Structural Calculations
DIAGONAL CARPORTS
Puyallup Public Safety Building

Steelport LLC - Client

DESIGN LOADS: ASCE-7(22) IBC (2021)

Roof Load = 28 psf (25S + 3D) + snow drifting
Wind: 110 mph (Exposure C)
Seismic: Ss = 1.24
Max Soil Bearing Pressure = 1500 psf

City of Puyallup
Building
REVIEWED
FOR
COMPLIANCE
SKinnear
10/16/2025
3:38:09 PM

Calculations required to be provided by the Permittee on site for all Inspections

City of Puyallup
Development & Permitting Services
ISSUED PERMIT

Building	Planning
Engineering	Public Works
Fire	Traffic

TIM COVERT
STATE OF WASHINGTON
17699
REGISTERED
PROFESSIONAL ENGINEER
5/3/24

PRCP20251335

Job No. 7324

TIM COVERT P.E. STRUCTURAL ENGINEER
1750 SW Skyline Blvd #221
Portland, Oregon 97221
Phone:(503) 228-0426

7324

LOAD -1

DESIGN CRITERIA

D 1 GOVERNING BUILDING CODE:
CONSTRUCTION AND DESIGN IN ACCORDANCE WITH 2015 INTERNATIONAL BUILDING ... AMENDED BY THE STATE OF WASHINGTON AND ... IBC (2021) ... THIS CODE SHALL GOVERN EXCEPT WHERE ... APPLICABLE CODES OR CONTRACT PROVISIONS ARE MORE RESTRICTIVE.

D 2 LIVE LOADS:
UNIFORM LIVE LOAD IN BAYS..... 1,250 PSF
2 ROOF LIVE LOAD (SEE NOTE D 6)..... 20 PSF

D 3 SNOW LOAD:
GROUND SNOW LOAD (SEE NOTE D 6)..... 25 PSF ~~20 PSF~~ *
DRIFT LOADS IN ACCORDANCE WITH ASCE 7

D 4 WIND:
BASIC WIND SPEED ..... 110 MPH
RISK CATEGORY II
EXPOSURE CATEGORY C
TOPOGRAPHIC FACTOR ..... K_{zt}= 1.0

110/C

D 5 SEISMIC:
MCE ACCELERATION, SHORT PERIOD ..... S_S = 1.24 g
MCE ACCELERATION, 1-SEC PERIOD ..... S_1 = 0.48 g
SITE CLASS C
DESIGN ACCEL, SHORT PERIOD ..... S_{DS}= 0.83g
DESIGN ACCEL, 1-SEC PERIOD ..... S_{D1} = 0.42g
RISK CATEGORY II
SEISMIC IMPORTANCE FACTOR ..... I= 1.00 I_p= 1.00,
EXCEPT FOR FIRE PROTECTION SYSTEM, EGRESS STAIRWAYS, AND COMPONENTS CONTAINING HAZARDOUS MATERIALS .... I_p= 1.50
SEISMIC DESIGN CATEGORY ..... D

D 6 PRE-ENGINEERED BUILDING COLUMN REACTIONS:
PRE-ENGINEERED BUILDING BY OTHERS. FOUNDATION IS DESIGNED FOR THE COLUMN REACTIONS AS DESCRIBED ON S-04.

COLUMN REACTIONS WERE PROVIDED BY NUCOR CORPORATION. IN THE EVENT OTHER PREFABRICATED BUILDING MANUFACTURER IS SELECTED THE CONTRACTOR SHALL FURNISH ALL COLUMN BASE REACTIONS TO ALLOW FOR FOUNDATION REDESIGN.

D 7 BAY WALL DESIGN LOADS:
BAY WALLS ARE DESIGNED FOR A UNIFORM LRFD LOAD OF 1,250 PSF.

* assume ASD, not ultimate.

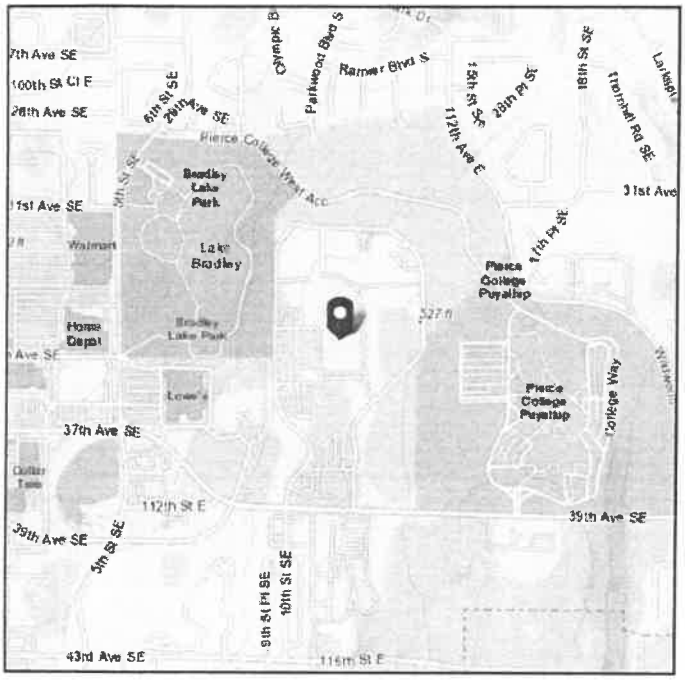
LOAD-2

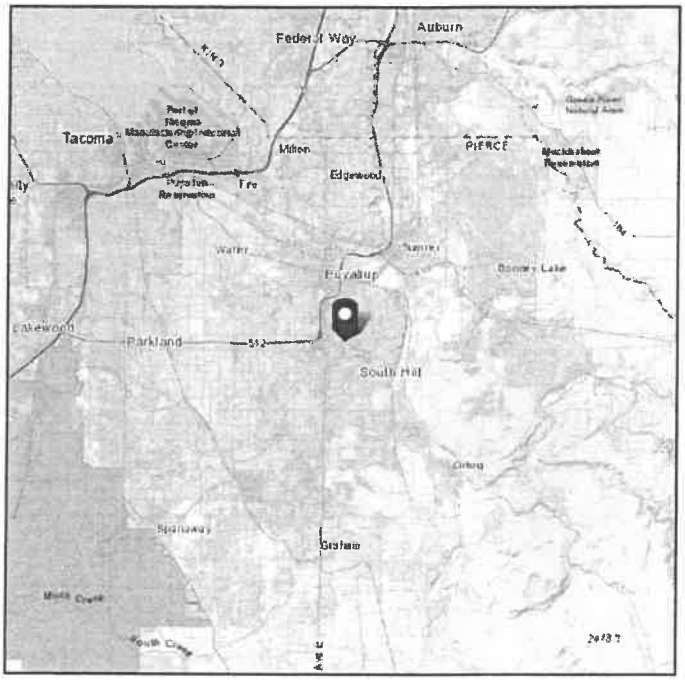
ASCE Hazards Report

Address:
1015 39th Ave SE
Puyallup, Washington
98374

Standard: ASCE/SEI 7-22
Risk Category: IV ✓
Soil Class: C - Very Dense Soil and Soft Rock

Latitude: 47.158856
Longitude: -122.279864
Elevation: 487.9235751673597 ft (NAVD 88)





Wind

Results:

Wind Speed	108 Vmph
10-year MRI	67 Vmph
25-year MRI	73 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph
300-year MRI	92 Vmph
700-year MRI	97 Vmph
1,700-year MRI	104 Vmph
3,000-year MRI	108 Vmph
10,000-year MRI	118 Vmph ← 110 (exp. C)
100,000-year MRI	136 Vmph
1,000,000-year MRI	154 Vmph

Data Source: ASCE/SEI 7-22, Fig. 26.5-1D and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Tue Nov 26 2024

LOAD-3

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

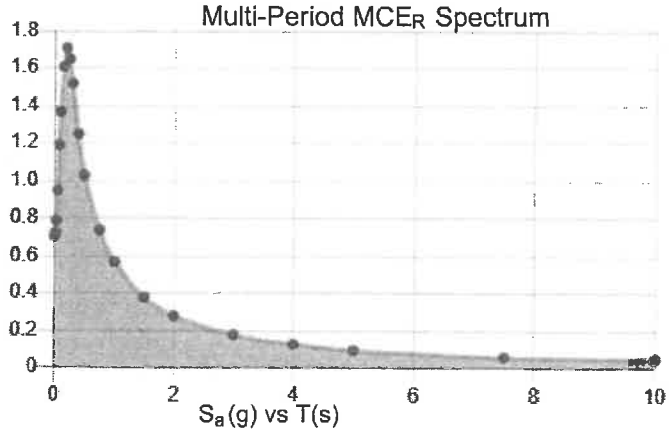
Seismic

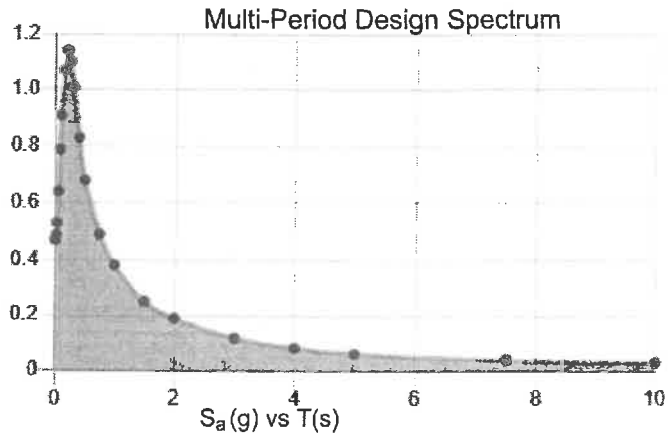
Site Soil Class: C - Very Dense Soil and Soft Rock

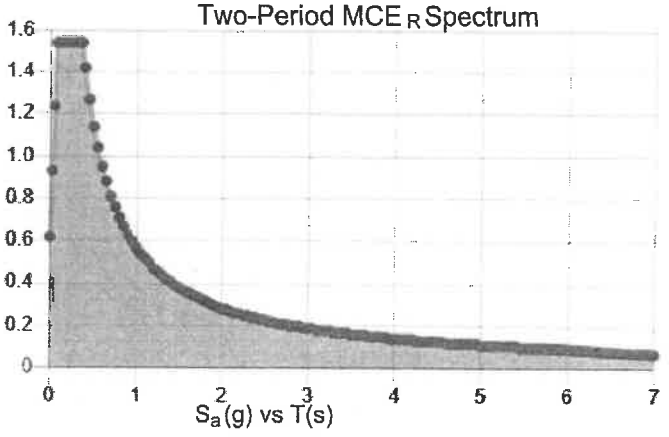
Results:

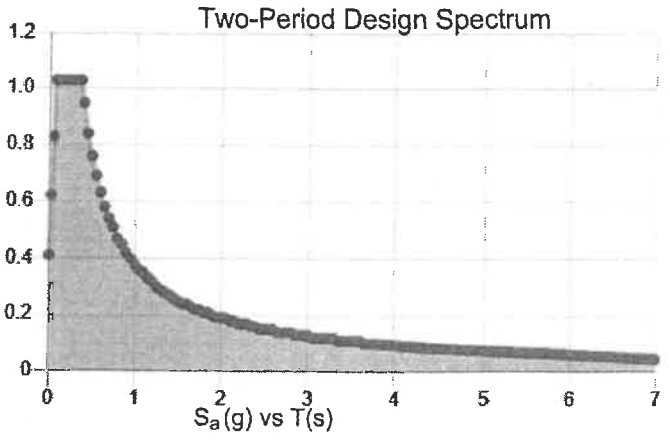
PGA_M :	0.55	T_L :	6	" 1.24 was given"
S_{MS} :	1.54	S_S :	1.42	
S_{M1} :	0.57	S_1 :	0.41	
S_{DS} :	1.03	V_{S30} :	530	
S_{D1} :	0.38			

Seismic Design Category: D









MCER Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Snow

Results:

Ground Snow Load, p_g:	61 lb/ft^2 → 43 psf (ASD)
20-year MRI Value:	12.37 lb/ft^2
Winter Wind Parameter:	0.35
Mapped Elevation:	431.2 ft
Data Source:	ASCE/SEI 7-22, Figures 7.6-1 and 7.6-2 A-D
Date Accessed:	Tue Nov 26 2024

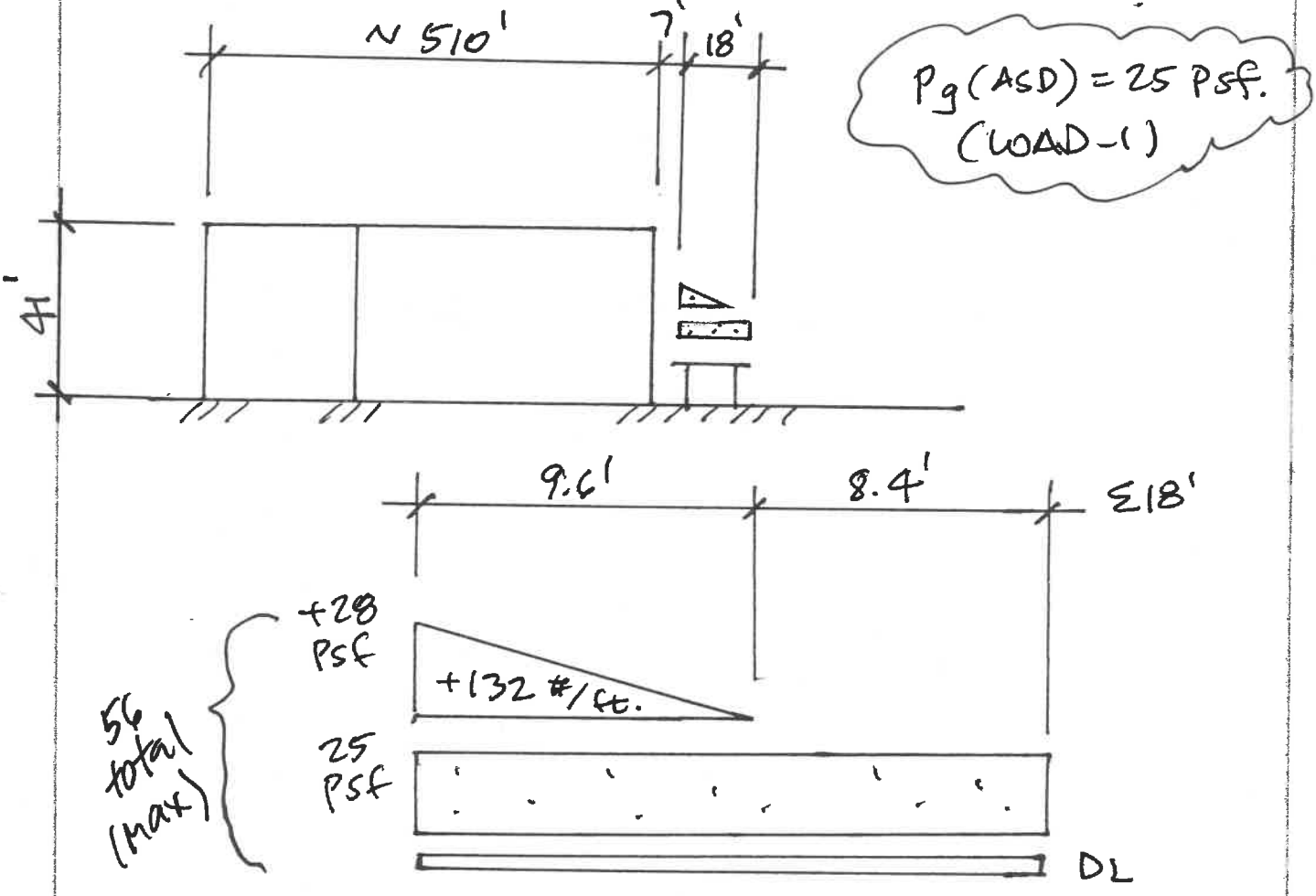
Values provided are ground snow loads. In areas designated "case study required," extreme local variations in ground snow loads preclude mapping at this scale. Site-specific case studies are required to establish ground snow loads at elevations not covered.

