

SITE PLAN
SCALE: N.T.S

NOTES:

- * All piping to be installed and tested as per NFPA standard.
- * All materials installed to be UL listed and approved.
- * All hangers to be installed as per NFPA standard.
- * System design based upon:
 1. Ordinary Hazard Group II for Apparatus bay, Wet System for Density of 8.1 LPM/MSQ over + 139 MSQ plus 550 IPM. How Allowance, As per NFPA 13.
 2. Light Hazard Occupancy for Dormitory, Offices, Washrooms etc. Wet system for Density of 4.1 LPM/MSQ over 139 Sq. Ft (Area reduced by 32% using quick response heads) i.e. 102 MSQ plus 380 LPM Hose Allowance, As per NFPA 13. (11.2.3.2.3.1)
- * Sprinkler Coverage: 21 MSQ Max For Light Hazard Areas
12 MSQ Max for Ordinary Hazard Areas.
- * All Lower Points To Be Drained, As Per NFPA.
- * Drawing subject to City of Mississauga Fire Department, Building Department & Owner approvals.
- * Final location and elevation of pipes to be co-ordinate on site.
- * All Dimension Arc centerline To centerline.
- * All control valves to be electrically supervised and connected to the Fire Alarm System by Others.
- * All Water Flow Switches and Pressure Alarm Switches shall be connected To the Fire Alarm System by Others.
- * All Electrical Wiring, Electrical Tracing and pipe Insulation for all wet Sprinkler lines located in unheated areas By Others.
- * All piping 32 mm. And smaller to be Sch. 40 threaded c/w 125 L.R. C. I. Screwed Fittings,
- * All piping 40 mm and larger to be sch.10 grooved c/w Grooved fittings.
- * Flow Test Data taken, As Follow: Date: Aug. 17, 2023 By: LHS Inc. At: 10:00a.m
Static Pressure 5.72 Bars.
Flow: 4918 LGPM @ 5.0 Bars.
- * The contractor shall verify all dimensions at the building site and report any discrepancies to the premises department prior to proceeding with work.
- * Do not scale drawing.
- * Owners to ensure adequate heat to prevent all piping from freezing.
- * Steel pipe to be used for the installation.
- * Calculations allow for 1.2M of AH-1 flex head connection
- * All Sprinkler Heads at Light Hazard area are Quick Response, As per NFPA.
- * ALL SPRINKLER MAIN PIPES IN THE ELECTRICAL ROOM TO HAVE A PAN DRIP.

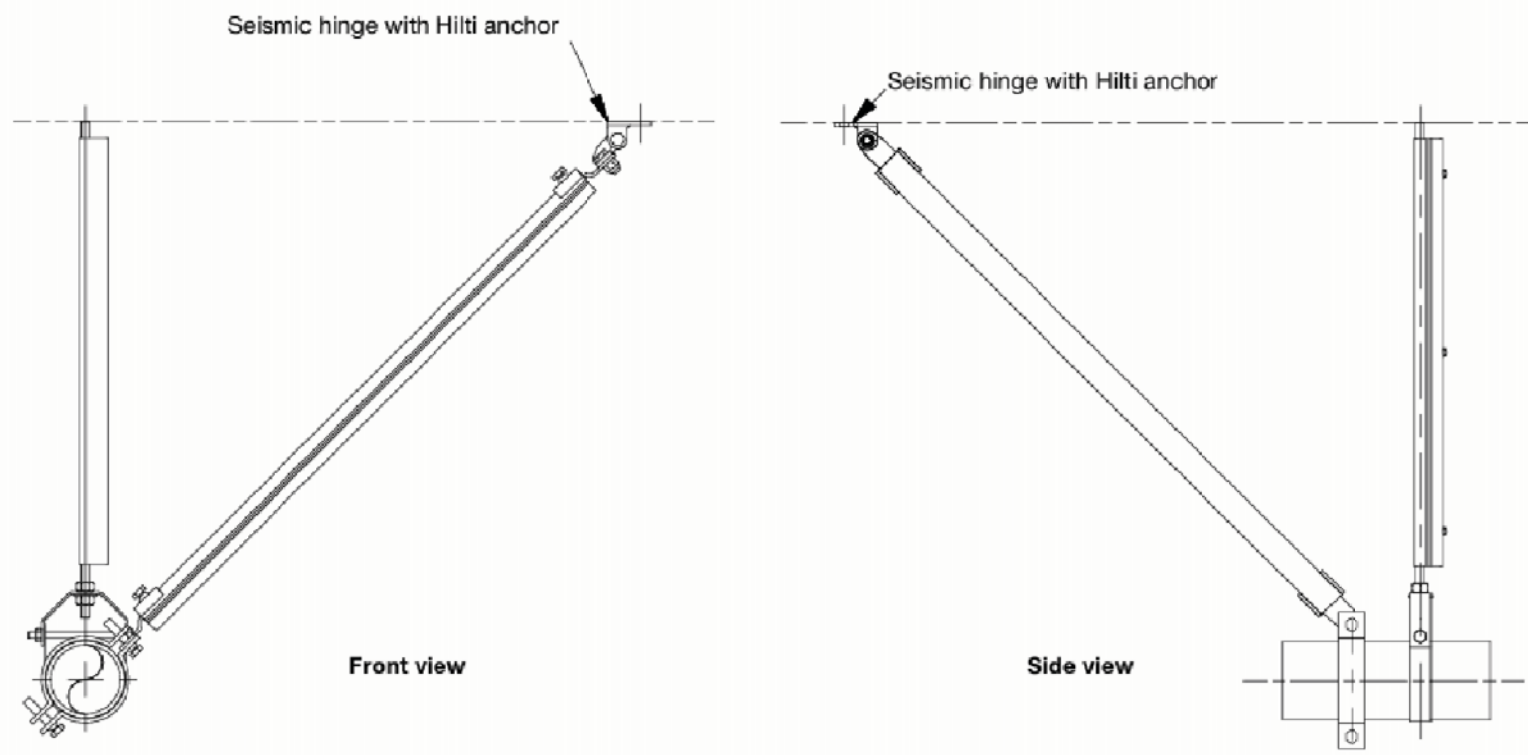
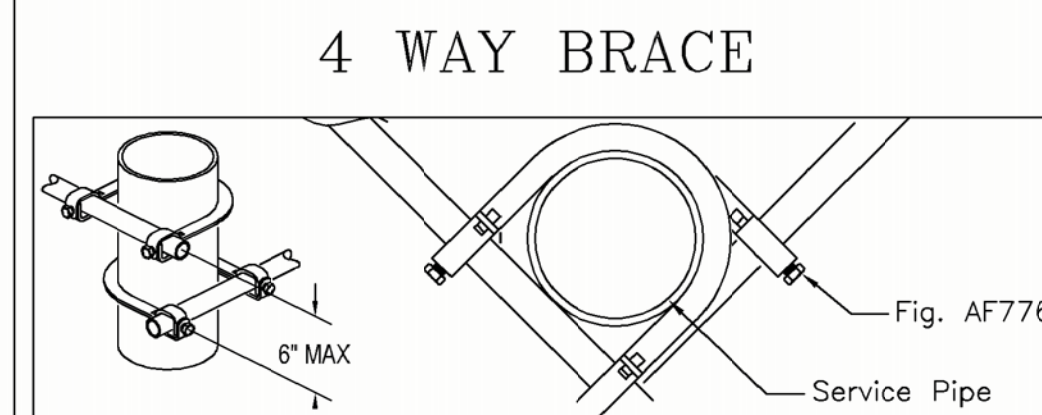
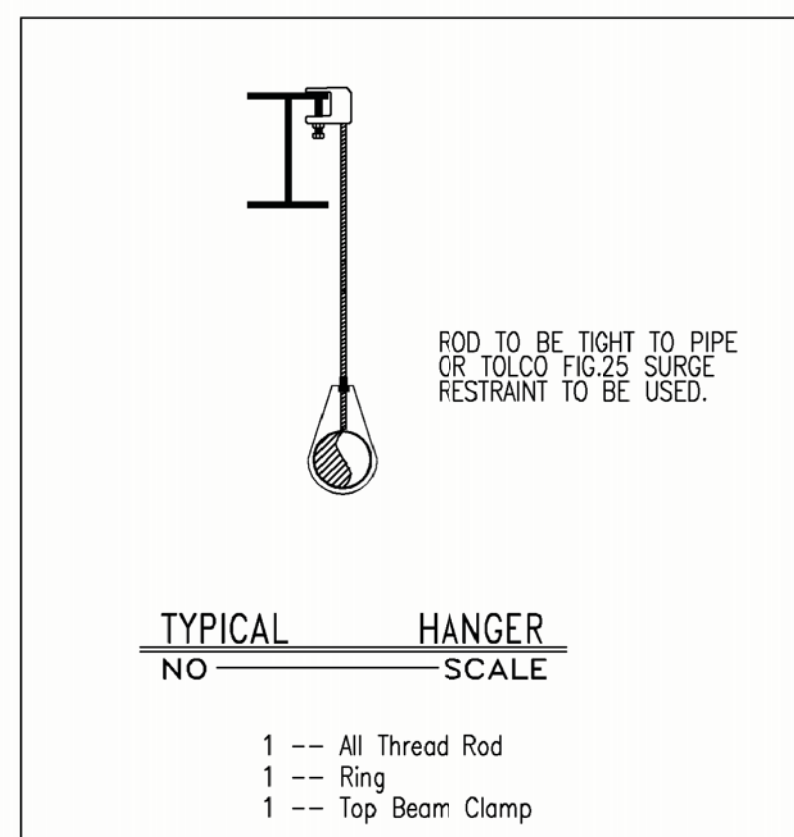


Figure 1 - Typical sprinkler pipe hanger with seismic sway brace

LATERAL - SEISMIC BRACE CALCULATIONS

Seismic Project	FIRE STATION 123	Brace Name	Lateral
Standard	NFPA 13-2016	Drawing Reference	SP-1
Brace Type	Lateral Brace as a Lateral & Longitudinal Brace	Approval Agency	UL Listed

STRUCTURE INFORMATION

Structure	I-Beam/Joint
Substrate	Horizontal Beam Flange
Thickness	0.64 cm - 1.27 cm.
Load Orientation	Parallel to Beam

BRACE INFORMATION

Brace Member	1 NPS Sch 40
Brace Length Max	2.13 m.
Brace Angle	30° - 90°
Least Radius of Gyration	10.693 mm.
l/r Ratio Max	200
Max Horizontal Load	4.119 kN.

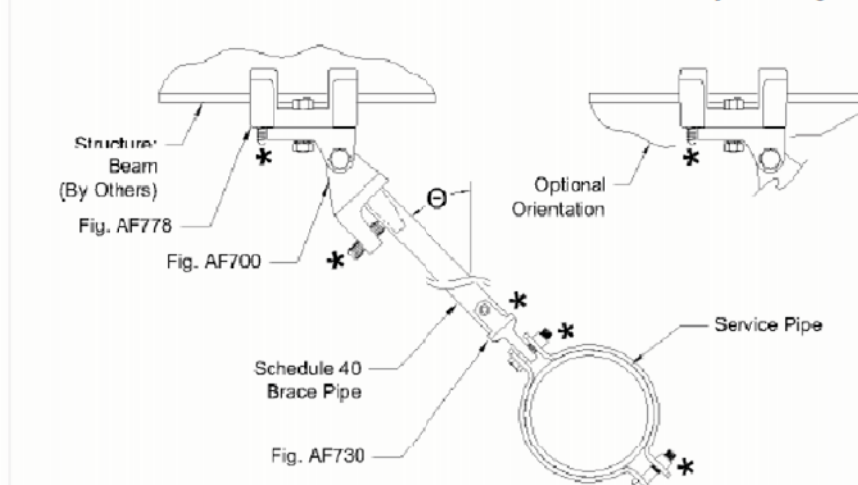
FASTENER INFORMATION

Fastener Name	N/A
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SEISMIC BRACE ATTACHMENTS

Model	Size	Load Rating
Structural Att.	AF778	N/A
Swivel Att.	AF700	1/2"
Pipe Att.	AF730	4 NPS

See Appendix A for alternate seismic brace attachments.
All seismic brace attachments manufactured by ASC Engineered Solutions.



LATERAL-2 - SEISMIC BRACE CALCULATIONS

Seismic Project	FIRE STATION 123	Brace Name	Lateral-2
Standard	NFPA 13-2016	Drawing Reference	SP-1
Brace Type	Lateral	Approval Agency	UL Listed

STRUCTURE INFORMATION

Structure	I-Beam/Joint
Substrate	Horizontal Beam Flange
Thickness	0.48 cm - 0.63 cm.
Load Orientation	Parallel to Beam

BRACE INFORMATION

Brace Member	1 NPS Sch 40
Brace Length Max	2.13 m.
Brace Angle	30° - 90°
Least Radius of Gyration	10.693 mm.
l/r Ratio Max	200
Max Horizontal Load	4.119 kN.

