



**SECTION 1028**

**POLYVINYL CHLORIDE CULVERT PIPE**

**1028.1 Scope.** This specification covers corrugated PVC culvert pipe intended for use in the construction of culverts, sewers and similar uses.

**1028.2 Basis of Acceptance.** Acceptance of corrugated PVC culvert pipe will be based upon the pipe being in accordance with this specification. Pipe shall be provided from an approved manufacturer, and will be accepted based on certification, identification markings and results from tests required by the engineer.

**1028.3 Material.** All corrugated PVC culvert pipe, couplings and fittings shall be in accordance with ASTM F 949 for 46 psi stiffness, except as follows.

**1028.3.1** Section properties shall be within the following limits:

<b>Minimum</b>					
Nominal Size S (in.)	Effective Pipe Wall Area $A_{eff}$ (in. <sup>2</sup> /in.)	Pipe Wall Centroid to Inside Face $y^c$ (in.)	Pipe Wall Moment of Inertia $I$ (in. <sup>4</sup> /in.)	Area Ratio <sup>a</sup> $A_{eff}/A_g$	Extreme Fiber Ratio <sup>b</sup> $y_c/c$
12	0.134	0.213	0.0059	0.814	0.622
15	0.149	0.257	0.0111		
18	0.195	0.309	0.0185		
24	0.235	0.406	0.0415		
30	0.284	0.523	0.0828		
36	0.347	0.634	0.1445		

<sup>a</sup>  $A_g$  equal gross area of pipe wall per unit length of pipe (in.<sup>2</sup>/in.)

<sup>b</sup>  $c$  equals the distance from the pipe wall centroid to the outermost fiber (in.)

**1028.3.2** The pipe shall not be perforated unless otherwise specified.

**1028.3.3** Field joints of corrugated PVC pipe shall provide circumferential and longitudinal strength to maintain the pipe alignment, prevent separation of pipe and prevent infiltration of side fill material. Coupling bands, if used, shall be of the same base material as the pipe. Prior to use, the design of coupling bands and fastening devices shall be submitted to and approved by Construction and Materials. Final acceptance of coupling bands and fastening devices will be based on field performance.

**1028.3.4** The manufacturer shall provide to the engineer an itemized statement of the sizes and lengths of pipe in each shipment.

**1028.4 Sampling, Testing and Acceptance Procedures.** Manufacturers furnishing pipe to MoDOT projects shall be qualified as herein described. All pipe will be subject to inspection by the engineer at the source of manufacture, at an intermediate shipping terminal or at the destination. The engineer shall be permitted free access to all facilities and records as required to conduct inspection and sampling in accordance with [Sec 106](#).

**1028.4.1 Application for Placement on Qualified List.** To become qualified, a written request shall be sent by the manufacturer to Construction and Materials with the following:

(a) A QC plan for each plant from which pipe is to be fabricated for use on MoDOT projects. The QC plan shall be in accordance with [Sec 1028.4.2](#), and shall provide that pipes be randomly selected for test by an independent testing laboratory, and that randomly selected pipes are representative of that manufacturer's pipe.

(b) A statement certifying that the quality control procedures at the plant, at a minimum, meet the requirements set forth in the manufacturer's QC plan.

(c) Sources for each material to be used in the fabrication of pipe.

(d) Certification that all pipe material to be used in the fabrication of pipe will be in accordance with MoDOT specifications.

(e) Units of measurement, English or metric, used to fabricate the pipe.

**1028.4.2 Manufacturer's QC Plans.** The QC plan for each plant shall include the following:

(a) A list of personnel with corresponding authority and responsibility.

(b) Qualifications of QC personnel, to include training received or to be given.

(c) A description of how the manufacturer proposes to control production in order to assure all material and workmanship incorporated into the fabrication of pipe meets the applicable specification requirements.

(d) The specific tests to be performed during or after production, frequency of these tests, the point where samples or inspections will be obtained or performed, and the format for recording test data.