"NOT USED"

Snow load values are mapped to a 0.5 mile resolution. This resolution can create a mismatch between the mapped elevation and the site-specific elevation in topographically complex areas. Engineers should consult the local authority having jurisdiction in locations where the reported 'elevation' and 'mapped elevation' differ significantly from each other.

Ground Snow Loads for IRC only, $p_{g(asd)}$: 42.7 lb/ft^2

SNOW DRIFTING (ASCE-7)



P_g (ASD) = 25 Psf. (LOAD-1)

SNOW DRIFT ON ADJACENT BLDGS:

HEIGHT OF TALL BLDG = 41 FT. ✓
HEIGHT OF LOWER BLDG = 10 FT. ✓
LENGTH OF TALL BLDG = 510 FT. ✓
HORIZ.SEPARATION = 7 FT. ✓
GROUND SNOW = 25 PSF.
W2 = .35 ✓

DRIFT HEIGHT = 1.597857 FT. ✓
DESIGN PRESSURE (MAX) = 27.56304 PSF. ✓
DRIFTING LENGTH = 9.587142 FT. ✓
DRIFT WEIGHT = 132.1254 PLF.
6h = 186
(6h -s)/6 = 29.83333 ✓
6h-s = 179

Steelport's SP-3F Decking:

good!

GA.	SPAN	4'	5'	6'	7'	8'	9'	10'
28 GA.	SS/DS	159 [157] PSF	102 [80]	71 [46]	52 [29]	40 [19]	31 [14]	25 [10]
	TS	198	127	88	65	50	38	31
26 GA.	SS/DS	189 [185]	121 [95]	84 [55]	61 [34]	41 [23]	37 [16]	30 [12]
	TS	236	151	105	77	59	46	37

$WL^2/8$

$WL^2/10$

Notes: "SP-3F" (Steelport 3' wide panels)

SS = Simple-span DS = Double-span TS = Triple-span

"Boxed" load shows L/180 deflection loads for simple-span.

use →

28 gage: t = 0.0157" wt = 0.75 psf Mr = 318 #'/ft
Ix = 0.115 in4 Sx = 0.109 in3

26 gage: t = 0.0185" wt = 0.89 psf Mr = 379 #'/ft
Ix = 0.136 in4 Sx = 0.130 in3

	12'
28GA.	18 [6] PSF
	22
26GA.	21 [7]
	26

12/19/24

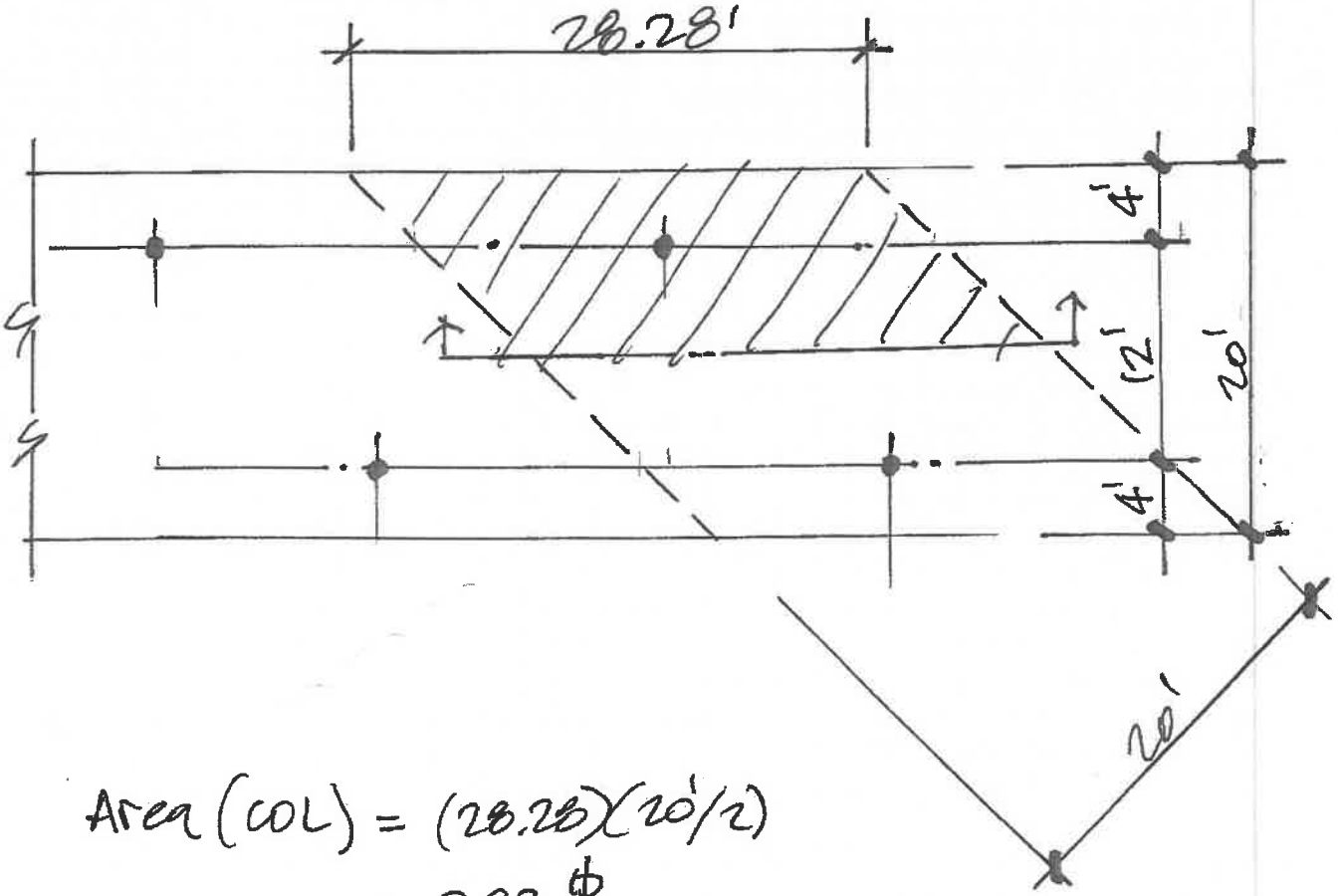
DECK-1

a = 2' (overhang) → q_{max} = 159 psf (OK)

l = 5'-4" (interior) → q_{max} = 112 psf (OK)

7324 PPS 7/21/25 COL-1

Check COLUMN LOADS:



Area (COL) = (28.28)(20'/2)
= 283 ϕ

SNOW = 7075 #/col.

DRIFT (extra) = (28.28)(132PLF) = 3733 #/col.

(DEAD = (.75PSF) + (4)(7.6PLF)/20' + (6.12)/14.14')
= 2.7 PSF (use 3 PSF)

DEAD = (3PSF)(283 ϕ) = 849 #/col.
+ (2) extra purlins for drifting.

7324 PPS 7/21/25 COL-2

COLUMN: MAX. LOAD (w/ drifting)

$F = (22.3\ psf)(35) =$

$A_{trib.} = \frac{(24")(16.28') + (5")(6')}{12'}$

$= 35\ \#/col.$

$(.6W) \rightarrow 782\ \#$

"a little high" (see next page)

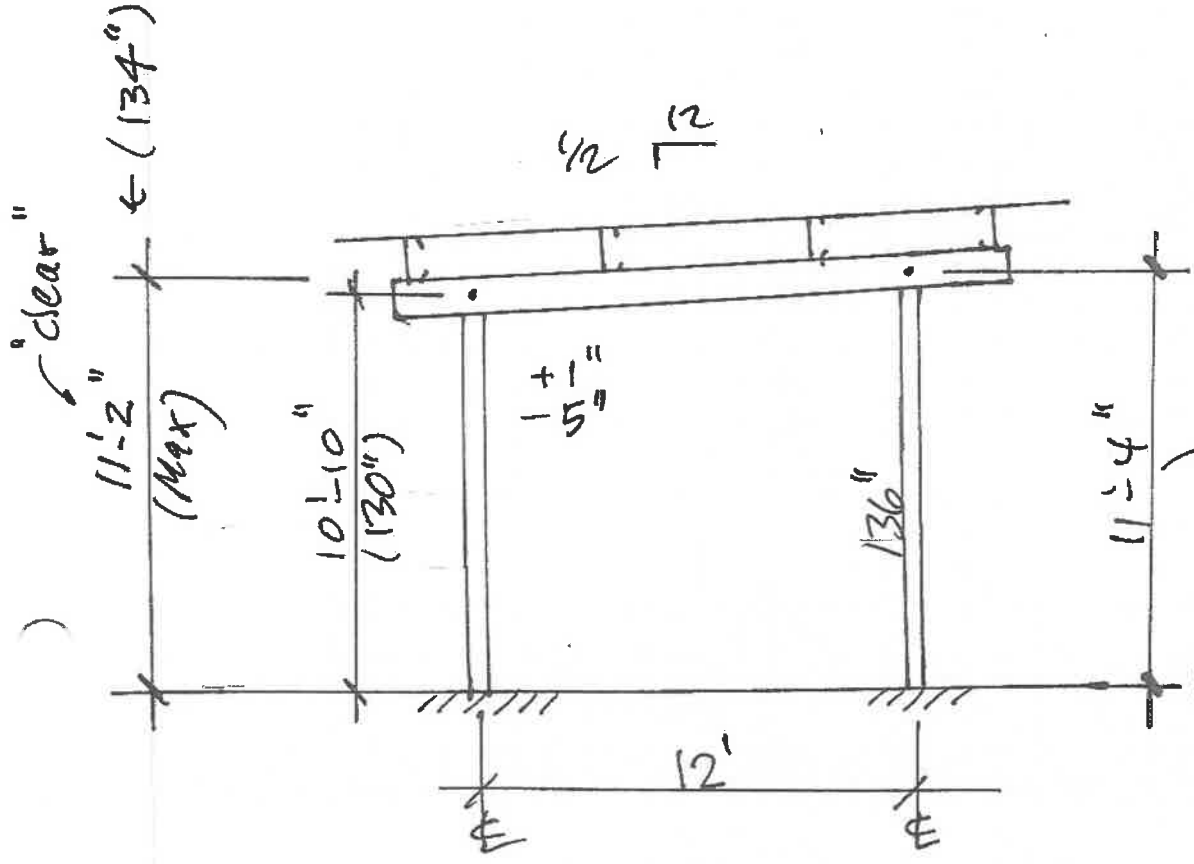
↓ 849 # + 428 # = 1277 #

Dbl. (2x) purlin (extra) wt.

10,808 #

12' + 144 #

↑ 12,229 # (Max.)

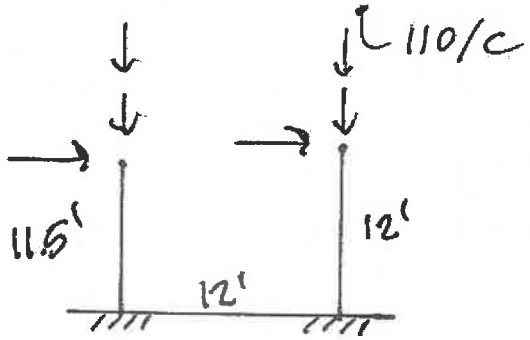


REFINE WIND LOAD-TO-COLUMNS:

$$A_{trib.}\ (\text{per Bay}) = (2')(28.28')_{\text{total}} + (.83')(5\tfrac{1}{2}')_{\text{cols}}$$

$$= 57\ \text{\#} / \text{BAY.}$$

$$\therefore F_{(total)} = (22.3\ \text{PSF})(57\ \text{\#}) = \underline{1272\ \text{\#}}$$



HSS 5 x 5 x 3/16
ASTM A500
Grade C

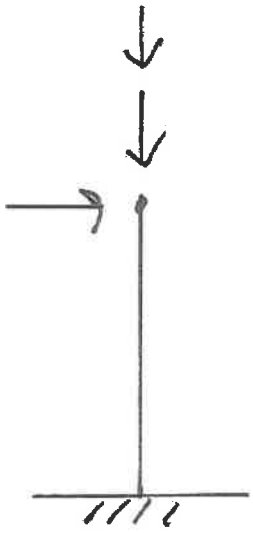
S = 2" deck + 14" purlin + 8" slope = 24" ✓

(Global) Model Settings

TALLEST COLUMN

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	0.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th (360-16): ASD
Adjust Stiffness?	No
Cold Formed Steel Code	AISI S100-16: ASD
Wood Code	AWC NDS-18: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-19
Masonry Code	TMS 402-16: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8



Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]	Yield[ksi]
1	A500 Gr.C RECT	29000	11154	0.3	0.65	0.527	50

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [i...	I (0,180) [in4]
1	HR1	HSS5X5X3	Column	RECT	A500 Gr.C R...	Typical	3.28	12.6	12.6

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	0	12	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N1	Reaction	Reaction	Reaction

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2		HR1	Column	RECT	A500 Gr.C ...	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rati..	TOM	Inactive
1	M1						Yes	** NA **		

Hot Rolled Steel Design Parameters

	Label	Shape	Length[...	Lb-out[ft]	Lb-in[ft]	Lcomp top...	Lcomp bot...	L-torq...	K-out	K-in	Cb	Chan...	a[ft]	Functi...
1	M1	HR1	12			Lb out			2.1	2.1		N/A	N/A	Lateral

Joint Loads and Enforced Displacements (BLC 1 : dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k...	Inactive
1	N2	L	Y	-1.277	

Joint Loads and Enforced Displacements (BLC 2 : snow 0.7S)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k...	Inactive
1	N2	L	Y	-10.808	

Joint Loads and Enforced Displacements (BLC 3 : wind 0.6W)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k...	Inactive
1	N2	L	X	0.595	

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]	Inactive
No Data to Print ...				