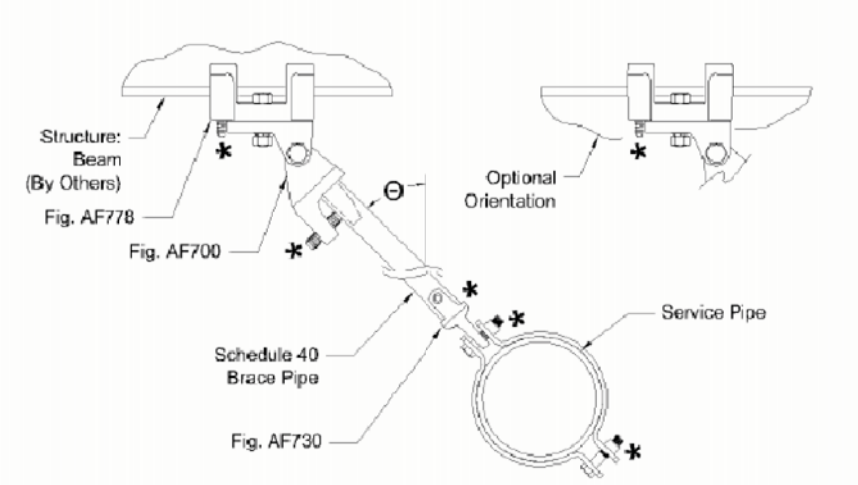
FASTENER INFORMATION

Fastener Name	N/A
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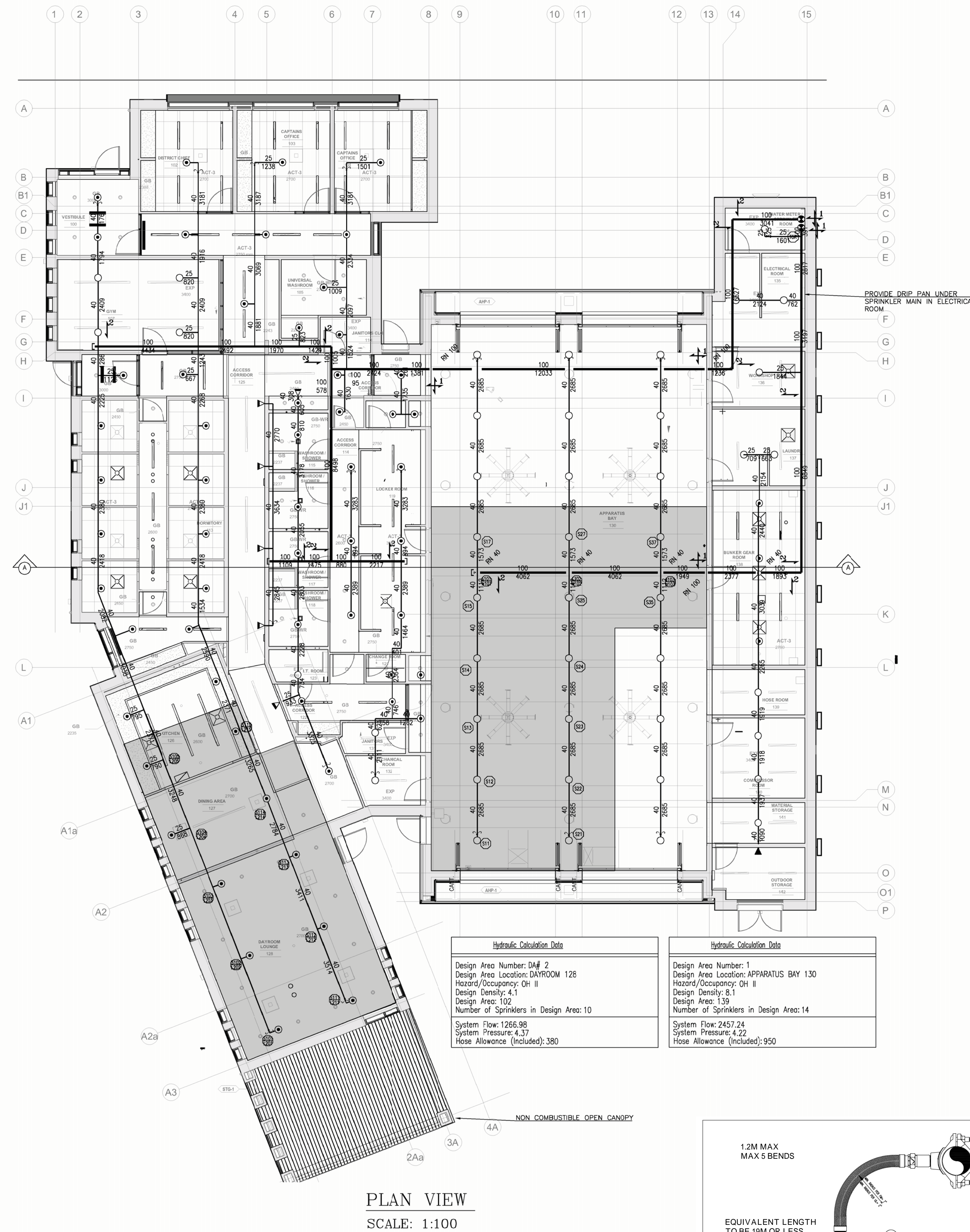
SEISMIC BRACE ATTACHMENTS

Model	Size	Load Rating
Structural Att.	AF778	N/A
Swivel Att.	AF700	1/2"
Pipe Att.	AF730	4 NPS

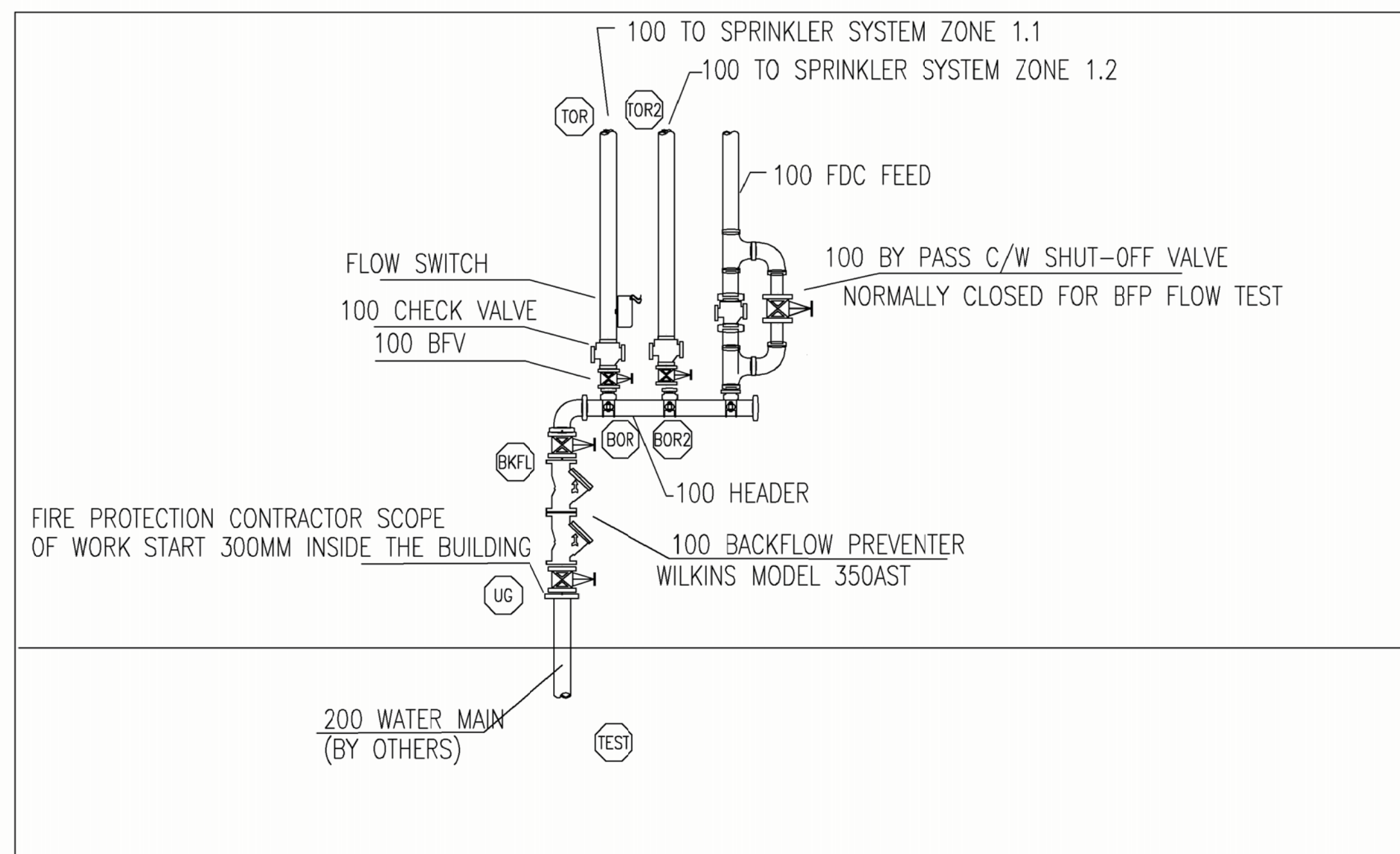
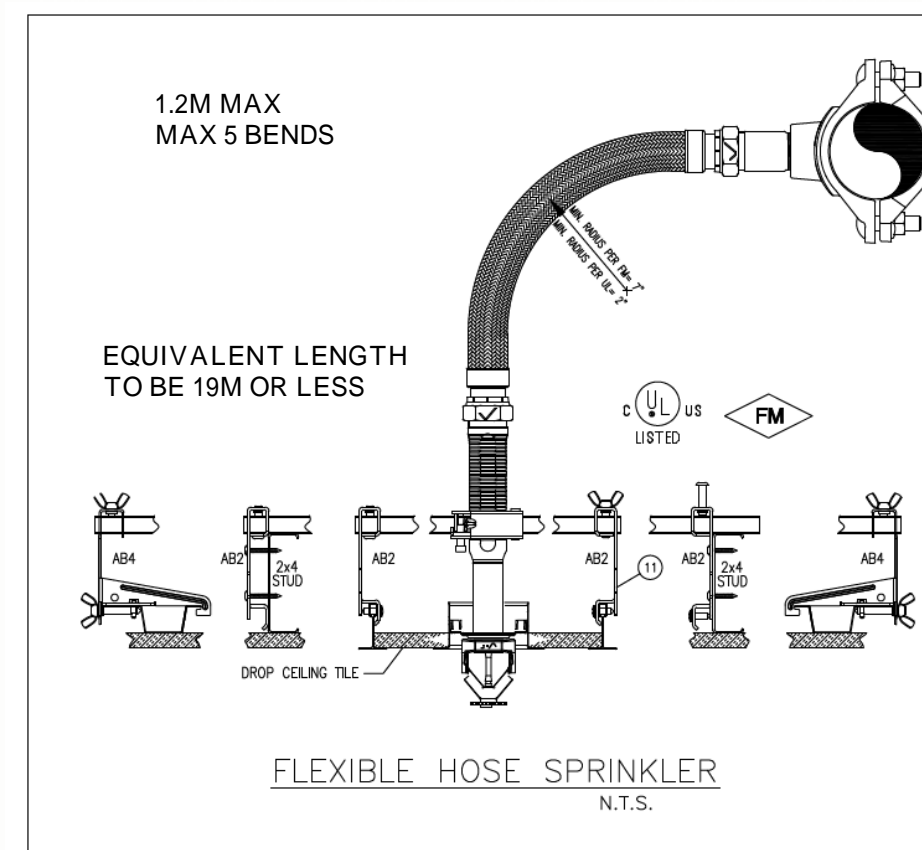
See Appendix A for alternate seismic brace attachments.
All seismic brace attachments manufactured by ASC Engineered Solutions.



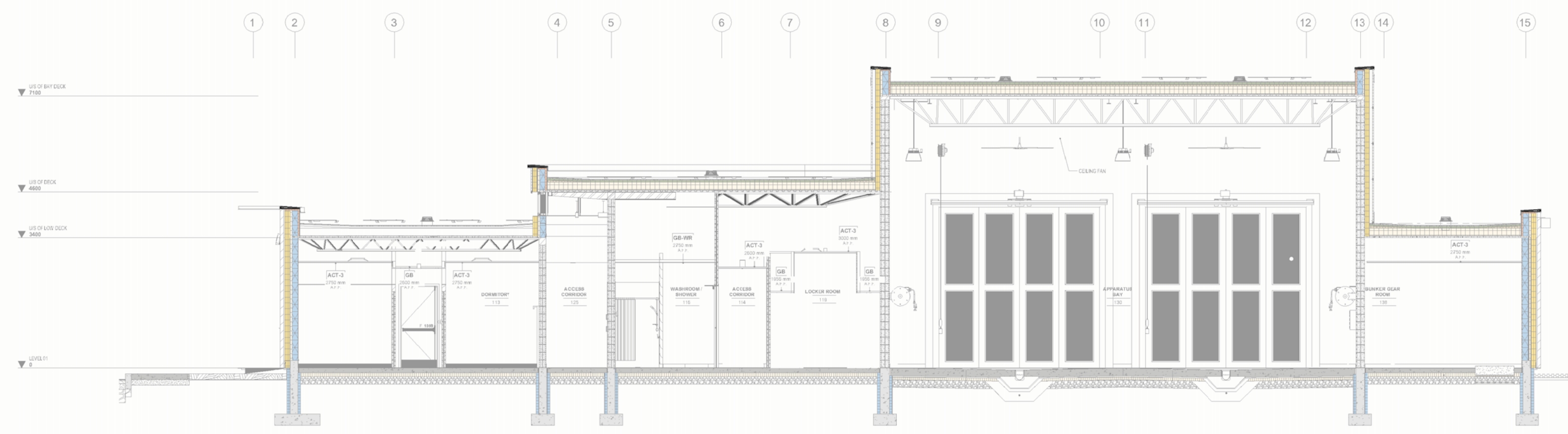
* - denotes hardware shown with the bolt head or nut broken off, as per the product installation instructions.
Not Vertical Reaction Forces do not need to be addressed per NFPA 13-2016.



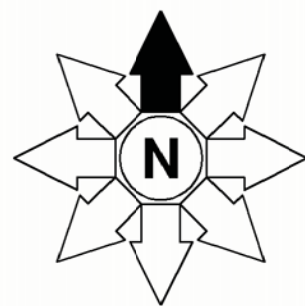
PLAN VIEW
SCALE: 1:100



RISER SCHEMATIC
SCALE: N.T.S



SECTION "A" VIEW
SCALE: 1:100



Revisions:	Date:	General Notes
1		1. All Pipe Locations are to be Field Measured Prior to Fabrication and installation by Sprinkler Contractor.
2		2. All Dimensions Shown are Center to Center.
3		3. High Temperature Heads are to be Field Located Where Required.
4		4. All Pipes and Hangers are to be Installed per NFPA #13.
5		5. Hangers are to be U.L. Listed and P.M. Approved.

