



FLOWGUARD GOLD

High-Quality Hot & Cold Water CPVC Plumbing Pipe

**A safe, cost-effective choice
for long-term residential
and commercial plumbing
system service.**





Harvel® FlowGuard Gold® CTS CPVC Plumbing Pipe provides exceptional corrosion resistance for hot and cold water plumbing applications. Easily installed using reliable solvent-welded joining techniques, Harvel® FlowGuard Gold® CTS CPVC pipe is the quality, cost-effective choice for long-term system service.

Product Ratings

Harvel® FlowGuard Gold® CTS CPVC hot and cold water plumbing pipe is manufactured in strict compliance with ASTM D2846. This standard defines requirements for materials, workmanship, dimensions, tolerances, pressure-bearing capability, and thermocycling resistance. Harvel® FlowGuard Gold® plumbing pipe is manufactured to SDR 11 specifications in accordance with this standard. With SDR series pipe, the outside-diameter-to-wall-thickness ratio is constant regardless of pipe diameter; therefore all sizes of pipe carry the same pressure rating.

Performance Testing

In addition to Harvel's rigorous in-house testing, Harvel® FlowGuard Gold® pipe is regularly tested by independent third parties to verify the product's quality and safety. Stringent testing is conducted by the National Sanitation Foundation (NSF) to ensure that Harvel pipe meets the requirements of NSF Standard 14 and NSF Standard 61 for quality and health effects. In addition to physical performance testing to ensure product quality, this testing ensures that Harvel® FlowGuard Gold® pipe does not contain nor contribute any harmful substances to the drinking water transported. As a result, Harvel® FlowGuard Gold® pipe contains the NSF stamp of approval for potable (drinking) water applications.

Based on large scale testing, Harvel® FlowGuard Gold® is also listed for surface burning characteristics by ULC having a low flame spread rating (<25) and a low smoke development rating (<50) validating the excellent fire performance properties of the piping. This listing can be used to validate that Harvel® FlowGuard Gold® can be installed within return air plenums based on its excellent fire performance properties. Harvel® FlowGuard Gold® also meets CSA B137.6 Chlorinated Polyvinyl Chloride (CPVC) pipe, tubing and fittings for hot and cold water distribution systems – this information, along with ULC flame and smoke information is printed on the pipe for easy identification in the field.

Code Approvals

Major building codes have approved the use of CPVC piping as an acceptable material for plumbing systems, provided that the piping conforms to applicable industry standards and has been listed by a third party for conformance to NSF Standard 14 and /or NSF Standard 61 requirements. Code bodies that accept the use of CPVC include BOCA National Plumbing Code, National Standard Plumbing Code, SBCCI Standard Plumbing Code, International Plumbing Code, and the Uniform Plumbing Code to name a few. The user should determine approval and installation requirements from the local code having jurisdiction prior to use.

Harvel® FlowGuard Gold® CTS CPVC Pipe SDR 11 Dimensions and Tolerances (inches)

Nominal Pipe Size (in.)	Average O.D.	O.D. TOL	Average I.D.	Minimum Wall	Wall TOL	Pressure Rating	
						@73°F	@180°F
1/2	0.625	±.003	0.469	0.068	+0.020	400	100
3/4	0.875	±.003	0.695	0.080	+0.020	400	100
1	1.125	±.003	0.901	0.102	+0.020	400	100
1-1/4	1.375	±.003	1.105	0.125	+0.020	400	100
1-1/2	1.625	±.004	1.309	0.148	+0.020	400	100
2	2.125	±.004	1.716	0.193	+0.023	400	100

Installation

It is important to follow proper storage and handling, joining, assembly, and other installation techniques to ensure a quality system installation. A properly designed and installed Harvel® FlowGuard Gold® plumbing system will provide years of trouble-free service, lasting much longer than metallic systems due to the product's inherent corrosion resistance and other factors. The following information is provided as a general guide toward that end.

