



CORRUGATED POLY VINYL CHLORIDE CULVERT PIPE FIELD SECTION 1028 APPENDIX A CORRUGATED POLY VINYL CHLORIDE (PVC) PIPE INSPECTION GUIDE

This guide will assist in the inspection of all types and configurations of corrugated Poly Vinyl Chloride (PVC) pipe, sockets and fittings. Answer each question and take the action indicated for the answer given. If no condition is provided for a particular answer, move on to the next question. **IT IS THE RESPONSIBILITY OF THE INSPECTOR TO CONFIRM THAT THIS INSPECTION GUIDE IS IN ACCORDANCE WITH CURRENT SPECIFICATION.**

Every lot should be visually inspected. The lot that appears to have the defects, or a lot selected at random if all lots appear to be of equal quality, shall be inspected in greater detail to generally establish the Quality Control practices of the manufacturer. And at least one pipe per size offered in the lot shall be inspected in detail using this inspection guide. The manufacturer may provide the definition of a lot. If no definition is provided, a lot will be one day's production. Or, if at the project, a lot shall be the entire quantity shipped.

If this inspection guide is used to inspect a rejected pipe, it shall be submitted with the notification to the manufacturer of the failure to meet specification.

Has any of the material or pipe included in this lot been rejected during a previous inspection visit?
If Yes, the entire lot is unacceptable. Yes No

Is this manufacturer approved for production of PVC pipe? (refer to FS-1028, Table 1)
If No, stop, the pipe is unacceptable. Yes No

Is the pipe accompanied by a bill of lading or delivery receipt at this location?
If No, stop, the pipe is unacceptable. Yes No

Does the bill of lading or delivery receipt contain an itemized list of the sizes and lengths of pipe?
If No, stop, the pipe is unacceptable. Yes No

Does the bill of lading or delivery receipt contain a MoDOT sample ID or is it accompanied by a Material Shipping Report Form?
If No, stop, the pipe is unacceptable. Yes No

Does the bill of lading or delivery receipt contain the certified statement, "This certifies that the pipe, sockets, and fittings in this shipment are in accordance with MoDOT specifications and were fabricated at an approved plant."
If No, stop, the pipe is unacceptable. Yes No



Is the certified statement signed by an authorized representative of the manufacturer?

If No, stop, the pipe is unacceptable. Yes No

Is the pipe marked (in accordance with ASTM F 949) with the following: the manufacturer's name, tradename, or trademark?

If No, stop, the pipe is unacceptable. Yes No

the nominal pipe size?

If No, stop, the pipe is unacceptable. Yes No

the designation of "ASTM F 949 (46 psi)" or "ASTM F 949 (115 psi)"?

If No, stop, the pipe is unacceptable. Yes No

the type of plastic "PVC" and minimum cell classification (ie. 12454-B)?

If No, stop, the pipe is unacceptable. Yes No

the extrusion code, including the date and location of manufacture?

(The date and location may be encoded in the manufacturer's extrusion code. If unsure, contact the manufacturer.)

If No, stop, the pipe is unacceptable. Yes No

Do the markings repeat on the pipe on intervals not exceeding 5 feet?

If No, stop, the pipe is unacceptable. Yes No

Are the letters of the markings at least ¼" in height?

If No, stop, the pipe is unacceptable. Yes No

Are there any visible cracks, holes, foreign materials, or other injurious defects that would be an indication of poor workmanship?

If Yes, stop, the pipe is unacceptable. Yes No

Are the color, density, and other physical properties uniform along the length of the pipe?

