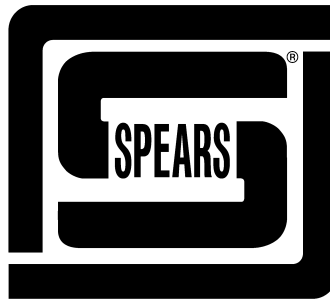




SPEARS® MANUFACTURING COMPANY

**FlameGuard™ CPVC  
FIRE SPRINKLER PRODUCTS**



**INSTALLATION INSTRUCTIONS**

FG-3-0202

## **FlameGuard™ LIMITED WARRANTY**

Except as otherwise mandated by law, Spears Manufacturing Company warrants that the goods which have been directly manufactured by them shall be free from defects in material and workmanship for a period of ten (10) years, from the date of shipment. CUSTOMER AGREES THAT THIS WARRANTY SHALL BE EFFECTIVE SO LONG AS THE GOODS ARE USED SOLELY FOR THE NORMAL PURPOSES FOR WHICH THEY ARE INTENDED AND IN CONFORMANCE WITH INDUSTRY ESTABLISHED ENGINEERING, INSTALLATION, OPERATING, AND MAINTENANCE SPECIFICATIONS, RECOMMENDATIONS AND INSTRUCTIONS. VIOLATION THEREOF SHALL VOID THIS WARRANTY AND RELIEVE COMPANY FROM ANY OBLIGATION UNDER THIS WARRANTY. COMPANY CANNOT AND DOES NOT ASSUME RESPONSIBILITY, AND EXPRESSLY DISCLAIMS ANY LIABILITY, DUE TO CUSTOMER'S, ANY INSTALLER'S OR END USER'S FAILURE TO COMPLY WITH SUCH SPECIFICATIONS, RECOMMENDATIONS AND INSTRUCTIONS.

If Customer receives any goods that appear to be defective, upon receipt of a Return Authorization (RA#) issued by Spears Customer Services Department, Customer may return such questionable goods. The material must be returned prepaid to Company at 15853 Olden Street, Sylmar, California 91342 along with completed Return Authorization documentation. After examination if the goods are determined to be defective in materials or workmanship directly provided by Company, Company, at its sole option, may either repair or replace the defective goods, or reimburse Customer for the cost of such goods. This shall be Customer's only remedy. All costs of shipping such questionable goods and any replacements thereof to and from Company's facility shall be borne by Customer. Customer agrees that Company will not be responsible for other parts or labor in connection with repairing, replacing, or returning such goods while goods are in possession of Company for analysis, nor for any delays beyond Company's reasonable control (including, with limitation, delays due to unavailability of materials, equipment, other supplies or labor, strikes, governmental regulation or other acts of God), provided that any delay shall toll the warranty period for the same amount of time as the delay itself.

COMPANY EXTENDS ONLY THIS WARRANTY AND EXPLICITLY WAIVES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ORAL OR STATUTORY (INCLUDING ANY IMPLIED WARRANTIES OR AFFIRMATION, SUITABILITY, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) APPLICABLE TO THE GOODS. NO AFFIRMATION BY COMPANY OR ANY OF ITS REPRESENTATIVES, BY WORDS OR CONDUCT, SHALL CONSTITUTE A WARRANTY. THIS WARRANTY MAY NOT BE EXTENDED, ALTERED OR OTHERWISE MODIFIED EXCEPT BY WRITTEN AGREEMENT SIGNED BY COMPANY.

BY ITS ACCEPTANCE OF THE GOODS, CUSTOMER HEREBY SPECIFICALLY AND EXPRESSLY WAIVES ALL OTHER LIABILITY OR OBLIGATION OF ANY KIND OR CHARACTER OF COMPANY, INCLUDING WITHOUT LIMITATION LIABILITY PREDICATED UPON STRICT LIABILITY OR TORT, AND ALL DAMAGES AND LOSSES AS A RESULT THEREOF, INCLUDING BUT NOT LIMITED TO ALL KNOWN, UNKNOWN, FORESEEABLE, UNFORESEEABLE, ABSOLUTE, CONTINGENT, LIQUIDATED, NON-LIQUIDATED, COMPENSATORY, GENERAL, SPECIAL, CONSEQUENTIAL, INCIDENTAL, OR PUNITIVE DAMAGES, AND WITH RESPECT TO THE GOODS, THEIR RETURN, REPAIR, RESTORATION AND REPLACEMENT. WITH RESPECT TO SUCH WAIVER, CUSTOMER HEREBY EXPLICITLY WAIVES CALIFORNIA CIVIL CODE §1542 WHICH STATES "A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS FAVOR AT THE TIME OF EXECUTING THIS RELEASE, WHICH IF KNOWN BY HIM MUST HAVE MATERIALLY ADVERSELY AFFECTED HIS SETTLEMENT WITH DEBTOR" AND ALL OTHER SIMILAR STATUTORY, COMMON AND CASE LAW RIGHTS, DEFENSES AND LIMITATIONS.

Having independently inspected a sample of the goods as fully as desired or having refused to make such examination upon acceptance of delivery of the goods, and except as otherwise herein provided, Customer hereby accepts the goods in its "AS IS" condition "WITH ALL FAULTS" without any other warranty, expressed or implied, and hereby accepts and assumes the entire risk and cost of all necessary servicing, repairs and remedy thereof.

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## IMPORTANT INFORMATION

*Please Read The Following Section Before Proceeding*

### **Use of this Manual**

Spears FlameGuard™ CPVC Fire Sprinkler Products are approved for use in combination with other listed manufacturers' products (see, "Use With Other Manufacturers' Pipes, Fittings, and Solvent Cements" section). However, specific application approvals may not be the same amongst manufacturers. **It is the installer's responsibility to verify suitability of products used in combination according to each manufacturer's installation instructions.** Engineering data related to the installation and use of CPVC Fire Sprinkler *Pipe* provided in this manual is based on product manufactured by the Victaulic Company of America (Victaulic FireLock™ ) or Harvel Plastics, Inc. (Harvel BlazeMaster®), as designated herein. If products other than Victaulic or Harvel are used, follow the appropriate manufacturer's installation instructions. Contact Spears if questions on any application not addressed in this manual.

This manual is intended for use by specifiers, installers, and users in the selection, design, installation, and inspection of Spears FlameGuard™ CPVC Fire Sprinkler Products for fire protection service. Due to the critical safety and loss prevention uses of such systems, all information contained herein is considered vital to obtain proper system performance and **must be read and understood carefully before starting the installation.** The information contained within this manual is accurate at the time of publication to the best of our knowledge. It is not meant as a replacement for formal installer training. We do not make any guarantees nor assume any liabilities arising out of its use. If you need additional copies, or if you have any questions about the safe installation and use of these products, contact Spears Manufacturing Company, P.O. Box 9203, Sylmar, CA 91392 or call (800)862-1499. Additional copies of this manual may be downloaded from our web site: [www.spearsmfg.com](http://www.spearsmfg.com).

## **Hazards & Information Definitions**

Definitions for identifying the various hazard levels are as follows:

- **WARNING** - The use of the word “WARNING” identifies the presence of hazards or unsafe practices that could result in severe personal injury if instructions, including recommended precautions, are not followed.
- **CAUTION** - The use of the word “CAUTION” identifies possible hazards or unsafe practices that could result in personal injury, product damage, and/or property damage if instructions, including precautions, are not followed.
- **NOTICE** - The use of the word “NOTICE” identifies special instructions that are highly important but not related to hazards.
- **Text information in bold print** – Text in bold print identifies additional important information that may or may not be related to a hazard, according to the topic and context.

## **System Engineering, Installation & Maintenance**

CPVC Fire Sprinkler Systems must be engineered, installed and maintained in accordance with local codes, standards and Spears FlameGuard™ CPVC Fire Sprinkler Products Installation Instructions. Code requirements and field conditions may differ. It is the responsibility of the installing contractor to insure that the product is suitable for the intended use and that all requirements have been satisfied.

## **Installer Training**

Spears Manufacturing Company recommends that installers receive proper installation training and that training be renewed every two (2) years. Training will be provided at no charge by contacting an authorized Spears FlameGuard™ CPVC Fire Sprinkler Products distributor or your nearest Spears Regional Distribution Center.

## General Installation Safety Instructions

- Use only recommended accessories. **Use of improper accessories or unapproved system components in conjunction with Spears FlameGuard™ CPVC Fire Sprinkler products will void the warranty and may result in improper operation of the system.**
- **CAUTION: Avoid dangerous environments.** If utilizing electrically powered tools for installation, be sure that the area is free of moisture or wetness that could create an unsafe condition. Keep work area clean and well illuminated. Allow sufficient space for measuring and system dry-fit to accommodate proper installation.
- Prevent back injury. Always practice safe lifting and installation techniques.
- Use only tools specifically designed for plastic pipe and fittings.
- Inspect the products. Be sure that all parts are included and that you have all necessary tools available to properly install the system.
- **CAUTION:** Follow all workplace safety requirements. Wear safety glasses, hardhat, and safety footwear. Always practice safety first.
- When solvent cementing, always work in a well-ventilated area. Avoid sources of heat or open flames. **DO NOT** smoke. Wear protective gloves. PVA-coated protective gloves are recommended for use while solvent cementing. If hands come in contact with solvent cement, use a waterless, abrasive soap.
- Wear ear protection. Protect your hearing if you are exposed to long periods of very noisy job-site operations.

## INTRODUCTION



Spears FlameGuard™ CPVC Fire Sprinkler products are manufactured from high quality, Post-Chlorinated Poly Vinyl Chloride (CPVC), a specialty thermoplastic material tested and approved by certifying agencies for use in CPVC fire sprinkler systems. Spears FlameGuard™ CPVC Fire Sprinkler products provide unique advantages over traditional metal fire sprinkler systems through superior hydraulics, ease of installation and handling and quick assembly using readily available, inexpensive tools.

## Handling & Storage

### Pipe & Fittings

Spears FlameGuard™ CPVC Fire Sprinkler Products resist attack from a large group of chemicals that are corrosive to metallic piping. However, care must be taken to avoid contact with chemicals that are harmful to CPVC. Specific chemicals or chemical vapors that contact CPVC can weaken or severely damage the system. Consult with the chemical manufacturer or Spears before use.

**WARNING: DO NOT expose Spears FlameGuard™ CPVC Fire Sprinkler Products to edible oils, esters, ketones, or petroleum-based products, such as cutting oils, packing oils, traditional pipe thread paste or dopes, and some lubricants. Consult with the chemical manufacturer or Spears before use. Contact with incompatible chemicals could cause serious personal injury, property damage, and product damage.**

Spears recommends that CPVC Fire Sprinkler Pipe be stored indoors. If storing outdoors, the products must be *covered* with a non-transparent material to prevent extended exposure to sunlight. Brief exposure to direct sunlight on the job site may result in color fade, but it will not affect the physical properties. Spears FlameGuard™ CPVC Fire Sprinkler Fittings should be stored indoors in their original containers to keep them free from dirt and to help reduce the possibility of damage.

