Now Listed and Approved for more types of applications than any other non-metallic system
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Lubrizol
Introduction

BlazeMaster® pipe and fittings are designed specifically for fire sprinkler systems. They are made from a specialty thermoplastic known chemically as post-chlorinated polyvinyl chloride (CPVC). BlazeMaster® pipe and fittings provide unique advantages in sprinkler installations including superior hydraulics, ease of joining, increased hanger spacing in comparison to other thermoplastics and ease of assembly. They also are based on a technology with a continuous and proven service history of more than 40 years.

This installation manual provides instructions for handling and installing a 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. It also is intended to supplement installation instructions published by manufacturers of pipe and fittings. Before commencing installation, a user should understand and confirm applicable National Fire Protection Association (NFPA) guidelines and local code approval and installation requirements for CPVC fire sprinkler systems.

BlazeMaster® CPVC pipe and fittings carry the markings of Underwriters Laboratories, Inc. (UL & C-UL) and Underwriters’ Laboratories of Canada (ULC), Factory Mutual (FM)*, The Loss Prevention Council (LPC), and the NSF International (NSF) for use with potable water. Refer to individual manufacturers’ installation instructions for specific listings and approvals.

Lubrizol produces and sells CPVC compounds to licensed manufacturers of BlazeMaster® pipe & fittings (see back cover for contact information). When this design manual states, “refer to manufacturer’s installation instructions” please refer to the individual installation instructions published by each pipe and/or fittings manufacturer.

For additional information regarding the BlazeMaster® product line, please refer to the internet website, www.blazemaster.com. An electronic version of this installation guide, the most current product compatibility information, the BlazeMaster® Blaster newsletter, and other BlazeMaster® fire sprinkler systems information can be found at this site.

Combination of BlazeMaster® Products with Other CPVC and Solvent Cements

All BlazeMaster® pipe, fittings and solvent cements have been evaluated and are listed for combination regardless of the licensed manufacturer that produces the products.

The BlazeMaster® products’ listing does not include the combination of BlazeMaster® CPVC pipe with other types of specially listed CPVC fire sprinkler pipes, fittings and solvent cements.

Where to Use BlazeMaster® Fire Sprinkler Systems

BlazeMaster® CPVC pipe and fittings are Listed by Underwriters Laboratories (UL & C-UL) and Underwriters Laboratories of Canada (ULC) for use in:

- Residential occupancies as defined in the Standard for Installation of Sprinkler Systems in Residential Occupancies up to Four Stories in Height, NFPA 13R.
- Residential occupancies as defined in the Standard for Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes, NFPA 13D.
- Air plenums, as defined by the Installation of Air Conditioning and Ventilating Systems, NFPA 90A.
- Installation of Private Fire Service Mains and Their Appurtenances, NFPA 24.
- System risers in residential buildings up to four stories in height, NFPA 13R and 13D.
- See UL Fire Protection Equipment Directory, categories VIWT and HFYH.

BlazeMaster® fire sprinkler systems shall be employed in wet-pipe systems. (A wet-pipe system contains water and is connected to a water supply so that the water will discharge immediately when

*As manufactured by Harvel, IPEX, Nibco, Tyco and Viking.
the sprinkler is opened.) BlazeMaster® CPVC pipe and fittings must never be used in a system using compressed air or other gases. National Fire Protection Association Standards 13, 13R, 13D, and NFPA 24 must be referenced and followed for design and installation requirements in conjunction with this design manual.

**Concealed Installations**

With concealed installation the minimum protection shall consist of one layer of 3/8" (9.5 mm) gypsum wallboard, or a suspended membrane ceiling with lay-in panels or tiles having a weight of not less than 0.35 pounds per square foot (1.7 kg per square meter) when installed with metallic support grids, or 1/2" (12.7 mm) plywood soffits.

For residential occupancies defined in NFPA 13R and 13D, the minimum protection may consist of one layer of 1/2" (12.7 mm) plywood. During periods of remodeling and renovation, appropriate steps must be taken to protect the piping from fire exposure if the ceiling is temporarily removed.

**Exposed Installations**

**Where Sprinklers are Required**

Note: It is always acceptable to install BlazeMaster® products in areas where sprinklers are not required. Refer to the manufacturer’s installation instructions.

As an alternative to the protection requirements, BlazeMaster® CPVC pipe and fittings may be installed without protection (exposed) when subject to the following additional limitations:

1. **Light Hazard or Residential 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 or Listed residential, 170°F (77°C) maximum temperature rated, pendent sprinklers located in accordance with their Listing and a maximum distance between sprinklers not to exceed 15 feet (4.57 m). The piping shall be mounted directly to the ceiling.

2. **Light Hazard or Residential 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 or Listed residential, 200°F (93°C) maximum temperature rated, horizontal sidewall sprinklers located in accordance with their Listing and a maximum distance between sprinklers not to exceed 14 feet (4.27 m). The piping shall be mounted directly to the sidewall.

3. **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 not to 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 head to a hanger shall be 3 inches (76 mm).

4. **Light Hazard Extended Coverage and Residential Sprinklers**
   Listed quick response, 200°F (93°C) maximum temperature rated, extended coverage sprinklers having deflectors installed within 12 inches (304 mm) from the ceiling and within 6 inches (152 mm) from the sidewall or Listed residential, 200°F (93°C) maximum temperature rated, extended coverage sprinklers located in accordance with their Listing and a maximum distance between sprinklers not to exceed 14 feet (4.27 m). The piping shall be mounted directly to the sidewall.
TFP-500, or HVC-500 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.

1. **Light Hazard Extended Coverage or Residential Pendent Sprinklers**
   List ed 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 ml/min).

   Listed residential, 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 ml/min).

2. **Light Hazard Extended Coverage or Residential Horizontal Sidewall Sprinklers**
   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 ml/min).

   Listed residential, 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 ml/min).

C. **Unfinished Basements**
BlazeMaster® CPVC pipe and fittings may be installed 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 utilizing nominal 2 in. x 10 in. solid wood joists on 16 in. centers.
   OR
The ceiling shall be horizontal and constructed utilizing nominal 2 in. x 12 in. solid wood joists on 16 in. centers. When installing BlazeMaster® CPVC pipe and fittings in conjunction with 2 in. x 12 in. solid wood joists, the maximum system working pressure under flowing conditions shall not exceed 100 psi and the maximum system working pressure under static (nonflowing) conditions shall not exceed 175 psi.

2. The distance from the floor to the bottom of the solid wood joists shall be between 7 ft. and 8 ft.
# For Exposed BlazeMaster® Applications

(Use in unfinished basements, system risers and mechanical tees and crosses are not included by this table)

<table>
<thead>
<tr>
<th>Sprinkler Configuration</th>
<th>Type of Sprinkler</th>
<th>Spacing Between Sprinklers (ft.)</th>
<th>Maximum Deflector Distance From Ceiling (in.)</th>
<th>Maximum Deflector Distance From Sidewall (in.)</th>
<th>Maximum Sprinkler Temperature Rating (°F)</th>
<th>Application Density (gpm/sq. ft.)</th>
<th>Additional Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Extended Coverage Sprinklers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendent</td>
<td>Light Hazard, Quick Response</td>
<td>≤20</td>
<td>8</td>
<td>n/a</td>
<td>155</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Horizontal Sidewall</td>
<td>Light Hazard Quick Response</td>
<td>≤ 16</td>
<td>12</td>
<td>6</td>
<td>175</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Light Hazard Quick Response</td>
<td>≤ 18</td>
<td>12</td>
<td>6</td>
<td>165</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Light Hazard, Quick Response Listed Reliable Sprinkler (SIN RA0362)</td>
<td>≤ 24</td>
<td>12</td>
<td>6</td>
<td>155</td>
<td></td>
<td>flow rate of 40 gpm and maximum coverage area of 24’ x 14’</td>
</tr>
<tr>
<td><strong>Residential Sprinklers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendent</td>
<td>Residential</td>
<td>≤15 per sprinkler Listing</td>
<td>n/a</td>
<td></td>
<td>170</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Residential</td>
<td>≤20</td>
<td>8</td>
<td>n/a</td>
<td>155</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Horizontal Sidewall</td>
<td>Residential</td>
<td>≤14 per sprinkler Listing</td>
<td>per sprinkler Listing</td>
<td></td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Residential</td>
<td>≤ 18</td>
<td>12</td>
<td>6</td>
<td>165</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td><strong>Standard Coverage Sprinklers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendent</td>
<td>Quick Response</td>
<td>≤ 15</td>
<td>8</td>
<td>n/a</td>
<td>170</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal Sidewall</td>
<td>Quick Response</td>
<td>≤ 14</td>
<td>12</td>
<td>6</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upright</td>
<td>Quick Response</td>
<td>≤ 15</td>
<td>in addition the distance from the ceiling to centerline of pipe must be a maximum of 7 1/2 inches</td>
<td></td>
<td>155</td>
<td></td>
<td>a hanger must be installed 3 inches from the centerline of the sprinkler head</td>
</tr>
</tbody>
</table>
3. Listed residential pendent sprinklers with a maximum temperature rating of 155°F and a minimum K-factor of 3.0 are to be used for this type of installation. The maximum sprinkler spacing shall not exceed 12 feet. 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 gpm per sprinkler. The sprinklers are to be installed with their deflectors a maximum of 1 3/4 in. below the bottom of the solid wood joists in anticipation of future installation of a finished ceiling. (reference NFPA 13D, Section 8.2.4, 2007 Edition)

