

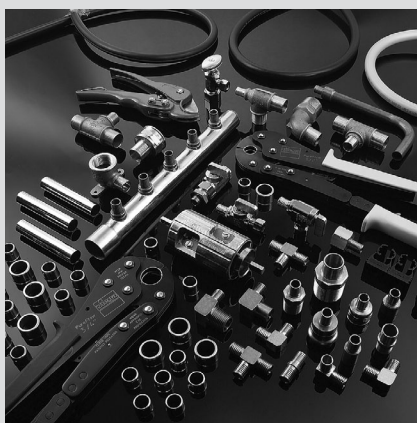
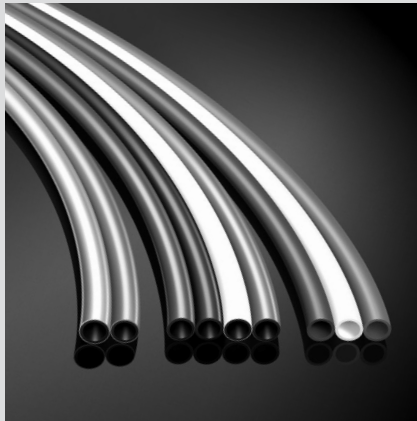
# PureFlow<sup>®</sup> Fire Sprinkler System For Residential Applications

**viega**

## Installation Manual



October 2010



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 MANABLOC is a registered trademark of Viega LLC  
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## Working with Viega is the perfect solution.

Viega researches, develops and produces complete system solutions for contractors. The components are produced at our plants or are supplied exclusively by the finest quality manufacturers. Each of our systems is developed in-house and tested under stringent quality control conditions to guarantee safety and efficient operation.

## An international company with a national commitment.

Viega PureFlow plumbing combines technology from both sides of the Atlantic into the very best PEX plumbing systems for our customers.

Viega's reach extends throughout North America with distribution across the U.S., Canada and Mexico.

Our network of sales experts and wholesale distributors can meet your needs whether you are in Boston or Berkeley. The products we deliver are the finest quality offered at a highly competitive price. Our goal is to remain on the forefront of the plumbing industry with our advanced products and a determination to remain the quality leader.

Call 800-976-9819 for your local representative and wholesale location.

## Why you can depend on Viega PureFlow.

- A safe system
- Competitively priced
- Leakproof fitting connection
- Highly flexible and kink resistant
- Lightweight and easy to handle
- Fast and solder-free installation
- No open flame during installation
- Reduced number of fittings used in wall
- Long life expectancy
- Non-corroding
- Reduced flow noises
- In coils or straight lengths
- Listed by NSF to meet the requirements of ANSI 14 and 61 and Annex G.
- Listed to ASTM F876/F2023 and F877

## IMPORTANT NOTICE

This installation guide is intended to assist in the design and installation of Viega multipurpose fire protection sprinkler/plumbing systems. System installation shall be done by installers trained through industry recognized or approved programs.

NOTE: References to ViegaPEX made throughout this publication include Black ViegaPEX Ultra and PureFlow PEX Press Fittings w/ attached sleeves.

IN THE EVENT OF CONFLICT OR INCONSISTENCY BETWEEN THESE INSTALLATION GUIDELINES AND LOCAL BUILDING OR PLUMBING CODES, LOCAL CODES SHOULD TAKE PRECEDENCE.

NOTE: Failure to follow the installation instructions will void the Viega Plumbing Warranty. Nothing in this publication is intended to create any warranty beyond Viega's applicable warranty. For additional information, contact Viega at 800-976-9819.

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## Terms Used In This Guide:

PEX	ViegaPEX cross-linked polyethylene tubing
AHJ	Authority Having Jurisdiction
NFPA	National Fire Protection Association
NSF	NSF International, Inc. (formerly National Sanitation Foundation)
CAN/CSA	Canadian Standards Association
"shall"	Required; a mandatory procedure
"may" or "should"	A suggested optional procedure

# 1. INTRODUCTION

## 1.1 Introduction

This manual is intended as a reference guide to aid in the design and installation of Viega's PEX Press Fire Sprinkler systems.

All installations must comply with the appropriate model and local codes as well as NFPA 13D "Installation of One- and Two- Family Dwellings and Manufactured Homes."

## 1.2 Viega

For more than 100 years, Viega has been a trusted name in the plumbing business globally.

Through innovative techniques, sophisticated technologies and acquisition of the top PEX plumbing products in the U.S., Viega has become the industry leader for PEX plumbing.

Viega produces a comprehensive range of plumbing and heating equipment. Anywhere that water flows in a building Viega manufactures a system to fit. The company's experience with press fitting technology in bronze, stainless steel and copper led to the development of the PureFlow water distribution system. Viega is positioned as the number-one supplier of PEX plumbing systems in North America.

Today Viega engineers and manufactures more than 12,000 system components at five state-of-the-art factories including our PEX tubing facility located in the heart of the United States. Viega quality has proven itself in millions of systems installed each year around the world.

Viega has a history in North America of technological innovation and customer service that is second to none. The Viega product line now is composed of multiple brands including ProPress® flameless copper joining technology, PureFlow® flexible PEX tubing plumbing technology, ProRadiant™ comfortable efficient heating technology and S-no-Ice® snow and ice melting technology, to name a few. Each product line is selected so that components work together to create a complete system concept. PureFlow plumbing provides complete PEX systems for potable water distribution, including manifolds, PEX and multilayer tubing, fittings and valves. The ProRadiant program includes a wide range of hydronic radiant systems and controls as well as thermostats and setpoint controls. The PureFlow fire sprinkler system includes ViegaPEX Ultra Black tubing and PEX Press fittings (with attached sleeves) for NFPA 13D residential fire sprinkler systems.

In addition, the Viega S-no-Ice line includes snow and ice detection controls, heat exchangers and snow melting systems.

As the pioneer in combining technology and engineering expertise from both sides of the Atlantic into the very best systems for our customers in North America, we are proud to present you the world's finest potable water distribution systems: PureFlow.

The name says it all. We look forward to sharing our history in the making with you.





### 1.3 PureFlow System Concepts

PureFlow ViegaPEX is a high-quality flexible PEX system for hot and cold potable water distribution.

The PureFlow plumbing system offers maximum security thanks to cold press and full circle crimp fitting techniques. These fittings guarantee the plumber quick installation, suitability for use in all types of applications at the construction site and vast reductions in the required number of fittings and necessary installation time.

Top quality materials such as brass, bronze, stainless steel and durable, environmentally compatible plastics provide the basis for the very highest standards of quality at Viega.

PEX tubing offers outstanding versatility. More than 655 million feet of Viega PEX tubing has been manufactured since 2006. This is conclusive evidence of this product's considerable importance in plumbing installation, in both quality and quantity.

This is clearly the result of excellent workmanship, fast and simple installation and the reliability and safety that are characteristic of the Viega system concept.

The efficiency of the integrated system concept for Viega branded products is confirmed by:

- perfectly coordinated components
- quick delivery at short notice
- time-saving installation
- complete installation of an entire system from one supplier

Viega's comprehensive services include technical support and warranty coverage, subject to the exclusive use of PureFlow system components.

PureFlow is a high-quality plumbing system. It is able to withstand high levels of thermal and mechanical stress (200°F at 80 psi, 180°F at 100 psi, 73.4°F at 160 psi).

### The systems incorporate:

- ViegaPEX tubing: red, white and blue cross-linked polyethylene tubing designed with superior chlorine resistance
- ViegaPEX Ultra tubing: red, white, blue and black cross-linked polyethylene tubing with added resistance to UV
- Viega FostaPEX tubing: cross-linked polyethylene with additional aluminum and polyethylene layers to provide rigidity and form stability, available in red or silver to differentiate hot water lines
- A range of bronze, brass or plastic fittings for both PEX Press and PEX Crimp fitting systems
- PureFlow MANABLOC distribution system for use with ViegaPEX tubing
- A range of inline, manifold and stop valves for Viega fitting systems
- Viega PureFlow press tools and jaws for the PEX Press fitting systems
- Viega PureFlow crimp tools for the PEX Crimp fitting systems



## 2. SYSTEM COMPONENTS AND PROPERTIES

### 2.1 ViegaPEX Ultra Black

ViegaPEX Ultra tubing is a high-density cross-linked polyethylene tubing (PEX). Cross-linking produces a strong, durable tubing ideal for both hot and cold potable water systems.

#### 2.1.1 PEX - The Superior Tubing

Cross-linked polyethylene is the ideal tubing choice for potable water systems. Compared to ordinary polyethylene tubing (PE), cross-linked tubing has higher temperature resistance and higher burst pressure.

ViegaPEX Ultra tubing is manufactured to ASTM F876/F877 standards and listed to ANSI/NSF standards 14 and 61. It is PEX 5006 (CL5) chlorine resistance rated for both traditional and continuous recirculation applications. ViegaPEX Ultra tubing is rated at 100 psi at 180°F and 160 psi at 73°F.

In addition, the smooth walls of ViegaPEX Ultra tubing are resistant to corrosion and scaling.

#### 2.1.2 Colors

ViegaPEX Ultra black tubing is currently the only ViegaPEX tubing approved for NFPA 13D fire sprinkler systems. However, Viega is in the process of expanding this offering. Check with your local Viega representative for additions to this offering. The UV resistance of this tubing enables exposure of up to 6 months. It also blocks transmission of visible light, preventing most types of algae growth from occurring.

#### 2.1.3 ViegaPEX Ultra Properties and Performance

Linear Expansion Coefficient:

- 1.1 inch per 100 feet per 10°F

Temperature and Pressure Ratings:

- 200°F at 80 psi
- 180°F at 100 psi
- 73.4°F at 160 psi

UV Resistance:

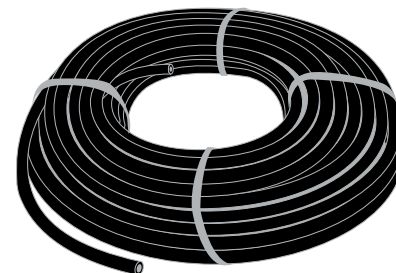
- maximum exposure 6 months

Flexibility:

- ViegaPEX Ultra can be easily bent by hand 8 times the radius of the actual tubing outside diameter (O.D.).

