

# Construction Specification 42—Concrete Pipe Conduits and Drains

## 1. Scope

The work shall consist of furnishing and installing concrete pipe or concrete drain tile and the necessary fittings as shown on the drawings.

## 2. Material

**Reinforced concrete pressure pipe** shall conform to the requirements of Material Specification 541, Reinforced Concrete Pressure Pipe, for the type and strength specified.

**Concrete culvert pipe** shall conform to the requirements of Material Specification 542, Concrete Culvert Pipe, for the kind of pipe specified.

**Concrete irrigation pipe, drainage pipe, and drain tile** shall conform to the requirements of Material Specification 543, Nonreinforced Concrete Pipe, for the kind of pipe or tile specified.

**Pipefittings** shall conform to the requirements of the applicable pipe specifications.

**Sealing compound for filling rubber gasket joints** shall conform to the requirements of Material Specification 536, Sealing Compound for Joints in Concrete and Concrete Pipe.

**Hot-pour joint sealer** shall conform to the requirements of Material Specification 536, Sealing Compound for Joints in Concrete and Concrete Pipe.

**Cold-applied sealing compound** shall conform to the requirements of Material Specification 536, Sealing Compound for Joints in Concrete and Concrete Pipe.

**Preformed sealing compound** shall conform to the requirements of Material Specification 536, Sealing Compound for Joints in Concrete and Concrete Pipe.

**Joint packing** shall be commercial grade oakum.

**Preformed expansion joint filler** shall conform to the requirements of Material Specification 535, Preformed Expansion Joint Filler.

**Portland cement concrete for bedding and cradles** shall conform to Construction Specification 31, Concrete for Major Structures, or Construction Specification 32, Structure Concrete.

## 3. Laying and bedding

Pipe and tile shall be laid to the line and grade shown on the drawings. Unless otherwise specified, belled pipe shall be laid with the bells or grooves facing upstream. When precast pipe risers and other similar precast pipe structures are installed before pipe installation, pipe may be installed in the downstream direction with the belled end upstream. Adequate bell clearance in the subgrade/bedding shall be provided.

**Concrete cradles or bedding**—Pipe to be cradled or bedded on concrete shall be set to the specified line and grade and temporarily supported on precast concrete blocks or wedges until the cradle or bedding concrete is placed. Concrete blocks or wedges used to temporarily support the pipe during placement of bedding or cradle shall be of a class of concrete equal to or stronger than that to be used in the bedding or cradle.

**Earth, sand, or gravel bedding**—The pipe shall be uniformly bedded throughout its entire length to the depth and in the manner specified on the drawings. The pipe shall be loaded sufficiently during back-filling around the sides to prevent displacement.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about a vertical centerline. Perforations shall be clear of any obstructions when the pipe is laid.

Elliptical pipe and pipe with elliptical or quadrant reinforcement shall be laid so that the vertical axis, as indicated by markings on the pipe, is in a vertical position.

#### **4. Joints**

Pipe joints shall conform to the details shown on the drawings and to the requirements of sections 5 and 6 of this specification applicable to the type of joint specified. Except where unsealed joints are indicated, pipe joints shall be sound and watertight at the pressure specified.

#### **5. Jointing bell and spigot pipe**

##### **Rubber gasket joint, pressure pipe**

Just before the joint is connected, the connecting surfaces of the spigot and the bell or coupling band, sleeve, or collar shall be thoroughly cleaned and dried. Also, the rubber gasket and the inside surface of bell or coupling band, sleeve, or collar shall be lubricated with a light film of soft vegetable soap compound (flax soap). The rubber gasket shall be stretched uniformly as it is placed in the spigot groove to ensure a uniform volume of rubber around the circumference of the pipe.

**Method 1**—The joint shall be connected by means of a pulling or jacking force so applied to the pipe that the spigot enters squarely into the bell.

