

April 22, 2026

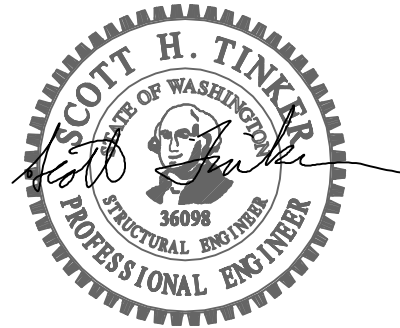
**STRUCTURAL CALCULATIONS**  
(Permit Submittal)

**CENTERIS DATA CENTER  
LEVEL 2 DATA CENTER TI**  
1023 39<sup>th</sup> Avenue SE  
Puyallup, WA 98374

Quantum Job Number: 23444.01

*Prepared for:*  
CENTERIS DATA CENTERS  
18300 Cascade Avenue S  
Seattle, WA 981188

*Prepared by:*  
QUANTUM CONSULTING ENGINEERS  
1511 Third Avenue, Suite 323  
Seattle, WA 98101  
TEL 206.957.3900  
FAX 206.957.3901



# Structural Design Criteria

**Building Code:** 2021 International Building Code  
**Building Department:** City of Puyallup

### Seismic Criteria

S<sub>s</sub>: 1.26  
S<sub>1</sub>: 0.43      Seismic Soil Site Class: D  
S<sub>ds</sub>: 1.01      Seismic Design Category: D  
S<sub>d1</sub>: 0.50

### Materials Criteria

#### Concrete (28 Day Strength):

Foundation/Slab on Grade      F'c= 3,000 PSI  
Walls and Columns      F'c= 3,000 PSI

#### Reinforcing Steel:

Grade 60      Fy= 60,000 PSI

#### Structural Steel:

Wide-Flange Sections: A-992      Fy= 50,000 PSI  
Miscellaneous Sections: A-36      Fy= 36,000 PSI  
Tube Sections: A-500      Fy= 46,000 PSI  
Pipe Sections: A-53      Fy= 35,000 PSI  
Welding      Fy= 70,000 PSI

⚠ This is a beta release of the new ATC Hazards by Location website. Please [contact us](#) with feedback.

ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

**ATC** Hazards by Location

**Search Information**

**Address:** 1015 39th Ave SE Puyallup, WA 98374  
**Coordinates:** 47.1590004, -122.2794422  
**Elevation:** 489 ft  
**Timestamp:** 2023-12-01T15:14:56.409Z  
**Hazard Type:** Seismic  
**Reference Document:** ASCE7-16  
**Risk Category:** III  
**Site Class:** D-default



**Basic Parameters**

Name	Value	Description
S <sub>S</sub>	1.257	MCE <sub>R</sub> ground motion (period=0.2s)
S <sub>1</sub>	0.433	MCE <sub>R</sub> ground motion (period=1.0s)
S <sub>MS</sub>	1.508	Site-modified spectral acceleration value
S <sub>M1</sub>	* null	Site-modified spectral acceleration value
S <sub>DS</sub>	1.005	Numeric seismic design value at 0.2s SA
S <sub>D1</sub>	* null	Numeric seismic design value at 1.0s SA

\* See Section 11.4.8

**Additional Information**

Name	Value	Description
SDC	* null	Seismic design category
F <sub>a</sub>	1.2	Site amplification factor at 0.2s
F <sub>v</sub>	* null	Site amplification factor at 1.0s
CR <sub>S</sub>	0.914	Coefficient of risk (0.2s)
CR <sub>1</sub>	0.898	Coefficient of risk (1.0s)
PGA	0.5	MCE <sub>G</sub> peak ground acceleration
F <sub>PGA</sub>	1.2	Site amplification factor at PGA
PGA <sub>M</sub>	0.6	Site modified peak ground acceleration
T <sub>L</sub>	6	Long-period transition period (s)
SsRT	1.257	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.375	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.433	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.483	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGA <sub>d</sub>	0.5	Factored deterministic acceleration value (PGA)

\* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

CABINET ANCHORAGE DESIGN : 2021: IBC / ASCE 7-16

Fp = 0.4 \* (ap/Rp) \* Sps \* Wp \* Ip \* (1 + 2 \* (z/h)) Eq 13.3-1

ap/Rp = 1/2.5 = 0.4 Table 13.5-1

Sps = 1.01 USGS

Wp = 2,500 lb (max.) 13.1.3

Ip = 1.0

z/h = 2.5/6.2 = 0.40

Fp = 0.4(0.4) 1.01 Wp (1.0)(1 + 2(0.4)) = 0.29 \* Wp GOVERNS

Fp min = 0.3 Sps Ip Wp = 0.25 Wp GOVERNS

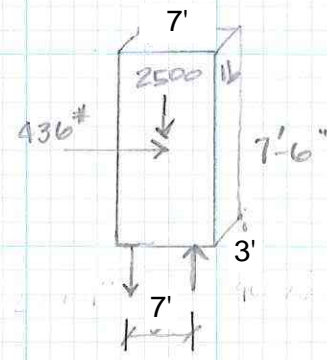
Fp A.S.D. = 0.7(0.29) 2,500 lb = 510 lb

AT R.A.F.

Mom = Fp \* (10.67') / 2 = 12721 lb-ft

MR = Wp \* 7' / 2 = 38700 lb-ft

SF = 1.320 > 1.67 OK



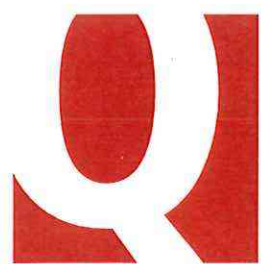
Maximum force in threaded rod (conservatively neglecting the RAF)

F = (2,500 lb / 4) + (3)(510 LB)(10.67'/2) / 9' / 2 = 625 + 453 = 1078 lb

1/2" phi THREADED ROD, h = 22"

Pcr = (pi^2 \* E \* I) / (k \* L^2) = (pi^2 \* (29,000) \* (pi/4 \* 0.25^4)) / ((1.0) \* (22)^2) = 1,811 lb >> 1078 lb OK

CHECK: "SHORT COLUMN" Pallow = 36 ksi (0.6) \* 1.5 in^2 = 3,240 lb, so buckling governs



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1511 THIRD AVENUE SUITE 323 SEATTLE, WA 98101 TEL 206.957.3900 FAX 206.957.3901 www.quantumce.com

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## CABINET ANCHORAGE DESIGN (Cont.)

- (E) R.A.F. designed for 100 PSF LL, 25 PSF SEISMIC MASS

TYPICAL CABINET ROW:

$$2500 \text{ LB} / (3'(7' + 4')) = 76 \text{ PSF}$$

SERVER IS 3'X7', AISLE IS 8' WIDE

- GRAVITY SUPPORT IS ADEQUATE, BUT SEISMIC BOLSTERING IS REQ'D W/ DIAGONAL RODS

### 3' CABINET DIRECTION

$$F_p = (1.41) 510 \text{ lb} / 2 \text{ braces} = 360 \text{ lb}, \quad \underline{1/2" \phi \text{ ROD}} \quad \underline{\text{OK}} \text{ by insp}$$

### 7' CABINET DIRECTION

$$F_p = 510 \text{ lb} \quad \text{tension or compression}, \quad \underline{1/2" \phi \text{ rod}}$$

$$\lambda_{\text{rod}} = \sqrt{2^2 + 7^2} = 7.3' = 88"$$

$$F_{\text{rod}} = 510 \text{ lb} (7.3'/7') = 532 \text{ lb}$$

$$f_t = 0.9 \text{ ksi} \quad \underline{\text{OK}} \text{ for tension only}$$



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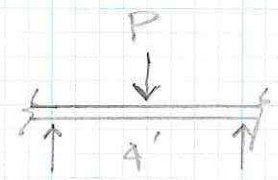
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CHECK UNI-STRUT

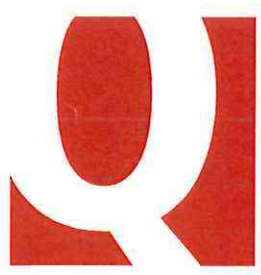
- design for worst case
- conservatively neglect RAF support for seismic V.O.T.

$l = 4'$   
 $P = 453 \text{ lb}$



$P_{all} = 850 \text{ lb}$  (0.67) (0.88)  
 $P_{all} = 501 \text{ lb} > 453 \text{ lb}$  OK

1 5/8" x 1 5/8" UNISTRUT  
 See next sheet.