#### 2.1.4 Tubing Markings

ViegaPEX Ultra tubing is marked every 2 to 5 feet with the following representative information:



<b>Length Marker</b>	000 Feet
<b>Company</b>	Viega
<b>Product Name</b>	ViegaPEX™ Ultra
<b>Nominal Tubing Size</b>	3/4"
<b>Standard Dimension Ratio Tube Size</b>	SDR 9 CTS (copper tube size)
<b>Material Designation Code</b>	PEX5006
<b>Temperature &amp; Pressure Rating</b>	100 PSI @ 180°F/ 160 PSI @ 73F
<b>NSF Listing (Potable)</b>	cNSF@us-pw
<b>NSF Chlorine Listing</b>	CL5
<b>NSF Uniform Plumbing Code Listing</b>	NSF U.P. Code
<b>ASTM Tubing Standards Certification</b>	F876/F877
<b>Canadian Standard Assoc</b>	CSA B137.5
<b>Fittings System Compatibility</b>	PureFlow - ASTM F877/F1807/F2159
<b>UL Listing Temperature / Pressure Rating*</b>	cULus 3SAV UL1821 130 PSI @ 120F
<b>Plenum Rating**</b>	FS/SD 25/50 ASTM E84
<b>ICC Listing</b>	ES-PMG™ - 1038
<b>AWWA Listing</b>	C904
<b>HUD Listing</b>	MR 1276
<b>Manufacturer's Date Code</b>	1/1/2010
<b>Material Code</b>	B2X14.2
<b>Country of Manufacture</b>	MADE IN THE USA

\*3/4" through 2" tube sizes only

\*\*3/4" and smaller tube sizes only

#### 2.1.5 ViegaPEX Ultra Tubing Dimensions

Nominal Size	Inner Diameter	Outer Diameter	Wall Thickness	Capacity gal/ft
3/4"	.671	.875	.102	1.82
1"	.863	1.125	.131	3.04
1-1/4"	1.053	1.375	.160	4.52
1-1/2"	1.243	1.625	.190	6.30
2"	1.629	2.125	.248	10.83

NOTE: Dimensions are in English units. Tolerances shown are ASTM requirements. ViegaPEX Ultra is manufactured within these specifications.


#### 2.1.6 ViegaPEX Ultra Sizes

Nominal Size	Available Coil Lengths	Available Straight Lengths
3/4"	100, 500 feet	20-foot lengths in bundles of 25
1"	100, 500 feet	20-foot lengths in bundles of 5
1-1/4"	100, 300 feet	20-foot lengths in bundles of 5
1-1/2"	100 feet	20-foot lengths in bundles of 5
2"	100 feet	20-foot lengths in bundles of 5

## 2.2 Friction Loss

ViegaPEX pipe has a Hazen-Williams coefficient C-value of 150. Pipe friction loss calculations shall be performed according to the NFPA standards. The following table lists pressure loss in psi/ft of pipe for various flow rates.

Pressure Drop (psi per foot of PEX tubing)							
gpm	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
1	0.070	0.016					
1.5	0.149	0.034					
2.2	0.303	0.069					
2.5	0.385	0.087					
3	0.539	0.122	0.023				
3.5	0.717	0.162	0.030				
4		0.208	0.039				
5		0.314	0.059				
6		0.440	0.082	0.024			
7		0.586	0.109	0.032			
8			0.140	0.041			
9			0.174	0.051			
10			0.211	0.062	0.024		
11			0.252	0.074	0.028		
12			0.296	0.087	0.033		
13			0.343	0.101	0.038		
14				0.116	0.044		
16				0.148	0.056	0.025	
18				0.184	0.070	0.031	
20				0.224	0.085	0.038	
22				0.267	0.102	0.045	
24					0.119	0.053	
26					0.138	0.062	
28					0.159	0.071	
30					0.180	0.080	
32					0.203	0.091	.024
34						0.101	.027
36						0.113	.030
38						0.125	.033
40						0.137	.037
45							.046
50							.056
55							.066
60							.078
65							.090
70							.104
75							.118

 = 8 fps per size tubing

NOTE: Maximum flow for each size based on 12 FPS velocity. PSI x 2.307 = head loss.

## 2.3 PureFlow PEX Press Fittings

The PureFlow PEX Press System offers a variety of PEX Press fittings cast and machined from a solid bronze alloy (also available in zero lead\*) specially developed to resist dezincification. These fittings are available with attached sleeves and approved for use in potable water applications, radiant systems and residential fire sprinkler installations.

The PureFlow PEX Press System includes:

- straight couplings, elbows, and tees and adapters (both single size and reducing, available with or without attached sleeves)
- PureFlow PEX Press Hand Tool
- PureFlow PEX Press Power Tool

All PureFlow tubing, fittings and manifolds are NSF certified for use in potable water systems.

Each PureFlow Bronze PEX Press fitting is marked where space permits with the following information:

Manufacturer	VIEGA
ASTM standard	ASTM F877
Temperature Rating	180°F
Certifications	cNSF <sub>us</sub> -pw, cNSF <sub>us</sub> pw-G UPC®, cUL <sub>us</sub> ®

Note: all fittings may not be listed with each organization shown.

Zero Lead identifies Viega products meeting the lead free requirements of California and Vermont law, effective January 1, 2010, as tested and listed against NSF- 61, Annex G.



**Use only Viega Stainless Steel Press Sleeves and Press tools with PureFlow PEX Press fittings**

### 2.3.1 Friction Loss

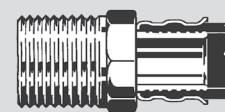
Hydraulic calculations for the sizing of ViegaPEX pipe and PureFlow PEX Press fittings shall be calculated by using the Hazen-Williams C-value of 150. Pipe friction loss calculations shall be made according to NFPA Standard 13. The following table shows the allowance of friction loss for fittings, expressed as equivalent length of pipe.

#### PureFlow PEX Press Friction Loss Equivalent Feet of SDR9 PEX Tubing

Size	Coupling	90° Elbow
3/4"	1	8
1"	1	10
1-1/4"	2	11
1-1/2"	2	13
2"	1	19

Size	Tee Flow Through	Tee Turned 90°
3/4"	1	9
1"	2	10
1-1/4"	2	11
1-1/2"	2	12
2"	2	18

Size	Horizontal Sprinkler Tee	Vertical Sprinkler Tee
3/4"	2	2
1"	2	6



*Cross-section of a completed PureFlow PEX Press fitting*



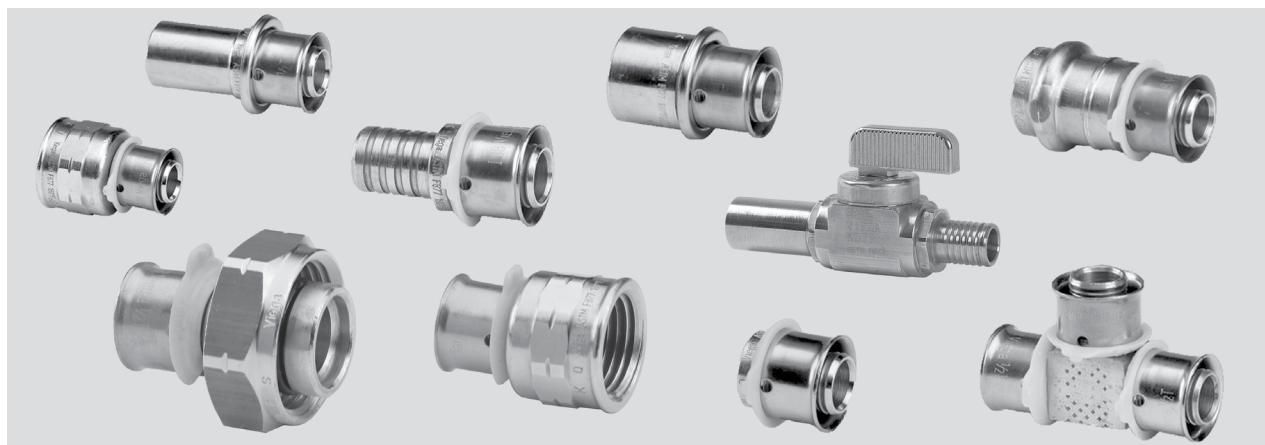
*PureFlow Press Power Tool*



*Jaws*

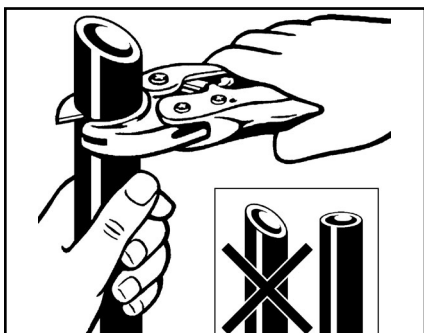


*PureFlow Press Hand Tool*

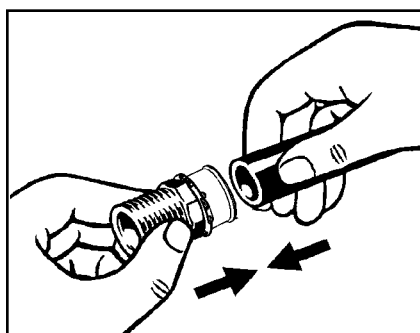




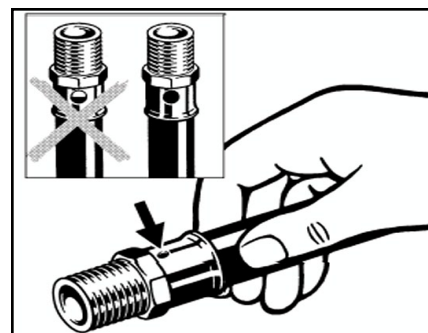
### 2.3.2 Making a PureFlow PEX Press Hand Tool Connection (Attached Sleeves)



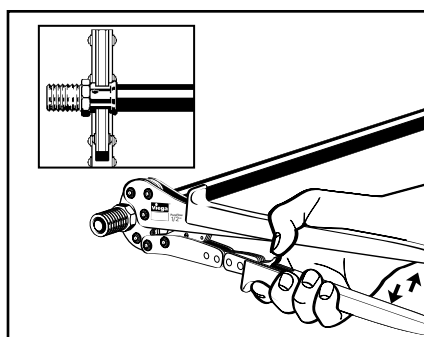
1. Square off tubing to proper length. Uneven, jagged or irregular cuts will produce unsatisfactory connections.