If No, stop, the pipe is unacceptable. Yes No

The outside diameter is measured by placing a circumferential wrap tape around the pipe, making sure the tape is flat against the pipe surface. The diameter reading is observed and estimated to the nearest 0.005 in. If a circumferential wrap tape is unavailable, a standard tape measure may be used instead. Wrap the tape measure around the pipe, keeping the tape as close and flat as possible, and read the circumference from the tape. To obtain the average outside diameter, repeat this process three times and average the observed values. Calculate the diameter using the following equation:

$$\text{diameter} = \text{circumference} / 3.1415$$

Is the average outside diameter within the specified tolerance?
(refer to ASTM F 949, Table 1, attached)

If No, stop, the pipe is unacceptable. Yes No



The wall thickness is measured using a cylindrical or ball anvil tubing micrometer (preferably accurate to within 0.001 in.). A minimum of 8 measurements are made at closely spaced intervals to ensure that the minimum and maximum wall thicknesses have been determined. The values are then averaged to obtain the average wall thickness. This process is used for inner, outer, and valley wall thickness.

Is the inner, outer, and valley wall thickness greater than or equal to the corresponding minimum specified thickness (where applicable)?
(refer to ASTM F 949, Table 1, attached)

If No, stop, the pipe is unacceptable.

Yes No

The average inside diameter is calculated from the average outside diameter and the effective wall thickness, t_e . The effective wall thickness will be measured using the same micrometer (described above) used make the other wall thickness measurements. The effective wall thickness will be the thickness of the pipe from the outside of the pipe to the inside of the pipe. Make at least 8 measurements at various locations along the circumference of the pipe. Average the 8 measurements to obtain the average effective wall thickness. Use the following equation to obtain the average inside diameter:

$$\text{average inside diameter} = \text{average outside diameter} - 2 * t_e$$

Is the average inside diameter within the specified tolerance?
(refer to Table 2, attached)

If No, stop, the pipe is unacceptable.

Yes No

Has 10 percent of the pipe in the same lot of pipe been rejected?

If Yes, stop, the entire lot of pipe is unacceptable.

Yes No

Sockets and Fittings (where applicable)

Are the sockets or fittings made of the same base material as the pipe?

If No, stop, the couplings or fittings are unacceptable.

Yes No

Do the socket dimensions meet the requirements given in Table 2 of ASTM F 949?

If No, stop, the socket is unacceptable.

Yes No

Do the fitting dimensions meet the requirements given in Table 3 of ASTM F 949?

If No, stop, the fitting is unacceptable.

Yes No

If molded fitting, does it meet the requirements given in Table 4 of ASTM F 949?

If No, stop, the fitting is unacceptable.

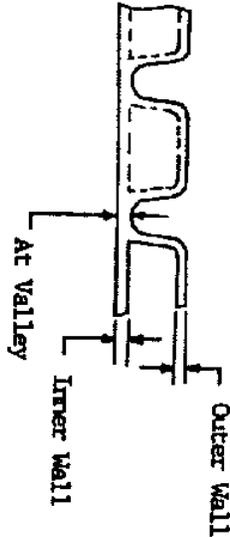
Yes No





TABLE 1 Pipe Dimensions

Note: 1 - Other corrugation configurations, meeting the following dimensional requirements are permissible.



