



Emerald Fire

Fire Sprinkler Specialists

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STEP BY STEP ELC – FP SEISMIC CALCULATIONS

JOB NO. 225002

FIRE PROTECTION SEISMIC CALCULATIONS

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APPENDIX A – D

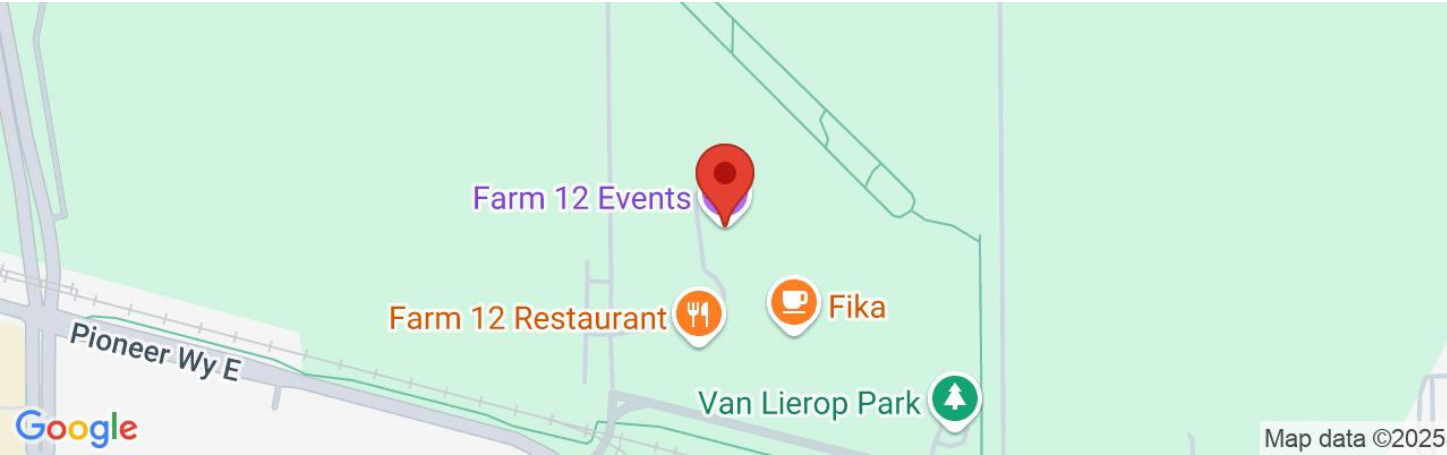
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USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.



3303 8th Ave SE, Puyallup, WA 98372, USA

Latitude, Longitude: 47.18607100000001, -122.249748



Date	4/1/2025, 12:45:54 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S _S	1.252	MCE _R ground motion. (for 0.2 second period)
S ₁	0.431	MCE _R ground motion. (for 1.0s period)
S _{MS}	1.502	Site-modified spectral acceleration value
S _{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S _{DS}	1.001	Numeric seismic design value at 0.2 second SA
S _{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F _a	1.2	Site amplification factor at 0.2 second
F _v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.5	MCE _G peak ground acceleration
F _{PGA}	1.2	Site amplification factor at PGA
PGA _M	0.6	Site modified peak ground acceleration
T _L	6	Long-period transition period in seconds
SsRT	1.252	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.369	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.431	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.48	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)

Type	Value	Description
PGA_{UH}	0.53	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.914	Mapped value of the risk coefficient at short periods
C_{R1}	0.898	Mapped value of the risk coefficient at a period of 1 s
C_V	1.35	Vertical coefficient

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Seismic Brace Report



Project Name Step By Step E.L.C. Puyallup

Date 03/31/2025

Address 3303 8th Ave SE,
Puyallup, WA 98372

Contractor Jeremy Patnoi
253-355-6135

Architect Jeffrey E. Brown
253-606-8324

APPROVAL STAMP

- ☐ Approved
- ☐ Approved as Noted
- ☐ Not Approved

Remarks:

Standard

NFPA 13-2019

BRACE SUMMARY

Brace Name	Drawing Reference	Seismic Design Load	Structure	Brace Description	Fastener	Attachments
Worst Case 4" Lateral Brace	FP4	394 lbf.	Saw Lumber or Glue-Laminated Timbers - SG = 0.50 to 0.65	Lateral Orientation H 45° - 59° 1 NPS Sch 40	1/2" Thru-Bolt per referenced edition of NFPA 13	AF700 - 1/2" AF035 - 4 NPS x 1 NPS
Worst Case 4" Longitudinal Brace	FP4	236 lbf.	Saw Lumber or Glue-Laminated Timbers - SG = 0.50 to 0.65	Longitudinal Orientation E 45° - 59° 1 NPS Sch 40	1/2" Thru-Bolt per referenced edition of NFPA 13	AF700 - 1/2" AF730 - 4 NPS
Worst Case 3" Lateral Brace	FP4	302 lbf.	Wood - SG = 0.50 to 0.65	Lateral Orientation B 45° - 59° 1 NPS Sch 40	1/2" Lag Screw per referenced edition of NFPA 13	AF700 - 1/2" AF035 - 3 NPS x 1 NPS
Worst Case 3" Longitudinal Brace	FP4	191 lbf.	Wood - SG = 0.50 to 0.65	Longitudinal Orientation B 45° - 59° 1 NPS Sch 40	1/2" Lag Screw per referenced edition of NFPA 13	AF700 - 1/2" AF730 - 3 NPS
Worst Case 2.5" Lateral Brace	FP4	166 lbf.	Saw Lumber or Glue-Laminated Timbers - SG = 0.50 to 0.65	Lateral Orientation H 45° - 59° 1 NPS Sch 40	1/2" Thru-Bolt per referenced edition of NFPA 13	AF700 - 1/2" AF035 - 2 1/2 NPS x 1 NPS
Worst Case 2.5" Longitudinal Brace	FP4	132 lbf.	Saw Lumber or Glue-Laminated Timbers - SG = 0.50 to 0.65	Longitudinal Orientation E 45° - 59° 1 NPS Sch 40	1/2" Thru-Bolt per referenced edition of NFPA 13	AF700 - 1/2" AF730 - 2 1/2 NPS

NOTE: Per NFPA 13-2019, 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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WORST CASE 4" LATERAL BRACE - SEISMIC BRACE CALCULATIONS

Seismic Project Worst Case Bracing

Standard NFPA 13-2019

Brace Type Lateral

Brace Name Worst Case 4" Lateral Brace

Drawing Reference FP4

Approval Agency FM Approved

STRUCTURE INFORMATION

Structure Lumber/Timbers (Thru Bolt)
Substrate Saw Lumber or Glue-Laminated Timbers - SG = 0.50 to 0.65
Load Orientation N/A

BRACE INFORMATION

Brace Member 1 NPS Sch 40
Brace Length Max 3 ft 6 in
Brace Angle 45° - 59°
Least Radius of Gyration 0.421 in.
I/r Ratio Max 100
Max Horizontal Load 4,455 lbf.

