

DISPLAY THIS CARD ON PRINCIPAL FRONTAGE OF WORK



# CITY OF PORTLAND

# BUILDING PERMIT

This is to certify that  
**FAUCHER, STEVE**  
**134 SOUTH ST**  
**BIDDEFORD, ME 04005**

For installation at  
**20 & 21 TRUE ST**  
**TWO-FAMILY HOME**

Job ID: **2011-11-2757-SF**

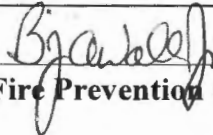
CBL: **424- A-007-001**

has permission to **install NFPA 13D sprinkler system**

provided that the person or persons, firm or corporation accepting this permit shall comply with all of the provisions of the Statutes of Maine and of the Ordinances of the City of Portland regulating the construction, maintenance and use of the buildings and structures, and of the application on file in the department.

Notification of inspection and written permission procured before this building or part thereof is lathed or otherwise closed-in. 48 HOUR NOTICE IS REQUIRED.

A final inspection must be completed by owner before this building or part thereof is occupied. If a certificate of occupancy is required, it must be

  
Fire Prevention Officer

(58)

\_\_\_\_\_  
Code Enforcement Officer / Plan Reviewer

THIS CARD MUST BE POSTED ON THE STREET SIDE OF THE PROPERTY  
PENALTY FOR REMOVING THIS CARD

## BUILDING PERMIT INSPECTION PROCEDURES

Please call 874-8703 or 874-8693 (ONLY)

or email: [buildinginspections@portlandmaine.gov](mailto:buildinginspections@portlandmaine.gov)

With the issuance of this permit, the owner, builder or their designee is required to provide adequate notice to the city of Portland Inspections Services for the following inspections. Appointments must be requested 48 to 72 hours in advance of the required inspection. The inspection date will need to be confirmed by this office.

- **Please read the conditions of approval that is attached to this permit!! Contact this office if you have any questions.**
- **Permits expire in 6 months. If the project is not started or ceases for 6 months.**
- **If the inspection requirements are not followed as stated below additional fees may be incurred due to the issuance of a "Stop Work Order" and subsequent release to continue.**

### **Final Fire**

The project cannot move to the next phase prior to the required inspection and approval to continue, REGARDLESS OF THE NOTICE OF CIRCUMSTANCES.

IF THE PERMIT REQUIRES A CERTIFICATE OF OCCUPANCY, IT MUST BE PAID FOR AND ISSUED TO THE OWNER OR DESIGNEE BEFORE THE SPACE MAY BE OCCUPIED.



# PORTLAND MAINE

*Strengthening a Remarkable City, Building a Community for Life • [www.portlandmaine.gov](http://www.portlandmaine.gov)*

Director of Planning and Urban Development  
Penny St. Louis

Job ID: 2011-11-2757-SF  
install NFPA 13D sprinkler system

For installation at:  
20 & 21 TRUE ST  
TWO-FAMILY HOME

CBL: 424- A-007-001

## Conditions of Approval:

### **Fire**

The sprinkler system shall be installed in accordance with NFPA 13D. A compliance letter is required.

Application requires State Fire Marshal approval.

**City of Portland, Maine - Building or Use Permit Application**

389 Congress Street, 04101 Tel: (207) 874-8703, FAX: (207) 8716

Job No: 2011-11-2757-SF 2012-42100-FSS	Date Applied: 03/23/2012	CBL: 424- A-007-001	
Location of Construction: 29-31 TRUE ST	Owner Name: TODD R SNIPER	Owner Address: 41 TRUE ST  PORTLAND, ME 04103	Phone:
Business Name:	Contractor Name: STEVE FAUCHER	Contractor Address: 134 SOUTH ST BIDDEFORD ME 04005	Phone: 207-590-2989
Lessee/Buyer's Name:	Phone:	Permit Type: FIRE SUPPRESSION SYSTEM	Zone: R-5
Past Use: New Duplex (#2011-11-2757)	Proposed Use: Same - duplex - install fire sprinkler system	Cost of Work: 7600.00	CEO District:
		Fire Dept: <input checked="" type="checkbox"/> Approved w/conditions <input type="checkbox"/> Denied <input type="checkbox"/> N/A	Inspection: Use Group: Type:
		Signature: <i>Bjorn [Signature]</i>	Signature:
Proposed Project Description: install sprinkler system		Pedestrian Activities District (P.A.D.)	

Permit Taken By:	<b>Zoning Approval</b>		
<p>1. This permit application does not preclude the Applicant(s) from meeting applicable State and Federal Rules.</p> <p>2. Building Permits do not include plumbing, septic or electrical work.</p> <p>3. Building permits are void if work is not started within six (6) months of the date of issuance. False informatin may invalidate a building permit and stop all work.</p>	<b>Special Zone or Reviews</b> <input type="checkbox"/> Shoreland <input type="checkbox"/> Wetlands <input type="checkbox"/> Flood Zone <input type="checkbox"/> Subdivision <input type="checkbox"/> Site Plan  <input type="checkbox"/> Maj <input type="checkbox"/> Min <input type="checkbox"/> MM Date: <i>OK 3/23/12</i> <i>ABN</i>	<b>Zoning Appeal</b> <input type="checkbox"/> Variance <input type="checkbox"/> Miscellaneous <input type="checkbox"/> Conditional Use <input type="checkbox"/> Interpretation <input type="checkbox"/> Approved <input type="checkbox"/> Denied Date:	<b>Historic Preservation</b> <input checked="" type="checkbox"/> Not in Dist or Landmark <input type="checkbox"/> Does not Require Review <input type="checkbox"/> Requires Review <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/Conditions <input type="checkbox"/> Denied Date: <i>ABN</i>
	<b>CERTIFICATION</b>		

I hereby certify that I am the owner of record of the named property, or that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his authorized agent and I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in the application is issued, I certify that the code official's authorized representative shall have the authority to enter all areas covered by such permit at any reasonable hour to enforce the provision of the code(s) applicable to such permit.

SIGNATURE OF APPLICANT	ADDRESS	DATE	PHONE
RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE		DATE	PHONE

R-5

NewTwoFamily - 2011-11-~~21~~ 2757

2012-42100

### One- or Two-family Fire Sprinkler Permit

If you or the property owner owes real estate or property taxes or user charges on any property within the city, payment arrangements must be made before permits of any kind are accepted.

Installation address: 29-<sup>(31)</sup> TRUE ST 424-A-007

Building owner: SNIPER Phone: \_\_\_\_\_

Installer: STEVE FAUCHER Phone: 207-590-2989

Total sq/ft of building floor space per unit: \_\_\_\_\_  Single-family home or

Sq/ft of sprinklered floor space per unit: 1,472.00  Two-family home

Is this a multipurpose piping system?  Y / N Sprinkler piping uses Pex?  Y / N

Water supply:  Municipal Water  Well pump  Stored water  Other

Include electronic copy of approved State Sprinkler Permit plans:

Additional cost to the owner for the home fire sprinkler system for each dwelling unit minus costs necessary for domestic needs (See below): **A=** 3,800.00

Attach cost breakdown:  A City plumbing permit has been pulled:

<p><b>COST OF WORK:</b> <u>\$7,600.00</u> (A times number of units)</p> <p><b>NO FEE REQUIRED</b></p>
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Dept of Building Inspections  
City of Portland Maine

MAR 23 2012

RECEIVED

Additional information and Frequently asked questions about home fire sprinkler systems may be found at [www.portlandmaine.gov/fireprevention](http://www.portlandmaine.gov/fireprevention).

Sprinkler system cost must deduct costs that would have been incurred if the system did not provide sprinkler service. In a well pump system it would include the difference between the well pump to be installed and the one that would have been installed if there were no sprinkler demand on the system. Includes additional piping and valves that are required only because of NFPA Standard 13D, and not already required for domestic needs. Includes cost of sprinkler heads and additional installation costs.



State of Maine  
Department of Public Safety



Fire Sprinkler System Permit

# 9913

**Sniper Residence unit 20 & 21**

Located at: 20 & 21 True Street  
In the Town of: Portland  
Occupancy/Use: Residential  
Type of System: NFPA 13D

Permission is hereby given to:

**SF Plumbing & Heating**

134 South Street  
Biddeford, ME 04005  
Contractor License # 567

to begin installation according to plans submittal approved by the Office of State Fire Marshal. The submittal is filed under log # 2121104 , and no departure from the application submittal shall be made without prior approval in writing. This permit is issued under the provisions of Title 32, Chapter 20, Section 12004-I. Nothing herein shall excuse the holder of this permit from failure to comply with local ordinances, zoning laws, o other pertinent legal restrictions. This permit shall be displayed at the construction site or be made readily available.

This permit was issued on 3/19/2012 for a fee paid of \$25.00

This permit will expire at midnight on Saturday, September 15, 2012

The expiration date applies only if the installation has not begun by that date and no permission has been granted to extend the date. Once installation begins, then the permit is valid for however long it takes to complete the installation, assuming that the work is fairly continuous.

John E. Morris  
Commissioner

**The type of Fire Department Connection and its location is to be according to the Local Fire Department**

Within 30 days of the completion of a new fire sprinkler system or an addition to an existing fire sprinkler system, a fire sprinkler system contractor shall provide to the Office of State Fire Marshal a copy of this permit signed and dated by the certified Responsible Managing Supervisor representing that the fire sprinkler system has been installed according to specifications of the approved plan to the best of the supervisor's knowledge, information, and belief. This requirement is part of the sprinkler law, and neglect of this duty is grounds to not renew the contractor's license to do work in the State of Maine. All renewed sprinkler licenses are good for two years and expire on a June 30th.

Job completed, tested and verified by date of \_\_\_\_\_

RMS for this job: Hubbard Daniel P

RMS Signature: \_\_\_\_\_

# Uponor

AQUASAFE® Fire Safety System

Uponor  
5925 148th Street West

Apple Valley, MN 55124  
800-321-4739

Job Name : SNIPER RESIDENCE - One Head Calculation (H.12)  
Drawing : RESIDENTIAL  
Location : 20 TRUE STREET PORTLAND ME 04101  
Remote Area : 1  
Contract : 120222-41L  
Data File : 120222-41L Sniper Residence.wx1

HYDRAULIC DESIGN INFORMATION SHEET

Name - SNIPER RESIDENCE Date - 3/12/12  
Location - PORTLAND ME 04101  
Building - RESIDENTIAL System No. - 1  
Contractor - SF PLUMBING & HEATING Contract No. - 120222-41L  
Calculated By - BRENT KOTULA CET III Drawing No. - 1  
Construction: (X) Combustible ( ) Non-Combustible Ceiling Height 8'  
OCCUPANCY - RESIDENTIAL

S Type of Calculation: ( )NFPA 13 Residential ( )NFPA 13R (X)NFPA 13D  
Y Number of Sprinklers Flowing: (X)1 ( )2 ( )4 ( )  
S ( )Other  
T ( )Specific Ruling Made by Date  
E  
M Listed Flow at Start Point - 13 Gpm System Type  
Listed Pres. at Start Point - 7.04 Psi (X) Wet ( ) Dry  
D MAXIMUM LISTED SPACING 16 x 16 ( ) Deluge ( ) PreAction  
E Domestic Flow Added - 5 Gpm Sprinkler or Nozzle  
S Additional Flow Added - Gpm Make RELIABLE Model RFC49  
I Elevation at Highest Outlet - 126 Feet Size 3/8 K-Factor 4.9  
G Note: Temperature Rating 155  
N

Calculation Gpm Required 18 Psi Required 38.4 At Ref Pt STR  
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:  
A Date of Test - 10/6/1989 Rated Cap. Cap.  
T Time of Test - NA @ Psi Elev.  
E Static (Psi) - 70 Elev.  
R Residual (Psi) - 50 Other Well  
Flow (Gpm) - 1233 Proof Flow Gpm  
S Elevation - 91

P Location: STREET  
P  
L Source of Information: WATER AUTHORITY  
Y

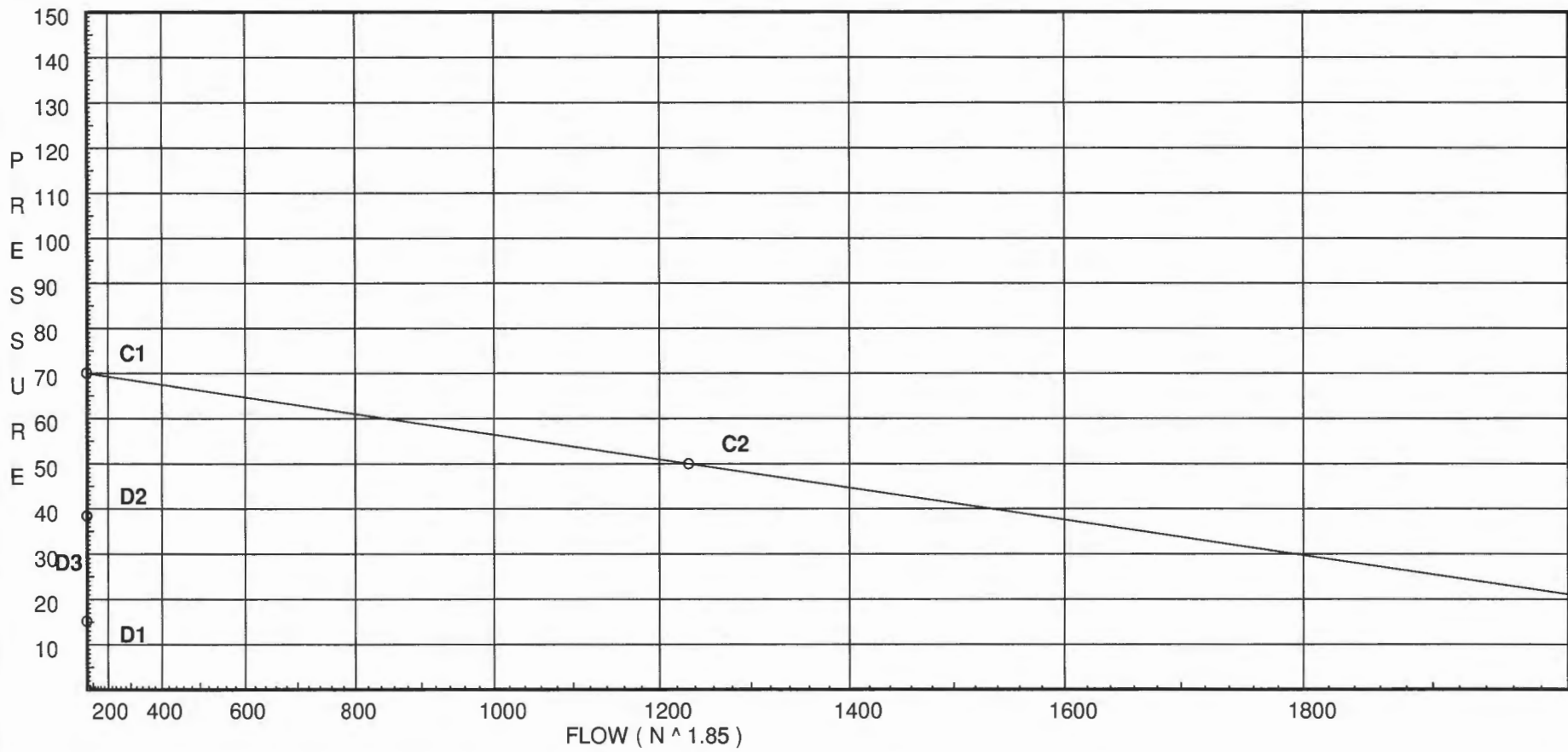


Water Supply Curve (C)

Uponor  
 SNIPER RESIDENCE - One Head Calculation (H.12)

City Water Supply:  
 C1 - Static Pressure : 70  
 C2 - Residual Pressure: 50  
 C2 - Residual Flow : 1233

Demand:  
 D1 - Elevation : 15.158  
 D2 - System Flow : 13.0012  
 D2 - System Pressure : 38.399  
 Hose ( Adj City ) : \_\_\_\_\_  
 Hose ( Demand ) : 5  
 D3 - System Demand : 18.0012  
 Safety Margin : 31.593



# Fittings Used Summary

Uponor  
 SNIPER RESIDENCE - One Head Calculation (H.12)

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 Date 3/13/2012

Fitting Legend		1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24	
Abbrev.	Name																					
E	90° Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61	
G	Generic Gate Valve	1	1	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13	
T	90° Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121	
Utb	Aquapex Tee - Branch	2	6	6	9.08	12.88	13.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Utr	Aquapex Tee - Run	1	2	2	1.64	2.39	2.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

## Units Summary

Diameter Units           Inches  
 Length Units            Feet  
 Flow Units               US Gallons per Minute  
 Pressure Units          Pounds per Square Inch

# Flow Summary - NFPA 2007

Uponsor  
 SNIPER RESIDENCE - One Head Calculation (H.12)

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## SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
STR	70.0	50	1233.0	69.992	18.0	38.399

## NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
H.12	126.0	4.9	7.04	13.0	
T.47	126.0		7.39		
T.45	117.0		11.5		
H.14	117.0		11.53		
T.42	117.0		11.67		
T.41	117.0		11.77		
T.32	108.0		15.86		
T.37	108.0		15.92		
T.27	99.0		19.96		
T.26	99.0		19.96		
T.25	99.0		19.97		
H.5	99.0		20.08		
T.21	99.0		20.26		
T.20	99.0		20.27		
T.19	99.0		20.35		
T.17	99.0		20.46		
S.1	95.0		22.37		
MTR	91.0		27.25		
X01	91.0		29.09	5.0	
STR	91.0		38.4		
T.49	126.0		7.36		
T.43	117.0		11.46		
T.44	117.0		11.47		
H.13	117.0		11.65		
T.40	117.0		11.78		
T.33	108.0		15.95		
H.16	126.0		7.39		
T.50	126.0		7.42		
T.48	126.0		7.42		
T.46	117.0		11.47		
H.15	126.0		7.42		
T.39	117.0		11.82		
T.28	108.0		15.85		
H.4	108.0		15.87		
T.23	108.0		15.88		
T.22	108.0		15.93		
T.18	99.0		20.0		
H.1	99.0		20.12		
H.10	117.0		11.8		
T.38	117.0		11.83		
H.9	117.0		11.82		
T.29	108.0		15.86		

# Flow Summary - NFPA 2007

Uponsor  
SNIPER RESIDENCE - One Head Calculation (H.12)

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Date 3/13/2012

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## NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
H.8	108.0		15.93		
T.36	108.0		15.94		
T.35	108.0		15.94		
T.34	108.0		15.96		
H.3	108.0		15.94		
T.30	108.0		15.95		
H.11	108.0		15.94		
H.7	108.0		15.95		
H.6	99.0		19.96		
H.2	99.0		19.98		

# Final Calculations - Hazen-Williams

Uponor  
SNIPER RESIDENCE - One Head Calculation (H.12)

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
H.12 to T.47	6.99	0.862 150.0 0.0320	1Utr	2.0 0.0 0.0	9.000 2.000 11.000	7.040 0.0 0.352			K Factor = 4.90 Vel = 3.84	
T.47 to T.45	-3.47 3.52	0.862 150.0 0.0090	2Utb	12.0 0.0 0.0	11.000 12.000 23.000	7.392 3.898 0.208			Vel = 1.94	
T.45 to H.14	3.74 7.26	0.862 150.0 0.0340		0.0 0.0 0.0	1.000 0.0 1.000	11.498 0.0 0.034			Vel = 3.99	
H.14 to T.42	0.0 7.26	0.862 150.0 0.0345	1Utr	2.0 0.0 0.0	2.000 2.000 4.000	11.532 0.0 0.138			Vel = 3.99	
T.42 to T.41	0.0 7.26	0.862 150.0 0.0343	1Utr	2.0 0.0 0.0	1.000 2.000 3.000	11.670 0.0 0.103			Vel = 3.99	
T.41 to T.32	-3.90 3.36	0.862 150.0 0.0082	2Utb	12.0 0.0 0.0	11.000 12.000 23.000	11.773 3.898 0.189			Vel = 1.85	
T.32 to T.37	1.43 4.79	0.862 150.0 0.0160	1Utr	2.0 0.0 0.0	2.000 2.000 4.000	15.860 0.0 0.064			Vel = 2.63	
T.37 to T.27	-2.15 2.64	0.862 150.0 0.0053	2Utb	12.0 0.0 0.0	14.000 12.000 26.000	15.924 3.898 0.137			Vel = 1.45	
T.27 to T.26	-1.38 1.26	0.862 150.0 0.0015	1Utr	2.0 0.0 0.0	2.000 2.000 4.000	19.959 0.0 0.006			Vel = 0.69	
T.26 to T.25	0.0 1.26	0.862 150.0 0.0013	1Utr	2.0 0.0 0.0	5.000 2.000 7.000	19.965 0.0 0.009			Vel = 0.69	
T.25 to H.5	2.70 3.96	0.862 150.0 0.0112	1Utr	2.0 0.0 0.0	7.000 2.000 9.000	19.974 0.0 0.101			Vel = 2.18	
H.5 to T.21	0.0 3.96	0.862 150.0 0.0112	1Utr 1Utb	2.0 6.0 0.0	9.000 8.000 17.000	20.075 0.0 0.190			Vel = 2.18	
T.21 to T.20	4.49 8.45	1.291 150.0 0.0060		0.0 0.0 0.0	1.000 0.0 1.000	20.265 0.0 0.006			Vel = 2.07	
T.20 to T.19	4.55 13.0	1.291 150.0 0.0142	1E	3.276 0.0 0.0	2.000 3.276 5.276	20.271 0.0 0.075			Vel = 3.19	
T.19 to T.17	0.0 13.0	1.291 150.0 0.0141	1E	3.276 0.0 0.0	5.000 3.276 8.276	20.346 0.0 0.117			Vel = 3.19	
T.17 to S.1	0.0 13.0	1.291 150.0 0.0141	1T	6.553 0.0 0.0	6.000 6.553 12.553	20.463 1.732 0.177			Vel = 3.19	

# Final Calculations - Hazen-Williams

Uponsor  
SNIPER RESIDENCE - One Head Calculation (H.12)

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Date 3/13/2012

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
S.1 to MTR	0.0 13.0	1.291 150.0 0.0142	2E	6.553 0.0 0.0	4.000 6.553 10.553	22.372 4.732 0.150			* Fixed loss = 3 Vel = 3.19	
MTR to X01	0.0 13.0	0.911 150.0 0.0771	1T	3.801 0.0 0.0	20.000 3.801 23.801	27.254 0.0 1.836			Vel = 6.40	
X01 to STR	5.00 18.0	0.911 150.0 0.1409	1E 1T 1G	1.521 3.801 0.76	60.000 6.082 66.082	29.090 0.0 9.309			Qa = 5 Vel = 8.86	
	0.0 18.00						38.399		K Factor = 2.90	
H.12 to T.49	6.01 6.01	0.862 150.0 0.0242	1Utr	2.0 0.0 0.0	11.000 2.000 13.000	7.040 0.0 0.315			Vel = 3.30	
T.49 to T.43	-2.47 3.54	0.862 150.0 0.0091	2Utb	12.0 0.0 0.0	11.000 12.000 23.000	7.355 3.898 0.210			Vel = 1.95	
T.43 to T.44	-0.69 2.85	0.862 150.0 0.0060		0.0 0.0 0.0	1.000 0.0 1.000	11.463 0.0 0.006			Vel = 1.57	
T.44 to H.13	2.89 5.74	0.862 150.0 0.0222	1Utr	2.0 0.0 0.0	6.000 2.000 8.000	11.469 0.0 0.178			Vel = 3.16	
H.13 to T.40	0.0 5.74	0.862 150.0 0.0223	1Utr	2.0 0.0 0.0	4.000 2.000 6.000	11.647 0.0 0.134			Vel = 3.16	
T.40 to T.33	-1.74 4.0	0.862 150.0 0.0114	2Utb	12.0 0.0 0.0	12.000 12.000 24.000	11.781 3.898 0.274			Vel = 2.20	
T.33 to T.20	0.55 4.55	0.862 150.0 0.0145	1Utb	6.0 0.0 0.0	23.000 6.000 29.000	15.953 3.898 0.420			Vel = 2.50	
	0.0 4.55						20.271		K Factor = 1.01	
T.49 to H.16	2.47 2.47	0.862 150.0 0.0048	1Utr	2.0 0.0 0.0	6.000 2.000 8.000	7.355 0.0 0.038			Vel = 1.36	
H.16 to T.50	0.0 2.47	0.862 150.0 0.0047	1Utr	2.0 0.0 0.0	4.000 2.000 6.000	7.393 0.0 0.028			Vel = 1.36	
T.50 to T.44	0.42 2.89	0.862 150.0 0.0062	2Utb	12.0 0.0 0.0	12.000 12.000 24.000	7.421 3.898 0.150			Vel = 1.59	
	0.0 2.89						11.469		K Factor = 0.85	
T.47 to T.48	3.46 3.46	0.862 150.0 0.0090	1Utr	2.0 0.0 0.0	1.000 2.000 3.000	7.392 0.0 0.027			Vel = 1.90	

# Final Calculations - Hazen-Williams

Uponor  
SNIPER RESIDENCE - One Head Calculation (H.12)

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Date 3/13/2012

Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.48 to T.46	-0.42 3.04	0.862 150.0 0.0069	2Utb	12.0 0.0 0.0	10.000 12.000 22.000	7.419 3.898 0.151			Vel = 1.67	
T.46 to T.45	0.69 3.73	0.862 150.0 0.0100	1Utr	2.0 0.0 0.0	1.000 2.000 3.000	11.468 0.0 0.030			Vel = 2.05	
	0.0 3.73					11.498			K Factor = 1.10	
T.48 to H.15	0.42 0.42	0.862 150.0 0.0001	1Utr	2.0 0.0 0.0	5.000 2.000 7.000	7.419 0.0 0.001			Vel = 0.23	
H.15 to T.50	0.0 0.42	0.862 150.0 0.0002		0.0 0.0 0.0	5.000 0.0 5.000	7.420 0.0 0.001			Vel = 0.23	
	0.0 0.42					7.421			K Factor = 0.15	
T.43 to T.46	0.69 0.69	0.862 150.0 0.0005	1Utr	2.0 0.0 0.0	9.000 2.000 11.000	11.463 0.0 0.005			Vel = 0.38	
	0.0 0.69					11.468			K Factor = 0.20	
T.41 to T.39	3.90 3.9	0.862 150.0 0.0107	1Utr	2.0 0.0 0.0	2.000 2.000 4.000	11.773 0.0 0.043			Vel = 2.14	
T.39 to T.28	-1.03 2.87	0.862 150.0 0.0062	2Utb	12.0 0.0 0.0	10.000 12.000 22.000	11.816 3.898 0.136			Vel = 1.58	
T.28 to H.4	-1.43 1.44	0.862 150.0 0.0017	1Utr	2.0 0.0 0.0	8.000 2.000 10.000	15.850 0.0 0.017			Vel = 0.79	
H.4 to T.23	0.0 1.44	0.862 150.0 0.0018	1Utr	2.0 0.0 0.0	3.000 2.000 5.000	15.867 0.0 0.009			Vel = 0.79	
T.23 to T.22	2.77 4.21	0.862 150.0 0.0125	1Utr	2.0 0.0 0.0	2.000 2.000 4.000	15.876 0.0 0.050			Vel = 2.31	
T.22 to T.18	-1.10 3.11	0.862 150.0 0.0072	2Utb	12.0 0.0 0.0	12.000 12.000 24.000	15.926 3.898 0.172			Vel = 1.71	
T.18 to H.1	1.38 4.49	0.862 150.0 0.0141	1Utr	2.0 0.0 0.0	7.000 2.000 9.000	19.996 0.0 0.127			Vel = 2.47	
H.1 to T.21	0.0 4.49	0.862 150.0 0.0142	1Utb	6.0 0.0 0.0	4.000 6.000 10.000	20.123 0.0 0.142			Vel = 2.47	
	0.0 4.49					20.265			K Factor = 1.00	

# Final Calculations - Hazen-Williams

Uponor  
SNIPER RESIDENCE - One Head Calculation (H.12)

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Date 3/13/2012

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.40 to H.10	1.74	0.862 150.0	1Utr	2.0 0.0	7.000 2.000	11.781 0.0				
	1.74	0.0024		0.0	9.000	0.022		Vel =	0.96	
H.10 to T.38	0.0	0.862 150.0	1Utr	2.0 0.0	8.000 2.000	11.803 0.0				
	1.74	0.0024		0.0	10.000	0.024		Vel =	0.96	
T.38 to T.23	1.03	0.862 150.0	2Utb	12.0 0.0	14.000 12.000	11.827 3.898				
	2.77	0.0058		0.0	26.000	0.151		Vel =	1.52	
	0.0 2.77					15.876		K Factor =	0.70	
T.39 to H.9	1.03	0.862 150.0	1Utr	2.0 0.0	4.000 2.000	11.816 0.0				
	1.03	0.0010		0.0	6.000	0.006		Vel =	0.57	
H.9 to T.38	0.0	0.862 150.0	1Utr	2.0 0.0	4.000 2.000	11.822 0.0				
	1.03	0.0008		0.0	6.000	0.005		Vel =	0.57	
	0.0 1.03					11.827		K Factor =	0.30	
T.28 to T.29	1.43	0.862 150.0	1Utr	2.0 0.0	1.000 2.000	15.850 0.0				
	1.43	0.0017		0.0	3.000	0.005		Vel =	0.79	
T.29 to T.32	0.0	0.862 150.0	1Utr	2.0 0.0	1.000 2.000	15.855 0.0				
	1.43	0.0017		0.0	3.000	0.005		Vel =	0.79	
	0.0 1.43					15.860		K Factor =	0.36	
T.37 to H.8	2.14	0.862 150.0		0.0 0.0	1.000 0.0	15.924 0.0				
	2.14	0.0030		0.0	1.000	0.003		Vel =	1.18	
H.8 to T.36	0.0	0.862 150.0	1Utr	2.0 0.0	2.000 2.000	15.927 0.0				
	2.14	0.0038		0.0	4.000	0.015		Vel =	1.18	
T.36 to T.35	-0.19	0.862 150.0		0.0 0.0	1.000 0.0	15.942 0.0				
	1.95	0.0030		0.0	1.000	0.003		Vel =	1.07	
T.35 to T.34	0.19	0.862 150.0	1Utr	2.0 0.0	1.000 2.000	15.945 0.0				
	2.14	0.0033		0.0	3.000	0.010		Vel =	1.18	
T.34 to T.25	0.55	0.862 150.0	2Utb	12.0 0.0	10.000 12.000	15.955 3.898				
	2.69	0.0055		0.0	22.000	0.121		Vel =	1.48	
	0.0 2.69					19.974		K Factor =	0.60	
T.22 to H.3	1.10	0.862 150.0	1Utr	2.0 0.0	10.000 2.000	15.926 0.0				
	1.1	0.0010		0.0	12.000	0.012		Vel =	0.60	
H.3 to T.30	0.0	0.862 150.0	1Utr	2.0 0.0	10.000 2.000	15.938 0.0				
	1.1	0.0011		0.0	12.000	0.013		Vel =	0.60	



# Final Calculations - Hazen-Williams

Uponsor  
SNIPER RESIDENCE - One Head Calculation (H.12)

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Date 3/13/2012

Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.30 to T.33	-0.55 0.55	0.862 150.0 0.0002	1Utb 6.0 1Utr 2.0	1.000 8.000 9.000	15.951 0.0 0.002			Vel = 0.30	
	0.0 0.55				15.953			K Factor = 0.14	
T.36 to H.11	0.19 0.19	0.671 150.0 0.0001	1Utb 6.0 0.0	4.000 6.000 10.000	15.942 0.0 0.001			Vel = 0.17	
H.11 to T.35	0.0 0.19	0.671 150.0 0.0002	1Utr 2.0 1Utb 6.0	3.000 8.000 11.000	15.943 0.0 0.002			Vel = 0.17	
	0.0 0.19				15.945			K Factor = 0.05	
T.30 to H.7	0.55 0.55	0.862 150.0 0.0003	1Utr 2.0 0.0	1.000 2.000 3.000	15.951 0.0 0.001			Vel = 0.30	
H.7 to T.34	0.0 0.55	0.862 150.0 0.0002	1Utr 2.0 0.0	11.000 2.000 13.000	15.952 0.0 0.003			Vel = 0.30	
	0.0 0.55				15.955			K Factor = 0.14	
T.27 to H.6	1.38 1.38	0.862 150.0 0.0020	0.0 0.0	1.000 0.0 1.000	19.959 0.0 0.002			Vel = 0.76	
H.6 to H.2	0.0 1.38	0.862 150.0 0.0015	1Utr 2.0 0.0	9.000 2.000 11.000	19.961 0.0 0.017			Vel = 0.76	
H.2 to T.18	0.0 1.38	0.862 150.0 0.0016	1Utr 2.0 0.0	9.000 2.000 11.000	19.978 0.0 0.018			Vel = 0.76	
	0.0 1.38				19.996			K Factor = 0.31	

# Reliable®

Model RFC30 (SIN RA0611)  
 Model RFC43 (SIN RA0612)  
 Model RFC49 (SIN RA0616)  
 Residential Flat Concealed  
 Sprinklers

**A Residential Flat Concealed Sprinkler engineered for a minimum design density of 0.05 gpm/ft<sup>2</sup> with low GPM requirements.**

## Features

1. Very low water flow requirements.
2. 1/2" (13mm) Total adjustment.
3. Thread-On/Thread-Off or Push-On/Thread Off cover attachment option.
4. Smooth aesthetic ceiling profile.
5. Available in brass, chrome and black plated or painted finishes.