4. All system mains shall be run perpendicular to the joists. All branch lines shall be run parallel to the joists. Schedule 80 fittings shall be used for sizes 1-1/2 inch and larger.

5. All solvent cement joints shall be made with BlazeMaster One Step Solvent Cement (TFP-500, BM-5, CSC-500, or HVC-500).

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. When the length exceeds 32 feet, blocking shall be utilized. The blocking shall be constructed of minimum 1/2 in. plywood and shall be the full depth of the wood joists.
Basement Installation with Center Wall Riser with Main at Wall

Basement Installation with Riser in Corner
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 in., the gap shall be filled with insulation, caulking, or other suitable material.

7. 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 solid wood joists at or below the center of the depth of the solid wood joist for support - the holes should be oversized to allow for movement and located to not impair the structural integrity of the joists.

**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.

8. 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 in. wood blocking or listed support devices for thermoplastic sprinkler piping which offset the pipe a nominal distance of 1 1/2 in. from the solid wood joists.

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. For additional information regarding the assembly and installation of BlazeMaster® CPVC pipe and fittings, please refer to the manufacturer's installation instructions.
Factory Mutual
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 Nonmanufacturing as defined in FM Data Sheet 3-26, Fire protection Water Demands for Nonstorage 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.

Factory Mutual standards do not permit the use of nonmetallic fire sprinkler piping in areas where seismic protection is required.

The design and installation details are as follows:

(a) Occupancy must be per Data Sheet 3-26, Table 2, Section L, with smooth flat horizontal ceilings, a maximum ceiling height of 10 ft (3 m), and other installation details per FM Data Sheet 2-8N, Installation of Sprinkler Systems. Examples of these occupancies include apartments, restaurants, schools, hospitals, libraries, offices, etc.

(b) The following FM Approved sprinklers must be used:

1) Extended coverage light hazard (ECLH) control mode specific application sprinklers with minimum flow or pressure established for the sprinkler as covered in Data Sheet 2-8N.
2) Quick response control mode density area sprinklers with a minimum density of 0.1 gpm/ft² (4 mm/min).
3) 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 2-8N. 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.

(c) 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 ft (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, but its flow must be included in the total hydraulic design.

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

In addition 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.

The Loss Prevention Council
Use of 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 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.

*Soffi-Steel is a trademark of Grice Engineering.
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.

**Sprinkler Head Temperature Ratings**
BlazeMaster® pipe and fittings shall be used in sprinkler systems employing sprinkler heads rated 225°F (107°C) when installed concealed (protected) in accordance with the Listing. Sprinkler temperature ratings for exposed installations are indicated in the individual sections of this manual.

**Temperature/Pressure Rating**
BlazeMaster® pipe and fittings (3/4" - 3" (20 – 80 mm) are rated for continuous service of 175 psi (1207 kPa) at 150°F (65°C). BlazeMaster® pipe and fittings are suitable for use in areas where ambient temperatures are within the range of 35°F (2°C) to 150°F (65°C). BlazeMaster® pipe can be installed in an area, such as an attic, where the temperature will exceed 150°F (65°C) if ventilation is provided or if insulation is used around the pipe to maintain a cooler environment. BlazeMaster® piping systems must be laid out so that the piping is not closely exposed to devices that generate heat in excess of 150°F (65°C) such as light fixtures, ballasts and steam lines. If the installation is in an area subject to freezing temperatures, the sprinkler system must be protected from freezing. A frozen system will not only be deactivated, but the pressures that may build up can cause the sprinkler heads to open or damage the pipes.

**Combustible Concealed Installations**
BlazeMaster® pipe and fittings must never be installed in combustible concealed spaces requiring sprinklers, as referenced in NFPA 13.

**EXCEPTION:** Specially listed sprinkler heads exist that have been tested and are listed for use with BlazeMaster® products in combustible concealed spaces requiring sprinklers. When using BlazeMaster® products in these applications always follow the sprinkler head manufacturers’ installation guidelines.

Similarly there are specially listed sprinkler heads that have been tested and are listed for use with BlazeMaster® products in attics that require sprinklers. The sprinkler head manufacturers’ installation guidelines must be followed when using BlazeMaster® pipe and fittings with these sprinkler heads.

**NFPA 13R and 13D**
NFPA 13R and 13D permit the omission of sprinklers from combustible concealed spaces and BlazeMaster® pipe and fittings may be installed in these areas when sprinklering residential occupancies according to these standards.

**Air Plenums**
BlazeMaster® pipe and fittings are approved for use in air plenums. BlazeMaster® pipe and fittings have been investigated by UL per the requirements of UL 1887 and found to comply with the combustibility requirements for thermoplastic sprinkler pipe as described in the Standard for Installation of Air Conditioning and Ventilating Systems, NFPA 90A and various model mechanical codes.

**Note:** BlazeMaster® pipe and fittings may be installed in the plenum adjacent to, but not over, an opening in the ceiling such as ventilation grills.

**Canadian Installations (ULC & C-UL)**
BlazeMaster® CPVC products are listed under CAN/ULC Standard S102.2M for flame spread of 5, smoke development of 15, and fuel contribution of 0, meeting the National Building Code of Canada.
Ordinary Hazard Installations
Section 6.3.6.2 of NFPA 13 (2007 Edition) permits the use of pipe or tube listed for light hazard occupancies to be installed in ordinary hazard rooms of otherwise light hazard occupancies where the room does not exceed 400 ft² (37 m²). BlazeMaster® CPVC pipe and fittings can be installed in these installations in accordance with the manufacturer’s installation instructions and this design manual.

Garage Installations
When installed concealed, BlazeMaster® CPVC pipe and fittings may be used to protect 13R garages per the following requirements:

1. Minimum protection shall consist of either one layer of 3/8" (9.5 mm) thick gypsum or 1/2" (12.7 mm) thick plywood.

2. Listed pendent or sidewall sprinklers with a maximum temperature rating of 225°F (107°C) shall be utilized. All sprinklers shall be installed per the manufacturer’s published installation instructions.

3. The system shall be installed per the requirements of NFPA 13R.

4. The BlazeMaster® CPVC sprinkler pipe and fittings shall be installed per the manufacturer’s installation instructions and this design manual.

Note: NFPA 13D, Section 8.6.4 (2007 Edition) states: "Sprinklers shall not be required in garages, open attached porches, carports, and similar structures". Since sprinklers are not required in NFPA 13D garages, these installations do not fall within the scope of the Listing. However, BlazeMaster® CPVC pipe and fittings may be installed in NFPA 13D garages with the approval of the local authority having jurisdiction.