Solvent Cement Joining Techniques

Harvel® FlowGuard Gold® pipe is joined by the solvent cementing process; a reliable field-proven, joining technique for many years. When properly conducted, this method provides a strong, homogenous joining area in which the mating surfaces are chemically fused together, producing a strong, leak-tight seal when cured. Prior to solvent cementing, appropriate safety precautions should be taken:

- Use only CPVC cement conforming to ASTM F493
- Follow the solvent cement manufacturer's instructions
- Avoid breathing vapors
- Use only with adequate ventilation
- Avoid frequent contact with skin
- Avoid contact with eyes
- Eliminate all ignition sources
- Store primer and solvent cement in the shade between 40°F and 110°F
- Close containers tight when not in use, and cover as much as possible during use
- Follow all manufacturer-recommended precautions when using power tools
- Flush the system for a minimum of 10 minutes after pressure testing to remove trace amounts of solvents or other system components

Minimum Cure Time Prior to Testing at 150 psi with Cold Water (based on use of IPS one-step CPVC cement)

Pipe Size (in.)	Ambient Temperature During Cure Time		
	>60°F	40°F-60°F	<40°F
1/2	15 min.	20 min.	30 min.
3/4	15 min.	20 min.	30 min.
1	15 min.	20 min.	30 min.
1-1/4	15 min.	20 min.	30 min.
1-1/2	30 min.	45 min.	1 hour
2	30 min.	45 min.	1 hour

Exercise special care when assembling Harvel® FlowGuard Gold® pipe in extremely low temperatures (below 40°F) or extremely high temperatures (above 80°F). Extra set and handling times must be allowed in colder temperatures. Make certain cement has not “gelled” when cementing pipe and fittings in colder temperatures. Make certain both surfaces being joined are wet with cement during assembly when working in extremely hot temperatures.

Hangers and Supports

Proper support spacing is critical to ensure that deflection is kept to a minimum. Hangers used must have an adequate load bearing surface free of any rough or sharp edges that could damage the pipe during use. They must also not restrict linear movement of the system due to the effects of expansion and contraction; overtightening must be avoided.

Pipe Size (in.)	Max. Hanger Support Spacing (ft.)
1/2	3
3/4	3
1	3
1-1/4	4
1-1/2	4
2	4

Wall Penetration

Building codes require that a fire-rated wall or floor must be sealed back to its original integrity when penetrated. Several sealants and materials are suitable for use with Harvel® FlowGuard Gold® pipe to construct an appropriate UL Classified penetration system (fire-rated penetration system). When installed properly, these systems will provide a two-hour fire rating. Consult local building code requirements. CAUTION: Certain fire-stopping sealants and components contain stress cracking agents and other chemicals which may cause damage to CPVC piping; contact the appropriate manufacturer for compatibility with CPVC piping prior to use.

Note: When installing CPVC piping in areas where the system must be drained to protect it from freezing, the lines must be sloped to drain.

Threaded Connections

Harvel® FlowGuard Gold® pipe can be connected to copper, brass, valves, and other piping materials using transition unions, compression fittings, specially reinforced male and female adapters, and other readily available transition fittings. Follow the fitting manufacturer’s installation instructions for the specific connection being used to ensure a proper leak-free joint. When using compression fittings utilizing brass ferrules,

it is recommended that Teflon tape be wrapped around the ferrule prior to assembly to help compensate for differences in expansion rates between CPVC and metallics. Teflon tape is also the recommended thread sealant for threaded connections. Certain pipe joint pastes and sealant compounds contain substances which could be damaging to CPVC and result in system failure. If joint sealant other than Teflon tape is used, contact the sealant manufacturer for compatibility with CPVC. Caution must be exercised to prevent overtightening of threaded connections and compression fittings.

Where water temperatures are 150°F or higher, use transition fittings incorporating rubber seals or other approved specialty transition fittings at the plastic to metal changeover. Follow appropriate safety precautions and manufacturer’s recommendations when working with or near open flame during soldering operations. Extreme care must be used when soldering to prevent flame contact with CPVC tubing.