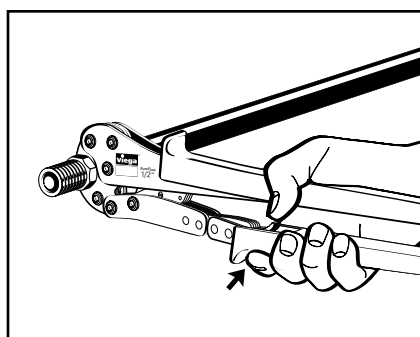
2. Insert PEX Press fitting with attached sleeve into tubing and engage fully.



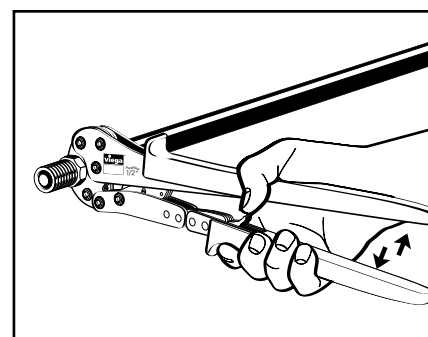
3. Ensure full tubing insertion at view holes in attached press sleeve. Full insertion means tubing must be completely visible in at least two view holes and partially visible in the one.



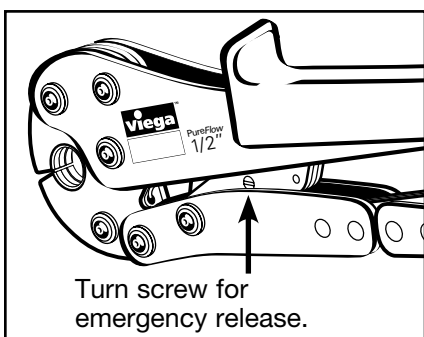
4. Position press tool perpendicular over Press Sleeve resting it against the tool locator ring.



5. Close handles using trigger to reduce grip span if desired.

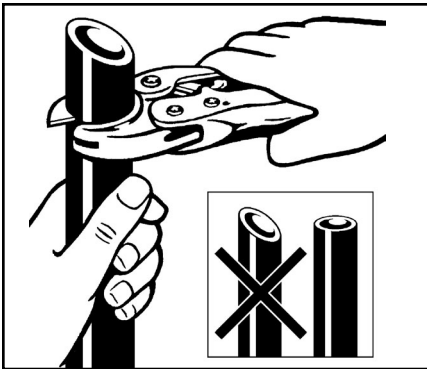


6. Extend handle and continue ratcheting until automatic tool release occurs at proper compression force.

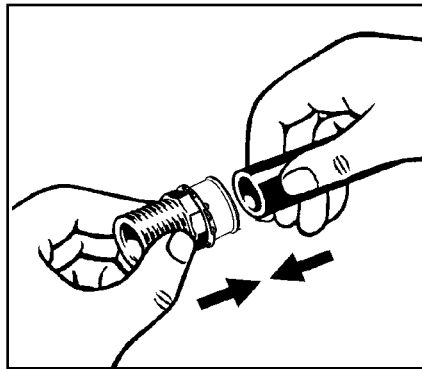


7. **Warning:** The connection is not leakproof when the tool has been opened by emergency release. The tool locator ring must be present to ensure a proper PEX Press connection,

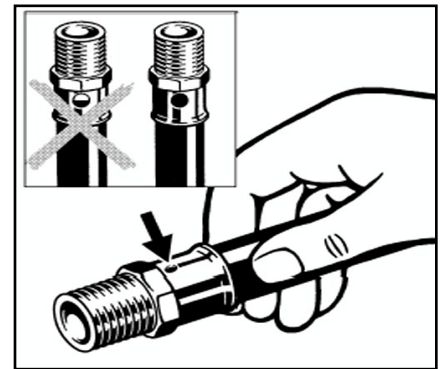
### 2.3.3 Making a PureFlow PEX Press Power Tool Connection (Attached Sleeves)



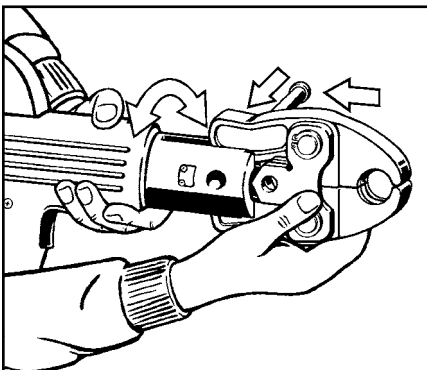
1. Square off tubing to proper length. Uneven, jagged or irregular cuts will produce unsatisfactory connections.



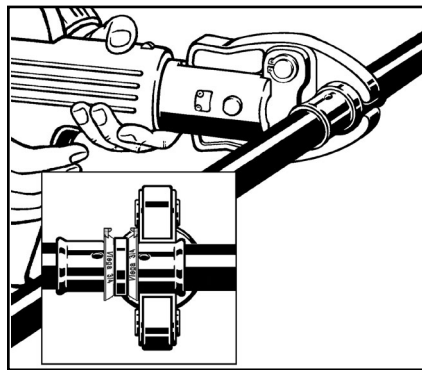
2. Insert PEX Press fitting with attached sleeve into tubing and engage fully.



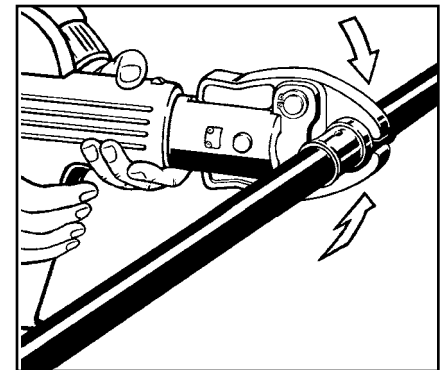
3. Ensure full tubing insertion at view holes in attached press sleeve. Full insertion means tubing must be completely visible in at least two view holes and partially visible in the one.



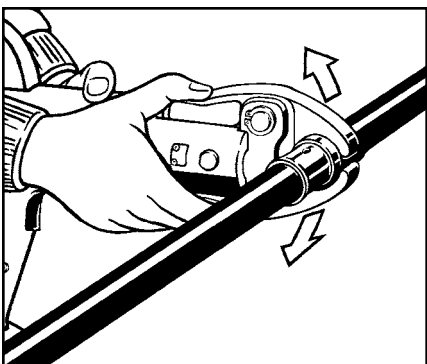
4. Insert the appropriate PureFlow Press Jaw into the press tool and push in the holding pin until it locks.



5. Open jaw and position perpendicular over Press Sleeve. Close jaw.



6. Start pressing process; hold the trigger until the jaw has automatically released.



7. When press connection is complete, open and remove jaw.

## 2.4 Sprinklers

Automatic sprinkler heads are heat-actuated suppression devices that when exposed to temperatures at or above its thermal rating, automatically allow water to flow through the sprinkler head which disperses water onto the heat source. Residential fire sprinklers are primarily designed to save lives by providing adequate time for occupants to exit the area experiencing the fire.

Viega only recommends listed residential fire sprinkler heads as defined by their ratings (temperature / flow rate). Installation of these heads shall be per the manufacturer's specified listings and or limitations.

### 2.4.1 Types of Sprinklers

Residential fire sprinkler installations primarily have four types of sprinkler heads; Flush concealed, concealed recessed pendant, recessed pendant, and horizontal sidewall sprinklers.

Each type of sprinkler head is intended for a specific mounting application and has distinct advantages focused mostly on aesthetic in the home. Cover plates are also available and may come in various colors direct from the manufacturer.

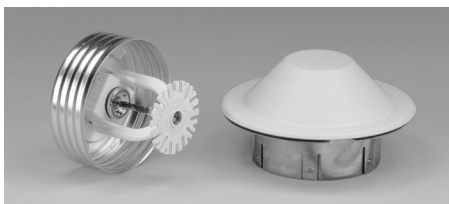
Sprinkler head design typically utilizes either a fusible link or a heat-sensitive glass bulb that upon sensing heat, expands and bursts triggering the water to flow.

Residential fire sprinkler head must have all appropriate listings and must comply with the appropriate model and local codes as well as NFPA 13D "Installation of One- and Two- Family Dwellings and Manufactured Homes."



*Flush concealed sprinklers with components*

Flush concealed sprinklers are designed to be concealed behind a ceiling surface. A cover plate mounts flush with the ceiling.



*Concealed recessed pendant sprinklers with components*

Concealed recessed pendant sprinklers typically have a conical shaped trim plate cover that extends down from the finished ceiling surface.



*Recessed pendant sprinklers with components*

Recessed pendant sprinklers remain visible once installed (no cover plate).



*Horizontal sidewall sprinklers with components*

Horizontal sidewall sprinklers remain visible once installed in the wall (no cover plate).

### 2.4.2 Sprinkler Temperature Ratings

There are two types of sprinkler head temperature ratings defined as ordinary or intermediate.

Recessed pendants and horizontal side wall type heads are considered ordinary having a rating of 155°F (68°C). These shall not be installed where ceiling temperatures can exceed 100°F (38°C). Cover plate assemblies on concealed pendant sprinklers shall have a temperature rating of 135°F (57°C).

Flush concealed sprinkler heads have a temperature rating of 140°F (60°C) and their cover plate assembly is rated at 135°F (57°C).

Intermediate sprinkler heads have a temperature rating of 175°F (79°C) and shall be installed when ceiling temperature range from 101°F (39°C) and 150°F (66°C). Temperatures shall not exceed 120°F (49°C) to be in accordance with the UL and C-UL Listing.

Sprinkler heads shall not be stored in areas that could experience temperatures above 100°F (38°C).

Each type of sprinkler head and associated cover plate has an maximum application temperature rating that must be specified within the design. Ambient temperature exposure must be taken into account during the design of the fire sprinklers system.

