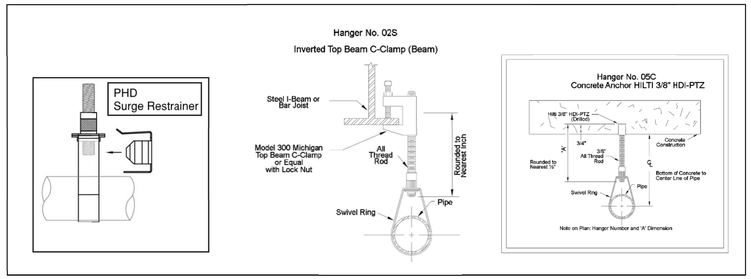
RSN: 1823630
Permit # 2024-2456053-CT
SHEET 1 of 31

STEEL PIPE HANGER SPACING UNDER 100PSI			
PIPE SIZE	BETWEEN HANGERS	TO END OF LINE	ARM-OVER LENGTH MAX.
1"	12'-0"	(SSP) 3'-0" (SSU) 3'-0"	(SSP) 2'-0" (SSU) 2'-0"
1½"	12'-0"	(SSP) 4'-0" (SSU) 4'-0"	(SSP) 2'-0" (SSU) 2'-0"
1½"	15'-0"	(SSP) 5'-0" (SSU) 5'-0"	(SSP) 2'-0" (SSU) 2'-0"
2"	15'-0"	(SSP) 5'-0" (SSU) 5'-0"	(SSP) 2'-0" (SSU) 2'-0"
2½"	15'-0"	(SSP) 5'-0" (SSU) 5'-0"	(SSP) 2'-0" (SSU) 2'-0"
3"	15'-0"	(SSP) 5'-0" (SSU) 5'-0"	(SSP) 2'-0" (SSU) 2'-0"
4"	15'-0"	(SSP) 5'-0" (SSU) 5'-0"	(SSP) 2'-0" (SSU) 2'-0"
PER NFPA 13 - 17.4.2 (A)			
*NOTE: This table is based upon threadable thinwall pipe 1"-2" and 2½" and larger pipe is other steel pipe.			



HANGER DETAILS
N. T. S.

Adopted Codes

ICC 2021
NEC 2020
NFPA 13 2019
NFPA 72 2019
COA Amendments 22 & 66

Scope of Work

1) Modify the existing previously hydraulically calculated fire sprinkler system to accommodate a new tenant build-out. Add (9), relocate (25), and plug (5) new sprinkler heads due to modified wall and ceiling configurations.

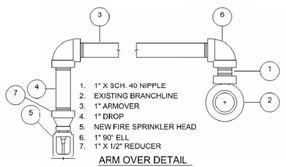
Project Notes

1) Fire sprinkler hangers shall be installed per NFPA 13 2019 section 29.5.
2) Fire Sprinkler piping, sprinkler, and hanger modifications shall be installed per NFPA 13 2019 section 29.5
3) All new 1" piping shall be bull moose schedule 40.
4) There shall be no new penetrations into rated walls.
5) Armovers shall be 1" NPT unless specified.
6) The modifications presented pose no significant change to the hydraulic design area.
7) The GC shall coordinate with building management and the fire alarm contractor for fire alarm system shutdown.
8) It's the owners responsibility to maintain at least 40° F throughout the area of work to prevent the sprinkler system from freezing.
9) Sprinklers shall be installed at quarter-point in 2'x4' ceiling tiles and center-of-tile in 2'x2' ceiling tiles unless specified otherwise by the sprinkler project manager.
10) Relocating existing branch lines and sprinkler mains, painting of pipe, patching walls or ceilings, wireing, demolotion work, custom sprinkler heads, alarm modifications, and testing or adding backflow devices are excluded from this scope of work.

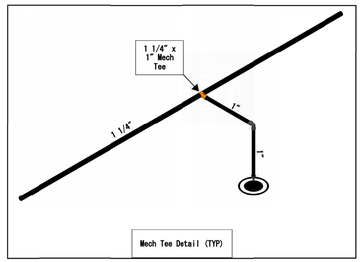
- - - - - = Existing Pipe
——— = New Pipe
◉ = Modified Pendent
⊘ = Modified Upright
● = Existing Sprinkler
\ = Hanger Ring

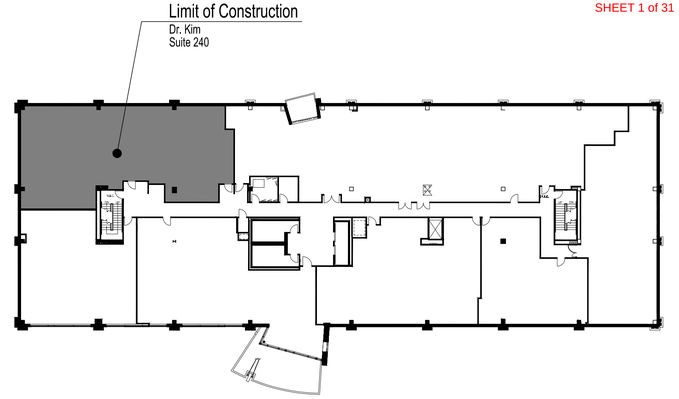


2 Reflected Ceiling Plan
Suite 240
Scale: 1/8" = 1'-0"
North



SPRINKLER DETAILS
N. T. S.





1 Proximity Plan
Level Two
Not to Scale
North

Codes and Regulations

Building Profile

City/ County: Aurora / Arapahoe
AHJ: Aurora Building Division
Construction Classification: II-B
Building Height / Levels: Unknown / 4
Automatic Sprinklers Throughout

Use and Occupancy

Occupant Name: Dr. Kim
Occupant Use: General Business Office
Occupancy Classification: Business Group B

Tenant Area

	Total	Existing	Expansion
(approx.) Useable SF:	3,131.387700		
Construction Area:	3,132		

City of AURORA

Applicable Codes

2021 IBC	(International Building Code)
2021 IEBC	(International Existing Building Code)
2021 IPC	(International Plumbing Code)
2021 IMC	(International Mechanical Code)
2021 IFC	(International Fire Code)
2021 IECC	(International Energy Conservation Code)
2020 NEC	(National Electric Code)
2017 ICC/ANSI A117.1	Accessibility Standard

Room Schedule

200	Public Corridor	213	Exam
201	Waiting	214	Office
202	Reception	215	Office
203	Work Room	216	Break Room
204	Hallway	217	Lab
205	Procedure	218	Exam
206	Exam	219	IT / Storage
207	Exam	220	----
208	Exam	221	ADA Restroom
209	Exam	222	Public Corridor
210	----	223	Storage
211	Exam	224	MA Station
212	Procedure	225	Storage

COA Adopted Codes for this project:
ICC-2021 - NEC-2023
NFPA 13-2019 - NFPA 72-2019
COA Amendments 22 & 66

City of Aurora Building Division
Counter Permit Authorized by: *MApodaca*
RSN: *1823630*
Permit: *2024-2456053-CT*
Date: *Jul 26, 2024*
2021 INTERNATIONAL CODES & 2023 NEC

Provide a full size set of legible approved construction documents **PRINTED IN COLOR** for review by the Field Inspector.

	CNT	Symbol	Position	Temp	K-Factor	Finish	Response	NPT	Make	Model
Add	10	◉A	Semi-Recessed	155	5.6	White	Quick	1/2"	Reliable	RA3415
Relocate	21	◉R	Semi-Recessed	155	5.6	White	Quick	1/2"	Reliable	RA3415
Plug	4	P								

1444 S. Potomac

1444 S. Potomac
Aurora, CO 80112

Suite 240

Dr. Kim

ALLIANCE
—FIRE PROTECTION—

PO Box 2023
Centennial,
CO 80161

Drawn by: JL
State Contractor #: 24-S-17474
Date: 7/16/2024

NICET CERTIFIED
Troy Nicholas
Water-Based Systems Layout Level III
Certification Number: 166704
Expires: 05-01-2027

Troy Nicholas
Digitally signed by Troy Nicholas
DN: C=US, E=troy@alliancefireco.com, OU=Alliance Fire Protection LLC, CN=Troy Nicholas
Reason: I have reviewed this document
Date: 2024.07.22 10:09:26-06'00'

Equipment Submittal

Dr. Kim

1444 S Potomac Aurora, CO 80122

Suite 240

NICET CERTIFIED

Troy Nicholas
Water-Based Systems Layout Level III
Certification Number: 166704
Expires: 05-01-2027

Troy Nicholas

Digitally signed by Troy Nicholas
DN: C=US, E=troy@alliancefireco.com, OU=Alliance Fire Protection LLC, CN=Troy Nicholas
Reason: I have reviewed this document
Date: 2024.07.17 00:03:39-06'00'

ALLIANCE
—FIRE PROTECTION—

RSN: 1823630
Permit # 2024-2456053-CT
SHEET 3 of 31

Reliable®

Model F1FR56 Series Quick-Response Extended Coverage (QREC) Sprinklers

K-factor 5.6 (80)

Features

- Extended coverage quick-response sprinklers
- Pendent and horizontal sidewall (EC-8) deflectors
- Low profile, compact design
- Available in a wide variety of finishes

Product Description

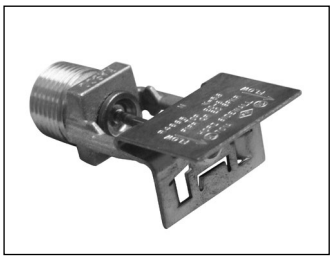
Reliable Model F1FR56 QREC series sprinklers are quick-response extended coverage standard spray automatic fire sprinklers utilizing a sensitive 3.0 mm glass bulb thermal element for use in light hazard occupancies.

Pendent and horizontal sidewall sprinklers may be installed exposed or surface mounted using escutcheons such as the Reliable Models B, C, or HB (reference Technical Bulletin 204). When installed recessed or concealed, the Model F1FR56 QREC series sprinklers are specifically listed with and may only be installed with listed Reliable escutcheons and cover plates. Refer to the technical information on the following pages for specific listings for recessed and concealed installations and refer to Figures 3 and 4 for dimensional information.

Table A provides a summary of the approvals and availability of specific Model F1FR56 QREC series sprinkler configurations. Additional technical information for each sprinkler model is provided on the following pages.



Model F1FR56 QREC Pendent



Model F1FR56 QREC
Horizontal Sidewall

Note: Not all versions of the product are shown.