FASTENER INFORMATION

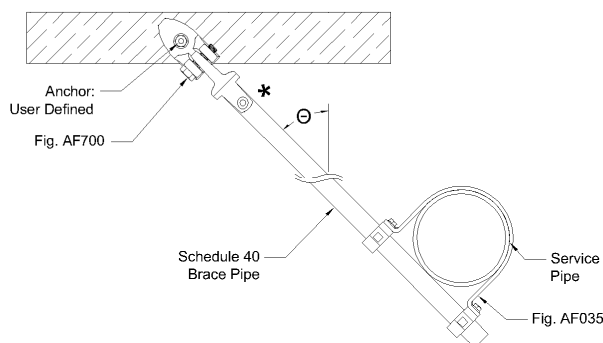
Fastener Name Thru-Bolt per referenced edition of NFPA 13
Fastener Orientation H
Fastener Diameter 1/2 in.
Nominal Embedment 3 1/2 in.
Max Horizontal Load 412 lbf.

SEISMIC BRACE ATTACHMENTS

	Model	Size	Adj. Load
Swivel Att.	AF700	1/2"	1,711 lbf.
Pipe Att.	AF035	4 NPS x 1 NPS	988 lbf.

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 13-2019.

SPRINKLER SYSTEM LOAD CALCULATION ($F_{PW} = C_p * W_p$) $C_p = 0.594$

Qty	Line	Description	Pipe Size/Type	Length	Weight/ft	Weight/Line	Total Weight
1	Main	Braced Pipe	4 NPS Steel Sch 10	29.21 ft.	11.78 lb/ft.	344.09 lb.	344.09 lb.
1	Branch 1	Segment A	1 1/4 NPS Steel Sch 10	67.00 ft.	2.52 lb/ft.	168.84 lb.	168.84 lb.
1	Branch 2	Segment A	1 NPS Steel Sch 40	30.50 ft.	2.05 lb/ft.	62.52 lb.	62.52 lb.

Weakest Main Size	Spacing	Max Fpw
4 NPS Steel Sch 10	30 ft.	1,071 lbf.

Total System Weight	575.45 lb.
System Design Weight (W_p)	662.00 lb.
Horizontal Seismic Load (F_{pw})	394 lbf.

WORST CASE 4" LONGITUDINAL BRACE - SEISMIC BRACE CALCULATIONS

Seismic Project Worst Case Bracing

Standard NFPA 13-2019

Brace Type Longitudinal

Brace Name Worst Case 4" Longitudinal Brace

Drawing Reference FP4

Approval Agency FM Approved

STRUCTURE INFORMATION

Structure Lumber/Timbers (Thru Bolt)
Substrate Saw Lumber or Glue-Laminated Timbers - SG = 0.50 to 0.65
Load Orientation N/A

BRACE INFORMATION

Brace Member 1 NPS Sch 40
Brace Length Max 3 ft 6 in
Brace Angle 45° - 59°
Least Radius of Gyration 0.421 in.
I/r Ratio Max 100
Max Horizontal Load 4,455 lbf.

FASTENER INFORMATION

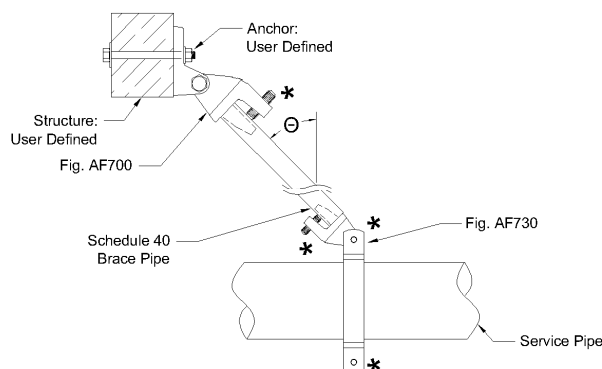
Fastener Name Thru-Bolt per referenced edition of NFPA 13
Fastener Orientation E
Fastener Diameter 1/2 in.
Nominal Embedment 2 1/2 in.
Max Horizontal Load 350 lbf.

SEISMIC BRACE ATTACHMENTS

	Model	Size	Adj. Load
Swivel Att.	AF700	1/2"	1,711 lbf.
Pipe Att.	AF730	4 NPS	709 lbf.

See Appendix A for alternate seismic brace attachments.

All seismic brace attachments manufactured by ASC Engineered Solutions.



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Net Vertical Reaction Forces do not need to be addressed per NFPA 13-2019.

SPRINKLER SYSTEM LOAD CALCULATION ($F_{PW} = C_p * W_p$) $C_p = 0.594$

Qty	Line	Description	Pipe Size/Type	Length	Weight/ft	Weight/Line	Total Weight
1	Main	Braced Pipe	4 NPS Steel Sch 10	29.21 ft.	11.78 lb/ft.	344.09 lb.	344.09 lb.

Total System Weight	344.09 lb.
System Design Weight (W_p)	396.00 lb.
Horizontal Seismic Load (F_{pw})	236 lbf.

WORST CASE 3" LATERAL BRACE - SEISMIC BRACE CALCULATIONS

Seismic Project Worst Case Bracing

Standard NFPA 13-2019

Brace Type Lateral

Brace Name Worst Case 3" Lateral Brace

Drawing Reference FP4

Approval Agency FM Approved

STRUCTURE INFORMATION

Structure Wood (Lag Bolt)

Substrate Wood - SG = 0.50 to 0.65

Load Orientation N/A

BRACE INFORMATION

Brace Member 1 NPS Sch 40

Brace Length Max 3 ft 6 in

Brace Angle 45° - 59°

Least Radius of Gyration 0.421 in.

I/r Ratio Max 100

Max Horizontal Load 4,455 lbf.

FASTENER INFORMATION

Fastener Name Lag Screw per referenced edition of NFPA 13

Fastener Orientation B

Fastener Diameter 1/2 in.

Nominal Embedment 4 1/2 in.

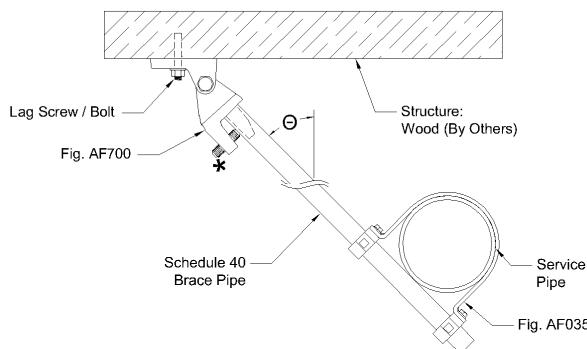
Max Horizontal Load 443 lbf.

SEISMIC BRACE ATTACHMENTS

	Model	Size	Adj. Load
Swivel Att.	AF700	1/2"	1,711 lbf.
Pipe Att.	AF035	3 NPS x 1 NPS	1,220 lbf.

See Appendix A for alternate seismic brace attachments.