Drawing Legend	Total This Sheet	Number of Sprinklers
Symbol	Description	Description
○	Hydraulic Reference Points	25MM (1") K81 CHROME DRY HSW OR 93C (200F)
○	Elev. Below Top of Steel	15MM (1/2") K81 CHROME SEMI-RECESSED PEND. OR 68C (155F)
○	Elev. Above Finished Floor	15MM (1/2") K81 BRASS UPRIGHT OR 93C (200F)
○	Elev. of Top of Steel	15MM (1/2") K81 CHROME HSW OR 93C (200F)
○	Ceiling Height	
○	Denotes Hanger Location	
○	Rise up or down	

Drawing Title	FIRE PROTECTION
Contract No.	J#32074
Drawn By	A.G.
Scale	AS NOTED
Date	31/05/24
Approval By	AHJ

Job:	FIRE STATION 123 3050 COLLEGEWAY MISSISSAUGA, ONT
Contractor:	EPI FIRE PROTECTION & SECURITY 675 GARYRAY DRIVE TORONTO, ONTARIO - M9L 1R2



EPI FIRE PROTECTION & SECURITY
675 GARYRAY DRIVE.
TORONTO, ONT
M9L 1R2
416 746-2225



Job Name : 3050 COLLEGEWAY - FIRE STATION 123
Drawing : FIRE STATION
Location : 3050 THE COLLEGEWAY, MISSISSAUGA, ONT
Remote Area : DA#1
Contract : J#32074
Data File : 3050 Collegeway - fire station 123 DA# 1.WXF

Hydraulic Design Information Sheet

Name - CITY OF MISSISSAUGA FIRE STATION 123 Date - 31/05/2024
Location - 3050 THE COLLEGEWAY, MISSISSAUGA, ONT
Building - FIRE STATION System No. - DA#1
Contractor - EPI FIRE PROTECTION Contract No. - J#32074
Calculated By - A.G Drawing No. - SP-1
Construction: () Combustible (X) Non-Combustible Ceiling Height - 7M
Occupancy - LIGHT HAZARD

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. () 1 () 2 () 3 () Ex.Haz.
Y () NFPA 231 () NFPA 231C () Figure Curve
S Other
T Specific Ruling 11.2.3.2.3.1 Made By Date
E

M	Area of Sprinkler Operation - 139	System Type	Sprinkler/Nozzle
	Density - 8.1	(X) Wet	Make
D	Area Per Sprinkler - 12	() Dry	Model UPRIGHT
E	Elevation at Highest Outlet - 7	() Deluge	Size 15
S	Hose Allowance - Inside - NA	() Preaction	K-Factor 81
I	Rack Sprinkler Allowance - NA	() Other	Temp.Rat.68
G	Hose Allowance - Outside - 950		

N
Note

Calculation Flow Required - 2457 Press Required - 4.22 TEST
Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 17/08/2024		Cap. -
T	Time of Test - 10:15AM	Rated Cap.-	Elev.-
E	Static Press - 5.72	@ Press -	
R	Residual Press - 5	Elev. -	Well
	Flow - 4918		Proof Flow
S	Elevation - 0		

U
P Location - 3010 collegeway, mississauga, ont
P
L Source of Information - LHS Inc,
Y

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	Solid Piled %	Palletized % Rack
M	() Single Row	() Conven. Pallet	() Auto. Storage () Encap.
S	() Double Row	() Slave Pallet	() Solid Shelf () Non
T	() Mult. Row		() Open Shelf
O			
R	K Flue Spacing	Clearance:Storage to Ceiling	
A	Longitudinal	Transverse	
G			
E	Horizontal Barriers Provided:		

Water Supply Curve

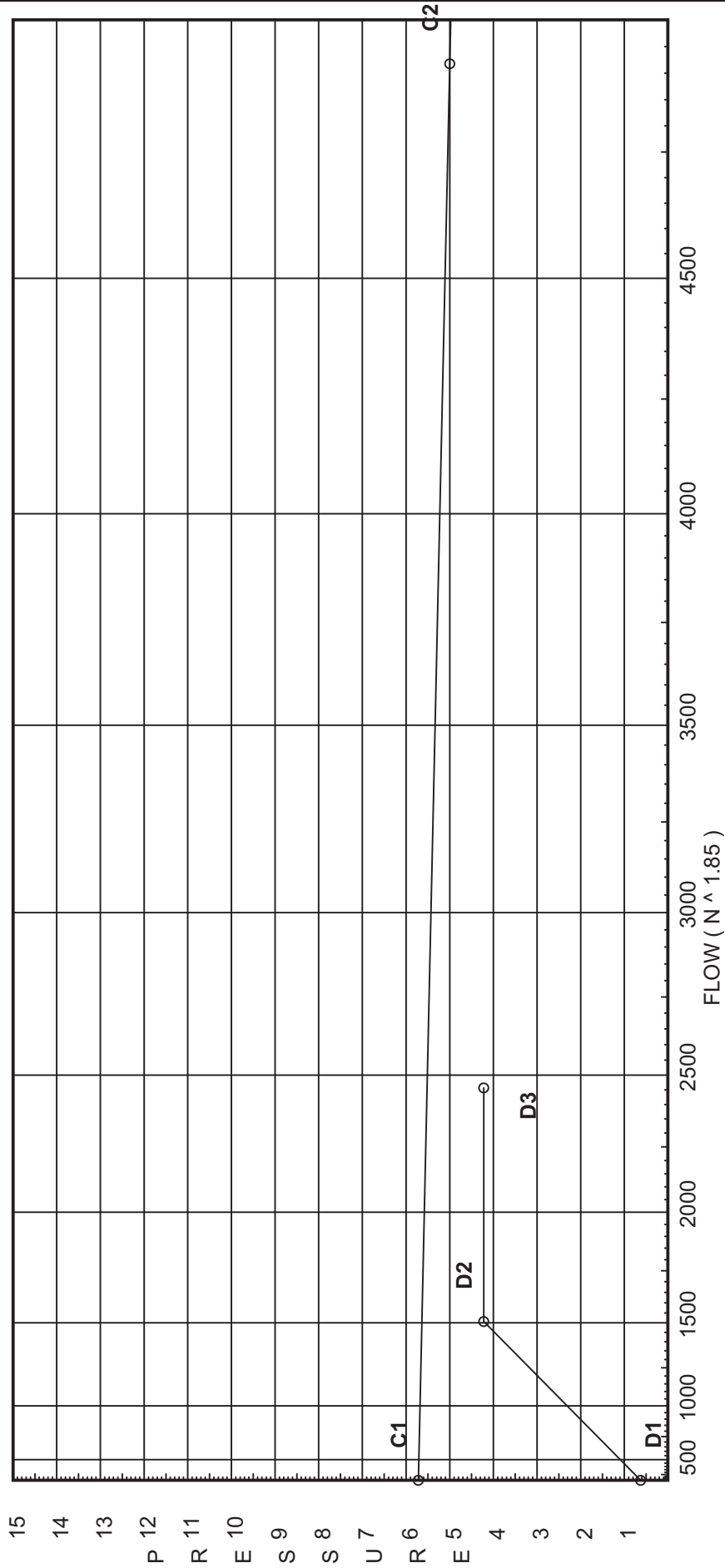
EPI FIRE PROTECTION & SECURITY
3050 COLLEGEWAY - FIRE STATION 123

City Water Supply:

C1 - Static Pressure : 5.72
C2 - Residual Pressure: 5
C2 - Residual Flow : 4918

Demand:

D1 - Elevation : 0.627
D2 - System Flow : 1507.24
D2 - System Pressure : 4.219
Hose (Demand) : 950
D3 - System Demand : 2457.24
Safety Margin : 1.301



Fittings Used Summary

EPI FIRE PROTECTION & SECURITY
3050 COLLEGEWAY - FIRE STATION 123

Fitting Legend Abbrev. Name	15	20	25	32	40	50	65	80	90	100	125	150	200	250	300	350	400	450	500	24
	Fitting generates a Fixed Loss Based on Flow																			
B NFPA 13 Butterfly Valve	0	0	0	0	0	1.83	2.13	3.05	0	3.66	2.74	3.05	3.66	5.79	6.4	0	0	0	0	0
E NFPA 13 90° Standard Elbow	0	0.61	0.61	0.91	1.22	1.52	1.83	2.13	2.44	3.05	3.66	4.27	5.49	6.71	8.23	0	0	0	0	0
G NFPA 13 Gate Valve	0	0	0	0	0	0.3	0.3	0.3	0.3	0.61	0.61	0.91	1.22	1.52	1.83	0	0	0	0	0
T NFPA 13 90° Flow thru Tee	0	0.91	1.52	1.83	2.44	3.05	3.66	4.57	5.18	6.1	7.62	9.14	10.67	15.24	18.29	0	0	0	0	0
Ziw Wilkins 350AST																				

Units Summary

- Diameter Units
Length Units
Flow Units
Pressure Units
- Millimeters
Meters
Liters per Minute
Bars

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

EPI FIRE PROTECTION & SECURITY
3050 COLLEGEWAY - FIRE STATION 123

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Date 31/05/2024

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>
TEST	5.72	5	4918.0	5.521	2457.24	4.219

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>	
S11	7.0	81	1.44	97.2	8.1	12
S12	7.0	81	1.45	97.62	8.1	12
S13	7.0	81	1.5	99.14	8.1	12
S14	7.0	81	1.6	102.32	8.1	12
S15	7.0	81	1.76	107.61	8.1	12
S17	7.0	81	2.14	118.51	8.1	12
L101	7.0		2.17			
S21	7.0	81	1.44	97.32	8.1	12
S22	7.0	81	1.46	97.74	8.1	12
S23	7.0	81	1.5	99.26	8.1	12
S24	7.0	81	1.6	102.44	8.1	12
S25	7.0	81	1.77	107.74	8.1	12
S27	7.0	81	2.15	118.65	8.1	12
L102	7.0		2.18			
S35	7.0	81	2.61	130.89	8.1	12
S37	7.0	81	2.61	130.8	8.1	12
L103	7.0		2.64			
M101	6.2		2.81			
M102	6.2		2.81			
M103	6.2		2.84			
TOR	3.1		3.47			
BOR	0.6		3.84			
UG	0.6		4.21			
TEST	0.6		4.22	950.0		

Final Calculations : Hazen-Williams

EPI FIRE PROTECTION & SECURITY
3050 COLLEGEWAY - FIRE STATION 123

Page 5
Date 31/05/2024

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/M	Pt Pe Pf	*****	Notes	*****
S11 to S12	7 7	81.00	97.20 97.2	40 42.73			2.685 2.685	120 0.0048	1.440 0.013		Vel = 1.13	
S12 to S13	7 7	81.00	97.62 194.82	40 42.73			2.685 2.685	120 0.0168	1.453 0.045		Vel = 2.26	
S13 to S14	7 7	81.00	99.14 293.96	40 42.73			2.685 2.685	120 0.0365	1.498 0.098		Vel = 3.42	
S14 to S15	7 7	81.00	102.32 396.28	40 42.73			2.685 2.685	120 0.0629	1.596 0.169		Vel = 4.61	
S15 to L101	7 7	81.00	107.61 503.89	40 42.73	T	3.022	1.112 3.022 4.134	120 0.0985	1.765 0.0 0.407		Vel = 5.86	
L101			0.0 503.89						2.172		K Factor = 341.91	
S17 to L101	7 7	81.00	118.51 118.51	40 42.73	T	3.022	1.573 3.022 4.595	120 0.0067	2.141 0.0 0.031		Vel = 1.38	
L101 to M101	7 6.200		503.89 622.4	40 42.73	T	3.022	0.800 3.022 3.822	120 0.1455	2.172 0.078 0.556		Vel = 7.23	
M101			0.0 622.40						2.806		K Factor = 371.56	
S21 to S22	7 7	81.00	97.32 97.32	40 42.73			2.685 2.685	120 0.0045	1.444 0.012		Vel = 1.13	
S22 to S23	7 7	81.00	97.74 195.06	40 42.73			2.685 2.685	120 0.0171	1.456 0.046		Vel = 2.27	
S23 to S24	7 7	81.00	99.26 294.32	40 42.73			2.685 2.685	120 0.0361	1.502 0.097		Vel = 3.42	
S24 to S25	7 7	81.00	102.44 396.76	40 42.73			2.685 2.685	120 0.0633	1.599 0.170		Vel = 4.61	
S25 to L102	7 7	81.00	107.74 504.5	40 42.73	T	3.022	1.112 3.022 4.134	120 0.0987	1.769 0.0 0.408		Vel = 5.86	
L102			0.0 504.50						2.177		K Factor = 341.93	
S27 to L102	7 7	81.00	118.65 118.65	40 42.73	T	3.022	1.573 3.022 4.595	120 0.0067	2.146 0.0 0.031		Vel = 1.38	
L102 to M102	7 6.200		504.50 623.15	40 42.73	T	3.022	0.800 3.022 3.822	120 0.1457	2.177 0.078 0.557		Vel = 7.24	

Final Calculations : Hazen-Williams

EPI FIRE PROTECTION & SECURITY
3050 COLLEGEWAY - FIRE STATION 123

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Date 31/05/2024

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/M	Pt Pe Pf	*****	Notes	*****
M102			0.0 623.15					2.812		K Factor = 371.61	
S35 to L103	7 7	81.00	130.89	40	T 3.022	1.112 3.022	120	2.611 0.0			
			130.89	42.73		4.134	0.0082	0.034		Vel = 1.52	
L103			0.0 130.89					2.645		K Factor = 80.48	
S37 to L103	7 7	81.00	130.80	40	T 3.022	1.573 3.022	120	2.608 0.0			
			130.8	42.73		4.595	0.0081	0.037		Vel = 1.52	
L103 to M103	7 6.200		130.89	40	T 3.022	0.800 3.022	120	2.645 0.078			
			261.69	42.73		3.822	0.0293	0.112		Vel = 3.04	
M103			0.0 261.69					2.835		K Factor = 155.42	
M101 to M102	6.200 6.200		622.40	100		4.062	120	2.806 0.0			
			622.4	108.2		4.062	0.0015	0.006		Vel = 1.13	
M102 to M103	6.200 6.200		623.15	100		4.062	120	2.812 0.0			
			1245.55	108.2		4.062	0.0057	0.023		Vel = 2.26	
M103 to TOR	6.200 3.100		261.69	100	4E 16.061	24.472 16.061	120	2.835 0.304			
			1507.24	108.2		40.533	0.0081	0.328		Vel = 2.73	
TOR to BOR	3.100 .600		0.0	100	T B 8.031 4.818	3.000 12.849	120	3.467 0.245			
			1507.24	108.2		15.849	0.0081	0.128		Vel = 2.73	
BOR to UG	.600 .600		0.0	100	2E Ziw 8.031 0.0	1.000 8.031	120	3.840 0.292		** Fixed Loss = 0.292	
			1507.24	108.2		9.031	0.0082	0.074		Vel = 2.73	
UG to TEST	.600 .600		0.0	200	E T 8.683 16.876	30.000 27.490	140	4.206 0.0			
			1507.24	210.06	G 1.93	57.490	0.0002	0.013		Vel = 0.72	
TEST			950.00 2457.24					4.219		Qa = 950.00 K Factor = 1196.31	



EPI FIRE PROTECTION & SECURITY
675 GARYRAY DRIVE.
TORONTO, ONT
M9L 1R2
416 746-2225



Job Name : CITY OF MISSISSAUGA FIRE STATION 123
Drawing : FIRE STATION
Location : 3050 THE COLLEGEWAY, MISSISSAUGA, ONT
Remote Area : DA#2
Contract : J#32074
Data File : 3050 Calc #2.WXF

Hydraulic Design Information Sheet

Name - CITY OF MISSISSAUGA FIRE STATION 123 Date - 31/05/2024
Location - 3050 THE COLLEGEWAY, MISSISSAUGA, ONT
Building - FIRE STATION System No. - DA#2
Contractor - EPI FIRE PROTECTION Contract No. - J#32074
Calculated By - A.G Drawing No. - SP-1
Construction: () Combustible (X) Non-Combustible Ceiling Height - 7M
Occupancy - LIGHT HAZARD

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. () 1 () 2 () 3 () Ex.Haz.
Y () NFPA 231 () NFPA 231C () Figure Curve
S Other

