

**CHESTER
METROPOLITAN
DISTRICT**

SPECIFICATIONS

Chester, S.C.

Revised 9/21/98

00100

CODES & STANDARDS

01. Codes and Standards: Codes and Standards established by the following agencies and publications shall be held to be a part of this specification. All codes and regulations shall be the latest approved edition.
 - A. American National Standards Institute (ANSI)
 - B. American Water Works Association (AWWA)
 - C. American Society for Testing and Materials (ASTM)
 - D. National Sanitation Foundation (NSF)

End of Section

SECTION 01000

SITE WORK

01. SCOPE OF WORK: The Contractor shall furnish all labor, equipment, tools, and materials necessary to perform all task required to complete the site work to include clearing and grubbing of the project area and the line rights of way within the limits shown on the plans and as required to perform the work, in coordination with all other work, and in coordination with the required relocation, and protection of existing structures and utilities. All incidental work, material, or appurtenances not specifically shown but necessary for completion of the work, shall be furnished by the contractor at no additional expense to the District. The Contractor shall Consult with the District prior to beginning work and a full understanding reached as to procedure for site work. Contractor shall then conduct clearing, grubbing and site work in strict accordance with these agreements.
02. PROTECTION OF WORK AREA: All work is to be performed in accordance with OSHA requirements and State and local rules and regulations. Barricades and other protective devices shall be used to prevent damage to existing structures, equipment, utilities, pavement, fencing, and property, as well as to prevent damage to ongoing work.
 - A. Adjacent property is to be protected from damage from equipment, clearing and grubbing operations, disposal of materials, drainage from the construction site, and storage of dirt and debris.
 - B. Any ongoing work, existing structures, piping, utilities, equipment, and property damaged during the site work is to be immediately restored to its original or better condition at the expense of the Contractor.
 - C. Trees and vegetation remaining in place are to be protected from damage from skinning, cutting, or breakage of limbs, bark, and roots, stockpiling of construction or excavated materials within the drip line, and compaction, of soil within the drip line due to vehicular or foot traffic. Temporary barricades, fencing or any other appropriate means of protection are to be used. Damaged trees and vegetation are to be restored under the supervision of a tree surgeon or replaced by the Contractor at no additional expense to the District.
 - D. The Contractor shall conduct all work with full consideration of all proper and legal rights of the District, adjacent property owners and the public and with the least possible amount of inconvenience to them.
03. CLEARING AND GRUBBING: All stumps, roots, weeds, grass, and other vegetation are

to be cleared from the project site and rights-of-way within the limits shown on the plans and as specified herein. All stumps, logs, brush, and other debris resulting from the cleaning operation are to be disposed of by hauling from the site.

- A. Water Line rights of way off public road rights of way are to be completely cleared and grubbed a width of ten (10) feet on either side of the center line of the entire length of the water line unless otherwise noted or specified. With prior approval of the District, additional width is to be cleared and grubbed if in the opinion of the District it is required for construction of the water line. All cleared areas are to be grubbed and grassed. Water lines along highway rights of way are to be cleared only as required for construction. Planted bushes, shrubs and trees are to be protected from damage as well as any item specifically marked for protection.
04. REMOVAL OF EXISTING STRUCTURES: Existing structures, pavement, walks, gutters, fences, planted trees, bushes, shrubbery, etc., and all other items within the project limits and interfering with the construction work shall be temporarily removed from the construction site and replaced in equal or better condition by the Contractor.
05. DISPOSAL OF DEBRIS: All debris and material resulting from the site work must be hauled from the site and disposed of in a proper and legal manner. Burning of cleared and grubbed material shall not be allowed. All debris and cleared material shall be removed from the job site within 10 days and properly disposed of.
06. CONDITION OF RIGHT OF WAY: All rights of way shall be cleared, graded, drainage improved, as required by the Engineer and the Highway Department, grassed and generally left in better condition than originally found prior to beginning construction.
07. GRASSING: All areas disturbed during construction are to be grassed as part of completing the work.
08. EROSION CONTROL: The provisions and standards of Chester County and South Carolina shall be strictly adhered to.

End of Section

SECTION 01100

GRADING, FILLING & EXCAVATION

01. SCOPE OF WORK: labor, equipment, tools, and materials necessary to perform all tasks required to complete all excavation and backfilling and grading of the project site as shown on the drawings and as specified herein. The Contractor shall be responsible for coordination with other work. All incidental work, material, labor and appurtenances not specifically shown but necessary for completion of the work shall be furnished and installed by the Contractor at no additional expense to the District .

02. GENERAL: Excavation, grading and trenching is to take place within the limits indicated on the drawings. The Contractor shall maintain proper site drainage it all times so that water does not pond or damage adjacent property . Erosion and sediment control measures are to be initiated at the beginning of the construction and maintained throughout the duration of the Project in accordance with state and local rules, regulations and recommendations.
 - A. Earthwork Classification: All grading, and excavation shall be considered unclassified for payment purposes. Additional payment will he made for rock excavation as defined in Classified Excavation.

 - B. Sheathing and Bracing: proper sheathing and bracing and protection of all excavation and back filling shall be the responsibility of the Contractor and shall be done in strict accordance with OSHA regulations and safe practices as required for protection of ongoing work, existing structures, piping, utilities, and personnel. Water line trenches in streets shall not be laid back but cut vertically.

 - C. Compaction: In-place moisture density testing may be conducted at the recommendation of the District Engineer to insure that all placed and compacted material, to include fill and backfill of structures and piping, complies with the specifications. Testing is to be performed by a licensed testing laboratory at locations to be determined by the District Engineer. Tests are to be paid for by the District. Work not complying with the specified compaction shall be removed, recompacted and retested at Contractor's expense.

03. SITE GRADING: site grading is to be completed within the limits and the elevations and grade shown on the drawings. The Contractor shall be responsible for staking all water lines and all other units of construction, for the purpose of establishing proper locations and elevations at the units.
- A. Protection: The Contractor is responsible for maintaining all existing utilities, roads, structures, construction staking and property corners free from damage. The Contractor shall be responsible for verifying the location and existence of all structures and utilities within or adjacent to the project area. Any item that is damaged during construction shall be promptly repaired by the Contractor, at his own expense, to its original or better condition unless otherwise directed by the District.
04. FILLING: Site grading shall be conducted in such a manner as to minimize filling. Any filling done shall be compacted to minimum of 90% as measured by the AASHTO method T99.
- A. Material: Placed fill material shall be soil free of roots, stones having a diameter greater than 6 inches, trash, and debris, Fill material is to be placed in horizontal layers no deeper than 8 inches and thoroughly compacted before placing additional layers.
05. EXCAVATION AND BACKFILLING: Excavation and backfilling for structures and trenching for pipelines shall be made at the locations and subgrade shown on the drawings. The area to be excavated is to be cleared and grubbed prior to beginning work in accordance with Section 01000.
- A. Existing Utilities: Before beginning any excavation, the Contractor shall be responsible for notifying the offices of all public utilities in the work area and locating all existing utilities and protecting such utilities from damage during construction. The drawings may not show the exact location of all utilities.
1. Failure to show existing utilities on the drawings shall not relieve the Contractor from the responsibility of locating and protecting all utilities from damage prior to and during construction.
 2. Utilities damaged during construction shall be immediately repaired at the Contractor's expense.
 3. The Contractor shall be responsible for promptly providing temporary service in the event that utilities are damaged and service is interrupted. Such temporary service is to be approved by the Owner of the damaged utility.