## Listings & Approval

1. Listed by Underwriters Laboratories, and certified by UL for Canada (cULus)
2. NYC MEA 258-93-E

## UL Listing Categories

Residential Automatic Sprinklers

## UL Guide Number

VKKW

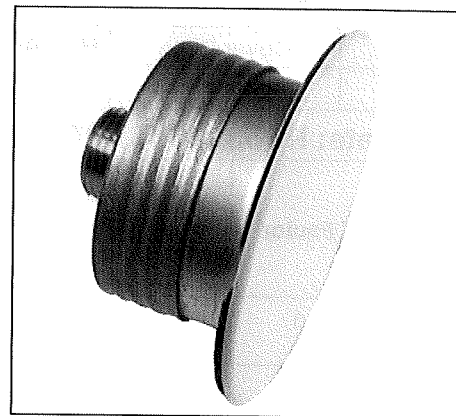
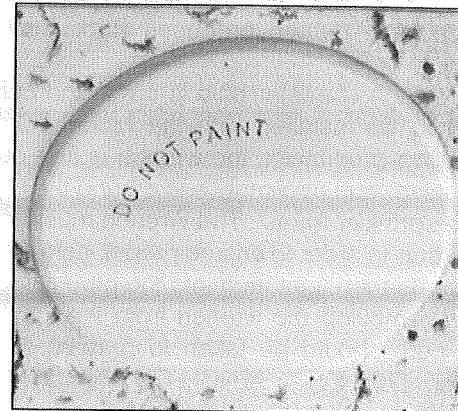
## Product Description

Model RFC30, RFC43 and RFC49 Concealed Residential Sprinklers are fast response residential fusible solder link automatic sprinklers. Residential sprinklers differ from standard sprinklers primarily in their response time and water distribution patterns.

Model RFC30, RFC43 and RFC49 sprinklers discharge water in a hemispherical pattern below the sprinkler deflector. Residential distribution patterns are higher and generally contain a finer droplet size than standard sprinkler patterns.

The combination of speed of operation and high discharge pattern required for residential sprinklers has demonstrated, in fire testing, an ability for controlling residential fires, and thereby providing significant evacuation time for occupants.

The RFC30, RFC43 and RFC49 Sprinklers provide the best form of fire protection by combining an attractive appearance and 1/2" (13mm) of cover adjustment for ease of installation. The small diameter cover plate is easily and positively attached and blends into the ceiling, concealing



the most dependable fire protection available, an automatic sprinkler system.

The RFC30, RFC43 and RFC49 are UL Listed Residential Sprinklers to be installed in the residential portions of any occupancy in accordance with NFPA 13, 13R, & 13D.

The RFC30, RFC43 and RFC49 can reduce the need for precise cutting of drop nipples. The threaded cover plate assembly can be adjusted without tools to fit accurately against the ceiling. The fire protection system need not be shut down to adjust or remove the cover plate assembly.

## Application and Installation

The RFC30, RFC43 and RFC49, for residential installations, use a 165°F (74°C) fusible solder link in a tuning fork style sprinkler frame with a drop-down deflector. This assembly is recessed into the ceiling and concealed by a flat cover plate. The cover plate is attached to the skirt, using 135°F (57°C) ordinary temperature classification solder. When the ceiling temperature rises, the solder holding the cover plate releases the cover allowing the deflector to drop into position and exposing the sprinkler inside to

**The Reliable Automatic Sprinkler Co., Inc., 103 Fairview Park Drive, Elmsford, New York 10523**

ceiling temperature. The subsequent operation of the solder link opens the waterway and causes the deflector to drop into position to distribute the discharging water in a hemispherical pattern below the sprinkler deflector. Any adjustment of thread engagement between the cover plate and cup will assure that the drop-down deflector is properly located below the ceiling. The residential distribution pattern contains a finer droplet size than a standard sprinkler, and the pattern produces significantly higher wall wetting.

After a 2<sup>5</sup>/<sub>8</sub> inch diameter hole is cut in the ceiling, the sprinkler is to be installed with the Model FC Wrench. When installing a sprinkler, the wrench is first positioned into the sprinkler/cup assembly and around the hexagonal body of the sprinkler frame. The Wrench must bottom out against the cup in order to ensure proper, safe installation. The sprinkler is then tightened into the pipe fitting. When inserting or removing the wrench from the sprinkler/cup assembly, care should be taken to prevent damage to the sprinkler. DO NOT WRENCH ON ANY OTHER PART

OF THE SPRINKLER/CUP ASSEMBLY. MODEL RFC30, RFC43 AND RFC49 CONCEALED SPRINKLERS MUST BE INSTALLED ONLY WITH 135°F RATED COVERS.

**Note:** A leak tight 1/2" NPT (R1/2) sprinkler joint can be obtained with a torque of 8-18 ft-lbs (10,8 - 24,4 N-m). Do not tighten sprinklers over maximum recommended torque. It may cause leakage or impairment of the sprinklers.

Cover assemblies provide up to 1/2" (13mm) of adjustment. Turn the cover clockwise until the flange is in contact with the ceiling. For the push-on/thread-off option, the cover assembly is pushed onto the cup and final adjustment is made by turning the cover clockwise until the skirt flange makes full contact with the ceiling. Cover removal requires turning in the counter-clockwise direction.

In ceilings that have a plenum space above the sprinkler, the plenum space may have neutral or negative pressurization but must not be positively pressurized. Inspect all sprinklers after installation to ensure that the gap between the cover plate and ceiling and the 4 slots in the cup are all open and free from any air flow impediment.

### Temperature Rating

Sprinkler	Cover Plate	Max. Ambient Temp.
165°F/74°C	135°F/57°C	100°F/38°C

### Installation Data: RFC30 (SIN RA0611)

Thread Size inch (mm)	K Factor	Sprinkler Spacing ft. (m)	Maximum Distance to Wall ft. (m)	Minimum Distance between sprinklers ft. (m)	Minimum Required Sprinkler Discharge	
					Flow gpm (Lpm)	Press. psi (bar)
1/2" (15mm)	3.0	12 x 12 (3.6x3.6)	6 (1.83)	8 (2.43)	9 (34.1)	9.0 (0.62)
1/2" (15mm)	3.0	14 x 14 (4.3x4.3)	7 (2.13)	8 (2.43)	10 (37.8)	11 (0.76)

Note: 1 bar = 100 Kpa

### Installation Data: RFC43 (SIN RA0612)

Thread Size inch (mm)	K Factor	Sprinkler Spacing ft. (m)	Maximum Distance to Wall ft. (m)	Minimum Distance between sprinklers ft. (m)	Minimum Required Sprinkler Discharge	
					Flow gpm (Lpm)	Press. psi (bar)
1/2" (15mm)	4.3	12 x 12 (3.6x3.6)	6 (1.83)	8 (2.43)	12 (45)	7.8 (0.54)
1/2" (15mm)	4.3	14 x 14 (4.3x4.3)	7 (2.13)	8 (2.43)	13 (49)	9.1 (0.63)
1/2" (15mm)	4.3	16 x 16 (4.9x4.9)	8 (2.43)	8 (2.43)	13 (49)	9.1 (0.63)
1/2" (15mm)	4.3	18 x 18 (5.5x5.5)	9 (2.74)	8 (2.43)	18 (68)	17.5 (1.21)
1/2" (15mm)	4.3	20 x 20 (6.0x6.0)	10 (3.05)	8 (2.43)	21 (79)	23.8 (1.64)

Note: 1 bar = 100 Kpa

### Installation Data: RFC49 (RA0616)

Thread Size inch (mm)	K Factor	Sprinkler Spacing ft. (m)	Maximum Distance to Wall ft. (m)	Minimum Distance between sprinklers ft. (m)	Minimum Required Sprinkler Discharge	
					Flow gpm (Lpm)	Press. psi (bar)
1/2" (15mm)	4.9	12 x 12 (3.6x3.6)	6 (1.83)	8 (2.43)	13 (49)	7.0 (0.48)
1/2" (15mm)	4.9	14 x 14 (4.3x4.3)	7 (2.13)	8 (2.43)	13 (49)	7.0 (0.48)
1/2" (15mm)	4.9	16 x 16 (4.9x4.9)	8 (2.43)	8 (2.43)	13 (49)	7.0 (0.48)
1/2" (15mm)	4.9	18 x 18 (5.5x5.5)	9 (2.74)	8 (2.43)	17 (64.3)	12.0 (0.83)
1/2" (15mm)	4.9	20 x 20 (6.0x6.0)	10 (3.05)	8 (2.43)	20 (75.7)	16.7 (1.14)

Note: 1 bar = 100 Kpa

**FOR SLOPED CEILING APPLICATIONS SEE RASCO BULLETIN 035.**

## Maintenance

Model RFC30, RFC43 and RFC49 Concealed Sprinklers should be inspected quarterly and the sprinkler system maintained in accordance with NFPA 25. Do not clean sprinklers with soap and water, ammonia or any other cleaning fluids. Remove dust by using a soft brush or gentle vacuuming. Remove any sprinkler cover plate assembly which has been painted (other than factory applied) or damaged in any way. A stock of spare sprinklers should be maintained to allow quick replacement of damaged or operated sprinklers. Prior to installation, sprinklers should be maintained in the original cartons and packaging until used to minimize the potential for damage to sprinklers that would cause improper operation or non-operation.

## Model RFC30, RFC43 and RFC49 Residential Concealed Sprinkler Specification

Sprinklers shall be cULus Listed low flow residential concealed sprinklers with drop-down deflector and adjustable flat cover plate engineered for a minimum design density of 0.05 gpm/ft<sup>2</sup>. Sprinkler frame and deflector shall be of bronze frame construction having a 1/2" NPT thread. Thermal element shall consist of an approved black-painted beryllium-nickel fusible solder link with symmetric lever mechanism, maintaining a Teflon-coated Belleville spring washer and machined brass cap water seal assembly containing no plastic parts. Sprinkler K-factor shall be nominal 3.0 (44), 4.3 (62.4), and 4.91 (70) having a 5/16", 3/8" and 7/16" orifice. Temperature rating shall be Ordinary 165°F (74°C); cover plate temperature rating to be 135°F (57°C). Cover plate assembly shall

consist of a brass cover plate and copper alloy retainer flange allowing a 1/2" cover plate adjustment. Any secure engagement between the cover plate and the cup will assure that the drop-down deflector is properly located below the ceiling. A plastic protective cap shall be provided and factory installed inside the sprinkler cup to protect the drop-down sprinkler deflector from damage, which could occur during construction before the cover plate is installed. Standard cover finish: [Chrome] [White] [Specialty – specify]. Residential concealed sprinklers shall be Reliable Model RFC30, SIN RA0611 (Bulletin 006), Model RFC43, SIN RA0612 (Bulletin 006) or Model RFC49, SIN RA0616 (Bulletin 006).

## Ordering Information

### Specify:

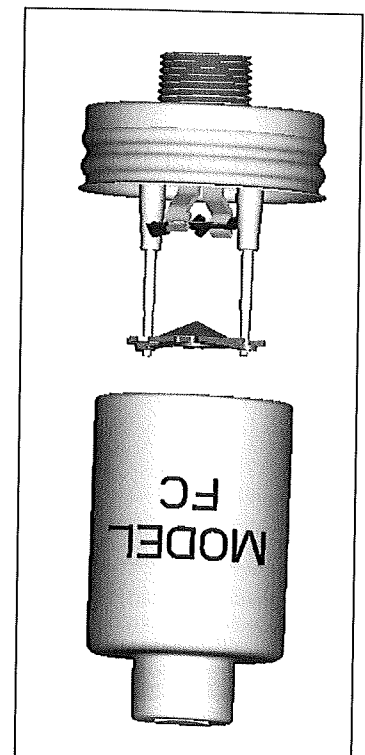
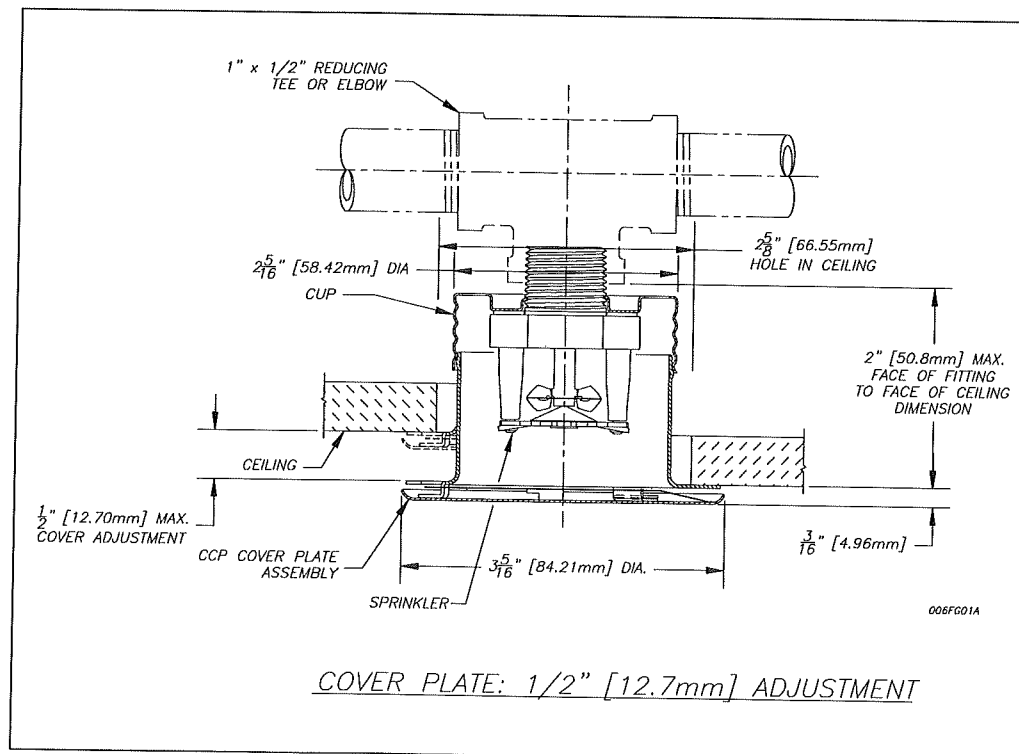
1. Sprinkler Model
2. Cover Plate Finish
3. Thread-On or Push-On Feature

## Cover Plate Finishes <sup>(1)</sup>

Standard Finishes
Chrome
White
Special Application Finishes
Bright Brass
Black Plating
Black Paint
Off White
Satin Chrome

<sup>(1)</sup> Other colors and finishes available. Consult factory for details.

**Note:** Paint or any other coatings applied over the factory finish will void all approvals and warranties.



# Reliable...For Complete Protection

Reliable offers a wide selection of sprinkler components. Following are some of the many precision-made Reliable products that guard life and property from fire around the clock.

- Automatic sprinklers
- Flush automatic sprinklers
- Recessed automatic sprinklers
- Concealed automatic sprinklers
- Adjustable automatic sprinklers
- Dry automatic sprinklers
- Intermediate level sprinklers
- Open sprinklers
- Spray nozzles
- Alarm valves
- Retarding chambers
- Dry pipe valves
- Accelerators for dry pipe valves
- Mechanical sprinkler alarms
- Electrical sprinkler alarm switches
- Water flow detectors
- Deluge valves
- Detector check valves
- Check valves
- Electrical system
- Sprinkler emergency cabinets
- Sprinkler wrenches
- Sprinkler escutcheons and guards
- Inspectors test connections
- Sight drains
- Ball drips and drum drips
- Control valve seals
- Air maintenance devices
- Air compressors
- Pressure gauges/identification signs
- Fire department connection

The equipment presented in this bulletin is to be installed in accordance with the latest published Standards of the National Fire Protection Association, Factory Mutual Research Corporation, or other similar organizations and also with the provisions of governmental codes or ordinances whenever applicable. Products manufactured and distributed by Reliable have been protecting life and property for over 90 years, and are installed and serviced by the most highly qualified and reputable sprinkler contractors located throughout the United States, Canada and foreign countries.

Manufactured by

**Reliable**<sup>®</sup>

The Reliable Automatic Sprinkler Co., Inc.  
(800) 431-1588 Sales Offices  
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(914) 829-2042 Corporate Offices  
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# Uponor

AQUASAFE® Fire Safety System

Uponor  
5925 148th Street West

Apple Valley, MN 55124  
800-321-4739

Job Name : SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)  
Drawing : RESIDENTIAL  
Location : 20 TRUE STREET PORTLAND ME 04101  
Remote Area : 1  
Contract : 120222-41L  
Data File : 120222-41L Sniper Residence.wx2

HYDRAULIC DESIGN INFORMATION SHEET

Name - SNIPER RESIDENCE Date - 3/12/12  
Location - PORTLAND ME 04101  
Building - RESIDENTIAL System No. - 1  
Contractor - SF PLUMBING & HEATING Contract No. - 120222-41L  
Calculated By - BRENT KOTULA CET III Drawing No. - 1  
Construction: (X) Combustible ( ) Non-Combustible Ceiling Height 8'  
OCCUPANCY - RESIDENTIAL

S Type of Calculation: ( ) NFPA 13 Residential ( ) NFPA 13R (X) NFPA 13D

Y Number of Sprinklers Flowing: ( ) 1 (X) 2 ( ) 4 ( )

S ( ) Other

T ( ) Specific Ruling Made by Date

E  
M Listed Flow at Start Point - 13 Gpm System Type  
Listed Pres. at Start Point - 7.04 Psi (X) Wet ( ) Dry  
D MAXIMUM LISTED SPACING 16 x 16 ( ) Deluge ( ) PreAction  
E Domestic Flow Added - 5 Gpm Sprinkler or Nozzle  
S Additional Flow Added - Gpm Make RELIABLE Model RFC49  
I Elevation at Highest Outlet - 126 Feet Size 3/8 K-Factor 4.9  
G Note: Temperature Rating 155  
N

Calculation Gpm Required 31.0414 Psi Required 63.85 At Ref Pt STR  
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:  
A Date of Test - 10/6/1989 Rated Cap. Cap.  
T Time of Test - NA @ Psi Elev.  
E Static (Psi) - 70 Elev.  
R Residual (Psi) - 50 Other Well  
Flow (Gpm) - 1233 Proof Flow Gpm  
S Elevation - 91

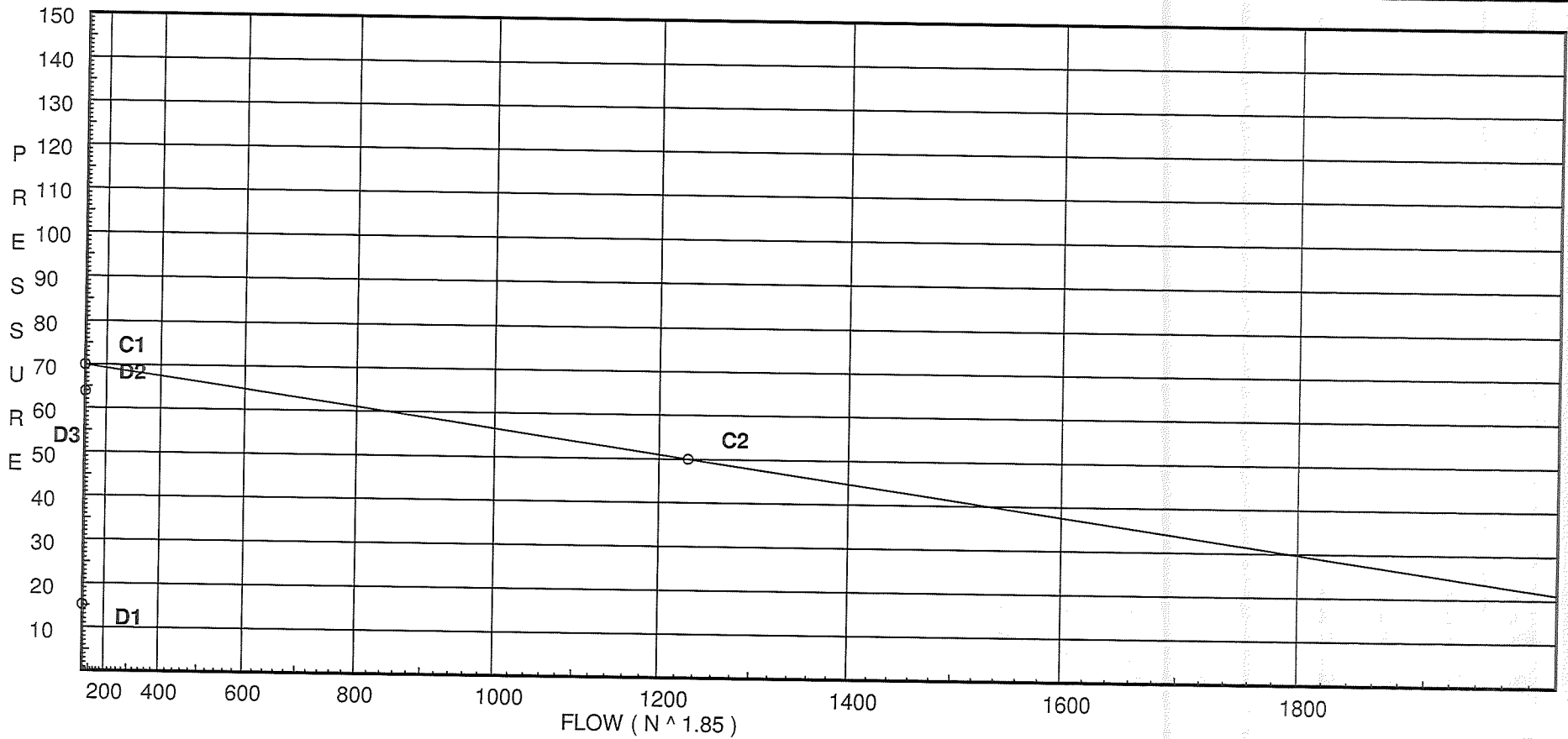
P Location: STREET  
P  
L Source of Information: WATER AUTHORITY  
Y

City Water Supply:

C1 - Static Pressure : 70  
 C2 - Residual Pressure: 50  
 C2 - Residual Flow : 1233

Demand:

D1 - Elevation : 15.158  
 D2 - System Flow : 26.0414  
 D2 - System Pressure : 63.852  
 Hose ( Adj City ) : \_\_\_\_\_  
 Hose ( Demand ) : 5  
 D3 - System Demand : 31.0414  
 Safety Margin : 6.126





Fittings Used Summary

Uponor  
 SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)

Fitting Legend		1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24	
Abbrev.	Name																					
E	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61	
G	Generic Gate Valve	1	1	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13	
T	90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121	
Utb	Aquapex Tee - Branch	2	6	6	9.08	12.88	13.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Utr	Aquapex Tee - Run	1	2	2	1.64	2.39	2.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Units Summary

Diameter Units      Inches  
 Length Units        Feet  
 Flow Units            US Gallons per Minute  
 Pressure Units       Pounds per Square Inch

Flow Summary - NFPA 2007

Uponsor  
 SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)

Page 4  
 Date 3/13/2012

**SUPPLY ANALYSIS**

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
STR	70.0	50	1233.0	69.978	31.04	63.852

**NODE ANALYSIS**

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
H.16	126.0	4.9	7.04	13.0	
T.49	126.0		7.42		
T.43	117.0		11.89		
T.46	117.0		11.93		
T.45	117.0		12.06		
H.14	117.0		12.18		
T.42	117.0		12.67		
T.41	117.0		13.04		
T.32	108.0		17.61		
T.37	108.0		17.84		
T.27	99.0		22.24		
T.26	99.0		22.26		
T.25	99.0		22.29		
H.5	99.0		22.66		
T.21	99.0		23.34		
T.20	99.0		23.37		
T.19	99.0		23.64		
T.17	99.0		24.06		
S.1	95.0		26.43		
MTR	91.0		31.7		
X01	91.0		38.34	5.0	
STR	91.0		63.85		
T.50	126.0		7.12		
T.44	117.0		11.91		
H.13	117.0		12.56		
T.40	117.0		13.05		
T.33	108.0		17.95		
H.15	126.0	4.9	7.08	13.04	
T.48	126.0		7.5		
H.12	126.0		7.48		
T.47	126.0		7.54		
T.39	117.0		13.19		
T.28	108.0		17.58		
H.4	108.0		17.64		
T.23	108.0		17.67		
T.22	108.0		17.85		
T.18	99.0		22.37		
H.1	99.0		22.83		
H.10	117.0		13.14		
T.38	117.0		13.23		
H.9	117.0		13.21		
T.29	108.0		17.6		

# Flow Summary - NFPA 2007

Uponsor  
 SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)

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## NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
H.8	108.0		17.86		
T.36	108.0		17.91		
T.35	108.0		17.92		
T.34	108.0		17.96		
H.3	108.0		17.9		
T.30	108.0		17.94		
H.11	108.0		17.91		
H.7	108.0		17.94		
H.6	99.0		22.25		
H.2	99.0		22.31		

# Final Calculations - Hazen-Williams

Uponor  
SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Fng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
H.16 to T.49	8.65	0.862 150.0	1Utr	2.0 0.0	6.000 2.000	7.040 0.0			K Factor = 4.90	
T.49 to T.43	8.65	0.0475		0.0	8.000	0.380			Vel = 4.76	
T.49 to T.43	-2.53	0.862 150.0	2Utb	12.0 0.0	11.000 12.000	7.420 3.898				
T.43 to T.46	6.12	0.0250		0.0	23.000	0.576			Vel = 3.36	
T.43 to T.46	-4.05	0.862 150.0	1Utr	2.0 0.0	9.000 2.000	11.894 0.0				
T.46 to T.45	2.07	0.0035		0.0	11.000	0.038			Vel = 1.14	
T.46 to T.45	5.98	0.862 150.0	1Utr	2.0 0.0	1.000 2.000	11.932 0.0				
T.45 to H.14	8.05	0.0413		0.0	3.000	0.124			Vel = 4.43	
T.45 to H.14	6.38	0.862 150.0		0.0 0.0	1.000 0.0	12.056 0.0				
H.14 to T.42	14.43	0.1230		0.0	1.000	0.123			Vel = 7.93	
H.14 to T.42	0.0	0.862 150.0	1Utr	2.0 0.0	2.000 2.000	12.179 0.0				
T.42 to T.41	14.43	0.1225		0.0	4.000	0.490			Vel = 7.93	
T.42 to T.41	0.0	0.862 150.0	1Utr	2.0 0.0	1.000 2.000	12.669 0.0				
T.41 to T.32	14.43	0.1223		0.0	3.000	0.367			Vel = 7.93	
T.41 to T.32	-7.73	0.862 150.0	2Utb	12.0 0.0	11.000 12.000	13.036 3.898				
T.32 to T.37	6.7	0.0296		0.0	23.000	0.681			Vel = 3.68	
T.32 to T.37	2.87	0.862 150.0	1Utr	2.0 0.0	2.000 2.000	17.615 0.0				
T.37 to T.27	9.57	0.0572		0.0	4.000	0.229			Vel = 5.26	
T.37 to T.27	-4.28	0.862 150.0	2Utb	12.0 0.0	14.000 12.000	17.844 3.898				
T.27 to T.26	5.29	0.0192		0.0	26.000	0.498			Vel = 2.91	
T.27 to T.26	-2.76	0.862 150.0	1Utr	2.0 0.0	2.000 2.000	22.240 0.0				
T.26 to T.25	2.53	0.0048		0.0	4.000	0.019			Vel = 1.39	
T.26 to T.25	0.0	0.862 150.0	1Utr	2.0 0.0	5.000 2.000	22.259 0.0				
T.25 to H.5	2.53	0.0049		0.0	7.000	0.034			Vel = 1.39	
T.25 to H.5	5.39	0.862 150.0	1Utr	2.0 0.0	7.000 2.000	22.293 0.0				
H.5 to T.21	7.92	0.0404		0.0	9.000	0.364			Vel = 4.35	
H.5 to T.21	0.0	0.862 150.0	1Utr 1Utb	2.0 6.0	9.000 8.000	22.657 0.0				
T.21 to T.20	7.92	0.0404		0.0	17.000	0.687			Vel = 4.35	
T.21 to T.20	9.00	1.291 150.0		0.0 0.0	1.000 0.0	23.344 0.0				
T.20 to T.19	16.92	0.0230		0.0	1.000	0.023			Vel = 4.15	
T.20 to T.19	9.12	1.291 150.0	1E	3.276 0.0	2.000 3.276	23.367 0.0				
T.19	26.04	0.0510		0.0	5.276	0.269			Vel = 6.38	

