EAST LARIMER COUNTY WATER DISTRICT

STANDARD CONSTRUCTION SPECIFICATIONS FOR WATER MAINS

July 2016

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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SCOPE

A. The purpose of this document is to present the East Larimer County Water District's criteria for the construction of 6-inch through 16-inch water mains, water services and all appurtenances associated with these mains and services. It is to be used by Owners, Developers, Consultants or Design Engineers, and Contractors as guidelines for the design and construction of said mains, services, and appurtenances.

1. In the case of water mains larger than 16-inch, the Owner, or his representative, shall submit construction specifications to the District for review, prior to the District's approval of construction drawings.

B. These specifications are intended to be sufficiently detailed to provide adequate definition of the work to be performed and to insure the quality of that work.

1. The contractor shall make himself thoroughly familiar with the provisions and the content of these Specifications.

C. These specifications are composed of written Material Specifications and Standard Drawings. The interpretation of any section, or of differences between sections shall be made by the District.

1. When a conflict occurs between or within standards, specifications, or drawings, an interpretation shall be made by the District.

1.2 SPECIFICATION DOCUMENTS

A. Definitions.

1. DISTRICT - the authorized representative of the East Larimer County Water District.

2. OWNER - the developer, corporation, association, partnership, or individual who has entered into an Agreement with the District and for whom the work is to be provided.

3. CONSULTANT - 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 his agent.

4. CONTRACTOR - the corporation, association, partnership, or individual who has entered into an Agreement with the Owner to perform the work.

5. STANDARD STREET SPECIFICATIONS - The current City of Fort Collins, Larimer County, or State Department of Transportation design criteria for streets, as project location dictates.

6. ENGINEER - The Engineer of the District, or his authorized representative.

7. CONSTRUCTION INSPECTOR - Authorized representative of the District, who is assigned to make inspections for contract performances, standards, and contract compliance.

8. CONSTRUCTION DRAWINGS - Detailed and working drawings, including plan, profile, and detail sheets of proposed utility improvements, approved by the District.

9. PROJECT RECORD DRAWINGS - Detailed drawings which show actual construction and contain field dimensions, elevations, details, changes made to the construction drawings by modification, details which were not included on the construction drawings, and horizontal and vertical locations of underground utilities.

    a. Project Record Drawings are usually construction drawings which have been modified to contain the information listed above.

10. OR AN APPROVED EQUAL - as approved to being equal by the District.

    a. Reference Section 01600.

11. PROVIDE - furnish and install complete in place.

12. REMOVE - remove and dispose.

13. SHALL - a mandatory condition.

14. WORK - the entire completed construction or the various separately identifiable parts required to be furnished. Work is the result of performing services, furnishing the labor and furnishing and incorporating materials and equipment into the construction.

15. AWWA - American Water Works Association.

16. ACI - American Concrete Institute.

17. ASTM - American Society for Testing and Materials.

18. ANSI - American National Standards Institute.

19. AASHTO - American Association of State Highway and Transportation Officials.

20. CDOT STANDARDS - Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

B. Interpretation

1. These Specification's contain many command sentences which are directed at the Contractor unless otherwise stated.

2. The Contractor shall request clarification, in writing, of all apparent conflicts by contacting the District. The District will not be responsible for any explanations, interpretations, or supplementary data provided by others.

1.3 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, which will least interfere with service.

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 02713.

1.4 WORK SEQUENCE

A. Contractor shall coordinate the sequence of activities, taking in to account work by others; possible easement requirements; Local, State, and Federal permit requirements; and District Construction Sequence. Note that any County or City road access permit(s) as required for the project shall be the responsibility of and obtained by the Contractor. Any Federal or State road access permit(s) as required for the project shall be the responsibility of and obtained by the District.

B. Contractor shall coordinate the beginning of work, excavation near ditches, railroads, road cuts, pipe filling, chlorination testing and pressure testing with the District, and any affected agencies, such as ditch companies, Public Service Company, Platte River Power Authority, etc. prior to beginning construction.

C. Contractor shall coordinate backfilling operations and testing with the District.

1.5 NOTIFICATIONS

A. Contractor shall contact the District, the Engineer, all utilities, and other concerned agencies, at least 48 hours (exclusive of holidays and weekends) prior to working in areas near underground utilities.

B. Contractor shall pothole and verify location of all existing utilities prior to commencing construction to avoid conflicts.

C. Contractor shall give the Engineer and the District 24 hours (exclusive of holidays and weekends) notice prior to inspections and testing.

D. Contractor shall notify the District, as well as the City, County or State, a minimum of one week prior to beginning work in any public right-of-way.

1.6 SAFETY AND PROTECTION

A. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. Employees on the work 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 and utilities not designated for removal, relocation or replacement in the course of construction.

B. 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.

1.7 SPECIAL REQUIREMENTS

A. Any employee(s) of the pipeline Contractor, or any Contractor-assigned sub-contractor, who do 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.

Should the Contractor fail to remove the identified person(s) or fail to furnish skilled and experienced personnel, or proper personnel for the successful performance of the work, the District may suspend the work by written notice until compliance is achieved.

B. 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.

C. All work must be accepted by the District prior to being placed in service.

D. District furnished material.

1. If the District furnishes any materials, the Contractor shall be responsible for such materials once they have been picked up or delivered to the job site.

2. Contractor shall repair, in a manner acceptable to the District, or replace any 'District furnished material', which has been damaged or stolen, at his own expense.

3. The Contractor is responsible for the careful inspection of District furnished material at the time of delivery.

4. The District is responsible for the quality and operational design aspects of any District furnished material.

E. Landscaping Adjacent to District Waterlines: No landscaping (bushes, shrubs, trees or other plantings) that has a mature height of over 3 feet (3-ft)shall be placed within ten feet (10-ft) of any District waterline (distribution main, service line, meter, etc.). The District shall have the right to remove any landscaping that violates this standard, at any time such landscaping is discovered, and shall not be required to replace the removed landscaping.

SECTION 01600

MATERIALS, EQUIPMENT AND WORKMANSHIP

1.1 MATERIALS AND EQUIPMENT

A. Contractor shall furnish all materials, equipment, labor, and all other facilities and incidentals necessary for the execution, disinfection, testing, and completion of the work, with the exception of any such items furnished by the District.

1. Reference Section 01010 and 02646.

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 their compliance with these specifications.

a. The District shall test any manufacturer's material it deems necessary.

b. It is the Contractor's responsibility to insure 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 a 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.

E. In approving materials or equipment for installation, the District assumes no responsibility for 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.

1.2 WORKMANSHIP

A. Contractor shall provide competent, disciplined, suitably qualified personnel to lay out the work and perform the construction.

B. 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.

SECTION 01656

DISINFECTION OF DOMESTIC WATER LINES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers the filling and disinfection of potable water distribution lines.

B. 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 in-service distribution system.

1.2 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Reference the Forwards to AWWA B300-80 and AWWA C651-86.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hypochlorites.

1. Reference AWWA B300-87.

B. Adhesive.

1. Permatex No. 2.

PART 3 - EXECUTION

3.1 GENERAL

A. The contractor shall flush and satisfactorily disinfect new water lines prior to placing them in service, in accordance with AWWA C651-86.

B. Filling pipe:

1. The District shall operate existing valves to fill the pipe, open air blow-offs, and hydrants.

3.2 PRELIMINARY FLUSHING

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

1. Preliminary flushing shall not be performed if the tablet method of disinfection is approved by the District.

3.3 METHODS

A. General.

1. The District shall:

a. Determine the disinfection method to be used.

b. Approve the method for disposal of flushing water.

c. Sample and test flows from the pipe system extremities until clear, potable water is obtained.

