

ips

fire protection
piping systems

CPVC Design and Installation Guide



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This product user guide is intended to assist designers and installers in obtaining the best results from the system. The contents are relevant only to CPVC fire sprinkler systems manufactured by Harvel Plastics Inc., and Spears Manufacturing Co. The guide is an edited version of their detailed design and installation guides and has been produced to supplement their publications - not to replace them.

Prior to commencing any installation, users must read and understand the manufacturer's guide, and have completed an IPS authorised training course.



Advantages

CPVC Fire Sprinkler piping is designed specifically for fire sprinkler systems - providing unique advantages to the contractor. The easy assembly provided by the solvent cement system and excellent hydraulics makes CPVC an outstanding material for this application.

CPVC Fire Sprinkler piping is manufactured from a special thermoplastic, known chemically as Post-Chlorinated Polyvinyl Chloride. The characteristics of the material and the pipe dimensions provide unique advantages in sprinkler installations: superior hydraulics; ease of joining; increased hanger spacing in comparison to other plastics; and assembly with readily available, inexpensive tools. The product has a continuous service history of more than 30 years.



Approvals

CPVC fire sprinkler systems manufactured by Harvel Plastics, Inc., and Spears Manufacturing Co. have been tested and approved by Underwriters Laboratories (UL), Factory Mutual System (FM) and the Loss Prevention Certification Board (LPCB) for a range of residential, LH (Light Hazard) and OH1 (Ordinary Hazard Group 1) occupancies.

The products are approved and listed by NSF and WRAS as being suitable for use in contact with cold potable water.

Scope of Use

CPVC fire sprinkler systems are designed for use in wet pipe systems only (a wet pipe system contains water and is connected to a water supply system so that water will discharge immediately when the sprinkler is opened). **CPVC fire sprinkler systems must never be used in a system using compressed air or other gases.**

Typical applications include:-

Occupancy	EN 12845 Hazard Classification
Houses, apartments and multiple occupancy homes (HMO's)	LH
Residential care homes	LH or OH1
Schools, colleges and other educational establishments	LH or OH1
Offices	LH or OH1
Museums, libraries, court rooms, prisons, churches	LH or OH1
Hotels	OH1
Hospitals	OH1
Attics	OH1

However it is not permitted to use CPVC fire sprinkler piping in areas within such occupancies where higher hazard conditions exist, such as in commercial kitchens, plant rooms or store rooms, or in other industrial applications such as factories or warehouses.

Refer to LPC Technical Bulletin TB227 for guidance on scope of use when designing systems to LPC Rules. The system is UL listed for use in Light Hazard occupancies as defined in NFPA 13, as well as residential occupancies as defined in NFPA 13R and 13D. It is also listed by UL under the requirements of UL 1887 for use in air plenums. FM approval is limited to light hazard occupancies where the piping is completely separated by non-removable, fire resistant barriers from any area protected by the system.

CPVC fire sprinkler piping is suitable for use where an occupancy has been designated life safety, subject to the agreement of all parties having jurisdiction.

The system is also suitable for use in residential and domestic sprinkler systems when designed in accordance with BS9251 and the BAFSA Technical Guidance Note No.1 "The Design and Installation of Residential and Domestic Sprinkler Systems".

Where there is any doubt regarding the suitability of the material, guidance must always be sought from our technical department or agreement reached between all parties having jurisdiction.

Where to Install CPVC Fire Sprinkler Systems

CPVC fire sprinkler pipes and fittings are suitable for use in areas where the ambient temperatures are within the range 2°C to 50°C. They are not listed for outdoor use.

Concealed Installations

Within a suitable occupancy, the piping may be installed “concealed” without restriction in all suitable locations. Listed sprinkler heads should be rated at 107°C (225°F) or lower. Concealed piping is defined as having a barrier that will provide one half-hour fire resistance between the protected area and the CPVC piping (for example behind a gypsum wall board). The barrier must provide the equivalent to a minimum protection of one layer of 10mm gypsum wallboard, 12mm plywood soffits or a suspended ceiling with lay-in panels or tiles having a weight of not less than 1.7 kg per m² when installed with metallic support grids.

Exposed Installations

As an alternative to the minimum barrier requirements required for concealed installations, CPVC fire sprinkler piping can be installed exposed, subject to the following restrictions:-

All Sprinkler Types

- The pipe should be installed below a smooth, flat, horizontal ceiling.

Pendent Sprinklers

- Listed quick-response sprinklers having a maximum temperature rating of 76°C (170°F) must be installed with deflectors within 200mm from the ceiling; *or*,
- Listed residential pendent sprinklers having a maximum temperature rating of 76°C (170°F) should be located in accordance with their listing; *and*,
- The maximum distance between sprinklers is not to exceed 4.5 metres; *and*,
- The piping shall be mounted directly to the ceiling.

Sidewall Sprinklers

- Listed quick-response sprinklers having a maximum temperature rating of 76°C (170°F) must be installed with deflectors within 150mm from the ceiling and 100mm from the sidewall; *or*,
- Listed quick-response sprinklers having a maximum temperature rating of 93°C (200°F) must be installed with deflectors within 300mm from the ceiling and 150mm from the sidewall; *or*,
- Listed residential sprinklers having a maximum temperature rating of 93°C (200°F) should be located in accordance with their listing; *and*,
- The maximum distance between sprinklers is not to exceed 4.2 metres; *and*,
- The piping shall be mounted directly to the sidewall.

Upright Sprinklers

- Listed quick-response sprinklers having a maximum temperature rating of 68° C (155° F) must be installed so that deflectors are a maximum of 100mm from the ceiling; *and*,
- The maximum distance from the ceiling to the centreline of the pipe run shall be 190mm; *and*,
- The distance from the centreline of a sprinkler head to a hanger shall be 75mm; *and*,
- The maximum distance between sprinklers is not to exceed 4.5 metres; *and*,
- Rigid pipe hangers must be used, fixed to the ceiling.

