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Load Calcs for Patio Beam

Beam Length = 23ft

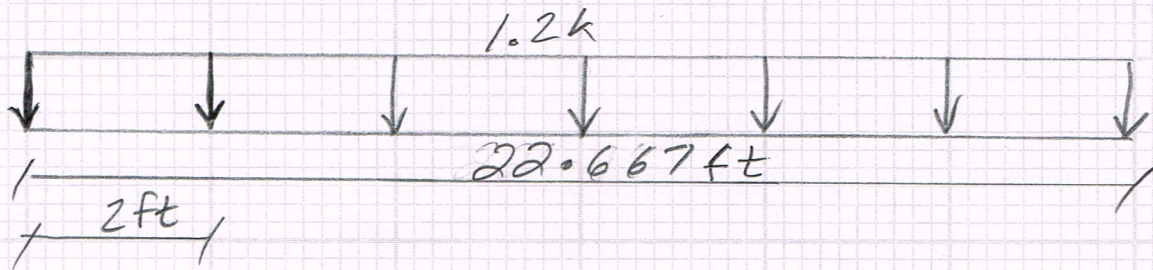
Loads: Wind Loads = 535.1# @ 2' O.C. TRUSS

Dead Loads = 160.1# @ 2' O.C.

Roof Live Loads = 304# @ 2' O.C.

LRFD Load Combinations

$$\begin{aligned} \text{Eqn 16-A} &= 1.2D + 1.6W + f_1L + 0.5L_r \\ &= 1.2(.16k) + 1.6(.535k) + .5(0) + .5(.304k) \\ &= 1.2k @ 2' O.C. \end{aligned}$$



1200# @ 2' O.C. or 600# @ 1' O.C.