All seismic brace attachments manufactured by ASC Engineered Solutions.



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Net Vertical Reaction Forces do not need to be addressed per NFPA 13-2019.

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

$C_p = 0.594$

Qty	Line	Description	Pipe Size/Type	Length	Weight/ft	Weight/Line	Total Weight
1	Main	Braced Pipe	3 NPS Steel Sch 10	13.00 ft.	7.94 lb/ft.	103.22 lb.	103.22 lb.
1	Branch 1	Segment A	1 1/2 NPS Steel Sch 10	34.71 ft.	3.04 lb/ft.	105.52 lb.	105.52 lb.
1	Branch 2	Segment A	1 1/4 NPS Steel Sch 10	42.71 ft.	2.52 lb/ft.	107.63 lb.	107.63 lb.
1	Branch 3	Segment A	1 NPS Steel Sch 40	12.00 ft.	2.05 lb/ft.	24.60 lb.	24.60 lb.
1	Branch 4	Segment A	2 NPS Steel Sch 10	23.71 ft.	4.22 lb/ft.	100.06 lb.	100.06 lb.

Weakest Main Size

3 NPS Steel Sch 10

Spacing

20 ft.

Max Fpw

966 lbf.

Total System Weight

441.03 lb.

System Design Weight (W_p)

508.00 lb.

Horizontal Seismic Load (F_{pw})

302 lbf.

WORST CASE 3" LONGITUDINAL BRACE - SEISMIC BRACE CALCULATIONS

Seismic Project Worst Case Bracing

Standard NFPA 13-2019

Brace Type Longitudinal

Brace Name Worst Case 3" Longitudinal Brace

Drawing Reference FP4

Approval Agency FM Approved

STRUCTURE INFORMATION

Structure Wood (Lag Bolt)
Substrate Wood - SG = 0.50 to 0.65
Load Orientation N/A

BRACE INFORMATION

Brace Member 1 NPS Sch 40
Brace Length Max 3 ft 6 in
Brace Angle 45° - 59°
Least Radius of Gyration 0.421 in.
I/r Ratio Max 100
Max Horizontal Load 4,455 lbf.

FASTENER INFORMATION

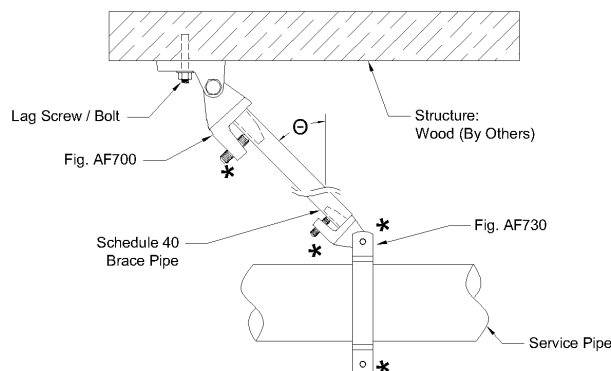
Fastener Name Lag Screw per referenced edition of NFPA 13
Fastener Orientation B
Fastener Diameter 1/2 in.
Nominal Embedment 4 1/2 in.
Max Horizontal Load 443 lbf.

SEISMIC BRACE ATTACHMENTS

	Model	Size	Adj. Load
Swivel Att.	AF700	1/2"	1,711 lbf.
Pipe Att.	AF730	3 NPS	906 lbf.

See Appendix A for alternate seismic brace attachments.

All seismic brace attachments manufactured by ASC Engineered Solutions.



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Net Vertical Reaction Forces do not need to be addressed per NFPA 13-2019.

SPRINKLER SYSTEM LOAD CALCULATION ($F_{PW} = C_p * W_p$) $C_p = 0.594$

Qty	Line	Description	Pipe Size/Type	Length	Weight/ft	Weight/Line	Total Weight
1	Main	Braced Pipe	3 NPS Steel Sch 10	35.00 ft.	7.94 lb/ft.	277.90 lb.	277.90 lb.

Total System Weight	277.90 lb.
System Design Weight (W_p)	320.00 lb.
Horizontal Seismic Load (F_{pw})	191 lbf.

WORST CASE 2.5" LATERAL BRACE - SEISMIC BRACE CALCULATIONS

Seismic Project Worst Case Bracing
Standard NFPA 13-2019
Brace Type Lateral

Brace Name Worst Case 2.5" Lateral Brace
Drawing Reference FP4
Approval Agency FM Approved

STRUCTURE INFORMATION

Structure Lumber/Timbers (Thru Bolt)
Substrate Saw Lumber or Glue-Laminated Timbers - SG = 0.50 to 0.65
Load Orientation N/A

BRACE INFORMATION

Brace Member 1 NPS Sch 40
Brace Length Max 3 ft 6 in
Brace Angle 45° - 59°
Least Radius of Gyration 0.421 in.
l/r Ratio Max 100
Max Horizontal Load 4,455 lbf.

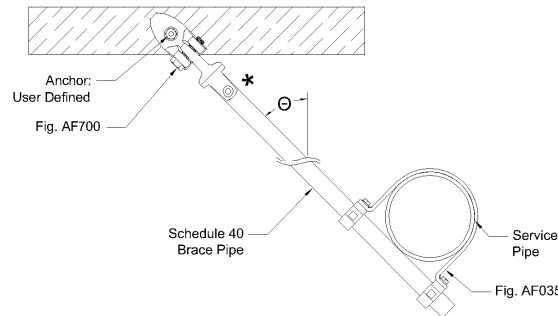
FASTENER INFORMATION

Fastener Name Thru-Bolt per referenced edition of NFPA 13
Fastener Orientation H
Fastener Diameter 1/2 in.
Nominal Embedment 2 1/2 in.
Max Horizontal Load 343 lbf.

SEISMIC BRACE ATTACHMENTS

	Model	Size	Adj. Load
Swivel Att.	AF700	1/2"	1,711 lbf.
Pipe Att.	AF035	2 1/2 NPS x 1 NPS	1,220 lbf.

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 13-2019.

SPRINKLER SYSTEM LOAD CALCULATION ($F_{PW} = C_p * W_p$) $C_p = 0.594$

Qty	Line	Description	Pipe Size/Type	Length	Weight/ft	Weight/Line	Total Weight
1	Main	Braced Pipe	2 1/2 NPS Steel Sch 10	19.00 ft.	5.89 lb/ft.	111.91 lb.	111.91 lb.
1	Branch 1	Segment A	1 1/4 NPS Steel Sch 10	38.50 ft.	2.52 lb/ft.	97.02 lb.	97.02 lb.
1	Branch 2	Segment A	1 NPS Steel Sch 40	16.04 ft.	2.05 lb/ft.	32.88 lb.	32.88 lb.

Weakest Main Size	Spacing	Max Fpw
2 1/2 NPS Steel Sch 10	20 ft.	641 lbf.

Total System Weight	241.81 lb.
System Design Weight (W_p)	279.00 lb.
Horizontal Seismic Load (F_{pw})	166 lbf.

