

#21056
Supplemental Structural Calculations For:

Sterba Mironova Residence Addition

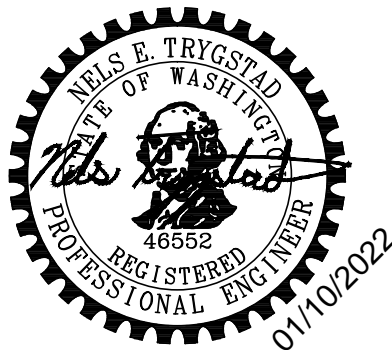
9811 SE 40th St
Mercer Island, WA 98040

Architect: TAM Design

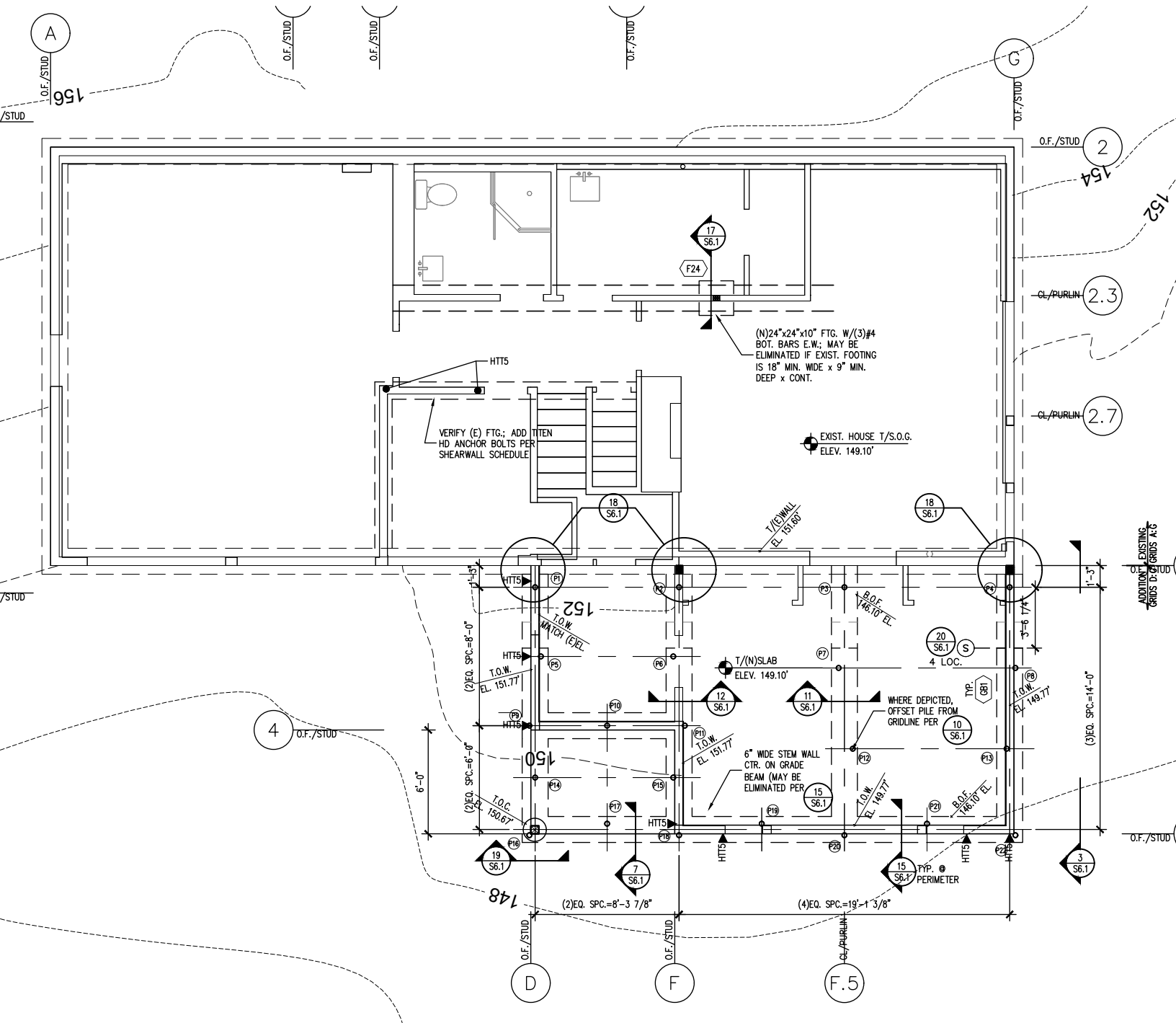
Design Criteria: IBC 2018 as adopted by Mercer Island
Wind: Wind Speed = 110 mph, Exposure 'B', Kzt = 1.0
Seismic: Site Class D [Default], SDC = D, R = 6.5, I=1.0
Roof Rain-on-Snow Load = 25 psf
Roof Future PV Load = 5psf
Deck Live Load = 60psf
Residential Floor Live Load = 40psf