**WARNING: Spears FlameGuard™ CPVC Fire Sprinkler Products and pipe must not be subjected to prolonged sunlight exposure. The use of pipe and fittings that have been damaged due to improper storage could cause serious personal injury, property damage, and product damage.**

Reasonable care must be exercised in handling Spears FlameGuard™ CPVC Fire Sprinkler Products. DO NOT drop the products or drop anything on them. If improper handling results in scratches, splits, or gouges, the damaged fitting or section of pipe must be discarded.

**WARNING: DO NOT install Spears FlameGuard™ CPVC Fire Sprinkler Products that have been scratched, split, or gouged. The use of pipe and fittings that have been damaged due to improper handling could cause serious personal injury, property damage, and product damage.**

### **One-Step Solvent Cement**

Spears FS-5 One-Step Low VOC Solvent Cement must be stored out of direct sunlight in an ambient temperature between 40°F (4°C) and 110°F (43°C). The solvent cement may be used for a period of two years from the date stamped on the container. Expired solvent cement must be discarded in an environmentally friendly fashion, in accordance with local regulations. To prolong the life of the cement, the containers must be kept tightly closed when not in use and covered as much as possible when in use.

**WARNING:**

- **Spears FS-5 One-Step Low VOC Solvent Cement is highly flammable. Eliminate all ignition sources.**
- **Avoid breathing vapors. Use only with adequate ventilation. Explosion-proof, general mechanical ventilation or local exhaust is recommended to maintain vapor concentrations below recommended exposure limits. In confined or partially enclosed areas, a NIOSH approved organic vapor cartridge respirator with a full**



face-piece is recommended. Avoid frequent contact with skin. It is recommended that you wear PVA coated gloves and an impervious apron.

- Avoid contact with eyes. Splash-proof chemical goggles are recommended.
- Review the Material Safety Data Sheet (MSDS) and the important product information provided on the label for Spears FS-5 One-Step Low VOC Solvent Cement.

Failure to follow the above recommendations could result in death or serious personal injury.

### **Listings, Approvals, Application & Use**

Spears FlameGuard™ CPVC Fire Sprinkler products are fully tested and approved for use in wet pipe fire sprinkler systems by Underwriters Laboratories Inc., FM Global, and the Loss Prevention Certification Board. Spears FlameGuard™ CPVC Fire Sprinkler products are listed by NSF International for use in potable water systems. For specific listing information not covered in this manual concerning Factory Mutual, The loss Prevention Certification Board or NSF International, please contact your nearest Spears Regional Distribution Center.

**NOTICE:** National Fire Protection Association (NFPA) Standards 13, 13R, and 13D must be referenced for design and installation requirements in conjunction with this manual and all local codes.

**CAUTION:** Spears FlameGuard™ CPVC Fire Sprinkler products are NOT listed for outdoor applications. Outdoor installation could result in product failure and property damage and will not be covered under the Spears FlameGuard™ CPVC Fire Sprinkler products warranty.

**CAUTION:** Spears FlameGuard™ CPVC Fire Sprinkler products are to be used in wet pipe systems only. A wet pipe system is one that contains water and is connected to a water supply system so that the water will discharge immediately when the sprinkler is opened.

**WARNING:** Spears FlameGuard™ CPVC Fire Sprinkler products must never be used or tested in a system of compressed air or other gases. Failure to follow this warning could result in product failure, property damage and severe personal injury or death.

## **Light Hazard Occupancies**

Spears FlameGuard™ CPVC Fire Sprinkler products are UL Listed for use in Light Hazard Occupancies, as defined in the NFPA 13.

In accordance with NFPA 13, paragraph 3-3.5, "Pipe or tube listed for light hazard occupancies shall be permitted to be installed in ordinary hazard rooms of otherwise light hazard occupancies where the room does not exceed 400 square feet. **NOTICE: Local jurisdictions must approve of this exception.**

## **Residential Occupancies**

Spears FlameGuard™ CPVC Fire Sprinkler products are UL Listed for use in:

Residential occupancies up to and including four stories in height, as defined in NFPA 13R.

Residential occupancies, as defined in the Standard for the Installation of Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes, NFPA 13D.

## **Concealed Installations**

In concealed installations, the minimum protection shall be one layer of 3/8-inch gypsum wallboard, 1/2-inch plywood soffits, or a suspended membrane ceiling with lay-in panels or tiles having a minimum weight of not less than 0.35 lbs/ft<sup>2</sup> when installed with metal support grids. The minimum protection for residential occupancies, defined in NFPA 13D and 13R, may consist of one layer of 1/2-inch plywood.

Spears FlameGuard™ CPVC Fire Sprinkler Products must be used in sprinkler systems employing sprinkler heads rated at 170° F (77°C) or lower. Factory Mutual (FM) requires the use of non-removable, fire-resistant barriers.

**NOTICE:** Spears FlameGuard™ CPVC Fire Sprinkler Products CANNOT be installed exposed in spaces defined by NFPA 13 as combustible, concealed areas that require sprinklers. NFPA 13D and NFPA 13R permit the omission of sprinklers in combustible, concealed spaces. Spears FlameGuard™ CPVC Fire Sprinkler Products can be installed in these areas when sprinkling residential occupancies in accordance with these standards.

## **Exposed Installations**

Spears FlameGuard™ CPVC Fire Sprinkler Products are UL Listed for use in installations without protection (exposed), with the following restrictions:

Exposed CPVC Fire Sprinkler piping is installed below a smooth, flat, horizontal ceiling construction utilizing UL Listed support devices.

Listed, Quick-Response, ordinary temperature-rated pendent sprinklers having deflectors installed within 8 inches from the ceiling. Listed, Residential, ordinary temperature-rated, pendent sprinklers located in accordance with their Listing. The maximum distance between sprinklers must not exceed 15 feet. The piping must be mounted directly to the ceiling.

Listed, Quick-Response, ordinary temperature-rated horizontal sidewall sprinklers having deflectors installed within 6 inches from the ceiling and within 4 inches from the sidewall. Listed, Residential, ordinary temperature rated horizontal sidewall sprinklers located in accordance with their Listing. The maximum distance between sprinklers must not exceed 14 feet. The piping must be mounted directly to the sidewall.

Listed, Quick-Response, upright sprinklers having a maximum temperature rating of 155°F (68°C) must be installed so that the deflectors are a maximum of 4" from the ceiling. The maximum distance from the ceiling to the centerline of the main run of pipe must be 7-1/2". The distance from the centerline of a sprinkler head to a hanger must be 3". Rigid pipe hangers secured to the ceiling must be used.

## **Return Air Plenum Installation**

Spears FlameGuard™ CPVC Fire Sprinkler products meet the combustibility requirements for thermoplastic sprinkler pipe, as described in the Standard for Installation of Air Conditioning and Ventilating Systems, NFPA 90A.

Spears FlameGuard™ CPVC Fire Sprinkler products must be installed in the plenum space at a horizontal distance of at least 24 inches from openings in the ceiling, such as ventilation grills.

## **Garage Installations**

Spears FlameGuard™ CPVC Fire Sprinkler Products are suitable for use in garages requiring sprinklers, as defined in NFPA 13R, with the following requirements:

Minimum protection consisting of either one layer of 3/8-inch thick gypsum or 1/2-inch thick plywood must be provided.

Listed pendent or sidewall sprinklers with a maximum temperature rating of 170°F (77° C) must be used.

All sprinklers must be installed per the manufacturer's published installation instructions.

The system must be installed per the requirements of NFPA 13R and these installation instructions.

## **Ambient Temperature Limitations**

Spears FlameGuard™ CPVC Fire Sprinkler products are suitable for use in areas where ambient temperatures are within the range of 35° F (2° C) to 150° F (65° C). The Loss Prevention Certification Board (LPCB) listing states the maximum ambient temperature shall not exceed 120° F (50° C).

## **High Temperature Areas**

Spears FlameGuard™ CPVC Fire Sprinkler products can be installed in areas, such as an attic, where the ambient temperature exceeds 150° F (65° C) if ventilation is provided or if insulation is used around the product to maintain a cooler environment.

**WARNING: DO NOT install Spears FlameGuard™ CPVC Fire Sprinkler products in areas where the ambient temperature exceeds 150° F (65° C) without adequate ventilation or insulation around the product to maintain a cooler environment.**

## **Cold Temperature Areas**

Spears FlameGuard™ CPVC Fire Sprinkler products can be used in areas where the ambient temperature remains above 35°F (2°C). These products can also be used in an area subject to freezing temperatures if the sprinkler system installation is protected from freezing. Many standard cold weather piping design and installation practices can be used to protect the system from freezing, including, but not limited to, the use of glycerin, insulation installation techniques, and pipe insulation. Contact the manufacturers for compatibility of their products with Spears FlameGuard™ CPVC Fire Sprinkler products. NOTE: Attention must be given to local insulating techniques and codes that require a particular method. Since very cold weather will

make Spears FlameGuard™ CPVC Fire Sprinkler Products more susceptible to damage, extra care should be taken to avoid rough handling or impact to these products.

**WARNING: DO NOT allow a sprinkler system to freeze. A frozen system will deactivate and the pressures built up can cause the sprinkler heads to open or damage the pipe and fittings.**

Antifreeze solutions of water and USP or CP grade GLYCERIN are acceptable for use with Spears FlameGuard™ CPVC Fire Sprinkler products. **Refer to NFPA 13, NFPA 13R, NFPA 13D and consult the local authority having jurisdiction before using glycerin solutions in fire sprinkler applications.**

**WARNING: DO NOT use glycol-based antifreeze solutions. Glycol solutions are not chemically compatible with the CPVC material and can cause damage to the CPVC Fire Sprinkler System.**

The following information can be used to determine the quantity of a glycerin based antifreeze solution needed to protect the piping system.

Nominal Pipe Size –inch (Actual mm Size)	US Gallons of Water Per Foot
3/4 (26,9)	.0311
1 (33,7)	.0494
1-1/4 (42,4)	.0792
1-1/2 (48,3)	.1042
2 (60,3)	.1636
2-1/2 (73,0)	.2395
3 (88,9)	.3555

Note: The gallons per foot column can be used for calculations when adding GLYCERIN to the piping system for freeze protection. All fire protection systems winterized with glycerin solutions must conform to local, state, and NFPA requirements. Glycerin based solutions are the only antifreeze solutions recommended for use. Glycol solutions are not chemically compatible with the CPVC material, and their use may result in damage to the CPVC Fire Sprinkler System.

## **Fire Sprinkler System Risers**

Spears FlameGuard™ CPVC Fire Sprinkler products are UL Listed for use as system risers in NFPA 13R and 13D installations. Minimum protection must consist of one layer of 3/8-inch gypsum wallboard or 1/2-inch plywood. CPVC Fire Sprinkler Risers must be installed in accordance with NFPA 13, Support of Risers, the listed CPVC pipe manufacturer's installation instructions, and with these installation instructions. System risers employing listed CPVC pipe and Spears FlameGuard™ CPVC Fire Sprinkler fittings must not be installed exposed. Refer to the "Hanger Supports" section for detailed installation instructions for riser supports.