System Risers in NFPA 13, 13R and 13D Applications
BlazeMaster® CPVC pipe and fittings may be used as system risers in accordance with NFPA 13, 13D and 13R when subject to the following limitations:

1. When installed protected (concealed), the minimum protection shall consist of either one layer of 3/8 in. (9.5 mm) thick gypsum wallboard or 1/2 in. (12.7 mm) thick plywood.

2. When installed without protection (exposed), the following limitations shall apply:

Note: Only NFPA 13R and 13D applications may be installed without protection (exposed).

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

b) A Listed residential pendent sprinkler is to have a maximum temperature rating of 155°F and a minimum K-factor of 3.0 and is to be installed at a maximum horizontal distance of 12 inches from the centerline of the riser. 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 gpm per sprinkler.

c) The riser shall be supported vertically within 2 feet of the ceiling or bottom of the joist.

d) The minimum riser diameter shall be 1 in. and the maximum riser diameter shall be 2 in.

e) The maximum distance between the wall(s) and the outside surface of the riser pipe shall be 1 1/2 in.
f) All solvent cement joints shall be made with BlazeMaster® One Step Solvent Cement (TFP-500, CSC-500, HVC-500, BM-5).

3. The system shall be installed per the requirements of NFPA 13, Sections 9.2.5 (2007 Edition), Support of Risers.

4. The BlazeMaster® CPVC sprinkler pipe and fittings 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. Do this by using riser clamps or double bolt pipe clamps Listed for this service. The clamps must not exert compressive stresses on the pipe. It is recommended that 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.

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.


3. The system shall be installed per the requirements of NFPA 24.

4. The 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 (2007 Edition).

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 (2007 Edition).
**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, sand, crushed stone or other approved material 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 is 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 UNDRYED JOINT.** This snaking is necessary in order to allow for any anticipated thermal movement that could take place in the newly joined pipeline.

**Loop Offset in Inches 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 Feet | 3” | 4” | 5” | 5” | 6” | 6” | 7” | 7” | 8” | 8” |
| 50 Feet | 7” | 9” | 11” | 13” | 14” | 16” | 17” | 18” | 19” | 20” |
| 100 Feet | 13” | 18” | 22” | 26” | 29” | 32” | 35” | 37” | 40” | 42” |

**Loop Offset in mm for Contraction:**

| Maximum Temperature Variation, °C, Between Time of Solvent Welding and Final Use |
|----|----|----|----|----|----|----|----|----|----|----|
| Loop Length | 5° | 10° | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° |
| 5 Meters | 65 | 83 | 95 | 105 | 114 | 123 | 133 | 143 | 154 | 164 |
| 15 Meters | 164 | 219 | 266 | 307 | 343 | 377 | 409 | 440 | 469 | 498 |
| 30 Meters | 314 | 424 | 522 | 609 | 687 | 758 | 823 | 884 | 943 | 999 |
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 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" (12.7 mm) or less should be used to surround the pipe with 6" (152 mm) to 8" (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.

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 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 4" (102 mm) in diameter should be removed. Rolling equipment or heavy tampers should only be used to consolidate the final backfill.

Outdoor Installations
BlazeMaster® pipe and fittings are not listed for exposed, outdoor applications.

Updated UL Listing Information
BlazeMaster® fire sprinkler system’s listings can change. For a current list log on to www.blazemaster.com.

Product Rating, Capabilities and Material Properties

Pressure Rating
BlazeMaster® pipe and fittings (3/4" (20mm) – 3" (80 mm)) are rated for continuous service of 175 psi (1207 kPa) at 150°F (65°C).

Pipe Dimensions and Weights
BlazeMaster® pipe is produced in SDR 13.5 dimensions. SDR, or standard dimensional ratio, means the pipe wall thickness is directly proportional to the outside diameter. This results in all diameters carrying the same pressure capability. BlazeMaster® pipe is produced to the specifications of ASTM F 442. BlazeMaster® fittings are produced to ASTM F 437, F 438, or F 439 specifications depending on the size and configuration.
Hydraulic Design

C Factor

Hydraulic calculations for the sizing of BlazeMaster® pipe and fitting shall be calculated using the Hazen-Williams C factor of 150.

Pipe Friction Loss

Pipe friction loss calculations shall be made according to NFPA 13 Section 22.4 (2007 Edition).

Fittings Friction Loss

The following table shows the allowance for friction loss for fittings, expressed as equivalent length of pipe.

<table>
<thead>
<tr>
<th>Allowance for Friction Loss in Fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SDR 13.5 Equivalent Pipe)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>3/4&quot; (20mm)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Tee Branch</td>
</tr>
<tr>
<td>Elbow 90°</td>
</tr>
<tr>
<td>Elbow 45°</td>
</tr>
<tr>
<td>Coupling</td>
</tr>
<tr>
<td>Tee Run</td>
</tr>
</tbody>
</table>

Physical and Thermal Properties of BlazeMaster® CPVC

<table>
<thead>
<tr>
<th>Property</th>
<th>CPVC</th>
<th>ASTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Gravity</td>
<td>1.53</td>
<td>D 792</td>
</tr>
<tr>
<td>IZOD Impact Strength (ft. lbs./inch, notched)</td>
<td>3.0</td>
<td>D 256A</td>
</tr>
<tr>
<td>Modulus of Elasticity, @ 73°F, psi</td>
<td>$4.23 \times 10^5$</td>
<td>D 638</td>
</tr>
<tr>
<td>Ultimate Tensile Strength, psi</td>
<td>8,000</td>
<td>D 638</td>
</tr>
<tr>
<td>Compressive Strength, psi</td>
<td>9,600</td>
<td>D 695</td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td>.35 - .38</td>
<td>-</td>
</tr>
<tr>
<td>Working Stress @ 73°F, psi</td>
<td>2,000</td>
<td>D 1598</td>
</tr>
<tr>
<td>Hazen-Williams C Factor</td>
<td>150</td>
<td>-</td>
</tr>
<tr>
<td>Coefficient of Linear Expansion in./(in. °F)</td>
<td>$3.4 \times 10^{-5}$</td>
<td>D 696</td>
</tr>
<tr>
<td>Thermal Conductivity BTU/hr./ft.²/F/ln.</td>
<td>0.95</td>
<td>C 177</td>
</tr>
<tr>
<td>Limiting Oxygen Index</td>
<td>60%</td>
<td>D 2863</td>
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<tr>
<td>Electrical Conductivity</td>
<td>Non Conductor</td>
<td></td>
</tr>
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</table>

Note: The above average OD and average ID information is per ASTM F442. Check with individual manufacturers for actual OD and ID information.

BlazeMaster® Pipe Dimensions and Weights

SDR 13.5 (ASTM F 442)

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>Average OD</th>
<th>Average ID</th>
<th>Pounds Per Foot Empty</th>
<th>Kilograms Per Meter Empty</th>
<th>H2O Filled Pounds Per Foot</th>
<th>Kilograms Per Meter H2O Filled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inches</td>
<td>mm</td>
<td>Inches</td>
<td>mm</td>
<td>Empty</td>
<td>Empty</td>
<td>H2O Filled</td>
</tr>
<tr>
<td>3/4&quot;</td>
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<td>0.250</td>
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<td>33.4</td>
<td>0.262</td>
<td>0.390</td>
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<td>1.660</td>
<td>42.2</td>
<td>0.418</td>
<td>0.622</td>
<td>1.079</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>40.0</td>
<td>1.900</td>
<td>48.3</td>
<td>0.548</td>
<td>0.816</td>
<td>1.417</td>
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<tr>
<td>2&quot;</td>
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<td>2.375</td>
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<td>0.859</td>
<td>1.278</td>
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<tr>
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<td>2.875</td>
<td>73.0</td>
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<td>1.871</td>
<td>3.255</td>
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<tr>
<td>3&quot;</td>
<td>80.0</td>
<td>3.500</td>
<td>88.9</td>
<td>1.867</td>
<td>2.778</td>
<td>4.629</td>
</tr>
</tbody>
</table>
Thermal Expansion and Contraction

BlazeMaster® CPVC pipe, like all piping materials, expand and contract with changes in temperature. The coefficient of linear expansion is: 0.0000340 inch/inch-°F (0.000061 cm / cm °C). Lineal expansion is the same for all pipe diameters.