Water Heater Connections

Care should be used to prevent contact of the Harvel® FlowGuard Gold® pipe with heat-producing sources. Gas water heaters require the use of a metallic nipple or appliance connector at least six inches long to be installed above the flue piping as a transition piece to prevent damage to the CPVC by excessive heat build-up from the flue. CPVC can be installed directly onto electric water heaters with special transition fittings. Some codes require metal connectors on electric water heaters; consult applicable code requirements prior to installation.

Testing

Once the system has been installed and allowed to cure properly the system shall be tested in accordance with applicable code requirements. When testing with water (hydrostatic testing), the system must be slowly filled with water and the air bled from the highest and furthest points in the system before test pressure is applied. Air must be removed from piping systems to prevent it from being locked in the system when pressure is applied. Failure to do so could be harmful to jobsite personnel should a failure occur. If a leak is found, the affected product must be cut out and discarded. A new section can be installed using couplings or other approved means.

⚠ WARNING — THE USE OF COMPRESSED AIR OR GASES FOR PRESSURE TESTING CAN RESULT IN SYSTEM DAMAGE, SERIOUS BODILY INJURY, OR EVEN DEATH.

Storage and Handling

Reasonable care should be exercised when handling and storing Harvel® FlowGuard Gold® CTS CPVC pipe to prevent damage caused by impact, improper storage, or other forms of abuse. Harvel® FlowGuard Gold® pipe should be kept in its original packaging to keep it free from dirt and debris, and to reduce the possibility of damage. Product containing fractures, splits, gouges, or other damaged sections must not be used. Damaged sections must be cut out and discarded. When stored outdoors, Harvel pipe should be covered with a non-transparent material. Brief exposure to sunlight may cause the product’s color to fade, but it will not affect its physical properties.

Thermal Expansion

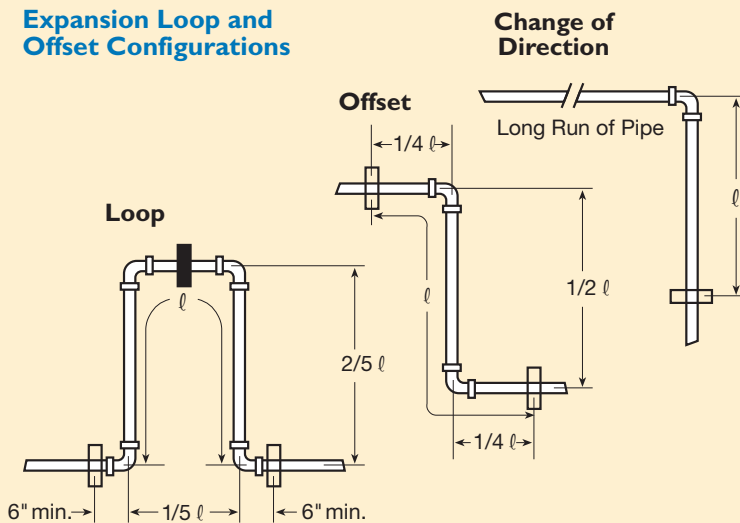
All piping systems expand and contract with changes in temperature. This issue must be addressed with appropriate system design to prevent damage to the system. Harvel® FlowGuard Gold® CTS CPVC plumbing pipe will expand or contract approximately 1 inch per 50 feet of pipe with every 50°F of temperature rise or fall. The effects of expansion/contraction are usually absorbed by the system at changes of direction in the piping. In other words, long, straight runs of piping are more susceptible to experiencing measurable movement with changes in temperature. As with other piping materials, the installation of an expansion loop or offset is required on long, straight runs, which will allow the piping system to absorb the forces generated by expansion/contraction without damage. The rate of expansion does not vary with pipe size. The effects of expansion/contraction are more pronounced on hot water lines. Generally the amount of temperature change experienced is no

more than 100°F. The chart below can be used to determine the size of an expansion joint needed to compensate for movement when a temperature change of 80°F is experienced.