## **Underground Fire Service**

Spears FlameGuard™ CPVC Fire Sprinkler products are suitable for use with CPVC pipe that is UL Listed for use in underground water service.

## **Factory Mutual Approvals**



Spears FlameGuard™ CPVC Fire Sprinkler products have been approved by Factory Mutual for use in unexposed, non-removable, fire-resistant barriers:

Light Hazard occupancies, as defined in NFPA 13, the Standard for "Installation of Sprinkler Systems."

Residential occupancies, as defined in NFPA 13R, the Standard for "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."

Residential occupancies, as defined in NFPA 13D, the Standard for "Installation of Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes."

Underground fire service systems, as defined in NFPA 24, the "Standard for Installation of Private Fire Service Mains and Their Appurtenances."

## Loss Prevention Certification Board LPCB



Spears FlameGuard™ CPVC Fire Sprinkler Products are approved for use as agreed between plastics suppliers, purchaser/installer, authority having jurisdiction and/or insurer in accordance with documented supplier Installation Instructions but subject to the following criteria taking precedence:

- Use of plastic pipe and fittings is subject to water authority agreement for the territory concerned.
- LPCB Approved quick response sprinklers shall be used with exposes (i.e., fire exposure) plastic pipe and fittings.
- Plastic pipe and fittings are suitable for use only with wet pipe systems.
- Care should be exercised to ensure that joints are adequately cured, in accordance with the manufacturer's installation instructions prior to pressurization.
- Plastic pipe and fittings shall not be installed outdoors.
- Where plastic pipe and fittings are exposed (i.e., fire exposure), the system shall be installed close to a flat ceiling construction.
- Sprinkler systems which employ plastic pipe and fittings shall be designed where possible to ensure no "no flow" sections of pipework in the event of sprinkler operation.

In addition, the maximum normal ambient temperature shall not exceed 120°F (50°C). The product shall only be installed in the UK by LPCB Certificated or Registered installing companies or by firms outside the UK who can provide evidence of personnel training in the installation of the product.

## NSF International



Spears FlameGuard™ CPVC Fire Sprinkler products have been approved by NSF for potable water applications. These products meet all applicable performance standards for a pressure rated application, as required in ANSI/NSF Standard 14, and they comply with ANSI/NSF Standard 61 for health effects. Spears FlameGuard™ CPVC Fire Sprinkler products are tested against ASTM Standards F438 and F439.

## **Penetrating Fire-rated Walls & Partitions**

Before beginning, consult the building codes and authorities having jurisdiction in your area. Several UL Classified, through-penetration firestop systems are approved for use with CPVC pipe. Consult the UL Building Materials Directory, the UL Fire Resistance Directory, and the system manufacturer for proper selection and application. Two manufacturers of Listed systems for use with CPVC pipe are Nelson Fire Stop Products (800-331-7325) and Tremco (800-321-7906). Consult Spears Manufacturing Company for further information.

## **Heat Sources & Open Ceiling Areas**

Piping systems using Spears FlameGuard™ CPVC Fire Sprinkler products must be laid out so that the piping is not closely exposed to heat producing sources, such as light fixtures, ballasts, and steam lines. Pipe must not be positioned directly over open ventilation grills. During remodeling or ceiling repair, appropriate precautions must be implemented to properly protect the piping.

## **Use With Other Manufacturers' Pipes, Fittings, & Solvent Cements**

Spears FlameGuard™ CPVC Fire Sprinkler products are UL Listed for use in combination with UL Listed CPVC sprinkler products manufactured by Victaulic (pipe and fittings), Harvel (pipe), Ipex (pipe and fittings), Grinnell (pipe and fittings), or Central (pipe and fittings), or TYCO Fire Products (pipe and fittings).

**NOTICE:** While Spears FlameGuard™ CPVC Fire Sprinkler Products are UL Listed for use in combination with other listed manufacturers' products, specific application approvals may not be the same amongst manufacturers. It is the installer's responsibility to verify suitability of products used in combination according to each manufacturer's installation instructions. Contact Spears if you have questions on any application not addressed in this manual.

Spears recommends the use of FS-5 One Step Low VOC Solvent Cement. However, Victaulic 899; Ipex BM-5; Central Sprinkler CSC-500; and TYCO Fire Products TFP-500 CPVC Solvent Cements can also be used in place of the FS-5 One Step Low VOC Solvent Cement, provided that the assembly and curing information referenced within this manual is used.



## Installation & Joining

Spears FS-5 One Step Low VOC Solvent Cement eliminates the need for primers that are typical in two-step cementing processes. The One-Step joining method simplifies installations by reducing labor and offers faster curing times before pressure testing (in most cases).

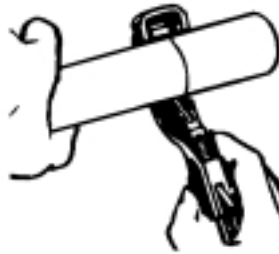
**WARNING:** Before assembling any Spears FlameGuard™ CPVC Fire Sprinkler products, you must inspect all components for cuts, scratches, gouges, split ends, or any other irregularities that have occurred during shipping and handling. Listed CPVC Fire Sprinkler pipe should be checked for any damage or evidence of cracking. If evident, cut off at least two inches of the pipe beyond any visible crack.

**WARNING:** Make sure you follow all assembly and curing information referenced within this manual when installing Spears FlameGuard™ CPVC Fire Sprinkler products. Failure to follow this instruction could cause improper curing, resulting in serious personal injury, significant property damage, joint leakage, or joint failure.

## Pipe Cutting & Preparation

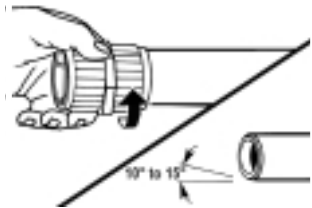
### Step 1 Cut Pipe Square.

Cutting the pipe as square as possible provides the maximum bonding surface area and assures proper alignment of the assembled joint. Pipe ends must be cut square using either a ratchet cutter, wheel-type cutter, fine-toothed hand saw & miter box, or power cut-off saw. When using a ratchet-type cutter, be careful not to split the pipe, especially in temperatures below 50°F (10°C). A fine-toothed hand saw (16-18 teeth/inch) with little or no set is recommended. A power cut-off saw with carbide blade is recommended for high volume cutting.



## Step 2 Deburr & Bevel Pipe.

Regardless of cutting method used in Step 1, burrs are created that can prevent contact between the pipe and the fitting during assembly and must be removed from the outside and the inside of the pipe. All pipe ends must be beveled  $10^{\circ}$  to  $15^{\circ}$ . Commercially available deburring & beveling tool is recommended, or a mill file may be used.



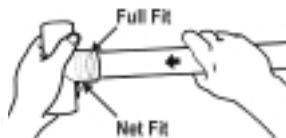
## Step 3 Clean Joint Components.

Using a clean, dry rag, wipe any loose dirt and moisture from the fitting's socket and pipe end. Moisture can slow the cure time, and at this stage of assembly, excessive water can reduce joint strength.

**WARNING: DO NOT attempt to join moisture -wet surfaces.**

## Step 4 Check Joint Interference Fit (Dry Fit) .

An interference fit between pipe and fitting socket is necessary for proper fusion of the joint. To check, lightly insert pipe into fitting socket. **DO NOT FORCE**. The pipe should enter the fitting socket 1/4 or 3/4 of the way (full interference fit). If the pipe bottoms out with little interference (net fit), use extra solvent cement in making the joint. **DO NOT** use any components that appear irregular or do not fit properly.



## Solvent Cement Welded Joints

**WARNING:** You must read the "Handling and Storage" section "Warning" information applicable to solvent cement prior to proceeding.

For best results, installation should be made at temperatures between 40° F and 110° F. All components must be clean and dry. Before assembling any Spears FlameGuard™ CPVC Fire Sprinkler products, verify the manufactured date located on the FS-5 cement container. The cement can be used for a period of two years from the date stamped on the container. When cementing pipe and fittings in extremely cold temperatures, make sure the cement has not "JELLED."

**CAUTION:** Jelled or expired cement will not provide the strength needed to make a proper joint. Jelled or expired cement must be discarded in an environmentally friendly fashion, in accordance with local regulations. To prolong the life of the cement, keep the containers tightly closed when not in use, and cover the container as much as possible during use.

### Step 1 Apply Cement.

Using an applicator no less than ½ the size of the pipe diameter, work the cement into the joining surfaces in a circular motion. Apply a liberal coat to the outside of the pipe end.



Apply a medium coat to the inside of the fitting socket.

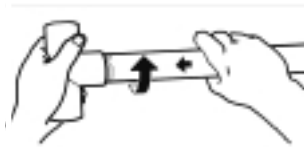


If the pipe bottoms out in the fitting during the dry fit, apply a second coat of cement to the pipe end. Always apply a second coat of cement to the pipe for joints that are 1-1/4 inch and larger.

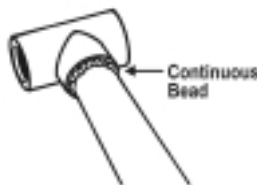
**CAUTION:** Avoid puddling the cement on or within the fitting and pipe. Puddled cement causes excess softening and damage to the CPVC material. Care should be taken in cementing Sprinkler Head Adapters and Adjustable Sprinkler Head Adapters to avoid cement running into threads or adjustable adapter body. Where possible, it is recommended that the Head Adapter be pre-installed to a pre-cut Drop (section of pipe) and allowed to achieve initial set in an inverted position. The Head Adapter and drop combination can then be installed into the system fitting.

### **Step 2** Join Components.

Immediately following application of cement and **before it starts to set**, insert pipe into the fitting socket using a 1/4-turn, twisting motion until it meets the fitting pipe stop.



A continuous bead of cement should form around the circumference of the joint. If bead is not continuous, insufficient cement was applied and must be cut and discarded from the system. Hold joint together for approximately 30 seconds to make sure the pipe does not move or back out of the fitting socket. Any cement in excess of the bead can be wiped off using a cloth.



### **Step 3** Initial Set & Cure Times.

The set and cure times for Spears FS-5 Low VOC Solvent Cement depend on pipe size, temperature, relative humidity, and tightness of fit. Drying time is faster for drier environments, smaller pipe sizes, higher temperatures, and tighter fits.

Special care must be taken when assembling Spears FlameGuard™ CPVC Fire Sprinkler products in extremely low temperatures (below 40°F/4°C) or extremely high temperatures (above 80°F/27°C). Extra set and handling times must be allowed in colder temperatures. When cementing pipe and fittings in extremely cold temperatures, make sure the cement has not "JELLED." Jelled cement must be discarded.

In extremely hot temperatures, make sure both surfaces to be joined are still wet with cement during assembly.

You must allow the assembly to set, without any stress on the joint, for five minutes. Following the initial set period, the assembly can be handled by carefully avoiding stresses to the joint.

Sprinklers can be installed ONLY after all CPVC pipe and fittings, including sprinkler head adapters, are solvent cemented to the piping system and allowed to cure for a minimum of 30 minutes. It is unacceptable practice to install sprinklers on the head adapter fittings and then solvent cement the assembly to the "drop."

