension.
 - a. Rocks or stones which are larger than 3 inches in any dimension shall not be placed within one foot of pavement subgrade or within one foot of the finished surface of unpaved areas.
- 2. If imported soil is used for trench backfill, it shall meet CDOT Section 703 Specifications for Aggregate Base Course, Class 5 or 6, as shown in the tables below.
 - a. CDOT Class 5:

Size	Percent Passing
1-1/2"	100
1"	95 – 100
#4	30 – 70
#200	3 – 15



b. CDOT Class 6:

Size	Percent Passing
1"	100
3/4"	95 – 100
#4	30 – 65
#8	25 – 55
#200	3 – 12

PART 3 - EXECUTION

3.01. PREPARATION

- A. Topsoil shall be stripped from areas which are to be disturbed by construction and stockpiled.
 - 1. Topsoil shall be segregated from non-organic trench excavation material and debris.

3.02. TRENCHING

- A. Trenches shall be excavated by open cut methods, except where boring or tunneling is indicated, shown on drawings, or approved by the District.
- B. Care shall be used when operating mechanical equipment in locations where it may cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground.
- C. Excavation and/or shoring equipment shall be designed and operated in such a manner that the bottom elevation of the trench can be controlled with uniform trench widths and vertical sidewalls which extend from the bottom of the trench to an elevation one foot above the top of the installed pipe.
- D. Trench alignment shall be sufficiently accurate to permit pipe to be aligned properly with an 8-inch minimum clearance between the pipe and the sidewalls of the trench.
 - 1. The trench sidewall shall not be undercut to obtain clearance.
- E. The Contractor shall over excavate a minimum of 6 inches below the bottom of the pipe wherever the trench bottom is rock, shale, or other unsuitable material as may be determined by the District Inspector or Design Engineer.
 - 1. Over excavation shall be backfilled and compacted with acceptable granular material (reference Paragraph 2.05.).
- F. Preparation of Trench Bottom
 - 1. Trench bottoms shall be graded uniformly to provide clearance for each section of pipe.
 - 2. Loose material, water, and foreign objects shall be removed from the trench.
 - 3. The Contractor shall provide a firm suitable subgrade for application of bedding material.



4. Wherever unstable material is encountered in the bottom of the trench, said material shall be over excavated to a depth suitable for construction of a stable subgrade.
 - a. The depth suitable for construction of a stable subgrade shall be determined by the District Engineer or as directed by the District Inspector.
 - b. The over-excavation shall be backfilled with stabilization material and compacted as required by the District (reference Paragraph 2.01.).

G. Stockpiling Excavated Materials

1. Suitable material for backfilling shall be stockpiled in an orderly manner and at a minimum of 2 feet from the edge of the trench.
2. Excess excavated materials that are not suitable or not required for backfilling shall be removed and disposed.
3. Excavated material shall not be stockpiled against existing structures or appurtenances.

H. Limiting Trench Widths

1. The minimum clear width of the trench measured at the spring-line of the installed pipe should be 1 foot greater than the outside diameter of the pipe.
2. The maximum trench width at an elevation of 12 inches above the top of the installed pipe shall be equal to the pipe outside diameter plus two feet or 32 inches, whichever is greater.
3. If PVC pipe is used and the maximum cover over the pipe exceeds 17 feet, a granular material shall be placed to an elevation of 1 foot above the top of the pipe and compacted to 95% of maximum relative density per ASTM D2049.
4. See District Standard Construction Details drawings.

3.03. PIPE BEDDING

A. Placement and Compaction

1. Reference pipe bedding specification (Paragraph 2.02.) and District Standard Construction Details drawings.
2. Bedding material shall be distributed and graded to provide uniform and continuous support beneath the pipe at all points between bell holes or pipe joints.
 - a. Pipe shall not be supported by the bells.
3. 4" Diameter and Larger Pipe
 - a. Bedding material shall be deposited and compacted uniformly and simultaneously a minimum of 6 inches under and on each side of the pipe and 1 foot minimum above the pipe.
4. Service Line or Small Diameter Pipe



- a. Bedding material shall be deposited and compacted uniformly and simultaneously a minimum of 6 inches under and on each side of the pipe and 12 inches minimum above the pipe
5. Granular bedding material shall be compacted in accordance with these Specifications.
- B. Cut-off walls (reference Paragraph 2.03.) shall be constructed in such a manner as to impede passage of water through bedding material for the full depth of the granular bedding material to a minimum of 1-foot above the groundwater's maximum elevation and the full width of the trench.
 1. Cut-off walls shall be located as follows:
 - a. Along the length of the water line where the water line is located in groundwater.
 - b. Cut-off walls shall be spaced not more than 400 feet apart.
 - c. The top of the cut-off wall shall be a minimum 1-ft above the high groundwater elevation.
 - d. At locations shown on the construction drawings.
 - e. As required by the District Inspector based on site conditions.
 2. Cut-off walls at ditch crossings may be different from the above requirements as may be specified by the ditch company. The Contractor shall follow all ditch company requirements.

3.04. BACKFILLING AND COMPACTION

- A. Trenches shall be backfilled promptly after the pipe has been installed and inspected.
 1. Backfill around valve boxes and any other appurtenance shall be compacted with hand operated equipment.
- B. Sheeting Removal (if the Contractor elects to use sheeting)
 1. Do not remove sheeting prior to backfilling.
 2. Use effective methods to protect the construction, other structures, utilities, and properties during sheeting removal.
 3. Voids left by sheeting removal shall be filled with dry sand.
 4. Sheeting which is left in place shall be cut off at an elevation 1.5 feet below the finish grade of unpaved areas or the subgrade of paved areas.
- C. Backfill material shall be deposited in uniform horizontal layers which may not exceed 6 inches (compacted depth) in all areas.
 1. Other thickness may be used with the prior approval of the District.
- D. Methods and equipment which are appropriate for the backfill of material shall be employed.
 1. Backfill equipment or backfilling methods which transmit damaging shocks to the pipe are not to be used.



- E. Compaction shall not be performed by jetting or water settling.
- F. If compaction cannot be obtained with job excavated material, trench backfill material shall be imported.
- G. Topsoil shall be replaced to the depth of stripping over all areas which are to receive vegetation.
- H. Excess excavated materials and materials not suitable for backfill shall be removed from the site.

3.05. FIELD QUALITY CONTROL

A. Field Compaction Control

- 1. Field tests will be conducted to determine compliance with compaction methods and specified density in accordance with ASTM D2922.
 - 2. Compaction tests shall be performed at:
 - a. Depth: 1.5 feet above the top of the pipe.
 - b. Vertical Increments: At 1-foot vertical increments up to the finish grade.
 - c. Frequency of Compaction Testing:
 - i. Water Lines: Compaction tests shall be performed at least once every 100 linear feet as measured along the length of the pipe
 - ii. Service Lines: Compaction tests shall be performed:
 - 1. Frequency: On at least 50 percent of the service lines.
 - 2. Locations: All tests shall be performed in locations where the service line is under/within roadways.
 - d. If the District determines that reliable and uniform results are produced by the Contractor's construction techniques, the frequency of testing may be changed to once every 300 feet with written approval from District.
- B. Compaction shall be to the following minimum densities (reference ASTM D698 or AASHTO T99 unless otherwise indicated):
- 1. Cut-off wall material:
 - a. 95% of maximum density.
 - 2. Pipe and service line bedding:
 - a. Compacted granular material: 80% of maximum relative density (ASTM D2049).
 - 3. Trench backfill (water lines and service lines):
 - a. Paved roadways, sidewalks, and other areas which are to be paved:
 - i. 95% of maximum density.
 - ii. Or as required by the local road authority having jurisdiction of the road.
 - b. Gravel roadways: 95% of maximum density.
 - c. Fields and all other areas: 95% of maximum density.
 - d. Under footings, foundations, or structures: 98% of maximum density.
 - e. All other locations: 95% of maximum density.



C. Moisture Content:

1. All compacted backfill shall be within 2% (\pm) of the optimum moisture content of the soil as determined by ASTM D698.
2. Water shall be added to the material, or the material shall be harrowed, disced, bladed, or otherwise worked to ensure a uniform moisture content as specified.

END OF SECTION



SECTION 32 01 10 PAVEMENT REPAIR AND RESURFACING

PART 1 - GENERAL

1.01. DESCRIPTION

A. This Section covers surface obstructions which the Contractor must remove and replace such as pavement, drives, curbs, gutters, sidewalks, and similar surfaces as required to perform the work.

1. The Contractor has the option of protecting instead of removing and replacing obstructions that interfere with the work.

1.02. QUALITY ASSURANCE

A. All work shall be performed as specified herein and in accordance with the latest revisions of the local jurisdiction's applicable codes and standards.

B. The words "Standard Street Specifications" as used herein refer to the current City of Fort Collins, Town of Timnath, Larimer County, or Colorado Department of Transportation criteria and specifications as each jurisdiction has in place for applicable work.

PART 2 - PRODUCTS

2.01. AGGREGATE, ASPHALT, AND CONCRETE

A. All materials such as but not limited to aggregate, bituminous material, and concrete, which are used in the repair of surface obstructions, shall conform to the applicable Standard Street Specifications.

PART 3 - EXECUTION

3.01. MANHOLE FRAMES AND VALVE BOXES

A. Prior to placing the base course, manhole frames and water valve boxes shall be raised to final grade.

B. Foreign matter that has been introduced into manholes and valve boxes by the Work, shall be removed immediately to provide free access to these facilities.

C. All valve boxes and manhole rings shall be straight and properly aligned.

1. Valve boxes shall be inspected by placing a valve key on the operating nut to ensure proper alignment.

3.02. ASPHALT AND CONCRETE, INCLUDING BASE AND GRAVEL SURFACING



- A. The Contractor shall remove, dispose of, and restore asphalt, concrete pavement, curbs, drives, sidewalks, and gravel surfacing in accordance with the Standard Street Specifications of the appropriate agency.

3.03. CONCRETE SURFACING

- A. Except for improvements on private property, asphalt, concrete drives, curbs, gutters, sidewalks, and similar structures shall be removed, disposed of, and restored in accordance with the Standard Street Specifications of the appropriate agency.

3.04. FIELD QUALITY CONTROL

- A. Subgrade, aggregate base course, and bituminous pavement shall be compacted in accordance with the Standard Street Specifications.
- B. Concrete
 - 1. Reference the appropriate Standard Street Specifications.

END OF SECTION



SECTION 33 05 06 TESTING PIPING SYSTEMS

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers the hydrostatic testing of water distribution lines, appurtenances, and water service lines greater than 2-inch diameter.
- B. All water lines, appurtenances, and water service lines greater than 2-inch diameter shall be tested.
 - 1. For water service lines greater than 2-inch diameter the service line piping up to the meter vault and including the bypass line and isolation valves on the downstream side of the meter vault shall be tested. The water meter shall not be in place during the testing.
- C. Once the pipeline has been filled and disinfected and backfilling has been completed and approved, a hydrostatic pressure test shall be conducted.
 - 1. The Contractor shall provide all equipment and personnel to perform the hydrostatic test. Pressure testing equipment shall be approved by the District prior to commencing testing.
 - a. Test equipment shall be able to maintain a continuous internal pipe test pressure and accurately measure leakage from the pipe over the required test period.
 - b. The maximum allowable pressure gauge increment shall be 5 psi.
 - c. A water meter shall be used to measure the amount of water used in pressurizing the system. Water meters shall have been calibrated within the last six (6) months with calibration results available upon request by the District.
 - 2. The District will record times, leakage readings, and pressure over the test period.
- D. Testing shall not occur until at least 7 days have elapsed since the last concrete thrust restraint was cast.
 - 1. A minimum of 72 hours shall have elapsed if high-early-strength concrete was used.
- E. Testing shall not occur until after the pipeline has been chlorinated, bacteriological tests have passed, and the water line flushed.
- F. The water line shall remain filled with water for a minimum of 24 hours prior to the hydrostatic pressure test.

1.02. QUALITY ASSURANCE



- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
 - 1. Federal, state, and local codes, regulations, and ordinances.
 - 2. American Water Works Association (AWWA).
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

PART 2 - PRODUCTS

2.01. EQUIPMENT

- A. The Contractor shall provide all equipment and water required to perform the test.

PART 3 - EXECUTION

3.01. PRESSURE TEST

- A. "Leakage" shall be defined as the quantity of water that must be added to the pipeline to maintain a pressure of within 5 psi of the specified test pressure after the air has been expelled and the pipe has been filled with water.
- B. Test Pressure and Duration
 - 1. For steel pipe, ductile iron pipe, cast iron pipe, and PVC pipe, the minimum test pressure shall be 200 psi.
 - 2. A residual pressure of within 5 psi of the test pressure shall be maintained for a minimum of 2 hours.
- C. Allowable Leakage
 - 1. The maximum allowable leakage for each test section of ductile iron pipe, cast iron pipe, steel pipe, and PVC pipe shall be determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7,400}$$

Where:

L = Maximum allowable leakage (gallons).

N = Number of joints in pipeline being tested.

D = Nominal diameter of pipe (inches).

P = Average test pressure during the leakage test (psi).

- a. Reference AWWA C600.
- D. Test Section Length
 - 1. The maximum length of pipe per test shall be 1,000 feet unless otherwise written approval for an alternate length is provided by the District Inspector.



E. Testing Against Valve

1. Unless written approval is given by the District Inspector, the hydrostatic pressure test shall be performed against all valves within the new water line system.
 - a. Variances may be granted with written approval from the District Inspector.

