

SECTION 02521

PIPE CULVERTS AND STORM DRAINS

PART 1: GENERAL

1.01 DESCRIPTION

- A. The work of this section consists of the construction or reconstruction of culverts and storm drains, hereinafter referred to as "conduit" as specified herein and in reasonably close conformity with the lines and grades indicated on the drawings or established by the Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Trenching, Backfilling and Compacting - Section 02221; Seeding - Section 02485.

1.03 CONTRACTOR'S OPTION

- A. Unless a specific type is indicated, the Contractor has the option of furnishing either flexible or rigid pipe as specified below. Unless specifically indicated, only one type shall be used.

1.04 ORDERING PIPE

- A. The Contractor shall not order or have delivered pipe for the project until a list of the sizes and specific lengths is furnished by him to the Engineer for approval.

PART 2: MATERIALS

2.01 CORRUGATED METAL PIPE AND PIPE ARCHES

- A. These conduits and the coupling bands shall meet the requirements of AASHTO M36 for the sectional dimensions and gages indicated on the drawings. Shop-formed elliptical pipe and shop-strutted pipe shall be furnished where specified.
- B. Special sections, such as elbows and flared end sections, for these conduits shall be of the same gage as the conduits to which they are joined, and shall conform to the applicable requirements of AASHTO M36.

2.02 BITUMINOUS COATED CORRUGATED METAL PIPE AND ARCHES

- A. These conduits and the coupling bands shall meet the requirements of AASHTO M190 for the sectional dimensions, gages and type of bituminous coating indicated on the drawings. Coupling bands shall be fully coated with bituminous material. Shop-formed elliptical pipe and shop-strutted pipe shall be furnished where indicated on the drawings.
- B. Special sections, such as elbows and flared end sections, for these conduits shall be of the same gage as the conduit to which they are joined, and shall meet the applicable requirements of AASHTO M190. Coating and invert paving shall be of the type indicated on the drawings.
- C. When asbestos bonded bituminous coating is indicated on the drawings, these requirements shall equally apply and in addition the special process of embedding asbestos fiber in the molten metallic bonding medium shall be used to bond the bituminous coating.

2.03 NON-REINFORCED CONCRETE PIPE

- A. This pipe shall conform to the requirements and AASHTO M86 for the diameters and strength classes indicated on the drawings. Unless otherwise indicated, pipe wall design and use of elliptical reinforcement in circular pipe are optional.

2.04 INSPECTION

- A. When the location of manufacturing plants allows, the plants will be inspected periodically for compliance with specified manufacturing methods, and material samples will be obtained for laboratory testing for compliance with materials quality requirements. This can be the basis for acceptance of manufacturing lots as to quality.
- B. All materials will be subject to inspection for acceptance as to condition at the latest practicable time the Engineer has the opportunity to check for compliance prior to or during incorporation of materials in the work.

PART 3: EXECUTION

3.01 EXCAVATION

- A. Trenches shall be excavated in accordance with requirements of Section 02221 to a width sufficient to allow for proper jointing of the conduit and thorough compaction of the

bedding and backfill material under and around the conduit. Where feasible, trench walls shall be vertical.

- B. The completed trench bottom shall be firm for its full length and width. There required, in the case of cross drains, the trench shall have a longitudinal camber of the magnitude indicated on the drawings.
- C. Where conduits are to be placed in embankment fill, the excavation shall be made after the embankment has been completed to the height indicated on the drawings.

3.02 BEDDING

- A. The conduit bedding shall conform to the class indicated on the drawings. When no bedding class is indicated, the requirements for Class C bedding shall apply.
 - 1. Class A bedding shall consist of a continuous concrete cradle conforming to the drawing details.
 - 2. Class B bedding shall consist of bedding the conduit to a depth of not less than 30 percent of the vertical outside diameter of the conduit plus 4 inches, the thickness of bedding material. The bedding material shall be sand of selected sandy soil all of which passes a 3/8-inch sieve and not more than 10 percent passes a No. 200 sieve. The layer of bedding material shall be shaped to fit the conduit for at least 15 percent of its total height. Recesses in the trench bottom shall be shaped to accommodate the bell when bell and spigot type conduit is used.
 - 3. Class C bedding shall consist of bedding the conduit to a depth of not less than 10 percent of its total height. The bed shall be shaped to fit the conduit and shall have recesses shaped to receive the bell.

