



Standard Test Method for Effects of Outdoor Weathering on Pipeline Coatings¹

This standard is issued under the fixed designation G11; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method is intended to define conditions for the exposure of coated pipe to weather.

1.2 This test method specifies qualifications for the samples, procedure to be followed in exposure to weather, and procedure for evaluating effects of exposure including visual examination and other tests.

1.3 The values stated in SI units to three significant decimals are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[G8 Test Methods for Cathodic Disbonding of Pipeline Coatings](#)

[G10 Test Method for Specific Bendability of Pipeline Coatings](#)

[G12 Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel \(Withdrawn 2013\)](#)³

[G14 Test Method for Impact Resistance of Pipeline Coatings \(Falling Weight Test\)](#)

[G62 Test Methods for Holiday Detection in Pipeline Coatings](#)

[G70 Test Method for Ring Bendability of Pipeline Coatings \(Squeeze Test\) \(Withdrawn 2013\)](#)³

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.48 on Durability of Pipeline Coating and Linings.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

3. Summary of Test Method

3.1 The effects of outdoor weathering on pipeline coatings after 6, 12, and 24 months' exposure are determined visually and by electrical means by comparing exposed samples of coated pipe with unexposed samples of coated pipe before and after impact and bending tests. At the beginning of the test the starting samples are qualified by a cathodic disbonding test.

4. Significance and Use

4.1 Since coated pipe may be stored outdoors for long periods before burial, weathering tests of the type described in this test method are needed to evaluate the stability of these coatings stored outdoors. The results obtained should be treated only as indicating the general effect of weathering. Exposure conditions vary greatly from year to year, from one part of a year to another, and from locality to locality. The results of short-term exposure tests in the north are more meaningful if exposure is started in the summer followed by a winter season. In southern areas where climatic conditions are more uniform throughout the year, the time of year when short-term exposure is started is less critical. In all localities, the longer the exposure period, the more reliable are the results obtained.

5. Location of Test Sites

5.1 Weathering racks shall be located in cleared areas representative of local outdoor weather conditions.

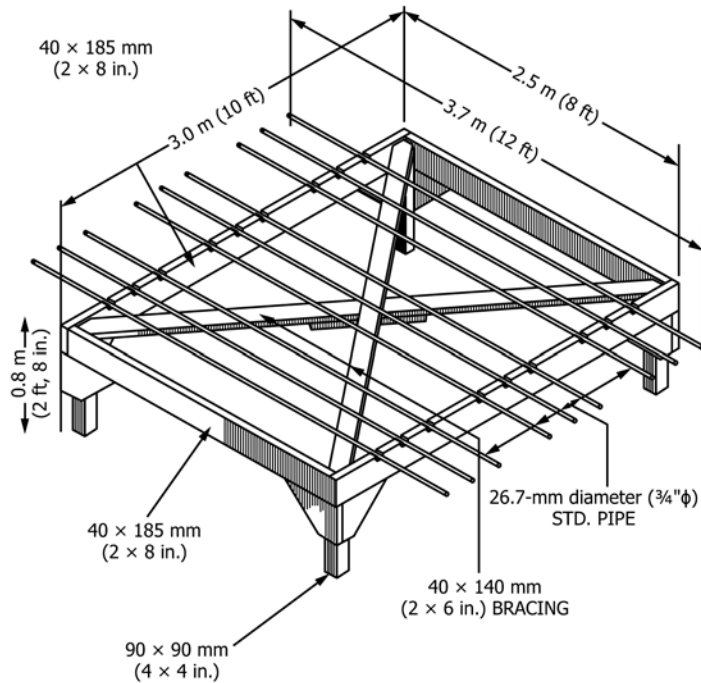
6. Apparatus

6.1 *Racks*—The horizontal racks shall be any suitable pipe storage racks of sufficient height to prevent any undesirable effects of vegetation growth during the period of exposure. Racks may be constructed from a variety of materials, but pipe specimens must rest on a nonconductive surface. An example of a suitable rack is illustrated in [Fig. 1](#).

7. Sampling

7.1 Each starting sample shall consist of coated 26.7-mm ($\frac{3}{4}$ -in. nominal) diameter steel pipe from a production lot having a minimum length of 4.4 m (14.4 ft). The sample shall be from a lot produced under conditions capable of being duplicated on a production scale.