- B. Structural Excavation: Excavation of structures shall be made at the locations shown on the drawings and to the sub-grade required. Excavation shall include the placement of suitable material as backfill and the proper and legal disposal of unsuitable or excess excavated material as approved by the District Engineer. Unless otherwise indicated, all structural excavation shall be unclassified for payment purposes.
1. The excavation shall be kept free of water at all times during construction. The surrounding area shall be graded to slope away from the excavation, or other suitable means shall be provided to prohibit surface drainage from entering the excavation. Groundwater entering the excavation shall be continuously pumped out so that water does not accumulate in any portion of the excavation.
 - a) If unsuitable structural sub-grade conditions result from the Contractor's failure to prohibit surface water from entering the excavation or failure to properly remove groundwater from the excavation, the sub-grade shall be repaired to the satisfaction of the District Engineer and at the Contractor's expenses.
 2. The bottom of the excavation shall be level and to the sub-grade elevation shown on the drawings. The bottom at proper sub-grade elevation shall be firm throughout and free of any soft or wet material.
 - a) Six (6) inches minimum of washed crushed stone shall be placed beneath all structural foundations for all excavations extending below the groundwater table. Sub-grade elevations must be adjusted to accommodate the placement of stone.
 - b) Whenever naturally occurring, soft or unsuitable sub-grade material, (not indicated on the drawings) is encountered at the sub-grade elevation, the Contractor, upon prior approval by the District Engineer, shall remove such soft or unsuitable material and replace it with acceptable compacted soil, crushed stone, or concrete as directed by the District Engineer. The Contractor shall be entitled to additional payment in accordance with specified change order procedures.
 3. Rock excavation shall be accomplished by ripping, or blasting by experienced personnel, and in a manner that protects existing structure, piping, utilities, and personnel from damage or injury. Rock and other debris resulting from such excavation shall be hauled from the site by the Contractor and properly and legally disposed of. Personnel responsible for

blasting shall secure licensing, permits and insurance required by the State of South Carolina.

C. Trench Excavations: Trenches are to be excavated by open cut to the depth, grade and alignment shown on the drawings.

1. Trench depth, unless otherwise indicated, shall be sufficient to allow a minimum of 4 feet of cover over the pipe.
2. Unless otherwise noted on the drawings, trench width shall be held to a minimum and in no case exceed, by the following dimensions, the outside diameter of the pipe being placed:

Outside diameter of pipe or conduit being placed	Excess trench width measured at the top of pipe or conduit
32 inches or less:	12-18 inches
36 inches or greater:	24 inches

3. Trench walls are to be cut vertically from the trench bottom to a minimum level 1 foot above the top of the pipe. Trench walls may be laid back above the minimum vertical height to accommodate soil and working conditions except when located in street or road rights-of-way.
4. Where trenching takes place in existing concrete or asphalt roadway pavement, the pavement shall be saw cut a width 2 feet wider than the top width of the trench, unless otherwise noted on the drawings. Ragged edges of pavement shall be recut as required prior to paving to form a straight and uniform alignment.
5. All trenches are to be excavated below the established sub-grade as required for preparation of trench foundation as shown on the drawing. All bedding material shall be well compacted and so shaped that the load is supported along the entire length of the pipe barrel. Bell holes shall be dug to prohibit additional loading on the bells and to provide for completion of joints. Class C bedding shall be used throughout except when the following conditions are encountered.
 - a) Where cover over the pipe exceeds 18 feet or where specifically noted on the plans - Class B required.
 - b) Where groundwater is encountered - Class C-alternate.

6. The trench shall be kept free of water at all times during pipe laying operations. Groundwater entering the excavation shall be continuously pumped out so that water does not accumulate in trench or make the sub-grade and pipe foundation unstable or soft.
 7. All "Classified Excavation" (rock) shall be done under the supervision of a person thoroughly skilled in this type of work. All measures possible shall be taken to protect life and property. Flagmen shall be placed beyond the blast zone to prohibit entry into the blast area and danger zone. The Contractor shall be responsible for all damage done as result of the blasting operation. Personnel responsible for blasting shall secure licensing, permits and insurance required by the State of South Carolina.
- D. Backfilling: Backfilling of structures and trenching is to be performed in such a manner as to provide a properly compacted backfill, free from rocks, organic matter, frozen material, excessively wet material, roots and other unsuitable debris. Suitable backfill material shall be borrowed from off site if necessary. Cost of all borrowed backfill material shall be included in the unit price for the pipe and structures.
1. Backfill of trenches is to be hand or mechanically tamped under and around the pipe in 6-inch lifts to a depth of 24 inches above the pipe. As fast as the material is placed, it shall be cut under the haunches of the pipe with a shovel and thoroughly compacted with light tamps for the full width of the trench to provide support for the bottom and sides of the pipe. The remainder of the backfill is to be compacted throughout in 8-inch maximum lifts to the required density specified below. Backfill under roads, pavement, sidewalks, parking areas and driveways is to be mechanically tamped throughout.
 2. Backfill of all structures is to be mechanically tamped throughout the 6-inch maximum lifts to obtain the compaction specified below.
 3. Compact with a mechanical tamp all backfill in areas under roads, pavement, sidewalks, parking areas and structures to 95 percent maximum dry density as determined by the AASHTO Method T99. Backfill material, at the time it is placed, shall have moisture content within 5 percent of the backfill's optimum moisture content.
 4. Backfill of all pipe shall be done in such a manner so that stones or debris are not bedded against the pipe.

06. CLASSIFIED EXCAVATION: Classified excavation shall be limited to the excavation of "solid rock" for pipeline and structures, disposal of excavated rock and backfilling of the rock trenches and rock excavation to the level of the original ground line. The work shall include all labor, materials, equipment, permits, and any other incidental work required for excavation of solid rock. Rock shall be excavated 6" below normal sub-grade.
- A. Solid rock shall be defined as that rock located in the trench or structural excavation that in the opinion of the District Engineer, cannot be removed with a pick, shove, ditching machine, backhoe, or other similar item and which requires drilling, blasting, or jackhammering for removal.
 - B. All backfilling of rock trenches and structural excavation shall be select fill material free of debris and rock. No excavation rock shall be permitted in the backfill.
 - C. The Contractor shall notify the District Engineer prior to excavating rock so that the District personnel may be present to measure the rock as it is being excavated and before any backfilling takes place.
 - D. Personnel responsible for blasting shall secure licensing, permits, and insurance required by the State of South Carolina.

End of Section

SECTION 01200

GRASSING

01. **SCOPE OF WORK:** The Contractor shall furnish all labor, equipment, tools, and materials necessary to perform all tasks required to complete all grassing within the limits of right-of-way and other disturbed areas shown on the plans, in coordination with all other divisions of work. Any incidental work, material, or appurtenances not specifically shown, but necessary for completion of the work, shall be furnished as required. All unpaved areas cleared and grubbed, graded, filled, excavated, or otherwise disturbed during construction, both within and beyond the right-of-way limits shown on the plans, shall be grassed. Grassing includes both temporary and permanent grassing.

02. **GENERAL:** The Contractor shall be responsible for verifying the condition and suitability of areas to receive grassing. The work to be performed under this section consists of preparing the seedbed; furnishing, placing, and covering limestone, fertilizer, and seed; compacting seedbeds; furnishing and securing mulch; mowing; and other operations necessary for the permanent establishment of grasses. All disturbed areas are to be grassed.
 - A. The Contractor shall adapt his operations to variations in the weather, seasons of the year, and soil conditions as necessary for the establishment of temporary and permanent grass cover.

 - B. Before acceptance and final payment is made for the grassing work, a complete and full coverage of all areas to be grassed shall be obtained. All eroded areas are to be filled, reseeded, and completely covered with grass.
 1. Areas where surface drainage has been channelized and washing is evident are to be regarded, stabilized with degradable woven mesh, secured with stakes in accordance with the manufacturer's recommendations, and regrassed.