# Final Calculations - Hazen-Williams

Uponor  
SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Fting's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.19 to T.17	0.0 26.04	1.291 150.0 0.0511	1E	3.276 0.0 8.276	5.000 3.276 0.0 0.423	23.636 0.0		Vel = 6.38	
T.17 to S.1	0.0 26.04	1.291 150.0 0.0511	1T	6.553 0.0 12.553	6.000 6.553 0.642	24.059 1.732		Vel = 6.38	
S.1 to MTR	0.0 26.04	1.291 150.0 0.0511	2E	6.553 0.0 10.553	4.000 6.553 0.539	26.433 4.732		* Fixed loss = 3 Vel = 6.38	
MTR to X01	0.0 26.04	0.911 150.0 0.2789	1T	3.801 0.0 23.801	20.000 3.801 6.639	31.704 0.0		Vel = 12.82	
X01 to STR	5.00 31.04	0.911 150.0 0.3860	1E 1T 1G	1.521 3.801 0.76	60.000 6.082 66.082	38.343 0.0 25.509		Qa = 5 Vel = 15.28	
	0.0 31.04					63.852		K Factor = 3.88	
H.16 to T.50	4.36 4.36	0.862 150.0 0.0133	1Utr	2.0 0.0 6.000	4.000 2.000 6.000	7.040 0.0 0.080		Vel = 2.40	
T.50 to T.44	3.20 7.56	0.862 150.0 0.0370	2Utb	12.0 0.0 24.000	12.000 12.000 24.000	7.120 3.898 0.888		Vel = 4.16	
T.44 to H.13	4.05 11.61	0.862 150.0 0.0820	1Utr	2.0 0.0 8.000	6.000 2.000 8.000	11.906 0.0 0.656		Vel = 6.38	
H.13 to T.40	0.0 11.61	0.862 150.0 0.0820	1Utr	2.0 0.0 6.000	4.000 2.000 6.000	12.562 0.0 0.492		Vel = 6.38	
T.40 to T.33	-3.56 8.05	0.862 150.0 0.0416	2Utb	12.0 0.0 24.000	12.000 12.000 24.000	13.054 3.898 0.998		Vel = 4.43	
T.33 to T.20	1.07 9.12	0.862 150.0 0.0524	1Utb	6.0 0.0 29.000	23.000 6.000 29.000	17.950 3.898 1.519		Vel = 5.01	
	0.0 9.12					23.367		K Factor = 1.89	
T.50 to H.15	-3.20 -3.2	0.862 150.0 -0.0076		0.0 0.0 5.000	5.000 0.0 5.000	7.120 0.0 -0.038		Vel = 1.76	
H.15 to T.48	13.04 9.84	0.862 150.0 0.0604	1Utr	2.0 0.0 7.000	5.000 2.000 7.000	7.082 0.0 0.423		K Factor = 4.90 Vel = 5.41	
T.48 to T.46	-3.86 5.98	0.862 150.0 0.0240	2Utb	12.0 0.0 22.000	10.000 12.000 22.000	7.505 3.898 0.529		Vel = 3.29	
	0.0 5.98					11.932		K Factor = 1.73	

# Final Calculations - Hazen-Williams

Uponor  
SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.49 to H.12	2.52	0.862 150.0	1Utr	2.0 0.0	11.000 2.000	7.420 0.0				
	2.52	0.0048		0.0	13.000	0.063			Vel = 1.39	
H.12 to T.47	0.0	0.862 150.0	1Utr	2.0 0.0	9.000 2.000	7.483 0.0				
	2.52	0.0049		0.0	11.000	0.054			Vel = 1.39	
T.47 to T.45	3.86	0.862 150.0	2Utb	12.0 0.0	11.000 12.000	7.537 3.898				
	6.38	0.0270		0.0	23.000	0.621			Vel = 3.51	
	0.0 6.38					12.056			K Factor = 1.84	
T.48 to T.47	3.85	0.862 150.0	1Utr	2.0 0.0	1.000 2.000	7.505 0.0				
	3.85	0.0107		0.0	3.000	0.032			Vel = 2.12	
	0.0 3.85					7.537			K Factor = 1.40	
T.43 to T.44	4.06	0.862 150.0		0.0 0.0	1.000 0.0	11.894 0.0				
	4.06	0.0120		0.0	1.000	0.012			Vel = 2.23	
	0.0 4.06					11.906			K Factor = 1.18	
T.41 to T.39	7.73	0.862 150.0	1Utr	2.0 0.0	2.000 2.000	13.036 0.0				
	7.73	0.0388		0.0	4.000	0.155			Vel = 4.25	
T.39 to T.28	-1.99	0.862 150.0	2Utb	12.0 0.0	10.000 12.000	13.191 3.898				
	5.74	0.0222		0.0	22.000	0.489			Vel = 3.16	
T.28 to H.4	-2.87	0.862 150.0	1Utr	2.0 0.0	8.000 2.000	17.578 0.0				
	2.87	0.0062		0.0	10.000	0.062			Vel = 1.58	
H.4 to T.23	0.0	0.862 150.0	1Utr	2.0 0.0	3.000 2.000	17.640 0.0				
	2.87	0.0062		0.0	5.000	0.031			Vel = 1.58	
T.23 to T.22	5.55	0.862 150.0	1Utr	2.0 0.0	2.000 2.000	17.671 0.0				
	8.42	0.0452		0.0	4.000	0.181			Vel = 4.63	
T.22 to T.18	-2.18	0.862 150.0	2Utb	12.0 0.0	12.000 12.000	17.852 3.898				
	6.24	0.0259		0.0	24.000	0.622			Vel = 3.43	
T.18 to H.1	2.76	0.862 150.0	1Utr	2.0 0.0	7.000 2.000	22.372 0.0				
	9.0	0.0511		0.0	9.000	0.460			Vel = 4.95	
H.1 to T.21	0.0	0.862 150.0	1Utb	6.0 0.0	4.000 6.000	22.832 0.0				
	9.0	0.0512		0.0	10.000	0.512			Vel = 4.95	
	0.0 9.00					23.344			K Factor = 1.86	

# Final Calculations - Hazen-Williams

Uponsor  
SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Fng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.40 to H.10	3.56	0.862 150.0	1Utr 2.0 0.0	7.000 2.000	13.054 0.0			Vel = 1.96	
H.10 to T.38	0.0	0.862 150.0	1Utr 2.0 0.0	8.000 2.000	13.136 0.0			Vel = 1.96	
T.38 to T.23	3.56	0.862 150.0	2Utb 12.0 0.0	14.000 12.000	13.228 3.898			Vel = 3.05	
	0.0	0.0210	0.0	26.000	0.545				
	5.55				17.671			K Factor = 1.32	
T.39 to H.9	1.99	0.862 150.0	1Utr 2.0 0.0	4.000 2.000	13.191 0.0			Vel = 1.09	
H.9 to T.38	1.99	0.862 150.0	1Utr 2.0 0.0	6.000 2.000	13.210 0.0			Vel = 1.09	
	0.0	0.0032	0.0	6.000	0.019				
	1.99	0.0030	0.0	6.000	0.018				
	0.0				13.228			K Factor = 0.55	
T.28 to T.29	2.87	0.862 150.0	1Utr 2.0 0.0	1.000 2.000	17.578 0.0			Vel = 1.58	
T.29 to T.32	2.87	0.862 150.0	1Utr 2.0 0.0	3.000 2.000	17.597 0.0			Vel = 1.58	
	0.0	0.0063	0.0	3.000	0.019				
	2.87	0.0060	0.0	3.000	0.018				
	0.0				17.615			K Factor = 0.68	
T.37 to H.8	4.28	0.862 150.0	0.0 0.0	1.000 0.0	17.844 0.0			Vel = 2.35	
H.8 to T.36	4.28	0.862 150.0	1Utr 2.0 0.0	2.000 2.000	17.857 0.0			Vel = 2.35	
T.36 to T.35	0.0	0.862 150.0	0.0 0.0	1.000 0.0	17.909 0.0			Vel = 2.14	
	-0.39	0.0110	0.0	1.000	0.011				
T.35 to T.34	3.89	0.862 150.0	1Utr 2.0 0.0	1.000 2.000	17.920 0.0			Vel = 2.35	
	0.39	0.0127	0.0	3.000	0.038				
T.34 to T.25	4.28	0.862 150.0	2Utb 12.0 0.0	10.000 12.000	17.958 3.898			Vel = 2.97	
	1.12	0.0199	0.0	22.000	0.437				
	5.4				22.293			K Factor = 1.14	
T.22 to H.3	2.19	0.862 150.0	1Utr 2.0 0.0	10.000 2.000	17.852 0.0			Vel = 1.20	
H.3 to T.30	2.19	0.862 150.0	1Utr 2.0 0.0	12.000 2.000	17.896 0.0			Vel = 1.20	
	0.0	0.0037	0.0	12.000	0.044				
	2.19	0.0038	0.0	12.000	0.045				

# Final Calculations - Hazen-Williams

Uponor  
SNIPER RESIDENCE - Two Head Calculation (H.16 & H.15)

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Fting's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.30 to T.33	-1.12 1.07	0.862 150.0 0.0010	1Utb 1Utr	6.0 2.0 0.0	1.000 8.000 9.000	17.941 0.0 0.009				Vel = 0.59
	0.0 1.07					17.950				K Factor = 0.25
T.36 to H.11	0.39 0.39	0.671 150.0 0.0005	1Utb	6.0 0.0 0.0	4.000 6.000 10.000	17.909 0.0 0.005				Vel = 0.35
H.11 to T.35	0.0 0.39	0.671 150.0 0.0005	1Utr 1Utb	2.0 6.0 0.0	3.000 8.000 11.000	17.914 0.0 0.006				Vel = 0.35
	0.0 0.39					17.920				K Factor = 0.09
T.30 to H.7	1.12 1.12	0.862 150.0 0.0010	1Utr	2.0 0.0 0.0	1.000 2.000 3.000	17.941 0.0 0.003				Vel = 0.62
H.7 to T.34	0.0 1.12	0.862 150.0 0.0011	1Utr	2.0 0.0 0.0	11.000 2.000 13.000	17.944 0.0 0.014				Vel = 0.62
	0.0 1.12					17.958				K Factor = 0.26
T.27 to H.6	2.76 2.76	0.862 150.0 0.0060		0.0 0.0 0.0	1.000 0.0 1.000	22.240 0.0 0.006				Vel = 1.52
H.6 to H.2	0.0 2.76	0.862 150.0 0.0057	1Utr	2.0 0.0 0.0	9.000 2.000 11.000	22.246 0.0 0.063				Vel = 1.52
H.2 to T.18	0.0 2.76	0.862 150.0 0.0057	1Utr	2.0 0.0 0.0	9.000 2.000 11.000	22.309 0.0 0.063				Vel = 1.52
	0.0 2.76					22.372				K Factor = 0.58



# Reliable®

## Residential Sprinkler For Sloped Ceilings

### Guidelines for Listed Residential Sprinkler Installations below Sloped Ceilings

The installation guidelines cover  
Residential Sprinkler Models:

- F1 Res 49 Pendent
- F1 Res 49 Recessed Pendent/F2
- F1 Res 58 Pendent
- F1 Res 58 Recessed Pendent/F2
- F1 Res 44 HSW
- F1 Res 44 Recessed HSW/F2
- F1 Res 49 CCP
- F1 Res 58 CCP
- RFC 43 Flat Concealed
- RFC 49 Flat Concealed

#### Listings & Approvals

1. Listed by Underwriters Laboratories Inc. and  
UL Certified for Canada (cULus)
2. NYC MEA 258-93-E

#### UL Listing Category

Residential Automatic Sprinkler  
UL Guide Number  
VKKW

#### Patents

US Patent No. 6,516,893 applies to Model F1 Res 49 &  
58 Pendent Sprinklers  
US Patent No. 7,353,882 applies to Model F1 Res 44  
HSW Sprinklers  
Other Patents Pending

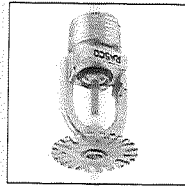
#### Product Description for F1 Res Sprinklers

Model F1 Res Pendent sprinklers are fast response sprinklers combining excellent durability, high sensitivity glass-bulb and low profile decorative design. The F1 Res Horizontal Sidewall sprinklers are equally attractive when above ceiling piping cannot be used.

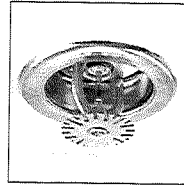
The 3mm glass-bulb pendent sprinklers, with a K Factor of 4.9 & 5.8 for pendent and 4.4 for horizontal sidewall, permit the efficient use of residential water supplies for sprinkler coverage in residential fire protection design.

The low flow F1 Res sprinklers are specially engineered for fast thermal response to meet the sensitive fire protection application needs of the latest residential market standards (UL 1626 Standard \*). Upon fire conditions, rising heat causes a sprinkler's heat-sensitive glass-bulb to shatter, releasing the waterway for water flow onto the deflector, evenly distributing the discharged water to control a fire.

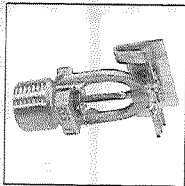
The Reliable Automatic Sprinkler Co., Inc., 103 Fairview Park Drive, Elmsford, New York 10523



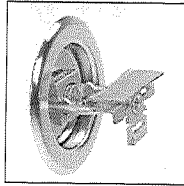
F1 Res 49 & 58  
Pendent



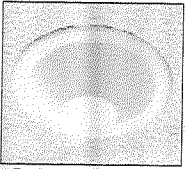
F1 Res 49 & 58  
Recessed Pendent / F2



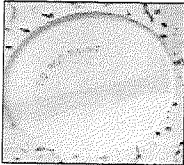
F1 Res 44  
HSW



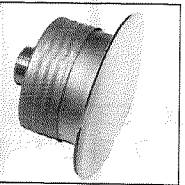
F1 Res 44  
Recessed HSW/F2



F1 Res 49 & 58 CCP  
Pendent



RFC 43 & RFC 49



RFC 43 & RFC 49

\* Effective date July 12, 2002

#### Product Description for RFC 43 & RFC 49

Model RFC43 & RFC49 Concealed Residential Sprinklers are fast response residential fusible solder link automatic sprinklers. Residential sprinklers differ from standard sprinklers primarily in their response time and water distribution patterns.

Model RFC43 & RFC49 sprinklers discharge water in a hemispherical pattern below the sprinkler deflector. Residential distribution patterns are higher and generally contain a finer droplet size than standard sprinkler patterns.

The combination of speed of operation and high discharge pattern required for residential sprinklers has demonstrated, in fire testing, an ability for controlling residential fires, and thereby providing significant evacuation time for occupants.

The RFC43 & RFC49 Sprinkler provides the best form of fire protection by combining an attractive appearance and 1/2" (13mm) of cover adjustment for ease of installation. The small diameter cover plate is easily and positively attached and blends into the ceiling, concealing the most dependable fire protection available, an automatic sprinkler system.

The RFC43 & RFC49 are UL Listed Residential Sprinkler to be installed in the residential portions of any occupancy in accordance with NFPA 13, 13R, & 13D.

The RFC43 & RFC49 can reduce the need for precise cutting of drop nipples. The threaded cover plate assembly can be adjusted without tools to fit accurately against the ceiling. The fire protection system need not be shut down to adjust or remove the cover plate assembly.

#### Technical Data (F1 Res Sprinklers):

- Thermal Sensor : Nominal 3mm glass-bulb
- Sprinkler Frame : Brass Casting
- Sprinkler Pressure Rating : 175 psi  
Factory Hydrostatically Tested to 500 psi
- Thread Size : 1/2" NPT (R1/2)
- K Factor : 4.9 (Actual) - F1 Res 49 Pendent Sprinkler  
4.4 (Actual) - F1 Res 44 HSW Sprinkler  
5.8 (Actual) - F1 Res 58 Pendent Sprinkler
- Density : Minimum .05 gpm/ft<sup>2</sup>

#### Technical Data (RFC 43 & RFC 49):

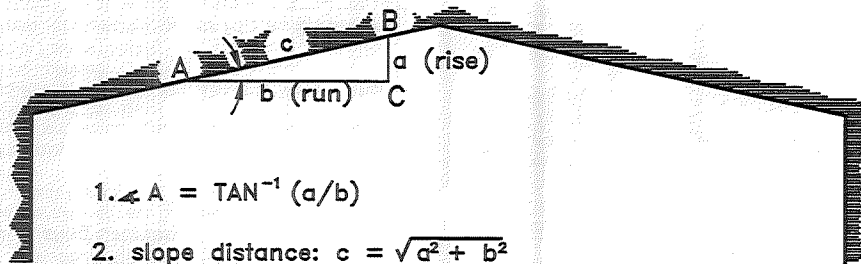
- Thermal Sensor : 165°F Fusible Link
- Sprinkler Frame : Brass Machined
- Sprinkler Pressure Rating : 175 psi  
Factory Hydrostatically Tested to 500 psi
- Thread Size : 1/2" NPT (R1/2)
- K Factor : 4.3 (Actual) RFC43;  
4.9 (Actual) RFC49
- Density : Minimum .05 gpm/ft<sup>2</sup>

#### Application

Model F1 Res and RFC 43 & RFC 49 Sprinklers are used for Residential Fire Protection according to UL 1626 Standard\*. Be sure that orifice size, temperature rating, deflector style, cover plate and sprinkler type are in accordance with the latest published standards of The National Fire Protection Association or the approving Authority Having Jurisdiction.

\* Effective date July 12, 2002

METHOD OF CALCULATING THE CONVERSION OF 'RISE-OVER-RUN' TO DEGREES OF AN ANGLE.



1.  $\angle A = \text{TAN}^{-1} (a/b)$

2. slope distance:  $c = \sqrt{a^2 + b^2}$

Example:  $a = 4$   
 $b = 12$

$\angle A = \text{TAN}^{-1} (a/b)$

$\angle A = \text{TAN}^{-1} = (0.333)$

$\angle A = 18.43^\circ$

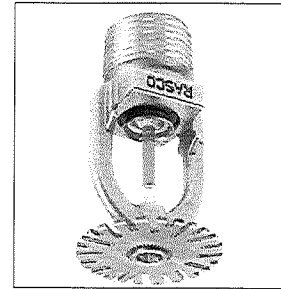
slope distance:  $c = \sqrt{4^2 + 12^2}$

$c = \sqrt{160}$

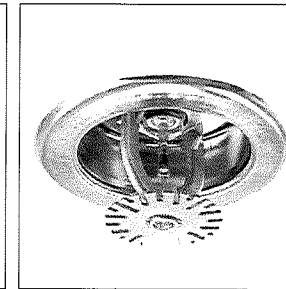
$c = 12.65$

035\_ROR-A

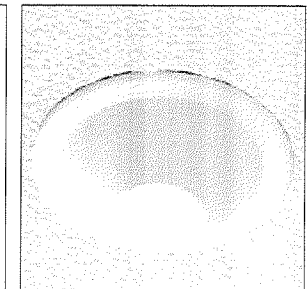
Model F1 Res 49 Pendant & F1 Res 49 Recessed Pendant/F2 & F1 Res 49 CCP Pendant, Model F1 Res 58 Pendant & F1 Res 58 Recessed Pendant/F2 & F1 Res 58 CCP Pendant, RFC 43 & RFC 49 Pendant Flat Concealed Sprinklers installed below Sloped Ceilings.



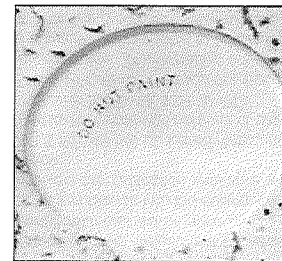
F1 Res 49 & 58  
Pendant



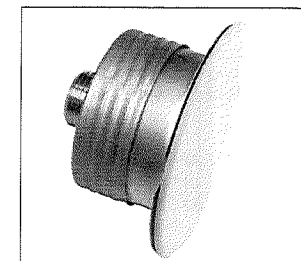
F1 Res 49 & 58  
Recessed Pendant / F2



F1 Res 49 & 58 CCP  
Pendant

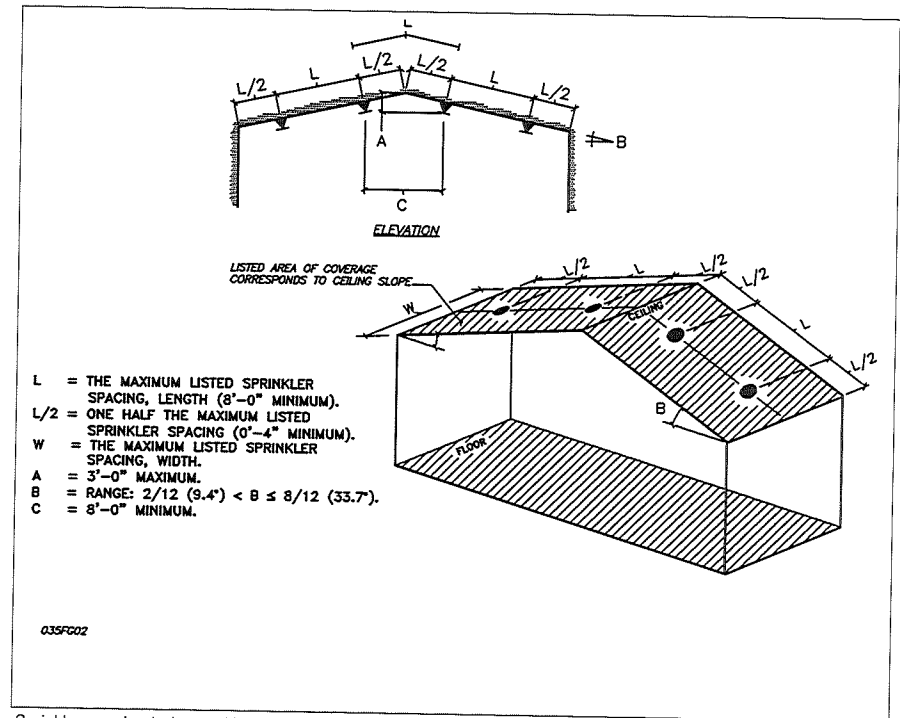
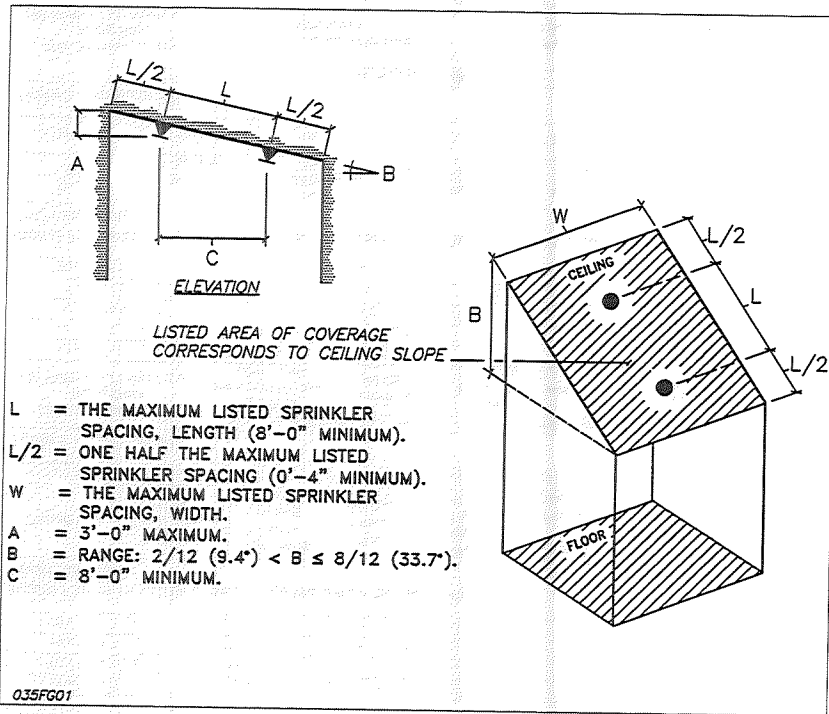


RFC 43 & RFC 49



RFC 43 & RFC 49

**Note:** F1 Res 49 CCP Pendant, RFC 43 and RFC 49 sprinklers are not suitable for installation in ceilings which have positive pressure in the space above.



Sprinkler spacing below multiple sloped ceilings with a maximum slope of 8/12 (33.7°) pitch.

Model F1Res 49 Pendant & F1 Res 49 Recessed Pendant/F2 installed below Sloped Ceiling.

Technical Data

Thread Size	Max. Pressure psi (bar)	Max. Ambient Temp. °F (°C)	Actual K Factor (metric)	Sprinkler Length	Escutcheon	Sprinkler Identification Number (SIN)
½" NPT (R½)	175 (12)	100 (38)	4.9 (69,94)	2.25" (57mm)	F2 (1/2" Adjustment)	R3516

Table 1 - Application

Max. Sprinkler Spacing Along Slope (W) Width x (L) Length ft (m)	Max. Slope of ½/12 (33.7°) Pitch				Max. Slope of ¼/12 (18.4°) Pitch	
	Min. Flow Per Sprinkler Head gpm (Lpm)		Pressure psi (bar)		Sprinkler Temp. Rating °F (°C)	
	155°F (68°C)	175°F (79°C)	155°F (68°C)	175°F (79°C)	Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)
12 x 12 (3.6 x 3.6)	13 (49)	13 (49)	7.0 (0,48)	7.0 (0,48)	13 (49)	7.0 (0,48)
14 x 14 (4.3 x 4.3)	13 (49)	13 (49)	7.0 (0,48)	7.0 (0,48)	13 (49)	7.0 (0,48)
16 x 16 (4.9 x 4.9)	13 (49)	13 (49)	7.0 (0,48)	7.0 (0,48)	13 (49)	7.0 (0,48)
18 x 18 (5.5 x 5.5)	17 (64,3)	18 (68,2)	12.0 (0,83)	13.5 (0,93)	18 (68,3)	13.5 (0,93)
20 x 20 (6.1 x 6.1)	20 (75,7)	21 (79,5)	16.7 (1,15)	18.4 (1,28)	20 (75,7)	16.7 (1,15)

Model F1Res 49 CCP Pendant installed below Sloped Ceiling.

Technical Data

Thread Size	Sprinkler Temp. Rating °F (°C)	CCP Assy. Temp. Rating °F (°C)	Max. Pressure psi (bar)	Max. Ambient Temp. °F (°C)	Actual K Factor (metric)	Sprinkler Length	Sprinkler Identification Number (SIN)
½" NPT (R½)	155 (68)	135 (57)	175 (12)	100 (38)	4.9 (69,94)	2.25" (57mm)	R3516

Table 2 - Application

Max. Sprinkler Spacing Along Slope (W) Width x (L) Length ft (m)	Max. Slope of ½/12 (33.7°) Pitch		Max. Slope of ¼/12 (18.4°) Pitch	
	Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)	Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)
	155°F (68°C)	175°F (79°C)	155°F (68°C)	175°F (79°C)
12 x 12 (3.6 x 3.6)	14 (53)	8.2 (0,57)	13 (49)	7.0 (0,48)
14 x 14 (4.3 x 4.3)	14 (53)	8.2 (0,57)	13 (49)	7.0 (0,48)
16 x 16 (4.9 x 4.9)	14 (53)	8.2 (0,57)	14 (53)	8.2 (0,56)
18 x 18 (5.5 x 5.5)	23 (87)	22 (1,52)	20 (75,7)	17 (1,17)
20 x 20 (6.1 x 6.1)	23 (87)	22 (1,52)	21 (75,7)	17 (1,17)

Model F1Res 58 Pendant & F1 Res 58 Recessed Pendant/F2 installed below Sloped Ceiling.

Technical Data

Thread Size	Max. Pressure psi (bar)	Max. Ambient Temp. °F (°C)	Actual K Factor (metric)	Sprinkler Length	Escutcheon	Sprinkler Identification Number (SIN)
½" NPT (R½)	175 (12)	100 (38)	5.8 (83,38)	2.25" (57mm)	F2 (1/2" Adjustment)	R3513

Table 3 - Application

Max. Sprinkler Spacing Along Slope (W) Width x (L) Length ft (m)	Max. Slope of ½/12 (33.7°) Pitch				Max. Slope of ¼/12 (18.4°) Pitch	
	Min. Flow Per Sprinkler Head gpm (Lpm)		Pressure psi (bar)		Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)
	155°F (68°C)	175°F (79°C)	155°F (68°C)	175°F (79°C)	155°F (68°C)	155°F (68°C)
12 x 12 (3.6 x 3.6)	21 (79,5)	23 (87)	13.1 (0,9)	15.7 (1,1)	20 (75,7)	12 (0,83)
14 x 14 (4.3 x 4.3)	21 (79,5)	23 (87)	13.1 (0,9)	15.7 (1,1)	20 (75,7)	12 (0,83)
16 x 16 (4.9 x 4.9)	21 (79,5)	23 (87)	13.1 (0,9)	15.7 (1,1)	20 (75,7)	12 (0,83)
18 x 18 (5.5 x 5.5)	23 (87)	--	15.7 (1,1)	--	20 (75,7)	12 (0,83)
20 x 20 (6.1 x 6.1)	23 (87)	--	15.7 (1,1)	--	20 (75,7)	12 (0,83)

Model F1Res 58 CCP Pendant installed below sloped Ceiling.