Sprinkler Summary — **Table A**

Sprinkler Model	K-Factor gpm/psi$^{1/2}$ (lpm/bar$^{1/2}$)	Orientation	Listings & Approvals	Max. Working Pressure psi (bar)	Sprinkler Identification Number (SIN)
F1FR56 QREC	5.6 (80)	Pendent	cULus	250 (17.2)	RA2845
		Concealed Pendent	cULus	250 (17.2)	RA2845
		Horizontal Sidewall	cULus, FM	175 (12)	RA2865

Model F1FR56 Extended Coverage Pendent Sprinkler — SIN RA2845

Technical Specifications
- **Style:**
  - Pendent
  - Recessed Pendent
  - Concealed Pendent
- **Threads:** 1/2" NPT or ISO 7-R1/2
- **Nominal K-Factor:** 5.6 (80 metric)
- **Max. Working Pressure:** 250 psi (17.2 bar)

Material Specifications
- **Thermal Sensor:** 3 mm Glass Bulb
- **Sprinkler Frame:** Brass Alloy
- **Cap:** Bronze Alloy
- **Sealing Washer:** Nickel with PTFE
- **Load Screw:** Copper Alloy
- **Deflector:** Brass Alloy

Sprinkler Finishes
(See Table B)

Sensitivity
Quick response

Temperature Ratings
135°F (57°C)
155°F (68°C)

Recessed Escutcheons
Model F1
Model F2
Model FP

Cover Plate
Model CCP (135°F [57°C])

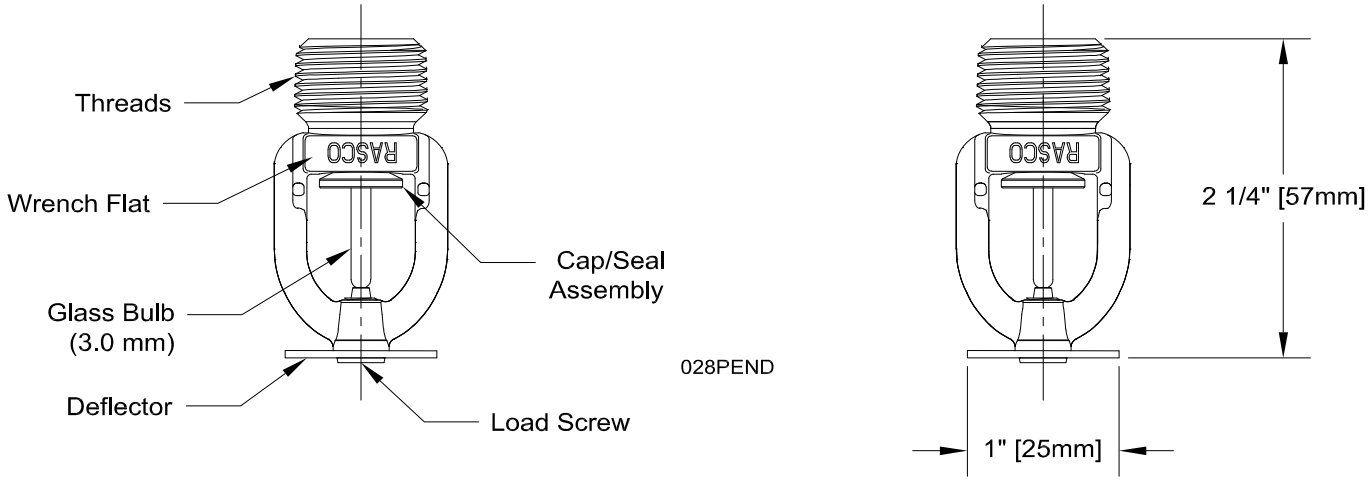
Sprinkler Wrenches
Model W2 (non-recessed)
Model W4 (recessed or concealed)

Listings and Approvals[1]
cULus Listed



Notes:
1. Listed for light hazard use only.

Model F1FR56 EC Pendent Sprinkler Components and Dimensions — **Figure 1**



Note: Please refer to Figure 3 for recessed and concealed installation.

F1FR56 EC Pendent Required Minimum Flow and Pressure — **Table B**

Coverage Area ft x ft (m x m)	Flow gpm (L/min)	Pressure psi (bar)
16 x 16 (4.9 x 4.9)	26 (98.4)	21.6 (1.5)
18 x 18 (5.5 x 5.5)	33 (125.0)	34.7 (2.4)
20 x 20 (6.0 x 6.0) [1]	40 (151.4)	51.0 (3.5)

Note: For cULus Listing, limited to 135°F (57°C) temperature rating only.

Model F1FR56 Extended Coverage Horizontal Sidewall Sprinkler — SIN RA2865

Technical Specifications
- **Style:**
  - Horizontal Sidewall
  - Recessed Horizontal Sidewall
- **Threads:** 1/2" NPT or ISO 7-R1/2
- **Nominal K-Factor:** 5.6 (80 metric)
- **Max. Working Pressure:**
  - 175 psi (12 bar)

Material Specifications
- **Thermal Sensor:** 3 mm Glass Bulb
- **Sprinkler Frame:** Brass Alloy
- **Cap:** Bronze Alloy
- **Sealing Washer:** Nickel with PTFE
- **Load Screw:** Copper Alloy
- **Deflector:** Brass Alloy

Sprinkler Finishes
(See Table B)

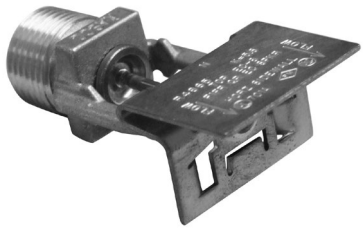
Sensitivity
Quick response

Temperature Ratings
135°F (57°C)
155°F (68°C)
175°F (79°C)

Recessed Escutcheons
Model F1
Model F2
Model FP

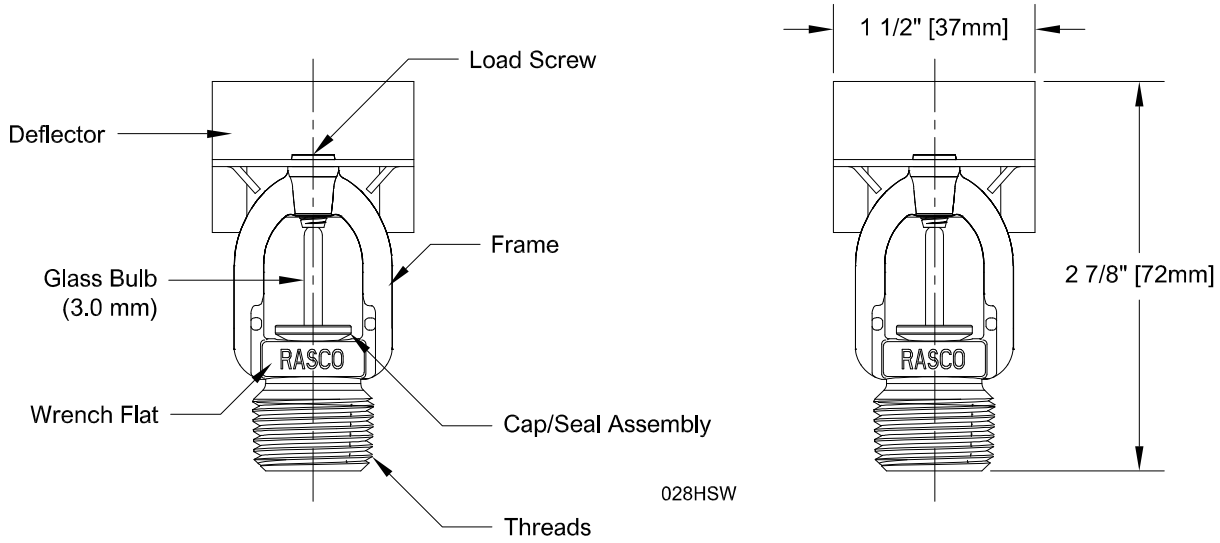
Sprinkler Wrenches
Model W2 (non-recessed)
Model W4 (recessed)

Listings and Approvals[1]
cULus Listed
FM Approved[2]



Notes:
1. Listed and Approved for light hazard only.
2. FM Approved in 135°F (57°C) temperature rating only.

Model F1FR56 EC Horizontal Sidewall Sprinkler Components and Dimensions — **Figure 2**



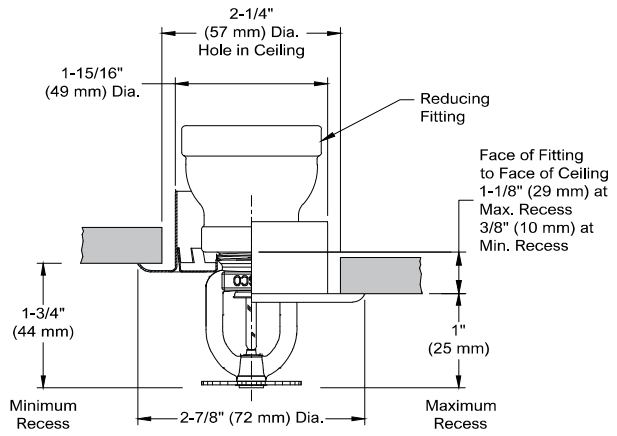
Note: Please refer to Figure 4 for recessed installation.

F1FR56 EC Horizontal Sidewall Required Minimum Flow and Pressure — **Table C**

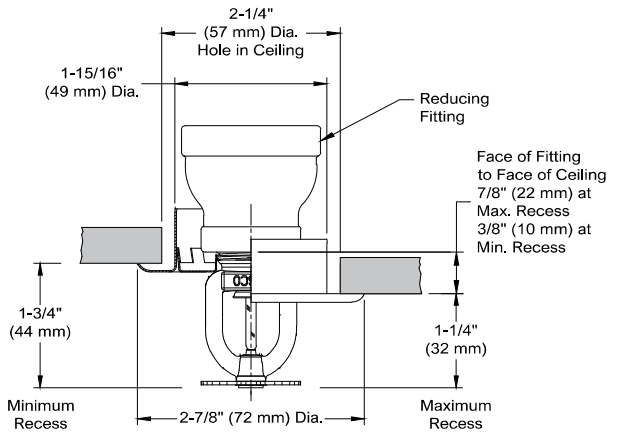
Coverage Area ft x ft (m x m)	cULus		FM	
	Flow gpm (L/min)	Pressure psi (bar)	Flow gpm (L/min)	Pressure psi (bar)
16 x 16 (4.9 x 4.9)	26 (98.4)	21.6 (1.5)	26 (98.4)	21.5 (1.5)
16 x 18 (4.9 x 5.5)	29 (125.0)	26.6 (1.8)	30 (113.6)	28.5 (2.0)
16 x 20 (4.9 x 6.0)	32 (121.1)	32.4 (2.2)	33 (125.0)	34.5 (2.4)

Recessed and Concealed Installation: Pendent Sprinklers

Figure 3

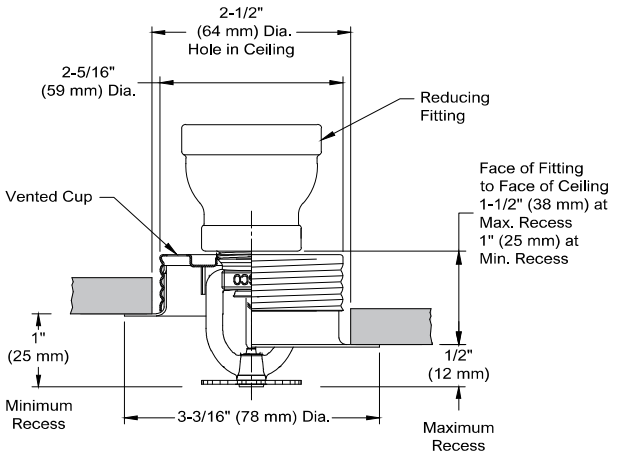


Models F1 & F1FR Pendent Sprinkler
with Model F1 Recessed Escutcheon
3/4" (19mm) Nominal Adjustment



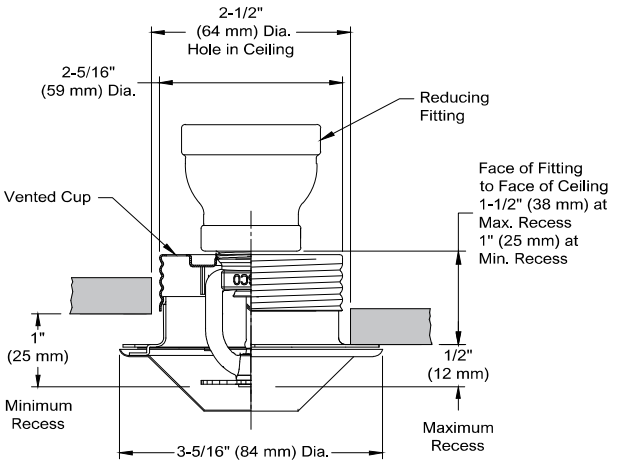
Models F1 & F1FR Pendent Sprinkler
with Model F2 Recessed Escutcheon
1/2" (13mm) Nominal Adjustment

F1_REC_PEND_CCP



Models F1 & F1FR Pendent Sprinkler
with Model FP Recessed Escutcheon
1/2" (13mm) Nominal Adjustment

Note: Model FP recessed assemblies may not be used where the pressure in the space above the ceiling is positive with respect to the protected area. Ensure that the openings in the Model FP cup are unobstructed following installation.



