



SECTION 1049

PRECAST CONCRETE BOX CULVERTS

1049.1 Scope. This specification covers precast concrete box culverts.

1049.2 Acceptance. The basis of acceptance will be with producer's QMP in accordance with [Sec 1001.14](#).

1049.2.1 Lot Size Definition. A lot is defined as one day's production.

1049.2.2 Quality Control. The producer QMP shall define quality control testing and inspection frequencies and shall include the following minimum requirements.

1049.2.2.1 Compressive strength of cylinders or cores shall be taken at a minimum of once per lot in accordance with ASTM C1577. Compressive strength testing shall also be performed to control handling and curing operations. Cylinders shall be cured in accordance with AASHTO T23 field curing procedures.

1049.2.2.2 Air and slump of fresh concrete shall be taken a minimum of once per lot.

1049.2.2.3 Aggregate gradation, absorption and deleterious shall be checked a minimum of once per month per aggregate source in accordance with [Sec 1005](#).

1049.2.2.4 Steel placement shall be checked and documented for each unit.

1049.2.2.5 Finished dimensions shall be checked and documented for each unit.

1049.2.2.6 All equipment used for testing shall be maintained and calibrated in accordance with AASHTO R18 or equivalent program.

1049.2.2.7 Concrete plant(s) shall be calibrated and monitored in accordance with the producer's QMP.

1049.2.3 Quality Assurance. The QMP shall reference an industry organization or define independent QA testing frequencies including the following:

Tested Property ^a	Test Method	Independent QA
Air	T152	Twice a year
Slump	T119	Twice a year
Coarse Aggregate Deleterious	TM71	Twice a year
Coarse Aggregate Absorption	T85	Twice a year
Compressive Strength	T22	Twice a year
Absorption (per mix)	T280	Once a year

^a All samples shall be taken at the precast plant

1049.2.4 MoDOT Hold Points.

1049.2.4.1 MoDOT shall verify steel placement prior to concrete pour.

1049.2.4.2 Prior to shipping, producers shall notify MoDOT and obtain a MoDOT identification number(s).

1049.2.4.3 Repair methods and completion of repairs for non-conforming work shall be approved by the engineer.

1049.2.5 MoDOT Quality Assurance and Auditing. The engineer may perform QA testing and audit the producer's QMP, documentation and production at any time, which may include coring of the precast units at the producer's expense.

1049.2.6 Deficient Work. A procedure addressing deficient work in accordance with [Sec 1001.14](#).

1049.2.6.1 Filling of form tie cavities and repair of other defects shall be in accordance with [Sec 703](#).

1049.2.7 Non-Conforming Work. A procedure addressing non-conforming work is accordance with [Sec 1001.14](#).

1049.3 Material.

1049.3.1 Cement. Cement shall be in accordance with [Sec 1019](#).

1049.3.2 Fly Ash. Fly ash shall be in accordance with [Sec 1018](#).

1049.3.3 Ground Granulated Blast Furnace Slag. Ground granulated blast furnace slag shall be in accordance with the requirements of [Sec 1017](#).

1049.3.4 Aggregate. Fine and coarse aggregate for the concrete mixture shall be in accordance with [Sec 1005](#), except the requirements for gradation and percent passing the No. 200 sieve will not apply.

1049.3.5 Steel Reinforcement. Reinforcement shall be in accordance with [Sec 1036.3](#).

1049.3.6 Concrete Mixture. Concrete shall be a minimum of 5,000 psi in accordance with ASTM C1577 and the mix design shall be approved by the engineer. Admixtures or blends may be used with approval from engineer.

1049.4 Design. Except as otherwise specified herein, precast concrete box sections for the culvert shall be in accordance with ASTM C 1577. Designs shall be submitted to the inspecting District.

1049.4.1 Substituted precast concrete box culvert sections shall be designed for the earth cover shown on the plans for the cast-in-place box culvert, and shall be equal in height and cross sectional area or as approved by the engineer.

