Advantages of GF Harvel PVC and CPVC Products

Consistency/Quality – developed, processed, and designed to consistently meet and/or exceed industry standards for strength and durability

Chemically Resistant over a broad range of chemicals, concentrations and reagent mixtures

Strength – high tensile strength and well balanced physical properties provides long-term pressure bearing capability for aggressive fluid handling applications

Corrosion Resistant – Immune to electrolytic, galvanic and vapor phase corrosion

Clean, non-contaminating materials for use in potable water and other applications where contamination of fluids conveyed is critical

Lightweight – minimizes labor, handling and jobsite mechanical equipment; greatly reducing installation related costs

Simple Joining Methods – leak-free dependable joints via solvent cement joining minimizes equipment requirements and reduces installation costs

Rigid – requires fewer hangers and supports compared to other plastic pipe materials

Smooth Surfaces – reduce friction loss and provide good abrasion resistance

Low Thermal Conductivity – provides good insulation qualities with low heat transfer; less energy use overtime

Good electrical insulation values

Ease of Fabrication – can be easily machined, heat formed, welded, and subjected to a variety of other joining and fabrication techniques

Safety – industry regulated for toxological compliance (NSF Std 61); exhibit good fire performance characteristics (will not independently support combustion)

Typical Applications of GF Harvel Piping Products

GF Harvel PVC and CPVC piping products can be found in applications in the following industries where water, chemical and corrosive fluid production, transfer and mixing are utilized:

Chemical Process Industries: Chemical processing - Industrial waste - Laboratory Semiconductor - Pulp & Paper - Electroplating - Electronics Metal Treating - Chlor-Alkali - Fertilizer - Color industries - Textile - Mining - Air Pollution Control - Photo Finishing - Printing

Industrial Processing: Plant Water Distribution - Cooling Water - Waste-Water - Process Water - Reclaim - Waste Treatment - HVAC Pollution Control - Brine Production & Disposal

Power Generation: Boiler Feed Water - Atomic Energy - Fly Ash Slurries - Coal Mining - Gas Industry - Oil Refining Cooling Water - Water and Waste Water Treatment

Food and Beverage: Potable Water - Bottled Water - Ultra Pure Water - Food Processing - Meat Packing - Poultry Farming & Processing Distilled Water - Ice Production & Equipment

High Purity Applications: Semiconductor - Pharmaceutical Biotechnology - Chemical Manufacturing - Health Care - Universities - Clean Room Applications - Wet Bench Construction - Ultrapure Water

Water and Waste Water: Water Treatment - Waste Water Treatment - Reclaim Aeration - Desalination - Detention & Collection - Water Resource Conservation - Ground Remediation - Well Casing & Well Monitoring

Aquaculture: Life Support Systems - Public Aquariums - Fish Hatcheries - Lobster Ponds - Fish Ladders - Fish Farming etc.

Recreational: Water Parks - Theme Parks - Fountains - Water Features - Swimming Pools

Agricultural/Irrigation: Commercial Irrigation - Golf Courses - Farming - Genetic Engineering - Greenhouses

General Services: Hot and Cold Water Plumbing - Municipal Water - Process Water - Commercial Roof Drain - Bridge Drain - Industrial Parks - Shopping Centers - Surface Drainage - Landfill Marine Applications - Drain Waste & Vent

Fire Protection: NFPA 13 Light Hazard, 13R & 13D - Fire Sprinkler Systems found in Highrise Office Buildings - Hotels Motels - Dormitories - Apartments - Nursing Homes - Hospitals - Single Family Residences

Specialty Applications: Visual Leak Detection - Dual Containment - Decorative Applications - Civil Defense - Naval Military Applications - Fire Resistive Construction

GF Harvel PVC and CPVC Materials

PVC

Polyvinyl Chloride (PVC) is an amorphous thermoplastic material that can be formulated or "compounded" to target a specific application. Minor ingredients must be blended with PVC resin to create a PVC compound that is processable into a finished product. The physical properties of PVC can be altered considerably to provide desirable properties by compounding techniques. Additives such as impact modifiers, stabilizers, lubricants, processing aids, pigments and other ingredients can be modified to obtain desirable properties. As such, PVC is available in a wide range of products from flexible tubing, film packaging materials, and vinyl siding, through various blends that can be used to produce rigid PVC pressure piping.