Model F1FR56 CCP Conical Concealed Sprinkler
1/2" (13mm) Nominal Adjustment
(Nominal Cover Plate Projection is 1" (25 mm))

Note: Model CCP concealed assemblies may not be used where the pressure in the space above the ceiling is positive with respect to the protected area. Ensure that the openings in the Model CCP cup are unobstructed following installation.



F1 Escutcheon
(F2 Similar)

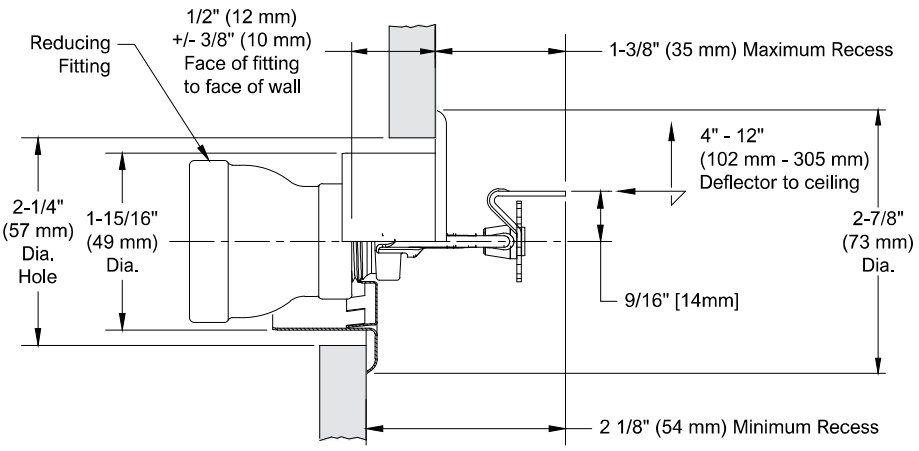


FP Escutcheon



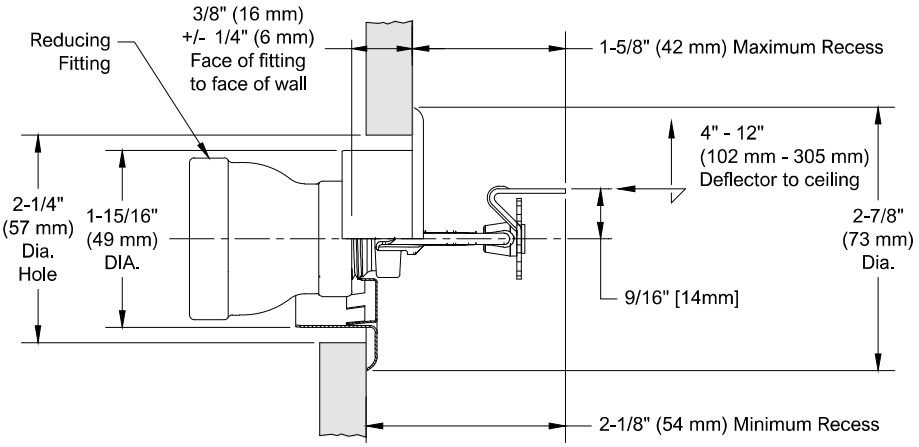
CCP Cover Plate

Recessed Installation: Horizontal Sidewall Sprinklers **Figure 4**

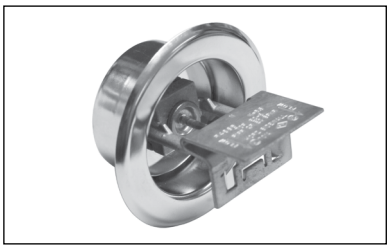


Model F1FR Horizontal Sidewall Sprinkler
with Model F1 Recessed Escutcheon
3/4" (19mm) Nominal Adjustment

F1_REC_HSW_NO FP



Model F1FR Horizontal Sidewall Sprinkler
with Model F2 Recessed Escutcheon
1/2" (13mm) Nominal Adjustment



Model F1 Recessed Escutcheon
(Model F2 similar)

Wrenches



Model W2 (non-recessed)



Model W4
(recessed, concealed pendent)

Finishes[1]

Table B

Standard Finishes			Special Application Finishes		
Sprinkler	**F1, F2 and FP**[2] **Escutcheons**	**CCP Cover Plate**[2]	**Sprinkler**	**F1, F2 and FP**[2] **Escutcheons**	**CCP Cover Plate**[2]
Bronze	Brass	Chrome	Electroless Nickel PTFE[3][4]	Bright Brass	Bright Brass
Chrome	Chrome	White Paint	Bright Brass	Satin Chrome	Satin Chrome
White Polyester[3]	White Polyester		Satin Chrome	Custom Color Polyester	Custom Color Paint
			Custom Color Polyester[3]		

Notes:
1. Paint or any other coating applied over the factory finish will void all approvals and warranties.
2. Model FP escutcheons and Model CCP sprinklers utilize a galvanized steel cup with a finished trim ring or cover plate.
3. cULus Listed as corrosion resistant.
4. FM Approved as corrosion resistant (horizontal sidewall only).

Installation

Model F1FR EC Series sprinklers must be installed in accordance with NFPA13 and the requirements of all applicable authorities having jurisdiction using the Reliable sprinkler installation wrench identified in this bulletin. Any other wrench may damage the sprinkler. The Models W2 and W4 wrenches have two sets of jaws. Use the smallest set of jaws that fit on the wrench flats of the sprinkler. A leak tight sprinkler joint can be obtained with a torque of 8 to 18 lb-ft (11 to 24 N·m). Do not tighten sprinklers over the maximum recommended installation torque. Exceeding the maximum recommended installation torque may cause leakage or impairment of the sprinkler.

Glass bulb sprinklers have orange bulb protectors or protective caps to minimize bulb damage during shipping, handling and installation. Reliable sprinkler installation wrenches are designed to install sprinklers with bulb protectors in place. Remove the bulb protector at the time when the sprinkler system is placed in service for fire protection. Removal of the bulb protector before this time may leave the bulb vulnerable to damage. Remove bulb protectors by undoing the clasp by hand. Do not use tools to remove bulb protectors.

Maintenance

Reliable Model F1FR EC series sprinklers should be inspected and the sprinkler system maintained in accordance with NFPA 25, as well as the requirements of any Authorities Having Jurisdiction.

Prior to installation, sprinklers should remain in the original cartons and packaging until used. This will minimize the potential for damage to sprinklers that could cause improper operation or non-operation.

Do not clean sprinklers with soap and water, ammonia liquid or any other cleaning fluids. Remove dust by gentle vacuuming without touching the sprinkler.

Replace any sprinkler which has been painted (other than factory applied). A stock of spare sprinklers should be maintained to allow quick replacement of damaged or operated sprinklers. Failure to properly maintain sprinklers may result in inadvertent operation or non-operation during a fire event.

Guarantee

For the guarantee, terms, and conditions, visit www.reliablesprinkler.com.

Ordering Information

Specify the following when ordering:

Model
- F1FR56 QREC

Deflector/Orientation
- Pendent
- CCP Concealed Pendent
- Horizontal Sidewall

Temperature Rating
- See sprinkler technical specifications

Sprinkler Finish
- See Table B

Recessed Escutcheon
- F1
- F2
- FP

Escutcheon Finish
- See Table B

CCP Cover Plate Temperature Rating
- 135°F (57°C)

CCP Cover Plate Finish
- See Table B

Sprinkler Wrench
- Model W2 (non-recessed)
- Model W4 (recessed, concealed)

P/N 9999970388

Eddythread 40

A Lightweight Schedule 40 Replacement Pipe That Has a Corrosion Resistance Ratio of 1.0

Bull Moose Tube Company has been making pipe for a long time and is recognized as a producer of quality pipe products. Eddythread 40 is designed with the same thoroughness as our other fine pipe products and now our customers have an option to buy a carefully designed replacement for Schedule 40 that:

- Has a Corrosion Resistance Ratio of 1.0
- Has a Pressure Rating of 300 psi
- Is Lighter Weight Than Schedule 40
- Is Approved by Factory Mutual and Listed by Underwriters Laboratories
- Is Produced in Accordance to ASTM A-135 and A-795
- Can be Used With Standard Schedule 40 Threaded Fittings, Couplings and Valves
- Is Produced From Steel With Excellent Properties of Strength and Threadability
- Can be Used in Wet, Dry, Preaction, and Deluge Type Sprinkler Systems*
- Offers Lower Freight Costs

EDDYTHREAD 40 SPECIFICATIONS

NOMINAL PIPE SIZE (in)	WEIGHT (lbs/ft)	I.D. (in)	BUNDLE SIZE
1	1.461	1.083	70
1 1/4	2.070	1.418	51
1 1/2	2.547	1.654	44
2	3.308	2.123	30

CORROSION RESISTANCE RATIOS

NOMINAL PIPE SIZE (in)	SCHEDULE 40	EDDYTHREAD 40
1	1.00	1.00
1 1/4	1.00	1.00
1 1/2	1.00	1.00
2	1.00	1.00

** Eddythread 40 can be hot dipped galvanized to meet FM's requirement for dry systems*

BULL MOOSE TUBE COMPANY
A CAPARO company

1819 Clarkson Road
Chesterfield, MO 63017
(800) 325-4467
FAX: (636) 537-2645
www.bullmoosetube.com
e-mail:sales@bullmoosetube.com

For additional information, contact your salesperson today at (800) 325-4467 or (636) 537-2600 in the USA, or from Canada call (800) 882-4666

All information contained herein is accurate as known at the time of publication. Bull Moose Tube reserves the right to change product specifications without notice and without incurring obligation.

