MEMORANDUM

TO: Whitney Madison
Babienko Architects PLLC
815 Seattle Boulevard South
Studio 206
Seattle, WA 98134

FROM: Douglas Clair

DATE: 2/15/18

PAGES: (81) incl. cover + full-sized plan sheets

RE: LS Residence (Permit #1708-086), Mercer Island Corrections Notice 1, dated 1/17/18.

Whitney:

This memo summarizes my responses to the various structural items shown on the City of Mercer Island Corrections Notice dated xxxxx

Sheet		Comment and Response
S1.0	*1)*	*Steel stairs on this project appear to be specialty design. Include steel stair shop drawings, and indicate which deferred submittals will require design by the manufacturers' engineer (likely CLT and Stair)* Steel stair stringers and details have been added to the plan set. See updated sheets S2.0, S2.1, S2.2 & S3.1.
	2)	*Staff note, no response required: a key inspection will be added to the coversheet requiring that the CLT shop drawings and stamped calculations be submitted for review and approval to CMI 3 weeks prior to fabrication.* CLT panels including overhangs have been designed per manufacturers design specifications available on the manufacturer website. Shop drawings including panel layouts from the manufacturer should be provided to ensure than spans of the panels are adequate to support the cantilevered and double cantilevered edges.
S2.0	*1)*	*Provide calculations for hold-down anchor table 10/S5.0. That detail appears to only apply at stem wall construction. Many of these anchors are installed in thickened slab. Designate on plan which anchors are post-installed in existing concrete and provide calculations, notes and details specific to that installation (10/S5.0 states that all are cast in place)* Note to cast-in or epoxy holdowns have been added next to each foundation holddown callout. Holddowns not called on plans have been removed from

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schedule. HDU4 epoxy embedment in 10/S5.0 has been updated. Please see detail 12/S5.0 for notes how to cast anchors through stem into footing for increased capacity.

Detail 6/S3.0 has been added and referenced on plans for increased concrete depth for HDU8 anchors.

See Attachment A for holddown calculations. These values are designed for the maximum loads the holddown hardware can transmit to the anchors. Holddowns specified in shearwall calculations have been verified for a demand less than the allowed capacity of specified holddown.

2) *Provide calculations for retaining wall shown in 12/S3.1*

See Attachment B for retaining wall calculation.

3) *Coordinate with arch to provide footings for exterior stair (see A507)*

Strip footing has been added to the plan sheet as well as a new detail (5/S3.0) to show footing and wall detailing at exterior stair.

S2.1 1) *The garage topping slab doesn't appear to be called out or specified (if it deviates from the typical nonstructural topping slab which is requested in an architectural comment)*

Topping slab does not need to be reinforced at the garage. Floor joists are designed for garage loading as well as added weight from topping slab. Note to be updated in architectural drawings.

2) *Calculations and beam layouts and callouts don't appear to be coordinated with the main floor framing*

New beam layout and corresponding beam calculations have been updated to match.

See Attachment C for calculations.

3) *Please review gravity calculations and callouts. This beam is noted as FB27 and no calculation is found in the packet.*

FB27 has been added/updated in calculations and beam map in Attachment C.

4) *Please review gravity calculations and callouts. This beam is noted as FB12 and no calculation is found in the packet.*

FB12 has been added/updated in calculations and beam map in Attachment C.

5) *This beam is noted as moment frame but not included in lateral calculation (or gravity design). Provide a complete narrative and design for the structure here.*

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FB101 has been added in calculations and beam map in Attachment C. This beam has been designed for lateral and gravity loads.

This moment frame has been designed to support lateral loading of the main floor deck only. Lateral loads along this grid line have been dragged into the diaphragm and into the SW5 wall segments beyond. A continuous CMSTC14 strap has been calculated as a tension strap and added at the plywood level to ensure load transfer from shearwalls above are carried into basement level shearwall. Horizontal offset irregularity penalties have been applied to the connection of the diaphragm to the shearwall segments. Detail 7/S4.3 has been added. Calculations for the strap have been added to Attachment C.

6) *Provide floor system for exterior deck beyond SLT7 span.*

Wall studs for landing and sloping exterior stair have been added to the plans. Sawn lumber framing will bear on the new wall and a new header added to the plans.

7) *Coordinate with arch to provide details of landing and attachment and foundation for exterior stair.*

Stud wall and footing have been added along with new detail 5/S3.0 to cover framing to support stair landing.

8) *Please review gravity calculations and callouts for main floor framing vs calculations provided and keyplan on calc page 12/78. There appear to have been revisions to framing following the calculations.*

Gravity calculations and main floor framing callouts have been updated on plans and in Attachment C calculations. Upper floor loading has been revised in locations where previous calculations differed from the proposed plan.

S2.2

1) *Coordinate with arch where the open stair 1/A508 is shown on upper floor plan A102. The change in elevation reflected in detail 4/S4.2 along Grid 2 appears to occur elsewhere in the arch set.*

Stair opening have been coordinated with the architectural set. Detail 4/S4.2 has been updated to more accurately match architectural sections.

2) *There appear to be conflicts between structural and architectural on the framing here (architectural shows stringer connection to the face/bottom of CLT where the wide flange interferes). If there is interaction between two designs which will require deferred submittal, provide enough detail and appropriate reactions on the bearing element to direct the design of the deferred items, ie if this stair is intended to free-span around the corner and attach to the top of the CLT panel in the living room, provide the reactions on plan.*

Stair stringer and attachment has been coordinated with architectural set. Updated stringer attachment details have been added to sheet S3.1.

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3) *Second floor key on calculation page 11/78 also calls this beam SB13 (I think). See other comment this sheet. No calc for this MC13 or the W12x30 supporting it (nor any W12x30) were found in the calculations. The gravity calcs may be a partial set?*

Calculations for beam SB13 and the corresponding supporting beams (SB14 & SB24) have been included.

See Attachment D for calculations.

4) *Arch upper floor plan shows a step in elevation at the entryway to the master closet, how is this constructed?*

Step has been removed from architectural plans.

5) *Is there a post here not called out on this level?*

(2)2x6 post has been designed and added to the plan set in this location.

See Attachment E for calculations.

6) *Provide collector and drag connection design for SW4 along grid 5.*

W12x30 beam serves as the drag strut/ collector for this shearwall.

See Attachment F for calculations.

7) *Provide collector and drag connection design for SW6 along grid 4.*

Northern W12x30 has been extended to span over the grid 4 SW to collect floor loading in the SW. Strap has been added to the face of this beam and adjacent GL beam to drag southern diaphragm loads into SW.

See Attachment G for calculations.

8) *Provide a detail of this post offset. These posts do not appear on the level below.*

New post has been added to the plans to support this point load. Loading from new post has been carried to beam below and is reflected in updated beam calculations found in the updated calculation set.

9) *Clarify floor beam calculations. This beam appears to be called out on key as SB13. Calculations Jump from SB10 on page 34/78 to SB20 on page 35/78. Verify in the calculation for this beam that deflection is coordinated with detailing of or manufacturer's tolerance for vertical deflection at the sliding door below.*

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Beam map has been updated to include calculations for this beam, SB200. Manufacturer recommends a max deflection of 0.25" (or l/720). Beam has been updated to a W12x30.

See Attachment D for calculations.

S2.3 2) *Calculation for BR18 appears to be missing from calc packet. Please check gravity calc packet for completeness against framing keyplan.*

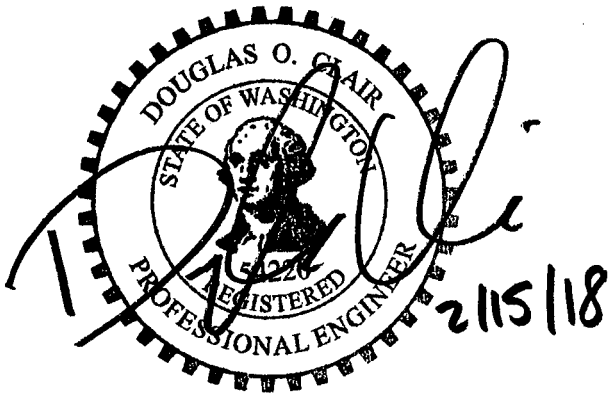
Roof framing beam map has been updated and beam calculations have been updated. Please note beam callouts may skip numerical order as beams from older plan sets have been removed. This should be apparent in new beam map.

See Attachment H for calculations.

I trust this summarizes the issues adequately.

Sincerely,

Douglas O. Clair, P.E.



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Attachment A

Structural Calculations for Correction Notice Item S2.0 – Note 1

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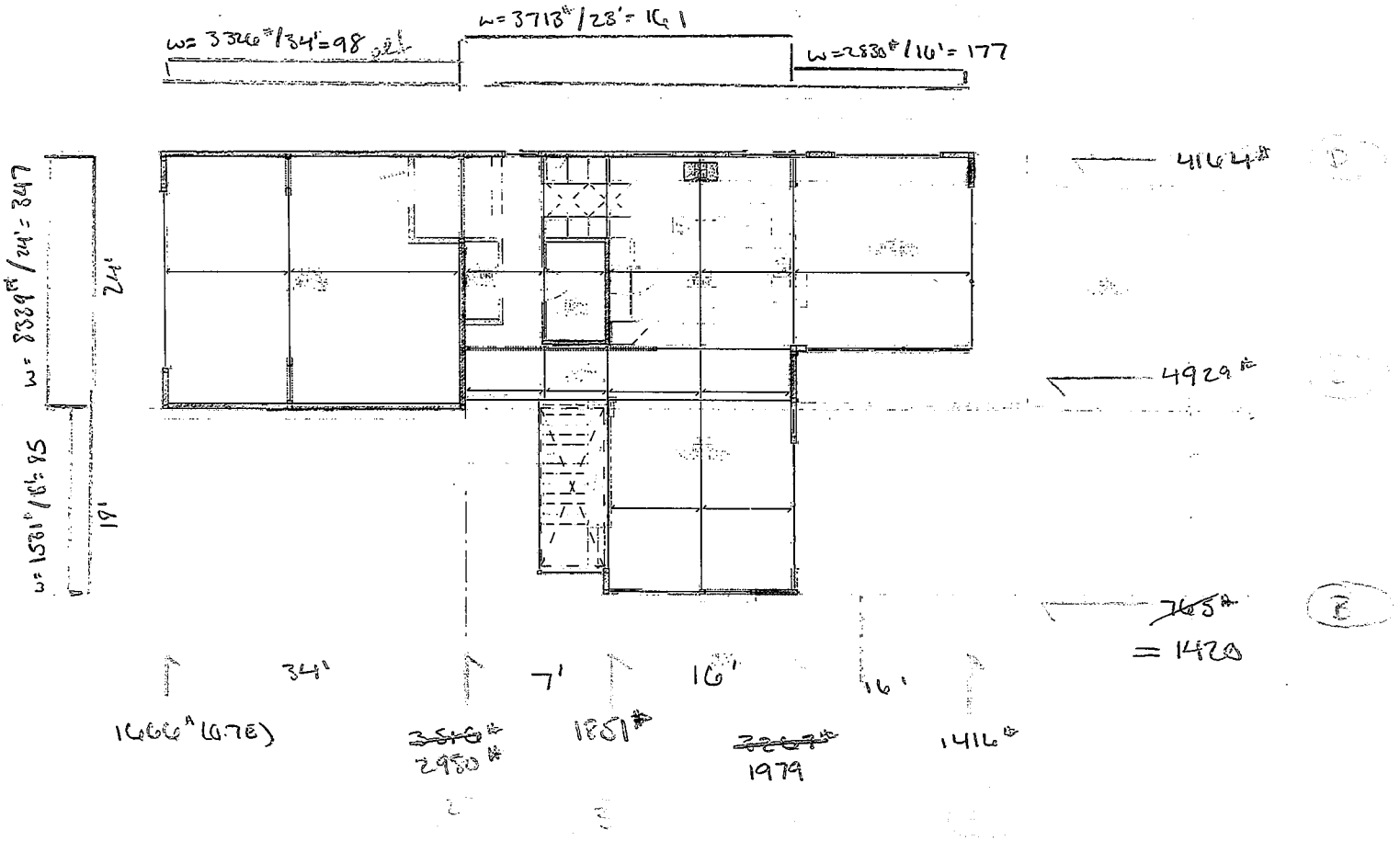
U. FLOOR - LATERAL

$F_{FLOOR} = 7040^{\#}$

$F_{FLOOR\ ROOF} = 2830^{\#}$



LATERAL DESIGN – UPPER FLOOR

R = 1466# + 984# = 2450#
ℓ = 8.75'
v = 302 plf SW2
h = 8.5'
OT = 2574 HDU4
(2)2x4

R = 3516# + 3349# = 6865#
ℓ = 15.5'
v = 249 plf SW2
h = 8.5'
OT = 2119 (2)CS16
(2)2x4

R = 1979# + 2870# = 4849#
ℓ = 5.5'
v = 881# plf SW6
h = 8.5'
OT = 7494#
OT_OTHER = 4464# + 3151# = 10645#
USE HDU14
C = 14262# w/ (5)2x6
ℓ = 14'6"
v = 435
v' = 435 x 26/2 = 5654 plf SW4
h = 8.5'
OT = 3698# (3)CS16
TL = 5278
C = 6732# (3)2x6

R = 1420# + 2122# = 3542#
ℓ = 4.0'
v = 886 plf SW5
h = 8.5'
OT = 4054
7526# HDU11
(3)2x6

R = 4920# + 4383# = 9303#
ℓ = 33'
v = 281 plf SW2
h = 8.5'
OT = 2396# HDU4
(2)2x4

