NSF International
Special Engineered Specification
NSF SE 8459

CPVC Schedule 40 & 80 Pipe and Fittings with High HDB at 180°F

The Public Health and Safety Company.™

NSF SE 8459
SPECIFICATIONS FOR A SPECIAL ENGINEERED (SE) PRODUCT

CPVC Schedule 40 & 80 Pipe and Fittings with High HDB at 180° F

1. Purpose:
This specification defines the product-specific requirements for testing, marking, and in-plant quality control of Chlorinated Poly (Vinyl Chloride) (CPVC) Schedule 40 and Schedule 80 pipe and fittings made from CPVC compounds that are rated for a high Hydrostatic Design Basis (HDB) at 180°F.

2. Scope of Specification:
This specification applies to Chlorinated Poly (Vinyl Chloride) (CPVC) Schedule 40 and Schedule 80 plastic hot-and-cold water distribution systems manufactured from CPVC compounds that are rated for a high Hydrostatic Design Basis (HDB) at 180°F.

3. Application:
CPVC Schedule 40 and Schedule 80 pipe and fittings certified against these requirements are authorized for use in ambient (73°F), domestic hot (140°F), and commercial hot (180°F) applications and are acceptable for use in potable water pressure systems.
The curing of assemblies is necessary for products to comply with the requirements of this specification:
The cure schedule is 1 week at room temperature and 2 weeks at 180°F.

4. Reference Documents:
ASTM Standards:
ASTM D618 – Practice for Conditioning Plastics for Testing
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 D1784 – Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785 – Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2122 – Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D2837 – Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
ASTM F412 – Terminology Relating to Plastic Piping Systems
ASTM F438 – Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F439 – Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F441 – Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
ASTM F1498 – Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings

NSF Standards:
NSF/ANSI Standard 14 – Plastic Piping System Components and Related Materials
NSF/ANSI Standard 61 – Drinking Water Systems Components – Health Effects

5. Materials:

5.1. Physical Properties Requirements –
5.1.1. Pipe shall be manufactured from a CPVC material that meets or exceeds a 24448 cell class when tested against ASTM D1784.
5.1.2. Fittings shall be manufactured from a CPVC material that meets or exceeds a 23447 cell class when tested against ASTM D1784.

5.2. Rework Material – Rework material shall be of the same formulation and from the same plant location as the virgin material used in the production of the pipe and fittings.

5.3. Long-Term Hydrostatic Strength – The Hydrostatic Design Basis (HDB) of the CPVC compound used in the production of pipe and fittings shall meet the following requirements:

Pipe Compound*
73°F – 4,000 psi HDB
180°F – 1,250 psi HDB
Fitting Compound
73°F – 4,000 psi HDB
180°F – 1,000 psi HDB

* 4120-06 material as defined in ASTM F441

6. Testing Requirements:

6.1. Schedule 40 and 80 Fittings –
6.1.1. Dimensions – Fittings shall meet the dimensional requirements of ASTM F438 or ASTM F439, as applicable.
6.1.2. Sustained Pressure – Fittings shall meet the short-term hydrostatic pressure tests per Tables A and B when tested in assembly with pipe.
6.1.3. Burst Pressure – Fittings shall meet the minimum burst requirements as specified in ASTM F438 or ASTM F439, as applicable.

6.2. Schedule 40 and 80 Pipe –
6.2.1. Dimensions - CPVC pipe shall meet the dimensional requirements of ASTM F441.
6.2.2. Sustained Pressure Tests –
6.2.2.1. Pipe shall meet the short-term hydrostatic pressure tests per Tables A and B.
6.2.2.2. Pipe shall meet the requirements of the 1,000 hour sustained pressure test as specified in ASTM F441.
6.2.3. Flattening – Pipe shall meet the flattening requirements as specified in ASTM F441.
6.2.4. Burst Pressure – Pipe shall meet the minimum burst requirements as identified in ASTM F441.

6.3. Solvent Cement – In addition to meeting the requirements of ASTM F493, solvent cement shall meet the sustained pressure requirements of Table A or Table B when tested with either Schedule 40 or Schedule 80 pipe and fittings meeting this specification.

6.4. Potable Water Requirement – Pipe and fittings intended for use in potable water applications shall meet the requirements of NSF/ANSI Standard 61.