RSN: 1823630
Permit # 2024-2456053-CT
SHEET 11 of 31

NFPA SWIVEL RING HANGER — FIG. 141 & 141F

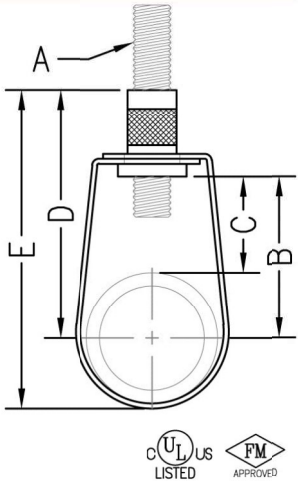
Function: Designed for the suspension of non-insulated stationary pipe lines. The knurled insert nut that allows a vertical adjustment after installation, is tapped to NFPA reduced rod size standards. Captured knurled insert nut present on pipe sizes ½" (15mm) to 2" (50mm). The capture is permanent in the bottom portion of the band, allowing the hanger to be opened during installation if desired, but preventing the knurled insert nut from falling completely out. Fig. 141F has a layer of felt which separates the pipe from the hanger to reduce vibration and sound.

Material: Carbon steel

Finish: Pre-galvanized **(Fig. 141)** or pre-galvanized with felt lining **(Fig. 141F)**

Approvals: Underwriters' Laboratories Listed in the U.S. (UL), Canada (CUL), for use with standard steel pipe sizes ¾" (20mm) to 8" (200mm) and CPVC pipe size ¾" (20mm) to 4" (100mm). Factory Mutual Approved for steel pipe sizes ¾" (20mm) to 8" (200mm). Complies with Federal Specifications A-A-1192A (Type 10), and Manufacturers' Standardization Society ANSI/MSS SP-58 (Type 10) which supersedes ANSI/MSS SP-69.

Ordering: Specify figure number and pipe size.



NOTE: If ordering Fig. 141F felt lined hangers for pipe sizes of 3½"(90mm) or under, order the next largest size to allow for the thickness of the felt lining. Metric knurl insert nuts available upon request.

Pipe Size		Rod Size	B		Adj. C		D		E		Max. Rec. Load		Wt. Each	
											lbs.	kN	lbs.	kg
½	(15)	⅜	1 7/8	(47.63)	1 7/16	(36.51)	2 3/4	(69.85)	3 1/16	(77.79)	300	(1.33)	.10	(.05)
¾	(20)	⅜	1 11/16	(42.86)	1 1/8	(28.58)	2 1/2	(63.50)	3 1/16	(77.79)	300	(1.33)	.10	(.05)
1	(25)	⅜	1 5/8	(41.28)	1	(25.40)	2 1/2	(63.50)	3 3/16	(80.96)	300	(1.33)	.10	(.05)
1¼	(32)	⅜	1 15/16	(49.21)	1 1/16	(26.99)	2 13/16	(71.44)	3 9/16	(90.49)	300	(1.33)	.11	(.05)
1½	(40)	⅜	2 1/8	(53.98)	1 1/16	(26.99)	3 1/8	(79.38)	3 7/8	(98.43)	300	(1.33)	.11	(.05)
2	(50)	⅜	2 7/16	(61.91)	1 1/8	(28.58)	3 5/16	(84.14)	4 3/8	(111.13)	300	(1.33)	.14	(.06)
2½	(65)	⅜	3 1/16	(77.79)	1 5/8	(41.28)	3 15/16	(100.01)	5 3/8	(136.53)	525	(2.34)	.19	(.09)
3	(80)	⅜	3 11/16	(93.66)	1 7/8	(47.63)	4 9/16	(115.89)	6 5/16	(160.34)	525	(2.34)	.23	(.10)
3½	(90)	⅜	3 3/4	(95.25)	1 7/8	(47.63)	4 5/8	(117.48)	6 5/8	(168.28)	525	(2.34)	.25	(.11)
4	(100)	⅜	4 3/16	(106.36)	1 7/8	(47.63)	5 1/16	(128.59)	7 5/16	(185.74)	650	(2.89)	.30	(.14)
5	(125)	½	4 5/8	(117.48)	1 5/8	(41.28)	5 5/8	(142.88)	8 3/8	(212.73)	1000	(4.45)	.50	(.23)
6	(150)	½	5 5/8	(142.88)	2 1/4	(57.15)	6 1/2	(165.10)	9 13/16	(249.24)	1000	(4.45)	.58	(.26)
8	(200)	½	6 13/16	(173.04)	2 7/16	(61.91)	7 15/16	(201.61)	12 1/4	(311.15)	1000	(4.45)	.90	(.41)

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SURGE RESTRAINT — FIG. 055

Function: Designed to restrict the upward movement of activated fire sprinkler systems. Grips ring hanger, NOT THE NUT, and allows for fine tuning adjustments. Listed for use with PHD Manufacturing, Inc. Figure 141 ring hangers only.
Material: Spring Steel
Finish: Powder Coated
Install: Installs easily before or after pipe installation and without tools. Simply clip Fig. 055 onto Fig. 141 ring hanger and run the hanger rod down to the bottom plate surface to ensure proper restraint.
Approvals: Underwriters Laboratories listed for US and Canada.
Ordering: Specify figure number.
NOTE: For use up to 2" (50) pipe, one size fits all.

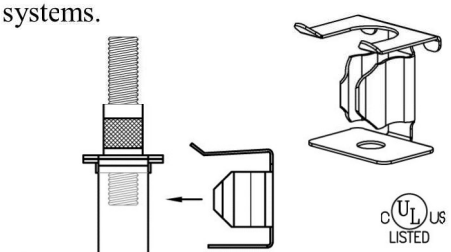


Fig. 055
(Pictured With Fig. 141)

3.2.11.1 Product description
3.2.11.2 Material specifications
3.2.11.3 Technical data
3.2.11.4 Installation instructions
3.2.11.5 Ordering information

3.2.11 STUD FASTENERS FOR ATTACHMENT TO CONCRETE

3.2.11.1 PRODUCT DESCRIPTION

The Hilti threaded stud program is for use with Hilti powder-actuated tools to provide a faster and more reliable solution for making attachments to concrete base materials. Threaded studs are available in standard carbon steel. The X-W6 and W10 threaded studs have varying shank lengths to provide more reliable fastenings to standard and high strength concrete. Thread diameters of 1/4" have thread lengths ranging from 1/2" through 1-1/2". The 3/8" thread diameter has a single thread length of 1-3/16".



X-W6



W10

Listings/Approvals

ICC-ES (International Code Council)
ESR-1663 with LABC/LARC Supplement

FM (Factory Mutual)
W10-30-27P10, W10-30-32P10 and W10-30-42P10 Fasteners for Sprinkler Pipe Hangers

UL (Underwriters Laboratories)
W10-30-32P10 and W10-30-42P10, Fasteners for Sprinkler Pipe Hangers - Up to 2-1/2" diameter pipe

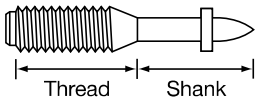
3.2.11.2 Material specifications

Fastener designation	Fastener material	Fastener plating
X-W6	Carbon Steel	5 µm Zinc[1]
W10	Carbon Steel	5 µm Zinc[1]

1 ASTM B633, SC1, Type III. Refer to Section 2.3.3.1 for more information.

3.2.11.3 Technical data

Fastener designation	Thread designation	Thread length in. (mm)	Shank length in. (mm)
X-W6-20-22	UNC 1/4-inch	**3/4** (20)	**7/8** (22)
X-W6-20-27	UNC 1/4-inch	**3/4** (20)	**1** (27)
X-W6-38-27	UNC 1/4-inch	**1-1/2** (38)	**1** (27)
W10-30-27	UNC 3/8-inch	**1-3/16** (30)	**1** (27)
W10-30-32	UNC 3/8-inch	**1-3/16** (30)	**1-1/4** (32)
W10-30-42	UNC 3/8-inch	**1-3/16** (30)	**1-5/8** (42)



Allowable loads in normal weight concrete[1,2]

Description	Fastener	Shank diameter in. (mm)	Minimum embedment in. (mm)	Concrete compressive strength			
				2000 psi		4000 psi	
				Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
1/4–20 Threaded stud	X-W6	**0.145** (3.7)	**3/4** (19)	**40** (0.18)	**55** (0.24)	**40** (0.18)	**55** (0.24)
			1 (25)	**85** (0.38)	**195** (0.87)	**110** (0.49)	**225** (1.00)
3/8–16 Threaded stud	W10	**0.205** (5.2)	**1** (25)	**85** (0.38)	**95** (0.42)	**100** (0.44)	**105** (0.47)
			1-1/4 (32)	**175** (0.78)	**345** (1.53)	**200** (0.89)	**380** (1.69)
			1-5/8 (41)	**285** (1.27)	**380** (1.69)	**385** (1.71)	**395** (1.76)

1 The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

2 Multiple fasteners are recommended for any attachment.

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Allowable Loads in Minimum f'_c = 3000 psi Structural Lightweight Concrete[1,4]

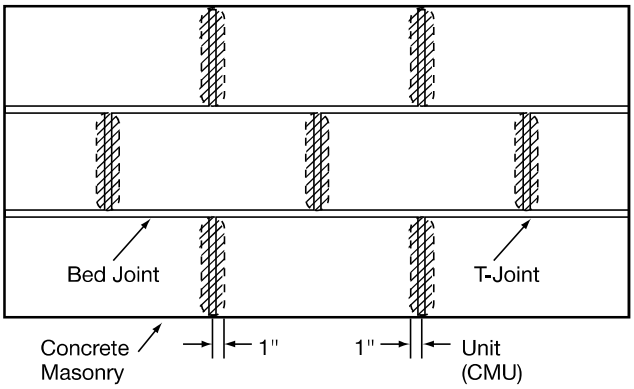
Fastener description	Fastener	Shank dia. in. (mm)	Min. embed. in. (mm)	Fastener location				
				Installed into concrete		Installed through 3" deep metal deck into concrete[2,3]		
				Tension lb (kN)	Shear lb (kN)	Tension lb (kN)		Shear lb (kN)
						Upper flute	Lower flute	
1/4–20 Threaded Stud	X-W6	0.145 (3.7)	3/4 (20)	125 (0.56)	185 (0.82)	125 (0.56)	115 (0.54)	185 (0.82)
			1 (25)	175 (0.78)	185 (0.82)	160 (0.71)	180 (0.80)	185 (0.82)
3/8–16 Threaded Stud	W10	0.205 (5.2)	1 (25)	265 (1.18)	190 (0.85)	160 (0.71)	–	185 (0.82)
			1-1/4 (32)	280 (1.25)	380 (1.69)	160 (0.71)	210 (0.93)	470 (2.09)
			1-5/8 (41)	445 (1.98)	540 (2.40)	435 (1.93)	325 (1.45)	675 (3.00)

1 The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
2 The steel deck profile is 3" deep composite floor deck with a thickness of 20 gauge (0.0358"). Figure 1 (Section 3.2.1.6) shows the nominal flute dimensions, fastener locations and load orientations for the deck profile.
3 Structural lightweight concrete fill above top of metal deck shall be a minimum of 3-1/4" deep.
4 Multiple fasteners are recommended for any attachment.