Member Distributed Loads

Member Label	Direction	Start Magnitude[k...	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]	Inactive
No Data to Print ...						

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	dead	None			1		
2	snow 0.7S	None			1		
3	wind 0.6W	None			1		

Load Combinations

	Description	Sol..	PD..	SR..	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	D + S	Yes	Y		1	1	2	1	Y	-1												
2	D + .6W	Yes	Y		1	1	3	1	Y	-1												
3	Combo 6a	Yes	Y		1	1	2	0.75	3	0.75	Y	-1										

Load Combination Design

	Description	ASIF	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless
1	D + S				Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	D + .6W				Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Combo 6a				Yes	Yes	Yes	Yes	Yes	Yes	Yes

Node Reactions (By Item)

	LC	Node Label	X [k]	Y [k]	MZ [k-ft]
1	1	N1	0	12.229	0
2	2		-0.595	1.421	7.444
3	3		-0.446	9.527	7.497
4	1	Totals:	0	12.229	
5	2		-0.595	1.421	
6	3		-0.446	9.527	
7	1	COG (ft):	X: 0	Y: 11.929	
8	2		X: 0	Y: 11.392	
9	3		X: 0	Y: 11.909	

f max.
R.
sway

Node Displacements

	LC	Node Label	X [in]	Y [in]	Rotation [rad]
1	1	N1	0	0	0
2	2		0	0	0
3	3		0	0	0
4	1	N2	0	-0.018	0
5	2		1.695	-0.002	-1.76e-2
6	3		1.707	-0.014	-1.773e-2

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	12.229	0	0
2			2	12.193	0	0
3			3	12.157	0	0
4			4	12.121	0	0
5			5	12.085	0	0
6	2	M1	1	1.421	0.62	7.444
7			2	1.385	0.62	5.583
8			3	1.349	0.62	3.722
9			4	1.313	0.62	1.861
10			5	1.277	0.62	0
11	3	M1	1	9.527	0.625	7.497
12			2	9.491	0.625	5.622
13			3	9.455	0.625	3.748
14			4	9.419	0.625	1.874
15			5	9.383	0.625	0

Member End Reactions

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	I	12.229	0	0
2			J	12.085	0	0
3	2	M1	I	1.421	0.62	7.444
4			J	1.277	0.62	0
5	3	M1	I	9.527	0.625	7.497

Member End Reactions (Continued)

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
6			J	9.383	0.625	0

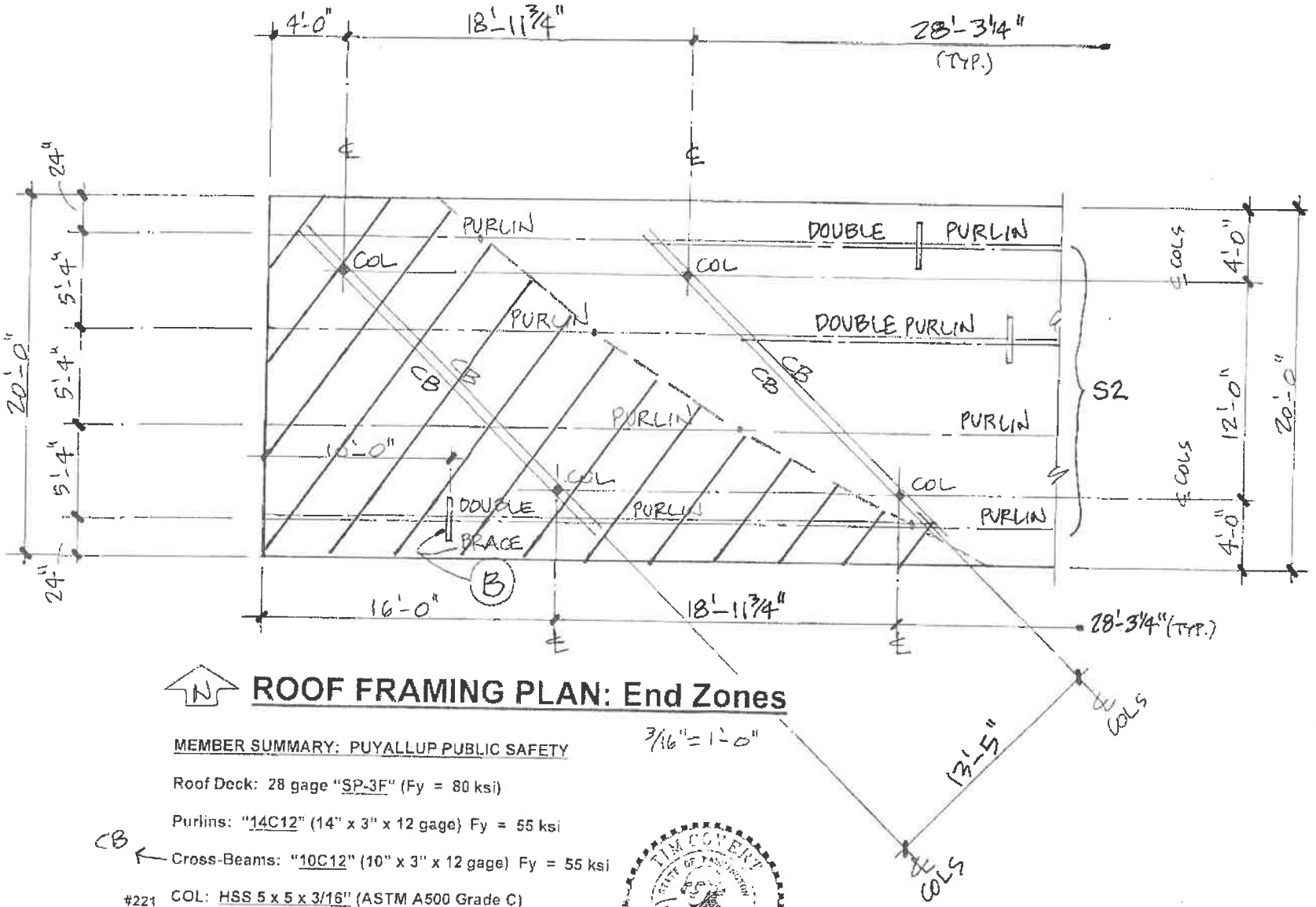
Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
1	1	M1	1	3.728	0	0	0
2			2	3.717	0	0	0
3			3	3.706	0	0	0
4			4	3.695	0	0	0
5			5	3.684	0	0	0
6	2	M1	1	0.433	0.398	-17.725	17.725
7			2	0.422	0.398	-13.294	13.294
8			3	0.411	0.398	-8.862	8.862
9			4	0.4	0.398	-4.431	4.431
10			5	0.389	0.398	0	0
11	3	M1	1	2.905	0.401	-17.849	17.849
12			2	2.894	0.401	-13.387	13.387
13			3	2.883	0.401	-8.925	8.925
14			4	2.872	0.401	-4.462	4.462
15			5	2.861	0.401	0	0

Member AISC 15th (360-16): ASD Steel Code Checks (By Item)

	LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Pnc/om [k]	Pnt/om [k]	Mn/om [k-ft]	Cb	Eqn
1	1	M1	HSS5X5X3	0.59	0	0	12	20.71	98.204	14.696	1	H1-1a*
2	2			0.541	0	0.022	12	20.71	98.204	14.696	1.667	H1-1b
3	3			0.913	0	0.022	12	20.71	98.204	14.696	1.667	H1-1a

GOOD.



ROOF FRAMING PLAN: End Zones

3/16" = 1'-0"

MEMBER SUMMARY: PUYALLUP PUBLIC SAFETY

Roof Deck: 28 gage "SP-3F" (Fy = 80 ksi)

Purlins: "14C12" (14" x 3" x 12 gage) Fy = 55 ksi

CB ← Cross-Beams: "10C12" (10" x 3" x 12 gage) Fy = 55 ksi

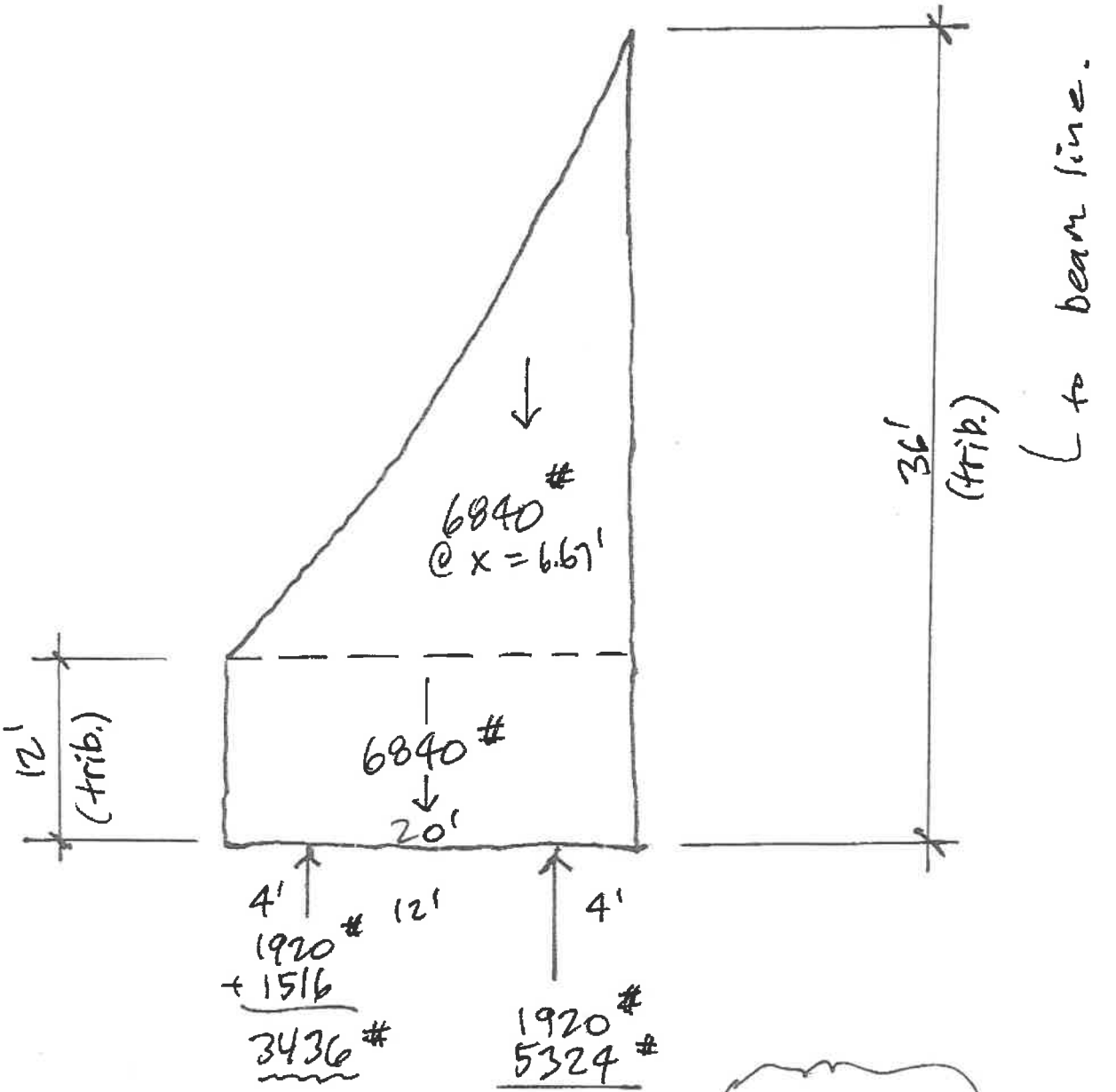
#221 COL: HSS 5 x 5 x 3/16" (ASTM A500 Grade C)

Footings: 36" diameter x 4'-6" deep (augered)
Do NOT form. No Sonotubes.

7324 PPS 7/21/25 COL-B

7324 PPS 7/21/25 COL-9

COLUMN REACTIONS: (end bays)



Use 3½ psf (DL)
25 psf (SL)
28½ psf

7324 PPS 7/21/25 COL-10

FOOTINGS: use 36" diameter

"POLE" F = 677 # @ ht. = 11.5'
= 595 # @ ht. = 12.0'

FOOTING DESIGN per IBC 1807.3.2
FORCE = 677 LBS.
HEIGHT = 11.5 FT ABOVE GRADE.
MAX PASSIVE PRESSURE = 300 PCF.
DIAMETER of FOOTING = 3 FT.

FOOTING IS NON-CONSTRAINED at GRADE.

MINIMUM DEPTH of FOOTING = 4.5 FT.

FOOTING DESIGN per IBC 1807.3.2
FORCE = 595 LBS.
HEIGHT = 12 FT ABOVE GRADE.
MAX PASSIVE PRESSURE = 300 PCF.
DIAMETER of FOOTING = 3 FT.

FOOTING IS NON-CONSTRAINED at GRADE.

MINIMUM DEPTH of FOOTING = 4.5 FT

"AUGERED"

FOOTING DEPTH CALCULATION:

DESIGN UPLIFT = 5000 LBS. → 17.7 psf (available)

MINIMUM WEIGHT = 8350 LBS.

DIAMETER OF FOOTING = 3 FT.

MINIMUM FOOTING DEPTH = 4.5 FT.

ANGLE-OFF-VERTICAL = 15 DEGREES.

WEIGHT OF CONCRETE = 4771.29 LBS.

WEIGHT OF SOIL (CONE) = 3584.613 LBS.

DENSITY, CONCRETE = 150 PCF

DENSITY, SOIL = 100 PCF

up(psf) = (13.4)(.85)(2.1) / MWFRS = 23.7 psf

>> 13.7 psf.

