



**Summary of Substantive Changes
between the 2015 and the 2017a editions of
ASTM F2389 “Pressure-rated Polypropylene (PP) Piping Systems”**

Presented to the IAPMO Standards Review Committee on May 8, 2017

General: The changes to this standard may have an impact on currently listed products. The substantive changes are:

- Expanded the standard to include PP-RCT material (see Sections 3.2, 5.4, 8.3.1 and Tables 9 and 10)
- Added requirements to include transition fittings for PP to PEX (see Sections 5.9 and 7.2.6).
- Removed the impact strength testing requirements (see former Section 8.3 and former Table 9)
- Clarified the chlorine resistance requirements for pipe labeled CL-TD and CL-R (see Sections 8.6 and 9.3)

Section 2, Referenced Documents: Updated the referenced documents in accordance with the changes in the body of the standard.

~~ISO 3127 Thermoplastic Pipes—Determination of Resistance to External Blows—Round the Clock Method~~
[ISO 13760 Plastic Pipe for the Conveyance of Fluid Under Pressure – Miners Rule – Calculation Method for Cumulative Damage](#)

Section 3, Terminology: Added the definition and discussion of PP-RCT as follows:

3.2 Definitions of Terms Specific to This Standard:

3.2.1 polypropylene random copolymer (PP-R) [or polypropylene random copolymer with modified crystallinity and temperature resistance \(PP-RCT\)](#), *n*—a propylene plastic containing not more than 50% of another olefinic monomer (or monomers), having no functional group other than the olefinic group, and copolymerized with the propylene.

[3.2.1.1 Discussion—Polypropylene materials are described in detail in ISO 15874. The performance of PP-R and PP-RCT is distinguished by the minimum reference curves in ISO15874. Historically, PP-RCT has referred to a polypropylene random copolymer with modified crystallinity that delivers performance characteristics referenced in ISO15874. However, recent developments make it possible to attain the PP-RCT performance requirements other than through modification of crystallinity.](#)

3.2.1.2 Discussion—This term is also used for finished compound which comprises the PP-R [or PP-RCT](#) resin and additives such as colorants, UV inhibitors, and stabilizers. Polypropylene random copolymers containing more than one additional monomer are often referred to as “terpolymers.”



Section 5, Materials and Manufacture: Added requirements to include PP-RCT material and PP to PEX transition fittings as follows:

5.4 Minimum Required Strength (MRS)—The PP-R material used in the pipe and fittings shall have an MRS value of 1160 psi (8.0 MPa) or 1450 psi (10.0 MPa) and the PP-RCT material used in the pipe and fittings shall have a minimum MRS value of 1624 psi (11.2 MPa) based on testing in accordance with ISO 9080 and classification of the lower confidence limit (σ LCL) at 50 years in accordance with ISO 12162.

5.9 PEX Adapters—The PEX fitting ends of PP to PEX transition fittings shall meet the material requirements of the corresponding PEX fitting standard.

Section 7, Dimensions and Tolerances: Added requirements to include transition fittings for PP to PEX as follows:

7.2 Fittings Dimensions—Fittings dimensions shall meet the requirements in 7.2.1 through ~~7.2.4~~ 7.2.6.

7.2.6 PEX Adapters—The PEX fitting ends of PP to PEX transition fittings shall meet the dimensional requirements of the corresponding PEX fitting standard.

8. Requirements: Removed the impact strength requirements, added thermal stability requirements for PP-RCT and clarified the chlorine resistance requirements for CL-TD and CL-R as follows:

~~*8.3 Impact Strength—When tested in accordance with ISO 3127, 9 of 10 specimens shall pass at the impact level specified in Table 9 at a test temperature of $32 \pm 2^{\circ}\text{F}$ ($0 \pm 1^{\circ}\text{C}$).*~~

