

STRUCTURAL CALCULATIONS

FOR

Covered Deck

9575 SW 62nd Dr
Portland, Oregon 97219



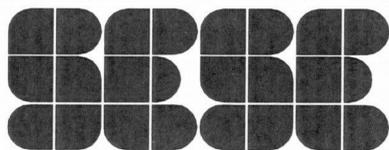
RENEWAL DATE: 12/31/2013

SHANE EMPEY STRUCTURAL ENGINEERS (SESE) was retained in a limited capacity for this project. Design is based upon information provided by the client who is solely responsible for accuracy of it. SESE has prepared these calculations solely for the items listed above. The owner, architect, and/or contractor shall hold SESE harmless for any member or system not part of this analysis.

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Arch'l Drawings included as 8.5x11 sheets for <u>Reference only</u>	R1 - R10

Contact Person: SHANE A. EMPEY



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Project: Covered Deck

Client: Erin Lamb Proj. No.: 12-109

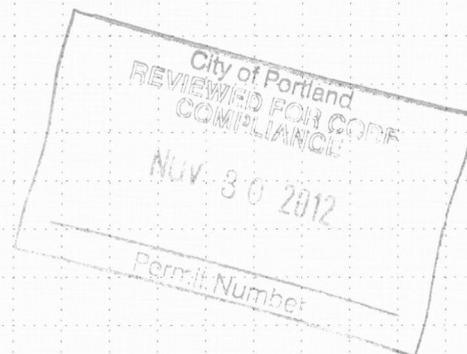
Date: November 2012 By: SAE Sheet No.: COVER

SITE VISIT SUMMARY

ON TUESDAY NOVEMBER 13, 2012 AT 8 O'CLOCK A.M. I MADE A SITE VISIT TO OBSERVE THE DECK UNDER CONSTRUCTION AND ACCESS THE FEASIBILITY OF ENCLOSING A PORTION. THE DECK IS BEING CONSTRUCTED PER CITY OF PORTLAND PRESCRIPTIVE MEASURES, WHICH IS VERY CONSERVATIVE WITH RESPECT TO MINIMUMS WHICH MAY BE JUSTIFIED BY CALCULATIONS.

THE EXISTING GARAGE STRUCTURE WAS ALSO DESIGNED PER PRESCRIPTIVE PATH MEASURES, AND IS ALSO VERY CONSERVATIVE. THESE CALCULATIONS HAVE BEEN PREPARED TO ADDRESS THE COVERED PORTION OF THE DECK WHICH DOES NOT FIT WITHIN PRESCRIPTIVE DESIGN.

WITHIN THE PROPOSED COVERED PORTION, ROOF RAFTERS ARE PARALLEL WITH THE EXISTING STRUCTURAL WALL AND SUPPORTED BY STANDARD 2x WALL FRAMING. THESE WALLS ARE SUPPORTED BY DOUBLE FLOOR JOISTS WHICH ARE SUPPORTED BY A 4x BEAM AND LEDGER BOLTED TO THE EXISTING CONCRETE FOUNDATION. THE FLOOR FRAMING ARE PERPENDICULAR TO THE EXISTING STRUCTURAL WALL AND ARE SUPPORTED BY THE SAME 4x BEAM AND WALL LEDGER. SIMPSON HARDWARE IS USE THROUGHOUT. LATERAL LOAD AT THE NEW GABLE WALL IS ADDRESSED BY 2x6 CROSS BRACING AND 4x4 POSTS WHICH ALLOW FOR A SMALLER CONCRETE BASE THAN WOULD BE REQUIRED WITH CANTILEVERED POSTS.



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EXISTING BUILDING KEY NOTES:

- 1 VERIFY EXISTING WALL SHEETING MEETS THE CODE MINIMUM STANDARD:
 NOMINAL 1/2" WALL SHEETING (APA RATED 32/16) TYPICAL
 W/ 8d COMMONS @ 6" o/c AT EDGES @ 12" o/c A.T FIELD

