

# L2 ENGINEERS

17848 NE 198th Place  
Woodinville, WA 98072



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## Structural Calculations

### Hu Residence

2448 – 72<sup>nd</sup> Ave SE  
Mercer Island, WA

Project # 22-052  
January 12, 2024

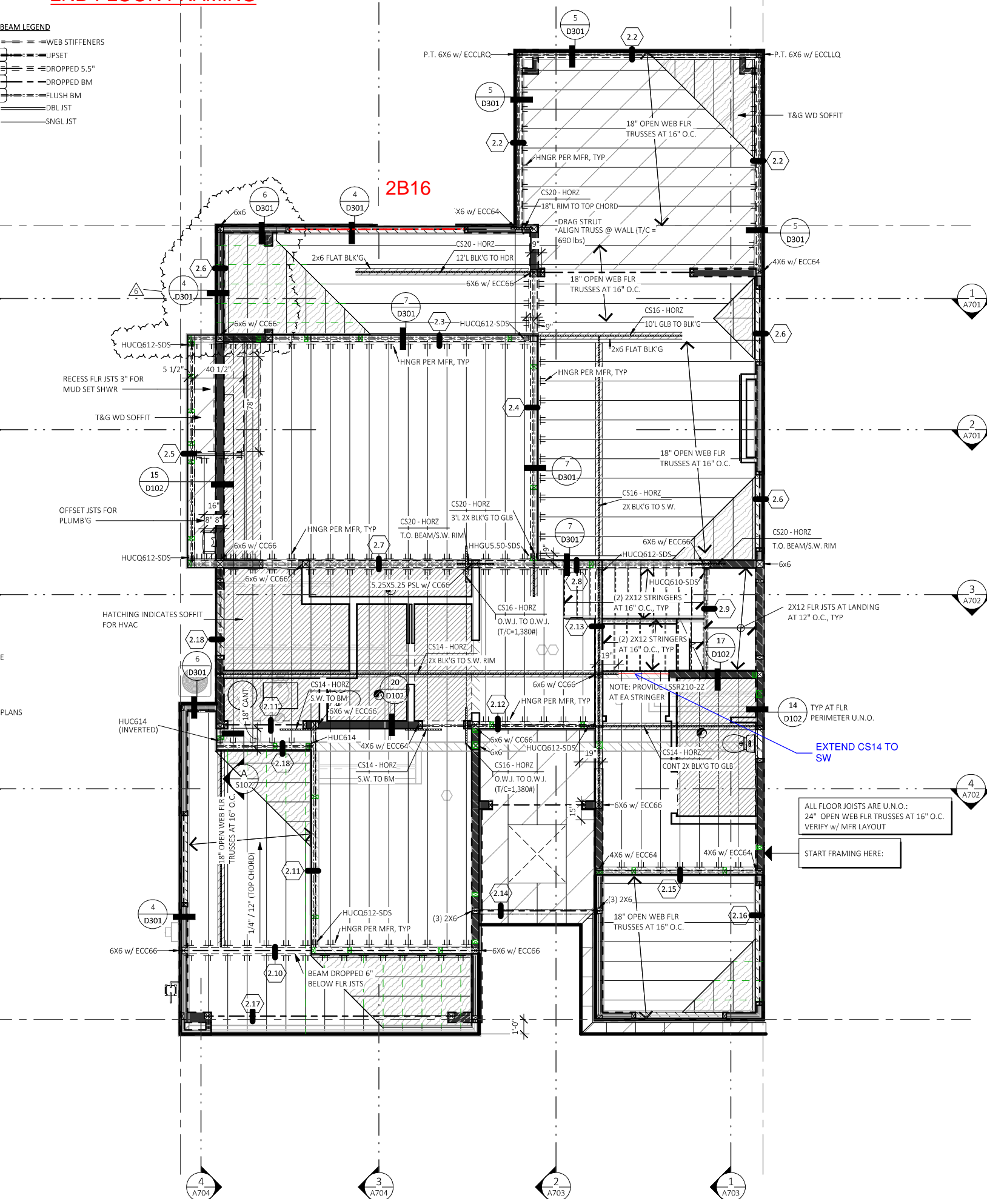


1/12/2024



# 2ND FLOOR FRAMING

- BEAM LEGEND**
- WEB STIFFENERS
  - UPSET
  - DROPPED 5.5"
  - DROPPED BM
  - FLUSH BM
  - DBL JST
  - SINGL JST



**Wood Beam**

Project File: hu residence.ec6

LIC#: KW-06016908, Build:20.23.10.02

L2 Engineers

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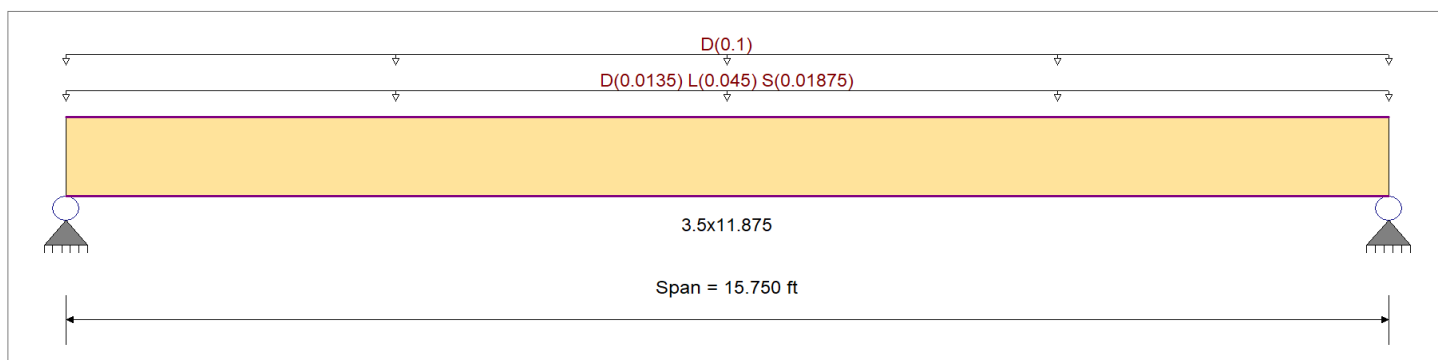
**DESCRIPTION: 2B16**

**CODE REFERENCES**

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16  
 Load Combination Set : ASCE 7-16

**Material Properties**

Analysis Method : Allowable Stress Design	Fb +	2900 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	2900 psi	Ebend- xx	2200 ksi
	Fc - Prll	2900 psi	Eminbend - xx	1118.19 ksi
Wood Species : iLevel Truss Joist	Fc - Perp	750 psi		
Wood Grade : Parallam PSL 2.2E	Fv	290 psi		
	Ft	2025 psi	Density	45.07 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added  
 Uniform Load : D = 0.0180, L = 0.060, S = 0.0250 ksf, Tributary Width = 0.750 ft, (rOOF)  
 Uniform Load : D = 0.10 , Tributary Width = 1.0 ft, (Slider)

**DESIGN SUMMARY**

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.247</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.136</b> : 1
Section used for this span		<b>3.5x11.875</b>	Section used for this span		<b>3.5x11.875</b>
fb: Actual	=	716.96psi	fv: Actual	=	39.46 psi
F'b	=	2,903.37psi	F'v	=	290.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	7.875ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.058 in	Ratio = 3240 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.209 in	Ratio = 904 >=240	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.2091	7.932		0.0000	0.000

**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.270	1.270
Max Upward from Load Combinations	1.270	1.270
Max Upward from Load Cases	0.894	0.894
D Only	0.894	0.894
+D+L	1.248	1.248
+D+Lr	0.894	0.894
+D+S	1.041	1.041
+D+0.750Lr+0.750L	1.160	1.160
+D+0.750L+0.750S	1.270	1.270