For Pipe Stiffness of 46 PSI

Nominal Size in.	Outside Diameter		Inside Diameter		Minimum Wall Thickness			
	Average, In. (mm)	Tolerance on Average, in. (mm)	Average, In. (mm)	Tolerance on Average, in. (mm)	Inner Wall, in. (mm)	Outer Wall, in. (mm)	At Valley, in. (mm)	At Valley, in. (mm)
4	4.300 (109.2)	±0.009 (±0.229)	3.950 (100.3)	±0.011 (±0.279)	0.022 (0.559)	0.018 (0.457)	0.028 (0.711)	0.028 (0.711)
6	6.420 (163.1)	±0.011 (±0.279)	5.908 (150.1)	±0.015 (±0.381)	0.025 (0.635)	0.022 (0.559)	0.032 (0.813)	0.032 (0.813)
8	8.600 (218.4)	±0.012 (±0.305)	7.881 (200.2)	±0.018 (±0.457)	0.035 (0.889)	0.030 (0.762)	0.045 (1.143)	0.045 (1.143)
10	10.796 (273.9)	±0.015 (±0.381)	9.846 (250.1)	±0.021 (±0.533)	0.045 (1.143)	0.036 (0.914)	0.055 (1.397)	0.055 (1.397)
12	12.795 (325.0)	±0.018 (±0.457)	11.715 (297.6)	±0.028 (±0.711)	0.058 (1.397)	0.049 (1.245)	0.072 (1.829)	0.072 (1.829)
15	15.658 (397.7)	±0.023 (±0.584)	14.338 (364.2)	±0.035 (±0.889)	0.077 (1.956)	0.055 (1.397)	0.082 (2.337)	0.082 (2.337)
18	19.152 (488.5)	±0.028 (±0.711)	17.552 (445.8)	±0.042 (±1.067)	0.084 (2.134)	0.067 (1.702)	0.103 (2.616)	0.103 (2.616)
21	22.630 (574.8)	±0.033 (±0.838)	20.705 (525.9)	±0.048 (±1.24)	0.095 (2.413)	0.073 (1.854)	0.123 (3.124)	0.123 (3.124)
24	25.560 (649.7)	±0.039 (±0.991)	23.469 (596.1)	±0.057 (±1.448)	0.110 (2.791)	0.085 (2.161)	0.137 (3.486)	0.137 (3.486)
27	28.860 (733.0)	±0.049 (±1.25)	26.440 (671.6)	±0.069 (±1.75)	0.120 (3.048)	0.091 (2.311)	0.147 (3.734)	0.147 (3.734)
30	32.150 (816.6)	±0.059 (±1.50)	29.469 (748.5)	±0.081 (±2.057)	0.130 (3.302)	0.105 (2.667)	0.157 (4.011)	0.157 (4.011)
36	38.740 (984.0)	±0.079 (±2.007)	35.475 (901.1)	±0.105 (±2.667)	0.150 (3.810)	0.125 (3.175)	0.171 (4.343)	0.171 (4.343)

For Pipe Stiffness of 115 PSI

Nominal Size	Outside Diameter		Inside Diameter		Minimum Wall Thickness			
	Average, In. (mm)	Tolerance on Average, in. (mm)	Average, In. (mm)	Tolerance on Average, in. (mm)	Inner Wall, in. (mm)	Outer Wall, in. (mm)	At Valley, in. (mm)	At Valley, in. (mm)
8	8.600 (218.4)	±0.012 (±0.305)	7.710 (195.8)	±0.018 (±0.457)	0.037 (0.940)	0.050 (1.270)	0.048 (1.219)	0.048 (1.219)
10	10.786 (273.9)	±0.015 (±0.381)	9.644 (245.0)	±0.021 (±0.533)	0.046 (1.195)	0.052 (1.320)	0.065 (1.651)	0.065 (1.651)
12	12.795 (325.0)	±0.018 (±0.457)	11.480 (291.6)	±0.028 (±0.711)	0.070 (1.778)	0.088 (1.727)	0.091 (2.311)	0.091 (2.311)
15	15.658 (397.7)	±0.023 (±0.584)	14.053 (356.97)	±0.035 (±0.889)	0.092 (2.337)	0.088 (2.235)	0.118 (2.997)	0.118 (2.997)



TABLE 2

Diameter Dimensional Tolerances (ENGLISH)

Nominal Pipe Size, Inch	Average Inside Diameter, Inch	Lower Tolerance, Inch	Lower Tolerance, mm^a	Upper Tolerance, Inch	Upper Tolerance, mm^a
4	3 15/16	3 15/16	100	3 15/16	101
6	5 15/16	5 14/16	150	5 15/16	150
8	7 14/16	7 14/16	200	7 14/16	200
10	9 14/16	9 13/16	250	9 14/16	251
12	11 11/16	11 11/16	297	11 12/16	298
15	14 5/16	14 5/16	363	14 6/16	365
18	17 9/16	17 8/16	445	17 10/16	447
21	20 11/16	20 10/16	525	20 12/16	527
24	23 8/16	23 7/16	595	23 8/16	598
27	26 7/16	26 6/16	670	26 8/16	673
30	29 8/16	29 6/16	746	29 9/16	751
36	35 8/16	35 6/16	898	35 9/16	904

^a The metric dimensions have been hard converted from their English counterparts.