Georg Fischer Harvel LLC blends its own PVC compounds that are optimized specifically for GF Harvel's quality line of rigid PVC piping products. GF Harvel utilizes several different PVC compounds formulated specifically for the production of different PVC product lines. This ensures tight control over consistency and quality in the end product, which has been optimized for chemical resistance and pressure bearing capability. GF Harvel PVC materials are listed by NSF International to NSF STD 61, toxicology, as being safe for use in potable water applications. ASTM Standard D1784, Standard Specification for rigid polyvinyl Chloride) (PVC) compounds and chlorinated (polyvinyl Chloride) (CPVC) compounds calls out minimum physical property requirements of compounds that are used in the production of PVC pipe and fittings. This standard classifies the physical properties through a "Cell Classification" system that calls out base resin, minimum impact strength, tensile strength, modulus of elasticity, heat deflection temperature under load, and flammability when tested per applicable ASTM standards. Unplasticized or rigid PVC compound used for the manufacture of pipe and fittings, has a Cell Classification of 12454 per ASTM D1784, and is also known as Type I Grade I PVC or PVC 1120. Refer to Physical Properties section, Chemical Resistance Data, and Industry Standards & Test Methods section for additional information.

PVC Cell Classification 12454 = PVC Type I, Grade I = Rigid (unplasticized) PVC = PVC 1120 = H707 PVC (GF Harvel tradename)

GF Harvel PVC Product Line

Schedule 40, Schedule 80 & Schedule 120 PVC Pressure Pipe
SDR Series Pressure Pipe (SDR 13.5, SDR 21, SDR 26 & SDR41)
GF Harvel Clear™ PVC Schedule 40 & Schedule 80 Pipe
PVC Duct
PVC Machining Shapes (solid bar, hollow bar, angle and other machine stock)
GF Harvel LXT® Ultra-Pure Water Piping
EnviroKing™UV Clear Piping
Custom Dimensions and Colors

CPVC

Chlorinated polyvinyl chloride (CPVC) is created by subjecting PVC resin to a post chlorination reaction that results in additional chlorine atoms on the base molecule. This results in an amorphous thermoplastic material similar to PVC with added advantages: a higher heat distortion temperature and improved fire performance properties at relatively low cost compared to alternate materials. As with PVC, the physical properties of CPVC can be altered considerably to provide desirable properties by compounding techniques. Due to its higher heat distortion temperature, GF Harvel CPVC can be used in piping applications at temperatures up to 60˚F higher than PVC piping, having a maximum service temperature for pressure applications of 200˚F. GF Harvel CPVC provides an economic solution for piping utilized in process piping, hot water and similar service applications where operating conditions exceed the recommended temperature limits of PVC. This greatly expands the application range for thermoplastic pipe, providing an economical solution for piping used in elevated temperature service.

GF Harvel utilizes several different CPVC compounds formulated specifically for the production of different CPVC end products. Refer to Physical Properties section, Chemical Resistance Data, and Industry Standards & Test Methods section for additional information. GF Harvel utilizes CPVC materials listed by NSF International to NSF STD 61, toxicology, as being safe for use in potable water applications. The Cell Classification call out for most CPVC piping materials per ASTM D1784 is as follows:

CPVC Cell Classification 23447 = CPVC Type IV, Grade I = Rigid (unplasticized) CPVC = CPVC

GF Harvel CPVC Product Line

Schedule 40 & Schedule 80 CPVC Pressure Pipe
CPVC Duct
CPVC Machining Shapes (solid bar, hollow bar, angle and other machine stock)
GF Harvel HydroKing® and GF Harvel FlowGuard Gold® CTS CPVC Hot and Cold Water Plumbing Pipe
GF Harvel CPVC Fire Sprinkler Pipe
GF Harvel FlameTech™

NOTE Although PVC and CPVC are similar in nature they are not the same. Care should be used when investigating chemical resistance, joining/fabrication techniques, and service applications. GF Harvel utilizes several different PVC and CPVC compounds for the production of different product lines. Different compounds may exhibit slight variations in actual physical properties and resultant cell classifications as compared to those stated. Contact GF Harvel Tech Services for additional information if necessary.