WORST CASE 2.5" LONGITUDINAL BRACE - SEISMIC BRACE CALCULATIONS

Seismic Project Worst Case Bracing

Standard NFPA 13-2019

Brace Type Longitudinal

Brace Name Worst Case 2.5" Longitudinal Brace

Drawing Reference FP4

Approval Agency FM Approved

STRUCTURE INFORMATION

Structure Lumber/Timbers (Thru Bolt)
Substrate Saw Lumber or Glue-Laminated Timbers - SG = 0.50 to 0.65
Load Orientation N/A

BRACE INFORMATION

Brace Member 1 NPS Sch 40
Brace Length Max 3 ft 6 in
Brace Angle 45° - 59°
Least Radius of Gyration 0.421 in.
I/r Ratio Max 100
Max Horizontal Load 4,455 lbf.

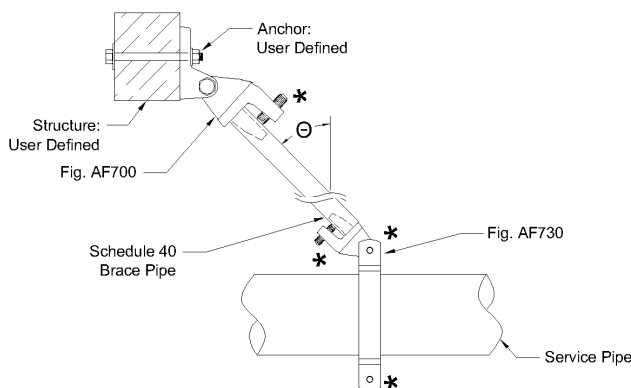
FASTENER INFORMATION

Fastener Name Thru-Bolt per referenced edition of NFPA 13
Fastener Orientation E
Fastener Diameter 1/2 in.
Nominal Embedment 2 1/2 in.
Max Horizontal Load 350 lbf.

SEISMIC BRACE ATTACHMENTS

	Model	Size	Adj. Load
Swivel Att.	AF700	1/2"	1,711 lbf.
Pipe Att.	AF730	2 1/2 NPS	477 lbf.

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



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 Net Vertical Reaction Forces do not need to be addressed per NFPA 13-2019.

SPRINKLER SYSTEM LOAD CALCULATION ($F_{PW} = C_p * W_p$) $C_p = 0.594$

Qty	Line	Description	Pipe Size/Type	Length	Weight/ft	Weight/Line	Total Weight
1	Main	Braced Pipe	2 1/2 NPS Steel Sch 10	32.67 ft.	5.89 lb/ft.	192.43 lb.	192.43 lb.

Total System Weight	192.43 lb.
System Design Weight (W_p)	222.00 lb.
Horizontal Seismic Load (F_{pw})	132 lbf.

Appendix A - Alternate Seismic Brace Attachments

WORST CASE 4" LATERAL BRACE

Fastener	Capacity	Nom. Embedment	Min. Edge 1/2	Swivel	Pipe Attachment
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF001 4 NPS x 1 NPS 729 lbf.
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	AF735 4 NPS x 1 NPS 1,602 lbf.
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	AF775 4 NPS x 1 NPS 1,097 lbf.
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	AF776 4 NPS x 1 NPS 668 lbf.
--	--	--	--	--	AF730 4 NPS 1,220 lbf.

WORST CASE 4" LONGITUDINAL BRACE

Fastener	Capacity	Nom. Embedment	Min. Edge 1/2	Swivel	Pipe Attachment
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF775 4 NPS x 1 NPS 627 lbf.
Thru-Bolt per referenced edition of NFPA 13	350 lbf.	2 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	350 lbf.	2 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	350 lbf.	2 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	350 lbf.	2 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--

WORST CASE 3" LATERAL BRACE

Fastener	Capacity	Nom. Embedment	Min. Edge 1 2	Swivel	Pipe Attachment
Lag Screw per referenced edition of NFPA 13	443 lbf.	4 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF001 3 NPS x 1 NPS 552 lbf.
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF735 3 NPS x 1 NPS 1,609 lbf.
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF775 3 NPS x 1 NPS 777 lbf.
Lag Screw per referenced edition of NFPA 13	443 lbf.	4 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	AF776 3 NPS x 1 NPS 600 lbf.
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	AF730 3 NPS 1,500 lbf.
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Lag Screw per referenced edition of NFPA 13	443 lbf.	4 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Lag Screw per referenced edition of NFPA 13	443 lbf.	4 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--

WORST CASE 3" LONGITUDINAL BRACE

Fastener	Capacity	Nom. Embedment	Min. Edge 1 2	Swivel	Pipe Attachment
Lag Screw per referenced edition of NFPA 13	443 lbf.	4 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF775 3 NPS x 1 NPS 627 lbf.
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	--
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	--
Lag Screw per referenced edition of NFPA 13	443 lbf.	4 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Lag Screw per referenced edition of NFPA 13	443 lbf.	4 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Lag Screw per referenced edition of NFPA 13	443 lbf.	4 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Lag Screw per referenced edition of NFPA 13	462 lbf.	5 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--
Lag Screw per referenced edition of NFPA 13	468 lbf.	6 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--