Technical Data

Thread Size	Sprinkler Temp. Rating °F (°C)	CCP Assy. Temp. Rating °F (°C)	Max. Pressure psi (bar)	Max. Ambient Temp. °F (°C)	Actual K Factor (metric)	Sprinkler Length	Sprinkler Identification Number (SIN)
½" NPT (R½)	155 (68)	135 (57)	175 (12)	100 (38)	5.8 (83,38)	2.25" (57mm)	R3513

Table 4 - Application

Max. Sprinkler Spacing Along Slope (W) Width x (L) Length ft (m)	Max. Slope of ¼/12 (18.4°) Pitch	
	Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)
18 x 18 (5.5 x 5.5)	20 (75,7)	12 (0,83)
20 x 20 (6.1 x 6.1)	20 (75,7)	12 (0,83)

Model RFC43 Pendant Flat Concealed installed below Sloped Ceiling.

Technical Data

Thread Size	Sprinkler Temp. Rating °F (°C)	Coverplate Temp. Rating °F (°C)	Max. Pressure psi (bar)	Max. Ambient Temp. °F (°C)	Actual K Factor (metric)	Max. Adjustment	Sprinkler Identification Number (SIN)
½" NPT (R½)	165 (74)	135 (57)	175 (12)	100 (38)	4.3 (61,4)	½" (13mm)	RA0612

Table 5 - Application

Max. Sprinkler Spacing Along Slope (W) Width x (L) Length ft (m)	Max. Slope of ½/12 (33.7°) Pitch		Max. Slope of ¼/12 (18.4°) Pitch	
	Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)	Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)
	155°F (68°C)	175°F (79°C)	155°F (68°C)	175°F (79°C)
12 x 12 (3.6 x 3.6)	18 (68)	17.5 (1,21)	13 (49)	9.1 (0,63)
14 x 14 (4.3 x 4.3)	18 (68)	17.5 (1,21)	13 (49)	9.1 (0,63)
16 x 16 (4.9 x 4.9)	18 (68)	17.5 (1,21)	13 (49)	9.1 (0,63)
18 x 18 (5.5 x 5.5)	24 (91)	31 (2,14)	18 (68)	17.5 (1,21)
20 x 20 (6.1 x 6.1)	24 (91)	31 (2,14)	21 (79)	23.8 (1,64)

Model RFC 49 Pendant Flat Concealed installed below Sloped Ceiling.

Technical Data

Thread Size	Sprinkler Temp. Rating °F (°C)	Coverplate Temp. Rating °F (°C)	Max. Pressure psi (bar)	Max. Ambient Temp. °F (°C)	Actual K Factor (metric)	Max. Adjustment	Sprinkler Identification Number (SIN)
½" NPT (R½)	165 (74)	135 (57)	175 (12)	100 (38)	4.9 (69,94)	½" (13mm)	RA0616

Table 6 - Application

Max. Sprinkler Spacing Along Slope (W) Width x (L) Length ft (m)	Max. Slope of ½/12 (33.7°) Pitch		Max. Slope of ¼/12 (18.4°) Pitch	
	Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)	Min. Flow Per Sprinkler Head gpm (Lpm)	Pressure psi (bar)
	155°F (68°C)	175°F (79°C)	155°F (68°C)	175°F (79°C)
16 x 16 (4.9 x 4.9)	28 (106)	23 (19,3)	18 (68)	13.5 (0,93)
18 x 18 (5.5 x 5.5)	29 (109,8)	29 (20,0)	18 (68)	13.5 (0,93)
20 x 20 (6.1 x 6.1)	30 (113,6)	30 (30,0)	23 (87)	22 (1,52)

Installation Guidelines

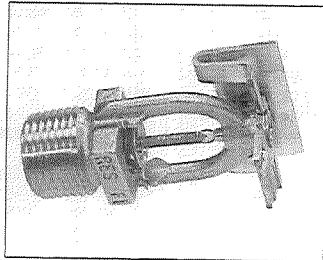
- For systems designed in accordance with NFPA 13, 13D and 13R, where specific UL Listed flows are not required, consult with the local Authority Having Jurisdiction regarding the number of design sprinklers for sloped ceilings having a pitch greater than (9.4°).
- Installation of UL Listed residential sprinklers under sloped ceilings shall be limited to a type of unobstructed construction consisting of smooth ceilings, as defined by NFPA 13, having a maximum pitch of 4/12 (18.4°) or 8/12 (33.7°).
- Spacing of residential sprinklers under sloped ceilings is measured along the slope when determining the distance off of walls and between sprinklers.
- Measure listed areas of coverage along the sloped ceiling. The actual floor coverage area will be less than the listed area.
- For coverage areas less than the listed coverage area shown in Tables 1 through 5, use the minimum flow requirement for the next largest listed coverage area.
- Minimum spacing between pendant type sprinklers is 8 ft. (2.4 m). Minimum distance from a pendant type sprinkler and an adjacent wall is 4" (102 mm).
- Residential sprinklers located closest to the peak of the ceiling shall have the deflectors located not more than 3 ft (1m) vertically down from the peak. Align deflectors parallel with the ceiling slope 1" to 4" (25mm to 102mm) below the sloped ceiling.
- Hydraulic Requirements:
  - For NFPA 13D Systems, the number of design sprinklers shall include all sprinklers within a compartment, up to a maximum of two sprinklers (where specific UL Listed flows are required) that requires the greatest hydraulic demand.

- b. For NFPA 13R Systems, the number of design sprinklers shall include all sprinklers within a compartment, up to a maximum of four (4) sprinklers (where specific UL Listed flows are required), that requires the greatest hydraulic demand.
- c. For NFPA 13 systems, the design area shall be the area that includes the four (4) hydraulically most demanding sprinklers. The minimum required discharge from each of the four hydraulically demanding sprinklers shall be the greater of the following:

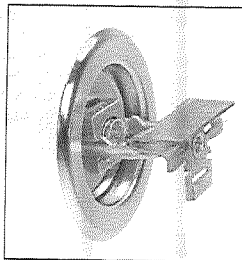
- (1) In accordance with the minimum flow rates indicated by the individual listings (that already will provide a minimum density of 0.1 gpm/ft<sup>2</sup>); or
- (2) A calculated value based on delivering a minimum of 0.1 gpm/ft<sup>2</sup> over the design area.

9. Because of the varied nature of residential construction features, there will be some compartment designs which cannot be fully sprinklered in accordance with NFPA 13, 13D, or 13R. In these instances, consult the Authority Having Jurisdiction (AHJ) for guidance and approval. This includes sloped ceilings having a pitch greater than 8/12 (33.7°).
10. Glass bulb sprinklers have orange bulb protectors to minimize bulb damage during shipping, handling and installation. REMOVE THIS PROTECTION AT THE TIME THE SPRINKLER SYSTEM IS PLACE IN SERVICE FOR FIRE PROTECTION. Removal of the protectors before this time may leave the bulb vulnerable to damage. RASCO wrenches are designed to install sprinklers when covers are in place. REMOVE PROTECTORS BY UNDOING THE CLASP BY HAND. DO NOT USE TOOLS TO REMOVE THE PROTECTORS.

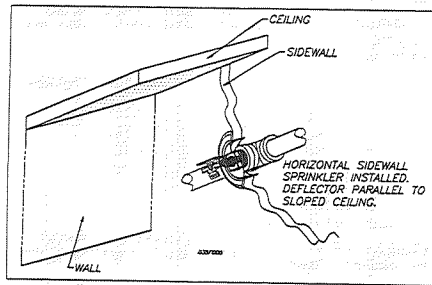
**Model F1Res 44 and F1 Res 44 HSW/W/2 installed below Sloped Ceiling.**



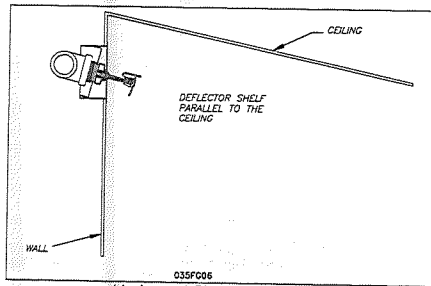
F1 Res 44  
HSW



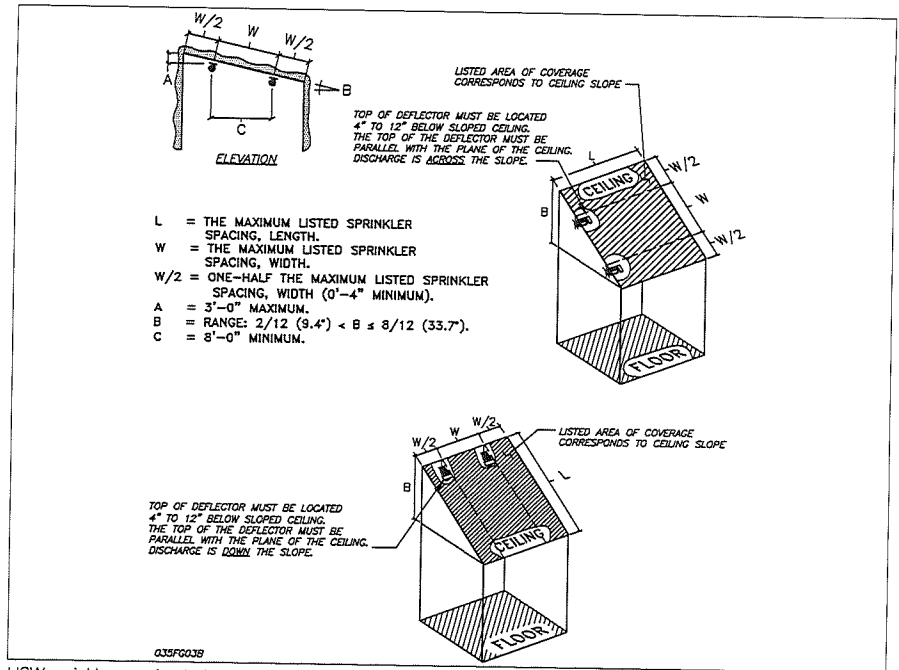
F1 Res 44  
Recessed HSW/W/2



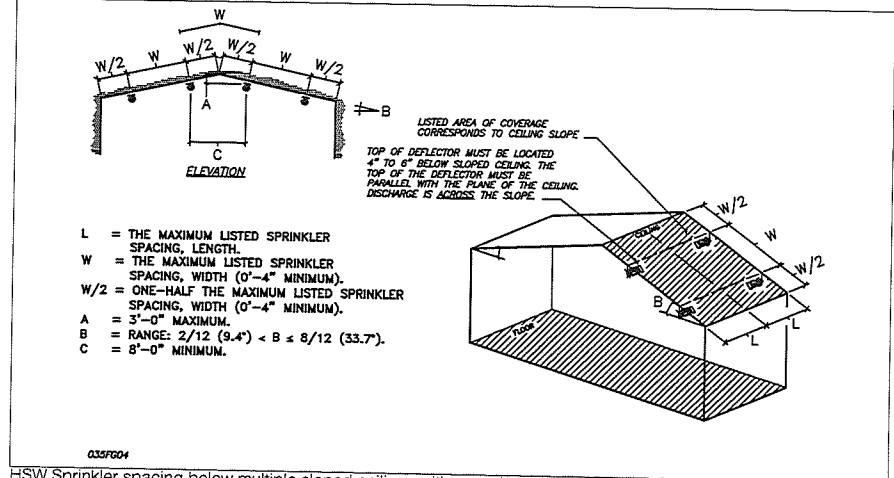
Horizontal Sidewall Sprinkler  
(with discharge directed across the slope)



Horizontal Sidewall Sprinkler  
(with discharge directed down the slope)



HSW sprinkler spacing below single sloped ceilings with a maximum slope of 8/12 (33.7°) pitch.



HSW Sprinkler spacing below multiple sloped ceilings with a maximum slope of 8/12 (33.7°) pitch.

**Model F1RES 44 HSW & F1RES 44 HSW Recessed HSW/F2 installed below Sloped Ceiling.**

**Technical Data**

Thread Size	Sprinkler Temp. Rating °F (°C)	Max. Pressure psi (bar)	Max. Ambient Temp. °F (°C)	Actual K Factor (metric)	Sprinkler Length	Escutcheon	Sprinkler Identification Number (SIN)
1/2" NPT (R1/2)	155 (68) 175 (79)	175 (12)	100 (38)	4.4 (62.8)	2.45" (62mm)	F2 (1/2" Adjustment)	R3531

**Table 7 - Application**

Max. Sprinkler Spacing Along Slope (W) Width x (L) Length ft (m)	Max. Slope of 1/2 (18.4°) Pitch			
	Discharge Directed Across the Slope 4" to 6" Deflector to Ceiling		Discharge Directed Across the Slope 6" to 12" Deflector to Ceiling	
	Min. Flow gpm (Lpm)	Pressure psi (bar)	Min. Flow gpm (Lpm)	Pressure psi (bar)
12 x 12 (3.6 x 3.6)	16 (60.5)	13.3 (0.92)	17 (64.3)	15 (1.04)
14 x 14 (4.3 x 4.3)	16 (60.5)	13.3 (0.92)	17 (64.3)	15 (1.04)
16 x 16 (4.9 x 4.9)	16 (60.5)	13.3 (0.92)	17 (64.3)	15 (1.04)
16 x 18 (4.9 x 5.5)	18 (68.1)	16.8 (1.16)	20 (75.6)	20.7 (1.43)
16 x 20 (4.9 x 6.1)	23 (88.1)	27.4 (1.89)	23 (88.1)	27.4 (1.89)

**Table 8 - Application**

Max. Sprinkler Spacing Along Slope (W) Width x (L) Length ft (m)	Max. Slope of 3/12 (33.7°) Pitch					
	Discharge Directed Down the Slope 4" to 6" Deflector to Ceiling		Discharge Directed Down the Slope 6" to 12" Deflector to Ceiling		Discharge Directed Across the Slope 4" to 12" Deflector to Ceiling	
	(1) Min. Flow gpm (Lpm)	Pressure psi (bar)	(1) Min. Flow gpm (Lpm)	Pressure psi (bar)	(1) Min. Flow gpm (Lpm)	Pressure psi (bar)
12 x 12 (3.6 x 3.6)	12 (45.4)	7.5 (0.52)	14 (53.0)	10.2 (0.71)	16 (60.6)	13.3 (0.92)
14 x 14 (4.3 x 4.3)	14 (53.0)	10.2 (0.71)	16 (60.6)	13.3 (0.92)	16 (60.6)	13.3 (0.92)
16 x 16 (4.9 x 4.9)	16 (60.6)	13.3 (0.92)	17 (64.4)	15 (1.04)	16 (60.6)	13.3 (0.92)
16 x 18 (4.9 x 5.5)	18 (68.1)	16.8 (1.16)	20 (75.6)	20.7 (1.43)	--	--
16 x 20 (4.9 x 6.1)	23 (72.0)	27.4 (1.89)	23 (87.1)	27.4 (1.89)	--	--

(1) Minimum flow per sprinkler gpm (Lpm).

(2) Minimum 3 head design in a compartment.

(3) 155°F only.

**Installation Guidelines**

- For systems designed in accordance with NFPA 13, 13D and 13R, where specific UL Listed flows are not required, consult with the local Authority Having Jurisdiction regarding the number of design sprinklers for sloped ceilings having pitch greater than (9.4°).
- Installation of UL Listed residential sprinklers under sloped ceilings shall be limited to a type of unobstructed construction consisting of flat, smooth ceilings, as defined by NFPA 13, having a maximum pitch of 4/12 (18.4°) or 8/12 (33.7°).
- Where listed, install horizontal sidewall sprinklers along the wall below the sloped ceiling when discharge is directed across the slope, and install at the peak below the sloped ceiling when discharge is directed down the slope. Always align the sprinkler deflector parallel with the direction of the sloped ceiling.
- Residential HSW sprinklers located closed to the peak of the ceiling shall have the deflectors located not more than 3 ft. (1m) vertically down from the peak.
- Spacing of residential HSW sprinklers under sloped ceilings is measured along the slope when determining the distance off of walls and between sprinklers.
- Measure listed areas of coverage along the sloped ceiling. The actual floor coverage area will be less than the listed area.
- For coverage areas less than the listed coverage area shown in Tables 1 through 6, use the minimum flow requirement for next largest listed coverage area.
- Minimum spacing between horizontal sidewall sprinklers is 8 ft. (2.4 m). Minimum distance from a horizontal sidewall sprinkler and an adjacent wall is 4" (102 mm).
- Hydraulic Requirements:
  - For NFPA 13D Systems, the number of design sprinklers shall include all sprinklers within a compartment, up to a maximum of two sprinklers (where specific UL Listed flows are required) that requires the greatest hydraulic demand.
  - For NFPA 13R Systems, the number of design sprinklers shall include all sprinklers within a compartment, up to a maximum of four (4) sprinklers (where specific UL Listed flows are required), that requires the greatest hydraulic demand.

- For NFPA 13 systems, the design area shall be the area that includes the four (4) hydraulically most demanding sprinklers. The minimum required discharge from each of the four hydraulically demanding sprinklers shall be the greater of the following:
  - In accordance with the minimum flow rates indicated by the individual listings (that already will provide a minimum density of 0.1 gpm/ft2); or
  - A calculated value based on delivering a minimum of 0.1 gpm/ft2 over the design area.

- Because of the varied nature of residential construction features, there will be some compartment designs which cannot be fully sprinklered in accordance with

NFPA 13, 13D, or 13R. In these instances, consult the Authority Having Jurisdiction (AHJ) for guidance and approval. This includes sloped ceilings having a pitch greater than 8/12 (33.7°).

- Glass bulb sprinklers have orange bulb protectors to minimize bulb damage during shipping, handling and installation. REMOVE THIS PROTECTION AT THE TIME THE SPRINKLER SYSTEM IS PLACE IN SERVICE FOR FIRE PROTECTION. Removal of the protectors before this time may leave the bulb vulnerable to damage. RASCO wrenches are designed to install sprinklers when covers are in place. REMOVE PROTECTORS BY UNDOING THE CLASP BY HAND. DO NOT USE TOOLS TO REMOVE THE PROTECTORS.

**Model F1 res 49 Pendent, F1 Recessed Pendent/F2, F1 Res 49 Concealed (CCP), RFC 49 and RFC 43 installed below sloped ceiling with a maximum slope of 3/12 (33.7°) pitch.**

**Table 9 - Application**

Model	K - Factor (metric)	Max. Spacing Ft. x Ft (m x m)	Min. Flow/Pressure gpm (lpm) / psi (bar)	Sprinkler Temperature Rating °F (°C)	Coverplate Temperature Rated °F (°C)
F1 Res 49 Pendent	4.9 (69.94)	10 x 10 (3 x 3)	13(49) / 7.0(0.48)	155 (68)	--
F1 Res 49 Recessed Pendent/F2	4.9 (69.94)	10 x 10 (3 x 3)	13(49) / 7.0(0.48)	155 (68)	--
F1 Res 49 CCP Pendent	4.9 (69.94)	10 x 10 (3 x 3)	13(49) / 7.0(0.48)	155 (68)	135 (57)
RFC49 Pendent	4.9 (69.94)	10 x 10 (3 x 3)	14(53) / 8.2(0.57)	165 (74)	135 (57)
RFC43 Pendent	4.3 (61.4)	10 x 10 (3 x 3)	18(68) / 17.5(1.21)	165 (74)	135 (57)

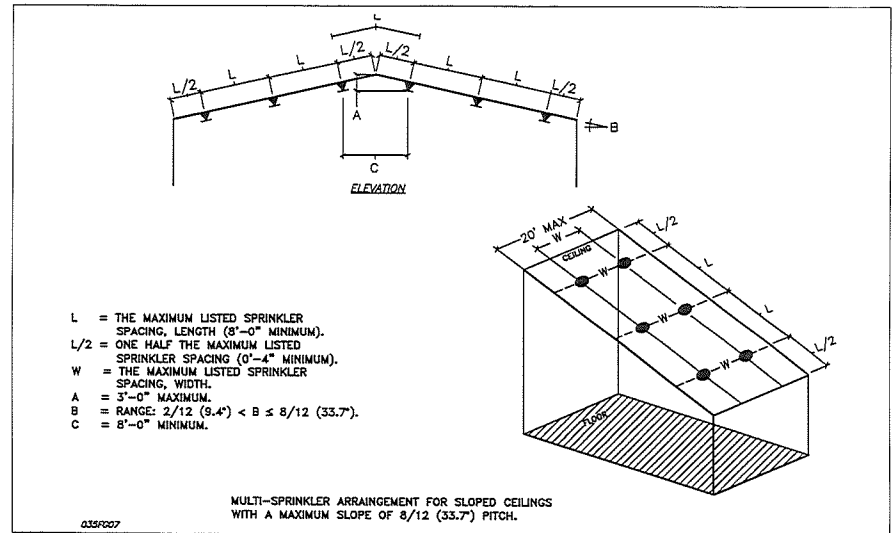


Fig. 7

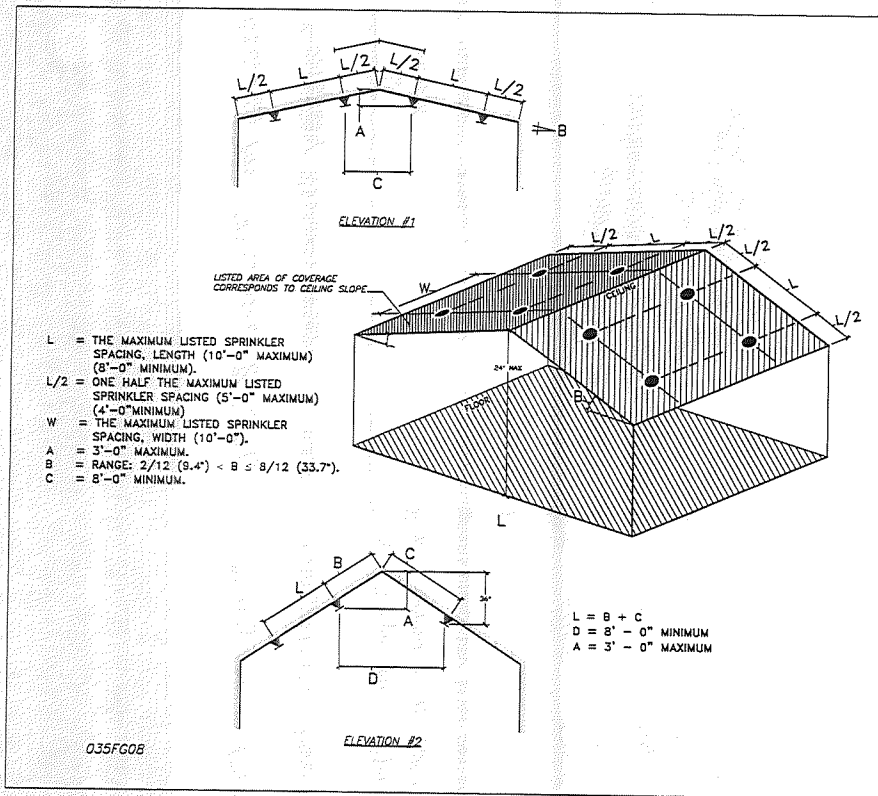


Fig. 8

### Installation Guidelines per UL1626A

- For systems designed in accordance with NFPA 13, 13D and 13R, where specific UL Listed flows are not required, consult with the local Authority Having Jurisdiction regarding the number of design sprinklers for sloped ceilings having pitch greater than (9.4°).
- Installation of UL Listed residential sprinklers under sloped ceilings shall be limited to a type of unobstructed construction consisting of smooth ceilings, as defined by NFPA 13, having a maximum pitch of 8/12 (33.7°).
- Spacing of residential sprinklers under sloped ceilings is measured along the slope when determining the distance off of walls and between sprinklers.
- Measure listed areas of coverage along the sloped ceiling. The actual floor coverage area will be less than the listed area.
- For coverage areas less than the listed coverage area shown in Tables 8, use the minimum flow requirement listed.
- Minimum spacing between pendent type sprinklers is 8 ft. (2.4 m). Minimum distance from a pendent type sprinkler and an adjacent wall is 4" (102 mm).
- Residential sprinklers located closest to the peak of the ceiling shall have the deflectors located not more than 3 ft (1 m) vertically down from the peak. Align deflectors parallel with the ceiling slope 1" to 4" (25mm to 102mm) below the slope ceiling.
- Hydraulic Requirements:
  - For UL1626A, the number of design sprinklers shall include up to a maximum of two sprinklers that requires the greatest hydraulic demand.
- Glass bulb sprinklers have orange bulb protectors to minimize bulb damage during shipping, handling and installation. REMOVE THIS PROTECTION AT THE TIME THE SPRINKLER SYSTEM IS PLACE IN SERVICE FOR FIRE PROTECTION. Removal of the protectors before this time may leave the bulb vulnerable to damage. RASCO wrenches are designed to install sprinklers when covers are in place. REMOVE PROTECTORS BY UNDOING THE CLASP BY HAND. DO NOT USE TOOLS TO REMOVE THE PROTECTORS.
- A maximum distance from the floor to the ceiling peak of 24 ft.
- A maximum of two sprinklers installed within 3 ft. vertically of the peak.
- Installation is for smooth, flat ceilings only that do not extend into or serve as a ceiling for an upper level floor in the structure.

The equipment presented in this bulletin is to be installed in accordance with the latest published Standards of the National Fire Protection Association, Factory Mutual Research Corporation, or other similar organizations and also with the provisions of governmental codes or ordinances whenever applicable. Products manufactured and distributed by Reliable have been protecting life and property for over 90 years, and are installed and serviced by the most highly qualified and reputable sprinkler contractors located throughout the United States, Canada and foreign countries.

Manufactured by

**Reliable**

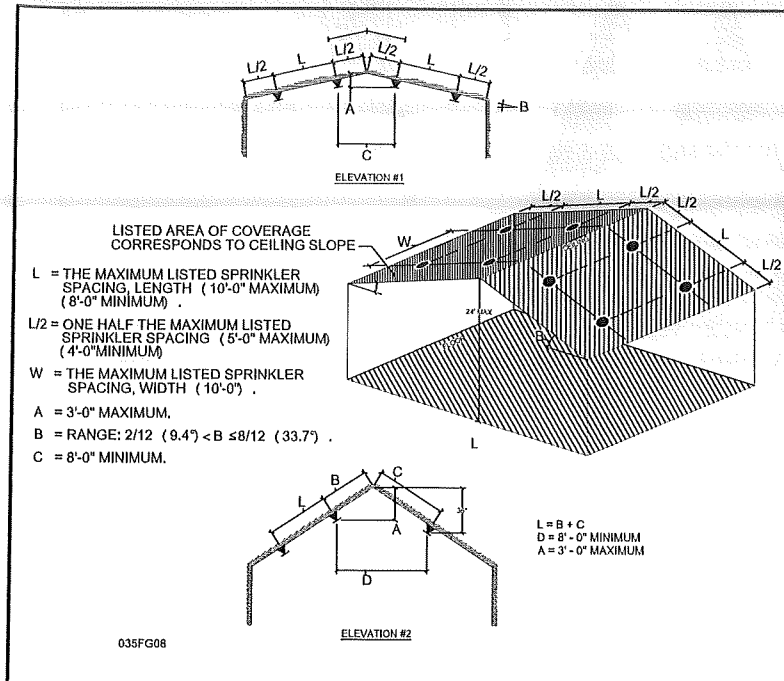
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## The Design Criteria for Sloped & Sloped Beamed Ceilings in NFPA 13D One and Two Family Dwellings & Manufactured Homes Has Changed.



A Tentative Interim Amendment (TIA No.1028R) to NFPA 13D for 2010 has been issued by the NFPA Standards Council.

Testing supported by The Fire Protection Research Foundation indicates that residential sprinklers listed for applications with smooth, flat ceilings can meet the stated purpose in NFPA 13D standards when installed on a sloped or sloped and beamed ceiling.

Sloped and Sloped/Beamed Ceilings, under certain conditions, can now be protected with residential sprinklers based upon a maximum two (2) sprinkler demand that has the same flow rate as the sprinklers smooth, flat ceiling listing.

**The TIA No.1028R revises NFPA 13D - 2010 edition sections 8.1.2, 8.1.3, A.8.1.2, and A.8.1.3. Please read and adhere to these sections for the complete new design criteria.**

### A brief recap:

The sprinklers in the design area shall be all of the sprinklers in a compartment, up to a maximum of two, which require the greatest demand for:

- Smooth, flat ceilings to a maximum 24 feet in height.
- Smooth, ceilings (with no beams) sloped up to 8/12 and a maximum ceiling height of 24' above the floor.
- A ceiling with beams up to 14" deep sloped up to 8/12 and a maximum ceiling height of 24' above the floor. Pendent sprinklers shall be installed under the beams and the compartment cannot exceed 600 square feet.
- A ceiling with beams of any depth sloped up to 8/12 and a maximum ceiling height of 24' above the floor. Sidewall or pendent sprinklers shall be installed in each pocket formed by the beams and the compartment cannot exceed 600 square feet.

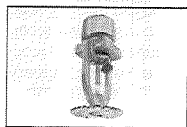
All Reliable residential sprinklers can be used for these applications based upon the spacing, flow, and pressure as listed for smooth and flat ceilings. (See Bulletins: 135, 006, 033 and 032).

This TIA is for 13D applications only. Changes to 13R will be in the 2013 Edition. Our special 10' x 10' spacing listings for sloped ceilings are still advantageous for 13R installations. (See Table 9, Bulletin 035).