Allowable Loads in Concrete Masonry Units[1,2,3,4,5,8]

Fastener description	Fastener	Shank diameter in. (mm)	Minimum embedment in. (mm)	Hollow CMU				Grout filled CMU			
				Face shell[6]		Mortar joint[6]		Face shell[6]		Mortar joint[6]	
				Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear[7] lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear[7] lb (kN)
1/4-20 Threaded Stud	X-W6	0.145 (3.7)	1 (25)	105 (0.47)	175 (0.78)	80 (0.36)	110 (0.49)	125 (0.56)	175 (0.78)	135 (0.60)	150 (0.67)

1 The tabulated allowable load values are for the low-velocity fastener only, using a safety factor of 5.0 or higher. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
2 The tabulated allowable load values are for low-velocity fasteners installed in normal weight or lightweight concrete masonry units conforming to ASTM C90.
3 The tabulated allowable load values are for low-velocity fasteners installed in concrete masonry units with mortar conforming to ASTM C270, Type N.
4 The tabulated allowable load values are for low-velocity fasteners installed in concrete masonry units with grout conforming to ASTM C476, as coarse grout.
5 The tabulated allowable load values are for one low-velocity fastener installed in an individual masonry unit cell and at least 4" from the edge of the wall.
6 Fastener can be located anywhere on the face shell or mortar joint as shown in the figure to the right.
7 Shear direction can be horizontal or vertical (Bed Joint or T-Joint) along the CMU wall plane.
8 Multiple fasteners are recommended for any attachment.



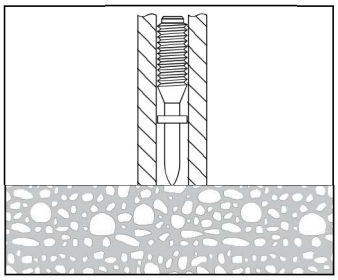
Acceptable locations (NON-SHADED AREAS) for threaded studs in CMU walls

Allowable bending moments for threaded stud fasteners installed in minimum 2,000 psi concrete[1,2]

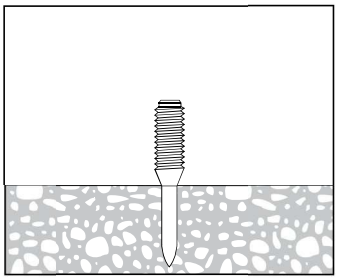
Fastener designation	M_{rec} ft-lb (Nm)
X-W6	3.6 (4.9)
W10	10.0 (13.6)

1 Based on a safety factor greater than or equal to 2.0.
2 For more information on bending moments, reference Section 3.2.2.7.

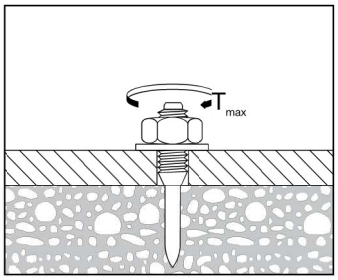
3.2.11.4 INSTALLATION INSTRUCTIONS*



1. Press tip of fastener to concrete base material. Drive fastener with Hilti powder-actuated tool.



2. Ensure proper threaded stud embedment.



3. Make attachment. Do not exceed Maximum Tightening Torque, T_{max}.

* These are abbreviated instructions which may vary by application. **ALWAYS** review/follow the instructions accompanying the product.

Maximum tightening torque, T_{max}, for threaded studs driven into concrete, ft-lb (Nm)

Stud type	
X-W6	W10
3.0 (4.0)	**4.5** (6.0)

3.2.11.5 ORDERING INFORMATION

Fastener description	Shank length in. (mm)	Shank Ø in. (mm)	Thread length in. (mm)	Thread Ø	Guidance washer Ø	Packaging quantity
X-W6-20-22 FP8	**7/8** (22)	**0.145** (3.7)	**3/4** (20)	UNC 1/4-inch	8 mm plastic	100 pcs
X-W6-20-27 FP8	**1** (27)	**0.145** (3.7)	**3/4** (20)	UNC 1/4-inch	8 mm plastic	100 pcs
X-W6-38-27 FP8	**1** (27)	**0.145** (3.7)	**1-1/2** (38)	UNC 1/4-inch	8 mm plastic	100 pcs
W10-30-27 P10	**1** (27)	**0.205** (5.2)	**1-3/16** (30)	UNC 3/8-inch	10 mm plastic	100 pcs
W10-30-32 P10	**1-1/4** (32)	**0.205** (5.2)	**1-3/16** (30)	UNC 3/8-inch	10 mm plastic	100 pcs
W10-30-42 P10	**1-5/8** (42)	**0.205** (5.2)	**1-3/16** (30)	UNC 3/8-inch	10 mm plastic	100 pcs





X-W6



W10*

* W10 threaded stud installation requires a 10mm fastener base plate.

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Fasteners

Anchors, expansion shields, concrete inserts, explosive-driven fasteners and threaded head screws provide anchorage to building structural members for supporting pipe hangers. See PIPE HANGER listing for other components and minimum rod sizes. Unless specifically noted in the listing, the following fasteners are FM Approved for vertical installation only.

Explosive-Driven Fasteners

Explosive-driven fasteners provide anchorage to concrete or steel building members for supporting pipe hangers. The powder-actuated tool used for driving these fasteners may represent an ignition source; therefore, it should not be used in classified hazardous locations or near easily ignited materials. Fasteners should not be used for support of pipe hangers to structural members in Earthquake Zones 500 or less as defined by FM Global Property Loss Prevention Data Sheet 1-2.

A coupling and locknut are provided with each fastener for attaching a pipe hanger to the fastener.

Explosive-Driven Fasteners

Fastener, Cat. No.	*Coupling, Cat. No.*	*For Use In*	*Max Pipe Size, in. (mm)*
W10-30-27P10	D1025	Concrete	2 (51)
W10-30-27P10	ACI-F	"	3 1⁄2 (89)
W10-30-27P10	ACI-H	"	5 (127)
W10-30-32P10	D1025	"	2 (51)
W10-30-32P10	ACI-F	"	3 1⁄2 (89)
W10-30-32P10	ACI-H	"	5 (127)
W10-30-42P10	D1025	"	2 (51)
W10-30-42P10	ACI-F	"	3 1⁄2 (89)
W10-30-42P10	ACI-H	"	5 (127)
W10-30-47P10	D1025	"	2 (51)
W10-30-47P10	ACI-F	"	3 1⁄2 (89)
W10-30-47P10	ACI-H	"	5 (127)
EW10-30-15P10	D1025	Steel	2 (51)
EW10-30-15P10	ACI-F	"	3 1⁄2 (89)
EW10-30-15P10	ACI-H	"	5 (127)

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Fastener, Cat. No.	*Rod Size, in.*	*For Use In*	*Max Pipe Size, in. (mm)*
X-EW6H-11-9 FP8	1⁄4	Steel	3 1⁄2 (89)
X-EW6H-11-9 P12	1⁄4	Steel	3 1⁄2 (89)
X-EW6H-20-9 FP8	1⁄4	Steel	3 1⁄2 (89)
X-EW6H-20-9 P12	1⁄4	Steel	3 1⁄2 (89)
X-EW6H-28-9 FP8	1⁄4	Steel	3 1⁄2 (89)
X-EW6H-28-9 P12	1⁄4	Steel	3 1⁄2 (89)
X-EW6H-38-9 FP8	1⁄4	Steel	3 1⁄2 (89)
X-EW6H-38-9 P12	1⁄4	Steel	3 1⁄2 (89)
X-HS W6 U19 P8 S15	1⁄4	Steel	3 1⁄2 (89)
X-HS W10 U19 P8 S15	3⁄8	Steel	5 (127)
X-EW10H-30-14 P10	3⁄8	Steel	5 (127)

These fasteners are also FM Approved for horizontal installation. Max pipe size 3 1⁄2 in. (89 mm).

Company Name:	Hilti Inc
Company Address:	5400 S 122nd East Ave, Tulsa, Oklahoma 74146, USA
Company Website:	http://www.hilti.com
New/Updated Product Listing:	No
Listing Country:	United States of America
Certification Type:	FM Approved

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Rod couplers

Material Specifications

Material	ASTM A563, Grade A carbon steel;
Finish	Zinc electroplated to ASTM B 633-98, SC 1, Type I
Thread	Class 2A fit; Class 2B thread



Ordering Information

Description	Length	Width across flats	Qty	Item No.	MSS-SP-58[1] Allowable Tensile Load at 650°F	AISC[2] Allowable Load (lb)
1/4" Rod Coupler	7/8"	3/8"	100	411746	300	780
3/8" Rod Coupler	1-1/8"	1/2"	50	411747	730	1750
1/2" Rod Coupler	1-1/4"	5/8"	50	411748	1350	3110
5/8" Rod Coupler	2-1/8"	13/16"	50	411749	2160	4860
3/4" Rod Coupler	2-1/4"	1"	25	411750	3230	6700

1 Per MSS-SP-58-2002, the ultimate tensile loads are based on a tensile stress of 50,000 psi multiplied by the threaded rod root area based on coarse thread UNC.
2 AISC Allowable Tensile load = 0.33 x Fu x Anom
AISC Allowable Shear load = 0.17 x Fu x Anom

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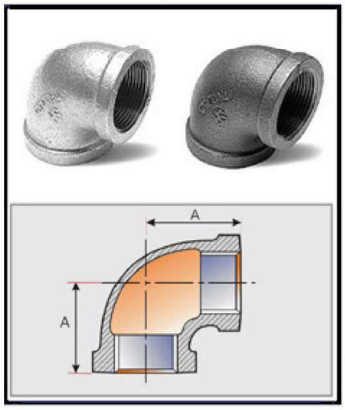
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ELBOWS 90°

AL 90, BL 90

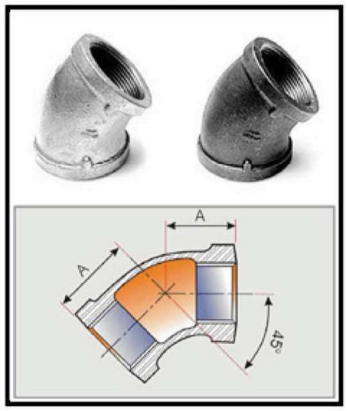


Size (inch)	Dimensions A	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	17.5	50	600	12	0.0306	18
1/4	20.6	35	420	12	0.0515	22
3/8	24.1	90	360	4	0.0710	26
1/2	28.4	50	200	4	0.1195	24
3/4	33.3	35	105	3	0.1865	20
1	38.1	20	60	3	0.2838	17
1 1/4	44.5	20	40	2	0.4504	18
1 1/2	49.3	15	30	2	0.5736	17
2	57.2	8	16	2	0.8932	14
2 1/2	68.6	-	12	1	1.4816	18
3	78.2	-	8	1	2.2560	20
3 1/2	86.9	-	4	1	3.1930	13
4	96.3	-	2	1	4.2200	8
5	114.3	-	2	1	6.7980	14
6	132.0	-	1	1	8.8690	9

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

ELBOWS 45°

AL 45, BL 45

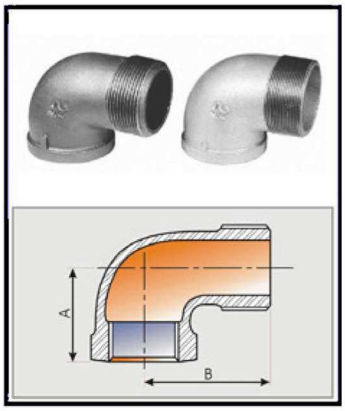


Size (inch)	Dimensions A	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	16.0	50	600	12	0.0245	15
1/4	18.5	30	360	12	0.0464	17
3/8	20.3	75	300	4	0.0676	20
1/2	22.3	50	200	4	0.1024	20
3/4	24.9	40	120	3	0.1628	20
1	28.4	20	60	3	0.2503	15
1 1/4	32.8	20	40	2	0.3467	14
1 1/2	36.3	10	30	3	0.5098	15
2	42.7	12	24	2	0.8008	19
2 1/2	49.5	-	12	1	1.2640	15
3	55.1	-	10	1	1.9436	19
4	66.3	-	4	1	3.4280	14
5	77.5	-	2	1	4.8500	10
6	87.9	-	1	1	6.7660	7