**Method 2**—The joint shall be connected in accordance with the manufacturer's recommendations.

**Use with either method**—When the spigot has been seated to within 0.5 inch of its final position, the position of the gasket in the joint shall be checked around the entire circumference of the pipe using a metal feeler gauge. In any case where the gasket is found to be displaced, the joint shall be disengaged and properly reconnected. After the proper position of the gasket has been confirmed, the spigot shall be completely pulled into the bell and the section of the pipe shall be adjusted to line and grade.

##### **Rubber gasket joints, sewer, and culvert pipe or irrigation pipe**

The pipe shall be joined in accordance with the gasket manufacturer's recommendations except as otherwise specified.

##### **Mastic sealed joints**

At the time of assembly, the inside surface of the bell and the outside surface of the spigot shall be clean, dry, and primed as recommended by the manufacturer of the sealing compound. A closely twisted gasket of joint packing of the diameter required to support the spigot at the proper grade and to make the joint concentric shall be made in one piece of sufficient length to pass around the pipe and lap at the top. The gasket shall be laid in the bell throughout the lower third of the circumference. The end of the spigot shall be laid on the gasket, and the spigot shall be fully inserted into the bell so that the pipe sections are closely fitted and aligned. The gasket then shall be lapped at the top of the pipe and thoroughly packed into the annular space between the bell and the spigot.

**Hot-pour joint sealer**—The sealing compound shall be heated to within the temperature range recommended by the manufacturer and shall not be overheated or subjected to prolonged heating. After the joint is assembled with the pipe in its final location, a suitable joint runner shall be placed around the

joint with an opening left at the top. Molten sealing compound shall be poured into the joint as rapidly as possible without entrapping air until the annular space between bell and spigot is completely filled. After the compound has set, the runner may be removed. Alternate joints may be poured before the pipe is lowered into the trench. In this case the joint shall be poured with the pipe in a vertical position without the use of the runner. The compound shall have thoroughly set before the pipe is placed in the trench, and the pipe is handled so as to cause no deformation of the joint during placement.

*Cold-applied sealing compound*—The annular space between bell and spigot shall be completely filled with the sealing compound. The compound shall be mixed on the job in accordance with the manufacturer's recommendations and in relatively small quantities so that setting will not be appreciable before application.

*Preformed sealing compound*—Joint packing is not required except as recommended by the manufacturer of the sealing compound. Preformed strips or bands of the sealing compound shall be applied to the bell and spigot before assembly of the joint in accordance with the manufacturer's recommendations. Any compound extruded from the interior side of the joint during assembly shall be trimmed even with the interior surface of the pipe.

### **Cement mortar sealed joints**

Cement mortar for joints shall consist of one part by weight of portland cement and two parts by weight of fine sand with enough water added to produce a workable consistency. At the time of assembly, the inside surface of the bell and the outside surface of the spigot shall be clean and moist.

*With packing*—A closely twisted gasket of joint packing of the diameter required to support the spigot at the proper grade and to make the joint concentric shall be made in one piece of sufficient length to pass around the pipe and lap at the top. The gasket shall be saturated with neat cement grout, laid in the bell throughout the lower third of the circumference, and covered with mortar. The end of the spigot shall be fully inserted into the bell so that the pipe sections are closely fitted and aligned. A small amount of mortar shall be placed in the annular space throughout the upper two-thirds of the circumference. The gasket then shall be lapped at the top of the pipe and thoroughly packed into the annular space between the bell and the spigot. The remainder of the annular space then shall be filled completely with mortar and beveled off at an angle of about 45 degrees with the outside of the bell. If the mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint thus made shall be wrapped with cheesecloth. After the mortar has set slightly, the joint shall be wiped inside the pipe. If the pipe is too small for a person to work inside, wiping may be done by dragging an approved swab through the pipe as the work progresses.

*Without packing*—The lower part of the bell shall be filled with stiff mortar of sufficient thickness to make the inner surface of the abutting sections flush. The spigot end of the pipe to be joined shall be fully inserted into the bell so that the sections are closely fitted and aligned. The remaining annular space between the bell and spigot shall then be filled with mortar and the mortar neatly beveled off at an angle of about 45 degrees with the outside of the bell. After the mortar has set slightly, the joint shall be wiped inside the pipe. If the pipe too small for a person to work inside, wiping may be done by dragging an approved swab through the pipe as the work progresses.

