



Viking Plastics

BlazeMaster[®] CPVC
Fire Sprinkler Systems

**Installation and
Design Manual**

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SCAN for more info

** BlazeMaster is a registered trademark of The Lubrizol Corporation*

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LIMITED WARRANTY
VIKING PLASTICS CPVC PRODUCTS

VIKING PLASTICS ("Viking Plastics") warrants solely to the original buyer ("Buyer") that its BlazeMaster® Pipe (the "Products") will be free from defects in material and workmanship and will conform to the applicable ASTM standard in effect at the time of production of the Products. Under proper handling, use, service and installation in accordance with applicable standards of the National Fire Protection Association ("NFPA") and/or the standards adopted by any local governmental authority having jurisdiction, the warranty period extends for ten (10) years from the date of shipment to the original buyer. Remedy for breach of this warranty is limited to replacement of, or credit for, the price paid by Buyer for the defective Products, at the sole discretion of Viking Plastics. Viking Plastics shall not be responsible for sprinkler system design errors, or for inaccurate or incomplete information supplied by the Buyer or its employees, agents or representatives.

VIKING PLASTICS EXPRESSLY DISCLAIMS LIABILITY OR OBLIGATION OF ANY KIND OR CHARACTER INCLUDING, WITHOUT LIMITATION, LIABILITY BASED UPON CONTRACT, TORT, STRICT LIABILITY OR UNDER ANY OTHER LEGAL THEORY, FOR ANY LABOR EXPENSE FOR REMOVAL OR REINSTALLATION OF ANY DEFECTIVE PRODUCTS AND/OR ANY INCIDENTAL, INDIRECT, SPECIAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES. THIS LIMITED WARRANTY IS THE ONLY WARRANTY MADE BY VIKING PLASTICS AND IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE WHICH ARE EXPRESSLY DISCLAIMED.

NO STATEMENT, CONDUCT, OR DESCRIPTION BY VIKING PLASTICS OR ANY OF ITS REPRESENTATIVES, IN ADDITION TO OR BEYOND THIS LIMITED WARRANTY, SHALL CONSTITUTE A WARRANTY. THIS LIMITED WARRANTY MAY ONLY BE EXTENDED, ALTERED OR MODIFIED IN WRITING, AND SUCH MODIFICATION MUST BE SIGNED BY AN AUTHORIZED OFFICER OF VIKING PLASTICS.

This Limited Warranty does not apply under any of the following circumstances:

- If the Products are not installed in compliance with the instructions published by Viking Plastics and in accordance with industry-established engineering, installation, operating and maintenance specifications, recommendations, and instructions or are not installed in conformance with all applicable fire and building code requirements.
- If the Products fail due to defect or deficiencies in design, engineering, installation, or operation of the water distribution system of which they are a part.

- If the Products have been the subject of modification, misuse, misapplication, improper maintenance or repair, improper handling and/or storage, damage caused by the fault or negligence of anyone other than Viking Plastics, or any other act or event beyond the control of Viking Plastics.
- If the Products fail due to the freezing of water in the Products.
- If the Products fail due to contact with chemical agents, fire stopping materials, thread sealants, plasticized vinyl products, cutting oils, or other aggressive chemical agents not compatible with CPVC compounds.
- If the Products fail for any reason other than a defect in materials or workmanship or the Products' lack of conformity to the applicable ASTM standard.

All Products alleged to be defective MUST be made available to Viking Plastics, at Buyer's expense, at the following address, for verification, inspection and determination of cause. The Limited Warranty will not apply to any Products for which a defect is claimed unless written NOTICE is mailed to Viking Plastics, at the following address, within thirty (30) days after the date of discovery of any such alleged defect.

Viking Plastics
Attention: Warranty Department
202 Industrial Drive
Huntsville, AL 35811

Viking Plastics does not warrant and cannot accept responsibility for the performance, dimensional accuracy, or compatibility of pipe, solvent weld fittings, gasketed or threaded transitional fittings, or any system component not manufactured by Viking Plastics.

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Introduction

BlazeMaster® CPVC fire sprinkler products produced by Viking Plastics 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. Viking Plastics BlazeMaster® 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. These products also are based on a technology with a continuous and proven service history of more than forty (40) years.

This design manual provides instructions for handling and installing a Viking Plastics BlazeMaster® fire sprinkler system as well as information regarding system design. It is intended as a supplement to basic, fundamental knowledge relating to the installation and/or repair of CPVC fire sprinkler systems. Before commencing installation, a user should fully understand and confirm applicable National Fire Protection Association (NFPA) installation standards; national, state/provincial and local building codes and ordinances; and installation requirements for CPVC fire sprinkler systems.

BlazeMaster® CPVC pipe and fittings carry the markings of Underwriters Laboratories Inc. (UL), either Underwriters Laboratories of Canada (ULC) or Underwriters Laboratories Inc. (C-UL), Factory Mutual (FM) Loss Prevention Certification Board (LPCB), Materials and Equipment Acceptance (MEA) of New York City, and the NSF International (NSF) for use with potable water. Additional international and local jurisdiction certifications may also apply.

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

Viking Plastics BlazeMaster® CPVC fire sprinkler products are approved for use in combination with other listed BlazeMaster® manufacturers' products as well as other listed manufactures' products (see, "Use with Other Manufacturers' Pipes, Fittings, and Solvent Cements" section). However, specific application approvals may not be the same among manufacturers. It is the installer's responsibility to verify suitability of products used in combination according to each manufacturer's installation instructions. Instructions related to the use of specific materials detailed herein are based on the use of products manufactured by Viking Plastics. If products other than Viking Plastics are used, follow the appropriate manufacturer instructions.

Engineering data related to the installation and use of Listed BlazeMaster® CPVC Fire Sprinkler Materials provided in this manual is based on the data available at the time of printing. If products other than Viking Plastics BlazeMaster® pipe made from BlazeMaster® compounds are used, follow the appropriate manufacturer's installation instructions. **Contact Viking Plastics if there are questions on any matters or applications not specifically addressed in this manual.**

This manual is intended for use by specifiers, installers, and users in the selection, design, installation, and inspection of Viking Plastics BlazeMaster® 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 proper system performance and must be carefully read and understood before starting the installation. This manual is not meant as a replacement for formal installer training and is intended for use only by a qualified installer and/or contractor. Viking Plastics expressly disclaims any and all liability for product use or installation in any matter other than expressly stated herein.** If you need additional copies, or if you have any questions about the proper installation and use of these products, contact Viking Plastics, 202 Industrial Drive, Huntsville, AL 35811 or call 877-384-5464. You may also email Viking Plastics at techsvcs@vikingcorp.com.

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Hazard Identification

Definitions for identifying the various hazard levels found in this document 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 and/or death 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 and/or death, 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 specific hazards.

Installer Training Available

Viking Plastics recommends that installers receive proper installation training and that this training is renewed every two (2) years. Training can be arranged by contacting an authorized Viking Plastics BlazeMaster® CPVC fire sprinkler products distributor.

Safety Guidelines for Installation



WARNING

WARNING: USE ONLY RECOMMENDED TOOLS, ACCESSORIES AND COMPONENTS. USE OF IMPROPER TOOLS, ACCESSORIES OR UNAPPROVED SYSTEM COMPONENTS IN CONJUNCTION WITH VIKING PLASTICS CPVC FIRE SPRINKLER PRODUCTS WILL VOID THE WARRANTY AND MAY RESULT IN PROPERTY DAMAGE, PRODUCT DAMAGE, SEVERE PERSONAL INJURY AND/OR DEATH.



WARNING

WARNING: 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 TO ACCOMMODATE PROPER INSTALLATION.



WARNING

WARNING: FOLLOW ALL WORKPLACE SAFETY REQUIREMENTS. WEAR SAFETY GLASSES, HARD HAT, AND SAFETY FOOTWEAR. ALWAYS PRACTICE SAFETY FIRST.

- Prevent back injury. Always practice safe lifting and installation techniques.
- Use only tools specifically designed for CPVC 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.
- 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, immediately rinse with water and wash thoroughly with a waterless, abrasive soap.
- Wear ear protection. Protect your hearing if you are exposed to long periods of very noisy job-site operations.

Material Compatibility

Viking Plastics BlazeMaster® CPVC fire sprinkler products resist attack from a large group of substances that are corrosive to metallic piping. However, care must be taken to avoid contact with substances 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 Viking Plastics before use. For a list designating a selection of both compatible and incompatible products, visit the BLAZEMASTER® FIRE SPRINKLER SYSTEMS web site at www.systemcompatible.com.

For reference purposes, the following label is included with each package of Viking Plastics CPVC products:

NOTICE

NOTICE: This CPVC fire sprinkler product is a Life Safety Assembly and must be treated carefully. Please read the following before any activity which could contact this system:

- **Read and follow the CPVC manufacturer's installation instructions.** Training by an authorized representative is available and is recommended. Proof of training may be required by local authorities.
- **CPVC piping components may be damaged by certain substances used in construction and building maintenance.**
- ONLY system-compatible materials including, but not limited to solvent cements, caulks, sealants, cutting oils and thread pastes as noted by the manufacturer's installation instructions should be used in contact with this system.
- DO NOT expose CPVC products to incompatible substances, such as cutting oils, non-water-based paints, packing oils, traditional pipe thread paste and dope, fungicides, termiticides, insecticides, detergents, building caulks, adhesive tape, solder flux, flexible wire/cable (with special consideration for communications cabling), and non-approved spray foam insulation materials.
- DO NOT expose CPVC products to edible oils, solvents, or glycol-based anti-freeze fluids.
- When combining metallic pipe and fittings with CPVC products in a system, the cutting oil should be removed prior to assembly.
- DO NOT store CPVC products in containers with metal products where they may become damaged or contaminated with packing oils.
- DO NOT handle CPVC products with gloves contaminated with oils (hydrocarbons) or other incompatible materials.

Failure to follow the manufacturer's installation instructions and this notice may cause cracks or fractures to develop in CPVC products, resulting in property damage due to leaks or

flooding. The presence of any visible cracks may require partial or full system replacement. Please contact the manufacturer for additional information.

FOR ADDITIONAL INFORMATION, CONTACT VIKING AT 1-877-384-5464.

Handling & Storage

- Viking Plastics recommends storing CPVC Fire Sprinkler Fittings indoors in their original containers to keep them free from dirt and to help reduce the possibility of damage.
- Viking Plastics recommends storing its BlazeMaster® CPVC Fire Sprinkler Pipe indoors.
- If storing outdoors, the products must be covered with a non-transparent material to prevent exposure to direct ultraviolet light and/or direct sun exposure for long periods.
- Storing CPVC pipe and fittings in intact, original shipping bags and/or boxes will adequately protect the product.
- Store away from steam lines and heat sources.
- CPVC pipe and fittings should be assembled only when temperatures are 50°F (10°C) or greater. If product is handled at very low temperatures, it may be more brittle than usual and should be handled with additional care.
- Piping should be supported in strict compliance with these instructions. If desired, additional support above minimum requirements can be added.



WARNING

WARNING: VIKING PLASTICS BLAZEMASTER® CPVC FIRE SPRINKLER PRODUCTS AND FITTINGS MUST NOT BE SUBJECTED TO PROLONGED SUNLIGHT EXPOSURE. THE USE OF PIPE AND FITTINGS THAT HAVE BEEN DAMAGED DUE TO IMPROPER STORAGE COULD CAUSE PRODUCT DAMAGE, PROPERTY DAMAGE, SERIOUS PERSONAL INJURY AND/OR DEATH.

REASONABLE CARE MUST BE EXERCISED IN HANDLING VIKING PLASTICS BLAZEMASTER® CPVC FIRE SPRINKLER PRODUCTS. DO NOT DROP THE PRODUCTS OR DROP ANYTHING ON THEM. DO NOT DRAG THE PACKAGED OR UNPACKAGED PRODUCTS ACROSS HARD OR ABRASIVE SURFACES. IF IMPROPER HANDLING RESULTS IN SCRATCHES, SPLITS, CUTS, GOUGES OR DAMAGE IN ANY WAY, THE DAMAGED FITTING OR SECTION OF PIPE MUST BE DISCARDED.



WARNING

WARNING: DO NOT INSTALL VIKING PLASTICS BLAZEMASTER® CPVC FIRE SPRINKLER PRODUCTS THAT HAVE BEEN SCRATCHED, SPLIT, CUT, GOUGED OR DAMAGED IN ANY WAY. THE USE OF PIPE AND FITTINGS THAT HAVE BEEN DAMAGED DUE TO IMPROPER HANDLING COULD CAUSE PROPERTY DAMAGE, PRODUCT DAMAGE, SERIOUS PERSONAL INJURY AND/OR DEATH.

One-Step Solvent Cement

One-step solvent cement must be stored out of direct sunlight in an ambient temperature between 40°F (4°C) and 90°F (32°C). If handled properly, 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 federal, state and 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. Viking Plastics CPVC pipe is listed for use with Spears's FS-5, NIBCO's FP-1000, IPEX's BM-5, Hershey's HVC-500, Victaulic Style #899 and Tyco's TFP-500 one-step solvent CPVC cements.