03. **PERMANENT GRASSING:** Permanent grassing shall be established on all unpaved areas graded or disturbed during construction.
 - A. Materials: Materials shall be approved by the District Engineer prior to use and shall include limestone, fertilizer, seed, and mulching materials.
 1. Fertilizer shall be an acceptable commercial fertilizer having the following percentages of phosphorous, nitrogen, and potassium by weight: phosphorous - 10%, nitrogen - 10%, potassium - 10%.

2. Limestone shall be an agricultural grade limestone containing no less than 85 percent by weight of combined calcium and magnesium carbonate. All limestone shall be graded so that 100 percent will pass through U.S. standard 10 mesh screen and 40 percent will pass through U.S. Standard mesh screen. Any hardened or caked limestone shall be pulverized to its original condition before being used.
3. Seed shall be a mixture of Fescue and Bermuda with a purity of no less than 90 percent and a germination rate of no less than 80 percent and conforming to state law.

B. Seedbed Preparation: The seedbed shall be prepared in topsoil placed by the Contractor. The soil shall be scarified or otherwise loosened to a depth of 5 inches or more. All clods are to be broken up and all rocks and debris removed. The upper 3 inches of soil shall be worked into an acceptable seedbed by the use of pulverizers, drags, or harrow. Seedbed preparation shall not be done when the soil is frozen, extremely wet, or otherwise unsuitable as determined by the District Engineer.

1. Fertilizer shall be uniformly distributed at a minimum amount of 1200 pounds per acre.
2. Limestone shall be uniformly applied at a minimum rate of 2000 pounds per acre and worked into the soil prior to the incorporation of the seed.
3. Fertilizer, limestone, and seed shall be applied within 24 hours of completing seedbed preparation.

C. Seeding. Seed shall be uniformly distributed over the seedbed and immediately harrowed, dragged, raked, or otherwise worked into the seedbed so as to cover the seed with a layer of soil compatible with germination requirements. Immediately after the seed has been covered, the seedbed shall be compacted in a manner compatible with standard grassing practices. Seed shall be applied to the seedbed in the following amounts:

Fescue -----150 pounds per acre
 Bermuda----- 40 pounds per acre

D: Mulching Mulch shall be applied to the seedbed areas within 36 hours after completion of the seeding operation.

1. Mulch shall consist of grain straw or other suitable materials approved by

the District Engineer.

2. Prior to applying mulch, all roots, debris, and rocks greater than 2 inches in diameter are to be removed from the seedbed area.
3. Care shall be taken not to displace soil or seed during mulching operations.
4. Mulch shall be spread uniformly by hand or by mechanical spreaders and blower in the amount of 60 bales per acre.
5. Mulch on slopes greater than 5% is to be held in place by applying emulsified asphalt in the amounts of 250 gallons of emulsified asphalt per acre or shall be held in place by woven mesh properly staked.
6. Mulch in ditch lines is to be held in place by woven mesh and replaced as required if washed away by heavy rains.

Other suitable means of holding the mulch in place may be used with prior approval of the District Engineer.

E. Maintenance of Seeding and Mulching: Areas where seeding and mulching have been performed shall be maintained by the Contractor until an acceptable grass cover has been obtained and accepted by the District.

1. Maintenance shall include mowing at the times and locations directed by the District Engineer; repair of areas of erosion and washing; repair of damaged areas, areas of soft material likely to cause rutting; and reseeding as necessary to establish a sufficient uniform grass cover.

04. TEMPORARY GRASSING: Temporary grassing shall be performed in selected areas in advance of permanent grassing operations for the purpose of minimizing erosion in graded and disturbed areas during construction operation. Temporary grassing is considered to be a supplement to and not a substitute for, permanent grassing operations, erosion, or sediment control measures. The work shall include preparing seedbeds; furnishing, placing, and covering fertilizer and seed; mowing; and any other operations necessary for establishing temporary grassing of the required areas.

A. Temporary Grassing shall be done promptly at the location and times directed by the District Engineer and under the following conditions:

- 1) When a graded area cannot be brought to final grade and remain undisturbed and permanently grassed during construction, temporary grassing shall be provided until final grade can be obtained and the graded

area permanently grassed.

- 2) When washing or erosion can occur on disturbed areas where temporary suspension of construction activity has taken place.
 - 3) When an immediate ground cover is desirable to minimize washing, erosion, sedimentation, or pollution on any area.
 - 4) When the season of the year is not suitable for establishing permanent grassing.
- B. Areas to be Grassed shall be loosened to a depth of 5 inches. The surface to be seeded shall have adequate terraces and other irregularities in which seed and fertilizer can lodge so that the grassing materials cannot be easily dislodged by wind, rain, or surface runoff.
- C. Seed and Fertilizer shall be applied uniformly at the required application rates over the prepared area to be grassed.
- D. 10-10-10 Fertilizer shall be applied at a rate of 500 pounds per acre.
- E. Areas of Temporary Grassing shall be maintained in satisfactory condition until being permanently grassed. The maintenance shall include repair of erosion, reseeding, and mowing. All work to maintain areas of temporary seeding shall be done promptly at the direction of the District Engineer.

End of Section

SECTION 01300

PAVING AND SURFACING

01. SCOPE OF WORK: The Contractor shall furnish all labor, equipment, tools, and materials necessary to perform tasks required to complete all paving and surfacing as shown on the drawings and specified herein, in coordination with all other divisions of work and in coordination with required relocation and protection of existing utilities. Any incidental work, material, or appurtenances not specifically shown, but necessary for completion of the work, shall be furnished by the Contractor as required. Work under this section covers paving and surfacing of roads, drives, and parking areas.

02. MATERIALS:

A. Aggregate Base Course: Base course material shall consist of crushed stone, or gravel having hard, strong, durable particles free from adherent coatings. The crushed stone or gravel shall be graded downward from 1-1/2 inches as follows:

Graduation Size -----	Percent Passing -----	Tolerance -----
1-1/2 inch	100%	+- 0%
1 inch	86%	+- 11%
1/2 inch	67%	+- 12%
No. 4	45%	+- 10%
No. 10	35%	+- 10%
No. 40	22%	+- 8%
No. 200	8%	+- 4%

B. Pavement: All pavement shall be Bituminous plant Mix Pavement unless otherwise noted or specified herein. All pavement shall conform to the requirements of the South Carolina Highway Department.

03. CONSTRUCTION: Areas to be Paved and surfaced will consist of road patching, road resurfacing and parking areas. All trench excavation subgrade shall be prepared in accordance with Section 02200 and paved in accordance with the details shown on the plans. The subgrade for the access drives shall be compacted to 95% prior to placement of crushed stone.

A. Pavement Placement: Bituminous Plant Mix Pavement shall be placed and compacted to a minimum depth of 1-1/2 inches with heavy rollers in accordance with the requirements of the South Carolina Highway Department. The pavement

is not to be placed during rainy weather, when the subgrade or base course is frozen, or when moisture on the surface to be paved would prohibit proper bond. Pavement shall not be placed when the air temperature, as measured in the shade away from artificial heat, is less than 35 degrees fahrenheit. In the event that paving operations have started, paving may continue until the air temperature drops to 32 degrees fahrenheit at which time the paving must immediately cease. The compacted pavement shall be on less than 1-1/2 inches.