(OK)

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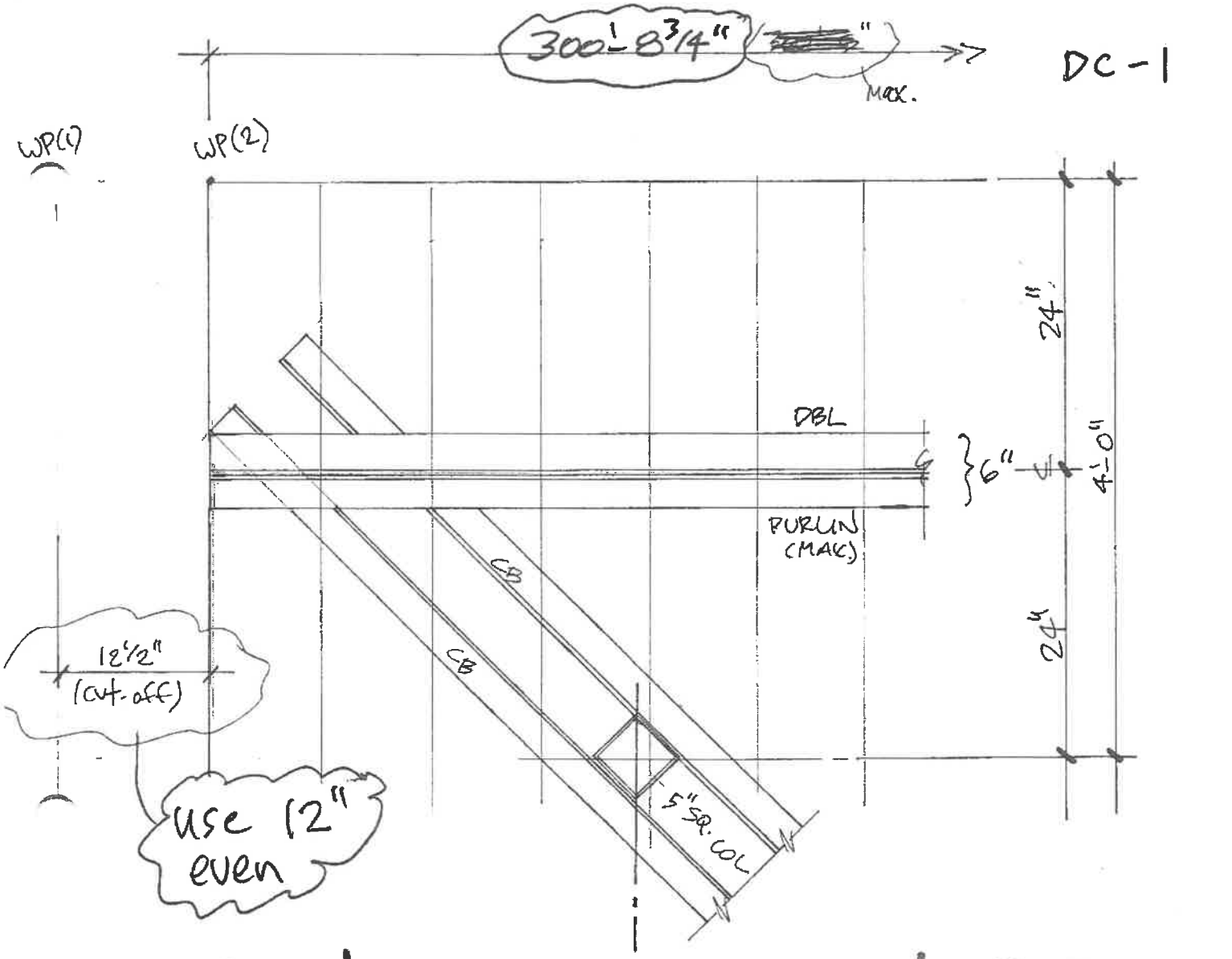
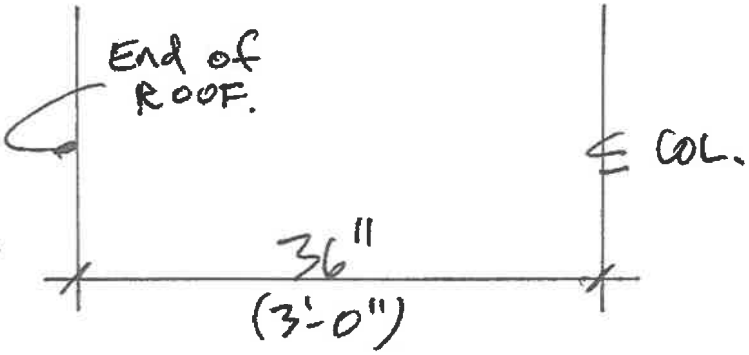


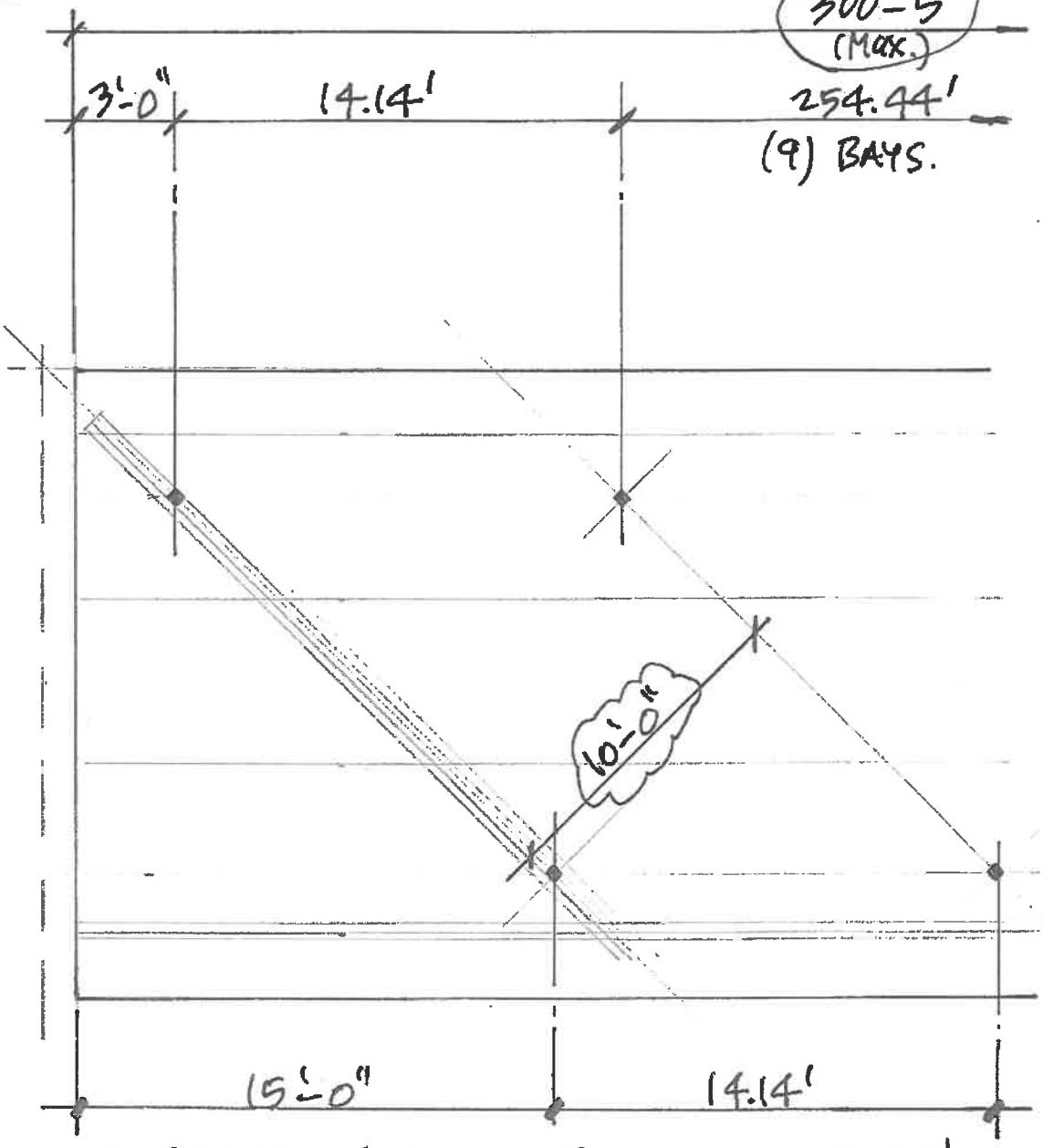
PLAN @ CUT-OFF CORNERS:



Yes = 300'-8 3/4"

DC-2

NO — 300'-5" (Max.)



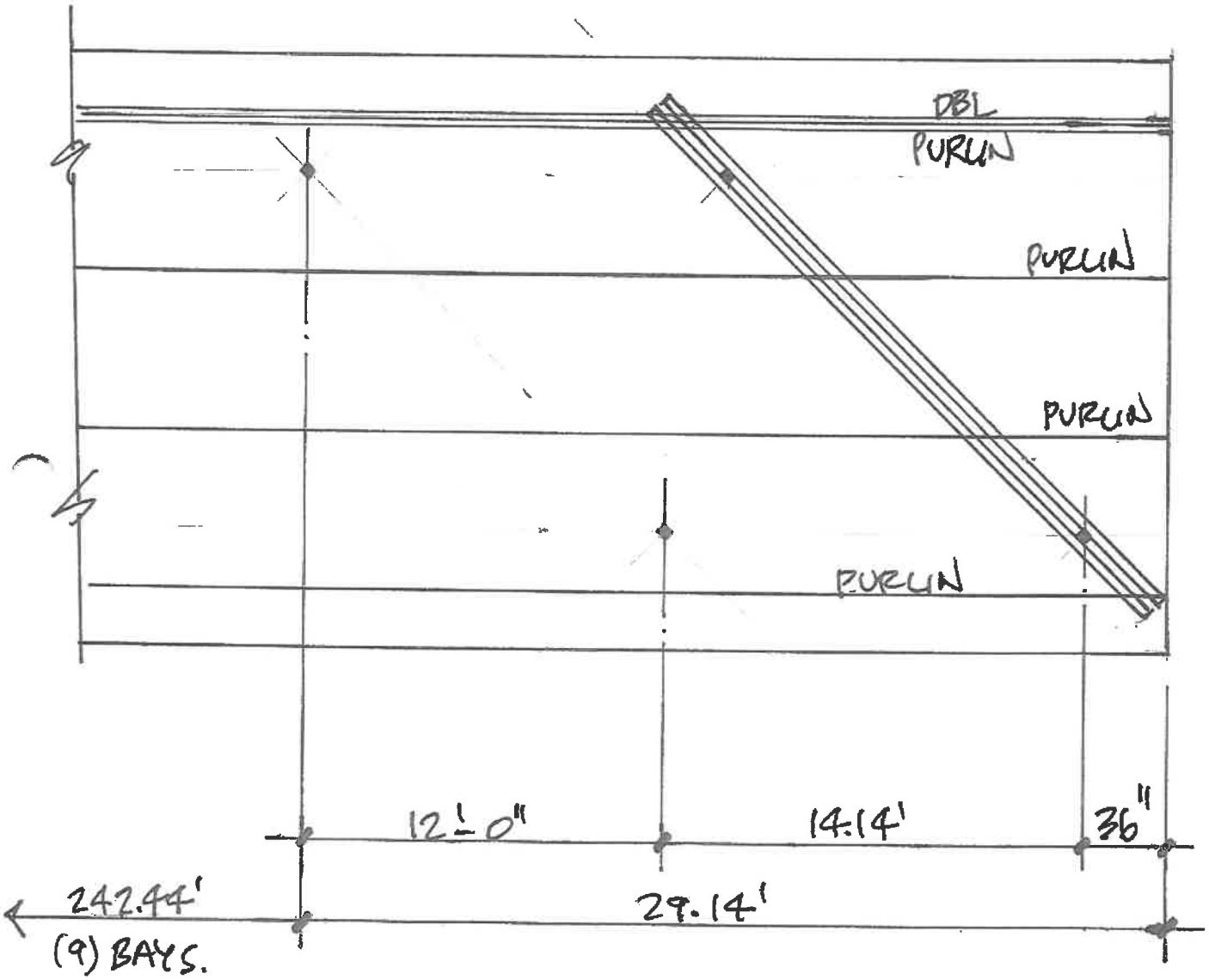
Δ (right) = (300.42 - 17.14' - 254.44) = 28.84'
(28.83')

3.0'
14.14'
12.0'
29.14' vs 28.83' (Δ = 3.67")

use 4"

LEFT:

DC-3



$\Sigma = (242.44) + (2)(29.14) = 300'-8\frac{3}{4}"$

added 4"

RIGHT:

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PPS 8/14/25 DC-4

DIMENSION CHECK

300.73' = 300'-8 3/4" (4" longer)

O/H (Left) = 3'-0"

O/H (right) = 15'-0"

9x = 254.44'

∴ short bays = $\frac{28.29'}{2}$ = 14.15'

14'-1 3/4"

10'-0" (ok) ✓

1

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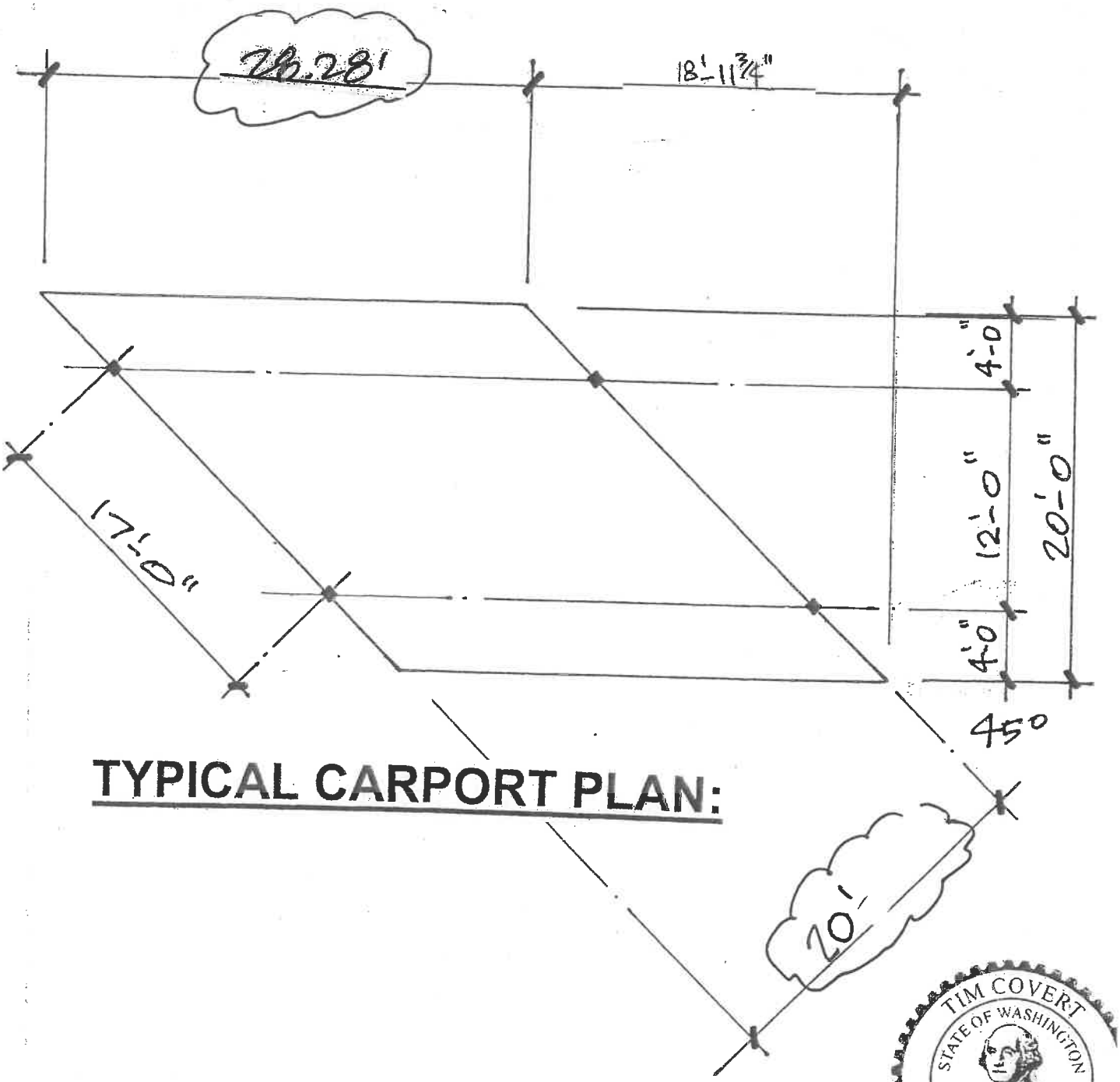
$\measuredangle$ = 45° (from before)

DEPTH of CARPORTS = 20'-0"



TYPICAL CARPORT PLAN:

Using "14C12" purlins...

