

## SECTION 1302

## PIPE INSTALLATION

## 1302-1 GENERAL

**1302-1.1 Description.** - This work shall consist of laying pipe in trenches or jacking pipe, and making joints as required to complete the pipe installation, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Trenches shall be excavated, trench bottom prepared, and bedding placed and compacted as specified in Section 1301, "Trench Excavation, Bedding, and Backfill" of these City Standard Specifications.

Bell holes shall be excavated at each joint, if necessary, to provide full length barrel support of the pipe and to prevent point loading at the bells or couplings.

Fill material or trench subgrade beneath the pipe shall be graded and shaped to provide a uniform and continuous support beneath the pipe at all points between the bell holes or pipe joints.

Unless otherwise specified or directed by the Engineer, all pipe shall be laid straight between the changes in alignment and at uniform grade between changes in grade. For concrete pipes with elliptical reinforcement, the pipe shall be placed with the minor axis of the reinforcement in a vertical position.

Attention is directed to Section 1301-1.5, "Existing Utilities" of these City Standard Specifications for requirements relating to protection of existing facilities.

**1302-2 MATERIALS.** - Materials shall conform to the requirements of Section 1207, "Pipe and Structures" of these City Standard Specifications and the requirements of this Section.

**1302-3 TRENCH DEWATERING.** - At all times groundwater and surface runoff shall be controlled to maintain the trench in a stable condition during construction.

At the time of laying pipe, the prepared trench shall be in a firm and dry condition. If trench is not in such condition, the Contractor shall furnish and operate such pumps or other devices as may be necessary for removing ground water from trenches during the construction of pipeline system.

When shown on the plans, or ordered by the Engineer, a filter blanket of pervious material or permeable material conforming to the provisions of Section 19-3.065, "Pervious Backfill Material" of the City Standard Specifications shall be placed in accordance to the dimensions shown on the plans or to a depth ordered by the Engineer. If the filter blanket is ordered by the Engineer, it will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the General Conditions.

## 1302-4 PIPE LAYING

**1302-4.1 General.** - Regardless of the type of pipe shown on the plans or as specified in the special provisions the standard procedures for pipe laying specified herein shall apply.

Pipe will be inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be subject to rejection. All corrective work shall be approved by the Engineer and shall be at no cost to the City.

When connections are to be made to any existing pipe, conduit, or other appurtenances, the actual elevation or position of which cannot be determined without excavation, the Contractor shall excavate for, and expose, the existing improvement before laying any pipe or conduit. The Engineer shall be given the opportunity to inspect the existing pipe or conduit before connection is made. Any adjustments in line or grade which may be necessary to accomplish the intent of the plans shall be made, and the Contractor will be paid for any additional work resulting from such change in line or grade as extra work as provided in Section 4-1.03D, "Extra Work" of the General Conditions.

Pipe shall be laid to upgrade with the socket or collar ends of the pipe upgrade unless otherwise approved by the Engineer.

Corrugated metal pipes shall be laid with external laps of the circumferential seams toward the inlet end. Corrugated pipes shall be shipped and handled in such a manner as to prevent damage to protective coatings.

Pipe shall be laid to plan line and grade, within uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the socket or collar which shall not bear upon the subgrade or bedding. Any pipe which is not in true alignment or shows any undue settlement after laying shall be taken up and relaid at no cost to the City.

At the close of work each day, or whenever the work ceases for any reason, the end of the pipe shall be securely closed unless otherwise permitted by the Engineer.

**1302-4.1.1 Laterals.** - The term "sewer lateral connection" or "house lateral" as used in these specifications, on the plans or other drawings, is used to designate the branch sewers laid from the main sewer to points on the property lines from which sewer service can be obtained by proper connection therefrom. When so indicated by the plans, house lateral connections shall be laid either from the upper end of a "y" branch or from a manhole to the property lines. All laterals shall be laid to a grade of 1/4-inch vertical rise to one foot run of pipe, (2%) slope, unless otherwise specified by the Engineer. When the top of the lateral is less than 3 feet below the subgrade at any point, ductile iron pipe shall be used for the lateral unless specified otherwise on plans.

A 2 inch by 2 inch by 3 foot redwood marker shall be placed at the end of the sewer lateral, or, if the curb is already in, a letter "S" shall be stamped on the face of the curb at a point opposite the end of the sewer lateral.

Storm sewer laterals shall be laid on a minimum grade of two percent (1/4" per foot).

#### **1302-4.2 Field Joining of Pipe.** -

**1302-4.2.1. General.** - Materials for pipe joints shall conform to the applicable requirements of Section 1207, "Pipe and Structures."