A 25°F change in temperature will cause an expansion of 1/2 inch for a 50 foot straight run of BlazeMaster® pipe. For most operating and installation conditions, expansion and contraction can be accommodated at changes in direction of the pipe run. However, in certain instances, expansion loops or offsets may be required when installing long, straight runs of pipe.

The formula to calculate the amount of thermal expansion or contraction is \[ \Delta L = 12 \times e \times L \times \Delta T \]

Where: \( e = 3.4 \times 10^{-5} \) inch/inch-°F; \( L = \) Length of run in feet; \( \Delta T = \) Temperature change °F; \( \Delta L = \) Change in length due to change in temperature.

### Thermal Expansion in Inches

<table>
<thead>
<tr>
<th>Temp. Change ΔT °F</th>
<th>Length of Run in Feet</th>
<th>Thermal Expansion ΔL (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>.04</td>
<td>.08</td>
</tr>
<tr>
<td>30</td>
<td>.06</td>
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<td>70</td>
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<td>.18</td>
<td>.37</td>
</tr>
<tr>
<td>100</td>
<td>.20</td>
<td>.41</td>
</tr>
</tbody>
</table>

### Thermal Expansion in Centimeters

<table>
<thead>
<tr>
<th>Temp. Change ΔT °C</th>
<th>Length of Run in Meters</th>
<th>Thermal Expansion ΔL (cm.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>.06</td>
<td>.12</td>
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<tr>
<td>15</td>
<td>.09</td>
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<td>20</td>
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<td>25</td>
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<td>30</td>
<td>.18</td>
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<td>35</td>
<td>.21</td>
<td>.43</td>
</tr>
<tr>
<td>40</td>
<td>.24</td>
<td>.49</td>
</tr>
</tbody>
</table>
Pipe Deflection
BlazeMaster® 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 Deflection
BlazeMaster® 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)
### Permissible Bending Deflections SDR 13.5 (73°F) in Inches

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>2'</th>
<th>5'</th>
<th>7'</th>
<th>10'</th>
<th>12'</th>
<th>15'</th>
<th>17'</th>
<th>20'</th>
<th>25'</th>
<th>30'</th>
<th>35'</th>
<th>40'</th>
<th>45'</th>
<th>50'</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot;</td>
<td>1.3</td>
<td>7.8</td>
<td>15.4</td>
<td>31.3</td>
<td>45.1</td>
<td>70.5</td>
<td>90.6</td>
<td>125.4</td>
<td>195.9</td>
<td>282.1</td>
<td>383.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&quot;</td>
<td>1.0</td>
<td>6.3</td>
<td>12.3</td>
<td>25.0</td>
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<td>56.3</td>
<td>72.3</td>
<td>100.1</td>
<td>156.4</td>
<td>225.2</td>
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<td>0.8</td>
<td>5.0</td>
<td>9.7</td>
<td>19.8</td>
<td>28.5</td>
<td>44.6</td>
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<td>79.3</td>
<td>123.9</td>
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<td>242.8</td>
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<td>1 1/2&quot;</td>
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<td>8.5</td>
<td>17.3</td>
<td>24.9</td>
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<td>155.9</td>
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<td>31.2</td>
<td>40.0</td>
<td>55.4</td>
<td>86.6</td>
<td>124.7</td>
<td>169.7</td>
<td>221.7</td>
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<td>5.6</td>
<td>11.4</td>
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<td>25.8</td>
<td>33.1</td>
<td>45.8</td>
<td>71.5</td>
<td>103.0</td>
<td>140.2</td>
<td>183.1</td>
<td>231.8</td>
<td>286.2</td>
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<td>2.4</td>
<td>4.6</td>
<td>9.4</td>
<td>13.5</td>
<td>21.2</td>
<td>27.2</td>
<td>37.6</td>
<td>58.8</td>
<td>84.6</td>
<td>115.2</td>
<td>150.4</td>
<td>190.4</td>
<td>235.1</td>
</tr>
</tbody>
</table>

### Permissible Bending Deflections SDR 13.5 (23°C) in cm

<table>
<thead>
<tr>
<th>Pipe Size (mm)</th>
<th>20 mm</th>
<th>25 mm</th>
<th>32 mm</th>
<th>40 mm</th>
<th>50 mm</th>
<th>65 mm</th>
<th>80 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mm</td>
<td>8.6</td>
<td>6.8</td>
<td>5.4</td>
<td>4.7</td>
<td>3.8</td>
<td>3.1</td>
<td>2.6</td>
</tr>
<tr>
<td>25 mm</td>
<td>34.3</td>
<td>27.4</td>
<td>21.7</td>
<td>18.9</td>
<td>15.2</td>
<td>12.5</td>
<td>10.3</td>
</tr>
<tr>
<td>32 mm</td>
<td>77.1</td>
<td>61.6</td>
<td>48.8</td>
<td>42.6</td>
<td>34.1</td>
<td>28.2</td>
<td>23.1</td>
</tr>
<tr>
<td>40 mm</td>
<td>147.2</td>
<td>109.5</td>
<td>86.7</td>
<td>75.8</td>
<td>60.6</td>
<td>50.1</td>
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<tr>
<td>50 mm</td>
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<td>171.0</td>
<td>155.5</td>
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<td>246.3</td>
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<tr>
<td>80 mm</td>
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<td>346.8</td>
<td>320.3</td>
<td>286.2</td>
<td>253.4</td>
<td>208.2</td>
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</table>

**Maximum Installed Deflections**

(Both Ends Restrained)

![Figure 6: Both Ends Restrained](image)

### Permissible Bending Deflections SDR 13.5 (73°F) in Inches

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>2'</th>
<th>5'</th>
<th>7'</th>
<th>10'</th>
<th>12'</th>
<th>15'</th>
<th>17'</th>
<th>20'</th>
<th>25'</th>
<th>30'</th>
<th>35'</th>
<th>40'</th>
<th>45'</th>
<th>50'</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot;</td>
<td>.3</td>
<td>2.0</td>
<td>3.8</td>
<td>7.8</td>
<td>11.3</td>
<td>17.6</td>
<td>22.6</td>
<td>31.1</td>
<td>49.0</td>
<td>70.5</td>
<td>96.0</td>
<td>125.4</td>
<td>158.7</td>
<td>195.9</td>
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<td>6.3</td>
<td>9.0</td>
<td>14.1</td>
<td>18.1</td>
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<td>39.1</td>
<td>56.3</td>
<td>76.6</td>
<td>100.1</td>
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<td>44.6</td>
<td>60.7</td>
<td>79.3</td>
<td>100.4</td>
<td>123.9</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
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<td>1.1</td>
<td>2.1</td>
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<td>6.2</td>
<td>9.7</td>
<td>12.5</td>
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<td>27.1</td>
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<td>53.0</td>
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<td>87.7</td>
<td>108.2</td>
</tr>
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<td>2&quot;</td>
<td>.1</td>
<td>.9</td>
<td>1.7</td>
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<td>10.0</td>
<td>13.9</td>
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<tr>
<td>2 1/2&quot;</td>
<td>.1</td>
<td>.7</td>
<td>1.4</td>
<td>2.9</td>
<td>4.1</td>
<td>6.4</td>
<td>8.3</td>
<td>11.4</td>
<td>17.9</td>
<td>25.8</td>
<td>35.1</td>
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<td>3&quot;</td>
<td>.1</td>
<td>.6</td>
<td>1.2</td>
<td>2.4</td>
<td>3.4</td>
<td>5.3</td>
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<td>Pipe Size</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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<td>14</td>
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<tr>
<td>20 mm</td>
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<td>19.3</td>
<td>34.2</td>
<td>53.5</td>
<td>77.1</td>
<td>104.9</td>
<td>137.0</td>
<td>173.4</td>
<td>214.1</td>
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<tr>
<td>25 mm</td>
<td>1.7</td>
<td>6.8</td>
<td>15.4</td>
<td>27.4</td>
<td>42.8</td>
<td>61.6</td>
<td>83.8</td>
<td>109.5</td>
<td>138.6</td>
<td>171.1</td>
<td>207.1</td>
<td>246.4</td>
<td>289.2</td>
<td>335.4</td>
</tr>
<tr>
<td>32 mm</td>
<td>1.4</td>
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<td>12.2</td>
<td>21.7</td>
<td>33.9</td>
<td>48.8</td>
<td>66.4</td>
<td>86.7</td>
<td>109.7</td>
<td>135.4</td>
<td>163.9</td>
<td>195.0</td>
<td>228.9</td>
<td>265.4</td>
</tr>
<tr>
<td>40 mm</td>
<td>1.2</td>
<td>4.7</td>
<td>10.6</td>
<td>18.9</td>
<td>29.6</td>
<td>42.6</td>
<td>58.0</td>
<td>75.7</td>
<td>95.8</td>
<td>118.3</td>
<td>143.2</td>
<td>170.4</td>
<td>200.0</td>
<td>231.9</td>
</tr>
<tr>
<td>50 mm</td>
<td>0.9</td>
<td>3.8</td>
<td>8.5</td>
<td>15.2</td>
<td>23.7</td>
<td>34.1</td>
<td>46.4</td>
<td>60.7</td>
<td>76.8</td>
<td>94.8</td>
<td>114.7</td>
<td>136.5</td>
<td>160.2</td>
<td>185.8</td>
</tr>
<tr>
<td>65 mm</td>
<td>0.8</td>
<td>3.1</td>
<td>7.0</td>
<td>12.5</td>
<td>19.6</td>
<td>28.2</td>
<td>38.4</td>
<td>50.1</td>
<td>63.4</td>
<td>78.3</td>
<td>94.7</td>
<td>112.7</td>
<td>132.3</td>
<td>153.5</td>
</tr>
<tr>
<td>80 mm</td>
<td>0.6</td>
<td>2.6</td>
<td>5.8</td>
<td>10.3</td>
<td>16.1</td>
<td>23.1</td>
<td>31.5</td>
<td>41.1</td>
<td>52.1</td>
<td>64.3</td>
<td>77.8</td>
<td>92.6</td>
<td>108.6</td>
<td>126.0</td>
</tr>
</tbody>
</table>