M_R = 16.99 k'

S_{xc} = 6.37 in³. ✓

I_{xc} = 53.2 in⁴. ✓

FOR L = 29'-0"

w (max) = 162 PLF ✓

= 154 PLF (added self weight)

└ deck + snow. (26)

∴ spacing req'd (Max.) = 6'-0" (26 psf)

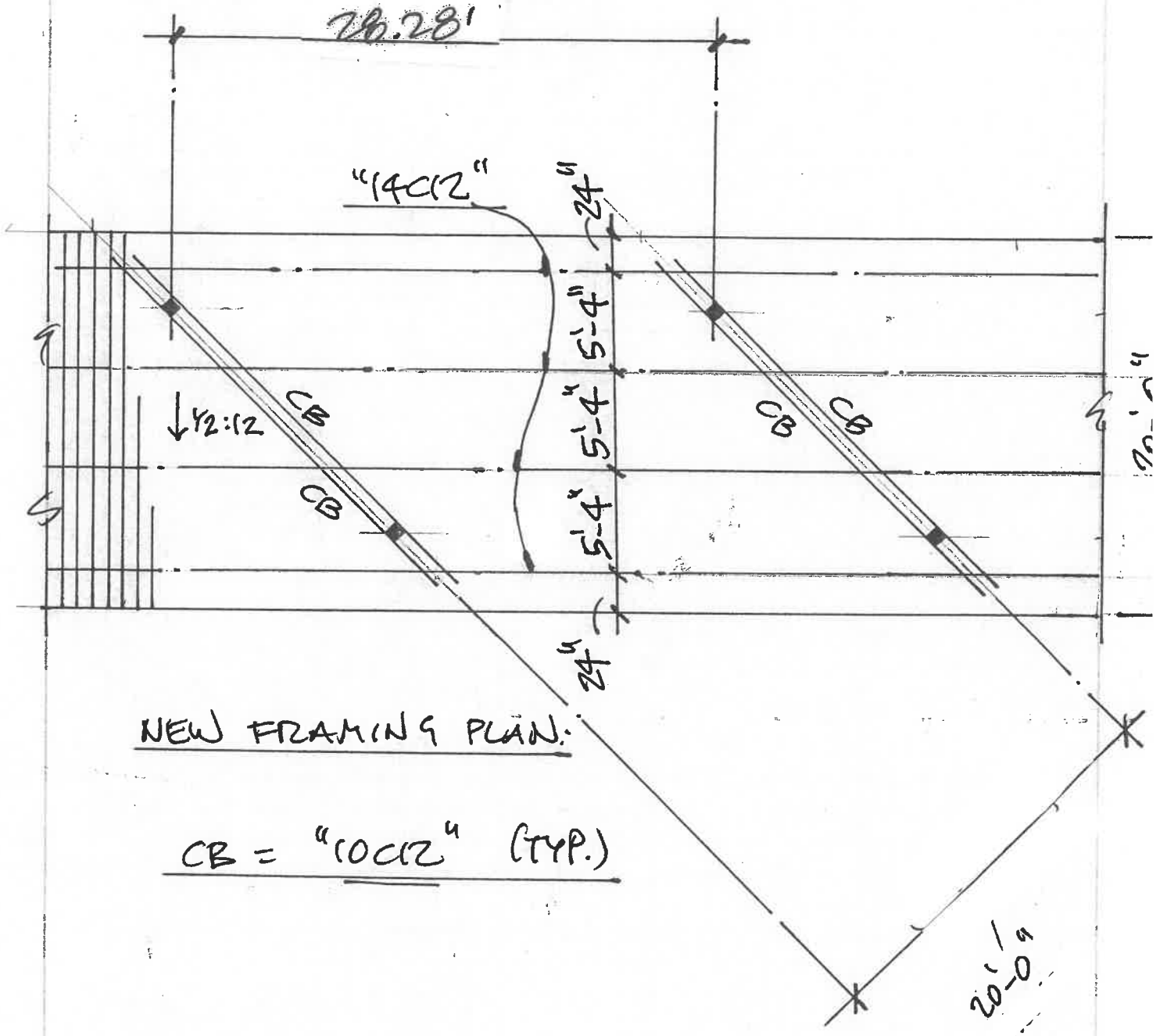
Δ_{max} = L/212 (TL) (ok)

```
DEFLECTION CHECK:
  SPAN = 29 ft.and 348 INCHES.
  UNIFORM LOAD = 162 plf.
    SAG = 1.642691 inches.
    SAG = L/ 211.8475 ←
      Ix  = 53.2 in^4 ✓
```

TOTAL LOAD = (25+2)(20')(29') = 15,640 #

162 x 29 = 4698 # / purlin

∴ n (min.) = (4) "14C12"s ✓

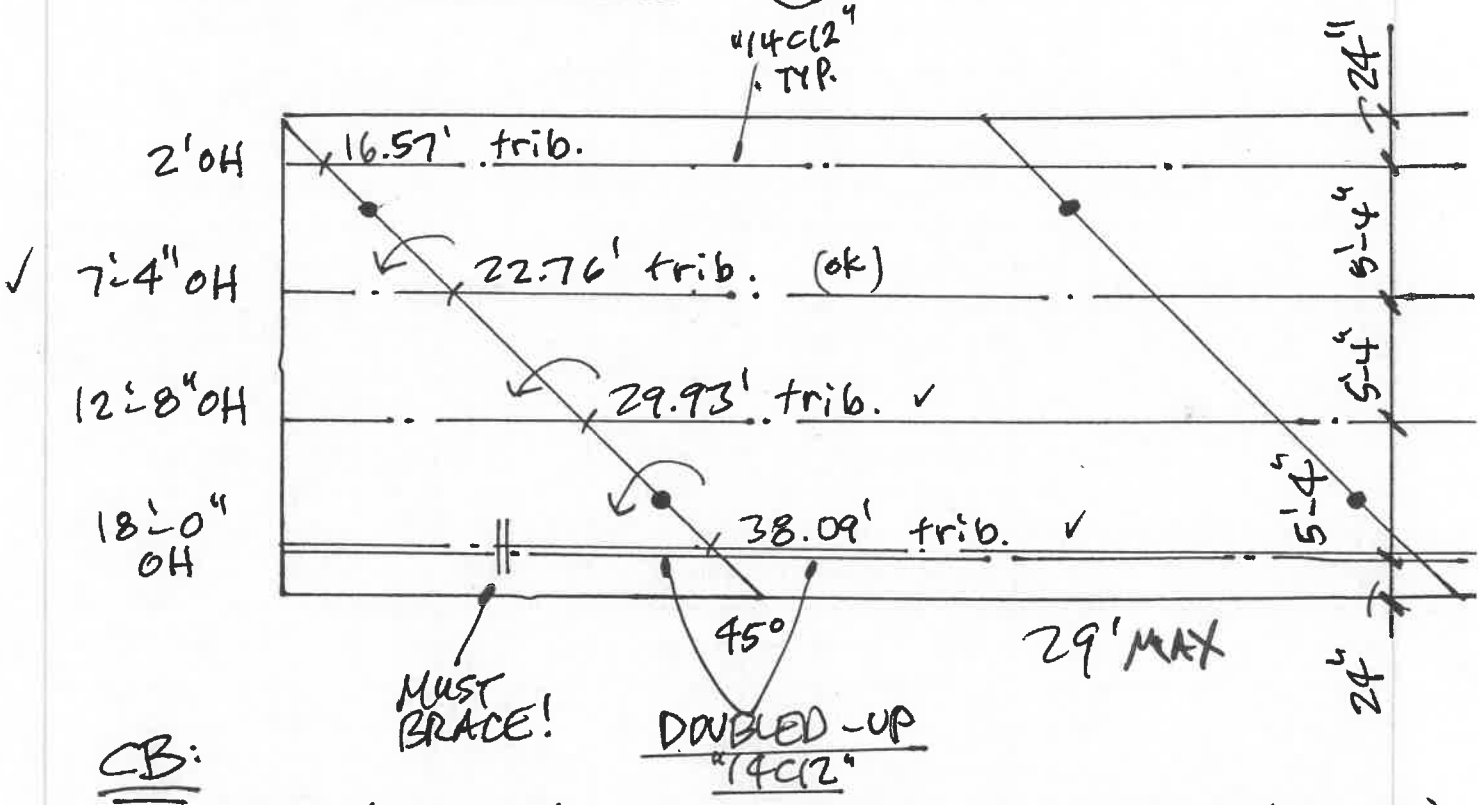


NEW FRAMING PLAN.

CB = "10CC12" (TYP.)

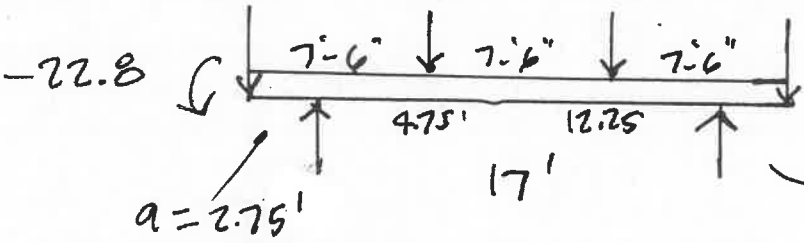
CROSS – BEAMS: (see previous pg.)

check END BAYS: (ok)



CB:

8.29' 11.38' 14.97' 19.05' (tribs per beam)

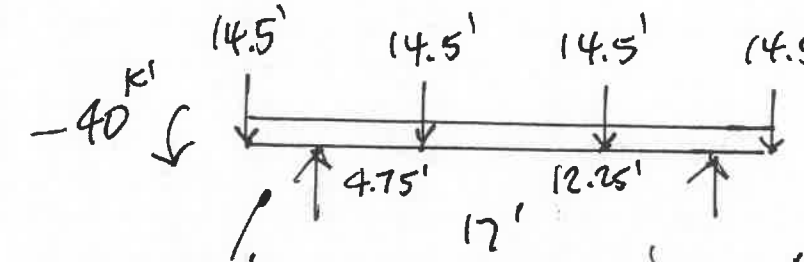


END BAYS ✓

→ M = 65.4 < 68.875

DIAGONAL SPACINGS:

14.5' 14.5' 14.5' 14.5' (tribs...)

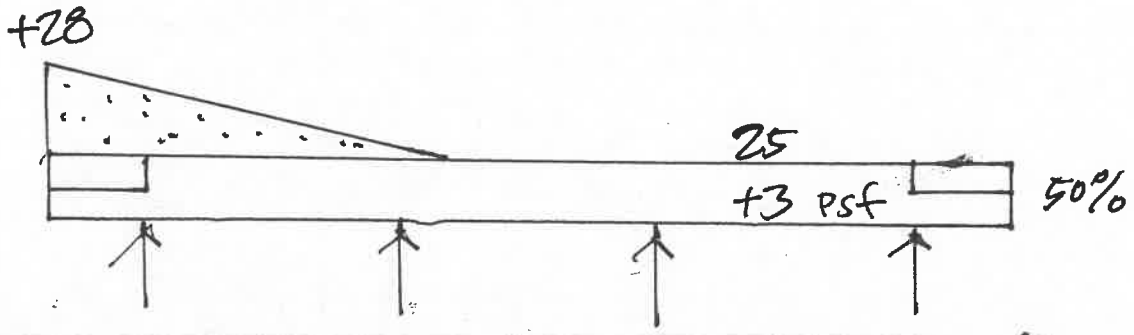


TYPICAL/INT. ✓

M = 68.875

↕ "THIS CONTROLS" (TYP.) (by 5%)

REACTIONS: LOADS-TO-PURLINS



BAL.	126	149	149	126
w/ DRIFT'G	230	187	147	126
unbal. →	95	155	155	95

1. "14C12" (4) REQ'D. (ok)

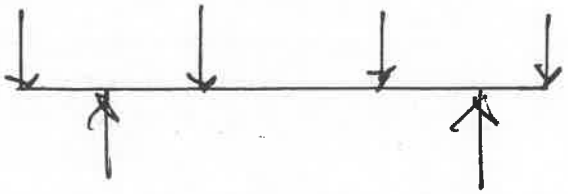
2. Double-up "14C12" for nearest two purlins. @ drifting.

$$M_{Max\ (normal)} = \frac{155\,(29)^2}{8} = 16{,}294^{\#'} \quad \text{(ok)}$$

< 16.99

check CB ... (cross-beam)

$M \cong Pa = (2160)(4.75) = 10.26 < 12^{k'}$ (10C12) ✓

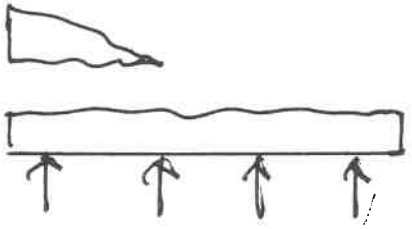


(Global) Model Settings

DECK ANALYSIS. (purlin loadings)

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	0.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th (360-16): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-16: ASD
Wood Code	AWC NDS-18: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-19
Masonry Code	TMS 402-16: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8



Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]	Yield[ksi]
1	A36 Gr.36	29000	11154	0.3	0.65	0.49	36

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [i...	I (0,180) [in4]
1	HR1A	M8X2.9	Beam	None	A36 Gr.36	Typical	0.914	0.248	1.5

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	2	0	0
3	N3	7.33	0	0
4	N4	12.667	0	0
5	N5	18	0	0
6	N6	20	0	0

24'

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N2	Reaction	Reaction	
2	N3		Reaction	
3	N4		Reaction	
4	N5		Reaction	

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2		HR1A	Beam	None	A36 Gr.36	Typical
2	M2	N2	N3		HR1A	Beam	None	A36 Gr.36	Typical
3	M3	N3	N4		HR1A	Beam	None	A36 Gr.36	Typical
4	M4	N4	N5		HR1A	Beam	None	A36 Gr.36	Typical
5	M5	N5	N6		HR1A	Beam	None	A36 Gr.36	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rati...	TOM	Inactive
1	M1						Yes			
2	M2						Yes			
3	M3						Yes			
4	M4						Yes			
5	M5						Yes			

Hot Rolled Steel Design Parameters

	Label	Shape	Length[...	Lb-out[ft]	Lb-in[ft]	Lcomp top...	Lcomp bot...	L-torq...	K-out	K-in	Cb	Chan...	a[ft]	Functi...
1	M1	HR1A	2			Lb out						N/A	N/A	Lateral
2	M2	HR1A	5.33			Lb out						N/A	N/A	Lateral
3	M3	HR1A	5.337			Lb out						N/A	N/A	Lateral
4	M4	HR1A	5.333			Lb out						N/A	N/A	Lateral
5	M5	HR1A	2			Lb out						N/A	N/A	Lateral

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k...	Inactive
No Data to Print ...				