Refer to the following tables for minimum cure times before pressure testing. NOTE: These cure times have been tested and approved for Spears FlameGuard™ CPVC Fire Sprinkler products. Grinnell CPVC fire sprinkler products have different cure time requirements. Please refer to Grinnell installation instructions when using Spears products in combination with Grinnell CPVC fire sprinkler products.

**Table 1: 225 psi / 1551 kPa (maximum) Test Pressure**

<b>Ambient Temperature During Cure</b>			
Pipe Size Nominal In. (Actual mm)	60°F to 120°F (16°C to 49°C)	≥ 40° F (≥ 4°C)	≥ 0° F (≥ -18°C)
3/4" (26,7)	1 hour	4 hours	48 hours
1" (33,7)	1-1/2 hours	4 hours	48 hours
1-1/4" & 1-1/2" (42,4 & 48,3)	3 hours	32 hours	10 days
2" (60,3)	8 hours	48 hours	Note 1
2-1/2" & 3" (73,0 & 88,9)	24 hours	96 hours	Note 1

**Table 2: 200 psi / 1379 kPa (maximum) Test Pressure**

<b>Ambient Temperature During Cure</b>			
Pipe Size Nominal In. (Actual mm)	60°F to 120°F (16°C to 49°C)	≥ 40° F (≥ 4°C)	≥ 0° F (≥ -18°C)
3/4" (26,7)	45 minutes	1-1/2 hours	24 hr.
1" (33,7)	45 minutes	1-1/2 hours	24 hr.
1-1/4" & 1-1/2" (42,4 & 48,3)	1-1/2 hours	16 hours	120 hours
2" (60,3)	6 hours	36 hours	Note 1
2-1/2" & 3" (73,0 & 88,9)	8 hours	72 hours	Note 1

Note 1: Solvent cement can be applied at temperatures below 40°F (4°C) in all sizes. For the 2 - inch size & larger, the temperature must be raised to 40°F (4°C) or above and allowed to cure per the recommended times before the system is filled and pressurized.

**Table 3: 100 psi / 689 kPa (maximum) Test Pressure**

<b>Ambient Temperature During Cure</b>			
Pipe Size Nominal In. (Actual mm)	60°F to 120°F (16°C to 49°C)	≥ 40° F (≥ 4°C)	≥ 0° F (≥ -18°C)
3/4" (26,7)	15 minutes	15 minutes	30 minutes
1" (33,7)	15 minutes	30 minutes	30 minutes
1-1/4" (42,4)	15 minutes	30 minutes	2 hours

NOTICE: 1-1/2-inch and larger must be tested ONLY in accordance with Table 1 and Table 2.

**WARNING: Make sure you allow the cement to cure according to the times listed in the charts for the pipe size and ambient temperature. These cure times have been tested and approved for Spears FlameGuard™ CPVC Fire Sprinkler products. DO NOT install any sprinkler heads until the piping system has cured for a minimum of 30 minutes.**

The following guidelines provide an estimate of the quantities of Spears FS-5 Low VOC Solvent Cement that you will need to complete the assembly.

## Solvent Cement Requirements

Fitting Size Nominal Inch (Actual mm)	Solvent Cement Number of Joints Per Quart (estimated)
3/4" (26,7)	270
1" (33,7)	180
1-1/4" (42,4)	130
1-1/2" (48,3)	100
2" (60,3)	70
2-1/2" (73,0)	50
3" (88,9)	40

### Threaded Connections

Threaded connections require application of thread sealants that have been tested and approved for use with the CPVC fire sprinkler material. Spears recommends the use of Spears Blue 75™ Thread Sealant. These products have been tested for compatibility with Spears FlameGuard™ CPVC Fire Sprinkler Products; however, it is important to consult the sprinkler head manufacturer to verify chemical compatibility with their products.

**WARNING:** Use only thread sealant recommended by Spears. Other joint compounds or pastes may contain substances that could cause stress cracks in the CPVC or brass materials. Spears DOES NOT recommend the use of TFE tape ("Teflon tape"). Tape sealants can create an adverse "wedging" action with tapered pipe threads that can produce excessive stresses resulting in fitting failure.

**WARNING:** Cutting oils used in metal pipe threading cause stress cracking in CPVC materials. All cutting oils must be removed and the metal pipe thoroughly flushed and degreased prior to assembly with CPVC systems.

#### **Step 1** Apply Thread Sealant.

Apply the sealant to the male threads only. Make sure all threads are covered. DO NOT clog the waterway with excess sealant. DO NOT use a combination of tape and thread sealant on the joint.

### **Step 2 Assemble Joint by Hand.**

Thread pipe or sprinkler head “finger tight” for initial assembly (just enough to fully engage thread clearance). CAUTION: Care must be taken in properly aligning male to female threads to avoid possible cross threading.

### **Step 3 Wrench Make-Up.**

Threaded fittings must always be installed using commercially available strap wrenches. Do not use conventional pipe wrenches that can damage the plastic fitting. Apply wrench make-up of no more than one to two turns beyond finger tight engagement. Care must be taken in final positioning to avoid the need to “back-up” the wrenched assembly.

**WARNING: DO NOT over-torque any threaded connections. Generally, one to two turns beyond finger-tight are required to make a threaded connection. Factory testing has indicated that 10-25 ft-lbs of torque is adequate to obtain a leak free seal.**

NOTICE: 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.

### **Painting Pipe & Fittings**

**CAUTION:** The UL Listing DOES NOT cover painted CPVC fire sprinkler piping products. Use of certain paints, such as oil-based, can damage CPVC fire sprinkler piping products. Before painting any CPVC fire sprinkler piping products, you must consult with your local authority having jurisdiction for restrictions.

### **Cleaning**

Spears FlameGuard™ CPVC Fire Sprinkler Products can be cleaned using a mild soap and water solution. DO NOT use ammonia or other harsh chemical cleaners.



## Transitions to Other Materials

Specifically designed female threaded adapters, grooved coupling adapters, and flanges are Listed for connecting systems incorporating Spears FlameGuard™ CPVC Fire Sprinkler Products to other materials, valves, and accessories. A special, reinforced female threaded adapter is available for connection to the sprinkler head.

## Flanged Connections

Piping runs joined to the flanges must be installed in a straight line in relation to the flange to avoid stress at the flange due to misalignment. In addition, piping must be secured and supported to prevent lateral movement, which can create stress and damage the flange. Use only full-faced, Grade E, EPDM, 1/8" thick flange gaskets.

### Step 1 Attach Flange to Pipe.

The flange must be attached to UL Listed CPVC pipe following procedures for Solvent Cement Welded Joints in this manual.

NOTICE: When using "One-Piece" type flanges (fixed flange ring), care must be taken to align bolt holes with mating flange during solvent welding installation to pipe, or assure that pipe in system can be adequately rotated for correct hole alignment.

### Step 2 Position Gasket & Align Flanges.

With gasket between flanges, align gasket and mating flange bolt holes by rotating flange ring (see notice above).

### Step 3 Install Bolts, Nuts, & Washers.

Bolts should be lubricated with an acceptable anti-seize lubricant (such as IMS Copper Flake). Insert required bolts through flange bolt holes being sure to use two (2) flat washers per bolt, one at head and one below nut. Make sure that mating flanges are flush against gasket and properly aligned. Tighten nuts by hand until snug.

**WARNING: Certain lubricants can cause stress cracking in CPVC materials.**

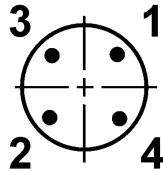
## Step 4 Tighten Flange Bolts.

Establish uniform pressure over the flange face by tightening bolts in 5-ft. lbs. increments using the sequence shown in Figure 1 and specified torque values.

**CAUTION:** DO NOT use bolts to draw together improperly mated flanges. Care must be taken to avoid "bending" the flange ring when attached to a raised-face flange or wafer style valves.

## Flange Data & Bolt Torque

The following recommendations are based on the use of two standard flat washers, standard nuts, and 1/8-inch thick EPDM full-face gasket. Actual field conditions may require a variation in these recommendations.



Flange Size Nominal in (Actual mm)	Recommended Torque ft-lbs (N-m)
3/4 to 1-1/2 (26,7 - 48,3)	12 (16,3)
2 to 3 (60,3 - 88,9)	25 (33,9)

Flange Size Nominal in. (Actual mm)	Bolt Holes	Bolt Diameter inches (mm)	Minimum Bolt Length inches (mm)
3/4 (26,7)	4	1/2 (12,7)	2 (50,8)
1 (33,7)	4	1/2 (12,7)	2-1/4 (57,2)
1-1/4 (42,4)	4	1/2 (12,7)	2-1/4 (57,2)
1-1/2 (48,3)	4	1/2 (12,7)	2-1/2 (63,5)
2 (60,3)	4	5/8 (15,9)	3 (76,2)
2-1/2 & 3 (73,0 & 88,9)	4	5/8 (15,9)	3-1/4 (82,6)

## Grooved Coupling Adapters

Spears FlameGuard™ CPVC Grooved Coupling Adapters are designed for use with Victaulic Style 75 and Style 77 Flexible Couplings. Other UL Listed couplings of similar flexible design may be used.

**CAUTION:** The use of rigid style couplings will damage the Grooved Coupling Adapter. Consult coupling manufacturer for proper selection

### **Step 1** Inspect Pipe & Adapter.

Check to ensure that both pipe and Grooved Coupling Adapter are free of indentations, projections, or roll marks on the gasket seating areas. Pipe end must be cut square and any loose scale, paint or dirt removed.

**NOTICE:** Use a standard grade “E” (EPDM) compound gasket with a green stripe or a grade “E,” type “A” gasket with a purple stripe that is suitable for wet fire sprinkler service.

### **Step 2** Inspect & Lubricate Gasket.

Be sure the gasket is clean and free of any cracks, cuts, or other defects that could cause leaks. DO NOT allow solvent cement to contact the sealing surface of the gasket. Lubricate the gasket with a vegetable soap-based gasket lubricant, such as IPS Weld On Gasket/Joint Lubricant #787 or Seacord Corp. Ease-On Pipe Joint Lubricant to prevent pinching and to assist in the seating and alignment process. Apply a thin layer of lubricant to the gasket lips and exterior surface. Pre-lubricated gaskets, such as VIC-PLUS manufactured by Victaulic, may be used. It is the installer’s responsibility to determine both the gasket suitability and chemical compatibility of the lubricant. Consult gasket manufacturer.

**WARNING:** Certain lubricants may contain petroleum based or other chemical than can damage the gasket or adapter. Verify the suitability of the lubricant with the manufacturer before use.

### **Step 3** Align Components & Install Gasket.

Place the gasket over the pipe end making sure the gasket lip does not overhang the end of the pipe. Align the grooved coupling adapter with the end of the pipe and slide the gasket over the seating surface of the adapter, centering the gasket between the two grooves. Make sure the gasket is not pinched between the pipe and the adapter fitting. No portion of the gasket should extend into the grooves.