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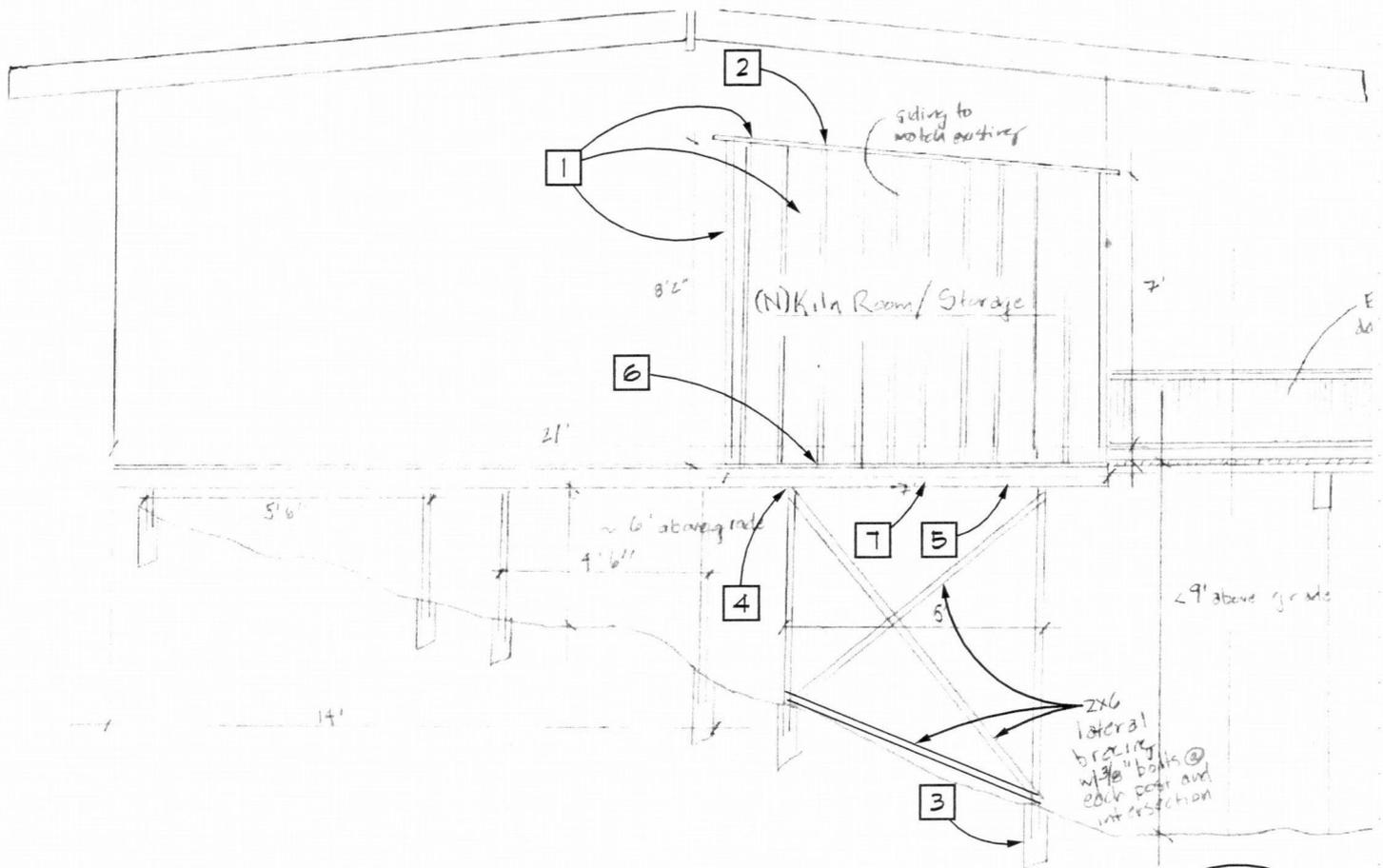


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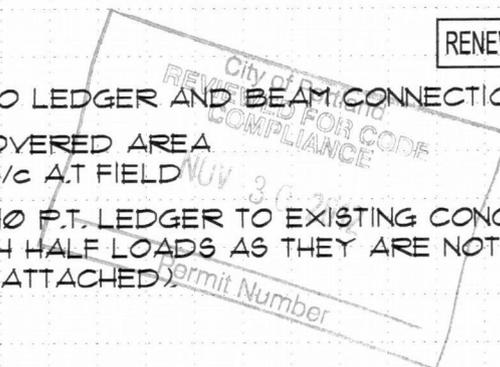


NEW COVERED DECK KEY NOTES:

- 1 NOMINAL 1/2" WALL AND ROOF SHEATHING ON NEW AREAS W/ 8d COMMONS @ 6' o/c AT EDGES @ 12" o/c AT FIELD
- 2 FASTEN END RAFTER TO EA EXISTING WALL STUD W/ 2-#8x3" SCREWS AND EDGE NAIL TO ROOF SH'TG
- 3 16" x 2'-6" CONCRETE FOOTING W/ SIMPSON "CBSQ44" BASE TO 4x4 POST.
- 4 SIMPSON "BC4" AT 4x4 POST TO 4x BEAM
- 5 SIMPSON "HUS" TYPE HANGERS AT JOISTS TO LEDGER AND BEAM CONNECTIONS.
- 6 NOMINAL 5/8" T&G FLOOR SHEATHING AT COVERED AREA W/ 8d COMMONS @ 6' o/c AT EDGES @ 12" o/c AT FIELD
- 7 (2) SIMPSON "WEDGE BOLTS" @ 18" o/c AT 2x10 P.T. LEDGER TO EXISTING CONCRETE WALL. NOTE: THESE ANCHORS ARE DESIGNED WITH HALF LOADS AS THEY ARE NOT SUBJECTED TO SEISMIC OR WIND LOADING. (SEE CALC AT ATTACHED)



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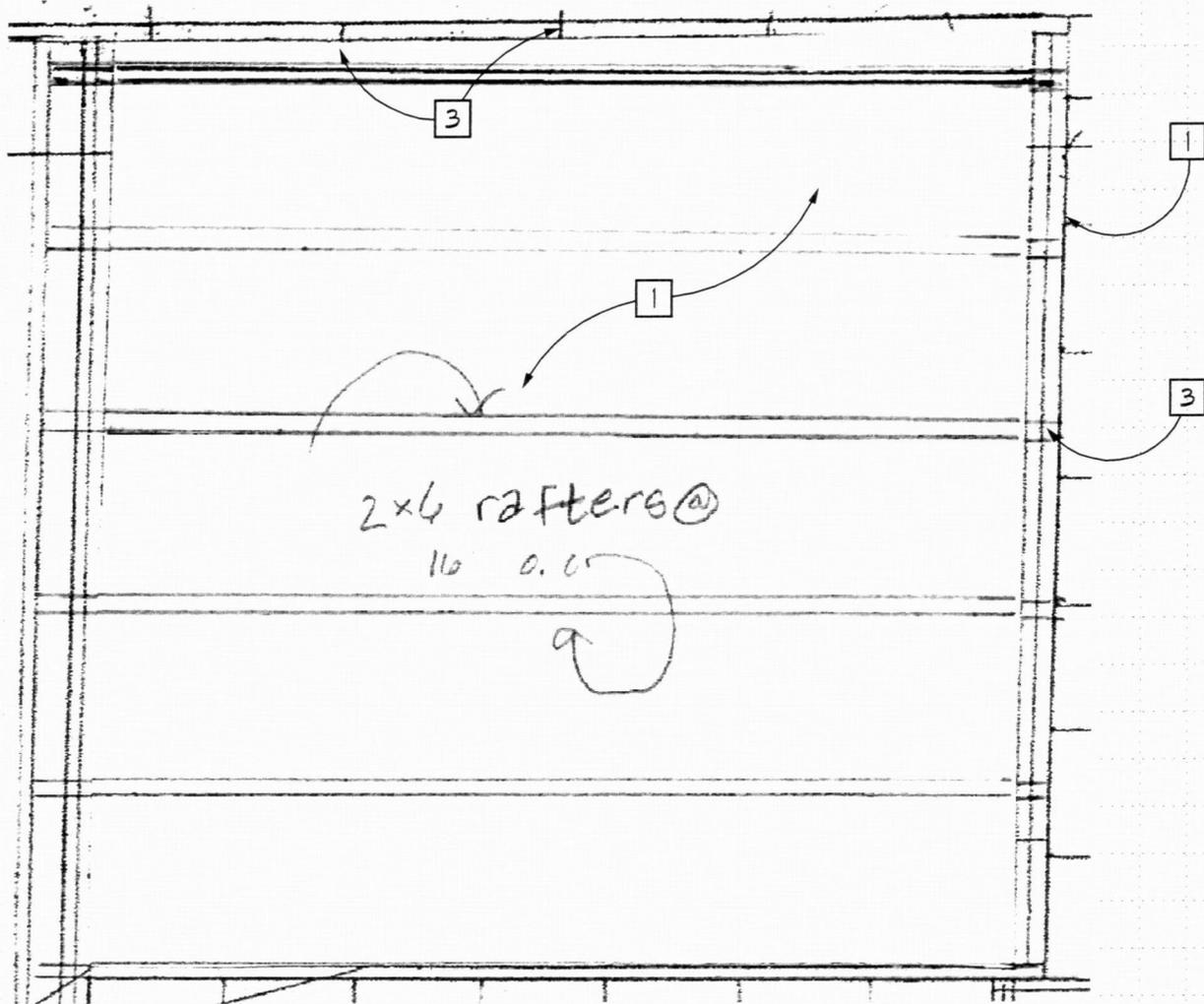
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Client: Erin Lamb