3.02. PASSING

- A. If the tests disclose leakage greater than that specified or if any leak is visible, the defective materials and joints shall be located and repaired.
 1. The tests shall be repeated until the leakage is less than the maximum allowed or there is no visible leak.
- B. All visible leaks shall be repaired regardless of maximum allowable leakage.
- C. Except for visible leaks, passing of the pressure test shall be based on maximum allowable leakage per pipe section tested.

3.03. WET TAP PRESSURE TEST

- A. All wet taps of live water lines shall be pressure tested after the tapping valve has been installed but before the tap is completed.
- B. Test Pressure
 1. The pressure test of the tapping valve shall be completed with a minimum test pressure of 200 psi.
 2. A residual pressure of within 5 psi of the test pressure shall be maintained for a minimum of 5 minutes with no additional water added.
- C. Passing
 1. If the residual pressure drops more than 5 psi below the test pressure the test is considered to have failed.
 - a. The pressure test shall then be repeated until the test section passes.
 - b. All visible leaks shall be repaired regardless of a test passing based on residual pressure drop.

END OF SECTION



SECTION 33 05 08 PIPE BORING AND JACKING

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This section covers the furnishing and installation of buried casing pipe installed either by open-cut, boring, or jacking.

1.02. QUALITY ASSURANCE

A. Design Criteria

1. Specified thickness for pipe and casings are based upon the superimposed loads and not upon the loads which may be placed on the pipe because of jacking operations.
 - a. Increased pipe strength shall be provided as necessary to withstand jacking loads.
2. Bore Design
 - a. Design of the bore and method shall be the responsibility of the Design Engineer. Project specifications shall be provided as required for each bore location.

B. Construction Criteria

1. The Contractor shall obtain the necessary permits from the appropriate entities (county, city, railroad, ditch company, etc.), prior to commencing construction. The District will submit applications to those entities that require such. Provision of materials required for District submitted applications will be the responsibility of the Design Engineer.
2. The Contractor shall obtain the bonds or the indemnity which are required by the permits, for protection against any damage and interference, with traffic and service, which are caused by the construction activities.
3. All excavations shall conform to the Section 31 23 35 – Trenching, Backfilling, and Compacting.

- C. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:

1. Federal, state, and local codes, regulations, and ordinances.
2. American Society of Testing and Materials (ASTM).
3. American Welding Society (AWS).
4. American Petroleum Institute (API).



- D. Welding procedures, welders, and welding operations shall be qualified and certified in accordance with the AWS for the type of joint and welding procedure used.
- E. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

PART 2 - PRODUCTS

2.01. CASING PIPE – SMOOTH STEEL

- A. The minimum yield point of smooth steel casing pipe shall be 35,000 psi.
- B. The minimum wall thickness of smooth steel casing pipe shall be as determined by the Design Engineer. In no event shall the minimum wall thickness be less than 3/8 inch.
- C. Smooth steel casing pipe shall conform to ASTM 139, Grade B (hydrostatic pressure test).
- D. The ends of smooth steel casing pipe shall be beveled for field welding.
 - 1. All field welds shall be painted with an epoxy polyamide exterior coating or a coal-tar enamel coating conforming to AWWA C203 Section 2.
 - a. The minimum thickness of the exterior coating shall be 16 mil.
- E. Steel casing pipe shall have an epoxy polyamide exterior coating or when required by the Design Engineer, coal tar enamel exterior coating which conforms to the most recent version of AWWA C203.

2.02. ACCESSORIES

A. Casing Seals

- 1. Casing seals shall be wrap-around type manufactured from high density rubber with stainless steel straps for attachment.
- 2. Acceptable manufacturers:
 - a. CCI Pipeline Systems, Model ESW.
 - b. Pipeline Seal and Insulator, Inc., Model W.
 - c. Approved equal.

B. Casing Spacers

- 1. Casing spacers are required for support of all cased carrier piping and shall be prefabricated stainless steel with an elastomeric liner. Runners (skids) shall be of suitable material such as glass filled polymer, glass reinforced nylon, or UHMW polyethylene.
- 2. Acceptable manufacturers:
 - a. CCI Pipeline Systems, Model CSS.
 - b. PowerSeal Pipeline Products Corp., Model 4810.



c. Approved equal.

C. Pipe Joint Restraints

1. Reference 33 05 20 – Ductile Iron Pipe and Fittings.
2. Reference 33 05 29 – Plastic Pressure Pipe.
3. Reference 33 14 10 – Water Distribution System.
4. Reference 33 14 22 – Hydrants.

2.03. CONTACT GROUT

A. Contact grout as referred to in this section is used to fill the voids between the exterior of the casing and the soil.

B. Grouting Equipment

1. The Contractor is responsible for supplying the equipment necessary to complete the work as specified herein.

C. Material

1. Portland cement shall be in accordance with ASTM C150, Type II or Type III.
2. Contact Grout shall be a mixture of Portland cement and water with a maximum water/cement ratio of 1:1 by volume and a 28-day strength of at least 250 psi. Sand may be added only with District approval.

D. Grouting Ports

1. The casing pipe shall be provided with ports for the injection of Contact Grout.
2. Port locations shall be spaced no greater than 10 feet longitudinally.
3. The ports shall be installed during the manufacturing of the pipe. No ports shall be added in the field.
4. The ports shall be supplied with threaded grout port plugs.
5. The ports shall be as follows:
 - a. Specifically designed by the pipe manufacturer.
 - b. In accordance with the pipe manufacturer's specifications and guidelines.
 - c. Plugged following use.
 - d. Watertight and in full compliance with the pipe design requirements including but not limited to pressure rating, resistance to corrosion, and other forms of degradation.

PART 3 - EXECUTION

3.01. CASING INSTALLATION

A. General

1. Vertical and horizontal offset staking shall be provided at both ends of bored or jacked crossings.



- a. Horizontal alignment shall not be deviated from by more than 6 inches.
 - b. Grade shall not be deviated from by more than 3 inches as measured from the pipe invert.
2. Open trench excavation shall not be permitted where boring or jacking is specified.
 3. The earth which is displaced by the casing shall be removed from the construction site.
 4. Wherever it is indicated in the Construction Drawings, the casing shall be installed by open cut methods.
 - a. Reference Section 31 23 35 – Trenching, Backfilling, and Compacting.
- B. Smooth Steel Pipe
1. Adequate equipment shall be provided to ensure a smooth, continuous, and uniform casing with no exterior voids.
 2. Each section of pipe shall be welded with a full penetration butt-weld around the entire circumference of the joint to form a watertight continuous conduit capable of resisting all stresses including jacking stresses.
- C. Grouting
1. All spaces between the casing and the earth shall be filled with grout.
 2. Grouting operations shall be performed in a sequence which will preclude any deflections which exceed 5 percent of the tunnel diameter.
 3. After the grout is in place, each hole shall be plugged to prevent the backflow of grout.
- 3.02. CARRIER PIPE INSTALLATION
- A. Carrier pipe shall be the size and type specified on the Construction Drawings.
 - B. Casing spacers shall be individually attached to the pipe as specified by the manufacturer.
 1. Each pipe shall have a minimum of 3 chocks per 20 feet of pipe section.
 2. All carrier pipe joints shall be fully restrained.
 - C. The annular space between buried casing and the carrier pipes shall be left vacant.
 - D. The ends of the casing pipe shall be sealed with casing seals.

END OF SECTION



SECTION 33 05 10 TAPPING SLEEVES AND VALVES

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers large diameter (3 through 12 inches) connection outlets to pressurized water mains (4 through 30 inches in diameter) by means of sleeve tapping with tapping valves (i.e., not tapping saddles).
1. Reference Section 33 14 18 – Service Lines, Meters, and Appurtenances for tapping saddles (i.e., outlets 2 inches and smaller).

1.02. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
1. Federal, state, and local codes, regulations, and ordinances.
 2. American National Standard Institute (ANSI).
 3. American Water Works Association (AWWA).
 4. American Society for Testing and Materials (ASTM).
 5. Manufacturers Standardization Society (MSS).
 6. National Sanitation Foundation (NSF).
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.03. SUBMITTALS

- A. Certification
1. Submit manufacturer's certification that products meet the referenced standards.
 2. Submit manufacturer's certification that products are NSF 61 certified for potable water service.
- B. Reference Section 01 33 00 – Submittals.

1.04. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Precautions shall be taken to prevent damage to materials during delivery and storage.
- B. Sleeves, valves, and appurtenances shall be stored off the ground and away from materials that could contaminate potable water systems.
- C. Precautions shall be taken to keep all joints and internal parts clean.



1.05. INSTALLATION OF WET TAPS

- A. The Contractor shall not make any taps without prior permission from the District.
- B. All taps shall be made with a tapping sleeve in accordance with these Specifications and with the manufacturer's recommendations, unless otherwise approved by the District.
- C. Service taps on live mains will be made only under the direct supervision and coordination with the District.
- D. Size on size tapping is prohibited.
- E. Tapping equipment shall be of good quality, used for the purpose intended, and used in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01. TAPPING SLEEVE

- A. Standards for 4- through 30-inch mains and 4- through 12-inch branch outlets shall be in accordance with AWWA C223 with the following additional requirements or exceptions:
 - 1. Sizes: As shown on approved Construction Drawings.
 - 2. Tapped main material:
 - a. C900 PVC pipe.
 - b. Ductile iron pipe.
 - c. Asbestos cement pipe
 - 3. Material: Type 304 stainless steel per ANSI 21.11.
 - a. The entire stainless steel sleeve shall be fully passivated.
 - 4. Minimum working pressure: 200 psi.
 - 5. Outlet connection: Stainless steel mechanical joint (MJ).
 - 6. Testing outlet
 - a. A 3/4-inch NPT by welded coupling shall be attached to the outlet nozzle of each tapping sleeve assembly complete with a 3/4-inch square head pipe plug.
 - 7. Gasket
 - a. Provide a “Waffle: style gasket with a full 360-degree seal.
 - b. Virgin NBR (R78) material, with integral “raised” ring seal to aid in high pressure sealing.
 - c. Gaskets shall be NSF 61-certified for potable water service.
 - 8. Nuts, bolts, and washers
 - a. Type 304 stainless steel, per ASTM A193 and ASTM A194.
 - i. Stainless steel hex nuts shall be furnished with fusion bonded coating to prevent seizing and galling.



9. Flanges shall be fabricated of type 304 stainless steel per ANSI 21.11. In addition, the machined face shall be recessed for tapping valves in accordance with MSS SP-60. An exception applies for PowerSeal 3490MJ since this tapping sleeve has an MJ outlet that accepts an MJ x MJ valve.
10. Acceptable manufacturers and models:
 - a. Ford Meter Box Co., Model FAST, FTSS, or FTSAS with MJ Adapter Outlet.
 - b. PowerSeal Pipeline Products Corp., Model 3490 MJ.
 - c. Romac Industries Inc., Model SST III, SS MJ outlet.
 - d. Approved equal.

2.02. TAPPING VALVES

A. General

1. All tapping valves shall be resilient-seated gate valves manufactured in accordance with AWWA C509 with the following additional requirements or exceptions. Reduced-wall gate valves may be supplied in accordance with AWWA C515.
2. All tapping valves shall have fusion-bonded epoxy coated interior and exterior in accordance with AWWA C550 and comply with NSF-61 & 372

B. Valve Size and Description

1. Tapping valves specified in this Section are 3- to 12-inch nominal sizes.
2. The standard direction of opening is counterclockwise as viewed from the top (open left).

C. Inlet End of Valve

1. Inlet end of valve shall be a mechanical joint. All dimensions and drillings of the mechanical joint shall conform to the dimensions of MSS SP-60 in 3- through 12-inch nominal pipe sizes.
2. Inlet end of the valve shall be mechanical joint type if PowerSeal Model 3490MJ sleeve is used.

D. Outlet End of Valve

1. Outlet end of tapping valve mating with the tapping machine must be parallel and concentric with the opposite flange and concentric with the water line to provide proper alignment for the tapping operation.
2. Outlet end of valve shall have a standard mechanical joint end conforming to AWWA C111.

E. Seat Ring Size

1. Body of the valve and seat opening shall be sized large enough to accommodate the following sizes of shell cutters:



Approved Shell Cutter Diameters		
Tapping Valve Size	Cutter Diameter	Tolerance
4"	3-7/8"	± 1/32"
6"	5-13/16"	± 1/32"
8"	7-7/8"	± 1/32"
10"	9-3/4"	± 1/32"
12"	11-7/8"	± 1/32"

F. Service

1. All valves shall be suitable for frequent operation as well as service involving long periods of inactivity. Valves shall be capable of operating satisfactorily with flows in either direction and shall provide zero leakage past the seat. The operating pressure for all sizes shall be 200 psi.

G. Testing

1. The valve manufacturer shall test all valves according to AWWA C550.

H. Certification

1. The manufacturer shall furnish a sworn statement that the inspection and all the specified tests have been made, and the results thereof comply with the requirements of the applicable Standards herein specified. A copy of the Certification including compliance with NSF/ANSI 61 shall be sent to the District.

I. Acceptable manufacturers:

1. American Flow Control, Series 2500 RW.
2. Clow Valve Co., C515 MJ Tap.
3. Kennedy Valve Co., C515 7000 Series.
4. Mueller Co., T2361.

PART 3 - EXECUTION

3.01. GENERAL

- A. Tap PVC pipe in general accordance with the “PVC Pressure Pipe Tapping Guide” by the Uni-Bell PVC Pipe Association; refer to this document for minimum distances from pipe ends, joints, fittings, etc.