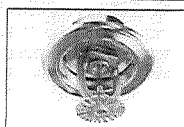
For any questions, please contact [Technical Services](#) at 1-800-55-RASCO.



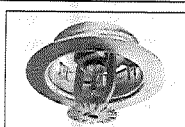
# Reliable® Model F1 Res and RFC Residential Sprinkler Design and Installation Guide



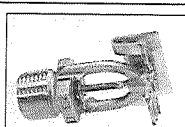
F1 Res 30/30LL,  
49/49LL, 58/58LL & 76  
Pendant



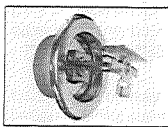
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49/49LL, 58/58LL & 76  
Recessed Pendant / F1



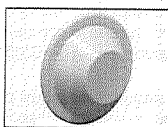
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49/49LL, 58/58LL & 76  
Recessed Pendant / FP



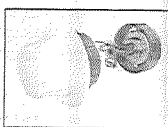
F1 Res 44/44LL  
& 58/58LL  
HSW



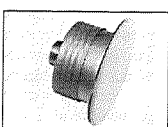
F1 Res 44/44LL  
& 58/58LL  
Recessed HSW/F2



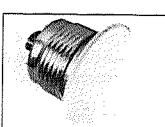
F1 Res 30/30LL,  
49/49LL, 58/58LL & 76  
CCP Pendant



F1 Res 44/44LL  
SWC



RFC 30/30LL,  
43/43LL, 49/49LL



RFC 56

Sprinkler Model and Type	Sprinkler Identification Number	Reliable Bulletin Number
F1 Res 30/30LL Pendant F1 Res 30/30LL Recessed Pendant/F1 F1 Res 30/30LL Recessed Pendant/FP F1 Res 30/30LL Concealed Pendant/CCP	R3511 RA3311	Horizontal Ceilings - 135, 033
F1 Res 49/49LL Pendant F1 Res 49/49LL Recessed Pendant/F1 F1 Res 49/49LL Recessed Pendant/FP F1 Res 49/49LL Concealed Pendant/CCP	R3516, RA3316	Horizontal Ceilings - 135, 033 Sloped Ceilings - 035
F1 Res 58/58LL Pendant F1 Res 58/58LL Recessed Pendant/F1 F1 Res 58/58LL Recessed Pendant/FP F1 Res 58/58LL Concealed Pendant/CCP	R3513, RA3313	Horizontal Ceilings - 135, 033
RFC 30/30LL, 43/43LL & 49/49LL Concealed Pendant	RA0611, RA0612, RA0616, RA3211, RA3212, RA3216	Horizontal Ceilings - 006, 032 Sloped Ceilings - 035
RFC 56 Concealed Pendant	RA0914	Horizontal Ceilings - 009
F1 Res 44/44LL Horizontal Sidewall F1 Res 44/44LL Recessed Horizontal Sidewall	R3531, RA3331	Horizontal Ceilings - 135, 033 Sloped Ceilings - 035
F1 Res 44/44LL SWC Concealed Horizontal Sidewall	R3531, RA3331	Horizontal Ceilings - 135, 033
F1 Res 58/58LL Horizontal Sidewall F1 Res 58/58LL Recessed Horizontal Sidewall/F2	R3533, RA3335	Horizontal Ceilings - 135, 033
F1 Res 76 Pendant/F1 Res 76 Recessed Pendant/F1 F1 Res 76 Recessed Pendant/FP F1 Res 76 Concealed Pendant/CCP	R7618	Horizontal Ceilings - 135, 176

Table A  
Model F1 Res and Model RFC Residential Sprinklers

## General

Reliable residential sprinklers utilize a fast response thermal element and are intended for use in only wet-pipe residential sprinkler systems designed in accordance with the following NFPA standards: NFPA 13D, Installation of Sprinkler Systems for One- and Two-Family Dwellings and Manufactured Homes; NFPA 13R, Installation of Sprinkler Systems for Residential Occupancies Up to and Including Four Stories in Height; and for the residential portions of any occupancy as permitted by NFPA 13, Installation of Sprinkler Systems. Fast response and high wall wetting characteristics of residential sprinklers improve life safety by maintaining a tenable environment, providing escape time for occupants.

NFPA 13D is appropriate for protection against fire hazards only in one- and two-family dwellings and manufactured homes. Residential portions of any other type of building or occupancy should be protected with residential sprinklers in accordance with NFPA 13, or in accordance with NFPA 13R. NFPA 13R is appropriate for use as an option to NFPA 13 only in those residential occupancies up to and including four stories in height. Where buildings are greater than four stories in height, or where buildings are of mixed use where residential is not the predominant occupancy, protect residential portions of such buildings with residential or quick response sprinklers in accordance with NFPA 13.

This document provides design guidelines for the Model F1/Res and RFC Residential Sprinklers shown in Table A, which are cULus Listed to provide a minimum density of 0.05 gpm/ft<sup>2</sup>, in accordance with the above-mentioned standards, manufacturer's instructions, and technical bulletins. Where documentation for residential sprinkler systems does not exist for particular applications, information based on NFPA 13 is used.

Residential fire sprinkler systems should only be designed and installed by competent individuals trained and experienced with automatic sprinkler system design and installation. Several criteria may apply to a given installation and the designer and/or installer must be familiar with the applicable codes, standards, and guidelines governing such an installation. The Reliable Model F1/Res and RFC residential sprinklers described herein must be installed and maintained in compliance with this document manufacturer's recommendations, with the latest published standards of the National Fire Protection Association (NFPA), and with any additional local jurisdictional requirements. Failure to comply may result in the impairment of sprinkler integrity and proper operation. Because of the various features of residential type architecture, there will be some compartment designs which cannot be fully sprinklered in accordance with the recommendations of NFPA 13, 13D, or 13R. In these instances, consult the Authority Having Jurisdiction for guidance and approval.

The owner is responsible for maintaining their fire protection system and associated devices in proper operating condition. Refer to NFPA 25, Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, for guidance on testing and maintenance of automatic sprinkler systems.

## Approvals

All Reliable residential sprinklers have been designed and tested in accordance with the latest Edition of Underwriters Laboratories (UL) 1626, Standard for Residential Sprinklers for Fire Protection Service. Typically, they are cULus Listed for installation under smooth, flat ceilings of unobstructed construction, unless otherwise noted in the specific listings, with specific approved spacing, flows, and pressures. Reliable residential sprinklers are cULus Listed for installation on both horizontal ceilings with a maximum slope of 2/12 (9.4°) pitch, and sloped ceilings (where applicable) having maximum slopes of 4/12 (18.4°) and 8/12 (33.7°) pitch. The design criteria for residential sprinklers contained in the current NFPA 13D, 13R, and 13 Standards must be followed except as modified by the individual UL 1626 listing information, the information in the Reliable residential sprinkler bulletins, and this installation guide. The Authority Having Jurisdiction (AHJ) must make final approval for all residential sprinkler installations for compliance with all applicable codes, standards, and jurisdictional requirements.

One of the most important revisions of the Third Edition of UL 1626 is the new minimum density requirement for residential sprinklers manufactured after July 12, 2002. When establishing a minimum cULus Listed flow rate, the manufacturer must use a minimum discharge rate over the specified coverage area corresponding to a 0.05 gpm/ft<sup>2</sup> density. In some cases, however, to successfully pass the UL 1626 fire tests, the UL Listed flow rate may be greater than the calculated 0.05 gpm/ft<sup>2</sup> density. Increased flow rates for horizontal sidewall type sprinklers, which exceed this minimum density, is common. Because this minimum density is a listing requirement, the use of residential sprinklers meeting this criterion is applicable to all editions of NFPA 13, 13R and 13D. The design criteria for residential sprinklers contained in the current NFPA Standards must be followed except as modified by the individual cULus Listing information provided in the technical bulletins referenced in Table A.

## Definitions

The following NFPA definitions are applicable to the terms used in this installation guide. Where terms are not included, refer to NFPA 13, NFPA 13D and NFPA 13R for official definitions:

**Residential Sprinkler** – A type of fast-response sprinkler that has a thermal element with an RTI of 50 (m-s)<sup>2</sup> or less, has been specifically tested for its ability to enhance survivability in the room of fire origin and listed for use in the protection of dwelling units. Residential sprinklers possess a fast response thermal element and produce a spray pattern that discharges water higher on the wall than a standard spray sprinkler.

**Dwelling** – Any building that contains not more than one or two dwelling units intended to be used, rented, leased, let or hired out to be occupied or that are occupied for habitation purposes.

**Dwelling Unit** – One or more rooms, arranged for the use of one or more individuals living together, as in a single housekeeping unit, that normally have cooking, living, sanitary, and sleeping facilities. Dwelling units include hotel rooms, dormitory rooms, condominiums, apartments, and similar living units.

**Compartment** – A compartment is a space completely enclosed by walls and a ceiling. The compartment enclosure is permitted to have openings (in walls) to an adjoining space, provided that soffits or lintels along the ceiling over the compartment opening has a minimum depth of 8 in. (203mm) from the ceiling. In other words, areas such as hallways, stairwells, and rooms must be separated by beams, lintels or soffits 8 or more inches in depth to be considered single compartments.

**Obstructed Construction** – Panel construction and other construction where beams, trusses, or other members impede heat flow or water distribution in a manner that materially affects the ability of sprinklers to control or suppress a fire. See NFPA 13 Appendix for detailed explanations of this type of construction.

**Unobstructed Construction** – Construction where beams, trusses, or other members do not impede heat flow or water distribution in a manner that materially affects the ability of sprinklers to control or suppress a fire. This type of construction has the following features: (1) horizontal structural members that are not solid; (2) openings of the structural members are at least 70% of the cross sectional area; (3) depth of the structural members do not exceed the least dimension of the openings; or (4) the spacing of structural members exceeds 7.5

feet on center. See NFPA 13 Appendix for detailed explanations of this type of construction.

**Flat Ceiling** – a continuous ceiling in a single plane.

**Smooth Ceiling** – A continuous ceiling free from significant irregularities, lumps or indentations.

**Horizontal Ceiling** – A ceiling that does not exceed a slope of 2/12 pitch (slope of 16.7% or 9.4°).

**Sloped Ceiling** – A ceiling exceeding a maximum slope of 2/12 (9.4°) pitch.

## Installation Considerations

Residential sprinklers utilizing a glass bulb thermal element have orange protective caps and straps to provide temporary protection to the frangible glass bulb during shipping and installation.

- a. Do not install any bulb type sprinkler if the bulb is cracked or there is liquid missing from the bulb. While holding the sprinkler in the horizontal position, a small air bubble having an approximate diameter of 1/16" should be visible.
- b. The sprinkler is designed for installation with the protective strap in place using the appropriate sprinkler wrench.
- c. Sprinklers that are dropped during the installation process or that are installed on piping other than that in accordance with item "a" shall be replaced, including sprinklers with protective caps or straps.
- d. Protective caps and straps shall be removed only using means in accordance with the manufacturer's installation instructions. They are not to be left on the sprinkler after the sprinkler system is placed in service.
- e. Protective caps and straps shall be removed only when water supply is made available to the sprinkler for the purposes of fire protection and placed in service.
- f. A leak-tight 1/2" NPT sprinkler joint should be obtained with a maximum torque of 14 ft-lbs to 21 ft-lbs. (approximately 2 turns past hand tight. Do not over tighten). Higher levels of torque may distort the sprinkler inlet or bend the frame, causing leakage or impairment of the sprinkler.

Where applicable, escutcheon plates must be installed. Absence of an escutcheon plate, where there is an annular space between the ceiling and the sprinkler, may delay sprinkler operation in the event of a fire.

Never introduce any leak stopping additives to any fire sprinkler system.

Residential sprinklers must be installed with the manufacturer's specified sprinkler wrench. Channel locks, crescent wrenches or anything other than the proper sprinkler wrench shall not be used.

Installing sprinklers in CPVC and copper piping systems require special considerations. Never install the sprinkler into the reducing fitting prior to attaching the reducing fitting to the system piping. When installing residential sprinklers or commercial sprinklers in a CPVC piping system, sprinklers must be installed only after the reducing fitting has been installed and the CPVC manufacturer's setting time for the primer and/or cement has passed. This is to ensure that the cement does not accumulate within the sprinkler. In copper piping systems, sprinklers must be installed only after the inside of the sprinkler drop and associated fittings have been wire-brushed to remove any residual flux. Residual flux can cause corrosion. Both of these conditions can impair and prevent proper sprinkler operation.

## System Design Criteria

### Permitted Sprinklers for Residential Sprinkler Systems

For NFPA 13D and 13R sprinkler systems, only listed residential sprinklers shall be used, with the following exceptions:

1. Listed standard dry-pendent or dry sidewall sprinklers shall be permitted to be extended into unheated areas not intended for living purposes.
2. Quick-response sprinklers shall be permitted to be used in mechanical closets.
3. For NFPA 13R systems, listed quick-response sprinklers shall be permitted to be installed in dwelling units meeting the definition of a compartment where no more than four (4) sprinklers are located within the dwelling unit.

Non-residential sprinklers are to be installed in accordance with the criteria specified by NFPA 13.

## Residential Sprinkler Positioning and Spacing Requirements

When locating residential sprinklers, consideration must be given to sensitivity, sprinkler spacing, obstructions to discharge, temperature rating, and proximity to heat sources.

### Sprinkler Sensitivity - Deflector Positioning

Residential pendent sprinklers not listed with specific positioning criteria must be positioned so that the deflectors are within 1 in. to 4 in. (25.4 mm to 102 mm) from the ceiling. On flat, horizontal ceilings, Reliable Model F1 Res 49 pendent and recessed pendent sprinklers may also be positioned with the deflector 4" to 8" (102 mm to 203 mm) from the ceiling, in accordance with the listed flows and pressures shown in Bulletin 135. If located in

closets, it is permitted to install pendent sprinklers so that the deflector is within 12 inches (305 mm) of the ceiling. Residential sidewall sprinklers that have not been listed with specific positioning criteria must be positioned so that the deflectors are within 4 in. to 6 in. (102 mm to 152 mm) from the ceiling. Install sidewall sprinklers having listed positioning criteria in accordance with their listing. Under both horizontal and sloped ceilings, always align sprinkler deflectors so that the deflector is parallel with the plane of the ceiling surface.

### Sprinkler Spacing Under Horizontal Ceilings

Several maximum coverage areas are used for residential sprinklers in accordance with minimum listed flows and pressures. The area of coverage must be equal to or greater than both the length and width of the hazard area. Residential sprinklers must be located not more than half the listed spacing nor less than 4" (102 mm) from walls. Adjacent sprinklers must be located no farther apart than the listed spacing; the minimum distance to prevent cold soldering, unless otherwise specified, is 8 feet (2.44 m).

When selecting an area of coverage, the suggested practice is to select one that can be adequately supplied by the available water supply, allowing for the installation of as few sprinklers as possible while observing all guidelines pertaining to obstructions and spacing. After selection of an area of coverage, sprinklers must be spaced according to the criteria set forth in the NFPA standards and this document.

### Sprinkler Spacing Under Sloped Ceilings

For installation under sloped ceilings, several maximum coverage areas are also provided, but at different minimum flows and pressures than those for horizontal ceilings. The spacing of sprinklers is measured along the slope when determining the distance off of walls and between sprinklers. Residential sprinklers may be located no more than 1/2 the listed spacing nor less than 4" (102 mm) from the peak of the sloped ceiling. Residential sprinklers located at the highest elevation must not be located more than 3 feet (0.9 m) measured vertically down from the peak. Refer to Reliable Bulletin 035 for listed coverage areas, flow and pressure requirements, and positioning criteria for residential sprinklers installed under sloped ceilings.

### Obstruction to Water Distribution

Refer to Figures 1 through 13 for the location of sprinklers relative to obstructions. The discharge from residential sprinklers is directed radially outward and downward from the sprinkler. Sprinklers must be located such that there will not be any spaces shielded from distribution by walls, dividing partitions, or other dwell-

ing construction features. If the sprinkler water distribution pattern is obstructed, the obstruction is to be considered the maximum distance of coverage for a given sprinkler. Additional sprinklers beyond the obstruction may be necessary unless the obstruction criteria contained herein can be met. Consult the appropriate NFPA standard and/or the AHJ for guidance regarding these situations.

Reliable flat plate concealed sprinklers, the Models RFC30 (30LL), RFC43 (43LL), RFC49 (49LL) and RFC56, utilize a drop-down style deflector. The distance the deflector drops below the ceiling is needed when determining the position of the deflector above the bottom of an obstruction. These distance are as follows:

- Nonadjusted (cover plate flush to cup) - 7/8" (22mm)
- At full (1/2") adjustment - 3/8" (9.5mm)

#### Continuous and Noncontinuous Obstructions

A minimum distance is required to be maintained between sprinklers and continuous obstructions, such as beams, soffits, and long horizontal light fixtures. See Figures 1, 2, 4, 5, 6, 7 and/or 13.

A minimum distance is also required to be maintained between sprinklers and noncontinuous obstructions, such as ceiling fans and certain light fixtures. The ceiling fan motor housing is the primary element that can obstruct the sprinkler discharge pattern. Testing has demonstrated that no adverse effects occur as a result of the ceiling fan's blade rotation in either direction.

With regards to location of sprinklers near light fixtures, there are two considerations; the amount of heat the light gives off and the light fixture as an obstruction. The minimum distance of a sprinkler relative to the light as a heat source is given in Table B. If the light is also an obstruction, then the obstruction criteria must be applied,

relative to the minimum distance required from Table B.

For noncontinuous obstructions, apply the "four times rule" as provided in NFPA 13 where it is determined that the sprinkler can spray to at least two sides of the obstruction; either over and under or around the obstruction on both sides. Sprinklers shall be positioned away from the obstruction a minimum distance of four times the maximum dimension of the obstruction. The maximum clear distance required shall be 36" (914mm).

#### Temperature Ratings

Ordinary temperature rated sprinklers (135°F [57°C], 155°F [57°C]) are only permitted for installation where the maximum ambient ceiling temperature will not exceed 100°F (38°C). Where ambient ceiling temperatures are expected to exceed 100°F (38°C), use intermediate temperature-rated residential sprinklers (175°F [79°C]), which can be exposed to a maximum ambient temperature of 150°F (66°C). The following practices apply, unless higher expected ambient temperatures require a higher temperature rated sprinkler:

1. Sprinklers under glass or plastic skylights exposed to direct rays of the sun shall be of the intermediate temperature classification.
2. Sprinklers in an unventilated concealed space under insulated roof or in an unventilated attic shall be of the intermediate temperature classification.
3. Residential sprinklers must be located so as to prevent inadvertent operation due to exposure to normal heat sources. Sprinklers must be positioned a sufficient distance away from heat sources such as fireplaces, ovens, kitchen ranges, hot water pipes, water heaters, furnaces and associated duct work, and light fixtures. The following minimum distances in accordance with NFPA 13D and 13R must be maintained as indicated in Table B.

**Table B – Minimum Distances for Ordinary and Intermediate Residential Sprinklers Relative to Specific Heat Sources**

Heat Source	Minimum Distance from Edge of Source to Ordinary Temperature Sprinkler (135°F or 155°F)	Minimum Distance from Edge of Source to Intermediate Temperature Sprinkler (175°F)
	in. (mm)	in. (mm)
Side of open or Recessed fireplace	36 (914)	12 (305)
Front of recessed fireplace	60 (1524)	36 (914)
Coal or wood-burning stove	42 (1067)	12 (305)
Kitchen range	18 (457)	9 (229)
Wall oven	18 (457)	9 (229)
Hot air flues	18 (457)	9 (229)
Uninsulated heat ducts	18 (457)	9 (229)
Uninsulated hot water pipes	12 (305)	6 (152)
Side of ceiling or wall-mounted hot air diffusers	24 (607)	12 (305)
Front of wall-mounted hot air diffusers	36 (914)	18 (457)
Hot water heater or furnace	6 (152)	3 (76)
Light Fixture 0 W – 250 W	6 (152)	3 (76)
250 W – 499 W	12 (305)	6 (152)

5.

#### Hydraulic Design Requirements

Reliable residential sprinkler listings indicate minimum flow rates for each specified coverage area. Hydraulic calculations are required to verify adequate water supply at the hydraulically most remote single sprinkler operating at the minimum flow and pressure listed for single-sprinkler operation. Where a compartment has more than one sprinkler, multiple sprinkler calculations are required, and each sprinkler must be calculated flowing identical minimum flow rates. No reduction in minimum flow requirements is provided for flowing multiple sprinklers. More design sprinklers may need to be calculated than the minimum stated by the NFPA standards where unusual conditions may result in more sprinklers operating. These conditions include sloped ceilings having a pitch greater than 8/12 (33.7%) or beamed ceilings qualifying as obstructed construction, as defined by NFPA 13. Consult with the AHJ regarding the number of "design sprinklers" for these types of applications.

#### NFPA 13D

The number of design sprinklers under flat, smooth, horizontal ceilings shall include all sprinklers within a compartment, up to a maximum of two (2) sprinklers, that requires the greatest hydraulic demand. The cULus Listed specific coverage criteria for systems designed to NFPA 13R are given in the technical bulletins referenced in Table A, as a function of the maximum allowable coverage area and temperature rating. For actual coverage areas less than or between those indicated in the respective bulletin, it is necessary to use the minimum required flow for the next largest area, as shown above.

For example, assuming the use of a pendent sprinkler, for an actual coverage area of 12 ft x 14 ft (3.7 m x 4.2 m), the specific coverage criteria for a 14 ft x 14 ft (4.2 m x 4.2 m) coverage area must be used. For an actual coverage area of 15 ft x 15 ft (4.6 m x 4.6 m), the specific coverage criteria for a 16 ft x 16 ft (4.9 m x 4.9 m) coverage area must be used.

#### NFPA 13R

The number of design sprinklers under flat, smooth, horizontal ceilings shall include all sprinklers within a compartment, up to a maximum of four (4) sprinklers, that requires the greatest hydraulic demand. The cULus Listed specific coverage criteria for systems designed to NFPA 13R are given in the technical bulletins referenced in Table A, as a function of the maximum allowable coverage area and temperature rating. For actual coverage areas less than or between those indicated in the respective bulletin, it is necessary to use the minimum required flow for the next largest area, as shown above.

#### NFPA 13

For residential sprinkler systems designed to NFPA 13, a minimum density of 0.1 gpm/ft<sup>2</sup> must be provided over the "design area" that includes the four (4) hydraulically most demanding sprinklers for the actual coverage areas being protected by the 4 sprinklers. The minimum required discharge from each of the four most hydraulically demanding sprinklers shall be the greater of the following:

1. The flow rates given in the Reliable Residential Sprinkler Technical Bulletins referenced in Table A for NFPA 13D and 13R as a function of temperature rating and maximum allowable coverage area (for actual coverage areas less than or between those indicated in the respective technical bulletin, it is required to use the minimum required flow for the next largest coverage area); or
2. A minimum discharge density of 0.1 gpm/ft<sup>2</sup> applied over the "design area" consisting of the four most hydraulically demanding sprinklers for the actual coverage areas being protected by the four sprinklers. The maximum dimension of the actual coverage area cannot be any greater than the minimum coverage area indicated in the technical bulletins referenced in Table A.

**Design Note:** Using the  $A_s = S \times L$  method to determine the sprinkler protection area of coverage in accordance with NFPA 13, apply the 0.1 gpm/ft<sup>2</sup> density to this area to determine the minimum required flow. Compare this flow to the minimum 0.05 gpm/ft<sup>2</sup> cULus Listed flow for the appropriate coverage area in the technical bulletin for the specific residential sprinkler. If the flow stated in the technical bulletin is less than the calculated 0.1 gpm/ft<sup>2</sup> density flow required, the .1 density flow must then be used in the equation  $Q=K\sqrt{P}$ , solving for P, to establish the minimum required pressure using the sprinkler K-factor. **Note:** In many cases the listed flow of individual residential sprinklers may exceed the required minimum 0.05 gpm/ft<sup>2</sup> density. Reliable has available residential sprinklers with larger K-factors (K=5.6 and K=5.8) that will provide lower pressure demands for 0.1 gpm/ft<sup>2</sup> densities in NFPA 13 residential applications.

#### Example No. 1

If a room is 12 ft wide x 20 ft long (3.6 m x 6.1 m), the coverage area being considered would be 240 ft<sup>2</sup> (22.3 m<sup>2</sup>). Using an F1 Res 49 pendent sprinkler (1"-4" ceiling-to-deflector distance), the flow for a 20 ft x 20 ft (6.1 m x 6.1 m) coverage area is 20 gpm @ 16.7 psi (75.7 L/min @ 1.14 bar). However, based on a discharge density of 0.1 gpm/ft<sup>2</sup>, the flow rate required would be 24 gpm (90.8 L). Therefore, 24 gpm (90.8 L/min) would be the minimum flow required for each design sprinkler. The corresponding pressure would be 24 psi (1.65 bar)

6.

**Example No. 2**

If a room is 10 ft wide x 20 ft long (3.0 m x 6.1 m), the coverage area being considered would be 200 ft<sup>2</sup> (18.6 m<sup>2</sup>). Using an F1 Res 58 pendent sprinkler (1"–4" ceiling-to-deflector distance), the flow for a 20 ft x 20 ft (6.1 m x 6.1 m) coverage area is 22 gpm @ 14.4 psi (83.3 L/min @ 0.99 bar). Based on a discharge density of 0.1 gpm/ft<sup>2</sup>, the flow rate required would only be 20 gpm (75.7 L/min). However, the flow of 22 gpm must still be used as the minimum flow for each design sprinkler, since this is the minimum cULus Listed flow for this sprinkler at the 20 ft x 20 ft coverage area.

**Example No. 3**

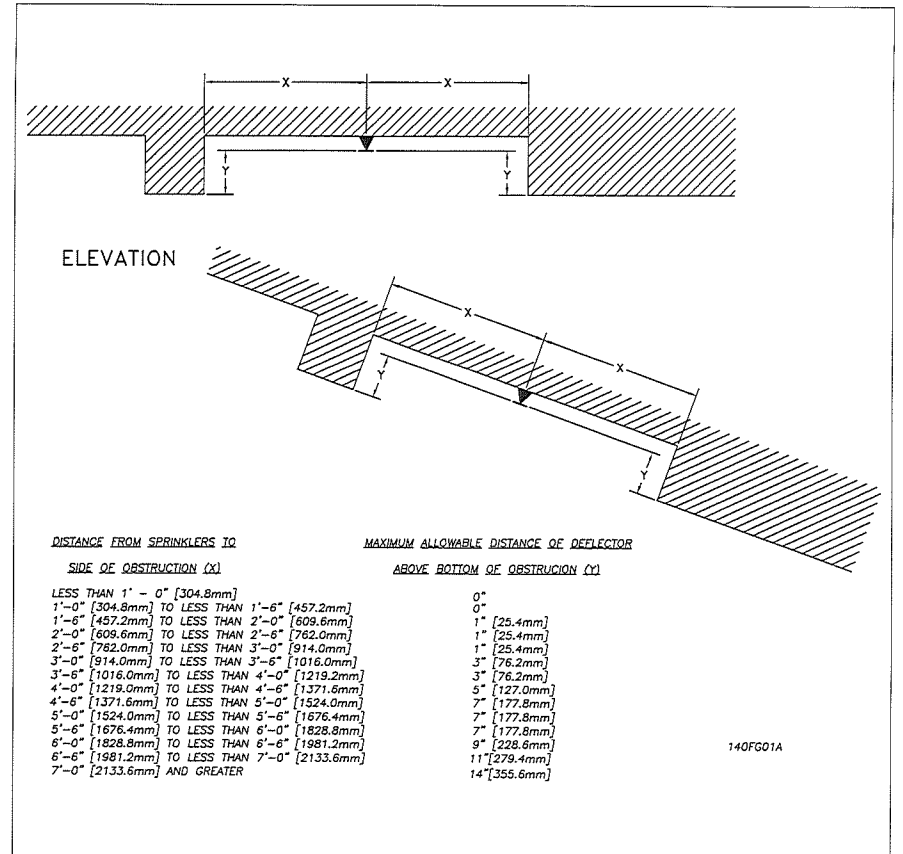
For a situation where the coverage area per sprinkler is 16 ft x 8 ft (4.9 m x 2.4 m), or 128 ft<sup>2</sup> (11.9 m<sup>2</sup>), the F1 RES 44 HSW, having a temperature rating of 155°F (68°C) and positioned 4" to 6" (101 mm to 152 mm) below the ceiling, requires a minimum flow of 16 gpm @ 13.3 psi (60.6 L/min @ .92 bar) for a 16 ft x 16 ft (4.9 m x 4.9 m) coverage area. Based on a minimum discharge of 0.1 gpm/ft<sup>2</sup>, the flow rate needed would only be 12.8 gpm @ 10.2 psi (48.4 L/min @ 0.7 bar). However, the flow rate of 16 gpm (60.6 L/min) must still be used for each design sprinkler.