WARNING

WARNING: ONE-STEP SOLVENT CEMENT IS HIGHLY FLAMMABLE. ELIMINATE ALL IGNITION SOURCES. NO SMOKING WHILE USING SUCH CEMENT. IGNITION OF THE CEMENT COULD CAUSE PROPERTY DAMAGE, PRODUCT DAMAGE, SERIOUS PERSONAL INJURY AND/OR DEATH.

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 SHOULD BE WORN AT ALL TIMES. REVIEW THE MATERIAL SAFETY DATA SHEET (MSDS), AND THE IMPORTANT PRODUCT INFORMATION PROVIDED ON THE LABEL OF ONE-STEP SOLVENT CEMENT. FAILURE TO FOLLOW THE ABOVE RECOMMENDATIONS COULD CAUSE PROPERTY DAMAGE, PRODUCT DAMAGE, SERIOUS PERSONAL INJURY AND/OR DEATH.

Where to Use BlazeMaster® Fire Sprinkler Systems

Viking Plastics BlazeMaster® CPVC Fire Sprinkler Products are listed by Underwriters Laboratories Inc. (UL and C-UL), FM Global, and Loss Prevention Certification Board (LPCB) for use in wet pipe fire sprinkler systems. Viking Plastics BlazeMaster® CPVC Fire Sprinkler Products are certified by NSF International for use in potable water systems. For specific listing information not covered in this manual concerning UL, Factory Mutual or NSF International, please contact Viking Plastics.

NOTICE

NOTICE: National Fire Protection Association (NFPA) Standards 13, 13R, 13D, NFPA 24, and national building codes must be referenced for additional, more stringent design and installation requirements in conjunction with this manual and all other national, state/provincial or local codes.



CAUTION

CAUTION: Viking Plastics BlazeMaster® CPVC Fire Sprinkler products are NOT listed for above ground outdoor applications.



WARNING

WARNING: Outdoor installation could result in product failure, property damage, personal injury and/or death and will not be covered under the Viking Plastics BlazeMaster® CPVC Fire Sprinkler products warranty.

NOTICE

NOTICE: Viking Plastics BlazeMaster® CPVC fire sprinkler products are to be used in wet pipe systems only. A wet pipe system is one that contains water or water and glycerin (for freeze protection) and is connected to a water supply system so that the water or water and glycerin solution will discharge immediately when the sprinkler is opened.



WARNING

WARNING: VIKING PLASTICS 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 DAMAGE, PROPERTY DAMAGE AND/OR SEVERE PERSONAL INJURY OR DEATH.

Light Hazard Occupancies

Viking Plastics BlazeMaster® CPVC fire sprinkler products are UL and C-UL Listed for use in: Light Hazard Occupancies as defined

in the National Fire Protection Association Standard for the Installation of Sprinkler Systems, NFPA 13. In accordance with NFPA 13, section 6.3.6.2 (2002, 2007, 2010) and section 3-3.5 (1999), 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 application.

Residential Occupancies

Viking Plastics BlazeMaster® CPVC fire sprinkler products are UL and C-UL Listed for use in: Residential occupancies as defined in the National Fire Protection Association Standard for the Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height, NFPA 13R, and residential occupancies as defined in the National Fire Protection Association 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 (9.5 mm) gypsum wallboard, 1/2 inch (12.7 mm) plywood soffits, or a suspended membrane ceiling with lay-in panels or tiles having a minimum weight of not less than 0.35 lbs/ft² (1.7 kg/m²) 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 (12.7 mm) plywood.

In accordance with the C-UL Listing, the effectiveness of this protection can be impaired if penetrated by large openings such as ventilation grills, except where exhaust fans are connected to metal ducts serving washrooms. Where such penetration is present, individual openings exceeding 0.03 m² but not exceeding 0.71 m² in area must be located so that the distance from the edge of the opening to the nearest sprinkler does not exceed 300 mm. Viking Plastics BlazeMaster® CPVC products shall not be used where such openings exceed 0.71 m² in area. The effect of the presence of non-rated recessed lighting fixtures, public address speakers and other interruptions of the protective membrane has not been investigated and may cause damage to the products and may result in property damage, personal injury and/or death.

Viking Plastics BlazeMaster® CPVC fire sprinkler products must be used in sprinkler systems employing standard response, or quick response sprinklers rated at 225°F (107°C) or lower.

Combustible Concealed Installations

Viking Plastics BlazeMaster® CPVC fire sprinkler products CANNOT be installed exposed in spaces defined by NFPA 13 as combustible concealed areas requiring sprinklers. NFPA 13D and NFPA 13R permit the omission of sprinklers in combustible concealed spaces and Viking Plastics BlazeMaster® CPVC

sprinkler products can be installed in these areas when sprinkling residential occupancies in accordance with these standards.

Exception: In accordance with the UL Listing, specially Listed sprinklers exist that have been tested and are Listed for use with Viking Plastics products in combustible concealed spaces requiring sprinklers. When using Viking Plastics BlazeMaster® products in these applications, always follow the sprinkler manufacturers' installation guidelines.

Exposed Installations

Listed hangers are required for all exposed installations. Viking Plastics BlazeMaster® CPVC fire sprinkler products are UL and C-UL Listed for installation by a qualified installer or contractor without protection (exposed) with the following restrictions:

• **Standard Coverage Sprinklers**

These installations shall be below a smooth, flat, horizontal ceiling construction and require the use of Viking Plastics approved one-step cement. The use of listed hangers for thermoplastic sprinkler piping mounted directly to the ceiling (or wall) is permitted. The resulting clearance between the pipe and ceiling (or wall) resulting from the use of the listed hanger is acceptable.

○ ***Light Hazard Pendent Sprinklers***

Listed quick response, 170 °F (77 °C) maximum temperature rated, pendent sprinklers having deflectors installed within 8 inches (203 mm) from the ceiling. The maximum distance between sprinklers shall not exceed 15 feet (4.57 m). The piping shall be mounted directly to the ceiling.

○ ***Light Hazard Horizontal Sidewall Sprinklers***

Listed quick response, 200 °F (93 °C) maximum temperature rated, horizontal sidewall sprinklers having deflectors installed within 12 inches (304 mm) from the ceiling and within 6 inches (152 mm) from the sidewall. The maximum distance between sprinklers shall not exceed 14 feet (4.27 m). The piping shall be mounted directly to the sidewall.

○ ***Light Hazard Upright Sprinklers***

Listed quick response, 155 °F (68 °C) maximum temperature rated, upright sprinklers having deflectors installed within 4 inches (101 mm) from the ceiling and a maximum distance between sprinklers shall not exceed 15 feet (4.57 m). The maximum distance from the ceiling to the centerline of the main run of pipe shall not exceed 7-1/2 inches (190 mm) and the distance from the centerline of a sprinkler to the closest hanger shall be 3 inches (76 mm).

- **Light Hazard Extended Coverage Sprinklers**

These installations shall be below a smooth, flat, horizontal ceiling construction, are limited to unobstructed construction, require the use of Schedule 80 fittings for sizes 1-1/2 inches and greater, and require the use of Viking Plastics approved one-step solvent cement. For pendent sprinkler installations, the piping shall be mounted directly to the ceiling. For horizontal sidewall sprinkler installations, the piping shall be mounted directly to the sidewall. The use of listed surface-mount hangers for thermoplastic sprinkler piping mounted directly to the ceiling (or wall) is permitted. The resulting clearance between the pipe and ceiling (or wall) resulting from the use of the listed hanger is acceptable.

For Exposed BlazeMaster® Applications (Use in unfinished basements, system risers, and mechanical tees and crosses are not included in this table)							
Sprinkler Configuration	Type of Sprinkler	Spacing Between Sprinklers (ft.)	Maximum Deflector Distance from Ceiling (in.)	Maximum Deflector Distance from Sidewall (in.)	Maximum Sprinkler Temp. Rating (°F)	Application Density (gpm/sq. ft.)	Additional Limitations
Extended Coverage Sprinklers							
Pendent	Light Hazard, Quick Response	=20 8		n/a	155	0.10	
Horizontal Sidewall	Light Hazard, Quick Response	=16 12		6	175	0.10	
		=18 12		6	165	0.10	
	Light Hazard, Quick Response Listed Reliable Sprinkler (SIN RA036Z)	=24	12	6	155	flow rate of 40 gpm and maximum coverage area of 24' x 14'	
Residential Sprinklers							
Pendent R	Residential	=15 per Sprinkler Listing		n/a	170	per Sprinkler Listing	
		=20		n/a	155	0.10	
Horizontal Sidewall	Residential	=14 per Sprinkler Listing		per Sprinkler Listing	200	per Sprinkler Listing	
		=18 12		6	165	0.10	
Standard Coverage Sprinklers							
Pendent Q	Quick Response	=15	8	n/a	170	0.10	
Horizontal Sidewall	Quick Response	=14	12	6	200	0.10	
Upright	Quick Response	=15	4 in addition the distance from the ceiling to centerline at pipe must be a maximum at 7 1/2 inches		155	0.10	a hanger must be installed 3 inches from the centerline of the sprinkler head

- **Light Hazard Extended Coverage Pendent Sprinklers**

Listed light hazard, extended coverage, quick response, 155 °F (68 °C) maximum temperature rated, pendent sprinklers having deflectors installed within 8 inches (203 mm) from the ceiling, a maximum distance between sprinklers not to exceed 20 feet (6.09 m), and an application density not less than 0.10 gpm/ft² (4.08 mm/min).

- **Light Hazard Extended Coverage Horizontal Sidewall Sprinklers**

Listed light hazard, extended coverage, quick response, 165 °F (74 °C) maximum temperature rated, horizontal sidewall sprinklers having deflectors installed within 12 inches (304 mm) from the ceiling and within 6 inches (152 mm) from the sidewall, a maximum distance between sprinklers not to exceed 18 feet (5.48 m), and an

application density not less than 0.10 gpm/ft² (4.08 mm/min).

Listed light hazard, extended coverage, quick-response, 175 °F (79 °C) maximum temperature rated, horizontal sidewall sprinklers having deflectors installed within 12 inches (304 mm) from the ceiling and within 6 inches (152 mm) from the sidewall, a maximum distance between sprinklers not to exceed 16 feet (4.87 m), and an application density not less than 0.10 gpm/ft² (4.08 mm/min).

Listed horizontal sidewall, light hazard, quick response extended coverage sprinklers, 155 °F (68 °C) maximum temperature rating, manufactured by Reliable Automatic Sprinkler Co. Inc., SIN RA0362 having deflectors installed within 12 inches (30 cm) from the ceiling and within 6 inches (15 cm) from the sidewall and a maximum distance between sprinklers not to exceed 24 feet (7.31 m) with a flow not less than 40 gal/min (152 L/min) per sprinkler.

- **Residential**

These installations shall be below a smooth, flat, horizontal ceiling construction, are limited to the unobstructed construction, require the use of Schedule 80 fittings for sizes 1-1/2 inches and greater, and require the use of Viking Plastics approved one-step solvent cement. For pendent sprinkler installations, the piping shall be mounted directly to the ceiling. For horizontal sidewall sprinkler installations, the piping shall be mounted directly to the sidewall. The use of listed surface-mount hangers for thermoplastic sprinkler piping mounted directly to the ceiling (or wall) is permitted. The resulting clearance between the pipe and ceiling (or wall) resulting from the use of the listed hanger is acceptable.

- **Residential Pendent Sprinklers with maximum lateral distance between sprinklers ≤ 15 feet (4.57 m)**

Listed residential pendent 170 °F (77 °C) maximum temperature rated sprinklers with deflectors of sprinklers installed in accordance with their listing and not exceeding 8 inches (203 mm) from the ceiling. The demand for the sprinklers shall be the minimum flow rates indicated in the individual listings.

- **Residential Pendent Sprinklers with lateral distance between sprinklers > 15 feet (4.57 m) but ≤ 20 feet (6.09 m)**

Listed residential pendent 155 °F (68 °C) maximum temperature rated sprinklers with deflectors of sprinklers installed in accordance with their listing and not exceeding 8 inches (203 mm) from the ceiling. The demand for the sprinklers shall be the greater of either the minimum flow rates indicated in the individual listing or the calculated flow rate based on delivering a minimum of

0.10 gpm/sq ft over the design area in accordance with the provisions of NFPA 13 section 8.5.2.1 (2002, 2007, 2010).