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

STREET ELBOWS 90°

ASL 90, BSL 90



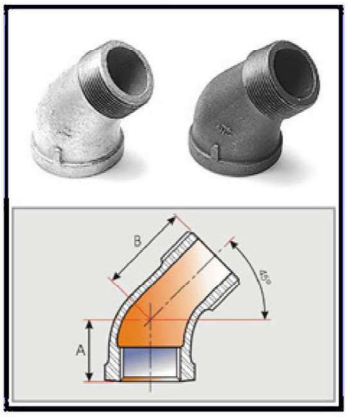
Size (inch)	Dimensions A	B	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	17.5	25.4	60	720	12	0.0256	18
1/4	20.6	30.2	35	420	12	0.0440	18
3/8	24.1	36.6	60	240	4	0.0720	17
1/2	28.4	41.4	60	180	3	0.1070	19
3/4	33.3	48.0	35	105	3	0.1740	18
1	38.1	54.3	45	90	2	0.2693	24
1 1/4	44.5	62.2	25	50	2	0.4216	21
1 1/2	49.3	68.3	9	27	3	0.5734	15
2	57.2	82.8	8	16	2	1.0092	16
2 1/2	68.6	98.0	5	10	2	1.6400	16
3	78.2	114.5	-	8	1	2.4160	19
4	96.3	144.5	-	4	1	4.2400	17
5	114.3	174.2	-	1	1	5.5000	6
6	130.3	204.0	-	1	1	12.3666	12

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

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STREET ELBOWS 45°

ASL 45, BSL 45

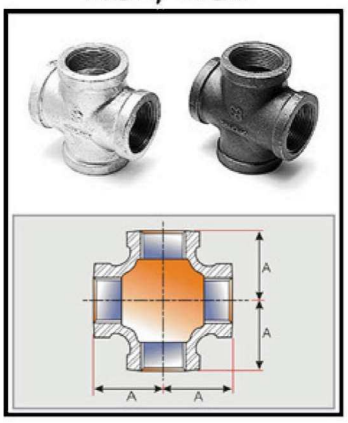


Size (inch)	Dimensions A	Dimensions B	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	16.0	21.0	70	840	12	0.0243	20
1/4	18.5	23.9	40	480	12	0.0395	19
3/8	20.3	26.2	100	400	4	0.0582	23
1/2	22.3	33.0	75	225	3	0.0996	22
3/4	24.9	37.5	40	120	3	0.1436	17
1	28.4	43.0	25	75	3	0.2540	19
1 1/4	32.8	47.4	10	40	4	0.3546	14
1 1/2	36.3	51.7	10	30	3	0.5104	15
2	42.7	60.4	12	24	2	0.7944	19
2 1/2	49.5	69.0	6	12	2	1.3512	16
3	55.1	80.2	3	6	2	2.1280	13
4	66.3	99.0	-	4	1	3.3770	14

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

CROSSES

ACR, BCR

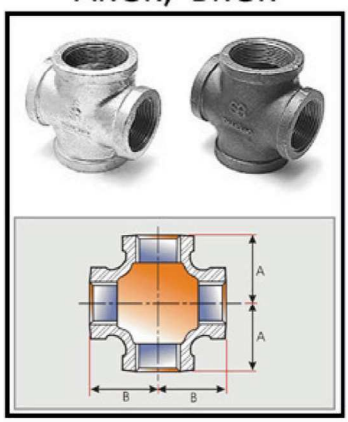


Size (inch)	Dimensions A	Inner Box B	Master Ctn. Pcs./Box	NO.of Pcs./Ctn.	Weight/Pcs. Inner Box	N.W./Ctn. (Kgs.)
1/8	17.5	30	360	12	0.0520	19
1/4	20.6	60	240	4	0.0881	21
3/8	24.1	50	150	3	0.1310	20
1/2	28.4	30	90	3	0.1980	18
3/4	33.3	20	60	3	0.3006	18
1	38.1	15	30	2	0.4642	14
1 1/4	44.5	10	20	2	0.7200	14
1 1/2	49.3	8	16	2	0.9384	15
2	57.2	5	10	2	1.4200	14
2 1/2	68.6	3	6	2	2.4520	15
3	78.2	2	4	2	3.7440	15
4	96.3	1	2	2	6.2900	13

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

REDUCING CROSSES

ARCR, BRCR



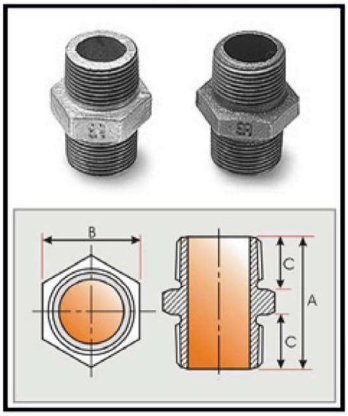
Size (inch)	Dimensions A	Dimensions B	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1 1/2 X 1 1/4	46.2	47.8	9	18	2	0.9060	16
2 X 1 1/4	48.3	53.3	5	10	2	1.1380	11
2 1/2 X 1 1/4	52.0	62.0	4	8	2	1.4510	12
2 1/2 X 1 1/2	56.0	63.0	4	8	2	1.5430	12

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

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NIPPLES

NI

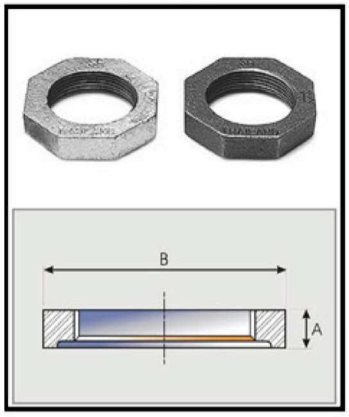


Size (inch)	Dimensions A	B	C	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	32	14	11.0	240	960	4	0.0220	21
1/4	34	17	12.0	200	800	4	0.0260	21
3/8	36	21	13.0	150	600	4	0.0410	25
1/2	45	27	18.5	80	320	4	0.0692	22
3/4	48	32	19.5	60	180	3	0.1056	20
1	53	38	21.5	40	120	3	0.1560	19
1 1/4	56	48	23.0	35	70	2	0.2226	19
1 1/2	60	55	24.0	25	50	2	0.3360	17
2	70	70	28.0	18	36	2	0.6112	22
2 1/2	76	85	31.0	10	20	2	0.8636	17
3	84	100	34.0	6	12	2	1.2865	15
4	95	130	38.5	3	6	2	1.8512	11

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

LOCKNUTS

ALN, LN

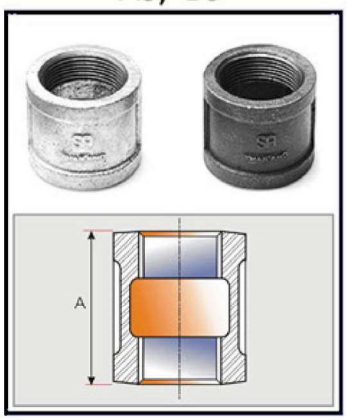


Size (inch)	Dimensions A	B	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	5.0	17.5	250	3000	12	0.0080	24
1/4	6.6	21.3	125	1500	12	0.0117	18
3/8	7.3	25.4	125	1500	12	0.0150	23
1/2	8.1	30.0	150	600	4	0.0387	23
3/4	8.8	36.3	90	360	4	0.0526	19
1	9.9	44.5	60	240	4	0.0826	20
1 1/4	10.9	53.3	45	180	4	0.1220	22
1 1/2	12.1	59.7	45	135	3	0.2084	28
2	13.7	73.2	25	75	3	0.2680	19
2 1/2	15.2	98.0	20	40	2	0.5150	21
3	17.2	117.3	20	40	2	0.6090	24
4	20.5	147.1	7	14	2	0.7530	11

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

COUPLINGS

AS, BS



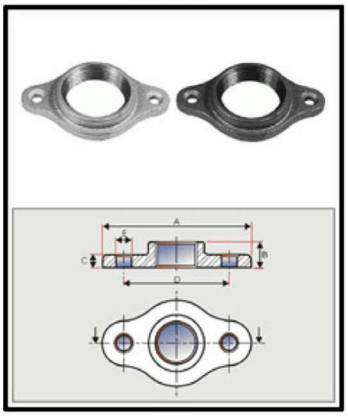
Size (inch)	Dimensions A	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	24.4	70	840	12	0.0250	21
1/4	26.9	40	480	12	0.0399	19
3/8	29.5	40	480	12	0.0574	28
1/2	34.0	60	240	4	0.0920	22
3/4	38.6	50	150	3	0.1330	20
1	42.4	25	100	4	0.2077	21
1 1/4	49.0	16	64	4	0.3164	20
1 1/2	54.6	18	36	2	0.4196	15
2	64.3	12	24	2	0.6556	16
2 1/2	73.2	8	16	2	1.0320	17
3	80.8	-	12	1	1.6377	20
4	93.7	3	6	2	2.6060	16

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

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WASTENUTS

AWN

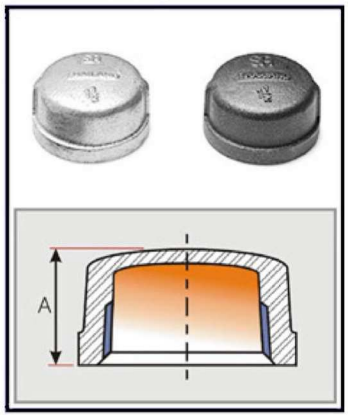


Size (inch)	Dimensions A	B	C	D	E	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight. /Pcs	N.W./Ctn. (Kgs.)
1/2	62.0	6.0	4.4	46.0	6.0	90	360	4	0.0540	19
3/4	73.0	10.5	5.0	54.0	7.3	80	240	3	0.0800	19
1	84.1	11.2	4.8	65.1	7.2	50	200	4	0.0960	19
1 1/4	100.0	12.7	5.6	77.8	8.7	30	120	4	0.1450	17
1 1/2	109.5	14.3	6.4	87.3	8.7	50	100	2	0.1890	19
2	130.2	16.0	7.2	104.8	8.7	30	60	2	0.2850	17

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

CAPS

ACA, BCA

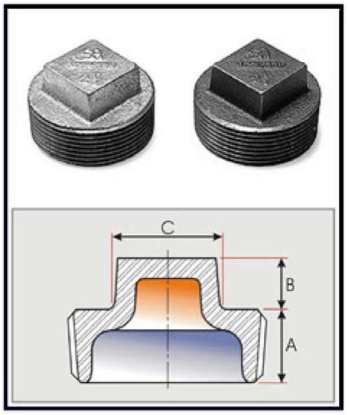


Size (inch)	Dimensions A	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	13.5	120	1440	12	0.0161	23
1/4	16.0	80	960	12	0.0245	24
3/8	18.8	60	720	12	0.0347	25
1/2	22.1	75	300	4	0.0575	17
3/4	24.6	40	160	4	0.0966	15
1	29.5	25	100	4	0.1424	14
1 1/4	32.5	20	80	4	0.2008	16
1 1/2	33.8	18	54	3	0.2528	14
2	36.8	12	36	3	0.4220	15
2 1/2	43.2	20	40	2	0.7270	29
3	45.7	-	24	1	1.0684	26
3 1/2	48.3	6	12	2	1.4680	18
4	52.8	6	12	2	1.7672	21