### 2.4.3 Sprinkler Orifice Size (K-factor)

Sprinkler flow rates are typically expressed using a K-factor, and this is used to calculate the sprinklers flow rate based on a specific pressure. The size of a sprinklers orifice is proportional to the size of its K-factor and the larger the orifice the higher the K-factor. Typical residential fire sprinkler heads have K-factors ranging between 5.5, 5.2, 4.9, 4.3 and 4.1. This relation can be shown in the formula below:

$$P = (F/K)^2$$

P = pressure (psi)

F = flow from sprinkler (gpm)

K = K-factor of sprinkler head

### 2.4.4 Additional Requirements

It is important to handle the sprinkler heads with extreme care protecting them from any type of damage.

As these are life safety devices, never install a sprinkler head that has been damaged in any way if suspicion of damage has occurred. Some examples of damage include prolonged exposed to maximum ambient temperatures and cracked glass bulbs. If a damage is head is found, it should be permanently disposed of.

#### Sprinkler Protection

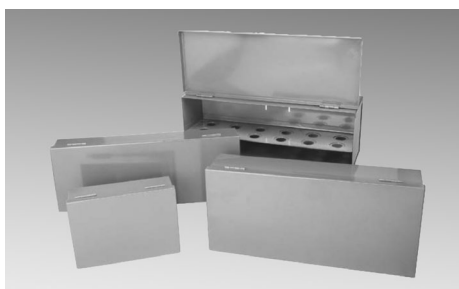
Sprinkler heads are generally shipped with a removable cover that protects the heat-sensing element from damage. It is recommended that this plastic cover be kept in place during all phases of construction including painting or texturing of the ceiling and walls. Removal of these plastic shells must be done prior to placing the system in service. It may be helpful to keep spare protective caps in the sprinkler cabinet for future use.



*Keep heads within protective shell during installation*

#### Spare Sprinkler

Since sprinkler heads are a one-time use device, NFPA 13D requires at least one spare sprinkler head of each type, orifice size and temperature rating shall be available on the construction site, stored in an appropriate cabinet designed for this application. Consult your AHJ as local requirements may differ from out lined in NFPA 13D. An installation wrench for each head must be available as well. This is to allow immediate repair, replacement or removal of heads that have been damaged or operated.



*Storage cabinets for spare heads and wrenches*

#### Sprinkler Wrenches

As with any specialty system, special tools are required. Residential fire sprinkler systems utilize various wrenches designed for each type of head. These wrenches are essential to proper installation by ensuring proper leverage and minimizing slippage. The use of standard wrenches will increase the potential of damage to the head. Check with your sprinkler head manufacturer / supplier for the appropriate installation tool required.



*Sprinkler wrenches*



## 3. SPRINKLER SYSTEM PLANNING AND DESIGN

### 3.1 General

Prior to the installation of the system, the building plans outlining the piping layout, hydraulic flow / pressure demand (expressed in GPM and PSI) and sprinkler head locations shall be submitted to, and approved by the Authority Having Jurisdiction (AHJ). All deviations from the approved plans will require permission from local authorities. The system design, including the piping layout, sprinkler head location and hydraulic demand calculations, shall conform to the NFPA 13D Standard.

The following steps will assist in proper design and planning of your system:

- Identify local jurisdiction requirements, including determination of pertinent building codes, fire protection codes and plumbing codes.
- Obtain information on the residence including "Use Group Classification" and specifics on the type of residence in which the system will be installed.
- Identify the water supply source and available flow in gallons per minute and supply pressure in psi.
- Identify the water supply service line including elevation difference between connections and routing of the service line into the residence.
- Determine the specifications for the sprinkler heads including water flow and operating pressure requirements and coverage area specifications.
- Lay out the piping system in the residence as a looped or gridded system.
- Lay out the piping system for the cold water distribution and hot water distribution.
- Perform the hydraulic calculations on the system to determine system performance.

### 3.2 Local Jurisdiction Requirements

The first step in starting a sprinkler system design is you must determine the local authorities requirements, to include getting clarification of which pertinent plumbing codes and NFPA sprinkler installation standards are being followed by the AHJ. This also includes identifying the required licensing need to be a qualified sprinkler system installer.

Note: Fire sprinkler plans for NFPA 13D systems are reviewed by the local AHJ, therefore, It is the responsibility of a qualified sprinkler designer to be familiar with all local requirements for the system design and layout.

### 3.3 Residence Information

The next step is to ensure the residence characteristics qualify for being protected by an NFPA 13D sprinkler system. These are typically categorized as being one-family dwellings, two-family dwellings, multiple single-family dwellings, modular homes and manufactured housing.

Note: Confirm with the local AHJ as to whether any local building codes requirements, such as the use of fire separation walls, could allow more than two dwelling units to be protected by a NFPA 13D sprinkler system.

After verifying that the residence qualifies to be protected by an NFPA 13D system the remaining construction details of the residence must be identified. This encompasses being familiar with every level of home as identified on the building plan for the over all layout, room sizes, ceiling heights (type, pitch and or slope) including crawl space, basement, garages, attics and individual levels.

### 3.4 Water Supply Source

All Multipurpose systems shall have at least one automatic water supply as identified by the NFPA 13D standard. Any of the following automatic water supply systems are acceptable:

- A connection to a reliable waterworks system (with or without automatic pump)
- An elevated water storage tank
- A pressure tank designed to ASME standards for a pressure vessel and connected to a reliable pressure source
- A stored water source with an automatically operated pump

For systems using stored water as the sole source supply, the minimum water volume required to be stored in the supply shall be equal to the maximum system flow demand rate multiplied by 10 minutes, which includes 5 GPM for domestic use. The total capacity typically works out to be 350 gallons. This is based off the flow demand of two sprinkler heads at 15 GPM each plus the 5 GPM domestic (35 GPM total) multiplied by 10 minutes. Refer to NFPA 13D for additional stored water supply requirements.

Upon identifying the type of water supply source being used, the next step is to determine its available gallons per minute flow and pressure. This can be measured at a near by hydrant or obtained by contacting the local water works authority

When determining the system supply pressure, minimum pressure conditions occurring during periods of heavy use, such as overnight or summer, must be considered. An accurate assessment of the available flow and supply pressure is critical for proper design and layout of the sprinkler system.

The desirable range for available water flow to the systems is 30 to 50 GPM. The desirable range for system supply pressure is 60 to 80 psi. Hydraulic calculations are required to determine the exact requirements for each system.

### 3.5 Water Supply Service Line

Use standard sizing practices per local code to identify your water service supply, then determine the layout of the piping. This should include all typical pressure losses associated with both the plumbing and fire sprinkler system demand.

Using standard code sizing practices for service line sizing includes pressure drop caused by any elevation (0.433 psi/ft) differences between the service system and shall include other conditions affecting pressure as follows:

#### 3.5.1 Shut-Off Valve

The NFPA requires that a single control valve in the main service supply line be present to shut off both the plumbing and sprinkler systems. If separate valves are used for these systems the sprinkler valve shall be locked in the open position or observed by a monitoring system.

The main shut off valve shall have a an attached sign adjacent to it with lettering 1/4" or larger stating the following:

"Warning, the water system for this home supplies fire sprinklers that require certain flows and pressures to fight a fire. Devices that restrict to flow or decrease the pressure or automatically shut off the water to the fire sprinkler system, such as water softeners, filtration systems, and automatic shutoff valves, shall not be added to this system without a review of the fire sprinkler system by a fire protection specialist. Do not remove this sign."

This requirement may vary based on local jurisdictional requirements. Contact your local AHJ for clarification.

### 3.5.2 Water Meters

When sizing water meters for multipurpose systems, always take into consideration their pressure and flow limitations, exceeding these could result in poor or improper system operation.

It is the responsibility of the installer to verify that the pressure loss and flow rate through the selected meter is within the acceptable limits. Refer to the below table for general water meter pressure losses.

Meter (in)	18 GPM	23 GPM	26 GPM
3/4	4	8	9
1	2	3	3
1-1/2	—	1	2
2	—	—	—

Meter (in)	31 GPM	39 GPM	52 GPM
3/4	13	—	—
1	4	6	10
1-1/2	2	4	7
2	1	2	3

*Common pressure loss through water meters at various flows shown in psi*

#### 3.5.3 Pressure Reducing Valves

Use a pressure reducing valve (PRV) for systems exceeding a supply pressure above 80 psi. To insure proper system operation, it is the responsibility of the installer to account for any pressure and/or flow losses associated with the PRV.

#### 3.5.4 Backflow Requirements

Back flow prevention is not required for service lines supplying both domestic and sprinkler systems. It is the responsibility of the installer to check with the local AHJ for any additional back flow requirements.

### 3.5.5 Water Softeners

It is the responsibility of the installer to account for any additional pressure loss or flow restriction caused by a water softener present in the water supply system. Improper operation of the fire sprinkler system could result if the softener is not properly accounted for in the system design.

#### 3.5.6 Smoke Detectors and Waterflow Alarms

A waterflow alarm on a multipurpose piping system is not required under the NFPA standard when the dwelling has smoke detectors installed in accordance with NFPA 72, National Fire Alarm and Signaling Code.

#### 3.5.7 Sprinkler Head Requirements

Viega does not currently offer sprinklers, therefore, installers are welcome to source any brand they prefer.

Sprinkler head performance requirements are designated by the amount of coverage area they can achieve based on available water flow and operating pressure. Its recommended practice to source a sprinkler head with the lowest flow providing the greatest coverage area. A favorable sprinkler coverage area ranges from 12' x 12' to 20' x 20' at 13-15 gpm with a 7-9 psi operating pressure. Refer to the NFPA13D standard and the residential sprinkler head manufacturers listing for proper minimum and maximum head spacing. If the heads are mounted too close the spray from one hitting the other can interfere with the heads ability to operate properly. Do not exceed the maximum spacing requirements of the sprinklers listing.

NOTE: Consider proper clearance from ceiling fans, duct work, DWV piping, fireplaces, lights and registers when locating the sprinkler heads.

## 3.6 Piping System Layout

NFPA 13D defines several types of piping system layouts. These include gridded, looped and straight run layouts.

The fire sprinkler system shall be appropriately sized taking into account system flow and pressure requirements utilizing 3/4" as the minimum pipe size per NFPA 13D.

### 3.6.1 Piping Configurations

The NFPA 13D Standard allows three types of multipurpose sprinkler system configurations to be used in residential occupancies: gridded, looped, straight run or combinations thereof.