3.02. TAPPING

- A. Properly prepare and secure the excavation, exposing the pipe to be tapped. Confirm the pipe material, class, thickness, and type is suitable for the tapping operation and that the correct sleeve is furnished for each tapping operation.
- B. Provide the District with a minimum of forty-eight (48) hours advance notice of the tapping operation.



- C. Coordinate with the District to identify any valves in the vicinity of the work that the District can operate if this should be necessary.
- D. Provide suitable support to the tapping valve, sleeve and accessories to prevent transferring forces to the existing pipeline during the tapping operation and when subsequently backfilling the excavation and carefully compacting the backfill.
- E. Following installation of the tapping sleeve and valve, but prior to beginning the tap, pressure test the sleeve to 200 psi for ten (10) minutes to confirm there is no visible leakage or as directed by the District.
- F. Upon completion of the tapping operation inspect the sleeve and valve to ensure there is no leakage. Any visible leakage shall be stopped prior to backfilling.

3.03. INSPECTION

- A. The Contractor shall ensure that the tapping sleeve and valve remain exposed until after the inspection/mapping and the approval for backfill is given by the District.
- B. All tap inspections shall be scheduled with the District.

END OF SECTION



SECTION 33 05 20 DUCTILE IRON PIPE, FITTINGS, AND COUPLINGS

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section addresses ductile iron pipe, fittings, flanges, special couplings, and other accessories.
- B. Pipe shall be furnished completely with all fittings, flanges, specials, and other accessories.

1.02. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
 - 1. Federal, state, and local codes, regulations, and ordinances.
 - 2. American National Standard Institute (ANSI).
 - 3. American Water Works Association (AWWA).
 - 4. American Society for Testing and Materials (ASTM).
 - 5. American Society of Mechanical Engineers (ASME).
 - 6. Ductile Iron Pipe Research Association (DIPRA).
 - 7. National Sanitation Foundation (NSF).
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.03. SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittals.
- B. Submit manufacturer's certification that products meet the referenced standards.
- C. Submit manufacturer's certification that products are NSF 61 certified for potable water service.

1.04. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Storage
 - 1. Lubricant shall be stored and used in a manner which will avoid contamination.
 - 2. Rubber gaskets shall be stored in a cool, dark location away from grease, oil and ozone producing electric motors.



3. The maximum stacking heights of pipe as listed in Tables 1 and 2 of AWWA C600 shall not be exceeded.
- B. Handling
1. Slings, pipe tongs, or skids shall be used for handling pipe.
 2. Pipe or fittings shall not be dropped.
 - a. Dropping pipe or fittings onto cushions is also forbidden.
 3. Pipe or fittings shall not be handled in any manner which will cause damage.
 - a. Damaged pipe or fittings shall not be installed and shall be immediately removed from the work site.

PART 2 - PRODUCTS

2.01. DUCTILE IRON PIPE

A. General

1. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 subject to the following supplemental requirements:
 - a. The pipe shall be of the diameter shown, furnished complete with gaskets, all required appurtenances, and fittings, as indicated on the Construction Drawings.
 - b. All ductile iron pipe with flanged, flat faced joints shall be manufactured in accordance with ANSI A21.15 (AWWA C115).
2. Thickness Class
 - a. Flanged ductile iron pipe with threaded flanges shall be Thickness Class 53 pipe.
 - b. Ductile iron pipe which is less than 12 inches in diameter shall be Thickness Class 52 pipe.
 - c. Ductile iron pipe which is 12 inches in diameter or larger shall be Thickness Class 51 pipe.
3. Pressure Class
 - a. Ductile iron pipe which is 12 inches and smaller in diameter shall have a working pressure rating of 350 psi.
 - b. Ductile iron pipe which is larger than 12 inches in diameter shall have a working pressure rating of 250 psi.

B. Laying Length

1. Pipe laying lengths shall be provided in 20-foot nominal lengths with allowable trim pipe lengths in accordance with ANSI/AWWA C151/A21.51 and special shorter lengths provided as required by the Construction Drawings.
 - a. Random lengths shall not be acceptable.

C. Lining



1. Except otherwise provided herein, interior surfaces of all ductile iron pipe shall be lined with cement mortar lining applied in conformity with ANSI/AWWA C104/A21.4.
2. Minimum lining thickness shall be the “double” thickness, per ANSI/AWWA C104/A21.4.

D. Coating

1. Underground Locations (e.g., Buried)
 - a. All ductile iron pipe shall have a bituminous coating on the pipe exterior. The minimum thickness of the bituminous coating shall be 1 mil.
 - b. All buried ductile iron pipe shall be polyethylene encased (reference Paragraph 2.06.A.).
2. Exposed Locations (e.g., Above Ground or in Vaults)
 - a. Reference 09 90 00 – Painting and Coating, System No. 10.

E. Acceptable Manufacturers

1. American Ductile Iron Pipe Co.
2. McWane Ductile.
3. U.S. Pipe.
4. Approved equal.

2.02. FITTINGS

A. General

1. Fittings shall be ductile iron in accordance with ANSI/AWWA C111/A21.11, ANSI/AWWA C110/A21.10, or ANSI/AWWA C153/A21.53.
2. Pressure Rating
 - a. Buried service for push-on, restrained push-on, or mechanical joints:
 - i. 4 inch through 24 inches: 350 psi.
 - b. Exposed service for flanged joints:
 - i. 4 inch through 64 inches: 250 psi.
3. Acceptable Manufacturers:
 - a. American Ductile Iron Pipe Co.
 - b. McWane Ductile.
 - c. Sigma Corp.
 - d. Star Pipe Products.
 - e. Tyler Pipe & Coupling.
 - f. U.S. Pipe.
 - g. Approved equal.

B. Joints

1. Buried locations: Mechanical joint with restraining gland.



2. Exposed locations: Flanged joint.

C. Lining

1. Except otherwise provided herein, interior surfaces of all fittings and specials shall be lined with:

a. Fusion-bonded epoxy, per AWWA C116.

D. Coatings

1. Underground Locations

a. Fusion-bonded epoxy, per AWWA C116.

2. Exposed Locations (e.g., Above Ground or in Vaults)

a. Reference 09 90 00 – Painting and Coating, System No. 10.

E. Nuts and Bolts

1. All nuts and bolts shall be manufactured in accordance with ANSI A21.11(AWWA C111).

2. All bolts, T-bolts, and nuts for buried service shall:

a. Have a fluoropolymer coating which is VOC compliant, resin bonded, thermal cured, and dry lubricant properties.

i. Acceptable products and manufacturers:

1. Star Pipe Products, “Star Blue Coated T-Bolts and Nuts”

2. Approved equal.

b. Be installed with zinc anode caps.

i. Acceptable products and manufacturers:

1. Farwest Corrosion Control Co., MARS Zinc Cap.

2. Approved equal.

2.03. COUPLINGS

A. General

1. The manufacturer of the coupling shall be experienced in design and construction, shall be regularly engaged in manufacture, and shall have produced couplings of the sizes specified which have given successful service for a period of at least 5 years.

B. Mechanical Couplings and Transition Couplings

1. Mechanical couplings shall conform to ANSI/AWWA C219.

2. Type: Mechanical compression sleeve.

3. Materials

a. Center Barrel: Ductile Iron in accordance with ASTM A536.

b. End Ring: Ductile Iron in accordance with ASTM A536.

c. Hardware: High-strength low alloy steel.



i. Gasket material shall be styrene-butadiene.

6. Acceptable Manufacturers

- a. EBAA Iron Sales Inc., 2100 Megaflange.
- b. Romac Industries Inc., Model FCG.
- c. Romac Industries Inc., Model RFCA (Restrained DIP).
- d. Romac Industries Inc., Model RFCA-PVC (Restrained PVC).
- e. Approved equal.

2.04. JOINTS

A. General

1. Ductile iron pipe and fittings shall be furnished with push-on joints, push-on restrained joints, mechanical joints, restrained mechanical joints, and flanged joints as required.
2. Provide joint restraint for all mechanical joints.

B. Push-on Joints

1. Push-on joints shall conform to ANSI/AWWA C111/A21.11.
2. Gasket material shall be styrene-butadiene.
3. Gasket material for air shall be EPDM or Viton as required for operating temperature.
4. Lubricant shall be furnished by pipe manufacturer.
5. Pressure rating for push-on joints shall be a minimum specified pressure rating of the pipe.

C. Flanged Joints

1. Flanged joints shall conform to ANSI/AWWA C115/A21.15, ANSI/AWWA C153/A21.53, ANSI/ASME B16.5, and ANSI/ASME B16.1.
2. Threaded companion flanges for ductile iron pipe shall be ductile iron in accordance with ANSI/AWWA C115/A21.15, not ANSI/ASME B16.1.
3. Bolt circle and bolt holes shall be of ANSI/ASME B16.1 for Class 125 and ANSI/ASME B16.5 for Class 150 flanges.
4. Flanges shall be rated for at least 250 psi working pressure.
5. Bolts, gaskets, and installation shall be in accordance with ANSI/AWWA C115/A21.15 requirements.
6. Gasket material shall be styrene-butadiene.
7. Flanged joints are not acceptable for use in buried service, unless shown otherwise on the Construction Drawing and approved by the District.

D. Restrained Joints

1. General



- a. Restrained joints and restrained joint pipe shall be rated for the specified pressure rating of the pipe.
 - b. Gasket material shall be styrene rubber (SBR).
2. Restrained Push-on Joints
- a. Joint design to provide method of joint restraint that prevents disengagement.
 - b. Design shall permit deflection of the joint after assembly.
 - c. Ductile iron locking components inserted into the bell face to provide positive axial lock between bell interior surface and retainer weldment on spigot end.
 - i. Design shall allow disassembly without damage to components.
 - d. Provide all specialty gaskets and accessories that are required for the system.
 - e. The connecting tie rods that join the two rings shall be made of low alloy steel that conforms to ANSI/AWWA C111/A21.11. Side clamp bolts shall be of SAE J429 Grade 5 material.
3. Push-on joints shall be restrained with any of the following (reference Paragraph 2.02.E. for Nuts and Bolts):
- a. EBAA Iron Sales Inc., 1700 Megalug.
 - b. Ford Meter Box Co., Uniflange Series, UFR 1390-C.
 - c. Romac Industries Inc., 600 Series, Style 611.
 - d. Sigma Corp, One-Lok.
 - e. Star Pipe Products, Stargrip, Series 3100.
 - f. Approved equal.
4. Mechanical joints shall be restrained with any of the following (reference Paragraph 2.02.E. for Nuts and Bolts):
- a. EBAA Iron Sales Inc., 1100 Megalug.
 - b. Ford Meter Box Co., Uniflange, 1400 Series.
 - c. Romac Industries Inc., GripRing.
 - d. Sigma Corp., One-Lok.
 - e. Star Pipe Products, Stargrip, Series 3000.
 - f. Approved equal.

2.05. PIPE LINING

- A. All ductile iron pipe shall have a standard thickness cement mortar lining.
1. Ductile iron pipe less than 12 inches in diameter shall have a cement mortar lining with a minimum thickness of 1/16 inch.
 2. Ductile iron pipe larger than 12 inches in diameter shall have a cement mortar lining with a minimum thickness of 3/32 inch.
- B. All ductile iron pipe lining shall conform to ANSI A21.4(AWWA C104).

2.06. ACCESSORIES

- A. Polyethylene Encasement
1. Conform to AWWA C105/A21.5.



2. Raw material used to manufacture polyethylene film shall be in accordance with ASTM D1248: Type 1, Class A, Grade E-1.
3. Polyethylene encasement shall consist of three layers of co-extruded linear low-density polyethylene fused into a single layer.
4. The inside surface of the polyethylene encasement to be in contact with the pipe, fitting, or valve exterior shall be infused with a blend of anti- microbial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.
5. Properties
 - a. The polyethylene film shall meet the following properties and requirements:

Property	Min. Requirements
Tensile Strength	3,600 psi per ASTM D882
Elongation	800% per ASTM D882
Dielectric Strength	800 V/mil thickness per ASTM D149
Impact Resistance	600 g per ASTM D709 Method B
Thickness	8 mil
Propagation Tear Resistance	2,550 grams force per ASTM D1922

6. Reference Paragraph 3.01.E.
 7. Color
 - a. Potable water: clear or white.
- B. Tracer Wire
1. Refer to Section 33 14 10 – Water Distribution System.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. Pipe and fittings shall be examined for cracks, dents, abrasions or other flaws prior to installation.
 1. Defective pipe and fittings shall be marked and removed from the site.
- B. Reference Section 33 14 10 – Water Distribution System.
- C. Cutting the Pipe
 1. The pipe shall be cut smooth, straight and at right angles to the pipe axis with a saw or an abrasive wheel.
 2. The pipe or cement lining shall not be damaged during the cutting operation.
 3. The cut ends and rough edges of the pipe shall be ground off so they are smooth.
 4. The cut end of the pipe shall be beveled for push on joints.
- D. Field Joints



1. Push on joints shall be used in underground locations unless indicated otherwise on the Construction Drawings.
 2. All joints shall be watertight and free from leaks.
 3. Joints shall not be deflected beyond the maximum values as specified in Tables 5 and 6 of AWWA C600.
 4. After initial acceptance of the water line, the Contractor shall be responsible for the repair of any leak which is discovered within a two-year period.
- E. Polyethylene Encasement
1. All ductile iron pipe, fittings, and couplings shall be double wrapped in polyethylene encasement.
 2. Polyethylene encasement may be installed by Methods A, B or C, of ANSI 21.5 82 (AWWA C105).
 3. Rips, punctures, or other damage to the polyethylene encasement shall be repaired with adhesive tape or with a short length of polyethylene wrapped around the pipe and secured in place with tape.
 4. A sealed encasement shall be maintained on the pipe with the polyethylene.
 - a. The polyethylene shall be taped to existing lines and to the ends of other overlap sections.
 - b. Sections of polyethylene shall overlap each other by a minimum of 1 foot.
 5. Bedding and backfilling shall be controlled so that the polyethylene is not torn or damaged.
 6. Polyethylene encasement shall be used at these additional, buried locations:
 - a. Valves and fitting with flanged or mechanical joints.
 - b. Bolted fitting, such as couplings.
 - c. Tie rods and joint harness.