### **Unsealed joints**

When unsealed joints are specified, they shall conform to the details shown on the drawings.

## **6. Joining tongue and groove pipe**

### **Cement mortar sealed joint**

Mortar shall be as specified for bell and spigot joints. The tongue end of the section being placed shall be covered with mortar and firmly pressed into the groove of the laid section so that the tongue fits snugly

and truly in the groove and that mortar is squeezed out on both the interior and exterior of the joint. Care shall be taken that no mortar falls from the groove end during the abutting operation. Immediately after the pipe sections have been abutted, exposed external surface mortar shall be pressed into the joint and any excess mortar removed. After this is done, the interior surface of the joint shall be carefully pointed and brushed smooth and all surplus mortar removed.

### **Mastic sealed joints**

Strips or bands of preformed sealing compound shall be applied to the tongue and groove before assembly of the joint in accordance with the manufacturer's recommendations. Any compound extruded from the interior side of the joint during assembly shall be trimmed even with the interior surface of the pipe.

### **Rubber gasket joints**

The pipe shall be joined in accordance with the gasket manufacturer's recommendations except as otherwise specified.

### **Unsealed joints**

When unsealed joints are specified, they shall conform to the details shown on the drawings.

## **7. Banding**

When external mortar bands are specified, they shall conform to the details shown on the drawings.

## **8. Curing mortar joints and bands**

The external surface of mortar joints shall be covered with moist earth, sand, canvas, burlap, or other approved material and shall be kept moist for 10 days or until the pipe is backfilled. Earth backfilling operations shall not begin until 24 hours after joints are finished.

Water shall not be turned into the conduit within 24 hours after the joints are finished. Hydrostatic pressure shall not be applied to the conduit before 14 days after the joints are finished.

## **9. Pressure testing**

**Method 1**—Pressure testing of the completed conduit is not required.

**Method 2**—Before the concrete or earth backfill is placed around the conduit, the conduit shall be tested for leaks in the following manner:

The ends of the conduits shall be plugged and a standpipe with a minimum diameter of 2 inches shall be attached to the upstream plug. The conduit shall be braced at each end to prevent slippage. The conduit and the standpipe shall be filled with water. The water level in the standpipe shall be maintained a minimum of 10 feet above the invert of the upstream end of the conduit for a period of not less than 2 hours. Any leaks shall be repaired and the conduit shall be retested as described. The procedure shall be repeated until the conduit is watertight.

**Method 3**—Before the concrete or earth backfill is placed around the conduit, the conduit shall be tested at the specified test pressure for a period of at least 2 hours. Any leaks shall be repaired, and the conduit shall be retested. The procedure shall be repeated until the conduit is watertight.

**Method 4**—Before the concrete or earth backfill is placed around the conduit joint to be tested, the joint shall be tested in accordance to ASTM C 1103, Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines. Any joints showing leaks shall be relaid or repaired, and the joint shall be retested. The procedure shall be repeated until the joint passes the test.

For methods 2, 3, and 4, the pipe joints shall show no leakage. Damp spots developing on the surface of the pipe are not considered leaks.

## **10. Measurement and payment**

**Method 1**—For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe or tile is determined to the nearest 0.1 foot by measurement of the laid length along the invert centerline of the conduit. Payment for each kind, size, and class of pipe or tile is made at the contract unit price for that kind, size, and class. Such payment constitutes full compensation for furnishing, transporting, and installing the pipe or tile complete in place.

**Method 2**—For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe or tile is determined as the sum of the nominal laying lengths of the sections used. Payment for each kind, size, and class of pipe or tile is determined as the sum of the nominal laying lengths of the sections used. Payment for each kind, size, and class of pipe or tile is made at the contract unit price for that kind, size, and class. Such payment constitutes full compensation for furnishing, transporting, and installing the pipe or tile complete in place.

**All methods**—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 11 of this specification.

## **11. Items of work and construction details**