#### *Gridded*

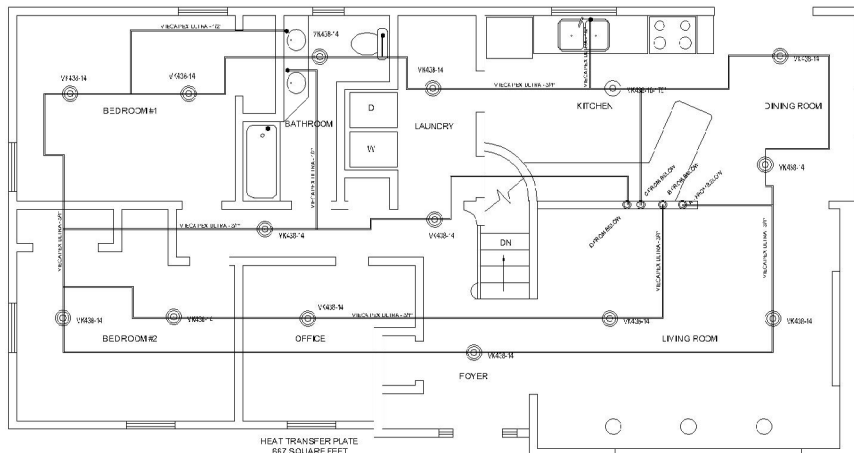
This system is connected by multiple branch lines. An activated sprinkler is provided with water from both sides, while other branch lines help transfer the water. Gridded systems provide excellent hydraulic characteristics.

#### *Looped*

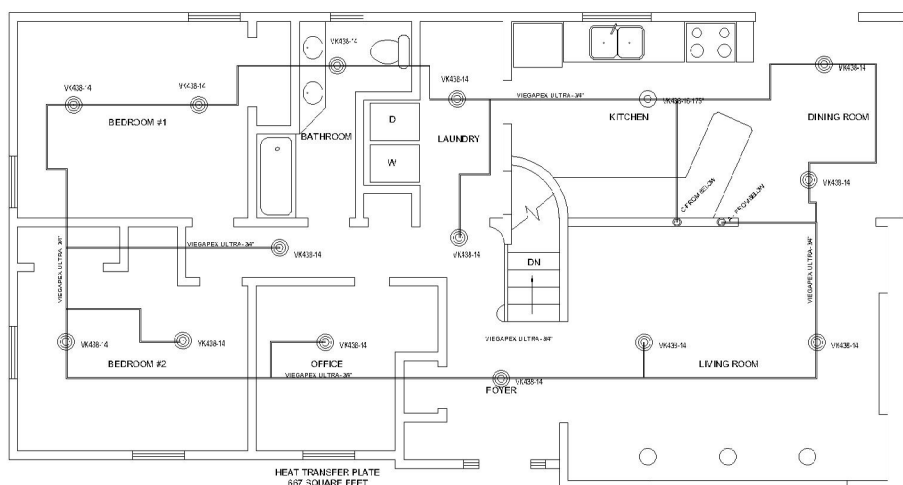
In this system, multiple cross mains are connected, but the branch lines are not. The hydraulic characteristics of looped systems are not as efficient as gridded systems.

#### *Straight Run*

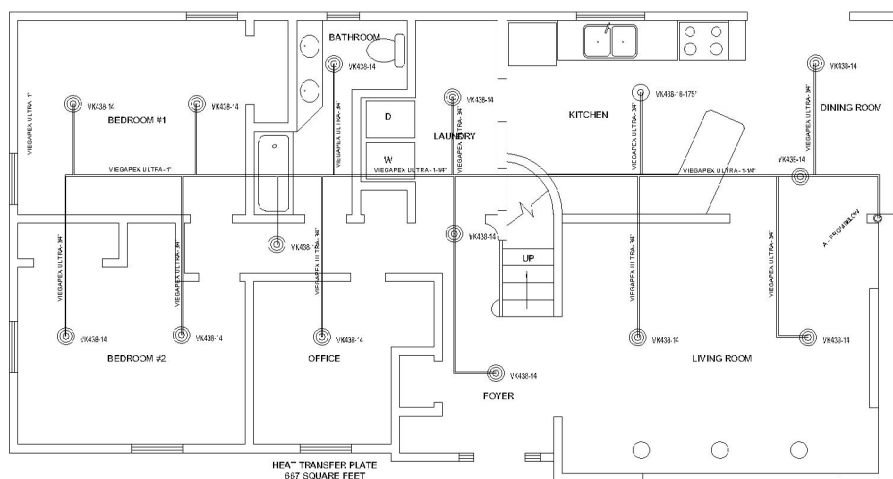
In this system, also known as a tree-type system, each sprinkler head is served by only one water flow path. Due to the inefficiency of the hydraulic characteristics of this system, straight run systems are not recommended for multipurpose applications.



Gridded System



Looped System



Straight Run System

### 3.6.2 Plumbing System Connections

Piping systems intended to serve both fire protection and domestic plumbing needs is a multipurpose piping system as defined in NFPA 13D.

Local plumbing codes may apply to these types of systems. Consult your local AHJ for applicable requirements.

### 3.6.3 System Pressure Gauge

Although not mandatory, a system pressure gauge can be installed to monitor system pressure. This pressure is considered to be the working (static pressure) or non-flowing pressure.

### 3.6.4 Connections to Domestic Cold Water Plumbing Systems

If allowed by the AHJ, PureFlow PEX Press tees may be installed in the ViegaPEX fire sprinkler main for connecting potable water fixture supplies. It is required by NFPA 13D that the plumbing supply piping comply with local plumbing codes. ViegaPEX tubing and PureFlow fittings meet all requirements for domestic plumbing applications.

### 3.6.5 Hot Water Distribution System Layout

The domestic hot water system sizing and layout is to be determined by the governing local plumbing codes.

### 3.6.6 Required Hydraulic Calculations

In order to ensure proper sprinkler head operation, hydraulic calculations must be performed. NFPA 13D establishes required design criteria. The layout, calculations and installation of systems installed in accordance with this standard shall only be performed by knowledgeable people trained through industry recognized or approved programs. Check with the local AHJ whether specific credentials are required (NICET III or PE).

Viega Technical Services provide fire sprinkler designs. Please call: 877-843-4262.

The following information is required prior to obtaining a fire sprinkler design:

Service Line / Source:

- Street Pressure (PSI)
- Distance from street to house (ft)
- Distance from meter to house (ft)
- Material for Service (copper/ PEX PVC)
- Service line size
- Location of service, where entering house
- Additional in line devices adding pressure drop
- Elevation change from street to base of house
- Water supply type (city / well)

Approval / System Design:

- Material AHJ approved?
- Type of installer AHJ approved?
- Is plumbing integrated?
- Is a NICET III stamp required on design?
- Preferred Head type (concealed, pendent, sidewall)
- Brand preference for heads (Tyco, Viking, Reliable)

Construction Details:

- Ceiling height (ft)
- Architectural features on plans (tray ceilings, knee walls..)
- Vaulted ceilings / stairs (peak location and pitch)
- Plans available in AutoCAD?
- Are appliances and heat sources shown on plans?
- Should areas not required to have sprinklers be considered? (baths under 55 sq ft., all closets)



## 4. INSTALLING THE VIEGAPEX ULTRA TUBING SYSTEM

### 4.1 Installation

Black ViegaPEX Ultra is available in sizes 3/4" - 2" and is UL and cUL listed for use in residential fire protection systems per NFPA 13D. ViegaPEX Ultra is also listed for potable water applications. Consult the local AHJ for any additional requirements.

### 4.2 Additional Information / Guidelines

Below are important guidelines that must be followed when using ViegaPEX Ultra and PEX Press fittings:

- 1) ViegaPEX Ultra (black only) and PEX Press fittings, sizes 3/4" - 2" are approved for use in potable water applications and have a UL listing for use in residential fire sprinkler systems per NFPA 13D.
- 2) Adequate protection must be provided for the Viega tubing and fittings and must include a minimum of 3/8" gypsum wallboard, a metal gridded suspended ceiling utilizing lay-in tiles having a weight of not less than 0.35 lbs/sq ft, or 1/2" plywood soffits. Viega offers a ProPress® fitting system for copper tubing that may be acceptable for use in exposed areas. Consult with your AHJ for approval and or any additional requirements for this type of installation.
- 3) For remodels, adequate protection must be provided for all Viega tubing and fittings to prevent damage.
- 4) Viega fire sprinkler systems shall not be used in concealed combustible areas where sprinklers are required by NFPA 13D.

- 5) Maintain 24" minimum clearance from openings in the ceiling such as return grilles.
- 6) Viega fire sprinkler fittings are intended for use in residential fire sprinkler applications only per NFPA 13D. Installations should not include a fire department connection and shall be designed to withstand a maximum working pressure and temperature of 130 psi at 120°F.

- 7) Viega fire sprinkler systems are not intended for outdoor use and are intended for wet pipe systems only.

NOTE: For detailed information, please consult NFPA 13D, the local building codes and the AHJ.

### 4.3 Handling ViegaPEX Tubing

The properties of ViegaPEX tubing make it very easy to work with and install in most types of construction. Some care must be taken to prevent damage to the tubing before and during installation:

- Use care to protect ViegaPEX and tubing from physical damage during storage and installation. Keep the tubing away from sharp objects, open flames, etc., and do not place heavy objects on the tubing.
- Damaged sections of tubing should be cut out and discarded.
- Do not expose ViegaPEX tubing to sunlight or any UV source for extended periods of time (less than 60 days for standard ViegaPEX or less than 6 months for ViegaPEX Ultra).
- Do not store ViegaPEX tubing outdoors where it may be exposed to UV light.

### 4.4 Uncoiling ViegaPEX Tubing

An uncoiler should be used to prevent twisting when removing tubing from 3/8"-1" coils. Roll coils out and use care to avoid twisting 1-1/4", 1-1/2" and 2" coils or when a uncoiler is unavailable. If larger diameter tubing is used for short run sections, straight lengths are also available which can assist in this type installation.