7. Product 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 information shall be placed on the pipe in no less than 5’ intervals:
Nominal pipe size
Material designation CPVC 4120-06
Pressure rating at 73°F and 180°F
Pipe schedule
Material cell classification
Manufacturer’s name and/or trademark
NSF® pw – SE

7.3. The following information shall be placed on the fittings:
Nominal size
Material cell classification
Manufacturer's name and/or trademark
NSF® pw – SE

8. In-plant Quality Control Requirements:

The following tests are to be performed on pipe at start-up and designated frequencies thereafter:

Chlorinated poly(vinyl chloride) (CPVC) pipe test frequency

Test	Frequency
burst pressure[1]	24 h
dimensions	
pipe OD	2 h
pipe wall thickness	2 h
Pipe out-of-roundness	2 h
flattening resistance	annually
sustained pressure pipe and fittings assemblies	annually

[1] If one compound is continuously used in several machines or sizes, 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.

The following tests are to be performed on fittings at start-up and designated frequencies thereafter:

Chlorinated poly(vinyl chloride) (CPVC) fittings test frequency

Test	Frequency
burst pressure[5]	weekly
dimensions	
body wall thickness	weekly
socket bottom avg. diameter and out of roundness[1]	24 h
socket entrance avg. diameter and out of roundness[1]	24 h
socket depth[1, 3]	24 h
socket wall thickness	24 h
spigot ends of fittings, min. wall thickness	24 h
spigot ends of fittings, avg. diameter and out of roundness[2]	24 h
thread length[3,4]	(see footnotes 5, 6)
thread gauge	24 h
sustained pressure pipe and fittings assemblies	annually

[1] Plug gauges are permitted, provided that the mold has been qualified by complete dimensioning and appropriate testing on all products from all mold cavities to verify compliance with the referenced standard.

[2] Ring gauges are permitted, provided that the mold has been qualified by complete dimensioning and performance of appropriate testing on all products from all cavities to verify.

[3] Applies only to molded fittings.

[4] Socket depth and thread length are only required to be verified at the time a new tool is "qualified" or when new or repaired cores are made.

[5] Burst pressure requirement does not apply to reducer bushings.

Note: Fitting Pattern Laying Length dimensions are to be checked at each Mold Tooling Qualification. Tooling Qualifications are made to each new mold tool and after any alterations or repairs to the tool.

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Table A – Minimum Hydrostatic Sustained Pressure Requirements for Assemblies Comprised of Schedule 80 Pipe and Schedule 80 Fittings Produced from CPVC Material Having an HDB as Specified in Section 5.3, Tested in Either Water or Air Bath External Environment at 180°F [82°C]

			Hydrostatic Test Pressure, psi	
Condition	Duration	Pipe Size	Water	Air
A	6 minute	1/2"	1164	1230
		3/4"	943	997
		1"	865	914
		1 1/4"	713	754
		1 1/2"	646	682
		2"	555	586
		2 1/2"	583	616
		3"	514	544
		4"	444	470
		6"	383	405
		8"	338	357
B	4 hours	1/2"	851	941
		3/4"	690	763
		1"	632	699
		1 1/4"	522	577
		1 1/2"	472	522
		2"	406	448
		2 1/2"	426	471
		3"	376	416
		4"	325	359
		6"	280	310
		8"	247	273

Table B – Minimum Hydrostatic Sustained Pressure Requirements for Assemblies Comprised of Schedule 40 Pipe and Schedule 40 Fittings Produced from CPVC Material Having an HDB as Specified in Section 5.2, Tested in Either Water or Air Bath External Environment at 180°F [82°C]

			Hydrostatic Test Pressure, psi	
Condition	Duration	Pipe Size	Water	Air
A	6 minute	1/2"	818	865
		3/4"	662	699
		1"	617	653
		1 1/4"	505	534
		1 1/2"	453	479
		2"	380	402
		2 1/2"	417	441
		3"	361	381
		4"	305	322
		6"	242	256
		8"	213	225
B	4 hours	1/2"	598	662
		3/4"	484	535
		1"	451	499
		1 1/4"	370	409
		1 1/2"	332	367
		2"	278	308
		2 1/2"	305	337
		3"	264	292
		4"	223	247
		6"	177	196
		8"	156	172