3.02. JOINT INSTALLATION

A. Push-on Joints

1. Dirt, oil, grit, excess coatings, and other foreign matter shall be removed from the inside of the bell and the outside of the spigot.
2. The gasket shall be inserted.
3. A thin film of lubricant shall be applied to the inside surface of the gasket and the spigot end of the pipe.
4. The joint surface shall not be allowed to come in contact with the ground.
5. The pipe shall have a depth mark prior to assembly to ensure that the spigot end is inserted at the full depth of the joint.
6. The joint shall be completed, taking care that the spigot is inserted to the depth mark.



- a. Stabbing of pipe shall not be allowed.
- b. Under no circumstances shall joints be seated utilizing powered mechanical equipment.

B. Mechanical Joints

- 1. Dirt, oil, grit, excess coating, and other foreign matter shall be removed from the inside of the bell and the outside of the spigot.
- 2. A thin film of lubricant shall be applied to the inside of the bell, the outside of the spigot, and the gasket.
- 3. Nuts shall be alternately tightened on opposite sides of the pipe to produce equal pressure on all parts of the gland.
- 4. Holes in mechanical joint bells shall straddle the top centerline.
- 5. A torque limiting wrench shall be used, and bolts shall be tightened to torque values per the manufacturer’s requirements or the following, whichever is more stringent:

Joint Size	Bolt Size	Torque (ft. lbs.)
3”	5/8”	45 – 60
4 - 24”	3/4”	75 – 90
30 - 36”	1”	100 – 120
42 - 48”	1-1/4”	120 - 150

C. Mechanical Couplings

- 1. Dirt, oil, grit, excess coating, and other foreign matter shall be removed from each end of the pipe.
- 2. Any cut ends or rough edges of the pipe shall be ground off so that they are smooth.
- 3. The gap between pipe ends being coupled shall be less than 1 inch and greater than 1/4 inch.

D. Flanged Joints

- 1. Pipe shall be extended completely through screwed on flanges.
- 2. The pipe and the flange face shall be machine finished in a single operation.
- 3. Any restraints on the pipe which will prevent uniform gasket compression or cause unnecessary stress in the flanges shall be eliminated.
- 4. Mechanical connections shall not be assembled until all flanged joints, which are affected, have been tightened.
- 5. Bolts spaced on opposite sides of the pipe shall be alternately tightened to ensure uniform gasket compression.
- 6. Holes in flanges shall straddle the top centerline.

3.03. MECHANICAL JOINT RESTRAINT



A. Reference Section 33 14 10 – Water Distribution System.

END OF SECTION



SECTION 33 05 29 PLASTIC PRESSURE PIPE

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers plastic pressure pipe.
 - 1. All pipe shall be furnished complete with all fittings, specials, and other accessories.

1.02. USE

- A. Unless otherwise approved by the District, plastic pressure pipe shall be utilized for all new water main installation.

1.03. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
 - 1. Federal, state, and local codes, regulations, and ordinances
 - 2. American Water Works Association (AWWA) C900.
 - 3. NSF 61 rated for potable water service.
 - 4. Material shall meet ASTM D 1784.
 - 5. Dimensions shall meet AWWA C900.
 - 6. Joints gaskets shall meet ASTM F477.
 - 7. Joints shall meet ASTM D3139 for tightness.
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.04. SUBMITTALS

- A. Submit manufacturer's certification that products meet the referenced standards.
- B. Submit manufacturer's certification that products are NSF 61 certified for potable water service.
- C. Reference Section 01 33 00 – Submittals.

1.05. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Storage
 - 1. Lubricant shall be stored and used in a manner which will avoid contamination.



2. Rubber gaskets shall be stored in a cool, dark location away from grease, oil and ozone producing electric motors.
 3. Pipe shall not be stacked higher than 5 feet.
 4. Pipe shall be stored on a flat surface which provides even support for the pipe barrel.
 - a. Pipe shall not be stored in such a way as to be supported by the bell.
 5. Any pipe which exhibits any signs of deterioration or damage shall not be used.
 6. Pipe which exhibits any signs of ultraviolet deterioration shall not be used.
- B. Handling
1. Pipe shall be handled with slings, pipe tongs or skids.
 2. Pipe or fittings shall not be dropped.
 - a. Dropping pipe or fittings onto cushions is also forbidden.
 3. Care must be taken to prevent damage to the pipe and fittings by impact, bending, compression, or abrasion.
 4. Damaged pipe or fittings shall not be installed.

PART 2 - PRODUCTS

2.01. PLASTIC PRESSURE PIPE

- A. All plastic pressure pipe shall be manufactured in accordance with AWWA C900.
- B. Plastic pressure pipe rating (pressure class) shall be:
 1. 4- to 16-inch diameter pipe: AWWA C900 DR18 (pressure class 235).
 2. Pipe with a diameter greater than 16 inches shall be specified based by Design Engineer.
- C. All joints on plastic pressure pipe shall be push-on using an integral bell with an elastomeric gasket.
- D. Pipe color shall be blue to distinguish as potable water.
- E. All plastic pressure pipe shall have a nominal laying length of 20 feet.
 1. Random pipe lengths are not acceptable.
- F. Acceptable manufacturers:
 1. Diamond Plastics Corp.
 2. JM Eagle Inc.
 3. North American Pipe Company.
 4. Approved equal.

2.02. PIPE JOINTS



- A. Direct Bury
 - 1. Bell ends with elastomeric gaskets. Solvent cement joints are prohibited.
- B. Horizontal Directional Drilling
 - 1. Fusible C900 manufactured by Underground Solutions, Inc.
 - 2. Low profile restrained joint pipe such as C900/RJ system manufactured by CertainTeed or approved equal.

2.03. FITTINGS AND COUPLINGS

- A. All fittings and couplings shall be manufactured in accordance with AWWA C153, C111, C550, C116 and C104.
- B. All fittings and couplings shall have one of the following types of connections:
 - 1. Flanged joint (not for buried services).
 - 2. Mechanical joint with mechanical restraints.
- C. Restrained Joints
 - 1. Push-On Joints (reference Section 33 05 20 – Ductile Iron Pipe and Fittings, Paragraph 2.02.E. for Nuts and Bolts):
 - a. EBAA Iron Sales Inc., Megalug, Series 1600.
 - b. Ford Meter Box Co., Uniflange Series UFR 1390-C.
 - c. Romac Industries Inc., 600 Series Style 611.
 - d. Sigma Corp., One-Lok.
 - e. Star Pipe Products, Stargrip, Series 4100.
 - f. Approved equal.
 - 2. Mechanical Joints (reference Section 33 05 20 – Ductile Iron Pipe and Fittings, Paragraph 2.02.E. for Nuts and Bolts):
 - a. EBAA Iron Sales Inc., 2000PV Megalug or 2000SV Megalug.
 - b. Ford Meter Box Co., Uniflange Series 1500.
 - c. Romac Industries Inc., GripRing.
 - d. Sigma Corp., One-Lok.
 - e. Star Pipe Products, Stargrip, Series 4000.
 - f. Approved equal.
- D. Reference Section 33 05 20 – Ductile Iron Pipe and Fittings.

2.04. ACCESSORIES

- A. Tracer Wire
 - 1. Reference Section 33 14 10 – Water Distribution System.
- B. Polyethylene Encasement
 - 1. Reference Section 33 05 20 – Ductile Iron Pipe and Fittings.
- C. Warning Tape



1. Tape to read: CAUTION: BURIED WATER LINE BELOW.
2. Colors: Blue with black text.
3. APWA and AASHTO compliant.
4. Tape shall be detectable 5 mil foil for plastic piping or other detectable non-degradable material.
5. Reference Section 33 14 10 – Water Distribution System.

PART 3 - EXECUTION

3.01. INSTALLATION

A. Pipe and fittings shall be examined for cracks, dents, abrasions, or other flaws prior to installation.

1. Defective pipe and fittings shall be marked and removed from the site.

B. Cutting the Pipe

1. The pipe shall be cut smooth, straight, and at right angles to the pipe axis with saws or pipe cutters designed specifically for the material.
2. When installation involves spigot joints, the pipe end shall be beveled in accordance with the manufacturer's recommendations.
3. When installation involves mechanical joints, the pipe end shall remain smooth and straight.
4. Burrs shall be removed, and all dust shall be wiped off of the jointing surfaces.

C. Field Joints

1. Push on joints shall be used.
2. All joints shall be watertight and free from leaks.
3. Joints shall not be deflected beyond the maximum values as recommended by the pipe manufacturer.
4. After the initial acceptance of the water line, the Contractor shall be responsible for the repair of any leak which is discovered within the warranty period.

D. Tracer Wire

1. Reference Section 33 14 10 – Water Distribution System.

3.02. JOINT INSTALLATION

A. Push-on Joints

1. Dirt, oil, grit, excess coatings, and other foreign matter shall be removed from the inside of the bell and the outside of the spigot.
2. The gasket shall be inserted into the bell of the pipe.



3. A thin film of lubricant shall be applied to the inside surface of the gasket and the spigot end of the pipe.
4. The joint surface shall not be allowed to come in contact with the ground.
5. The pipe shall have a depth mark prior to assembly to ensure that the spigot end is inserted at the full depth of the joint.
6. The joint shall be completed, taking care that the spigot is inserted to the depth mark.
 - a. Stabbing of pipe shall not be allowed.
 - b. Under no circumstances shall joints be seated utilizing powered mechanical equipment.
7. Previously completed joints shall not be disturbed during the jointing operation.
8. All pipe sections shall be installed with manufacturer lettering facing up to facilitate installation inspection.

END OF SECTION



SECTION 33 13 00 DISINFECTION OF WATER LINES

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This section covers the filling and disinfection of potable water lines, fire hydrants, and appurtenances.
- B. The Contractor is responsible for disinfection and testing of water lines.
- C. The District alone shall operate existing valves to prevent the disinfectant solution from flowing back into the line supplying the water or into adjacent parts of the distribution system in service.

1.02. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. The forward of AWWA Standard C651 will be helpful in determining the best disinfection method to be used.
- B. The forwards of AWWA B300 contain information and additional reference material regarding the safe handling of hypochlorites and liquid chlorine. The Contractor shall familiarize itself with this information prior to performing any disinfection work.
- C. Storage shall be in a cold, dark, dry, and secure area. Extreme care shall be exercise in handling of hypochlorites.

PART 2 - PRODUCTS

2.01. MATERIALS

- A. Hypochlorites
 - 1. Reference AWWA B300.

PART 3 - EXECUTION

3.01. GENERAL

- A. All newly constructed pipelines must be flushed, chlorinated, and dechlorinated. Bacteriological testing must be performed, and results must pass before pressure testing and placing pipeline in service.
- B. All water line disinfection and testing shall consist of a whole-system procedure that will include all water lines and water service lines up to the curb stop as installed for each proposed lot within the development or as is a part of an installed water system.
- C. The Contractor shall, with the District Inspector's acceptance, flush and satisfactorily disinfect new water lines prior to placing them in service in accordance with AWWA C651



D. Filling New Water Lines

1. The District shall operate existing valves and hydrants to fill the water lines and open existing air blowoffs.
2. The Contractor shall operate new valves, air valves, blowoffs, and hydrants.

3.02. PRELIMINARY FLUSHING

A. The District shall flush pipelines at a minimum velocity of 2.5 ft./sec., to remove foreign material prior to disinfection.

B. Disposing of Chlorinated Water During Flushing Activities

1. Dechlorination: A reducing agent shall be applied to the water to be disposed to thoroughly neutralize the remaining chlorine residual. Where necessary, federal, state, and local regulatory agencies should be contacted to determine special provisions for the disposal of chlorinated water.
2. Permitting: The Contractor shall acquire all permits required for flushing/disposing of water.
3. Chlorine residual of water being flushed/disposed shall be reduced to a concentration of less than 0.1 mg/l.
4. The water to be disposed of shall have a pH of between 6.5 and 9 Standard Units (S.U.).
5. Reference Appendix B of AWWA C651 for a list of neutralizing chemicals.

3.03. METHODS

A. General

1. The District shall conduct the following:
 - a. Review and accept the disinfection method to be used.
 - b. Sample and test flows from the pipe system extremities until clear, potable water is obtained.
2. The Contractor shall conduct the following:
 - a. Propose the method of disinfection subject to District review and acceptance.
 - b. Properly dispose of all flushed water (reference Paragraph 3.02.B.).
 - c. Reimburse the District for all costs of disinfection and flushing including sampling, testing, and flushed water use.

B. Granular Method

1. The granular method consists of placing calcium hypochlorite granules in the water line during construction and filling the water line with potable water when installation is complete.
 - a. Reference Table 1, AWWA B651 for quantity of granules.
 - b. During construction calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch



water line, in each section of pipe and in hydrant laterals, and any other appurtenance or section of pipe necessary to attain full chlorination of the new water line.

