

CPVC Schedule 40/80 Pipe & Fitting Specifications & Pipe Dimensions

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CPVC Schedule 40 & Schedule 80 Pipe Specifications

APPLICATION

Corrosion resistant pressure pipe, IPS sizes 1/4" through 24", for use at temperatures up to and including 200°F. Pressure rating (130 psi to 1130 psi) varies with schedule, pipe size, and temperature. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens. Chemical resistance data is available and should be referenced for proper material selection. Pipe exhibits excellent physical properties and flammability characteristics. Typical applications include: chemical processing, plating, high purity applications, hot and cold potable water systems, water and wastewater treatment, and other applications involving hot corrosive fluid transfer.

SCOPE

This specification outlines minimum manufacturing requirements for Chlorinated Polyvinyl Chloride (CPVC) Schedule 40 & Schedule 80 iron pipe size (IPS) pressure pipe. This pipe is intended for use in applications where the fluid conveyed does not exceed 200°F. This pipe meets and or exceeds the industry standards and requirements as set forth by the American Society for Testing and Materials (ASTM) and the National Sanitation Foundation (NSF).

CPVC MATERIALS

The material used in the manufacture of the pipe shall be a rigid chlorinated polyvinyl chloride (CPVC) compound, Type IV Grade 1, with a Cell Classification of 23447 as defined in ASTM D1784. This compound shall be light gray in color as specified, and shall be approved by NSF use with potable water.

DIMENSIONS

CPVC Schedule 40 & Schedule 80 pipe shall be manufactured in strict accordance to the requirements of ASTM F441 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to this standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM F441. All belled-end pipe shall have tapered sockets to create an interference type fit, which meet or exceed the dimensional requirements and the minimum

socket length for pressure-type sockets as defined in ASTM D2672. This pipe shall have a flame spread rating of < 25 and a Smoke Development rating of < 50 when tested for surface burning characteristics in accordance with CAN/ULC-S102-2-M88 or equivalent.

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CPVC Schedule 40 Pipe Dimensions

PIPE SIZE	O.D.	AVE. I.D.	MIN WALL	NOM. WEIGHT (Wt./ft.)	MAX. W.P. PSI
1/4"	.540	.344	.088	.096	780
3/8"	.675	.473	.091	.128	620
1/2"	.840	.602	.109	.190	600
3/4"	1.050	.804	.113	.253	480
1"	1.315	1.029	.133	.371	450
1-1/4"	1.660	1.360	.140	.502	370
1-1/2"	1.900	1.590	.145	.599	330
2"	2.375	2.047	.154	.803	280
2-1/2"	2.875	2.445	.203	1.267	300
3"	3.500	3.042	.216	1.660	260
3-1/2"	4.000	3.521	.226	1.996	240
4"	4.500	3.998	.237	2.363	220
5"	5.563	5.016	.258	2.874	190
6"	6.625	6.031	.280	4.164	180
8"	8.625	7.942	.322	6.268	160
10"	10.750	9.976	.365	8.886	140
12"	12.750	11.889	.406	11.751	130
14"	14.000	13.073	.437	13.916	130
16"	16.000	14.940	.500	18.167	130
18"	18.000	16.809	.562	22.965	130

20"	20.000	18.743	.593	29.976	120
24"	24.000	22.544	.687	37.539	120

CPVC Schedule 80 Pipe Dimensions

PIPE SIZE	O.D.	AVE. I.D.	MIN WALL	NOM. WEIGHT (Wt./ft.)	MAX. W.P. PSI
1/4"	.540	.282	.119	.117	1130
3/8"	.675	.403	.126	.162	920
1/2"	.840	.526	.147	.238	850
3/4"	1.050	.722	.154	.322	690
1"	1.315	.936	.179	.473	630
1--1/4"	1.660	1.255	.191	.654	520
1-1/2"	1.900	1.476	.200	.793	470
2"	2.375	1.913	.218	1.097	400
2-1/2"	2.875	2.290	.276	1.674	420
3"	3.500	2.864	.300	2.242	370
3-1/2"	4.000	3.326	.318	2.735	350
4"	4.500	3.786	.337	3.277	320
5"	5.563	4.768	.375	4.078	290
6"	6.625	5.709	.432	6.258	280
8"	8.625	7.565	.500	9.506	250
10"	10.750	9.493	.593	14.095	230
12"	12.750	11.294	.687	19.392	230
14"	14.000	12.410	.750	23.261	220
16"	16.000	14.213	.843	29.891	220
18"	18.000	16.014	.937	37.419	220
20"	20.000	17.814	1.031	45.879	220

24" 24.000 21.418 1.218 64.959 210

ASTM STANDARD D1784 MATERIAL EQUIVALENTS: Cell Classification 23447 = CPVC
Type IV Grade 1 = CPVC 4120

Pipe sizes shown are manufactured in strict compliance with ASTM F441

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The pressure ratings given are for water, non-shock, @ 73°F. The following temperature de-rating factors are to be applied to the working pressure ratings (WP) listed when operating at elevated temperatures.

