



**Summary of Substantive Changes
between the 2018 and 2022 editions of
ASTM F2769 “Polyethylene of Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing
and Distribution Systems”**

Presented to the IAPMO Standards Review Committee on January 9, 2023

General: The change to this standard may have an impact on currently listed products. The substantive changes are found in Section 7.11 Environmental Stress Cracking Test.

- Test method for Environmental Stress Cracking has been further expanded include language from Section 7.5, that was previously just referenced.
- The test sample size has been modified.
- Pass fail criteria have been clarified.

7. Test Methods

7.11 Environmental Stress Cracking Test—~~Use Test~~ six randomly selected 10 in. ~~to 15 in.~~ (250 mm ~~to 375 mm~~) long specimens for this test.

NOTE 7—Straight or previously coiled specimens are permissible although straight specimens are preferred for ease of notching and accurate control of the notch depth.

7.11.1 Within each specimen ~~Make~~ a notch on the inside of the tubing wall in the axial direction. The notch depth shall be 10.3 % of ~~measured~~ minimum wall thickness ~~and the notch length 1 in. (25 mm) as specified in Table 3 for the specimen tubing size. The notch depth tolerance shall be 60.0005 in. (± 0.013 mm) and the full depth notch shall be 1.0 in. ± 0.1 in. in length (25 mm ± 3 mm).~~ Use a sharp blade mounted in a jig to make this ~~imperfection notch~~. Use a depth micrometer or other means for setting the blade in the jig so that the notch depth is controlled as specified. The notch shall be placed, at its nearest point, at least 1.5 times the nominal diameter away from end closures.

7.11.2 Fill the tubing with the test medium which is 5.0% ± 0.5 % ~~“Igepal CO-630”~~ by weight nonylphenoxy poly(ethyleneoxy) ethanol mixed with 95 % of untreated water. ~~The test is then made in accordance with 7.5, under the pressures given in Table 5, except maintain the pressure for 100 h.~~

NOTE 8—The nonylphenoxy poly(ethyleneoxy) ethanol has historically been synonymous with “Igepal CO-630,” for example, CAS# 68412-54-4 or CAS# 9016-45-9. This test has been historically performed with untreated water, generally meaning potable tap water supplied by utilities. Environmental stress cracking is a failure mode normally apparent after long-term use of tubing. The use of a surfactant and 180 °F (93 °C) test conditions are intended to produce results indicative of expected longterm performance in a reasonable time frame. Nonylphenoxy poly(ethyleneoxy) ethanol waste is considered in some jurisdictions to be environmentally hazardous. For disposal of nonylphenoxy poly(ethyleneoxy) ethanol waste local regulations should be consulted and adhered to.

7.11.3 Test the specimens in accordance with Test Method D1598 for 100 hours at 180 °F (82 °C) using the pressure specified in Table 5 for 180 °F (82 °C) and the tubing size. Testing shall be conducted in accordance with Test Method D1598 with the exceptions that the testing is not required to be carried out



until specimen failure as defined in Test Method D1598, and the specimen lengths are permitted to be shorter than specified in Test Method D1598.

7.11.4 Visually evaluate any specimens that have lost pressure during testing for ductile or brittle failure mode using the definitions within Terminology F412. Any ductile failure result(s) shall be discarded, and re-test(s) performed.

NOTE 9—Failures, if they occur via environmental stress cracking, should result in brittle failure which occurs via slow crack growth emanating from the notch.

7.11.4.1 A mixed failure mode sometimes occurs in environmental stress cracking tests where the early stages of fracture are brittle and the final stages of failure are ductile; these failures display slow crack growth characteristics just “outside” of the notch (that is, propagating radially through the pipe wall thickness) and ductile ballooning in the final stages of failure. If upon microscopic inspection slow crack growth characteristics are present these failures shall be considered brittle and retained as valid failures and not discarded.

7.12 Slow Crack Growth Resistance—The test shall be conducted in accordance with Test Method F1473 at a stress of 2.4 MPa with a modification in test temperature. Testing shall be performed at 194 °F (90 °C). The average failure time shall be calculated from two test specimens.