### Handling and Storage

BlazeMaster® CPVC is a tough, corrosion resistant material, but does not have the mechanical strength of steel. Reasonable care must be exercised in handling BlazeMaster® pipe and fittings. They must not be dropped or have objects dropped on them. If improper handling results in scratches, splits, or gouges, the damaged section shall be cut out and discarded.

BlazeMaster® pipe must be covered with a non-transparent material when stored out of doors for extended periods of time. Brief exposure to direct sunlight on the job site may result in color fade but will not affect physical properties. BlazeMaster® fittings should be stored in their original containers to keep them free from dirt and reduce the possibility of damage. Caution should be taken not to overstack boxes of BlazeMaster® fittings in extreme temperature environments (>150°F).

### Joining BlazeMaster® Pipe and Fittings with Red One-Step Solvent Cement

**Note:** One-Step Cement requires no cleaner or primer. Refer to individual manufacturers’ installation instructions.

#### Cutting
BlazeMaster® pipe can be easily cut with a ratchet cutter, a wheel-type plastic tubing cutter, a power saw or a fine toothed saw. To ensure the pipe is cut square, a miter box is recommended when using a saw. A square cut provides the surface of the pipe with maximum bonding area. If any indication of damage or cracking is evident at the pipe end, cut off at least 2 inches (50.8 mm) beyond any visible crack.

#### Deburring

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 shall be placed at the end of the pipe to ease entry of the pipe into the socket and minimize the chances of wiping solvent cement from the fitting during insertion.

#### Fitting Preparation

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. Check the interference fit of the pipe and fitting. The pipe should enter the fitting socket easily 1/4 to 3/4 of the way. At this stage, the pipe should not bottom out in the socket.

#### Solvent Cement Application

Cement shall be applied (worked into pipe) with an applicator half the nominal size of the pipe diameter. Apply a heavy, even coat of cement to the outside
pipe end. Apply a medium coat to the fitting socket. Pipe sizes 1\(\frac{1}{4}\) inches (32 mm) and above shall always receive a second cement application on the pipe end. (Apply cement on the pipe end, in the fitting socket, and on the pipe again.) Only use solvent cements that have been specifically investigated and tested for use with BlazeMaster® CPVC systems and approved by the pipe and fitting manufacturers. Too much cement can cause clogged waterways. Do not allow excess cement to puddle in the pipe and fitting assembly.

Special care shall be exercised when assembling BlazeMaster® systems in extremely low temperatures (below 40°F (4°C)) or extremely high temperatures (above 100°F (38°C)). Extra set time shall be allowed in colder temperatures. When cementing pipe and fittings in extremely cold temperatures, make certain that the cement has not become lumpy or has “gelled”. Gelled cement must be discarded. In extremely hot temperatures, make sure both surfaces to be joined are still wet with cement when putting them together.

Assembly
After applying cement, immediately insert the pipe into the fitting socket, while rotating the pipe one-quarter turn. Properly align the fitting for the installation at this time. Pipe must bottom to the stop. Holding the assembly for 10 to 15 seconds to ensure initial bonding. **A bead of 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 can be wiped off with a rag. Care shall be exercised when installing sprinkler heads. Sprinkler head fittings shall be allowed to cure for a minimum of 30 minutes prior to installing the sprinkler head. When installing sprinkler heads, be sure to anchor or hold the pipe drop securely to avoid rotating the pipe in previously cemented connections. Previously cemented fittings shall also be permitted to cure for a minimum of 30 minutes.

**Warning:** Sprinkler heads shall be installed only after all the CPVC pipe and fittings, including the sprinkler head adapters, are solvent welded and allowed to cure for a minimum of 30 minutes. Sprinkler head fittings should be visually inspected and probed with a wooden dowel to ensure that the water way and threads are clear of any excess cement. Once the installation is complete and cured per Table I, II or III, the system shall be hydrostatically tested. Sprinklers shall not be installed in the fittings prior to the fittings being cemented in place.

**Note:** Safety and Health Precautions. 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.

**Set and Cure Times**
Solvent cement set and cure times are a function of pipe size, temperature, relative humidity, and tightness of fit. Curing time is faster for drier environments, smaller pipe sizes, higher temperatures and tighter fits. Cure times should be increased when moisture is present such as during cut-ins to live sprinkler lines. 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 the following tables for minimum cure times prior to pressure testing.
**TABLE I**

225 psi (1552 kPa) Test Pressure (maximum)
Ambient Temperature During Cure Period

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>60°F to 120°F (16°C to 49°C)</th>
<th>40°F to 59°F (4°C to 15°C)</th>
<th>0°F to 39°F (-18°C to 4°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; (20 mm)</td>
<td>1 hr.</td>
<td>4 hrs.</td>
<td>48 hrs.</td>
</tr>
<tr>
<td>1&quot; (25 mm)</td>
<td>1 1/2 hrs.</td>
<td>4 hrs.</td>
<td>48 hrs.</td>
</tr>
<tr>
<td>1 1/4&quot; &amp; 1 1/2&quot; (32 &amp; 40 mm)</td>
<td>3 hrs.</td>
<td>32 hrs.</td>
<td>10 days</td>
</tr>
<tr>
<td>2&quot; (50 mm)</td>
<td>8 hrs.</td>
<td>48 hrs.</td>
<td>Note 1</td>
</tr>
<tr>
<td>2 1/2&quot; &amp; 3&quot; (65 &amp; 80 mm)</td>
<td>24 hrs.</td>
<td>96 hrs.</td>
<td>Note 1</td>
</tr>
</tbody>
</table>

**TABLE II**

200 psi (1379 kPa) Test Pressure (maximum)
Ambient Temperature During Cure Period