B. Tablet method.

1. The tablet method consists of placing calcium hypochlorite granules and tablets in the water main during construction, and filling the main with potable water when installation is completed.

a. The tablet method shall not be used if trench water or foreign material has entered the water line, or if the water temperature is below forty-one degrees Fahrenheit (five degrees Celsius).

i. If trench water or foreign material has entered the water line, or if the water temperature is below forty-one degrees Fahrenheit, the continuous-feed method of chlorination shall be used.

b. Calcium hypochlorite granules shall be placed at the upstream end of the first section of

pipe, at the upstream end of each branch main, and at 500 foot intervals.

i. Reference Table 1, AWWA C651-86.

c. 5-gram calcium hypochlorite tablets shall be placed in each section of pipe, hydrant, hydrant lateral, and other appurtenances.

i. Reference Table 2, AWWA C651-86.

d. Tablets and granules shall be placed in sufficient number and amount to produce a minimum chlorine concentration in the treated water of 50 milligrams per liter.

e. Except in hydrants and joints, tablets shall be attached with an approved adhesive, and shall be on the top of the interior of the pipe in such a manner that there is no adhesive on the tablet except on the broad side of the tablet next to the pipe surface.

i. Reference paragraph 2.1.B.

f. The District shall introduce water into the pipes at a velocity of less than 1 ft./sec.

g. The chlorinated water shall be retained in the 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 main.

C. Continuous-feed method.

1. The continuous-feed method of disinfecting water mains consists of placing calcium hypochlorite granules in the main during construction, completely filling the main to remove all air pockets, flushing the completed main to remove the particulates, and filling the main with potable water chlorinated so that after a 24 hour holding period in the main, there will be a free chlorine residual of not less than 10 milligrams per liter.

a. Calcium hypochlorite granules shall be placed in the pipe sections during construction.

i. Reference Section 3.3.B.1.c.

b. Preliminary flushing shall occur.

i. Reference Section 3.2 and AWWA C651-86.

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 main shall be filled with the chlorine solution.

ii. Reference Table 4 of AWWA C651-86.

d. The chlorinated water shall be retained in the main 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 main.

D. Slug Method.

1. The slug method of disinfecting water lines shall be used only at the direction of the District.

a. Reference AWWA C651-86.

3.4 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 is less than 1 milligram per liter, whichever is higher.

3.5 BACTERIOLOGICAL TESTS

A. An accredited water quality control laboratory, as previously approved by the District, shall collect samples from the pipeline after final flushing, and prior to placing water lines in service, to test for bacteriological quality to show the absence of coliform organisms. Payment for testing shall be the responsibility of the Contractor.

B. The number and frequency of samples shall be determined

by the approved laboratory based upon AWWA C651-86.

1. In no case shall the number of samples be less than one (1).

3.6 REPETITION OF PROCEDURE

A. If the initial disinfection, or subsequent disinfections, fails to produce satisfactory samples, the main shall be reflushed and resampled. If the samples are still not satisfactory, the main shall be rechlorinated by the continuous-feed or the slug method of chlorination until satisfactory results are obtained.

B. If the residual is less than 25 milligrams per liter, as stated in Paragraph 3.3, the water lines shall be rechlorinated by the continuous-feed or slug method of chlorination and retested.

SECTION 01666

TESTING PIPING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers the hydrostatic testing of water distribution lines.

B. Once the pipeline has been filled and disinfected, and backfilling has been completed and approved, a 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 pressure of 150 psi. and accurately measure leakage from the pipe over a 2 hour, minimum, 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.

2. The District will record times, leakage readings and pressure over the test period.

C. 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 elapse if high-early-strength cement is used.

D. Testing shall not occur until after the pipeline has been chlorinated and flushed.

E. Pipe shall remain filled with water for a minimum of 24 hours prior to the hydrostatic pressure test.

F. Unless prior permission is given by the District, the hydrostatic pressure test shall be performed against all valves within the new piping system.

1.2 PRESSURE TEST

A. "Leakage" is 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.

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. The maximum allowable leakage for each test section of ductile iron pipe, cast iron pipe, steel pipe, and PVC pipe is determined by the following formula:

$$L = \frac{ND(P)^{1/2}}{7400}H$$

where: L = maximum allowable leakage, in gallons.
N = number of joints in the length of pipeline.
D = nominal pipe diameter, in inches.
P = average test pressure during the leakage test, in psi.
H = number of test hours.

1. Reference AWWA C600-77.

D. Testing and Leakage.

1. Unless prior written permission is given by the District, a test section shall not be any longer than the length of pipe between adjacent line valves.

1.3 PASSING

A. If the tests disclose leakage greater than that specified 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.

B. With the exception of obvious leaks, passing of the pressure test shall be on the basis of maximum allowable leakage per section tested.

C. All visible leaks shall be repaired regardless of maximum allowable leakage.

1.4 WET TAP PRESSURE TEST

A. All wet taps of live mains shall be pressure tested after the tapping valve has been installed and the tap is completed.

B. Test Pressure.

a. The pressure test of the tapping valve shall be completed with a minimum test pressure of 200 psi.

b. A residual pressure of within 5 psi of the test pressure shall be maintained for a minimum of 5 minutes.

C. Passing.

a. If the tests disclose leakage greater than that specified the defective materials and connection shall be immediately repaired.

b. The pressure test shall then be repeated until the leakage is less than the maximum allowed.

c. All visible leaks shall be repaired regardless of maximum allowable leakage.

SECTION 01710

SITE CLEANUP

1.1 GENERAL

A. Site cleanup shall be executed during the progress of the work, and at the completion of the work.

1.2 EXECUTION

A. Construction materials shall be neatly stored.

B. Containers shall be provided for the collection of waste material and debris.

1. Containers shall be stored out of the right-of-way.

C. Volatile wastes 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. Contractor shall restore any land that will not be paved with asphalt, or concrete, to its original condition.

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.

2. All exterior paved surfaces shall be broom cleaned, and left in good repair.

1.3 DISPOSAL

A. In order to maintain an orderly site, waste material and debris shall be removed periodically.

B. Volatile wastes shall be removed daily.

SECTION 01720

PROJECT RECORD DRAWINGS

1.1 RECORDING OF DRAWINGS

A. Accurate Project Record Drawings shall be compiled by the Contractor and provided to the District prior to Preliminary acceptance of the Work.

B. Each sheet of the drawings shall be labeled "DRAWINGS OF RECORD" in neat large printed letters.

C. Construction information shall be recorded concurrently with construction progress.

D. Project Record Drawings shall be marked legibly and with an indelible pen.

E. Project Record Drawings shall record actual construction and contain the following:

1. Field dimensions, elevations, and details.

2. Changes which are made by a modification.

3. Details which are not on the original Construction Drawings.

4. Horizontal and vertical locations of underground utilities and appurtenances referenced to a minimum of three permanent surface improvements.

5. Depths of various elements of work in relation to project datum.

1.2 MAINTENANCE OF PROJECT RECORD DRAWINGS DURING CONSTRUCTION

A. Project Record Drawings shall be stored apart from documents used for construction.

B. Project Record Drawings shall be maintained in a clean, dry, legible condition and in good order.

1. Project Record Drawings and any documents used for the preparation of said Drawings shall not be used for construction purposes.

1.3 SUBMISSION

A. Project Record Drawings shall be submitted to the District with a transmittal letter, in duplicate, containing:

   1. Date.

   2. Project title.

   3. Contractor's name, address and telephone number.

   4. Developer's name, address, and telephone number.

   5. Title and number of each Record Document.

B. Project Record Drawings shall be submitted on 24" x 36", 3 mil (minimum) reproducible, double-matte mylar.

   1. No acceptance of the utility lines will be made until the Project Record Drawings are received and accepted by the District.

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.1 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.

1.2 QUALITY ASSURANCE

A. Soil compaction tests shall be performed in accordance with:

1. ASTM D698 - Standard Method of Test for Moisture Density Relations of Soils.

2. ASTM D2049 - Standard Method of Test for Relative Density of Cohesionless Soils.

B. Construction Staking.

1. Construction staking shall be performed with qualified, competent personnel.

2. All survey notes and construction staking notes shall be entered into bound, hard cover field books.

3. Staking of the work shall be at a maximum of 50 foot stations.

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 Developer's Engineer in performing surveys which are required by the work, shall be available to the District for examination throughout the construction period.