Extended Coverage Pendent Sprinklers

- Listed quick-response extended coverage sprinklers having a maximum temperature rating of 68°C (155°F) must be installed with deflectors within 200mm from the ceiling; *or*,
- Listed residential extended coverage sprinklers having a maximum temperature rating of 68°C (155°F) must be installed with deflectors within 200mm from the ceiling; *and*,
- The maximum distance between sprinklers is not to exceed 6 metres; *and*,
- The minimum application density shall be 4.1mm/min; *and*,
- The piping shall be mounted directly to the ceiling.

Extended Coverage Sidewall Sprinklers

- Listed quick-response extended coverage sprinklers having a maximum temperature rating of 79°C (175°F) must be installed with deflectors within 300mm from the ceiling and 150mm from the sidewall; *and*,
- The maximum distance between sprinklers is not to exceed 4.9 metres; *and*,
- The minimum application density shall be 4.1mm/min; *or*,
- Listed quick-response extended coverage sidewall sprinklers having a maximum temperature rating of 73°C (165°F) must be installed with deflectors within 300mm from the ceiling and 150mm from the sidewall; *and*,
- The maximum distance between sprinklers is not to exceed 5.5 metres; *and*,
- The minimum application density shall be 4.1mm/min; *or*,
- Listed residential extended coverage sidewall sprinklers having a maximum temperature rating of 73°C (165°F) must be installed with deflectors within 300mm from the ceiling and 150mm from the sidewall; *and*,
- The maximum distance between sprinklers is not to exceed 5.5 metres; *and*,
- The minimum application density shall be 4.1mm/min; *or*,
- Listed quick-response extended coverage sidewall sprinklers having a maximum temperature rating of 68°C (155°F), manufactured by Reliable Automatic Sprinkler Co. Inc., (SIN RA0362) must be installed with deflectors within 300mm from the ceiling and 150mm from the sidewall; *and*,
- The maximum distance between sprinklers is not to exceed 7.3 metres; *and*,
- The minimum flow shall be 40 gpm per sprinkler.

Combustible Concealed Installations

In accordance with the UL listing, CPVC fire sprinkler piping can be used in specific light-hazard, combustible concealed and non-combustible concealed spaces that require sprinkler protection when installed with Tyco Fire Products Model CC1 - 2.8 K-Factor or Model CC2 - 5.6 K-Factor Combustible Concealed Space Sprinklers, Specific Application Upright, or Viking Microfast® COIN™ Quick Response Combustible Interstitial Space Upright Sprinklers for Specific Application. The system must be installed in accordance with the applicable sprinkler manufacturer's instructions.

Combustible Attic Installations

In accordance with the UL listing, CPVC fire sprinkler piping can be installed in the attic space provided that the attic space is protected with listed Tyco Fire Products Specific Application Attic Sprinklers. The system must be installed in accordance with the applicable sprinkler manufacturer's instructions, and may be used to feed the wet system sprinklers below the ceiling and exposed to feed the wet system specific application attic sprinklers.

Ceiling Voids and Return Air Plenums

CPVC fire sprinkler piping can be installed in ceiling voids and air plenums:-

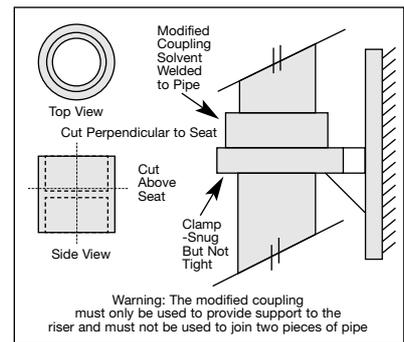
- Where sprinkler protection is not required within the ceiling void under BS EN 12845 and protection is being added at the discretion of the building owner.
- When the sprinkler piping is used to feed the wet system sprinklers below the void.

The pipes must be located at a horizontal distance of at least 600mm from openings in the ceiling (such as ventilation grills).

System Risers

CPVC fire sprinkler piping may be used for system risers, subject to the following restrictions:-

- Vertical risers must be supported at each floor level, or at 3m intervals, whichever is less.
- Vertical lines must be supported at intervals to avoid placing excessive load on a fitting at the lower end. This is done using riser clamps or double bolt pipe clamps listed for this service. The clamps must not exert compressive stresses on the pipe. If possible, clamps should be located just below a fitting so that the shoulder of the fitting rests against the clamp. If necessary, a coupling can be modified and solvent welded to the pipe as a bearing support so that the shoulder of the fitting rests on the clamp. Follow the recommended cure time before applying any load to the fitting. Do not use riser clamps that squeeze the pipe and depend on compression of the pipe to support the weight.
- Risers must not be installed exposed. Protection against mechanical damage must be provided as shown above for concealed installations, except where the riser is in a dedicated riser shaft where general access is restricted.



Supporting Vertical Risers

Concrete or Stucco

CPVC fire sprinkler piping is not adversely affected by direct contact with concrete or stucco, but contact should be avoided with other incompatible construction materials including thread sealants, caulks, etc. CPVC piping may be installed directly in concrete or stucco subject to the following restrictions:-

- Straight runs of pipe should be used wherever possible.
- A 25mm foam insulation sleeve should be fitted where the pipe enters or exits the concrete, or at construction joints.
- Before covering with concrete or stucco the pipe should be intermittently secured using correctly sized plastic pipe clips.
- When laying out the system care should be taken to ensure that the pipe has no contact with sharp objects or sharp edges of materials.

CPVC fire sprinkler piping may also be run under a concrete slab, provided that the system is fully pressure tested before pouring the slab. The pipe should be evenly supported in smooth bottom trenches free from rocks and sharp objects, and covered with a minimum of 100mm thick pea gravel. Foam pipe insulation 25mm thick should be used to sleeve the pipe at changes of direction, where the pipe comes out of the slab, and at construction joints.

Underground

CPVC fire sprinkler piping is suitable for use below ground and is listed by UL for underground water service.