R = 11604# + 3240# = 14604#
ℓ = 48'
v = 154 plf SW1
OT = 1465 CS16
(2)2x6

SW ADDED
R = 1851#
ℓ = 10'
v = 185# SW1
h = 8.5
OT = 1572
0.60L = 1850#
OT - 0.60L = Ø no HD
SW SUFFICIENT

LS

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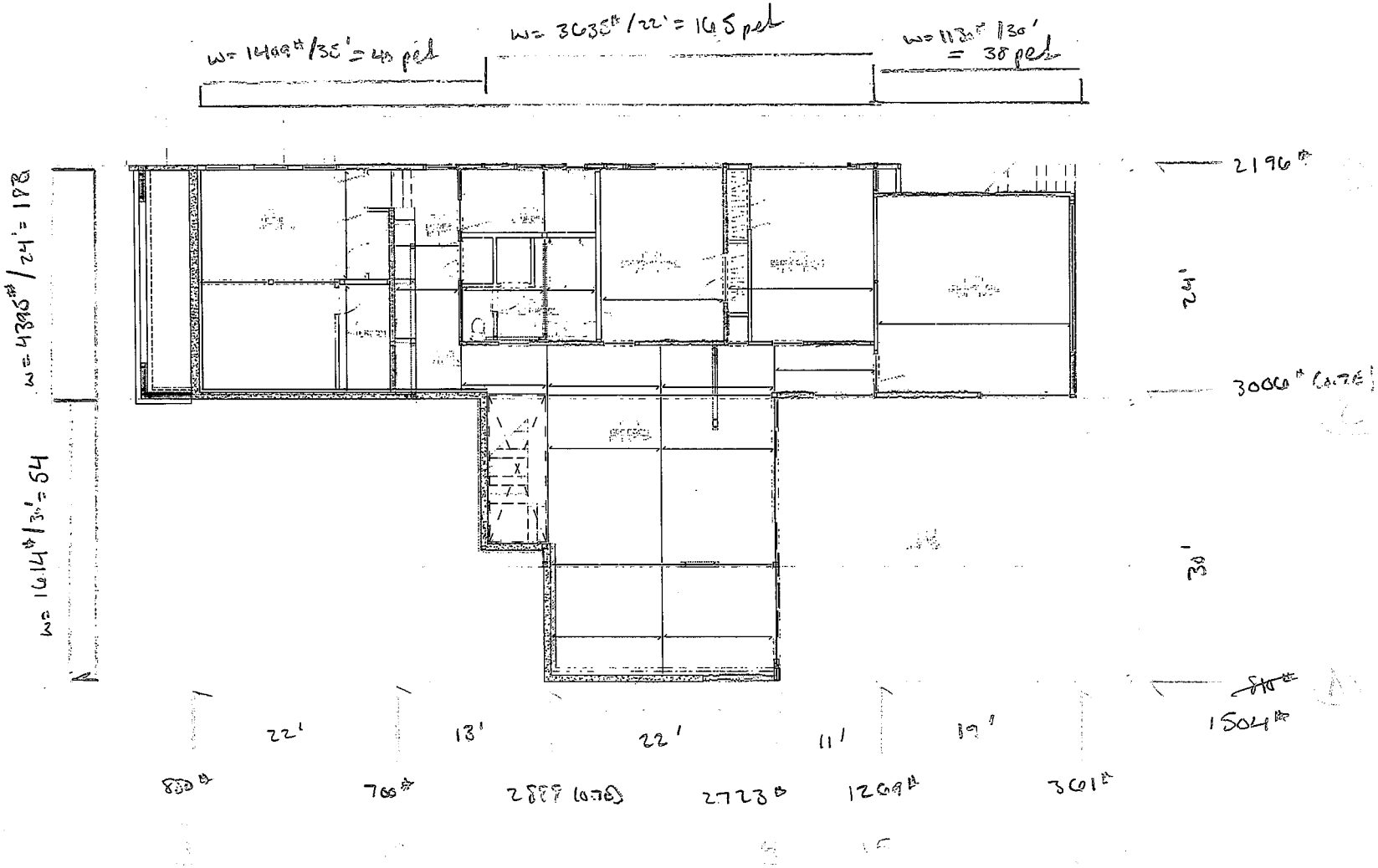
MAIN FLOOR LATERAL

$F_{MAIN,1} = 4850^{\#}$

$F_{BSB,1} = 1130^{\#}$



LATERAL DESIGN - MAIN FLOOR

$h_{typ} = 9'$

$R = 700^{\#} + 6805^{\#} = 7505$

$\ell = 18.67'$

$v = 405$ plf SW3

$OT = 3047^{\#}$ HDU5

(2)2x4

$R = 2723^{\#} + 6137^{\#} = 8861^{\#}$

$\ell = 12'$

$v = 738$ plf SW5 *** MAX HDU8

$OT = 6045$ ~~HDU5~~ HDU8

(4)2x4

$R = 1269^{\#} + 1416^{\#} = 2685^{\#}$

$\ell = 16.0'$

$v = 167$ plf SW1

$OT = 1510$ HDU2

(2)2x4

$R = 301^{\#}$

$\ell = 4.33'$

$v = 83$ plf SW1

$OT = 750$ HDU2

(2)2x6

1504# 3542#

$R = 840^{\#} + 1958^{\#} = 5046^{\#}$

$\ell = 11.5'$

$v = 438$ plf SW3

$h = 2.0'$

$v_{DEMAND} = 5046/23'$

$= 219$ plf < 276 plf ✓

$OT = 876^{\#}$

0.6D = 1008# (2)2x6

$R = 3006^{\#} + 9303^{\#} = 12309^{\#}$

1/2 IR 16' CONC WALL

$R' = 6155^{\#}$

$\ell = 14.75'$

~~$v = 417$ plf~~ SW3

$OT = 3755$ HDU5 MAX HDUS

(2)2x6

$R = 2196^{\#} + 7404^{\#} = 9600$

$\ell = 42'$

$v = 229$ plf SW2

$OT = 7057$ HDU2

(2)2x6

LS

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Company:	HVE	Date:	1/25/2018
Engineer:	DOC	Page:	1/4
Project:	LS		
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description: HDU2
EPOXY
8" STEM WALL
Location:
Fastening description:

2. Input Data & Anchor Parameters

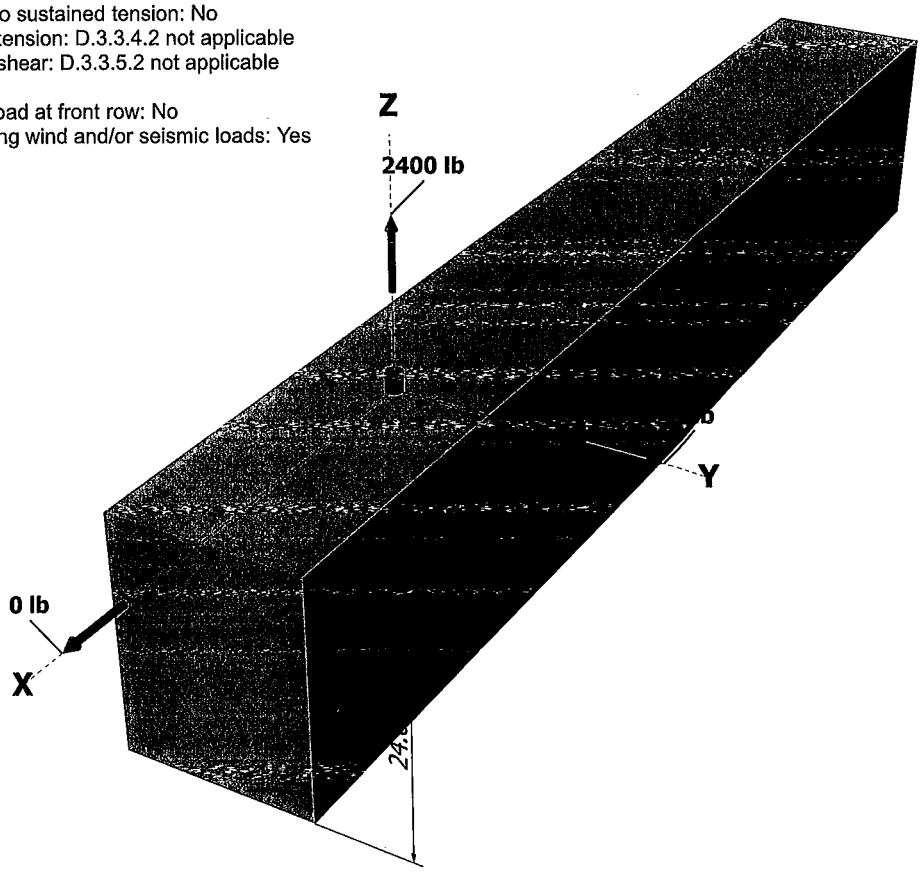
General
Design method:ACI 318-11
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 8.000
Code report: ICC-ES ESR-2508
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 11.13
c_{ac} (inch): 13.33
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: No
Ductility section for tension: D.3.3.4.2 not applicable
Ductility section for shear: D.3.3.5.2 not applicable
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

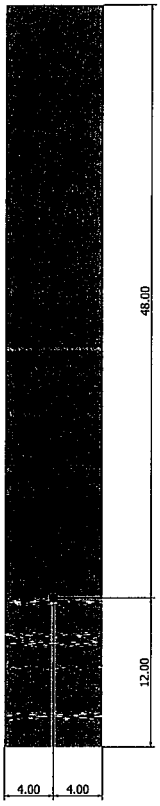
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 24.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout in tension: No
Do not evaluate concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

<Figure 1>



Company:	HVE	Date:	1/25/2018
Engineer:	DOC	Page:	2/4
Project:	LS		
Address:			
Phone:			
E-mail:			

<Figure 2>



Recommended Anchor
Anchor Name: SET-XP® - SET-XP w/ 5/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-2508

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2400.0	0.0	0.0	0.0
Sum	2400.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2400
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. D.5.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13110	0.75	9833

5. Concrete Breakout Strength of Anchor in Tension (Sec. D.5.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. D-6)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	8.000	19233

$0.75\phi N_{cb} = 0.75\phi \, (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. D.4.1 & Eq. D-3)

A_{Nc} (in^2)	A_{Nco} (in^2	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cb}$ (lb)
192.00	576.00	4.00	0.800	1.00	1.000	19233	0.65	2500

6. Adhesive Strength of Anchor in Tension (Sec. 5.5)

$\tau_{k,cr} = \tau_{k,cr} f_{short\text{-}term} K_{sat} \alpha_{N,seis}$

$\tau_{k,cr}$ (psi)	$f_{short\text{-}term}$	K_{sat}	$\alpha_{N,seis}$	$\tau_{k,cr}$ (psi)
435	1.72	1.00	1.00	748

$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef}$ (Eq. D-22)

λ_a	τ_{cr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	748	0.63	8.000	11753

$0.75\phi N_a = 0.75\phi \, (A_{Na} / A_{Na0}) \Psi_{ed,Na} \Psi_{cp,Na} N_{ba}$ (Sec. D.4.1 & Eq. D-18)

A_{Na} (in^2)	A_{Na0} (in^2)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ed,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	ϕ	$0.75\phi N_a$ (lb)
128.74	258.98	8.05	4.00	0.849	1.000	11753	0.65	2419

11. Results

Interaction of Tensile and Shear Forces (Sec. D.7)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	2400	9833	0.24	Pass
Concrete breakout	2400	2500	0.96	Pass
Adhesive	**2400**	**2419**	**0.99**	**Pass (Governs)**

SET-XP w/ 5/8"Ø F1554 Gr. 36 with hef = 8.000 inch meets the selected design criteria.

12. Warnings

- When cracked concrete is selected, concrete compressive strength used in concrete breakout strength in tension, adhesive strength in tension and concrete pryout strength in shear for SET-XP adhesive anchor is limited to 2,500 psi per ICC-ES ESR-2508 Section 5.3.

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 D.3.3.4.3 for tension need not be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 D.3.3.5.3 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

Company:	HVE	Date:	1/25/2018
Engineer:	DOC	Page:	1/4
Project:	LS		
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description: HDU4
EPOXY
8" STEM WALL
Location:
Fastening description:

2. Input Data & Anchor Parameters

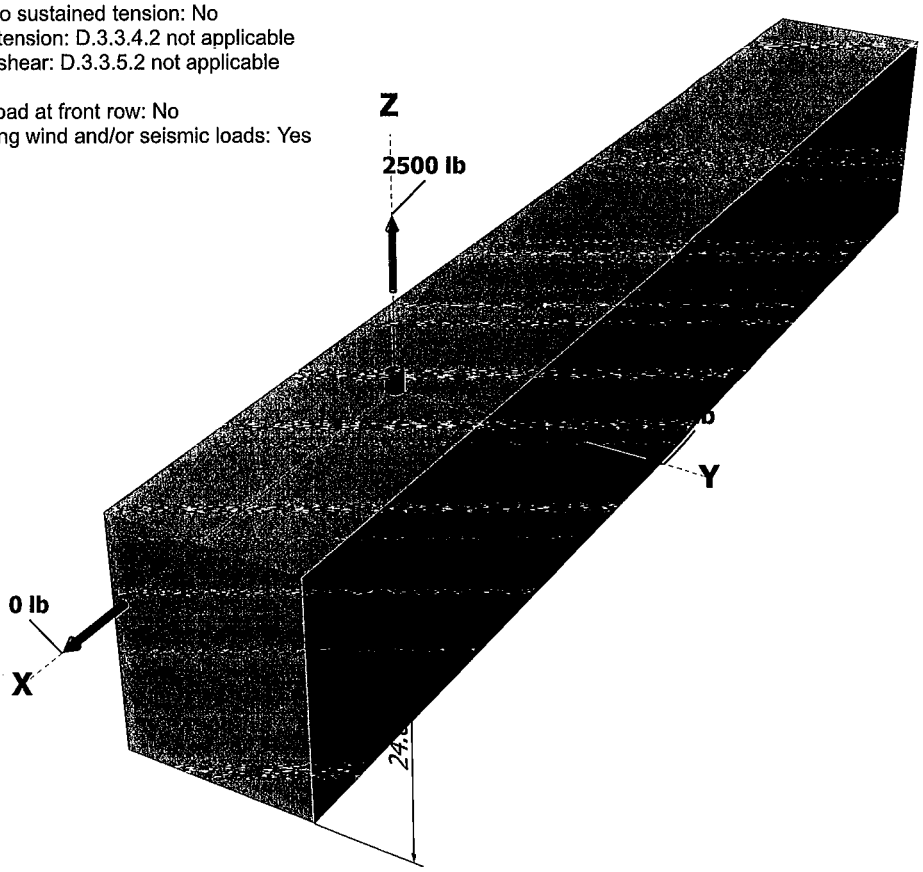
General
Design method:ACI 318-11
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 12.500
Code report: ICC-ES ESR-2508
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 15.63
c_{ac} (inch): 26.30
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: No
Ductility section for tension: D.3.3.4.2 not applicable
Ductility section for shear: D.3.3.5.2 not applicable
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

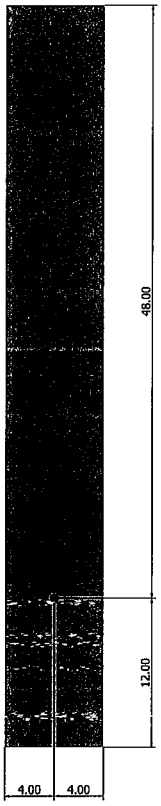
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 24.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout in tension: No
Do not evaluate concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

<Figure 1>



Company:	HVE	Date:	1/25/2018
Engineer:	DOC	Page:	2/4
Project:	LS		
Address:			
Phone:			
E-mail:			

<Figure 2>



Recommended Anchor
Anchor Name: SET-XP® - SET-XP w/ 5/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-2508

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2500.0	0.0	0.0	0.0
Sum	2500.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2500
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. D.5.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13110	0.75	9833

5. Concrete Breakout Strength of Anchor in Tension (Sec. D.5.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. D-6)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	8.000	19233

$0.75\phi N_{cb} = 0.75\phi \, (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. D.4.1 & Eq. D-3)

A_{Nc} (in^2)	A_{Nco} (in^2	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cb}$ (lb)
192.00	576.00	4.00	0.800	1.00	1.000	19233	0.65	2500

6. Adhesive Strength of Anchor in Tension (Sec. 5.5)

$\tau_{k,cr} = \tau_{k,cr} f_{short\text{-}term} K_{sat} \alpha_{N.seis}$

$\tau_{k,cr}$ (psi)	$f_{short\text{-}term}$	K_{sat}	$\alpha_{N.seis}$	$\tau_{k,cr}$ (psi)
435	1.72	1.00	1.00	748

$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef}$ (Eq. D-22)

λ_a	τ_{cr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	748	0.63	12.500	18364

$0.75\phi N_a = 0.75\phi \, (A_{Na} / A_{Na0}) \Psi_{ed,Na} \Psi_{cp,Na} N_{ba}$ (Sec. D.4.1 & Eq. D-18)

A_{Na} (in^2)	A_{Na0} (in^2)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ed,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	ϕ	$0.75\phi N_a$ (lb)
128.74	258.98	8.05	4.00	0.849	1.000	18364	0.65	3779

11. Results

Interaction of Tensile and Shear Forces (Sec. D.7)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	2500	9833	0.25	Pass
Concrete breakout	**2500**	**2500**	**1.00**	**Pass (Governs)**
Adhesive	2500	3779	0.66	Pass

SET-XP w/ 5/8"Ø F1554 Gr. 36 with hef = 12.500 inch meets the selected design criteria.

