



## SECTION 726

### RIGID PIPE CULVERTS

**726.1 Description.** This work shall consist of providing concrete and vitrified clay pipe of the diameter or shape designated, laid upon a bed and backfilled as specified on the plans, or as directed by the engineer. Pipe shall be in accordance with Section 724.

**726.1.1** If the contract specifies reinforced concrete pipe or pipe culverts by group and the contractor elects to furnish reinforced concrete pipe, the type of installation and the class of pipe shall be in accordance with the plans for the applicable allowable overfill height.

**726.1.2** If the contract specifies vitrified clay pipe or if the contract specifies pipe culverts by group and the contractor elects to furnish vitrified clay pipe, such pipe shall be placed in a trench in accordance with the plans for the allowable overfill height.

**726.1.3** If the contract specifies non-reinforced concrete pipe, the contractor may, at no additional cost to the Commission, furnish reinforced concrete pipe of like sizes and strengths in accordance with these specifications.

**726.1.4** If reinforced concrete pipe is specified in the contract or elected for use by the contractor, pipe of a higher class may be used, but payment will be made for the class of pipe specified in the contract for that culvert.

**726.1.5** The class of pipe or type of installation shall be as shown on the plans or as approved by the engineer.

**726.1.6** The type of pipe permitted in extending an existing pipe shall conform to the type used in place, except as otherwise specified in the contract or prohibited by any of the requirements set out herein.

**726.1.7** If standard strength vitrified clay pipe is specified in the contract or elected for use by the contractor, extra strength vitrified clay pipe may be used, but payment will be made for standard strength vitrified clay pipe. Only extra strength vitrified clay pipe shall be used under roadways. Standard strength vitrified clay pipe will be permitted only where vehicular traffic is not anticipated.

**726.2 Material.** All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Reinforced Concrete Culvert	1026
Vitrified Clay Sewer and Culvert Pipe	1030
Reinforced Concrete Elliptical Culvert	1034
Reinforced Concrete Arch Culvert	1035
Plastic Joint Compound for Vitrified Clay and Concrete Pipe	1057
Material for Joints	1057
Mortars and Grout	1066

### **726.3 Construction Requirements.**

**726.3.1 Laying.** Rigid pipe shall be carefully laid as shown on the plans, with hub, bell or groove ends upstream and with the spigot or tongue end entered the full length into the adjacent section of pipe. Elliptically reinforced pipe shall be oriented and laid such that the top and bottom of the pipe, as marked on the pipe, are in the proper position. If the pipe is to be laid below the ground line, a trench shall be excavated to the required section and depth to permit required compaction of the backfill under the haunches and around the pipe. Any pipe that is not in true alignment or that shows any undue settlement after laying, but before the fill is placed, shall be removed and re-laid at the contractor's expense. Camber shall be built into the pipe structure as shown on the plans or as approved by the engineer. All joints, except for field or private entrance culverts, shall be sealed with an approved plastic compound, tubular joint seal, an external wrap, cement mortar or other approved methods to create a soil tight condition. Rubber gasket joints may be used at no additional cost to the Commission. Where permissible lift holes have been used, the holes shall be filled with approved material or plug and sealed as required for culvert pipe joints. Lifting devices shall have sufficient bearing on the inside of the pipe to avoid damage resulting from a concentration of stresses around the lift holes. The joint between the bell and spigot shall be uniform for the full circumference and within allowable design tolerances.

**726.3.1.1** If rubber gasket-type pipe or vitrified clay pipe is specified or used, joints shall be installed in accordance with the manufacturer's recommendations.

**726.3.1.2** In sealing rigid pipe with mortar, the mortar contact areas of all pipe ends shall be damp when mortar is applied. After applying mortar to the entire interior surface of the bell or groove, the spigot or tongue end shall be forced into position. Any remaining void in the bell or groove shall be filled with a hub of mortar built up adjacent to the bell, or a bead of mortar built up around a groove-type joint. The interior joints of either type of pipe shall be finished flush with the surface of the pipe. The outside surface of mortar joints shall be cured with membrane curing compound.