Trenches should be of adequate width to allow convenient installation, while at the same time being as narrow as possible. Minimum trench widths may be utilised by joining pipe outside the trench and lowering it into the trench after adequate joint strength has been achieved. Trench widths will need to be wider where pipe is to be joined in the trench or where thermal expansion and contraction is a factor.

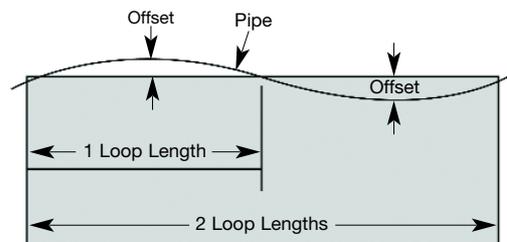
The pipe should be buried to the following depth:-

- A minimum of 300mm to 450mm for light traffic areas
- A minimum of 750mm to 1000mm for heavy traffic areas
- A minimum of 300mm below the maximum expected frost line

Where pipes are installed beneath surfaces that are subject to heavyweight or constant traffic (such as roads or railways) it is recommended that the pipes are run within a metal or concrete sleeving. The pipe should be evenly supported in smooth bottom trenches free from rocks and sharp objects, and covered with a minimum of 100mm thick pea gravel.

If trenching CPVC pipe during hot weather, it is advisable to snake the pipe beside the trench during its required drying time. This will allow for any anticipated thermal contraction that may take place as cooling occurs. Snaking may also be required for pipe that is laid directly in the trench during hot weather (necessitating a wider trench than otherwise required) if it is backfilled with cool earth before the joints are thoroughly dry. Use the following guidelines for loop offset dimensions. **Be especially careful not to apply any stress that will disturb an undried joint.**

Loop offset in mm for Contraction					
Loop Length	Maximum Temperature Variation (°C)				
	10°	20°	30°	40°	50°
5 Metres	83	105	123	143	164
15 Metres	219	308	388	440	498
30 Metres	424	609	858	884	999



Underground pipe must be thoroughly inspected and fully tested for leaks prior to backfilling. Pea gravel should be used to provide a minimum of 100mm of cover above the pipe. The ground should be backfilled in uniform layers that are compacted by hand or mechanical tamper. Large or sharp rocks and other debris should be removed. Rolling equipment or heavy tampers should only be used to consolidate the final backfill.

Wall Penetrations

Building codes or regulations must be adhered to when penetrating building structures:-

- When penetrating fire rated walls or partitions, use only firestop products that are approved for use with CPVC pipe.
- It is acceptable to cut holes in wood studs to lead the pipe through without contact. The holes should be oversized to allow for movement.
- CPVC fire sprinkler pipes should be protected from sharp edges when passing through metal studs.

Painting

CPVC fire sprinkler piping can be overpainted, but only water or latex based paints should be used. Oil based paints, or any type of paint with solvent content, must not be used with CPVC. Never paint sprinkler heads. No special surface preparation is required other than cleaning with a mild soap and water mixture prior to painting. Consult local authorities having jurisdiction before painting.

Freeze Protection

Within the heated envelope of a building, temperatures are normally within an acceptable range. However if the installation is in an area subjected to freezing temperatures, protection is recommended. Pipe insulation is the most common method and will usually provide an adequate level of protection. Trace heating of CPVC is permitted provided some simple safeguards are followed - consult our technical department for advice. The use of anti-freeze solutions is **not** recommended.

Hangers and Supports

CPVC pipes should be supported to ensure that unnecessary stresses are avoided. All pipe hangers must have a load bearing surface of at least 12.7mm, and they should be free from any rough or sharp edges which could come into contact with the pipe. They should be loose fitting to allow free axial movement of the pipe, and care should be taken not to prevent axial movement by installing fittings or other components next to hangers. The Tolco range of UL approved clips and hangers is ideal for this application - see price list for details.

Vertical pipes should be supported at each floor or at 3m intervals, whichever is less, avoiding placing the weight of the run on a fitting or joint, and horizontal runs should be braced so that stress loads (caused by bending or snaking of the pipe) are not placed on a fitting or joint.

Piping should be supported at centres not greater than the distances in the table.

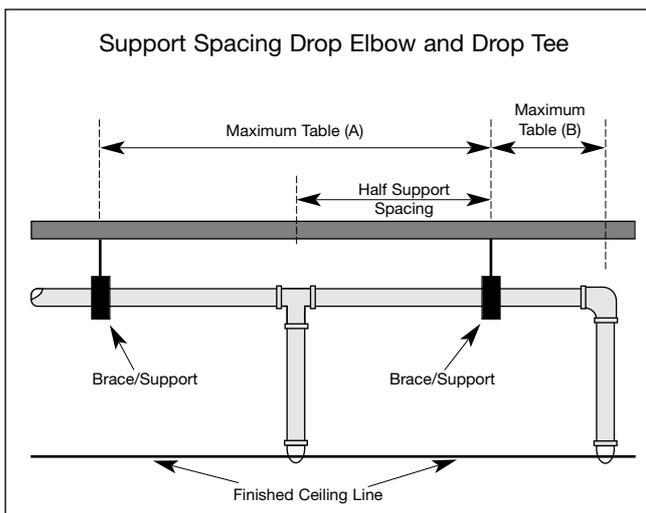
Maximum Pipe Support Spacing							
Pipe Size	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
Spacing (m)	1.7	1.8	2.0	2.1	2.4	2.7	3.0



Sprinkler Bracing

When a sprinkler head activates, a significant reactive force can be exerted on the pipe. With a pendent head, this reactive force can cause the pipe to lift vertically if it is not properly secured, especially if the sprinkler drop is from a smaller diameter pipe.