**Sloped Ceilings**

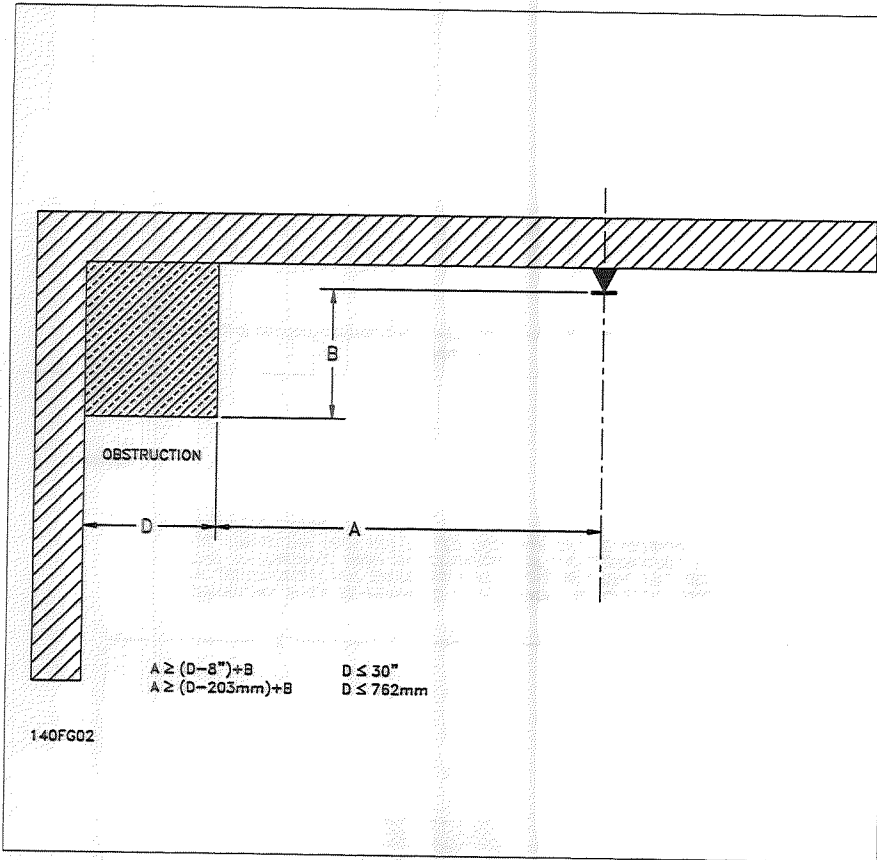
Specific UL Listed flows, pressures and coverage areas for sloped ceilings are provided in Reliable Bulletin 035. Refer to this bulletin for hydraulic design requirements. The number of design sprinklers is the same as that specified for horizontal ceilings, with the exception of the Model F1Res 44 HSW. This sprinkler requires a minimum 3 sprinkler design in a compartment when discharging across the slope, as specified in Bulletin 035. For systems designed to NFPA 13, 13D or 13R, where specific cULus Listed flows for sloped ceilings are not required, consult with the AHJ regarding the number of "design sprinklers" for sloped ceilings having a pitch greater than 2 in 12 (9.4°). cULus Listed flows and pressures do not exist for sloped ceilings having a pitch greater than 8/12 (33.7°). Again, consult with the AHJ regarding the number of "design sprinklers" for these types of applications. Listed areas of coverage must correspond to ceiling slope, and spacing of sprinklers under sloped ceilings is measured along the slope when determining distance off of walls and between sprinklers.

**Care and Maintenance**

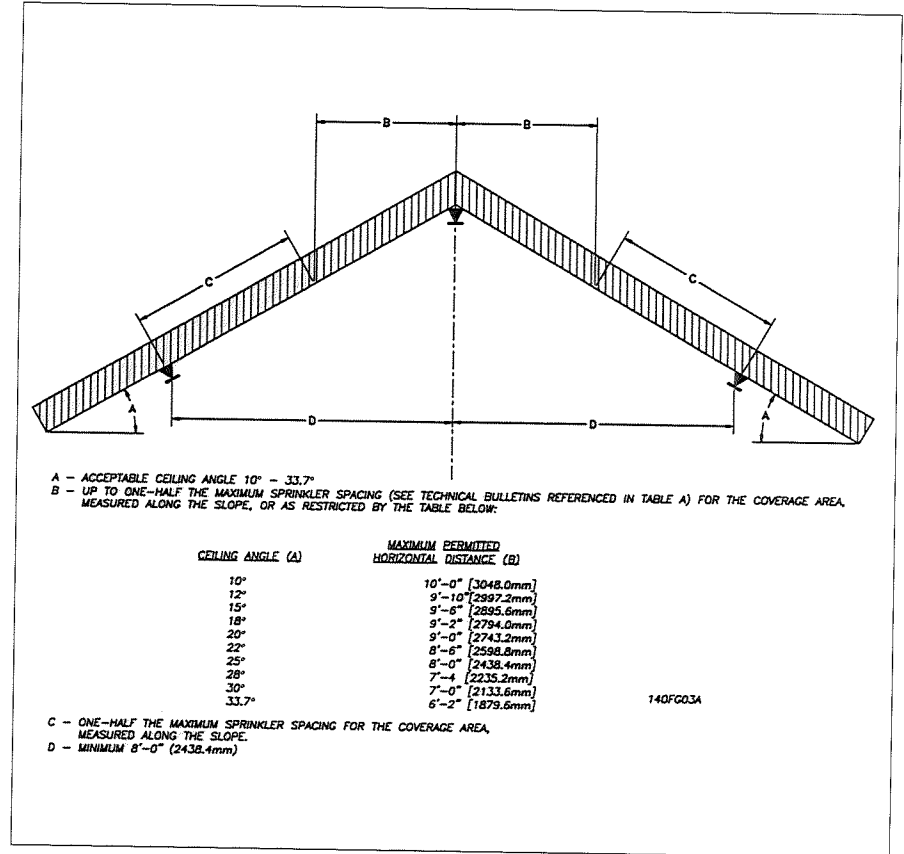
It is recommended that automatic sprinkler systems be inspected and maintained in accordance with the criteria set forth in NFPA 25, Inspection, Testing and Maintenance of Water-Based Fire Protection Systems by a qualified inspection service. Do not clean the sprinklers with soap and water, detergents, ammonia, or any other cleaning fluid. Remove dust by using a soft brush or feather duster, or by gentle vacuuming with a soft bristle brush. Any sprinklers that have operated, been damaged or been painted outside of the factory shall be replaced with a new sprinkler. The new sprinkler shall have the same performance characteristics as the original sprinkler; that is the same temperature rating, nominal K-factor, coverage area, and the same or lower flow rate requirements. Wet-pipe sprinkler systems must be maintained at a minimum temperature of 40°F (4°C). Exposure to freezing temperatures can damage system piping and residential sprinklers. Do not hang anything from sprinklers or sprinkler piping. Do not put curtains, drapes or valences around sprinklers. Doing so will obstruct the discharge pattern of the sprinkler.



**Figure 1**  
Position of sprinklers to avoid obstructions to discharge radially from pendent sprinklers.



**Figure 2**  
Positioning of pendent type sprinklers relative to obstructions against walls.



**Figure 3**  
Sprinkler spacing for pendent sprinklers located at the peak.

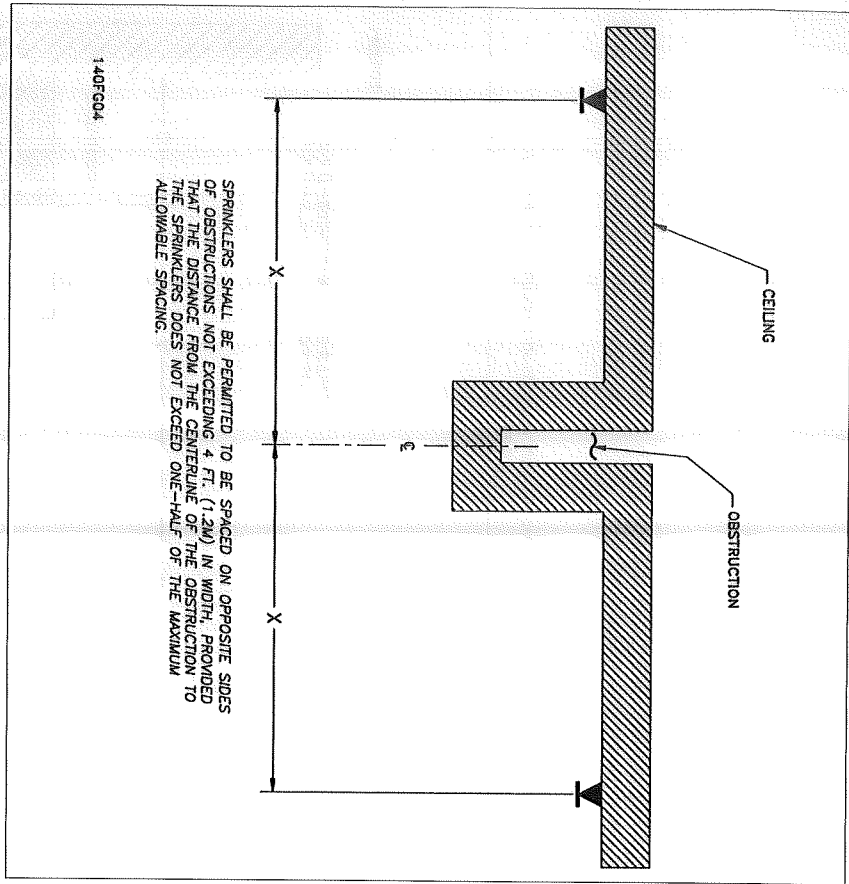
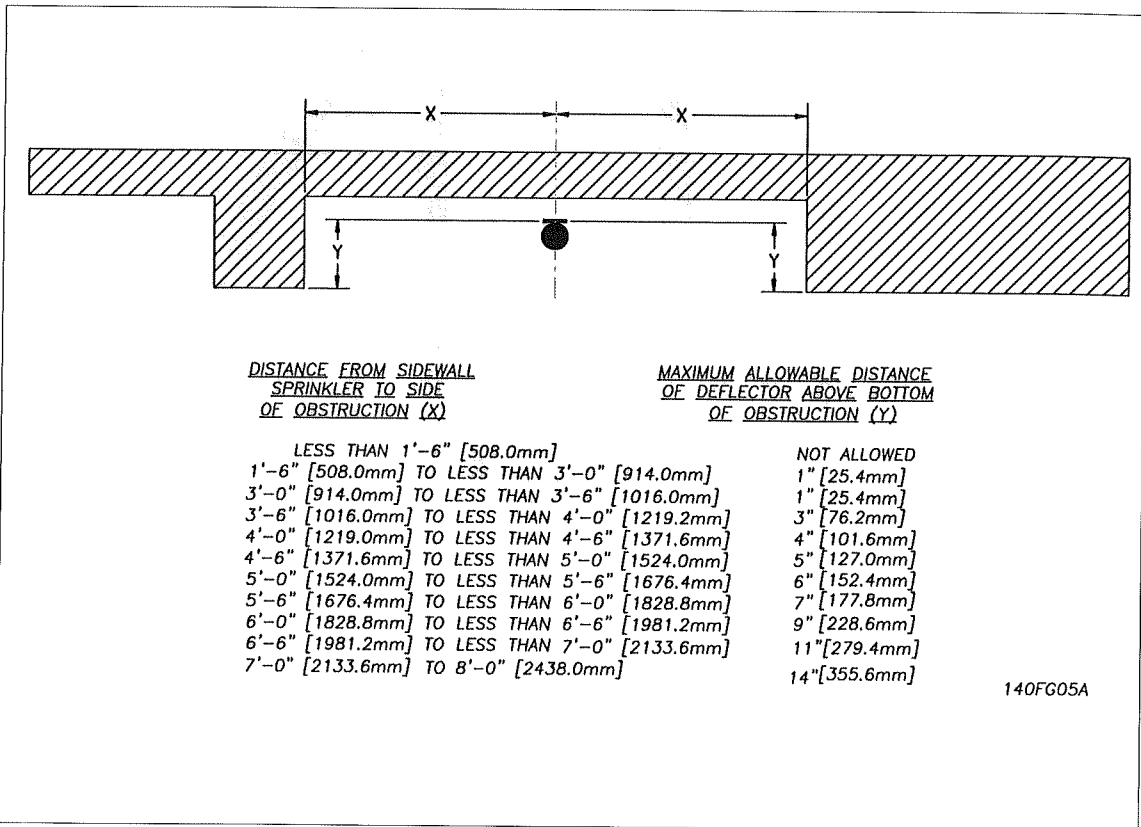


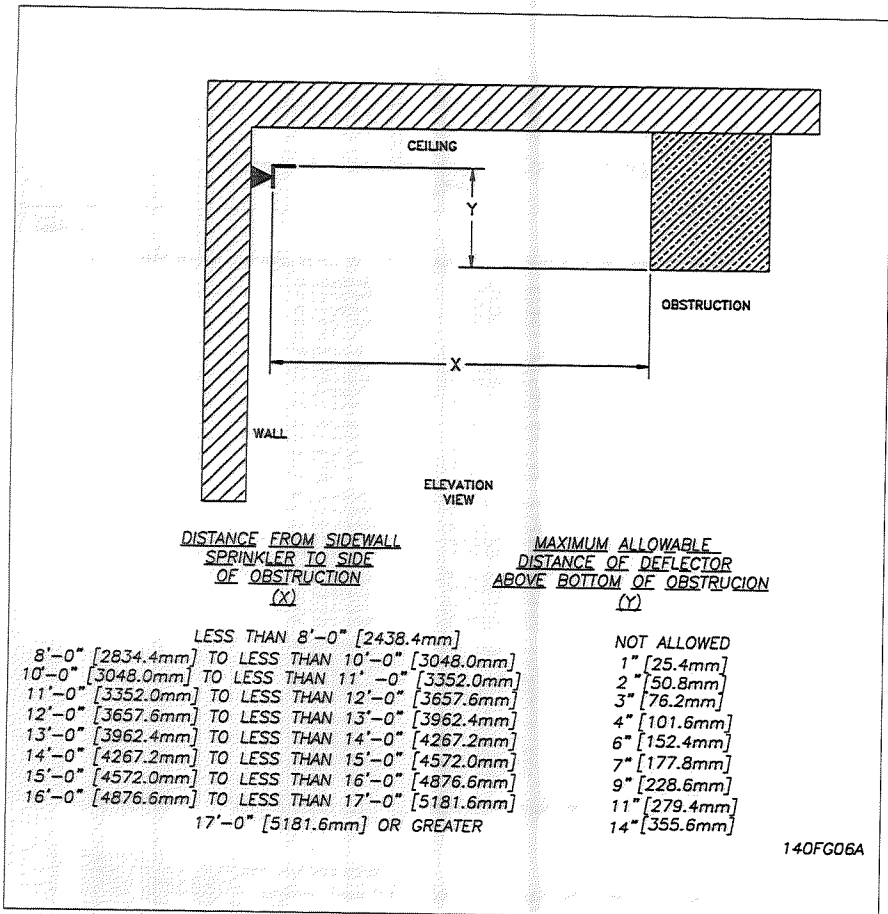
Figure 4  
Positioning of pendant sprinklers relative to continuous obstructions at the ceiling.

11.

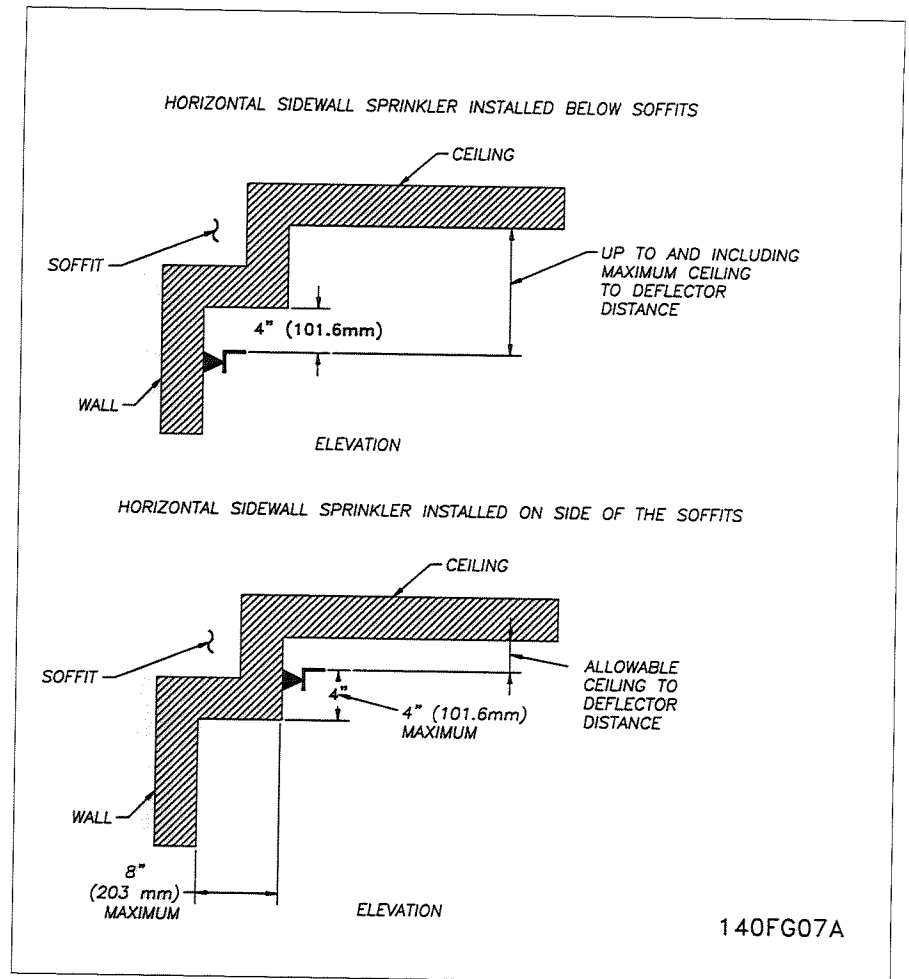


12.

Figure 5  
Positioning of sidewall sprinklers to avoid obstructions along the wall.



**Figure 6**  
Positioning of sidewall sprinklers to avoid obstructions.



**Figure 7**  
Positioning of HSW sprinklers relative to continuous obstructions along a wall.

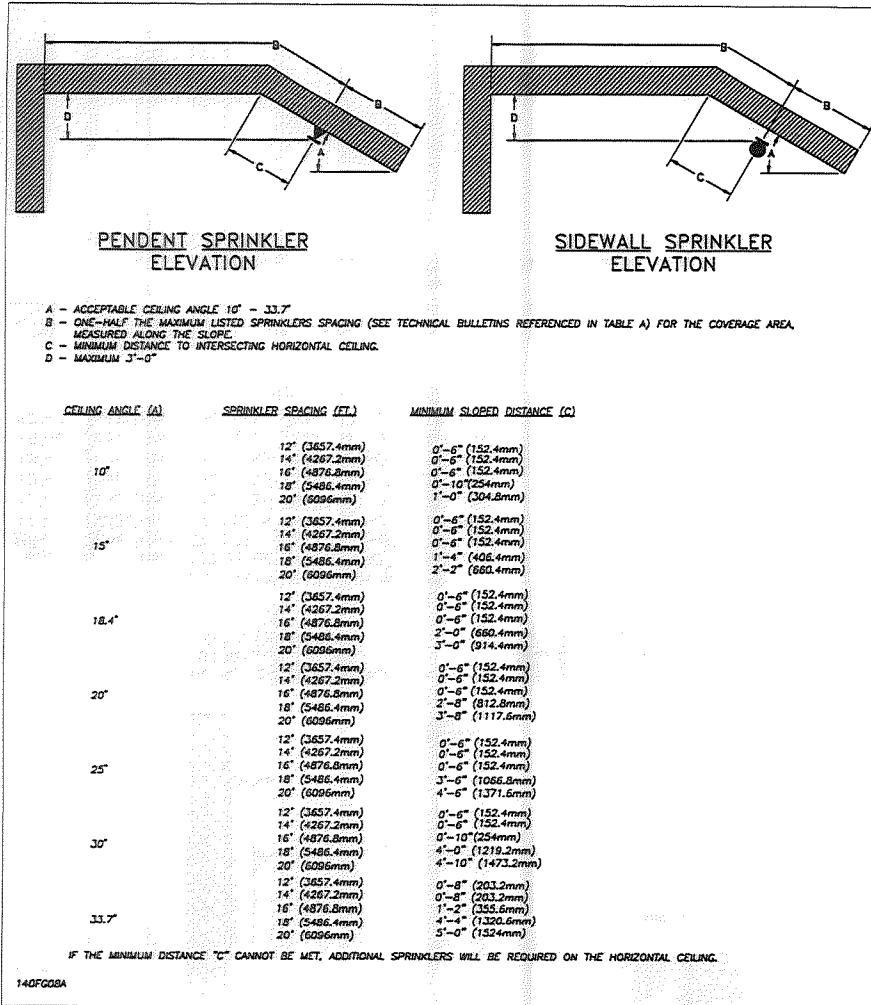


Figure 8  
Obstruction to discharge by intersecting horizontal ceiling.

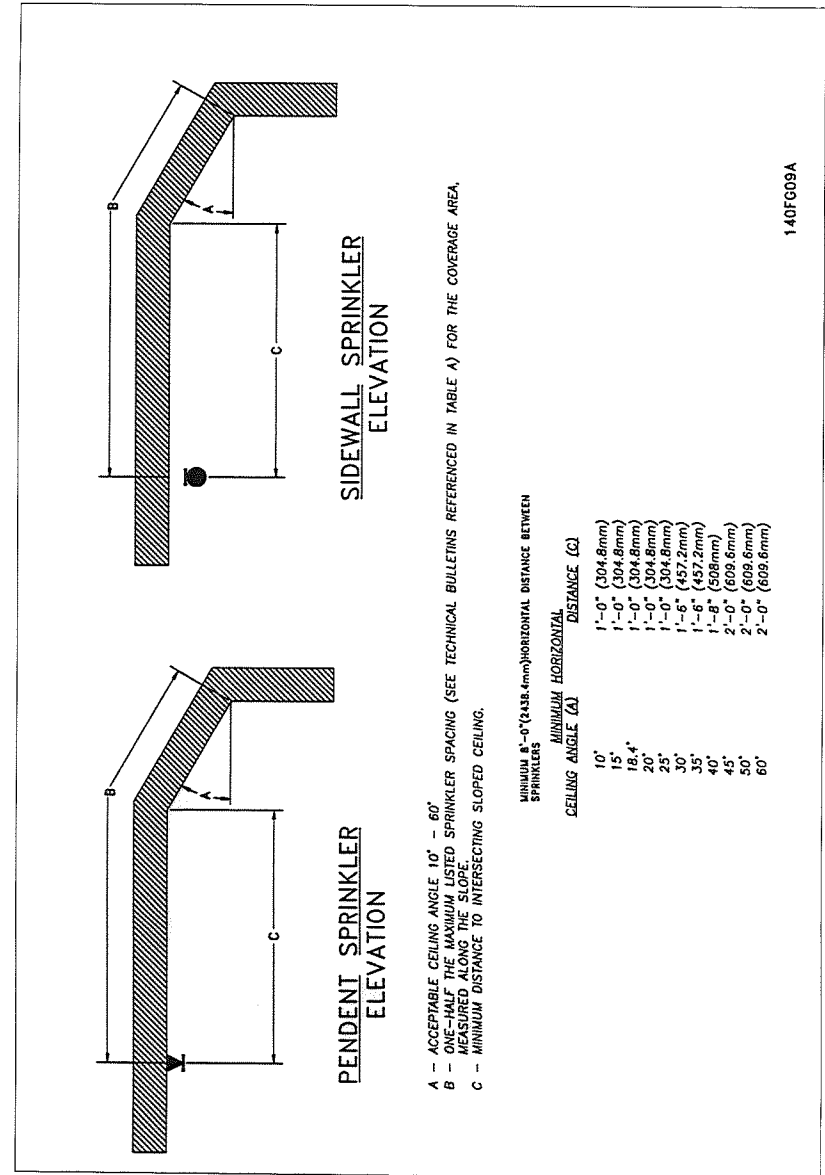


Figure 9  
Obstruction to discharge by intersecting sloped ceiling.



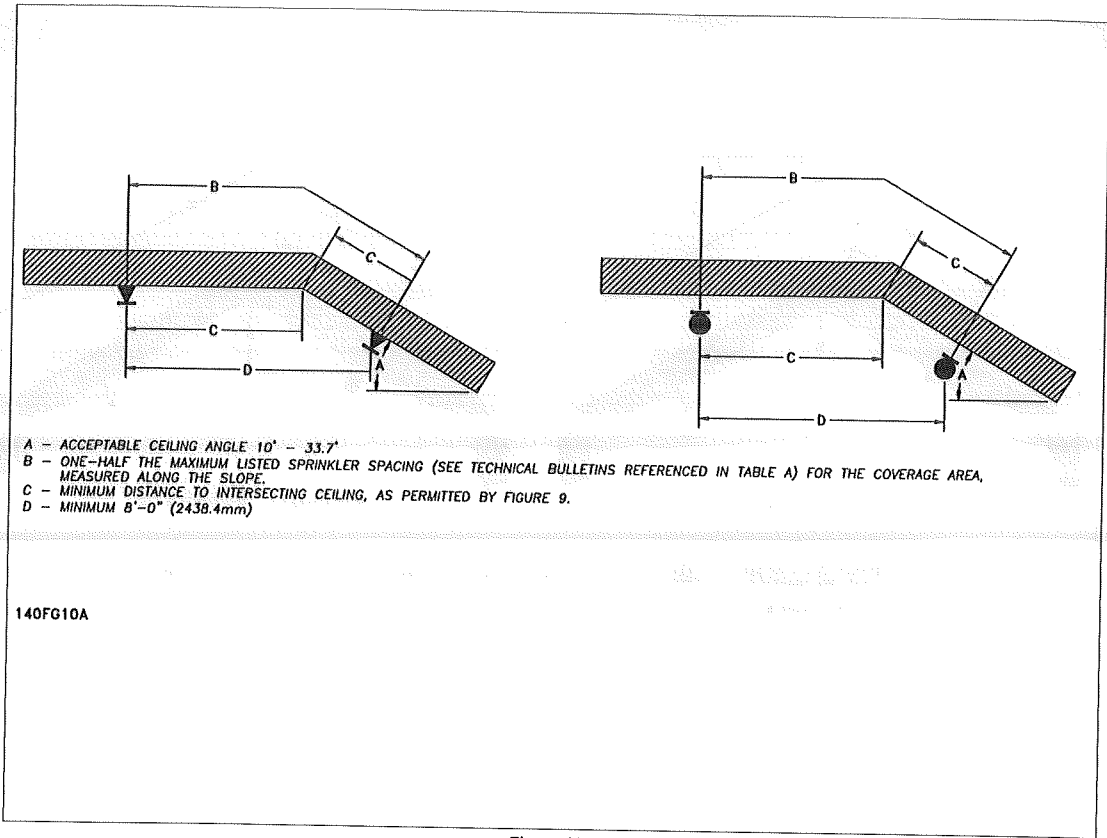


Figure 10  
Minimum distance between sprinklers on intersecting ceilings.

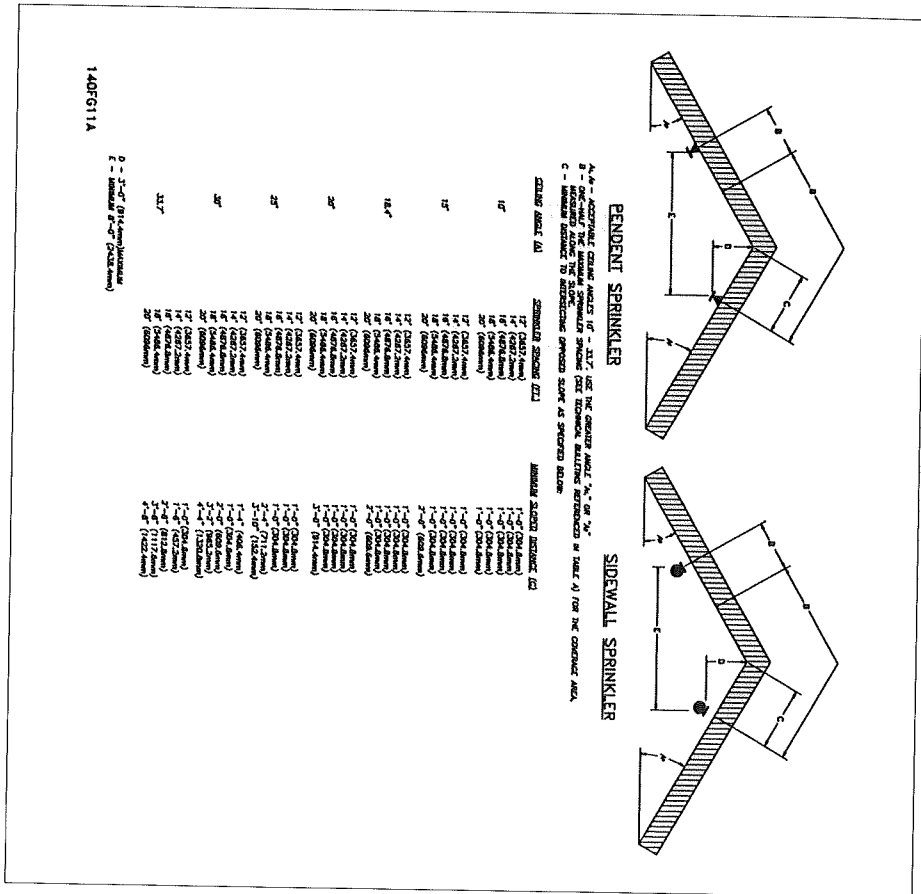
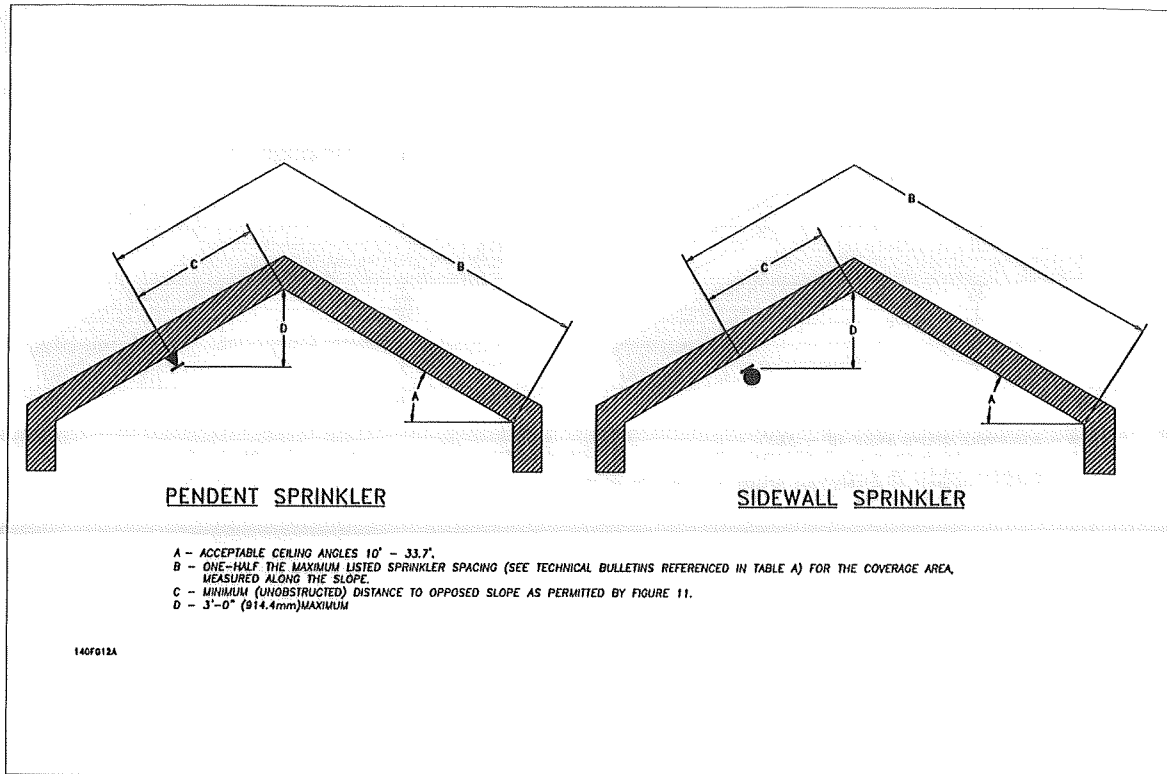


Figure 11  
Non-symmetric sprinkler locations on opposing scopes.