**726.3.1.3** In sealing rigid pipe with plastic joint compound, trowel grade compound shall be applied to the mating surfaces of both the tongue and groove, or to the entire interior surface of the bell and the upper portion of the spigot. The joints shall be forced together with excess compound extruding both inside and outside the joint. Rope or tape type plastic compound shall be applied in accordance with the manufacturer's recommendations. Excess compound shall be removed from the interior surface where accessible. Tubular joint seals shall be installed as recommended by the manufacturer.

**726.3.1.4** If external wrap is used, the wrap shall be installed in accordance with the manufacturer's recommendations.

**726.3.2 Bedding.** Bedding for reinforced concrete pipe shall consist of Category 1, Category 2 or Category 3 soil as shown on the plans.

**726.3.2.1** Category 1 soil shall consist of a well-graded mixture of stone fragments, gravel and sand in accordance with AASHTO M 145, Group A-1 or A-3.

**726.3.2.2** Category 2 soil shall consist of non-plastic or moderately plastic granular material with a silt content higher than that of Category 1, and shall be in accordance with AASHTO M 145, Group A-2 or A-4.

**726.3.2.3** Category 3 soil shall consist of silty clays, and shall be in accordance with AASHTO M 145, Group A-5, A-6 or A-7.

### **726.3.3 Installation.**

**726.3.3.1 Installation of Pipe Prior to Placing Embankment.** After the pipe has been laid, the material in the haunch and lower side zones shall be placed to a minimum width of one pipe diameter outside the pipe. The haunch and lower side material shall be compacted to the required densities shown on the plans. When all material has been placed and compacted up to the springline of the pipe, the remaining fill material shall be placed in accordance with the requirements of the adjacent fill. If a subtrench will be required to install the pipe to the specified grade, the width of the trench shall be shown on the plans. Sufficient clearance shall be provided in order to attain the required compaction in the haunch and outer bedding zone.

**726.3.3.2 Installation of Pipe After Placing Embankment.** The roadway embankment shall be placed and compacted to the required density to a minimum elevation of one foot below the bottom of the pavement base material. A trench, in accordance with the section shown on the plans, shall be excavated through the embankment to a depth sufficient to place the required bedding and maintain the specified grade of the pipe. Bedding shall be placed to the required thickness and grade and shall not be compacted under the middle one third of the pipe. The bedding outside the middle one third of the pipe and the material in the haunch and lower side zones shall be compacted up to the springline of the pipe. The placement of the remainder of the embankment material above the springline shall be compacted in accordance with the requirements for the adjacent fill.

**726.3.3.3 Extra Strength Vitrified Clay Pipe.** Vitrified clay pipe shall be laid in a trench with a width, on a plane level with the top of the pipe, no greater than that shown on the plans for the respective pipe diameter. The trench shall have a minimum depth of one outside pipe diameter plus 16 inches. If the original ground line is below an elevation one foot above the top of the proposed pipe, embankment shall be constructed to at least one foot above the proposed pipe prior to excavating the trench. The trench walls shall be as nearly vertical as practical. Prior to laying the pipe, the bottom of the trench shall be covered with a bedding, consisting of a 4-inch layer of sand. After laying the pipe, the trench shall be backfilled with sand around the pipe for at least 10 percent of the height of the pipe. The sand shall be thoroughly compacted by the use of tampers or by flooding. The remainder of the trench shall be backfilled in accordance with [Sec 726.3.4](#).

**726.3.3.4 Bedding in Unsuitable Material.** If rock is encountered, the bedding depth shall be increased to  $1/12$  the outside diameter of the pipe, but no less than 6 inches. The width of the cushion excavation shall be 1.33 times the outside diameter of the pipe, but no less than 24 inches wider than the outside diameter of the pipe. If soft, spongy or unstable material is encountered, the material shall be removed and replaced with soil compacted to the level specified for the lower side zone.

**726.3.4 Backfilling.** Backfilling shall be placed as soon as practical in accordance with [Sec 206](#). Suitable backfill and embankment material, free from large lumps, clods or rocks, shall be compacted in accordance with [Sec 203](#). Care shall be taken to properly compact the backfill under the haunches of pipe-arch. Before heavy construction equipment is operated over the pipe, the contractor shall provide an adequate depth and width of compacted backfill or other cover to protect the pipe from damage or displacement. Any damage or displacement shall be repaired or corrected at the contractor's expense.