- c. Granules shall be placed in sufficient number and amount to produce a minimum chlorine concentration in the treated water of 50 milligrams per liter.
 - d. The District shall introduce water into the water line at a velocity of less than 1 ft/sec.
 - e. The chlorinated water shall be retained in the water lines for a minimum of 24 hours at which time the treated water must contain no less than 25 milligrams per liter of chlorine throughout the entire length of the water line.
 - i. Reference Table 4, AWWA B651.
2. The granular method shall not be used if trench water or foreign material has entered the water line, if the water main extensions are over 1000 feet in length, if the water main is larger than 12-inches in diameter, or if the water temperature is below 41 degrees Fahrenheit.

C. Continuous Feed Method

1. The continuous feed method of disinfecting water lines consists of placing calcium hypochlorite granules in the water line during construction, completely filling the water line to remove all air pockets, flushing the completed water line to remove the particulates, and filling the water line with potable water chlorinated so that after a 24 hour holding period in the water line, there will be a free chlorine residual of not less than 10 milligrams per liter.
 - a. The Contractor shall place Calcium hypochlorite granules in the pipe sections during construction.
 - i. Reference Paragraph 3.03.B.1.c.
 - b. Preliminary flushing shall occur.
 - i. Reference Paragraph 3.02. and AWWA C651.
 - c. Chlorinated water shall be introduced into the water lines at a constant measured rate so that the chlorine concentration is maintained at a minimum of 25 milligrams per liter of free chlorine.
 - i. The entire water line shall be filled with the chlorine solution.
 - ii. Reference Table 4, AWWA B651.
 - d. The chlorinated water shall be retained in the water line for a minimum of 24 hours, at which time the treated water must contain no less than 10 milligrams per liter of free chlorine residual throughout the entire length of the water line.

D. Slug Method

1. The slug method consists of completely filling the water line to eliminate air pockets, flushing the water line to remove particulates, then slowly flowing through the water line a slug of water dosed with chlorine to a concentration of 100 milligrams per liter. The slow rate of flow ensures that all parts of the water line and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hr.



2. The slug method of disinfecting water lines shall be used only at the direction of the District.
3. Reference AWWA C651.

3.04. FINAL FLUSHING

- A. After chlorination, the District shall assist the Contractor to flush the chlorinated water from the water lines until the chlorine concentration is no higher than that prevailing in the system or less than 1 milligram per liter, whichever is higher.
- B. The Contractor shall be responsible for dechlorination of the flushed water including all permitting that may be required.
- C. Reference Paragraph 3.02.B. for disposing of chlorinated water.

3.05. BACTERIOLOGICAL TESTS

- A. The District shall coordinate sampling from the water line after chlorination and final flushing but prior to pressure testing and placing the water line in service. Samples shall be analyzed for bacteriological presence to verify the absence of coliform organisms in the water line before the water line is placed in service.
- B. Sample location and number shall be determined by the District based upon AWWA C651. In no case shall the number of samples be less than one.
- C. Samples may only be collected Monday through Thursday, holidays excluded.
- D. Samples shall be collected by the Contractor and delivered to an accredited water quality control laboratory as approved by the District.
- E. Payment for testing shall be the responsibility of the Contractor.

3.06. REPETITION OF PROCEDURE

- A. If the initial disinfection or subsequent disinfections fails to produce passing results, the water line shall be reflashed and resampled.
 1. If the samples are still not satisfactory, the water line shall be re-chlorinated by the continuous feed or the slug method of chlorination as stated in Paragraph 3.03 until satisfactory results are obtained.

END OF SECTION



SECTION 33 14 10 WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section addresses the acceptable products, materials, and construction practices which may be used in the installation of water distribution mains.

1.02. QUALITY ASSURANCE

- A. Water system installations shall conform to the regulations of the Colorado Department of Public Health and Environment, and the Water Quality Control Commission.
- B. Construction staking: Reference Section 31 23 35 – Trenching, Backfilling, and Compacting, Paragraph 1.02.B.
- C. Horizontal alignment shall not deviate more than 6 inches.
- D. Vertical alignment shall not deviate more than 3 inches as measured from the pipe invert.
- E. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by the local jurisdiction:
 - 1. Federal, state, and local codes, regulations, and ordinances.
 - 2. American National Standard Institute (ANSI).
 - 3. American Water Works Association (AWWA).
 - 4. American Society for Testing and Materials (ASTM).
 - 5. National Association of Corrosion Engineer's International (NACE).
 - 6. National Electrical Code (NEC).
 - 7. National Electric Manufacturers Association (NEMA).
 - 8. Underwriters Laboratory (UL).
 - 9. East Larimer County Water District (ELCO), Cross-Connection Control and Backflow Prevention Manual.
- F. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.03. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Reference sections:



1. Section 33 05 20 – Ductile Iron Pipe.
2. Section 33 05 29 – Plastic Pressure Pipe.
3. Section 33 14 20 – Valves.
4. Section 33 14 18 – Service Lines, Meters, and Appurtenances.
5. Section 33 14 22 – Hydrants.

1.04. JOB CONDITIONS

- A. Foreign material, including trench water, shall not be permitted to enter the pipe.
- B. Debris, tools, clothing, or other material shall not be permitted in the pipe.
- C. To prevent water, debris, and animals from entering the pipe, the open ends of the pipe shall be plugged with a blocked, watertight plug when pipe laying is not in progress and at the end of each working day.
- D. Effective measures shall be used to prevent uplifting or floating of the pipeline prior to completion of the backfilling operations.
- E. Pipe shall not be installed under the following conditions:
 1. When the trench contains water.
 2. When the weather conditions are unsuitable:
 - a. Temperature less than -5 degrees Fahrenheit.
 - b. Snowing.
 - c. Raining.
 - d. High winds.
 3. When the trench bottom is unstable.
- F. Pipe and appurtenances shall be protected against dropping and damage.
 1. Pipe and appurtenances shall not be used if they are damaged.

PART 2 - PRODUCTS

2.01. PIPE

- A. Reference sections:
 1. Section 33 05 20 – Ductile Iron Pipe.
 2. Section 33 05 29 – Plastic Pressure Pipe.
- B. The same type of pipe material shall be used for each size pipe.
 1. Pipe material shall not be interchanged except where another type of pipe material is specifically indicated.

2.02. VALVES

- A. Reference Section 33 14 20 – Valves.



2.03. HYDRANTS

A. Reference Section 33 14 22 –Hydrants.

2.04. SERVICE LINES, METERS, AND APPURTENANCES

A. Reference Section 33 14 18 – Service Lines, Meters, and Appurtenances.

2.05. DUCTILE IRON FITTINGS, AND MECHANICAL JOINT RESTRAINT

A. Reference Section 33 05 20 – Ductile Iron Pipe.

2.06. TAPPING SLEEVES AND VALVES

A. Reference Section 33 05 10 – Tapping Sleeves and Valves.

2.07. PRECAST CONCRETE STRUCTURES

A. Reference Section 03 40 00 – Precast Concrete.

2.08. FASTENERS

A. Fasteners for use with flanged joints shall conform to AWWA C111 and AWWA C115 latest editions.

2.09. METAL SURFACE PROTECTIVE COATING

A. Polyethylene Encasement

1. Reference Section 33 05 20 – Ductile Iron Pipe and Fittings.
2. Reference Section 33 05 29 – Plastic Pressure Pipe.

B. Spray-On Rubberized Coating for Bolts

1. Shall be a rubberized spray-on undercoating.
2. Acceptable manufacturers:
 - a. NAPA, Mac’s Rubberized Undercoat.
 - b. TiteSeal Rubberized Undercoating.
 - c. Approved equal.

2.10. TRACER WIRE AND ACCESSORIES

A. Water distribution lines shall be installed with tracer wire as follows:

1. 12-gauge solid, insulated copper tracer wire taped to the top of all pipe using vinyl “E” tape (Winmore #413-E or approved equal).

B. Tracer wire shall be connected at all piping intersections to form one continuous system and shall be watertight.

C. The type of tracer wire installed shall depend upon the method of installation as follows:

1. Direct-Bury Installations:



- a. Single-conductor, 12-gauge, insulated solid copper wire rated for 600-volt service.
 - b. Suitable for underground service and buried directly with the pipe.
 - c. THHN, THWN, or approved equal.
 - d. Acceptable manufacturers:
 - i. Copperhead Industries, HS-CCS HDPE 30-mil.
 - ii. Performance Wire & Cable Inc.
 - iii. Pro-line Safety Products Company.
 - iv. Approved equal.
2. Trenchless Installations:
- a. Tracer wire shall be a 304 stainless steel alloy, 12-gage solid, annealed conductor insulated with 45-mil, high molecular weight, high density polyethylene (HMW-HDPE) and rated for direct bury use at 30 volts.
 - b. Insulator shall be 0.045 inch.
 - c. Insulator color shall be blue for potable water pipes.
 - d. Acceptable manufacturers:
 - i. Performance Wire and Cable, Inc., Solid SS /45 mil HD-HMWPE.
 - ii. Approved equal.

2.11. WATER LINE MARKING TAPE

- A. Thickness shall be 5 mils with no less than 0.00035-inch (0.35 mil) aluminum foil thickness.
- B. Width shall be 6 inches.
- C. Markings shall bear the printed identification of the utility below it such as, “Caution Buried Water Line Below.”
- D. Color shall be blue for potable water.
- E. Acceptable Manufacturer:
 1. Pro-Line Safety Products, Detectable Underground Marking Tape.
 2. Approved equal.

2.12. CATHODIC PROTECTION SYSTEMS AND ACCESSORIES

- A. Anodes Acceptable Manufacturers:
 1. Northtown Company, SuperMAG Product No. H-MG-60 HP.
 2. Approved equal.
- B. Weld seals acceptable manufacturers:
 1. Primer
 - a. Royston Roybound 747.
 - b. Approved equal.
 2. Seal



- a. Royston Handy Cap.
- b. Approved equal.

C. Adapter Sleeves Acceptable Manufacturers:

1. ThermOweld.
2. Approved equal.

D. Test Stations Acceptable Manufacturers:

1. Handley Industries Inc., 2-inch Cathodic Test Stations.
2. Approved equal.

2.13. STAINLESS STEEL REPAIR CLAMPS

A. General

1. The manufacturer of repair clamps shall be experienced in its design and construction, shall be regularly engaged in their manufacture, and shall have produced repair clamps which have given successful service for a period of at least 5 years.

B. Service

1. The repair clamps shall be installed only on pipes that have structural integrity. The operating pressure for all types of pipes is 150 psi. Repair clamps shall not be installed on Ductile Iron Pipe that has developed a leak due to corrosion.

C. Material

1. All stainless steel repair clamps and fabrications shall be Type 304 stainless steel per ANSI 21.11. All welds shall be fully passivated by a chemical technique which restores the corrosion resistant characteristics of stainless steel.

D. Gasket

1. Shall be made of virgin styrene butadiene rubber (SBR) or Nitrile (Buna-N, NBR) compounded for water service. Gasket shall be bonded to stainless steel by suitable means.

E. Bolts and Hex Nuts

1. All bolts shall be of Type 304 stainless steel per ASTM A193 and A194. Stainless steel hex nuts shall be furnished with a coating to prevent seizing and galling.

F. Acceptable Manufacturers:

1. Ford Meter Box Co., Model FS1/FS2.
2. PowerSeal Pipeline Products Corp., Model 3122AS.
3. Romac Industries Inc., Model SS1/SS2.
4. Approved equal.

2.14. REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY



A. General

1. All reduced-pressure backflow assemblies shall be manufactured in accordance with AWWA C511 with the following additional requirements or exceptions.
2. All Reduced Pressure Backflow Prevention Assemblies shall comply with the District's most recent Cross-Connection Control and Backflow Prevention Manual.

B. Testing

1. The manufacturer shall test all reduced-pressure backflow assemblies according to AWWA C511.

C. Lining and Coating

1. All reduced-pressure backflow assemblies shall be epoxy coated inside and out according to AWWA C550 for sizes 2.5 inches and larger.

2.15. DOUBLE CHECK BACKFLOW ASSEMBLY

A. General

1. All double check backflow assemblies shall be manufactured in accordance with AWWA C510 with the following additional requirements or exceptions.
2. All Double Check Backflow Assemblies shall comply with the District's most recent Cross-Connection Control and Backflow Prevention Manual.

B. Valves

1. Sizes 2.5 inches and larger shall have Non-Rising Stems.

C. Testing

1. The manufacturer shall test all double-check backflow assemblies according to AWWA C510.

D. Lining and Coating

1. All backflow assemblies shall be epoxy-lined and coated according to AWWA C550 for sizes 2.5 inches and larger.

2.16. CONNECTIONS TO EXISTING PIPE

A. All connections to existing pipe shall be made as follows:

1. For connection to existing PVC, ductile iron, or cast-iron pipe (solid sleeves, restrained):
 - a. Acceptable manufacturers:
 - i. EBAA Iron Sales Inc., 3800 Mega-Coupling.
 - ii. EBAA Iron Sales Inc., Series 1100CH.
 - iii. Approved equal.
2. For connection to existing asbestos-cement (AC) pipe:
 - a. For normal AC pipe: Romac Industries Inc., XR501 coupling.



- b. For Simplex AC pipe: Romac Industries Inc., MACRO coupling.
- c. Approved equal.

PART 3 - EXECUTION

3.01. INSPECTION

- A. Pipe barrel and fittings shall be free of dirt or other foreign objects prior to installation.
- B. Pipe and fittings shall be inspected for cracks, dents, abrasions, or other flaws prior to installation.
- C. Pipe and fittings with damaged linings or coatings shall be rejected.
 - 1. Defective pipe shall be marked and removed from the site.

3.02. PREPARATION

- A. Trenching, Backfilling, and Compacting
 - 1. Reference Section 31 23 25 – Trenching, Backfilling, and Compacting.
- B. Connections
 - 1. The location and elevations of the existing pipe shall be verified prior to construction.