1.3 JOB CONDITIONS

A. Drainage and groundwater.

1. All excavations and trenches shall be kept free from excess groundwater during construction.

2. Any water which is encountered in the trench shall be removed to the extent necessary to provide a firm subgrade, to permit joints to be made in the dry, and to prevent the entrance of water into the pipeline.

3. Surface runoff shall be diverted as necessary to keep excavations and trenches free from water during construction.

4. 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.

5. Water shall be prevented from entering into previously constructed pipe.

6. 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 automotive 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 amount 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. Contractor shall notify each affected utility owner and request utilities to be field located by surface reference at least 48 hours prior to trenching or excavation.

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 appropriate agency.

      i. All other underground obstructions shall be replaced with new materials.

      b. The area in which the underground obstruction was located shall be restored to original condition, or better.

1.4 MAINTENANCE AND CORRECTION

A. Contractor shall maintain and repair all trench settlement and make necessary repairs to pavement, sidewalks or other structures which may be damaged as a result of backfill settlement.

1. Contractor shall warrant work for a period of two (2) years after completion and preliminary acceptance of the work. At end of the two year warranty period a final inspection shall be completed by the District and, if no problems are noted, final acceptance will be given.

B. Contractor may perform such maintenance and repairs by subcontract.

1. If the contractor chooses to subcontract the warranty work, he shall submit to the District, a copy of the subcontract, or the work authorization, as evidence of the contractor's faithful intention to perform any repairs which may become necessary during the two-year warranty period.

PART 2 - MATERIALS

2.1 STABILIZATION MATERIAL

A. If the existing soil in the trench bottom is judged to be unsuitable by the District, the top 6-inches of the pipe subgrade shall be removed and replaced with a stabilization material.

1. Stabilization material is crusher-run rock, conforming to ASTM D448, or CDOT #357.

SIZE	PERCENT PASSING
2"	95-100
1"	35- 70
1/2"	10- 30
#4	0- 5

B. Acceptable types of filter fabric and their manufacturers are:

1. Mirafi 140 and 500 x, by "Celanese".

2. Bidim C-28 and C-34.

3. True Tex M G-100, by "True Temper".

4. Fibretex Grade 150, by "Crown Zellerbach".

2.2 BEDDING MATERIALS

A. Granular material.

1. Uniformly graded material, conforming to CDOT #67.

SIZE	PERCENT PASSING
1"	100
3/4"	90-100
3/8"	20- 55
#4	0- 10
#8	0- 5

B. Select soil.

1. Excavated material which is free from rocks, clods, and stones greater than 1 1/2 inch in any dimension, and which meets other requirements of trench backfill material.

2. Granular material.

a. Reference paragraph 2.2.A.

C. Barrier material.

1. Soil Classification.

a. GC - clayey gravels, gravel-sand-clay mixtures.

b. SC - clayey sands, sand-clay mixtures.

c. CL - inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, clean clays.

d. Material may be finely divided, suitable, job excavated material free from stones, organic matter and debris.

D. Hydrant gravel.

1. Reference Section 02644.

2.3 TRENCH BACKFILL MATERIAL

A. Trench backfill material shall be placed from a point 12-inches above the pipe to 12-inches below the ground surface or to the bottom of the pavement subgrade, whichever is greater.

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 specifications for Class #2.

PART 3 - EXECUTION

3.1 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.

3.2 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. Trench width shall be maintained to within 3 inches of that specified on plans.

C. 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.

D. Mechanical 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.

E. 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 in order to obtain clearance.

F. Contractor shall over-excavate a minimum of six inches below the bottom of the pipe wherever the trench bottom is rock, shale, or other unsuitable material.

   1. Over-excavation shall be backfilled and compacted with acceptable Granular Material.

      a. Reference paragraph 2.2 A.

G. 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 subgrade, which is suitable 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 Engineer.

      b. The over-excavation shall be backfilled with stabilization material and compacted as required by the District.

         i. Reference paragraph 2.1.

H. Stockpiling excavated materials.

1. Suitable material for backfilling shall be stockpiled in an orderly manner, and a minimum of 2 feet from the edge of the trench.

2. Excess excavated materials not suitable or not required for backfilling shall be removed and disposed.

3. Excavated material shall not be stockpiled against existing structures or appurtenances.

I. Limiting trench widths.

1. Trenches shall be excavated to a width necessary to provide an 8-inch minimum working space between the pipe and the trench walls for proper pipe installation, joining, and bedding.

2. The maximum trench width at an elevation 12 inches above the top of the installed pipe, shall be 2 barrel diameters of the pipe, or 32 inches, whichever is greater.

   a. If the width of the trench, 12 inches above the top of the pipe, exceeds the maximum allowable trench width, a higher strength pipe or special pipe bedding shall be provided, as required by soil loading conditions and as determined by the District.

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, as per ASTM D2049.

3.3 PIPE BEDDING

A. Placement and compaction.

1. Reference Pipe Bedding Detail.

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. To prevent vertical or lateral displacement of pipe, 3/4" CDOT #67 specification washed rock bedding material shall be deposited and compacted uniformly and simultaneously a minimum of four inches (4") under and on each side to top of pipe. Note - In unstable conditions; i.e., rock, water, wet soils, etc., the District may require CDOT #357 specification bedding.

4. Granular bedding material shall be compacted in accordance with these Specifications.

B. Ground water barriers 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, and the full width of the trench.

1. Ground water barriers shall be approximately four (4) feet long and spaced not more than 400 feet apart.

2. Material shall be as specified by the ditch company which controls the irrigation ditch.

a. If there is no ditch company, the District shall determine the material to be used.

3.4 BACKFILLING AND COMPACTION

A. Trenches shall be backfilled promptly after the pipe has been installed and inspected.

1. Backfill around manholes and valve boxes shall be compacted with hand-operated equipment.

2. Reference paragraph 1.3.B.2.

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 1-1/2 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 six (6) inches (compacted depth), in all areas.

1. Other thickness may be used with the prior written 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 can not 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.

3.5 FIELD QUALITY CONTROL

A. Field compaction control.

1. Field tests will be conducted to determine compliance of compaction methods with specified density in accordance with ASTM D2922 (Tests for Density of Soil and Soil-Aggregate In Place by Nuclear Methods).

2. Compaction tests shall be performed at a depth of 1.5 feet above the top of the pipe and in 1 foot vertical increments up to the finish grade.

a. Compaction tests shall be performed at least once every 100 linear feet, as measured along the length of the pipe.

b. 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.

B. Compaction shall be to the following minimum densities: (Reference ASTM D698 or AASHTO T99 unless otherwise indicated).

1. Barrier material: 95% of maximum density.

2. Pipe bedding.

a. Compacted granular material: 80% of maximum relative density (ASTM D2049).

b. Carefully compacted select soil: 90% of maximum density.

c. Barrier material: 95% of maximum density.

3. Trench backfill.

a. Paved roadways, sidewalks and other areas which are to be paved.

i. Top four feet: 95% of maximum density.

ii. Remainder of trench: 90% of maximum density.

b. Gravel roadways: 95% of maximum density.

c. Fields and all other areas: 90% of maximum density.

d. Under footings, foundations or structures: 100% of maximum density.

e. All other locations: 95% of maximum density.

C. Moisture content.

1. All compacted backfill shall be within 2% (+/-) 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 insure a uniform moisture content, as specified.

SECTION 02224

PIPE BORING AND JACKING

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 QUALITY ASSURANCES

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 as a result of jacking operations.

a. Increased pipe strength shall be provided as necessary to withstand jacking loads.

B. Construction Criteria.

1. Contractor shall obtain the necessary permits from the appropriate entities (County, City, railroad, ditch company, etc), prior to commencing construction. The District shall be responsible for obtaining Federal or State road access permit(s).

2. 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.

PART 2 - PRODUCTS

2.1 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 as determined by the agency granting the

crossing permit. In no event shall the minimum wall thickness be less than 3/8".

C. The ends of smooth steel casing pipe shall be beveled for field welding.

D. Buried smooth steel casing pipe shall have a coal-tar enamel exterior coating, which conforms to AWWA C203-86, Section 2 (when required by the Construction Drawings).

1. If the Contractor elects to omit the coal-tar enamel exterior coating, 1/16 inch shall be added to the required thickness of the casing pipe.