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>60°F to 120°F (16°C to 49°C)</th>
<th>40°F to 59°F (4°C to 15°C)</th>
<th>0°F to 39°F (-18°C to 4°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; (20 mm)</td>
<td>45 mins.</td>
<td>1 1/2 hrs.</td>
<td>24 hrs.</td>
</tr>
<tr>
<td>1&quot; (25 mm)</td>
<td>45 mins.</td>
<td>1 1/2 hrs.</td>
<td>24 hrs.</td>
</tr>
<tr>
<td>1 1/4&quot; &amp; 1 1/2&quot; (32 &amp; 40 mm)</td>
<td>1 1/2 hrs.</td>
<td>16 hrs.</td>
<td>120 hrs.</td>
</tr>
<tr>
<td>2&quot; (50 mm)</td>
<td>6 hrs.</td>
<td>36 hrs.</td>
<td>Note 1</td>
</tr>
<tr>
<td>2 1/2&quot; &amp; 3&quot; (65 &amp; 80 mm)</td>
<td>8 hrs.</td>
<td>72 hrs.</td>
<td>Note 1</td>
</tr>
</tbody>
</table>

**TABLE III**

100 psi (690 kPa) Test Pressure (maximum)
Ambient Temperature During Cure Period

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>60°F to 120°F (16°C to 49°C)</th>
<th>40°F to 59°F (4°C to 15°C)</th>
<th>0°F to 39°F (-18°C to 4°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; (20 mm)</td>
<td>15 mins.</td>
<td>15 mins.</td>
<td>30 mins.</td>
</tr>
<tr>
<td>1&quot; (25 mm)</td>
<td>15 mins.</td>
<td>30 mins.</td>
<td>30 mins.</td>
</tr>
<tr>
<td>1 1/4&quot; (32 mm)</td>
<td>15 mins.</td>
<td>30 mins.</td>
<td>2 hrs.</td>
</tr>
</tbody>
</table>

Note 1: For these sizes, the solvent cement can be applied at temperatures below 40°F (4.5°C), however, the sprinkler system temperature must be raised to a temperature of 40°F (4.5°C) or above and allowed to cure per the above recommendations prior to pressure testing.
Pressure Testing
Once an installation is completed and cured, per the above recommendations, the system should be pressure tested at 200 psi (1379 kPa) for 2 hours. See Table II for curing conditions in this case. The system should be pressure tested at 50 psi (345 kPa) in excess of maximum pressure when the maximum system pressure is to be maintained in excess of 150 psi (1034 kPa). See Table I for curing conditions in this case. This is in accordance with the requirements established by NFPA Standard 13, Section 24.2.1 (2007 Edition). Sprinkler systems in one- and two-family dwellings and mobile homes may be tested at line pressure, Table III curing conditions, in accordance with the requirements established by NFPA 13D, Section 4.3 (2007 Edition). 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 are potentially damaging, regardless of the piping materials used. Air or compressed gas should never be used for pressure testing. 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.

Estimating One-Step Solvent Cement Requirements
The following guidelines are provided to allow estimation of one-step solvent cement quantities needed.

<table>
<thead>
<tr>
<th>Fitting Size</th>
<th>Number of Joints Per Quart</th>
<th>Number of Joints Per Liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; (20 mm)</td>
<td>270</td>
<td>285</td>
</tr>
<tr>
<td>1&quot; (25 mm)</td>
<td>180</td>
<td>190</td>
</tr>
<tr>
<td>1 1/4&quot; (32 mm)</td>
<td>130</td>
<td>137</td>
</tr>
<tr>
<td>1 1/2&quot; (40 mm)</td>
<td>100</td>
<td>106</td>
</tr>
<tr>
<td>2&quot; (50 mm)</td>
<td>70</td>
<td>74</td>
</tr>
<tr>
<td>2 1/2&quot; (65mm)</td>
<td>50</td>
<td>53</td>
</tr>
<tr>
<td>3&quot; (80mm)</td>
<td>40</td>
<td>42</td>
</tr>
</tbody>
</table>
Cut-In Procedure 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 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 points must be followed to ensure the highest integrity:

- 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.

- The cut-in connection to the existing system should be made first, prior to proceeding with additional work.

- 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). One method to verify that the water has been drained from the system is to remove the sprinkler heads on each side of the cut-in and allow any remaining water to drain.

- Carefully review and follow manufacturer’s 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).

- Carefully measure and cut pipe to proper length to ensure complete insertion during assembly (check the interference fit of the components being joined).

- **Note:** During assembly of the cut-in tee (and other components) it is important to make a one-quarter turn when inserting the pipe into the fitting per the manufacturer’s assembly instructions, particularly on 1½” pipe sizes and larger. This may require the use of several components assembled in combination with the cut-in tee to create a short spool piece assembly. This can be accomplished by using socket unions, flanges, or grooved coupling adapters that will ensure that a one-quarter turn can be obtained on all pipe connections being joined.

- 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).

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

• After work is completed and cut-in cure times are met, inspect work for proper alignment and hanger placement prior to pressure testing.

• 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).

• After cut-in cure times are met and the air is bled from the system, it is recommended that 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 over the system pressure. This approach will minimize the potential for water damage should a leak occur.

WARNING: AIR OR COMPRESSED GAS MUST NEVER BE USED FOR PRESSURE TESTING

Cut-Ins
Minimum Cure Prior to Pressure Testing

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Ambient Temperature During Cure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60°F to 120°F</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>1 hour</td>
</tr>
<tr>
<td>1&quot;</td>
<td>1½ hour</td>
</tr>
<tr>
<td>1½&quot; &amp; 1½&quot;</td>
<td>3 hour</td>
</tr>
<tr>
<td>2&quot;</td>
<td>8 hour</td>
</tr>
<tr>
<td>2½&quot; &amp; 3&quot;</td>
<td>24 hour</td>
</tr>
</tbody>
</table>

* Solvent cement can be applied at temperatures below 40°F for pipe 2" in size and larger; however, the temperature of the system must be raised to 40°F 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 to 120°F cure schedule.
Hangers and Supports

Because BlazeMaster® pipe is rigid, it requires fewer supports than flexible plastic systems. The support spacing is shown in the following table.

Most hangers designed for metal pipe are suitable for BlazeMaster® pipe. Do not use undersized hangers. Hangers with sufficient load bearing surface shall be selected based on pipe size, i.e., 1 1/2" hangers for 1 1/2" pipe. The hanger shall not have rough or sharp edges that come in contact with the pipe. The pipe hangers must comply with the requirements in NFPA 13, 13R, and 13D.

For Quick Response upright sprinkler heads, rigid hangers secured to the ceiling shall be used.

When a sprinkler head activates, a significant reactive force can be exerted on the pipe. With a pendent head, this reactive force can cause the pipe to lift vertically if it is not properly secured, especially if the sprinkler drop is from small diameter pipe. The closest hanger shall brace the pipe against vertical lift-up. See Tables B & C.

Any of a number of techniques can be used to brace the pipe. Four acceptable approaches would be to use a standard band hanger positioning the threaded support rod to 1/16 inch (1.588 mm) above the pipe, a split-ring hanger, a wrap-around U hanger, or a special escutcheon which prevents upward movement of the sprinkler through the ceiling.

### TABLE A

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>Maximum Support Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>inches</td>
<td>mm</td>
</tr>
<tr>
<td>3/4</td>
<td>20.0</td>
</tr>
<tr>
<td>1</td>
<td>25.0</td>
</tr>
<tr>
<td>1 1/4</td>
<td>32.0</td>
</tr>
<tr>
<td>1 1/2</td>
<td>40.0</td>
</tr>
<tr>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td>2 1/2</td>
<td>65.0</td>
</tr>
<tr>
<td>3</td>
<td>80.0</td>
</tr>
</tbody>
</table>

### TABLE B

<table>
<thead>
<tr>
<th>Nominal Pipe Size</th>
<th>Maximum Support Spacing Distance In Line</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sprinkler Head Drop Tee</td>
</tr>
<tr>
<td></td>
<td>Less than 100 psi (690 kPa)</td>
</tr>
<tr>
<td>3/4&quot; (20 mm)</td>
<td>4' (1.22 m)</td>
</tr>
<tr>
<td>1&quot; (25 mm)</td>
<td>5' (1.52 m)</td>
</tr>
<tr>
<td>1 1/4&quot; (32 mm)</td>
<td>6' (1.83 m)</td>
</tr>
<tr>
<td>1 1/2&quot; - 3&quot; (40 - 80 mm)</td>
<td>7&quot; (2.13 m)</td>
</tr>
</tbody>
</table>

### TABLE C

<table>
<thead>
<tr>
<th>Nominal Pipe Size</th>
<th>Maximum Support Spacing Distance End Line</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sprinkler Head Drop Elbow</td>
</tr>
<tr>
<td></td>
<td>Less than 100 psi (690 kPa)</td>
</tr>
<tr>
<td>3/4&quot; (20 mm)</td>
<td>9&quot; (229 mm)</td>
</tr>
<tr>
<td>1&quot; (25 mm)</td>
<td>12&quot; (305 mm)</td>
</tr>
<tr>
<td>1 1/4&quot; (32 mm)</td>
<td>16&quot; (406 mm)</td>
</tr>
<tr>
<td>1 1/2&quot; - 3&quot; (40 - 80 mm)</td>
<td>24&quot; (610 mm)</td>
</tr>
</tbody>
</table>

Figure 7: Support Spacing Drop Elbow and Drop Tee
Penetration of Studs and Joists

Wooden Studs and Joists
It is acceptable to cut holes in wood studs for support. The holes should be oversized to allow for movement.

