



SECTION 1047

POLYETHYLENE CULVERT PIPE

1047.1 Scope. This specification covers polyethylene culvert pipe used for the construction of culverts and other uses specified in the contract documents.

1047.2 Basis of Acceptance. Acceptance of polyethylene culvert pipe will be based on the pipe being provided by a qualified manufacturer, certification, manufacturer quality control documentation, identification markings and tests on samples of the material as required by the engineer.

1047.3 Material. Polyethylene culvert pipe, couplings and fittings shall be in accordance with AASHTO M 294 for corrugated or AASHTO MP 20 for steel reinforced. In case of conflict with AASHTO M 294 or AASHTO MP 20, these specifications shall govern.

1047.3.1 Section properties shall be within the following limits:

Corrugated							
Nominal Size <i>S</i> (in.)	Minimum						Maximum
	Effective Pipe Wall Area <i>A_{eff}</i> (in. ² /in.)	Pipe Wall Centroid to Inside Face <i>y_c</i> (in.)	Pipe Wall Moment of Inertia <i>I</i> (in. ⁴ /in.)	Area Ratio ^a <i>A_{eff} / A_g</i>	Extreme Fiber Ratio ^b <i>y_c / c</i>	Inside Diameter <i>D_i</i> (in.)	Outside Diameter <i>D_o</i> (in.)
12	0.163	0.382	0.0313	0.699	0.494	12.02	14.60
15	0.202	0.413	0.0465	0.768	0.447	14.83	17.82
18	0.209	0.569	0.0653	0.749	0.554	17.83	21.42
24	0.233	0.669	0.1317	0.667	0.552	23.71	27.98
30	0.2330	0.757	0.2415	0.816	0.448	29.46	34.98
36	0.294	1.058	0.3153	0.683	0.588	35.44	41.92
42	0.331	1.140	0.5395	0.693	0.564	40.98	48.18
48	0.323	1.095	0.4682	0.681	0.543	47.12	54.34
60	0.438	1.477	0.8150	0.751	0.766	58.90	66.97

^a *A_g* equals gross area of pipe wall per unit length of pipe (in²/in.).

^b *c* equals the distance from the pipe wall centroid to the outermost fiber (in.).

Steel Reinforced				
Minimum				Maximum
Nominal Size <i>S</i> (in.)	Wall Steel Area <i>A</i> (in. ² /ft)	Wall Steel Moment of Inertia <i>I</i> (in. ⁴ /in.)	Rib Radius of Gyration <i>r</i> (in.)	Rib Width/Thickness Ratio <i>b/t</i>
24	0.348	0.00063	0.144	8.97
30	0.344	0.00086	0.170	10.03
36	0.404	0.00122	0.187	10.36
42	0.461	0.00152	0.195	9.91
48	0.379	0.00218	0.257	11.90
60	0482	0.00352	0.290	11.88

1047.3.2 The pipe shall be Type S and not be perforated unless specified otherwise.

1047.3.3 Field joints shall provide circumferential and longitudinal strength to maintain the pipe alignment, prevent separation of pipe and prevent infiltration of fill material. Coupling bands, if used, shall be of the same base material as the pipe. Corrugations in the bands shall have the same configuration as the corrugations in the pipe ends being connected. 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.

1047.3.4 The manufacturer shall provide to the engineer an itemized statement of the sizes, section properties and lengths of pipe in each shipment.

1047.3.5 Pipe may be fabricated using English units of measurement. Pipe fabricated using English measurements shall meet the diameter dimensions shown on the plans. Pipe tolerances will be in accordance with AASHTO M 294 or AASHTO MP 20.

1047.4 Sampling, Testing and Acceptance Procedures. All manufacturers furnishing pipe meeting the requirements of AASHTO M 294, for MoDOT projects shall be qualified as described herein. All manufacturers furnishing pipe meeting the requirements of AASHTO MP 20 for MoDOT projects shall meet the quality control and assurance requirements of the appendix section in MP 20 and these specifications. All pipes will be subject to inspection by the engineer at the source of manufacture, at an intermediate shipping terminal or at destination. The engineer shall be allowed unlimited access to all facilities and records as required to conduct inspection and sampling in accordance with [Sec 106](#).

1047.4.1 Application for Placement on Qualified List. To become qualified to furnish pipe meeting AASHTO M 294, a written request shall be sent by the manufacturer to Construction and Materials, and shall include the following information:

(a) A copy of the manufacturer's current National Product Evaluation Program (NTPEP) certification.