### **Step 4** Install Coupling.

Place the coupling housings over the gasket, making sure the housing keys engage into the grooves of the pipe and the adapter fitting. Insert the bolts and apply the nuts finger-tight. Using a socket wrench or other appropriate tool, tighten the nuts alternately and equally until you achieve metal-to-metal contact at the housings’ bolt pads.

**WARNING:** You must tighten the bolts alternately and evenly to achieve metal-to-metal contact at the housings' bolt pads.

Inspect the joints before and after pressure testing. Look for gaps between the bolts pads and for housing keys that are not inside the grooves. Ensure that the pipe alignment does not place undue stress on the grooved coupling adapters.

The maximum recommended pipe hanger distance from the grooved coupling adapter fitting is shown in the following table.

Pipe Size Nominal in (Actual mm)	Maximum Recommended Hanger Spacing feet (meters)
1-1/4 (42,4)	6-1/2 (2,0)
1-1/2 (48,3)	7 (2,1)
2 (60,3)	8 (2,4)
2-1/2 (73,0)	9 (2,7)
3 (88,9)	10 (3,0)

As an added precaution to enhance the structural design of the system, it is suggested that a hanger or support be located at or near the grooved coupling adapter joint. This hanger or support can be on either side of the coupling. However, this is not a requirement, since the hanger spacing shown in the above table meets the minimum requirements established by UL.

## Adjustable Sprinkler Head Adapter Installation

Spears FlameGuard™ 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 out completely before beginning the installation process.

### Step 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 manual. 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.

## **Step 2** Install Sprinkler Head.

Sprinkler head installation must be in accordance with the approved procedures for Threaded Connections, as outlined in this manual. 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.

## **Step 3** Adjust Finished Height.

Always use multiple wrench flats for making adjustments

**CAUTION:** Care must be taken not to extend or retract the adjustment barrel excessively, since this may result in damage to the adapter.

For the purpose of hydraulic calculations, the 3/4-inch and 1-inch adjustable sprinkler head adapters have an average equivalent length of pipe in feet of 0.75' (3/4-ft).

## **Hydrostatic Testing**

When an installation is complete and the pipe joints are fully cured, per the requirements within this manual, the system **MUST** be pressure tested in accordance with NFPA 13, NFPA 24, or any other applicable NFPA standard requirement. The system must be tested with water. The purpose of the hydrostatic pressure test is to check for leakage, and it may not identify improperly assembled joints. This test **MUST NOT** be considered a substitute for full compliance to our published installation instructions.

When using Spears FlameGuard™ CPVC Fire Sprinkler Products in systems supplied by pumps, the system must be designed to ensure that surge potentials generated by pump operation will not cause damage to the piping system.

Air must be removed from piping systems (plastic or metal) to prevent it from being locked in the system when pressure is applied. Entrapped air can generate excessive surge pressures that are potentially damaging and life threatening, regardless of the piping materials used.

**WARNING:** Spears FlameGuard™ CPVC Fire Sprinkler Products must never be used or tested in a system of compressed air or other gases. Air must be removed from piping systems. Entrapped air can generate excessive surge pressures, regardless of the piping materials used. Failure to follow this warning could result in product failure, property damage and severe personal injury or death.

If a leak is found, the fitting must be cut out and discarded. A new section can be installed using couplings or a union. Unions must be used in accessible areas only.

## Engineering Data

### Product Specifications

Spears FlameGuard™ CPVC Fire Sprinkler Products are made for use with Listed CPVC Fire Sprinkler Pipe produced in SDR 13.5 dimensions, as specified in ASTM F-442. Engineering data on Material Properties and Expansion & Contraction for CPVC pipe in this manual are provided for both (A) Victaulic FireLock™ and (B) Harvel BlazeMaster® CPVC Fire Sprinkler Pipe. Consult other pipe manufacturers for applicable variations.

Spears FlameGuard™ CPVC Fire Sprinkler Fittings are produced in Schedule 40 and Schedule 80 dimensions for sizes 3/4" through 1-1/4" and in Schedule 80 for sizes 1-1/2" through 3", in accordance with ASTM F-437, ASTM F-438, and ASTM F-439, as applicable. These products are UL Listed, FM/Approved for a rated working pressure of 175 psi (1200 kPa) at 150°F (65°C) for sprinkler service and LPCB Listed for a rated working pressure of 175 psi (1200 kPa) at 120°F (49°C).

### CPVC Fire Sprinkler Pipe Dimensions

SDR 13.5 (Ref. ASTM F442)			
Size Nominal inches (Actual mm)	Average OD inches (mm)	Average ID inches (mm)	Weight lbs/ft (kg/m)
3/4 (26,7)	1.050 (26,7)	0.874 (22,5)	0.168 (0,2)
1 (33,7)	1.315 (33,4)	1.101 (28,2)	0.262 (0,4)
1-1/4 (42,4)	1.660 (42,2)	1.394 (35,6)	0.418 (0,6)
1-1/2 (48,3)	1.900 (48,3)	1.598 (40,7)	0.548 (0,7)
2 (60,3)	2.375 (60,3)	2.003 (50,9)	0.859 (1,2)
2-1/2 (73,0)	2.875 (73,0)	2.423 (61,5)	1.257 (1,2)
3 (88,9)	3.500 (88,9)	2.950 (75,0)	1.867 (1,2)

## Hydraulic Design

Hydraulic calculations for the sizing of systems incorporating Spears FlameGuard™ CPVC Fire Sprinkler Products must be calculated using a Hazen-Williams C value of 150. Pipe friction loss calculations must be made according to NFPA Standard 13. The following table shows the allowance for friction loss for fittings, expressed as equivalent length of pipe. For additional information regarding friction loss, contact Spears.

## Allowance for Friction Loss in Fittings

Equivalent Feet (meters) of Pipe

	3/4" 26,7 mm	1" 33,7 mm	1-1/4" 42,4 mm	1-1/2" 48,3 mm	2" 60,3 mm	2-1/2" 73,0 mm	3" 88,9 mm
Tee Run	1 (0,3)	1 (0,3)	1 (0,3)	1 (0,3)	1 (0,3)	2 (0,6)	2 (0,6)
Tee Branch	3 (0,9)	5 (1,5)	6 (1,8)	8 (2,4)	10 (3,1)	12 (3,7)	15 (4,6)
90° Elbow	7 (2,1)	7 (2,1)	8 (2,4)	9 (2,7)	11 (3,4)	12 (3,7)	13 (4,0)
45° Elbow	1 (0,3)	1 (0,3)	2 (0,6)	2 (0,6)	2 (0,6)	3 (0,9)	4 (1,2)
Coupling	1 (0,3)	1 (0,3)	1 (0,3)	1 (0,3)	1 (0,3)	2 (0,6)	2 (0,6)

## Hangers & Supports

Since CPVC Fire Sprinkler pipe is rigid, it requires fewer supports than flexible, plastic systems. Spears recommends use of hangers that are designed and listed for supporting the CPVC Fire Sprinkler pipe. However, some hangers designed for steel pipe may be used if their suitability is clearly established. These hangers must have a minimum 1/2-inch, load-bearing surface, and they must be selected to accommodate the specific pipe size. In addition, they cannot contain rough or sharp edges that contact the pipe, and they must not bind the pipe from axial movement. Vertical runs must be supported so that the weight of the run is not on a fitting or a joint.

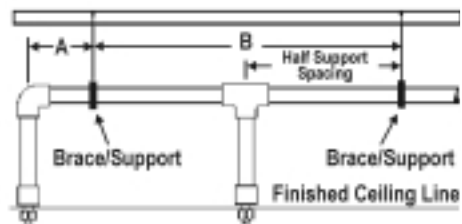
Horizontal runs must be braced so that the stress loads (caused by bending or snaking pipe) will not be placed on a fitting or a joint. Support spacing is shown in the following table. See "Pipe Deflection" in this manual for information regarding bending or snaking CPVC Fire Sprinkler Pipe.

Pipe Size Nominal inches (Actual mm)	Maximum Support Spacing feet (meters)	Wt. of Water Filled Pipe lbs/ft (kg/m)
3/4 (26,7)	5-1/2 (1,7)	0.427 (0,6)
1 (33,7)	6 (1,8)	0.674 (0,9)
1-1/4 (42,4)	6-1/2 (2,0)	1.078 (1,5)
1-1/2 (48,3)	7 (2,1)	1.412 (1,9)
2 (60,3)	8 (2,4)	2.223 (3,0)
2-1/2 (73,0)	9 (2,7)	3.254 (61,5)
3 (88,9)	10 (3,0)	4.831 (75,0)

Since CPVC Fire Sprinkler pipe is rigid, it requires fewer supports than flexible, plastic systems. Spears recommends use of hangers that are designed and listed for supporting the CPVC Fire Sprinkler. However, some hangers designed for steel pipe may be used if their suitability is clearly established. These hangers must have a minimum 1/2-inch, load-bearing surface, and they must be selected to accommodate the specific pipe size. In addition, they cannot contain rough or sharp edges that contact the pipe, and they must not bind the pipe from axial movement. NFPA 13D permits "support methods comparable to those required by local plumbing codes." The above hanger/support requirements must also be followed on NFPA 13D systems.

**CAUTION:** DO NOT use hanger items such as plumber's tape or "nail-on" devices. Pipe hanger must comply with NFPA 13, 13D and 13R.

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 secured properly, especially if the sprinkler drop is from small diameter pipe. The pipe must be braced against the vertical lift-up with the closest hanger. Refer to the following illustration and Table A & B.





**Table A - Maximum Support Spacing Distance  
End Line Sprinkler Head Drop Elbow**

Pipe Size Nominal inches (Actual mm)	Line pressure < 100 psi ( < 689 kPa)	Line pressure > 100 psi ( > 689 kPa)
3/4 (26,7)	9 inches (228,6 mm)	6 inches (168,3 mm)
1 (33,7)	12 inches (304,8 mm)	9 inches (228,6 mm)
1-1/4 (42,4)	16 inches (406,4 mm)	12 inches (304,8 mm)
1-1/2 - 3 (48,3 - 88,9)	24 inches (610,0 mm)	12 inches (304,8 mm)

Note: Support spacing can be increased by approximately 50% for lower pressures.

**Table B - Maximum Support Spacing Distance  
Inline Sprinkler Head Drop Tee**

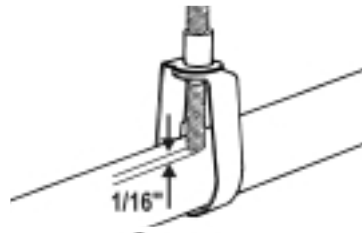
Pipe Size Nominal inches (Actual mm)	Line pressure < 100 psi ( < 689 kPa)	Line pressure > 100 psi ( > 689 kPa)
3/4 (26,7)	4 feet (1,22 meters)	3 feet * (0,91 meters)
1 (33,7)	5 feet (1,52 meters)	4 feet * (1,22 meters)
1-1/4 (42,4)	6 feet (1,83 meters)	5 feet * (1,52 meters)
1-1/2 - 3 (48,3-88,9)	7 feet (2,13 meters)	7 feet (2,13 meters)

Note: \*Support spacing can be increased by one foot for lower pressures.

