6.50 PIPE CULVERTS BY THE GRADING CONTRACTOR

This chapter addresses the construction of roadway pipe culverts, entrance pipe culverts, and pipe letdown structures which do not require structural concrete.

The culvert inspector should be familiar with the following:

Current Standard Specifications
Supplemental Specifications
Project Plans
Standard Road Plans, particularly the RF section

6.51 MATERIAL

Pipe material requirements are included in *Specifications 4141, 4143, 4144, 4145, 4146, and 4147. Materials I.M.'s 441, 443, and 445* identify approved producers and/or certification for concrete and metal pipe culverts. Currently, aluminum pipe may only be furnished for coated corrugated pipe with the approval of the engineer. It is important that the producers of the material to be incorporated into a project meet the requirements of these *Materials I.M.'s*. The final acceptance of the material is at the project. This inspection is to insure that there has been no damage during delivery. Any pipe culvert damaged in shipment shall not be accepted.

6.52 PIPE INSTALLATION

Excavation

Method of measurement for Class 20 excavation for culvert installation is based on a 1:1 slope from the excavation bottom to ground level.

Bedding

Roadway pipe culverts are bedded according to Class B or Class C requirements depending on design conditions. For roadway culverts, Class B bedding is required unless specified otherwise and requires the contractor to overcut the area on which the pipe is to be placed so a minimum 50 mm (2-inch) layer of sand is placed between the soil and the pipe. Class B bedding requires that 15 percent of the pipe height rest on the sand below the bottom of the pipe.

Class C bedding requires that a saddle be constructed on compacted or natural earth so that 10 percent of the height is below the bottom of the pipe. Class C bedding is to be shaped by a template or cut by other means and checked with a template to insure that the pipe culvert is supported for its full length. Proper shaping of the saddle is needed to develop the strength of the pipe and prevent washout.

Unless specifically addressed in the contract documents, Class B bedding is not required for entrance pipes 600 mm (24 inches) or less in diameter.

Class B bedding may be substituted for Class C bedding at the contractor's option.

Joints

Allowable joint openings for Rigid Pipe Culverts are described in Specification 2416.03, D, 5. If pipe joints are not within these tolerances, the joints are to be encased with concrete collars (Type C-1 connections).

Joints for corrugated steel pipe let-down structures *(Typicals 1401, 1402, 1403, 1501 & 1602)* will be made with positive type joint couplings as identified in *Materials I.M. 441.*

Backfilling

This operation may involve *Specifications 2107, 2402.03, G, 2402.03, H and* 2416.03, D, 4. The inspector should insure that all applicable sections are followed.

Special attention should be given to culvert wingwalls and flumes to insure proper compaction to prevent erosion and possible washout. The soil should be brought up even with these walls so the surface water will flow over these walls and not along them. Heavy equipment should be kept 1 m (3 feet) or more away from these wingwalls. Compaction within 1 m (3 feet) of the wingwall shall be with pneumatic hand tampers or small hand operated vibratory plate compactors.

Compaction with moisture control is sometimes specified for locations where a culvert is being placed in an existing roadway. This is intended to insure proper compaction thereby reducing settlement. The limits of the moisture control area are detailed in the plans or an area 2 m (6 feet) wide on each side as described in *Specification 2402.12A.* The 2 m (6 feet) width is specified so type "A" compaction *(Specification 2107)* is used for this backfill.

Flowable mortar is sometimes included in the plans for backfilling culverts. The plans will identify the locations and show the details for using the flowable mortar. Refer to *Construction Manual Chapter 11* for flowable mortar.

6.53 CULVERT ABANDONMENT

If a culvert is relocated, the existing culvert should be removed if feasible. If an existing culvert is to be plugged, it should be completely filled with suitable material for the entire length. This is to insure that voids do not develop later by water washing soil through cracks into the open portion of the culvert. Suitable material may be granular backfill, sand, flowable mortar, etc.

6.54 LOAD LIMITS OVER CULVERTS

This instruction is to identify the conditions under which earth moving equipment may haul over culverts. No other modifications of *Specification 1105.12 shall be allowed.*

Note that the equivalent metric units are not included in this section.

Axle loads from hauling equipment shall not exceed the values shown in the following table:

Span (Feet)	Design Fill (Feet)	Depth of Fill in Place (Feet)	Maximum Axle Load (Pounds)
Under 8	0	0	50,000
8 or more	0	0	45,000
6 or less	0 or more	4(minimum)	80,000
8 or more	4 or more	4 (minimum)	80,000
6 or less	0 or more	5 (minimum)	100,000
8 or more	5 or more	5 (minimum)	100,000

6 or less	0 or more	6.5 (minimum)	120,000
8 or more	7 or more	7 (minimum)	120,000
6 or less	0 or more	8 (minimum)	140,000
8 or more	8 or more	8 (minimum)	140,000
6 or less	0 or more	9 (minimum)	150,000
8 or more	9 or more	9 (minimum)	150,000

The “designed fill” or “minimum depth of fill in place” must be in place before scrapers may cross over box culverts. The following are several example explanations:

- Hauling of axle loads up to 80,000 pounds is permitted over culverts designed for 4 feet or more of fill, after a fill of 4 feet is in place.
- Hauling of axle loads up to 100,000 pounds is permitted over culverts designed for 5 feet or more of fill, after a fill of 5 feet is in place.
- Hauling of axle loads up to 80,000 pounds is permitted over culverts having a 6-foot span or less, designed for zero feet of fill or more, after a fill of at least 4 feet is in place.
- Hauling of axle loads up to 100,000 pounds is permitted over culverts having a 6-foot span or less, designed for zero feet of fill or more, after a fill of at least 5 feet is in place.

Hauling with scrapers over pipe culverts is permitted only after the height of fill over the pipe is as tabulated below for scrapers of given weight.

Axle Load	Height of Fill
80,000 pounds maximum	Equal to its inside diameter but not less than 2 feet
Over 80,000 pounds to 100,000 pounds maximum	Equal to its inside diameter but not less than 3 feet

These restrictions do not relieve the contractor of the responsibility for damage to reinforced concrete box culverts or pipes during the hauling operation.

Axle loads greater than 100,000 pounds may be allowed after specific evaluation. The contractor is to provide the equipment weight information to project engineer. The project engineer then forwards the request to the Office of Construction for evaluation.

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