Length of Expansion Loop (ℓ) in Inches Required for 80°F Temperature Change

Pipe Size (in.)	Length of Run			
	40 ft.	60 ft.	80 ft.	100 ft.
1/2	22	27	31	34
3/4	26	32	36	41
1	29	36	41	46
1-1/4	32	40	46	51
1-1/2	35	43	50	56
2	40	49	57	64

Expansion Loop and Offset Configurations



Hangers or guides should only be placed in the loop, offset, or change of direction as indicated above. Piping supports should restrict lateral movement and should direct axial movement into the expansion loop. Do not restrain "change in direction" configurations by butting up against joists, studs, walls, or other structures.

For temperature changes greater than 100°F the actual amount of movement to be expected must be calculated based on the temperature changes anticipated. The rate of expansion or contraction can be calculated as follows:

$$\Delta L = 12 y l (\Delta T)$$

where: ΔL = expansion or contraction in inches
 $y = 3.8 \times 10^{-5}$ (coefficient of linear expansion)
 l = length of piping run in feet
 ΔT = temperature change °F
 (Maximum temperature - temperature @ installation)

Once the change in length (ΔL) has been determined, the length of an offset or expansion loop required to compensate for this change can be calculated as follows:

$$\ell = \sqrt{\frac{3ED(\Delta L)}{2S}}$$

ℓ = Length of expansion loop in inches
 E = Modulus of elasticity
 D = Average outside diameter of pipe
 ΔL = Change in length of pipe due to temperature change
 S = Working stress at max. temperature

CAUTIONS

CPVC products resist attack from a wide range of chemicals that are corrosive to metallic piping. CPVC products can however be damaged by contact with chemicals found in some construction and ancillary products such as thread sealants, anti-freeze solutions, fire stop materials, etc. It is important to verify the compatibility of materials that come in contact with the CPVC system prior to use to ensure long-term performance.

- **DO NOT stack, support, hang equipment, or hang flexible wire/cable (especially communications cable), or other material on the CPVC system.**
- **DO NOT expose CPVC products to incompatible substances such as cutting oils, non-water based paints, packing oils, traditional pipe thread paste and dope, fungicides, termiticides, insecticides, detergents, building caulks, adhesive tape, solder**

flux, flexible wire/cable (with special consideration for communications cabling), and non-approved spray foam insulation materials.

- **DO NOT expose CPVC products to edible oils, solvents, or glycol-based anti-freeze fluids.**
- **DO NOT expose CPVC products to open flame, solder, and soldering flux.**
- **DO NOT drop, distort, or impact CPVC products or allow objects to be dropped on them.**

Failure to follow this notice may cause cracks or fractures to develop in CPVC products resulting in property damage and personal injury due to leaks or flooding.



1. Cutting

Harvel® FlowGuard Gold® pipe must be cut square to obtain the proper insertion depth and to provide the maximum bonding area for solvent cementing. Harvel pipe can easily be cut with a wheel-type plastic tubing cutter, ratchet-style cutter, fine-toothed hand saw (hack saw), or power saw. A miter box should be used when working with saws to ensure a square cut. If ratchet-style cutters are used, their blades must be sharpened regularly. The use of ratchet cutters with dull blades, or their use in cold weather, will tend to compress the pipe prior to cutting which can result in hairline fracturing. The raised bead left on the pipe OD after cutting, must be removed prior to solvent cementing — see step number 2 regarding beveling. Any cuts, fractures, splits, or other damaged areas must be removed prior to joining. Cut off at least 2" beyond any visible fracture.



2. Beveling/Deburring

Burrs, filings, shavings etc. caused by the cutting process must be removed from the outside and inside of the pipe. Shavings and other debris will prevent proper contact of the joining surfaces and can lead to joint failure. Chamfering tools are available for this purpose, however pocket knives or files are also suitable. A slight bevel is required on the pipe end to help ease entry into the fitting socket, and to prevent solvent cement from being pushed ahead of the pipe during the assembly process. Many chamfering tools designed for use with plastic are readily available. These tools are specifically designed to remove burrs and provide a proper bevel simultaneously.