OPERATING TEMPERATURE (°F)	DE-RATING FACTOR
73-80	1.00
90	0.91
100	0.82
110	0.72
120	0.65
130	0.57
140	0.50
150	0.42
160	0.40
170	0.29
180	0.25
200	0.20

Multiply the working pressure rating of the selected pipe at 73°F, by the appropriate de-rating factor to determine the maximum working pressure rating of the pipe at the elevated temperature chosen.

EXAMPLE: 10" CPVC SCHEDULE 80 @ 120°F = ?

230 psi x 0.65 = 149.5 psi max. @ 120°F

THE MAXIMUM SERVICE TEMPERATURE FOR CPVC IS 200°F.

Solvent cemented joints should be utilized when working at or near maximum temperatures.

Threading of Schedule 40 CPVC pipe is not a recommended practice due to insufficient wall thickness. Thread only Schedule 80 or heavier walls. **Threading requires a 50% reduction in pressure rating stated for plain end pipe @ 73°F.**

Chemical resistance data should be referenced for proper material selection and possible de-rating when working with fluids other than water.

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General Specifications for Standard CPVC Schedule 40 and Schedule 80 Fabricated Drainage Fittings

Scope

This specification is applicable to fabricated fittings, as constructed by Harrison Machine & Plastic Corporation, as they pertain to (CPVC) Chlorinated Polyvinyl Chloride Schedule 40 & Schedule 80 fitting configurations.

Materials of Construction

(CPVC) Chlorinated Polyvinyl Chloride

Fittings are to be manufactured from CPVC material which meets or exceeds the requirements of ASTM D-1784, Type IV, Grade 1, cell classification 23447B.

Pressure pipe used in fabrication must conform to ASTM D-441 and listed by the National Sanitation Foundation (NSF) for potable water applications.

Sheet stock material (where used) must conform to ASTM D-1784, cell classification 23447B, Type IV, Grade 1, manufactured without the use of plasticizers or fillers.

Solvent Cement and Welding Rod (CPVC)

All solvent cements used, to conform to ASTM D-2564, listed by NSF for potable use applications

Welding rod used in the manufacture of the above fittings, shall conform to ASTM D-1784, cell class 23447B for CPVC and shall be of a material compatible with the corresponding pipe/sheet stock

Assembly and Construction Procedures

Fittings shall be Butt Fusion (machine) welded where feasible or hand welded (fillet welded) by qualified and experienced craftsman trained in the art of thermoplastic welding and fabrication.

CPVC fittings will be gray in color (this color code applies to both pressure and drainage patterns)

Dimensional Specifications

All cataloged fittings to be constructed in accordance with Harrison Machine and Plastic Corporation, published drawings. Non-cataloged fittings will be furnished in accordance to or as agreed upon customer specifications.

All female sockets shall have an interference fit with corresponding size pipe. **Refer to Table 2**

Component cut length dimension tolerances of $\pm .500$ "

Angle (change of direction tolerances of $\pm 2^\circ$)

Product Quality

All fitting welds (hand and machine) shall be 100% spark tested

Fiberglass reinforced fittings shall be as free as possible from visual defects such as foreign inclusions, air bubbles or delamination

Random inspection performed daily by floor supervisor

TABLE 1

Pertains to pipe stock used in fabrication

Maximum Working Pressure (psi) @ 73°F

Size	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Sch 40	220	180	160	140	130	130	130	130	130	130
Sch 80	320	280	250	230	230	220	220	220	220	220

TABLE 2

Tapered Belled/Socket Dimensions for PVC & CPVC Schedule 40 & Schedule 80 Fittings

Socket Entrance	Socket Bottom	Socket Depth
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Nominal Pipe Size	I.D. Minimum	I.D. Maximum	I.D. Minimum	I.D. Maximum	Schedule 40	Schedule 80
4"	4.509"	4.527"	4.482"	4.500"	1.875"	1.875"
6"	6.636"	6.658"	6.603"	6.625"	3.000"	3.000"
8"	8.640"	8.670"	8.595"	8.625"	4.000"	4.000"
10"	10.761"	10.791"	10.722"	10.752"	5.000"	5.000"
12"	12.763"	12.793"	12.721"	12.751"	6.000"	6.000"
14"	14.030"	14.045"	13.985"	14.000"	7.000"	7.000"
16"	16.037"	16.052"	15.985"	16.000"	8.000"	8.000"
18"	18.041"	18.056"	17.985"	18.000"	9.000"	9.000"
20"	20.045"	20.060"	19.985"	20.000"	10.000"	10.000"
24"	24.060"	24.075"	24.000"	24.015"	12.000"	12.000"

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General Specifications for Standard CPVC Schedule 40 & Schedule 80 Fabricated Pressure Fittings

Scope

This specification is applicable to fabricated fittings, as constructed by Harrison Machine & Plastic Corporation, as they pertain to (CPVC) Chlorinated Polyvinyl Chloride Schedule 40 & Schedule 80 fitting configurations.