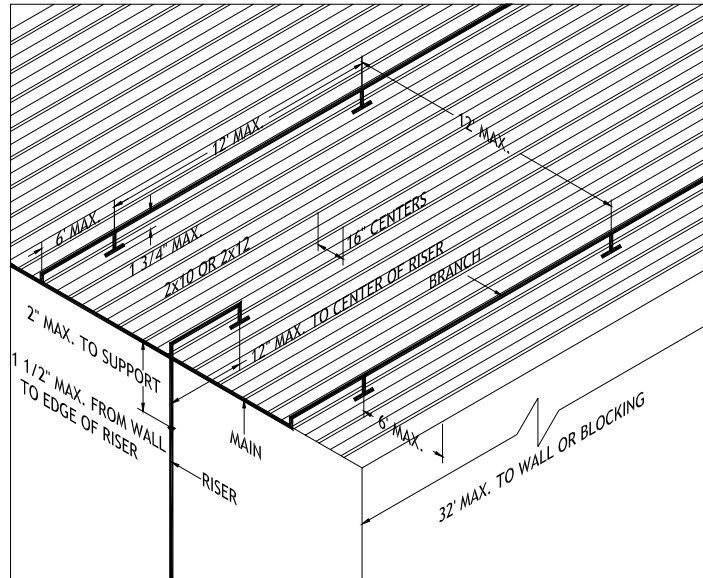
- **Residential Horizontal Sidewall Sprinklers with maximum lateral distance between sprinklers \leq 14 feet (4.26 m)**
Listed residential horizontal sidewall 200 °F (93 °C) maximum temperature rated sprinklers with deflectors of sprinklers located in accordance with their listing. The demand for the sprinklers shall be the minimum flow rates indicated in the individual listings.
- **Residential Horizontal Sidewall Sprinklers with lateral distance between sprinklers $>$ 14 feet (4.26 m) but \leq 18 feet (5.48 m)**
Listed residential horizontal sidewall 165 °F (74 °C) maximum temperature rated sprinklers installed with deflectors of sprinklers up to 12 inches (304 mm) down from the ceiling and within 6 inches (152 mm) of the side wall. The demand for the sprinklers shall be the greater of either the minimum flow rates indicated in the individual listing or the calculated flow rate based on delivering a minimum of 0.10 gpm/sq ft over the design area in accordance with the provisions of NFPA 13 section 8.5.2.1 (2002, 2007, 2010). The maximum sprinkler area of coverage shall not exceed 18 feet by 18 feet.

Unfinished Basements

Viking Plastics BlazeMaster® CPVC fire sprinkler products are UL and C-UL Listed for installation by a qualified installer or contractor without protection (exposed) in unfinished basements in accordance with NFPA 13D when subject to the following additional limitations:

1. The ceiling shall be horizontal and constructed with nominal 2 inch x 10 inch solid wood joists on 16 inch (40.6 cm) centers.
OR
The ceiling shall be horizontal and constructed with nominal 2 inch x 12 inch solid wood joists on 16 inch (40.6 cm) centers. When installing Viking Plastics BlazeMaster® CPVC products in conjunction with 2 inch x 12 inch solid wood joists, the maximum system working pressure under flowing conditions shall not exceed 100 psi (690 kPa) and the maximum system working pressure under static (non-flowing) conditions shall not exceed 175 psi (1207 kPa).
2. The distance from the floor to the bottom of the solid wood joists shall be between 7 and 8 feet (2.14 and 2.43 m).
3. Listed residential pendent sprinklers with a maximum temperature rating of 155°F (68°C) and a minimum K-factor

of 3.0 shall be used for this type of installation. The maximum sprinkler spacing shall not exceed 12 feet (3.65 m). The system is to be designed based upon the Listed flows for the sprinkler selected, except that the flow for a single sprinkler or for multiple sprinklers flowing is to be not less than 11 gal/min (41.64 liter/min) per sprinkler. The sprinklers are to be installed with their deflectors a maximum of 1-3/4 inch (4.4 cm) below the bottom of the solid wood joists in anticipation of future installation of a finished ceiling. (Reference NFPA 13D.)



**Basement Installation with
Center Wall Riser with Main at Wall**

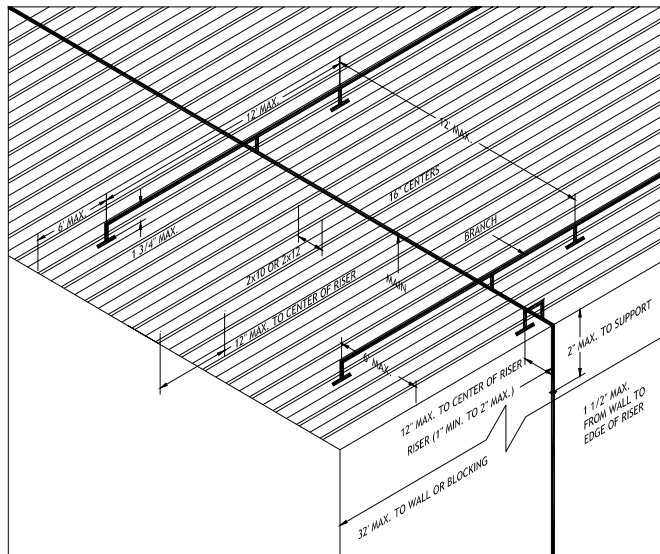
4. All system mains shall be run perpendicular to the joists. All branch lines shall be run parallel to the joists. Schedule 80 fittings in the 1-1/2 inch (40 mm) and larger size shall be used.
5. All solvent cement joints shall be made with Viking Plastics approved one-step solvent cement.
6. When the total protected area exceeds 1,000 square feet, blocking shall be utilized to divide the area into individual compartments not exceeding 1,000 square feet. The maximum length along the joist shall not exceed 32 feet (9.75 m). When the length exceeds 32 feet (9.75 m), blocking shall be utilized. The blocking shall be constructed of minimum 1/2 inch (12.7 mm) plywood and shall be the full depth of the wood joists. It is acceptable for items such as piping, wires, ducts, etc. to penetrate the blocking. The gap between the item penetrating the blocking and the blocking should be minimized. For installations where the gap exceeds 1/4 inch

(6 mm), the gap shall be filled with insulation, caulking, or other suitable material.

- When installing BlazeMaster® CPVC pipe and fittings perpendicular (system mains) to the solid wood joists, Listed support devices for thermoplastic sprinkler piping or other Listed support devices shall be used, which mount the piping directly to the bottom of the solid wood joists. As an alternative to mounting the pipe and fittings below the solid wood joists, it is also acceptable to cut holes in the joists at or below the center of the depth of the joist for support. The holes should be oversized to allow for movement and located to not impair the structural integrity of the joists.

 **CAUTION**

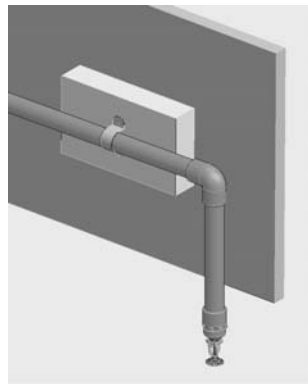
CAUTION: When drilling holes in the solid wood joists, the structural integrity must be maintained. Consult the Authority Having Jurisdiction (AHJ) or building code for requirements.



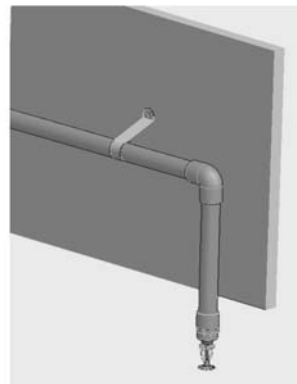
**Basement Installation with
Center Wall Riser with Center Room Main**

- When installing BlazeMaster® CPVC pipe and fittings parallel (branch lines) to the solid wood joists, the pipe and fittings shall be installed in the cavity below the bottom of the ceiling and above the bottom of the joist. The branch lines shall be located at or below the center of the depth of the solid wood joist. The pipe shall be installed utilizing Listed support devices for thermoplastic sprinkler piping or other Listed support devices, which mount the piping directly to nominal 2 inch wood blocking or Listed support devices for thermoplastic

sprinkler piping, which offset the pipe a nominal distance of 1-1/2 inch (40 mm) from the solid wood joists.

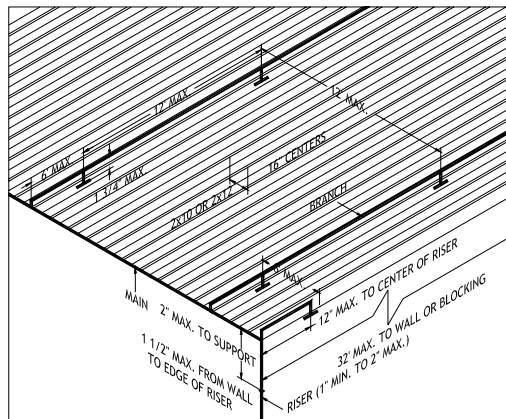
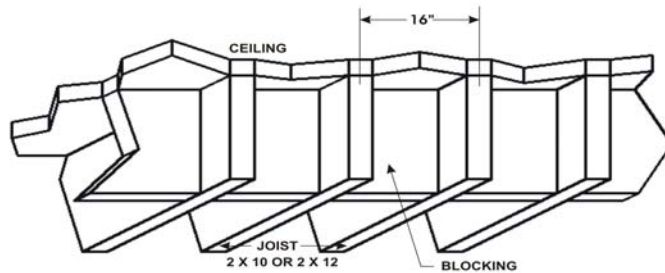


Branches Supported with Blocking



Branches Supported with Hangers

Use of BlazeMaster® CPVC pipe and fittings is limited to basements where the quantity and combustibility of contents is low and fires with relatively low rates of heat release are expected.



Basement Installation with Riser in Corner

Return Air Plenum

Viking Plastics BlazeMaster® 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. In accordance with the UL and C-UL Listing, Viking Plastics BlazeMaster® CPVC fire sprinkler products may be installed in the plenum adjacent to, but not over, openings in the ceiling such as ventilation grills and require the use of Schedule 80 fittings in the 1-1/2 inch (40 mm) and larger size.

Garage Installations

Viking Plastics BlazeMaster® CPVC fire sprinkler products are UL Listed for installation by a qualified installer or contractor in garages requiring sprinklers, as defined in NFPA 13R, with the following requirements:

1. Minimum protection consisting of either one layer of 3/8 inch (9.5 mm) thick gypsum or 1/2 inch (12.7 mm) thick plywood shall be provided.
2. Listed pendent or sidewall sprinklers with a maximum temperature rating of 225°F (107°C) shall be used.
3. All sprinklers shall be installed per the manufacturer's published installation instructions.
4. The system must be installed per the requirements of NFPA 13R and these installation instructions.

Ambient Temperature Limitations

Viking Plastics BlazeMaster® 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).

High Temperature Areas

Viking Plastics BlazeMaster® 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.



CAUTION

CAUTION: DO NOT install Viking Plastics BlazeMaster® CPVC fire sprinkler products in areas where the ambient temperature exceeds 150°F (65°C) without adequate ventilation or compatible insulation around the product to maintain a cooler environment. Installation in areas where the ambient temperature exceeds

150°F (65°C) can cause damage to the CPVC sprinkler system and may result in property damage, personal injury and/or death.

Heat Sources & Open Ceiling Areas

Piping systems using Viking Plastics BlazeMaster® 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 shall not be positioned directly over open ventilation grills. During remodeling or ceiling repair, appropriate precautions shall be implemented to properly protect the piping.

Cold Temperature Areas

Viking Plastics BlazeMaster® 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 Viking Plastics BlazeMaster® CPVC Fire Sprinkler products.

Attention must be given to local insulating techniques and codes that require a particular method. Since very cold weather will make Viking Plastics BlazeMaster® CPVC Fire Sprinkler products more susceptible to damage, extra care should be taken to avoid rough handling or impact to these products.



WARNING

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 VIKING PLASTICS BLAZEMASTER® CPVC FIRE SPRINKLER PRODUCTS. REFER TO NFFA 13, NFFA 13R, NFFA 13D AND CONSULT THE LOCAL AUTHORITY HAVING JURISDICTION BEFORE USING GLYCERIN SOLUTIONS IN FIRE SPRINKLER APPLICATIONS. AN INACTIVE FIRE SPRINKLER SYSTEM CAN RESULT IN PROPERTY DAMAGE, PERSONAL INJURY, AND/OR DEATH.



WARNING

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 AND

**MAY RESULT IN PROPERTY DAMAGE, PERSONAL INJURY,
AND/OR DEATH.**



WARNING

WARNING: MANUFACTURED PREMIXED GLYCERIN SOLUTIONS USED SHALL CONFORM TO NFPA TIA 10-2 PREMIX ANTIFREEZE SOLUTION (GLYCERIN) ISSUED MARCH 1, 2011 WITH AN EFFECTIVE DATE OF MARCH 21, 2011 IN ACCORDANCE WITH NFPA 13, 13D, AND 13R (2010 FOR ALL).

Pipe Volume

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

Nominal Size in Inches (Metric)	Gallons per Foot of Pipe	Liters per Meter of Pipe
3/4" (20 mm)	0.031 0.38	5
1" (25 mm)	0.049 0.60	9
1-1/4" (32 mm)	0.079 0.98	1
1-1/2" (40 mm)	0.104 1.29	2
2" (50 mm)	0.164 2.03	7
2-1/2" (65 mm)	0.240 2.98	1
3" (80 mm)	0.355 4.40	9

NOTE: The "gallons per foot" column can be used for calculations when adding a manufactured premixed glycerin solution to the piping system for freeze protection.