2.2 ACCESSORIES

A. Casing Seals.

1. Casing seals shall be prefabricated with high density rubber and stainless steel straps.

2. The acceptable type and manufacturer of casing seals are:

a. Pipeline Seal and Insulator Co., Model W.

b. Or an approved equal.

B. Chocks.

1. Chocks are required for support of all cased carrier piping and shall be prefabbed as available from Powerseal as Model 4810, or approved equal.

C. Grout.

1. Grout shall consist of 1 part Portland Cement and 3 parts sand.

PART 3 - EXECUTION

3.1 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 02221.

B. Smooth Steel Pipe.

1. Adequate equipment shall be provided so as to insure 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 in order to prevent the backflow of grout.

3.2 CARRIER PIPE INSTALLATION

A. Reference Section 02615.

B. Support chocks shall be individually attached to the pipe as specified by the manufacturer.

a. Each pipe shall have a minimum of 3 chocks per pipe section.

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.

SECTION 02225

SPANNED PIPE CASING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers the furnishing and the installation of spanned (or aerial) pipe casing.

1.2 QUALITY ASSURANCES

A. Design Criteria.

1. Specified thickness for casing pipe is based upon the suspension loads.

a. Increased pipe strength shall be provided as necessary to withstand projected suspension loading.

B. Construction Criteria.

1. Contractor shall obtain the necessary permits from the appropriate entities, prior to commencing construction. Or, in the case of public rights-of-way, the District shall be responsible for obtaining the necessary access permits.

2. 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.

PART 2 - PRODUCTS

2.1 CASING PIPE AND SUPPORT MEMBERS - 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 determined by the agency granting the crossing permit. In no event shall the minimum wall thickness be

less than 3/8".

1. Reference District Detail Drawing titled "Spanned Crossing Detail".

C. The ends of smooth steel casing pipe shall be beveled for field welding.

D. Support member steel shall be a minimum of 5/8" in thickness.

1. Reference District Detail Drawing titled "Spanned Crossing Detail".

E. All casing pipe and support member material shall be coated with a rust inhibitive epoxy paint exterior coating of a neutral grey or tan color.

2.2 ACCESSORIES

A. Casing Seals.

1. Casing seals shall not be required when interior void area between carrier piping and casing pipe is sealed with insulation as specified in Section 2.2, C. below.

B. Chocks.

1. Chocks are required for support of all cased carrier piping and shall be prefabbed as available from Powerseal as Model 4810, or approved equal.

C. Insulation.

1. All void areas within spanned (or aerial) casing pipe shall be completely filled with injected polyethylene foam insulation.

PART 3 - EXECUTION

3.1 CASING INSTALLATION

A. General.

1. Vertical and horizontal offset staking shall be provided at both ends of spanned casing installation.

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.

B. Steel Pipe.

1. Adequate equipment shall be provided so as to insure a continuous and uniform casing.

2. Each section of pipe and support members 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 projected suspension stresses.

C. Insulating.

1. Polyethylene foam insulation shall be injected through each injection port and each end of casing to completely fill all voids between carrier piping and casing.

3.2 CARRIER PIPE INSTALLATION

A. Reference Section 02615.

B. Support chocks shall be individually attached to the pipe as specified by the manufacturer.

a. Each pipe shall have a minimum of 3 chocks per pipe section.

SECTION 02575

PAVEMENT REPAIR AND RESURFACING

PART 1 - GENERAL

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

1.2 The words "Standard Street Specifications", as used herein, refer to the current City of Fort Collins, Larimer County or State Department of Transportation Design Criteria and Standards for Streets.

PART 2 - MATERIALS

2.1 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 "Standard Street Specifications".

PART 3 - EXECUTION

3.1 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 which is 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 assure a proper alignment.

3.2 ASPHALT AND CONCRETE, INCLUDING BASE AND GRAVEL SURFACING

A. 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.

3.3 CONCRETE SURFACING

A. With the exception of 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.

3.4 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 "Standard Street Specifications".

2. Reference Section 03300.

SECTION 02615

DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers ductile iron pipe.

B. Pipe shall be furnished complete with all fittings, flanges, specials and other accessories.

1.2 PRODUCT DELIVERY, STORAGE AND HANDLING

A. 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 shall not be handled in any manner which will cause damage.

B. 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 C600-77, shall not be exceeded.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE

A. All ductile iron pipe, with push-on joints, shall be

manufactured in accordance with ANSI A21.51-86(AWWA C151).

B. All ductile iron pipe, with flanged, flat faced joints, shall be manufactured in accordance with ANSI A21.15-83(AWWA C115).

C. Ductile iron pipe which is less than 12 inches in diameter shall be Class 52 pipe.

D. Ductile iron pipe which is 12 inches in diameter or larger shall be Class 51 pipe.

E. All ductile iron pipe shall have nominal laying lengths of either 18 or 20 feet.

1. Random pipe lengths are not acceptable.

2.2 FITTINGS AND COUPLINGS

A. All fittings and couplings shall be manufactured in accordance with AWWA C104-85, C-153, and C111-85.

B. All fittings and couplings shall have one of the following types of connections:

1. Flanged.

2. Mechanical joint.

3. Push-on.

C. All fittings and couplings shall be made of either gray-iron or ductile iron, epoxy-coated and have a minimum pressure rating of 150 psi.

D. All installed fittings and couplings shall be securely wrapped in 8 mil plastic.

E. All nuts and bolts shall be manufactured in accordance with ANSI-A21.11-00(AWWA C111).

F. For buried service all t-bolts and nuts shall:

a. Be installed with zinc anode caps.

i. Acceptable Products and Manufacturers:

1. MARS Zinc Cap as manufactured by Farwest

Corrosion Control Company.

2. Or approved equal.

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

i. Acceptable Manufacturer:

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

2. Or approved equal.

2.3 JOINTS

A. All mechanical and push-on joints shall be manufactured in accordance with ANSI A21.11-85(AWWA C111).

1. All gaskets shall be made of synthetic rubber.

2. Lubricant shall be that which is specified by the pipe manufacturer.

3. All nuts and bolts shall be manufactured in accordance with ANSI-A21.11-85(AWWA C111).

B. For buried service all t-bolts and nuts shall:

a. Be installed with zinc anode caps.

i. Acceptable Products and Manufacturers:

1. MARS Zinc Cap as manufactured by Farwest Corrosion Control Company.

2. Or approved equal.

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

i. Acceptable Manufacturer:

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

2. Or approved equal.

C. All ductile iron pipe with threaded flanged joints shall be manufactured in accordance with ANSI A21.15-83(AWWA C115).

1. All flanges shall be sized and drilled in accordance with ANSI B16.1, Class 125 Cast-Iron Flange.

2.4 PIPE LINING

A. All ductile iron pipe shall have a standard thickness cement mortar lining.

1. Ductile iron pipe which is less than 12 inches in diameter shall have a cement mortar lining with a minimum thickness of 1/16 inch.

2. Ductile iron pipe which is 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 A21.4-85(AWWA C104).

2.5 PIPE COATINGS

A. All ductile iron pipe shall have a bituminous coating on the pipe exterior.

1. The minimum thickness of the bituminous coating shall be 1 mil.

PART 3 - EXECUTION

3.1 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 02713.

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 Project 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 C600-77.

4. After initial acceptance of the waterline, the Contractor shall be responsible for the repair of any leak which is discovered within a two year period.

E. Loose polyethylene encasement

1. Polyethylene encasement shall be used whenever the resistivity of the native soil is less than 2,500 ohm-centimeters, or as required by the District.

2. All polyethylene encasement for ductile iron pipe shall conform to ANSI 21.5-82(AWWA C105).

   a. Polyethylene shall be a minimum of 6 mils thick.

   b. 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, which shall be 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 1 foot.

5. When polyethylene is used, the bedding and backfilling shall be controlled so that the polyethylene is not torn or damaged.