**Wood Beam**

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LIC# : KW-06016908, Build:20.23.10.02

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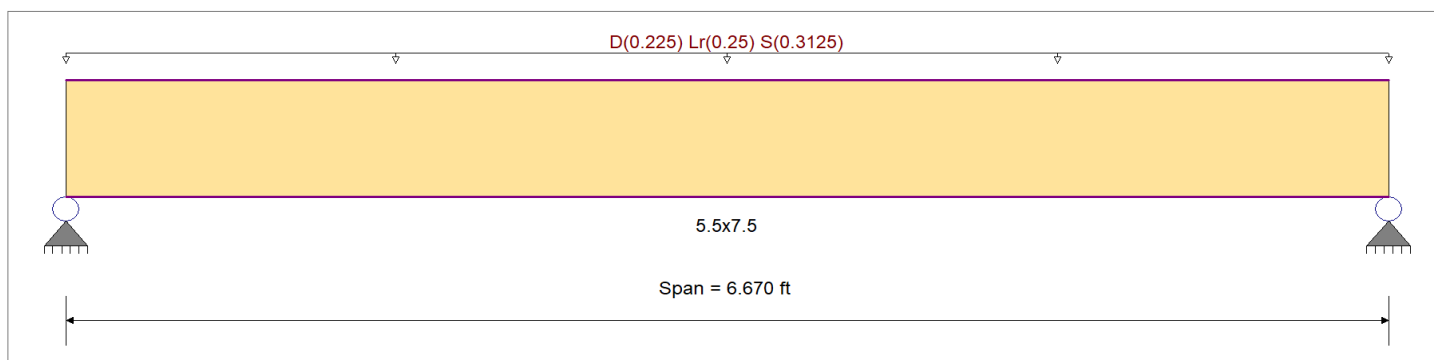
**DESCRIPTION:** RB2.2

**CODE REFERENCES**

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16  
 Load Combination Set : ASCE 7-16

**Material Properties**

Analysis Method : Allowable Stress Design	Fb +	2400 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1850 psi	Ebend- xx	1800ksi
	Fc - Prll	1650 psi	Eminbend - xx	950ksi
Wood Species : DF/DF	Fc - Perp	650 psi	Ebend- yy	1600ksi
Wood Grade : 24F-V4	Fv	265 psi	Eminbend - yy	850ksi
	Ft	1100 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added  
 Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 12.50 ft

**DESIGN SUMMARY**

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.252</b>	1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.175</b>	: 1
Section used for this span		<b>5.5x7.5</b>		Section used for this span		<b>5.5x7.5</b>	
fb: Actual	=	695.64	psi	fv: Actual	=	53.29	psi
F'b	=	2,760.00	psi	Fv	=	304.75	psi
Load Combination		+D+S		Load Combination		+D+S	
Location of maximum on span	=	3.335	ft	Location of maximum on span	=	0.000	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
<b>Maximum Deflection</b>							
Max Downward Transient Deflection		0.040	in	Ratio =	1990	>=360	Span: 1 : S Only
Max Upward Transient Deflection		0	in	Ratio =	0	<360	n/a
Max Downward Total Deflection		0.069	in	Ratio =	1157	>=240	Span: 1 : +D+S
Max Upward Total Deflection		0	in	Ratio =	0	<240	n/a

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0692	3.359		0.0000	0.000

**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.793	1.793
Max Upward from Load Combinations	1.793	1.793
Max Upward from Load Cases	1.042	1.042
D Only	0.750	0.750
+D+Lr	1.584	1.584
+D+S	1.793	1.793
+D+0.750Lr	1.376	1.376
+D+0.750S	1.532	1.532
+0.60D	0.450	0.450
Lr Only	0.834	0.834