12. Warnings

- When cracked concrete is selected, concrete compressive strength used in concrete breakout strength in tension, adhesive strength in tension and concrete pryout strength in shear for SET-XP adhesive anchor is limited to 2,500 psi per ICC-ES ESR-2508 Section 5.3.

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 D.3.3.4.3 for tension need not be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 D.3.3.5.3 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description: HDU5
CAST-IN FOOTING

Location:
Fastening description:

2. Input Data & Anchor Parameters

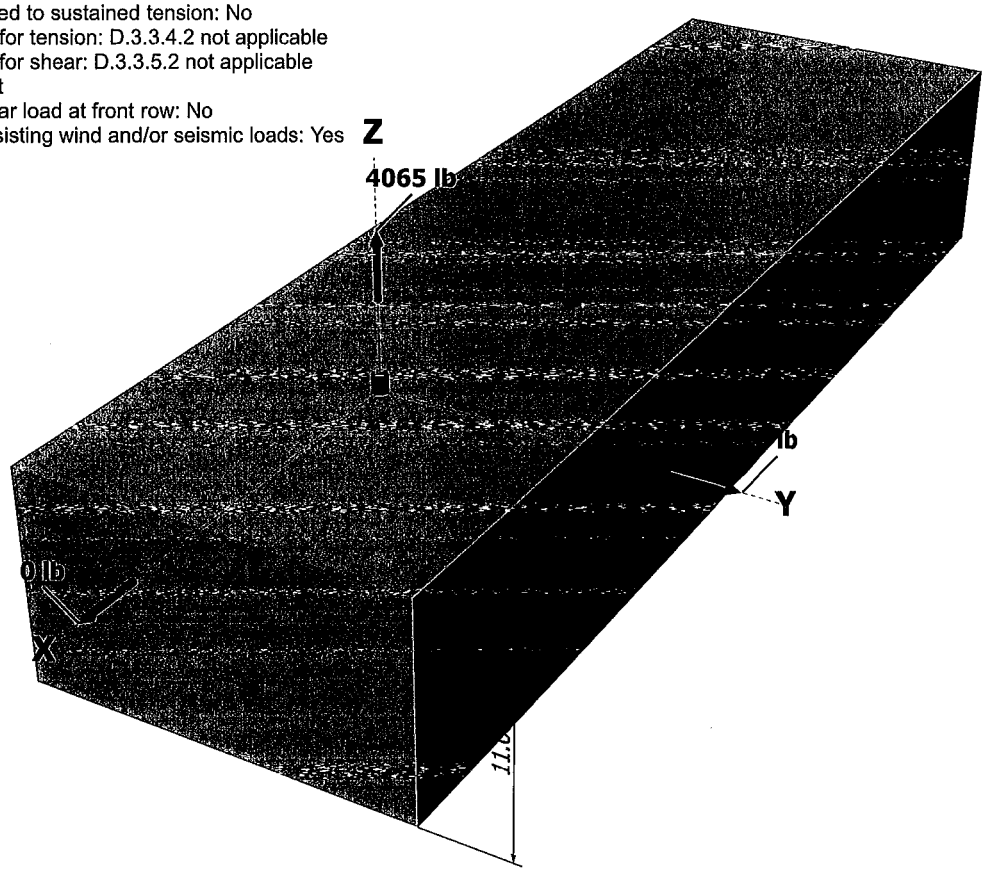
General
Design method:ACI 318-11
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: ICC-ES ESR-2508
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 9.13
c_{ac} (inch): 12.07
C_{min} (inch): 1.75
S_{min} (inch): 3.00

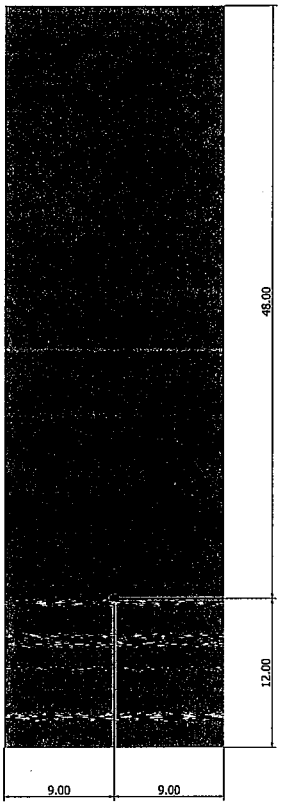
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 11.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout in tension: No
Do not evaluate concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: No
Ductility section for tension: D.3.3.4.2 not applicable
Ductility section for shear: D.3.3.5.2 not applicable
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

<Figure 1>



<Figure 2>



Recommended Anchor
Anchor Name: SET-XP® - SET-XP w/ 5/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-2508

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	4065.0	0.0	0.0	0.0
Sum	4065.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 4065
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. D.5.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13110	0.75	9833

5. Concrete Breakout Strength of Anchor in Tension (Sec. D.5.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. D-6)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	6.000	12492

$0.75\phi N_{cb} = 0.75\phi \, (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. D.4.1 & Eq. D-3)

A_{Nc} (in^2)	A_{Nco} (in^2	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cb}$ (lb)
324.00	324.00	9.00	1.000	1.00	1.000	12492	0.65	6090

6. Adhesive Strength of Anchor in Tension (Sec. 5.5)

$\tau_{k,cr} = \tau_{k,cr} f_{short\text{-}term} K_{sat} \alpha_{N,seis}$

$\tau_{k,cr}$ (psi)	$f_{short\text{-}term}$	K_{sat}	$\alpha_{N,seis}$	$\tau_{k,cr}$ (psi)
435	1.72	1.00	1.00	748

$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef}$ (Eq. D-22)

λ_a	τ_{cr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	748	0.63	6.000	3815

$0.75\phi N_a = 0.75\phi \, (A_{Na} / A_{Na0}) \Psi_{ed,Na} \Psi_{cp,Na} N_{ba}$ (Sec. D.4.1 & Eq. D-18)

A_{Na} (in^2)	A_{Na0} (in^2)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ed,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	ϕ	$0.75\phi N_a$ (lb)
258.98	258.98	8.05	9.00	1.000	1.000	8815	0.65	4297

11. Results

Interaction of Tensile and Shear Forces (Sec. D.7)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	4065	9833	0.41	Pass
Concrete breakout	4065	6090	0.67	Pass
Adhesive	**4065**	**4297**	**0.95**	**Pass (Governs)**

SET-XP w/ 5/8"Ø F1554 Gr. 36 with hef = 6.000 inch meets the selected design criteria.

12. Warnings

- When cracked concrete is selected, concrete compressive strength used in concrete breakout strength in tension, adhesive strength in tension and concrete pryout strength in shear for SET-XP adhesive anchor is limited to 2,500 psi per ICC-ES ESR-2508 Section 5.3.

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 D.3.3.4.3 for tension need not be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 D.3.3.5.3 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

Attachment B

Structural Calculations for Correction Notice Item S2.0 – Note 2

1932 First Avenue, Suite 720
Seattle, Washington 98101-2447
tel 206 624 4760 | fax 447 6971

This Wall in File: P:\Active Jobs\LS Residence\Engineering\ls retaining walls.RPX

Cantilevered Retaining Wall

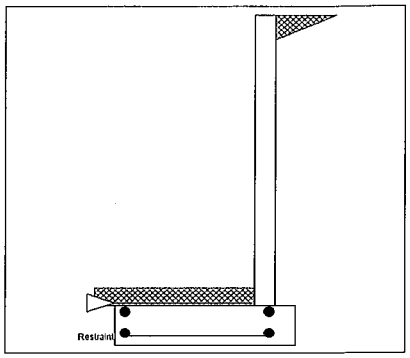
Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	288.0 lbs
Axial Live Load	=	230.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.60 OK
Slab Resists All Sliding !		
Total Bearing Load	=	2,329 lbs
...resultant ecc.	=	8.94 in
Soil Pressure @ Toe	=	1,032 psf OK
Soil Pressure @ Heel	=	4 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,444 psf
ACI Factored @ Heel	=	5 psf
Footing Shear @ Toe	=	17.1 psi OK
Footing Shear @ Heel	=	5.0 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	1,443.9 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	6.00
Rebar Size	=	# 4
Rebar Spacing	=	8.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	0.909
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	1,792.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	4,778.7
Moment.....Allowable	=	5,259.6
Service Level	psi =	
Strength Level	psi =	35.1
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	4.25
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	75.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

This Wall in File: P:\Active Jobs\LS Residence\Engineering\ls retaining walls.RPX

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.2701 in2/ft		
(4/3) * As :	0.3602 in2/ft	Min Stem T&S Reinf Area 1.152 in2	
200bd/fy : 200(12)(4.25)/60000 :	0.17 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.144 in2/ft	
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.2701 in2/ft	#4@ 16.67 in	#4@ 33.33 in
Provided Area :	0.3 in2/ft	#5@ 25.83 in	#5@ 51.67 in
Maximum Area :	0.5757 in2/ft	#6@ 36.67 in	#6@ 73.33 in

Footing Dimensions & Strengths

Toe Width	=	3.50 ft
Heel Width	=	1.00
Total Footing Width	=	4.50
Footing Thickness	=	13.00 in
Key Width	=	12.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	2.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,444	5 psf
Mu' : Upward	=	6,561	7 ft-#
Mu' : Downward	=	1,635	168 ft-#
Mu: Design	=	4,925	161 ft-#
Actual 1-Way Shear	=	17.11	5.01 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 4 @ 8.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 8.55 in, #5@ 13.25 in, #6@ 18.80 in, #7@ 25.64 in, #8@ 33.76 in, #9@ 42
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: Slab Resists Sliding - No Force on Key

Min footing T&S reinf Area	1.26	in2
Min footing T&S reinf Area per foot	0.28	in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 8.55 in	#4@ 17.09 in
#5@ 13.25 in	#5@ 26.50 in
#6@ 18.80 in	#6@ 37.61 in

Summary of Overturning & Resisting Forces & Moments

	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure =	1,443.9	3.03	4,371.7	Soil Over Heel =	480.0	4.25	2,040.0
Surcharge over Heel =				Sloped Soil Over Heel =			
Surcharge Over Toe =				Surcharge Over Heel =			
Adjacent Footing Load =				Adjacent Footing Load =			
Added Lateral Load =				Axial Dead Load on Stem =	288.0	3.75	1,080.0
Load @ Stem Above Soil =				* Axial Live Load on Stem =	230.0	3.75	862.5
=				Soil Over Toe =		1.75	
				Surcharge Over Toe =			
Total	1,443.9	**O.T.M.**	4,371.7	Stem Weight(s) =	600.0	3.75	2,250.0
=		=		Earth @ Stem Transitions =			
				Footing Weight =	731.3	2.25	1,645.3
				Key Weight =		2.50	
				Vert. Component =			
				Total =	2,099.3 lbs	**R.M.**=	7,015.3

Resisting/Overturning Ratio = **1.60**
Vertical Loads used for Soil Pressure = 2,329.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

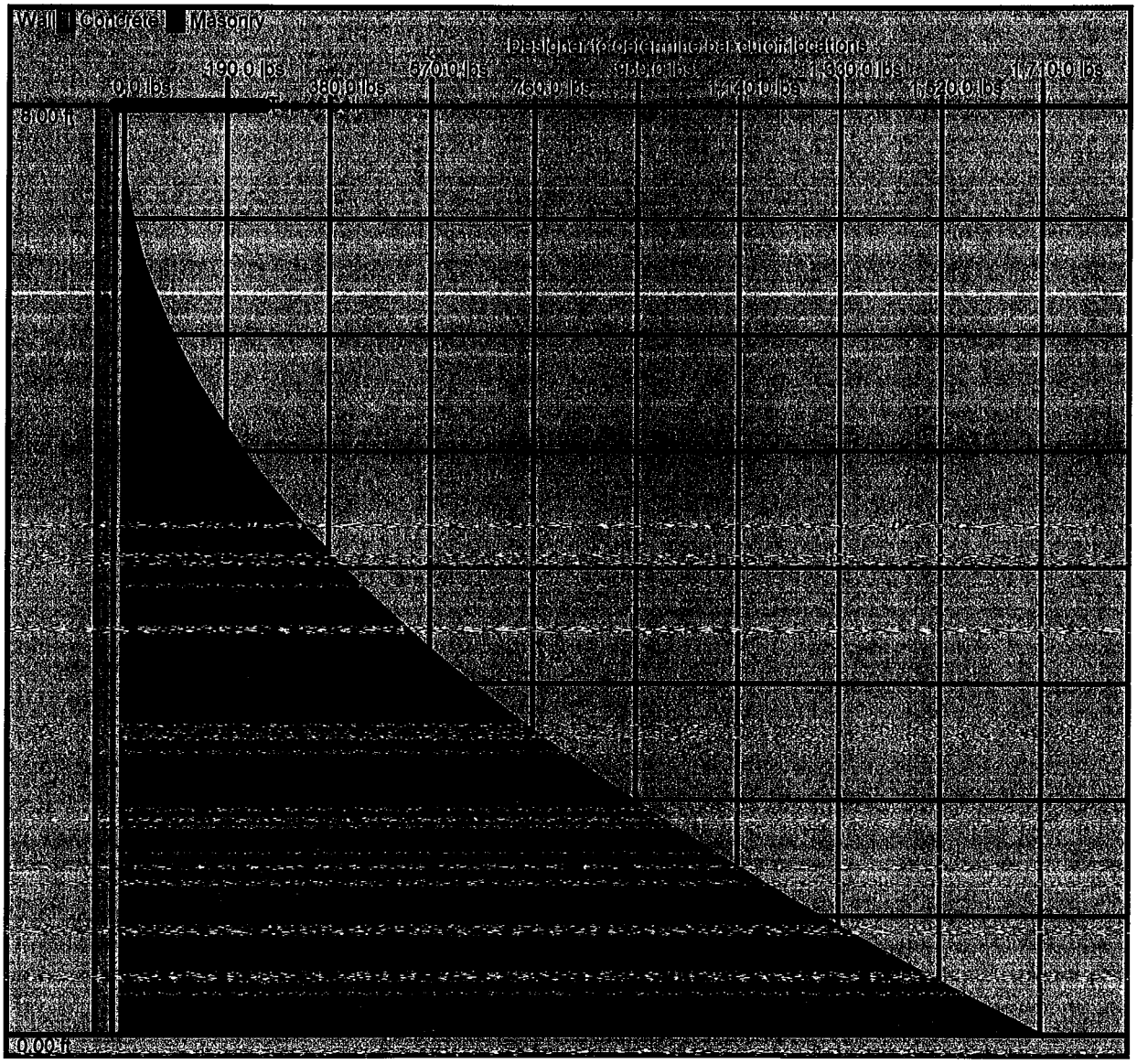
Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.051	in

