

SECTION 3710 - DUCTILE IRON SEWER FORCE MAIN INSTALLATION

PART 1 - GENERAL

1.1 SCOPE OF WORK:

- A. The CONTRACTOR shall, unless specified otherwise, furnish all material, equipment, tools, and labor necessary to do the work required under this standard and unload, haul, and distribute all ductile iron pipe, castings, fittings, and accessories including restrained joint ductile iron pipe. The CONTRACTOR shall also perform all necessary excavation; maintain all traffic control; sheet, brace, and support the adjoining ground or structures where necessary; handle all drainage or ground water; provide barricades, guards, and warning lights; lay and test the pipe, castings, fittings, valves, and accessories; backfill and consolidate the trenches and pits; restore the ground surface unless otherwise stipulated; remove surplus excavated material, clean the site of work; and maintain the street or other surface over the trenches as specified.
- B. The CONTRACTOR shall also furnish all equipment, tools, labor and materials required to rearrange branch connections to main sewers, or to rearrange sewers, conduits, ducts, pipe, or other structures in accordance with the contract drawings and stipulations included herein. This includes both known and unknown underground structures and conduits.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Trench Excavation for Sewer Force Mains: Section 3725
- B. Bedding and Backfill for Sewer Force Mains: Section 3735
- C. Sewer Force Main Leakage Test: Section 3860

PART 2 - EXECUTION

2.1 INSTALLING DUCTILE IRON PIPE:

- A. Inspection:
 - 1. Shop Inspection - All materials furnished to the CONTRACTOR are subject, at the discretion of the OWNER, to inspection and approval at the manufacturer's plant. All pipe larger than 36" ID must pass full length gauge test for roundness.
 - 2. Field Inspection - All pipe and accessories shall be laid, joined, and tested under pressure for defects and leakage in the manner specified and in the presence of, and as approved by the ENGINEER.
- B. Responsibility for Material:
 - 1. Responsibility for Material Furnished by CONTRACTOR - The CONTRACTOR shall be responsible for all material furnished by him and shall replace at this own expense all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishings of all material and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work.
 - 2. Responsibility for Material Furnished by OWNER - The CONTRACTOR's responsibility for material furnished by the OWNER shall begin at the point of its delivery to the CONTRACTOR. Materials already on the site shall become the CONTRACTOR's responsibility on the day of the award of the contract. The CONTRACTOR shall examine all material furnished by the OWNER at the time and place of delivery to him and shall reject all defective material. Any material furnished by the OWNER and installed by the CONTRACTOR without discovery of such defects will, if found defective prior to final

acceptance of the work be replaced with sound material by the OWNER unless damaged by the CONTRACTOR. The CONTRACTOR, however, shall, at his own expense, furnish all supplies, labor, and facilities necessary to remove said defective material and install the sound material in a manner satisfactory to the ENGINEER.

3. Responsibility for Safe Storage - The CONTRACTOR shall be responsible for the safe storage of material furnished by or to him and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Valves shall be drained and stored in a manner that will protect them from damage by freezing.
4. Replacement of Damaged Material - Any material furnished by the OWNER that becomes damaged after acceptance by the CONTRACTOR shall be replaced by the CONTRACTOR at his own expense.

C. Handling of Material:

1. Hauling:

- a. All materials furnished by the CONTRACTOR shall be delivered and distributed at the site by the CONTRACTOR. Materials furnished by the OWNER shall be picked up by the CONTRACTOR at points designated in the purchaser's addendum to this standard and hauled to and distributed at the site, unless otherwise stated.
- b. Ductile iron pipe, fittings, valves, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled, on skidways shall not be skidded or rolled against pipe already on the ground.

2. Unloading at Site of Work - Pipe shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be made by the CONTRACTOR at his expense in a manner satisfactory to the ENGINEER.

D. Alignment and Grade:

1. General - The force main shall be laid and maintained to the required lines and grades with fittings, valves, and other appurtenances at the required locations; spigot centered in bells; and all valve stems and air release valves plumb.
2. Deviations Occasioned by Other Structures - Whenever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plans is required, the ENGINEER shall have the authority to change the plans and order a deviation from the line and grade or arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstructions. If the change in plans results in a change in the amount of work by the CONTRACTOR, such altered work shall be done on the basis of payment to the CONTRACTOR for extra work or credit to the OWNER for less work. Whenever possible, a minimum of eighteen inches (18") vertical clearance shall be maintained between the force main and any perpendicular conduits.
3. Caution in Excavation - The CONTRACTOR shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and he shall be responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part. Refer to Section 1010 - General Scope and Special Provisions, Part 1.7.
4. Subsurface Exploration - Whenever, in the opinion of the ENGINEER, it is necessary to explore and excavate to determine the location of existing underground structures, the CONTRACTOR shall make explorations and excavations for such purposes. The CONTRACTOR shall not be allowed extra compensation unless the structures are not

indicated in the construction documents and are not reasonably evident by a visual inspection of the area.

5. Depth of Pipe/Cover - Minimum cover shall be forty-eight inches (48"). All pipe shall be laid to the depth shown on the contract drawings or as required in the purchaser's addendum to this standard. Any variation therefrom shall be made only at the order of the ENGINEER.