The closest hanger must brace the pipe against vertical lift-up, and supports must be positioned at distances not greater than the following:-



Maximum Support Spacing Distance (m) In-Line Sprinkler Head Drop Tee (A)		
Pipe Size	Less than 7 bar	Greater than 7 bar
3/4"	1.22	0.92
1"	1.52	1.22
1 1/4"	1.83	1.52
1 1/2" - 3"	2.13	2.13

Maximum Support Spacing Distance (m) End Line Sprinkler Head Drop Elbow (B)		
Pipe Size	Less than 7 bar	Greater than 7 bar
3/4"	0.23	0.15
1"	0.30	0.23
1 1/4"	0.40	0.30
1 1/2" - 3"	0.60	0.30

To brace the pipe, one common method is to use a standard band hanger, positioning the threaded support rod to within 2mm above the pipe. It is important, however, not to have the rod in contact with the pipe. We strongly recommend the use of the UL listed Tolco Fig. 25 surge restrainer, which is used in conjunction with Tolco band hangers. This easily installed combination restricts the upward movement of the pipe while not allowing the threaded support rod to contact the pipe.



Handling and Storage

CPVC fire sprinkler piping is tough and corrosion resistant, but does not have the mechanical strength of steel. Reasonable care should be exercised, particularly when handling pipes. They must not be dropped or have objects dropped on them. If improper handling results in scratches, splits or gouges, the damaged section must be cut out and discarded. When stored outdoors, pipes must be covered with a non-transparent material. Fittings are best stored in their original containers to keep them free from dirt and reduce the possibility of damage. When storing fittings loose, avoid mixing them in storage bins with metal piping products.

Extra care should be used when handling CPVC materials in very cold weather, as the material becomes more susceptible to impact damage.

Product Specification and System Design

CPVC fire sprinkler pipes are manufactured in accordance with ASTM F442. CPVC fire sprinkler fittings are manufactured in accordance with ASTM F437 (threaded type), and ASTM F438 or F439 (socket type) as applicable.

The system is rated for continuous service under a pressure of 12 bar at up to 50°C, and may be tested at up to 1/2 times working pressure - refer to testing information.

Pipe Dimensions and Weights

Nominal Pipe Size		Outside Diameter	Inside Diameter	Weight /m Empty	Weight /m Full
Inch	mm	mm	mm	kg	kg
3/4"	20	26.7	22.2	0.25	0.69
1"	25	33.4	28.0	0.39	1.01
1 1/4"	32	42.2	35.4	0.62	1.61
1 1/2"	40	48.3	40.6	0.82	2.11
2"	50	60.3	50.9	1.29	3.31
2 1/2"	65	73.0	61.5	1.86	4.82
3"	80	88.9	74.9	2.84	8.15

Hydraulic Design

CPVC pipe sizing calculations should be done using a Hazen-Williams C value of 150. The formula for calculating pipe friction loss is as follows:-

$$\text{Pressure drop in bar} = \frac{6.05 * 10^5}{C^{1.85} * d^{4.87}} * L * Q^{1.85}$$

Where: Q = Flow in l/min

C = the Hazen-Williams C value of 150 for CPVC pipe

d = the pipe inside diameter in mm

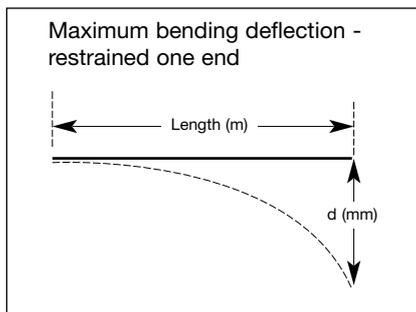
L = length of pipe for which the friction loss is being calculated

The following table shows the allowance for friction loss in fittings, expressed as equivalent length of pipe (mm):-

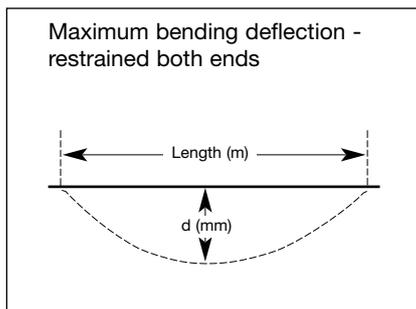
	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
Tee Branch	914	1524	1829	2438	3048	3658	4572
Tee Run	305	305	305	305	305	610	610
Elbow 90°	2134	2134	2438	2843	3353	3658	3962
Elbow 45°	305	305	610	610	610	914	1219
Coupling	305	305	305	305	305	610	610

Pipe Deflection

CPVC is a ductile material that allows it to be deflected, within permissible limits, around or away from objects during installation. The maximum deflections (d) for CPVC fire sprinkler pipe in mm are as follows:-



Pipe Size	Pipe length (m)						
	1.5	3	4.5	6	7.5	12	15.5
3/4"	198	795	1790	3160	7165	-	-
1"	160	635	1430	2542	5720	10170	-
1 1/4"	127	503	1133	2014	4531	8057	-
1 1/2"	109	439	990	1760	3960	7038	10998
2"	89	353	792	1407	3167	5631	8798
2 1/2"	74	290	655	1163	2616	4650	7264
3"	61	239	538	955	2149	3820	5972



Size	Pipe length (m)						
	1.5	3	4.5	6	7.5	12	15.5
3/4"	51	198	447	795	1790	3185	4975
1"	41	160	358	635	1430	2542	3972
1 1/4"	30	127	284	503	1130	2014	3147
1 1/2"	28	109	246	439	991	1760	2748
2"	23	90	198	353	792	1410	2200
2 1/2"	18	74	162	290	655	1163	1816
3"	15	61	135	239	538	955	1494