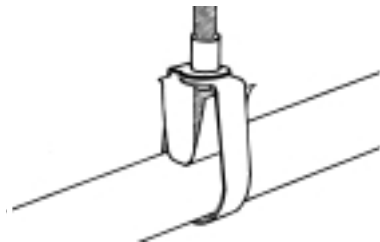
Numerous common methods are used to brace Fire Sprinkler Pipe. A few acceptable methods include: use of a standard band hanger by positioning the threaded support rod to 1/16-inch above the pipe (however, it is important that the rod does not contact the pipe), a wrap around U-hanger, a special escutcheon which prevents upward movement of the sprinkler through the ceiling or band hangers with Surge Restraints to provide surge protection for the system.

Pipe hangers are available that are tested and UL Listed for fire sprinkler service. These hangers comply with NFPA 13 requirements for use with CPVC fire sprinkler piping systems. The following illustrations depict several of these.

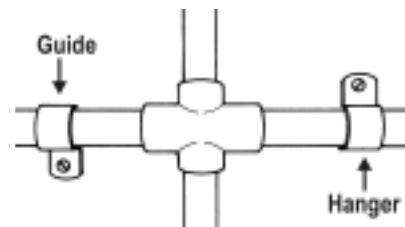
**Band Hanger** - designed to support CPVC piping systems when used in conjunction with a hanging steel threaded rod that is suspended from a ceiling or other flat, horizontal surface. The threaded rod must be leveled properly before installing the hanger and restraint.



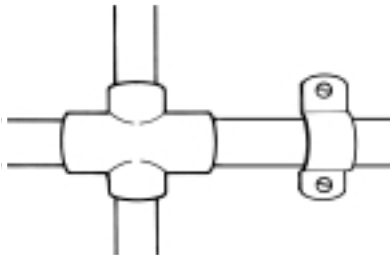
**Surge Restraint** - when installed with the Band Hanger, as shown below, provides surge protection for the system.



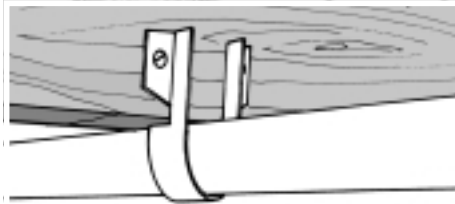
**One Hole Wrap-Around Strap** - designed to support CPVC piping systems only when the hanger tab is in the vertical position, and the screw-type fastener is in the horizontal position. The one-hole strap can be used as a pipe restrainer when the hanger tab is in the downward position, but it cannot be used as a hanger to hold any weight of the system. In addition, the one-hole strap can be used as a piping system guide when the system lies on top of the beam, and the beam supports the system's weight. The one-hole strap is not intended to support the CPVC piping system from under a ceiling or any other flat, horizontal surface. For this application, install two-hole strap.



**Two-Hole Strap** - designed to support CPVC piping systems when attached to a flat, horizontal surface with the screw-type fasteners in the vertical position. In addition, the two-hole strap is designed to support CPVC piping systems when attached to a flat, vertical surface with one mounting tab in the vertical position and the screw-type fasteners in the horizontal position. The two-hole strap can be used as a piping system guide when the system lies on top of a beam, and the beam supports the system's weight.



**Two-Hole 90° Side Mount Strap** - designed to support CPVC piping systems when attached to a horizontal beam with the screw-type fasteners in the horizontal position and the pipe hanging below the beam. The fastener's mounting edges are designed to allow the screws to be installed horizontally. This is a benefit when overhead clearance is limited. In addition, the 90° side mount strap can be used in a restrainer fashion when it is attached to the top of a beam, and the system lies on top of the beam.



## **Riser Supports**

Risers must be supported by pipe clamps or by hangers located on the horizontal connection close to the riser. Only Listed hangers and clamps can be used. Vertical lines must be supported at intervals to avoid placing excessive load on a fitting at the lower end. This can be done by using riser clamps or double-bolt pipe clamps listed for this service.

Hangers and supports must not compress, distort, cut, or abrade the piping, and they must allow free movement of the pipe for thermal expansion and contraction. DO NOT use riser clamps that squeeze the pipe and depend on compression of the pipe to support the weight.

Maintain vertical piping in straight alignment with supports at each floor level or 10-foot intervals, whichever is less. CPVC risers in vertical shafts or buildings with ceilings over 25 feet must be aligned straight and supported at each floor level or 10-foot intervals, whichever is less.

Clamps must not exert compressive stresses on the pipe. If possible, the clamps should be located directly below a coupling so that the shoulder of the coupling rests against the clamp. A coupling can be modified to achieve this by cutting a CPVC coupling just above the stop at the socket bottom. Then, cut this piece in half lengthwise to provide two halves that do not contain the stop. Follow the "Solvent Cement Welding Instructions" to cement the two halves to the pipe at the required location, and make sure that the shoulder of the modified coupling rests on the clamp. Allow the assembly to cure before placing any stress on the joint.

**WARNING: CPVC pipe and/or system components must not be used to provide structural support for the system. Care should be used when installing, hanging, or bracing to prevent unnecessary stress loads on the CPVC piping system.**

## **Exposed Installations**

For exposed installations that incorporate pendent or sidewall sprinklers, UL Listed support devices for thermoplastic sprinkler piping, or other listed support devices shall be used to mount the piping directly to the ceiling or sidewall.

## **Earthquake Bracing**

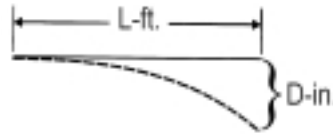
Since CPVC fire sprinkler plastic piping is more ductile than metallic sprinkler pipe, it has a greater capacity to withstand earthquake damage. In areas subject to earthquakes, CPVC fire sprinkler systems should be designed and braced in accordance with local codes and NFPA Standard 13.

## Pipe Deflection

Installation of systems incorporating Spears FlameGuard™ CPVC Fire Sprinkler Products may require bending or snaking of piping. The following information can be used in determining maximum deflection allowable for various run lengths and pipe sizes. Consult UL Listed Fire Sprinkler pipe manufacturer's installation instructions for additional information on trenching, snaking, underground installation, and backfilling.

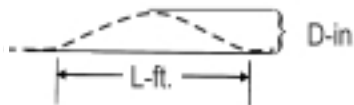
### Maximum Bending Deflections in Inches For Given Lengths of CPVC, SDR 13.5 (73°F)

Pipe Size SDR 13.5	Length of Run (L) in Feet													
	2	5	7	10	12	15	17	20	25	30	35	40	45	50
	Pipe Deflection (D) in Inches													
3/4	1.3	7.8	15.4	31.3	45.1	70.5	90.6	124.4	195.9	282.1	383.9	-	-	-
1	1.0	6.3	12.3	25.0	36.0	56.3	72.3	100.1	156.5	225.2	306.6	400.4	-	-
1-1/4	0.8	5.0	9.7	19.8	28.5	44.6	57.3	79.3	123.9	178.4	242.8	317.2	401.4	-
1-1/2	0.7	4.3	8.5	17.3	24.9	39.0	50.1	69.3	108.2	155.9	212.2	277.1	350.7	433.0
2	0.6	3.5	6.8	13.9	20.0	31.2	40.0	55.4	86.6	124.7	169.7	221.7	280.6	346.4
2-1/2	0.5	2.9	5.6	11.4	16.5	25.8	33.1	45.8	71.5	103.0	140.2	183.1	231.8	286.2
3	0.4	2.4	4.6	9.4	13.5	21.2	27.2	37.6	58.8	84.6	115.2	150.4	190.4	235.1



### Maximum Snaking Deflections in Inches For Given Lengths of CPVC, SDR 13.5 (73°F)

Pipe Size SDR 13.5	Length of Run (L) in Feet													
	2	5	7	10	12	15	17	20	25	30	35	40	45	50
	Pipe Deflection (D) in Inches													
3/4	0.3	2.0	3.8	7.8	11.3	17.6	22.6	31.3	49.0	70.5	96.0	125.4	158.7	195.9
1	0.3	1.6	3.1	6.3	9.0	14.1	18.1	25.0	39.1	56.3	76.6	100.1	126.7	156.4
1-1/4	0.2	1.2	2.4	5.0	7.1	11.2	14.3	19.8	31.0	44.5	60.7	79.3	100.4	123.9
1-1/2	0.2	1.1	2.1	4.3	6.2	9.7	12.5	17.3	27.1	39.0	53.0	69.3	87.7	108.2
2	0.1	0.9	1.7	3.5	5.0	7.8	10.0	13.9	21.6	31.2	42.4	55.4	70.1	86.6
2-1/2	0.1	0.7	1.4	2.9	4.1	6.4	8.3	11.4	17.9	25.8	35.1	45.8	57.9	71.5
3	0.1	0.6	1.2	2.4	3.4	5.3	6.8	9.4	14.7	21.2	28.8	37.6	47.6	58.8



## Material Properties

**Table I-A  
Modulus of Elasticity & Stress vs. Temperature  
For Victaulic FireLock™ CPVC Fire Sprinkler Pipe**

Property	Temperature °F							
	73	80	90	100	110	120	140	150
Modulus of Elasticity "E" x 10 <sup>5</sup> psi	3.90	3.84	3.78	3.70	3.46	3.21	3.05	2.84
Working Stress "S" psi	1,900	1,785	1,630	1,485	1,345	1,270	950	875

**Table I-B  
Modulus of Elasticity & Stress vs. Temperature  
For Harvel BlazeMaster® CPVC Fire Sprinkler Pipe**

Property	Temperature °F							
	73	80	90	100	110	120	140	150
Modulus of Elasticity "E" x 10 <sup>5</sup> psi	4.23	4.14	3.99	3.85	3.70	3.55	3.23	3.08
Working Stress "S" psi	2,000	1,875	1,715	1,560	1,415	1,275	1,000	875

**Table II  
Physical & Thermal Properties**

Property		A-Victaulic FireLock™ CPVC Pipe	B-Harvel BlazeMaster® CPVC Pipe	ASTM
Specific Gravity	"Sp. Gr."	1.51	1.55	D 792
IZOD Impact Strength (ft. lbs/inch of notch)		5.0	3.0	D 256A
Modulus of Elasticity, psi	"E"	3.9 X 10 <sup>5</sup>	4.23 x 10 <sup>5</sup>	D 638
Ultimate Tensile Strength, psi		8,000	8,400	D 638
Compressive Strength, psi		9,000	9,600	D 695
Poisson's Ratio		.35 - .38	.35 - .38	-
Working Stress @ 73°F, psi		1,900	2,000	D 1598
Hazen-Williams "C" Factor		150	150	-
Coefficient of Linear Expansion in./in.°F	"e"	3.2 X 10 <sup>-5</sup>	3.4 X 10 <sup>-5</sup>	D 696
Thermal Conductivity BTU/(hr°F Win)	"k"	0.95	0.95	C 177
Upper Temperature Limit	"°F"	205	210	-
Flammability		Flame Retardant	Flame Retardant	
Electrical Conductivity		Non Conductor	Non Conductor	

## Expansion and Contraction

Spears FlameGuard™ CPVC Fire Sprinkler Products, like all piping materials, expand and contract with changes in temperature. If the coefficient of linear expansion is  $3.2 \times 10^{-5}$  inch /inch-°F. A 25°F change in temperature will cause an expansion of 1 inch for a 100-foot straight length. For most operating and installation conditions, expansion and contraction can be accommodated at changes of direction.