T Specific Ruling 11.2.3.2.3.1 Made By Date

M Area of Sprinkler Operation - 102 System Type Sprinkler/Nozzle
Density - 4.1 (X) Wet Make
D Area Per Sprinkler - 21 () Dry Model UPRIGHT
E Elevation at Highest Outlet - 2.700 () Deluge Size 15
S Hose Allowance - Inside - NA () Preaction K-Factor 81
I Rack Sprinkler Allowance - NA () Other Temp.Rat.68
G Hose Allowance - Outside - 380

N
Note

Calculation Flow Required - 1266.98 Press Required - 4.37 TEST
Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:
A Date of Test - 17/08/2024 Cap. -
T Time of Test - 10:15AM Rated Cap.- Elev.-
E Static Press - 5.72 @ Press -
R Residual Press - 5 Elev. - Well
Flow - 4918 Proof Flow
S Elevation - 0

U
P Location - 3010 collegeway, mississauga, ont

P
L Source of Information - LHS Inc,
Y

C Commodity Class Location
O Storage Ht. Area Aisle W.
M Storage Method: Solid Piled % Palletized % Rack
M () Single Row () Conven. Pallet () Auto. Storage () Encap.
S R () Double Row () Slave Pallet () Solid Shelf () Non
T A () Mult. Row () Open Shelf
O C

R K Flue Spacing Clearance:Storage to Ceiling
A Longitudinal Transverse

G
E Horizontal Barriers Provided:

Water Supply Curve

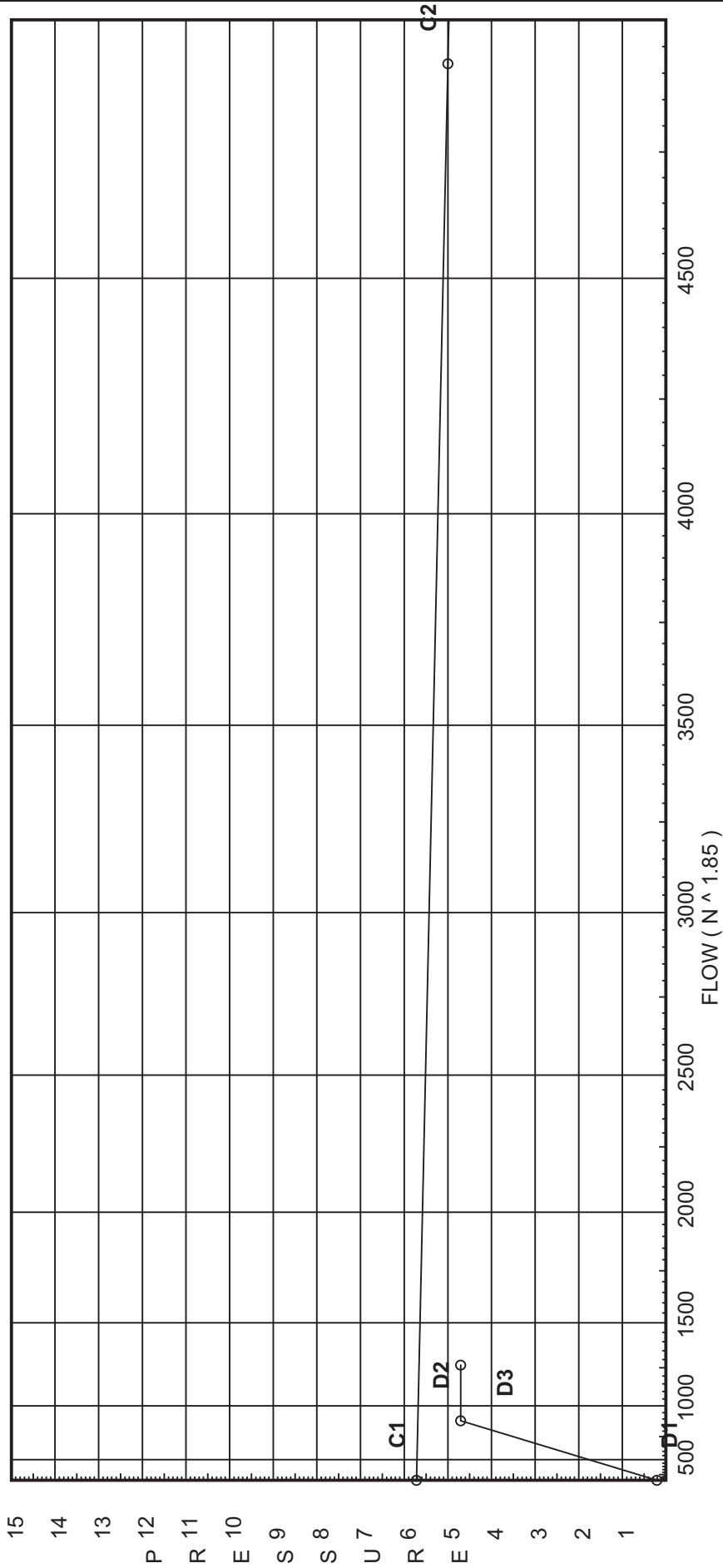
EPI FIRE PROTECTION & SECURITY
CITY OF MISSISSAUGA FIRE STATION 123

City Water Supply:

C1 - Static Pressure : 5.72
C2 - Residual Pressure: 5
C2 - Residual Flow : 4918

Demand:

D1 - Elevation : 0.206
D2 - System Flow : 886.97
D2 - System Pressure : 4.707
Hose (Demand) : 380
D3 - System Demand : 1266.97
Safety Margin : 0.955



Fittings Used Summary

EPI FIRE PROTECTION & SECURITY
CITY OF MISSISSAUGA FIRE STATION 123

Fitting Legend Abbrev. Name	15	20	25	32	40	50	65	80	90	100	125	150	200	250	300	350	400	450	500	24
	Fitting generates a Fixed Loss Based on Flow																			
B NFPA 13 Butterfly Valve	0	0	0	0	0	1.83	2.13	3.05	0	3.66	2.74	3.05	3.66	5.79	6.4	0	0	0	0	0
E NFPA 13 90° Standard Elbow	0	0.61	0.61	0.91	1.22	1.52	1.83	2.13	2.44	3.05	3.66	4.27	5.49	6.71	8.23	0	0	0	0	0
G NFPA 13 Gate Valve	0	0	0	0	0	0.3	0.3	0.3	0.3	0.61	0.61	0.91	1.22	1.52	1.83	0	0	0	0	0
T NFPA 13 90° Flow thru Tee	0	0.91	1.52	1.83	2.44	3.05	3.66	4.57	5.18	6.1	7.62	9.14	10.67	15.24	18.29	0	0	0	0	0
Ziw Wilkins 350AST																				

Units Summary

- Diameter Units
Length Units
Flow Units
Pressure Units
- Millimeters
Meters
Liters per Minute
Bars

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

EPI FIRE PROTECTION & SECURITY
CITY OF MISSISSAUGA FIRE STATION 123

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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>
TEST	5.72	5	4918.0	5.661	1266.97	4.707

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>	
S101	2.7	81	1.13	86.1	4.1	21
S102	2.7	81	1.14	86.41	4.1	21
S103	2.7	81	1.17	87.5	4.1	21
S104	2.7	81	1.22	89.36	4.1	21
S105	2.235	81	1.35	94.01	6.1	12
S111	2.7	81	1.13	86.14	4.1	21
S112	2.7	81	1.14	86.45	4.1	21
S113	2.7	81	1.17	87.54	4.1	21
S114	2.7	81	1.22	89.4	4.1	21
S115	2.235	81	1.35	94.05	6.1	12
L101	3.0		1.84			
L102	3.0		1.85			
L103	3.0		1.9			
L104	3.0		1.98			
L105	3.0		2.14			
L111	3.0		1.84			
L112	3.0		1.85			
L113	3.0		1.9			
L114	3.0		1.98			
L115	3.0		2.14			
M201	3.0		3.97			
M202	3.0		3.97			
TOR2	3.0		4.17			
BOR2	0.6		4.45			
UG	0.6		4.7			
TEST	0.6		4.71	380.0		

Final Calculations : Hazen-Williams

EPI FIRE PROTECTION & SECURITY
CITY OF MISSISSAUGA FIRE STATION 123

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/M	Pt Pe Pf	*****	Notes	*****
S101 to L101	2.700 3	81.00	86.10 86.1	25 26.645		19.800 19.800	120 0.0373	1.130 -0.029 0.739		Vel = 2.57	
L101			0.0 86.10					1.840		K Factor = 63.47	
S102 to L102	2.700 3	81.00	86.41 86.41	25 26.645		19.800 19.800	120 0.0376	1.138 -0.029 0.744		Vel = 2.58	
L102			0.0 86.41					1.853		K Factor = 63.48	
S103 to L103	2.700 3	81.00	87.50 87.5	25 26.645		19.800 19.800	120 0.0384	1.167 -0.029 0.761		Vel = 2.62	
L103			0.0 87.50					1.899		K Factor = 63.50	
S104 to L104	2.700 3	81.00	89.36 89.36	25 26.645		19.800 19.800	120 0.0400	1.217 -0.029 0.792		Vel = 2.67	
L104			0.0 89.36					1.980		K Factor = 63.51	
S105 to L105	2.235 3	81.00	94.01 94.01	25 26.645		19.800 19.800	120 0.0439	1.347 -0.075 0.870		Vel = 2.81	
L105			0.0 94.01					2.142		K Factor = 64.23	
S111 to L111	2.700 3	81.00	86.14 86.14	25 26.645		19.800 19.800	120 0.0374	1.131 -0.029 0.740		Vel = 2.58	
L111			0.0 86.14					1.842		K Factor = 63.47	
S112 to L112	2.700 3	81.00	86.45 86.45	25 26.645		19.800 19.800	120 0.0376	1.139 -0.029 0.745		Vel = 2.58	
L112			0.0 86.45					1.855		K Factor = 63.47	
S113 to L113	2.700 3	81.00	87.54 87.54	25 26.645		19.800 19.800	120 0.0385	1.168 -0.029 0.762		Vel = 2.62	
L113			0.0 87.54					1.901		K Factor = 63.49	
S114 to L114	2.700 3	81.00	89.40 89.4	25 26.645		19.800 19.800	120 0.0401	1.218 -0.029 0.793		Vel = 2.67	
L114			0.0 89.40					1.982		K Factor = 63.50	
S115 to L115	2.235 3	81.00	94.05 94.05	25 26.645		19.800 19.800	120 0.0440	1.348 -0.075 0.871		Vel = 2.81	

Final Calculations : Hazen-Williams

EPI FIRE PROTECTION & SECURITY
CITY OF MISSISSAUGA FIRE STATION 123

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Date 31/05/2024

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/M	Pt Pe Pf	*****	Notes	*****
L115			0.0 94.05					2.144		K Factor = 64.23	
L101 to L102	3		86.10	40		3.514	120	1.840 0.0			
L102 to L103	3		86.1	42.73		3.514	0.0037	0.013		Vel = 1.00	
L103 to L104	3		86.41	40		3.411	120	1.853 0.0			
L103 to L104	3		172.51	42.73		3.411	0.0135	0.046		Vel = 2.01	
L103 to L104	3		87.50	40		2.784	120	1.899 0.0			
L104 to L105	3		260.01	42.73		2.784	0.0291	0.081		Vel = 3.02	
L104 to L105	3		89.36	40		3.248	120	1.980 0.0			
L105 to M201	3		349.37	42.73		3.248	0.0499	0.162		Vel = 4.06	
L105 to M201	3		94.01	40	E T	1.511 3.022	19.000 4.533	120	2.142 0.0		
M201	3		443.38	42.73		23.533	0.0776	1.827		Vel = 5.15	
M201			0.0 443.38					3.969		K Factor = 222.55	
L111 to L112	3		86.14	40		3.514	120	1.842 0.0			
L112 to L113	3		86.14	42.73		3.514	0.0037	0.013		Vel = 1.00	
L112 to L113	3		86.46	40		3.411	120	1.855 0.0			
L113 to L114	3		172.6	42.73		3.411	0.0135	0.046		Vel = 2.01	
L113 to L114	3		87.54	40		2.784	120	1.901 0.0			
L114 to L115	3		260.14	42.73		2.784	0.0291	0.081		Vel = 3.02	
L114 to L115	3		89.40	40		3.248	120	1.982 0.0			
L115 to M202	3		349.54	42.73		3.248	0.0499	0.162		Vel = 4.06	
L115 to M202	3		94.05	40	E T	1.511 3.022	19.000 4.533	120	2.144 0.0		
M202	3		443.59	42.73		23.533	0.0777	1.829		Vel = 5.16	
M202			0.0 443.59					3.973		K Factor = 222.55	
M201 to M202	3		443.38	100		4.332	120	3.969 0.0			
M202 to TOR2	3		443.38	108.2		4.332	0.0009	0.004		Vel = 0.80	
M202 to TOR2	3		443.60	100	8E	32.123	32.636 32.123	120	3.973 0.0		
TOR2 to BOR2	3		886.98	108.2		64.759	0.0030	0.196		Vel = 1.61	
TOR2 to BOR2	3		0.0	100	T B	8.031 4.818	3.000 12.849	120	4.169 0.235		
BOR2 to UG	.600		886.98	108.2		15.849	0.0030	0.048		Vel = 1.61	
BOR2 to UG	.600		0.0	100	2E Ziw	8.031 0.0	1.000 8.031	120	4.452 0.222		
UG	.600		886.98	108.2		9.031	0.0031	0.028		** Fixed Loss = 0.222 Vel = 1.61	

Final Calculations : Hazen-Williams

EPI FIRE PROTECTION & SECURITY
CITY OF MISSISSAUGA FIRE STATION 123

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/M	Pt Pe Pf	*****	Notes	*****
UG to TEST	.600 .600		0.0 886.98	200 210.06	E T G	8.683 16.876 1.93	30.000 27.490 57.490	140 0.0001	4.702 0.0 0.005		Vel = 0.43	
TEST			380.00 1266.98						4.707		Qa = 380.00 K Factor = 583.98	

Seismic Brace Report



Project Name Moss Park Armoury
Date 06/03/2024
Address 130 Queen st East
Toronto, ON M5A 1R5



APPROVAL STAMP

- ☐ Approved
☐ Approved as Noted
☐ Not Approved

Remarks:

Standard NFPA 13-2016

BRACE SUMMARY

Brace Name	Drawing Reference	Seismic Design Load	Structure	Brace Description	Fastener	Attachments
Lateral-2	SP-1	2.13 kN.	Horizontal Beam Flange	Lateral Orientation 30° - 90° 1 NPS Sch 40	AF778	AF700 - 1/2" AF730 - 4 NPS
Lateral	SP-1	2.231 kN.	Horizontal Beam Flange	Lateral Orientation 30° - 90° 1 NPS Sch 40	AF778	AF700 - 1/2" AF730 - 4 NPS

NOTE: Per NFPA 13-2016, all load capacities listed for fasteners installed in cracked concrete have been reduced based on the prying factors listed for ASC's swivel attachments. Prying factors for NFPA fastener orientations "A" through "I" may be found in ASC's individual product submittal at asc-es.com

NFPA 13-2016 Product loads incorporate a minimum safety factor of 1.5. NFPA 13-2019 FM Product loads have been reduced to include a safety factor of 2.2 unless noted in the applicable product submittal.