Versa Lam Beam Triple 1 1/4" @ 16" depth
24' length Total allowable = 244 PLF

Roof Live Loads

Roof Truss supported on Beam

$$(10\text{ft} \times \frac{1}{2}) = 5\text{ft} + 2.6\text{ft} = 7.6\text{ft}$$

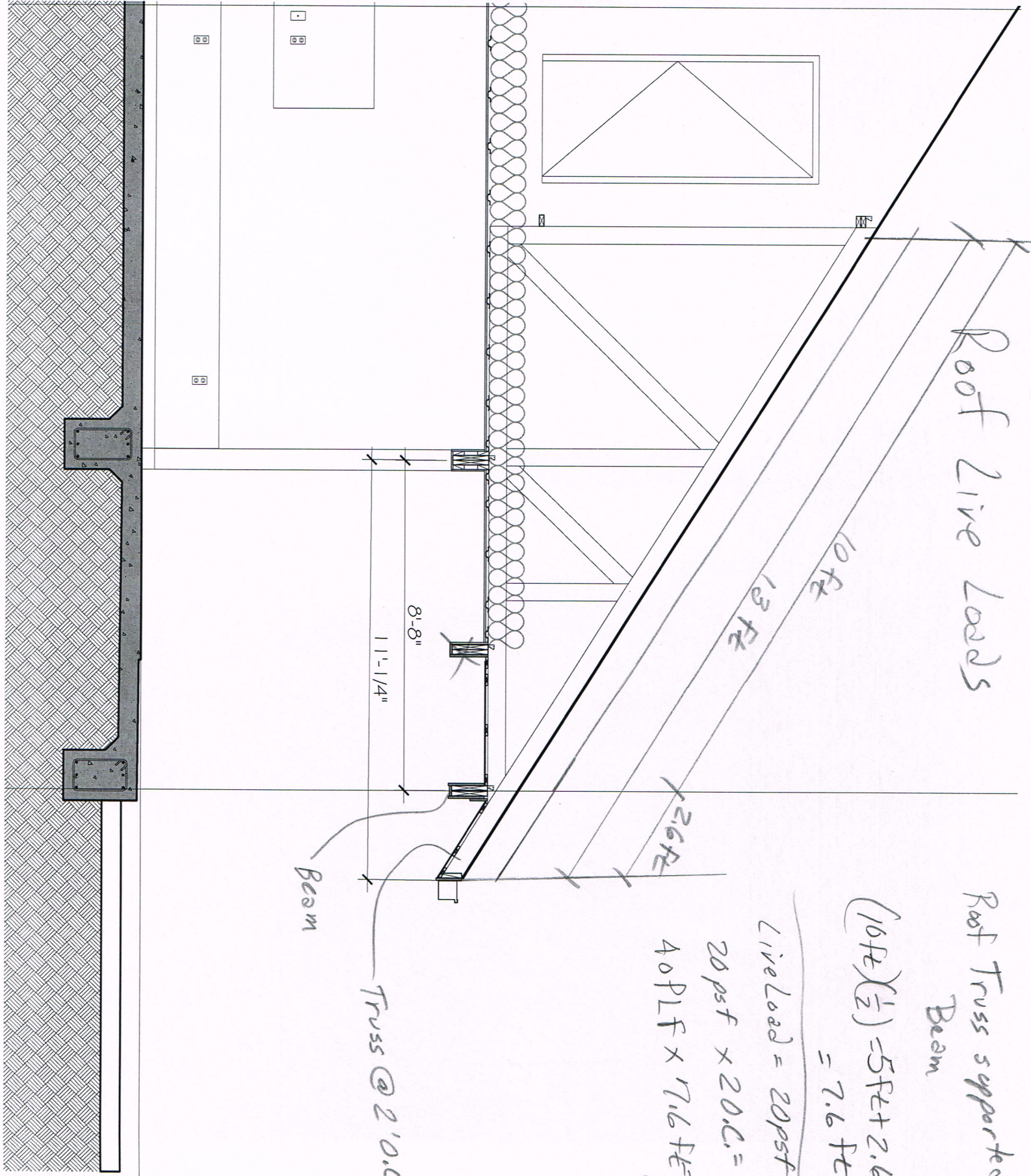
$$\text{Live Load} = 20\text{psf}$$

$$20\text{psf} \times 20.0\text{c} = 40\text{PLF}$$

$$40\text{PLF} \times 7.6\text{ft} = 304\text{\#} @ 2'0\text{c}$$

Truss @ 2'0.c.

Beam



Dead Loads
Truss Spacing = 2' O.C.

Asphalt Shingles 2.8 psf
 1/2" Plywood 1.7 psf
 2" Insulation 1 psf
 3/4" Plywood ceiling 2.5 psf

Insulation 8 psf

8 psf x 2' O.C. x 7.6 ft = 121.6#
 Wood Truss 5.2 psf
 x 7.6 ft
 39.52# @ 2' O.C.