6. Loose 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.

3.2 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 insure that the spigot end is inserted 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. A torque limiting wrench shall be used, and bolts shall be tightened to the following torque values:

Bolt Size	Torque(Ft. Lbs.)
5/8"	40 - 60
3/4"	60 - 90
1"	70 - 100
1 1/4"	90 - 120

5. Holes in mechanical joint bells shall straddle the top centerline.

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.

2. The gap between pipe ends being coupled shall be less than one 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 assure uniform gasket compression.

6. Holes in flanges shall straddle the top centerline.

SECTION 02622

PLASTIC PRESSURE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section covers plastic pressure pipe.

1. All pipe shall be furnished complete with all fittings, specials, and other accessories.

1.2 USE

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

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. 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.

B. 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.

PART 2 - PRODUCTS

2.1 PLASTIC PRESSURE PIPE

A. All plastic pressure pipe shall be manufactured in accordance with AWWA C900-97 or AWWA C905-97.

B. Plastic pressure pipe shall be:
1. C900, Class 150 (DR 18) – for pipe diameter 4 to 12 inches.
2. C905, Class 165 (DR 25) – for pipe diameter 14 to 24 inches.
3. Pipe with a diameter greater than 24 inches shall be specified based on engineered design.

C. All joints on plastic pressure pipe shall be push-on, using an integral bell with an elastomeric-gasket.

D. The following are acceptable manufacturers of plastic pressure pipe:

1. J-M Pipe

2. Diamond

3. North American

4. P.W. Eagle

E. All plastic pressure pipe shall have a nominal laying length of 20 feet.

1. Random pipe lengths are not acceptable.

2.2 FITTINGS

A. Reference Section 02615.

2.3 COUPLINGS

A. Reference Section 02615.

PART 3 - EXECUTION

3.1 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 02713.

C. Cutting the pipe.

1. The pipe shall be cut smooth, straight and at right angles to the pipe axis, with saws or pipe cutters which are 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.

D. 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 waterline, the Contractor shall be responsible for the repair of any leak which is discovered within a two year period.

3.2 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 insure that the spigot end is inserted 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.

B. Plastic pressure pipe shall not be installed without the use of tracing wire.

1. A single, braided, 12-gauge, insulated copper wire (to be used as a tracing wire) shall be taped to the top of all pipe using vinyl “E” tape (Winmore #413-E or approved equal).

    a. The tracing wire shall be one piece, installed in a continuous run between access points (trace 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 continuous loop. 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.

2. Contractor shall check tracing 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. In the event that continuity test reveals a loss of continuity, the Contactor shall locate the break and repair damage prior to proceeding on with the installation of further piping and tracing wire. Upon substantial completion of the project the complete tracing wire installation shall be checked for continuity by ELCO Water District staff. The project will not be approved for service until such time as all continuity tests pass.

SECTION 02641

VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 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 of 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

2.1 GENERAL

A. All valves shall open counter-clockwise (left).

B. All buried valves shall have a 2-inch square operating nut.

1. All operating nuts shall be painted black.

C. Any valve which will be placed in a vault, shall have a valve operator which is specifically approved by the District.

2.2 GATE VALVES

A. All gate valves shall be a resilient seat type and manufactured in accordance with AWWA C509-87.

1. All gate valves shall have an epoxy coated interior.

B. All gate valves shall be provided with two O-ring type stem seals, in accordance with Section 4.8 of AWWA C-509-87. Gate valves must meet or exceed requirements as set forth by AWWA C-515.

1. Acceptable manufacturers of gate valves are:

    a. Mueller.

    b. American Flo Control.

    c. Clow

No substitutions will be allowed.

2.3 BUTTERFLY VALVES

A. All butterfly valves shall conform to AWWA C504-80.

1. All butterfly valves shall have an epoxy coated interior.

2. All flanged butterfly valves shall be the short body type.

3. All butterfly valves shall be Class 150B.

4. The operator torque shall be as specified in AWWA C504-80, Appendix A.

5. Acceptable manufacturers of butterfly valves are:

    a. Mueller

    b. Pratt

    c. Approved equal

2.4 VALVE BOXES

A. Main Line Valves

1. All valve boxes shall be East Jorden or Castings 5 1/4 inch shaft, screw-type with the word "WATER" cast into the lid.

2. All valve boxes shall be 664-S series, #6 base.

3. All installed valve boxes shall be securely wrapped in 8 mil plastic.

No substitutions will be allowed.

2.5 AIR RELIEF/VACUUM RELIEF VALVES

A. Materials and Construction

1. Air relief and vacuum relief valves shall have an integral type assembly which will function both as an air release and vacuum valve.

2. All air relief and vacuum relief valves shall be rated at a working pressure of 150 psi. and a minimum hydrostatic test pressure of 250 psi.

3. The size of air relief and vacuum relief valves shall be as noted on the Construction Drawings.

4. Taps for air relief and vacuum relief valves shall be made with a tapping saddle.

5. 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 C800-66.

   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.

6. The body of all air relief and vacuum relief valves shall be either cast iron, conforming to ASTM A48-Class 35A, or ductile iron, conforming to ASTM A27-GR U60-30.

7. The working parts and seats of air relief and vacuum relief valves shall be brass, stainless steel, or other non-corroding material.

8. The float of air relief and vacuum relief valves shall be stainless steel.

9. All air relief and vacuum relief valves shall be watertight to a pressure of 150 psi.

10. A vacuum check shall be provided where required on Construction Drawings.

B. Manufacturers

1. Acceptable air release and vacuum relief valves, and their manufacturers are:

    a. APCO Combination Air Release Valve, by Valve and Primer Corporation.

    b. Crispin Universal Air Valve, by Multiplex Manufacturing.

    c. CAV Combination Air Release and Vacuum Valve, G.A. Industries Inc.

2.6 CHECK VALVES

A. Acceptable check valves and their manufacturers are:

1. G.A. Industries, Inc., 250 D with renewable bronze seat.

2. American Darling, 52 SC.

3. Mueller, "Detector Gravity".

B. All check valves shall be rated at a working pressure of 150 psi.

PART 3 – APPLICATION

3.1 VALVE TYPE

A. Valves 12” or larger in size and valves installed within pressure zones maintaining 100 p.s.i. or greater, as determined by the DISTRICT, shall be butterfly valves. An exception to this requirement will be that all wet tap connections shall be made with tapping valves.

PART 4 - EXECUTION

4.1 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. The valve 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.

   a. Reference Section 02221.

4. All installed valves shall be securely wrapped in 8 mil plastic.

C. Valves – Wet Tap Installations

1. Valves installed in a wet tap configuration shall pass pressure testing at 200 P.S.I. for 5 minutes prior to commencing tap of the live main.

D. 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 which are mounted to one side of the valve shall be located to the south or west of the valve.

4. Valve boxes which 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. All installed valve boxes shall be securely wrapped in 8 mil plastic.

4.2 AIR RELIEF/VACUUM RELIEF VALVES

A. Air relief and vacuum relief valves shall be installed at high points, and as shown on the Construction Drawings.

B. Air relief and vacuum relief valves shall be installed in accordance with the standard District detail.

4.3 OPERATION

A. Valves which have been accepted by the District shall be operated by District personnel only.

SECTION 02644

FIRE HYDRANTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section covers dry-barrel fire hydrants.

1.2 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

2.1 GENERAL

A. All fire hydrants shall be manufactured in accordance with AWWA C502-85.

1. The fire hydrant valve and the nozzle caps shall open counterclockwise (left).
2. The fire hydrant 1" square operating nut shall open clockwise (right).

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 02641.

C. The hydrant tee on the main line shall be a swivel tee.

D. Acceptable fire hydrant models and their manufacturers are:

1. Mueller Super Centurion with epoxy coated shoe.

2. American Flo Control Waterous Pacer WB-67-250X with epoxy coated shoe.

No substitution will be allowed.

2.2 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 150 psi.