Description:

The following calculations are generated to account for Geotech Consultants November 22, 2021 recommendation that the front addition be supported on pin/pipe piles. They correlate with the updated 01/10/2022 resubmittal structural plan set.



CALCULATION
SECTION 8.0:
**SUPPLEMENTAL
FOUNDATION
ENGINEERING**



Foundation Plan

SCALE: 1/4" = 1'-0"



Project: STEREA REMODEL

21056 Date: 1/8/21

Client: PIN FILES

Page Number:

PIN FILE LAYOUT

GRID (F)

	D	L	S
Roof 408	182		226
WALL 200	200		
FUR 762	<u>208</u>	<u>554</u>	<u>1</u>
Σ	590	554	226

L.C.
 $L+D = 1144 \text{ plf D.N. Gov.}$

$75\% (L+S) + D = \underline{\underline{1175 \text{ plf Gov.}}}$

FOR LOADING, ASSUME 2'x2' FILES

W/ 1'x6" STEM:

$(2' \times 2' + 0.5' \text{ D}) 145 = 653 \text{ plf}$

FILE CAP = 12" , W.C. LOAD = $1175 + 653 = 1828 \text{ plf}$

$\text{MAX. SFC} = \frac{12,000}{1828} = 6.5'$

NEW SUSPENDED SLAB

7" SLAB $145 = 85 \text{ psf D}$
LL: 40 psf L

GRID	TRIB.	SLAB DL	FUR LL
G/F/G	4.7'	398	188
F/F.5	11.7'	990	468

WITH SUSPENDED SLAB...

D	L	S
1580	1022	226

GRID (F.5)

SLAB	D	L
G/BM	990	468
	580	

$\Sigma 1570$ 468

2038 plf

SFC @ 5.38 MAX.

$D + 75\% (L+S) = 2516 \text{ plf}$

$D + L = 2602 \text{ plf Gov.}$

SFC @ 4.6' MAX.

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 Engineer:
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Concrete Beam

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C.T. ENGINEERING

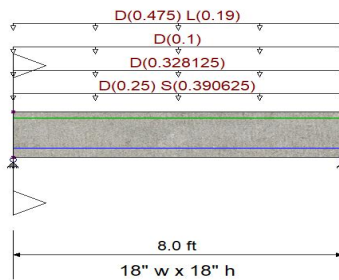
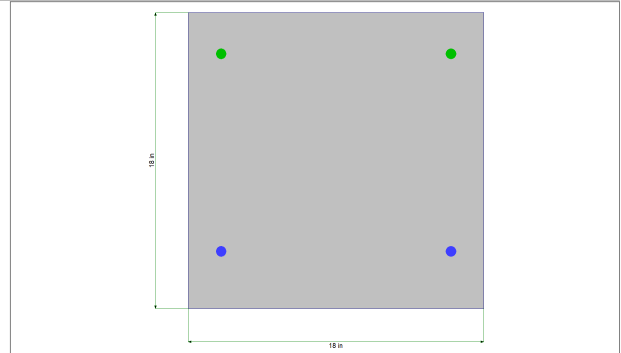
DESCRIPTION: Garage Grade Beam

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : IBC 2018

Material Properties

f'_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup =	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 18.0 in, Height = 18.0 in

Span #1 Reinforcing...