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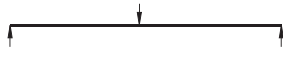

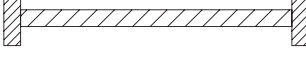
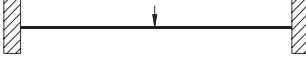
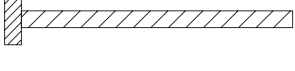

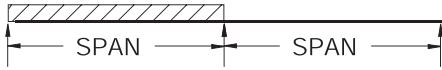
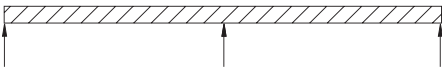


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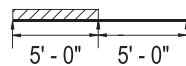
**CONVERSION FACTORS FOR BEAMS WITH VARIOUS STATIC LOADING CONDITIONS**

All Beam Load tables are for single-span (simple) beams supported at the ends. These can be used in the majority of the cases. However, there are times when it is necessary to know what happens with other loading and support conditions. Some common arrangements are shown below. Simply multiply the values from the Beam Load tables by factors given below

Load and Support Condition		Load Factor	Deflection Factor
1. Simple Beam, Uniform Load		1.00	1.00
2. Simple Beam, Concentrated Load at Center		.50	.80
3. Simple Beam, Two Equal Concentrated Loads at 1/4 pts		1.00	1.10
4. Beam Fixed at Both Ends, Uniform Load		1.50	.30
5. Beam Fixed at Both Ends, Concentrated Load at Center		1.00	.40
6. Cantilever Beam, Uniform Load		.25	2.40
7. Cantilever Beam, Concentrated Load at End		.12	3.20
8. Continuous Beam, Two Equal Spans, Uniform Load on One Span		1.30	.92
9. Continuous Beam, Two Equal Spans, Uniform Load on Both Ends		1.00	.42
10. Continuous Beam, Two Equal Spans, Concentrated Load at Center of One Span		.62	.71
11. Continuous Beam, Two Equal Spans, Concentrated Load at Center of Each Span		.67	.48

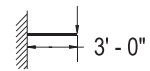
**EXAMPLE I:**

Determine load and deflection of a P 1000 beam continuous over one support and loaded uniformly on one span.



**EXAMPLE II**

Determine load and deflection of a P 5500 cantilever beam with a concentrated load on the end.



**SOLUTION:**

- A. From load table for P1000 on page 25 load for a 5'-0" span is 680# and deflection is .35".
- B. Multiply by factors from Table above.  
Load = 680# x 1.30 = 884#  
Deflection = .35" x .92 = .32"

**SOLUTION:**

- A. From load table P5500 on page 58 load for a 3'-0" span is 2180# and deflection is .09".
- B. Multiply by factors from Table above.  
Load = 2180# x .12 = 262#  
Deflection = .09" x 3.20 = .29"

**P1000 & P1001 Channels**

**P1000 - BEAM LOADING**

Span In	Max. Allowable Uniform Load Lbs	Defl. at Uniform Load In	Uniform Loading at Deflection		
			Span/180 Lbs	Span/240 Lbs	Span/360 Lbs
24	1,690	0.06	1,690	1,690	1,690
36	1,130	0.13	1,130	1,130	900
48	850	0.22	850	760	500
60	680	0.35	650	480	320
72	560	0.50	450	340	220
84	480	0.68	330	250	160
96	420	0.89	250	190	130
108	380	1.14	200	150	100
120	340	1.40	160	120	80
144	280	2.00	110	80	60
168	240	2.72	80	60	40
192	210	3.55	60	50	NR
216	190	4.58	50	40	NR
240	170	5.62	40	NR	NR

**P1001 - BEAM LOADING**

Span In	Max. Allowable Uniform Load Lbs	Defl. at Uniform Load In	Uniform Loading at Deflection		
			Span/180 Lbs	Span/240 Lbs	Span/360 Lbs
24	3,500*	0.02	3,500*	3,500*	3,500*
36	3,190	0.07	3,190	3,190	3,190
48	2,390	0.13	2,390	2,390	2,390
60	1,910	0.20	1,910	1,910	1,620
72	1,600	0.28	1,600	1,600	1,130
84	1,370	0.39	1,370	1,240	830
96	1,200	0.51	1,200	950	630
108	1,060	0.64	1,000	750	500
120	960	0.79	810	610	410
144	800	1.14	560	420	280
168	680	1.53	410	310	210
192	600	2.02	320	240	160
216	530	2.54	250	190	130
240	480	3.16	200	150	100