*Uncoiler, Stock Code 53509*

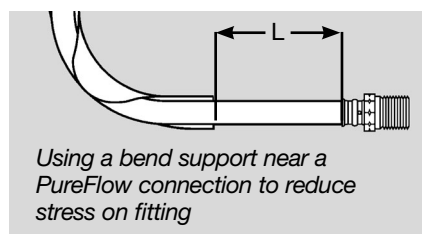
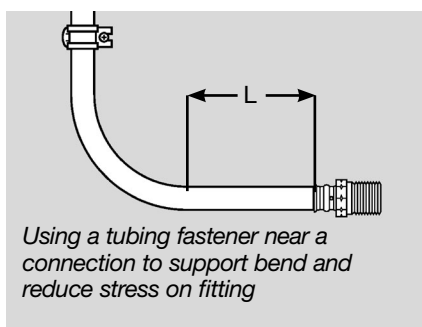
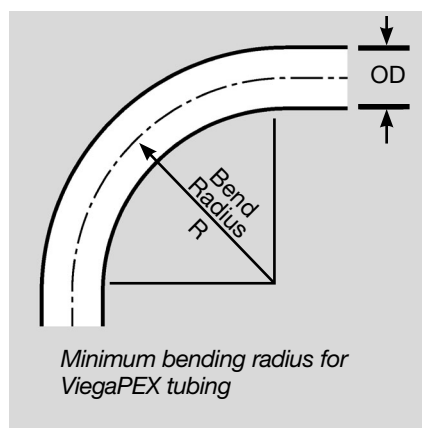
### 4.5 Bending ViegaPEX Tubing

UL listed ViegaPEX tubing can be free bent (unsupported bend) to a minimum radius of 8x the actual tubing O.D. ViegaPEX that is not UL rated can be bent to a minimum radius of 5x the tubing O.D. with the use of a Viega approved bend support. The tubing O.D. can be calculated by adding 1/8" to the PEX nominal size (ex: 1" PEX + 1/8" = 1-1/8" O.D.).

To calculate the minimum bend radius multiply the O.D. dimension by the bend factor (8x) (ex: 1-1/8" x 8 = 9" bend radius). If bending against a PEX coil bend direction, the bending radius

is 24x the tubing O.D.  
To reduce damaging stress on PureFlow fittings, bend supports or tubing fasteners must be used to anchor all bends made close to fittings. Support must be provided for tubing bends located closer to fittings than distance "L" in table below. See the diagrams below for typical

Tubing size	Distance from fitting to bend
3/8" PEX	L = 6 inches
1/2" PEX	L = 8 inches
3/4" PEX	L = 10 inches
1" PEX	L = 12 inches
1-1/4" PEX	L = 14 inches
1-1/2" PEX	L = 16 inches
2" PEX	L = 18 inches



installation examples.

## 4.6 Installation Temperature Range

The flexibility of ViegaPEX tubing and the strength of the PureFlow PEX connections combine to provide a system that can be installed during any weather. The positive compression provided by the PureFlow PEX Press hand tools allow installation in temperatures down to 32°F.

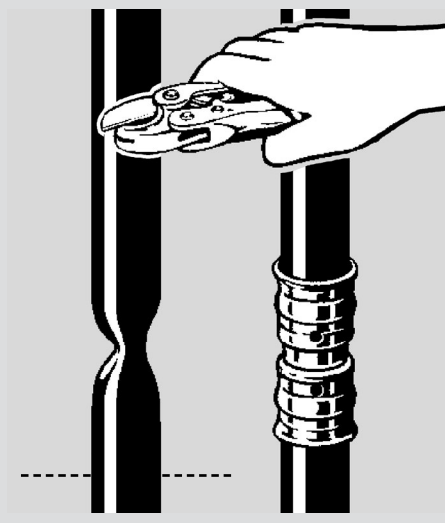
## 4.7 Removing PureFlow PEX Press Connections (Attached Sleeves)

Should a mistake be made, simply cut out the PEX fitting and replace with a new one. Do not reuse PureFlow PEX Press fittings.

## 4.8 Repairs

Sections of kinked tubing should be repaired by cutting out the damaged

Inserting a coupling to repair kinked tubing

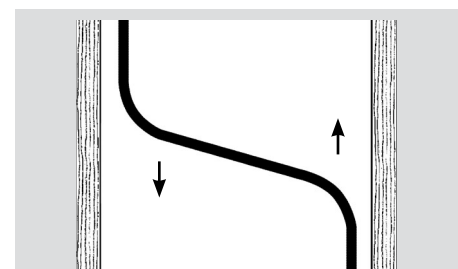


## 4.9 Tubing Expansion

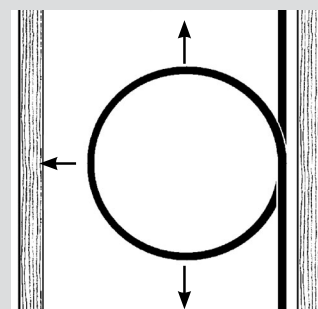
When installing ViegaPEX tubing, expansion and contraction of the material must be considered. ViegaPEX tubing should not be pulled tight when installed, as cold water will cause tubing to shrink slightly as the system is filled. A slight amount of slack should be left in each run to allow for this contraction without stressing the fittings.

Expansion of the tubing in hot water lines should be accommodated by using expansion loops or offsets. Fasteners should not grip tubing tightly so that it can move slightly as expansion takes place. Expansion loops or offsets will give tubing a place to grow without stressing fittings. Using suspension clip fasteners at all penetrations will allow tubing to move without creating noise.

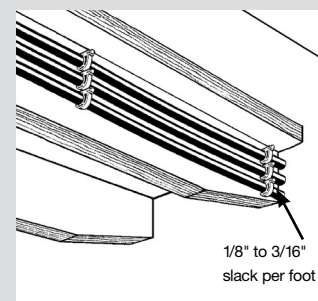
ViegaPEX expands or contracts 1.1 inches in length per 100 feet of tubing for every 10°F change in temperature.



Offsets also provide room for tubing expansion



Using a loop to accommodate tubing expansion



Allow some slack in all runs to prevent damage from tubing contraction.

## 4.10 Freezing

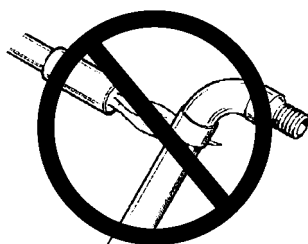
The flexibility of ViegaPEX tubing makes it resistant to damage from freezing, but precautions to prevent freezing should be taken when low temperatures might be encountered.

Insulating each PEX tube individually or as a group is not generally necessary if the PEX tubing is installed within the insulation envelope of the structure, i.e. the heated area. For example, the tubing may be installed under the insulation in the attic or within an interior wall of a heated space.

Typically, local codes dictate the type and amount of insulation required in ceiling spaces. All piping, fittings and sprinkler heads shall be installed within the building insulation envelope on the "warm side" of the insulation. Installation of the insulation shall follow the guidelines of the insulation manufacturer.

PEX tubing systems should not be intentionally installed in areas subjected to freezing.

Do not use open torch or excessive heat to thaw PEX tubing. Tubing failure or damage can result.



Heat (DO NOT USE A TORCH) must be applied directly to the frozen tubing section. Temperature on tubing shall not exceed 180°F.

## Several suitable methods exist to thaw PEX tubing.

They include:

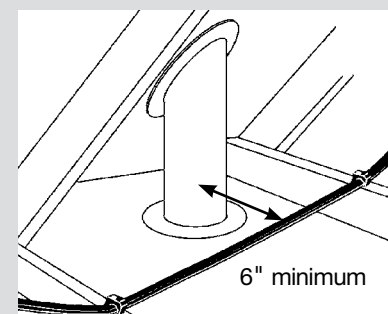
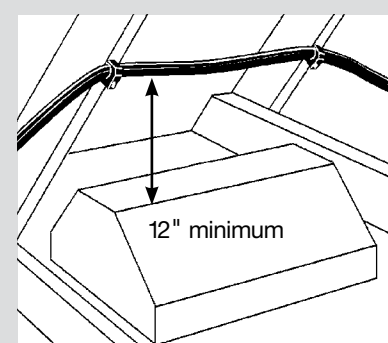
- Hot water
- Wet hot towels
- Hand-held hair dryer
- Low wattage electrical heating tape (self limiting)
- A commercial system that pumps heated water through a tube to the ice blockage, and returns the cooled water for reheating

## 4.11 Heaters, Flues, Vents and Recessed Lights

Keep ViegaPEX tubing a **MINIMUM of 12" vertically and 6" horizontally** from sources of high heat such as gas flue vents, heating appliances or electric motors. Concerning recessed lighting (including low voltage types) and proper installation clearance, Viega recognizes the following types of lighting fixtures: "Type IC," or "Inherently Protected," which allow direct contact with thermal insulation and other combustible materials, and "Type Non-IC," which require a minimum clearance of 3" to thermal insulation. If room does not allow for the minimum clearance spacing specified by Viega, then the PEX tubing must be insulated with a suitable pipe insulation capable of withstanding the specific maximum temperatures generated by the fixture. Minimum clearance between any pipe insulation and fixture shall be per the requirements of the fixture type and local building codes.

Forced air heating ducts and PVC power vent flues are not generally considered sources of high heat. These areas of installation should be rechecked after further construction and other mechanical systems have been installed.

In cases where light leakage (direct beam) from a UV generating light source (special lighting or heating type lamps) is possible tubing must be adequately protected with light blocking insulation.



*Maintain a minimum 12" of vertical and 6" of horizontal clearance from recessed lights and appliance or heater vents.*

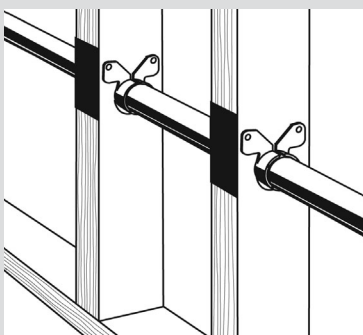
## 5. VIEGAPEX SPRINKLER SYSTEM TUBING SUPPORT REQUIREMENTS

### 5.1 Wood Frame Construction

ViegaPEX tubing is ideal for use in wood frame construction. The ability to bend the tubing around corners and obstacles greatly simplifies installation. This system eliminates the expensive and time-consuming use of fittings where tubing turns within a wall, and eliminates the potential fire hazard of soldering close to exposed framing members.