1. Pavement shall be mechanically tamped and thoroughly compacted around fence posts, structures, and all other areas not accessible to a wheeled roller.
04. CLEAN UP: At the completion of the paving operation, the paved areas and areas adjacent to the paved areas are to be cleaned, left in good condition, and free from debris. All loose aggregate is to be removed and the area surrounding the pavement graded smooth to drain.
05. CONNECTION TO EXISTING PAVEMENT: When new pavement is to be tied to existing pavement. the existing pavement is to be saw cut in a true line to eliminate all ragged edges; the base Course refined and mechanically compacted; and a tack course applied prior to placement and compaction of new pavement.

SECTION 01400

PIPING GENERAL REQUIREMENTS

01. **SCOPE OF WORK:** This section specifies the general requirements for installation of all piping, valves and fittings. The Contractor shall furnish all labor, equipment, tools, and materials necessary to perform all tasks required to properly install all pipe work as shown on the drawings and specified herein, in coordination with all other work and in coordination with the required protection, relocation or connection to existing utilities. Any incidental work, material, or appurtenances not specifically shown, but necessary for completion of the work shall be furnished by the Contractor as required.
02. **MATERIALS:** All piping to include valves and fittings shall be of the type and size as shown on the drawings or specified in other sections. Materials are to be of standard manufacturer meeting all requirements of applicable ASTM standards. Materials not specifically covered by and meeting ASTM, AWWA, and National Sanitation Federation Standards shall not be used.
03. **EQUIPMENT PIPING:** All piping necessary for proper installation and operation of equipment shall be installed as required to fit the equipment provided. The Contractor shall be responsible for providing piping and support necessary for proper equipment installation and operation whether or not the required piping and pipe supports are shown on the drawings. All piping is to be properly installed and supported in accordance with equipment manufacturer's recommendations so as not to put strain on equipment connections and to prevent excessive vibrations.
04. **INSTALLATION:** All piping shall be installed in a proper and workmanlike manner, property protected and supported, free from leakage and meeting all requirements for inspection and testing as specified in other sections.
 - A. **Concrete Blocking:** Concrete blocking shall be provided for all underground pressurized piping at all fittings, bends, and ends of pipe to prevent movement of pipe and fittings. Concrete shall be Class A (3000 psi). The concrete blocking shall bear on undisturbed earth in the bottom and sides of the trench and shall be equal to or greater than the dimensions shown on the drawings.
 - B. **Concrete Protection:** Protection and encasement concrete shall be Class B (2500 psi) and provided where shown on the drawings, or as necessary for protection of existing piping or utilities as directed by the Engineer.

- C. Installation: All piping is to be installed to the line, grade, and elevations shown on the plans.
1. Water lines are to be installed in a true line and grade and in a manner so as to prohibit the formation of high and low spots in the piping likely to trap air.
 2. All fitting, valves, sleeves, couplings, and appurtenances are to be compatible with, and of equal pressure class as, the piping being used.
- D. Pipework in Structures: Pipework in structures is to include all pipe, fittings, valves, sleeves, and supports necessary for complete installation. Piping is to be compatible with the equipment provided.
1. All piping through walls of the manholes shall be adequately supported, and caulked water-tight with non-shrink grout.
05. TESTING: All piping shall be pressure tested and tested for leakage. Procedures for testing are specified in other sections. All potable waterlines are to be disinfected.
06. SHOP DRAWINGS: Shop drawings shall be submitted on all pipe, fittings, valves, sleeves, couplings, supports, and appurtenances required for complete installation of the piping. Where material being utilized is the same as specified, the Contractor shall submit shop drawings and a verification statement that all piping is as specified.
07. CLEAN UP: All piping shall be thoroughly cleaned of concrete, mortar, mud, dirt, debris, and rust prior to painting or coating. All areas of piping shall be cleaned up after installation to remove debris, and discarded and unused piping. The area of piping is to be graded smooth to drain and left in a condition satisfactory to the District Engineer before piping shall be considered to be complete. All above ground metal piping is to be painted.

End of Section

SECTION 01500

WATER LINES

01. **SCOPE OF WORK:** The Contractor shall furnish all labor, equipment, tools, and materials necessary to perform all tasks required to complete the construction of pressurized water line piping, valves, fittings, hydrants and appurtenances in accordance with the drawings and as specified herein, in coordination with all other divisions of work and in coordination with the required relocation of existing utilities and the connection of piping to the existing source of water. Any incidental work, material, or appurtenances not specifically shown, but necessary for completion of the work, shall be furnished by the Contractor at no additional cost to the District.
02. **GENERAL:** Work to install water lines shall be in conformance with Section 01400. All other work to clear, grub, grass, trench excavation, and backfill shall be as specified in other sections. Testing, sterilization, and placement in service shall be considered as an integral part of the work to completely install the water line.
03. **MATERIAL:**
 - A. Pipe: Pipe material shall be as shown on the drawings, contained in the bid form and as specified herein. Valves, fittings, and appurtenances shall be the same type, size, and pressure class as the connecting piping. All piping material shall be certified by the AWWA and National Sanitation Foundation (NSF) for use as piping for potable water.
 1. Ductile Iron Pipe and Fittings Section 02100
 2. PVC Pipe and Fittings Section 02200
 - B. Valves, Hydrants, and Appurtenances: shall be as specified in Section 02000
04. **INSTALLATION:** Piping, valves, fittings, and appurtenances shall be properly installed, sterilized, pressure tested, and certified for use by the Engineer and State before the work shall be considered complete. Pipe is to be protected from mud and debris at all times.
 - A. Trench and Foundations: Trench and foundations for all underground water lines shall be Class C unless otherwise shown on the drawing.
 - B. Underground Piping: All underground piping shall have a minimum cover of 4 feet unless otherwise noted.

C. Separation:

1. For work in South Carolina separation between water lines and sewer lines shall be in accordance with the latest edition of "Recommended Standards for Sewage Works", 197B Edition, Chapter 20, section 29, and the following criteria should be met:

- a) Water mains should be laid at least 10' horizontally from any existing or proposed sewer. Such deviation may allow for installation of the water main closer to a sewer, provided that the water main is laid in a separate trench, such that the bottom of the water main is at least 18" above the top of the sewer.
- b) Water mains crossing sewers should be laid to provide a minimum vertical distance of 18" between the invert of the water main and the top of the sewer line; both the water and sewer lines must be cast iron or ductile iron. At crossing; one full length of water pipe should be located so both joints will be as far from the sewer as possible.

05. **HYDROSTATIC TESTING:** All water lines to include piping, valves, fittings, and appurtenances shall be tested by the Contractor. All water lines must successfully pass leakage test before being accepted by the District as properly installed. Water lines not passing the leakage test must be repaired and retested by the Contractor until the tests are successfully passed. Contractor shall install all taps and fittings required for testing and sterilization.

A. Leakage Test: A leakage test is to be performed after the water lines have successfully been pressure tested. The air is to be expelled from all water lines and the lines pressurized with water to the maximum operating pressures as directed by the Engineer. After obtaining the test pressure, the amount of subsequent water pumped into the water lines is to be measured by the use of a metering pump or other suitable device as approved by the Engineer. Leakage from the water lines will be considered to be the same as the amount of subsequent water pumped into the lines.

1. No water lines will be accepted as properly installed until the leakage in each section tested is less than the amount as determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7400}$$

L = Allowable leakage in gallons per hour.

D = Nominal diameter of pipe, in inches.

P = Average test pressure in pounds per square inch.

N = Number of joints.

2. All sections of water line failing the leakage test are to be repaired and retested by the Contractor until the water lines have successfully passed the leakage test.

C. Water for Testing: The District is to provide all water for testing at no cost to the Contractor. The Contractor shall be responsible for furnishing all hose, temporary piping, fittings, and transportation required to deliver the furnished water from the point of delivery by the District to the point where testing is to take place. The point of delivery shall be at the end of the existing water system owned and operated by the CMD Water District.