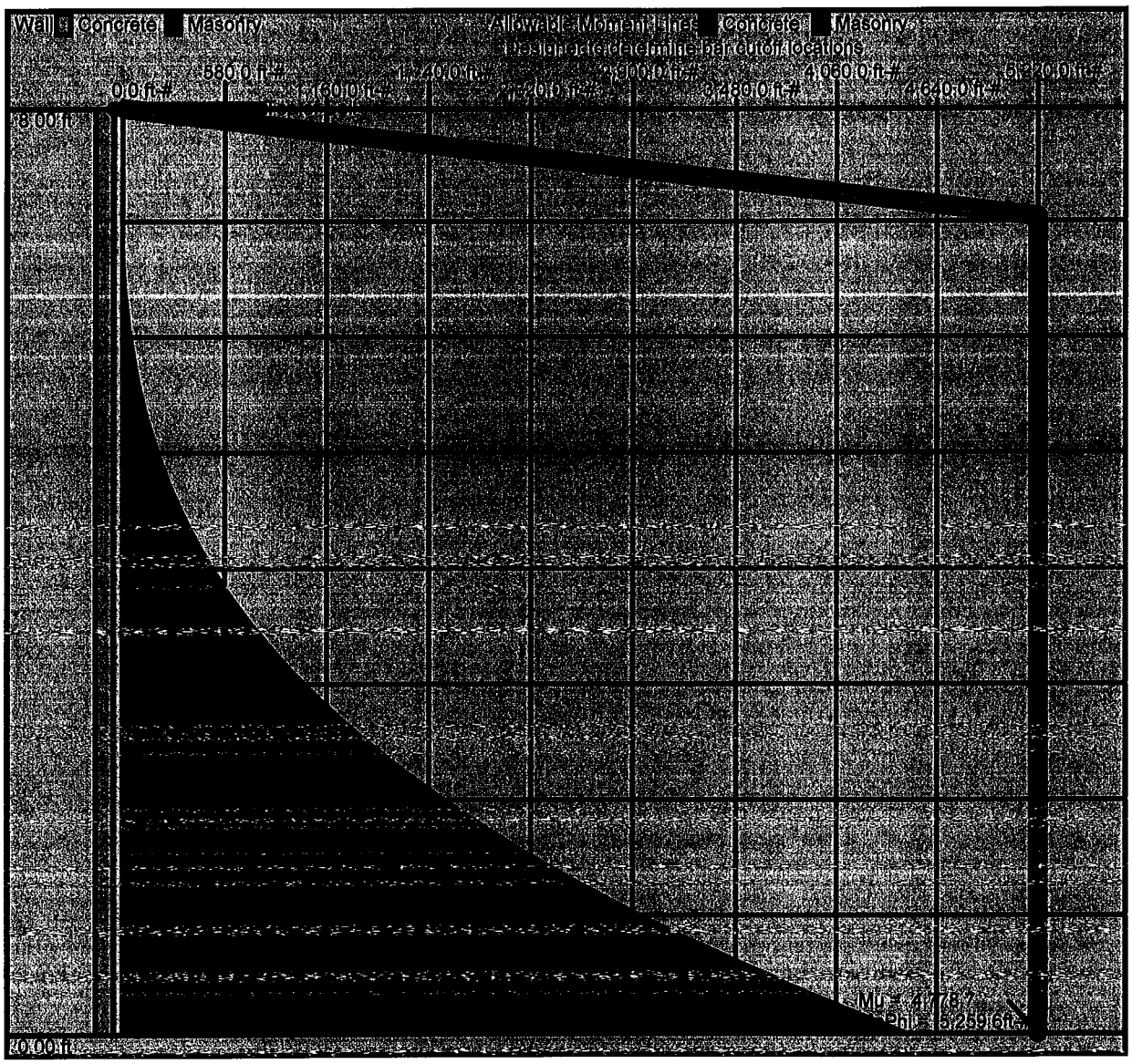
The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment =	18.72 in
Development length for #4 bar specified in this stem design segment =	14.40 in
Hooked embedment length into footing for #4 bar specified in this stem design segment =	8.40 in
As Provided =	0.3000 in2/ft
As Required =	0.2701 in2/ft


Wall
Concrete
Masonry
Designer to determine bar cutoff locations
190.0 lbs
670.0 lbs
1,330.0 lbs
1,710.0 lbs
380.0 lbs
760.0 lbs
1,140.0 lbs
1,520.0 lbs
8.00 ft
0.00 ft


Wall Concrete Masonry
Allowable Moment Lines Concrete Masonry
Design data determine bar cut-off locations
0.0 ft-#
1,580.0 ft-#
3,160.0 ft-#
1,120.0 ft-#
2,240.0 ft-#
2,800.0 ft-#
3,480.0 ft-#
4,060.0 ft-#
4,640.0 ft-#
5,220.0 ft-#
8.00 ft
0.00 ft
Mu = 4,776.7
Phi = 5,259.6 ft-#

Attachment C

Structural Calculations for Correction Notice Item S2.1 – Notes 2,3,4,5,8

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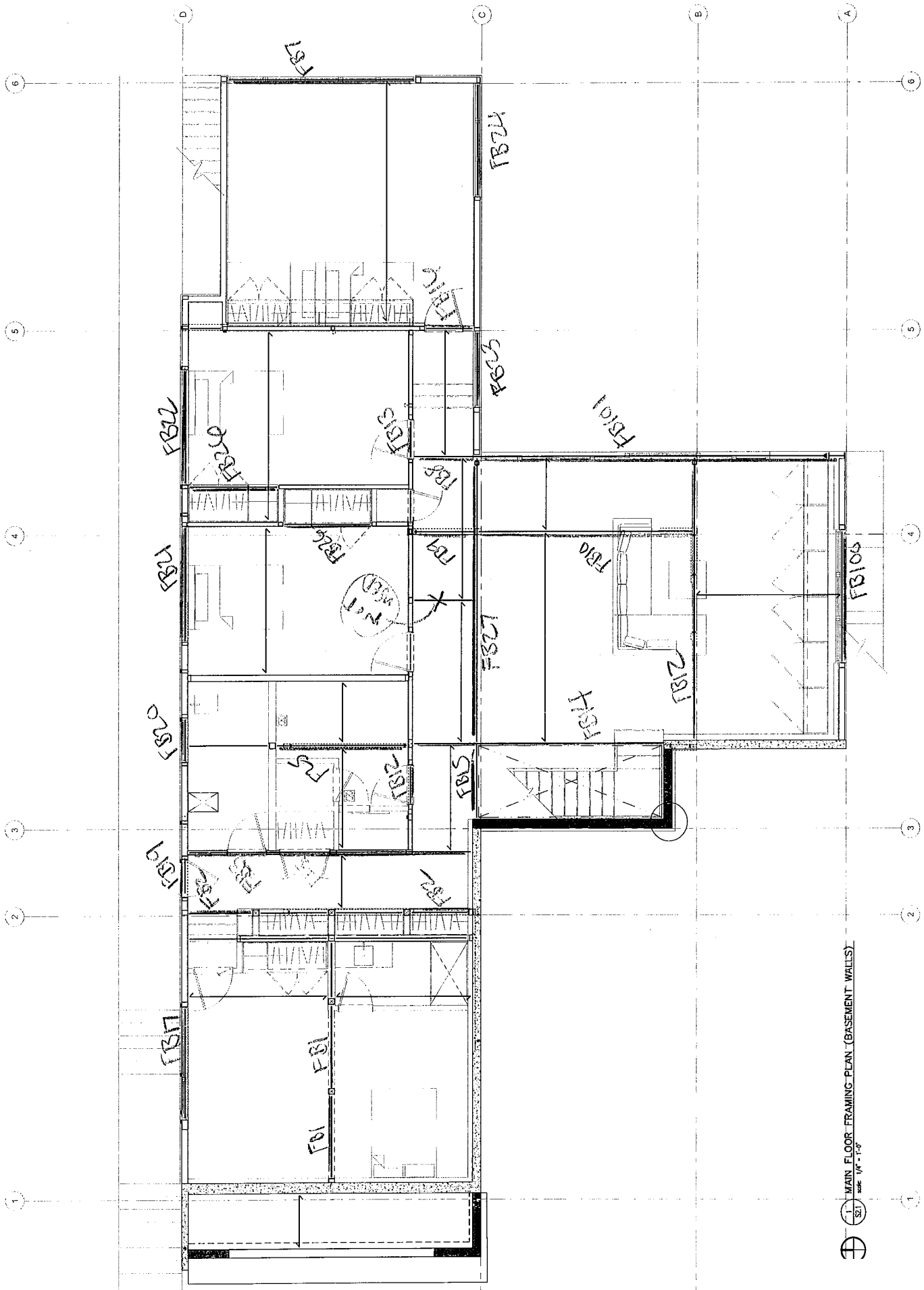
Seattle, Washington 98101-2447
tel 206 624 4760 | fax 447 6971

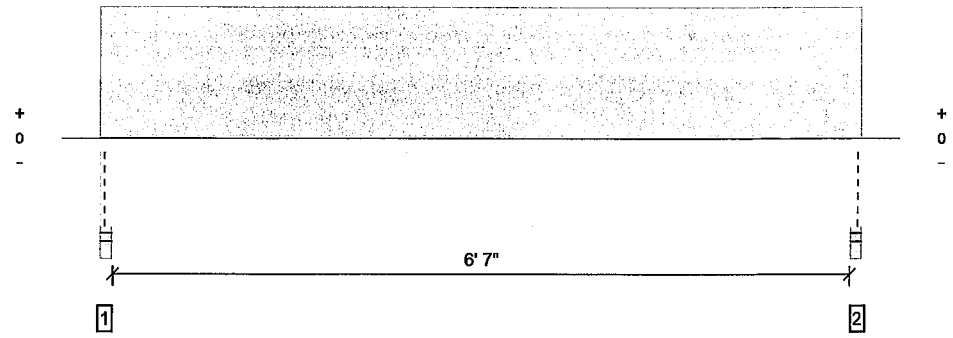


1 MAIN FLOOR FRAMING PLAN (BASEMENT WALLS)
S2.1 scale: 1/4" = 1'-0"

FORTE® **MEMBER REPORT** *Level-1ST, Floor: Drop Beam FB1* **PASSED**

1 piece(s) 3 1/2" x 7 1/2" 24F-V8 DF Glulam

Overall Length: 7' 2"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3167 @ 2"	7656 (3.50")	Passed (41%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2357 @ 11"	4638	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	5159 @ 3' 7"	6563	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.100 @ 3' 7"	0.228	Passed (L/823)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.196 @ 3' 7"	0.342	Passed (L/419)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 7' 2" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 7' 2" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 6' 10".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Support (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	3.50"	3.50"	1.50"	1555	1613	3168	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	1555	1613	3168	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 7' 2"	N/A	6.4		
1 - Uniform (PSF)	0 to 7' 2" (Top)	11' 3"	38.0	40.0	Residential - Living Areas

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Refer to current Weyerhaeuser literature for installation details. (www.woodbywy.com) Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC ES under technical reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports refer to http://www.woodbywy.com/services/s_CodeReports.aspx.

The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

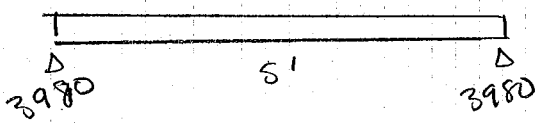
SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Wes Isbell Harriott Valentine Engineers (20) 662-4476 wisbell@harriottvalentine.com	

BEAM UPDATE

FB2

$w_{roof} = 7' \times 50\,psf = 350$
$w_{2nd} = 12' \times 85\,psf = 1020$
$w_{floor} = 2.5' \times 85\,psf = 213$
} 1583 plf



$V = 3.98^{k}$ $\quad V_u = 8.36^{k}$

$M = 4.95^{k\text{-}ft}$ $\quad M_u = 11.86^{k\text{-}ft}$

$D_{TL} = 0.06'' = \ell/940$

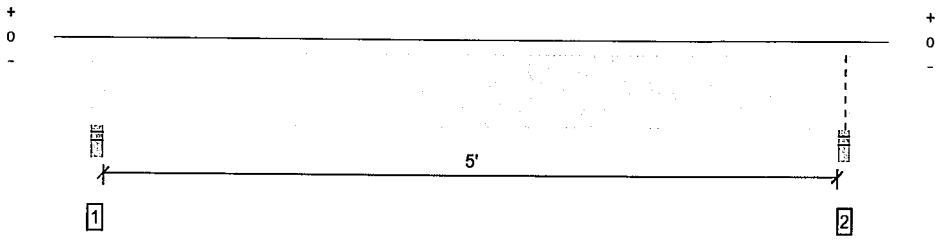
USE GL 5 1/2 x 7 1/2

1932 First Avenue, Suite 720
Seattle, Washington 98101-2447
tel. 206 624 4760 | fax 447 6971

FORTE® **MEMBER REPORT** *Level-1ST, Drop Beam FB3* **PASSED**

1 piece(s) 3 1/2" x 7 1/2" 24F-V8 DF Glulam

Overall Length: 5' 7"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.

Member Reaction (lbs)	1985 @ 2"	7656 (3.50")	Passed (26%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1333 @ 11"	4638	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	2449 @ 2' 9 1/2"	6563	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.023 @ 2' 9 1/2"	0.175	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.055 @ 2' 9 1/2"	0.262	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 5' 7" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 5' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

1 - Stud wall - DF	3.50"	3.50"	1.50"	1157	828	1985	None
2 - Stud wall - DF	3.50"	3.50"	1.50"	1157	828	1985	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

0 - Self Weight (PLF)	0 to 5' 7"	N/A	6.4		
1 - Uniform (PSF)	0 to 5' 7" (Top)	7' 5"	55.0	40.0	Residential - Living Areas

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The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Doug Clair HVE (206) 624-4760 dclair@harriottvalentine.com	

FB4
NOT
USED

1932 First Avenue, Suite 720
Seattle, Washington 98101-2447
tel. 206 624 4760 | fax 447 6971

FBS
NOT
USED

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tel. 206 624 4760 | fax 447 6971

FBG
NOT
USED

1932 First Avenue, Suite 720
Seattle, Washington 98101-2447
tel. 206 624 4760 | fax 447 6971

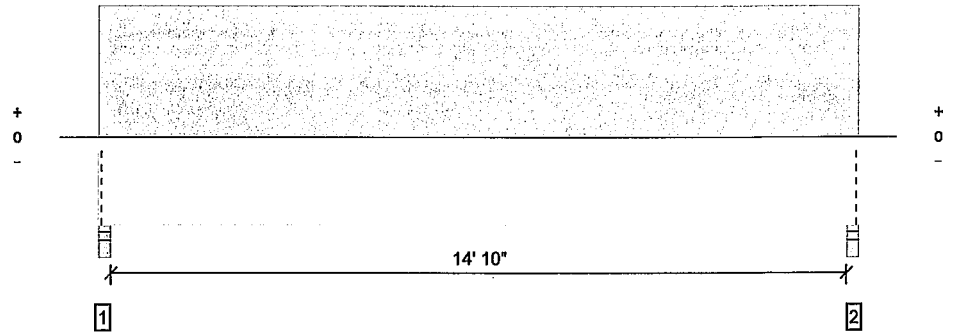
FORTE®

MEMBER REPORT *Level-1ST, Drop Beam FB7*

PASSED

1 piece(s) 5 1/2" x 13 1/2" 24F-V8 DF Glulam

Overall Length: 15' 5"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8031 @ 2"	12031 (3.50")	Passed (67%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	6555 @ 1' 5"	13118	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	29627 @ 7' 8 1/2"	33413	Passed (89%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.224 @ 7' 8 1/2"	0.503	Passed (L/809)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.598 @ 7' 8 1/2"	0.754	Passed (L/303)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 15' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 15' 5" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 15' 1".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)			
	Total	Available	Required	Dead	Floor Live	Total	Accessories
1 - Stud wall - DF	3.50"	3.50"	2.34"	5024	3006	8030	Blocking
2 - Stud wall - DF	3.50"	3.50"	2.34"	5024	3006	8030	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 15' 5"	N/A	18.0		
1 - Uniform (PSF)	0 to 15' 5" (Top)	9' 9"	65.0	40.0	Residential - Living Areas

Weyerhaeuser Notes

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The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Wes Isbell Harriott Valentine Engineers (20) 662-4476 wisbell@harriottvalentine.com	