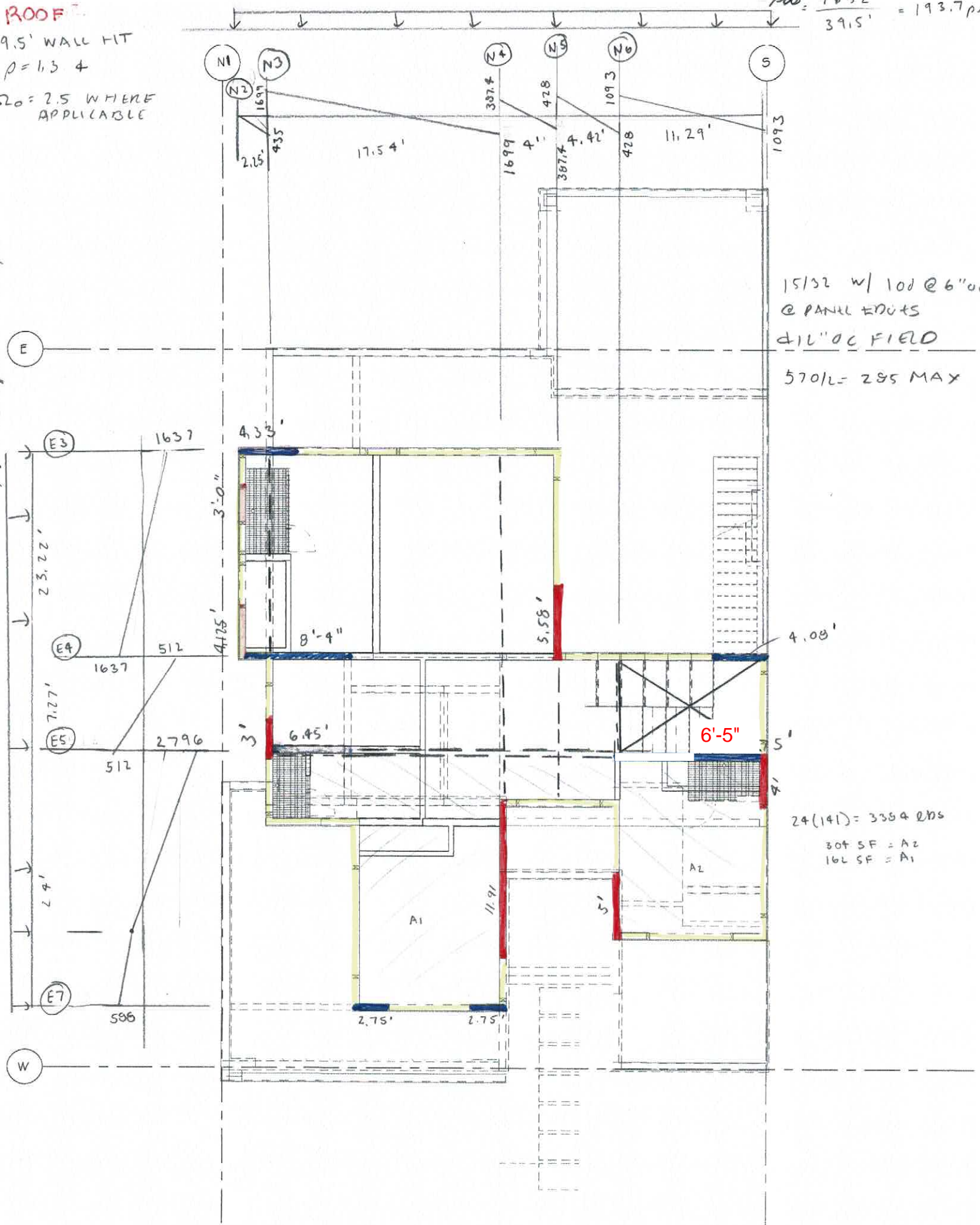
**ROOF**

9.5' WALL HIT  
 $\rho = 1.34$

$\Omega_0 = 2.5$  WHERE APPLICABLE

$PW = \frac{7652}{39.5} = 193.7$

$PW = 7652 / 59.5 = 128.7$