06. DISINFECTION: After successfully testing, all water lines shall be disinfected by the Contractor before being placed into service. The lines are to be thoroughly flushed out and cleaned of any dirt, mud, discolorization and debris.

Disinfection shall be in accordance with the following:

A. South Carolina: A disinfecting solution of chlorine or calcium hypochlorite shall be introduced at one end of the water line as water is being withdrawn at the other end so that 50 PPM of free chlorine is maintained throughout the entire water line. The chlorine solution shall remain in the piping for 24 hours, after which time the residual chlorine shall not have dropped below 25 PPM. If the chlorine residual has dropped below 10 PPM, a new disinfecting solution shall be introduced and the process repeated. The Contractor shall be responsible for installing all taps and fittings required to disinfect the line.

- 1) Bacteriological Analysis: Two bacteriological samples of the water shall be taken a minimum of 24 hours apart after disinfection and tested by a South Carolina DHEC approved private lab. These tests shall be conducted at the expense of the District and not the Contractor. Should the bacteriological analysis indicate that the line is not disinfected as determined by the local State or Federal regulations, the Contractor shall repeat the disinfecting process as described above at no expense to the District.

- B. All chemicals, taps, testing points, and apparatus required for disinfecting the lines shall be furnished by the Contractor.
- C. All water for disinfection shall be furnished by the District as specified in the pressure and leakage tests. Contractor is to provide means of transporting water from Owner's delivery point to lines to be tested.
- D. The contractor shall be responsible for the collection and delivery of water samples to be tested.

End of Section

SECTION 02000

VALVES, HYDRANTS AND METERS

01. SCOPE OF WORK: Work furnished under this section shall consist of all valves, meters, hydrants, and appurtenances installed as part of the water line piping.
02. GENERAL: All valves, meters, hydrants, and appurtenances shall be furnished and installed in accordance with Section 01400 "Piping General Requirements," and as shown on the drawings. All material shall be the same or greater pressure class than the joining pipe.
 - A. All Valves and Fittings greater than 2 inches and installed above ground shall be flanged, ANSI Class 125, unless otherwise noted.
 - B. All Valves Installed Below Ground shall be mechanical joint and have a valve box. If installed outside, asphalt and a concrete valve doughnut is to be used.
03. VALVES: Valves shall be provided as shown on the drawing and as specified herein. All valves shall open left and have open and close direction indicator.
 - A. Gate Valves: Gate valves shall be the double disc type RS seat manufactured and tested in accordance with the requirements of the latest revision to the AWWA Standard C500. Valves shall be non-rising stem unless otherwise noted.
 1. All valves shall have a minimum design working pressure of 150 psig and a test pressure of 300 psig.
 2. Valves 3 inches and smaller installed below ground shall have a valve box over the handwheel.
 3. All valves 3 inches and smaller shall be all brass with 2" square nut and shall have a ball valve and threaded (NPT) connections. Valves described in this paragraph shall be Jenkins, Crane, Lukenhiemer or Mueller.
 4. Valves to 10" in size shall be cast iron body, bronze discs and seat buna-o-ring gaskets high strength bronze stem 2" cast iron operating nut with mechanical joint connections. Valves described in this paragraph shall be Mueller, M & H or AVK.
 5. Valves 12" and larger shall be butterfly type as described in paragraph B.

- B. Butterfly Valves. Butterfly valves shall be tight closing, rubber seat type with rubber seats that are securely fastened to the body. No metal to metal seating surfaces will be allowed. Butterfly valves shall meet the full requirements of the latest edition of AWWA Standard C504.
1. Valves shall be constructed of cast iron ASTM A-126 Class B or ductile iron.
 2. Valve discs shall be constructed of stainless steel ASTM A-436 Type 1.
 3. Valve stems shall be stainless stem with 2" cast iron operating nut.
 4. Valve ends shall be mechanical joint.
 5. Valves described in this paragraph shall be Mueller, M & H or Dezurk. Must be epoxy coated C550 with RS or SS disc.
- C. Check Valves: Check valves shall be the swing type manufactured and tested in accordance with the requirements of the latest revision to the AWWA Standard C-508.
1. Check valves larger than 6-inches shall have an outside spring and lever, iron body, and shall be bronze mounted, full opening and suitable for minimum working pressures of 150 psi.
 2. Check valves 3-inches and smaller shall be all brass type with threaded NPT connections.
04. VALVE BOXES: Valve boxes shall be POE type 107 valve box designed for use in roads, driveways, and other areas experiencing heavy traffic.
- A. Valve Box Base shall be round unless otherwise specified.
 - B. Lid shall be close fitting and have the letter "W" or the word "Water" printed on the top.
 - C. Riser shall be minimum 6" P.V.C.
05. VALVE MARKERS: Valve markers are to be constructed of concrete as shown on the standard detail and shall be placed adjacent to each underground valve for the purpose of marking each valve.
- A. Valve Marker is to note the distance from the marker to the valve.

- B. Valve Markers are to be field located and placed in a spot that will not interfere with vehicular or pedestrian traffic. Location shall be approved by the District prior to installation.

06. HYDRANTS:

- A. FIRE HYDRANTS shall meet all requirements of American Water Works Standard C502 and be self-draining and non-freezing. Three-way hydrants with two 2-1/2 inch and one 4-1/2 inch nozzles are to be used only in locations approved by the District. Hydrants shall have traffic flange to prevent damage. All hydrants shall be counter-clockwise on, clockwise off.
 - 1. Hydrant is to be a center stem compression type hydrant which opens against the pressure and closes with the pressure. Hydrant shall open by turning in a counter-clockwise direction.
 - 2. Hydrant body shall be all cast iron or ductile iron with 6 inch mechanical joint, connecting shoe, glands, gasket and belts with minimum 4-1/2" barrel.
 - 3. Hydrant shall be furnished for a bury of 4'0" unless otherwise specified.
 - 4. Valve seat ring shall be brass.
 - 5. Fire hydrant shall be rated for 150 psi working pressure and 300 psi static pressure.
 - 6. Hydrants shall be Mueller Centurion, M & H or AVK.
 - 7. Hydrants shall be provided with 6" hydrant lead, valve, and valve anchoring tee.
 - 8. Hydrant shall be red in color.
- B. Post Hydrants shall meet all requirements of American Water Works Standards and be self-draining and non-freezing with a single 2-1/2 inch nozzle.
 - 1. Hydrant shoe shall be 2-inch maximum diameter with IPT for connection to 2-inch GIP blow off line and valve.
 - 2. Post hydrant shall be manufactured by Mueller.

07. CORPORATION VALVES:

- A. 3/4-inch corporation valves are to be bronze 85-5-5-5 with CC male threaded inlet and outlet suitable to receive a 3/4" brass flare nut fitting for connection with a 3/4-inch Mueller insta-tite for 3/4 IPS 200 PSI coil pipe.
 - 1. Corporation valves shall have a working pressure of 250 psi.
- B. Corporation valves 1 inch and larger are to be bronze 85-5-5-5 with a threaded male outlet for a brass flare nut.

08. TAPPING SLEEVES:

- A. Tapping Sleeves shall be suitable for tapping all types of pipe manufactured and shall be stainless steel full circle ductile flange. Tapping valve to be provided from same manufacturer.

09. TAPPING SADDLES:

- A. Tapping Saddles shall be suitable for tapping PVC water pipe ranging in size from 3 inches and larger providing a watertight seal.