**Figure 12**  
Single sprinkler coverage criteria for cathedral ceilings.

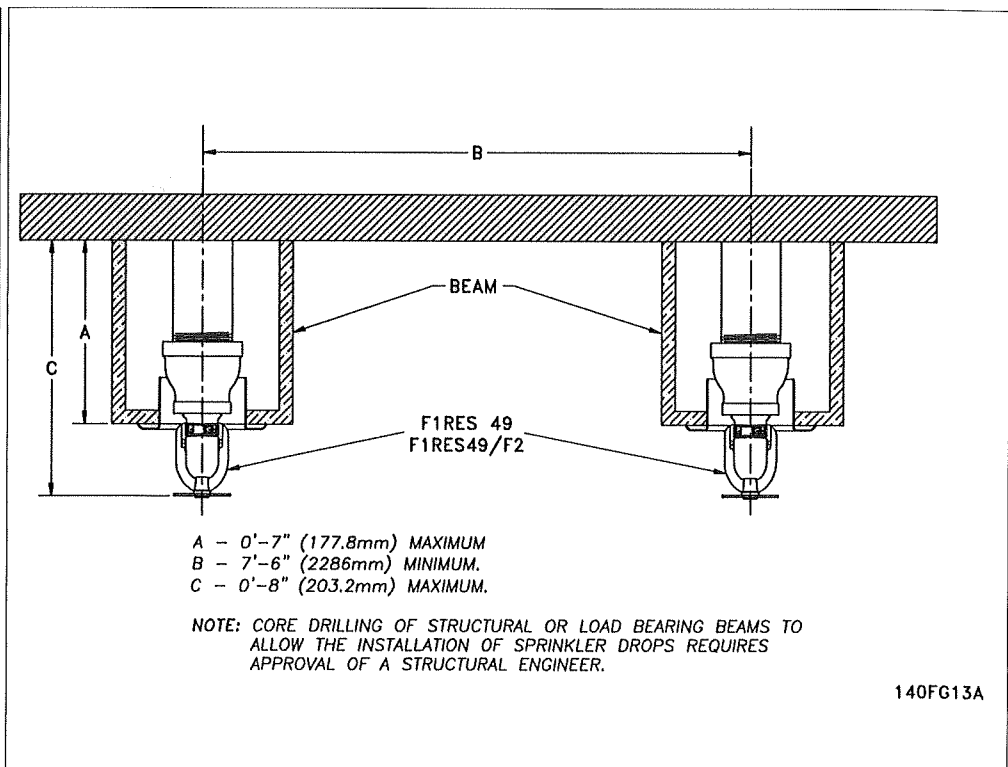


Manufactured by

The Reliable Automatic Sprinkler Co., Inc.  
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The equipment presented in this bulletin is to be installed in accordance with the latest published Standards of the National Fire Protection Association, Factory Mutual Research Corporation, or other similar organizations and also with the provisions of governmental codes or ordinances whenever applicable. Products manufactured and distributed by Reliable have been protecting life and property for over 50 years, and are installed and serviced by the most highly qualified and reputable sprinkler contractors located throughout the United States, Canada and foreign countries.



**Figure 13**  
Pendant sprinkler positioning for beamed ceiling.

## Uponor AquaPEX® White

Submittal Information  
Revision D: July 6, 2010

### Project Information

Job Name:

Location:

Engineer:

Contractor:

Manufacturer's Representative:

Part No. Ordered:

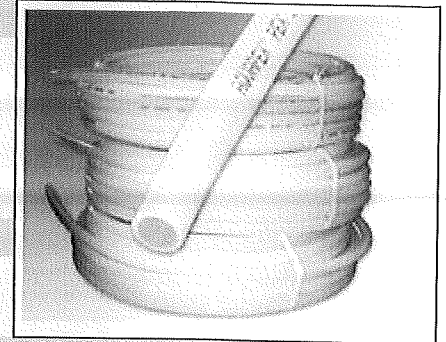
Date Submitted:

Submitted By:

Approved By:

### Technical Data

Material: Crosslinked polyethylene PEX-a Engel Method; PEX 5006  
Standard Grade Hydrostatic Ratings (PPI): 200°F (93°C) at 80 psi  
180°F (82°C) at 100 psi  
73.4°F (23°C) at 160 psi  
½", ¾", and 1" AquaPEX® White only: 120°F (49°C) at 130 psi  
Linear Expansion Rate: 1.1"/10°F (12°C)/100'



### Product Information and Application Use

Uponor AquaPEX White is tubing used for hot and cold domestic potable water distribution, residential fire safety and radiant heating systems containing no ferrous corrodible components or where ferrous components are isolated from the tubing.

✓ Description	Part Number	I.D. (A)	O.D. (B)	Weight
<input type="checkbox"/> ¼" Uponor AquaPEX White, 100-ft. coil	F1040250	0.241"	0.375"	4.0 lbs.
<input type="checkbox"/> ⅜" Uponor AquaPEX White, 400-ft. coil	F1090375	0.350"	0.500"	20.0 lbs.
<input type="checkbox"/> ⅜" Uponor AquaPEX White, 1,000-ft. coil	F1120375	0.350"	0.500"	44.0 lbs.
<input type="checkbox"/> ½" Uponor AquaPEX White, 100-ft. coil*	F1040500	0.475"	0.625"	6.0 lbs.
<input type="checkbox"/> ½" Uponor AquaPEX White, 300-ft. coil*	F1060500	0.475"	0.625"	18.0 lbs.
<input type="checkbox"/> ½" Uponor AquaPEX White, 1,000-ft. coil*	F1120500	0.475"	0.625"	54.0 lbs.
<input type="checkbox"/> ⅝" Uponor AquaPEX White, 300-ft. coil	F1060625	0.574"	0.750"	28.0 lbs.
<input type="checkbox"/> ⅝" Uponor AquaPEX White, 1000-ft. coil	F1120625	0.574"	0.750"	86.0 lbs.
<input type="checkbox"/> ¾" Uponor AquaPEX White, 100-ft. coil*	F1040750	0.671"	0.875"	10.0 lbs.
<input type="checkbox"/> ¾" Uponor AquaPEX White, 300-ft. coil*	F1060750	0.671"	0.875"	34.0 lbs.
<input type="checkbox"/> ¾" Uponor AquaPEX White, 500-ft. coil*	F1100750	0.671"	0.875"	54.0 lbs.
<input type="checkbox"/> 1" Uponor AquaPEX White, 100-ft. coil*	F1041000	0.862"	1.125"	20.0 lbs.
<input type="checkbox"/> 1" Uponor AquaPEX White, 300-ft. coil*	F1061000	0.862"	1.125"	56.0 lbs.
<input type="checkbox"/> 1" Uponor AquaPEX White, 500-ft. coil*	F1101000	0.862"	1.125"	93.0 lbs.
<input type="checkbox"/> 1¼" Uponor AquaPEX White, 100-ft. coil	F1061250	1.054"	1.375"	34.0 lbs.
<input type="checkbox"/> 1¼" Uponor AquaPEX White, 300-ft. coil	F1021250	1.054"	1.375"	106.0 lbs.
<input type="checkbox"/> 1½" Uponor AquaPEX White, 100-ft. coil	F1061500	1.244"	1.625"	44.0 lbs.
<input type="checkbox"/> 1½" Uponor AquaPEX White, 300-ft. coil	F1021500	1.244"	1.625"	133.0 lbs.
<input type="checkbox"/> 2" Uponor AquaPEX White, 100-ft. coil	F1062000	1.629"	2.125"	68.2 lbs.
<input type="checkbox"/> 2" Uponor AquaPEX White, 200-ft. coil	F1052000	1.629"	2.125"	136.4 lbs.
<input type="checkbox"/> 2" Uponor AquaPEX White, 300-ft. coil	F1022000	1.629"	2.125"	204.6 lbs.
<input type="checkbox"/> 3" Uponor AquaPEX White, 100-ft. coil	F1063000	2.400"	3.125"	128.0 lbs.
<input type="checkbox"/> 3" Uponor AquaPEX White, 350-ft. coil	F1023000	2.400"	3.125"	442.0 lbs.

### Installation

Approved fittings are ProPEX® fittings<sup>1</sup> for sizes ¾" through 2" AquaPEX. Use WIPEX™ fittings for 3" AquaPEX. Refer to the Uponor Professional Plumbing Installation Guide, Radiant Floor Heating Installation Handbook or AquaSAFE™ Residential Fire Sprinkler Installation Guide for more information.

### Standards

### Codes

### Listings

CSA B137.5; ASTM F876; ASTM F877; ASTM F1960; ASTM-E84; ASTM-E119/UL 263

IPC; UPC; NSPC; NPC of Canada

\*½", ¾", 1" UL 1821; \*ULC/ORD - C 199 P; IAPMO; CSA; HUD; WARNOCK HERSEY; NSF; ITS; UL; ICC; ANSI/NSF 14- and 61-certified; AWWA C904<sup>2</sup>; CAN/ULC S102.2 (U.S.: ¾" diameter and smaller; Canada: 1" diameter and smaller)

### Related Applications

### Contact Information





PEX-a Plumbing Systems  
Radiant Heating and Cooling Systems  
AquaSAFE Fire Safety Systems

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Fax: (800) 638-9517  
www.uponor.ca

<sup>1</sup>ProPEX® is a registered trademark of Uponor, Inc. ProPEX™ is a trademark of Uponor Ltd.

<sup>2</sup>This listing is for ¾" AquaPEX tubing and larger.

Print Stream on Tubing	Explanation
UPONOR AquaPEX	Brand Name
PEX 5006	ASTM F2023 Testing I/A/W ASTM F876
½ IN	Tubing Size (Example: ½")
SDR9	Standard Dimensional Ratio of 9
 B137.5 POTABLE	Potable Water Listing by CSA
 130PSI 120° F (49° C) UL1821	Rating I/A/W UL 1821 (½", ¾" and 1" only)
ULC-ORD C199P <sup>1</sup>	Canadian Rating I/A/W UL1821 and C199P
 ASTM F876/F877/F2023	ASTM Tubing Standards Listed by NSF
ASTM F1960/F2080/F1807	ASTM Fitting Standards Listed by NSF
	IAPMO Reports 3558, 3960
ICC ESR-1099	ICC Evaluation Services Report ESR-1099
ICC ESR1529	ICC Evaluation Services Report ESR 1529
HUD MR1269d	HUD Material Release Report 1269d
WHI-LISTED CAN/US FS25/SD50	Warnock Hersey Listing for 25/50 Plenum Rating
160PSI 73.4°F (23°C)/100PSI 180°F (82°C)/80PSI 200°F (93°C)	Hydrostatic Ratings from PPI in Accordance with ASTM F876
UPONOR PEX-a TUBING	Type of Crosslinking (PEX-a)
UN04950127 <sup>2</sup>	Manufacturing Code to Audit Material Source
xxxxxx <sup>3</sup>	Footage Marker in Increments of 3' (three feet)

<sup>1</sup> For ½-inch tubing only

<sup>2</sup> USA, Material Type, Extruder No., Year, Month, Day

<sup>3</sup> Footage marking in increments of three feet (3')

**Table 1-1: Print Stream Identification**

### ProPEX® Sprinkler Adapters and Fittings

Uponor offers sprinkler adapter fittings specifically designed for the AquaSAFE Fire Safety system. These fittings feature ProPEX connections and a standard ½" NPT outlet for connecting fire sprinklers.

**Table 1-2** shows the required tubing length needed to approximate the equivalent pressure resistance of the different types of Uponor ProPEX fittings.

### Calculated Equivalent Tubing Length

Fitting Type	Tubing Size	
	¾"	1"
Tee - Run	2'	2'
Tee - 90°	6'	6'
90° Elbow	5'	6'
Coupling	2'	2'

**Table 1-2: Pressure Resistance (Fittings/Tubing)**

## ProPEX Lead-free (LF) Brass Fire Sprinkler Adapter Tee

Submittal Information  
Revision A: Nov. 20, 2009

### Project Information

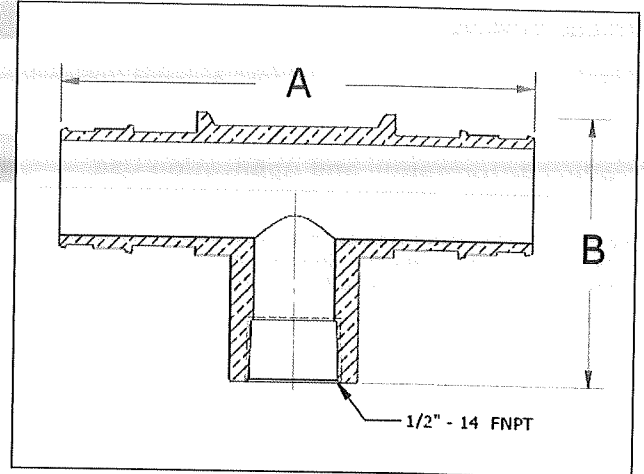
Job Name:		Part No. Ordered:	
Location:		Date Submitted:	
Engineer:		Submitted By:	
Contractor:		Approved By:	
Manufacturer's Representative:			

### Technical Data

Material: C69300 Brass

### Product Information and Application Use

Designed for use with 3/4" or 1" Uponor AquaPEX® tubing, the ProPEX® Lead-free Brass Fire Sprinkler Adapter Tee connects fire sprinklers to the Uponor residential AquaSAFE™ Looped multipurpose fire safety system, which combines fire sprinklers with a home's potable cold-water plumbing system. Use Uponor ProPEX fittings for the connections.



✓ Description	Part Number	A	B	Weight
<input type="checkbox"/> ProPEX LF Brass Fire Sprinkler Adapter Tee, 1" PEX x 1" PEX x 1/2" FNPT	LF7701010	4.09"	2.325"	0.62 lbs.
<input type="checkbox"/> ProPEX LF Brass Fire Sprinkler Adapter Tee, 3/4" PEX x 3/4" PEX x 1/2" FNPT	LF7707575	3.62"	2.325"	0.64 lbs.

### Installation

Use the appropriate Uponor ProPEX Ring for the tubing. Install the tee using the Fire Sprinkler Adapter Mounting Bracket (A7750700) and Fire Sprinkler Adapter Push-on Nut (F7000005). For more information, refer to the Uponor AquaSAFE Looped System Installation Guide.

### Related Products

A7750700: Fire Sprinkler Adapter Mounting Bracket, 3/4" and 1"  
F7000005: Fire Sprinkler Adapter Push-on Nut

### Standards

CAN/CSA B137.5; ASTM F877; ASTM F1960; UL 1821; ULC/ORD - C199P

### Codes

IPC; UPC; NSPC; IRC; IMC; NPC of Canada

### Listings

ANSI/NSF 14- and 61-certified; ICC ESR 1099; HUD MR 1269; IAPMO

### Related Applications

PEX-a Plumbing Systems  
AquaSAFE Fire Safety Systems

### Contact Information

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www.uponor.ca

<sup>1</sup>ProPEX® is a registered trademark of Uponor, Inc. ProPEX™ is a trademark of Uponor Ltd.

# Fire Sprinkler Adapter Mounting Bracket

Submittal Information

Revision A: Nov. 17, 2009

## Project Information

Job Name:

Location:

Part No. Ordered:

Engineer:

Date Submitted:

Contractor:

Submitted By:

Manufacturer's Representative:

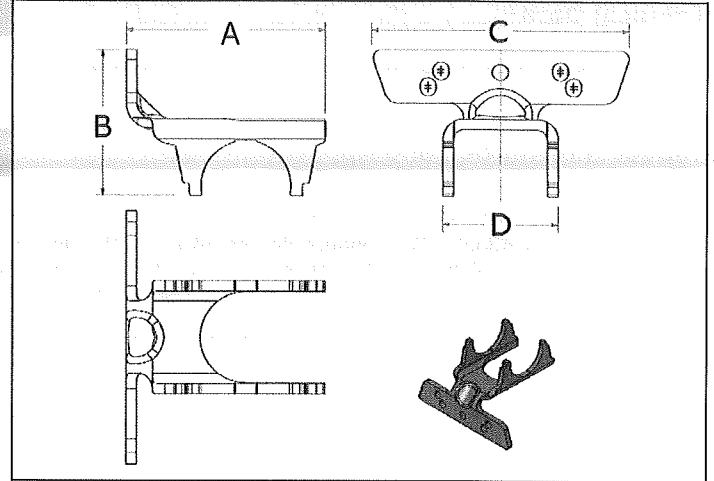
Approved By:

## Technical Data

Material: 1050 Annealed (spheroidized) spring steel

## Product Information and Application Use

Uponor's Fire Sprinkler Adapter Mounting Bracket is designed to rigidly mount ProPEX® Lead-free Brass Fire Sprinkler Adapter Tees (LF7701010 and LF7707575) in Uponor AquaSAFE™ multi-purpose residential fire sprinkler systems.<sup>1</sup>



✓	Description	Part Number	A	B	C	D	Weight
<input type="checkbox"/>	Fire Sprinkler Adapter Mounting Bracket, ¾" and 1"	A7750700	2.48"	1.84"	3.16"	1.42"	0.21 lbs.

## Installation

Attach the sprinkler-mounting bracket or sprinkler adapter to the structure with two #10 x 1½" Pan Head, Full Thread Screws (F7001500) or equivalent. Refer to the sprinkler plan mounting details for correct placement of brackets and adapters, taking into account the ceiling type and sprinkler model. When installing adapter tee into bracket, use Fire Sprinkler Adapter Push-on Nut (F7000005). For more information, refer to the Uponor AquaSAFE Looped System Installation Guide.

## Related Products

LF7701010: ProPEX Brass Fire Adapter Tee, 1" PEX x 1" PEX x ½" FNPT

LF7707575: ProPEX Brass Fire Adapter Tee, ¾" PEX x ¾" PEX x ½" FNPT

## Standards

UL1821; ULC/ORD - C199P (for use with brass sprinkler adapter tees)

## Codes

N/A

## Listings

N/A

## Related Applications

PEX-a Plumbing Systems  
AquaSAFE Fire Safety Systems

## Contact Information

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www.uponor.ca

<sup>1</sup>ProPEX® is a registered trademark of Uponor, Inc. ProPEX™ is a trademark of Uponor Ltd.

## ProPEX® Fire Sprinkler Adapter

Submittal Information

Revision B: March 17, 2009

### Project Information

Job Name:

Location:

Part No. Ordered:

Engineer:

Date Submitted:

Contractor:

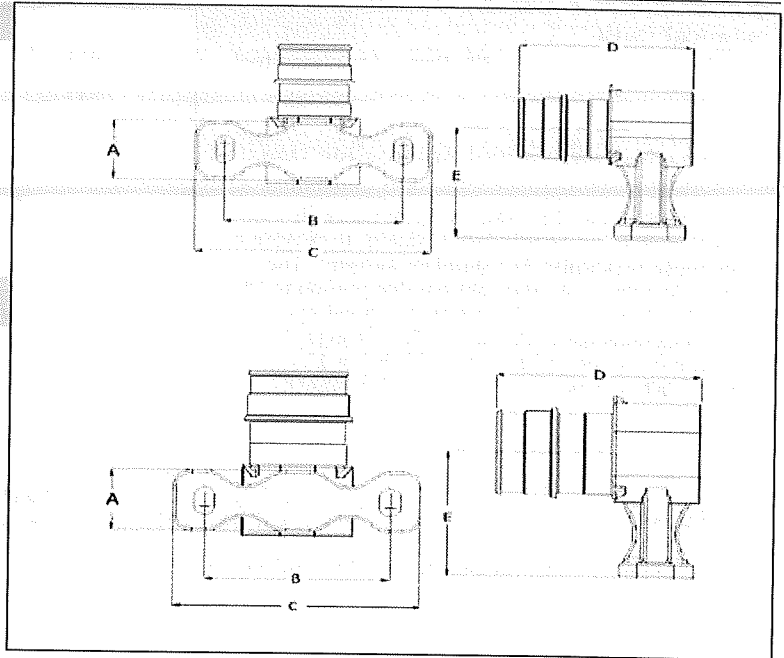
Submitted By:

Manufacturer's Representative:

Approved By:

### Technical Data

Material: 300 Series Stainless Steel



### Product Information and Application Use

Use the ProPEX® Fire Sprinkler Adapter in conjunction with the appropriate sprinkler to provide a multi-purpose residential fire sprinkler system<sup>1</sup>. For residential applications, the system is installed with the cold-potable portion of the Uponor plumbing system. Make connections with Uponor ProPEX fittings. These fittings are designed for use only with 3/4" or 1" AquaPEX® White tubing in the Uponor AQUASAFE® Looped System.

✓ Description	Part Number	A	B	C	D	E	Weight
<input type="checkbox"/> ProPEX Fire Sprinkler Adapter, 3/4" PEX x 1/2" FNPT	Q7517550	0.75"	1.88"	2.50"	1.82"	1.41"	0.268 lbs.
<input type="checkbox"/> ProPEX Fire Sprinkler Adapter, 1" PEX x 1/2" FNPT	Q7511050	0.75"	1.88"	2.50"	2.06"	1.54"	0.408 lbs.

### Installation

Use appropriate ProPEX Ring for connecting the tubing. Refer to the AquaPEX Installation Handbook or the Uponor AQUASAFE® Installation Guide for additional information.

### Standards

CAN/CSA B137.5; ASTM F877; ASTM F 1960

### Codes

IPC; UPC; NSPC; IRC; IMC; NPC of Canada

### Listings

ANSI/NSF 14- and 61-certified; U.P. Code; ICC ESR 1099; HUD MR 1269; UL 1821; ULC/ORD - C 199 P

### Related Applications

PEX-a Plumbing Systems  
AQUASAFE Fire Safety Systems

### Contact Information

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<sup>1</sup>ProPEX® is a registered trademark of Uponor, Inc. ProPEX™ is a trademark of Uponor Ltd.

## ProPEX® Fire Sprinkler Adapter Elbow

Submittal Information

Revision B: March 17, 2009

### Project Information

Job Name:

Location:

Part No. Ordered:

Engineer:

Date Submitted:

Contractor:

Submitted By:

Manufacturer's Representative:

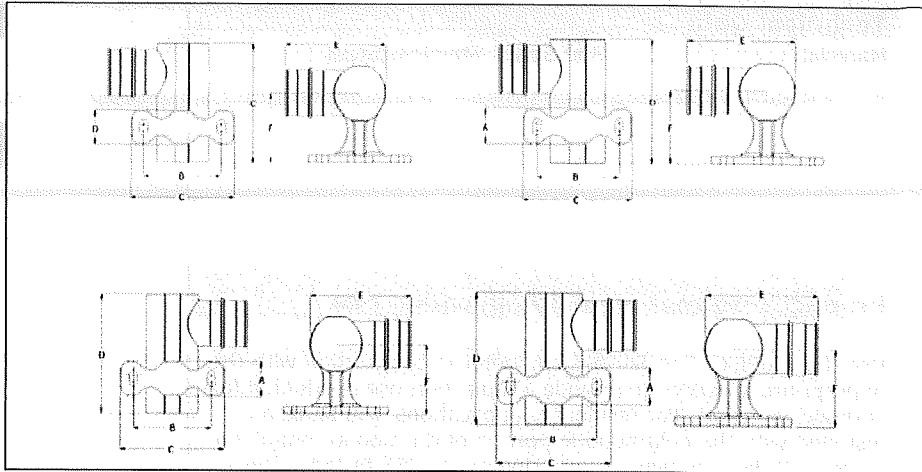
Approved By:

### Technical Data

Material: 300 Series Stainless Steel

### Product Information and Application Use

Use the ProPEX® Fire Sprinkler Adapter Elbow in conjunction with the appropriate sprinkler to provide a multipurpose residential fire sprinkler system<sup>1</sup>. The system is installed with the cold-potable portion of the Uponor plumbing system for residential applications. Make connections using Uponor ProPEX fittings. The fittings are designed for use only with ¾" or 1" AquaPEX® White tubing in the Uponor AQUASAFE® Looped System.



✓ Description	Part Number	A	B	C	D	E	F	Weight
<input type="checkbox"/> ProPEX Fire Sprinkler Adapter Right Elbow, ¾" PEX x ½" FNPT	Q7537550	2.25"	1.95"	1.41"	2.25"	1.95"	1.41"	0.410 lbs.
<input type="checkbox"/> ProPEX Fire Sprinkler Adapter Right Elbow, 1" PEX x ½" FNP	Q7531050	2.63"	2.43"	1.54"	2.63"	2.43"	1.54"	0.783 lbs.
<input type="checkbox"/> ProPEX Fire Sprinkler Adapter Left Elbow, ¾" PEX x ½" FNPT	Q7547550	2.25"	1.95"	1.41"	2.25"	1.95"	1.41"	0.410 lbs.
<input type="checkbox"/> ProPEX Fire Sprinkler Adapter Left Elbow, 1" PEX x ½" FNPT	Q7541050	2.63"	2.43"	1.54"	2.63"	2.43"	1.54"	0.783 lbs.

### Installation

Use appropriate ProPEX Ring when connecting the tubing. Refer to the AquaPEX Installation Handbook or the Uponor AQUASAFE Installation Guide for additional information.

### Standards

CAN/CSA B137.5; ASTM F877; ASTM F1960

### Codes

IPC; UPC; NSPC; IRC; IMC; NPC of Canada

### Listings

ANSI/NSF 14- and 61-certified; ICC ESR 1099; HUD MR 1269; IAPMO 3558; UL 1821; ULC/ORD - C 199 P

### Related Applications

PEX-a Plumbing Systems  
AQUASAFE Fire Safety Systems

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## ProPEX® Ring

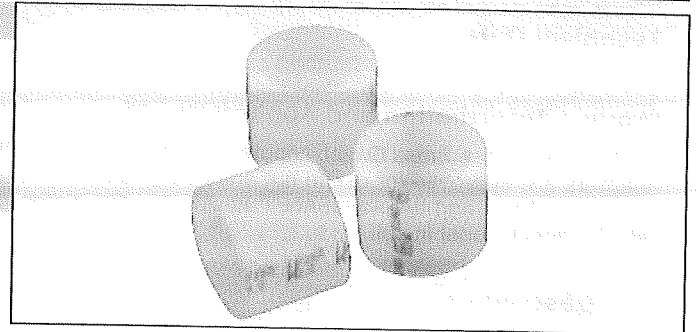
Submittal Information  
Revision B: April 13, 2011

### Project Information

Job Name:	
Location:	Part No. Ordered:
Engineer:	Date Submitted:
Contractor:	Submitted By:
Manufacturer's Representative:	Approved By:

### Technical Data

Material: PEX-a (Engel Method)  
Density: 926 to 940 kg/m<sup>3</sup>  
Degree of Crosslinking: 70% to 89%



### Product Information and Application Use

Manufactured from PEX-a material, Uponor ProPEX® Rings are required to make a proper ProPEX connection.<sup>1</sup> Red print on the rings indicates hot lines. The 1/2", 3/4" and 1" ProPEX Ring with Stop includes a leading edge chamfer and stop edge.

✓ Description	Part Number	Length	i.d.	o.d.	Weight
<input type="checkbox"/> ProPEX Ring, 3/8"	Q4690302	0.54"	0.49"	0.74"	0.005 lbs.
<input type="checkbox"/> ProPEX Ring with Stop, 1/2" (red print)	Q4690511	0.63"	0.63"	0.87"	0.006 lbs.
<input type="checkbox"/> ProPEX Ring with Stop, 1/2"	Q4690512	0.63"	0.63"	0.87"	0.006 lbs.
<input type="checkbox"/> ProPEX Ring, 5/8"	Q4680625	0.79"	0.75"	1.00"	0.008 lbs.
<input type="checkbox"/> ProPEX Ring with Stop, 3/4"	Q4690756	0.87"	0.88"	1.13"	0.012 lbs.
<input type="checkbox"/> ProPEX Ring, 1"	Q4681000	1.10"	1.13"	1.42"	0.020 lbs.
<input type="checkbox"/> ProPEX Ring with Stop, 1"	Q4691000	1.10"	1.13"	1.42"	0.020 lbs.
<input type="checkbox"/> ProPEX Ring, 1 1/4"	Q4681250	1.35"	1.38"	1.66"	0.030 lbs.
<input type="checkbox"/> ProPEX Ring, 1 1/2"	Q4681500	1.61"	1.63"	1.91"	0.040 lbs.
<input type="checkbox"/> ProPEX Ring, 2"	Q4682000	1.97"	2.14"	2.61"	0.133 lbs.

### Installation

Square cut the Uponor ProPEX tubing. Remove excess material. Slide the ProPEX Ring over the end of the tubing (maximum 1/16" over-hang). When using the 1/2" ProPEX Ring with stop edge, slide the ring on (i.e., chamfered edge first) until the end of the tubing contacts the stop edge. Expand tubing and ring. Rotate tool a quarter turn after each expansion to prevent the formation of grooves. Remove the expansion tool and fully seat the tubing and ring against the shoulder of the fitting. You should make ProPEX connections at temperatures above 5°F / -15°C. For more information, refer to the AquaPEX® Professional Plumbing Installation Handbook, AquaSAFE™ Fire Safety Installation Guide or the Uponor Radiant Installation Handbook.