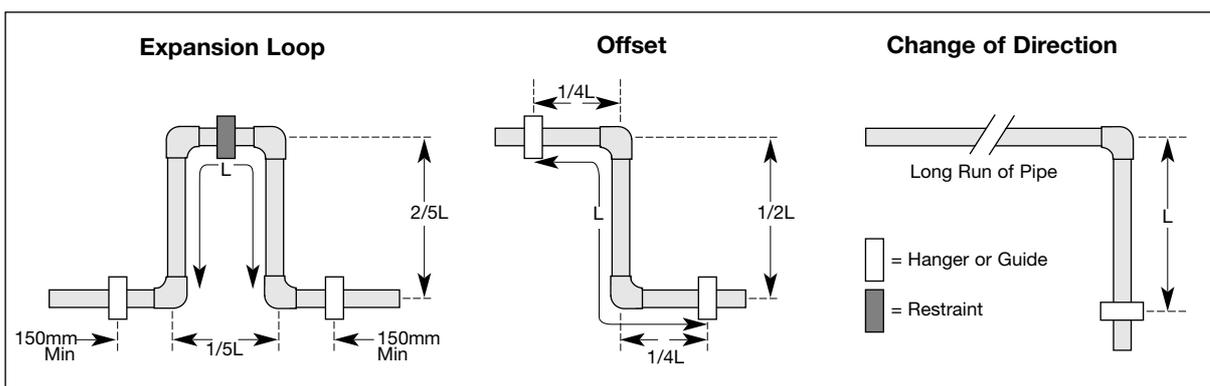
Thermal Expansion and Contraction

Thermoplastic piping will expand and contract with changes in temperature at a higher rate than for metals. The coefficient of linear expansion for CPVC is 6.1×10^{-5} per 1°C temperature change (or $0.061\text{mm/m}^{\circ}\text{C}$). For example, a 15°C temperature increase will cause an expansion of 18.3mm in a 20m straight length. However for most installations, expansion and contraction is accommodated by the changes of direction naturally occurring in a system.

When considering the effects of thermal expansion and contraction it is important to remember that the temperature measurement begins at the time of installation and continues throughout the period that the product is in use. This should especially be noted if a system is installed in cold ambient temperature conditions.

Methods of compensating for thermal expansion are:-

- expansion loops
- offsets
- changes of direction



Hangers are used both to provide restraint (as a fixed point) and also to provide a guide to allow movement in the correct direction. The hangers should restrict lateral movement but allow for axial movement. They must not be overtightened. The surface in contact with the pipe should be smooth and free from sharp edges so as not to score or damage the material.

The following table gives a guide to the dimension L used when sizing an expansion loop, offset or change of direction. The table covers pipe diameters from $\frac{3}{4}''$ to $2''$, with a range of pipe lengths and temperature variations. For values outside the range covered, contact our technical department.

To use the table, first determine the pipe size to be used and the length of straight run in metres. Next determine the temperature variation ($^{\circ}\text{C}$) that the system will experience. The dimension L is shown in mm on the table.

Dimension L in mm for Expansion Loop, Offset or Change of Direction													
Pipe Size	Variation $^{\circ}\text{C}$	Length of Run (m)					Pipe Size	Variation $^{\circ}\text{C}$	Length of Run (m)				
		10	20	30	40	50			10	20	30	40	50
$\frac{3}{4}''$	10°	350	350	500	500	700	$1 \frac{1}{2}''$	10°	450	450	650	650	900
	20°	350	500	700	700	900		20°	450	650	900	900	1200
	30°	500	700	700	900	900		30°	650	900	1200	1200	1200
$1''$	10°	350	500	500	700	700	$2''$	10°	500	700	700	700	950
	20°	500	700	700	900	900		20°	500	700	950	1300	1300
	30°	500	700	900	900	1100		30°	700	950	1300	1300	1750
$1 \frac{1}{4}''$	10°	450	650	650	700	700	Enquire for other pipe sizes, lengths and temperatures						
	20°	650	700	700	950	950							
	30°	650	700	950	1200	1200							

Chemical Suitability

CPVC is resistant to a large range of chemicals that are corrosive to metal piping, however care must be taken to avoid contact with chemicals that are harmful to CPVC including some that are found in some common construction products. Particular care should be taken to avoid contamination with edible oils, esters, ketones, or petroleum based products such as cutting or packing oils that may be present in metallic system components, as well as traditional pipe thread pastes or dopes. Do not store or install CPVC products in direct contact with plasticizer containing materials such as electrical tape or certain wire and cable insulations.

Jointing CPVC Systems

Solvent Cement Jointing

Prior to assembly all piping system components should be inspected for damage or irregularities. Mating components should be checked to ensure that tolerances are compatible. Do not use any items which appear irregular or which do not fit correctly. Estimate the quantity of solvent cement required for the job using the table, and ensure that all materials and tools are available and ready for use.

Number of Joints per Pint Cement Can							
Pipe Size	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
Joints	135	90	65	50	35	35	20



1 Cutting

CPVC fire sprinkler pipe can easily be cut with a wheel type pipe cutter, a power saw or a fine toothed hand saw. Ensure that the pipe is cut square, and take care not to split the pipe when working in temperatures lower than 10°C. If there is any evidence of damage or cracking, cut off at least 50mm beyond any visible mark or crack.



2 Deburring

Burrs and filings must be removed from the outside and inside of the pipe. Use a chamfering tool or file to carry out this task, then apply a slight bevel to the end of the pipe, which will ease entry of the pipe into the fitting and minimise the chances of wiping solvent cement from the fitting.



3 Fitting Preparation

Use a clean, dry rag to wipe loose dirt, grease and moisture from the fitting socket and pipe end. Moisture can slow cure time and reduce the joint strength.



4 Check For Interference Fit

Before applying solvent cement, carefully test the fit. Do not use excessive force. The pipe should enter the fitting socket easily to 1/3 to 2/3 of the way. If the pipe bottoms in the fitting with little interference, extra solvent cement will need to be used.

Caution: Before opening tins of solvent cement ensure that the safety data sheet has been carefully read and understood - copies on request or at www.ips-blazemaster.com



5 Applying Solvent Cement

Spears FS-5 solvent cement must be applied with an applicator or natural bristle brush at least 1/2 the pipe diameter. Work quickly and without interruption or delays between the stages involved.

Apply a heavy, even coat of cement to the outside of the pipe end. Then apply a medium coat to the fitting socket. If there was little interference when the dry fit was checked, or if the pipe size is 1 1/4" or greater, a second coat of cement should be applied to the pipe end.