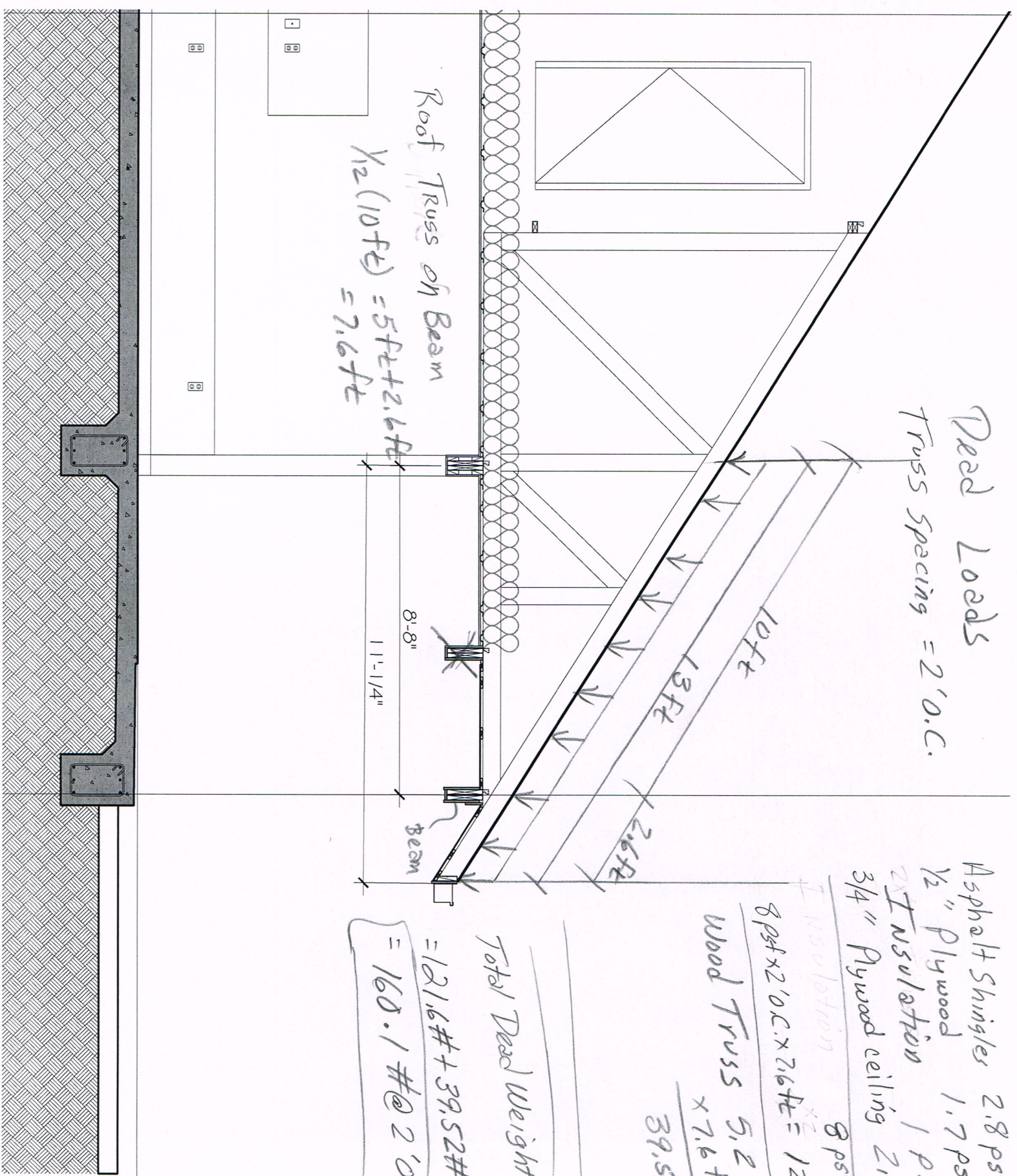
Total Dead Weight

= 121.6# + 39.52#
 = 160.1# @ 2' O.C.

Roof Truss on Beam
 $1/2 (10 ft) = 5 ft + 2.6 ft$
 $= 7.6 ft$

8'-8"
 11'-1/4"