Metal Studs
BlazeMaster® pipe and fittings should be protected from sharp edges when passing through metal studs.

Transition to Other Materials

Support
Additional support should be added at the metal side of a BlazeMaster® CPVC-metal transition to support the weight of the metal system.

Threaded Connections
BlazeMaster® CPVC male and female threaded adapters or flanges are listed for connecting a BlazeMaster® fire sprinkler system to other materials, valves, and appurtenances.

A thread sealant shall be used in making threaded connections. TFE (Teflon®) thread tape is the recommended sealant. Some thread sealants other than TFE thread tape contain solvents or other materials that may be damaging to CPVC. Refer to manufacturers’ installation instructions for specific recommendations on thread sealants. Always consult with the manufacturer of the material for compatibility with BlazeMaster® CPVC pipe and fittings or reference the Chemical Compatibility and FGG/BM® System Compatible program sections of www.blazemaster.com for additional information.

Care shall be exercised when transitioning between BlazeMaster® pipe and fittings and metal. Care must be taken to avoid over-torquing. Refer to manufacturers’ installation instructions for torque requirements.

Flanged Connections
Flange Make-Up: Once a flange is joined to pipe, the method for joining two flanges is as follows:

1. Piping runs joined to the flanges must be installed in a straight line position to the flange to avoid stress at the flange due to misalignment. Piping must also be secured and supported to prevent lateral movement that can create stress and damage the flange.

2. With gasket in place, align the bolt holes of the mating flanges by rotating the ring into position. (Consideration should be given to alignment of one-piece flange prior to joining with pipe.)

3. Insert all bolts, washers (two standard flat washers per bolt), and nuts.

4. Make sure the faces of the mating surfaces are flush against gasket prior to bolting down the flanges.

5. Tighten the nuts by hand until they are snug. Establish uniform pressure over the flange face by tightening the bolts in 5 ft.-lb. (6.8 Newton-m) increments according to the sequence shown in Figure 8: Bolt Tightening Sequence following a 180° opposing sequence.

6. Care must be taken to avoid “bending” the flange when joining a flange to a “raised face” flange, or a wafer-style valve. Do not use bolts to bring together improperly mated flanges.

Caution: Over-torquing will damage the flange.

Torque given is for dry, non-lubricated bolt, standard washers, neoprene 1/8” (3.18 mm) thick full face gasket. If lubricant (non-petroleum based) is used, torque levels may vary. Actual field conditions may require a variation in these recommendations.

Recommended Bolt Torque

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>Bolt Diameter</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; - 1 1/2&quot; (20 – 40mm)</td>
<td>1/2&quot; (12.7 mm)</td>
<td>10 – 15 ft. lbs (13.6 – 20.3 Newton-m)</td>
</tr>
<tr>
<td>2&quot; – 3&quot; (50 – 80 mm)</td>
<td>5/8&quot; (15.9 mm)</td>
<td>20 – 30 ft. lbs. (27.1 – 40.7 Newton-m)</td>
</tr>
</tbody>
</table>

Figure 8: Bolt Tightening Sequence
Grooved Coupling Adapters

The following procedures are recommended for proper assembly of the Grooved Coupling Adapter. **READ THESE INSTRUCTIONS CAREFULLY BEFORE BEGINNING INSTALLATION.**

1. Inspect the fittings and pipe to insure that they are sufficiently free from indentations, projections or roll-marks on the gasket seating areas of the fitting and pipe. The pipe should be squarely cut with any loose scale, paint, and/or dirt removed from the groove and seating surface. **Use a standard grade E**, EPDM compound that is suitable for wet fire sprinkler service. A flexible coupling shall be used with grooved coupling adapters. **Caution:** Use of rigid style couplings may damage the grooved coupling adapter. Consult the coupling manufacturer for proper selection.

   *See manufacturer for temperature ratings.*

2. Make sure the gasket is clean and free of any cracks, cuts or other defects which may cause leaks. Lubricate the gasket with a vegetable soap-based gasket lubricant. **Caution:** Use of petroleum based lubricants will damage the gasket and adapter resulting in stress failure of the CPVC adapter. A gasket/joint lubricant is recommended to prevent pinching the gasket and to assist in seating the gasket during the alignment process. Apply the appropriate lubricant to the gasket lips and exterior surface of the gasket.

3. Place the gasket over the metal pipe ends, being sure gasket lip does not overhang the pipe end. Insert the CPVC grooved coupling adapter into the gasket. Make sure that the gasket is centered between the two grooves. No portion of the gasket should extend into the grooves. **Caution:** Make sure the gasket is not pinched between the pipe and the fitting.

4. Place the metal housing over the gasket, making sure the metal housing key is into the grooves on the metal pipe and the CPVC coupling adapter. Insert the bolts and hand tighten. Tighten the bolts alternately and equally until the bolt pads are touching metal-to-metal. In completing a proper joint, the gasket is also slightly compressed, adding to the strength of the seal from the gasket’s durometer.

5. Inspect the joints before and after pressure testing. Look for gaps between the bolt pads and for housing keys that are not inside the grooves.

**Other Design Criteria**

**Chemical Compatibility**

CPVC domestic water, fire sprinkler, and industrial piping systems have been used successfully for more than 40 years in new construction, re-pipe and repair. CPVC products are ideally suited for these applications due to their outstanding corrosion resistance. Occasionally, however, CPVC can be damaged by contact with chemicals found in some construction products (and site preparations). This may result in damage to property, people, or the BlazeMaster® CPVC fire sprinkler system. **Reasonable care needs to be taken to insure that products coming into contact with CPVC systems are chemically compatible.** Lubrizol recommends that chemical compatibility with CPVC be confirmed with the manufacturer of the product in contact with CPVC piping systems. If chemical compatibility with CPVC is in question, Lubrizol recommends isolating the suspect product from contact with CPVC pipe or fittings.

Lubrizol maintains a list of products that have been shown to be **UNACCEPTABLE** for (unprotected use) contact with CPVC systems. Chemically incompatible products are added to this list as they are brought to our attention. For the most current list of chemically incompatible products, contact Lubrizol or refer to the Chemical Compatibility Section under Design & Installation at [www.blazemaster.com](http://www.blazemaster.com). A product’s absence from this list does not imply or insure CPVC chemical compatibility.

The FGG/BM® System Compatible program identifies products that have been determined to be compatible with CPVC compounds.
manufactured by Lubrizol, such as BlazeMaster® CPVC. Products included in this program carry the FGG/BM® System Compatible logo on their label. Additional information on this program can be found on the internet at www.blazemaster.com under Design and Specifications.

**ALWAYS CHECK THE PRODUCT MANUFACTURER’S RECOMMENDATION IN THIS REGARD.**

**A Note on Microbiologically Influenced Corrosion (MIC)**

In areas where water supplies are known to have contributed to MIC, NFPA requires metallic fire sprinkler system water supplies to be tested and appropriately treated. Reference Section 23.1.5 of NFPA 13 (2007 Edition). This testing and treatment is not required when using BlazeMaster® CPVC products. BlazeMaster® CPVC is not susceptible to MIC because:

1. CPVC surfaces discourage the adherence of the bacteria associated with MIC. In metallic systems, colonies form around the bacteria that entrap organic acids against the wall, causing the pitting which is common with MIC.