2-#5 at 3.50 in from Bottom, from 0.0 to 8.0 ft in this span

2-#5 at 2.50 in from Top, from 0.0 to 8.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.0160, S = 0.0250 ksf, Tributary Width = 15.625 ft, (Roof with no sod)

Uniform Load : D = 0.0250 ksf, Tributary Width = 13.125 ft, (sod only)

Uniform Load : D = 0.10 k/ft, Tributary Width = 1.0 ft, (Framed Wall)

Uniform Load : D = 0.10, L = 0.040 ksf, Tributary Width = 4.750 ft, (GARAGE SLAB)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.473 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.001 in Ratio = 72853 >=360.
Mu : Applied	19.962 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
Mn * Phi : Allowable	42.187 k-ft	Max Downward Total Deflection	0.006 in Ratio = 14861 >=180.
Location of maximum on span	3.993 ft	Max Upward Total Deflection	0.000 in Ratio = 0 <180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	7.659	7.659
Overall MINimum	0.760	0.760
+D+H	5.918	5.918
+D+L+H	6.678	6.678
+D+Lr+H	5.918	5.918
+D+S+H	7.480	7.480
+D+0.750Lr+0.750L+H	6.488	6.488
+D+0.750L+0.750S+H	7.659	7.659
+D+0.60W+H	5.918	5.918

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C.T. ENGINEERING

DESCRIPTION: Garage Grade Beam

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.70E+H	5.918	5.918
+D+0.750Lr+0.750L+0.450W+H	6.488	6.488
+D+0.750L+0.750S+0.450W+H	7.659	7.659
+D+0.750L+0.750S+0.5250E+H	7.659	7.659
+0.60D+0.60W+0.60H	3.551	3.551
+0.60D+0.70E+0.60H	3.551	3.551
D Only	5.918	5.918
L Only	0.760	0.760
S Only	1.563	1.563
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+0.50L+1.60S+1.60H	1	0.00	14.50	9.98	9.98	0.00	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.09	14.50	9.76	9.76	0.86	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.17	14.50	9.54	9.54	1.71	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.26	14.50	9.33	9.33	2.53	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.35	14.50	9.11	9.11	3.34	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.44	14.50	8.89	8.89	4.12	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.52	14.50	8.67	8.67	4.89	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.61	14.50	8.45	8.45	5.64	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.70	14.50	8.24	8.24	6.37	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.79	14.50	8.02	8.02	7.08	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.87	14.50	7.80	7.80	7.77	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	0.96	14.50	7.58	7.58	8.45	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.05	14.50	7.36	7.36	9.10	0.98	21.51	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.14	14.50	7.14	7.14	9.73	0.89	21.40	Vu < PhiVc/2	lot Reqd 9.6.	21.4	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.22	14.50	6.93	6.93	10.35	0.81	21.31	Vu < PhiVc/2	lot Reqd 9.6.	21.3	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.31	14.50	6.71	6.71	10.94	0.74	21.23	Vu < PhiVc/2	lot Reqd 9.6.	21.2	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.40	14.50	6.49	6.49	11.52	0.68	21.16	Vu < PhiVc/2	lot Reqd 9.6.	21.2	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.49	14.50	6.27	6.27	12.08	0.63	21.10	Vu < PhiVc/2	lot Reqd 9.6.	21.1	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.57	14.50	6.05	6.05	12.62	0.58	21.05	Vu < PhiVc/2	lot Reqd 9.6.	21.0	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.66	14.50	5.84	5.84	13.14	0.54	21.00	Vu < PhiVc/2	lot Reqd 9.6.	21.0	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.75	14.50	5.62	5.62	13.64	0.50	20.95	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.84	14.50	5.40	5.40	14.12	0.46	20.91	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	1.92	14.50	5.18	5.18	14.58	0.43	20.87	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.01	14.50	4.96	4.96	15.03	0.40	20.84	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.10	14.50	4.75	4.75	15.45	0.37	20.80	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.19	14.50	4.53	4.53	15.86	0.34	20.77	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.27	14.50	4.31	4.31	16.24	0.32	20.74	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.36	14.50	4.09	4.09	16.61	0.30	20.72	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.45	14.50	3.87	3.87	16.96	0.28	20.69	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.54	14.50	3.65	3.65	17.29	0.26	20.67	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.62	14.50	3.44	3.44	17.60	0.24	20.65	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.71	14.50	3.22	3.22	17.89	0.22	20.62	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.80	14.50	3.00	3.00	18.16	0.20	20.60	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.89	14.50	2.78	2.78	18.41	0.18	20.58	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	2.97	14.50	2.56	2.56	18.65	0.17	20.56	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	3.06	14.50	2.35	2.35	18.86	0.15	20.55	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	3.15	14.50	2.13	2.13	19.06	0.13	20.53	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	3.23	14.50	1.91	1.91	19.23	0.12	20.51	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	3.32	14.50	1.69	1.69	19.39	0.11	20.49	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	3.41	14.50	1.47	1.47	19.53	0.09	20.48	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	3.50	14.50	1.25	1.25	19.65	0.08	20.46	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0	0.0
+1.20D+0.50L+1.60S+1.60H	1	3.58	14.50	1.04	1.04	19.75	0.06	20.44	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0	0.0