Proj. No.: 12-109

Date: November 2012 By: SAE

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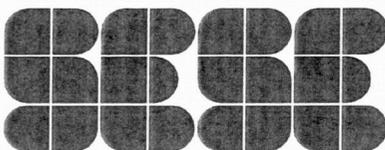
ROOF FRAMING KEY NOTES:

- 1 NOMINAL 1/2" WALL AND ROOF SHEATHING ON NEW AREAS W/ 8d COMMONS @ 6" o/c AT EDGES @ 12" o/c AT FIELD
- 2 FASTEN END RAFTER TO EA EXISTING WALL STUD W/ 2-#8x3" SCREWS AND EDGE NAIL TO ROOF SH'TG
- 3 FASTEN END RAFTER TO WALL TOP PLATE W/ 3-10d TOENAILS AND SIMPSON "H2.5" OR BETTER

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REGISTERED PROFESSIONAL ENGINEER
 69197
Shane Empey
 OREGON
 JANUARY 02, 2008
 SHANE A. EMPEY

RENEWAL DATE: 12 / 31/2013



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Project: Covered Deck
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 Date: November 2012 By: SAE Sheet No.: 4

DESIGN CRITERIA

Design per 2009 IBC as modified by the 2010 OSSC

Vertical Loads

12 psf.....(DL)	Exterior wall DL.....	10 psf
20 psf.....(SL)	Interior wall DL.....	8 psf
<hr/>		
32 psf.....(TL - ROOF)		

12 psf.....(DL)
40 psf.....(LL)
<hr/>
52 psf.....(TL - FLOOR)

100 psf.....(LL kiln allowance)

Wind: (See Attached Analysis)

Based on ASCE 7 (method 2)

Seismic

Site Classification D (assumed)

$$F_a := 1.11 \quad F_v := 1.724$$

$$S_s := 0.974 \quad S_1 := 0.338$$

$$S_{DS} := 0.721 \quad S_{D1} := 0.388$$

$$R := 6.5 \quad (\text{light framed wood shear walls})$$

$$I := 1.0 \quad (\text{Standard Occupancy Structure})$$

$$V_{\text{strength}} := (S_{DS} * I) / R * W = 0.111 * W \quad (\text{Main Lateral System})$$

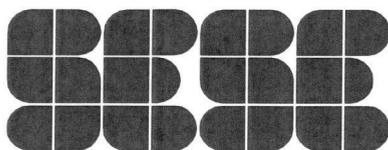
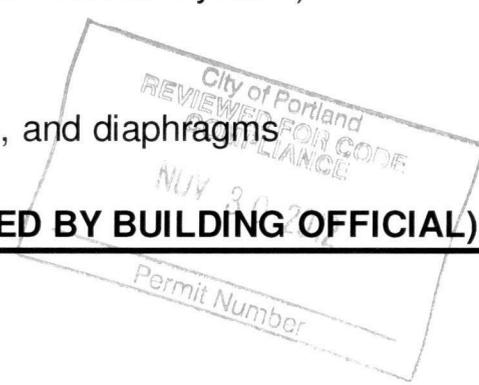
$$V_{\text{stress}} := 0.7 * V_{\text{strength}} = 0.078 * W \quad (\text{Main Lateral System})$$

Structural System

Hand Cut Wood Roof, bearing/shear walls, and diaphragms

Soil Bearing (ASUMED - TO BE VERIFIED BY BUILDING OFFICIAL)