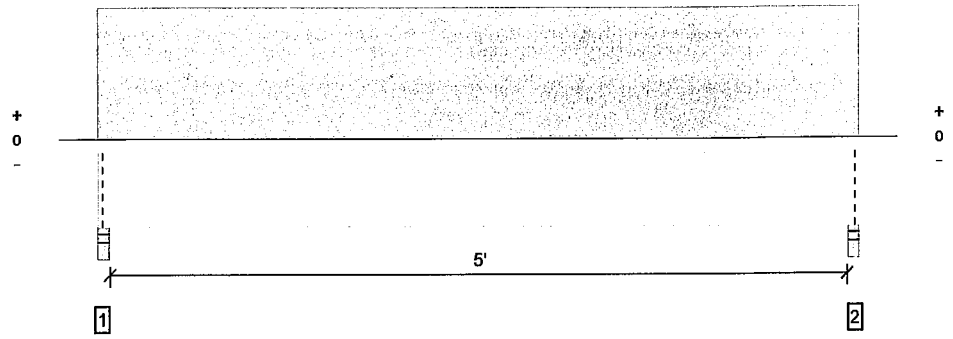
FORTE®

MEMBER REPORT *Level-1ST, Drop Beam FB8*

PASSED

1 piece(s) 3 1/2" x 7 1/2" 24F-V8 DF Glulam

Overall Length: 5' 7"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2829 @ 2"	7656 (3.50")	Passed (37%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1900 @ 11"	4638	Passed (41%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	3491 @ 2' 9 1/2"	6563	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.033 @ 2' 9 1/2"	0.175	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.078 @ 2' 9 1/2"	0.262	Passed (L/806)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 5' 7" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 5' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

Supports	Bearing			Load to Support (lbs)			
	Total	Available	Required	Dead	Floor Live	Total	Accessories
1 - Stud wall - DF	3.50"	3.50"	1.50"	1645	1184	2829	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	1645	1184	2829	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 5' 7"	N/A	6.4		
1 - Uniform (PSF)	0 to 5' 7" (Top)	10' 7 3/16"	55.0	40.0	Residential - Living Areas

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The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

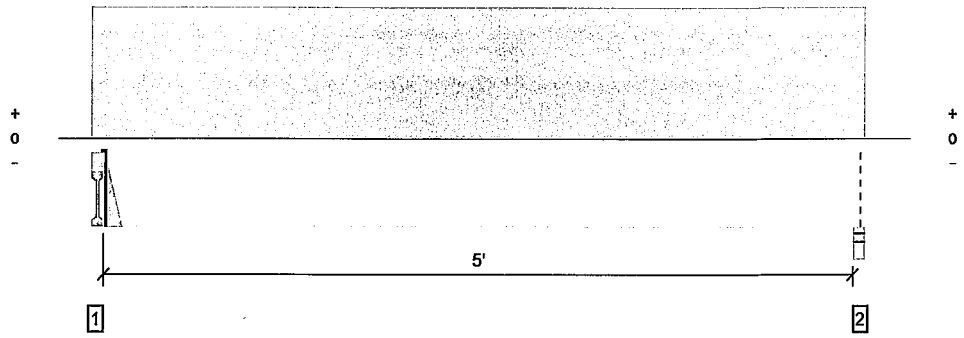
Forte Software Operator	Job Notes
Wes Isbell Harriott Valentine Engineers (20) 662-4476 wisbell@harriottvalentine.com	

Forte v5.2, D

FORTE® **MEMBER REPORT** *Level-1ST, Drop Beam FB9* **PASSED**

1 piece(s) 3 1/2" x 7 1/2" 24F-V8 DF Glulam

Overall Length: 5' 7"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2025 @ 3 1/2"	3413 (1.50")	Passed (59%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1531 @ 11"	4638	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	2594 @ 2' 6 3/4"	6563	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.023 @ 2' 10 1/4"	0.171	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.055 @ 2' 10 1/4"	0.256	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 4" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 5' 4" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 5' 1 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)			
	Total	Available	Required	Dead	Floor Live	Total	Accessories
1 - Hanger on Single 2X DF plate	3.50"	Hanger[1]	1.50"	1311	942	2253	See note [1]
2 - Stud wall - DF	3.50"	3.50"	1.50"	1256	901	2157	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Connectors: Simpson Strong-Tie Connectors

Support	Model	Seat Length	Top Nails	Face Nails	Member Nails	Accessories
1 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 5' 7"	N/A	6.4		
1 - Uniform (PSF)	0 to 5' 7" (Top)	8' 3"	55.0	40.0	Residential - Living Areas

Weyerhaeuser Notes

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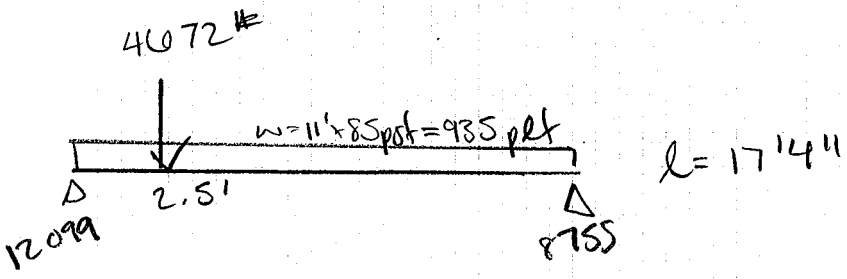
The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Wes Isbell Harriott Valentine Engineers (20) 662-4476 wisbell@harriottvalentine.com	

BEAM DESIGN

FB10



U=12.10^{k} U_k=67.4^{k}

M=41.18^{k}-ft M_n=113.77^{k}-ft

Δ_L= 0.27" = ℓ/770

Δ_L= 0.13" = ℓ/>1000

USE W12x35

1932 First Avenue, Suite 720
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tel. 206 624 4760 | fax 447 6971

FB11
NOT
USED

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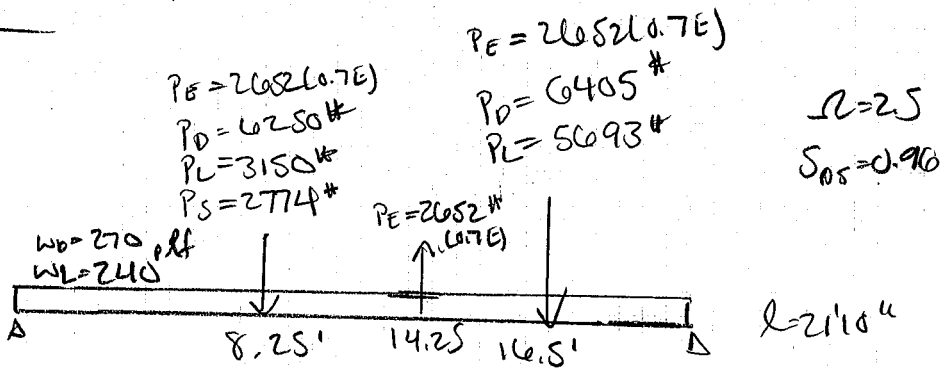
BEAM DESIGN

FB12



D	8065	M = 58.37	$\Delta_D = 0.55''$	9825
L	5944	M = 42.49	$\Delta_L = 0.40''$	8114
S	1736	M = 14.29		1040
E	1455	M = 11.50		1217
ΩE	3637	M = 28.75		3043

D + L
$U = 17.94^k$
$M = 100.80^{k\text{-}ft}$
$U_n = 67.4^k$
$M_n = 113.77^{k\text{-}ft}$
$\Delta_{TL} = 0.95'' = \ell/265$
$\Delta_L = 0.40'' = \ell/654$

D + 0.75(L + S)
$U = 16.71^k$
$M = 100.96^{k\text{-}ft}$
$U_n = 67.4^k$
$M_n = 113.77^{k\text{-}ft}$

D(1 + 0.14S_{DS}) + 0.75(0.7E + L + S)
$U = 19.98$
$M = 128.40$
$U_n = 81^k$
$M_n = 136.5$ ← W1 20% INCREASE PER ASCE 12.4.3.3

USE W12x35
CAMBER BEAM 3/4"

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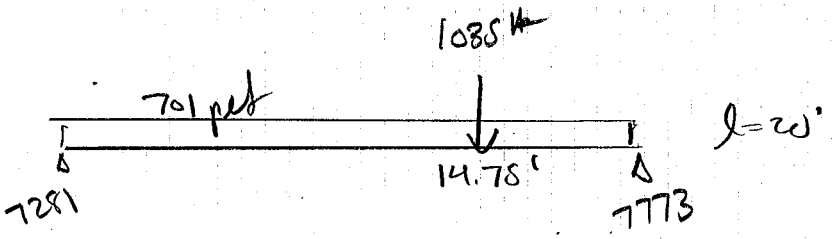
BEAM DESIGN

FB14



$U = 7.77^{k}$

$M = 37.82^{k-ft}$

$U_L = 100^{k}$

$M_L = 89.82^{k-ft}$

$\Delta_{D+L} = 0.44" = \ell/545$

USE MC12x35

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BEAM DESIGN

FB1S W12x35 FINE BY INSPECTION

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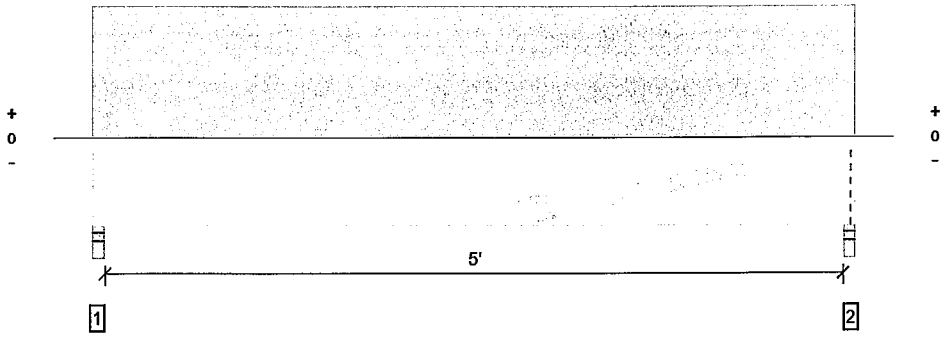
FORTE®

MEMBER REPORT *Level-1ST, Drop Beam FB16*

PASSED

1 piece(s) 3 1/2" x 7 1/2" 24F-V8 DF Glulam

Overall Length: 5' 7"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4129 @ 2"	7656 (3.50")	Passed (54%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2773 @ 11"	4638	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	5095 @ 2' 9 1/2"	6563	Passed (78%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.045 @ 2' 9 1/2"	0.175	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.114 @ 2' 9 1/2"	0.262	Passed (L/552)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 5' 7" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 5' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)			
	Total	Available	Required	Dead	Floor Live	Total	Accessories
1 - Stud wall - DF	3.50"	3.50"	1.89"	2509	1619	4128	None
2 - Stud wall - DF	3.50"	3.50"	1.89"	2509	1619	4128	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 5' 7"	N/A	6.4		
1 - Uniform (PSF)	0 to 5' 7" (Top)	5'	55.0	40.0	Residential - Living Areas
2 - Uniform (PSF)	0 to 5' 7" (Top)	9' 6"	65.0	40.0	

Weyerhaeuser Notes

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The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

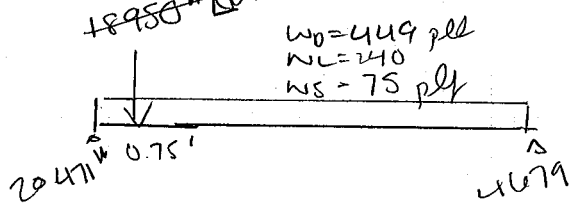
Forte Software Operator	Job Notes
Wes Isbell Harriott Valentine Engineers (20) 662-4476 wisbell@harriottvalentine.com	

BEAM DESIGN

~~FB18~~

FB17

~~18950# [illegible] 0.75(4.5)~~ 12.033 ← ADJ. FOR X/D



U = ~~20.471~~ 14.68^k V_u = 15.05^k

M_u = 15.89^{k-ft} M_u = 37.7^{k-ft}

D_{req} = 0.07^u · l/933

USE GL 6"x13"

REDUCE SHEAR BY X/D @ SUPPORT

dist from support

ASSUMED ~~12"~~ 13.5" DEPTH

1932 First Avenue, Suite 720
Seattle, Washington 98101-2447
tel. 206 624 4760 | fax 447 6971

FB18 ~~[illegible]~~

NOT USED

~~[illegible]~~

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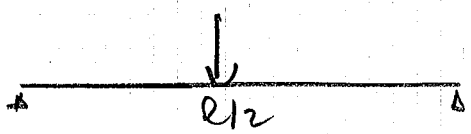
tel. 206 624 4760 | fax 447 6971

BEAM DESIGN

FB20

$P_D = 3937\#$
$P_L = 1120\#$
$P_S = 3346\#$



$l = 3'9"$

D	1969	M=3.69k-ft	1969
L	560	M=1.05k-ft	560
S	1673	M=3.14k-ft	1673

D+L V=2.53k M=4.75k-ft V_n=4.16 M_n=5.75 Δ_{12}=0.02"=l/>1100

USE (3)2x10

D+0.75(L+S) V=3.04k M=5.83k-ft V_n=5.82 M_n=8.89

USE (3)2x12

OR GL 3 1/2 x 7 1/2 V_n=5.32k M_n=7.55k-ft

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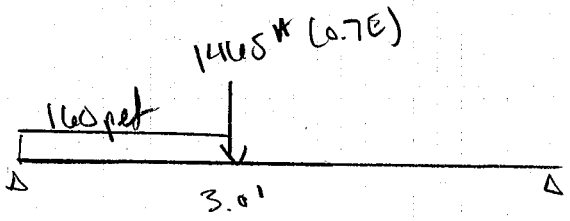
BEAM DESIGN

FB2



D+0.7E.

$U = 2045^{\#}$

$M = 2.52^{k\text{-}ft}$

$U_u = 3.50^{k}$

$M_u = 3.57^{k\text{-}ft}$

$C_D = 1.6$

456 (2)2×8

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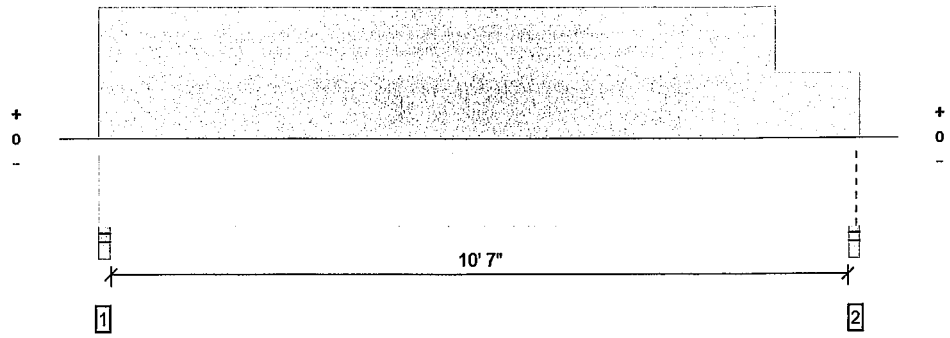
FORTE

MEMBER REPORT *Level-1ST, Drop Beam FB25*

PASSED

1 piece(s) 5 1/2" x 12" 24F-V8 DF Glulam

Overall Length: 11' 2"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6899 @ 2"	12031 (3.50")	Passed (57%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5362 @ 9' 10 1/2"	11660	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	18035 @ 5' 6 11/16"	26400	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.115 @ 5' 6 15/16"	0.361	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.267 @ 5' 6 15/16"	0.542	Passed (L/487)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 11' 2" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 11' 2" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 10' 10".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)			
	Total	Available	Required	Dead	Floor Live	Total	Accessories
1 - Stud wall - DF	3.50"	3.50"	2.01"	3918	2981	6899	None
2 - Stud wall - DF	3.50"	3.50"	1.80"	3534	2662	6196	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 11' 2"	N/A	16.0		
1 - Uniform (PSF)	0 to 11' 2" (Top)	6' 5"	55.0	40.0	Residential - Living Areas
2 - Uniform (PSF)	0 to 9' 11" (Top)	7'	48.0	40.0	

Weyerhaeuser Notes

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The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

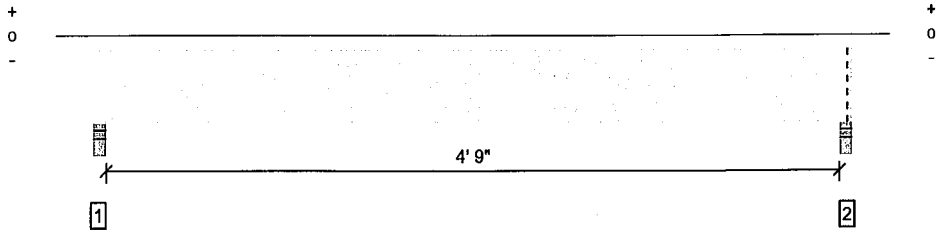
SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Wes Isbell Harriott Valentine Engineers (20) 662-4476 wisbell@harriottvalentine.com	

FORTE® **MEMBER REPORT** *Level-1ST, Drop Beam FB26* **PASSED**

1 piece(s) 3 1/2" x 7 1/2" 24F-V4 DF Glulam

Overall Length: 5' 4"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.