WORST CASE 2.5" LATERAL BRACE

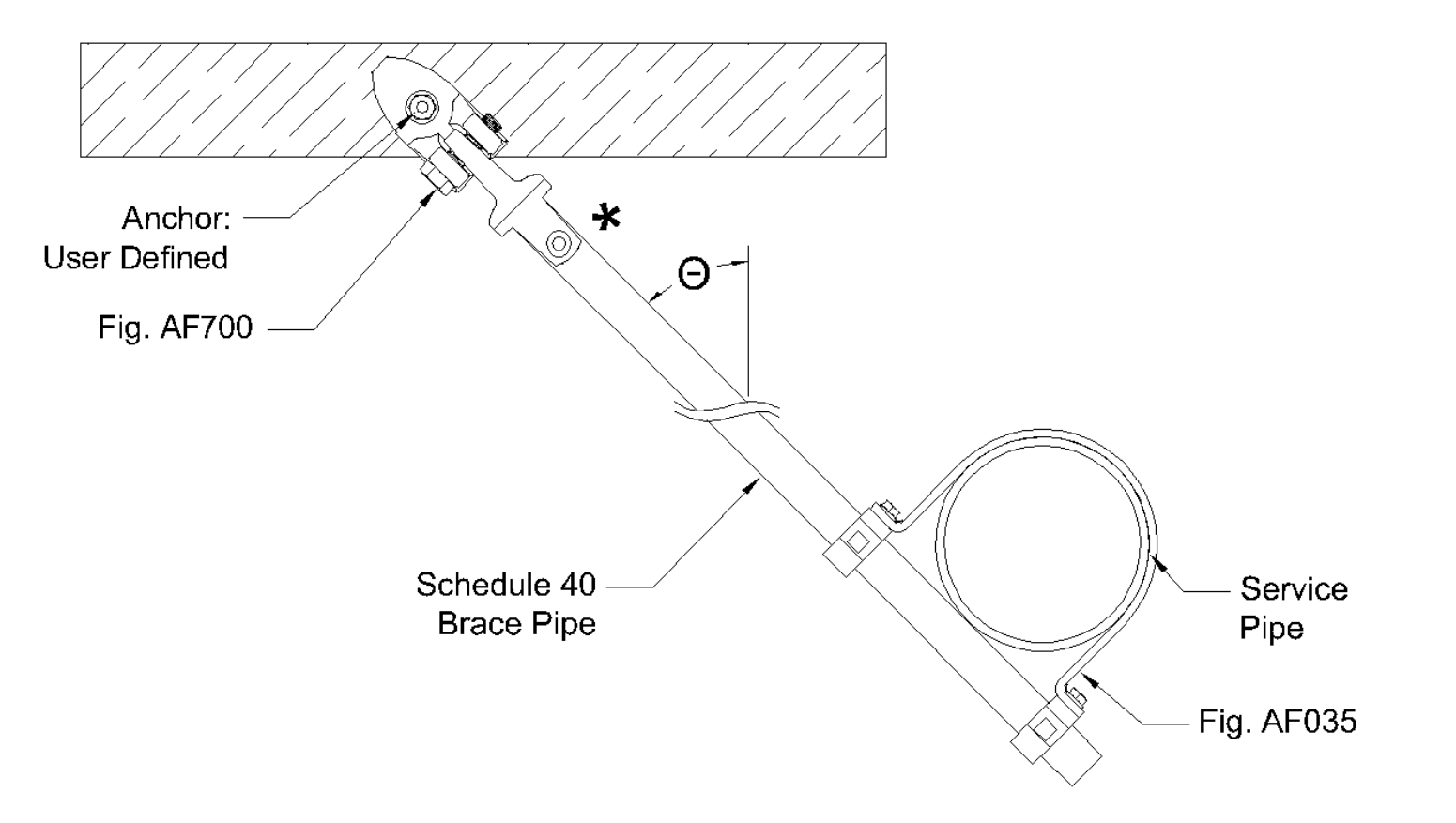
Fastener	Capacity	Nom. Embedment	Min. Edge 1/2	Swivel	Pipe Attachment
Thru-Bolt per referenced edition of NFPA 13	268 lbf.	1 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF001 2 1/2 NPS x 1 NPS 552 lbf.
Thru-Bolt per referenced edition of NFPA 13	343 lbf.	2 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF735 2 1/2 NPS x 1 NPS 1,711 lbf.
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF775 2 1/2 NPS x 1 NPS 1,677 lbf.
Thru-Bolt per referenced edition of NFPA 13	268 lbf.	1 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	AF776 2 1/2 NPS x 1 NPS 600 lbf.
Thru-Bolt per referenced edition of NFPA 13	343 lbf.	2 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	AF730 2 1/2 NPS 1,554 lbf.
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	268 lbf.	1 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	343 lbf.	2 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	268 lbf.	1 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	343 lbf.	2 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	268 lbf.	1 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	412 lbf.	3 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--

WORST CASE 2.5" LONGITUDINAL BRACE

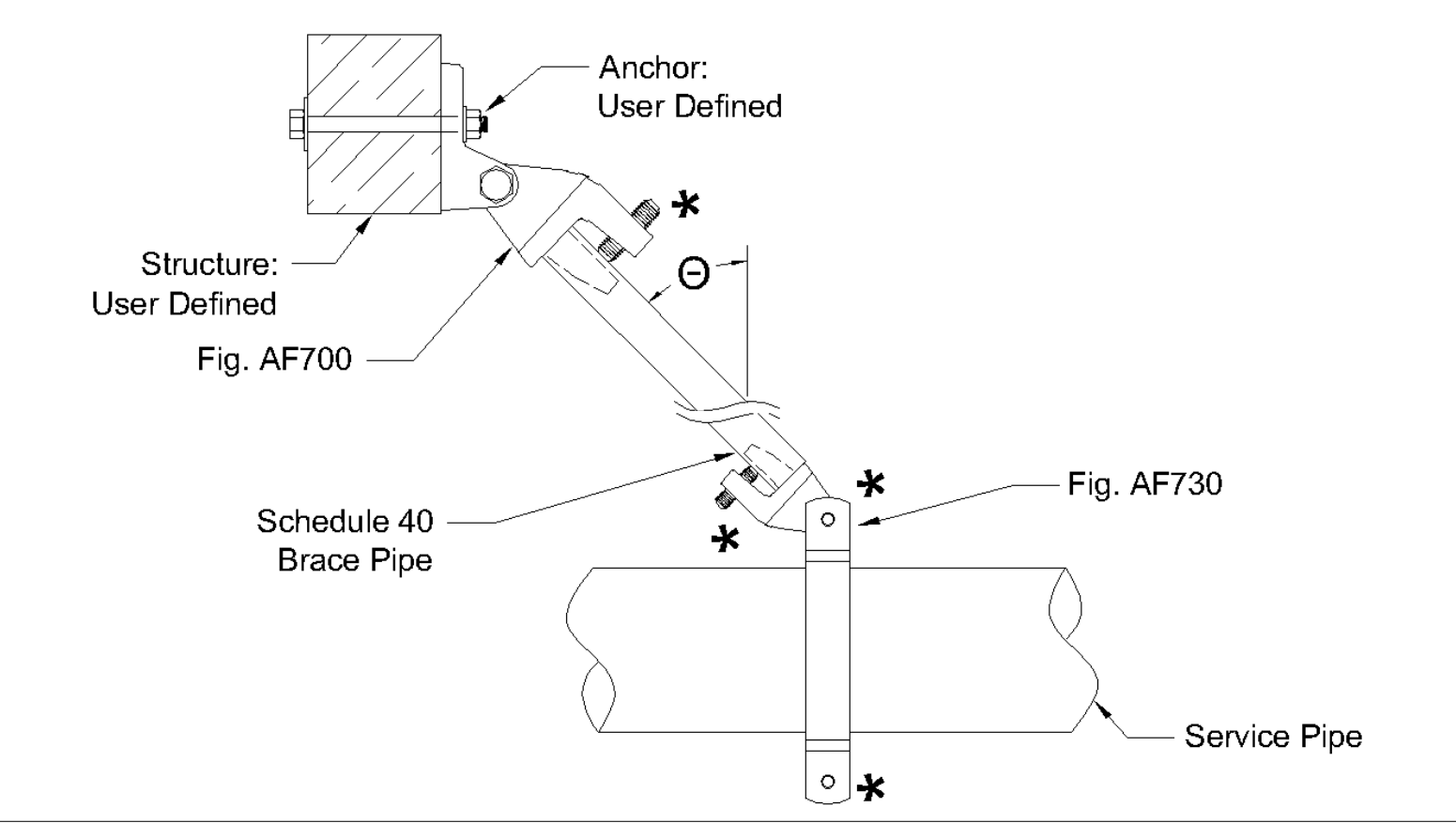
Fastener	Capacity	Nom. Embedment	Min. Edge 1 2	Swivel	Pipe Attachment
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	AF775 2 1/2 NPS x 1 NPS 777 lbf.
Thru-Bolt per referenced edition of NFPA 13	350 lbf.	2 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF075 1 NPS x 1/2" 1,363 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	350 lbf.	2 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF076 1/2" 1,234 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	350 lbf.	2 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF077 1 NPS x 1/2" 422 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	350 lbf.	2 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF771 1 NPS x 1/2" 1,731 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	287 lbf.	1 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--
Thru-Bolt per referenced edition of NFPA 13	437 lbf.	3 1/2 in.	-- --	AF700 1/2" 1,711 lbf.	--