Pipe joints shall be handled and assembled in accordance with the following general requirements:

- 1) Care shall be taken to avoid dragging the spigot on the ground or allowing it to be damaged by contact with gravel, crushed stone or other hard objects.
- 2) Joint mating surfaces shall be cleaned immediately prior to jointing.

Joining of pipe sections shall be in accordance with the manufacturer's or industry recommendations for the type of joints used and as specified herein. All joints shall be so formed that when the pipe sections are drawn together the system shall be continuous, uniform, and watertight.

**1302-4.2.2. Vitrified Clay Pipe.** - Unless otherwise indicated on the plans or specified in the special provisions, vitrified clay pipe shall be joined as herein specified with either premolded resilient compression joints or compression couplings.

- (1) **Resilient Compression Joints.** - The mating components of premolded resilient compression joints shall be wiped clean of dirt and other foreign matter, and the surfaces coated with an approved lubricant. The spigot end of the pipe to be installed shall be positioned in the bell end of the pipe previously laid and shoved home. For large diameter pipe, a lever attachment or bar cushioned by a wooden block shall be used to mate the pipes. In no case shall a bar be used on the unprotected bell end of pipe.

The mating surfaces of the pipes shall be in tight contact with each other upon completion of the joining installation.

- (2) **Compression Couplings.** - Unless otherwise specified, pipe shall be delivered to the job site with the sleeve attached to one end of each pipe section. The spigot end of the pipe to be joined shall be inserted in the sleeve and the steel compression band shall be tightened immediately.

**1302-4.2.3 Concrete Pipe Joints.** - The ends of concrete pipe (reinforced or nonreinforced) sections shall be so formed that when properly laid together they will make a continuous and uniform line of pipe. The joints shall be such design as will permit placement without appreciable irregularities in the flowline, and capable of being sealed to prevent leakage or infiltration.

Unless otherwise indicated on the plans or specified in the special provisions, concrete pipe shall be joined, as herein specified, with rubber gasketed joints.

- (1) **Rubber Gasketed Joints.** - Gasket type joints shall be watertight and flexible. Each joint shall contain a solid gasket of neoprene or other material approved by the Engineer, which shall be the sole element responsible for

watertightness of the joint. When laying the pipe, the bell end of the pipe shall be laid with the bell upstream. The gasket and bell shall be thoroughly cleaned and then lubricated with a soft vegetable soap compound. The gasket shall be stretched evenly when it is installed on the pipe. The spigot end of the pipe to be laid shall be inserted into the bell end of the previously laid pipe. For pipe in which the inside joints are to be pointed, suitable spacers shall be placed against the inside shoulder of the bell to provide the proper space between the abutting ends of the pipe. After the joint is assembled, a feeler gage shall be inserted between the bell and the spigot and the position of the gasket checked around the complete circumference of the pipe. If the gasket has been improperly placed the pipe shall be withdrawn and the joint remade. The gasket shall not be reused if damaged.

**1302-4.2.4 Cast and Ductile Iron Pipe Joints.** - The type of joint to be used will be indicated on the plans or in the special provisions, and shall be installed as specified by the manufacturer.

**1302-4.2.5 Corrugated Metal Pipe Joints.** - Corrugated metal pipe shall be joined with coupling bands. The separate sections of pipe shall be laid in the trench with outside laps of circumferential joints upgrade, with longitudinal laps positioned other than in the invert, and with a maximum spacing between sections of 1-1/2 inches. The sections shall then be joined with coupling bands. Corrugations or projections on the coupler shall properly engage the pipe corrugations of each section before bolts are tightened.

Paved inverts shall be placed and centered on the bottom of the trench. Any damage to the protective lining and coating shall be repaired prior to the backfilling around the pipe.

If waterproof joints are called for on the plans, or specified, the caulking compound or other waterproofing material used shall be subject to the approval of the Engineer.

Where hydraulic structures such as manholes are constructed in conjunction with corrugated metal pipe, the ends of pipes shall penetrate through structure walls and be placed flush or cut off flush with the structure face, unless otherwise directed by the Engineer.

**1302-4.2.6 Poly-Vinyl Chloride Pipe Joints.** - Poly-Vinyl Chloride pipe shall be sealed with rubber sealing ring premolded in the bell of the pipe for sewer pipe or with insertable rubber sealing rings for pressure pipe. Lubricant shall be applied to spigot end of pipe. The pipe shall be assembled to coupling by using a bar and wood block or level or friction pullers. The spigot end shall be pushed in until the reference mark on the spigot end is flush with the end of the bell. The pipe lengths in the trench shall be continuously supported between bell holes.