3. Fitting Preparation

Wipe dirt, debris, and moisture from the pipe end and fitting socket using a clean, dry rag. Moisture will slow the cure time and reduce joint strength. Inspect piping and components for damage or irregularities prior to assembly. Do not use components that appear irregular or that do not fit properly; contact the appropriate manufacturer of the product in question to determine usability. Check the dry fit of the pipe and fitting prior to assembly. The pipe should enter the fitting socket easily one-quarter to three-quarters of the way.



4. Solvent Cement Application

USE ONLY CPVC CEMENT that conforms to ASTM F493. The use of the wrong cement can result in failure. Harvel recommends the use of IPS 713 CPVC cement, P-68 primer, or IPS Low VOC one-step CPVC cement or equivalent. Two solvent cementing processes are available: the two-step solvent cement and primer process and the one-step process. The two-step process utilizes the application of primer to the outside of the pipe and the interior fitting socket prior to applying the solvent cement. When using primer, it must be applied to both the pipe and fittings using the appropriate size applicator. A dauber or paint brush approximately half the size of the pipe diameter is appropriate. A rag must not be used. Apply primer to the fitting socket, then to the outside of the pipe end, re-dipping the applicator as necessary to ensure the entire joining surfaces are wet; apply solvent cement immediately after primer application while primed surfaces are tacky. Cement application for one- or two-step process: Apply a heavy, even coat of cement to the outside pipe end. Apply a medium coat to the fitting socket. A second application of cement should be applied to the pipe end if there was little or no interference when the dry fit was checked. Do not allow excess cement to puddle in the pipe or fitting.



5. Assembly

Immediately insert the pipe into the fitting while rotating the pipe one-quarter turn to help distribute cement. Properly align the fitting for installation at this time. Pipe must bottom completely to the stop in the fitting. Hold the assembly for 10 to 15 seconds to ensure initial bonding. A continuous bead of cement should be evident around the pipe and fitting juncture. If the bead is not continuous, it may indicate that insufficient cement was applied. If insufficient cement is applied the fitting must be cut out, discarded, and begun again. Cement in excess of the bead should be wiped off with a rag.



6. Set and Cure Times

Assembled joints must be allowed to set and cure properly prior to testing the system. Set and cure times are a function of type of cement used, pipe size, temperature, humidity, and tightness of fit. Drying time is faster for drier environments, smaller sizes, higher temperatures, and tighter fits. The assembly must be allowed to set without any stress on the joint for one to five minutes depending on the pipe size and temperature. Following the initial set period, the assembly can be handled carefully. FOLLOW THE CEMENT MANUFACTURER'S RECOMMENDED CURE TIMES PRIOR TO PRESSURE TESTING — FAILURE TO DO SO WILL RESULT IN JOINT FAILURE.



SAMPLE SPECIFICATION

All CPVC SDR 11 Series hot and cold water plumbing pipe shall be manufactured from a Type IV, Grade I Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 24448 (CPVC4120) per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D2846, consistently meeting and/or exceeding the quality assurance test requirements of this standard with regard to pressure rating, material, workmanship, burst pressure, flattening resistance, and extrusion quality. The pipe shall be manufactured in the USA by an ISO 9001 certified manufacturer. All pipe shall be packaged on-line immediately after its manufacture and stored indoors after production at the manufacturing site until shipped from factory. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications. The pipe shall have a flame spread rating <25 and a smoke development rating <50 when tested and listed for surface burning characteristics in accordance with ULC-S102.2 or equivalent; this information shall be printed on the pipe along with the mark of the listing agency. This pipe shall also meet the requirements of CSA B137.6 for CPVC hot and cold water distribution piping. All pipe shall be manufactured by Harvel Plastics, Inc., trade name Harvel® FlowGuard Gold® CTS CPVC – No Equal.



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