Appendix B - Enlarged Images

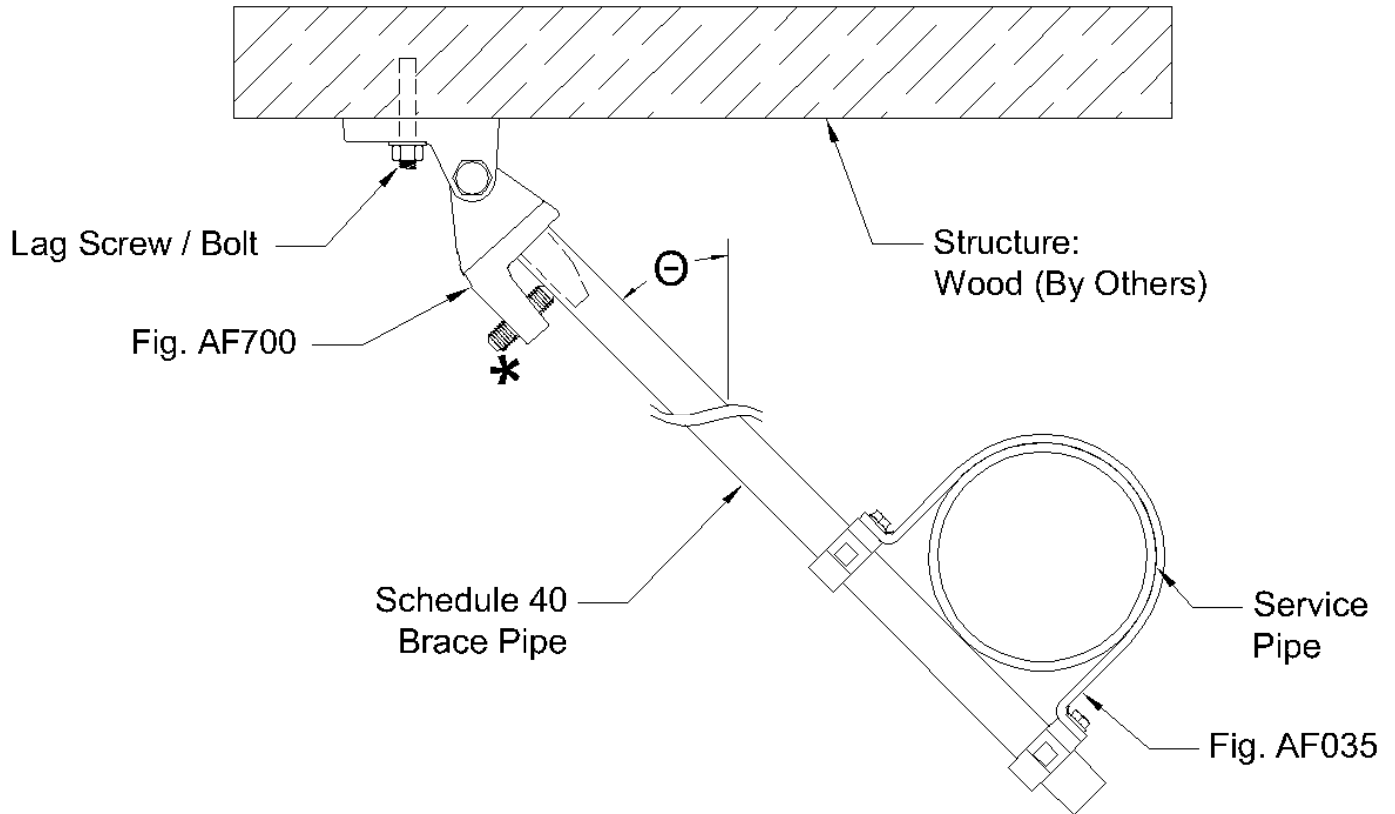
WORST CASE 4" LATERAL BRACE



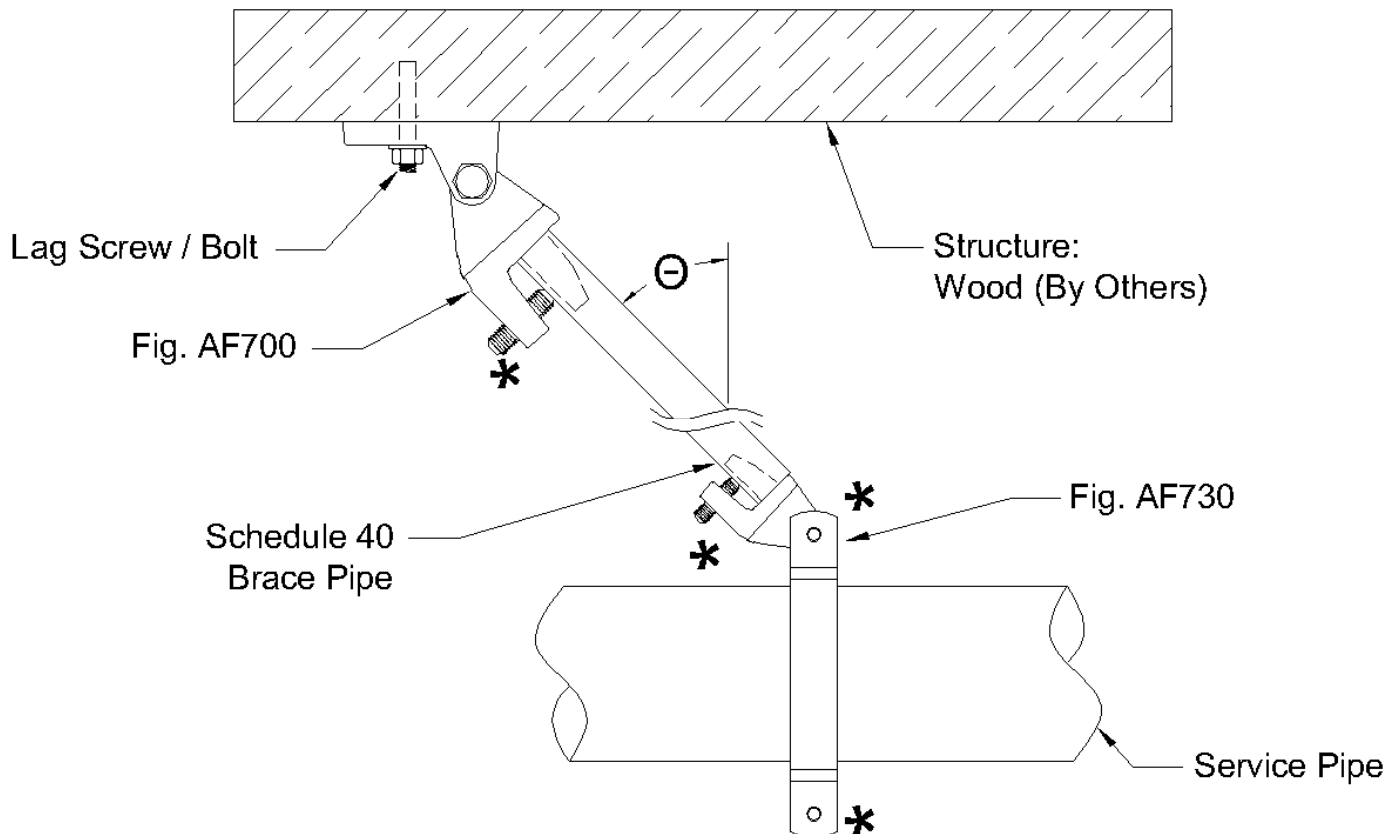
WORST CASE 4" LONGITUDINAL BRACE



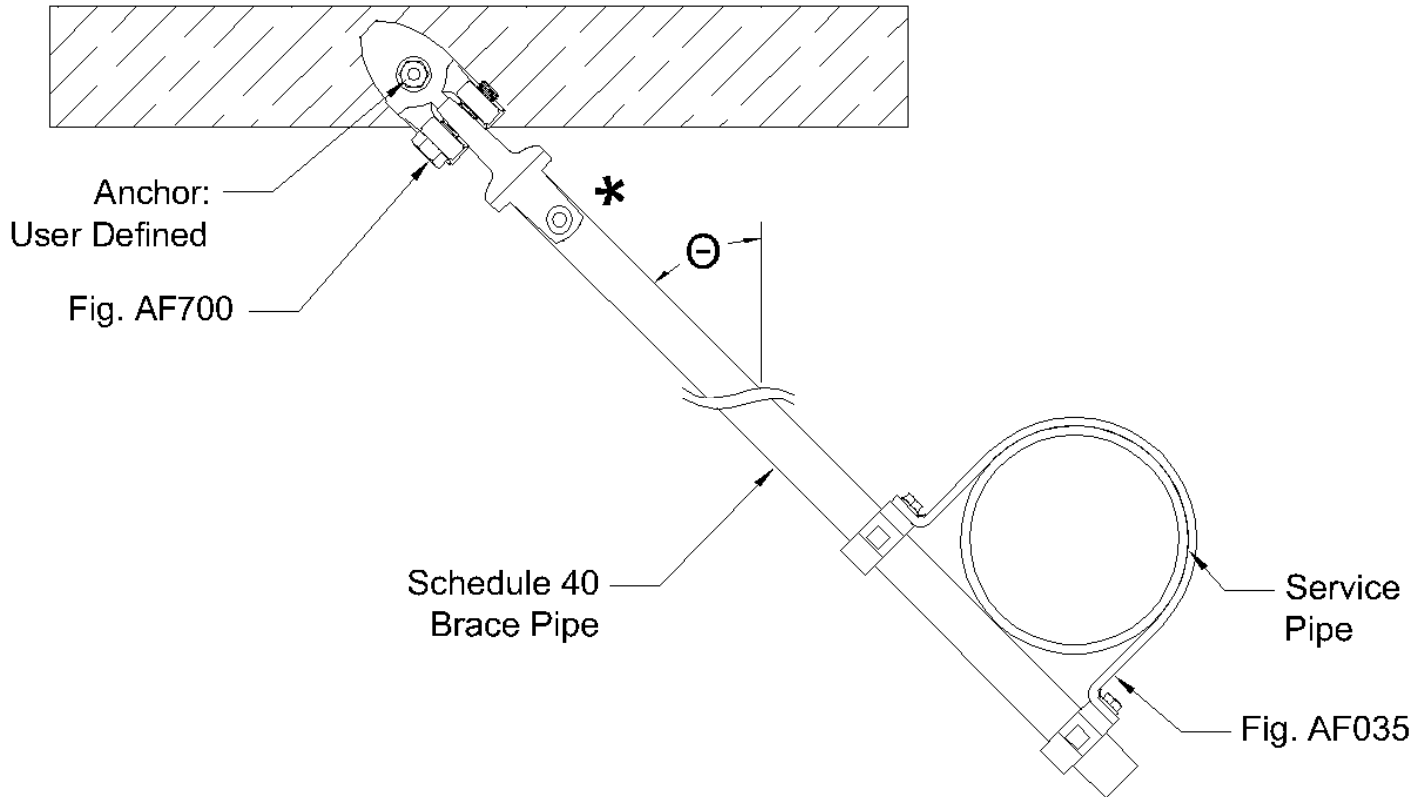
WORST CASE 3" LATERAL BRACE



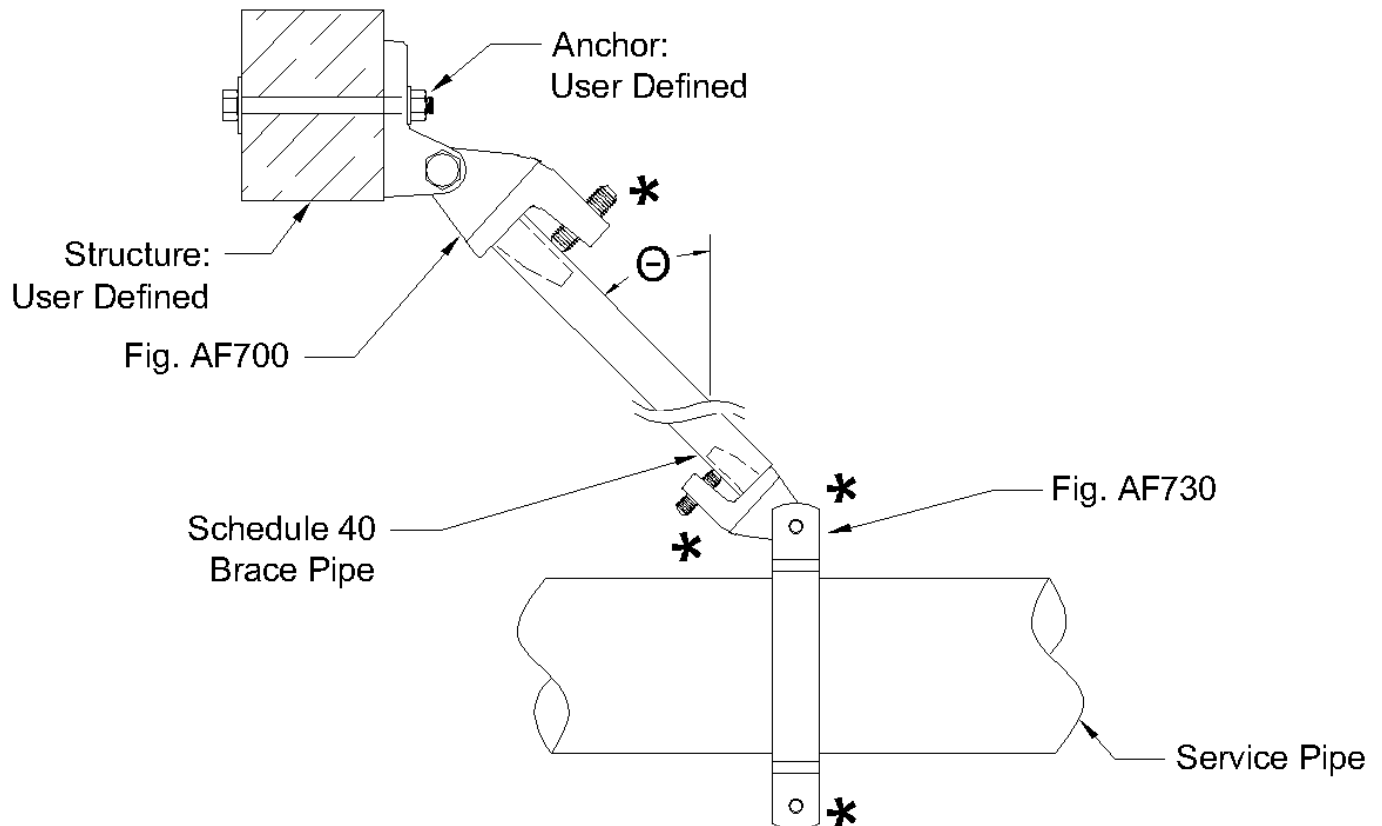
WORST CASE 3" LONGITUDINAL BRACE



WORST CASE 2.5" LATERAL BRACE



WORST CASE 2.5" LONGITUDINAL BRACE



* - 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
Worst Case 4" Lateral Brace	FP4	A	0.594	1.252	--	--	--	--	--
Worst Case 4" Longitudinal Brace	FP4	A	0.594	1.252	--	--	--	--	--
Worst Case 3" Lateral Brace	FP4	A	0.594	1.252	--	--	--	--	--
Worst Case 3" Longitudinal Brace	FP4	A	0.594	1.252	--	--	--	--	--
Worst Case 2.5" Lateral Brace	FP4	A	0.594	1.252	--	--	--	--	--
Worst Case 2.5" Longitudinal Brace	FP4	A	0.594	1.252	--	--	--	--	--