3.03. PIPE INSTALLATION

- A. All pipe shall be installed with the bells pointing in the direction that the work is progressing.
- B. All pipe shall be installed with the manufacturer's lettering on the top of the pipe to facilitate inspection and verification of pipe material being installed.
- C. The Contractor shall employ effective measures to prevent the opening of joints during bedding and backfilling operations.
- D. The joint shall be completed in accordance with the applicable pipe material specification and the pipe shall be adjusted to the correct line and grade as each length of pipe is placed in the trench.
- E. The pipe shall be secured in place with the specified bedding tamped under and around the pipe.
- F. The pipeline shall be installed so that a uniform positive or negative grade is maintained between the designed high and low points.
- G. The minimum depth of cover shall be 4.5 feet from the finished grade to the top of the pipe except as otherwise indicated on the Drawings.
- H. The maximum depth of cover shall be 5.5 feet from the finished grade to the top of the pipe, except as otherwise indicated on the Drawings.
- I. Concrete encasement of water mains shall not be allowed.



- J. Ductile iron pipe and fittings shall be installed with a double layer of polyethylene encasement.
- K. Water mains crossing sanitary sewers:
 - 1. At any location where water mains cross below sewer lines and there is less than 18 inches of clearance between the water main and sewer, the water main shall be installed in a casing per the District Standard Construction Detail Drawings for water main lowering. The casing shall be per Section 33 05 08 – Pipe Boring and Jacking.
 - 2. Suitable backfill or other structural protection shall be provided to prevent settling or failure of all pipe in the crossing area.

3.04. CONNECTION TO EXISTING PIPE

- A. Coordinate each connection with the District such that it will least interfere with existing service.
- B. Do not contaminate existing potable water lines.
 - 1. Do not permit trench water, mud, or other contaminating substances to enter pipelines.
- C. Swab the interior of new pipe, fittings, and valves installed in existing pipelines with a solution of 5 percent (50,000 ppm) chlorine solution prior to installation.
- D. Only the District shall operate existing valves, hydrants, blowoffs, curb stops, and other control units unless approved by the District Inspector.

3.05. THRUST RESTRAINT

- A. General
 - 1. All mechanical joints shall be restrained, inclusive of all push-on joints, fittings, valves, appurtenances, dead ends, etc.
 - 2. Thrust blocks are required at all fire hydrants per the District Standard Construction Detail Drawings.
 - a. Thrust blocks shall additionally be used where specified on the project drawings or where job site conditions require such (with approval or direction from District Inspector).
- B. Mechanical Joint Restraints
 - 1. Joint restraint lengths
 - a. Minimum joint restraint lengths along the water lines are given in District Standard Construction Detail Drawings unless specified with longer restraint lengths by the Design Engineer or required by the District Inspector per site specific conditions.
 - b. Restraint lengths for lowerings or fittings not listed in the District Standard Construction Detail Drawings shall be calculated by the Design Engineer and called out on the Construction Drawings.



c. Criteria for joint restraint length calculations is given in the District's Water Distribution System Design Criteria Manual.

2. Installation

a. All mechanical joint restraint devices shall be installed per the manufacturer's recommendations.

C. Thrust Blocks and Anchors

1. Reference District's Standard Construction Details Drawings - Typical Thrust Blocks.

2. Concrete thrust blocks shall only be used under the following conditions:

a. At all fire hydrants as shown on the District's Standard Construction Detail Drawings.

b. When specified on the Project Drawings.

c. When job specific conditions do not allow for adequate restraint of pipe using mechanical joint restraints.

d. When required by the District Inspector based on site specific conditions.

3. The minimum size of thrust blocks shall be determined from the table in the District's Standard Construction Details drawings – Typical Thrust Blocks.

4. Thrust block bearing surface shall be excavated into undisturbed soil.

a. All loose soil shall be disposed of, and the location where the thrust block is to be placed shall be carefully shaped to provide a uniform bearing surface of the required size.

b. Thrust block bottom shall be flat, and sides shall be vertical.

5. Thrust blocks shall be formed to provide access to fittings, valves, hydrants (and their weep holes), and other appurtenances.

6. Thrust blocks shall be extended from the fitting or valve to be blocked to solid undisturbed earth.

a. Thrust blocks shall be constructed so that joints, bolts, and mechanical restraints at the fittings and drain holes are clear and accessible.

7. Concrete shall be separated from fittings, valves, hydrants, and appurtenances by a double layer of 8-mil polyethylene film.

a. Concrete shall not be poured directly on or over fittings.

8. The District shall be notified 24 hours before concrete is placed.

9. Anchor blocks:

a. All anchor blocks shall be designed and sized by the Design Engineer.

3.06. TRACER WIRE

A. Tracer wire shall be installed with all water lines regardless of size or material.

B. Route wire to the surface at all required tracer wire test stations.



- C. Install tracer wire test stations at all fire hydrants or along every 500 feet of pipe if there are no fire hydrants.
- D. Terminate tracer wire in accordance with the applicable District Standard Construction Detail Drawings.
- E. The tracer wire shall be one piece, installed in a continuous run between access points (tracer wire terminal boxes located either right or left of all new project fire hydrant assemblies) and connected to any existing tracer wire at ends of project to form a continuous loop.
- F. At points where wiring splices may be required, exposed ends of the tracing wire shall be securely twisted together and secured with a watertight epoxy splicing adapter to prevent separation. The spliced section shall then be securely attached to the top of the pipe with vinyl "E" tape.
- G. Continuity: Contractor shall check tracer wire installation for continuity at each access point (trace wire terminal box installed adjacent to each new project fire hydrant assembly) as the project progresses and prior to compacting previously installed piping.
 - 1. If a continuity test fails, the Contractor shall locate the break and repair damage prior to proceeding on with the installation of further piping and tracer wire.
 - 2. Upon substantial completion of the project, the complete tracer wire installation shall be checked for continuity by the District.
 - 3. The project will not be approved for service until such time as all continuity tests pass.

3.07. INSTALLATION OF PIPELINE APPURTENANCES

- A. Valves, meters, hydrants, and other appurtenances to the water distribution lines shall be installed at the locations shown on the Construction Drawings or as approved by the District to accommodate field conditions.
 - 1. Measurements of the actual location of appurtenances shall be made prior to backfilling for recording in the project's Record Drawings.
 - a. Reference Section 01 78 39 – Record Documents.
- B. Dead-End Water Lines
 - 1. All dead-end water lines will be plugged and restrained.
 - 2. Temporary dead-ends
 - a. Dead-end water lines that are intended to be extended in the future shall:
 - i. Be installed a minimum distance of 20 feet unless less distance is authorized by the District due to property line constraints.
 - ii. Include an installed valve that controls that section of water line and positioned in the off position.
 - iii. Include a temporary fire hydrant or blowoff.
 - iv. Include tracer wire and a terminal box at the end of the piping (reference Paragraph 2.10.).



3. Permanent Dead-End Water Lines

- a. Blowoffs will not be allowed to be permanently installed on dead-end water lines.
- b. Permanent dead-end water lines shall have a fire hydrant installed at its end to facilitate the discharge of air and water.

3.08. PROTECTION OF METAL SURFACES

- A. All metal piping fittings shall be provided and installed with fusion bond epoxy coating and lining.
- B. If the surface epoxy coating of any supplied fitting has been damaged by installation, the material shall be rejected and removed from the job site.
- C. All fittings and associated metallic fasteners shall be protected with double-wrapped polyethylene covering.

3.09. STORM SEWER AND CULVERT CROSSING

A. Clearance

1. Water mains shall be installed with a minimum of 1.5 feet clearance from a storm sewer or culvert.

B. Protection from Freezing

1. Water mains installed over or under storm sewer (drainage) culverts shall be freeze protected using 4'x 8'x1/2" blueboard sheet insulation where specified or directed by District Inspector.
2. Water mains installed over storm sewer (drainage) culverts with less than minimum 4.5 feet cover from surface shall be blueboard insulated both above and below the water main. In such an event, blueboard insulation above the water main shall extend each way until such point that minimum surface cover of 4.5 feet is obtained.

END OF SECTION



SECTION 33 14 18

SERVICE LINES, METERS, AND APPURTENANCES

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers the materials and installation of corporation stops, curb stops, service lines, meters, meter sets, and meter pits.

1.02. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
 - 1. Federal, state, and local codes, regulations, and ordinances.
 - 2. American National Standard Institute (ANSI).
 - 3. American Water Works Association (AWWA).
 - 4. American Society for Testing and Materials (ASTM).
 - 5. Factory Mutual (FM) (for Fire Protection).
 - 6. Underwriters Laboratory (UL).
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.03. SUBMITTALS

- A. Submit manufacturer's certification that products meet the referenced standards.
- B. Submit manufacturer's certification that products are NSF 61 certified for potable water service.
- C. Reference Section 01 33 00 – Submittals.

1.04. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. All products shall be handled, stored, and protected in a manner that will prevent damage to materials, coatings, and finishes.
 - 1. All material shall be kept clean and free from dirt.

PART 2 - PRODUCTS

2.01. TAPPING SADDLES – 3/4 INCH THROUGH 2 INCH SERVICES



- A. All tapping saddles shall provide full support around the circumference of the pipe and have bearing area of sufficient width along the axis of the pipe to prevent distortion of the pipe when saddle is tightened.
 - B. 3/4 inch through 2 inches, inclusive, tapping saddles shall be constructed of the materials in accordance with one of the following descriptions:
 - 1. PVC pipe saddles, per AWWA C900, shall have a brass body with a stainless steel dual straps.
 - 2. Ductile Iron and Asbestos Cement (AC) pipe saddles shall have a brass body with double silicon bronze straps.
 - 3. Outlet Threads:
 - a. 3/4-inch and 1-inch saddles (outlet diameter): "cc" type only.
 - b. 1-1/2-inch and 2-inch saddles (outlet diameter): Female national pipe thread (FNPT).
 - C. All nuts, bolts, and accessories shall be in accordance with the manufacturer's specifications.
 - D. The Contractor shall consult with the District on site-specific tapping situations not specified above.
 - E. Acceptable Manufacturers
 - 1. A.Y. McDonald Mfg. Co., 3855 Series.
 - 2. Ford Meter Box Co., 202 Series.
 - 3. Mueller Co., BR2 Series.
 - 4. Approved equal.
- 2.02. SERVICES LARGER THAN 2 INCHES
- A. All services larger than 2 inches shall:
 - 1. Connect to the water main with a tee or reducing tee.
 - 2. Be installed with a 4- , 6- , or 8-inch gate valve at the water main.
 - 3. Be AWWA C900 DR18 PVC.
- 2.03. CORPORATION STOPS
- A. Corporation stops shall be used for all taps which are 1 inch and smaller.
 - B. All corporation stops shall conform to AWWA C800.
 - 1. All corporation stops shall have CTS compression connection on the outlet side.
 - 2. Corporation stop inlet side threads for tapped saddles shall be AWWA/CC type only.
 - 3. Corporation stop outlets shall be installed using a compression connection.
 - 4. Corporation stops shall be ball valves only.



C. Acceptable models and manufacturers:

1. A.Y. McDonald Mfg. Co., Series 74701BQ.
2. Mueller Co., B-25008N.
3. Approved equal.

2.04. SERVICE LINES

A. 1-Inch and Smaller, 1-1/2-Inch, and 2-Inch Diameters

1. Material shall be Type “K” soft copper.
2. All copper services shall conform to the appendix of AWWA C800.

B. Tracer Wire

1. Tracer wire shall be installed where PVC or non-metallic service line material is allowed.
2. Where used, service line tracer wire shall be installed from the tap/connection to the water main and to the meter pit/vault.
 - a. Reference 33 14 10 – Water Distribution System.

2.05. COUPLINGS FOR COPPER SERVICE LINES

A. All couplings shall be compression type.

B. Coupling material shall be lead free brass.

C. Acceptable manufacturers:

1. A.Y. McDonald Mfg. Co., 74701BQ Series.
2. Ford Meter Box Co., C44 d (where "d" equals the diameter of the service).
FB1000.
3. Mueller Co., 25008N.
4. Approved equal.

2.06. CURB STOPS

A. Curb stops shall be installed for taps that are 1 inch and smaller.

B. All curb stops shall have CTS compression x female national pipe thread (FNPT) connections.

C. Minneapolis pattern curb stop top threads are not acceptable.

D. Acceptable manufacturers:

1. A.Y. McDonald Mfg. Co., 76102Q (Q CTS Compression X FNPT ends).
2. Ford Meter Box Co., B66 series.
3. Mueller Co., B-25172N.
4. Approved equal.



2.07. VALVE BOXES FOR CURB STOPS

- A. Curb stop valve boxes shall have screw type extension/adjustment option; Minneapolis pattern boxes are not acceptable.
- B. Acceptable manufacturers:
 - 1. A.Y. McDonald Mfg. Co., 5700 Arch Pattern.
 - 2. Casting Inc. Series 6500 Screw Type.
 - 3. Approved equal.

2.08. VALVE BOXES FOR 1-1/2 INCH AND LARGER SERVICES

- A. Services shall have a minimum 2-inch diameter gate valve with a valve box installed at the tap/connection to the water main.
- B. See District Standard Construction Details drawings.
- C. Reference Section 33 14 20 – Valves.