3.03 LAYING CONDUIT

- A. The conduit laying shall begin at the downstream end of the conduit line. The lower segment of the conduit shall be in contact with the shaped bedding throughout its full length. Bell or groove ends of rigid conduits and outside circumferential laps of flexible conduits shall be placed facing upstream. Flexible conduit shall be placed with longitudinal laps or seams at the sides.

- B. Paved or partially lined conduit shall be laid so that the longitudinal center line of the paved segment coincides with the flow line. Elliptical and elliptically reinforced conduits shall be placed with the major axis within 5 degrees of a vertical plane through the longitudinal axis of the conduit.

3.04 JOINING CONDUIT

- A. Rigid conduits may be of bell and spigot or tongue and groove design unless one type is indicated. The method of joining conduit sections shall be such that the ends are fully entered and the inner surfaces are reasonably flush and even.
- B. Joints shall be made with (a) portland cement mortar, (b) portland cement grout, or (c) rubber gaskets, by a combination of these types, or any one type, as may be indicated.
- C. Mortar joints shall be made with an excess of mortar to form a bead around the outside of the conduit and finished smooth on the inside. For grouted joints, molds or runners shall be used to retain the poured grout. Rubber ring gaskets shall be installed so as to form a flexible watertight seal.
- D. When portland cement mixtures are used, the completed joints shall be protected against rapid drying by suitable covering material.
- E. Flexible conduits shall be firmly joined by coupling bands.
- F. Conduit shall be inspected before any backfill is placed. Any pipe found to be out of alignment, unduly settled, or damaged shall be taken up and relaid or replaced.

3.05 FIELD STRUTTING

- A. Where required by the drawings, the vertical diameter of round flexible pipe shall be increased 5 percent by means of jacks applied after the entire line of pipe has been installed on the bedding but before backfilling. The vertical elongation shall be maintained by means of sills and struts or by horizontal struts. Only horizontal ties shall be used on paved invert pipe.
- B. Ties and struts shall be left in place until the embankment is completed and compacted, unless otherwise directed.
- C. These construction specifications shall equally apply in the case of relaid conduits. In addition, all conduit salvaged for relaying shall be cleaned of all foreign material prior to

reinstallation.

3.06 BACKFILLING

- A. After the conduit is installed, the trench shall be backfilled with selected material in accordance with Section 02221.
- B. When the top of the conduit is exposed above the top of the trench, embankment material shall be placed and compacted for a width on each side of the conduit equal to at least twice the horizontal inside diameter of the conduit, or 12 feet, whichever is less. The embankment on each side of the conduit, for a distance equal to the horizontal inside diameter of the conduit, shall be of the same material and compacted in the manner described for backfilling. The remainder of the fill material shall not contain frozen lumps, stone in excess of 3-inch diameter, or other objectionable material. Compaction shall be achieved as provided for backfill or by rolling. The embankment shall be placed and compacted simultaneously on both sides of the conduit for the full width of the roadbed up to an elevation one foot above the top of the conduit. Above this elevation, embankment shall be placed and compacted in normal manner, except where the imperfect trench method is prescribed. All conduit after being bedded and backfilled as specified in this section shall be protected by a 4-foot cover of fill before heavy equipment is permitted to cross during construction of the roadway.

3.07 IMPERFECT TRENCH

- A. Under this method, for rigid conduit, the embankment shall be completed as described above, to a height above the conduit equal to vertical outside diameter of the conduit plus one foot. A trench equal in width to the outside horizontal diameter of the conduit shall then be excavated to within one foot of the top of the conduit, trench walls being as nearly vertical as possible. This trench shall be loosely filled brush or sawdust may be to fill the lower 1/4 to 1/3 of the trench. Construction of embankment above shall then proceed in a normal manner.

PART 4: MEASUREMENT AND PAYMENT

- A. Payment will be made for work contained in this Section on a contract unit price per linear foot basis.

END OF SECTION