NOTE 1—Pipe having a nominal diameter of 33.4-mm (1-in. nominal)



NOTE 1—All lumber is to be pretreated and painted.

FIG. 1 Construction Details of Outdoor Weathering Rack

can be used and is the largest diameter that can be evaluated in accordance with Test Method G10. Larger diameter pipes can be evaluated in accordance with Test Method G70.

7.2 Each starting sample shall have a piece 600 mm (24 in.) long cut from one end by sawing for use in qualification testing (Section 8) and designated the “qualification sample.” The remainder of each starting sample shall be designated the “sample.”

7.3 The total number of samples for each coating in test shall be four, divided as follows:

- 7.3.1 One to be removed after 6-months exposure,
- 7.3.2 One to be removed after 12-months exposure,
- 7.3.3 One to be removed after 24-months exposure, and
- 7.3.4 One to be used for determining original control values, which should be obtained as soon as possible on receipt of the pipe.

8. Procedure for Qualification Testing

8.1 Test each qualification sample in accordance with Test Methods G8, Test Method B.

8.2 Begin qualification testing at the same approximate time as sample testing.

8.3 If the results of the qualification testing are within the precision limits given in Test Methods G8, consider the samples to be reasonably equivalent and proceed with sample testing.

8.4 If the results of the qualification testing are not within the precision limits given in Test Methods G8, consider the samples to be unequivalent and discontinue exposure testing.

9. Procedure for Sample Testing

9.1 Identify the test samples with a letter, number, or symbol for ready identification after exposure. The marking shall not interfere with either the exposure or the testing.

9.2 Note and record the appearance of the sample.

9.3 Measure and record the coating thickness in accordance with Test Method G12.

9.4 Check coating for holidays with the appropriate detector, as described in Test Methods G62.

9.5 Make two 80-mm (3-in.) long scribes through the coating to bare metal. Begin one scribe at a point approximately 230-mm (9-in.) from one end of the pipe and continue it for 80 mm along the length of the pipe; begin the other scribe at a point approximately 230 mm from the opposite end of the pipe and continue it for 80 mm along the length of the pipe. Make sure that one scribe is on the top of the pipe, the other on the bottom.

9.6 Mount the samples on the rack as shown in Fig. 1 with one scribe facing skyward and one facing toward the ground. Group the three samples together so that like samples are lying alongside one another.

9.7 After exposure, again note and record the appearance of the sample and check for holidays in the manner followed prior to exposure. Next examine the sample visually for cracking, checking, blistering, corrosion, undercutting from the intentional scribe, and any other form of impairment of the coating.

9.8 Finally, cut a 300-mm (12-in.) specimen from one end of the sample, where the scribe is facing downward, and

subject to an impact test in accordance with Test Method **G14**. In the impact test, position the specimen so that the scribe faces downward.

9.9 Subject the remaining 2.5 m (8.2 ft) to a bend test in accordance with Test Method **G10**. In the bend test, position the skyward face of the sample as the outside of the bend.

9.10 Follow the procedure in **9.7**, **9.8**, and **9.9** on samples removed after each of the three exposure periods and compare results with those obtained on the control sample in **7.3**.

10. Report

10.1 Report the following information:

10.1.1 Results of qualification tests,

10.1.2 Sample number and description of coating system including: surface preparation, method of application, and coating thickness,

10.1.3 Appearance of sample and presence or absence of holidays prior to exposure,

10.1.4 Appearance of sample, presence, or absence of holidays after exposure, and duration of exposure,

10.1.5 Visual evidence of coating failure as noted by **9.7**,
10.1.6 Results of impact and bend tests after exposure as compared with those for the control sample, and
10.1.7 Type of environment and exposure.

11. Precision and Bias

11.1 The precision requirements for qualification testing in **8.3** of this test method and the precision requirements given in Test Method **G12** shall apply. Variations in samples and qualification samples shall be within respective precision limits for this test method to be valid. Bias cannot be determined since no generally accepted standards are available. The results obtained should be treated only as indicating the general effect of the weather directly effecting the test samples during the test period at the chosen test site. Exposure conditions vary greatly from year to year, from one part of the year to another, and from locality to locality.

12. Keywords

12.1 coated pipe storage; outdoor weathering; pipeline coatings; weather resistance

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