Dimensions & Pressure Ratings

PVC Pipe

Schedule 40 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.	Max. W.P. PSI*
1/8	0.405	0.249	0.068	0.051	810
1/4	0.540	0.344	0.088	0.086	780
3/8	0.675	0.473	0.091	0.115	620
1/2	0.840	0.602	0.109	0.170	600
3/4	1.050	0.804	0.113	0.226	480
1	1.315	1.029	0.133	0.333	450
1-1/4	1.660	1.360	0.140	0.450	370
1-1/2	1.900	1.590	0.145	0.537	330
2	2.375	2.047	0.154	0.720	280
2-1/2	2.875	2.445	0.203	1.136	300
3	3.500	3.042	0.216	1.488	260
3-1/2	4.000	3.521	0.226	1.789	240
4	4.500	3.998	0.237	2.118	220
5	5.563	5.016	0.258	2.874	190
6	6.625	6.031	0.280	3.733	180
8	8.625	7.942	0.322	5.619	160
10	10.750	9.976	0.365	7.966	140
12	12.750	11.889	0.406	10.534	130
14	14.000	13.073	0.437	12.462	130
16	16.000	14.940	0.500	16.286	130
18	18.000	16.809	0.562	20.587	130
20	20.000	18.743	0.593	24.183	120
24	24.000	22.544	0.687	33.652	120

Schedule 80 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.	Max. W.P. PSI*
1/8	0.405	0.195	0.095	0.063	1,230
1/4	0.540	0.282	0.119	0.105	1,130
3/8	0.675	0.403	0.126	0.146	920
1/2	0.840	0.526	0.147	0.213	850
3/4	1.050	0.722	0.154	0.289	690
1	1.315	0.936	0.179	0.424	630
1-1/4	1.660	1.255	0.191	0.586	520
1-1/2	1.900	1.476	0.200	0.711	470
2	2.375	1.913	0.218	0.984	400
2-1/2	2.875	2.290	0.276	1.500	420
3	3.500	2.864	0.300	2.010	370
3-1/2	4.000	3.326	0.318	2.452	350
4	4.500	3.786	0.337	2.938	320
5	5.563	4.768	0.375	4.078	290
6	6.625	5.709	0.432	5.610	280
8	8.625	7.565	0.500	8.522	250
10	10.750	9.493	0.593	12.635	230
12	12.750	11.294	0.687	17.384	230
14	14.000	12.410	0.750	20.852	220
16	16.000	14.213	0.843	26.810	220
18	18.000	16.014	0.937	33.544	220
20	20.000	17.814	1.031	41.047	220
24	24.000	21.418	1.218	58.233	210

Schedule 120 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.	Max. W.P. PSI*
1/2	0.840	0.480	0.170	0.236	1010
3/4	1.050	0.690	0.170	0.311	770
1	1.315	0.891	0.200	0.464	720
1-1/4	1.660	1.204	0.215	0.649	600
1-1/2	1.900	1.423	0.225	0.787	540
2	2.375	1.845	0.250	1.111	470
2-1/2	2.875	2.239	0.300	1.615	470
3	3.500	2.758	0.350	2.306	440
4	4.500	3.574	0.437	3.713	430
6	6.625	5.434	0.562	7.132	370
8	8.625	7.189	0.718	11.277	380

SDR 13.5 - Max W.P. 315 PSI*(all sizes)

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.
1/2	0.840	0.696	0.062	0.110

SDR 21 - Max W.P. 200 PSI*(all sizes)

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.
3/4	1.050	0.910	0.060	0.136
1	1.315	1.169	0.063	0.180
1-1/4	1.660	1.482	0.079	0.278
1-1/2	1.900	1.700	0.090	0.358
2	2.375	2.129	0.113	0.550
2-1/2	2.875	2.581	0.137	0.797
3	3.500	3.146	0.167	1.168
3-1/2	4.000	3.597	0.190	1.520
4	4.500	4.046	0.214	1.927
5	5.563	5.001	0.265	2.948
6	6.625	5.955	0.316	4.185
8	8.625	7.756	0.410	7.069

SDR 26 - Max W.P. 160 PSI*(all sizes)

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.
1	1.315	1.175	0.060	0.173
1-1/4	1.660	1.512	0.064	0.233
1-1/2	1.900	1.734	0.073	0.300
2	2.375	2.173	0.091	0.456
2-1/2	2.875	2.635	0.110	0.657
3	3.500	3.210	0.135	0.966
3-1/2	4.000	3.672	0.154	1.250
4	4.500	4.134	0.173	1.569
5	5.563	5.108	0.214	2.411
6	6.625	6.084	0.255	3.414
8	8.625	7.921	0.332	5.784
10	10.750	9.874	0.413	8.971
12	12.750	11.711	0.490	12.620
14	14.000	12.860	0.538	15.205
16	16.000	14.696	0.615	19.877
18	18.000	16.533	0.692	25.156
20	20.000	18.370	0.769	31.057
24	24.000	22.043	0.923	44.744

SDR 41 - Max W.P. 100 PSI*(all sizes)

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.
18	18.000	17.061	0.439	16.348
20	20.000	18.956	0.488	20.196
24	24.000	22.748	0.585	29.064