The products specified within this report are limited to the capability of the sway brace assembly alone to resist the calculated seismic force resulting from user input . Point loads applied to structural elements as a result of seismic forces are not evaluated by the software. The seismic load rating of the fastener attached to a structural element is determined by one of the following: NFPA 13, UL listing, FM Global approval, or other empirical testing. The review of the of the structural element(s) as a whole and/or the entire structure and its ability to resist the seismic load(s) is beyond the scope of these seismic calculations.

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LATERAL-2 - SEISMIC BRACE CALCULATIONS

Seismic Project FIRE STATION 123

Standard NFPA 13-2016

Brace Type Lateral

Brace Name Lateral-2

Drawing Reference SP-1

Approval Agency UL Listed

STRUCTURE INFORMATION

Structure	I-Beam/Joist
Substrate	Horizontal Beam Flange
Thickness	0.48 cm.-0.63 cm.
Load Orientation	Parallel to Beam

BRACE INFORMATION

Brace Member	1 NPS Sch 40
Brace Length Max	2.13 m.
Brace Angle	30° - 90°
Least Radius of Gyration	10.693 mm.
I/r Ratio Max	200
Max Horizontal Load	4.119 kN.

FASTENER INFORMATION

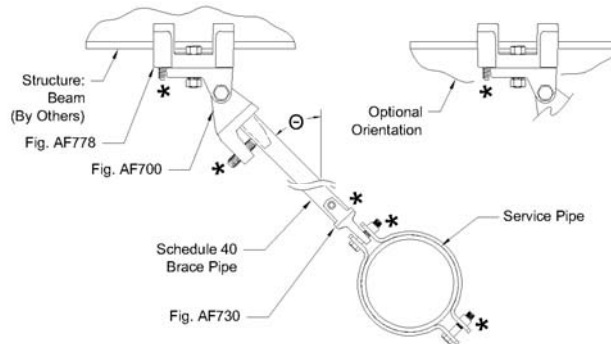
Fastener Name	N/A
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SEISMIC BRACE ATTACHMENTS

	Model	Size	Load Rating
Structural Att.	AF778	N/A	2.224 kN.
Swivel Att.	AF700	1/2"	4.19 kN.
Pipe Att.	AF730	4 NPS	4.19 kN.

See Appendix A for alternate seismic brace attachments.

All seismic brace attachments manufactured by ASC Engineered Solutions.



* - denotes hardware shown with the bolt head or nut broken off, as per the product installation instructions

Net Vertical Reaction Forces do not need to be addressed per NFPA 13-2016.

SPRINKLER SYSTEM LOAD CALCULATION ($F_{PW} = C_p * W_p$) $C_p = 0.330$

Qty	Line	Description	Pipe Diameter/Type	Length	Weight per m	Weight
1	Main	Braced Pipe	100 DN Steel Sch 10	12.00 m.	17.53 Kg/m.	210.37 kg.
2	Branch 1	Segment A	40 DN Steel Sch 10	40.00 m.	4.52 Kg/m.	180.96 kg.

Weakest Main Size	Spacing	Max Fpw
4 NPS Steel Sch 10	12.19 m.	3.421 kN.

Total System Weight	572.28 kg.
System Design Weight (W_p)	658.16 kg.
Horizontal Seismic Load (F_{pw})	2.13 kN.

LATERAL - SEISMIC BRACE CALCULATIONS

Seismic Project FIRE STATION 123
Standard NFPA 13-2016
Brace Type Lateral Brace as a Lateral & Longitudinal Brace

Brace Name Lateral
Drawing Reference SP-1
Approval Agency UL Listed

STRUCTURE INFORMATION

Structure I-Beam/Joist
Substrate Horizontal Beam Flange
Thickness 0.64 cm.-1.27 cm.
Load Orientation Parallel to Beam

BRACE INFORMATION

Brace Member 1 NPS Sch 40
Brace Length Max 2.13 m.
Brace Angle 30° - 90°
Least Radius of Gyration 10.693 mm.
I/r Ratio Max 200
Max Horizontal Load 4.119 kN.

FASTENER INFORMATION

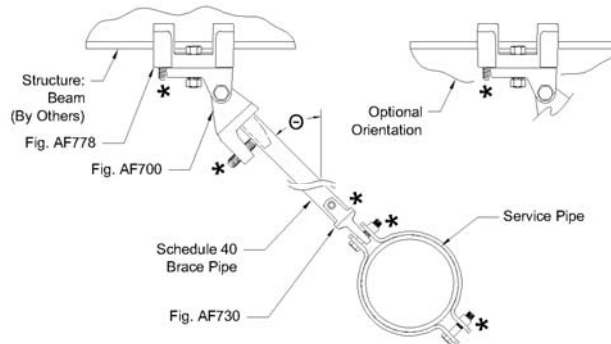
Fastener Name N/A

SEISMIC BRACE ATTACHMENTS

	Model	Size	Load Rating
Structural Att.	AF778	N/A	3.559 kN.
Swivel Att.	AF700	1/2"	4.19 kN.
Pipe Att.	AF730	4 NPS	4.19 kN.

See Appendix A for alternate seismic brace attachments.

All seismic brace attachments manufactured by ASC Engineered Solutions.



* - denotes hardware shown with the bolt head or nut broken off, as per the product installation instructions

Net Vertical Reaction Forces do not need to be addressed per NFPA 13-2016.

SPRINKLER SYSTEM LOAD CALCULATION ($F_{PW} = C_p * W_p$) $C_p = 0.330$

Qty	Line	Description	Pipe Diameter/Type	Length	Weight per m	Weight
1	Main	Braced Pipe	100 DN Steel Sch 10 x 100 DN Steel Sch 10	2.00 m. x 10.00 m.	17.53 Kg/m.	210.37 kg.
2	Branch 1	Segment A	40 DN Steel Sch 10	40.00 m.	4.52 Kg/m.	180.96 kg.
1	Branch 2	Segment A	40 DN Steel Sch 10	6.00 m.	4.52 Kg/m.	27.15 kg.

Weakest Main Size 4 NPS Steel Sch 10
Spacing 6.10 m.
Max Fpw 7.268 kN.

Total System Weight 599.43 kg.
System Design Weight (W_p) 689.46 kg.
Horizontal Seismic Load (F_{pw}) 2.231 kN.

Appendix A - Alternate Seismic Brace Attachments

LATERAL-2

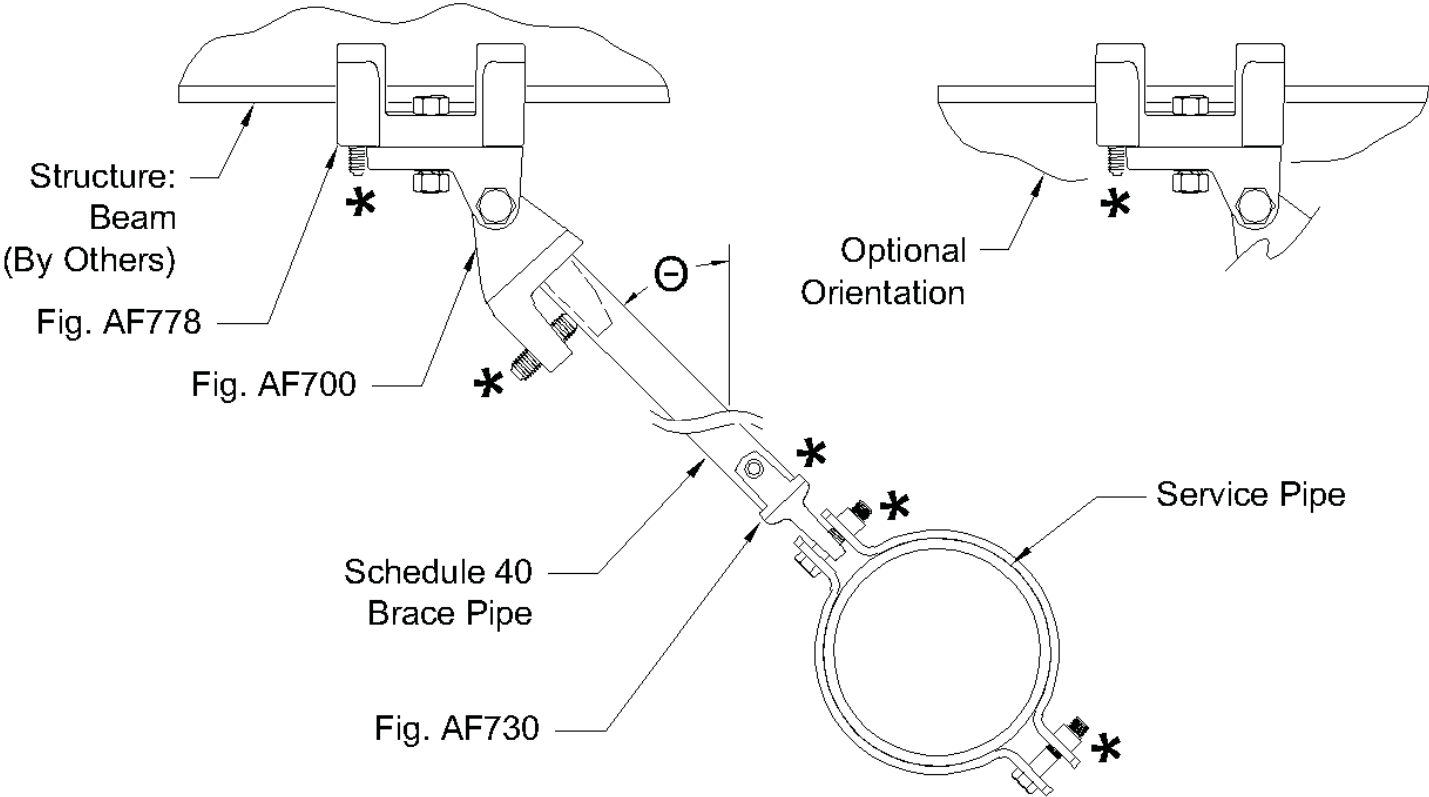
Structural Attachment	Structural Attach. Size	Structural Attach. Capacity	Swivel	Pipe Attachment
AF778	--	2.224 kN.	AF771 1 NPS x 1/2" 8.318 kN.	AF001 4 NPS x 1 NPS 2.224 kN.
AF778	--	3.559 kN.	AF771 1 NPS x 1/2" 8.318 kN.	AF035 4 NPS x 1 NPS 6.147 kN.
AF778	--	4.479 kN.	AF771 1 NPS x 1/2" 8.318 kN.	AF735 4 NPS x 1 NPS 4.19 kN.
AF778	--	3.559 kN.	AF700 1/2" 4.19 kN.	AF775 4 NPS x 1 NPS 2.224 kN.
AF778	--	4.479 kN.	AF700 1/2" 4.19 kN.	--
AF720	--	3.559 kN.	AF771 1 NPS x 1/2" 8.318 kN.	--
AF720	--	3.559 kN.	AF700 1/2" 4.19 kN.	--
AF727	--	4.19 kN.	AF727 1/2" 4.19 kN.	--
AF720	--	3.559 kN.	AF076 1/2" 6.147 kN.	--
AF772	Type A	2.224 kN.	AF771 1 NPS x 1/2" 8.318 kN.	--
AF772	Type B	2.224 kN.	AF771 1 NPS x 1/2" 8.318 kN.	--
AF772	Type A	2.224 kN.	AF700 1/2" 4.19 kN.	--
AF772	Type B	2.224 kN.	AF700 1/2" 4.19 kN.	--
AF087	--	3.114 kN.	AF075 1 NPS x 1/2" 4.479 kN.	--
AF087	--	3.114 kN.	AF076 1/2" 6.147 kN.	--
AF087	--	3.114 kN.	AF077 1 NPS x 1/2" 2.224 kN.	--
AF086	--	2.811 kN.	AF075 1 NPS x 1/2" 4.479 kN.	--
AF086	--	2.811 kN.	AF076 1/2" 6.147 kN.	--
AF086	--	2.811 kN.	AF077 1 NPS x 1/2" 2.224 kN.	--
AF086	--	2.811 kN.	AF700 1/2" 4.19 kN.	--