Tapping saddles shall have malleable iron (ASTM A47, Grade 32510) or ductile iron (ASTM A536) bodies. Two straps shall be provided, carbon steel (ASTM A307) electro galvanized with dichromate seal. Nuts and washers shall be cold formed semi-finished heavy hex steel electro galvanized with dichromate seal. Service saddles shall be Rockwell No. 313 service saddle or Mueller service clamp, iron, double strap with I.P. thread.

- 1. Maximum working pressure shall be 300 psig.
- 2. Outlet size shall be threaded for 3/4 inch through 2 inch standard iron pipe thread dimensions.
- 3. Outlet size shall be threaded for 3/4 inch through 2 inch standard iron pipe thread dimensions.

10. METER ASSEMBLY:

- A. Meter Assemblies shall consist of all work required to properly furnish and install a water service meter box and meter.
 - 1. Meter box shall be a Sumter 22A201-OP "Stretch Box".

- a) Meter box shall have a cast iron base and lid and plastic top section. The box shall measure approximately 18" x 11" at the base with a cover opening of approximately 13 3/4" x 6 3/4".
 - b) Meter boxes shall be suitable for installation of a standard plastic meter box extension. Meter box extensions shall be approximately 4 inches high and shall fit snugly in the meter box base for the purpose of raising the overall height of the meter box.
2. A brass "Ford" ball valve with locking wing nut suitable for connection to a 3/4 inch flare nut shall be provided ahead of the meter. The flare nut shall be all brass.
 3. Water meter couplings and nuts shall be furnished for the meter inlet and outlet. The tail piece is to have male iron pipe thread.
 4. Water meters shall be the positive displacement type meeting all requirements of the AWWA Standard C-700-77
 - a) Main case shall be bronze with graphite impregnated thermoplastic working chamber.
 - b) Lid and hinge shall be heavy duty nylon with brass pin.
 - c) Thimble shall be graphite impregnated nylon with high grade thermoplastic piston.
 - d) Shutter and driving bar shall be high impact nylon.
 - e) Strainer shall be polyacetal resin.
 - f) Counter gearing shall be polyacetal resin with high-impact nylon spindles.
 - g) Counter case shall be high-impact reinforced nylon.
 - h) Number wheels shall be polyacetal resin.
 - i) Register dial shall be 3-inches in diameter with one sweep of hand registering 10 gallons.
 - j) Meter shall be Sensus with touch read adaptor, all bronze.

5. A 1" x 1" Watts No. 7 dual check valve (Model No.7U4-5), all brass body, is to be provided behind the water meter. The dual check valve shall be provided with a threaded female connection on the inlet side and a threaded male connection on the outlet side.
6. A brass 3/4-inch gate valve is to be attached to the end of the brass 3/4-inch nipple outside the meter box. A PVC valve box with lid is to be placed for operation of the gate valve.
7. Service lines shall be 3/4" 200 PSI coil pipe IPS.

End of Section

SECTION 02100

DUCTILE IRON PIPE AND FITTINGS

01. SCOPE OF WORK: This section specifies the material and installation to be furnished for all ductile iron pipe and fittings as specified herein as shown on the drawings.

02. MATERIAL:

A. Pipe:

1. Ductile iron pipe shall be ductile cast iron manufactured in conformance with ANSI Standards A21.51 and A21.52, with the thickness to be in conformance with ANSI A21.50.
 - a) Ultimate Strength -- 60,000 psi minimum.
 - b) Yield Strength - 42,000 psi minimum.
 - c) Elongation - 10 percent minimum.
 - d) Charpy V-Notch impact strength - 7 ft. lb. at 70 degrees F. minimum.
2. Pipe 6 inches and larger shall be thickness Class 51, Ductile Iron, unless otherwise noted, having a rated water working pressure of 150 psi with a test pressure of 300 psi.
3. Pipe shall be suitable for push on joints or mechanical joints.
4. Pipe shall be coated on the outside with 1 mil minimum thickness of bituminous coating. For water service, the interior surface of pipe shall be lined with cement mortar conforming to ANSI/AWWA C104/A21.4, standard thickness. With 1 mil minimum thickness of bituminous material over cement lining.

B. Fittings:

- 1 Fittings for all piping, to include PVC, shall be Ductile Iron, having a rated working pressure of 350 psi for Ductile Iron Class 350 conforming to ASTM A399,1 grade 80-60-03.
2. Fittings shall be coated the same as specified for ductile iron pipe.
3. All fittings shall be suitable for use with both Ductile Iron and PVC pipe to be furnished. Transition gaskets are to be provided when using cast or ductile iron fittings with PVC piping.

03. INSTALLATION: All pipe and fittings shall be installed in accordance with standard and recommended practices of the Cast Iron Pipe Research Association and as specified in other sections of the specifications. Mechanical joints shall be used for pipe installed on piers. Push-on or mechanical joints shall be used for buried pipe installation. All fittings at bends, and tees shall be adequately blocked to prevent movement.

- A. All fittings for PVC piping 3-inches through 8 inches and installed underground shall be cast or ductile iron mechanical joint with appropriate transition gaskets provided to form a watertight joint.

End of Section

SECTION 02300

BORE AND ENCASEMENT

- 01. Scope of Work: The Contractor shall furnish all labor, equipment, tools and materials necessary to perform all tasks to complete highway and railroad bores.
- 02. General: Work to install water lines in highway and railroad bores shall be in conformance with Section 01400. All other work to clear, grub, grass, trench excavation and backfill shall be as specified in other sections.
- 03. Material:
 - A. Carrier Pipe: Ductile iron pipe shall be used on all highway and railroad bores as shown on the plans. Ductile iron pipe shall be as specified in Section 02100.
 - B. Encasement Pipe: Shall be provided on all railroad bores and as required by the South Carolina Highway Department. Encasement pipe shall be welded or seamless wrought steel pipe manufactured of Grade "B" steel in accordance with ASTM A 139 and shall be coated inside and out with (2) two coats of coal-tar epoxy. Pipe size and minimal wall thickness shall be as follows:

Carrier Pipe Nominal I.D.	Casing Pipe Minimum I.D.	Minimum Wall Thick. Inches
3"	12"	.250
6"	14"	.250
8"	16"	.250
10"	18"	.250
12"	20"	.250
16"	30"	.312

End of Section

SECTION 02200

PVC PIPE AND FITTINGS

01. SCOPE OF WORK: This section specifies the material and installation to be furnished for all PVC pipe & fittings as specified or shown on the plans.
02. MATERIAL:
 - A. Pipe:
 1. PVC pressure pipe shall conform to ASTM D3139, and ANSI/ASTM standard D2241 (PVC 1120) and shall bear the seal of the National Sanitation Foundation.
 - A. Unless otherwise specified all water line piping 3 through 6 inches and larger shall be Class 200 PVC, C 900 SDR 21 with a working pressure rating of 200 psi at 73 degrees Fahrenheit.
 - b. Unless otherwise specified all fittings for PVC piping 3 inches and larger shall be M.J. cast or ductile iron fittings with a transition gasket for use with PVC pipe.
 - C. Unless otherwise specified all water line piping 3-inches and smaller shall be Class 200 PVC, SDR 21, with a working pressure of 200 psi. Fittings shall be galvanized or brass with iron pipe threads.
 - d. All PVC piping shall be provided with continuous detectable tape marked "caution: Buried Water Line Below" as manufactured by Lineguard, Inc.. The tape shall be tied to meter boxes, valve boxes, & hydrants to aid in the location of the line. The location tape shall be placed in the top 12" of the backfill.
03. INSTALLATION:
 - A. ALL PVC Pressure Piping shall be installed and supported uniformly and continuously over its entire length on firm stable material. Backfill in contact with the pipe shall not contain rock or debris with a diameter greater than 1/2-inch.