### Standards

ASTM F1960

### Codes

IPC; UPC; NSPC; NPC of Canada

### Listings

UL 1821 (1/2", 3/4" and 1"); ULC/ORD - C 199 P (1/2", 3/4" and 1"); HUD MR 1269; ICC ESR 1099; ANSI/NSF 14- and 61-certified

### Related Applications

PEX-a Plumbing Systems  
Radiant Heating and Cooling Systems  
AquaSAFE Fire Safety Systems

### Contact Information

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# ProPEX® Lead-free (LF) Brass Sweat Adapter

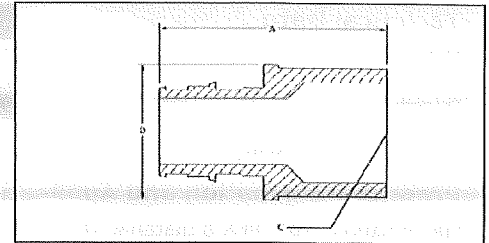
Submittal Information  
Revision A: Jan. 20, 2010

## Project Information

Job Name:	
Location:	Part No. Ordered:
Engineer:	Date Submitted:
Contractor:	Submitted By:
Manufacturer's Representative:	Approved By:

## Technical Data

Material: C69300 Brass



## Product Information and Application Use

ProPEX® Lead-free Brass Sweat Adapters transition Uponor PEX tubing to copper pipe.<sup>1</sup> Adapters are approved for use in hot and cold potable water systems, hydronic radiant heating systems and the AquaSAFE™ Residential Fire Safety System. These adapters are safe for direct burial in soil.

✓	Description	Part Number	A	B	C	Weight
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 3/8" PEX x 1/2" Copper	LF4513850	1.32"	0.721"	0.50" CU	0.08 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 1/2" PEX x 1/2" Copper	LF4515050	1.44"	0.750"	0.50" CU	0.08 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 1/2" PEX x 3/4" Copper	LF4515075	1.63"	0.989"	0.75" CU	0.16 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 3/4" PEX x 1/2" Copper	LF4517550	1.67"	1.070"	0.50" CU	0.16 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 3/4" PEX x 3/4" Copper*	LF4517575	2.04"	1.070"	0.75" CU	0.30 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 3/4" PEX x 1" Copper	LF4517510	2.17"	1.258"	1.00" CU	0.31 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 1" PEX x 1" Copper*	LF4511010	2.40"	1.345"	1.00" CU	0.30 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 1 1/4" PEX x 1 1/4" Copper	LF4511313	2.63"	1.640"	1.25" CU	0.50 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 1 1/2" PEX x 1 1/2" Copper	LF4511515	2.75"	1.875"	1.50" CU	0.50 lbs.
<input type="checkbox"/>	ProPEX LF Brass Sweat Adapter, 2" PEX x 2" Copper	LF4512020	3.53"	3.00"	2.00" CU	2.00 lbs.

## Installation

Use the appropriate Uponor ProPEX Ring for the tubing (sold separately). Do not solder within 18 inches of the ProPEX Fitting. Refer to AquaPEX® Professional Plumbing Installation Guide, Radiant Floor Heating Installation Handbook or AquaSAFE™ Residential Fire Sprinkler Installation Guide for additional information.

## Standards

CAN/CSA B137.5; ASTM F877; ASTM F1960

## Codes

IPC; UPC; NSPC; NPC of Canada

## Listings

HUD MR 1269; ICC ESR 1099; ANSI/NSF 14- and 61-certified; U.P. Code, Annex G; \*UL 1821; \*ULC/ORD C199P

## Related Applications

PEX-a Plumbing Systems  
Uponor Residential Fire Safety Systems  
Radiant Heating and Cooling Systems  
Snow and Ice Melting Systems  
Permafrost Protection Systems  
Turf Conditioning Systems

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## ProPEX® Lead-free (LF) Brass Female Threaded Adapter

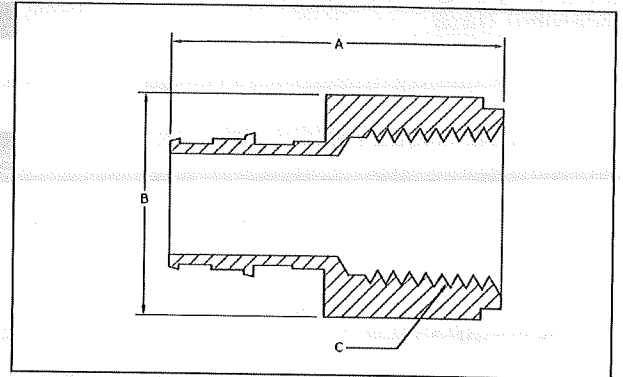
Submittal Information  
Revision A: Jan. 20, 2010

### Project Information

Job Name:	
Location:	Part No. Ordered:
Engineer:	Date Submitted:
Contractor:	Submitted By:
Manufacturer's Representative:	Approved By:

### Technical Data

Material: C69300 Brass



### Product Information and Application Use

The ProPEX® Lead-free Brass Female Threaded Adapter connects Uponor PEX tubing to female NPT threads.<sup>1</sup> Use these fittings in hot and cold domestic potable water systems or in any radiant heating system. One end of the adapter is manufactured with the Uponor ProPEX Fitting for connections to Wirsbo hePEX™ tubing or Uponor AquaPEX® tubing. The other end of the adapter connects to copper. These adapters are safe for direct burial in soil.

✓	Description	Part Number	A	B	C	Weight
<input type="checkbox"/>	ProPEX LF Brass Female Threaded Adapter, ½" PEX x ½" NPT	LF4575050	1.57"	1" HEX	½" NPT	0.20 lbs.
<input type="checkbox"/>	ProPEX LF Brass Female Threaded Adapter, ½" PEX x ¾" NPT	LF4575075	1.75"	1 <sup>3</sup> / <sub>16</sub> " HEX	¾" NPT	0.40 lbs.
<input type="checkbox"/>	ProPEX LF Brass Female Threaded Adapter, ¾" PEX x ¾" NPT*	LF4577575	1.87"	1 <sup>3</sup> / <sub>8</sub> " HEX	¾" NPT	0.20 lbs.
<input type="checkbox"/>	ProPEX LF Brass Female Threaded Adapter, ¾" PEX x 1" NPT	LF4577510	2.21"	1½" HEX	1" NPT	0.40 lbs.
<input type="checkbox"/>	ProPEX LF Brass Female Threaded Adapter, 1" PEX x 1" NPT	LF4571010	2.44"	1½" HEX	1" NPT	0.45 lbs.
<input type="checkbox"/>	ProPEX LF Brass Female Threaded Adapter, 1¼" PEX x 1¼" NPT	LF4571313	2.57"	2" HEX	1¼" NPT	1.00 lbs.
<input type="checkbox"/>	ProPEX LF Brass Female Threaded Adapter, 1½" PEX x 1½" NPT	LF4571515	2.75"	2½" HEX	1½" NPT	2.20 lbs.
<input type="checkbox"/>	ProPEX Brass Female Threaded Adapter, 2" PEX x 2" NPT	LF4572020	3.53"	3" HEX	2" NPT	2.20 lbs.

### Installation

ProPEX Tool and ProPEX Rings (sold separately) are required for connecting the PEX tubing. For more information, refer to the AquaPEX Professional Plumbing Installation Guide or the Radiant Floor Heating Installation Handbook.

### Standards

CAN/CSA B137.5; ASTM F877; ASTM F1960

### Codes

IPC; UPC; NSPC; NPC of Canada

### Listings

ANSI/NSF 14- and 61-certified; ICC ESR 1099; HUD MR 1269; U.P. Code, Annex G; \*UL 1821; \*ULC/ORD C199P

### Related Applications

PEX-a Plumbing Systems  
Radiant Heating and Cooling Systems  
Snow and Ice Melting Systems  
Permafrost Protection Systems  
Turf Conditioning Systems

### Contact Information

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<sup>1</sup>ProPEX® is a registered trademark of Uponor, Inc. ProPEX™ is a trademark of Uponor Ltd.

# ProPEX® Lead-free (LF) Brass Male Threaded Adapter

Submittal Information

Revision A: Jan. 28, 2010

## Project Information

Job Name:

Location:

Part No. Ordered:

Engineer:

Date Submitted:

Contractor:

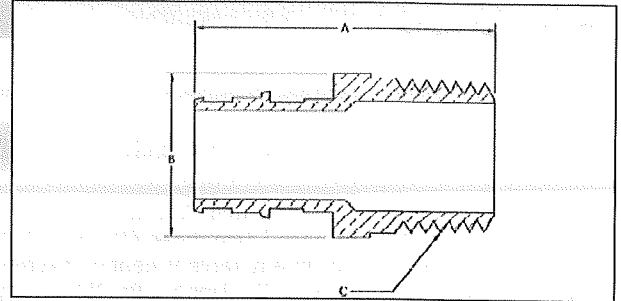
Submitted By:

Manufacturer's Representative:

Approved By:

## Technical Data

Material: C69300 Brass



## Product Information and Application Use

ProPEX® Lead-free Male Threaded Adapters connect Uponor PEX tubing to male NPT threads.<sup>1</sup> These adapters are safe for direct burial in soil.

✓	Description	Part Number	A	B	C	Weight
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 3/8" PEX x 1/2" NPT	LF4523850	1.62"	7/8" HEX	1/2" NPT	0.11 lbs.
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 1/2" PEX x 1/2" NPT	LF4525050	1.73"	7/8" HEX	1/2" NPT	0.32 lbs.
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 1/2" PEX x 3/4" NPT	LF4525075	1.78"	1 1/8" HEX	3/4" NPT	0.18 lbs.
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 3/4" PEX x 3/4" NPT*	LF4527575	2.02"	1 1/8" HEX	3/4" NPT	0.20 lbs.
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 3/4" PEX x 1" NPT*	LF4527510	2.22"	1 3/8" HEX	1" NPT	0.35 lbs.
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 1" PEX x 3/4" NPT	LF4521075	2.25"	1 1/4" HEX	3/4" NPT	0.30 lbs.
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 1" PEX x 1" NPT*	LF4521010	2.46"	1 3/8" HEX	1" NPT	0.44 lbs.
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 1 1/4" PEX x 1 1/4" NPT	LF4521313	2.72"	1 3/4" HEX	1 1/4" NPT	0.75 lbs.
<input type="checkbox"/>	ProPEX LF Brass Male Threaded Adapter, 1 1/2" PEX x 1 1/2" NPT	LF4521515	3.00"	2 1/4" HEX	1 1/2" NPT	0.80 lbs.
<input type="checkbox"/>	ProPEX Brass Male Threaded Adapter, 2" PEX x 2" NPT	LF4522020	3.86"	2 1/2" HEX	2" NPT	1.90 lbs.

## Installation

ProPEX Tool and ProPEX Rings (sold separately) are required for connecting the PEX tubing. Refer to the AquaPEX® Professional Plumbing Installation Guide or Radiant Floor Heating Installation Handbook for additional information.

## Standards

CAN/CSA B137.5; ASTM F877; ASTM F1960

## Codes

IPC; UPC; NSPC; NPC of Canada

## Listings

ANSI/NSF 14- and 61-certified; HUD MR 1269; ICC ESR 1099; IAPMO 3558; U.P. Code, Annex G; \*UL 1821; \*ULC/ORD C199P

## Related Applications

PEX-a Plumbing Systems  
 Radiant Heating and Cooling Systems  
 Snow and Ice Melting Systems  
 Permafrost Protection Systems  
 Turf Conditioning Systems

## Contact Information

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## ProPEX® Lead-free (LF) Brass Coupling

Submittal Information

Revision A: Jan. 28, 2010

### Project Information

Job Name:

Location:

Engineer:

Contractor:

Manufacturer's Representative:

Part No. Ordered:

Date Submitted:

Submitted By:

Approved By:

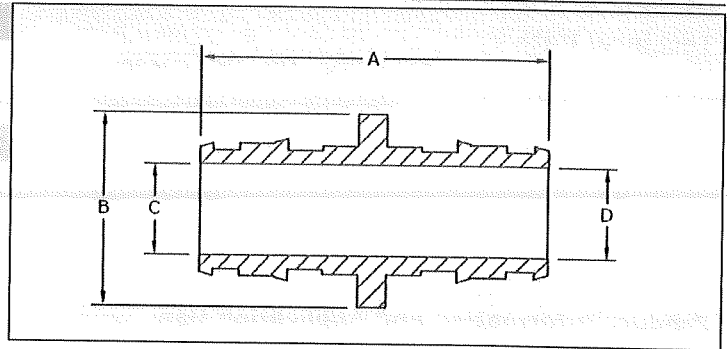
### Technical Data

Material

C69300 Brass

### Product Information and Application Use

ProPEX® Lead-free Brass Couplings are available for use in hot and cold domestic potable water systems.<sup>1</sup> Also approved for use in any radiant heating system. The coupling features the Uponor ProPEX Fitting for connections to Wirsbo hePEX™ tubing or Uponor AquaPEX® tubing. Couplings are safe for direct burial in soil.



✓	Description	Part Number	A	B	C	D	Weight
<input type="checkbox"/>	ProPEX LF Brass Coupling, 3/8" PEX x 1/2" PEX	LF4543850	1.42"	0.740"	0.398"	0.280"	0.05 lbs
<input type="checkbox"/>	ProPEX LF Brass Coupling, 1/2" PEX x 1/2" PEX*	LF4545050	1.54"	0.740"	0.398"	N/A	0.07 lbs
<input type="checkbox"/>	ProPEX LF Brass Coupling, 3/4" PEX x 3/4" PEX*	LF4547575	2.02"	1.187"	0.595"	N/A	0.13 lbs
<input type="checkbox"/>	ProPEX LF Brass Coupling, 3/4" PEX x 1" PEX*	LF4547510	2.25"	1.345"	0.795"	0.595"	0.16 lbs
<input type="checkbox"/>	ProPEX LF Brass Coupling, 1" PEX x 1" PEX*	LF4541010	2.49"	1.345"	0.818"	N/A	0.20 lbs

### Installation

ProPEX Tool and ProPEX Rings (sold separately) are required for connecting the PEX tubing. Use the appropriately sized Uponor ProPEX Ring for tubing connections. For more information, refer to the AquaPEX Professional Plumbing Installation Guide, the AquaSAFE™ Residential Fire Sprinkler Installation Guide or the Radiant Floor Heating Installation Handbook.

### Standards

CAN/CSA B137.5; ASTM F877; ASTM F1960

### Codes

IPC; UPC; NSPC; NPC of Canada

### Listings

IAMPO 3558; HUD MR 1269; ICC ESR 1099; NSF 14- and 61-certified; U.P. Code, Annex G; \*UL 1821; \*ULC/ORD C199P

### Related Applications

PEX-a Plumbing Systems  
 Uponor Residential Fire Safety Systems  
 Radiant Heating and Cooling Systems  
 Snow and Ice Melting Systems  
 Permafrost Protection Systems  
 Turf Conditioning Systems

### Contact Information

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## ProPEX® Brass Elbow

Submittal Information

Revision B: March 17, 2009

### Project Information

Job Name:

Location:

Part No. Ordered:

Engineer:

Date Submitted:

Contractor:

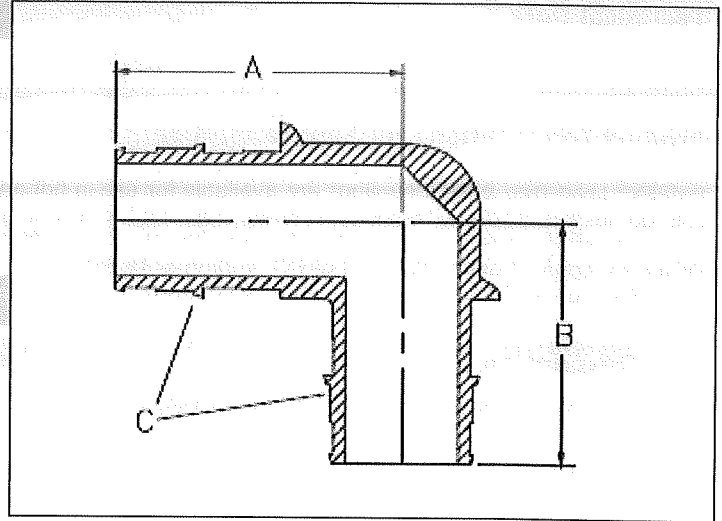
Submitted By:

Manufacturer's Representative:

Approved By:

### Technical Data

Material: B16 Copper Alloy UNS C36000



### Product Information and Application Use

The brass ProPEX® Elbow is available for use in hot and cold domestic potable water systems, and in the AQUASAFE® Residential Fire Safety systems. Also approved for use in any hydronic heating and AquaPEX® plumbing systems, each end of the elbow is manufactured with the ProPEX fitting for connections to hePEX™ or any AquaPEX tubing.

✓ Description	Part Number	A	B	C	Weight
<input type="checkbox"/> ProPEX Brass Elbow, 1/2" PEX x 1/2" PEX*	Q4710500	1.45"	1.48"	0.500"	0.10 lbs.
<input type="checkbox"/> ProPEX Brass Elbow, 5/8" PEX x 5/8" PEX	Q4710625	1.77"	1.57"	0.625"	0.15 lbs.
<input type="checkbox"/> ProPEX Brass Elbow, 3/4" PEX x 3/4" PEX*	Q4710750	2.04"	1.75"	0.750"	0.20 lbs.
<input type="checkbox"/> ProPEX Brass Elbow, 1" PEX x 1" PEX*	Q4711000	2.61"	2.28"	1.000"	0.30 lbs.
<input type="checkbox"/> ProPEX Brass Elbow, 2" PEX x 2" PEX	Q4712000	4.66"	4.36"	2.000"	2.20 lbs.

### Installation

Use appropriate ProPEX Ring for connecting the tubing. Refer to the AquaPEX Installation Handbook, the Radiant Floor Installation Handbook or the Uponor AQUASAFE® Installation Guide for additional information.

### Standards

CAN/CSA B137.5; ASTM F877; ASTM F 1960

### Codes

IPC; UPC; NSPC; NPC of Canada

### Listings

ANSI/NSF 14- and 61-certified; U.P. Code; ICC ESR 1099; HUD MR 1269; \*UL 1821; \*ULC/ORD C199P

### Related Applications

PEX-a Plumbing Systems  
AQUASAFE Fire Safety Systems  
Uponor Radiant Floor heating Systems

### Contact Information

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## ProPEX® Lead-free (LF) Brass Tee

Submittal Information

Revision B: Jan. 28, 2010

### Project Information

Job Name:

Location: \_\_\_\_\_ Part No. Ordered: \_\_\_\_\_

Engineer: \_\_\_\_\_ Date Submitted: \_\_\_\_\_

Contractor: \_\_\_\_\_ Submitted By: \_\_\_\_\_

Manufacturer's Representative: \_\_\_\_\_ Approved By: \_\_\_\_\_

### Technical Data

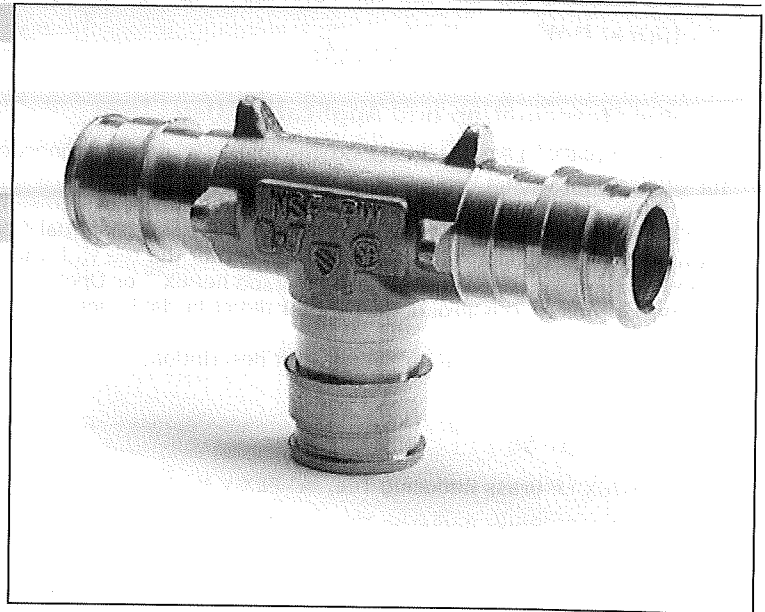
Material: C69300 Brass

### Product Information and Application Use

Uponor's ProPEX® Lead-free Brass Tees are ideal for use in hot and cold domestic potable water systems.<sup>1</sup>

This product is approved for use in the AquaSAFE™ Residential Fire Safety System. Also approved for any hydronic heating system application.

Each end of the ProPEX LF Brass Tee is manufactured with the Uponor ProPEX Fitting for connections to Wirsbo hePEX™ or Uponor AquaPEX® tubing. This product is safe for direct burial in soil.



✓	Description	Part Number	Length	Width	Weight
<input type="checkbox"/>	ProPEX LF Brass Tee, ½" PEX x ½" PEX x ½" PEX	LF4705050	2.52"	1.45"	0.20 lbs.
<input type="checkbox"/>	ProPEX LF Brass Tee, ¾" PEX x ¾" PEX x ¾" PEX	LF4707575	3.27"	1.93"	0.40 lbs.
<input type="checkbox"/>	ProPEX LF Brass Tee, 1" PEX x 1" PEX x 1" PEX	LF4701010	4.09"	2.42"	0.40 lbs.

### Installation

ProPEX Tool and ProPEX Rings (sold separately) are required for connecting the PEX tubing. Do not solder within 18 inches of the ProPEX connection. Refer to the AquaPEX Professional Plumbing Installation Guide, AquaSAFE Homeowner Handbook or Radiant Floor Heating Installation Handbook for additional information.

### Standards

CSA B137.5; ASTM F877; ASTM F1960

### Codes

IPC; UPC; NSPC; NPC of Canada

### Listings

IAPMO 3558; ANSI/NSF 14- and 61-certified; HUD MR 1269; ICC ESR 1099; UL 1821; ULC/ORD C 199P; U.P. Code, Annex G

### Related Applications

PEX-a Plumbing Systems  
 Uponor Residential Fire Safety Systems  
 Radiant Heating and Cooling Systems

### Contact Information

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 Apple Valley, MN 55124 USA  
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<sup>1</sup>ProPEX® is a registered trademark of Uponor, Inc. ProPEX™ is a trademark of Uponor Ltd.

## ProPEX® Lead-free (LF) Brass Reducing Tee

Submittal Information  
Revision B: Jan. 28, 2010

### Project Information

Job Name:

Location:

Engineer:

Contractor:

Manufacturer's Representative:

Part No. Ordered:

Date Submitted:

Submitted By:

Approved By:

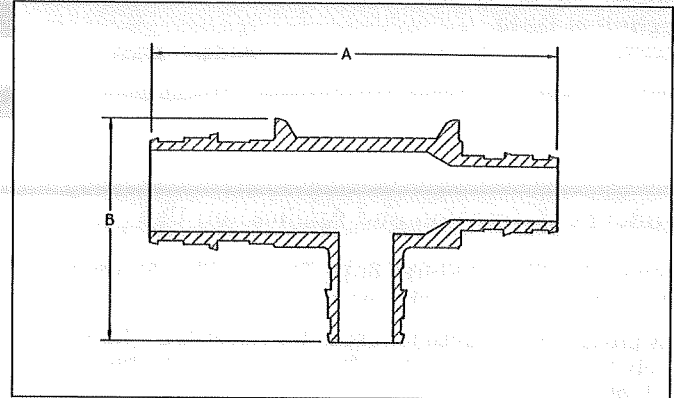
### Technical Data

Material: C69300 Brass

### Product Information and Application Use

Uponor's ProPEX® LF Brass Reducing Tee makes diverting connections for Uponor PEX tubing in supply and return mains.<sup>1</sup> This product is available for use in hot and cold domestic potable water systems, in any hydronic heating system and in the AquaSAFE™ Residential Fire Safety System. Uponor manufactures each end of the tee with the ProPEX Fitting for easy connections to Wirsbo hePEX™ or Uponor AquaPEX® tubing. This product is safe for direct burial in soil.

**Note:** Branch size is listed last in the part description.



✓	Description	Part Number	A	B	Weight
<input type="checkbox"/>	ProPEX LF Brass Reducing Tee, ¾" PEX x ¾" PEX x ½" PEX	LF4707550	3.27"	1.69"	0.40 lbs.
<input type="checkbox"/>	ProPEX LF Brass Reducing Tee, ¾" PEX x ¾" PEX x 1" PEX	LF4707710	3.62"	2.42"	0.50 lbs.
<input type="checkbox"/>	ProPEX LF Brass Reducing Tee, 1" PEX x ¾" PEX x ¾" PEX	LF4701775	3.86"	2.18"	0.30 lbs.
<input type="checkbox"/>	ProPEX LF Brass Reducing Tee, 1" PEX x ¾" PEX x 1" PEX	LF4701751	3.86"	2.42"	0.40 lbs.
<input type="checkbox"/>	ProPEX LF Brass Reducing Tee, 1" PEX x 1" PEX x ½" PEX	LF4701150	4.09"	1.95"	0.40 lbs.
<input type="checkbox"/>	ProPEX LF Brass Reducing Tee, 1" PEX x 1" PEX x ¾" PEX	LF4701175	4.09"	2.18"	0.40 lbs.

### Installation

ProPEX Tool and ProPEX Rings (sold separately) are required for connecting PEX tubing. Refer to the AquaPEX Professional Plumbing Installation Guide, the AquaSAFE Residential Fire Sprinkler Installation Guide or the Radiant Floor Heating Installation Handbook for additional information.

### Standards

CAN/CSA B137.5; ASTM F877; ASTM F1960

### Codes

IPC; UPC; NSPC; NPC of Canada

### Listings

IAPMO 3558; ANSI/NSF 14- and 61-certified; HUD MR 1269; ICC ESR 1099; UL 1821; ULC/ORD C 199P; U.P. Code, Annex G

### Related Applications

PEX-a Plumbing Systems  
Uponor Residential Fire Safety Systems  
Radiant Heating and Cooling Systems  
Snow and Ice Melting Systems  
Permafrost Protection Systems  
Turf Conditioning Systems

### Contact Information

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## 1" Branch Manifold with 1/2" ProPEX® Lead-free (LF) Outlets

Submittal Information

Revision A: Jan. 28, 2010

### Project Information

Job Name:

Location:

Part No. Ordered:

Engineer:

Date Submitted:

Contractor:

Submitted By:

Manufacturer's Representative:

Approved By:

### Technical Data

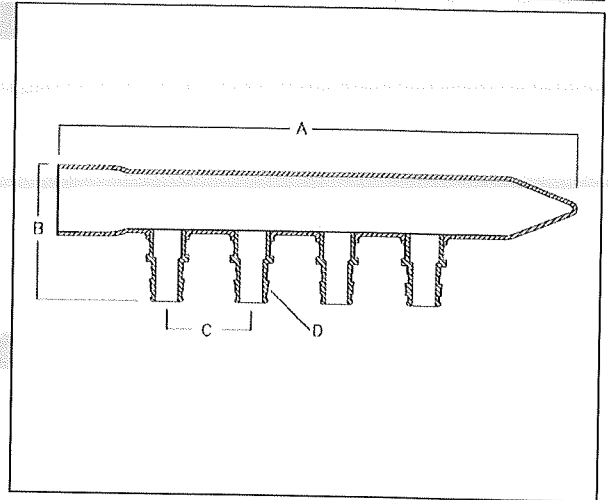
Material: Type L Copper; C69300 Brass

Maximum Temperature (no pressure): 320°F (160°C)

Maximum Working Temperature/Pressure: 210°F at 150 psi (99°C at 10 bar)

Maximum Flow Rate at 5 fps: 12.8 gpm

Maximum Flow Rate at 8 fps: 20.5 gpm



### Product Information and Application Use

The Uponor 1" Copper Branch Manifold with 1/2" ProPEX® Lead-free outlets is used for hot and cold domestic potable water distribution systems.<sup>1</sup> The manifold has a 1" copper sweat fitting adapter supply connection. All outlets are configured with 1/2" ProPEX Lead-free brass connections.

✓ Description	Part Number	A	B	C	D	Weight
<input type="checkbox"/> 1" Branch Manifold with 1/2" ProPEX LF outlets, 4 outlets	LF2801050	8.95"	2.40"	1.50"	1/2"	0.80 lbs.
<input type="checkbox"/> 1" Branch Manifold with 1/2" ProPEX LF outlets, 6 outlets	LF2811050	11.95"	2.40"	1.50"	1/2"	1.10 lbs.
<input type="checkbox"/> 1" Branch Manifold with 1/2" ProPEX LF outlets, 8 outlets	LF2821050	14.95"	2.40"	1.50"	1/2"	1.40 lbs.
<input type="checkbox"/> 1" Branch Manifold with 1/2" ProPEX LF outlets, 10 outlets	LF2831050	17.95"	2.40"	1.50"	1/2"	1.70 lbs.
<input type="checkbox"/> 1" Branch Manifold with 1/2" ProPEX LF outlets, 12 outlets	LF2841050	20.95"	2.40"	1.50"	1/2"	1.90 lbs.

### Installation

Use any product designed to mount 1" copper pipe as a mounting bracket. Any bend within 6 inches of the ProPEX connection to the manifold requires the use of a Tube Talon (F7050750) or Bend Support (A5110500 and A5150500). Refer to the AquaPEX® Professional Plumbing Installation Guide or the AquaSAFE™ Residential Fire Sprinkler Installation Guide for additional information.

### Standards

CAN/CSA B137.5; ASTM F877; ASTM F1960

### Codes

IPC; UPC; NSPC; NPC of Canada

### Listings

UL 1821; ULC/ORD - C 199P; ICC ESR 1099; ANSI/NSF 14- and 61-certified; IAPMO; U.P. Code, Annex G

### Related Applications

PEX-a Plumbing Systems  
 Uponor Residential Fire Safety Systems  
 Radiant Heating and Cooling Systems

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