~~*8.4.18.3.1*~~ *8.3.1 When tested in accordance with Test Method D1598, pipe and fittings shall not fail at the pressure corresponding to the pipe circumferential stresses and times given in ~~Table 10~~ Table 9 for PP-R and PP-RCT. If an assembly fails at a joint, the fitting material shall be permitted to be retested in pipe form.*

8.6 Oxidative Stability in Potable Chlorinated Water Applications—PP piping intended for use in the transport of potable water shall ~~have a minimum extrapolated time to time failure of 50 years when tested and evaluated in accordance with 9.3~~ meet the following requirements:

(1) Pipe labeled as CL-TD shall be tested in accordance with 9.3 and shall have a minimum extrapolated time to time failure of 50 years when tested in accordance with 9.3 and evaluated in accordance with 9.3.1.

(2) Pipe labeled as CL-R shall be tested in accordance with 9.3 and shall have a minimum extrapolated time to time failure of 50 years when tested in accordance with 9.3 and evaluated in accordance with 9.3.2.



Section 9, Test Methods: Clarified the chlorine resistance requirements CL-TD and CL-R as follows:

9.3 Oxidative Stability in Potable Chlorinated Water Applications—The test shall be conducted, and the extrapolated time-to-failure shall be determined in accordance with Test Method F2023. The test fluid shall be reverse-osmosis (RO) or deionized (DI) water prepared in accordance with 9.1.1 of Test Method F2023. The extrapolated time-to-failure shall be calculated in accordance with 13.3 of test method F2023 and as follows:

9.3.1 For a chlorine classification of CL-TD using the coefficients from test method F2023, 13.1 and using Miner’s Rule, calculate the estimated time-to-failure for a hoop stress corresponding to a sustained pressure of 80 psig (551.7 kPa) for the highest DR of the product line being evaluated at temperature exposure conditions of 25% of the total time at 140°F (60°C) and 75% of the total time at 73°F in accordance with ISO 13760.

9.3.2 For a chlorine classification of CL-R using the coefficients from test method F2023, 13.1 and using Miner’s Rule, calculate the estimated time-to-failure for a hoop stress corresponding to a sustained pressure of 80 psig (551.7 kPa) for the highest DR of the product line being evaluated at temperature exposure conditions of 100% of the total time at 140°F (60°C) in accordance with ISO 13760.

Former Table 9, Impact Conditions: Removed the impact strength conditions as follows:

TABLE 9 Impact Conditions

Nominal Diameter	Impact Mass, lb (kg), +0.01/-0.00 (+0.005/-0.000)	Impact Height, ft. (m) ² +0.03/-0.00 (+0.01/-0.00)
1/2, 3/4, 1, 1.6, 2.0, 2.5	0.55 (0.250)	3.3 (1.0)
1-1/2, 2, 3, 3.2, 4.0, 5.0, 6.3, 7.5	1.10 (0.500)	3.3 (1.0)
4, 6, 9.0, 11.0, 12.5	2.20 (1.000)	6.6 (2.0)
14.0	4.41 (2.00)	6.6 (2.0)
16.0	4.41 (2.00)	8.2 (2.5)

Table 9, Thermal Stability by Hydrostatic Test: Expanded to include requirement for PP-RCT as follows:

TABLE 109 Thermal Stability by Hydrostatic Test

Material	Hoop Stress, psi, (MPa)	Temperature, °F (°C)	Time, h
PP-R	275 (1.9)	230 (110)	8 760
<u>PP-RCT</u>	<u>377 (2.6)</u>	<u>230 (110)</u>	<u>8 760</u>



Table 10, Hydrostatic Test Conditions: Expanded to include requirement for PP-RCT as follows:

TABLE 1110 Hydrostatic Test Conditions

Material	Hoop Stress, psi, (MPa)	Temperature, °F (°C)	Time, h
PP-R	2320 (16.0)	68 (20)	1
	510 (3.5)	203 (95)	1000
PP-RCT	<u>2175 (15.0)</u>	<u>68 (20)</u>	<u>1</u>
	<u>551 (3.8)</u>	<u>203 (95)</u>	<u>1000</u>