Installation shall be in accordance with ASTM D2774.

B. All Pipe shall be installed in accordance with section 01400 "Piping General Requirements".

04. SHOP DRAWINGS: Shop drawings containing the pipe manufacturer and material specifications for each size of pipe are to be submitted to the Engineer for approval.

05. TESTING: The pipe furnished shall meet the following test limits:

A. Sustained pressure:

When tested in accordance with ASTM D1598, the pipe shall withstand the following sustained pressures at fiber stress indicated for 1000 hours without failure by ballooning, bursting or weeping.

Pipe Class		Hydrostatic Pressure	Fiber Stress
psi	SDR	psi	psi
200	21	420	4200

B. Quick Burst Pressure:

When tested in accordance with ASTM D 1599, the pipe shall withstand the following burst pressure, applied in 60 to 70 seconds, at fiber stress indicated without failure.

Pipe Class		Hydrostatic Pressure	Fiber Stress
psi	SDR	psi	psi
200	21	630	6400

C. Extrusion Quality

When tested in accordance with ASTM D 2152, the pipe shall not flake or disintegrate following 20 minutes immersion in anhydrous acetone. This test is intended as a quality control procedure applicable only for distinguishing between unfused and properly fused PVC.

D. Impact Resistance:

When tested at 73.4 degrees F. in accordance with ASTM D 2444, the pipe shall withstand the following impact levels without shattering, cracking or splitting:

Nominal pipe Size-Inches	SDR	Minimum Impact Strength Foot-pounds
6	21	300
8	21	300
10	21	300
12	21	300

- E. Pipe manufacturer shall certify in writing and receive the Engineer's approval, prior to shipment and delivery of pipe, that all pipe furnished meets the above test limits. Failure to provide the written certification shall be considered cause for rejection of the pipe by the District.

06. WARRANTY:

- A. All pipe shall be fully warranted by the pipe manufacturer against defects in material for a period of one year from date of delivery to job site. All pipe determined by the District to be defective or pipe not meeting the above specifications shall be promptly replaced.
- B. If during the warranty period and as a result of testing by the District, the pipe is found to not meet specified test conditions stated above, all pipe is to be dug up and replaced at the Contractor's expense.

End of Section

POLYVINYL CHLORIDE (PVC) PIPE

PIPE

All polyvinyl chloride pipe shall conform to ASTM D2241 and AWWA C900 “standard for polyvinyl chloride (PVC) pressure pipe, six inch through eight inch for water.” In all pressure zones the pipe must be Pressure Class 200 with a SDR of 14 or less. PVC pressure pipe shall be made from white or blue pigmented virgin materials whose cell classifications are either Class 1245A or 1245B and shall be furnished in length of 20 feet. Lesser lengths will be accepted to allow the proper placement of fittings, valves, etc. Pipe shall be furnished in cast-iron pipe equivalent outside diameters with rubber gasketed joints.

All 2" pipe shall be polyvinyl chloride (PVC) plastic pipe pressure Class 200 with SDR 21 and in accordance with ASTM D2241.

All piping must bear the approval of the National Sanitation Foundation (NSF).

JOINTS

Pipe jointing will be Elastomeric Gasket Joints conforming to AWWA C900 Standards for PVC. Pipe bells shall be integral to the pipe. Sleeve couplings are not permitted. Joints shall conform to ASTM D3139 for 2" PVC pipe.

FITTINGS

All fittings for six-inch PVC pipe and larger shall be ductile iron. All fittings shall have a minimum pressure rating of 200 PSI. Fittings for 2" PVC pipe shall be brass having a minimum pressure rating of 200 PSI.

Fittings shall include tees, crosses, air release valves, blow-offs, reducers, plugs, angles, and magnetic locator tape. All PVC pipe shall be marked with magnetic locator tape “Water Line Below.” Tape to be placed 6" above main.

DUCTILE IRON PIPE

PIPE

All ductile iron pipe furnished shall be for a working pressure not less than 350 PSI Class 50, conforming to the requirements of AWWA C151 and shall have a cement mortar lining of standard thickness in accordance with AWWA C104.

JOINTS

Ductile iron pipe shall be furnished with push on joints in accordance with AWWA C111. Fittings shall be ductile iron and in accordance with the requirements of AWWA C110. All fittings shall have cement mortar lining.

ANCHORAGE

The contractor shall provide pipeline restraint at all locations shown on the construction drawings. Anchorage shall be in the form of harnessed or restrained joints for the lengths of pipe and fittings shown.

CERTIFICATION

The manufacturer shall submit certificates certifying the product meets the requirements of these specifications. Each item shall be clearly marked with the name, size, and class and NSF stamp for potable water service.

UNIT OF MEASUREMENT AND PAYMENT

Measurement: The length of pressure pipeline to be used as a basis for payment shall be the horizontal distance taken along the centerline of each type, size and class of pipe. The measurement shall be taken through all valves and fittings built into the pipeline.

Payment: The unit price bid on a lineal foot basis shall include the cost of excavation and backfilling of the trench in addition to furnishing and installing all required pipe and fittings. Prices to include restoration of disturbed area (except public roadway pavement), driveways, sidewalks, seeding and mulching, flushing and cleaning, testing, disinfection, concrete thrust blocking.

STEEL CASING PIPE

PIPE

All steel casing pipe furnished shall conform to the requirements of ASTM A-252 Grade 2 and have cathodic protection as well as CB-42 protective coating.

CERTIFICATION

The manufacturer shall submit certificates certifying the product meets the requirements of these specifications.

UNIT OF MEASUREMENT AND PAYMENT

Measurement: The length of steel casing pipe to be used as a basis for payment shall be the horizontal distance taken along the centerline of each type, size and class of pipe.

Payment: The unit price bid on a lineal foot basis shall include the cost of excavation and backfilling of the trench in addition to furnishing and installing all required pipe and fittings. Prices to include restoration of disturbed area (except public roadway pavement), driveways, sidewalks, seeding and mulching, flushing and cleaning, testing, concrete thrust blocking.

DUCTILE IRON CARRIER PIPE

PIPE

All ductile iron pipe furnished shall be for a working pressure not less than 350 PSI Class 50, conforming to the requirements of AWWA C151.

JOINTS

Ductile iron pipe shall be furnished with mechanical joints in accordance with AWWA C111. Fittings shall be ductile iron and in accordance with the requirements of AWWA A21.11. All fittings shall have cement mortar lining.

ANCHORAGE

The contractor shall provide pipeline restraint at all locations shown on the construction drawings. Anchorage shall be in the form of harnessed or restrained joints for the lengths of pipe and fittings shown.

SPACERS

Spacers shall be placed 3 feet from the bell and spigot of each carrier pipe within the steel casing pipe. The spacers shall be the size required for the application and of a type equal to Spider SP-12 or approved equal.

CERTIFICATION

The manufacturer shall submit certificates certifying the product meets the requirements of these specifications. Each item shall be clearly marked with the name, size, and class and NSF stamp for potable water service.

UNIT OF MEASUREMENT AND PAYMENT

Measurement: The length of ductile iron carrier pipe to be used as a basis for payment shall be the horizontal distance taken along the centerline of each type, size and class of pipe. The measurement shall be taken through all valves and fittings built into the pipeline.

Payment: The unit price bid on a lineal foot basis shall include the cost of excavation and backfilling of the trench in addition to furnishing and installing all required pipe and fittings. Prices to include restoration of disturbed area (except public roadway pavement), driveways, sidewalks, seeding and mulching, flushing and cleaning, testing, disinfection, concrete thrust blocking.