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

PLUGS

AP, P



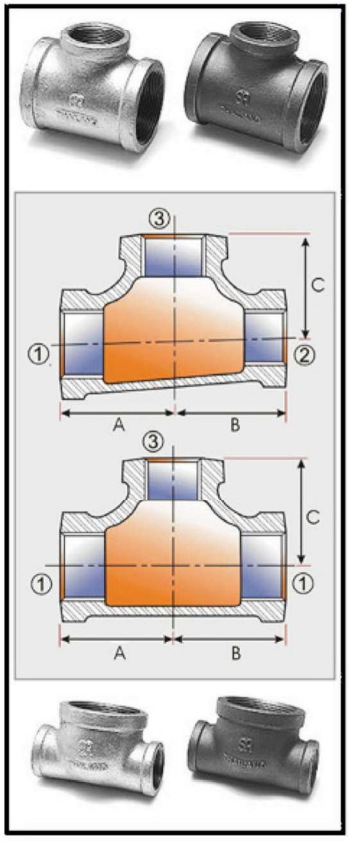
Size (inch)	Dimensions A	B	C	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	9.8	6.1	7.1	300	3.600	12	0.0058	21
1/4	11.6	7.1	9.5	150	1.800	12	0.0149	27
3/8	12.6	8.0	11.0	100	1.200	12	0.0220	26
1/2	14.7	9.7	14.3	50	600	12	0.0414	22
3/4	16.5	11.2	15.9	30	360	12	0.0660	21
1	19.1	12.7	20.9	20	240	12	0.1100	22
1 1/4	20.9	14.2	23.8	40	120	3	0.1840	21
1 1/2	21.7	15.8	28.6	30	90	3	0.2500	20
2	23.2	17.3	33.3	20	60	3	0.3840	21
2 1/2	32.0	18.8	38.1	16	32	2	0.5091	16
3	29.4	20.3	42.9	16	32	2	0.7532	24
4	31.0	25.4	58.0	6	12	2	1.4873	18

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

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REDUCING TEES

ART, BRT



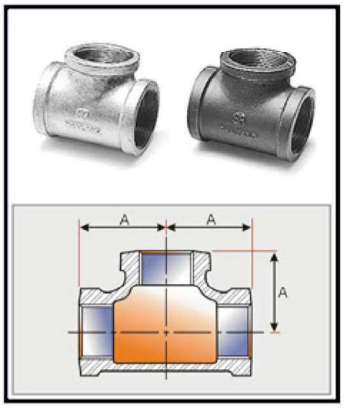
Size 1 x 2 x 3 (inch)	Dimensions A	B	C	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/4 X 1/8	18.8	18.8	19.3	25	300	12	0.0601	18
3/8 X 1/8	22.4	20.6	21.6	90	360	4	0.0730	26
3/8 X 1/4	22.4	22.4	22.9	60	240	4	0.0979	23
1/2 X 1/8	21.9	21.9	23.5	40	160	4	0.1080	17
1/2 X 1/4	24.6	24.6	24.9	40	160	4	0.1248	20
1/2 X 3/8	25.9	25.9	25.7	40	160	4	0.1350	22
3/4 X 1/8	24.0	24.0	25.7	32	128	4	0.1520	19
3/4 X 1/4	26.7	26.7	27.4	25	100	4	0.1746	17
3/4 X 3/8	27.9	27.9	28.1	25	100	4	0.1800	18
3/4 X 1/2	29.9	29.9	30.4	20	80	4	0.2239	18
1 X 1/4	27.6	27.6	30.4	20	80	4	0.2398	19
1 X 3/8	30.0	30.0	32.3	15	60	4	0.2730	16
1 X 1/2	31.4	31.4	34.8	15	60	4	0.3060	18
1 X 3/4	34.8	34.8	36.8	12	48	4	0.3484	17
1 1/4 X 1/4	30.0	30.0	36.6	20	40	2	0.3450	14
1 1/4 X 3/8	32.0	32.0	36.6	20	40	2	0.4009	16
1 1/4 X 1/2	34.0	34.0	38.9	20	40	2	0.4206	17
1 1/4 X 3/4	36.8	36.8	41.2	20	40	2	0.4719	19
1 1/4 X 1	40.1	40.1	42.2	20	40	2	0.5369	21
1 1/2 X 3/8	40.1	40.1	40.2	18	36	2	0.4450	16
1 1/2 X 1/2	35.8	35.8	42.2	18	36	2	0.4840	17
1 1/2 X 3/4	35.8	35.8	44.5	15	30	2	0.5320	16
1 1/2 X 1	41.9	41.9	45.7	10	30	3	0.6168	19
1 1/2 X 11/4	41.9	41.9	47.8	12	24	2	0.6906	17
2 X 3/8	46.2	46.2	-	10	20	2	0.6600	13
2 X 1/2	37.9	37.9	47.8	10	20	2	0.6768	14
2 X 3/4	40.6	40.6	50.0	10	20	2	0.7980	16
2 X 1	43.9	43.9	51.3	10	20	2	0.8096	16
2 X 11/4	47.3	47.3	52.2	8	16	2	0.9056	14
2 X 11/2	50.3	50.3	53.8	8	16	2	1.0662	17
2 1/2 X 1/2	40.2	40.2	55.9	6	12	2	1.2800	3
2 1/2 X 3/4	44.2	44.2	58.9	6	12	2	1.2680	15
2 1/2 X 1	46.5	46.5	59.0	5	10	2	1.3776	14
2 1/2 X 1 1/4	47.5	47.5	62.2	5	10	2	1.4808	15
2 1/2 X 1 1/2	54.9	54.9	63.8	5	10	2	1.5068	15
2 1/2 X2	60.7	60.7	66.0	4	8	2	1.7044	14
3 X 1/2	46.5	46.5	65.0	4	8	2	1.7130	14
3 X 3/4	45.5	45.5	65.3	3	6	2	1.3280	8
3 X 1	50.8	50.8	67.6	3	6	2	1.9765	12
3 X 1 1/4	55.1	55.1	69.6	3	6	2	1.6976	10
3 X 1 1/2	58.2	58.2	71.1	3	6	2	2.1740	13
3 X 2	64.0	64.0	73.4	3	6	2	2.3873	14
3 X 2 1/2	71.9	71.9	76.0	3	6	2	2.7200	16
4 X 1/2	53.5	53.5	79.2	2	4	2	2.5000	10
4 X 3/4	53.5	53.5	79.2	2	4	2	2.7500	11
4 X 1	-	-	-	2	4	2	3.0466	12
4 X 1 1/4	61.0	61.0	86.5	2	4	2	3.1120	12
4 X 1 1/2	62.5	62.5	82.6	2	4	2	3.4200	14
4 X 2	68.2	68.2	84.9	-	3	1	3.6770	11
4 X 2 1/2	77.5	77.5	89.2	-	3	1	4.1900	13
4 X 3	82.1	82.1	89.6	1	2	2	4.1920	8

' THE ACTUAL WEIGHT CAN VARY BY ± 3%

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TEES

AT, BT

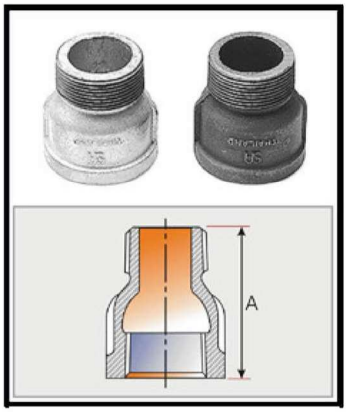


Size (inch)	Dimensions A	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/8	17.5	120	480	4	0.0452	22
1/4	20.6	75	300	4	0.0702	21
3/8	24.1	45	180	4	0.1087	20
1/2	28.4	40	120	3	0.1686	20
3/4	33.3	35	70	2	0.2542	18
1	38.1	20	40	2	0.3998	16
1 1/4	44.5	14	28	2	0.6020	17
1 1/2	49.3	12	24	2	0.7254	17
2	57.2	8	16	2	1.2100	19
2 1/2	68.6	4	8	2	2.2133	18
3	78.2	-	6	1	2.9500	18
4	96.3	1	2	2	5.2920	11
5	114.3	-	1	1	9.1200	9
6	132.0	-	1	1	11.8133	12

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

EXTENSION

AX, BX

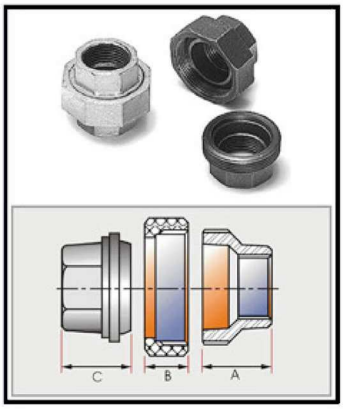


Size (inch)	Dimensions A	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
3/8	32	40	480	12	0.0480	23
1/2	40	75	300	4	0.0712	5
3/4	48	40	160	4	0.1400	20
1	55	30	90	3	0.1892	17
1 1/4	60	30	60	2	0.2872	17
1 1/2	65	20	40	2	0.3902	16
2	70	15	30	2	0.5990	18

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

UNIONS CONICAL IRON TO IRON SEAT

U340



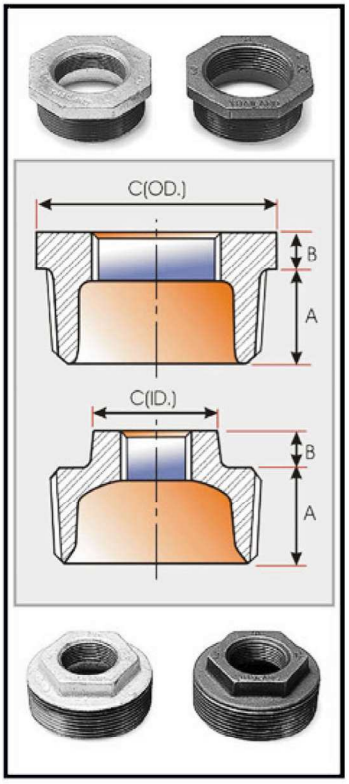
Size (inch)	Dimensions A	B	C	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/2	26.0	19.0	30.0	50	100	2	0.1990	20
3/4	28.0	20.0	30.5	35	70	2	0.2860	20
1	31.0	22.0	34.0	20	40	2	0.3480	14
1 1/4	33.0	24.0	40.0	15	30	2	0.6040	18
1 1/2	36.0	25.0	42.5	10	20	2	0.7180	14
2	42.0	27.0	46.0	6	12	2	1.0740	13
2 1/2	44.0	33.5	51.5	4	8	2	2.0000	16