**Table III-A  
Thermal Expansion in Inches  
For Victaulic FireLock™ CPVC Fire Sprinkler Pipe**

Temp. Change $\Delta T$ °F	Length of Run in Feet														
	5	10	15	20	25	30	35	40	45	50	70	90	120	160	
20	0.04	0.08	0.12	0.15	0.19	0.23	0.27	0.31	0.35	0.38	0.54	0.69	0.92	1.23	
30	0.06	0.12	0.17	0.23	0.29	0.35	0.40	0.46	0.52	0.58	0.81	1.04	1.38	1.84	
40	0.08	0.15	0.23	0.31	0.38	0.46	0.54	0.61	0.69	0.77	1.08	1.38	1.84	2.46	
50	0.10	0.19	0.29	0.38	0.48	0.58	0.67	0.77	0.86	0.96	1.34	1.73	2.30	3.07	
60	0.12	0.23	0.35	0.46	0.58	0.69	0.81	0.92	1.04	1.15	1.61	2.07	2.76	3.69	
70	0.13	0.27	0.40	0.54	0.67	0.81	0.94	1.08	1.21	1.34	1.88	2.42	3.23	4.30	
80	0.15	0.31	0.46	0.61	0.77	0.92	1.08	1.23	1.38	1.54	2.15	2.76	3.69	4.92	
90	0.17	0.35	0.52	0.69	0.86	1.04	1.21	1.38	1.56	1.73	2.42	3.11	4.15	5.53	
100	0.19	0.38	0.58	0.77	0.96	1.15	1.34	1.54	1.73	1.92	2.69	3.46	4.61	6.14	

**Table III-B  
Thermal Expansion in Inches  
For Harvel BlazeMaster® CPVC Fire Sprinkler Pipe**

Temp. Change $\Delta T$ °F	Length of Run in Feet														
	5	10	15	20	25	30	35	40	45	50	70	90	120	160	
20	0.04	0.08	0.12	0.16	0.20	0.24	0.29	0.33	0.37	0.41	0.57	0.73	0.98	1.31	
30	0.06	0.12	0.24	0.24	0.31	0.37	0.43	0.49	0.55	0.61	0.86	1.10	1.47	1.96	
40	0.08	0.16	0.33	0.41	0.41	0.49	0.57	0.65	0.74	0.82	1.14	1.47	1.96	2.61	
50	0.10	0.20	0.41	0.51	0.51	0.61	0.72	0.82	0.92	1.02	1.43	1.84	2.45	3.26	
60	0.12	0.24	0.49	0.61	0.61	0.73	0.86	0.98	1.10	1.22	1.71	2.20	2.94	3.92	
70	0.19	0.29	0.57	0.71	0.71	0.88	1.00	1.14	1.29	1.43	2.00	2.57	3.43	4.57	
80	0.16	0.33	0.65	0.82	0.82	0.98	1.14	1.31	1.47	1.63	2.28	2.94	3.92	5.22	
90	0.18	0.37	0.73	0.92	0.92	1.04	1.10	1.29	1.47	1.66	2.84	3.30	4.41	5.88	
100	0.20	0.41	0.82	1.02	1.02	1.22	1.43	1.63	1.84	2.04	2.86	3.67	4.90	6.53	

$$\Delta L = 12 eL (\Delta T)$$

$$e = 3.4 \times 10^{-5} \text{ in./in. } ^\circ\text{F} \text{ (Coefficient of Linear Expansion for Harvel BlazeMaster® CPVC Fire Sprinkler Pipe)}$$

— or —

$$e = 3.2 \times 10^{-5} \text{ in./in. } ^\circ\text{F} \text{ (Coefficient of Linear Expansion for Victaulic FireLock™ CPVC Fire Sprinkler Pipe)}$$

$$L = \text{Length of Run in Feet}$$

$$\Delta T = \text{Temperature Change in } ^\circ\text{F}$$

Example:

How much will a 40 ft. run of 2" Harvel BlazeMaster® CPVC Fire Sprinkler Pipe expand if the expected ambient temperature will range from 45°F to 85°F?

$$\Delta L = 12 eL (\Delta T)$$

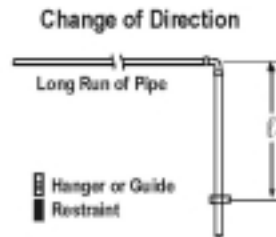
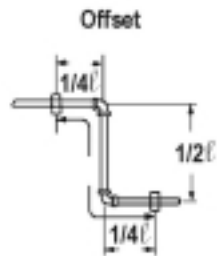
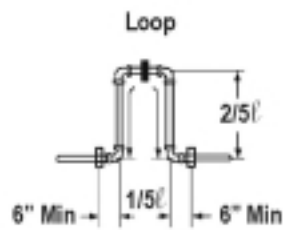
$$\Delta L = 12 (.000034) \times 40 \times 40$$

$$\Delta L = .65"$$

## Expansion Loop & Offset Configurations

Hangers or guides should only be placed in the loop, offset or change of direction as indicated below. Piping supports should restrict lateral movement and should direct axial movement into the expansion loop.

### Expansion Loop and Offset Configurations





**Table IV-A  
Expansion Loop Length in Inches  
For Victaulic FireLock™ CPVC Fire Sprinkler Pipe**

Nominal Pipe Size	Avg. O.D.	Length of Run in Feet													
		5	10	15	20	25	30	35	40	45	50	70	90	120	160
		Length of Loop (in.) Temperature = 30°F-100°F, ΔT = 70°F													
3/4	1.050	7	10	13	15	16	18	19	21	22	23	27	31	36	41
1	1.315	8	11	14	16	18	20	22	23	24	26	30	34	40	46
1-1/4	1.660	9	13	16	18	20	22	24	26	27	29	34	39	45	52
1-1/2	1.900	10	14	17	20	22	24	26	28	29	31	37	41	48	55
2	2.375	11	15	19	22	24	27	29	31	33	35	41	46	54	62

Note: Victaulic FireLock™ CPVC Fire Sprinkler Pipe available up to 2-inch size only.

**Table IV-B  
Expansion Loop Length in Inches  
For Harvel BlazeMaster® CPVC Fire Sprinkler Pipe**

Nominal Pipe Size	Avg. O.D.	Length of Run in Feet													
		5	10	15	20	25	30	35	40	45	50	70	90	120	160
		Length of Loop (in.) Temperature = 30°F-100°F, ΔT = 70°F													
3/4	1.050	7	11	13	15	17	18	20	21	22	24	28	32	37	42
1	1.315	8	12	14	17	19	20	22	24	25	26	31	35	41	47
1-1/4	1.660	9	13	16	19	21	23	25	26	28	30	35	40	46	53
1-1/2	1.900	10	14	20	22	22	25	27	28	30	32	38	43	49	57
2	2.375	11	16	19	22	25	27	30	32	34	35	42	48	55	63
2-1/2	2.875	12	18	21	25	27	30	33	35	37	39	46	52	60	70
3	3.500	13	19	24	27	30	33	36	38	41	43	51	58	67	77

Note: Table IV-A and IV-B are based on Stress & Modulus Elasticity at 100°F

$$l = \sqrt{\frac{3ED\Delta L}{2S}}$$

$l$  = Length of Expansion Loop in Inches

$E$  = Modulus of Elasticity at 100°F (Table I-A or I-B)

$D$  = Average O.D. of Pipe

$\Delta L$  = Change in Length of Pipe Due to Change in Temperature (Table III-A or III-B)

$S$  = Working Stress at 100° F (Table I-A or I-B)

Note: Data in Table I-A must be used with Table III-A and data in Table I-B with Table III-B

Example: How much expansion can be expected in a 200 ft. run of 2" Victaulic FireLock™ CPVC Fire Sprinkler Pipe and how long should the expansion loop be to compensate for this expansion? (The expected temperature range will be from 40° F to 110°F).

First Find:

$\Delta T$  = (Change in Temperature)

$\Delta T = T_2 - T_1$

$\Delta T = 110^\circ\text{F} - 40^\circ\text{F}$

$\Delta T = 70^\circ\text{F}$

To Find:

$\Delta L$  = (Amount of Expansion in inches from Table III-A)

$\Delta L = \Delta L$  of 160 ft. with a  $\Delta T$  of 70°F +  $\Delta L$  of 40 ft. with a  $\Delta L$  of 70°F

$\Delta L = 4.30" + 1.08"$

$\Delta L = 5.38"$

-OR-

$$\begin{aligned} \Delta L &= 12eL(\Delta T) \\ e &= 3.2 \times 10^{-5} \text{ (from Table II, Victaulic FireLock™ CPVC Pipe)} \\ L &= \text{Length of Run in Feet} \\ \Delta T &= \text{Change in Temperature in } ^\circ\text{F} \\ \Delta L &= 12 \times .000032 \times 200 \times 70 \\ \Delta L &= 5.38'' \end{aligned}$$

To find the length of the expansion loop or offset in inches:

$$l = \sqrt{\frac{3ED\Delta L}{2S}}$$

$$\begin{aligned} l &= \text{Length of Expansion Loop in Inches} \\ E &= \text{Modulus of Elasticity at } 110^\circ\text{F (Table I-A)} \\ D &= \text{Average O.D. of Pipe} \\ \Delta L &= \text{Change in Length of Pipe Due to Change in Temperature (Table III-A)} \\ S &= \text{Working Stress at } 100^\circ\text{ F (Table I-A)} \end{aligned}$$

$$l = \sqrt{\frac{3ED\Delta L}{2S}}$$

$$l = \sqrt{\frac{3 \times 346,000 \times 2.375 \times 5.38}{2 \times 1345}}$$

$$l = \sqrt{4931}$$

$$l = 70.2''$$

## Review – Do's & Don'ts

### Do's

- Read the manufacturer's installation instructions.
- Follow recommended safe work practices.
- Make certain that thread sealants, gasket lubricants, or fire stop materials are compatible with CPVC.
- Keep pipe and fittings in original packaging until needed.
- Cover pipe and fittings with an opaque tarp 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 ¼ 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.
- Fill lines slowly and bleed the air from the system prior to pressure testing.
- Support sprinkler head properly to prevent lift up of the head through the ceiling when activated.
- Keep threaded rod within 1/16" of the pipe or use a surge arrestor.
- Install Spears FlameGuard™ CPVC Fire Sprinkler Products in wet systems only.
- Use only glycerin and water solutions for freeze protection.
- Allow for movement due to expansion and contraction.
- Renew your Spears FlameGuard™ CPVC Fire Sprinkler Products installation training every two years.