Materials of Construction

(CPVC) Chlorinated Polyvinyl Chloride

Fittings are to be manufactured from CPVC material which meets or exceeds the requirements of ASTM D-1784, cell classification 23447B Type IV, Grade 1.

Pressure pipe used in fabrication must conform to ASTM F-441 and listed by the National Sanitation Foundation (NSF) for potable water applications.

Sheet stock material (where used) must conform to ASTM D-1784, cell classification 23447B, Type IV, Grade 1, manufactured without the use of plasticizers or fillers.

Solvent Cement and Welding Rod (CPVC)

All solvent cements used, conform to ASTM D-2564, listed by NSF for potable use applications.

Welding rod used in the manufacture of the above fittings, shall conform to ASTM D-1784, cell class 23447B, and shall be of a material compatible with the corresponding pipe/sheet stock.

Assembly/Construction Procedures

Fittings shall be Butt Fusion (machine) welded where feasible or hand welded (fillet welded) by qualified and experienced craftsman trained in the art of thermoplastic welding and fabrication.

All pressure fittings, with the exception of formed elbows, couplings, reducer couplings and reducer bushings will be 100% fiberglass reinforced with multiple layers or mat and resin to increase the base pressure rating of the fitting to meet or exceed the desired performance pressure rating of the corresponding diameter and wall Schedule of pipe. **Refer to Table 1.**

CPVC Schedule 40 & Schedule 80 fittings will be light gray in color. This color code applies to both pressure and drainage patterns.

Dimensional Specifications

All cataloged fittings to be constructed in accordance with Harrison Machine and Plastic Corporation, published drawings. Non-cataloged fittings will be furnished in accordance to or as agreed upon customer specifications.

All female sockets shall have an interference fit with corresponding size pipe. **Refer to Table 2**

Component cut length tolerances of $\pm .500$ ".

Angle (change of direction) tolerances of $\pm 2^\circ$.

Product Quality

All fitting welds (hand and machine) shall be 100% spark tested

Fiberglass reinforced fittings shall be as free as possible from visual defects such as foreign inclusions, air bubbles or delamination

Random inspection performed daily by floor supervisor

TABLE 1

Pertains to pipe stock used in fabrication (fittings are not pressure rated)

Maximum Working Pressure (psi) @ 73°F

Size	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Sch 40	220	180	160	140	130	130	130	130	130	130
Sch 80	320	280	250	230	230	220	220	220	220	220

TABLE 2

Tapered Belled/Socket Dimensions for PVC & CPVC Schedule 40 & Schedule 80 Fittings

Nominal Pipe Size	Socket Entrance		Socket Bottom		Socket Depth	
	I.D. Minimum	I.D. Maximum	I.D. Minimum	I.D. Maximum	Schedule 40	Schedule 80
4"	4.509"	4.527"	4.482"	4.500"	1.875"	1.875"
6"	6.636"	6.658"	6.603"	6.625"	3.000"	3.000"
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10"	10.761"	10.791"	10.722"	10.752"	5.000"	5.000"
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14"	14.030"	14.045"	13.985"	14.000"	7.000"	7.000"
16"	16.037"	16.052"	15.985"	16.000"	8.000"	8.000"
18"	18.041"	18.056"	17.985"	18.000"	9.000"	9.000"
4"	20.045"	20.060"	19.985"	20.000"	10.000"	10.000"
24"	24.060"	24.075"	24.000"	24.015"	12.000"	12.000"

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Solvent Cement Joining Recommendations (Large Diameter CPVC Joints)

These guidelines specifically address recommended procedures required in successfully making solvent weld joints for large diameter systems (i.e. 8" through 24"). Solvent cemented joints represent the final important steps in making the system either a success or a failure. It

is important that these instructions are carefully followed.

Important to all successful solvent weld joints there are "FOUR" important ingredients:

1. It is essential that surfaces to be cemented are clean and free of foreign material. If permitted to remain, grease, oil, ink, etc. can interfere with the solvent cementing process and reduce the strength of the bond.
2. Joining surfaces (pipe & fitting) must be dissolved and made soft.
3. Sufficient cement must be applied to fill gaps between pipe & fitting.
4. Assembly of pipe & fitting must be made while the surfaces are both wet and fluid

Large diameter joints are very similar to those for smaller diameters, in that both have tapered sockets. Tapered sockets have the capability of providing a fused joint at the socket bottom and a bonded joint at the top of the socket, resulting in a quality seal particularly in pressure applications. Tapered sockets, however, also result in a situation where the pipe will tend to "push-out" immediately after the pipe is inserted into the fitting socket. Care must be taken to hold the pipe in place until the cement begins to set.