A few rules should be followed when running ViegaPEX tubing in wood frame construction:

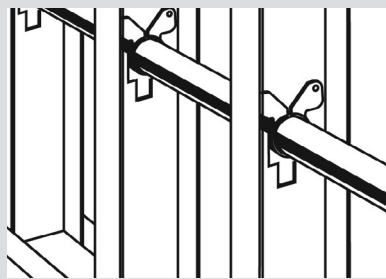
- Use nailing plates to protect the tubing from nails and screws where it passes through studs
- Suspension clips are optional but can reduce the potential for noise
- When turning tubing sharply to exit from a wall, a bend support must be provided. Either use a drop ear bend support, drop ear elbow or a stub out. Neglecting to use a support will place excessive stress on the fitting, and the tubing will not exit perpendicular to the wall



*Nailing plates protect tubing passing through studs and joists from nails*

### 5.2 Steel Construction

The PureFlow system works as well in steel frame construction as it does in wood. Where tubing runs through metal studs, suspension clip fasteners must be used to protect tubing from sharp stud edges (see illustration to the right). Follow the same guidelines for fastening and supporting the tubing as for wood frame construction.



*Suspension clip fasteners used to protect tubing from abrasion when passing through steel studs*

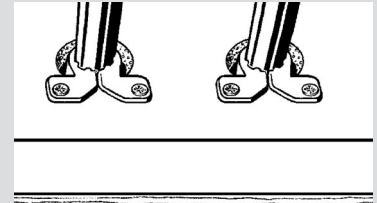
### 5.3 Supporting ViegaPEX Tubing

Use only plastic tubing supports. Metal supports may damage tubing.

When running tubing, leave a small amount of slack between fasteners to account for tubing contraction.

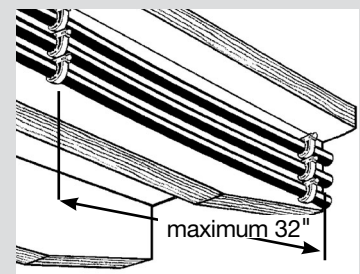
Note that ViegaPEX tubing will expand or contract 1.1 inches per 100 feet for every 10°F of temperature change. In long straight runs allow adequate clearance for this.

Tubing should be allowed freedom to move slightly as it expands. Do not clip it tightly into place or locate it where it will be tightly constrained. Use suspension clips or an approved plastic insulator where tubing passes through studs or joists to prevent abrasion and possible noise as tubing moves.



*Suspension clips support tubing in joist penetrations or anywhere abrasion is a concern*

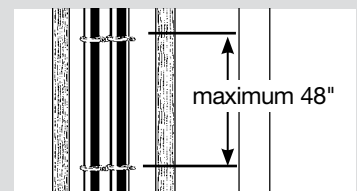
Local codes typically define the maximum distances between support devices. As a requirement per the UL Listing, supports shall be installed every 32" for horizontal pipe runs. For vertical runs, supports shall be installed every 48" as well as at each floor and mid-story guide.



*Tubing supported with U-clip or lock clip fasteners on horizontal runs*



*Suspension clip fasteners used at floor plate*



*J-clamp or lock clip fasteners used to support tubing in vertical runs between floors*



### 5.3.1 Fixed Support Points

Appropriate support is required on all residential fire sprinkler systems. All piping near a PureFlow plug or transition fitting shall be supported at the location. Either a locking clip, where ViegaPEX pipe snaps in place when pushed into the clip, or a full clamp, which completely encircles the pipe, can be used to support ViegaPEX. Locking clips require a #6 panhead wood screw (1" length) for mounting. Note: support points should not be directly on the fitting or the associated sleeve.

Residential fire sprinkler fitting supports have additional limitations which are outlined in the table on the right.



*Supports and hangers*

### 5.3.2 Sliding Sleeve Support Device

Adequate expansion and contraction must be accommodated in the fire sprinkler piping. Appropriate sized supports shall be utilized maintaining safe distances away from objects that could damage the pipe such as sharp edges or abrasive surfaces.

Additional support accessories are also available for a variety of applications such as wood or metal framework. Choose the right support device appropriate for the intended application.

**Support and Hanger Mounting Table**

Description	Horizontal	Vertical	Inverted
Lock Clip			
Full Clamp			
J-Clamp			

## 6. MOUNTING SPRINKLER FITTINGS

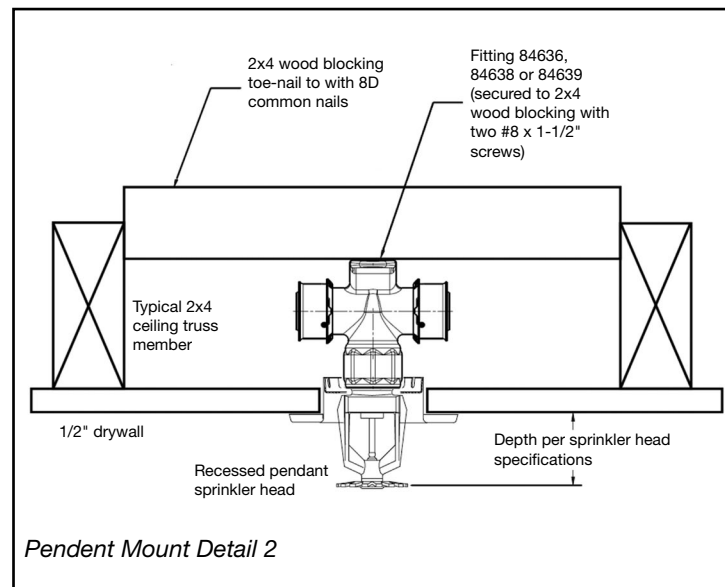
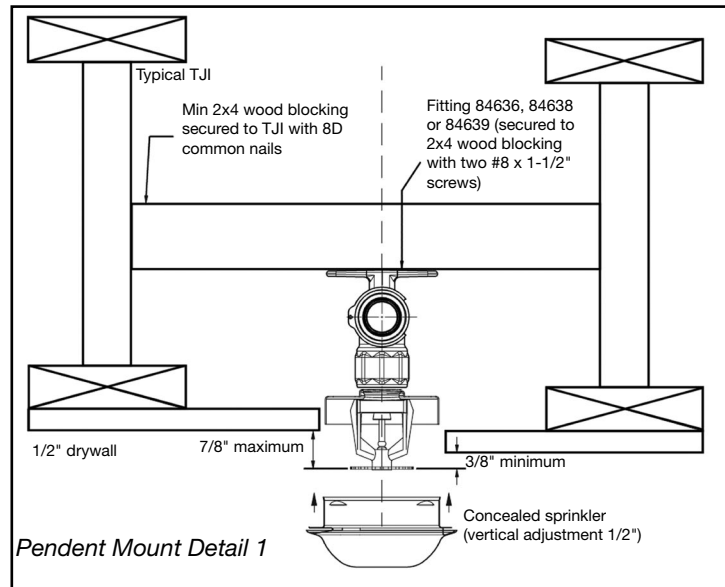
### 6.1 Mounting Sprinkler Fittings