**1302-4.2.7 Reinforced Plastic Mortar Pipe Joints.** - Reinforced Plastic Mortar pipe shall be sealed with a rubber sealing ring installed in a factory-formed groove in the spigot end of the pipe section. The mating areas of the pipe shall be

wiped clean, including the groove for the rubber sealing ring. The rubber ring shall be installed in groove. Assemble pipe sections by stabbing, bar and wood block or level or friction pullers making sure spigot end is firmly seated to the shoulder of the bell end of a joining pipe.

**1302-4.2.8 Acrylonitrile-Butadiene-Styrene (ABS) Composite Pipe Joint.** - ABS composite pipe shall be joined and sealed by solvent cement joint coupling and installed as herein specified. Apply a coat of primer to the inside of the socket and to the outside of the spigot end of pipe. Without delay, apply a coating of cement to the same surfaces in sufficient quantity that when the spigot is fully inserted into the socket, a bead of excess cement will form around the complete circumference of the outside juncture of the spigot and socket. Remove excess cement. The pipe lengths in the trench shall be continuously supported between joints.

### 1302-5 JACKING

**1302-5.1 General.** - Before starting excavation, the Contractor shall submit working drawings of jacking pit bracing, casing or conduit, and jacking head proposed to be used.

Unless otherwise specified, the methods and equipment used in jacking casing or pipe shall be optional with the Contractor, provided that the proposed method is approved by the Engineer. Such approval, however, shall in no way relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workers experienced in jacking operations shall be used in performing the work.

The leading section of casing or pipe shall be equipped with a jacking head securely anchored thereto to prevent any wobble or variation in alignment during the jacking operation.

The driving ends of the casing or pipe shall be properly protected against spalling and other damage, and intermediate joints shall be similarly protected by the installation of sufficient bearing shims to properly distribute the jacking stresses. Any sections of casing or pipe conduit showing signs of failure shall be removed and replaced with a new precast section or with a cast-in-place section, which is adequate to carry the loads imposed upon it.

Excavation shall not be made in excess of the outer dimensions of the casing or pipe being jacked unless approved by the Engineer. Every effort shall be made to avoid any loss of earth outside of the jacking head. Excavated material shall be removed from the casing or pipe as excavation progresses, and no accumulation of such material within the conduit will be permitted.

Once the jacking operation has commenced, it shall be continued uninterrupted around the clock until the casing or pipe has been jacked between the specified limits. This requirement may be modified if the Contractor submits to the Engineer for prior approval methods and details that shall prevent the "freezing" of the casing or pipe and ensure that the heading is stable at all times.

Upon completion of the jacking operations, all voids around the outside face of the casing or conduit shall be filled by grouting.

Grouting equipment and material shall be on the work site before jacking operations and drilling of grout holes are completed in order that grouting around the jacked casing or conduit may be started immediately after the jacking operations have finished.

Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of one part cement to 5 parts granular material. Where the soil is not suitable for this purpose, the Contractor shall import suitable material at no cost to the City. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

**1302-5.2 Jacking Reinforced Concrete Pipe.** - When pipe is specified to be jacked into place, the design of such pipe is based upon the superimposed loads and not upon the loads which may be placed upon the pipe as a result of the jacking operations. Any increase in pipe strength in order to withstand jacking loads shall be the responsibility of the Contractor.

Where pipe 60 inches or greater in inside diameter is to be jacked for a distance greater than 32 feet, a pilot tunnel shall be constructed first to ensure accuracy of grade and alignment. The dimensions and support of the pilot tunnel will be optional with the Contractor subject to the approval of the Engineer. Such approval shall in no way relieve the Contractor of the responsibility for damage of any nature which may occur as a result of the method.

Supports for pilot tunnels shall be removed as jacking progresses.

Unless the Contractor submits an alternate proposal to the Engineer for approval and the method is approved by the Engineer, the following method shall be used for supporting and guiding the pipe:

After the pilot tunnel has been constructed, a concrete cradle shall be placed true to line and grade and conforming to the outside radius of the pipe. The cradle shall be of such dimensions as to adequately and uniformly support the pipe under the lower 60 degree sector measured on the outside of the pipe. The curved surface shall be formed or accurately screeded to the proper dimensions. It shall be reinforced with not less than 0.3 percent of longitudinal steel and not less than 0.5 percent of transverse steel with respect to the cross-sectional area of the cradle. The transverse steel shall be bent on a radius equal to the radius of the outside of the pipe plus 2 inches and shall extend to within one inch of the edge of the cradle.

In lieu of the concrete cradle specified above, the Contractor may, subject to the approval of details by the Engineer, set steel rails in the concrete base slab to true line and grade.