2. As the bacteria associated with MIC cannot adhere to the inner surface of CPVC, the bacteria will not propagate as rapidly.

3. The organic acids produced by the MIC bacteria promote the oxidation of metals but do not affect CPVC. In fact, the compounds that comprise BlazeMaster® pipe and fittings are known to be unaffected in extreme acid environments far more severe than those environments associated with MIC.

**Note:** Metal components within non-metallic fire sprinkler systems are not immune to MIC.

**Freeze Protection**

Freeze protection can be provided in a variety of methods including system design, insulation, and antifreeze.

**Batt Insulation**

Many jurisdictions recommend the use of batt insulation for freeze protection in place of antifreeze solutions. These jurisdictions typically publish batt insulation guidelines that provide the minimum thickness of insulation to be utilized. Reference NFPA 13D Section 8.3.1 (2007 Edition) for additional recommendations.

**Antifreeze Solutions**

Glycerin antifreeze solutions are acceptable for use with BlazeMaster® piping. Glycol antifreeze solutions are not recommended for use with BlazeMaster® pipe and fittings. Always install antifreeze systems per the NFPA guidelines. Refer to Section 7.6.2 of NFPA 13 (2007 Edition).

The following considerations should be incorporated into the system design when providing for freeze protection:

- Always follow the manufacturers’ installation instructions provided by the BlazeMaster® pipe and fittings manufacturer. This is especially important with regard to the torque requirements for sprinkler installation, the specific type and use of Teflon® tape, and the specific type and use of a thread paste sealant.

- Use only high quality Teflon® tape or a thread paste sealant that is chemically compatible with CPVC and recommended by the sealant manufacturer. Reference the Chemical Compatibility and FGG/BM® System Compatible program sections of www.blazemaster.com for additional information. Never combine both Teflon® tape and thread paste sealants.

- Follow NFPA 13 Section 7.6.3.3 (2007 Edition) requirement regarding the installation and use of expansion chambers when backflow prevention devices are installed with steel, copper, and CPVC. NOTE: Most existing backflow prevention devices do not allow entrapped pressure to be relieved.

- Consider the use of glycerin and water solution antifreeze loops rather than the practice of installing glycerin and water solutions into the entire sprinkler system.
Painting
Water-based acrylic latex paint is the preferred and recommended paint to use on BlazeMaster® CPVC pipe and fittings. Oil or solvent-based paints may be chemically incompatible.

Certain types of oil or solvent-based paints may, however, be used provided that it is a light coating that dries quickly. These paints should not be allowed to puddle or pool on the surface. Application of solvent-based paints must be individually reviewed as there are certain types of paints and stains that contain drying oils and should not be used at all on CPVC.

Maintenance
Maintenance of a BlazeMaster® fire sprinkler system shall be in accordance with the Standard for Inspection, Testing and Maintenance of Water Based Extinguishing Systems as defined by NFPA 25.

Penetrating Fire Rated Walls and Partitions
Before penetrating fire rated walls and partitions, consult building codes and authorities having jurisdiction in your area. Several classified through-penetration firestop systems are approved for use with CPVC pipe. Consult the pipe manufacturer or BlazeMaster® fire sprinkler system representative for further information. Warning: Some firestop sealants or wrap strips contain solvents or plasticizers that may be damaging to CPVC. Always consult the manufacturer of the firestop material for compatibility with BlazeMaster® CPVC pipe and fittings. To avoid compatibility issues, reference the Chemical Compatibility and FGG/BM® System Compatible program sections of www.blazemaster.com for additional information.

Earthquake Bracing
Since BlazeMaster® CPVC pipe is more ductile than metallic sprinkler pipe, it has a greater capacity to withstand earthquake damage. In areas subject to earthquakes, BlazeMaster® fire sprinkler systems shall be designed and braced in accordance with local codes or NFPA 13, Section 9.3 (2007 Edition).

NFPA 13 recognizes the unique properties of nonmetallic fire sprinkler piping. Section 9.3.4.7 of the 2007 edition of NFPA 13 permits nonmetallic fire sprinkler pipe to penetrate a wall, floor, platform, or foundation without allowing for clearance in an opening if the pipe has the inherent flexibility equal to or greater than the flexibility provided by flexible couplings located within 1 foot of each side of the wall, floor, platform, or foundation.

BlazeMaster® CPVC fire sprinkler pipe has the flexibility to meet this criteria. The permissible bending deflection values for BlazeMaster® CPVC pipe can be found in the tables in the Pipe Deflection section of this manual.

When it is required to earthquake brace BlazeMaster® piping, it is important to use fittings, fasteners or clamps that do not have sharp edges or apply excessive compressive forces sufficient to distort the pipe.

Lubrizol
## Dos and Don’ts

While not a complete list, the following is intended to highlight many of the “Dos” and “Don’ts” addressed in this manual.

**Dos**
- Install product according to the manufacturer’s installation instructions.
- Follow recommended safe work practices.
- Make certain that thread sealants, gasket lubricants, or fire stop materials are compatible with BlazeMaster® CPVC.
- Use only latex-based paints if painting is desired.
- 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 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 before solvent cementing.
- Rotate the pipe 1/4 turn when bottoming pipe in fitting socket.
- Avoid puddling of solvent cement in fittings and pipe.
- Make certain that solvent cement does not run and plug the sprinkler head orifice.
- Follow the manufacturer’s recommended cure times prior to pressure testing.
- Fill lines slowly and bleed the air from the system prior to pressure testing.
- Support sprinkler head properly to prevent lift up of the head through the ceiling when activated.
- Keep threaded rod within 1/16" of the pipe.
- Install BlazeMaster® CPVC pipe and fittings in wet systems only.
- Use only insulation and/or glycerin & water solutions for freeze protection.
- Allow for movement due to expansion and contraction.
- Renew your BlazeMaster® CPVC pipe and fittings installation training every two years.

**Don’ts**
- Do not use edible oils such as Crisco® as a gasket lubricant.
- Do not use petroleum or solvent-based paints, sealants, lubricants or fire stop materials.
- Do not use any glycol-based solutions as an anti-freeze.
- Do not mix glycerin and water solution in contaminated containers.
- Do not use both Teflon® tape and thread sealants simultaneously.
- Do not use solvent cement that exceeds its shelf life or has become discolored or gelled.
- Do not allow solvent cement to plug the sprinkler head orifice.
- Do not connect rigid metal couplers to BlazeMaster® CPVC grooved adapters.
- Do not thread or groove BlazeMaster® CPVC pipe.
- Do not use solvent cement near sources of heat, open flame, or when smoking.
- Do not pressure test until recommended cure times are met.
- Do not use dull or broken cutting tool blades when cutting pipe.
- Do not use BlazeMaster® CPVC pipe that has been stored outdoors, unprotected and is faded in color.
- Do not allow threaded rod to come in contact with the pipe.
- Do not install BlazeMaster® CPVC pipe in cold weather without allowing for expansion.
- Do not install BlazeMaster® CPVC pipe and fittings in dry systems.
The information contained herein is believed to be reliable, based on extensive laboratory testing and thousands of successful CPVC system installations dating from 1960, but no representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular application or the results to be obtained therefrom. The information is based on laboratory work with small-scale equipment and does not necessarily indicate end product performance. Because of the variations in methods, conditions and equipment used commercially in processing these materials, no warranties or guarantees are made as to the suitability of the products for the applications disclosed. Full-scale testing and end product performance are the responsibility of the user. Lubrizol Advanced Materials, Inc. shall not be liable for and the customer assumes all risk and liability of any use or handling of any material beyond Lubrizol Advanced Materials, Inc.’s direct control. THE SELLER MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Nothing contained herein is to be considered as permission, recommendation, nor as an inducement to practice any patented invention without permission of the patent owner.