B. All fire hydrants shall have a minimum main valve box opening size of 5-1/4 inches.

C. Shoe inlets shall be 6 inches, with mechanical joint fittings.

D. Fire hydrant laterals shall be buried a minimum of 4-1/2 feet, unless otherwise directed by the District.

E. The fire hydrant pumper nozzle shall be 4-1/2 inches in diameter with 6 threads per inch.

   1. Pumper nozzle threads shall be open left.

F. Fire hydrant hose nozzles shall be 2-1/2 inch diameter with 7-1/2 threads per inch.

   1. Hose nozzle threads shall be open left.

G. All fire hydrants shall have a 1 inch square operating nut.

H. All fire hydrants shall be painted yellow by the Contractor.
   1. Approved paint: Aervoe Supreme Rust Shield
      Color: #5009 Equipment Yellow

2.3 HYDRANT GRAVEL

A. Hydrant gravel shall be well graded crushed stone or gravel, conforming to ASTM-D448, CDOT #67, as listed below:

SIZE	PERCENT PASSING
1"	100
3/4"	90 - 100
3/8"	20 - 55
#4	0 - 10
#8	0 - 5

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fire hydrants shall be installed in accordance with the standard District details, titled “Typical Fire Hydrant Installation” or “Typical Fire Hydrant Installation – High Density Development Areas.” The High Density Development Area installation detail will be applied to all projects designed to urban standards without borrow ditch cross section.

B. The Developer's 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 plans.

        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 insure 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. A concrete thrust block, with a minimum bearing surface area of 4.5 square feet, shall be placed behind the hydrant shoe.

    1. 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.

    2. Care shall be taken when placing thrust blocks so that hydrant drain holes remain free of obstructions.

F. After pouring the thrust block, hydrant gravel shall be placed to a depth of 12" above the hydrant shoe.

   1. Hydrant drain holes shall remain free of obstructions.

G. Hydrants which are placed in concrete sidewalks or pavement, shall maintain six inches of horizontal clearance between the concrete and the hydrant barrel.

   1. The space between the concrete and the barrel shall be filled with asphalt or gravel.

H. All hydrants shall conform to the Uniform Fire Code, Section 10.206 (1979).

   1. There shall not be a post, fence, vehicle, growth, trash, storage, or other material or thing, within 4 feet of a fire hydrant.

   2. The ground surrounding the fire hydrant shall slope away from the hydrant at a minimum grade of 2%.

I. After installation of the hydrant is complete, the oil/grease reservoir shall be checked to insure that it is full.

   1. If it is necessary to fill the reservoir, it shall be filled with the oil/grease which is specified by the hydrant manufacturer.

3.2 FREEZE PROTECTION

A. Fire hydrants installed to “Typical Fire Hydrant Installation” standard (where borrow ditch cross section is involved) will be protected from freezing of the 6” lead piping by either maintaining minimum cover of 4.5 feet from invert of the borrow ditch to top of lead piping or by means of insulating with 4’x8’x1/2” blueboard insulation on top of lead piping.

3.3 OPERATION

A. Fire Hydrants which have been accepted by the District, shall be operated by District personnel only.

SECTION 02645

FIRE LINE SERVICE MAINS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section covers the installation of fire line service mains. Fire line service mains are described as water service mains which are dedicated for the purpose of fire protection only; as in connection to a building fire standpipe, fire sprinkler system, etc. In some cases the fire line installation may also involve installation of an associated fire hydrant assembly.

1.2 CONDITIONS

A. Fire line mains are connected to the water distribution system by means of either an installed tee (requiring shut down of the existing distribution system main by District personnel, if main is in service) or by means of a wet tap assembly. Note that wet taps shall not involve a “size-on-size” connection; i.e., a 6” fire line main may not be connected to a 6” water distribution system main by means of a wet tap. The fire line main involved must be smaller than the distribution system main to allow a wet tap.

B. Connection of the fire line main to the distribution main will include a control valve at the tee or wet tap. Note that District ownership and maintenance for a connected fire line service main ends with and includes this control valve. Ownership and responsibility of the fire line service main beyond the control valve shall remain the perpetual responsibility of the property owner.

   The only exception shall be circumstances which also include a fire hydrant assembly connected to the subject fire line service main. In such case the District’s ownership and responsibility shall end with the tee connecting the fire hydrant to the fire line service main and shall include responsibility for the subject fire hydrant run and fire hydrant assembly.

C. All fire line service mains shall incorporate a District approved backflow prevention device.

PART 2 - PRODUCTS

2.1 PIPE

A. Reference Section 02713.

2.2 VALVES

A. Reference Section 02641.

2.3 FIRE HYDRANTS (IF REQUIRED)

A. Reference Section 02644.

PART 3 - EXECUTION

3.1 INSTALLATION

A. In the case of new water distribution system construction calling for fire line main stubouts, the approved contractor shall perform installation of the tee connection for all fire line service main connections.

B. In the case of water distribution systems already in service, connections made to the distribution system shall be made by District approved contractors only.

The property owner’s contractor shall then complete the proposed fire line service main from the installed connection to the designated point of termination.

SECTION 02646

SERVICE LINES, METERS AND APPURTENANCES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers the materials and installation of corporation stops, service lines, meters, meter setters and meter pits.

1.2 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The product shall be handled, stored, and protected in a manner which will prevent damage to materials, coatings and finishes.

B. All material shall be kept clean and free from dirt.

1.3 INSTALLATION OF SERVICE TAPS

A. Only District personnel shall make service taps on mains which have passed preliminary or final acceptance.

B. The Contractor shall not make any taps on newly constructed mains prior to approval by the District.

C. All service line taps shall be installed using tapping saddles.

1. Taps on existing lines shall be made with a tapping saddle and shall be completed by District personnel only.

D. Tapping equipment shall be of good quality, used for the purpose intended and used in accordance with manufacturer's instructions.

1. Reference Section 01600.

E. 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.

F. The contractor shall give forty-eight hours advance notice to the District before any tap is made.

1.4 MAINTENANCE AND CORRECTION

A. The contractor shall maintain and repair all service lines and any associated appurtenances which leak, were installed incorrectly, or otherwise prove to be defective, for a period of two (2) years after final completion and acceptance of the work.

1.5 METER SETTERS

A. Unless it is otherwise specified, meters, strainers, and meter setters for 1 1/2-inch, 2-inch and 3-inch meters shall be installed by the District, or Contractor by prior authorization. Decision for installation responsibility shall be as noted on Final Construction Plans for the Project.

   1. Meter settings for 1 1/2-inch and 2-inch meters shall be exterior settings only.

   2. Meter settings for 1 1/2-inch and 2-inch meters shall be installed in accordance with the standard District detail.

B. Acceptable meter setter manufacturers and models are:

   1. A.Y. McDonald Dual Check Setter

      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″

1.6 METER PITS

A. 3/4-inch and 1-inch meters pits shall be installed by the District. Decision for installation responsibility shall be as noted on Final Construction Plans for the Project.

   1. Meter pits shall be 20 inches in diameter, a minimum of 48 inches in length, wall thickness of 1/2″ and shall have a notched bottom.

   2. Acceptable meter pit manufacturers are:

a. Mid States
b. D.F.W. 1/2″ Wall

3. Meter pit covers shall be constructed of cast iron with rubber inner frost lid. Meter pit cover shall be pre-drilled with 1-3/4″ offset opening for “Toughread” head installation.

   a. The minimum allowable opening for meter pit covers shall be 11 inches diameter.

   b. All meter pit covers shall have a 27/32" worm-lock with a Standard Waterworks pentagon head.

4. Acceptable meter pit covers and their manufacturers are:

   a. Ford, W-3-TP Single.
   b. Ford, W-3-TTP Double.
   c. Casting, W32-CI with rubber inner lid and one 1-3/4″ pre-drilled opening (Single).
   d. Casting, W32-CI with rubber inner lid and two 1-3/4″ pre-drilled openings (Double).

B. 1 1/2-inch and 2-inch meters pits shall be installed by the Contractor.

1. Meter pits shall be constructed from standard 48 inch inside diameter precast concrete manhole sections.

   a. Reference Section 03400.

2. Meter pit covers shall be an aluminum manhole ring and cover with a 24-inch diameter opening.

   a. All meter pit covers shall have a 27/32" worm-lock with a Standard Waterworks pentagon head.

   b. All meter pit covers shall have the word "water" cast in the lid.