Member Reaction (lbs)	3417 @ 2"	7656 (3.50")	Passed (45%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2242 @ 11"	4638	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	4004 @ 2' 8"	6563	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.038 @ 2' 8"	0.167	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.081 @ 2' 8"	0.250	Passed (L/737)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 4" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 5' 4" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 5'.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

1 - Stud wall - DF	3.50"	3.50"	1.56"	1817	1600	3417	None
2 - Stud wall - DF	3.50"	3.50"	1.56"	1817	1600	3417	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

0 - Self Weight (PLF)	0 to 5' 4"	N/A	6.4		
1 - Uniform (PSF)	0 to 5' 4" (Top)	15'	45.0	40.0	Residential - Living Areas

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The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Doug Clair HVE (206) 624-4760 dclair@harriottvalentine com	

BEAM DESIGN

$P_E = 106000^{\#}(0.7E)$

$P_D = 7678^{\#}$

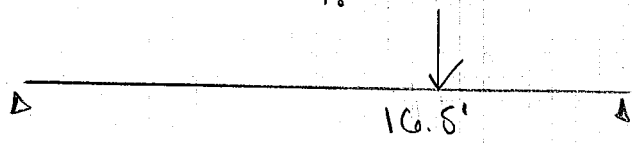
$P_L = 6910^{\#}$

$P_S = 1850^{\#}$

$\Omega = 2.5$

$S_{DS} = 0.96$

FB27



D	1919	M = 31.67	5760	Δ_D = 0.324"
L	1716	M = 28.31	5199	Δ_L = 0.22"
S	460	M = 7.60	1396	Δ_S = 0.060"
E	2650	M = 43.72"	7950	
2E	6625	M = 109.8	19875	

D + L (L) U = 10.87" U_n =

M_u = 59.98"/ft M_n =

Δ_{TL} = 0.46" = ℓ/

USE W12x35

$(1 + S_{DS}0.14)D$
~~$1 + \Omega(0.7E)$~~ U = 25.63" U_n = 86.22"

M = ~~410.97~~ 145.23 M_n = 153.29

→ WITH 20% INCREASE PER AISC 7-10 12.4.3.3

$(1 + 0.105 S_{DS})D$
$+ 0.75(L + S + 0.7E)$ U = 26.09" U_n = 86.22"

M = 143.76"-k/ft M_n = 153.29"

USE W12x35 ✓

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BEAM DESIGN

PB28

NOT USED

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FB29
NOT
USED

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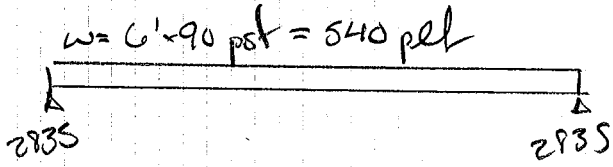
BEAM DESIGN

FB100



ℓ = 10'6"

V = 2,844#
M = 7.44 k-ft

V_W = 5.67#
M_W = 9.45 k-ft
Δ_{TL} = 0.39" = ℓ/326
Δ_L = 0.17" = ℓ/726

USE 6L 3½x9

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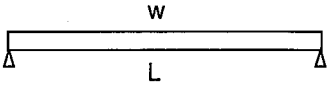
LS RL

BEAMS (SIMPLE SPAN UNIFORM LOAD)

CONCRETE 150 PLF



(floor) total floor = 85 psf; live load = 40 psf

(roof) total roof = 50 psf; snow load = 25 psf

location	criteria		demand		capacity		
BR4	w (total) =	85 plf	V =	0.09 k	Vr =	2.18 k	
BR5	w (live) =	40 plf	M =	0.04 k-ft	Mr =	2.23 k-ft	
SB18	L =	2.00 ft	EI (total) =	3.06E+05 lb-in2	EI =	1.24E+08 lb-in2	
SB19	floor =	1.00 ft	EI (live) =	2.16E+05 lb-in2	d (total) =	0.00 in = L/	####
FB20	roof =	0.00 ft			d (live) =	0.00 in = L/	####
	wall =	0.00 ft					
					use	**(2) 2x8**	

location	criteria		demand		capacity		
SB21	w (total) =	85 plf	V =	0.62 k	Vr =	2.18 k	
SB22	w (live) =	40 plf	M =	2.26 k-ft	Mr =	2.23 k-ft	
	L =	14.60 ft	EI (total) =	1.19E+08 lb-in2	EI =	1.24E+08 lb-in2	
	floor =	1.00 ft	EI (live) =	8.40E+07 lb-in2	d (total) =	0.70 in = L/	250
	roof =	0.00 ft			d (live) =	0.33 in = L/	531
	wall =	0.00 ft					
					use	**(2) 2x8**	

location	criteria		demand		capacity		
→ FB23	w (total) =	85 plf	V =	0.38 k	Vr =	2.18 k	
→ FB24	w (live) =	40 plf	M =	0.86 k-ft	Mr =	2.23 k-ft	
	L =	9.00 ft	EI (total) =	2.79E+07 lb-in2	EI =	1.24E+08 lb-in2	
	floor =	1.00 ft	EI (live) =	1.97E+07 lb-in2	d (total) =	0.10 in = L/	1066
	roof =	0.00 ft			d (live) =	0.05 in = L/	2266
	wall =	0.00 ft					
					use	**(2) 2x8**	

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(floor)
total floor = 85 psf
live load = 40 psf

location	criteria		demand		capacity		
FB2	w (total) =	287 plf	V =	0.55 k	Vr =	2.18 k	
	w (live) =	135 plf	M =	0.52 k-ft	Mr =	2.23 k-ft	
	L =	3.80 ft	EI (total) =	7.08E+06 lb-in2	EI =	1.24E+08 lb-in2	
	floor =	3.38 ft	EI (live) =	5.00E+06 lb-in2	d (total) =	0.01 in = L/	4198
	roof =	0.00 ft			d (live) =	0.01 in = L/	8920
	wall =	0.00 ft					
					use	**(2) 2x8**	
FB13	w (total) =	374 plf	V =	0.56 k	Vr =	2.18 k	
	w (live) =	176 plf	M =	0.42 k-ft	Mr =	2.23 k-ft	
	L =	3.00 ft	EI (total) =	4.54E+06 lb-in2	EI =	1.24E+08 lb-in2	
	floor =	4.40 ft	EI (live) =	3.21E+06 lb-in2	d (total) =	0.01 in = L/	6544
	roof =	0.00 ft			d (live) =	0.00 in = L/	####
	wall =	0.00 ft					
					use	**(2) 2x8**	
~~FB21~~	~~w (total) =~~	~~401 plf~~	~~V =~~	~~1.85 k~~	~~Vr =~~	~~2.78 k~~	
	~~w (live) =~~	~~176 plf~~	~~M =~~	~~4.29 k-ft~~	~~Mr =~~	~~3.33 k-ft~~	
	~~L =~~	~~9.25 ft~~	~~EI (total) =~~	~~1.43E+08 lb-in2~~	~~EI =~~	~~2.57E+08 lb-in2~~	
	~~floor =~~	~~4.40 ft~~	~~EI (live) =~~	~~9.40E+07 lb-in2~~	~~d (total) =~~	~~0.26 in = L/~~	~~432~~
	~~roof =~~	~~0.00 ft~~			~~d (live) =~~	~~0.11 in = L/~~	~~985~~
	~~wall =~~	~~3.00 ft~~					
					~~**use**~~	~~**(2) 2x10**~~	
FB22	w (total) =	157 plf	V =	0.76 k	Vr =	~~2.78 k~~ 2.18	
	w (live) =	40 plf	M =	1.85 k-ft	Mr =	~~3.33 k-ft~~ 2.23	
	L =	9.70 ft	EI (total) =	6.45E+07 lb-in2	EI =	2.57E+08 lb-in2	
	floor =	1.00 ft	EI (live) =	2.46E+07 lb-in2	d (total) =	0.25" ~~0.12~~ in = L/	~~957~~ 480
	roof =	0.00 ft			d (live) =	0.08" ~~0.03~~ in = L/	~~3757~~ 1920
	wall =	8.00 ft					
					use	~~**(2) 2x10**~~ (2) 2x6	

(floor)
total floor = 85 psf
live load = 40 psf

location	criteria		demand		capacity		
FB19	w (total) =	529 plf	V =	0.86 k	Vr =	2.18 k	
	w (live) =	232 plf	M =	0.70 k-ft	Mr =	2.23 k-ft	
	L =	3.25 ft	EI (total) =	8.17E+06 lb-in2	EI =	1.24E+08 lb-in2	
	floor =	5.80 ft	EI (live) =	5.38E+06 lb-in2	d (total) =	0.01 in = L/	3639
	roof =	0.00 ft			d (live) =	0.00 in = L/	8297
	wall =	4.00 ft					
					use	**(2) 2x8**	

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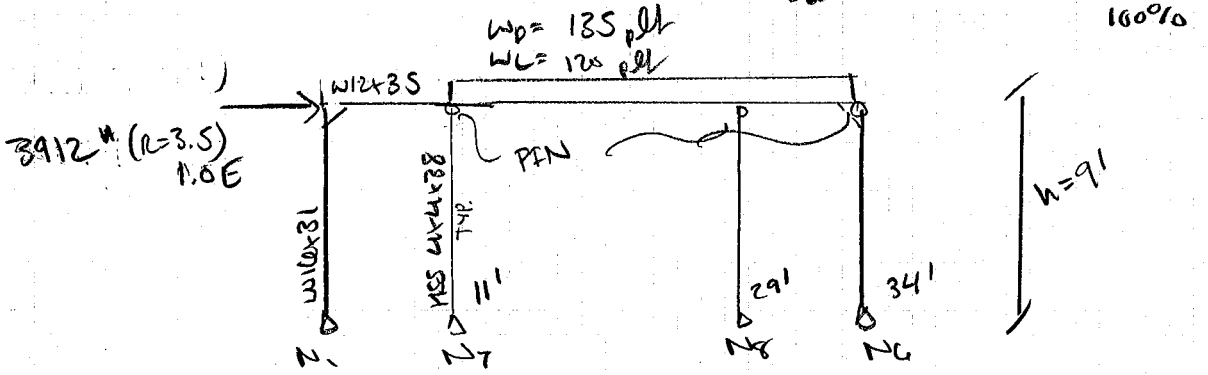
BEAM DESIGN / MOMENT FRAMES

TB101

MF TAKES MAIN FLOOR DECK ONLY; N SW ~~TAKES PER~~ DESIGNED TO TAKE LOAD 100%



$R = 322\ ft^2 (45\ psf\ DL)(0.27) = 3912^{\#}\ (1.0E)$
$= 2738^{\#}\ (0.7E)$

DRIFT: $\Delta_{TL} = 0.028''$

$ALLOWABLE = \frac{0.025 h_{wx}}{C_D} = \frac{0.025(9'\times 12'')}{3.0} = 0.90'' > 0.63''$ ✓

MEMBER CONDITION

W10x31	POST:	$V = 2.57^k$ $M = 28.27^{k\text{-}ft}$	DCR: 0.04 DCR: 0.35	
W12x35	BEAM	$V = 2.57^k$ $M = 28.27^{k\text{-}ft}$	DCR: 0.04 DCR: 0.35	$\Delta_{TL} = 0.10''$ $= L/>1000$ ✓
HSS	POST	$V = 1.22^k$ $M = 5.46^{k\text{-}ft}$	DCR = 0.02 DCR = 0.10	

REACTIONS

N_1: -2.57^k $\quad$ N_8: $+2.9^k$

N_7: $+3.95^k$ $\quad$ N_6: 0.85^k

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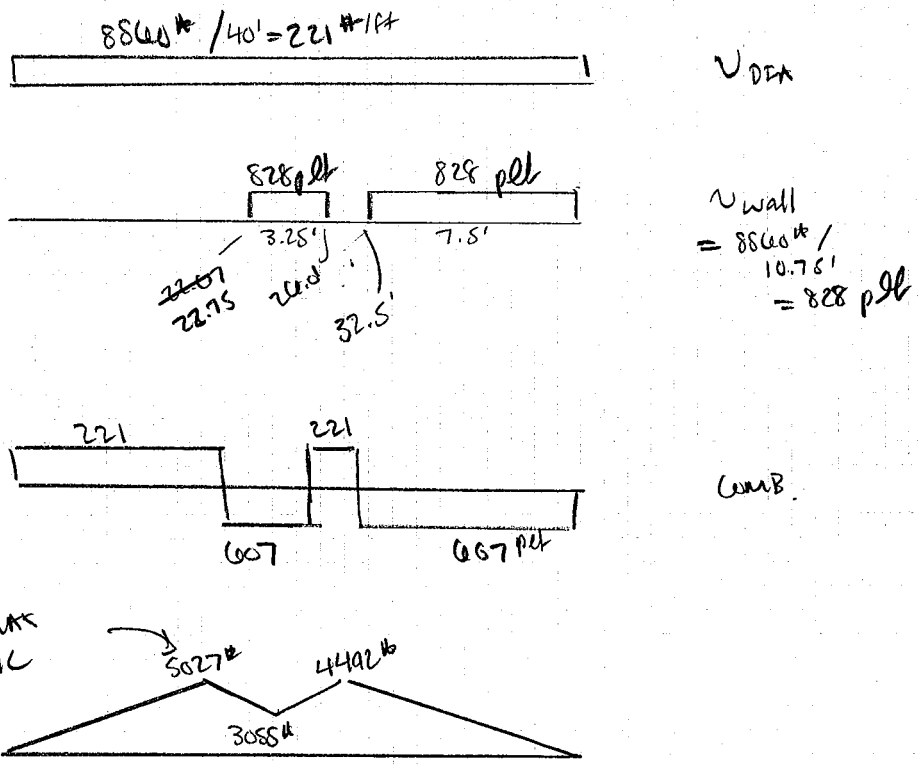
MF DRAG STRUT | STRAP

LINE (4) $U_{TOTAL} = 8800^{\#}$



COMP ⇒ SLT S $d = 6.66"$ $b = 12"$ TYP

$f_v = 135\ psi$

$U_n = 2/3 F_v A = 2/3(135)(6.66)(12") = 7192^{\#} > 5027^{\#}$

TENS ⇒ USP CMSTCH STRAP CONT.