**P1000 - COLUMN LOADING**

Unbraced Height In	Max. Allowable Load at Slot Face Lbs	Maximum Column Load Applied at C.G.			
		K = 0.65 Lbs	K = 0.80 Lbs	K = 1.0 Lbs	K = 1.2 Lbs
24	3,550	10,740	9,890	8,770	7,740
36	3,190	8,910	7,740	6,390	5,310
48	2,770	7,260	6,010	4,690	3,800
60	2,380	5,910	4,690	3,630	2,960
72	2,080	4,840	3,800	2,960	2,400
84	1,860	4,040	3,200	2,480	1,980
96	1,670	3,480	2,750	2,110	1,660
108	1,510	3,050	2,400	1,810	**
120	1,380	2,700	2,110	**	**
144	1,150	2,180	1,660	**	**

**P1001 - COLUMN LOADING**

Unbraced Height In	Max. Allowable Load at Slot Face Lbs	Maximum Column Load Applied at C.G.			
		K = 0.65 Lbs	K = 0.80 Lbs	K = 1.0 Lbs	K = 1.2 Lbs
24	6,430	24,280	23,610	22,700	21,820
36	6,290	22,810	21,820	20,650	19,670
48	6,160	21,410	20,300	18,670	16,160
60	6,000	20,210	18,670	15,520	12,390
72	5,620	18,970	16,160	12,390	8,950
84	5,170	16,950	13,630	9,470	6,580
96	4,690	14,890	11,190	7,250	5,040
108	4,170	12,850	8,950	5,730	3,980
120	3,690	10,900	7,250	4,640	**
144	2,930	7,630	5,040	**	**

**P1000/P1001 - ELEMENTS OF SECTION**

Parameter	P1000		P1001	
Area of Section	0.555	In <sup>2</sup>	1.111	In <sup>2</sup>
Axis 1-1				
Moment of Inertia (I)	0.185	In <sup>4</sup>	0.928	In <sup>4</sup>
Section Modulus (S)	0.202	In <sup>3</sup>	0.571	In <sup>3</sup>
Radius of Gyration (r)	0.577	In	0.914	In
Axis 2-2				
Moment of Inertia (I)	0.236	In <sup>4</sup>	0.471	In <sup>4</sup>
Section Modulus (S)	0.290	In <sup>3</sup>	0.580	In <sup>3</sup>
Radius of Gyration (r)	0.651	In	0.651	In

Notes:

\* Load limited by spot weld shear.

\*\* KL/r > 200

NR = Not Recommended.

- Beam loads are given in total uniform load (W Lbs) not uniform load (w lbs/ft or w lbs/in).
- Beam loads are based on a simple span and assumed to be adequately laterally braced. Unbraced spans can reduce beam load carrying capacity. Refer to Page 62 for reduction factors for unbraced lengths.
- For pierced channel, multiply beam loads by the following factor:  

"KO" Series.....	95%	"T" Series .....	85%
"HS" Series .....	90%	"SL" Series .....	85%
"H3" Series.....	90%	"DS" Series.....	70%
"WT" Series.....	85%		
- Deduct channel weight from the beam loads.
- For concentrated midspan point loads, multiply beam loads by 50% and the corresponding deflection by 80%. For other load conditions refer to page 18.
- All beam loads are for bending about Axis 1-1.