### **Don'ts**

- Do not use edible oils such as Crisco as a gasket lubricant.
- Do not use petroleum or solvent-based sealants, lubricants, or fire stop materials.
- Do not use any glycol-based solutions as an anti-freeze.
- Do not mix glycerin and water solutions in contaminated containers.
- Do not use solvent cement that exceeds its shelf life or has become discolored or jellied.
- 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 use ratchet cutters below 50°F.
- 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 Spears FlameGuard™ CPVC Fire Sprinkler Products in cold weather without allowing for expansion.
- Do not install Spears FlameGuard™ CPVC Fire Sprinkler Products in dry systems.

## Material Safety Data Sheet

IPS WELD-ON  
Date Revised: FEB 2000  
Supersedes: FEB 1999

Information on this form is furnished solely for the purpose of compliance with the Occupational Safety and Health Act and shall not be used for any other purpose. IPS Corporation urges the customers receiving this Material Safety Data Sheet to study it carefully to become aware of the hazards, if any, of the product involved. In the interest of safety, you should notify your employees, agents and contractors of the information on this sheet.

### Section I

**Manufacturer's Name:** IPS Corporation  
**Address:** 17109 S. Main St., PO Box 379, Gardena, CA 90248  
**Transportation Emergencies:** CHEMTREC: (800) 424-9300 or  
3 E COMPANY (800) 451-8346  
**Medical Emergencies:** 3 E (24 Hour No.) (800) 451-8346  
**Business:** (310) 898-3300  
**CHEMICAL NAME and FAMILY:** Solvent Cement for CPVC Plastic Pipe  
Mixture of CPVC Resin and Organic Solvents  
**Trade Name:** SPEARS FS-5  
**Formula:** Proprietary

### Section II - Hazardous Ingredients

None of the ingredients below are listed as carcinogens by IARC, NTP or OSHA

Ingredient: Chlorinated Polyvinyl Chloride Resin (CPVC)  
Cas#: NON/HAZ  
ACGIH-TLV: N/A  
OSHA-PEL: N/A  
Ingredient: Tetrahydrofuran (THF)\*\*  
Cas#: 109-99-9  
ACGIH-TLV: 200 PPM  
ACGIH-STEL: 250 PPM  
OSHA-PEL: 200 PPM  
OSHA-STEL: 250 PPM  
DUPONT (A) AEL: 25 PPM  
DUPONT (B) STEL: 75 PPM  
Ingredient: Methyl Ethyl Ketone (MEK)  
Cas#: 78-93-3  
Approx%: 2\*  
ACGIH-TLV: 200 PPM  
ACGIH-STEL: 300 PPM  
OSHA-PEL: 200 PPM  
OSHA-STEL: 300 PPM  
Ingredient: Cyclohexanone  
Cas#: 108-94-1  
ACGIH-TLV: 25 PPM Skin  
OSHA-PEL: 25 PPM Skin  
Ingredient: Acetone  
Cas#: 67-64-1  
ACGIH-TLV: 750 PPM  
ACGIH-STEL: 1000 PPM  
OSHA-PEL: 750 PPM  
OSHA-STEL: 1000 PPM

\*Title III Section 313 Supplier Notification: This product contains toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40CFR372. This information must be included in all MSDS's that are copied and distributed for this material.

(A) Dupont's Acceptable Exposure Limit (AEL) guidelines for 8 hour and 12 hour TWA, (B) Dupont's recommended STEL for 15 minute TWA.

\*\* Information found in a report from the National Toxicology Program (NTP) on an inhalation study in rats and mice suggests that Tetrahydrofuran (THF) can cause tumors in animals. In the study the rats and mice were exposed to THF vapor levels up to 1800 PPM for two years (their lifetime), 6 hours/day, 5 days/week. Test results showed evidence of liver tumors in female mice and kidney tumors in male rats. No evidence of tumors was seen in female rats and male mice. There is no data linking Tetrahydrofuran exposure with cancer in humans.

#### **BULK SHIPPING INFORMATION /CONTAINERS GREATER THAN ONE LITER**

DOT Shipping Name: Adhesive  
DOT Hazard Class: 3  
Identification Number: UN 1133  
Packaging Group: II  
Label Requirement: Flammable Liquid

#### **SHIPPING INFORMATION FOR CONTAINERS LESS THAN ONE LITER**

DOT Shipping Name: Consumer Commodity  
DOT Hazard Class: ORM-D

	<b>HMIS</b>	<b>NFPA</b>	<b>HAZARD RATING</b>
HEALTH:	2	2	0 - MINIMAL
FLAMMABILITY:	3	3	1 - SLIGHT
REACTIVITY:	0	1	2 - MODERATE
PROTECTIVE:			3 - SERIOUS
EQUIPMENT:	H		4 - SEVERE

H = Eye, Hand/Skin, Respiratory Protection and Impermeable Apron

### **Section III - Physical Data**

**Appearance:** Red, medium syrupy liquid  
**Specific Gravity @ 73°F ±3.6° (20°C ± 2°):** Typical 1.0 ± 0.040  
**Vapor Density (Air=1):** 2.49  
**ODOR:** Ethereal  
**VAPOR PRESSURE (mm Hg.):** 143mm Hg. based on first boiling component, THF @ 68°F (20°C)  
**EVAPORATION RATE (BUAC=1):** > 1.0  
**BOILING POINT (°F/°C):** 151°F (67°C) Based on first boiling component: THF  
**PERCENT VOLATILE BY VOLUME (%):** Approx. 70-80%

VOC STATEMENT: VOC as manufactured: 720 Grams/Liter. Maximum VOC emission per SCAQMD Rule 1168, Test Method 316A: 490 Grams/Liter.

### **Section IV Fire and Explosion Hazard Data**

**FLASH POINT:** -4°F (20°C) T.C.C. based on THF  
**FLAMMABLE LIMITS** (Percent by Volume)  
**LEL:** 2.0  
**UEL:** 11.8

**FIRE EXTINGUISHING MEDIA:** Ansul "Purple K" potassium bicarbonate dry chemical, carbon dioxide, National Aer-O-Foam universal alcohol resistant foam, water spray.

**SPECIAL FIRE FIGHTING PROCEDURES:** Evacuate enclosed areas, stay upwind. Close or confined quarters require self-contained breathing apparatus, positive, pressure masks or airline masks. Use water spray to cool containers, to flush spills from source of ignition and to disperse vapors.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Fire hazard because of low flash point and high volatility. Vapors are heavier than air and may travel to source(s) of ignition at or near ground or lower levels and flash back.

## Section V - Health Hazard Data

**PRIMARY ROUTES OF ENTRY:** Inhalation, Skin Contact

EFFECT OF OVEREXPOSURE

**ACCUTE:**

Inhalation: Severe overexposure may result in nausea, dizziness, headache. Can cause drowsiness, irritation of eyes and nasal passages.

Skin Contact: Skin irritant. Liquid contact may remove natural skin oils resulting in skin irritation. Dermatitis may occur with prolonged contact.

Skin Absorption: Prolonged or widespread exposure may result in the absorption of harmful amounts of material.

Eye Contact: Overexposure may result in severe eye injury with corneal or conjunctival inflammation on contact with the liquid. Vapors slightly uncomfortable.

Ingestion: Moderately toxic. May cause nausea, vomiting, diarrhea. May cause mental sluggishness.

**CHRONIC:** Symptoms of respiratory tract irritation and damage to respiratory epithelium were reported in rats exposed to 5000 ppm THF for 90 days. Elevation of SGPT suggests a disturbance in liver function. The NOEL was reported to be 200 ppm.

REPRODUCTIVE EFFECTS: N. AP.  
TERATOGENICITY: N. AP.  
MUTAGENICITY: N. AP.  
EMBRYOTOXICITY: N. AP.  
SENSITIZATION TO PRODUCT: N. AP.  
SYNERGISTIC PRODUCTS: N. AV.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** Individuals with pre-existing diseases of the eyes, skin or respiratory system may have increased susceptibility to the toxicity of excessive exposures.

### EMERGENCY AND FIRST AID PROCEDURES

Inhalation: If overcome by vapors, remove to fresh air and if breathing stopped, give artificial respiration. If breathing is difficult, give oxygen. Call physician.

Eye Contact: Flush eyes with plenty of water for 15 minutes and call a physician.

Skin Contact: Remove contaminated clothing and shoes. Wash skin with plenty of soap and water for at least 15 minutes. If irritation develops, get medical attention.

Ingestion: Give 1 or 2 glasses of water or milk. Do not induce vomiting. Call physician or poison control center immediately.

## Section VI - Reactivity

Stability: Stable

**Conditions to Avoid:** Keep away from heat, sparks, open flame and other sources of ignition.

Incompatibility: (Materials to avoid) Caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates.

Hazardous Decomposition Products: When forced to burn, this product gives out carbon monoxide, carbon dioxide, hydrogen chloride and smoke.

Hazardous Polymerization: Will not occur.

Conditions To Avoid: Keep away from heat, sparks, open flame and other sources of ignition.

## **Section VII - Spill Or Leak Procedures**

Steps To Be Take In Case Material Is Released Or Spilled: Eliminate all ignition sources. Avoid breathing of vapors. Keep liquid out of eyes. Flush with large amount of water. Contain liquid with sand or earth. Absorb with sand or nonflammable absorbent material and transfer into steel drums for recovery or disposal. Prevent liquid from entering drains.

Waste Disposal Method: Follow local, State and Federal regulations. Consult DISPOSAL EXPERT. Can be disposed of by incineration. Excessive quantities should not be permitted to enter drains. Empty containers should be air dried before disposing. Hazardous Waste Code: 214.

## **Section VIII - Special Protection Information**

Respiratory Protection (Specify type): Atmospheric levels should be maintained below established exposure limits contained in Section II. If airborne concentrations exceed those limits, use of a NIOSH approved organic vapor cartridge respirator with full face-piece is recommended. The effectiveness of an air purifying respirator is limited. Use it only for a single short-term exposure. For emergency and other conditions where short-term exposure guidelines may be exceeded, use an approved positive pressure self-contained breathing apparatus.

Ventilation - Use only with adequate ventilation. Provide sufficient ventilation in volume and pattern to keep contaminants below applicable exposure limits set forth in Section II. Use only explosion proof ventilation equipment.

Protective Gloves: PVA coated

Eye Protection: Splash proof chemical goggles

Other Protective Equipment And Hygienic Practices: Impervious apron and a source of running water to flush or wash the eyes and skin in case of contact.

## **Section IX - Special Precautions**

Precautions To Be Take In Handling And Storing: Store in the shade between 40°F - 90°F (5°C - 32.5°C). Keep away from heat, sparks, open flame and other sources of ignition. Avoid prolonged breathing of vapor. Use with adequate ventilation. Avoid contact with eyes, skin and clothing. Train employees on all special handling procedures before they work with this product.

Other Precautions: Follow all precautionary information given on container label, product bulletins and our solvent cementing literature. All material handling equipment should be electrically grounded.

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.











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