

**717.00 CONCRETE PIPE CULVERTS** (*SSHC Section 720*)

**717.01 DESCRIPTION**

- A. This work shall consist of furnishing and installing new reinforced concrete culvert pipe (round, pipe-arch and elliptical), reinforced concrete slotted pipe and the relaying of existing reinforced concrete pipe.

**717.02 MATERIAL REQUIREMENTS**

- A. Pipe Marking. Each section of pipe used should be marked with the fabrication inspector's initial and the class of pipe, when it arrives at the site. The culvert inspector should not permit the laying of any section that does not have these markings. The project manager will receive a copy of the "Report of Shipment of Reinforced Concrete Pipe" (Form DR-420), listing the size, class, length, number of sections of pipe, the inspector's identification mark and stock report number. The inspector will use the information contained in this report to verify approval of reinforced concrete pipe received on the project. The diameter, class, length, number of sections and the pipe identification number shall be recorded in the culvert notebook. Each section of pipe should be examined for damaged ends, cracks and evidence of poor manufacture. All irregularities should be referred to the Project Manager before using of the pipe.
- B. Ordering Material
1. The contractor is **not permitted to order or deliver** culvert pipe until a "culvert list" listing the correct sizes and lengths of pipe is furnished by the Project Manager.
  2. The Project Manager shall furnish a pipe list for driveway and sewer requirements.
  3. The District Construction Engineer, and the Project Manager should go over the drainage situation and features in the field to confirm that the structures shown in the plans are adequate to handle the drainage. The cross sections taken at each culvert site should be plotted, the roadway cross section template and the structure plotted thereon at the proper flow line elevations, and the length of the structure thus determined. If the Project Manager includes either a larger drainage structure, or an additional drainage structure in the culvert list, he/she should, if possible, specify the same type of structure, or the same kind of pipe (culvert pipe, concrete pipe or corrugated metal pipe) as is shown in the approved plans for the project for the other structures.
  4. In detailing and ordering the pipe culverts, the following rules should be followed for all kinds of culvert pipe (concrete pipe, corrugated metal pipe or culvert pipe):
    - a. The overall length of culvert pipe should be given to the closest 2 ft (600 mm).
    - b. The minimum distance from either end of the pipe to the break point of a broken back pipe culvert shall be 10 ft (3 m).

- c. The dimensions from ends of the pipe to break points, or between break points of a broken-back pipe culvert should be given to the closest 2 ft (600 mm) along the centerline of the pipe. The fabricator will be permitted to locate the elbows 1 foot (300 mm) in either direction from the locations shown in the culvert sketch.
- d. Generally, pipe culverts should not be designed or constructed with elbows of less than 5 degrees.
- e. Prepare a sketch for each broken-back pipe culvert, designing and detailing the structure using the chart "Slope Data for Pipe Culvert" as a guide, and including dimensions, details and elevations as shown in the sample culvert sketch shown in this Subsection.
- f. Pipe arch culverts are to be detailed and dimensioned the same as round pipe culverts. Broken-back pipe arch culverts should be avoided.
- g. If flared end sections are to be installed, the pay length shall be the order length shown in the culvert list and sketch. A note should be made as part of the list indicating that order lengths do not indicate the "Y" distances shown in the applicable Standard Plan in the case of metal pipe.
- h. The condition, kind of pipe, diameter and lengths right and left of centerline should be carefully checked before ordering extensions for an existing pipe culvert. Careful checking will eliminate ordering extensions which are improper as to length, diameter, kind of pipe, etc.
- i. The maximum discharge of the average pipe culvert without head on the inlet will be provided when such pipe are given a slope of between one percent and two percent. Slopes steeper than this will not increase the water carrying capacity of the culvert. The Project Manager should make every effort to use such slopes when they are compatible with other drainage requirements at the individual culvert site. In choosing between a straight and a broken-back culvert pipe, the Project Manager should realize that little, if any, value is gained by installing elbows of less than 5 degrees.
- j. If settlement or subsidence is anticipated under higher fills, pipe culverts and box culverts should be cambered. The plans will usually include a "Camber Note" which will state that the pipe culverts should be laid and box culverts constructed on parabolic camber grade as shown in the applicable standard plan, and will state the proportion of fill height which the foundation soil is expected to settle. Settlement of subsidence is generally zero at the toe of the slope, and at a maximum at the shoulder line.

### **717.03 CONSTRUCTION METHODS**

#### **A. Excavation and Backfilling**

- 1. See Section 702 of this manual.

B. Installation

1. Begin laying concrete pipe at the downstream end of the culvert with the groove or bell portion of each section upstream.
2. Irrigation culverts shall be constructed of concrete pipe and must have approved gaskets at the joints. These gaskets shall be installed as per the manufacturer's recommendations and standards. Here is example of how to calculate payment for excavation.

<b>EXAMPLE CALCULATION</b>
----------------------------

Area for 1.25 m depth:

1a

Area for 2.75 m depth:

1b + 2b + 3b

Area for 4.25 m depth:

1c + 2c + 3c

Area for 5.75 m depth:

1d + 2d + 3d

Area for greater than 5.75 m depth:

1e + 2e + 3e