1049.4.2 Special Designs. The producer shall request approval of any modified and special designs which differ from the designs in ASTM C 1577. The request for such modified and special designs shall fully describe any deviations from those standards, including a drawing showing wall thickness, concrete design strength, the type, size and placement of reinforcement, and inside or outside dimensions of both of the box sections.

1049.4.3 The minimum barrel length for box or end section shall be 2 feet.

1049.4.4 End sections may be precast or cast-in-place. If precast, the barrel, floor and wing walls shall be cast as an integral unit. In either case, the end sections shall be constructed to the same dimensions, shapes, and with the same reinforcement as shown on the plans for cast-in-place culvert.

1049.4.5 Segmented end sections may be provided, but will be considered a modified design and will require approval as such.

1049.4.6 Toe walls shall be provided on both the upstream and downstream ends as shown on the plans, and may be cast-in-place or precast. Precast toe walls shall be connected to the end section floor.

1049.5 Manufacture.

1049.5.1 Curing. Curing shall be in accordance with [Sec 1026](#) until the concrete has developed the specified compressive strength.

1049.5.2 The producer shall ensure that the placing, finishing and consolidating of concrete is in accordance with their producer quality management plan. Temperatures shall be maintained to prevent detrimental effects to precast production and the following:

- a) Concrete placed in cold weather shall be protected from freezing during the curing period by the use of a heated, weatherproof enclosure. Concrete shall not be placed on or against reinforcing steel or other surfaces with temperatures lower than 35 °F. No concrete shall be placed when the enclosure ambient temperature is below 35 °F.

The temperature of the mixed concrete when placed shall be no higher than 90 °F. The forms and reinforcing steel shall be cooled by acceptable methods to an ambient temperature of 90 °F or lower.

1049.5.3 Permissible Variations. Dimensions, position of reinforcement, area of reinforcement and haunch dimensions shall be in accordance with ASTM C1577.

1049.6 Marking. The following information shall be legibly marked on each box section by indentation, waterproof paint or other approved means. Box section span, rise, maximum and minimum design earth cover and specification designation.

- a) Date of manufacture.
- b) Name or trademark of the manufacturer.
- c) Indicator required by the QC program.
- d) Sample Identification Number.
- e) Station where the unit will be installed.
- f) Each section shall be clearly marked on either the inner or the outer surface during the process of manufacture. In addition, the word "top" shall be lettered with waterproof paint on the inside of the top surface.

1049.7 MoDOT Identification Number. The producer shall contact the engineer, a minimum of one business day, prior to shipping precast products. The engineer shall assign a specific MoDOT identification number for each size and type of product in the shipment.

1049.7.1 Prior to delivery to the jobsite, the source, intermediate agent, shipper or contractor's representative shall notify the inspecting District by fax or electronically a minimum of one business day or earlier, prior to the impending shipment of precast material. This notification shall include a shipping form (Precast Shipping Form) and will include, at minimum, the following:

- a) Contract Number and Project Number.
- b) Receiving Purchaser/Contractor.
- c) Type and quantity of material.
- d) Date of expected delivery to the jobsite.
- e) Manufacturer's name.
- f) Stationing or structure number on precast unit, if applicable.

1049.7.2 The precast unit shall be clearly and permanently marked by the precaster with the ID number in accordance with Sec 1049.7 prior to shipment. Requests for alternate precast labeling shall be submitted to the inspecting District for approval. Material without proper identification number shall not be permitted for use on a project.

1049.8 Delivery. A bill of lading or delivery receipt for each shipment shall be furnished to the engineer at the destination point. The bill of lading shall contain an itemized statement of the sizes and lengths of precast units with the corresponding designated MoDOT identification number provided to the manufacturer for each size and type of precast unit for that shipment. The bill of lading shall contain a certified statement. The certified statement shall be signed by an authorized representative of the manufacturer and shall state the following:

“This certifies that the precast products in this shipment are in accordance with MoDOT specifications.”