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]	Inactive
No Data to Print ...				

Member Distributed Loads (BLC 1 : dead)

	Member Label	Direction	Start Magnitude[k...	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]	Inactive
1	M1	Y	-0.003	-0.003	0	0	
2	M2	Y	-0.003	-0.003	0	0	
3	M3	Y	-0.003	-0.003	0	0	
4	M4	Y	-0.003	-0.003	0	0	
5	M5	Y	-0.003	-0.003	0	0	

Member Distributed Loads (BLC 2 : basic snow OH)

Member Label	Direction	Start Magnitude[k...	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]	Inactive

Member Distributed Loads (BLC 2 : basic snow OH) (Continued)

	Member Label	Direction	Start Magnitude[k...	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]	Inactive
1	M1	Y	-0.025	-0.025	0	0	
2	M5	Y	-0.025	-0.025	0	0	

Member Distributed Loads (BLC 3 : basic snow INT)

	Member Label	Direction	Start Magnitude[k...	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]	Inactive
1	M2	Y	-0.025	-0.025	0	0	
2	M3	Y	-0.025	-0.025	0	0	
3	M4	Y	-0.025	-0.025	0	0	

Member Distributed Loads (BLC 4 : drifting)

	Member Label	Direction	Start Magnitude[k...	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]	Inactive
1	M1	Y	-0.028	-0.022	0	0	
2	M2	Y	-0.022	-0.007	0	0	
3	M3	Y	-0.007	0	0	2.67	

(10') ok

little high.

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	dead	None					5
2	basic snow OH	None					2
3	basic snow INT	None					3
4	drifting	None					3

Load Combinations

	Description	Sol..	PD..	SR..	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	basic snow	Yes	Y		1	1	2	1	3	1																
2	drift snow	Yes	Y		1	1	2	1	3	1	4	1														
3	Unbalanced	Yes	Y		1	1	2	0.5	3	1																

Load Combination Design

	Description	ASIF	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless
1	basic snow				Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	drift snow				Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Unbalanced				Yes	Yes	Yes	Yes	Yes	Yes	Yes

Node Reactions (By Item)

	LC	Node Label	X [k]	Y [k]	MZ [k-ft]
1	1	N2	0	0.126	0
2	2		0	0.23	0
3	3		0	0.095	0
4	1	N3	0	0.149	0
5	2		0	0.187	0
6	3		0	0.155	0
7	1	N4	0	0.149	0
8	2		0	0.147	0
9	3		0	0.155	0
10	1	N5	0	0.126	0
11	2		0	0.126	0
12	3		0	0.095	0
13	1	Totals:	0	0.55	
14	2		0	0.69	

Node Reactions (By Item) (Continued)

	LC	Node Label	X [k]	Y [k]	MZ [k-ft]
15	3		0	0.5	
16	1	COG (ft):	X: 10	Y: 0	
17	2		X: 8.647	Y: 0	
18	3		X: 10	Y: 0	

Node Displacements

	LC	Node Label	X [in]	Y [in]	Rotation [rad]
1	1	N1	0	-0.001	8.425e-5
2	2		0	-0.005	2.73e-4
3	3		0	0.004	-1.524e-4
4	1	N2	0	0	-6.747e-5
5	2		0	0	-2.551e-5
6	3		0	0	-2.352e-4
7	1	N3	0	0	2.118e-5
8	2		0	0	9.005e-5
9	3		0	0	7.52e-5
10	1	N4	0	0	-2.146e-5
11	2		0	0	-3.547e-5
12	3		0	0	-7.549e-5
13	1	N5	0	0	6.805e-5
14	2		0	0	7.488e-5
15	3		0	0	2.359e-4
16	1	N6	0	-0.001	-8.367e-5
17	2		0	-0.001	-7.685e-5
18	3		0	0.004	1.531e-4

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	0	0
2			2	0	-0.014	0.003
3			3	0	-0.028	0.014
4			4	0	-0.041	0.031
5			5	0	-0.055	0.055
6	2	M1	1	0	0	0
7			2	0	-0.027	0.007
8			3	0	-0.054	0.027
9			4	0	-0.08	0.061
10			5	0	-0.105	0.107
11	3	M1	1	0	0	0
12			2	0	-0.008	0.002
13			3	0	-0.015	0.008
14			4	0	-0.023	0.017
15			5	0	-0.03	0.03
16	1	M2	1	0	0.071	0.055
17			2	0	0.034	-0.015
18			3	0	-0.002	-0.037
19			4	0	-0.039	-0.009
20			5	0	-0.076	0.067
21	2	M2	1	0	0.124	0.107
22			2	0	0.06	-0.015
23			3	0	0.001	-0.055
24			4	0	-0.053	-0.021
25			5	0	-0.102	0.083
26	3	M2	1	0	0.065	0.03

CHECK CANTILEVER BRACING: (see P-4)

FIRST: purlin

$w = 126$ PLF

$a = 18'$

$M_a = \frac{wa^2}{2} = 20{,}412^{\#'}$ N.G.

$> 16.99^{k'}$

"DOUBLE-UP"

SECOND purlin:

$w = 155$ PLF

$a = 12.67'$

$M_a = \frac{wa^2}{2} = 12{,}435^{\#'} << 16.99^{k'}$ (ok)

$f_b = 23.43$ ksi

F_b:

FIRST: $C_b = 1.75$

$L = 214"$

$I_y = 2.19$ (≈)

$S_x = 8.416$

$d = 14"$

```
FB = 12.15962 ksi.
  L = 214 inches.
    SX = 8.416001 in^3.
      IYC = 1.095 in^4.
        DEPTH = 14 inches.
          FACTOR 2 = 25141.5
          LIMIT 1 = 3335.5
          LIMIT 2 = 16675.75
          FACTOR 1= 119.8606
          CB = 1.75
```

$F_b = 12.15$ ksi. (ok)

$f_b = 19.3$

∴ MUST BRACE @ DOUBLES, TOO!

SECOND: $C_b = 1.75$

$L = 150"$

$I_y = 2.19$

$S_x = 8.416$

$d = 14"$

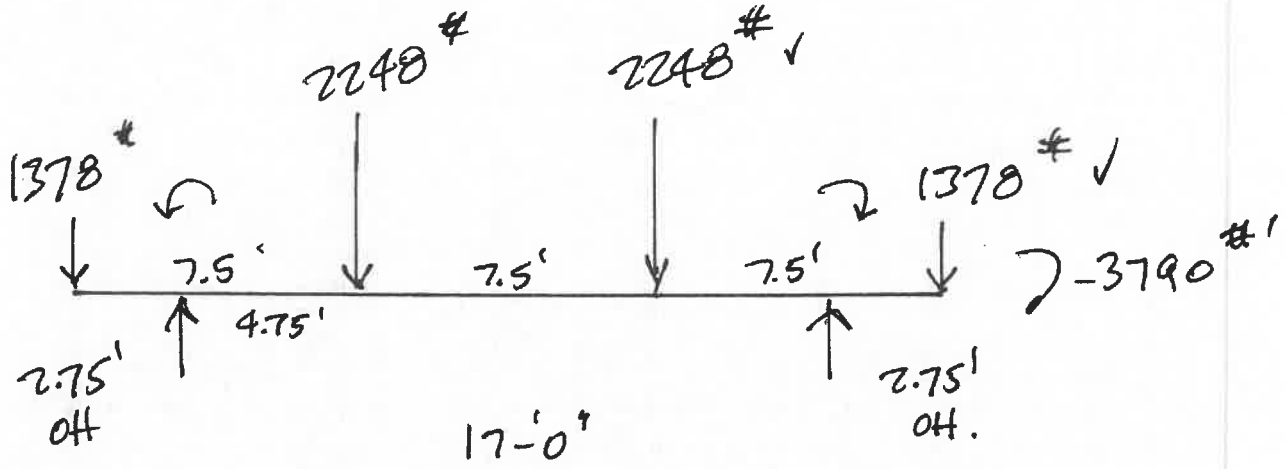
$F_b = 23.26$ ksi (ok)

≈ 23.43

```
FB = 23.25898 ksi.
  L = 150 inches.
    SX = 8.416001 in^3.
      IYC = 1.095 in^4.
        DEPTH = 14 inches.
          FACTOR 2 = 12352.25
          LIMIT 1 = 3335.5
          LIMIT 2 = 16675.75
          FACTOR 1= 84.01446
          CB = 1.75
```

∴ NO BRACING REQUIRED...

CROSS-BEAMS: (Unbalanced) TRIB. = 14.5'



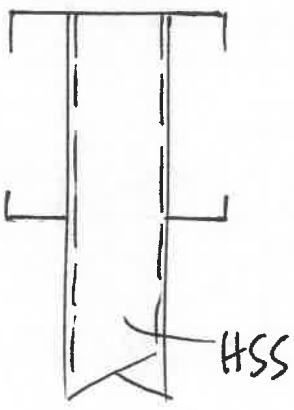
$M+ = Pa = (2248)(4.75) + (8)(17^2/8)$

$= \underline{10,967}^{\#'}$ (S/S)

$M(+)_{net} = 10,967 - (2.75)(1378) = \underline{7178}^{\#'}$

$<< 12^{K'}$

"10C12" still ok (each side)



P-12

BEAM SPAN = 17 FT.

LOAD CASE 1 POINT LOAD AT ANY POINT
LOAD = 14.5 LBS.
A = 4.75 FT. FROM LEFT SUPPORT.

14.5 = trib.

LOAD CASE 2 POINT LOAD AT ANY POINT
LOAD = 14.5 LBS.
A = 12.25 FT. FROM LEFT SUPPORT.

LOAD CASE: 1
LOAD CASE: 2

GLULAM BEAM USED:
FB= 2900 PSI.
FV= 290 PSI.
FC PERP = 750 PSI.
E= 2000000 PSI.

NO LOAD YET. for (comparison only)

MAXIMUM SHEARS, MOMENTS, AND DEFLECTIONS:

V = 14.5 M = 68.875 D = 1.925 /Ix

REACTION (LEFT) = 14.5 LBS. BEARING AREA REQ'D = 1.933333E-02 IN2.
REACTION (RIGHT) = 14.5 LBS. BEARING AREA REQ'D = 1.933333E-02 IN2.

SX = .285 IN3.
AV (MIN) = .075 IN2.

MINIMUM BEAM SIZE = 1.75 X 3.5

MAX. DEFLECTION = .3078717 INCHES = L/ 662.6136
A(PROVIDED) = 6.125 IN2.
SX (PROVIDED) = 3.572917 IN3. D.F. = 1.146719
IX(PROVIDED)= 6.252604 IN4.
BRG LENGTH REQD (LEFT) = 1.104762E-02 IN.
BRG LENGTH REQD (RIGHT) = 1.104762E-02 IN.

fb = 231.3236 psi.

LOAD CASE: 1
LOAD CASE: 2

GLULAM BEAM USED:
FB= 2900 PSI.
FV= 290 PSI.
FC PERP = 750 PSI.
E= 2000000 PSI.

MAXIMUM SHEARS, MOMENTS, AND DEFLECTIONS:

V = 14 M = 65.4 D = 1.75 /Ix

REACTION (LEFT) = 12.38309 LBS. BEARING AREA REQ'D = 1.651079E-02 IN2.

REACTION (RIGHT) = 13.96691 LBS. BEARING AREA REQ'D = 1.862255E-02 IN2.

SX = .2706207 IN3.
AV (MIN) = .0724138 IN2.

MINIMUM BEAM SIZE = 1.75 X 3.5

MAX. DEFLECTION = .2798834 INCHES = L/ 728.875
A(PROVIDED) = 6.125 IN2.
SX (PROVIDED) = 3.572917 IN3. D.F. = 1.146719
IX(PROVIDED)= 6.252604 IN4.
BRG LENGTH REQD (LEFT) = 9.434734E-03 IN.
BRG LENGTH REQD (RIGHT) = 1.064146E-02 IN.

fb = 219.6525 psi.

PURLINS:

CHECK "TYPICAL" UPLIFT BRACING ... "110/C"

$q = 13.43$ psf (ASD)
use $K_d = 0.85$
$q = 0.85$
} U_p(gross) = 15.5 psf.

$C_N = -1.36$ (12:12 = 2.4°)

$A_{eff} = 29^2/3 = 280^{\#} > 49^2 = 36^{\#}$

DL = .75 + 1.42 = 2.17 x 0.6 = 1.3 psf
(deck) (self) useable

∴ U_p (net) = 15.5 − 1.3 = 14.2 psf.

4.5' min.
5.32 max.