NOTICE

NOTICE: All fire protection systems winterized with a manufactured premix glycerin solution must conform to local, state, and federal requirements, including NFPA regulations. Manufactured premix glycerin-based solutions are the only antifreeze solutions recommended for use.

Pressure Rating

Viking Plastics BlazeMaster® products of nominal sizes 3/4 inch – 3 inch (20 – 80 mm) are rated for continuous service of 175 psi (1207 kPa) at 150°F (65°C).

Fire Sprinkler System Risers

Viking Plastics BlazeMaster® CPVC products may be installed by a qualified installer or contractor as system risers when subject to the following additional limitations:

1. Viking Plastics BlazeMaster® CPVC products may be used as system risers in accordance with NFPA 13 light hazard, NFPA 13D, and 13R when installed protected (concealed). The minimum protection shall consist of either one layer of 3/8 inch (9.5 mm) thick gypsum wallboard or 1/2 inch (12.7 mm) thick plywood.
2. Viking Plastics BlazeMaster® CPVC products may be used as system risers in accordance with NFPA 13D and 13R when installed without protection (exposed). When installed exposed, the following limitations shall apply:

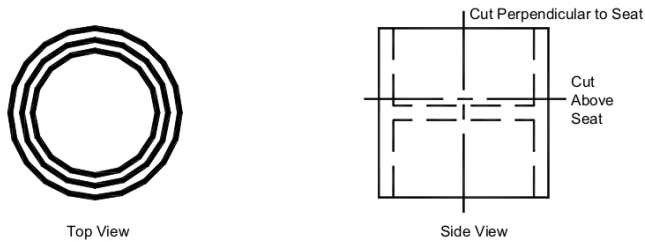
- (a) The riser shall be installed below a smooth, flat, horizontal ceiling construction. A Listed residential pendent sprinkler shall be installed with its deflector at the distance from the ceiling specified in the sprinkler Listing.

OR

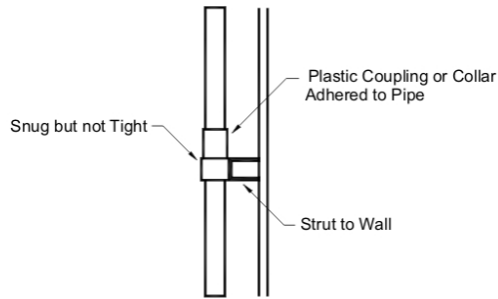
The riser shall be installed below a horizontal unfinished basement ceiling (in accordance with NFPA 13D) constructed with nominal 2 inch x 10 inch or nominal 2 inch x 12 inch exposed solid wood joists on 16 inch (40.6 cm) centers. A Listed residential pendent sprinkler shall be installed with its deflector a maximum of 1-3/4 inch (4.4 cm) below the bottom of the solid wood joist in anticipation of future installation of a finished ceiling.

- When installing BlazeMaster® CPVC pipe and fittings in conjunction with 2 inch x 12 inch solid wood joists, the maximum system working pressure under flowing conditions shall not exceed 100 psi (690 kPa) and the maximum system working pressure under static (non-flowing) conditions shall not exceed 175 psi (1207 kPa).
- b) A Listed residential pendent sprinkler having a maximum temperature rating of 155°F (68°C) and a minimum K-factor of 3.0 shall be installed at a maximum horizontal distance of 12 inches (30 cm) from the centerline of the riser. The system shall be designed based upon the Listed flows for the sprinkler selected, except that the flow for a single sprinkler or for multiple sprinklers flowing shall not be less than 11 gal/min (41.64 liter/min) per sprinkler.
 - c) The riser shall be supported vertically within 2 feet (.6 m) of the ceiling or bottom of the joist.

- d) The minimum riser pipe diameter shall be 1 inch (25 mm) and the maximum riser diameter shall be 2 inch (50 mm). Schedule 80 fittings for riser sizes 1-1/2 inch (40 mm) and larger shall be used.
 - e) The maximum distance between the wall(s) and the outside surface of the riser pipe shall be 1-1/2 inch (40 mm).
 - f) All solvent cement joints shall be made with Viking Plastics approved one-step solvent cement.
3. The system shall be installed per the requirements of NFPA 13, Support of Risers.
 4. Viking Plastics BlazeMaster® CPVC products shall be installed per the manufacturer's installation and design manual.
 5. Risers shall be supported by pipe clamps or by hangers located on the horizontal connection close to the riser. Only Listed hangers and clamps shall be used.
 6. Vertical lines must be supported at intervals, described in 7 & 8 below, to avoid placing excessive load on a fitting at the lower end. Use riser clamps or double bolt pipe clamps Listed for this service. The clamps shall not exert compressive stresses on the pipe. If possible, the 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 adhered to the pipe as a bearing support such that the shoulder of the fitting rests on the clamp. Follow the manufacturer's recommended cure time.



Field Modification for Riser Collar for Vertical Use



Coupling Modification for Riser Collar

The above illustration shows the recommended method for securing Viking Plastics BlazeMaster® Pipe vertically. Place clamp below shoulder of fitting.

NOTICE

NOTICE: Modified riser collar shall only be used to provide support to the riser and shall not be used to join pieces of pipe together. Use of a modified riser collar to join pipe together may result in property damage.

7. NOTICE : DO NOT use riser clamps that squeeze the pipe and depend on compression of the pipe to support the weight. Improper installation techniques may result in product failure and/or property damage.
8. NOTICE : Hangers and straps shall not compress, distort, cut or abrade the piping and shall allow for free movement of the pipe to allow for thermal expansion and contraction. Improper installation techniques may result in product failure and/or property damage.
9. Maintain vertical piping in straight alignment with supports at each floor level, or at 10 feet (3.05 m) intervals, whichever is less.
10. CPVC risers in vertical shafts or in buildings with ceilings over 25 feet (7.62 m) shall be aligned straightly and supported at each floor level, or at 10 feet (3.05 m) intervals, whichever is less.

Underground Water Pressure Service

Both pipe and fittings may be used in underground water pressure service installations per the following requirements:

1. ASTM D 2774, Standard Recommended Practice for Underground Installation of Thermoplastic Pressure Piping,

2. ASTM F 645, Standard Guide for Selection, Design and Installation of Thermoplastic Water Pressure Piping Systems, and
3. The system shall be installed per the requirements of NFPA 24.
4. BlazeMaster® CPVC sprinkler pipe and fittings shall be installed per the manufacturer's installation instructions and this design manual.

Thrust Blocking

If thrust blocks are utilized, they should be designed per NFPA 24, Section 10.8.2 (2002, 2007, 2010). Note: BlazeMaster® fire sprinkler systems utilize a solvent cement joining method. As such, thrust blocks are not required with BlazeMaster® CPVC pipe and fittings in underground water pressure service. Reference NFPA 24, Section A.10.8.1.1 (2002, 2007, 2010).

Trenching

The trench should be of adequate width to allow convenient installation, while at the same time being as narrow as possible. Minimum trench widths may be utilized by joining pipe outside of the trench and lowering it into the trench after adequate joint strength has been achieved. (Note: Refer to the recommended set and cure time tables for solvent cement joints). Trench widths will have to be wider where pipe is joined in the trench or where thermal expansion and contraction is a factor. See section titled "Snaking of Pipe".

- Water-filled pipe should be buried at least 12 inches (305 mm) below the maximum expected frost line.
- It is recommended that BlazeMaster® piping be run within a metal or concrete casing when it is installed beneath surfaces that are subject to heavy-weight or constant traffic such as roadways and railroad tracks.

The trench bottom should be continuous, relatively smooth and free of rocks. Where ledge rock, hardpan or boulders are encountered, it is necessary to protect the pipe from damage. Use a minimum of 4 inches (102 mm) of clean soil or sand as referenced in ASTM D 2774.

Sufficient cover must be maintained to keep external stress levels below acceptable design stress. Reliability and safety of service are of major importance in determining minimum cover. Local, state and national codes may also govern.

Snaking of Pipe

After BlazeMaster® CPVC pipe has been solvent welded, it is advisable to snake the pipe according to the below recommendations beside the trench during its required curing

time. **BE ESPECIALLY CAREFUL NOT TO APPLY ANY STRESS THAT WILL DISTURB THE UNDRIED JOINT.** This snaking is necessary in order to allow for any anticipated thermal movement that could take place in the newly joined pipeline.

Snaking is particularly necessary on the lengths that have been solvent welded during the late afternoon of a hot day, because their drying time will extend through the cool of the night when thermal contraction of the pipe could stress the joints to the point of pull out. This snaking is also especially necessary with pipe that is laid in its trench (necessitating wider trenches than recommended) and is back-filled with cool earth before the joints are thoroughly dry.

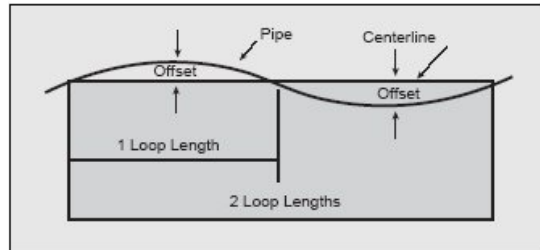


Figure 3: Snaking of Pipe

Backfilling

Note: Underground pipe shall be thoroughly inspected and tested for leaks prior to backfilling. Backfill material should be placed over pipe sections only, leaving the joints exposed during testing.

Ideally, backfilling should only be done early in the morning during hot weather when the line is fully contracted and there is no chance of insufficiently dried joints being subjected to contraction stresses.

The pipe should be uniformly and continuously supported over its entire length on firm, stable material. Blocking should not be used to change pipe grade or to intermittently support pipe across excavated sections.

Pipe is installed in a wide range of sub-soils. These soils should not only be stable, but applied in such a manner as to physically shield the pipe from damage. Attention should be given to local pipe laying experience that may indicate particular pipe bedding problems.

Backfill materials free of rocks with a particle size of 1/2 inch (12.7 mm) or less should be used to surround the pipe with 6 inch (152 mm) to 8 inch (203 mm) of cover. It should be placed in layers. Each soil layer should be sufficiently compacted to uniformly develop lateral passive soil forces during the backfill operation. It may be advisable to have the pipe under hydraulic pressure, 15 to 25 psi (103 – 172 kPa) during the backfilling.

Loop Offset in Inches (in) for Contraction

Maximum Temperature Variation, °F, Between Time of Solvent Welding and Final Use										
Loop Length	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
20 Ft	3"	4"	5"	5"	6"	6"	7"	7"	8"	8"
50 Ft	7"	9"	11"	13"	14"	16"	17"	18"	19"	20"
100 Ft	13"	18"	22"	26"	29"	32"	35"	37"	40"	42"

Loop Offset in Millimeters (mm) for Contraction

Maximum Temperature Variation, °C, Between Time of Solvent Welding and Final Use										
Loop Length	5.5°	11.1°	16.7°	22.2°	27.8°	33.3°	38.9°	44.4°	50°	55.6°
6.1 Meters	76.2	102	127	127	152	152	178	178	203	203
15.24 Meters	178	229	279	330	356	405	432	457	483	508
30.28 Meters	330	457	559	660	737	813	889	940	1016	1067

Vibratory methods are preferred when compacting sand or gravel. Best results are obtained when the soils are in a nearly saturated condition. Where water flooding is used, the initial backfill should be sufficient to insure complete coverage of the pipe. Additional material should not be added until the water-flooded backfill is firm enough to walk on. Care should be taken to avoid floating the pipe.

Sand and gravel containing a significant proportion of fine-grained material, such as silt and clay, should be compacted by hand or, preferably by mechanical tamper. The remainder of the backfill should be placed and spread in approximately uniform layers in such a manner as to fill the trench completely so that there will be no unfilled spaces under or about the rocks or lumps of earth in the backfill. Large or sharp rocks, frozen clods and other debris greater than 3 inch (76 mm) in diameter should be removed. Rolling equipment or heavy tampers should only be used to consolidate the final backfill.

Low Pressure Dry Sprinkler Systems

Viking Plastics BlazeMaster® pipe is Listed by UL for use in dry pipe sprinkler systems where the pressure does not exceed 15 psi and the ambient temperature is above -20°F. The dry system is to be installed in accordance with NFPA 13D, *Standard for*

Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes.

When air is used in dry pipe sprinkler systems that utilize BlazeMaster® CPVC pipe and fittings, there must be no residual oil in the compressed air. The types of oil used in this application may be incompatible with CPVC. If the oil is not removed from the compressed air, there is the risk that the oil may be incompatible with CPVC. In such situations, over time the CPVC pipe or fittings may fail due to this incompatibility. The removal of oil from the compressed air is beneficial from several other standpoints. Oil-laden air contaminates pneumatic systems, fouls critical instrumentation orifices, and produces unsafe environmental condensate. There are currently a variety of methods to remove the oil from compressed air.

The dry pipe sprinkler system must be designed to provide pressure relief when the system pressure exceeds 15 psi. As an alternative to this requirement, the system may be equipped with an alarm that sounds when the pressure exceeds 15 psi.

Factory Mutual Approvals

Viking Plastics BlazeMaster® CPVC fire sprinkler products are approved by Factory Mutual for use in unexposed installations when installed by a qualified installer or contractor.