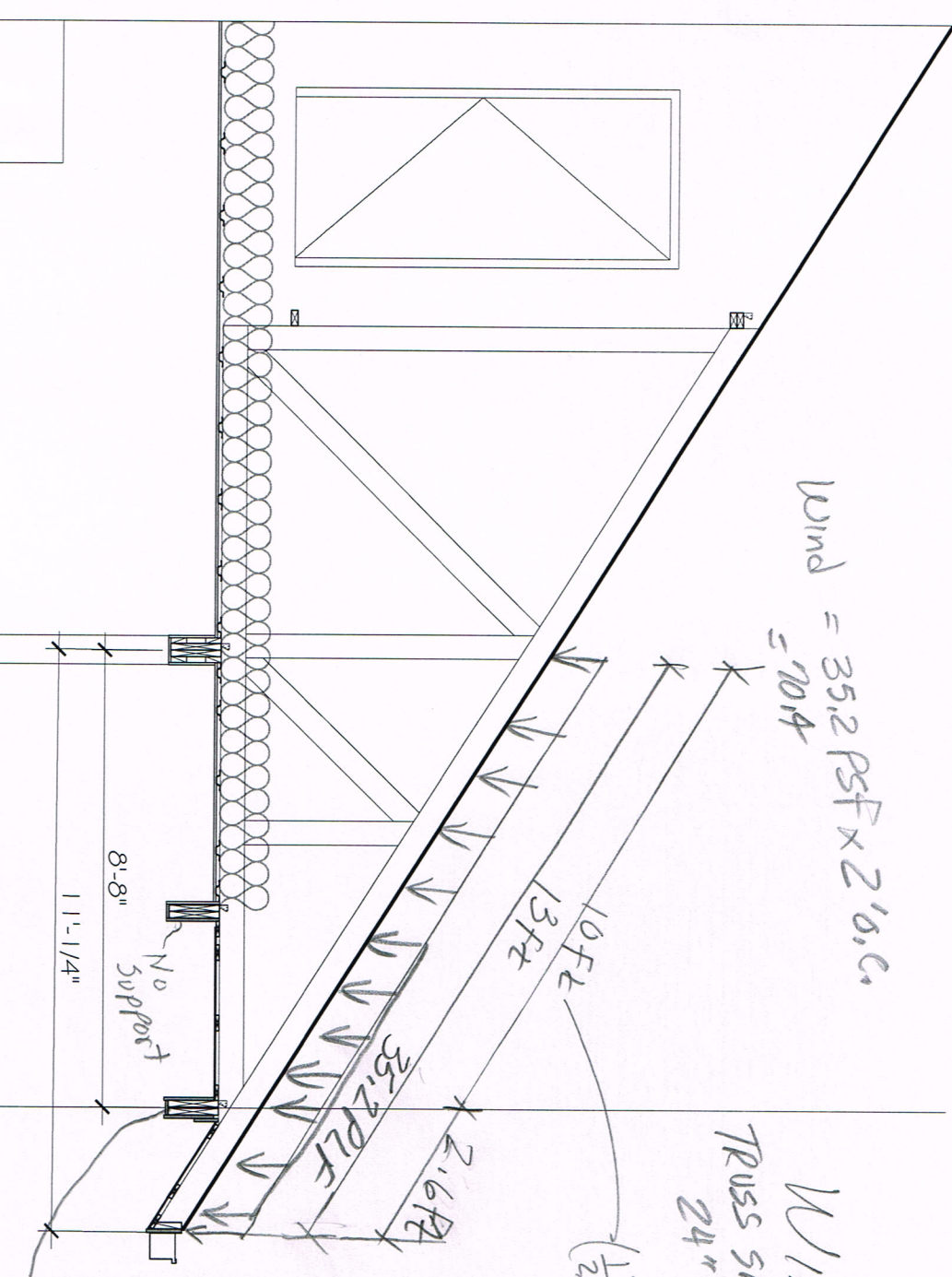
beam



Wind = 35.2 PSF x 2'0".c.
= 70.4

Wind Load
Truss Spacing
24" O.C.

(1/2) D = 5 FT
+ 2.6 FT
7.6 FT
x 70.4 PLF @ 2'0".c.
535.04 # @ 2'0".c.
(Wind Load)



8'-8"
11'-1/4"
No support
Beam

DM

8'-3 1/2"

4'-4 5/8"

17'-8 1/4"

8'-9"

4'-6 5/8"

P12

UR

102A

A

8'-0"

PATIO

A

1.2k @ 2'0.c.

1'-0 1/4"

Beam

22'-8 5/8"

Combined LRFD Loads

E

DRY (NIC)

71-

MWFRS Wind Load Calculations
ASCE 7-10 Chapter 28 Wind Loads on Buildings; Envelope Procedure
Simple Diaphragm

Project: Fire District #1 Station 14

Table 28.5-1 Enclosed Simple Diaphragm Low-Rise Buildings

- | | |
|--|--------------------------------|
| 1. Risk Category Table 1.5-1 | Cat IV Essential Facility |
| 2. Basic Wind Speed, by website at council.org | 155 mph |
| 3. Wind load parameters | |
| a. Surface Roughness, Section 36.7.2: | Roughness B |
| b. Exposure Category, Section 26.7.3: | Exposure C |
| c. Topographic Factor, Section 26.8.2: | $K_{zt} = 1$ |
| 4. Wind Pressures Fig 28.6-1 | Load Case 1 for roof slope 30° |