Note: bad joints are frequently the result of poor preparation (for example pipes not cut square or not chamfered) but most commonly they occur because insufficient cement has been applied. The application must be generous (without being excessive) and the joint must be brought together while all surfaces are wet.



6 Assembly

Immediately insert the pipe into the fitting socket while rotating the pipe 1/4 turn. Ensure that the fitting is correctly aligned, and that the pipe bottoms to the stop in the fitting. Hold the assembly for 30 seconds to ensure initial bonding.



7 Inspection

Visibly inspect the joint, checking for a bead of cement around the pipe and fitting juncture. If the bead is not continuous around the socket shoulder, it may indicate that insufficient solvent was applied. If this is the case, the joint must be cut out, disregarded, and begun again. Excess cement can be wiped off with a clean rag or brush.

Important Note:- solvent cements are flammable, and should not be stored or used near to heat, spark or open flames. Smoking is not permitted during use. Adequate ventilation must be provided, if necessary using forced ventilation, to remove vapours and minimize their inhalation. Contact with skin or eyes should be avoided, and adequate safety apparel should be provided to ensure this. The solvent cement can and material safety data sheet provides full information which must be followed on site at all times.

Set and Cure Times

The pipe size, tightness of fit, temperature and relative humidity all influence the set and cure time. Drying time is faster for smaller sizes, tighter fits, higher temperatures and drier environments. Equally, drying time is slower for larger sizes, looser fits, cooler temperatures and higher humidity environments. In any event, the assembly must be allowed to set, without any stress on the joint, for 1 to 5 minutes, depending on the pipe size and temperature.

Following the initial set, the assembly can be safely handled, but the joints must be left to cure for the following minimum periods before pressure testing takes place:-

Diameter	Ambient Temperature Conditions		
	16°C to 49°C	4°C to 15°C	-18°C to 3°C
3/4"	1 hr	4 hr	48 hr
1"	1 1/2 hr	4 hr	48 hr
1 1/4" & 1 1/2"	3 hr	32 hr	10 days
2"	8 hr	48 hr	See Note*
2 1/2" & 3"	24 hr	96 hr	See Note*

Note*: For these sizes, One Step Solvent Cement can be applied at temperatures below 4°C, however the sprinkler system temperature must be raised to a temperature of 4°C or above and allowed to cure as per the table prior to testing. Use care when assembling the system in temperatures below 4°C or above 26°C. In hot temperatures, make sure that both surfaces to be joined are still wet with cement during assembly. In cold temperatures, make sure that the cement is not "gelled". Gelled cement must be discarded.

Sprinklers must not be connected to the system until the joints have cured for at least 30 minutes. Sprinkler head fitting should be visibly inspected and probed with a wooden dowel to insure that the waterway and threads are clear of any excess cement. **It is an unacceptable practice to install sprinklers on the head adaptor fittings and then solvent cement to the "drop".**

Recommended Cut-in Procedures for System Modification or Repair

In order to maintain full system integrity, the following procedure must be followed when making a system modification or repair by cutting into an existing system line. A careful review of all joining procedures must be made prior to making a cut-in on an existing system and the minimum cut-in cure times schedule listed below must be followed. A variety of fitting combinations can be used to tie into an existing system or replace a section between fixed cut-in points. These include using a socket tee for add-ons or a socket coupling for repairs in combination with a mechanical joint such as a union grooved coupling adapter, or flange. Regardless of the components selected, the following must be adhered to:-

- System modification cut-ins should be made on the smallest diameter pipe section, in close proximity to the area of modification, capable of properly supplying the system change.
- Carefully plan and measure prior to cutting into the system. Provide adequate space and ensure that full insertion into fitting sockets can be made during assembly. Allowance must be made for making a 1/4-turn twist when inserting the pipe into the fitting during assembly, especially on 1-1/2" and larger pipe sizes. This may require assembly of components in combination with the cut-in tee to create a short spool piece for final connection using socket unions, flanges, or grooved coupling adapters.
- Review all installation and joining procedures prior to commencing cut-in.
- Depressurize and drain existing line prior to making the cut-in.
- Connect to the existing system prior to proceeding with the modification or repair.
- All pipe shavings, dirt, debris must be removed from the cut-in system and water and residual moisture must be removed from all solvent cement areas. Vacuum lines and wipe dry with a clean dry rag. Moisture and dirt will slow the curing and can affect joint strength.
- Use only a new can of solvent cement for cut-ins. Verify cement expiration date on can prior to use.
- Cut-ins for modifications or system repairs are often made under less than ideal situations compared to new installations. As a result, the minimum cut-in cure times shown in the table right must be used.

Diameter	Ambient Temperature Conditions		
	16°C to 49°C	4°C to 15°C	-18°C to 3°C
3/4"	24 hr	24 hr	48 hr
1"	24 hr	24 hr	48 hr
1 1/4" & 1 1/2"	24 hr	32 hr	10 days
2"	24 hr	48 hr	See Note*
2 1/2" & 3"	24 hr	96 hr	See Note*

Note*: Refer to note above

Testing

Prior to any testing of the piping system, the contractor should firstly carry out a visible inspection of the pipework to ensure that all joints have been solvent welded together. Once a system is completed and cured for the time period shown, the system should be hydraulically pressure tested at 15 bar or at 1 1/2 times normal working pressure, whichever is the greater, for not less than 2 hours.

The system must be slowly filled with water and bled from the highest and farthest sprinkler heads before test pressure is applied. Air must be completely removed from piping systems before pressure is applied.

Warning: air or compressed gas must never be used for pressure testing.

Connections to Other Materials

Threaded Connections

Thread sealants may only be used if they are tested and approved for use with CPVC - refer to our system price list for approved products. Some thread sealants contain substances that can cause stress cracking in the CPVC material, and must not be used. **Never use sealants or pastes that contain linseed oil.**

Apply sealant to the male threads only, making sure that all threads are covered. Care must be taken not to clog the water way with excess sealant.