CALCULATION METHODS

- A** C_p calculated per NFPA 13-2019 Table 18.5.9.3
- B** C_p entered by user
- C** C_p calculated per ASCE/SEI 7-16 per NFPA 13-2019 Section 18.5.9.4

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...

$$F_{pw} = C_p W_p$$

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

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

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

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

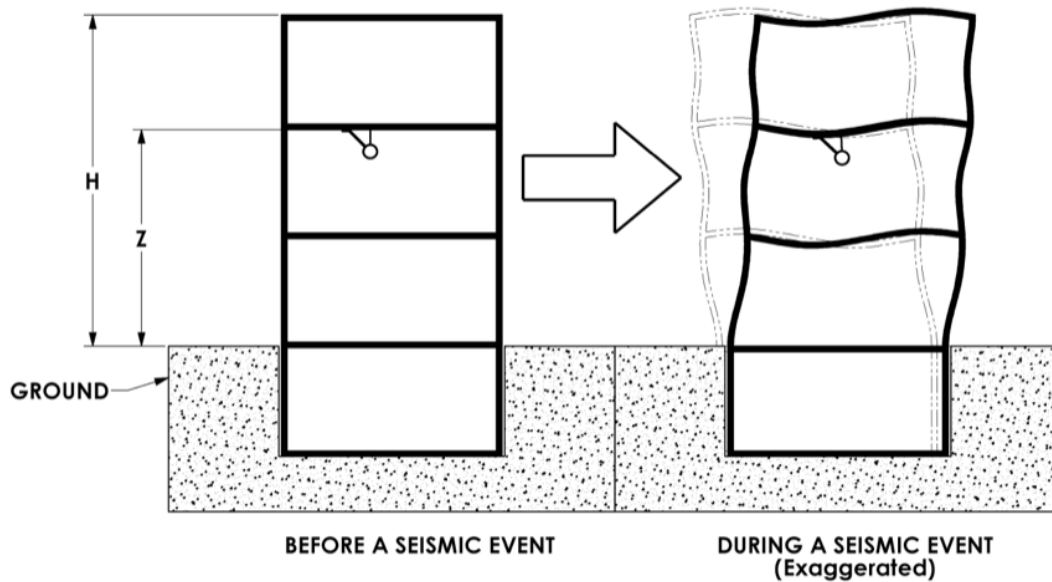
SITE COEFFICIENT, F_A PER ASCE/SEI 7-16

	$S_s \leq 0.25$	$S_s = 0.5$	$S_s = 0.75$	$S_s = 1$	$S_s = 1.25$	$S_s \geq 1.5$
A	0.8	0.8	0.8	0.8	0.8	0.8
B	0.9	0.9	0.9	0.9	0.9	0.9
C	1.3	1.3	1.2	1.2	1.2	1.2
D	1.6	1.4	1.2	1.1	1	1
E	2.4	1.7	1.3	1.2	1.2	1.2

Use straight-line interpolation for intermediate values of S_s .

SITE CLASSIFICATION PER ASCE/SEI 7-16

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 Step By Step E.L.C. Puyallup
Code Requirements NFPA 13-2019
Last Updated April 1, 2025

QUANTITY	FIGURE NUMBER	PRODUCT	DESCRIPTION
0		1/2" Thru-Bolt per referenced edition of NFPA 13	Fastener
0	AF700	1/2" AF700 Universal Swivel Attachment	AF700 - 1/2"
	AF035	4 NPS AF035 Model K Brace Clamp	AF035 - 4 NPS x 1 NPS
	AF730	4 NPS AF730 Longitudinal & Lateral Seismic Clamp	AF730 - 4 NPS
0		1/2" Lag Screw per referenced edition of NFPA 13	Fastener
	AF035	3 NPS AF035 Model K Brace Clamp	AF035 - 3 NPS x 1 NPS
	AF730	3 NPS AF730 Longitudinal & Lateral Seismic Clamp	AF730 - 3 NPS
	AF035	2 1/2 NPS AF035 Model K Brace Clamp	AF035 - 2 1/2 NPS x 1 NPS
	AF730	2 1/2 NPS AF730 Longitudinal & Lateral Seismic Clamp	AF730 - 2 1/2 NPS