Interpolating Wind Speeds												
Basic Wind Speed	Roof Angle	Load Case	Horizontal Pressures, P_{s30} (psf)				Vertical Pressures, P_{s30} (psf)				Overhangs	
			A	B	C	D	E	F	G	H	Eoh	Goh
150 mph	30° - 45°	1	40.1	27.4	31.9	22.0	3.1	-24.4	1.0	-20.9	-14.1	-16.1
160 mph	30° - 45°	1	45.7	31.2	36.3	25.0	3.5	-27.7	1.2	-23.8	-16.0	-18.3
155 mph	30° - 45°	1	42.9	29.3	34.1	23.5	3.3	-26.1	1.1	-22.4	-15.1	-17.2

5. Building mean height (h) = 26 ft

λ for Exposure C = 1.35

6. Adjusted wind pressure P_s = Equation 28.6-1

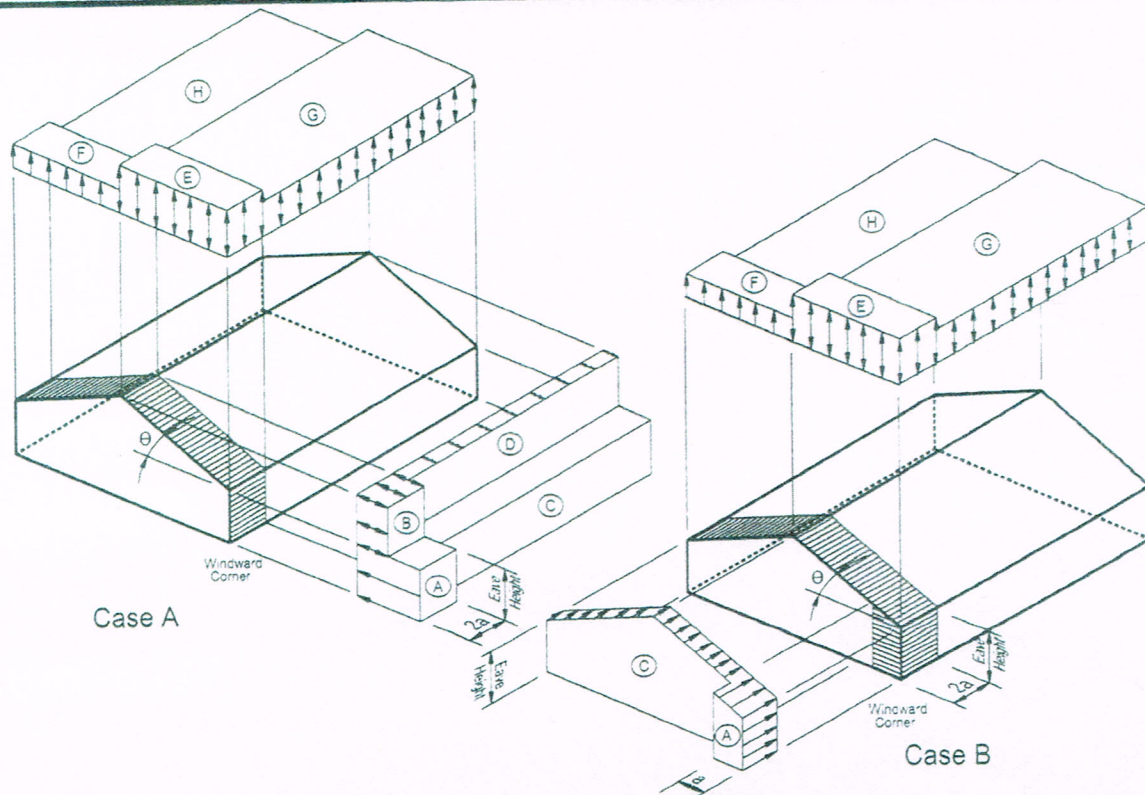
$$P_s = \lambda K_{zt} P_{s30} = 1.35 * 1 * P_{s30}$$