As with any solvent cemented joints, the pipe must be cut square and cleaned. Large diameter CPVC pipe may be cut with a skill-saw and a carbide tipped blade. A circular blade with 20 or less teeth is preferred over a finer blade which tends to heat the CPVC material as it cuts, resulting in a molten CPVC residue producing a rough cut. The use of a "pipe-belt" is recommended to ensure a straight cut.

After the pipe is cut to length, the outside and inside edges are to be deburred. This can be easily achieved by scraping these edges with a sharp edged piece of steel (i.e. file). This is a relatively easy step and only takes a few moments, but is a critical step.

Two or more pipe fitters are strongly recommended when making large diameter joints due to the bulk and weight of the system as well as the need to apply cement and primer as quickly as possible.

Align the pipe & fitting as close to its final position as possible. Elevate both the pipe & fitting so that the entire circumference is accessible.

Mechanical devices, such as come-alongs, are strongly recommended to pull the pipe into the fitting socket. The use of chains to "grasp" the pipe is an option but they may also slip. Sufficient cable or chain, enough to run the entire length of 20 foot joint(s) of pipe, must be laid out on either side of the joint, prior to assembly. Additional cable must be added in order to secure it to a 4x4 block, extending approximately 1 foot beyond the pipe on side. Cumbersome as it might appear, this method offers a more positive pull than other methods.

(Note: A chain sling may be used on the fittings providing it results in a "straight" pull.)

At this point, available manpower working in unison, is used to keep all components in place. Be sure the pipe & fitting are free to travel the required distance to seat at the fitting socket bottom. Mark the depth of the socket on the pipe, plus six inches, as an indication of pipe insertion depth. The two cable come-alongs are immediately hooked up at 3:00 and 9:00, so that after application of primer and solvent the joint may be pulled together.

When the chains (cables) are in place joint preparation now takes place.

Using Cleaner, clean pipe and fitting surfaces with a cotton rag to remove any moisture and excessive dirt.

After properly cleaning pipe surfaces, using Primer and a 3" to 4" wide brush, liberally apply the primer so that it flows on to and soaks into the plastic, resulting in a softening of the surfaces for maximum weldability. The primer should be applied to the pipe ends and to an area equal to the corresponding fitting socket depth plus approximately 4 inches. The primer will remove the glossy surface, dirt and surface printing. A properly primed surface will have a uniform dull surface which will begin to soften.

Prime the fitting socket in the same manner as described above. A second coating of primer may then be needed on the pipe to assure wet surfaces

Using Heavy Bodied Cement, liberally apply the solvent, again using a 3" to 4" brush, to both the fitting socket and pipe surface. Do not overbrush the solvent. When done properly, very little of the surface areas, to be joined should be visible. A thick even coat is needed to fill the gap between pipe & fitting.

Note: It may be advisable to put the primer and solvent into larger "wide-mouth" containers, prior to use to accommodate the 3" to 4" brushes.

Important: It is advisable to utilize two or more pipe fitters. One will apply primer/solvent to the fitting socket and the other to the pipe surface, simultaneously and quickly. The joint surfaces must be fluid when making the joint.

Using the come-along, pull joint together, drawing the pipe into the fitting socket until the pipe has reached the fitting stop (socket bottom). Observe the previously measured pipe markings to ensure pipe that the pipe is seated. At this point, the cement will ooze toward the bottom of the pipe and fill a small section inside the fitting. Remove as much visible excess cement as can be reached. One very large diameter systems, **"Do not venture inside the system to inspect the joint or to clean the solvent. The fumes can be dangerous."**

Any excess solvent on the outside of the joint should also be removed, to avoid puddling and for appearance.

Continue come-along pressure, holding the pipe into the fitting socket for approximately 15 minutes (or until the solvent begins to set-up), to prevent the pipe from "pushing-out".

Pressure test the system only after the joints have cured. Refer to curing schedules as defined by the solvent manufacturer which are primarily dependent upon temperature.

The above are recommendations only. Site conditions vary greatly. Harrison Machine & Plastic Corporation cannot be held responsible for results.

Equipment Needed for Installation/Assembly

Tape Measure	Pipe Belt	File	Clean Cotton Rags
Come-Alongs	Primer	Patience	Pencil
Saw & Circular Blade		Cement	Cleaner
Buckets	3" to 4" Brushes		