SDS SCREWS (DET 8/S4.3)

1/4"Ø x 8" LONG @ 4" o.c. ⇒ $Z = \frac{250^{\#}(1.0)}{1.25} \times \frac{12"}{4" o.c.} = 960\ plf > 828\ plf$ ✓

25% DECREASE FOR UERT OFFSET

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Attachment D

Structural Calculations for Correction Notice Item S2.2 – Notes 3,9

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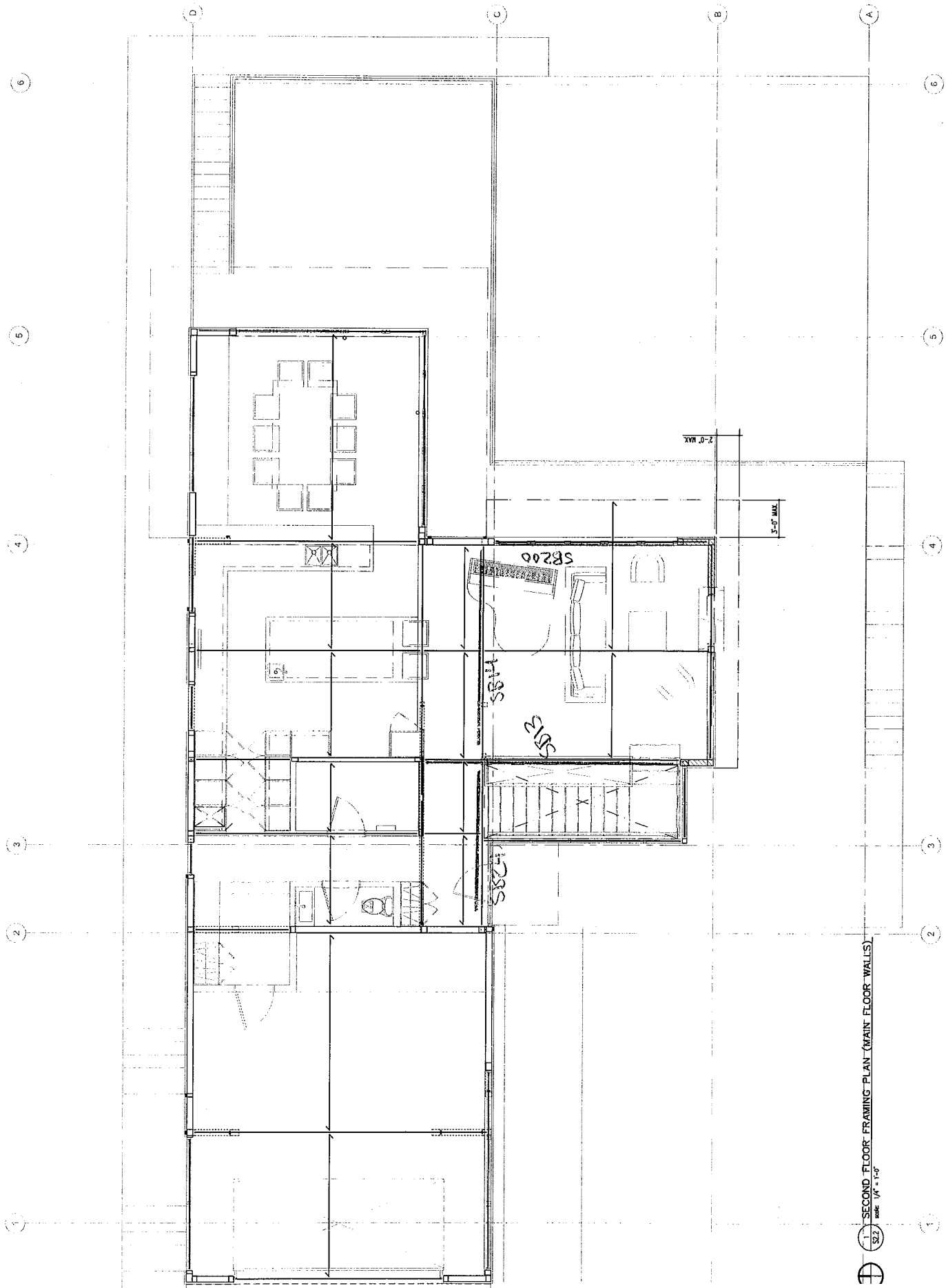
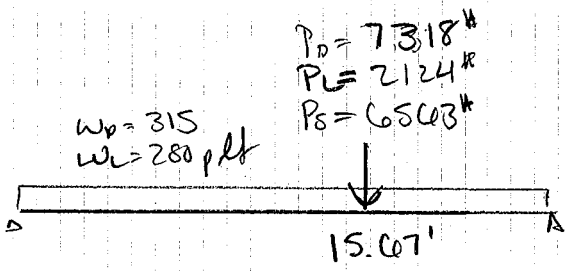


1 S2.2 SECOND FLOOR FRAMING PLAN (MAIN FLOOR WALLS)
SCALE: 1/4" = 1'-0"

BEAM DESIGN

SB13



ℓ = 20'6"

D	4952	M = 38.94	8822	$\Delta_D = \frac{0.44"}{0.38"}$
L	3370	M = 26.29	14493	$\Delta_L = \frac{0.25"}{0.21"}$
S	1550	M = 24.27	5026	$\Delta_S = \frac{0.23"}{= 0.19"}$

D+L V = 13.82 k, M = 59.23 k-ft U_n = 100.24 k ✓, M_n = 89.82 k-ft ✓, Δ_{D+L} = 0.69" = ℓ/356

USE MC12x35

D+S V = 13.85 k, M = 63.21 k-ft ✓ ✓

D+0.75(L+S) V = 15.96 k, M = 72.06 k-ft ✓ ✓

USE MC12x35

~~CHANGE~~

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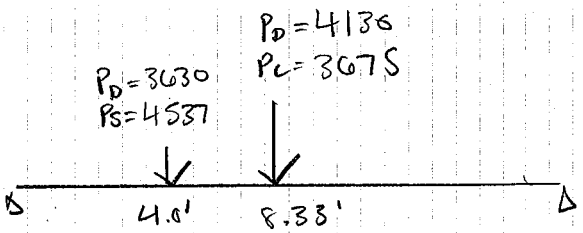
LS

BEAM DESIGN

SB14



D	4825	M= 24.48 k-ft	2935	Δ_D=0.16"
L	1839	M= 15.32 k-ft	1836	Δ_L=0.09"
S	3448	M= 13.80 k-ft	1690	Δ_S=0.07"

D+L V = 6.67 k, M = 39.8 k-ft V_n = 57.45 k, M_n = 96.30 k-ft, Δ_{D+L} = 0.25" = ℓ/800

USE ~~W18~~ W12x30

D+S V = 8.27 k, M = 38.28 k-ft V_n = 57.45 k, M_n = 96.30 k-ft, Δ_S = 0.07" = ℓ/1

USE W12x30

D+0.75(L+S) V = 8.79 k, M = 46.32 k-ft V_n = 57.45 k, M_n = 96.30 k-ft

USE W12x30

LS

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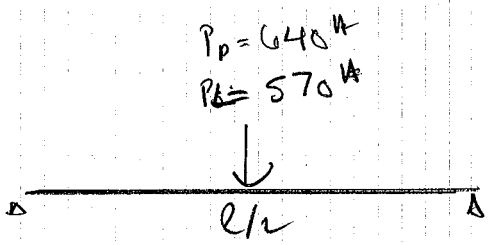
BEAM DESIGN

SB24



D	320	$M = 2.08^{k\text{-}ft}$	320	$\Delta_D = 0.01''$
L	285	$M = 1.35^{k\text{-}ft}$	285	$\Delta_L = 0.01''$

D+L $\quad U = 0.61^{k}$ $\quad U_u = 57.45^{k}$

$M = 3.43^{k\text{-}ft}$ $\quad M_u = 96.30^{k\text{-}ft}$

$\Delta_{D+L} = 0.02'' = \ell/>1000$

USE W12×30

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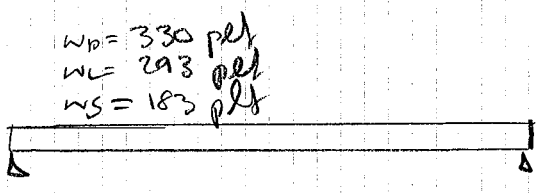
LS

BEAM DESIGN

DL = 45 psf
LL = 40 psf
SL = 25 psf

SB200



D	2433	$M_D = 8.97^{k\text{-}ft}$	2433	$\Delta_D = 0.25"$
L	2160	$M_L = 7.97^{k\text{-}ft}$	2160	$\Delta_L = 0.22"$ $= \ell/804$
S	1349	$M_S = 4.98^{k\text{-}ft}$	1349	$\Delta_S = 0.14"$

D+L $V = 4.59^k$, $M = 16.94^{k\text{-}ft}$ $V_u = 11.66^k$, $M_n = 20.21^{k\text{-}ft}$, $\Delta_{D+L} = 0.47" = \ell/376$

USE GL 5 1/2 × 12

D+0.75(L+S) $V = 5.04^k$, $M = 18.68^{k\text{-}ft}$ $V_u = 13.37^k$, $M_n = 38.14^{k\text{-}ft}$

FOR Δ CRITERIA OF 3/8" D+L

⇒ USE W12 × 30 $\Delta_{D+L} = 0.10" = \ell/>1000$

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LS

Attachment E

Structural Calculations for Correction Notice Item S2.2 – Note 5

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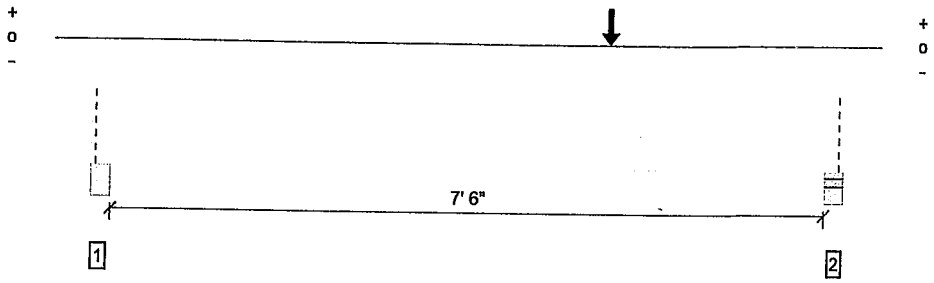
FORTE MEMBER REPORT *Level-2ND FLOOR, Drop Beam-SB20* **PASSED**

1 piece(s) 5 1/2" x 12" 24F-V8 DF Glulam

Overall Length: 8' 5"



All locations are measured from the outside face of left support (or left cantilever end).All dimensions are horizontal.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5815 @ 8' 1"	18906 (5.50")	Passed (31%)	--	1.0 D (All Spans)
Shear (lbs)	5791 @ 6' 11 1/2"	10494	Passed (55%)	0.90	1.0 D (All Spans)
Pos Moment (Ft-lbs)	13512 @ 5' 9"	23760	Passed (57%)	0.90	1.0 D (All Spans)
Live Load Defl. (in)	0.000 @ 0	0.258	Passed (2L/999+)	--	1.0 D (All Spans)
Total Load Defl. (in)	0.079 @ 4' 6 7/8"	0.387	Passed (L/999+)	--	1.0 D (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 8' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 5" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 7' 9".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)		Accessories
	Total	Available	Required	Dead	Total	
1 - Column - DF	5.50"	5.50"	1.50"	2543	2543	Blocking
2 - Stud wall - DF	5.50"	5.50"	1.69"	5815	5815	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Comments
0 - Self Weight (PLF)	0 to 8' 5"	N/A	16.0	
1 - Point (lb)	5' 9" (Top)	N/A	8223	

Weyerhaeuser Notes

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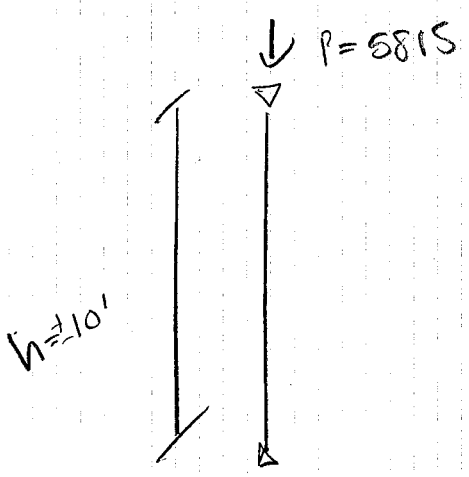
The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Wes Isbell Harriott Valentine Engineers (20) 662-4476 wisbell@harriottvalentine.com	

POST FOR @ SB20 - EAST REACTION



USE (2)2x6 POST

Species:	HF stud							
Size:	2x6							
Fc* =	800 psi		Fc ⊥ =	405 psi				<< sill plate is Hem-Fir
E =	1.20E+06 psi							
c' =	0.8							
d =	5.5 in							
KcE =	0.3							
le (ft)	le (in)	FcE (psi)	F'c (psi)	(2)2x6 Pa (lb)	(3)2x6 Pa (lb)	(4)2x6 Pa (lb)	(5)2x6 Pa (lb)	
Pa (perp)				6683	10024	13365	16706	
8.00	96.00	1182	645	10642	15963	21284	26605	<< crushing governs up to a height of 12'-5" w/ Hem-Fir (8'-5" if Doug-Fir)
8.50	102.00	1047	620	10229	15343	20457	25572	
9.00	108.00	934	593	9788	14683	19577	24471	
9.50	114.00	838	565	9329	13994	18658	23323	
10.00	120.00	756	537	8860	13290	17720	22151	
10.50	126.00	686	509	8390	12586	16781	20976	
11.00	132.00	625	480	7928	11892	15856	19820	
11.50	138.00	572	453	7479	11219	14959	18699	
12.00	144.00	525	427	7049	10574	14099	17624	

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Attachment F

Structural Calculations for Correction Notice Item S2.2 – Note 6

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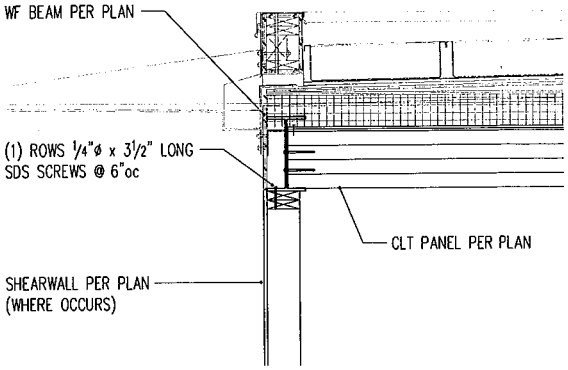
GRID LINE 5 COLLECTOR

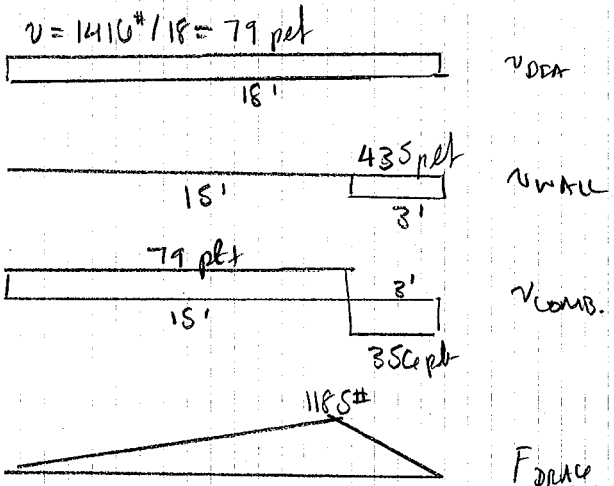
SEE 4/S4.3 FOR FRAMING
CALLOUTS IN COMMON