2.09. METER PITS AND VAULTS

- A. All meter pits and vaults shall be installed by the Contractor.
- B. All meter pit covers shall have the word "Water" cast in the lid.
- C. 3/4-Inch and 1-Inch Single Meter Pits
 - 1. Single Meter Pit Dimensions
 - a. Length: 48 inches.
 - b. Wall thickness: 1/2 inch.
 - c. Diameter
 - i. For 3/4 inch: 20 inches.
 - ii. For 1 inch: 24 inches.
 - d. All meter pits shall have a notched bottom.
 - 2. Acceptable Single Meter Pit Manufacturers:
 - a. DFW Plastics Inc.
 - b. Sigma Corp.
 - c. Approved equal.
 - 3. Single Meter Pit Cover – Frames and Lids
 - a. Cover frames shall be constructed of cast iron with 3-inch inner ‘drop type’ frost lid.
 - b. Cover lids shall:
 - i. Have a 12-inch diameter lid opening.
 - ii. Have a 27/32-inch worm lock with a Standard Waterworks pentagon head.
 - iii. Be polypropylene material (composite) and pre-drilled with centered 2-inch opening for an AMI transmitter antenna.
 - c. Acceptable manufacturers for single meter pit cover:
 - i. Castings Inc., CI 7020 with 3” inner drop lid INLP3.



- ii. Approved equal.

D. 3/4-Inch and 1-Inch Dual Meter Pits

1. Dual Meter Pit Dimensions

- a. Length: 48 inches.
- b. Wall thickness: 1/2 inch.
- c. Diameter
 - i. For 3/4-inch: 24 inches.
 - ii. For 1-inch: 30 inches.
- d. All meter pits shall have a notched bottom.

2. Acceptable Dual Meter Pit Manufacturers:

- a. DFW Plastics Inc.
- b. Sigma Corp.
- c. Approved equal.

3. Dual Meter Pit Cover – Frames and Lids

- a. Cover frames shall be constructed of cast iron with 3-inch inner ‘drop type’ frost lid (where available).
- b. Cover lids shall:
 - i. Have a 14-inch diameter lid opening.
 - ii. Have a 27/32-inch worm lock with a Standard Waterworks pentagon head.
 - iii. Be polypropylene material (composite) and pre-drilled with centered 2-inch opening for an AMI transmitter antenna.
- c. Acceptable manufacturers for dual meter pit cover:
 - 1. Castings Inc., CI 7016 with plastic inner frost lid.
 - 2. Approved equal.

E. 1-1/2-Inch and 2-Inch Meter Pits

- 1. Meter pits shall be constructed from standard 48-inch inside diameter precast concrete manhole sections.
 - a. Reference Section 03 40 00 – Precast Concrete.
- 2. Meter pit covers shall be a composite manhole ring and cover with frost lid and a 24-inch diameter opening.
 - a. All meter pit covers shall have a 27/32”-worm-lock with a Standard Waterworks pentagon head; and,
 - b. Be polypropylene material (composite) and pre-drilled with centered 2-inch opening for an AMI transmitter antenna.
 - c. Acceptable manufacturers:
 - i. Trumbull Manufacturing, Inc.
 - ii. Approved equal.

F. 3 Inch and Larger Meter Vaults

- 1. Reference District’s Standard Construction Detail Drawings:
 - a. 3”, 4”, & 6” Meter Vault.



- b. 4” & 6” Fire Series Assembly Meter Vault.
- 2. Meter vaults shall be constructed from precast concrete box sections designed for H-20 loading.
- 3. All steps shall be impact resistant copolymer polypropylene plastic molding around 1/2-inch diameter and grade 60 reinforcing steel conforming to ASTM C478 and placed 12 inches apart on-center.
- 4. Unless it is otherwise specified, meter vault covers shall be a composite manhole ring and cover with frost lid and a 24-inch diameter opening and pre-drilled with centered 2-inch opening for an AMI transmitter antenna. All meter vault covers shall have a 27/32"-worm lock with a Standard Waterworks pentagon head.
 - a. Acceptable cover manufacturers:
 - i. Trumbull Manufacturing, Inc.
 - ii. Approved equal.
- 5. 4-Inch and 6-Inch Fire Series Assembly Meter
 - a. Fire Service Assembly meters shall be manufactured in accordance and comply with the following:
 - i. AWWA C703.
 - ii. Lead-free provisions of the Safe Drinking Water Act.
 - iii. NSF/ANSI Standards 61 and 372.
 - iv. UL 327 and FM 1044.
 - v. Strainer:
 - 1. UL 321 and FM 5551
 - vi. Valve:
 - 1. UL 312 and FM 1045.
 - b. Coordinate with District Engineer for Fire Service Assembly meters 8 inches and larger.
 - c. Acceptable meter manufacturers:
 - i. Recordall, Fire Series Assembly (FSAA), Cold Water Meter & Strainer with Turbine Bypass.
 - ii. No substitution allowed.

2.10. METER SETTERS

A. Meter lay lengths shall be the following:

Meter Size	Lay Length
3/4"	7-1/2"
1"	10-3/4"
1-1/2"	13"
2"	17"
3"	17"
4"	20"
6"	24"

B. Acceptable Single Meter Setter Manufacturers and Models:



1. A.Y. McDonald Mfg. Co., Dual Check Setters:
 - a. 31-2-09 WDQQ-33 = 5/8"x3/4"
 - b. 31-4-09 WDQQ-44 = 1"
 - c. 31-3-09 WDQQ-33 = 3/4".
 - d. B612-WDFF-665 = 1-1/2".
 - e. B712-WDFF-775 = 2".
 2. Approved equal.
- C. Acceptable Dual Meter Setter Manufacturers and Models:
1. 3/4-Inch
 - a. U-Branch (1"x3/4"x3/4")
 - i. A.Y. McDonald Mfg. Co., Model 5182-048.
 - ii. Approved equal.
 - b. Angle ball valve
 - i. A.Y. McDonald Mfg. Co., Model 5139-181.
 - ii. Approved equal.
 - c. Dual check valve
 - i. A.Y. McDonald Mfg. Co., Model 5134-053.
 - ii. Approved equal.
 2. 1-Inch
 - a. U-Branch (1-1/2"x1"x1")
 - i. A.Y. McDonald Mfg. Co., Model 5182-455.
 - ii. Approved equal.
 - b. Angle ball valve
 - i. A.Y. McDonald Mfg. Co., Model 5149-185.
 - ii. Approved equal.
 - c. Dual check valve
 - i. A.Y. McDonald Mfg. Co., Model 5134-055.
 - ii. Approved equal.

PART 3 - EXECUTION

3.01. GENERAL

- A. All taps shall be made with a tapping saddle in accordance with these Specifications and the manufacturer's recommendations unless otherwise approved by the District.
- B. For 3 inch and larger wet taps, a static pressure test of 200 psi for ten 10 continuous minutes, with no visible leakage or pressure loss, shall be performed prior to the wet tap on all existing water mains.
- C. The Contractor shall obtain permission to tap and schedule an inspection of the tap from the District.
 1. A minimum notice of 48 hours is required for all tap inspections.



- D. The Contractor shall mark the ending location of all water services with a wood or metal post.
- E. Taps shall not be made within 5 feet of any valve, pipe joint, fitting, or other appurtenance.
- F. Taps shall be separated by at least 5 feet as measured along the pipe length.
- G. Taps made on opposite sides of a pipe shall also be separated a minimum 5 feet.

3.02. SERVICE LINES

- A. All service lines shall be a minimum of 54 inches and a maximum of 66 inches below the final grade.
- B. All copper service lines shall be installed as one continuous line from water main to curb stop. Splices are not acceptable.
 - 1. If at any time during the Warranty Period a copper service line is broken or requires repair, the Contractor shall replace the entire service line such that no splices or repair couplings exist.
- C. Service trenches shall be subject to all bedding, backfill, and compaction specifications.
 - 1. Reference Section 31 23 25 – Trenching, Backfilling, and Compacting.

3.03. CURB STOPS

- A. The Contractor shall adjust the curb stop box to 1/2 inch above final grade prior to final inspection.
- B. The curb stop box shall be fully extended to surface grade and screwed onto the curb stop.
- C. The curb stop box shall be properly plumbed so that a shut off key can be placed on the curb stop.
- D. If the grade of the ground surrounding the curb stop box is changed after the curb stop box has been installed, the curb stop box cover shall be adjusted to 1/2 inch above final grade.

3.04. INSTALLATION OF SERVICE TAPS

- A. The Contractor shall not install any 2-inch diameter and smaller taps on newly constructed mains prior to completion and acceptance of bacteriological and hydrostatic testing.
 - 1. Reference Section 33 05 06 – Testing Piping Systems; and Section 33 13 00 – Disinfection of Water Lines.
- B. The District reserves the right to make taps in lieu of the Contractor and the right to deny permission for any main to be tapped.
- C. The Contractor shall give forty-eight hours advance notice to the District before any tap is made.



- D. Taps 1 inch and smaller shall be installed using tapping saddles.
- E. Taps 1-1/2 inch and 2 inches shall be installed using tapping saddles.
- F. Taps greater than 2 inches shall be installed using tees. Wet taps for connections greater than 2 inches shall only be installed with prior approval by the District.
- G. Tapping equipment shall be of good quality, used for the purpose intended, and used in accordance with manufacturer's instructions.
 - 1. Reference Section 01 45 16 – Quality Requirements.

3.05. METER PITS AND VAULTS

- A. Meter pits, meters (where relevant), and vaults shall be installed according to the manufacturer's recommendations and in accordance with the District's Standard Construction Details drawings.
 - 1. All meter pits and vaults shall be installed by the Developer's Contractor.
 - 2. All Fire Series Assembly meters shall be installed by the Developer's Contractor.
- B. Meter pits and vaults shall not be installed in or closer than 5 feet from any street, alley, parking area, or driveway, nor closer than 10 feet from any building or building foundation unless otherwise authorized by the District.
- C. Landscape Separation
 - 1. There will be no major landscaping (e.g., boulders, etc.) or structure (retaining wall, etc.) within a 10-foot radius of the meter pit or vault structure.
 - 2. There shall be no shrubs within 5 feet of the meter pit or vault structure.
 - 3. There shall be no trees within 10 feet of the meter pit or vault structure.
- D. The ground surrounding meter pits and vaults shall slope away from the lid at a minimum grade of two (2) percent toward the street.
- E. There will be no plumbing connections inside the meter pit or vault.
- F. All tees, connections, and couplings shall be a minimum of 5 feet from the meter box, pit, or vault wall on the downstream side.
- G. Meter pit and vault covers shall be adjusted to 1/2-inch above final grade.
- H. Concrete meter vaults
 - 1. Reference Section 33 14 10 – Water Distribution System, and Section 03 40 00 – Precast Concrete.

3.06. METER SETTERS

- A. All meter setters shall be installed by the Developer's Contractor.
 - 1. Meter setters for 1-1/2 inch and 2-inch meters shall be installed in accordance with the District's Standard Construction Details drawings.

3.07. INSPECTION



- A. The tapping saddle, curb stop, corporation stop, and any couplings shall remain exposed until after the inspection and the approval for backfill is given by the District.
- B. The contractor shall turn on water at the corporation stop when the service is ready for inspection.
 - 1. The packing nut on the back of the corporation stop shall be tightened and water shall be flushed through the curb stop.
- C. All tap and service inspections shall be scheduled with the District.
 - 1. A minimum notice of 48 hours is required for all tap and service inspections.
- D. The water shall be turned on at the curb stop by District personnel only.

3.08. MAINTENANCE AND CORRECTION

- A. The Contractor shall replace all service lines and any associated appurtenances that leak, were installed incorrectly, or otherwise prove to be defective during the Warranty Period.

END OF SECTION



SECTION 33 14 20 VALVES

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section covers valves, valve operators, valve boxes, and appurtenances used for water distribution lines.

1.02. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
 - 1. Federal, state, and local codes, regulations, and ordinances.
 - 2. American National Standard Institute (ANSI).
 - 3. American Water Works Association (AWWA).
 - 4. American Society for Testing and Materials (ASTM).
 - 5. American Society of Mechanical Engineers (ASME).
 - 6. National Sanitation Foundation (NSF).
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.03. SUBMITTALS

- A. Submit manufacturer's certification that products meet the referenced standards.
- B. Submit manufacturer's certification that products are NSF 61 certified for potable water service.
- C. Reference Section 01 33 00 – Submittals.

1.04. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Precautions shall be taken to prevent damage to materials during delivery and storage.
- B. Valves shall be stored off the ground and away from materials that could contaminate potable water systems.
- C. Precautions shall be taken to keep all joints and internal parts clean.

PART 2 - PRODUCTS

2.01. GENERAL



- A. All valves shall open counterclockwise (left).
- B. Nuts and Bolts
 - 1. All valve connections shall use Star Pipe Products, “Star Blue Coated T-Bolts and Nuts” or approved equal.
 - 2. All valve top nuts and bolts shall be stainless steel.
- C. All buried valves shall have a 2-inch square operating nut.
 - 1. All operating nuts shall be painted black.
- D. Any valve which will be placed in a vault shall have a valve operator that is specifically approved by the District.

2.02. VALVE TYPE

- A. Valves smaller than 12-inch diameter shall be gate valves.
- B. Valves 12-inch diameter or larger shall be butterfly valves. An exception to this requirement will be that all wet tap connections shall be made with tapping valves.

2.03. GATE VALVES

- A. All gate valves shall:
 - 1. Be Class 250 with MJ x MJ ends.
 - 2. Be a resilient seat type, manufactured in accordance with AWWA C509, and meet or exceed requirements set forth in AWWA C515.
 - 3. Have fusion-bonded epoxy coated interior and exterior in accordance with AWWA C550.
 - 4. Be provided with two O ring type stem seals.
- B. Acceptable manufacturers:
 - 1. American Flow Control, Series 2500.
 - 2. Clow Valve Co., AWWA C509.
 - 3. M & H Valve Company, AWWA C509.
 - 4. Mueller Co., Model 2361 or 2362.
 - 5. US Pipe.
 - 6. Approved equal.