One method approved for Factory Mutual (FM) insured properties is to install the BlazeMaster® CPVC pipe protected by a permanent, non-removable fire-resistant barrier. As an alternative to the protection of a permanent, non-removable barrier, Factory Mutual has approved the use of BlazeMaster® CPVC pipe in combination with the Soffi-Steel™ covering system. Soffi-Steel™ is manufactured by Grice Engineering.

In Factory Mutual insured properties, BlazeMaster® CPVC pipe and fittings are permitted to be installed exposed (without protection) when the following conditions are met:

- The occupancy classification must be Miscellaneous Non-manufacturing as defined in FM Data Sheet 3-26, *Fire protection Water Demands for Non-storage Sprinklered Properties*, Table 2, section L.
- Only wet pipe sprinkler systems are to be used with BlazeMaster® pipe and fittings.
- Sprinklers must have quick response thermal sensing elements.

Note: Where piping is installed above drop-in ceiling tiles, the piping shall be considered exposed.

Use of this pipe is excluded in areas where seismic protection is required.

The design and installation details are as follows:

- 1) Occupancy must be per Data Sheet 3-26, Table 2, Section L, with smooth, flat horizontal ceilings, a maximum ceiling height of 10 feet (3 m), and other installation details per FM Data Sheet 2-0, *Installation of Sprinkler Systems*. Examples of these occupancies include apartments, restaurants, schools, hospitals, libraries, offices, etc.
- 2) The following FM Approved sprinkler heads must be used:
 - a) Extended coverage light hazard (ECLH) control mode specific application sprinklers with minimum flow or pressure established for the sprinkler as covered in Data Sheet 2-0.
 - b) Quick response control mode density area sprinklers with a minimum density of 0.1 gpm/ft² (4 mm/min).
 - c) Residential sprinklers with a minimum 0.1 gpm/ft² (4 mm/min).

Note: The EC-25 extended coverage control mode density area sprinkler is excluded.

For extended coverage light hazard sprinklers, locate the sprinklers as recommended in Data Sheet 2-0. For quick response, non-extended coverage sprinklers, locate the sprinklers so the deflectors are no more than 8 in. (100 mm) below the ceiling. For residential sprinklers, locate the sprinklers per the manufacturer's instructions.

- 3) BlazeMaster[®] fire sprinkler products may be used exposed as a vertical riser. In this installation, there needs to be a sprinkler (of the same type as in the area being protected) located adjacent to and no further than 1 foot (0.3 m) from the riser. The design flow is the same as for the other sprinklers; however, this sprinkler cannot be used as part of the design area, however, its flow must be included in the total hydraulic design.

Fire-rated, non-removable ceilings are not required.

NSF International

Viking Plastics BlazeMaster[®] CPVC fire sprinkler products are listed by NSF for potable water applications. These products comply with ANSI/NSF Standard 61 for health effects and ANSI/NSF 14.

ASTM Standards

Viking Plastics CPVC Fire Sprinkler Pipe products conform to the requirements of ASTM Standard F-442.

The Loss Prevention Council

Use of Viking Plastics Blazemaster® CPVC Fire Sprinkler Systems in accordance with The Loss Prevention Council (LPC) Section 21.1: Part 5 "List of Approved Fire and Security Products and Services" and Section 5 of BS 5306: Part II

The Loss Prevention Certification Board (LPCB) Listing is as follows:

1. The 'scope of use' of plastic pipe should be agreed between the purchaser, authority having jurisdiction, and/or insurer.
2. Use of plastic pipe and fittings is subject to water authority agreement for the territory concerned.
3. LPCB Approved quick response sprinklers shall be used with exposed (i.e. fire exposure) plastic pipe and fittings.
4. Plastic pipe and fittings are suitable for use only with wet pipe systems.
5. Care should be exercised to ensure that joints are adequately cured, in accordance with the manufacturer's installation instructions, prior to pressurization.
6. Plastic pipe and fittings shall not be installed outdoors.
7. Where plastic pipe and fittings are exposed (i.e. fire exposure), the system shall be installed close to a flat ceiling construction.
8. 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.

The Loss Prevention Certification Board listing applies to Light Hazard Classifications B.S. 5306: Part 2, Section two, paragraph 5.2 which fall within the scope of NFPA 13, 13R and 13D.

In addition, BlazeMaster® Fire Sprinkler Systems can be installed in certain ordinary classification (BS 5306: Part 2, Section two, paragraph 5.3) such as offices, retail shops and department stores when installed in accordance with Section 21.1: Part 5 of LPC "List of Approved Fire and Security Products and Services".

BlazeMaster® pipe and fittings should not be used in high hazard applications (BS 5306: Part 2, Section two, paragraph 5.4) and ordinary hazard applications where the fuel load or rate of heat release is high, such as boiler rooms, kitchens, manufacturing areas, and certain warehouse applications.

Penetrating Fire-Rated Walls & Partitions

Before beginning installation, 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.

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

Viking Plastics Blazemaster® CPVC fire sprinkler products are UL and C-UL Listed for use in systems containing other manufacturers' BlazeMaster® CPVC products Listed in accordance with the appropriate US and/or Canadian requirements.

NOTICE

NOTICE: While Viking Plastics Blazemaster® CPVC fire sprinkler products are UL Listed for use in combination with other listed manufacturers' products, specific application approvals may not be the same among manufacturers. It is the installer's responsibility to verify suitability of products used in combination according to each manufacturer's installation instructions. Contact Viking Plastics if you have questions on any application not addressed in this manual.

Viking Plastics approved one-step solvent cement can be used provided that the assembly and curing instructions referenced in this manual are followed. The one-step process eliminates the need for the primer application, as the cement itself provides adequate softening of the joining surfaces. This joining method simplifies installation by reducing labor and offers faster curing times prior to the pressure testing in most cases. **Note: Follow appropriate cure times for the solvent cement chosen.**

Installation & Joining

Use Viking Plastics approved CPVC one-step solvent cements referenced in "One-Step Solvent Cement" section on page 11 of this manual.

One-step 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

WARNING: BEFORE ASSEMBLING ANY VIKING PLASTICS BLAZEMASTER® CPVC FIRE SPRINKLER PRODUCTS, INSTALLERS MUST INSPECT ALL COMPONENTS FOR MANUFACTURING DEFECTS, AND 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. DO NOT USE ANY VISIBLY DAMAGED PRODUCTS. TO DO SO MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, SEVERE PERSONAL INJURY AND/OR DEATH.

Joining CPVC Pipe & Fittings with One-Step Solvent Cement



CAUTION

CAUTION: Installers must follow all assembly and curing information referenced within this manual when installing Viking Plastics Blaze-master® CPVC fire sprinkler products. Failure to follow this instruction could cause improper curing, resulting in product damage, property damage, severe personal injury and/or death.

CAUTION: Read and understand all instructions prior to assembly. Follow all instructions. Failure to follow instructions during joining and testing may result in pipe failure, clogged waterways, or leakage.

Cutting

CPVC pipe can be easily cut with a ratchet cutter, a wheel-type plastic tubing cutter, a power saw or a fine toothed saw. Tools used to cut CPVC must be designed for plastic use and must be in good condition in accordance with the tool manufacturer's recommendations. It is important to cut the pipe square. A square cut provides the surface of the pipe with maximum bonding area.



NOTICE

NOTICE: Care must be exercised if using ratchet cutters as they may split the pipe if not properly used and maintained.

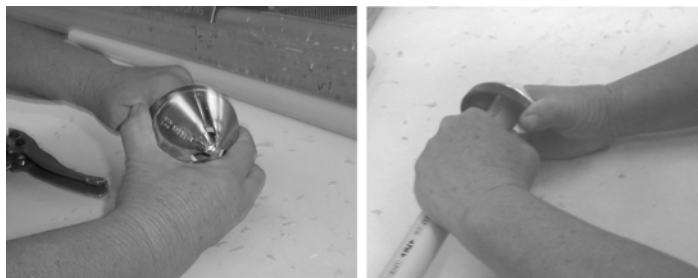
- Only use ratchet cutters that contain a sharp blade (blades dull quickly)
- Only use ratchet cutters at temperatures of 50°F (10°C) or warmer
- Only use well-maintained, good quality ratchet cutters capable of consistently cutting the pipe squarely

Failure to follow any of the above directions may result in leakage or property damage.

If any indication of damage or cracking is evident at the pipe end, cut off at least 2 inches (50 mm) beyond any visible crack.

Deburring & Beveling

Burrs and filings can prevent proper contact between pipe and fitting during assembly, and must be removed from the outside and the inside of the pipe. A chamfering tool or a file is suitable for this purpose. A slight bevel (approximately 10° to 15°) shall be placed at the end of the pipe to ease entry of the pipe into the socket. This will minimize the chance that the edges of the pipe will wipe solvent cement from the fitting socket during the insertion of the pipe.



Solvent Cement Application



CAUTION

CAUTION: Prior to using CPVC solvent cements, review and follow all precautions found on the container labels, material safety data sheet, and Standard Practice for Safe Handling ASTM F 402. Failure to follow precautions may result in injury.

Using a clean, dry rag, wipe loose dirt and moisture from the fitting socket and pipe end. Moisture can slow the cure time and

at this stage of assembly, excessive water can reduce joint strength.

The pipe should enter the fitting socket easily one-third to two-thirds of the way. Contact between the pipe and fitting is essential in making a good joint. This contact allows the solvent cement (which is applied in the next step) to effectively join the pipe and fitting.

Use a dauber that is properly sized for the pipe. For 3/4 inch (DN20) and 1 inch (DN25) pipe, use a dauber that is 1/2 inch (DN12) in size. For 1-1/4 inch (DN32) through 3 inch (DN80) pipe, use a dauber that is 3/4 inch (DN20) in size.

Only use solvent cements that have been specifically formulated and listed/approved for use with CPVC fire sprinkler systems and approved by the pipe and fitting manufacturers.

Vigorously apply a heavy, even coat of cement to the outside pipe end. Apply a medium coat to the fitting socket.



Pipe sizes 1-1/4 inch (DN32) and above shall always receive a second cement application on the pipe end. **FIRST APPLY CEMENT ON THE PIPE END, THEN IN THE FITTING SOCKET, AND, FINALLY, ON THE PIPE END AGAIN.**



NOTICE

NOTICE: Too much solvent cement can cause clogged waterways or weaken the wall of the pipe or fitting and result in pipe failure or leakage.

- DO NOT allow excess cement to puddle in the pipe and fitting assembly. To prevent this puddling, apply a lighter coating of solvent cement to the inside of the fitting socket than to the outside of the pipe.
- Wipe off excess cement from the outside of the joint. The solvents will evaporate, but the solvent cement inside the fitting will stay there.

Special care shall be exercised when assembling CPVC fire sprinkler systems in temperatures below 40°F (4°C). In colder temperatures extra time must be allowed for the solvent cement to set and cure. Extra care should be taken to prevent damaging the pipe during handling. When solvent welding pipe and fittings in colder temperatures, make certain that the cement has not become lumpy or has "gelled". Gelled cement must be discarded.

At temperatures above 80°F (27°C) make sure both surfaces to be joined are still wet with cement during assembly. Higher temperatures and/or wind accelerate the evaporation of the volatile solvents in the cement. Pipe stored in direct sunlight may have surface temperatures 20°F to 30°F above the air temperature. If possible store the pipe and fittings, or, at least, the ends to be solvent welded, out of the direct sunlight prior to cementing. The solvents will penetrate hot surfaces more deeply. In conditions like this it is very important to avoid puddling the solvent cement inside the fitting socket.

Assembly

After applying cement, immediately insert the pipe into the fitting socket, while rotating the pipe one-quarter turn until the pipe bottoms out at the fitting stop. Properly align the fitting for the installation at this time. Pipe must bottom to the stop. Hold the assembly for 30 seconds to ensure initial bonding. **A bead of solvent cement should be evident around the pipe and fitting juncture. If this bead is not continuous around the socket shoulder, it may indicate that insufficient cement was applied.** If insufficient cement is applied, the fitting must be cut out and discarded. Cement in excess of the bead should be wiped off with a rag.

NOTICE

NOTICE: Failure to allow sprinkler fitting joints to cure before installing sprinklers may result in cement in the sprinkler waterway.

- Install sprinkler heads only after all the CPVC pipe and fittings, including the sprinkler adapters, are solvent welded and allowed to cure for a minimum of 30 minutes.
- Do not install sprinklers in the fittings prior to the fittings being cemented in place.

Exercise care when installing sprinklers. Allow sprinkler head fittings and previously joined fittings to cure for a minimum of 30 minutes prior to installing the sprinkler. When installing sprinklers, be sure to anchor or hold the pipe drop securely to avoid rotating the pipe in previously cemented connections.



NOTICE

NOTICE: Too much solvent cement can cause clogged waterways.

- Visually inspect sprinkler fittings to ensure that the waterway and threads are clear of any excess cement.
- Once the installation is complete and **cured** per Table I, II or III, hydrostatically test the system.