Grout holes, pipe, and fittings shall be placed in the pipe invert on centers no greater than 5 feet and shall perform such pressure grouting as is necessary to fill voids and to secure uniform bearing between the cradle and the pipe. The grout shall be neat cement grout. Grouting pressures shall be as determined in the field by the Contractor and approved by the Engineer.

All costs involved in the performance of the work of constructing pilot tunnels and cradles shall be included in the price bid for jacking pipe.

**1302-5.3 Jacking Steel Casing and Installing Pipe Inside Casing.** - Unless otherwise specified on the plans, the size and wall thickness of the casing to be jacked to accommodate the contract pipeline shall be at the Contractor's

option except that the casing thickness shall be not less than 3/8-inch, and the Contractor shall be fully responsible for the sufficiency of the casing provided.

The joints of sections of casing to be jacked shall be welded with a continuous circumferential weld. It shall be the Contractor's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved.

All clay pipe installed in a jacked casing shall have mechanical compression joints. The pipe shall be braced or filled to prevent shifting or flotation during backfilling operations.

Backfill shall be gunite sand, gunite concrete, or pressure concrete, except where specified otherwise in the plans or in the special provisions. Pressure concrete shall not be placed until the mix design, placement method, and equipment have been approved by the Engineer.

If the pressure concrete mix cannot be readily pumped or placed by the placing equipment, additional water may be added, provided the water-cement ratio of the approved mix design is not exceeded.

Where gunite sand backfill is used, the pipe shall be laid on a concrete subbase or on gravel bedding where shown on the plans or approved by the Engineer.

The pipe barrels shall rest upon concrete support blocks with the pipe sockets clearing the concrete subbase by at least 1/2 inch.

In addition to submitting details of the jacking pit bracing, casing, and jacking head required, the Contractor shall submit to the Engineer for approval details of the following in advance of the proposed jacking operation: concrete support blocks, bracing to prevent pipe shifting or flotation, and pressure concrete mix design, placement method, and equipment.

**1302-5.4 Jacking Corrugated Steel Pipe.** - Corrugated steel pipe to be jacked in place between the limits shown on the plans shall conform to the provisions of these specifications and the following: The thickness of the pipe designated in the contract item will be the minimum thickness permitted. Any heavier thickness of pipe or other facilities required to withstand jacking pressure shall be determined and furnished by the Contractor at no cost to the City.

Corrugated pipe lengths may be joined by field riveting. Variation from theoretical alignment and grade at the time of completion of placing shall not exceed 1-inch per 100 feet.

The diameter of the excavated hole shall not be more than 0.1 foot greater than the outside diameter of the pipe. Sluicing or jetting with water will not be permitted. When material tends to cave in from outside of these limits, a shield shall be used ahead of the first section of pipe or the face of excavation shall not extend beyond the end of the pipe greater than 1-1/2 feet, unless permitted by the Engineer.

**1302-5.5 Tolerances.** - Pipe and casing shall be jacked true to line and grade. When a pilot tunnel is required to be constructed in connection with jacking reinforced concrete pipe, variations of the pilot tunnel from theoretical alignment and grade shall not exceed 0.25 percent of the distance from the jacking point to terminus of pilot tunnel, unless otherwise shown on the plans or specified in the special provisions.

**1302-6 MEASUREMENT.** - The work performed under this section will be listed in the contract item by pipe size, type, thickness, or whatever information is necessary for identification.

The length of the various pipes to be paid for will be the horizontal length in linear feet measured from centerline of structure to centerline of structure or terminus. Laterals to be paid for will be the horizontal length in linear feet from inside face of structure or terminus. Stub outs will be measured per linear foot and paid for by length designated on the plans or the length actually installed if ordered by the Engineer.

Pipe bends, wyes, tees and other branches will be measured and paid for per each of the actual number installed.

If the contract item is provided for, jacked casing will be measured per linear foot and paid for by the actual length of casing installed.

**1302-7 PAYMENT.** - The length of pipes and casing measured as specified in Section 1302-6 "Measurement," will be paid for at the contract unit price, per linear foot for the various types, sizes, and classes of pipe or casing installed.

Except when a contract item is provided for jacked casing the cost of furnishing and jacking casing in place shall be included in the contract price per linear foot for that portion of the pipeline to be installed within the casing.

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing various sizes and classes of pipe including excavating, furnishing, and placing backfill, jacking pipe or casing, connecting new pipe to existing facilities, restoration of pavement, testing, flushing and cleaning, complete in place as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Structures installed in connection with the pipe main or where otherwise shown separately on the plans will be measured and paid for in accordance with the provisions of Section 1305 "Pipeline Structures."