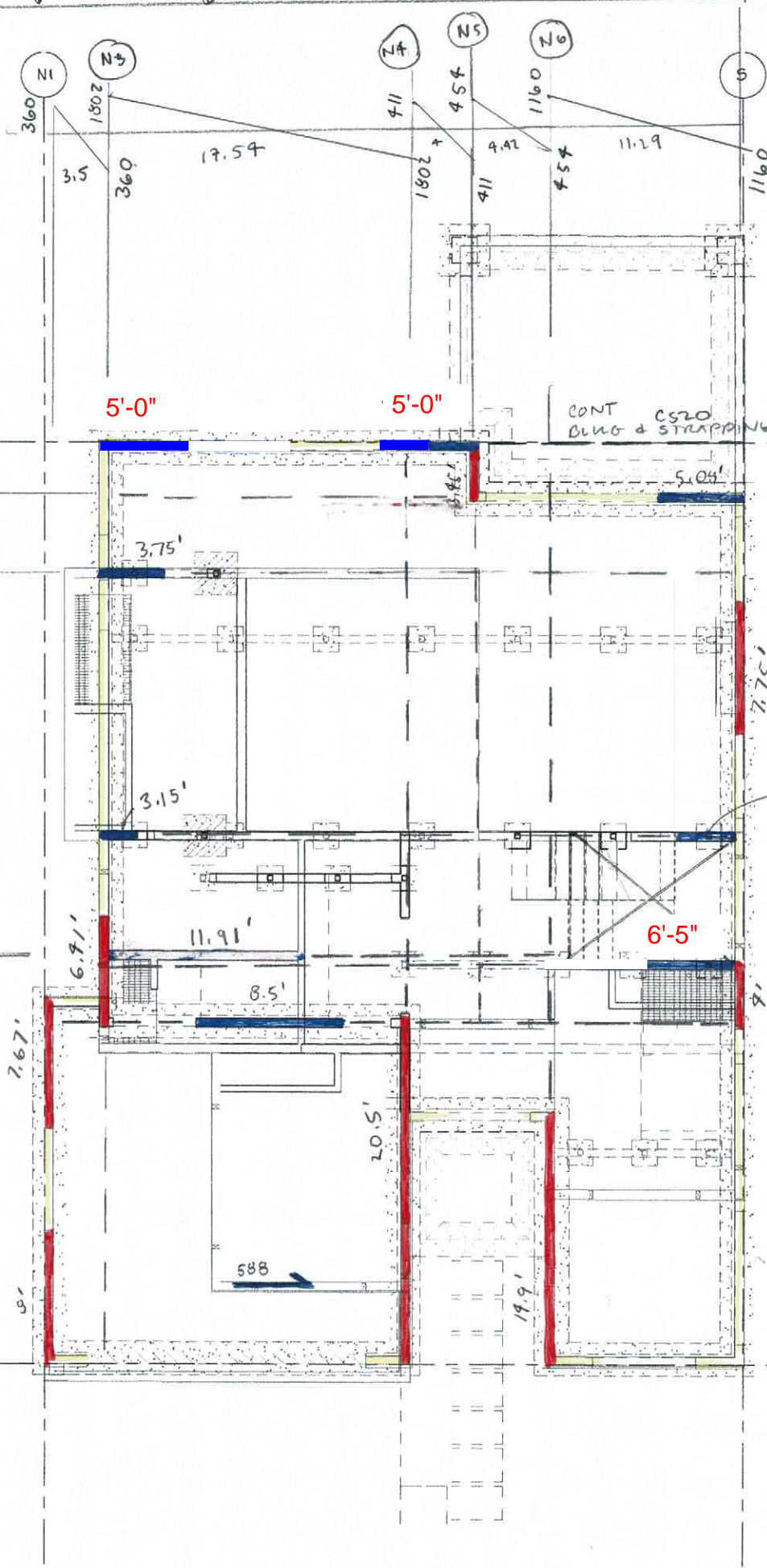
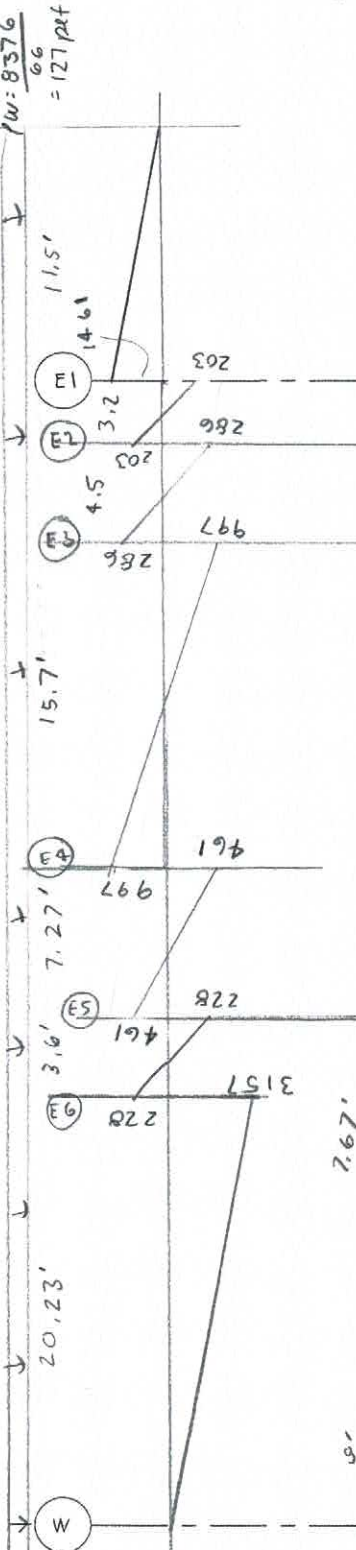
15/32 w/ 10d @ 6" OC  
 @ PANEL EDGES  
 #11" OC FIELD  
 570/L = 285 MAX