CPVC Pipe

Schedule 40 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.	Max. W.P. PSI*
1/4	0.540	0.344	0.088	0.096	780
3/8	0.675	0.473	0.091	0.128	620
1/2	0.840	0.602	0.109	0.190	600
3/4	1.050	0.804	0.113	0.253	480
1	1.315	1.029	0.133	0.371	450
1-1/4	1.660	1.360	0.140	0.502	370
1-1/2	1.900	1.590	0.145	0.599	330
2	2.375	2.047	0.154	0.803	280
2-1/2	2.875	2.445	0.203	1.267	300
3	3.500	3.042	0.216	1.660	260
3-1/2	4.000	3.521	0.226	1.996	240
4	4.500	3.998	0.237	2.363	220
5	5.563	5.016	0.258	2.874	190
6	6.625	6.031	0.280	4.164	180
8	8.625	7.942	0.322	6.268	160
10	10.750	9.976	0.365	8.886	140
12	12.750	11.889	0.406	11.751	130
14	14.000	13.073	0.437	13.916	130
16	16.000	14.940	0.500	18.167	130
18	18.000	16.809	0.562	22.965	130
20	20.000	18.743	0.593	29.976	120
24	24.00	22.544	0.687	37.539	120

Schedule 80 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.	Max. W.P. PSI*
1/4	0.540	0.282	0.119	0.117	1,130
3/8	0.675	0.403	0.126	0.162	920
1/2	0.840	0.526	0.147	0.238	850
3/4	1.050	0.722	0.154	0.322	690
1	1.315	0.936	0.179	0.473	630
1-1/4	1.660	1.255	0.191	0.654	520
1-1/2	1.900	1.476	0.200	0.793	470
2	2.375	1.913	0.218	1.097	400
2-1/2	2.875	2.290	0.276	1.674	420
3	3.500	2.864	0.300	2.242	370
3-1/2	4.000	3.326	0.318	2.735	350
4	4.500	3.786	0.337	3.277	320
5	5.563	4.768	0.375	4.078	290
6	6.625	5.709	0.432	6.258	280
8	8.625	7.565	0.500	9.506	250
10	10.750	9.493	0.593	14.095	230
12	12.750	11.294	0.687	19.392	230
14	14.000	12.410	0.750	23.261	220
16	16.000	14.213	0.843	29.891	220
18	18.000	16.014	0.937	37.419	220
20	20.000	17.814	1.031	45.879	220
24	24.000	21.418	1.218	64.959	210

NOTE *Pressure ratings are for water, non-shock, @73°F. Threaded pipe requires a 50% reduction in the pressure ratings stated for plain-end pipe @ 73°F. Threading recommended for Schedule 80 or heavier walls only. Maximum service temperature for PVC is 140°F. Maximum service temperature for CPVC is 200°F. The pressure rating of the pipe must be derated when working at elevated temperatures.

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

Refer to chemical resistance and installation data. All PVC piping is produced from NSF approved compounds conforming to ASTM D1784 and is NSF listed for potable water use.

ASTM Standard D1784 Material equivalents:
Cell classification 12454 = PVC Type I Grade I = PVC1120
Cell classification 23447 = CPVC Type IV Grade I = CPVC4120

Schedule 40, 80 & 120 PVC pipe is manufactured in strict compliance with ASTM D1785. Schedule 40 & 80 CPVC pipe is manufactured in strict compliance with ASTM F441.

Temperature De-rating

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 (W.P.) listed when operating at elevated temperatures.

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.

Solvent-cemented joints should be utilized when working at or near maximum temperatures of the material selected. GF Harvel Plastics does not recommend the use of standard threaded connections at temperatures above 110˚F for PVC or at temperatures above 150˚F for CPVC; use specialty reinforced adapters, flanged joints, unions or roll grooved couplings where disassembly is necessary at elevated temperatures.

Threading of Schedule 40 pipe (PVC or CPVC) 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 pressure de-rating when working with fluids other than water. Refer to GF Harvel's chemical resistance guide for additional information.

PVC Pipe

Operating Temp (°F)	De-Rating Factor
73	1.00
80	0.88
90	0.75
100	0.62
110	0.51
120	0.40
130	0.31
140	0.22

EX: 10" PVC SCHEDULE 80 @ 120°F = ?
230 psi x 0.40 = 92 psi max. @ 120°F

CPVC Pipe

Operating Temp (°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

EX: 10" CPVC SCHEDULE 80 @ 120°F = ?
230 psi x 0.65 = 149.5 psi max. @ 120°F