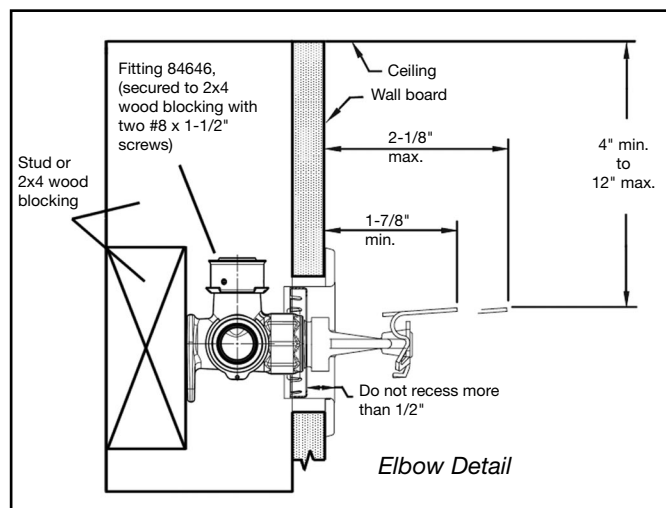
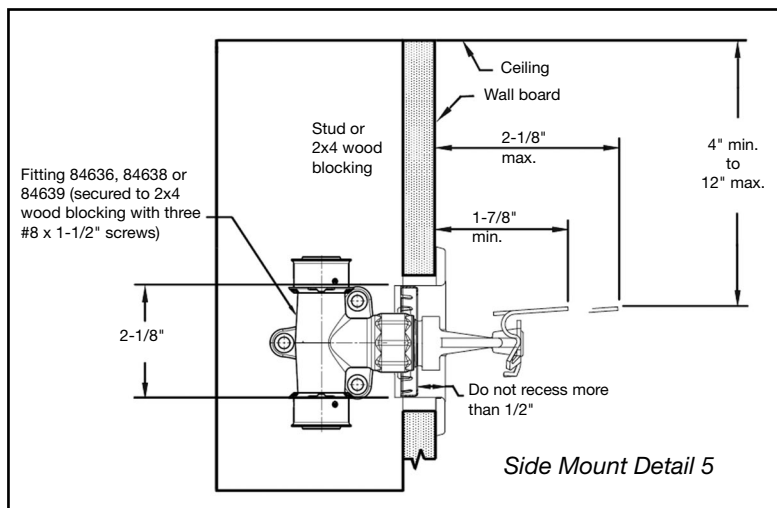
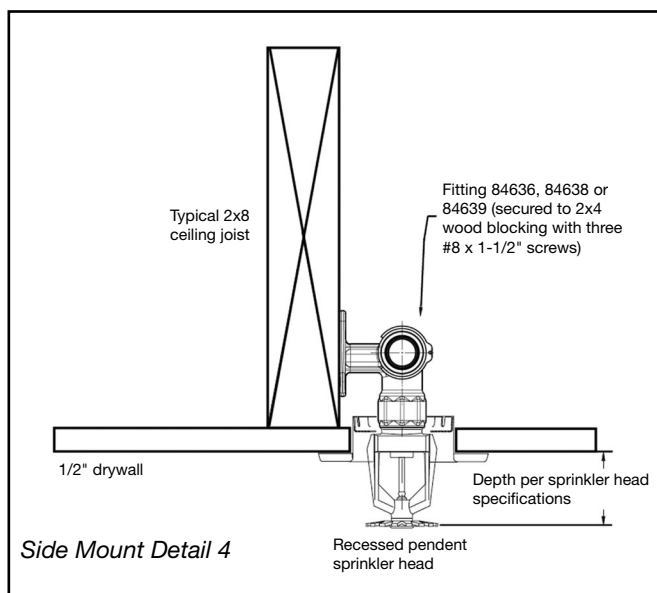
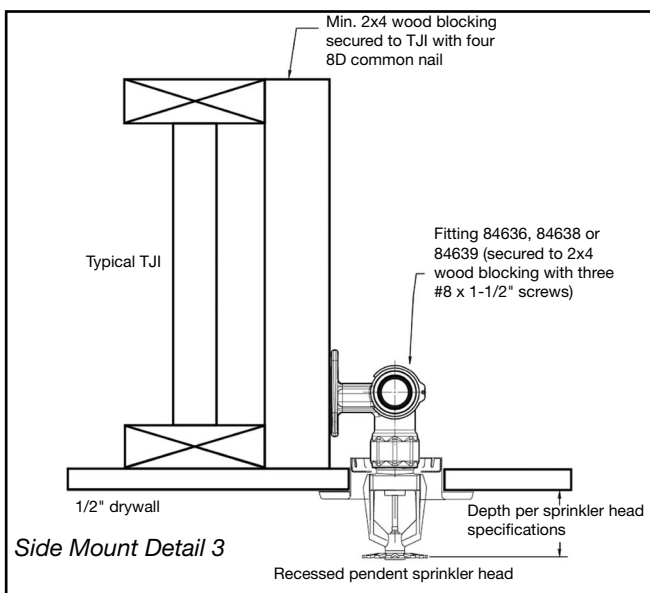
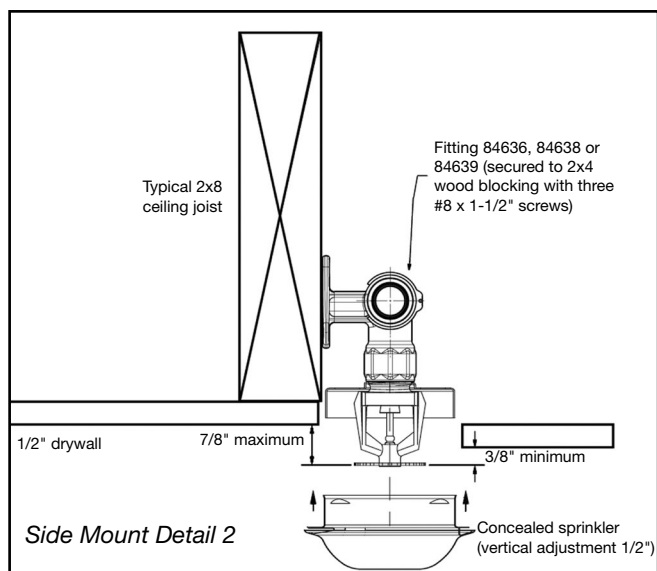
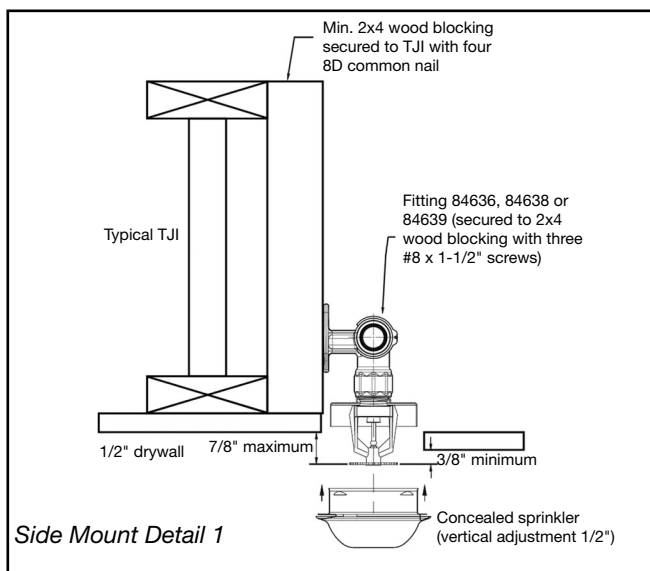
Sprinkler heads must be connected to PureFlow Fire Sprinkler fittings with mounting flanges for attachment. These fittings must be fastened as described below to prevent movement of the sprinkler head upon system activation.

PureFlow Fire Sprinkler fittings (with integral mounting attachments) must be affixed to solid supports using #8 x 1-1/2" or longer flat-head wood or hex head screws.

Each standard fitting (without mounting flange) must have approved fasteners placed on the tubing on all connections directly adjacent to the fitting. Affix the fasteners to the tubing, not over the fitting or press sleeves.

In addition, the PureFlow sprinkler tee fitting is specially designed to affix the sprinkler head in place so that during activation, the reaction forces caused by the flow of water through the sprinkler head will not displace the sprinkler head.





## 7. NEW SYSTEM MAINTENANCE

### 7.1 Pressure Testing

Upon completion of the fire sprinkler system, a pressure test is required. Refer to model, local and NFPA 13D requirements for additional information.

### 7.2 Flow Testing

After a successful completion of the pressure test, a flow test is required. Refer to your AHJ for additional information. This test ensures that the most hydraulically remote sprinkler head operates as intended in the design. The AHJ must be notified of the test and is typically required to witness all tests.

### 7.3 System Flushing

Viega recommends flushing the piping system with water prior to head installation. This should eliminate debris left behind in the pipe during installation.

### 7.4 Visual Inspection

All PureFlow systems must be visibly inspected prior to being concealed behind the walls. If any damage is visible, or there is a suspicion of damage, the section of pipe and fittings will need to be replaced.

### 7.5 System Maintenance

It is the responsibility of the property owner to adequately maintain and understand the operation of the fire sprinkler system as a life safety system. NFPA 13D recommends a monthly inspection with the following actions:

- Complete visual inspection
- Smoke alarm testing
- Inspect sprinkler head integrity
- Check system pressure
- Ensure main shut-off valve position is “open”
- Water supply flow verification
- If booster pumps are present, visible inspection is required



## 8. CODES, STANDARDS AND APPROVALS

### 8.1 Codes

PureFlow is accepted by the following model codes for use in potable hot and cold water distribution systems.

UPC - Uniform Plumbing Code

IPC - International Plumbing Code

IRC - International Residential Code

NSPC - National Standard Plumbing Code

NFPA - National Fire Protection Association

Most state written codes

Check with your local Viega Representative for code compliance in your area.

### 8.2 Standards

**ASTM - American Society for Testing and Materials**

**ASTM F876/F2023: Standard Specification for Cross-linked Polyethylene (PEX) Tubing -**

This standard contains finite dimensional requirements for SDR9 PEX tubing in addition to burst, sustained pressure, chlorine resistance and other relevant performance tests at different water temperatures.

**ASTM F877: Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems -**

This standard contains performance requirements for SDR9 PEX tubing and fitting systems. The standard contains finite dimensional requirements for tubing, in addition to burst, sustained pressure and other relevant performance tests at different water temperatures.

**NSF International**

**ANSI/NSF 14: Plastics Piping System Components and Related Materials -**

This standard establishes minimum physical and performance requirements for plastic piping components and related materials. These criteria were established for the protection of public health and the environment.

**ANSI/NSF 61: Drinking Water System Components - Health Effects -**

This standard establishes minimum health effects requirements for the chemical contaminants and impurities that are indirectly imparted to drinking water from products, components and materials used in drinking water systems. This standard does not establish performance or taste and odor requirements for drinking water system products, components or materials.

**ISO - International Standards Organization**

**ISO 9001** - This standard is intended to establish, document and maintain a system for ensuring production output quality. ISO 9001 certification is a tangible expression of a firm's commitment to quality that is internationally understood and accepted. All PureFlow PEX press fittings are manufactured in ISO 9001 certified facilities.

### 8.3 Listings and Certifications

**UL - Underwriters Laboratories**

**cULus UL 1821 130 psi / 120°F** - Product meets requirements of UL for NFPA 13D residential multipurpose fire sprinkler systems.

**PPI - Plastic Pipe Institute**

**TR 4 Listed Materials**

Listing of Hydrostatic Design Bases (HDB) Strength Design Bases (SDB), Pressure Design Bases (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

Pressure/Temperature Ratings:

- 160 psi at 73.4°F
- 100 psi at 180°F
- 80 psi at 200°F

**NSF International**

**NSF-pw certification mark -**

Product meets all applicable performance standards for pressure-rated potable water applications required in ANSI/NSF Standard 14 and complies with ANSI/NSF Standard 61 for health effects.

**cNSF®us pw-G** - Zero lead listing meeting California AB1953 and Vermont Act 193

**NSF U.P. Code** - Product meets requirements of the Uniform Plumbing Code™.

**PEX 5006** - Tested and listed to the NSF-pw (CL5) Chlorine resistance rating for an end use condition of 100% @ 140°F per ASTM F876, which is the highest Chlorine resistance rating available through ASTM. When the product is marked with the PEX 5006 NSF-pw (CL5) designation, it affirms the product is approved for use in continuous domestic hot water circulation systems with up to 140°F water temperatures.

**IAPMO R&T - International Association of Plumbing and Mechanical Officials Research and Testing**

**Certificate of Listing** - Product meets the requirements of the Uniform Plumbing Code™.

**ICC - ES - International Code Council - Evaluation Services**

**ICC Evaluation Services Report** - Product complies with International Plumbing Code and Uniform Plumbing Code.

Check with your local Viega Representative for further information or copies of above mentioned listings and certifications.

NOTES

NOTES

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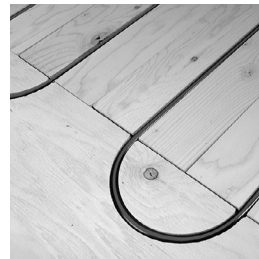
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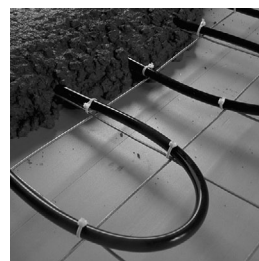
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