LATERAL

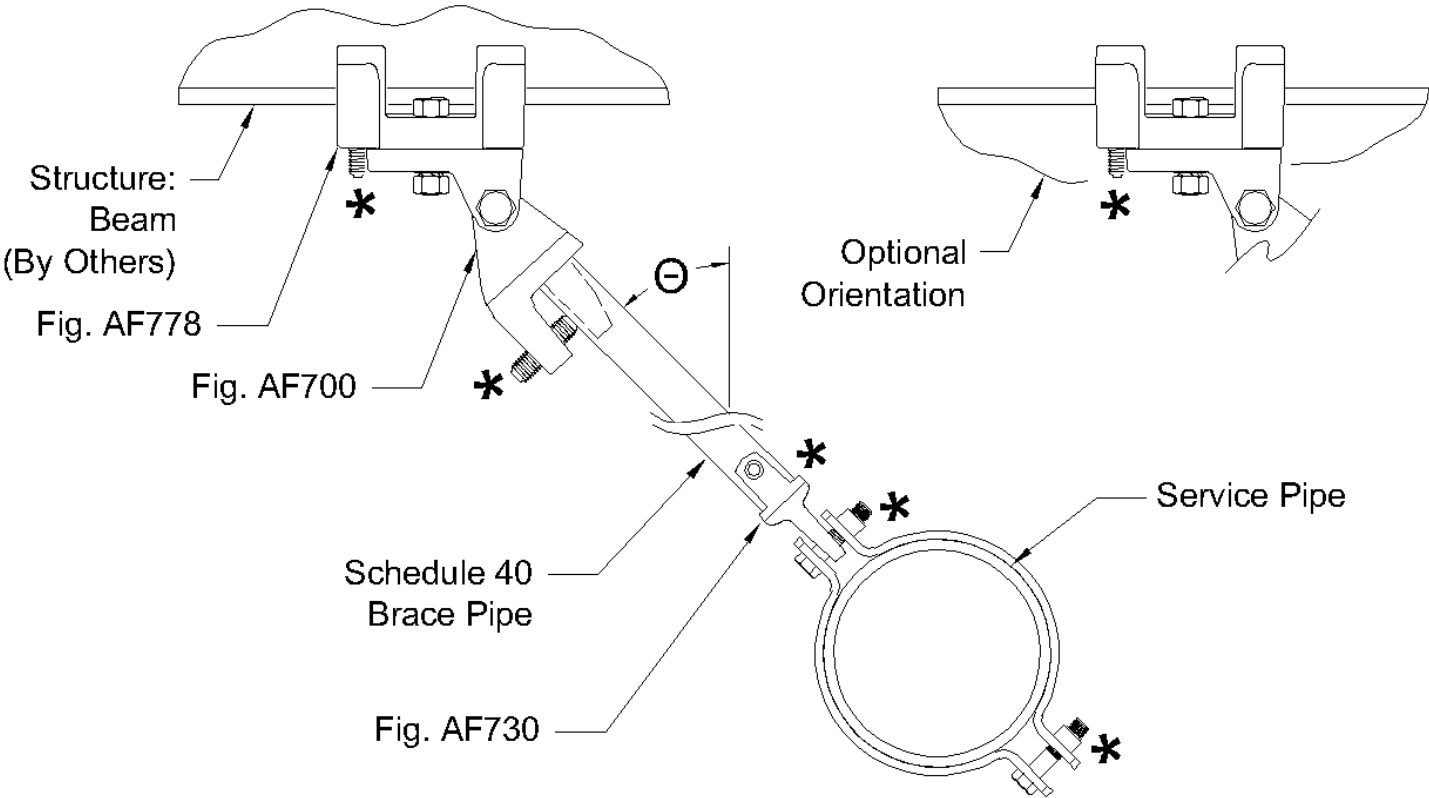
Structural Attachment	Structural Attach. Size	Structural Attach. Capacity	Swivel	Pipe Attachment
AF778	--	3.559 kN.	AF771 1 NPS x 1/2" 8.318 kN.	AF035 4 NPS x 1 NPS 6.147 kN.
AF778	--	4.479 kN.	AF771 1 NPS x 1/2" 8.318 kN.	AF735 4 NPS x 1 NPS 4.19 kN.
AF778	--	4.479 kN.	AF700 1/2" 4.19 kN.	--
AF720	--	3.559 kN.	AF771 1 NPS x 1/2" 8.318 kN.	--
AF720	--	3.559 kN.	AF700 1/2" 4.19 kN.	--
AF727	--	4.19 kN.	AF727 1/2" 4.19 kN.	--
AF720	--	3.559 kN.	AF076 1/2" 6.147 kN.	--
AF087	--	3.114 kN.	AF075 1 NPS x 1/2" 4.479 kN.	--
AF087	--	3.114 kN.	AF076 1/2" 6.147 kN.	--
AF086	--	2.811 kN.	AF075 1 NPS x 1/2" 4.479 kN.	--
AF086	--	2.811 kN.	AF076 1/2" 6.147 kN.	--
AF086	--	2.811 kN.	AF700 1/2" 4.19 kN.	--

Appendix B - Enlarged Images

LATERAL-2



LATERAL



** - denotes hardware shown with the bolt head or nut broken off, as per the product installation instructions*

Appendix C - C_p Calculations

BRACE CALCULATION DATA

Brace Name	Brace Ref	Method	C _p	S _s	Site	F _a	S _{DS}	Z	H
Lateral-2	SP-1	B	0.330	--	--	--	--	--	--
Lateral	SP-1	B	0.330	--	--	--	--	--	--

CALCULATION METHODS

- A** C_p calculated per NFPA 13-2016 Table 9.3.5.9.3
- B** C_p entered by user
- C** C_p calculated per ASCE/SEI 7-10 per NFPA 13-2016 Section 9.3.5.9.4

Notes for Calculation Method C

Per NFPA 13-2016, the following values are always assumed for a_p, R_p, and I_p:

a _p	R _p	I _p
2.5	4.5	1.5

LEGEND

- F_{pw}** Seismic Horizontal Design Force
- C_p** Seismic Coefficient per NFPA
- S_s** Short Period MCEr Spectral Response Acceleration
- F_a** Site Coefficient. See Tables Below.
- S_{DS}** Short Period Spectral Acceleration
- a_p** Component Amplification Factor. Taken as 2.5 for Fire Sprinkler Applications
- R_p** Component Response Modification Factor. Taken as 4.5 for Fire Sprinkler Applications
- I_p** Component Importance Factor. Taken as 1.5 for Fire Sprinkler Applications
- W_p** Component Operating Weight. Taken as the weight of the Fire Sprinkler System in the ZOI plus 15%
- z** Height in the structure where the component attaches to the structure. Height is relative to the base of the structure and shall not be taken as less than 0 and shall not be larger than "H".
- H** Average roof height of the structure relative to the base

EQUATIONS

$$F_{pw} = C_p W_p$$

$$\text{Where: } C_p = 0.7 * \frac{0.4 a_p S_{DS} I_p}{R_p} \left(1 + 2 \frac{Z}{H} \right)$$

$$\text{Where: } S_{DS} = \frac{2}{3} F_a S_s$$

$$C_{p \max} = 0.7 * 1.6 S_{DS} I_p$$

$$C_{p \min} = 0.7 * 0.3 S_{DS} I_p$$

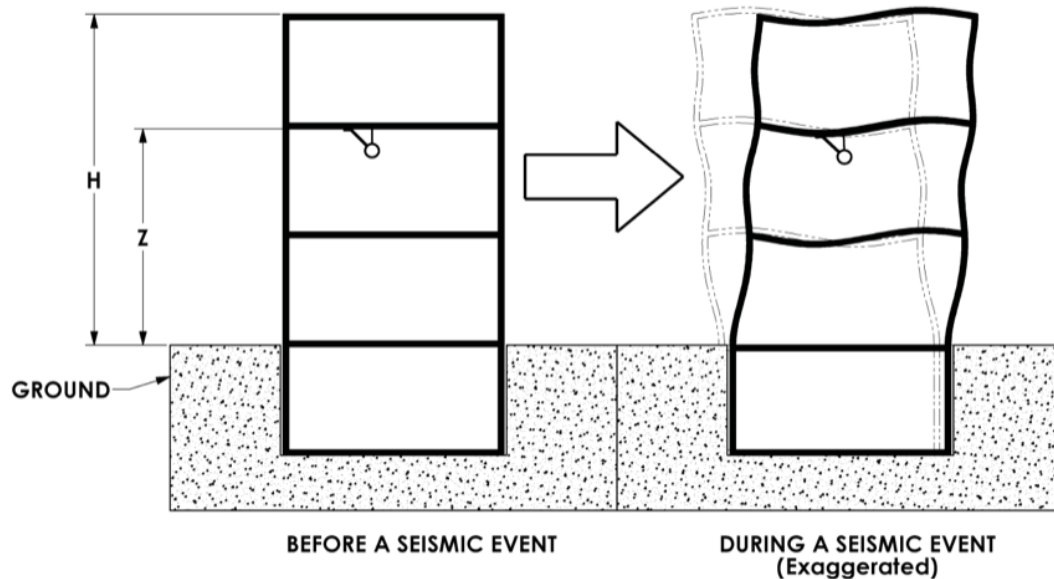
SITE COEFFICIENT, F_A PER ASCE/SEI 7-10

	$S_s \leq 0.25$	$S_s = 0.5$	$S_s = 0.75$	$S_s = 1$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1	1	1	1	1
C	1.2	1.2	1.1	1	1
D	1.6	1.4	1.2	1.1	1
E	2.5	1.7	1.2	0.9	0.9

Use straight-line interpolation for intermediate values of S_s .

SITE CLASSIFICATION PER ASCE/SEI 7-10

Site Class	Ground Structure
A	Hard Rock
B	Rock
C	Very Dense Soil and Soft Rock
D	Stiff Soil
E	Soft Clay Soil



Appendix D - Bill of Materials

Project Name Moss Park Armoury
Code Requirements NFPA 13-2016
Last Updated June 3, 2024

QUANTITY	FIGURE NUMBER	PRODUCT	DESCRIPTION
2			Fastener
2	AF778	AF778 Universal Structural Brace Attachment	AF778
2	AF700	1/2" AF700 Universal Swivel Attachment	AF700 - 1/2"
2	AF730	4 NPS AF730 Longitudinal & Lateral Seismic Clamp	AF730 - 4 NPS

Universal Structural Brace Attachment Fig. AF778

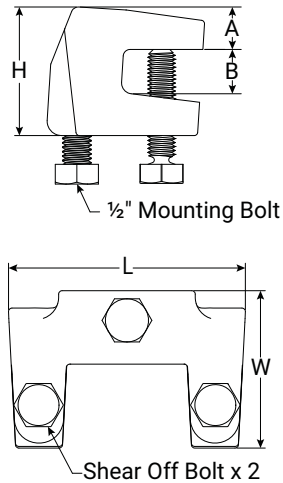
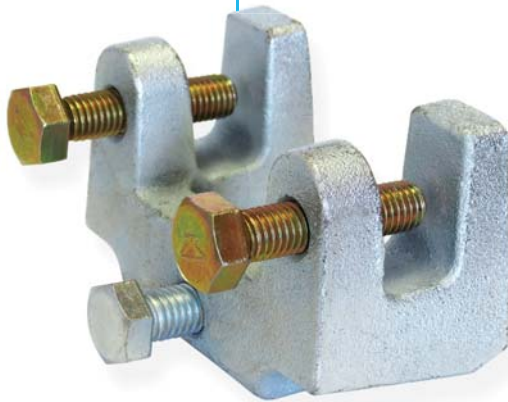


FIG. AF778 Dimensions and Weight

Mounting Bolt	A	B	L	W	H	Weight
	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs/kg
1/2" (M12)	0.75 19.1	0.75 19.1	4.13 104.8	2.75 69.9	2.25 57.2	2.26 1.03

Installation Instructions

- Place the AF778 on a horizontal or vertical steel flange.
- Hand tighten the set screws until they contact the flange. Continue to torque the set screws until the heads break off.
- Mount the AF700, AF771, or AF076 to the 1/2" mounting bolt. The mounting bolt shall be installed wrench tight (typically finger tight plus 1/4 to 1/2 turns).

Notes: When installed with the AF700, AF771, or AF076, the lowest load rating at angle shall control the load rating of the assembly.

Material Specifications

Size Range:

Flange Thickness: 1/8" to 3/4" thick

Material

Ductile Iron Casting with Carbon Steel Hardware

Finish

- ☐ Plain
- ☐ Electro-Galvanized per ASTM B633

Service

A seismic structural attachment designed to attach to steel I-beams, flanges, and joists. The AF778 rigidly braces piping systems subjected to horizontal and vertical seismic loads.

Approvals

cULus Listed (ANSI/UL 203a), FM Approved (FM 1950-13), & OSHPD (OPM-0351-13). Complies with NFPA 13, ASCE 7, IBC, & MSS SP-127 bracing requirements.

Features

- The set screw provides a visual indication that proper installation has been achieved
- May be installed anywhere a Fig 92 standard throat beam clamp may be installed

Ordering

Specify figure number, finish, and description.



PROJECT INFORMATION	APPROVAL STAMP
Project: Moss Park Armoury	<input type="checkbox"/> Approved
Address: 130 Queen st East, Toronto, ON M5A 1R5	<input type="checkbox"/> Approved as noted
Contractor:	<input type="checkbox"/> Not approved
Engineer:	Remarks:
Submittal Date: June 3, 2024	
Notes 1:	
Notes 2:	

Universal Structural Brace Attachment Fig. AF778

FIG. AF778 cULus Listing per ANSI/UL 203a (ASD)

Structure	Load Orientation	Flange Thickness In./ (mm)	Horizontal Load Rating at Brace Angle			
			30°-44° Lbf/(kN)	45°-59° Lbf/(kN)	60°-90° Lbf/(kN)	Listed Lbf/(kN)
Horizontal Steel Flange and Vertical Steel Flange	Parallel to Flange Perpendicular to Flange	0.1875 – 0.750 (4.76 – 19.05)	800 (3.56)	1131 (5.03)	1385 (6.16)	1600 (7.12)

- 1) Listed for installation with Fig. AF700, AF771, and AF076
- 2) Brace Angles are determined from Vertical.
- 3) Listed load ratings reduced for angle ranges in accordance with NFPA 13-2019 Table 18.5.2.3.
- 4) Minimum safety factor of 2.2 in accordance with NFPA 13-2019 Section A.18.5.2.3.

FIG. AF778 cULus Listing per UL 203a (ASD) for NFPA 13-2016 Editions or Earlier

UL's current Listings are predicated on installation in accordance with the latest edition of NFPA 13. The 2016 and earlier editions of NFPA 13 referenced a minimum safety factor of 1.5 for the load rating as compared to 2.2 for the current edition. The load ratings noted in this table are consistent with the historical cULus Listings that were evaluated to the requirements of UL 203A, Outline of Investigation for Sway Brace Devices for Fire Sprinkler System Piping, based upon a minimum safety factor of 1.5 in accordance with the earlier editions of NFPA 13. The load ratings based upon the 2016 or earlier editions of NFPA 13 should only be used where approved by the Authority Having Jurisdiction (AHJ).

Structure	Load Orientation	Flange Thickness In./ (mm)	Horizontal Load Rating at Brace Angle			
			30°-44° Lbf/(kN)	45°-59° Lbf/(kN)	60°-90° Lbf/(kN)	Listed Lbf/(kN)
Horizontal Steel Flange and Vertical Steel Flange	Parallel to Flange Perpendicular to Flange	0.1875 – 0.249 (4.76 – 6.32)	500 (2.22)	707 (3.15)	865 (3.85)	1000 (4.45)
		0.250 – 0.499 (6.35 – 12.67)	800 (3.56)	1131 (5.03)	1385 (6.16)	1600 (7.12)
		0.500 – 0.750 (12.70 – 19.05)	1007 (4.48)	1425 (6.34)	1744 (7.76)	2015 (8.96)

- 1) Listed for installation with Fig. AF700 & AF771
- 2) Brace Angles are determined from Vertical.
- 3) Listed load ratings reduced for angle ranges in accordance with NFPA 13-2016 Table 9.3.5.2.3.
- 4) Minimum safety factor of 1.5 in accordance with NFPA 13-2016 Section A.9.3.5.2.3.