If using PTFE tape, it must have a minimum thickness of 0.0025", and meet the requirements of BS7786. Starting with the first full thread, wrap PTFE tape in the direction of the threads, continuing over the entire thread length and making sure that all threads are covered. 2-3 wraps are sufficient for sprinkler head adaptors. Do not apply excessive wraps.

The following table shows the recommended torque for each type of threaded adaptor fitting. **Note: Do not overtorque.**

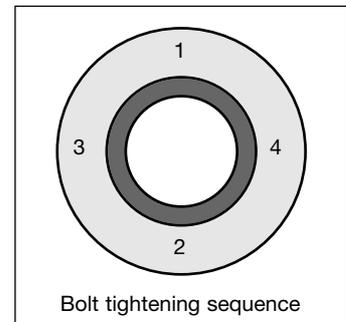
Recommended Torque for CPVC Threaded Adaptor Fittings				
TorqueSafe™ Gasket Head Adaptor	SR Plastic Thread Head Adaptor	Metal Thread Head Adaptor	Zinc SR Plastic Thread Head Adaptor	Metal Pipe Transition Adaptor
				
Hand Tight + 10 to 25 ft-lbs	Min 5 ft-lbs Max 10 ft-lbs	Min 15 ft-lbs Max 20 ft-lbs	Min 15 ft-lbs Max 20 ft-lbs	Hand Tight + 1 1/2 to 2 Turns

Flanged Connections

Care should be taken to ensure that pipes are correctly aligned and that the correct size bolts are used. With the gasket in place, the bolts should be tightened in 5 ft. lbs. increments following a 180° opposing sequence. Do not overtorque, as this may damage the flange. Use only full-face EPDM 3mm thick gaskets.

CPVC flanges are only available drilled to ASA 150. Consult our technical department if an alternative connection is required.

Connecting Flanges				
Flange Size	Bolt Holes	Bolt Diameter(mm)	Bolt Length(mm)	Torque(Ft. Lbs.)
3/4"	4	12	50	10-15
1"	4	12	60	10-15
1 1/4"	4	12	60	10-15
1 1/2"	4	12	65	10-15
2"	4	16	75	20-30
2 1/2"	4	16	85	20-30
3"	4	16	85	20-30



Grooved Coupling Adaptors

CPVC Grooved Coupling Adaptors are designed for use with flexible style couplings (eg. Victaulic Type 75) only. **The use of rigid style couplings is not permitted and may damage the CPVC adaptor fitting.**

Grade A (EPDM) gaskets should be used, lubricated with a vegetable based lubricant. **Do not use a petroleum based lubricant, it will contain chemicals which will cause damage to the adaptor fitting.** Caution: Victaulic lubricant is not suitable for use with CPVC. We recommend the use of IPS Weld-On EZ Flush Pipe Lubricant which is specifically formulated for use with plastic piping.

During assembly, a thin layer of lubricant should be applied to the gasket lips and gasket exterior surface. The gasket is fitted to the pipe, then slid over the adaptor end after ensuring careful alignment. It should be centred between the grooves, and not pinched between the pipe and fitting. The coupling bolts should be tightened alternately and equally until the housing bolt pads are touching metal to metal. The joint should be inspected before and after testing.

Pipe hangers are required to be fitted within the following distance from the grooved coupling adaptor fitting:-

Maximum Support Distance from Groove Coupling					
Pipe Size	1 1/4"	1 1/2"	2"	2 1/2"	3"
Distance (m)	2.0	2.1	2.4	2.7	3.0

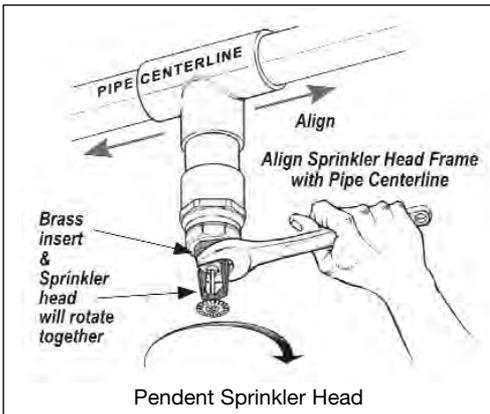
Connections to TorqueSafe™ Gasket Sealed Sprinkler Head Adaptors

This type of connection can only be made when using the FlameGuard™ TorqueSafe™ Gasket Female Sprinkler Head Adapter. This adapter has a special thread with gasket for sealing the sprinkler head. The adapter provides a special thread insert that can be rotated for proper frame alignment during installation.

Warning: Do not use any type of thread sealant when installing this adapter. Use of tape or paste sealant may impair proper sealing and function of the adapter.

1 Install Sprinkler Head by Hand

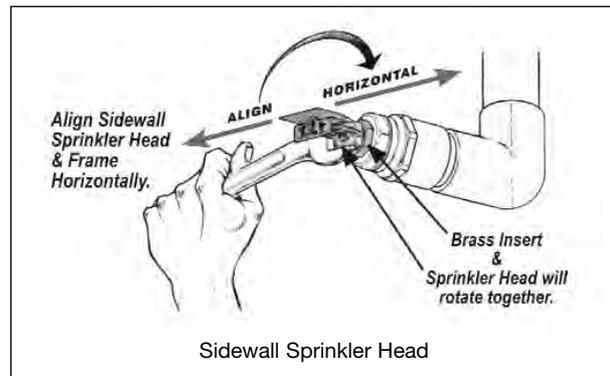
Check that elastomer gasket and threads are clean, dry and gasket is seated at the base of the adapter thread. Install sprinkler head into adapter until it is **hand tight only**. **Do not use any thread sealant!**



Sprinkler heads must be installed only after all fire sprinkler pipe fittings, including the sprinkler head adapters, are cemented to the piping and have been allowed to cure for a minimum of 30 minutes. Plastic threaded plugs are available for use in pressure testing. Before installing the sprinkler head, the sprinkler head fittings must be visually inspected or probed with a wooden dowel to ensure that the waterway and threaded areas are free of any excess cement that may restrict the flow of water.