1 1/8" Channel

Telestrut

Nuts & Hardware

General Fittings

Pipe/Conduit Supports

Electrical Fittings

Concrete Inserts

Solar

Unipier®

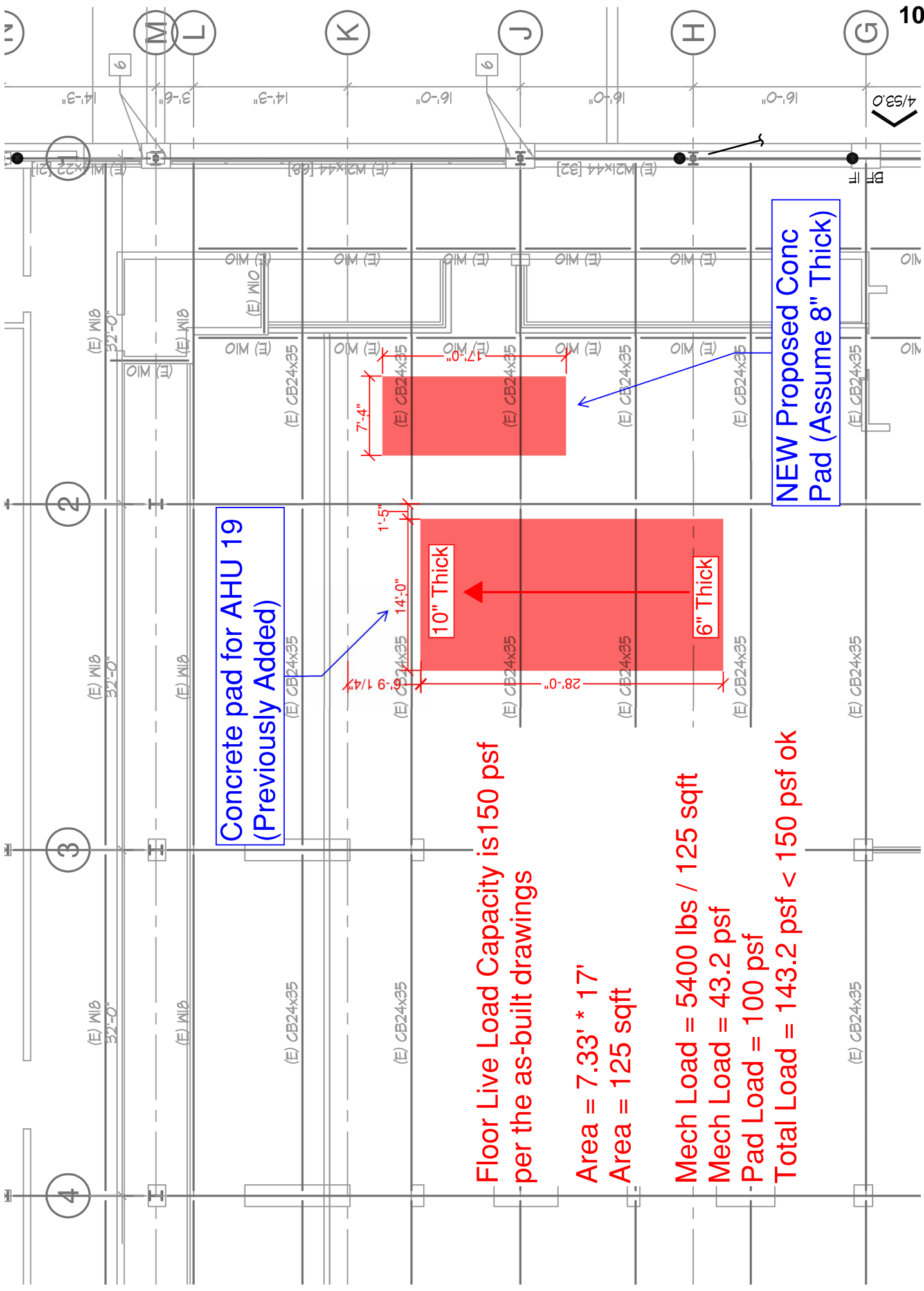


**LATERAL BRACING LOAD REDUCTION CHARTS**

Span		Single Channel										Double Channel											
Ft. (m)	In. (cm)	P1000	P1100	P2000	P3000	P3300	P4000	P4100	P4400	P4520	P5000	P5500	P1001	P1101	P2001	P3001	P3301	P4001	P4101	P4401	P4521	P5001	P5501
2 (0.61)	24 (61)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3 (0.91)	36 (91)	0.94	0.89	0.88	0.96	1.00	0.94	0.98	1.00	1.00	0.85	0.89	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4 (1.22)	48 (122)	0.88	0.78	0.75	0.91	1.00	0.88	0.94	0.98	1.00	0.70	0.77	1.00	0.98	0.98	1.00	1.00	0.98	1.00	1.00	1.00	0.97	0.98
5 (1.52)	60 (152)	0.82	0.68	0.61	0.88	0.98	0.83	0.91	0.96	1.00	0.55	0.67	0.97	0.93	0.92	0.98	1.00	0.93	0.96	1.00	1.00	0.90	0.93
6 (1.83)	72 (183)	0.78	0.59	0.48	0.84	0.97	0.79	0.89	0.94	0.98	0.44	0.58	0.93	0.87	0.85	0.95	0.97	0.88	0.92	0.97	0.97	0.83	0.87
7 (2.13)	84 (213)	0.75	0.52	0.41	0.82	0.96	0.75	0.86	0.92	0.97	0.38	0.51	0.89	0.82	0.78	0.92	0.95	0.83	0.89	0.95	0.95	0.76	0.81
8 (2.44)	96 (244)	0.71	0.47	0.35	0.79	0.94	0.72	0.84	0.91	0.96	0.33	0.46	0.85	0.76	0.71	0.88	0.92	0.79	0.85	0.92	0.92	0.68	0.76
9 (2.74)	108 (274)	0.69	0.43	0.32	0.77	0.93	0.69	0.82	0.89	0.95	0.30	0.42	0.81	0.70	0.64	0.85	0.90	0.74	0.81	0.90	0.90	0.61	0.70
10 (3.05)	120 (305)	0.66	0.40	0.29	0.75	0.92	0.66	0.80	0.87	0.94	0.28	0.40	0.78	0.65	0.57	0.82	0.87	0.69	0.78	0.87	0.87	0.54	0.64
12 (3.66)	144 (366)	0.61	0.36	0.25	0.70	0.89	0.60	0.76	0.84	0.91	0.24	0.36	0.70	0.54	0.45	0.76	0.82	0.60	0.71	0.82	0.83	0.43	0.53