FIG. AF778 FM Approved (Listing) per FM 1950-13 (ASD)

Structure	Load Orientation	Flange Thickness In./ (mm)	Horizontal Load Rating at Brace Angle			
			30°-44° Lbf/(kN)	45°-59° Lbf/(kN)	60°-74° Lbf/(kN)	75°-90° Lbf/(kN)
Horizontal Steel Flange	Parallel to Flange	0.125-0.750 (3.18-19.05)	1280 (5.69)	1840 (8.18)	2210 (9.83)	2470 (10.99)
	Perpendicular to Flange		1570 (6.98)	1490 (6.63)	1040 (4.63)	1150 (5.12)
Vertical Steel Flange	Parallel to Flange		870 (3.87)	1440 (6.41)	1230 (5.47)	1360 (6.05)
	Perpendicular to Flange		1038 (4.58)	2260 (10.05)	2490 (11.08)	2750 (12.23)

- 1) Listed for installation with Fig. AF700 & AF771
- 2) Brace Angles are determined from Vertical.
- 3) Listed load ratings reduced for angle ranges in accordance with NFPA 13-2019 Table 18.5.2.3.
- 4) Minimum safety factor of 1.5 in accordance with NFPA 13-2016 Section A.9.3.5.2.3. To convert the load ratings above to a safety factor of 2.2 per NFPA 13-2019 Section A.18.5.2.3, multiply load ratings by a factor of 0.68.
- 5) To convert to LRFD Load Ratings, ASD Load Ratings may be multiplied by a factor of 1.5

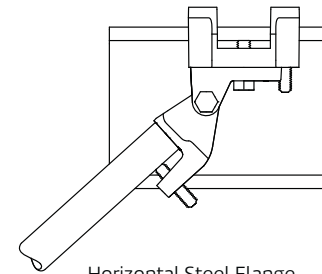
Notes:

ASC Engineered Solutions™ brand bracing components are designed to be compatible ONLY with other ASC Engineered Solutions brand bracing components, resulting in a Listed seismic bracing assembly. Updated UL listing information may be viewed at www.ul.com and updated FM approval information may be viewed at www.approvalguide.com.

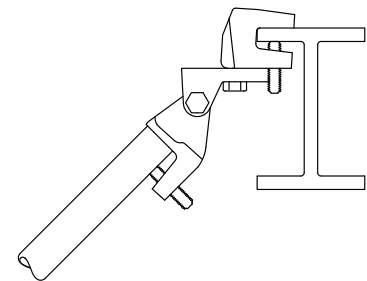
Disclaimer:

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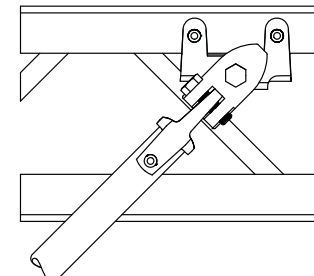
Seis Brace® Seismic Fire Protection Design Tool may be accessed at www.seisbrace.com



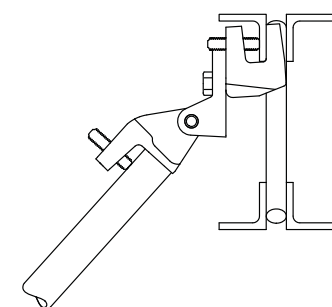
Horizontal Steel Flange
Seismic Load Parallel to Flange



Horizontal Steel Flange
Seismic Load Perpendicular to Flange



Vertical Steel Flange
Seismic Load Parallel to Flange



Vertical Steel Flange
Seismic Load Perpendicular to Flange



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Universal Swivel Attachment Fig. AF700

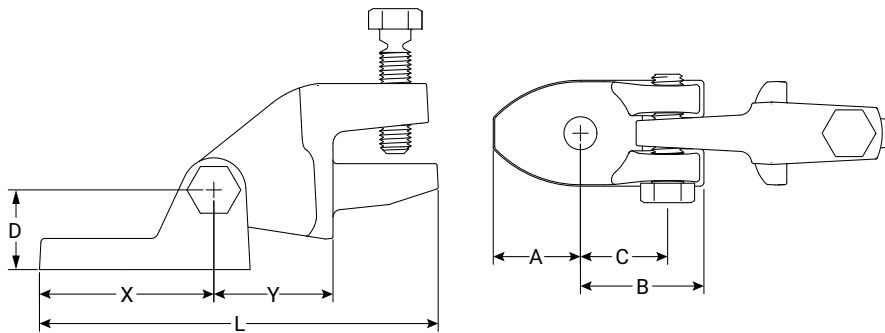
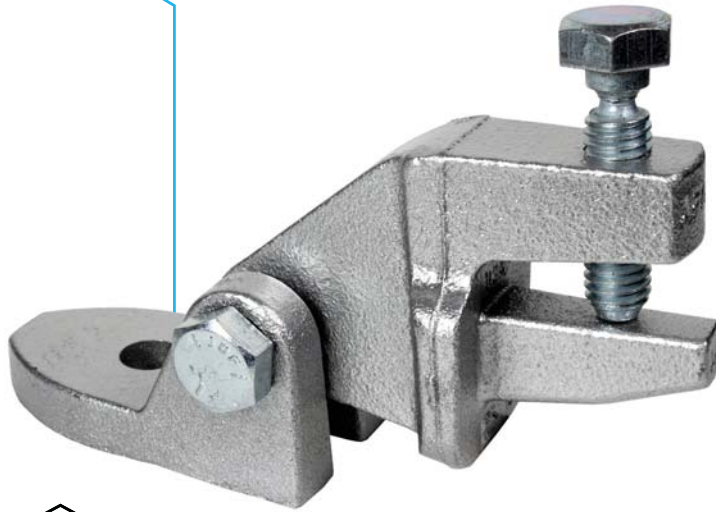


FIG. AF700 Dimensions and Weight

A	B	C	D	L	X	Y	Weight
in./mm	in./mm	in./mm	in./mm	in./mm	in./mm	in./mm	lbs/kgs
1.40	1.983	1.400	1.280	6.40	2.80	1.91	2.25
35.56	50.37	35.56	32.51	162.6	71.1	48.5	1.02

Notes:

ASC Engineered Solutions™ brand bracing components are designed to be compatible ONLY with other ASC Engineered Solutions brand bracing components, resulting in a Listed seismic bracing assembly. Updated UL listing information may be viewed at www.ul.com and updated FM approval information may be viewed at www.approvalguide.com.

Material Specifications

Size Range

Brace Member: See Table

Anchors: ½" – ¾" (M12–M18)

Material

Ductile Iron with Carbon Steel Hardware

Finish

☐ Plain

☐ Electro-Galvanized per ASTM B633

Service

A seismic swivel attachment designed to connect a brace member to the building structure or to a seismic structural attachment. The AF700 rigidly braces piping systems subjected to horizontal and vertical seismic loads.

Approvals

cULus Listed (ANSI/UL 203a), FM Approved (FM 1950-13), & FM Tested (FM 1950-16). FM Tested (ANSI/FM 1950-16). Complies with NFPA 13, ASCE 7, IBC, & MSS SP-127 bracing requirements.

Features

- The set screw provides a visual indication that proper installation has been achieved
- Eliminates brace member eccentricity by concentrically loading 1" and 1 ¼" brace pipes

Ordering

Specify figure number, fastener size, finish and description.

Disclaimer:

ASC Engineered Solutions does not provide any warranties and specifically disclaims any liability whatsoever with respect to ASC bracing products and components that are used in combination with products, parts or systems not manufactured or sold by ASC. In no event shall ASC be liable for any incidental, direct, consequential, special or indirect damages or lost profits where non-ASC bracing components have been, or are used.

Seis Brace® Seismic Fire Protection Design Tool may be accessed at www.seisbrace.com



PROJECT INFORMATION	APPROVAL STAMP
Project: Moss Park Armoury	<input type="checkbox"/> Approved
Address: 130 Queen st East, Toronto, ON M5A 1R5	<input type="checkbox"/> Approved as noted
Contractor:	<input type="checkbox"/> Not approved
Engineer:	Remarks:
Submittal Date: June 3, 2024	
Notes 1:	
Notes 2:	

Universal Swivel Attachment Fig. AF700

FIG. AF700 cULus Listing per ANSI/UL 203a (ASD)

Brace Member	Fastener Size	Horizontal Load Rating at Brace Angle			
		30°- 44°	45°- 59°	60°- 90°	Listed
1" - 2" Sch 40 Pipe (DN25 - DN50)	½" - ¾" (M12-M18)	942 lbf (4.19 kN)	1333 lbf (5.93 kN)	1632 lbf (7.26 kN)	1885 lbf (8.38 kN)

- 1) Load ratings may apply to NPFA 13 fastener orientations A, B, C, D, E, F, G, H, or I.
- 2) Brace Angles are determined from Vertical.
- 3) Listed load ratings reduced for angle ranges in accordance with NFPA 13-2019 Table 18.5.2.3.
- 4) See table below for listed brace members.
- 5) Minimum safety factor of 2.2 in accordance with NFPA 13-2019 Section A.18.5.2.3.

FIG. AF700 FM Approved (Listing) per FM 1950-13 (ASD)

Brace Member	Fastener Size	Horizontal Load Rating at Brace Angle			
		30°-44°	45°-59°	60°-74°	74°-90°
1" - 2" Sch 40 Pipe (DN25 - DN50)	½" - ¾" (M12-M18)	1780 lbf (7.92 kN)	2510 lbf (11.17 kN)	3080 lbf (13.70 kN)	3440 lbf (15.30 kN)

- 1) Load ratings may apply to NPFA 13 fastener orientations A, B, C, D, E, F, G, H, or I.
- 2) Brace Angles are determined from Vertical.
- 3) Listed load ratings reduced for angle ranges in accordance with NFPA 13-2019 Table 18.5.2.3.
- 4) See table below for listed brace members.
- 5) Minimum safety factor of 1.5 in accordance with NFPA 13-2016 Section A.9.3.5.2.3. To convert the load ratings above to a safety factor of 2.2 per NFPA 13-2019 Section A.18.5.2.3, multiply load ratings by a factor of 0.68.
- 6) To convert to LRFD Load Ratings, ASD Load Ratings may be multiplied by a factor of 1.5.

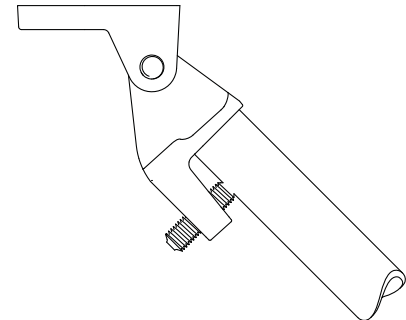
FIG. AF700 FM Listed, Approved & Tested Brace Members

Brace Member	Brace Size	Standard (or Equivalent)	UL	FM
Sch. 40 NPS Pipe	1", 1¼", 1½", 2"	ASTM A53, A106, A135, or A795	✓	✓
Sch. 40 Metric Pipe	DN25	KS S 3562	✓	✓
	DN32	EN10255H		✓
	DN40	GB/T 3091		✓
Metric Pipe	DN50	JIS G3454		✓

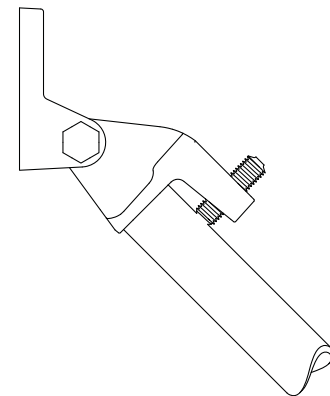
FIG AF700 Horizontal Prying Factors (Pr) Per NFPA 13: Angles (Deg)

Fastener Orientation	A	B	C	D	E	F	G	H	I
Brace Angle	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°	30°-44°	45°-59°	60°-90°
AF700	2.55	1.09	0.91	1.41	1.45	2.00	1.83	1.29	1.06
AF700 w/ Metal Deck ¹	2.55	1.09	1.14	-	-	-	-	-	-
AF700 w/ Metal Deck ²	2.75	1.11	1.14	-	-	-	-	-	-

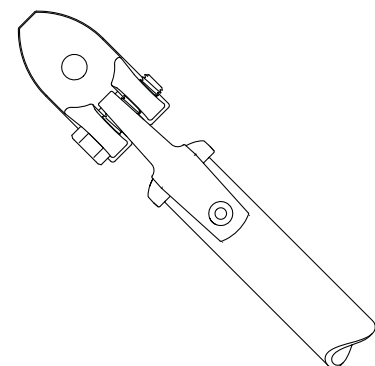
- 1) Prying factors reflect the baseplate "B" dimension overhanging the edge of the metal deck. Used for DeWalt anchor loads.
- 2) Prying factors reflect the baseplate "A" or "B" dimension overhanging the edge of the metal deck. Used for NFPA & Hilti anchor loads.
- 3) Prying Factors calculated in accordance with NFPA 13-2019 Section A.18.5.12.2.



NFPA 13 Orientations A, B, or C



NFPA 13 Orientations D, E, or F



NFPA 13 Orientations G, H, or I



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Universal Swivel Attachment Fig. AF700

Method 1 – Connection to Brace Member First

- 1 Slide the brace member over the lower jaw until it contacts the back wall.
- 2 Hand tighten the set screw until it contacts the brace member. Continue to torque the set screw until the head breaks off.
- 3 Rotate the brace assembly up to the fastener or the related seismic structural attachment and connect through the mounting hole.
- 4 Tighten per the fastener or structural attachment specifications.
- 5 Ensure the brace angle is within the range specified.

Notes: The cross bolt should be hand tight. For visual inspection, at least one thread should be exposed.

Method 2 – Connection to Structure First

- 1 Connect the AF700 to the fastener or the related seismic structural attachment.
- 2 Tighten per the fastener or structural attachment specifications.
- 3 Slide the brace member over the lower jaw until it contacts the back wall.
- 4 Hand tighten the set screw until it contacts the brace member. Continue to torque the set screw until the head breaks off.
- 5 Rotate the brace member until the brace angle is within the specified range.

Notes: The cross bolt should be hand tight. For visual inspection, at least one thread should be exposed..