(b) The pipe manufacturer's certified analysis certificate setting forth the name or brand of pipe to be furnished, the specified type, category, grade and class of polyethylene compounds. The certificate shall be sworn for the manufacturer by a person having legal authority to bind the company. The certificate shall have attached a certified test report from an approved independent testing laboratory showing specific results of tests performed on each diameter pipe to be furnished, conforming to all requirements of these specifications.

Pipes shall be randomly selected for test by the independent testing laboratory and shall be representative of that manufacturer's pipe.

(c) A guarantee that all pipe furnished shall be in accordance with the specification requirements, shall bear a suitable identification brand or mark and shall be replaced without cost to the Commission when not in accordance with the specified requirements. The guarantee shall be worded such that the guarantee will remain in effect as long as the manufacturer continues to furnish material. The manufacturer shall conduct tests and measurements as necessary to ensure the material produced complies with all specification requirements. These tests and measurements shall be identified by the identification symbols or code used on the pipe in a manner that will permit the manufacturer to produce specific reports showing test results representative of specific lots of polyethylene pipe. Copies of reports of these tests shall be kept on file and shall be submitted to the engineer upon request. The brand shall be removed or obliterated by the manufacturer on all material where control tests, as outlined herein, are not in accordance with this specification.

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

1047.4.2 Maintaining Qualification. To maintain qualification to furnish pipe meeting AASHTO M 294 , the manufacturer shall perform and maintain a quality control program in accordance with the NTPEP Certification Program. The manufacturer's NTPEP certification shall be maintained. The manufacturer shall maintain for three years a record of all test results, inspections and the bill of lading for each shipment of material used in the production of pipe and for each shipment of pipe. 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 1047.6](#) shall be provided for each shipment of pipe.

1047.4.3 Disqualification of a Manufacturer. A manufacturer may be disqualified to provide pipe for use on MoDOT projects based on the discretion of Construction and Materials, for reasons including, but not limited to, not maintaining NTPEP certification, failure of material to consistently meet specifications, falsification of documentation, misbranding of pipe, unsatisfactory performance in the field or for other reasons indicating lack of consistent material quality.

1047.4.3.1 In the case where a manufacturer loses NTPEP certification and was not disqualified for any other reason, reinstatement will be considered when the manufacturer is recertified by NTPEP.

1047.4.3.2 A manufacturer will not be considered for reinstatement until after one year from the date of removal for falsification of documents.

1047.4.3.3 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.

1047.4.3.4 A manufacturer disqualified within one year of the end of a disqualification may be subject to permanent removal, with no application for reinstatement accepted for a period of three years.

1047.4.4 Reinstatement of a Manufacturer. Consideration of reinstatement of a manufacturer once disqualified will be no sooner than specified in [Sec 1047.4.3](#), 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 a new application in accordance with [Sec 1047.4.1](#).

1047.4.5 Sampling of Material. Random sampling of the pipe will be conducted by the engineer to verify pipe and material is in accordance with this specification. Samples of polyethylene pipe will be obtained from fabricated culvert sections in accordance with AASHTO M 294 or AASHTO MP 20 at a frequency determined by the engineer.

1047.4.6 Inspection. Inspection will include an examination of the pipe for markings, deficiency in specified diameter, net length of fabricated pipe and evidence of poor workmanship. The inspection may include taking samples.

1047.4.7 Testing. Specimen testing size and method of tests shall be in accordance with AASHTO M 294 or AASHTO MP 20. 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.

1047.4.8 Unacceptable Material.

1047.4.8.1 Any individual section of pipe failing to meet the marking, diameter, length or workmanship requirements of these specifications will be unacceptable. If 10 percent of the pipe in any lot fails to meet these requirements, the entire shipment of that pipe diameter may be rejected.

1047.4.8.2 If a test specimen taken in accordance with [Sec 1047.4.7](#) fails to be in accordance with AASHTO M 294 or AASHTO MP 20, the pipe sampled will be rejected, and the lot will be resampled. A resample will be from the same diameter of pipe as the original sample. The resample shall be in accordance to these specifications or the entire shipment will be rejected.

1047.5 MoDOT Identification Number. When the manufacturer contacts the engineer in accordance with [Sec 1047.4.2](#), the engineer will assign a specific MoDOT identification number for each size of pipe in the shipment.

1047.6 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, were fabricated at an approved plant and were fabricated from the following brand names:”