C. 3-inch and larger meter vaults shall be installed by the contractor.

1. Meter vaults shall be constructed from precast concrete box sections designed for H-20 bridge

loading.

a. Vault dimensions for different size meters are as follows:

Meter Size	Inside Vault Dimension
3"	6' x 7'
4"	7' x 7'
6"	8' x 8'
8" and larger	determined by District

2. Unless it is otherwise specified, meter vault covers shall be an aluminum manhole ring and cover with a 24-inch diameter opening.

a. All meter vault covers shall have a 27/32" worm-lock with a Standard Waterworks pentagon head.

PART 2 - PRODUCTS

2.1 TAPPING SADDLES

A. All tapping saddles shall have a bronze or brass body, with bronze double flat straps or brass hinge assembly and bronze nuts.

1. Outlet threads on tapping saddles shall be "cc" type only.

B. Acceptable manufacturers of tapping saddles are:

1. Mueller.

2. Ford.

3. A.Y. McDonald

4. There will be no substitutions allowed.

2.2 CORPORATION STOPS

A. All corporation stops shall conform to AWWA C800-66.

1. All corporation stops shall be compression.

2. Corporation stop inlet threads for tapped saddles shall be "cc" type only.

3. Corporation stop outlets shall be installed using a compression connection.

4. Corporation stops shall be used for all taps which are 1-inch and smaller.

5. Corporation stops shall incorporate ball valves only.

   a. Plug valves will not be allowed.

B. Acceptable models and manufacturers of corporation stops for all installations are:

1. Mueller B-2508

2. Ford FB-10003Q

3. A.Y. McDonald 4701BQ

3. There will be no substitutions allowed.

2.3 COPPER SERVICE LINES

A. Copper pipe shall be used for service lines which are 2-inches and smaller.

B. All copper services shall conform to the Appendix to AWWA C800-66.

1. The copper for copper services shall be Type K, only.

2.4 COUPLINGS

A. All couplings shall be compression.

B. Acceptable couplings and their manufacturers are:

1. Mueller #H-15403.

2. Ford #C44-"d".

   a. "d" equals the diameter of the service.

3. A.Y. McDonald

4. There will be no substitutions allowed.

2.5 CURB STOPS

A. All curb stops shall have compression connections at both ends.

B. The top threads for all curb stops shall be Minneapolis type.

C. Curb stops shall be used for taps which are 1-inch and smaller.

D. Acceptable curb stops and their manufacturers for *Typical* installations are:

1. Mueller

a. B-25155 = 3/4″ & 1″

2. Ford

a. B44-33Q = 3/4″
b. B44-44Q = 1″

3. A.Y. McDonald

a. 6106Q = 3/4″ & 1″

4. There will be no substitutions allowed.

E. Acceptable curb stops and their manufacturers for *City Plan* installations are:

1. Mueller

a. B-25163 = 3/4″ & 1″

2. Ford

a. B41-33MQ = 3/4″
b. B41-44MQ = 1″

3. A.Y. McDonald

a. 6106Q = 3/4″ & 1″

4. There will be no substitutions allowed.

2.6 VALVE BOXES FOR CURB STOPS

A. Minneapolis pattern shall be used for all curb stops.

B. Acceptable valve boxes and their manufacturers are:

1. Mueller #H-10302

2. Ford #5614 = 3/4″ / #5623 = 1″

3. A.Y. McDonald #5614 = 3/4″ / #5623 = 1″

4. There will be no substitutions allowed.

C. Valve boxes for 3-inch and larger services.

1. Reference Section 02641

2.7 TAPPING SLEEVES

A. All 1 1/2" and 2" taps shall be made with SSI tapping sleeves.

2.8 90 DEGREE FITTINGS (CITY PLAN SERVICE DETAIL)

A. Acceptable 90 Degree Fittings and their manufacturers are:

1. Mueller

a. H-15531 = 3/4″ & 1″

2. Ford

a. L84-33MQ = 3/4″
b. L84-44MQ = 1″

3. A.Y. McDonald

a. 4779MQ = 3/4″ & 1″

4. There will be no substitutions allowed.

PART 3 - EXECUTION

3.1 GENERAL

A. The contractor shall not make any taps until the water main has been initially accepted, curb and gutter has been installed, and service locations and grades have been staked.

   1. There will be no exceptions made for water mains which are located in private roadways.

B. The contractor shall obtain permission to tap, and scheduled an inspection of the tap, from the District's Operations Manager.

   1. A minimum of 24 hours notice is required on all tap inspections.

      a. There will be no exceptions to the 24 hour notice requirement.

C. The contractor shall adjust stop boxes to final grade as determined by the grade stake.

   1. Grade stakes shall be a placed a minimum of five feet from the location of the stop box.

   2. Grade stakes shall not be disturbed prior to inspection of the service by the District.

D. The contractor shall mark the ending location of all water services with a wood or metal up-right.

3.2 CORPORATION STOPS

A. Taps shall not be made within two feet of any joint or fitting.

B. Taps shall be separated by at least two feet (measured along the pipe length), even when taps are made on opposite sides of pipe.

3.3 SERVICE LINES

A. All service lines shall be a minimum of 54 inches and a maximum of 66 inches below the final grade.

B. When backfilling the service trench, care shall be taken so that no stones larger than 3" are resting against the service line.

C. Service trenches shall be subject to compaction specifications.

1. Reference Section 02221.

3.4 CURB STOPS

A. The contractor shall adjust the curb stop box to 1/2-inch above final grade prior to final inspection.

B. Curb stop box shall be fully extended to surface grade and screwed onto the curb stop.

C. Curb stop box shall be plumb, so that a shut-off key can be placed on the curb stop.

3.5 INSPECTION

A. The contractor shall insure that the curb stop, corporation stop, and any couplings 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's Operations Manager.

1. A minimum of 24 hours notice is required on all tap and service inspections.

a. There will be no exceptions to the 24-hour notice requirement.

D. The water shall be turned on at the curb stop by District personnel only.

SECTION 02713

WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers the installation of water distribution lines.

1.2 QUALITY ASSURANCE

A. Water system installations shall conform to the regulations of the Colorado Department of Health, and the Water Quality Control Commission.

B. Construction staking.

1. Reference Section 02221.

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. The minimum effective area of thrust blocks, shall be as specified in standard District detail.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Reference Sections 02615, 02622, 02641, 02644, and 02646.

1.4 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. In order 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.

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 weather conditions are unsuitable.

a. Temperature is 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

2.1 PIPE

A. 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.

B. Reference Sections 02615 and 02622.

2.2 VALVES

A. Reference Section 02641.

2.3 HYDRANTS

A. Reference Section 02644.

2.4 SERVICE LINES, METERS, APPURTENANCES

A. Reference Section 02646.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

A. Trenching, backfilling and compaction.

1. Reference Section 02221.

B. Connections.

1. The location and elevation of the existing pipe shall be verified prior to construction.

3.3 PIPE INSTALLATION

A. All pipe shall be installed with the bells pointing in the direction that the work is progressing.

B. The contractor shall employ effective measures to prevent the opening of joints during bedding and backfilling operations.

C. 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.

D. The pipe shall be secured in place with the specified bedding tamped under and around the pipe.

E. The pipeline shall be installed so that a uniform positive or negative grade is maintained between the designed high and low points.

F. The minimum depth of cover shall be 4 1/2 feet from the finished grade to the top of the pipe, except as otherwise indicated on the Drawings.

G. The maximum depth of cover shall be 5 1/2 feet from the finished grade to the top of the pipe, except as otherwise indicated on the Drawings.

H. Concrete encasement of water mains shall not be allowed.

1. At any location where water mains cross sewer lines and the sewer is above the water main or there is less than 18 inches of vertical clear distance below the water main, the crossing shall be constructed by casing of the main. The casing shall be PVC pipe of a larger diameter and extend 5 feet each way from the point of crossing. The ends of the casing pipe shall be sealed by means of prefabricated casing seals. No casing pipe fill material shall be used in such instance.

   a. Reference Section 02224.