Set & Cure Times

NOTICE

NOTICE: Inadequate curing of solvent cement joints may cause pipe failure, clogged waterways, or leakage.

Solvent cement set and cure times are a function of pipe size, temperature, relative humidity, and tightness of fit. Curing time is faster for smaller pipe sizes, higher temperatures, drier environments, and tighter fits. Cure times should be increased when moisture is present such as during cut-ins to live sprinkler lines. (NOTE: A specific procedure for modifications or repairs to existing CPVC fire sprinkler lines is included in this manual.) The assembly must be allowed to set, without any stress on the joint, for 1 to 5 minutes, depending on pipe size and temperature. Following the initial set period, the assembly can be handled carefully, ***avoiding significant stresses to the joint.***

Refer to Tables I, II, and III for minimum cure times prior to pressure testing.

Table I: Ambient Temperature Cure Times for Test Pressures of 225 psi / 15.5 bar (maximum)

Nominal Pipe Size (Metric)	60°F to 120°F (16°C to 49°C)	≥ 40°F (≥ 4.4°C)	≥ 0°F (≥ -17.8°C)
3/4" (DN20)	1 hour	4 hours	48 hours
1" (DN25)	1-1/2 hours	4 hours	48 hours
1-1/4" & 1-1/2" (DN32 & DN40)	3 hours	32 hours	10 days
2" (DN50)	8 hours	48 hours	Note 1
2-1/2" & 3" (DN65 & DN80)	24 hours	96 hours	Note 1

Note 1: For these sizes, the solvent cement can be applied at temperatures below 40°F (4.4°C). However, the sprinkler system temperature must be raised to a temperature of 40°F (4.4°C) or above and allowed to cure per the above recommendations prior to pressure testing.

Table II: Ambient Temperature Cure Times for Test Pressures of 200 psi / 13.8 bar (maximum)

Nominal Pipe Size (Metric)	60°F to 120°F (16°C to 49°C)	≥ 40°F (≥ 4.4°C)	≥ 0°F (≥ -17.8°C)
3/4" (DN20)	45 minutes	1 1/2 hours	24 hours
1" (DN25)	45 minutes	1 1/2 hours	24 hours
1-1/4" & 1-1/2" (DN32 & DN40)	1-1/2 hours	16 hours	120 hours
2" (DN50)	6 hours	36 hours	Note 1
2-1/2" & 3" (DN65 & DN80)	8 hours	72 hours	Note 1

Note 1: For these sizes, the solvent cement can be applied at temperatures below 40°F (4.4°C). However, the sprinkler system temperature must be raised to a temperature of 40°F (4.4°C) or above and allowed to cure per the above recommendations prior to pressure testing.

Table III: Ambient Temperature Cure Times for Test Pressures of 100 psi / 6.9 bar (maximum)

Nominal Pipe Size (Metric)	60°F to 120°F (16°C to 49°C)	≥ 40°F (≥ 4.4°C)	≥ 0°F (≥ -17.8°C)
3/4" (DN20)	15 minutes	15 minutes	30 minutes
1" (DN25)	15 minutes	30 minutes	30 minutes
1-1/4" (DN32)	15 minutes	30 minutes	2 hours
1-1/2" (DN40)	Note 1	Note 1	Note 1

Note 1: 1-1/2 inch (40 mm) and larger must be tested ONLY in accordance with Table 1 and Table 2.



WARNING

WARNING: 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 VIKING PLASTICS BLAZEMASTER® CPVC FIRE SPRINKLER PRODUCTS. DO NOT INSTALL ANY SPRINKLER HEADS UNTIL THE PIPING SYSTEM HAS CURED FOR A MINIMUM OF THIRTY (30) MINUTES. FAILURE TO DO SO MAY RESULT IN PROPERTY DAMAGE, PRODUCT DAMAGE, SEVERE PERSONAL INJURY AND/OR DEATH.

System Acceptance Testing (Hydrostatic Pressure Test)



WARNING

WARNING: NEVER USE AIR OR COMPRESSED GAS FOR SYSTEM ACCEPTANCE TESTING (HYDROSTATIC PRESSURE TEST). SYSTEM FAILURE WHEN USING COMPRESSED AIR OR GAS FOR SYSTEM ACCEPTANCE TESTING MAY RESULT IN PROPERTY DAMAGE, SERIOUS INJURY, OR DEATH.

Once an installation is completed and joints are properly cured per preceding recommendations, the system should be pressure tested with water at 200 psi (13.8 bar) for 2 hours. See Table II for curing conditions at 200 psi (13.8 bar).

The system should be pressure tested with water at 50 psi (3.4 bar) in excess of maximum pressure when the maximum system pressure is to be maintained in excess of 150 psi (10.3 bar). See Table I for curing conditions at 225 psi (15.5 bar). This requirement is in accordance with the requirements established by NFPA Standard 13, Section 24.2.1 (2007, 2010).

Sprinkler systems in one- and two-family dwellings and mobile homes may be pressure tested with water at line pressure, after following Table III curing conditions, in accordance with the requirements established by NFPA 13D, Section 4.3 (2007) or Section 4.2 (2010).

When pressure testing, the sprinkler system shall be slowly filled with water and the air bled from the highest and farthest sprinkler heads before pressure testing is applied. 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 can result in bodily injury and/or property damage, regardless of the piping materials used.

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 should be used in accessible areas only.

Solvent Cement Requirements

The following guidelines provide an estimate of the quantities of one-step solvent cement that you will need to complete the assembly.

Nominal Fitting Size (Metric)	Number of Joints Per Quart	Number of Joints Per Liter
3/4" (20 mm)	270 2	85
1" (25 mm)	180 1	90
1-1/4" (32 mm)	130 1	37
1-1/2" (40 mm)	100 1	06
2" (50 mm)	70 74	
2-1/2" (65 mm)	50 53	
3" (80 mm)	40 42	

Threaded Connections

Viking Plastics recommends the use of a quality PTFE tape, having a thickness of .0025" or greater and meeting or exceeding military specification MIL-T-27730A for all threaded connections. The use of other thread sealants may result in damage to the Viking Plastics BlazeMaster® CPVC Fire Sprinkler Products. Thread sealants which carry the FG/G/BM® System compatible mark have been determined to be chemically compatible with Viking Plastics BlazeMaster® CPVC pipe and fittings.

NOTE: Starting with the first full thread and continuing over the entire threaded length, making sure that all the threads are covered, wrap PTFE tape in the direction of the threads. For sprinkler head adapters, 2-3 wraps of tape are sufficient. For female adapters transitioning to metal pipe 3-4 wraps are sufficient.



WARNING

WARNING: CARE MUST BE TAKEN TO AVOID OVER TORQUING – GENERALLY 1 TO 2 TURNS BEYOND FINGER TIGHT IS ALL THAT IS REQUIRED TO MAKE UP A THREADED CONNECTION. FACTORY TESTING HAS INDICATED 10-25 FT. LBS. (13.6 – 33.9 NM) OF TORQUE IS ADEQUATE TO OBTAIN A LEAK FREE SEAL. NIBCO RECOMMENDS THE USE OF A STRAP WRENCH WHEN MAKING UP THREADED CONNECTIONS. OVER-TIGHTENING MAY RESULT IN PROPERTY DAMAGE, PRODUCT DAMAGE, PERSONAL INJURY AND/OR DEATH.

Sprinkler head adapters are manufactured with a brass threaded insert to provide a high strength, heavy duty fitting for threaded connections with male metal threads.

Sprinkler heads shall be installed only after all the fire sprinkler pipe fittings, including the sprinkler head adapters, are solvent welded to the piping **and have been allowed to cure as recommended in the cure chart.** Plastic threaded plugs are available for use in pressure testing. The sprinkler head fittings should be visually inspected or probed with a wooden dowel, to insure the waterway and threads are clear of any excess cement.



CAUTION

CAUTION: It is an unacceptable practice to assemble sprinklers into the head adapter fittings and then solvent cement them to the drop.

NOTICE

NOTICE: Use only compatible solvent cement. Incompatible products may result in product failure and property damage.



WARNING

WARNING: CUTTING OILS AND SOME THREAD SEALANTS 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. VIOLATION OF THIS WARNING MAY CAUSE SYSTEM FAILURE AND/OR PRODUCT DAMAGE, PROPERTY DAMAGE AND MAY RESULT IN SEVERE PERSONAL INJURY AND/OR DEATH.

Cut-In Procedures for System Modification or Repairs

At times it may become necessary to make modifications to existing CPVC fire sprinkler systems. This can be done safely by

a qualified installer or contractor when the proper procedures are followed. The following procedure has been developed to assure that the modifications are done successfully.

PRIOR TO MAKING SYSTEM CUT-INS ON EXISTING SYSTEMS, CARE SHOULD BE USED TO REVIEW PROPER JOINING PROCEDURES AND TO FOLLOW CUT-IN CURE SCHEDULES TO ENSURE THE HIGHEST SYSTEM INTEGRITY. Several methods can be utilized to tie into an existing system using a socket style tee fitting in combination with the use of socket unions, grooved coupling adapters, and flanges. Regardless of the method used, the following procedure must be followed to ensure the highest integrity:

1. Existing lines must be drained adequately prior to solvent cementing. Use a Drain Vac unit to be sure all water is removed from the system (moisture can slow the cure time and reduce joint strength).
2. The cut-in connection to the existing system should be made first, prior to proceeding with additional work.
3. Carefully review and follow manufacturers solvent cementing procedures for proper joining techniques prior to commencing with cut-in (pipe must be cut square to proper length, deburred, beveled and dry to ensure proper insertion depth and highest integrity).
4. Carefully measure and cut pipe to proper length to ensure complete insertion during assembly (check the interference fit of the components being joined).
5. Using proper tools, the cut-in should be made on the smallest diameter pipe section (that is capable of adequately supplying the system changes) in close proximity to the modification being made. This approach will expedite cure times prior to pressure testing.
6. During assembly of the cut-in tee (and other components) it is important to make a 1/4 turn when inserting the pipe into the fitting per the manufacturer's assembly instructions, particularly on 1-1/2 inch (40 mm) pipe sizes and larger. This may require the use of several components assembled in combination with the cut-in tee to create as short spool piece assembly. This can be accomplished by using socket unions, flanges, or grooved coupling adapters that will ensure that a 1/4 turn can be obtained on all pipe connections being joined.
7. Prior to applying the solvent cement use a clean *dry* rag to wipe moisture and dirt from the fitting socket and the pipe end (the presence of moisture on the joining surfaces will reduce joint integrity).

8. Use a new can of cement when making cut-in connections (verify expiration dates stamped on can prior to use).
9. After all work is completed, the cut-in joints must be allowed to cure properly prior to pressure testing as follows:

Cut-Ins (Minimum Cure Prior To Pressure Testing)

Nominal Pipe Size (Metric)	Ambient Temperature During Cure		
	60°F to 120°F (16° C to 49° C)	≥ 40°F (≥ 4.4° C)	≥ 0°F (≥ -17.8° C)
3/4" (DN20)	1 hour	4 hour	48 hour
1" (DN25)	1-1/2 hour	4 hour	48 hour
1-1/4" & 1-1/2" (DN32 & DN40)	3 hour	32 hour	10 days
2" (DN50)	8 hour	48 hour	See Caution Below
2-1/2" & 3" (DN65 & DN80)	24 hour	96 hour	See Caution Below

 **CAUTION**

CAUTION: Solvent cement can be applied at temperatures below 40°F (4.4°C) for 2 inch (50 mm) sizes and larger, however the temperature of the system must be raised to 40°F (4.4°C) or higher and allowed to cure per the above recommendations prior to pressure testing. When bringing cement, pipe or fittings in from the outside, be sure they are brought up to room temperature before using the 60°F (16° C) to 120°F (49°C) cure schedule. (Also reference Note 1.)

10. *After work is completed and cut-in cure times are met,* inspect work for proper alignment and hanger placement prior to pressure testing.
11. *After cut-in cure times are met,* the system must be slowly filled with water and the air bled from the furthest and highest sprinkler heads before test pressure is applied (refer to manufacturer's installation instructions regarding Hydrostatic Testing).
12. *After cut-in cure times are met and the air is bled from the system,* it is recommended that the portion of the sprinkler system containing the cut-in tee be pressure tested. Prior to pressure testing, the system must be sectioned off to its smallest area using floor valves, etc., to isolate the cut-in area. It is further recommended that the test pressure applied should not exceed 50 psi (345 kPa) over the system pressure. This approach will minimize the potential for water damage should a leak occur.



WARNING

WARNING: AIR OR COMPRESSED GAS MUST NEVER BE USED FOR PRESSURE TESTING. VIOLATION OF THIS WARNING MAY CAUSE SYSTEM FAILURE AND/OR PRODUCT DAMAGE, AND MAY RESULT IN PROPERTY DAMAGE, SEVERE PERSONAL INJURY AND/OR DEATH.

Painting Pipe & Fittings

Water based acrylic latex paint is the preferred and recommended paint to use on BlazeMaster[®] pipe and fittings. Consult with local Authority Having Jurisdiction (AHJ) prior to covering any markings on Viking Plastics CPVC pipe.