2 Wrench Alignment

Use a wrench on the sprinkler head only (**Caution: Do not use back-up wrench on brass insert flats**), and rotate sprinkler head clockwise. When approximately 10 to 25 ft-lbs torque has been applied, the brass insert and sprinkler head will rotate together. At this point continue to turn only until the frame is properly aligned. **Caution: Never reverse or back-up the threaded assembly.** If over-adjusted, continue to rotate clockwise until properly aligned. Note: Back-up wrench may be applied to brass insert flats only for removal of sprinkler head if required.



Adjustable Sprinkler Head Adaptors

The CPVC adjustable fire sprinkler head adapter comes pre-assembled. There is no need for lubrication. It is recommended that the adjustable sprinkler head adapter be adjusted completely "in" by hand before beginning the installation process.

1 Install Adapter on Drop

The adjustable sprinkler head adapter must be installed in accordance with the approved procedures for solvent cement welded joints, as outlined in this guide. It is recommended that the drop/riser pipe be solvent cemented into the adjustable sprinkler head adapter first, and then into the drop/riser tee or elbow.

Caution: Care must be taken to prevent solvent cement from coming in contact with the internal O-ring seal or sealing surface. All pipe shavings, dirt and debris must be flushed from the drop prior to adjustment. **Do not over extend the adjustment barrel.** Extend only to the point that free movement stops or damage to internal sealing components may result.

2 Install Sprinkler Head

Sprinkler head installation must be in accordance with the approved procedures for threaded connections, as outlined in this guide. The adjustable sprinkler head adapter has multiple wrench flats provided to hold the adjustment barrel while installing the sprinkler head. These same wrench flats must be used to adjust the sprinkler head adapter to its required position.

Caution: Never use wrenches, pliers, or any other tool on the threaded portion of the adjustment barrel. **Do not over extend the adjustment barrel.**

3 Adjust Finished Height

The maximum range of travel is 41mm. Always use multiple wrench flats for making adjustments. Make adjustments slowly if system is pressurized in order to avoid inadvertently over extending adjustment barrel.

Caution: Care must be taken not to extend or retract the adjustment barrel excessively, since this may result in damage to the adapter. Adjust only to the point that free movement stops.

Do's and Don'ts

Do's

- Read and follow the manufacturer's installation instructions at all times.
- Follow recommended safe work practices.
- Make certain that thread sealants, gasket lubricants, or fire stop materials are compatible with CPVC.
- If painting is desired, use only water-based latex paints
- Keep pipe and fittings in original packaging until needed.
- Cover pipe and fittings with an opaque tarpaulin if stored outdoors.
- Follow proper handling procedures.
- Use tools specifically designed for use with plastic pipe and fittings.
- Use the proper solvent cement and follow application instructions.
- Use a drop cloth to protect interior finishes.
- Cut the pipe ends square.
- Deburr and bevel the pipe end with a chamfering tool.
- Rotate the pipe/turn when bottoming pipe in fitting socket.
- Avoid puddling of cement in fittings and pipe.
- Make certain no solvent cement is on sprinkler head and adapter threads.
- Make certain that solvent cement does not run and plug the sprinkler head orifice.
- Follow the manufacturer's recommended cure times prior to pressure testing.
- Flush the entire system including drops to remove pipe shavings, dirt and debris left from installation.
- Fill lines slowly and bleed the air from the system prior to flushing and pressure testing.
- Support sprinkler head properly to prevent lift up of the head through the ceiling when activated.
- Keep threaded rod within 1.5mm of the pipe or use a surge arrestor fitting.
- Install CPVC fire sprinkler products in wet systems only.
- Allow for movement due to expansion and contraction.
- Renew your CPVC fire sprinkler products installation training every two years.

Don'ts

- Do not use edible oils as a gasket lubricant.
- Do not use petroleum or solvent-based sealants, lubricants, or fire-stop materials.
- Do not use anti-freeze solutions.
- Do not use PTFE tape and thread sealants on the same threaded joint.
- Do not install tape, insulated wire or cable in direct contact with CPVC.
- Do not use solvent cement that exceeds its shelf life or has become discoloured or gelled.
- Do not allow solvent cement to plug the sprinkler head orifice.
- Do not connect rigid metal couplers to CPVC grooved adapters.
- Do not thread, groove, or drill CPVC pipe.
- Do not use solvent cement near sources of heat, open flame, or when smoking.
- Do not pressure test with air.
- Do not pressure test until recommended cure times are met.
- Do not cut pipe with dull or broken cutting-tool blades.
- Do not use ratchet cutters below 10°C.
- Do not use CPVC pipe that has been stored outdoors, unprotected and is faded in color.
- Do not allow threaded rod to come in contact with the pipe.
- Do not install CPVC fire sprinkler products in cold weather without allowing for expansion.
- Do not install CPVC fire sprinkler products in dry systems.



Spears' Manufacturing Company
CPVC Fire Sprinkler Piping Products

Be it known that
Terry Duell
has attended hands-on training
to serve as an INSTRUCTOR
regarding the proper method
of installing FlameGuard™ Fire
Sprinkler Products.

Gregory Peak
Gregory Peak
Director Technical Service

INSTRUCTOR
Issued: 11-06-08
Renewal is
recommended
within two years
from date of issue.

Important Note - Training

It is a mandatory requirement that installers shall have completed a training course in the installation of CPVC fire sprinkler systems prior to commencing any work. It is also recommended that training be renewed every two years. We provide training courses to customers free of charge either at our in-house training facility or on site, and issue job card to fully trained installers.

Please contact our technical department for further information.



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4" NB PVC
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TYR.

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TUBE CLAMP TYP.

NEW 150 St.St. Gr316 Sch 10

1005

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NEW 150 St.St. Gr316 Sch 10 PIPEWORK

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