WATER SERVICES

PIPE

All pipe for water services furnished and installed shall be $\frac{3}{4}$ or one inch flexible polyethylene IPS pipe. It shall have a working pressure of not less than 200 PSI and NSF approved. The water service pipe shall be suitable for use with Mueller Institute fittings. Only Mueller insta-tite fittings shall be used.

SERVICE BRANCHES

Where indicated on the plans, and as directed by the engineer, multiple water service lines shall join together prior to making the main line tap. A one inch diameter service line shall be used for the line between the tapping saddle and the service branch. A Mueller Institute branch fitting shall be used to create separate service lines prior to the meter box assembly. A $\frac{3}{4}$ inch diameter service line shall be installed after the branch connection.

TAPPING SADDLES

All tapping saddles for PVC water main pipe shall be steel or brass, for ductile iron pipe shall be Rockwell 313 or equivalent with single straps for $\frac{3}{4}$ " and one-inch tap and double straps for two-inch taps. Tapping saddle for asbestos cement pipe shall be the same as ductile iron pipe ($\frac{3}{4}$ ", 1", and 2").

GATE VALVE

All gate valves shall be furnished with a brass body, non-rising stem, cast iron handwheel, screw-in bonnet and full bore flow passage such as Watts WGV series or approved equal.

USER HOOK-UP

Upon completion and approval of testing and disinfection of the water mains, the contractor shall begin the process of connecting the water customers to the new water mains. The contractor shall perform the necessary relocation of the existing meter box assembly, if any, and the connection to the existing water service such that each water user is not without water service for more than three hours at any one time. The contractor shall notify all property owners who will have their water cutoff 24 hours prior to such cutoffs.

All existing services and water lines shall be kept in good working order until such time as the contractor is ready to activate the new services. In addition, care shall be taken to avoid contamination of the existing water lines and service connections.

The contractor shall take sufficient precautions to protect any trees located on the private property as well as sidewalks, driveways, and existing fences. Any damage to these items due to the contractor's work shall be the responsibility of the contractor. Any shrub or garden area within the private property that is in the immediate line of the proposed water service shall be removed by the contractor. The contract shall not require the contractor to replace shrubs or garden areas.

Payment: The unit price bid per each water service connection shall include the cost of furnishing the necessary tapping saddle, PE service line, branch connection, and miscellaneous fittings and to install all the above items including the in the water meter and box assembly as directed by the engineer and making the connections to the new water main or existing water main and the existing service line. Prices to include restoration of disturbed areas, including driveways, sidewalks, fences (except public roadway pavement), seeding and mulching, magnetic locator tape, and service line boring at sites specified on the construction plans.

Payment: The unit price bid per each new water service connection shall include the cost of furnishing the necessary tapping saddle, PE service line, branch connection, gate valve, turf box, and miscellaneous fittings and to install all the above items including the water meter and box assembly as directed by the engineer and making the connections to the new water main or existing water main and the existing service line. Prices to include restoration of disturbed areas, including driveways, sidewalks, fences (except public roadway pavement), seeding and mulching, magnetic locator tape, and service line boring at sites specified on the construction plans.

VALVES AND APPURTENANCES

GENERAL

Valves and gates of the sizes and types specified or shown on the construction drawings shall be provided for the proper completion of the work included under the project.

Operating nuts, valve boxes, gaskets, bolts, and nuts and all necessary appurtenances for a complete installation of the valves and gates shall be furnished with the valves.

Complete details of all valves to be used on the project shall be submitted to the engineer for review and contract compliance.

GATE VALVES

All valves on water mains shall be direct bury gate valves with resilient seat gate valves and shall be iron body, bronze mounted, double disc gate valves with non rising stems having either parallel or inclined seats in accordance with AWWA C500, "Gate Valves for Ordinary Water Works Service." Gate valves shall be designed with a minimum working pressure of 200 PSI.

Mechanical joint bell ends will be used in buried pipelines of mechanical joint and rubber seal type joint cast iron.

Gate valves shall be Mueller or approved equal.

VALVE BOXES

A valve box shall be provided for every operating nut of a buried valve with the operating mechanism fully protected with a cast iron grease case.

The valve box shall not transmit shock or stress to the valve. It shall be centered and plumb over the wrench nut of the valve. The box cover shall be flush with the finished pavement or at such other level as may be directed by the engineer.

The assembly shall consist of two pieces and a cover. The cover shall be marked "water" where the pressure main is installed for water service. The valve box shall be screw type, cast iron with 5¼ inch shaft. A round base which will enclose the valve bonnet shall be furnished with six inch and eight inch valves. An oval base shall be supplied with valves larger than eight inches.

OPERATING NUTS

Valves for buried pipe lines shall be furnished with two inch square wrench nuts. Nuts shall have a flanged base upon which shall be cast an arrow two inches long showing the direction of opening, and the word, "OPEN" in ½ inch or larger letters, shall be cast on the nut to indicate clearly the direction to turn the wrench opening the valve.

OPERATING NUT LOCATION

All operating nuts for buried valves covered by valve boxes shall be located within eight inches of the top of the box, and valve wrenches shall be four feet long, sized for two inch square nuts.

EXTENSION STEMS

Wherever extension stems are required for valve operation, the connection between the valve stem and extension stem shall be a pinned coupling to avoid possible disconnection.

DIRECTION OF OPENING

The valves shall open by turning the operator to the LEFT, that is, in a counter-clockwise direction, unless otherwise stated on the "Attention All Bidders."

TIE NEW LINES TO EXISTING

Where new lines are to be connected to existing lines, the contractor shall uncover the old line and tie the new line in. Ties will be made leak free and care shall be taken to avoid damage to the existing line. Any damage to the existing line shall be repaired by the contractor at no cost to the owner.

VALVE STEM PACKING

All valve stem packing shall be dye cut to fit the valve. The material to be used shall be Chesterton Style 324 Super-Lon.

TAPPING SLEEVES AND TAPPING VALVES

All tapping sleeves shall be all stainless steel. Tapping valves shall be Mueller resilient seat or equivalent. The tapping sleeve provided shall be suitable for use with the existing pipe size and material

FIRE HYDRANTS

Fire hydrants provided by the contractor shall be new and conform to the applicable requirements of AWWA C502. The hydrants shall have a main valve opening, size as designated herein, one pumper connection, and two hose connections. All connections shall be furnished with chained

caps.

The hydrants shall be supplied with six inch mechanical joint hub inlet normally for three feet burial of water main. Barrel extension sections completed with stem extensions shall be furnished for fire hydrants which are set with more than three feet of cover.

The hydrants shall incorporate a breakable component at the standpipe flange and a breakaway stem coupling so designed that when the hydrant is subject to severe impact, the special component shall shear off at the flange without damage to the hydrant barrel. The main valve shall remain closed if the barrel section and upper stem is separated from the remainder of the hydrant.

The fire hydrant shall be furnished with drain valves which will open when the main valve is closed and shall drain the standpipe completely. The drain valve shall close when the hydrant main valve is opened in such a manner that there will be no leakage through the waste outlets.

The fire hydrants shall be Mueller Super Centurion or M&H No. 129.

UNIT OF MEASUREMENT

Measurement: Payment shall be based on the number of each fire hydrant installed.

- A. **New Fire Hydrant Assembly:** Unit price shall include furnishing and installing new fire hydrant, tee, shutoff valve, thrust blocking, and related fittings.
- B. **Connect to Fire Hydrant (Fire Hydrant Provided by CMD):** Unit price shall include installing tee, shutoff valve, fire hydrant provided by CMD, thrust blocking, and related fittings.