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

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BUSHINGS

ABU, BU



Size (inch)	Dimensions A	B	C(id)	C(od)	Inner Box Pcs./Box	Master Ctn. Pcs./Ctn.	NO.of Inner Box	Weight/Pcs.	N.W./Ctn. (Kgs.)
1/4 X 1/8	13.2	3.8	-	16.3	120	1440	12	0.0130	19
3/8 X 1/8	12.2	4.1	-	21.6	75	900	12	0.0250	23
3/8 X 1/4	12.2	4.1	-	21.1	75	900	12	0.0201	18
1/2 X 1/8	16.4	4.8	-	26.2	150	600	4	0.0492	30
1/2 X 1/4	14.2	4.8	-	26.2	150	600	4	0.0425	26
1/2 X 3/8	14.2	4.8	-	26.2	150	600	4	0.0352	21
3/4 X 1/8	16.0	5.6	-	29.2	75	300	4	0.0758	23
3/4 X 1/4	16.0	5.6	-	29.2	75	300	4	0.0616	18
3/4 X 3/8	16.0	5.6	-	29.2	75	300	4	0.0524	16
3/4 X 1/2	18.0	5.6	-	29.2	75	300	4	0.0500	15
1 X 1/8	19.1	9.6	28.5	-	50	200	4	0.0938	19
1 X 1/4	19.1	9.6	28.5	-	50	200	4	0.0910	18
1 X 3/8	19.1	9.6	28.5	-	50	200	4	0.0862	17
1 X 1/2	21.6	6.4	-	36.1	50	200	4	0.1044	21
1 X 3/4	21.6	6.4	-	36.1	50	200	4	0.0844	17
1 1/4 X 1/4	22.8	8.6	28.5	-	30	120	4	0.1338	16
1 1/4 X 3/8	22.8	8.6	28.5	-	30	120	4	0.1200	14
1 1/4 X 1/2	22.8	8.6	31.5	-	30	120	4	0.1474	18
1 1/4 X 3/4	20.3	7.1	-	44.7	30	120	4	0.1864	22
1 1/4 X 1	20.3	7.1		44.7	30	120	4	0.1350	16
1 1/2 X 1/8	21.1	9.4	28.4	-	25	75	3	0.2950	22
1 1/2 X 1/4	23.6	9.4	28.5	-	25	75	3	0.1790	13
1 1/2 X 3/8	23.6	9.4	28.5	-	25	75	3	0.1740	13
1 1/2 X 1/2	23.6	9.4	34.0	-	25	75	3	0.1936	15
1 1/2 X 3/4	23.6	9.4	36.5	-	25	75	3	0.1892	14
1 1/2 X 1	23.3	7.9	-	50.8	25	75	3	0.2160	16
1 1/2 X 1 1/4	23.3	7.9	-	50.8	25	75	3	0.1471	11
2 X1/4	21.8	10.6	28.5	-	20	60	3	0.2732	16
2 X 3/8	22.4	10.0	28.5	-	20	60	3	0.2784	26
2 X 1/2	24.9	10.4	34.0	-	20	60	3	0.2832	17
2 X 3/4	24.9	10.4	41.4	-	20	60	3	0.3150	19
2 X 1	24.9	10.4	45.0	-	20	60	3	0.3080	18
2 X 1 1/4	27.0	11.0	-	63.0	20	60	3	0.3840	23
2 X 1 1/2	27.0	11.0	-	63.0	20	60	3	0.3155	19
2 1/2 X 1/2	27.2	11.2	34.0	-	15	30	2	0.7130	21
2 1/2 X 3/4	27.2	11.2	41.4	-	15	30	2	0.4328	13
2 1/2 X 1	27.2	11.2	49.5	-	15	30	2	0.4576	14
2 1/2 X 1 1/4	27.2	11.2	60.7	-	15	30	2	0.4973	15
2 1/2 X 1 1/2	27.2	11.2	-	75.7	15	30	2	0.6208	19
2 1/2 X 2	29.7	9.4	-	75.7	15	30	2	0.4460	13
3 X 1/2	28.7	12.2	34.0	-	12	24	2	1.0100	24
3 X 3/4	28.7	12.2	41.4	-	12	24	2	0.6180	15
3 X 1	28.7	12.2	49.5	-	12	24	2	0.6536	16
3 X 1 1/4	28.7	12.2	60.7	-	12	24	2	0.7950	19
3 X 1 1/2	28.7	12.2	68.1	-	12	24	2	0.7576	18
3 X 2	28.7	12.2	-	98.0	12	24	2	0.9220	22
3 X 2 1/2	28.7	12.2	-	98.0	12	24	2	0.8360	20
3 1/2 X 1 1/2	30.0	13.2	70.0	-	8	16	2	1.0000	16
3 1/2 X 2	33.0	13.2	83.3	-	8	16	2	1.1500	18
3 1/2 X 3	30.0	10.9	-	117.3	8	16	2	0.8488	14
4 X 1/2	39.8	14.2	-	121.0	5	10	2	1.6600	17
4 X 3/4	38.0	13.0	-	121.0	5	10	2	1.4650	15
4 X 1	31.0	15.2	-	-	5	10	2	1.1620	12
4 X 1 1/4	31.0	15.2	60.7	-	5	10	2	1.3712	14
4 X 1 1/2	31.0	15.2	68.1	-	5	10	2	1.0866	11
4 X 2	36.0	15.2	83.3	-	5	10	2	1.3592	14
4 X 2 1/2	31.0	15.2	98.0	-	5	10	2	1.5376	15
4 X 3	37.0	14.0	-	126.0	5	10	2	1.6804	17

*** THE ACTUAL WEIGHT CAN VARY BY ± 3%**

THREADED IRON

BROWSE TITUS FIRE PROTECTION PRODUCTS
GROOVED COUPLINGS
GROOVED FITTINGS
THREADED IRON
BALL VALVES
FASTENERS



CAST IRON

- Available in sizes from 1" to 2½", Class 125 Standard
- UL / FM Approved at 300 psi
- Air Tested

MALLEABLE IRON

- Available in sizes from 1/8" to 6", Class 150
- UL / FM Approved at 300 psi
- Air Tested

DUCTILE IRON

- Available in sizes from 1/2" to 2", Class 150 Standard DI
- UL / FM Approved at 500 psi

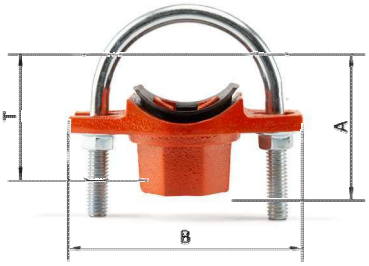
TITUS

RSN: 1823630
Permit # 2024-2456053-CT
SHEET 30 of 31

41 SADDLE-LET OUTLET TEE

U BOLT MECHANICAL TEE

- Ductile Iron ASTM A-536 Grade 65-45-12.
- Female NPT Threads conform to ASME B1.20.1
- Finish available in electro zinc plated or orange epoxy paint
- Gasket: Grade E – EPDM with operating temperature of -30F to 230F (-34C to 110C) and is marked by a green stripe
- Bolts are SAE J429 Grade 5
- Pressure rated up to 300p
- For current listing/approval details contact a Titus representative





Nominal Size in/mm	Hole Dia.∓ +0.04,-0 /+1,-0	Dimensions - in/mm			Take-Out T in/mm	Bolt Size in	Bolt Torque Lbs-Ft/N-M
		A	B	C			
1×1/2 25×15	**0.95** 24	**1.81** 46	**2.91** 74	**1.73** 44	**1.57** 40	**U-Bolt** 5/16Φ	**18-22** 25-30
1×3/4 25×20	**0.95** 24	**1.81** 46	**2.91** 74	**1.73** 44	**1.57** 40	**U-Bolt** 5/16Φ	**18-22** 25-30
1-1/4x1/2 32×15	**1.18** 30	**2.09** 53	**3.50** 89	**2.20** 56	**1.73** 44	**U-Bolt** 3/8Φ	**22-29** 30-40
1-1/4x3/4 32×20	**1.18** 30	**2.09** 53	**3.50** 89	**2.20** 56	**1.73** 44	**U-Bolt** 3/8Φ	**22-29** 30-40
1-1/4x1 32×25	**1.18** 30	**2.20** 56	**3.50** 89	**2.20** 56	**1.85** 47	**U-Bolt** 3/8Φ	**22-29** 30-40
1-1/2x1/2 40×15	**1.18** 30	**2.17** 55	**3.50** 89	**2.20** 56	**1.81** 46	**U-Bolt** 3/8Φ	**22-29** 30-40
1-1/2x3/4 40×20	**1.18** 30	**2.17** 55	**3.50** 89	**2.20** 56	**1.81** 46	**U-Bolt** 3/8Φ	**22-29** 30-40
1-1/2x1 40×25	**1.18** 30	**2.28** 58	**3.50** 89	**2.20** 56	**1.93** 49	**U-Bolt** 3/8Φ	**22-29** 30-40
2x1/2 50×15	**1.18** 30	**2.52** 64	**3.86** 98	**2.20** 56	**2.09** 53	**U-Bolt** 3/8Φ	**22-29** 30-40
2x3/4 50×20	**1.18** 30	**2.52** 64	**3.86** 98	**2.20** 56	**2.09** 53	**U-Bolt** 3/8Φ	**22-29** 30-40
2×1 50×25	**1.18** 30	**2.64** 67	**3.86** 98	**2.20** 56	**2.20** 56	**U-Bolt** 3/8Φ	**22-29** 30-40
2-1/2x1/2 65×15	**1.18** 30	**2.72** 69	**4.37** 111	**2.20** 56	**2.28** 58	**U-Bolt** 3/8Φ	**22-29** 30-40
2-1/2x3/4 65×20	**1.18** 30	**2.72** 69	**4.37** 111	**2.20** 56	**2.28** 58	**U-Bolt** 3/8Φ	**22-29** 30-40
2-1/2x1 65×25	**1.18** 30	**2.83** 72	**4.37** 111	**2.20** 56	**2.40** 61	**U-Bolt** 3/8Φ	**22-29** 30-40
3×1 80×25	**1.18** 30	**3.17** 80.5	**5.04** 128	**2.20** 56	**2.64** 67	**U-Bolt** 3/8Φ	**22-29** 30-40

PHD Manufacturing, Inc.
44018 Columbiana-Waterford Road
Columbiana, Ohio 44408-9481
Phone: 800-321-2736 • 330-482-9256
Fax: 330-482-2763
Web: www.phd-mfg.com

FIG. 055 SURGE RESTRAINT

PIPE SIZES: 3/4" through 2"

FUNCTION: Designed to restrict the upward movement of activated fire sprinkler systems. Grips ring hanger, NOT THE NUT, and allows for fine tuning adjustments. Listed for use with PHD Manufacturing, Inc. Figure 141 ring hangers only.

ORIENTATIONS:

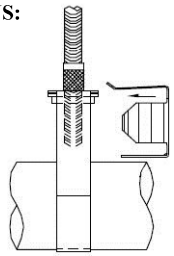


Illustration 1

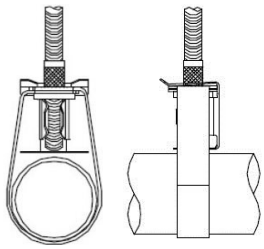


Illustration 1

APPROVALS: Underwriters Laboratories listed for US and Canada

MATERIAL: Spring Steel

FINISH: Black E-Coat

INSTALLATION: Installs easily before or after pipe installation and without tools. Simply clip Fig. 055 onto Fig. 141 ring hanger as shown above in Illustration 1. Run the hanger rod down to the bottom plate surface to ensure proper restraint as seen in Illustration 2.