**1028.4.3 Maintaining Qualification.** To maintain qualification, the manufacturer shall perform and maintain a QC program in accordance with the manufacturer's QC plan approved by Construction and Materials. The manufacturer shall conduct tests and inspection to verify that adequate QC is maintained, and that the pipe furnished is in accordance with these specifications. The manufacturer shall maintain for three years a record of all test results and inspections for review by the engineer. The records shall show that each shipment of pipe has been inspected by the plant's QC personnel. The record shall indicate the purchase order number or the project number, the route, county and date of inspection. The manufacturer shall notify Construction and Materials at least 24 hours prior to each shipment of pipe to a MoDOT project. Additional pipe may be considered part of the original shipment when the ordered quantity was underestimated or material was lost or damaged. A bill of lading in accordance with [Sec 1028.6](#) shall be provided for each shipment of pipe. Each plant shall maintain a current list of QC personnel with corresponding authority and responsibility. All training given to QC personnel shall be documented with a brief description of the training and shall be kept on file at the plant.

**1028.4.4 Disqualification of a Manufacturer.** A manufacturer may be disqualified from providing pipe for use on MoDOT projects based on the discretion of Construction and Materials, for reasons including, but not limited to, failure of material to consistently meet specifications, falsification of any documentation, misbranding of the pipe, unsatisfactory performance in the field or for other reasons indicating lack of consistent material quality.

**1028.4.4.1** A manufacturer will not be considered for reinstatement until after one year from the date of removal for falsification of documents.

**1028.4.4.2** Three notices of failure to meet specification requirements within a 12-month period will be cause for disqualification of the manufacturer for one year, effective from the date of the third notice.

**1028.4.4.3** A plant disqualified twice for any reason in any two-year period will be subject for permanent removal, with a minimal suspension of three years.

**1028.4.5 Reinstatement of a Manufacturer or Plant.** Consideration of reinstatement of a manufacturer once disqualified will be no sooner than specified in [Sec 1028.4.4](#), will require a written document from the manufacturer stating the reasons for disqualification and the action taken to correct those deficiencies, written concurrence from Construction and Materials that the problem has been suitably addressed, followed by an application in accordance with [Sec 1028.4.1](#).

**1028.4.6 Sampling of Material.** Random sampling of the pipe will be conducted by the engineer to verify if the pipe and material are in accordance with these specifications. Samples of PVC pipe will be obtained from fabricated culvert sections in accordance with ASTM F 949 at a frequency determined by the engineer.

**1028.4.7 Inspection.** Inspection will include an examination of the pipe for markings, deficiency in specified diameter, net length of fabricated pipe and any evidence of poor workmanship. The inspection may include taking samples.

**1028.4.8 Testing.** Specimen testing size and method of tests shall be in accordance with ASTM F 949. The contractor or manufacturer shall provide the equipment and personnel to cut a sample from a section of pipe. The sample shall include the markings or a record of the markings for that section of pipe.

**1028.4.9 Rejection.**

**1028.4.9.1** Any individual section of pipe failing to meet the marking, diameter, length or workmanship requirements of these specifications will be rejected. If 10 percent of the pipe in any lot fails to meet these requirements, the entire shipment of that pipe size may be rejected.

**1028.4.9.2** If a test specimen taken in accordance with [Sec 1028.4.8](#) fails to meet the requirements of ASTM F 949, the pipe sampled will be rejected and the lot will be resampled. A resample will be of the same size as the original sample. The resample shall be in accordance with these specifications, or the entire shipment will be rejected.

**1028.5 MoDOT Identification Number.** When the manufacturer contacts the engineer in accordance with [Sec 1028.4.3](#), the engineer will assign a specific MoDOT identification number for each size of pipe in the shipment.

**1028.6 Bill of Lading.** A bill of lading or delivery receipt for each shipment of pipe shall be furnished to the engineer at the shipping and destination points. The bill of lading shall contain an itemized statement of the sizes and lengths of pipe with the corresponding designated MoDOT identification number provided to the manufacturer for each size of pipe 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 pipe and bands in this shipment are in accordance with MoDOT specifications and were fabricated at an approved plant.”