WARNING

WARNING: THE UL AND C-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, OR CONTACT VIKING PLASTICS FOR PAINTING RECOMMENDATIONS. VIOLATION OF THIS WARNING MAY CAUSE SYSTEM FAILURE AND/OR PRODUCT DAMAGE, AND MAY RESULT IN PROPERTY DAMAGE, SEVERE PERSONAL INJURY AND/OR DEATH.

Transitions to Other Materials

Specifically designed threaded adapters, grooved coupling adapters, and flanges are listed for connecting systems incorporating Viking Plastics Blazemaster[®] CPVC fire sprinkler products to other materials, valves, and accessories.

NOTICE

NOTICE: Use only compatible lubricants, thread pastes, and gasket materials. Incompatible products may result in product failure and property damage.

Engineering Data - Product Specifications

Viking Plastics Blazemaster[®] CPVC fire sprinkler products are produced in SDR 13.5 dimensions, as specified in ASTM F-442. These products are UL Listed, or C-UL, and FM Approved for a rated working pressure of 175 psi (1200 kPa) at 150°F (65°C) for sprinkler service. Engineering data on Material Properties and Expansion & Contraction for CPVC pipe in this manual are provided for Viking Plastics Blazemaster[®] CPVC Fire Sprinkler Pipe.

BlazeMaster® CPVC Fire Sprinkler Fittings are produced in Schedule 40 dimensions for sizes 3/4 inch (20 mm) through 1-1/4 inch (32 mm) in accordance with ASTM F-438 and Schedule 80 dimensions for sizes 1-1/2 inch (40 mm) through 3 inch (80 mm) in accordance with ASTM F-439. Consult fitting manufacturers for applicable variations.

BlazeMaster® Pipe Dimensions & Weights SDR 13.5 (ASTM F-442)				
Nominal Size Inches/ (mm)	Average OD Inches/ (mm)	Average ID Inches/ (mm)	Empty lbs/ft (Kg/m)	H ₂ O Filled lbs/ft (Kg/m)
3/4" (20.0 mm)	1.050" (26.7 mm)	0.874" (22.2 mm)	0.168 lbs (0.250 kg)	0.428 lbs (0.637 kg)
1" (25.0 mm)	1.315" (33.4 mm)	1.101" (28.0 mm)	0.262 lbs (0.390 kg)	0.675 lbs (1.005 kg)
1-1/4" (32.0 mm)	1.660" (42.2 mm)	1.394" (35.4 mm)	0.418 lbs (0.622 kg)	1.079 lbs (1.606 kg)
1-1/2" (40.0 mm)	1.900" (48.3 mm)	1.598" (40.6 mm)	0.548 lbs (0.816 kg)	1.417 lbs (2.109 kg)
2" (50.0 mm)	2.375" (60.3 mm)	2.003" (50.9 mm)	0.859 lbs (1.278 kg)	2.224 lbs (3.310 kg)
2-1/2" (65.0 mm)	2.875" (73.0 mm)	2.423" (61.5 mm)	1.257 lbs (1.871 kg)	3.255 lbs (4.844 kg)
3" (80.0 mm)	3.500" (88.9 mm)	2.950" (75.0 mm)	1.867 lbs (2.778 kg)	4.829 lbs (7.186 kg)

NOTE: The above average OD and average ID information is per ASTM F-442. Check with individual manufacturers for actual OD and ID information.

Hydraulic Design

Hydraulic calculations for the sizing of systems incorporating Viking Plastics BlazeMaster® 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 Viking Plastics.

Allowance for Friction Loss in Fittings (SDR 13.5 Equivalent Pipe)							
	3/4" (20 mm)	1" (25mm)	1-1/4" (32mm)	1-1/2" (40 mm)	2" (50 mm)	2-1/2" (65 mm)	3" (80 mm)
Tee Branch	3' (0.91 m)	5' (1.52 m)	6' (1.83 m)	8' (2.44 m)	10' (3.05 m)	12' (3.66 m)	15' (4.57 m)
Elbow 90	7' (2.13 m)	7' (2.13 m)	8' (2.44 m)	9' (2.74 m)	11' (3.35 m)	12' (3.66 m)	13' (3.96 m)
Elbow 45	1' (0.31 m)	1' (0.31 m)	2' (0.61 m)	2' (0.61 m)	2' (0.61 m)	3' (0.91 m)	4' (1.22 m)
Coupling	1' (0.31 m)	1' (0.31 m)	1' (0.31 m)	1' (0.31 m)	1' (0.31 m)	2' (0.61 m)	2' (0.61 m)
Tee Run	1' (0.31 m)	1' (0.31 m)	1' (0.31 m)	1' (0.31 m)	1' (0.31 m)	2' (0.61 m)	2' (0.61 m)

Hangers & Supports

Since CPVC fire sprinkler pipe is rigid, it requires fewer supports than flexible, plastic systems. NOTE: Listed hangers are required for all exposed installations. Viking Plastics recommends the 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.



CAUTION

CAUTION: These hangers must have a minimum 1/2 inch (13 mm) 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.

NFPA 13D permits "support methods comparable to those required by local plumbing codes." These hanger support requirements must also be followed on NFPA 13D systems.

Table A - Standard Support Spacing

Nominal Size, Inches/(mm)	Max. Support Spacing, Feet/(Meters)
3/4" (20.0 mm)	5-1/2' (1.67 m)
1" (25.0 mm)	6' (1.82 m)
1-1/4" (32.0 mm)	6-1/2' (1.98 m)
1-1/2" (40.0 mm)	7' (2.13 m)
2" (50.0 mm)	8' (2.43 m)
2-1/2" (65.0 mm)	9' (2.74 m)
3" (80.0 mm)	10' (3.04 m)



CAUTION

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.



CAUTION

CAUTION: When a sprinkler head activates, a significant reactive force can be exerted on the pipe. With a pendent head, this

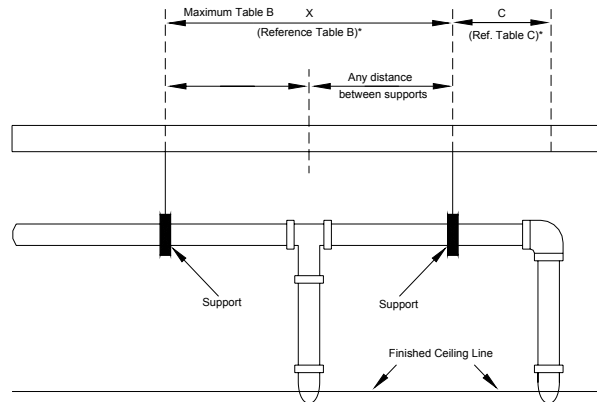
reactive force can cause the pipe to lift vertically if it is not secured properly, especially if the sprinkler drop is from small diameter pipe. The pipe must be braced against vertical lift-up with the closest hanger. Refer to the following illustration and Tables B & C.

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

Nominal Pipe Size (inches/mm)	Less than 100 psi (690 kPa)	More than 100 psi (690 kPa)
3/4" (20 mm)	4' (1.22 m)	3' (0.91 m)
1" (25 mm)	5' (1.52 m)	4' (1.22 m)
1-1/4" (32 mm)	6' (1.83 m)	5' (1.52 m)
1-1/2" – 3" (40 - 80 mm)	7' (2.13 m)	7' (2.13 m)

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

Nominal Pipe Size (inches/mm)	Less than 100 psi (690 kPa)	More than 100 psi (690 kPa)
3/4" (20 mm)	9" (228.6 mm)	6" (152.4 mm)
1" (25 mm)	12" (304.8 mm)	9" (228.6 mm)
1-1/4" (32 mm)	16" (406.4 mm)	12" (304.8 mm)
1-1/2" – 3" (40 - 80 mm)	24" (609.6 mm)	12" (304.8 mm)



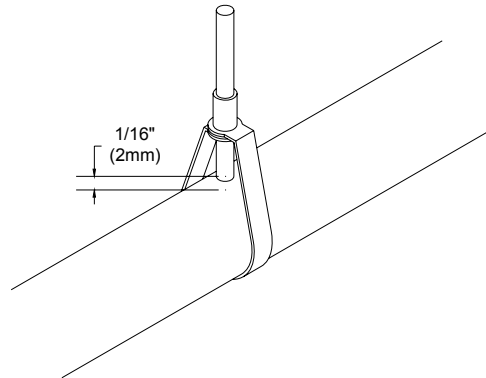
Support Spacing Drop Elbow and Drop Tee

Numerous common methods are used to brace fire sprinkler pipe. Acceptable methods include, but are not limited to, the following:

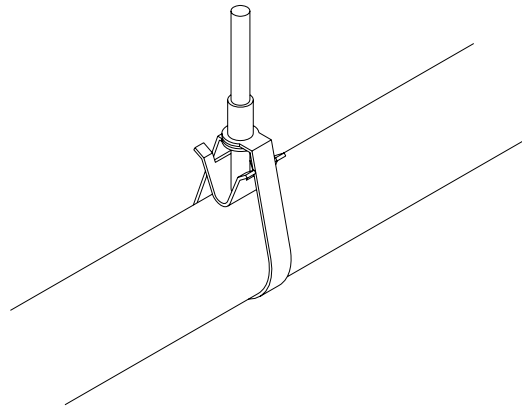
- Use of a standard band hanger by positioning the threaded support rod to 1/16 inch (2 mm) above the pipe (however, it is important that the rod does not contact the pipe).
- A wrap around U-hanger.
- A special escutcheon which prevents upward movement of the sprinkler through the ceiling or band hangers 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 descriptions are examples 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.

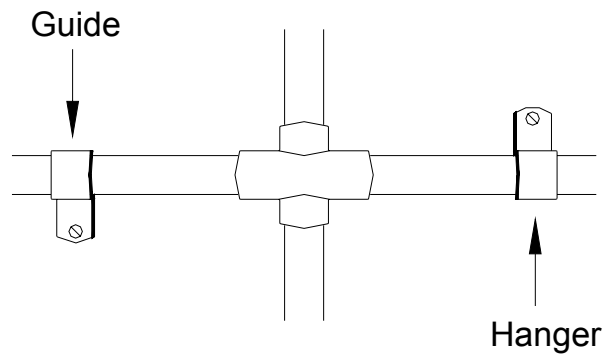


One Hole Wrap-Around Strap - designed to support CPVC piping systems only when the hanger tab is in the vertical

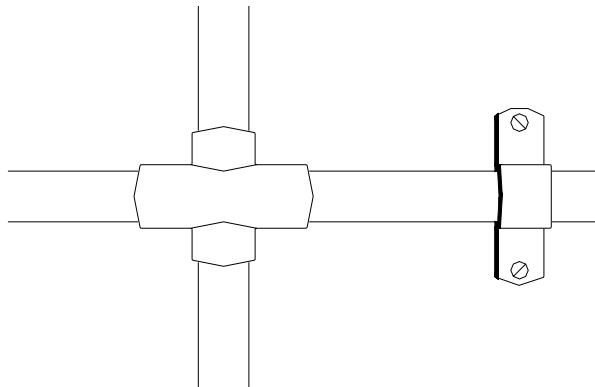
position, and the screw-type fastener is in the horizontal position. The one-hole strap can be used as a pipe restrainer when the hanger tab is in the downward position, but it cannot be used as a hanger to hold any weight of the system. In addition, the one-hole strap can be used as a piping system guide when the system lies on top of the beam, and the beam supports the system's weight.



CAUTION: 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 a two-hole strap.

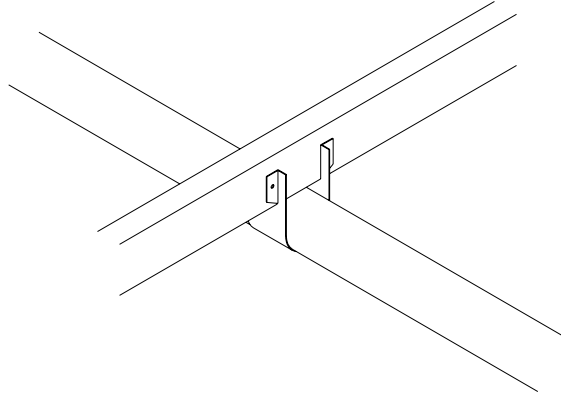


Two-Hole Strap - designed to support CPVC piping systems when attached to a flat, horizontal surface with the screw-type fasteners in the vertical position. In addition, the two-hole strap is designed to support CPVC piping systems when attached to a flat, vertical surface with one mounting tab in the 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.



CAUTION

CAUTION: 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 (3.05 m) intervals, whichever is less. CPVC risers in vertical shafts or buildings with ceilings over 25 feet (7.62 m) must be aligned straight and supported at each floor level or 10-foot (3.05 m) 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

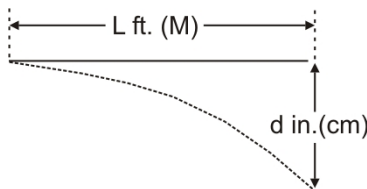
WARNING: CPVC PIPE AND/OR SYSTEM COMPONENTS MUST NOT BE USED TO PROVIDE STRUCTURAL SUPPORT FOR THE SYSTEM. CARE SHOULD BE USED WHEN INSTALLING, HANGING, OR BRACING TO PREVENT UNNECESSARY STRESS LOADS ON THE CPVC PIPING SYSTEM. FAILURE TO FOLLOW THIS WARNING CAN CAUSE PRODUCT FAILURE AND MAY RESULT IN PROPERTY DAMAGE, SEVERE PERSONAL INJURY AND/OR DEATH.