Structural Attachments, Anchors, & Fasteners Listed, Approved, & Tested with the AF700

Structural Attachment	Structure
AF085	Steel Joist (Top Chord)
AF086	Horizontal Steel Flange (I-Beam Bottom Flange)
AF772	Horizontal Steel Flange (I-Beam Bottom Flange)
AF778	Horizontal Steel Flange (I-Beam Top or Bottom Flange) C-Channel (Top or Bottom Flange) Vertical Flange of a Joist (Top Chord)
AF779	All Structures with the Applicable Approved Anchor or Fastener
DeWalt Power-Stud®+ SD1	Cracked Concrete Cracked Concrete Filled Metal Deck
DeWalt Power-Stud®+ SD2	Cracked Concrete Cracked Concrete Filled Metal Deck
DeWalt Wood-Knocker®II+	Cracked Concrete
DeWalt Bang-It®+	Cracked Concrete Filled Metal Deck
DeWalt DDI+™	Cracked Concrete Filled Metal Deck
Anchors & Fasteners Per NFPA 13	Cracked Concrete Cracked Concrete Filled Metal Deck Steel Wood Saw Lumber or Glue-Laminated Timbers



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Building connections that last™

Longitudinal & Lateral Seismic Clamp Fig. AF730

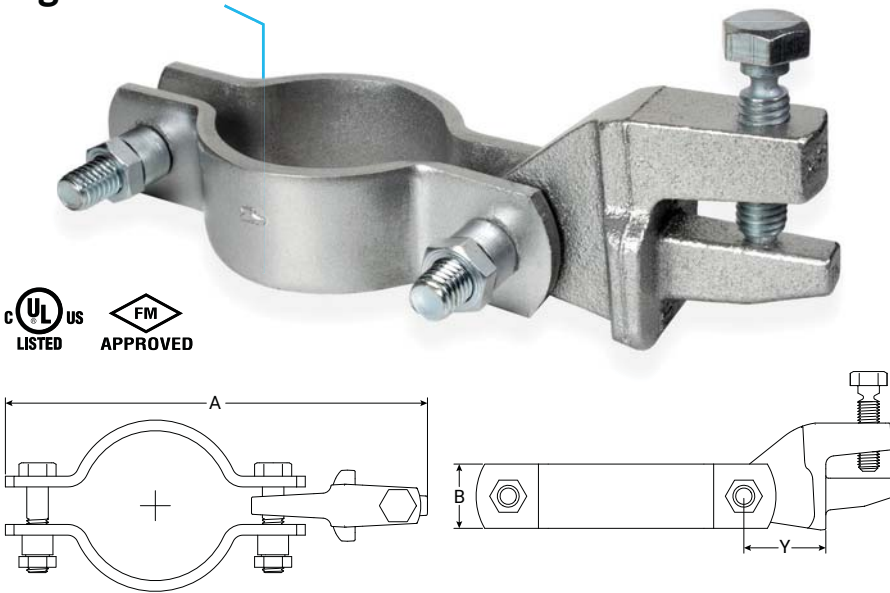


FIG. AF730 Dimensions and Weight

Size	A In./mm	B In./mm	Y In./mm	Weight lbs/kgs
1" (DN25)	7.6 193	1.50 38.1	1.91 48.5	2.49 1.13
1½" (DN32)	8.0 203			2.55 1.13
1½" (DN40)	8.2 208			2.64 1.20
2" (DN50)	8.7 221			2.78 1.26
2½"	9.2 234			2.92 1.32
3" (DN80)	9.8 249			3.13 1.42
4" (DN100)	10.8 274			3.38 1.53
5"	12.1 307			3.81 1.73
6"	13.2 335			4.12 1.87
8"	15.2 386			6.40 2.90
10"	18.1 460			7.60 3.45
12"	20.1 511			8.60 3.90

Notes:

ASC Engineered Solutions™ brand bracing components are designed to be compatible ONLY with other ASC Engineered Solutions brand bracing components, resulting in a Listed seismic bracing assembly. Updated UL listing information may be viewed at www.ul.com and updated FM approval information may be viewed at www.approvalguide.com.

Material Specifications

Size Range

Service Pipe Size: 1" – 12", DN25–DN100

Material

Carbon Steel Clamp and Hardware. Ductile Iron Brace Member Attachment Fitting.

Finish

- ☐ Plain
- ☐ Clamp: Hot Dipped Galvanized per ASTM A153
- ☐ Brace Member Attachment Fitting: Electro-Galvanized per ASTM B633

Service

A seismic longitudinal and lateral brace clamp designed to connect a piping system to a brace member. The AF730 rigidly braces piping systems subjected to horizontal and vertical seismic loads.

Approvals

cULus Listed (ANSI/UL 203a) and FM Approved (FM 1950–13). FM Tested (ANSI/FM 1950–16). Complies with NFPA 13, ASCE 7, IBC, & MSS SP-127 bracing requirements.

Features

- Torque off set screw and nuts provide a visual indication that the desired installation torque values have been achieved.

Ordering

Specify figure number, service pipe size, finish, and description.

Disclaimer:

ASC Engineered Solutions does not provide any warranties and specifically disclaims any liability whatsoever with respect to ASC bracing products and components that are used in combination with products, parts or systems not manufactured or sold by ASC. In no event shall ASC be liable for any incidental, direct, consequential, special or indirect damages or lost profits where non-ASC bracing components have been, or are used.

Seis Brace® Seismic Fire Protection Design Tool may be accessed at www.seisbrace.com

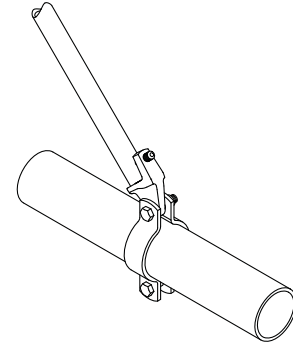


PROJECT INFORMATION	APPROVAL STAMP
Project: Moss Park Armoury	<input type="checkbox"/> Approved
Address: 130 Queen st East, Toronto, ON M5A 1R5	<input type="checkbox"/> Approved as noted
Contractor:	<input type="checkbox"/> Not approved
Engineer:	Remarks:
Submittal Date: June 3, 2024	
Notes 1:	
Notes 2:	

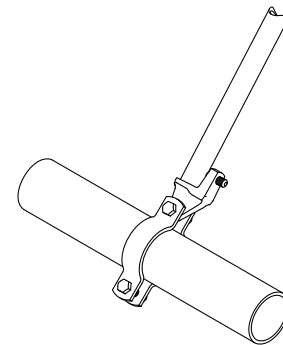
Longitudinal & Lateral Seismic Clamp Fig. AF730

FIG. AF730 cULus Listing per ANSI/UL 203a (ASD)

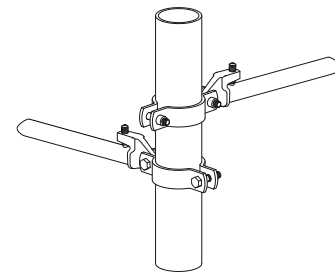
Service Pipe Size	Standard Service Pipe	Specialty Service Pipe	Horizontal Load Rating at Brace Angle							
			Longitudinal Load Rating				Lateral Load Rating			
			30°-44°	45°-59°	60°-90°	Listed	30°-44°	45°-59°	60°-90°	Listed
			lbf/kN	lbf/kN	lbf/kN	lbf/kN	lbf/kN	lbf/kN	lbf/kN	lbf/kN
1" (DN25)	Sch. 10 Sch. 40 Metric Pipe	Mega-Thread MLT / GL Eddy Thread EZ-Thread	340 1.51	480 2.14	588 2.62	680 3.02	340 1.51	480 2.14	588 2.62	680 3.02
1¼" (DN32)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow MLT / GL Mega-Thread Eddy Flow Eddy Thread EZ-Thread								
1½" (DN40)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow MLT / GL Mega-Thread Eddy Flow Eddy Thread Fire-Flo EZ-Thread	375 1.67	530 2.36	649 2.89	750 3.34	375 1.67	530 2.36	649 2.89	750 3.34
2" (DN50)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow MLT / GL Mega-Thread Eddy Flow Eddy Thread Fire-Flo EZ-Thread								
2½"	Sch. 10 Sch. 40	Mega-Flow Eddy Flow Fire-Flo	545 2.42	770 3.43	943 4.19	1090 4.85	545 2.42	770 3.43	943 4.19	1090 4.85
3" (DN80)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow Eddy Flow Fire-Flo								
4" (DN100)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow Eddy Flow Fire-Flo								
5"	Sch. 10 Sch. 40	—								
6"	Sch. 10 Sch. 40	Mega-Flow	942 4.19	1333 5.93	1632 7.26	1885 8.38	942 4.19	1333 5.93	1632 7.26	1885 8.38
8"	Sch. 10 0.188" Wall Sch. 40	—								
10"	0.188" Wall Sch. 40	—								



Longitudinal Application



Lateral Application



Riser Application

Brace Angles are determined from Vertical.

Sch. 10 & 0.188" Wall Load Ratings may be used for any thicker wall pipe of the same diameter.

Listed load ratings reduced for angle ranges in accordance with NFPA 13-2019 Table 18.5.2.3.

See table on page 4 for UL listed specialty pipes & UL Listed metric service pipes.

See table on page 4 for UL listed brace members.

Load ratings include a minimum safety factor of 2.2 in accordance with NFPA 13-2019 Section A.18.5.2.3.

All load ratings may be used for NFPA 13-2016 designs.



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Longitudinal & Lateral Seismic Clamp Fig. AF730

FIG. AF730 FM Approved (Listing) per FM 1950-13 (ASD)

Service Pipe Size	Standard Service Pipe	Specialty Service Pipe	Horizontal Load Rating at Brace Angle							
			Longitudinal Load Rating				Lateral Load Rating			
			30°-44°	45°-59°	60°-74°	75°-90°	30°-44°	45°-59°	60°-74°	75°-90°
			lbf/kN	lbf/kN	lbf/kN	lbf/kN	lbf/kN	lbf/kN	lbf/kN	lbf/kN
1" (DN25)	Sch. 10 Sch. 40 Metric Pipe	Mega-Thread MLT / GL Eddy Thread EZ-Thread	550 2.24	640 2.84	670 2.98	740 3.29	1740 7.74	2460 10.94	3010 13.39	3360 14.95
1¼" (DN32)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow MLT / GL Mega-Thread Eddy Flow Eddy Thread EZ-Thread	740 3.29	680 3.02	820 3.65	1620 7.21	1430 6.36	2020 8.99	2480 11.03	2770 12.32
1½" (DN40)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow MLT / GL Mega-Thread Eddy Flow Eddy Thread Fire-Flo EZ-Thread	800 3.56	650 2.89	790 3.51	1800 8.01	1790 7.96	2530 11.25	3100 13.79	3460 15.39
2" (DN50)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow MLT / GL Mega-Thread Eddy Flow Eddy Thread Fire-Flo EZ-Thread	830 3.69	990 4.4	1190 5.29	1620 7.21	1820 8.1	2580 11.48	3160 14.06	3530 15.7
2½"	Sch. 10 Sch. 40	Mega-Flow Eddy Flow Fire-Flo	800 3.65	700 3.11	850 3.78	1930 8.59	1610 7.16	2280 10.14	2790 12.41	3120 13.88
3" (DN80)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow Eddy Flow Fire-Flo	960 4.27	1330 5.92	1540 6.85	1700 7.56	1550 6.89	2200 9.79	2690 11.97	3010 13.39
4" (DN100)	Sch. 10 Sch. 40 Metric Pipe	Mega-Flow Eddy Flow Fire-Flo	760 3.38	1040 4.63	1270 5.65	1400 6.23	1260 5.6	1790 7.96	2190 9.74	2440 10.85
5"	Sch. 10 Sch. 40	—	890 3.96	1230 5.47	1410 6.27	1550 6.89	1260 5.6	1790 7.96	2190 9.74	2440 10.85
6"	Sch. 10 Sch. 40	Mega-Flow	700 3.11	940 4.18	1140 5.07	1310 5.83	950 4.23	1340 5.96	1640 7.3	1830 8.14
8"	0.188" Wall Sch. 40	—	990 4.4	1130 5.03	1360 6.05	1520 6.76	1540 6.85	2170 9.65	2660 11.82	2970 13.21
10"	0.188" Wall Sch. 40	—	1020 4.54	850 3.78	1000 4.45	1100 4.89	1700 7.56	2410 10.72	2950 13.12	3290 14.63
12"	0.188" Wall Sch. 40	—	970 4.31	1010 4.49	1220 5.43	1430 6.36	1690 7.52	2390 10.63	2930 13.03	3270 14.55

Brace Angles are determined from Vertical.

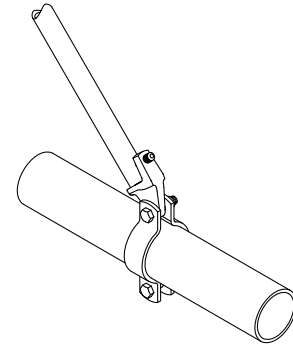
Sch. 10 & 0.188" Wall Load Ratings may be used for any thicker wall pipe of the same diameter.

Load ratings include a minimum safety factor of 1.5 in accordance with NFPA 13-2016 Section A.9.3.5.2.3. To convert the load ratings above to a safety factor of 2.2 per NFPA 13-2019 Section A.18.5.2.3, multiply load ratings by a factor of 0.68.

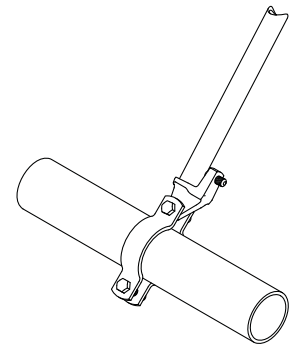
To convert to LRFD Load Ratings, ASD Load Ratings may be multiplied by a factor of 1.5.

See table on page 4 for FM approved metric service pipes.

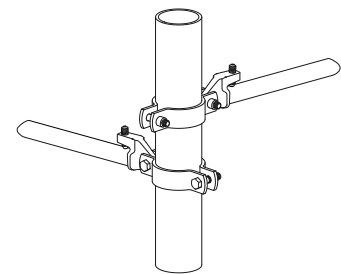
See table on page 4 for FM approved brace members.



Longitudinal Application



Lateral Application



Riser Application



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Longitudinal & Lateral Seismic Clamp Fig. AF730

Method 1 – Connection to Brace Member First

- 1 Slide the brace member over the lower jaw until it contacts the back wall of the brace member attachment fitting.
- 2 Hand tighten the set screw until it contacts the brace member. Continue to torque the set screw until the head breaks off.
- 3 Rotate the brace assembly to the service pipe. Unbolt the back nut & bolt and rotate the clamp halves over the service pipe. Re-assemble the nut and bolt.
- 4 Hand tighten the nuts on both sides of the clamp. Evenly and alternately torque the nut until the head breaks off. It is best practice to tighten the nut at the jaw side first.
- 5 Ensure the brace angle is within the range specified.

Method 2 – Connection to Service Pipe First

- 1 Unbolt the back nut & bolt and rotate the clamp halves over the service pipe. Re-assemble the nut and bolt.
- 2 Hand tighten the nuts on both sides of the clamp. Evenly and alternately torque the nut until the head breaks off. It is best practice to tighten the nut at the jaw side first.
- 3 Slide the brace member over the lower jaw until it contacts the back wall of the brace member attachment fitting.
- 4 Hand tighten the set screw until it contacts the brace member. Continue to torque the set screw until the head breaks off.

FIG. AF730 cULus Listed & FM Approved Brace Members

Brace Member	Sizes	Standards (or Equivalent)	UL Listed	FM Approved
Sch. 40 NPS Pipe	1", 1¼", 1½", 2"	ASTM A53, A106, A135, or A795	✓	✓
Sch. 40 Metric Pipe		KS D 3562	✓	✓
Metric Pipe	DN25, DN32, DN40, DN50	EN10255H		✓
		GB/T 3091		✓
		JIS G3454		✓

FIG. AF730 cULus Listed & FM Approved Metric Service Pipes

Brace Member	Service Pipe Sizes	UL Listed	FM Approved
KS D 3507 KS D 3537		✓	✓
KS D 3562 Sch. 40		✓	✓
GB/T 3091 GB/T 3092	DN25, DN32, DN40, DN50, DN 80, DN100		✓
JIS G3452			✓
EN 10255M			
EN 10255H			



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