24(141) = 3384 lbs  
 30# SF = A2  
 16# SF = A1

UPPER  
11' WALL HT

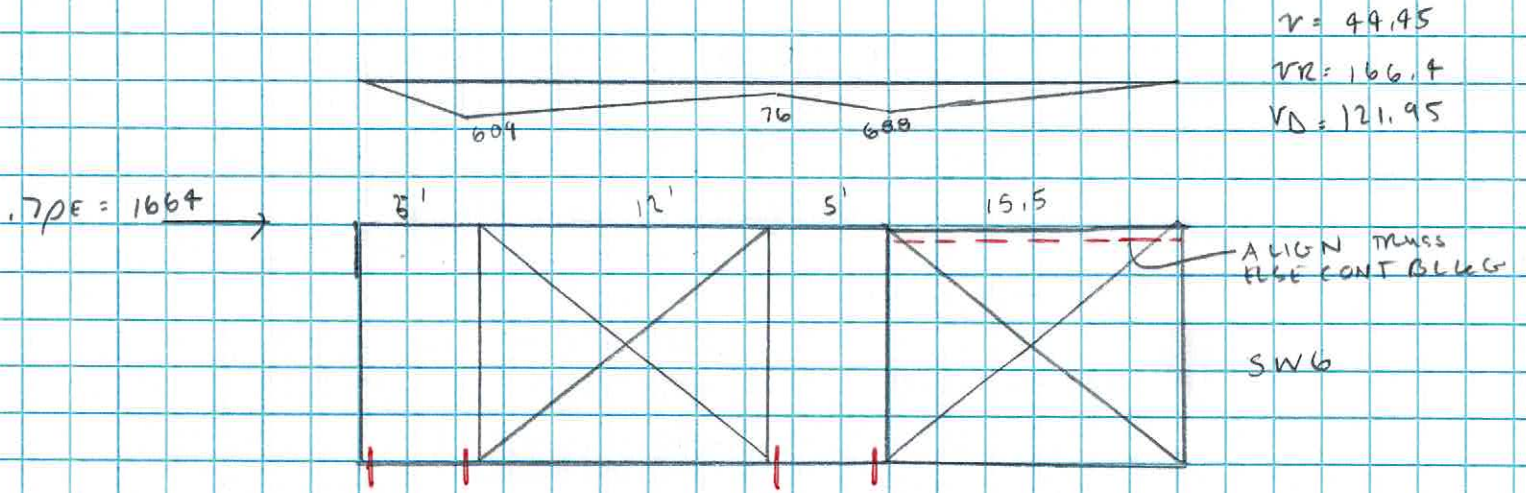
$\rho = 1.3$  &  
 $\Omega_0 = 7.5$  WHERE  
APPLICABLE