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 national, state and local codes including NFPA Standard 13.

Pipe Deflection

Viking Plastics Blazemaster® CPVC fire sprinkler piping is inherently ductile allowing it to be deflected, within permissible limits, around or away from objects during installation, which can reduce installation time. This ductility allows for greater freedom of design and lower installed cost. The maximum installed deflections for BlazeMaster® piping are as follows:



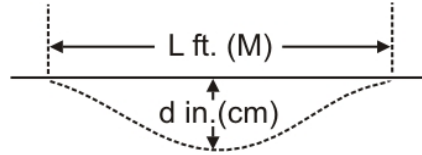
**Maximum Installed Deflections
(One End Restrained)**

Pipe Size	Permissible Bending Deflections SDR 13.5 (73°F) in Inches													
	Pipe Length in Feet													
	2	5	7	10	12	15	17	20	25	30	35	40	45	50
3/4"	1.3	7.8	15.4	31.3	45.1	70.5	90.6	125.4	195.9	282.1	383.9			
1"	1.0	6.3	12.3	25.0	36.0	56.3	72.3	100.1	156.4	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

Note: Allowable Bending Deflections Based on BlazeMaster® 88738 Orange 734 CPVC compound.

Permissible Bending Deflections SDR 13.5 (23°C) in cm														
Pipe Size	Pipe Length in Meters													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
20 mm	8.6	34.3	77.1	137.1	214.2	308.4	419.8	548.3	694.0	856.7	1036.7			
25 mm	6.8	27.4	61.6	109.5	171.0	246.3	335.2	437.8	554.1	684.1	827.8	985.1		
32 mm	5.4	21.7	48.8	86.7	135.5	195.1	265.5	346.8	439.0	541.9	655.7	780.4	915.8	
40 mm	4.7	18.9	42.6	75.8	118.4	170.4	232.0	303.0	383.5	473.5	572.9	681.8	800.2	928.0
50 mm	3.8	15.2	34.1	60.6	94.7	136.4	185.6	242.4	306.8	378.8	458.3	545.4	640.1	742.4
65 mm	3.1	12.5	28.2	50.1	78.2	112.6	153.3	200.3	253.4	312.9	378.6	450.6	528.8	613.3
80 mm	2.6	10.3	23.1	41.1	64.3	92.5	125.9	164.5	208.2	257.0	311.0	370.1	434.4	503.8

Note: Allowable Bending Deflections Based on BlazeMaster® 88738 Orange 734 CPVC compound.



**Maximum Installed Deflections
(Both Ends Restrained)**

Permissible Bending Deflections SDR 13.5 (73°F) in Inches														
Pipe Size	Pipe Length in Feet													
	2	5	7	10	12	15	17	20	25	30	35	40	45	50
3/4"	0.3	2.0	3.8	7.8	11.3	17.6	22.6	31.1	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	44.6	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

Note: Allowable Bending Deflections Based on BlazeMaster® 88738 Orange 734 CPVC compound.

Permissible Bending Deflections SDR 13.5 (23°C) in cm														
Pipe Size	Pipe Length in Meters													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
20 mm	2.1	8.6	19.3	34.2	53.5	77.1	104.9	137.0	173.4	214.1	259.0	308.2	361.8	419.5
25 mm	1.7	6.8	15.4	27.4	42.8	61.6	83.8	109.5	138.6	171.1	207.1	246.4	289.2	335.4
32 mm	1.4	5.4	12.2	21.7	33.9	48.8	66.4	86.7	109.7	135.4	163.9	195.0	228.9	265.4
40 mm	1.2	4.7	10.6	18.9	29.6	42.6	58.0	75.7	95.8	118.3	143.2	170.4	200.0	231.9
50 mm	0.9	3.8	8.5	15.2	23.7	34.1	46.4	60.7	76.8	94.8	114.7	136.5	162.2	185.8
65 mm	0.8	3.1	7.0	12.5	19.6	28.2	38.4	50.1	63.4	78.3	94.7	112.7	132.3	153.5
80 mm	0.6	2.6	5.8	10.3	16.1	23.1	31.5	41.1	52.1	64.3	77.8	92.6	108.6	126.0

Note: Allowable Bending Deflections Based on BlazeMaster® 88738 Orange 734 CPVC compound.

Material Properties

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

Property	Temperature °F									
	73	80	90	100	110	120	140	150		
Modulus of Elasticity "E" x 10 ⁵ 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

Note: Material properties based on BlazeMaster® 88738 Orange 734 CPVC compound.

Table II
Physical & Thermal Properties of BlazeMaster®

Property	CPVC	ASTM
Specific Gravity	1.53	D 792
IZOD Impact Strength (ft. lbs./inch, notched)	> 3.0	D 256A
Modulus of Elasticity, @ 73°F, psi	4.23 x 10 ⁵	D 638
Ultimate Tensile Strength, psi	> 8,400	D 638
Hazen-Williams C Factor	150	-
Coefficient of Linear expansion in./in./°F	3.4 x 10 ⁻⁵	D 696
Thermal Conductivity BTU/hr./ft. ² /°F/in.	0.95 C	177
Limiting Oxygen Index	60%	D 2863
Electrical Conductivity	Non Conductor	

NOTE: Material Properties based on BlazeMaster® 88738 CPVC compound.

Expansion and Contraction

BlazeMaster® CPVC fire sprinkler products, like all piping materials, expand and contract with changes in temperature. If the coefficient of linear expansion is 3.4 x 10⁻⁵ inch /inch-°F, a 25° F (4° C) change in temperature will cause an expansion of 1 inch (25 mm) for a 100-foot (30 m) straight length. For most operating and installation conditions, expansion and contraction can be accommodated at changes of direction.

Table III
Thermal Expansion

Temp Change ΔT °F	Length of Run in Feet													
	5	10	15	20	25	30	35	40	45	50	70	90	120	160
	Thermal Expansion ΔL (in.)													
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	0.18	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	0.24	0.33	0.41	0.49	0.57	0.65	0.73	0.82	1.14	1.47	1.96	2.61
50	0.10	0.20	0.31	0.41	0.51	0.61	0.71	0.82	0.92	1.02	1.43	1.84	2.45	3.26
60	0.12	0.24	0.37	0.49	0.61	0.73	0.86	0.98	1.10	1.22	1.71	2.20	2.94	3.92
70	0.14	0.29	0.43	0.57	0.71	0.86	1.00	1.14	1.29	1.43	2.00	2.57	3.43	4.57
80	0.16	0.33	0.49	0.65	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	0.55	0.73	0.92	1.10	1.29	1.47	1.65	1.84	2.57	3.30	4.41	5.88
100	0.20	0.41	0.61	0.82	1.02	1.22	1.43	1.63	1.84	2.04	2.86	3.67	4.90	6.53

Thermal Expansion based on BlazeMaster® 88738 Orange 734 CPVC compound.

Temp Change ΔT °C	Length of Run in Meters													
	1	2	4	6	8	10	12	14	16	18	20	30	40	50
	Thermal Expansion ΔL (cm)													
20	0.06	0.12	0.24	0.37	0.49	0.61	0.73	0.86	0.98	1.10	1.22	1.84	2.45	3.06
30	0.09	0.18	0.37	0.55	0.73	0.92	1.10	1.29	1.47	1.65	1.84	2.75	3.67	4.59
40	0.12	0.24	0.49	0.73	0.98	1.22	1.47	1.71	1.96	2.20	2.45	3.67	4.90	6.12
50	0.15	0.31	0.61	0.92	1.22	1.53	1.84	2.14	2.45	2.75	3.06	4.59	6.12	7.65
60	0.18	0.37	0.73	1.10	1.47	1.84	2.20	2.57	2.94	3.30	3.67	5.51	7.34	9.18
70	0.21	0.43	0.86	1.29	1.71	2.14	2.57	3.00	3.43	3.86	4.28	6.43	8.57	10.71
80	0.24	0.49	0.98	1.47	1.96	2.45	2.94	3.43	3.92	4.41	4.90	7.34	9.79	12.24
90	0.28	0.55	1.10	1.65	2.20	2.75	3.30	3.86	4.41	4.96	5.51	8.26	11.02	13.77
100	0.31	0.61	1.22	1.84	2.45	3.06	3.67	4.28	4.90	5.51	6.12	9.18	12.24	15.30

Thermal Expansion based on BlazeMaster® 88738 Orange 734 CPVC compound.

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

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

L = Length of Run in Feet

ΔT = Temperature Change in °F

Example:

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

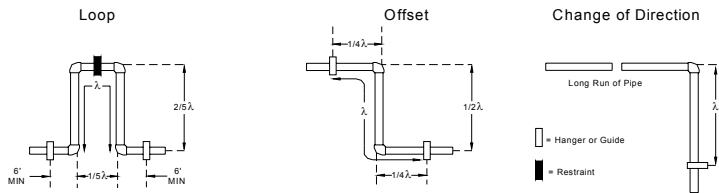
$$\Delta L = 12eL(\Delta T)$$

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

$$\Delta L = .65"$$

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 Configuration

Table IV
Expansion Loop Length in Inches For 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 = 100°F-30°F, ?T = 70°F																	
3/4"	1.05	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"	1.66	9	13	16	19	21	23	25	26	28	30	35	40	46	53		
1-1/2"	1.9	10	14	18	22	22	25	27	28	30	32	38	43	49	57		
2"	2.375	11	16	20	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"	3.5	13	19	24	27	30	33	36	38	41	43	51	58	67	77		

Note: Table IV is based on Stress & Elasticity at 100°F.

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

l = Length of Expansion Loop in Inches

E = Modulus of Elasticity at 100° F

D = Average O.D. of Pipe

ΔL = Change in Length of Pipe Due to Change in Temperature
(Table III)
S = Working Stress at 100° F (Table I)

Example:

How much expansion can be expected in a 200 ft. run of 2" BlazeMaster® 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:

ΔT = (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:

ΔL = (Amount of Expansion in inches from Table III)
 $\Delta L = \Delta L$ of 160 ft. with a ΔT of 70°F + ΔL of 40 ft. with a ΔT of 70°F
 $\Delta L = 4.57" + 1.14"$
 $\Delta L = 5.71"$

- OR -

$\Delta L = 12eL(\Delta T)$
 $e = 3.4 \times 10^{-5}$ (from Table II)
L = Length of Run in Feet
 ΔT = Change in Temperature in °F
 $\Delta L = 12 \times .000034 \times 200 \times 70$
 $\Delta L = 5.71"$

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

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

l = Length of Expansion Loop in Inches

E = Modulus of Elasticity at 110° F (Table I)

D = Average O.D. of Pipe

ΔL = Change in Length of Pipe Due to Change in Temperature
(Table III)

S = Working Stress at 110° F (Table I)

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

$$l = \sqrt{\frac{3 \times 370000 \times 2.375 \times 5.71}{2 \times 1415}}$$

$$l = \sqrt{5319}$$

$$l = 72.93"$$

NOTICE

Do's

- Installation should be made only by a qualified installer or contractor in accordance with all applicable codes and requirements.
- Read and follow the installation instructions.
- Follow recommended safe work practices.
- Make certain that thread sealants, gasket lubricants, or firestop 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 1/4 turn when bottoming pipe in fitting socket.
- Make certain no solvent cement is on sprinkler head or 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 only at a proper pressure.
- 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 inch of the pipe or use a surge arrestor.
- Install Viking Plastics Blazemaster® CPVC fire sprinkler products in wet systems only.
- Use only compatible insulation and/or manufacturer premixed glycerin solutions for freeze protection.
- Allow for movement due to expansion and contraction.
- Renew your Viking Plastics BlazeMaster® CPVC fire sprinkler products installation training every two years.



WARNING

Don'ts

- DO NOT use edible oils such as Crisco® as a gasket lubricant.
- DO NOT use petroleum or solvent-based sealants, lubricants, or firestop materials.
- DO NOT use any glycol-based solutions as an anti-freeze.
- DO NOT use anything other than manufactured premix glycerin solutions.
- DO NOT allow manufactured premixed glycerin 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 or groove 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 exceed proper pressure for testing.
- DO NOT use ratchet cutters below 50°F.
- DO NOT use CPVC pipe that has been stored outdoors, unprotected and/or is faded in color.
- DO NOT allow threaded rod to come in contact with the pipe.
- DO NOT install BlazeMaster® CPVC Fire Sprinkler Products in cold weather without allowing for expansion.
- DO NOT install BlazeMaster® CPVC Fire Sprinkler Products in dry systems.
- DO NOT allow puddling of cement in fittings and pipe.
- DO NOT use dull or broken cutting tool blades when cutting pipe.



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