3. Suitable backfill or other structural protection shall be provided to prevent settling or failure of the higher pipe.

3.4 THRUST RESTRAINT

A. Anchorage and Blocking.

1. Reference District Details - Typical Thrust Blocks and Typical Thrust Restraint.

2. Concrete thrust blocks for preventing pipe movement shall be provided at all mechanical joint plugs, wyes, tees, crosses, bends that deflect 11-1/4 degrees or more, reducers and valves. Mechanical joint anchor coupling fittings shall be provided to restrain all valves to tees.

3. The minimum size of thrust blocks shall be determined from the table in the standard District detail.

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

    a. All loose soil shall be disposed of, and the location where the thrust block is to be poured 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. The thrust block shall be formed to provide access to fittings, valves and hydrants.

6. The thrust block shall be extended from the fitting or valve to be blocked, to solid undisturbed earth.

    a. Thrust blocks shall be constructed so that joints and drain holes are clear and accessible.

7. Concrete shall be separated from fittings, valves and hydrants by an 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.

3.5 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 Record Drawings.

B. All dead-end waterlines will be plugged and have a thrust block poured against the plug.

    1. Dead-end waterlines that will be extended in the future shall be installed a minimum distance of twenty feet (20’), unless less distance is authorized by the District due to property line constraints.

2. Dead-end waterlines that will be extended in the future shall have the valve which controls that section of waterline left in the off position.

3. Dead-end waterlines shall be equipped with trace wire to the end of the piping. Said trace wire shall be brought to the surface and terminated with a trace wire box (blank valve box and cover).

C. Blow-offs will not be allowed to be permanently installed on dead-end waterlines.

1. Dead-end waterlines shall have a fire hydrant, air relief valve assembly or blow-off assembly installed at the end of the waterline to facilitate the discharge of air and water from the waterline.

a. If the waterline is to be extended in the future, a fire hydrant may be installed temporarily, until the extension occurs. In such case and when an air relief valve assembly is utilized in place of a fire hydrant or blow-off assembly, the air relief valve assembly shall be moved at the time of future extension of the main, to either the end of said extension or to the next high point of the line.

D. Blow-offs which are installed by the contractor during construction shall be permanently sealed and abandoned at the main prior to acceptance of the waterline.

3.6 PROTECTION OF METAL SURFACES

A. All metal piping fittings shall be provided and installed with epoxy coating.

B. If the surface epoxy coating of any supplied fitting has been damaged by installation, the material shall be protected by the following method:

a. All exposed surface area shall be protected with coal tar paint.

C. All associated fasteners shall be protected by one of the following methods:

1. Two coats of coal tar paint shall be applied to

ferrous metal rods, rebars, clamps, bolts, nuts and other accessories which are subject to submergence or contact with earth or fill material, and are not encased in concrete.

a. The first coat of coal tar paint shall be applied to a dry, clean surface.

b. The first coat of coal tar paint shall be allowed to dry before the second coat is applied.

2. Ferrous metal rods, rebars, clamps, bolts, nuts and other accessories which are subject to submergence or contact with earth or fill material, and are encased in concrete shall be protected with coal tar paint and with Protecto Wrap.

3.7 STORM DRAINAGE CULVERT CROSSING TREATMENT

A. Water mains installed over or under storm drainage culverts shall be freeze protected using 4’x8’x1/2” blueboard sheet insulation. In no event shall water main be installed with less than 1.5 feet clearance from culvert. Water mains installed over storm drainage culverts with less than minimum 4.5 feet cover from surface shall be blueboard insulated both above and below water main. In such event, blueboard insulation above water main shall extend each way until such point that minimum surface cover of 4.5 feet is again obtained.

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

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

1. Reference Section 02575 and the Standard Street Specifications.

PART 2 - MATERIALS

2.1 CEMENT

A. All Cement shall be Portland Cement.

1. Portland Cement shall conform to ASTM C150.

2. Portland Cement shall be Type V.

2.2 AGGREGATES

A. All fine and course aggregate shall conform to ASTM C33.

2.3 WATER

A. All water shall be free from objectionable quantities of silt, organic matter, alkali, salts, and other impurities.

2.4 ADMIXTURES

A. An air-entraining agent shall be used in all concrete.

1. All air-entraining agents shall conform to ASTM C260.

B. A water-reducing admixture may be used, if approved by the District.

1. A water-reducing admixture shall conform to ASTM C494, for Type A or Type D chemical admixture.

2. The water-reducing admixture shall not contain any calcium chloride.

3. The water-reducing admixture shall be compatible with the cement being used.

C. The contractor shall be responsible for any difficulties arising or damages occurring as a result of the selection and use of an admixture.

2.5 CONCRETE REINFORCEMENT

A. All deformed reinforcing bars shall conform to ASTM A615 or ASTM A617.

1. All bars shall be either Grade 40 or 60.

B. All welded steel wire fabric shall conform to ASTM A185.

PART 3 - CONCRETE

3.1 GENERAL

A. All concrete shall be Class A.

B. Concrete shall not be placed if air temperature is less than 40 degrees Fahrenheit, or greater than 90 degrees Fahrenheit.

C. 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. Concrete shall be allowed to cure for a minimum of 24 hours after the concrete is placed.

2. 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.

D. Concrete shall have a minimum of 6 sacks per cubic yard, and shall be allowed to develop a minimum compressive strength of 3000 psi. at 28 days.

3.2 CLASS A CONCRETE

A. Class A concrete shall be used for all concrete structures, thrust blocks, protective pads, and concrete fills.

B. Class A concrete shall have a maximum allowable water/cement ratio of 0.50, by weight.

   1. The water/cement ratio may be increased to 0.56, by weight, if a water-reducing agent is used.

      a. Reference paragraph 2.4.B.

C. Class A concrete shall have a minimum 28 day compressive strength of 3000 psi.

SECTION 03400

PRECAST CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers precast concrete products and accessories for meter pits, meter vaults, and vaults for air relief and vacuum relief valves.

1.2 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.

PART 2 - PRODUCTS

2.1 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 II Cement.

B. Concrete and Reinforcing Materials

1. Reference Section 03300.

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 3 No. 5 bars longitudinally and No. 4 bars at twelve inch centers transversely.

C. Mortar 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. 1/2 part hydrated lime; conforming to ASTM C207, Type S.

2. Pre-mixed non-shrinking Grout; the acceptable types and manufacturers of which are listed below:

a. Master Builders; "Embeco Mortar".

b. Sonneborn; "Ferrolith G-D.S. Redi-Mixed".

c. Or an 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; the acceptable types and manufacturers of which are listed below:

i. Master Builders; "Embeco Aggregate".

ii. Sonneborn; "Ferrolith G-D.S.".

iii. Or an approved equal.

D. Ring and Cover.

1. Acceptable ring and covers are:

a. Neenah, R-1706.

b. Or an approved equal.

E. Steps.

1. All steps shall be made of one of the following materials.

a. Aluminum.

b. Copolymer polypropylene plastic, conforming to ASTM C478 and ASTM C497.

2. Acceptable steps and their manufacturers are:

   a. Comco; 12653B.

   b. Neenah; R-1982-W.

   c. M.A. Industries; PS-2-PFS.

   d. Or an approved equal.

3. All steps shall be spaced 12" apart, (on center).

F. Preformed Plastic Gaskets.

1. All preformed plastic gaskets shall conform to AASHTO M198.

2. The diameter of preformed plastic gaskets shall be 1 1/2-inches for a 48-inch diameter manhole.

3. Acceptable preformed plastic gaskets and their manufacturers are:

   a. "Ram-Nek"; K.T. Snyder Co.

   b. "Rub'r-Nek"; K.T. Snyder Co.

   c. "Kent Seal"; Hamilton-Kent Manufacturing Co.

   d. Or an 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.

PART 3 - EXECUTION

3.1 PREPARATION

A. Trenching, Backfilling, and Compaction.

1. Reference Section 02221.

3.2 METER PIT MANHOLE AND VAULT CONSTRUCTION

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

   1. The locations of meter pit manholes and vaults shall be referenced to a minimum of two permanent surface references, and recorded on the "Drawings of Record".

      a. Reference Section 01720.

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.