14 (4.27)	168 (427)	0.55	0.32	0.23	0.66	0.86	0.55	0.73	0.81	0.89	0.22	0.32	0.63	0.45	0.38	0.70	0.78	0.51	0.64	0.77	0.78	0.35	0.45
16 (4.88)	192 (488)	0.51	0.30	0.21	0.62	0.84	0.50	0.69	0.78	0.87	0.21	0.30	0.56	0.39	0.32	0.64	0.73	0.44	0.57	0.72	0.73	0.30	0.39
18 (5.49)	216 (549)	0.47	0.28	0.19	0.58	0.81	0.47	0.65	0.75	0.84	0.19	0.28	0.49	0.34	0.28	0.58	0.68	0.39	0.50	0.67	0.68	0.27	0.34
20 (6.10)	240 (610)	0.44	0.26	0.18	0.54	0.78	0.43	0.61	0.72	0.82	0.18	0.26	0.44	0.31	0.25	0.52	0.63	0.35	0.45	0.62	0.63	0.24	0.30

**BEARING LOADS ON UNISTRUT CHANNEL**

Channel	Bearing Length 1 1/8" (41 mm) Maximum Allowable Loads Lbs (kN)		Bearing Length 1 1/8" (41 mm) Maximum Allowable Loads Lbs (kN)		Bearing Length 3/4" (82 mm) Maximum Allowable Loads Lbs (kN)	
	P1000	6,700 29.80	3,100 13.79	7,700 34.25		
P1100	3,500 15.57	1,700 7.56	4,000 17.79			
P2000	2,500 11.12	1,200 5.34	3,000 13.34			
P3000	6,700 29.80	3,200 14.23	7,700 34.25			
P3300	6,800 30.25	3,200 14.23	7,800 34.70			
P4000	2,600 11.57	1,200 5.34	3,000 13.34			
P4100	3,500 15.57	1,800 8.01	4,100 18.24			
P4400	7,300 32.47	3,400 15.12	8,400 37.37			
P4520	7,300 32.47	3,400 15.12	8,400 37.37			
P5000	6,500 28.91	3,000 13.34	7,500 33.36			
P5500	6,600 29.36	3,100 13.79	7,600 33.81			



Concrete pad for AHU 19  
(Previously Added)

NEW Proposed Conc  
Pad (Assume 8" Thick)

Floor Live Load Capacity is 150 psf  
per the as-built drawings

Area = 7.33' \* 17'

Area = 125 sqft

Mech Load = 5400 lbs / 125 sqft

Mech Load = 43.2 psf

Pad Load = 100 psf

Total Load = 143.2 psf < 150 psf ok