$W_{pw} = \frac{8376}{40.75} = 205.5$



23/32" w/ 10d  
@ 6" OC PANEL  
EDGES & 12" OC  
FIELD  
570 lb = 255 psf  
MAX

# REVISED SHEAR WALL ELEVATIONS



$$V = 44.45$$

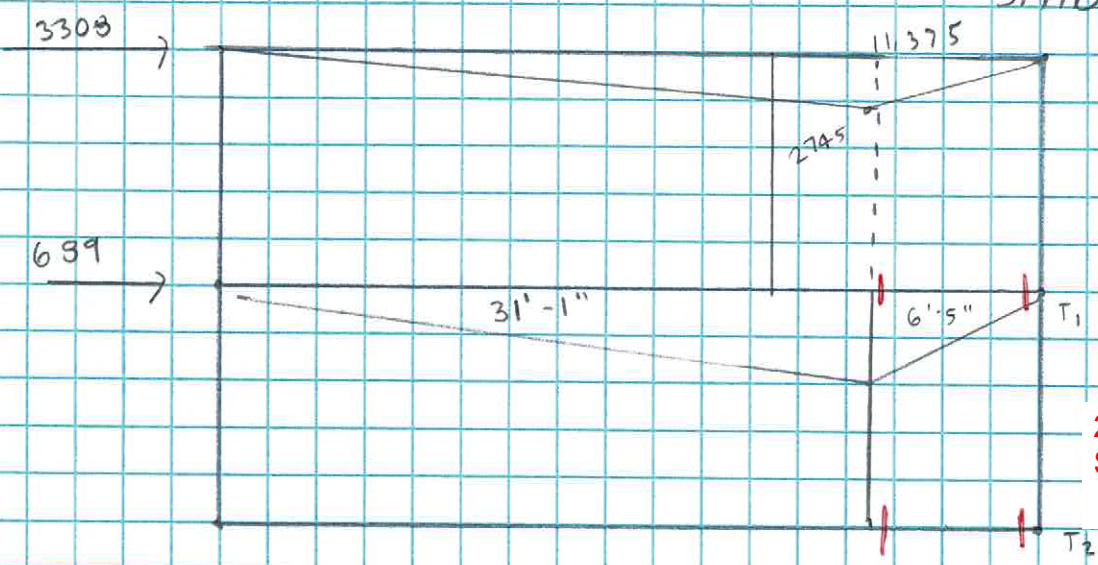
$$VR = 166.4$$

$$VD = 121.95$$

E1

$$T_1 = [1664/2(11) - .6(5)(89)(5/2)(11)] / 4.5 = 1870 \text{ lbs}$$

STHD10



$$V = 515 \text{ plf}$$

SW2

$$V = 622 \text{ plf}$$

2SW-4 (8dHF) (707PLF)  
SW-2 (8dDF) (640 PLF)

E5

$$T_1 = [3308(11) - 6.4(1.6)(7.2)(9.5)(6.4/2)] / 6.2 = 5733 \text{ lbs} \therefore \text{CM5TH}$$

$$T_2 = [3308(22) - 6.4(1.6)(7.2)(11)(6.4/2) + 689(11)] / 6.2 = 12803 \text{ lbs} \therefore \text{HDW14}$$