2.04. BUTTERFLY VALVES

- A. All butterfly valves shall conform to AWWA C504.
 - 1. All butterfly valves shall be fusion-bonded epoxy coated interior and exterior in accordance with AWWA C550.
 - 2. All flanged butterfly valves shall be the short body type.



3. All butterfly valves shall be Class 250.
4. The operator torque shall be as specified in AWWA C504.
5. Acceptable manufacturers:
 - a. Clow Valve Co., AWWA C504.
 - b. DeZurich, AWWA C504.
 - c. M & H Valve Company, Style 4500.
 - d. Mueller, Co., Lineseal.
 - e. Henry Pratt Co., Model 2FII or Triton XR-70.
 - f. Val-Matic, Series 2000.
 - g. Approved equal.

2.05. VALVE BOXES

A. Materials and Type

1. Ductile Iron, ASTM A48, Class 35.
2. Two piece adjustable, screw-type only.

B. Main Line Valves

1. All valve boxes shall be 5-1/4-inch diameter, screw type with the word "WATER" cast into the lid.
2. Acceptable manufacturers:
 - a. Casting Inc., CI-550 Series, #6 Base.
 - b. East Jordan Iron Works, Model 8550.
 - c. Approved equal.

2.06. AIR RELIEF/VACUUM RELIEF VALVES

A. Materials and Construction

1. Air valves shall be designed for clean water service in accordance with AWWA C512.
2. Air relief and vacuum relief valves shall have an integral type assembly which will function both as an air release and vacuum valve.
3. All air relief and vacuum relief valves shall be rated at a minimum working pressure of 250 psi.
4. The size of air relief and vacuum relief valves shall be as noted on the Construction Drawings.
5. Taps for air relief and vacuum relief valves shall be made with a tapping saddle.
6. Connections:
 - a. The inlet connection for air relief and vacuum relief valves shall be 2 inches in diameter with a tapered iron pipe thread conforming to AWWA C800.



- b. Connections on the outlet side of air relief and vacuum relief valves shall be threaded and shall be protected to minimize entry of debris and dirt into the valve.
7. The working parts and seats of air relief and vacuum relief valves shall be brass, stainless steel, or other non-corroding material.
8. All air relief and vacuum relief valves shall be watertight to a pressure of 150 psi.
9. Interior and exterior surfaces shall have an NSF approved epoxy coating.
10. Acceptable manufacturers:
 - a. A.R.I., Flow Control Accessories, Combination Air Valve, Model D-040.
 - b. APCO – Dezurik, Combination Air Release Valve Model ASU.
 - c. Approved equal.

2.07. CHECK VALVES

- A. All check valves shall be Class 250 and in accordance with AWWA C508.
- B. All check valves shall be coated internally and externally with an NSF 61 Certified epoxy coating and in accordance with AWWA C550.
- C. Acceptable manufacturers:
 1. American Flow Control, Series 52 SC.
 2. G.A. Industries, Inc., 250 D with renewable bronze seat.
 3. Mueller Co., AWWA C508.
 4. Approved equal.

2.08. BALL VALVES

- A. All shut-off (isolation) valves for air valves shall be ball valves except where specified or indicated otherwise.
- B. All ball valves shall be manufactured in accordance with AWWA C800.
- C. Any brass part of the valve in contact with potable water shall be made of “no-lead brass” and contain no more than one fifth of one percent (0.20%) total lead content by weight, per NSF 372.
- D. Shall have a full port stainless steel or chrome plated bronze ball with a Teflon seat.
- E. Minimum WOG pressure rating of 400 psi.
- F. Provide with female national pipe thread (FNPT) end connections.
- G. Provide with a lever operator.
- H. Acceptable manufacturers:
 1. Conbraco Industries, Apollo.
 2. Nibco Inc.
 3. Watts, lead free model.



4. Approved equal.
- 2.09. TAPPING VALVES
- A. All tapping valves shall be resilient seat type and manufactured in accordance with AWWA C509.
 - B. All tapping valves shall be provided with two O-ring type stem seals, in accordance with Section 4.8 of AWWA C509.
 - C. All tapping valves shall be equipped with an alignment ring on the flanged side of the valve.
 - D. Reference 33 05 10 – Tapping Sleeves and Valves.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. Valves and valve boxes shall be examined for cracks, dents, abrasions, and other flaws prior to installation.
 1. Defective valves and valve boxes shall be marked and removed from the site.
- B. Valves
 1. Valves shall be joined in the same manner used for joining ductile iron fittings.
 2. Valves shall be installed in such a manner that the operating nut is perpendicular to the pipe.
 3. The joined valve shall be supported in place on compacted granular material with a concrete block (cinder block not acceptable) supporting the valve body.
 4. Flanged valves shall not be buried.
 5. All installed valves shall be double wrapped in 8 mil plastic.
 - a. Reference Section 31 23 25 – Trenching, Backfilling, and Compacting.
- C. Fittings (Tees)
 1. All tees with a valve positioned on its branch shall be a swivel tee.
 2. All valves positioned on a run of a tee shall incorporate a Foster Adaptor.
- D. Valves – Wet Tap Installation
 1. Valves installed in a wet tap configuration shall pass pressure testing at 200 psi for 5 minutes prior to commencing tap of the live main.
- E. Valve Boxes
 1. Valve boxes shall be installed on all buried valves.
 2. Valve boxes shall be installed so that no stress is transmitted to the valve.
 3. Valve operators that are mounted to one side of the valve shall be located to the south or west of the valve.



4. Valve boxes that are to be set over the valve shall be plumb and directly over the valve with the top of the box on grade.
 - a. The soil around the valve box shall be carefully compacted around the barrel with hand equipment to minimize misalignment and the settling of the backfill.
 - b. Other valve box types shall be adjusted as required on the Construction Drawings.
 5. Valve stem extensions shall be installed on valves where the operating nut is more than 7 feet below finished grade.
 - a. Stem extensions shall bring the operating nut to within 4 feet of finished grade.
 6. All installed valve boxes shall be double wrapped in 8 mil plastic.
 - a. Reference Section 31 23 25 – Trenching, Backfilling, and Compacting.
- 3.02. AIR RELIEF/VACUUM RELIEF VALVES
- A. Air relief and vacuum relief valves shall be installed at high points as shown on the Construction Drawings.
 - B. Air relief and vacuum relief valves shall be installed in accordance with the District's Standard Construction Details drawings.
- 3.03. OPERATION
- A. Valves which have been accepted by the District shall be operated by District personnel only.

END OF SECTION



SECTION 33 14 22 HYDRANTS

PART 1 - GENERAL

1.01. DESCRIPTION

- A. This Section addresses dry-barrel fire hydrants and flushing hydrants and includes the acceptable products, materials, and construction practices which may be used in the construction and installation of fire hydrants.

1.02. QUALITY ASSURANCE

- A. All work shall be performed as specified herein and in accordance with the latest revisions of the following applicable codes and standards or as required by local jurisdiction:
 - 1. Federal, state, and local codes, regulations, and ordinances.
 - 2. American National Standard Institute (ANSI).
 - 3. American Water Works Association (AWWA).
 - 4. American Society for Testing and Materials (ASTM).
 - 5. American Society of Mechanical Engineers (ASME).
 - 6. National Fire Protection Association (NFPA).
- B. In the case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent requirements, as determined by the District, shall govern.

1.01. SUBMITTALS

- A. Submit manufacturer's certification that products meet all referenced standards.
- B. Submit manufacturer's certification that products are NSF 61 certified for potable water service.
- C. Reference Section 01 33 00 – Submittals.

1.02. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Fire hydrants shall be handled, stored, and protected in such a manner as to prevent damage to materials, coatings, and finishes.
- B. Fittings and joints shall be kept free from dirt, oil and grease.

PART 2 - PRODUCTS

2.01. GENERAL

- A. All fire hydrants shall be manufactured/certified in accordance with the following:



1. AWWA C502.
 2. UL 246.
 3. FM 1510.
 4. ANSI/NSF 61/372.
- B. The auxiliary gate valve on the hydrant lateral shall be a 6-inch resilient seat gate valve with a valve box.
1. Reference Section 33 14 20 – Valves.
- C. The hydrant tee on the main line shall be a swivel tee.
- D. Acceptable hydrant manufacturers:
1. American Flow Control, Waterous Pacer WB-67-250X.
 2. Mueller Co., Super Centurion 250, Model A423.
 3. No substitution allowed.

2.02. MATERIALS AND CONSTRUCTION

- A. All fire hydrants shall be a dry barrel type with a break away traffic flange designed for a working pressure of 250 psi.
1. The barrel and operating mechanism shall be designed so that in the event of an accident, damage, or breaking of the hydrant above or near the ground line, the main valve will remain closed and reasonably tight against leakage.
- B. Shoe inlets shall be 6 inches with mechanical joint fittings.
- C. Fire hydrant laterals shall be buried at a minimum of 4-1/2 feet unless otherwise directed by the District.
- D. The main valve shall be designed so that the removal of the assembly from the barrel is accomplished without excavation in accordance with AWWA C502.
- E. Hydrants shall be 3-way with one pumper nozzle and two hose nozzles.
1. The pumper nozzle shall be 4-1/2 inches nominal diameter .
 2. The hose nozzles shall be 2-1/2 inches nominal diameter.
 3. All nozzles shall be furnished with security chains with one end of each securely attached to the upper barrel section of the hydrant.
 4. Pumper nozzle threads shall be open left.
 5. Hose nozzle threads shall be open left.
- F. All fire hydrants shall have a 1-inch square operating nut with open-right operating direction.

2.03. COATINGS

- A. Fire hydrant coatings, exterior and interior, shall be NSF/ANSI 61-certified and AWWA C550-compliant.



- B. All fire hydrants shall be painted chrome yellow unless another color has been adopted as a standard by the local fire protection agency (reference NFPA 291).

2.04. HYDRANT GRAVEL

- A. Hydrant gravel shall be well washed conforming to ASTM D448, per CDOT Section 703 Specifications for Coarse Aggregates No. 67 as defined in the table below:

- 1. CDOT Coarse Aggregate No. 67, “3/4” Washed Gravel”

Size	Percent Passing
1”	100
3/4”	90 – 100
3/8”	20 – 55
#4	0 – 10
#8	0 – 5

2.05. FIRE LINES

- A. Reference Section 21 11 20 – Fire Line Service Mains.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. Fire hydrants shall be installed in accordance with the District’s Standard Construction Details drawings.
- B. The Design Engineer shall provide offset staking for both vertical and horizontal control.
- C. The joining of laterals, valves, and hydrants shall be handled in the same manner as pipe.
 - 1. The hydrant shall be installed vertically plumb with the pumper nozzle facing the direction shown on the District’s Standard Construction Details drawings.
 - a. The vertical distance from any finished surface to the centerline of the pumper nozzle shall not be less than 18 inches nor greater than 22 inches.
 - 2. The hydrant shall be set to the elevation staked to ensure that the bury line is at the final grade.
- D. The hydrant shall be supported on a minimum of 18 inches of compacted hydrant gravel.
 - 1. The hydrant shall be supported with a concrete block (cinder block not acceptable) or poured in place concrete, 12" x 12" x 4" in size.
- E. Restraint
 - 1. All pipe and fitting joints from water main tee to the hydrant shall be restrained with mechanical restraints.



2. A concrete thrust block with a minimum bearing surface area of 4.5 square feet shall be placed behind the hydrant shoe and at the tee from the water main.
 - a. A sheet of 8 mil polyethylene film shall be placed between hydrant shoe and concrete thrust block as well as completely around the riser from the shoe up to the bury line.
 - b. Thrust blocks must not impede hydrant drain holes.
- F. Hydrant gravel shall be placed to a depth of 12 inches above the hydrant shoe.
 1. Hydrant drain holes shall remain free of obstructions.
- G. With District approval, hydrants may be placed in concrete sidewalks or pavement provided that 6 inches of vertical clearance is maintained between the concrete and the hydrant barrel and bolts to facilitate service.
 1. The space between the concrete and the barrel shall be filled with asphalt or gravel.
- H. Landscaping and Obstructions
 1. No trees shall be placed closer than 10 feet from a fire hydrant.
 2. No fence, post, or other obstruction shall be placed closer than 5 feet from a fire hydrant.
 3. No landscaping planting other than turf shall be placed within 5 feet of a fire hydrant.
 4. The ground surrounding the fire hydrant shall slope away from the hydrant at a minimum grade of 2 percent.
- I. After the installation of the hydrant is complete, the oil/grease reservoir shall be checked to ensure that it is full.
 1. If it is necessary to fill the reservoir, it shall be filled with the oil/grease that is specified by the hydrant manufacturer.

3.02. FREEZE PROTECTION

- A. All fire hydrant lateral piping shall maintain a minimum cover of 4.5 feet.
 1. At borrow ditch crossings, hydrant lateral pipe cover shall be minimum 4.5 feet to top of lead piping or protected from potential damage and/or freezing by an acceptable method.
 - a. If it is impractical to achieve 4.5 feet of cover, the hydrant lateral piping shall be insulated with a minimum 4 ft x 8 ft x 1 in (minimum thickness) blueboard insulation on top of lateral piping.
 - b. Suitability of any insulation shall be at the sole discretion of the District Inspector.

3.03. OPERATION

- A. Fire hydrants which have been accepted and in operation by the District shall be operated by District personnel only.



END OF SECTION