$R = 1416^{\#}$ (0.7E)

$\ell_{DIAPH} = 18.0'$

$\ell_{WALL} = 3.33'$



USE W12x30 AS COLLECTOR

$P_{n,comp} = F_{cr} A_g / \Omega = 8.40 ksi\,(10.3\,in^2)/1.67 = 51.85^{k} > 1.18^{k}$

$F_e = \pi^2 E/(KL/r)^2 = \frac{\pi^2(29000)}{\left[\frac{(1.0\times 18\times 12)}{1.52}\right]^2} = 9.58\ ksi$

$F_{cr} = 0.877 F_e$

$= 8.40 ksi$

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COLLECTOR CONT'D

→ HORIZONTAL → SDS 1/4"Ø x 5" LONG @ 24" o.c
(2) ROWS

→ (1) SDS → $Z_{||} = 300^{\#}(1.6) = 480^{\#}$ / SCREW
C_D

→ # SCREWS = $\frac{18' \times 12''}{24'' o.c}$ x (2) ROWS = 18 SCREWS

→ Σ FORCES = $18 \times 480^{\#} =$ ~~$480^{\#}$~~ $8640^{\#} > 1416^{\#}$ ✓

→ VERTICAL TO SW → SDS 1/4 x 3½" LONG @ 6" o.c

→ (1) SDS → $Z_{\perp} = 245^{\#}(1.6) = 392^{\#}$ / SCREW
C_D

→ # SCREWS = $\frac{3.25' \times 12''}{6'' o.c} =$ ~~6.5~~ 6 SCREWS

→ Σ FORCE = $6 \times 392 = 2352^{\#} > 1416^{\#}$ ✓

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Attachment G

Structural Calculations for Correction Notice Item S2.2 – Note 7

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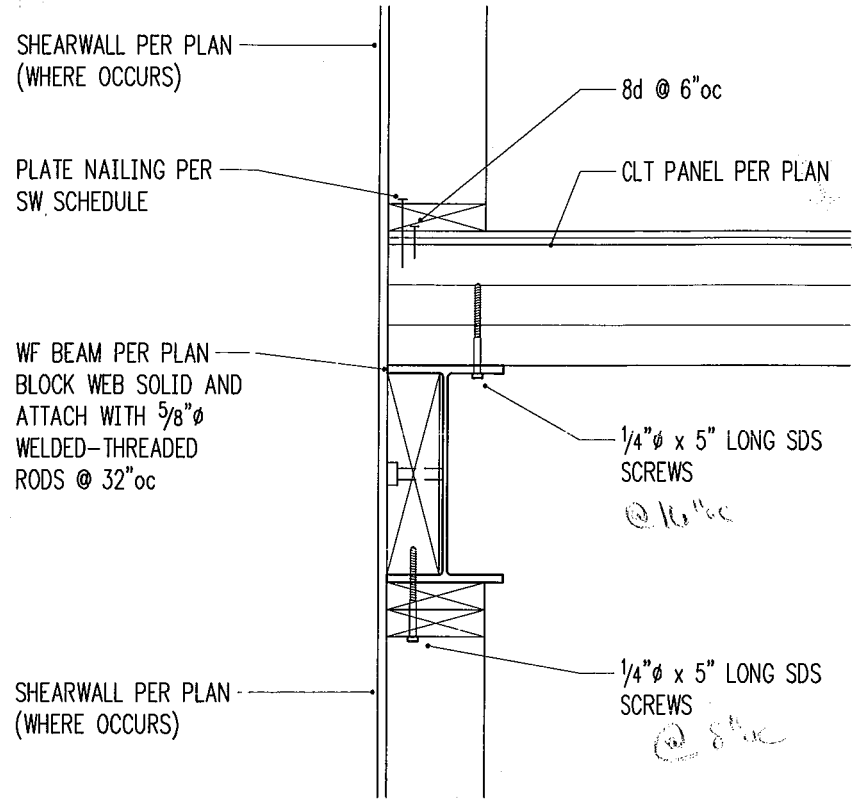
GRID LINE 4 COLLECTOR



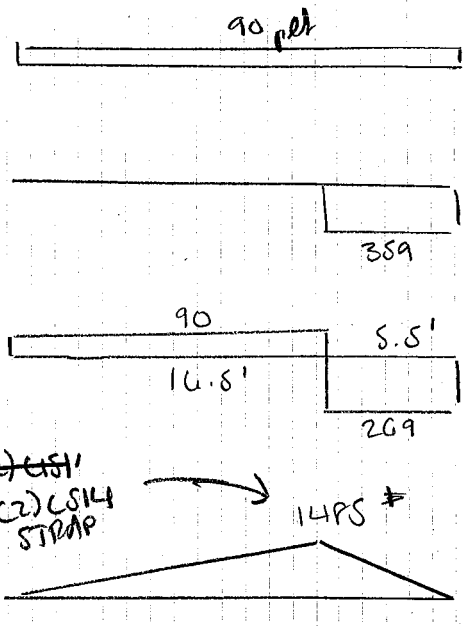
R = 1979 #

l_{WALL} = 5.5'

v_{WALL} = 359 plf

l_{DIAPH} = 22'

v_{DIAPH} = ~~50~~ 90 plf



WIDTH 30

ON GL 5'1x12

FINE BY

INSPECTION

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COLLECTOR SCREWS

$R = 1979^{\#}$

$\ell_{DIAPH} = 22'$

$\ell_{WALL} = 5.5'$

~~SLT~~ SLT TO WF

$1/4" \phi \times 5"$ LAG SDS $\Rightarrow$ $Z_{\perp} = 300^{\#}(1.6) = 480^{\#}$/screw

$\#\ \text{SCREWS} = \frac{1979^{\#}}{480^{\#}} = \cancel{4.12}\ 5\ \text{SCREWS}$

$\rightarrow \frac{\ell_{DIAPH}}{\#\ \text{screws}} = \frac{22' + 12"}{5\ \text{screws}} = 52"\text{oc}$

$\Rightarrow$ USE 16"oc

WF TO SW

$\#\ \text{SCREWS} = \frac{1979^{\#}}{480^{\#}} = 5\ \text{SCREWS}$

$\rightarrow \frac{\ell_{WALL}}{\#} = \frac{5.5' + 12"}{5} = \cancel{13.2"\text{oc}}$

USE 12"oc

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1

Attachment H

Structural Calculations for Correction Notice Item S2.3 – Note 2

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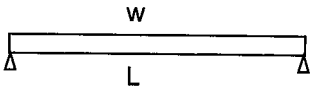
ROOF FRAMING PLAN (SECOND FLOOR WALLS)
scale: 1/4" = 1'-0"

BEAMS (SIMPLE SPAN UNIFORM LOAD)

ROOF



(snow)
total load = 45 psf
live load = 25 psf

location	criteria		demand		capacity		
				5.06 k			
BR1	w (total) =	675 plf	V =	~~5.26~~ k	Vr =	15.05 k	
	w (live) =	375 plf	M =	20.49 k-ft	Mr =	37.70 k-ft	
	L =	15.58 ft	EI (total) =	1.15E+09 lb-in2	EI =	2.03E+09 lb-in2	
	trib. =	15.00 ft	EI (live) =	9.58E+08 lb-in2	d (total) =	0.44 in = L/	424
					d (live) =	0.25 in = L/	763
					use	**GL 3.5x13.5**	

location	criteria		demand		capacity		
				3.24 k			
BR11	w (total) =	379 plf	V =	~~3.35~~ k	Vr =	16.70 k	
	w (live) =	210 plf	M =	14.78 k-ft	Mr =	46.06 k-ft	
	L =	17.67 ft	EI (total) =	9.40E+08 lb-in2	EI =	2.78E+09 lb-in2	
	trib. =	8.42 ft	EI (live) =	7.84E+08 lb-in2	d (total) =	0.30 in = L/	711
					d (live) =	0.17 in = L/	1279
					use	**GL 5.5x15**	

location	criteria		demand		capacity		
				4.05 k			
BR12	w (total) =	368 plf	V =	~~4.15~~ k	Vr =	24.60 k	
	w (live) =	204 plf	M =	23.46 k-ft	Mr =	78.31 k-ft	
	L =	22.60 ft	EI (total) =	1.91E+09 lb-in2	EI =	4.81E+09 lb-in2	
	trib. =	8.17 ft	EI (live) =	1.59E+09 lb-in2	d (total) =	0.45 in = L/	605
					d (live) =	0.25 in = L/	1089
					use	**GL 6.75x18**	

location	criteria		demand		capacity		
				3.12 k			
BR13	w (total) =	368 plf	V =	~~3.23~~ k	Vr =	16.70 k	
	w (live) =	204 plf	M =	14.20 k-ft	Mr =	46.06 k-ft	
	L =	17.58 ft	EI (total) =	8.99E+08 lb-in2	EI =	2.78E+09 lb-in2	
	trib. =	8.17 ft	EI (live) =	7.49E+08 lb-in2	d (total) =	0.28 in = L/	743
					d (live) =	0.16 in = L/	1338
					use	**GL 5.5x15**	

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location	criteria		demand		capacity		
				3.39 k			
BR16	w (total) =	450 plf	V =	~~3.53~~ k	Vr =	16.70 k	
	w (live) =	250 plf	M =	13.81 k-ft	Mr =	46.06 k-ft	
	L =	15.67 ft	EI (total) =	7.79E+08 lb-in2	EI =	2.78E+09 lb-in2	
	trib. =	10.00 ft	EI (live) =	6.49E+08 lb-in2	d (total) =	0.22 in = L/	858
					d (live) =	0.12 in = L/	1544
					use	**GL 5.5x15**	

location	criteria		demand		capacity		
				2.87 k			
BR17	w (total) =	379 plf	V =	~~2.98~~ k	Vr =	16.70 k	
	w (live) =	210 plf	M =	11.74 k-ft	Mr =	46.06 k-ft	
	L =	15.75 ft	EI (total) =	6.66E+08 lb-in2	EI =	2.78E+09 lb-in2	
	trib. =	8.42 ft	EI (live) =	5.55E+08 lb-in2	d (total) =	0.19 in = L/	1004
					d (live) =	0.10 in = L/	1806
					use	**GL 5.5x15**	

location	criteria		demand		capacity		
				4.13 k			
BR18	w (total) =	474 plf	V =	~~4.27~~ k	Vr =	24.60 k	
	w (live) =	264 plf	M =	19.21 k-ft	Mr =	78.31 k-ft	
	L =	18.00 ft	EI (total) =	1.24E+09 lb-in2	EI =	4.81E+09 lb-in2	
	trib. =	10.54 ft	EI (live) =	1.04E+09 lb-in2	d (total) =	0.23 in = L/	928
					d (live) =	0.13 in = L/	1670
					use	**GL 6.75x18**	

location	criteria		demand		capacity		
				2.79 k			
BR19	w (total) =	326 plf	V =	~~2.88~~ k	Vr =	238.02 k	
	w (live) =	181 plf	M =	12.73 k-ft	Mr =	96.81 k-ft	
	L =	17.67 ft	EI (total) =	8.10E+08 lb-in2	EI =	6.26E+09 lb-in2	
	trib. =	7.25 ft	EI (live) =	6.75E+08 lb-in2	d (total) =	0.11 in = L/	1856
					d (live) =	0.06 in = L/	3341
					use	**MC13x35**	

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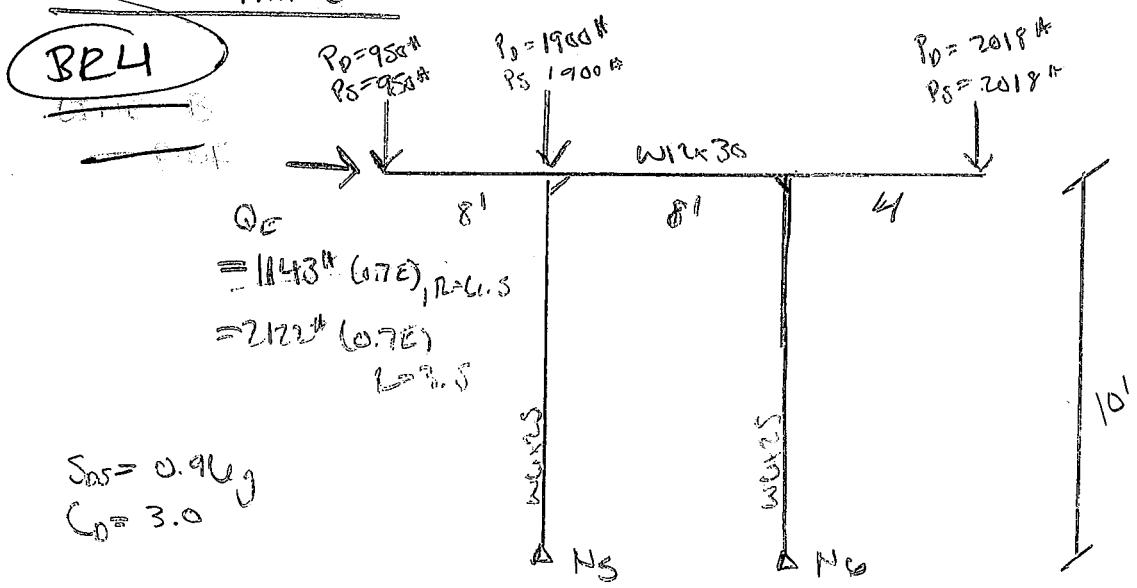
MOMENT FRAME

BR4



Q_E = 1143# (0.7E), R=6.5
= 2122# (0.7E)
R=3.5

S_{DS} = 0.96g
C_D = 3.0

ALLOWABLE DRIFT = $0.025 h_{sx}$
= 0.025(10'×12") = 3.0"

ACTUAL DRIFT = $\frac{\Delta C_d}{I} = \frac{0.6044(3.0")}{1.0}$ = 1.81" < 3.0" ✓

MEMBER FORCES

COLUMN W12x53 → U_{max} = 1.38^k
P_{max} = 73.478^k

BEAM W12x30 → U_{max} = 3.53^k
M_{max} = 21.85^{k-ft}
$\Delta_{DS,max\,reduced}$ = 3.177"
= 2/360 ✓

0.32 C BENDING

REACTIONS @ SHEAR WALLS

N5 → F_x = 1.38^k
F_y = +7.536^k
−0.972^k

N6 → F_x = 1.38^k
F_y = +6.28^k
−1.41^k

DIAPH → 2122#/250#/FT = 9 NAILS @ 2"c

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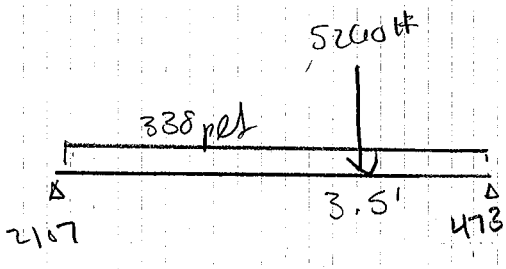
BEAM DESIGN

DL = 25 psf
SL = 25 psf

~~B1.1~~

B1.6



$\ell = 4'8''$

$U = 4.73^k$

$M = 5.30^{k'}$

$U_n = 15.05^k$

$M_n = 37.7^{k-ft}$

$\Delta_{TL} = 0.01'' < \ell/>1000$

USE CoL $5\frac{1}{2} \times 13\frac{1}{2}$

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