E. Laying:

1. Laying conditions shall be in accordance with "Standard Laying Conditions for Ductile Iron Pipe" AWWA/ANSI C150/A21.50. The minimum requirement for laying conditions is Type 3, with Type 5 required for pipes larger than 16" (see Section 3735). Type 5 laying condition is also required under pavements (roadways and driveways), regardless of the pipe size.
2. Lowering of Force Main Material into Trench:
 - a. Proper implements, tools, and facilities satisfactory to the ENGINEER shall be provided and used by the CONTRACTOR for the safe and convenient performance of the work. All pipe, fittings, and valves shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to force main materials and protective coatings and linings. Under no circumstances shall force main materials be dropped or dumped into the trench.
 - b. If damage occurs to any pipe, fittings, valves, or force main accessories in handling, the damage shall be immediately brought to the ENGINEER's attention. The ENGINEER shall prescribe corrective repairs or rejection of the damaged items.
3. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipe laying crew cannot put the pipe into the trench and in place without getting foreign material into it, the ENGINEER may require that before lowering the pipe into the trench, a heavy lightly woven canvas bag or other suitable material be placed over each end of the pipe and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.
4. Inspection Before Installation - All pipe and fittings shall be carefully examined for cracks and other defects while suspended above the trench immediately before installation into final position. Spigot ends shall be examined with particular care as this area is the most vulnerable to damage from handling. Defective pipe or fittings shall be laid aside for inspection by the ENGINEER, who will prescribe corrective repairs or rejection.
5. As each length of pipe is placed in the trench, the spigot end shall be centered in the bell and the pipe forced "home" and then adjusted to correct line and grade. The pipe shall be secured in place with approved backfill materials tamped under it except at the open bell. Precautions shall be taken to prevent dirt from entering the joint space.
6. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the ENGINEER. This provision shall apply during the lunch break as well as overnight. If water is in the trench, the plug shall remain in place until the trench is pumped completely dry.
7. Cutting of Pipe:
 - a. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the axis of the pipe.

- b. Cutting shall be done with an appropriate circular power saw with the proper blade.
 - c. Flame cutting of pipe by means of an oxyacetylene torch shall not be allowed.
8. Bell Ends to Face Direction of Laying - Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the ENGINEER. Unless approved otherwise by the ENGINEER, the pipe laying shall start at the discharge end and proceed toward the pump station with the bell ends of the pipe toward the pump station.
9. Blocking - Under no circumstances shall laying of pipe on blocks be permitted.

F. Joints:

1. Joining of Mechanical Joint Pipe and Fittings:
- a. Cleaning and Assembly of Joint - All lumps, blisters, excess coating, grit, oil, grease, and other foreign material shall be removed from at least the last 8 inches of the bell and spigot ends of each pipe. The outside of the spigot and the inside of the bell shall be wire brushed and thoroughly cleaned and dried before the pipe is laid. The cast iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the bell end. The rubber gasket shall be placed on the spigot end with the thick edge toward the gland.
 - b. Bolting of Joint - The entire section of the pipe shall be pushed forward to seat the spigot end into the bell. The gasket shall then be pressed into place within the bell; care shall be taken to locate the gasket evenly around the entire joint. The cast iron gland shall be moved along the pipe into position for bolting; then all of the bolts shall be inserted and the nuts finger-tightened. All nuts shall then be tightened with a suitable (preferably torque-limiting) wrench. The torque for 3/4" size bolts shall be 75-90 foot - lbs. Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland.
 - c. Permissible Deflection in Mechanical Joint Pipe - Whenever it is desirable to deflect mechanical joint pipe, the amount of deflection shall not exceed the maximum limits shown in Table 1 below. Pipe sections shall always be properly jointed and pushed home with their axes parallel (straight) before deflecting the joint even if this necessitates extra excavation. Bolts shall be hand tightened before the joint is deflected.

TABLE 1

<u>Size Pipe</u>	<u>18 Ft. Length</u>	<u>20 Ft. Length</u>
6"	27"	30"
8"	20"	22"
10"	20"	22"
12"	20"	22"
14"	13 "	15"
16"	13 "	15"
18"	11"	--
20"	11"	--
24"	9"	--

2. Joining of Push-On Joint Pipe:
- a. Cleaning and Assembly of Joints - All lumps, blisters, excess coating, grit, oil, grease, and other foreign material shall be removed from at least the last 8 inches of the bell and spigot ends of each pipe. The outside of the spigot and the inside of the bell shall be wire brushed and thoroughly cleaned and dried before the pipe is laid.

The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the bell socket with the thick end faced toward the spigot end of the pipe.

A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot end of the pipe or both. Gasket lubricant shall be supplied by the pipe manufacturer and approved by the ENGINEER.

The spigot end of the pipe shall be inserted into the socket using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the proper depth of the socket with a forked tool or jack-type tool or other device approved by the ENGINEER.

Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint. Field cut pipe lengths shall be filed or ground to resemble the spigot end as manufactured for such pipe.

- b. Permissible Deflection in Push-On Joint Pipe - Whenever it is desirable to deflect push-on joint pipe, the amount of deflection shall not exceed the maximum limits shown in Table 2 below. Pipe sections shall always be properly jointed and pushed "home" with their axes parallel (straight) before deflecting the joint even if this necessitates extra excavation.

TABLE 2

Maximum Permissible Deflection in Laying Push-On Joint Pipe

<u>Size Pipe</u>	<u>18 Ft. Length</u>	<u>20 Ft. Length</u>
6"	19"	21"
8"	19"	21"
10"	19"	21"
12"	19"	21"
14"	11"	12"
16"	11"	12"
18"	11"	--
20"	11"	--
24"	11"	--

PART 3 - BASIS OF PAYMENT: (Not Applicable)

END OF SECTION