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C.T. ENGINEERING

DESCRIPTION: Garage Grade Beam

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest
+1.20D+0.50L+1.60S+1.60H	1	3.67	14.50	0.82	0.82	19.83	0.05	20.43	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	3.76	14.50	0.60	0.60	19.89	0.04	20.41	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	3.85	14.50	0.38	0.38	19.93	0.02	20.40	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	3.93	14.50	0.16	0.16	19.96	0.01	20.38	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.02	14.50	-0.05	0.05	19.96	0.00	20.38	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.11	14.50	-0.27	0.27	19.95	0.02	20.39	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.20	14.50	-0.49	0.49	19.91	0.03	20.41	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.28	14.50	-0.71	0.71	19.86	0.04	20.42	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.37	14.50	-0.93	0.93	19.79	0.06	20.44	Vu < PhiVc/2	lot Reqd 9.6.	20.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.46	14.50	-1.15	1.15	19.70	0.07	20.45	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.55	14.50	-1.36	1.36	19.59	0.08	20.47	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.63	14.50	-1.58	1.58	19.46	0.10	20.49	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.72	14.50	-1.80	1.80	19.31	0.11	20.50	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.81	14.50	-2.02	2.02	19.15	0.13	20.52	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.90	14.50	-2.24	2.24	18.96	0.14	20.54	Vu < PhiVc/2	lot Reqd 9.6.	20.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	4.98	14.50	-2.45	2.45	18.75	0.16	20.55	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.07	14.50	-2.67	2.67	18.53	0.17	20.57	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.16	14.50	-2.89	2.89	18.29	0.19	20.59	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.25	14.50	-3.11	3.11	18.03	0.21	20.61	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.33	14.50	-3.33	3.33	17.74	0.23	20.63	Vu < PhiVc/2	lot Reqd 9.6.	20.6	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.42	14.50	-3.55	3.55	17.44	0.25	20.66	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.51	14.50	-3.76	3.76	17.12	0.27	20.68	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.60	14.50	-3.98	3.98	16.79	0.29	20.70	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.68	14.50	-4.20	4.20	16.43	0.31	20.73	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.77	14.50	-4.42	4.42	16.05	0.33	20.76	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.86	14.50	-4.64	4.64	15.66	0.36	20.79	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	5.95	14.50	-4.85	4.85	15.24	0.38	20.82	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.03	14.50	-5.07	5.07	14.81	0.41	20.85	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.12	14.50	-5.29	5.29	14.35	0.45	20.89	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.21	14.50	-5.51	5.51	13.88	0.48	20.93	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.30	14.50	-5.73	5.73	13.39	0.52	20.97	Vu < PhiVc/2	lot Reqd 9.6.	21.0	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.38	14.50	-5.94	5.94	12.88	0.56	21.02	Vu < PhiVc/2	lot Reqd 9.6.	21.0	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.47	14.50	-6.16	6.16	12.35	0.60	21.07	Vu < PhiVc/2	lot Reqd 9.6.	21.1	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.56	14.50	-6.38	6.38	11.80	0.65	21.13	Vu < PhiVc/2	lot Reqd 9.6.	21.1	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.64	14.50	-6.60	6.60	11.23	0.71	21.20	Vu < PhiVc/2	lot Reqd 9.6.	21.2	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.73	14.50	-6.82	6.82	10.65	0.77	21.27	Vu < PhiVc/2	lot Reqd 9.6.	21.3	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.82	14.50	-7.04	7.04	10.04	0.85	21.36	Vu < PhiVc/2	lot Reqd 9.6.	21.4	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.91	14.50	-7.25	7.25	9.42	0.93	21.45	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	6.99	14.50	-7.47	7.47	8.77	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.08	14.50	-7.69	7.69	8.11	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.17	14.50	-7.91	7.91	7.43	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.26	14.50	-8.13	8.13	6.73	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.34	14.50	-8.34	8.34	6.01	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.43	14.50	-8.56	8.56	5.27	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.52	14.50	-8.78	8.78	4.51	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.61	14.50	-9.00	9.00	3.73	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.69	14.50	-9.22	9.22	2.94	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.78	14.50	-9.44	9.44	2.12	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.87	14.50	-9.65	9.65	1.29	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0
+1.20D+0.50L+1.60S+1.60H	1	7.96	14.50	-9.87	9.87	0.43	1.00	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0 0.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio

MAXIMUM BENDING Envelope

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 Engineer:
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Concrete Beam

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DESCRIPTION: Garage Grade Beam

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	8.000	19.96	42.19	0.47
+1.40D+1.60H Span # 1	1	8.000	16.57	42.19	0.39
+1.20D+0.50Lr+1.60L+1.60H Span # 1	1	8.000	16.63	42.19	0.39
+1.20D+1.60L+0.50S+1.60H Span # 1	1	8.000	18.20	42.19	0.43
+1.20D+1.60Lr+0.50L+1.60H Span # 1	1	8.000	14.96	42.19	0.35
+1.20D+1.60Lr+0.50W+1.60H Span # 1	1	8.000	14.20	42.19	0.34
+1.20D+0.50L+1.60S+1.60H Span # 1	1	8.000	19.96	42.19	0.47
+1.20D+1.60S+0.50W+1.60H Span # 1	1	8.000	19.20	42.19	0.46
+1.20D+0.50Lr+0.50L+W+1.60H Span # 1	1	8.000	14.96	42.19	0.35
+1.20D+0.50L+0.50S+W+1.60H Span # 1	1	8.000	16.52	42.19	0.39
+1.20D+0.50L+0.70S+E+1.60H Span # 1	1	8.000	17.15	42.19	0.41
+0.90D+W+0.90H Span # 1	1	8.000	10.65	42.19	0.25
+0.90D+E+0.90H Span # 1	1	8.000	10.65	42.19	0.25

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750L+0.750S+0.5250E+H	1	0.0065	4.000		0.0000	0.000

Project:

Client:

$$\frac{18.6'}{2} = 9.3' \text{ SPAN}$$

TEL 7.3.1.1: $h = \frac{l}{20} \text{ MIN.} = 5\frac{5}{8}" \text{ MIN.}$

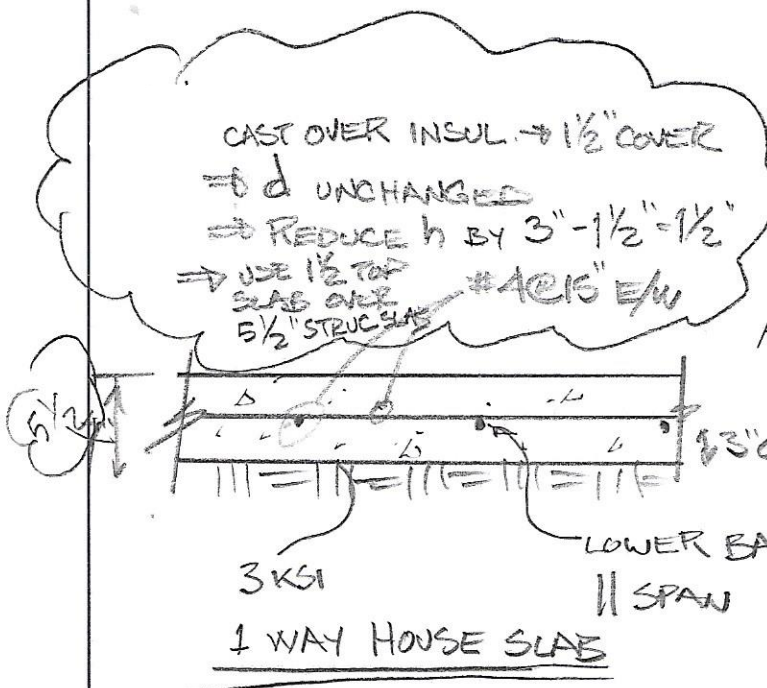
CAST OVER INSUL. $\rightarrow 1\frac{1}{2}"$ COVER
 $\Rightarrow d$ UNCHANGED
 \Rightarrow REDUCE h BY $3" - 1\frac{1}{2}" = 1\frac{1}{2}"$
 \Rightarrow USE $1\frac{1}{2}"$ TOP SLAB OVER $5\frac{1}{2}"$ STRUCT. SLAB
 #4 @ 15" E/W

$L = 40 \text{ PSF} \times 1.6 = 64 \text{ PSF}$

$D = 10 \text{ PSF W}$

AUX = 5 PSF FLOOR

$\times 1.2 = 18 \text{ PSF}$



$\frac{8}{12} \times 145 = 97 \text{ PSF} \times 1.2 = 116 \text{ PSF}$

$\Sigma 198 \text{ PSF}$

TRIAL # 2

#4 @ 18" = 0.133 in²/ft

b	d	A _c	ρ
12	4.5	54	0.00247
"	4.0	48	0.00278
"	3.5	42	0.00317
"	3.0	36	0.0037

For $d = 3.5"$ (7" SLAB)
 $M_u = 2010 \text{ K'}$ ULT.

$R = \frac{2,010(12)}{0.9(12)(3.5)^2} = 183$

60/3 KSI: $\rho = 0.0032$ REQ'D
 $= 0.0033$ MIN

$\Rightarrow 0.0033(12)(3.5) = 0.139 \text{ in}^2/\text{ft}$
 \Rightarrow #4 @ 16" O/C

0.0033 MIN. FOR TENS. CTRL

TEMP. REINF [TEL. 24.432]

$0.0018(7)(12) = 0.152 \text{ in}^2/\text{ft}$
 #4 @ 15" #4 @ 18" FOR 8" SLAB

TRIAL # 1

$M_u = \frac{198(9.3)^2}{8} = 2140 \text{ K'}$ ULT. DEM.

60/3 KSI:

$d = 4.5" \dots R = \frac{2140 \cdot 12}{0.9(12)(4.5)^2} = 118$

$\rho = 0.0021$

$A_s = 0.0021(12)(45) = 0.12 \text{ in}^2/\text{ft}$
 $= \frac{0.17 \text{ in}^2}{18"}$