ω(max) = (14.2)(5.32') = 74.5 PCF

↑ $M = \omega L^2/8 = 7564^{\#'} \rightarrow f_b = 14.3$ ksi
L = 28.5'

↑M (next) = (64)(28.5²/8) = 6488 $^{\#'}$ → f_b = 12.2 KSI

NO ↓ for $C_b = 1.14$ L = 342" $I_y = 2.193$

FB = 3.105679 ksi. $S_x = 8.416$ d = 14"
L = 342 inches.
SX = 8.416001 in^3.
IYC = 1.0965 in^4.
DEPTH = 14 inches.
FACTOR 2 = 64124.1
LIMIT 1 = 2172.84
LIMIT 2 = 10863.06
FACTOR 1= 237.1692
CB = 1.14

∴ MUST BRACE @ MID-SPAN.

FB = 14.16626 ksi. ← ok
L = 171 inches.
SX = 8.416001 in^3.
IYC = 1.0965 in^4.
DEPTH = 14 inches.
FACTOR 2 = 16031.03
LIMIT 1 = 2477.8
LIMIT 2 = 12387.7
FACTOR 1= 111.0476
CB = 1.3

TIM COVERT
STATE OF WASHINGTON
17699
REGISTERED
PROFESSIONAL ENGINEER

CHECK UPLIFT BRACING @ CROSS-BMS:

(110/C)

FB = 9.255823 ksi.
L = 204 inches.
SX = 5.243 in^3.
IYC = 1.0415 in^4.
DEPTH = 10 inches.
FACTOR 2 = 20949.85
LIMIT 1 = 2115.66
LIMIT 2 = 10577.19
FACTOR 1= 137.3817
CB = 1.11

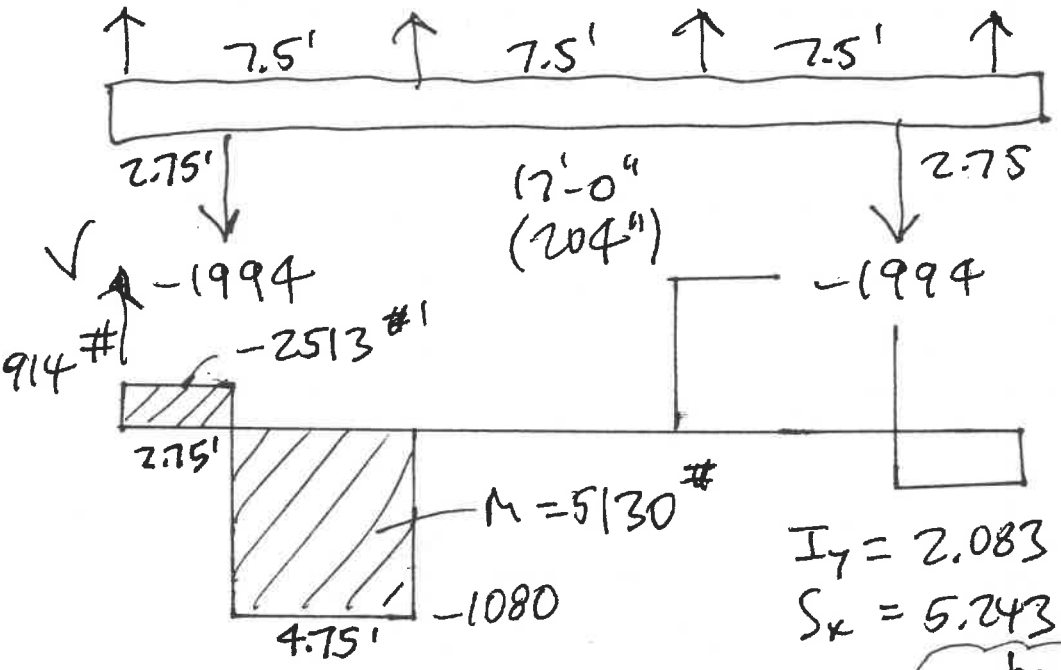
$q = 13.43$ psf $G = 0.85$ $C_N = -1.36$

$UP(gross) = 15.5$ psf.

$DL = (.72 + 1.41 + 0.39) = 2.53$ psf. (Min)

$UP(net) = 15.5 - (.6)(2.53) = \underline{14}$ psf.

$63 \times 14.5' = 914^{\#}$ $74.5 \times 14.5' = 1080^{\#}$



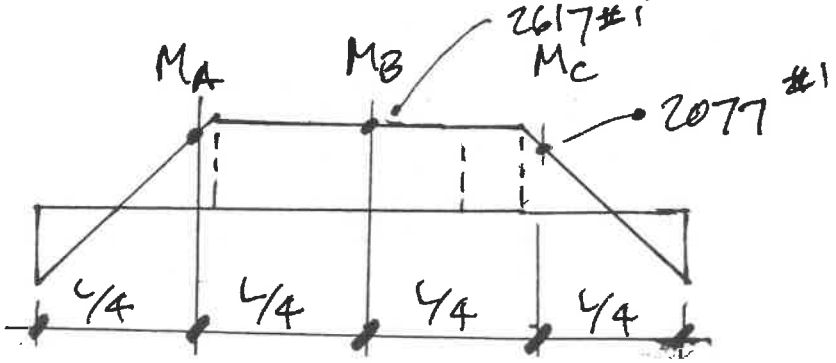
$I_y = 2.083$

$S_x = 5.243$

$M+ = (5130 - 2513) = 2617^{\#}$ unbraced ok

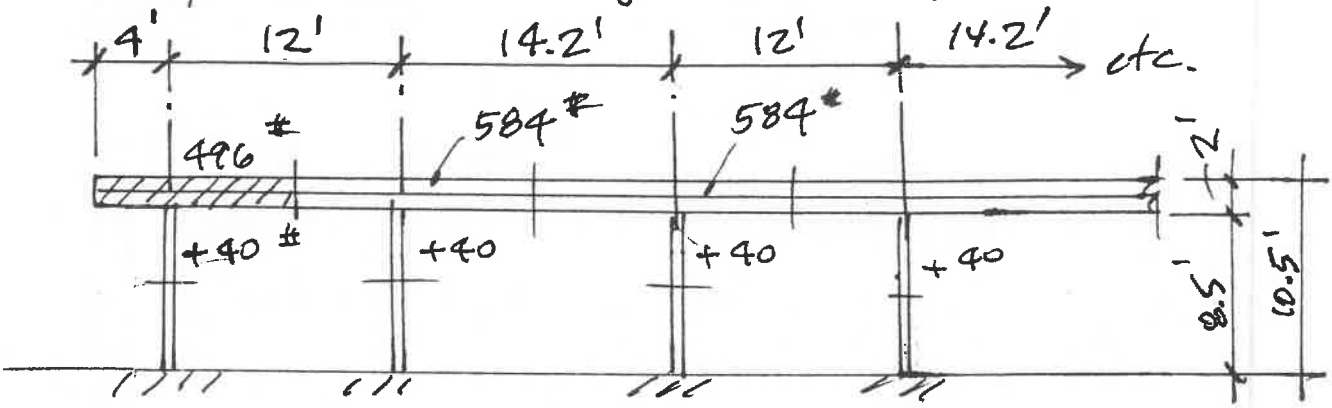
$S_{xe} = 4.5 in^3 \rightarrow f_b = 7.0$ ksi < 9.25 ksi

$$\therefore C_b = \frac{32,713}{6542 + 12,462 + 10,408} = 1.11$$



110 MPH EXP. C

WIND / HORIZ: $q = 13.43$ $G = 0.85$



B/S ≅ 250 s/h = 0.19 $C_f = 1.95$

∴ Design pressure = 22.3 psf. ✓

$s = 2"\text{ deck} + 14"\text{ purlin} + 9"\text{ slope} = 25"\ (2.083')$

DEAD (MAX) = 1.0 psf (deck) 28 GA.
= 1.5 psf (purlins) 14 C 12
= 0.5 psf (x-BMs) 10 C 12
Σ 3.0 psf. use 4 psf

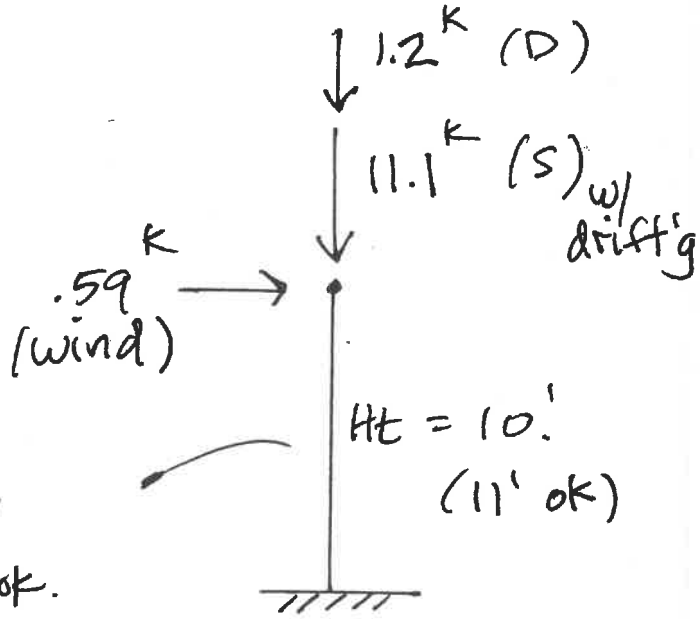
SNOW (MAX.) (870#) $R_{max} = 1.2^K$ (1160)

$R_{max} = (25)(29)(10) + (132)(29) = 11.1^K$/col.
(drifting #)

ΣR = 8450 # (w/o drifting) → 36" ϕ FTGS.

R (TYP.) = (25+4)(20')(29'/2)
= 8450 # < 10,050 # (OK)

COLUMN DESIGN:



(HSS 5x5 x 3/16) ok.

FOOTINGS:

ϕ = 36" diameter
depth = 4'-6"

"POLE"

```
FOOTING DESIGN per IBC 1807.3.2
     FORCE = 590 LBS.
     HEIGHT = 10  FT ABOVE GRADE.
     MAX PASSIVE PRESSURE = 300 PCF.
     DIAMETER of FOOTING = 3 FT.

          FOOTING IS NON-CONSTRAINED at GRADE.

          MINIMUM DEPTH of FOOTING = 4.25  FT.
          ====================================
```

FOOTING DEPTH CALCULATION:

```
DESIGN UPLIFT = 4500 LBS.  ↑ 14.7 PSF (OK)
MINIMUM WEIGHT = 7515 LBS.
DIAMETER OF FOOTING = 3 FT.
MINIMUM FOOTING DEPTH = 4.25 FT.
ANGLE-OFF-VERTICAL = 15 DEGREES.
     WEIGHT OF CONCRETE = 4506.219 LBS.
     WEIGHT OF SOIL (CONE) = 3146.46 LBS.
          DENSITY, CONCRETE = 150 PCF
          DENSITY, SOIL = 100 PCF
```

"AUGFTG"

check SEISMIC: (ASCE-7 gives higher values)

$S_s = 1.42$

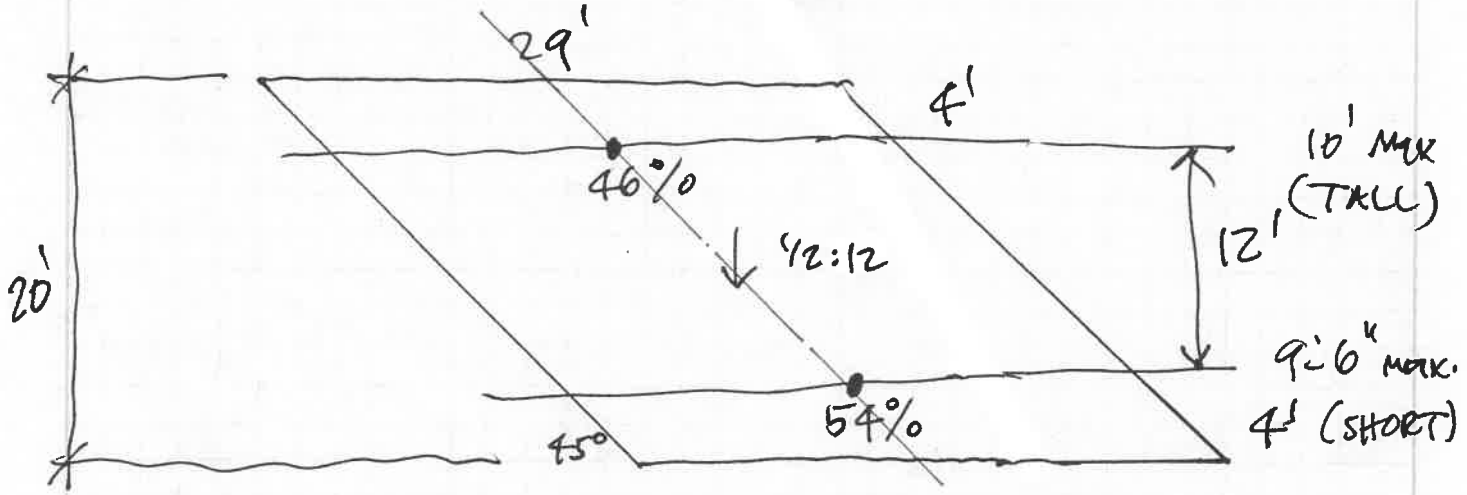
$S_{DS} = 1.03$

$R = 1\frac{1}{4}$

$C_s(ASD) = (1.03)(0.7) / 1.25$

$= 0.58$

(steel ordinary cantilevered columns)



$DL = (3psf)(29')(20') = 1740\#/BAY$

$0.7E = (.58)(1740) = 1004\#/BAY.$

$= 463\#/column$ (tall)

$= 541\#/column$ (short)

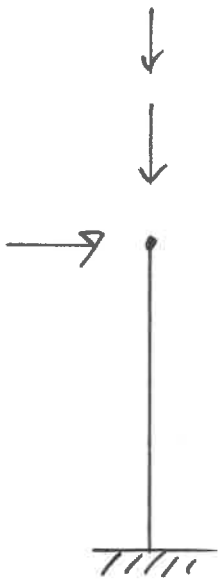
"wind controls"

(Global) Model Settings

TALL COLUMN w/ WIND & SNOW DRIFTING combined.