Adjusted Wind Pressure P_s												
Basic Wind Speed	Roof Angle	Load Case	Horizontal Pressures, P_s (psf)				Vertical Pressures, P_s (psf)				Overhangs	
			A	B	C	D	E	F	G	H	Eoh	Goh
155 mph	30° - 45°	1	57.9	39.6	46.0	31.7	4.5	-35.2	1.5	-30.2	-20.3	-23.2

7. D1.1 One and Two Story Building with $h \leq 30$ ft are exempt from torsional load cases.

Prepared by: David De
Date:

Main Wind Force Resisting System – Method 2		$h \leq 60$ ft.
Figure 28.6-1	Design Wind Pressures	Walls & Roofs
Enclosed Buildings		



Notes:

- Pressures shown are applied to the horizontal and vertical projections, for exposure B, at $h=30$ ft (9.1 m). Adjust to other exposures and heights with adjustment factor λ .
- The load patterns shown shall be applied to each corner of the building in turn as the reference corner. (See Figure 28.4-1)
- For Case B use $\theta = 0^\circ$.
- Load cases 1 and 2 must be checked for $25^\circ < \theta \leq 45^\circ$. Load case 2 at 25° is provided only for interpolation between 25° and 30° .
- Plus and minus signs signify pressures acting toward and away from the projected surfaces, respectively.
- For roof slopes other than those shown, linear interpolation is permitted.
- The total horizontal load shall not be less than that determined by assuming $p_s = 0$ in zones B & D.
- Where zone E or G falls on a roof overhang on the windward side of the building, use E_{OH} and G_{OH} for the pressure on the horizontal projection of the overhang. Overhangs on the leeward and side edges shall have the basic zone pressure applied.
- Notation:
 - a : 10 percent of least horizontal dimension or $0.4h$, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m).
 - h : Mean roof height, in feet (meters), except that eave height shall be used for roof angles $< 10^\circ$.
 - θ : Angle of plane of roof from horizontal, in degrees.

Dead Load	0.1601
Live Load	0
Wind Load	0.535
Water or Fluid	0
Roof Live Load	0.304
Snow Load	0
Rain Load	0
EarthQuake	0
H = Lateral Earth	0
T= Temp Exp/Cont	0

LRFD 2009 IBC

Eqn 16-1	1.4(D+F)	0.22414
Eqn 16-2	1.2(D+F+T) + 1.6(L+H) + 0.5(L _r or S or R)	0.34412
	1.2(D+F+T) + 1.6(L+H) + 0.5(S)	0.19212
	1.2(D+F+T) + 1.6(L+H) + 0.5(R)	0.19212
Eqn 16-3	1.2D + 1.6(L _r or S or R) + (f ₁ L or 0.8W)	0.67852
	1.2D + 1.6(L _r) + (0.8W)	1.10652
	1.2D + 1.6(L _r or S or R) + (f ₁ L or 0.8W)	0.67852
	1.2D + 1.6(L _r or S or R) + (f ₁ L or 0.8W)	0.62012
	1.2D + 1.6(L _r or S or R) + (f ₁ L or 0.8W)	0.19212
	1.2D + 1.6(L _r or S or R) + (f ₁ L or 0.8W)	0.62012
Eqn 16-4	1.2D + 1.6W + f ₁ L + 0.5(L _r or S or R)	1.20012
	1.2D + 1.6W + f ₁ L + 0.5(L _r or S or R)	1.04812
	1.2D + 1.6W + f ₁ L + 0.5(L _r or S or R)	1.04812
Eqn 16-5	1.2D + 1.0E + f ₁ L + f ₂ S	0.19212
Eqn 16-6	0.9D + 1.6W + 1.6H	1.00009
Eqn 16-7	0.9D + 1.6E + 1.6H	0.14409

ASD

Eqn 16-8	D + F	0.1601
Eqn 16-9	D + H + F + L + T	0.1601
Eqn 16-10	D + H + F + (L _r or S or R)	0.4641
		0.1601
		0.1601
Eqn 16-11	D + H + F + 0.75(L + T) + 0.75(L _r or S or R)	
	D + H + F + 0.75(L + T) + 0.75(L _r or S or R)	