



**NSF International**  
Special Engineered Specification  
NSF SE 1091

**10.1mm SDR 11 PEX  
Tubing**

The Public  
Health and Safety  
Company.™



**SPECIFICATIONS FOR A SPECIAL ENGINEERED (SE) PRODUCT**  
**NSF SE 1091**  
**10.1mm SDR 11 PEX Tubing**

**1. Purpose:**

This Special Engineered Specification addresses the performance of Crosslinked PE (PEX) tubing, which has been designated for use in potable water or radiant floor heating applications.

**2. Scope of Specification:**

This document addresses testing, marking, in-plant QC and the Listing format requirements for the specified product. This specification covers PEX tubing in metric dimensional sizes from 10.1 mm OD size in an SDR of 11.

**3. Application:**

This tubing has been evaluated for use in potable water or radiant heating applications.

**4. Referenced Standards:**

**ASTM Standards:**

ASTM D618 – Practice for Conditioning Plastics for Testing

ASTM D792 – Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

ASTM D1505 – Test Method for Density of Plastics by the Density Gradient Technique

ASTM D1598 – Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

ASTM D1599 – Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

ASTM D1600 – Terminology for Abbreviated Terms Relating to Plastics

ASTM D1898 – Practice for Sampling Plastics

ASTM D2122 – Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

ASTM D2765 – Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics

ASTM D2837 – Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials

ASTM D3895 – Test Method for Oxidative-Induction Time of Polyolefin's by Differential Scanning Calorimetry

ASTM F412 – Terminology Relating to Plastic Piping Systems

ASTM F493 – Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

ASTM F876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing

ASTM F877 – Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot and Cold Water Distribution Systems

ASTM F2023 – Test Method for Evaluating the Oxidative Resistance of Crosslinked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water

**NSF Standards:**

NSF/ANSI Standard 14 – Plastic Piping System Components and Related Materials

NSF/ANSI Standard 61 – Drinking Water Systems Components – Health Effects

**5.0 – Testing Requirements:**

**Material Designation Code Cells**

DR/SDR	Rated Temperature		Hydrostatic Design Stress		Pressure Rating for Water	
	°F	°C	psi	MPa	Psig	MPa
DR 11	73.4	23	630	4.34	125	0.86
	180	82.2	400	2.76	80	0.55
	200	93.3	315	2.17	60	0.41

**5.1 – Dimensional Requirements** – Tubing certified against the requirements of this document shall meet the dimensional specifications detailed in Table 1 for solid wall PEX tubing and Table 2 for Barrier PEX tubing.



**Table 1**

Dimensional Data for SDR 11 PEX – Base Pipe									
Nominal Pipe Size		Average Outside Diameter		Tolerances for Average Outside Diameter		Wall Thickness		Tolerances for Wall Thickness	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm.
0.375	10.1	0.394	10.0	+0.011 -0.000	+0.3 -0.0	0.039	1.0	+0.020 -0.000	+0.5 -0.0

**Table 2**

Dimensional Data for SDR 11 PEX – Pipe with EVOH Layer									
Nominal Pipe Size		Average Outside Diameter		Tolerances for Average Outside Diameter		Wall Thickness		Tolerances for Wall Thickness	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm.
0.375	10.1	0.406	10.3	+0.011 -0.006	+0.3 -0.15	0.045	1.15	+0.020 -0.003	+0.5 -0.075

**5.2 – Degree of Cross-linking (Percent Gel Content)** – PEX tubing produced against these specifications shall meet the minimum percent gel content as defined in ASTM F876 Section 6.8 and 7.9

**5.3 – Density** – PEX tubing produced against these specifications shall meet the density requirements of ASTM F876 Section 6.4 and 7.5

**5.4 – Hydrostatic Sustained Pressure Test** – PEX tubing produced against these specifications shall meet or exceed the requirements given in ASTM F876 Section 6.5 and 7.6 and Table 3 of this document when tested for 73°, 180°, and 200° F.

**Table 3 Minimum Hydrostatic Sustained Pressure Requirements for PEX**

Nominal Size		Pressure Required for Test, psi (MPa)					
mm	in	73.4°F (23°C)	180°F (82.2°C)	200°F (93.3°C)			
10.1	(3/8)	300 (2.08)	180 (1.24)	150 (1.04)			

**5.5 – Hydrostatic Burst Pressure Test** – PEX tubing produced against these specifications shall meet or exceed the requirements given in ASTM F876 Section 6.6 and 7.7 and Table 4 of this document when tested for 73°, 180°, and 200° F.

**Table 4 Burst Pressure Requirements for Water  
at Different Temperatures for PEX Pipe**

Nominal Size		Minimum Burst Pressures at Different Temperatures, psi (MPa)					
mm	in	73.4°F (23°C)	180°F (82.2°C)	200°F (93.3°C)			
10.1	(3/8)	445 (3.05)	200 (1.37)	170 (1.16)			

**5.6 – ESCR (Environmental Stress Crack Resistance)** – PEX tubing produced against these requirements shall meet the ESCR requirements as identified in ASTM F876 Section 6.7, 7.8, and table 3 of this document for 100 hours.

**5.7 – Bent Tube Hydrostatic Sustained Pressure Strength**– PEX tubing produced against this specification shall meet the Bent Tubing requirements as identified in ASTM F876 Section 6.12, 7.12, and Table 3 of this document.

**5.8 – Stabilizer Functionality** – PEX tubing produced against this specification shall meet the Stabilizer Functionality requirements as identified in ASTM F876 Section 6.9 and 7.10.



**5.9 – Thermocyclic** – PEX tubing produced against this specification shall meet the Thermocyclic requirements as identified in ASTM F877 Section 6.6 and 7.5.

**5.10 – Excessive Temperature** – PEX tubing produced against this specification shall meet the Excessive Temperature requirements as identified in ASTM F876 Section 6.13 and 7.12

**5.11 – Oxidative Stability in Potable Chlorinated Water Applications** – PEX tubing produced against this specification and intended for use with in Potable Water applications shall meet the requirements as identified in ASTM F876 Section 6.10 and 7.11.

## **6.0 – Material Requirements**

6.1 – PEX tubing produced against this specification and is intended for use in potable water system shall meet the applicable sections of NSF/ANSI Standard 61.

6.2 – PEX tubing produced against this specification shall meet the requirements of ASTM F877 Appendix X.1 Hydrostatic Design Stress

## **7.0 – Marking Requirements (Content of Marking)**

7.1 – Product marking shall be applied in such a manner that it remains legible under normal handling and installation conditions.

7.2 – The Following minimal information shall be placed upon the tubing in no less than 5' intervals:

- Nominal pipe size
- SDR 11
- Material designation as defined by ASTM F876 Section 3.2.7
- Pressure rating and temperature
- Manufacturer's Name and / or trademark
- Code to identify date and material used in production of tubing
- NSF rfh SE 'or' NSF pw SE

## **8.0 – In-Plant Quality Control Testing**

Test	Frequency
Bent tube hydrostatic sustained pressure (hot and cold)	Annually
Burst pressure <sup>1</sup>	24 h
Degree of crosslinking	Weekly
Dimensions	
Pipe OD or ID	2 h
Pipe wall thickness	2 h
Environmental stress crack resistance	Annually
Excessive temperature and pressure capability of tubing and pipe	Annually
Sustained pressure	Annually
<sup>1</sup> If one material is continuously used in several machines or sizes, then when a steady-state operation is obtained on each machine, sample selection shall be from a different extruder each day and rotated in sequence among all machines or sizes.	