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	0.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th (360-16): ASD
Adjust Stiffness?	No
Cold Formed Steel Code	AISI S100-16: ASD
Wood Code	AWC NDS-18: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-19
Masonry Code	TMS 402-16: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8



Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]	Yield[ksi]
1	A500 Gr.C RECT	29000	11154	0.3	0.65	0.527	50

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [i...	I (0,180) [in4]
1	HR1	HSS5X5X3	Column	RECT	A500 Gr.C R...	Typical	3.28	12.6	12.6

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	0	11	0

extra height ok

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N1	Reaction	Reaction	Reaction

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2		HR1	Column	RECT	A500 Gr.C ...	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rati...	TOM	Inactive
1	M1						Yes	** NA **		

Hot Rolled Steel Design Parameters

	Label	Shape	Length[...	Lb-out[ft]	Lb-in[ft]	Lcomp top...	Lcomp bot...	L-torq...	K-out	K-in	Cb	Chan...	a[ft]	Functi...
1	M1	HR1	11			Lb out			2.1	2.1		N/A	N/A	Lateral

Joint Loads and Enforced Displacements (BLC 1 : dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k...	Inactive
1	N2	L	Y	-1.2	

Joint Loads and Enforced Displacements (BLC 2 : snow 0.7S)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k...	Inactive
1	N2	L	Y	-11.1	

Joint Loads and Enforced Displacements (BLC 3 : wind 0.6W)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k...	Inactive
1	N2	L	X	0.59	

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]	Inactive
No Data to Print ...				

Member Distributed Loads

Member Label	Direction	Start Magnitude[k...	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]	Inactive
No Data to Print ...						

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	dead	None			1		
2	snow 0.7S	None			1		
3	wind 0.6W	None			1		

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	D + S	Yes	Y		1	1	2	1	Y	-1														
2	D + .6W	Yes	Y		1	1	3	1	Y	-1														
3	Combo 6a	Yes	Y		1	1	2	0.75	3	0.75	Y	-1												

Load Combination Design

	Description	ASIF	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless
1	D + S				Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	D + .6W				Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Combo 6a				Yes	Yes	Yes	Yes	Yes	Yes	Yes

Node Reactions (By Item)

	LC	Node Label	X [k]	Y [k]	MZ [k-ft]
1	1	N1	0	12.432	0
2	2		-0.59	1.332	6.707
3	3		-0.443	9.657	6.44
4	1	Totals:	0	12.432	
5	2		-0.59	1.332	
6	3		-0.443	9.657	
7	1	COG (ft):	X: 0	Y: 10.942	
8	2		X: 0	Y: 10.455	
9	3		X: 0	Y: 10.925	

Node Displacements

	LC	Node Label	X [in]	Y [in]	Rotation [rad]
1	1	N1	0	0	0
2	2		0	0	0
3	3		0	0	0
4	1	N2	0	-0.017	0
5	2		1.284	-0.002	-1.454e-2
6	3		1.233	-0.013	-1.396e-2

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	12.432	0	0
2			2	12.399	0	0
3			3	12.366	0	0
4			4	12.333	0	0
5			5	12.3	0	0
6	2	M1	1	1.332	0.61	6.707
7			2	1.299	0.61	5.03
8			3	1.266	0.61	3.353
9			4	1.233	0.61	1.677
10			5	1.2	0.61	0
11	3	M1	1	9.657	0.585	6.44
12			2	9.624	0.585	4.83
13			3	9.591	0.585	3.22
14			4	9.558	0.585	1.61
15			5	9.525	0.585	0

Member End Reactions

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	I	12.432	0	0
2			J	12.3	0	0
3	2	M1	I	1.332	0.61	6.707
4			J	1.2	0.61	0
5	3	M1	I	9.657	0.585	6.44

Member End Reactions (Continued)

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
6			J	9.525	0.585	0

Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
1	1	M1	1	3.79	0	0	0
2			2	3.78	0	0	0
3			3	3.77	0	0	0
4			4	3.76	0	0	0
5			5	3.75	0	0	0
6	2	M1	1	0.406	0.391	-15.968	15.968
7			2	0.396	0.391	-11.976	11.976
8			3	0.386	0.391	-7.984	7.984
9			4	0.376	0.391	-3.992	3.992
10			5	0.366	0.391	0	0
11	3	M1	1	2.944	0.376	-15.333	15.333
12			2	2.934	0.376	-11.5	11.5
13			3	2.924	0.376	-7.667	7.667
14			4	2.914	0.376	-3.833	3.833
15			5	2.904	0.376	0	0

Member AISC 15th (360-16): ASD Steel Code Checks (By Item)

	LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Pnc/om [k]	Pnt/om [k]	Mn/om [k-ft]	Cb	Eqn
1	1	M1	HSS5X5X3	0.504	0	0	11	24.647	98.204	14.696	1	H1-1a*
2	2			0.483	0	0.022	11	24.647	98.204	14.696	1.667	H1-1b
3	3			0.781	0	0.021	11	24.647	98.204	14.696	1.667	H1-1a

.78 < 1.0 (OK)

CONNECTIONS:

1. DECK-TO-PURLIN

110 MPH / EXP. C

$q = 13.43$ psf

$G = 0.85$

$A_{eff} = (1.5)(5.32'_{max}) = 7.98\,\#$ } Actual trib.

$= (1.5)(4.5'_{min}) = 6.75\,\#$ }

$a^2 = 9.0\,\#$ > 7.98# and 6.75#

C_N (ZONE 3) $= -4.08$ (other -2.05)$_{50\%}$

$\therefore$ UP (gross) $= (13.43)(.85)(-4.08)$

$= 46.5$ psf. $\rightarrow$ 46.1 net

$T_{max} = (7.98)(46.11) = 368\,\#$ / screw > 293 N.G.

$T_{min} = (6.75)(46.11) = 311\,\#$ / screw > 293 N.G.

< 415 pull-out.

$\therefore$ install screws @ 9" o/c

@ outer purlins (zone 3)

(18" o/c @ inner purlins) (zones 1 and 2)

2. PURLIN-TO-CROSS BEAM:

$UP\,(gross) = (13.43)(.85)(-1.36) = \underline{15.5}$ psf (gross)

$A_{eff} = 29^2/3 = 280\,\text{ft}^2 \gg 4a^2.$

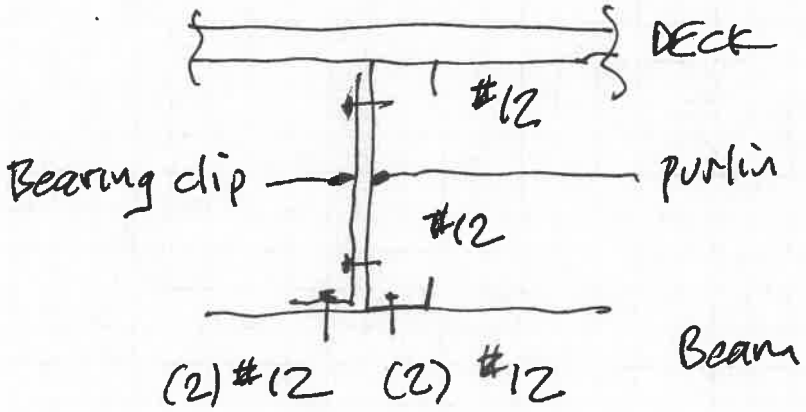
$.6D = 1.2$ psf.

$\therefore UP\,(net) = 15.5 - 1.2 = \underline{14.3}$ psf.

$R\uparrow (Max) = (14.3)(5.32)(29'/2) = \underline{1102}\,\#/\text{purlin}.$

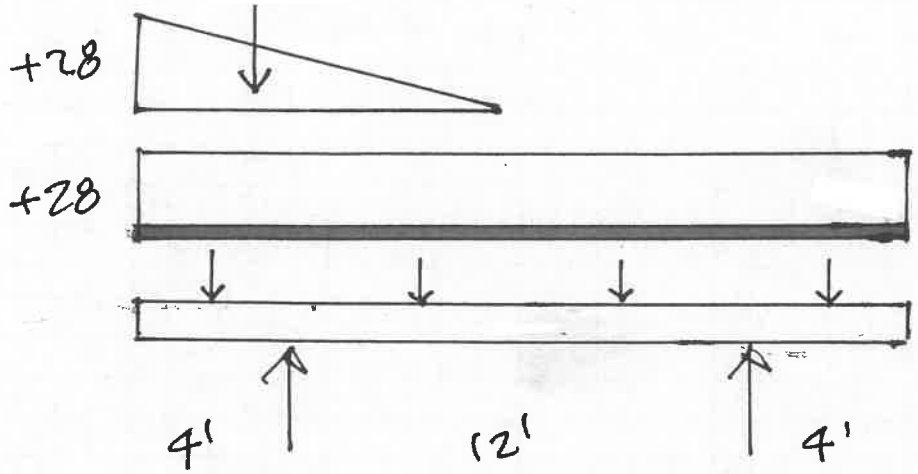
$T_R\,(pull\text{-}out) = 451\,\#/\text{screw}$

$\therefore \quad n = (3)$



3. CROSS-BEAM to COLUMN: (TRIB. = 14.5')

1916 @ x = 3.2' from left. add 7%



2050# (drift)
4060#
6110#

↳ n = (9) #12

4060#

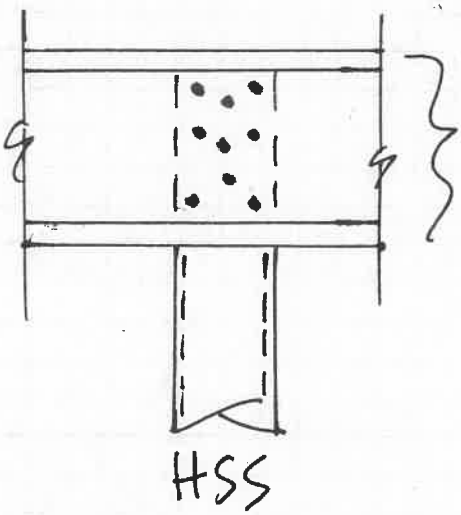
4060#

"shear controls"

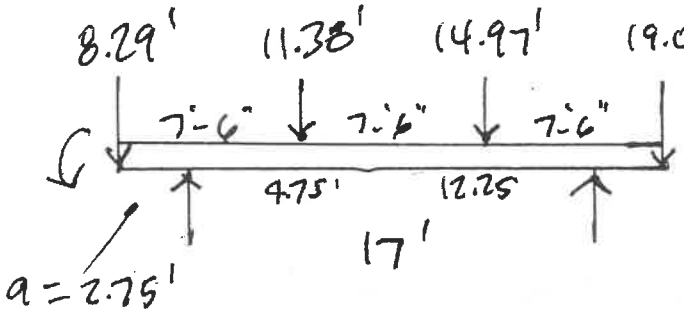
(7) #12 screws.

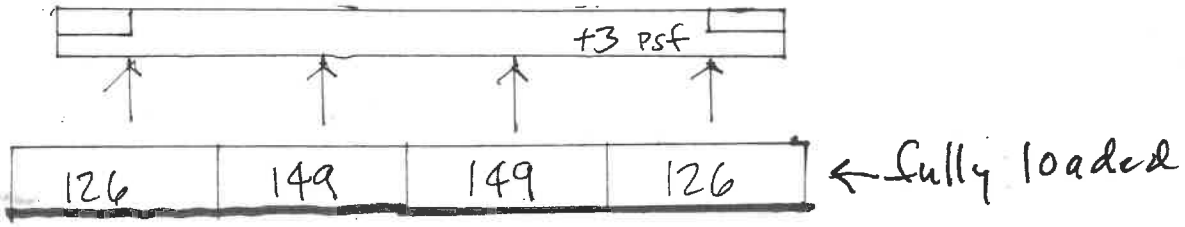
↳ n = (6) #12

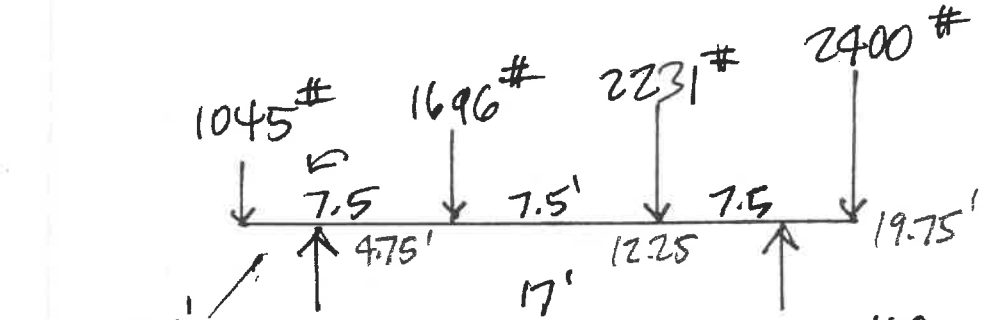
(see next pg.)



CHECK END BEAMS: (check outer column connection.)







$-M = 2872\#' \rightarrow -169\#$

-169
$+474\#$
$+1607\#$
$+2789\#$

$4701\# \rightarrow$ n = (7) — use this...

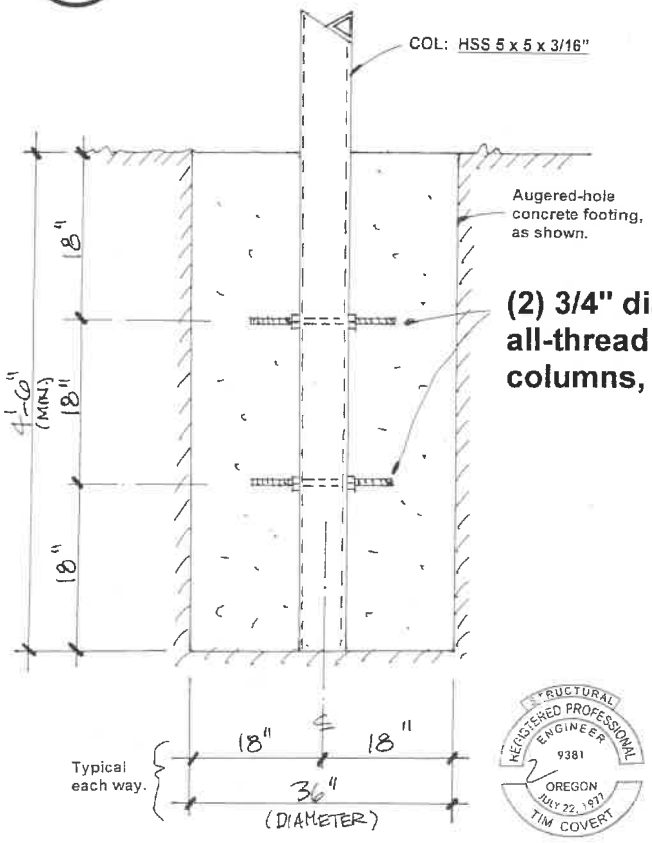
7324 PPS 5-10-25 CONN-5

4. COLUMN-TO-FOOTING

$R\downarrow (MAX) = (2)(6110) = 12{,}220^{\#}$

w/ drifting

TYPICAL FOOTING SECTION:



CAPACITY = (4)(4275#/BOLT) = 17,100# > 12,220# (OK)

3/4"ϕ

5/8"ϕ → (4)(2950) = 11,800# (OK) +4%