1500 psf Allowable



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Wind Loads for Main Wind Force Resisting System (MWFRS) Using ASCE 7-05 Method 2 for all heights (gable/hipped roofs)										
Building Dimensions		V (mph):	95	Cp		N-S wind		E-W wind		
N - S (ft):	32	Exposure	B	Windward Wall		0.80	1.30	0.80	1.28	
E - W (ft):	36	I_w :	1.00	Leeward Wall		-0.50		-0.48		
h_m (ft):	18	K_d :	0.85	Windward Roof		-0.07	0.50	-0.06	0.51	
Roof Pitch:	4 : 12	G:	0.85	Leeward Roof		-0.57		-0.57		
Roof Angle (deg)	18.4	NORTH - SOUTH WIND				EAST - WEST WIND				
q_h (psf)	11.9	WALLS		ROOF		WALLS		ROOF		
Height (ft)	K_z	q_z (psf)	LW "-P":	-5.1	LW "-P":	-5.8	LW "-P":	-4.8	LW "-P":	-5.7
			WW	TOTAL	WW	TOTAL	WW	TOTAL	WW	TOTAL
			"+" (psf)	"P" (psf)	"+" (psf)	"P" (psf)	"+" (psf)	"P" (psf)	"+" (psf)	"P" (psf)
0-15	0.57	11.3	7.7	12.7	-0.7	6.5	7.7	12.5	-0.5	6.3
18	0.61	11.9	8.1	13.1	-0.7	6.5	8.1	12.9	-0.6	6.3
27	0.68	13.4	9.1	14.1	-0.8	6.6	9.1	13.9	-0.6	6.4

$$q_z = 0.0256 \times K_z \times K_{zt} \times K_d \times V^2 \times I_w \quad (\text{ASCE Eq. 6-15})$$

$$K_{zt} = 1.0$$

$$P = q(GC_p) - q_i(GC_{pi}) \quad (\text{ASCE Eq. 6-17})$$

(FOR TYPICAL STRUCTURES, INTERNAL COMPONENTS OF WW AND LW PRESSURES CANCEL. THIS ANALYSIS HAS THEREFORE IGNORED THESE COMPONENTS)

WIND VS SEISMIC CHECK:

$$W_{wind} = 12.7 \text{ psf} \times (8.75 \text{ ft}) = 112 \text{ PLF} \quad \text{-THEREFORE WIND CONTROLS LATERAL DESIGN-}$$

$$W_{seis} = C_s \times W_p = 0.078 \times 544 = 45 \text{ PLF}$$

$$C_s = 0.078$$

$$W_p = 12 \text{ psf} (7 \text{ ft} + 25 \text{ ft}) + 10 \text{ psf} \times 8 \text{ ft} \times 2 = 544$$

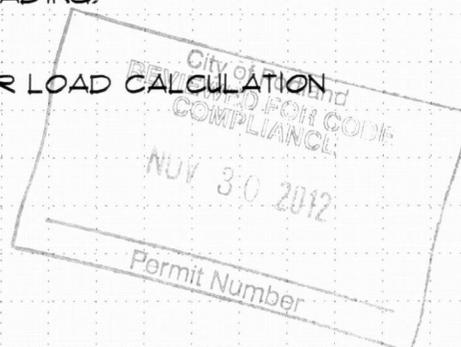
MOTION PERPENDICULAR TO EXISTING WALL:

NO CHANGE HAS OCCURRED TO EXISTING WIND EXPOSURE. THE LEEWARD WIND LOADING ON THE DECK COVER = $5 \text{ psf} \times (7 \text{ ft} + 9 \text{ ft}) = 315 \#$
 BY ENGINEERS JUDGEMENT THE SCREW CONNECTION AT WALL STUDS AND END RAFTER TO EXISTING WALL IS ADEQUATE TO RESIST THIS LOADING.

MOTION PARALLEL TO EXISTING WALL:

SEE ATTACHED CALC FOR EXISTING WALL SHEAR LOAD CALCULATION

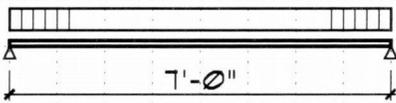
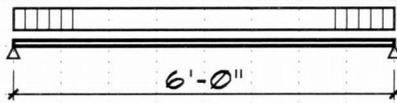
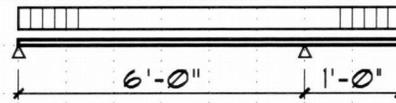
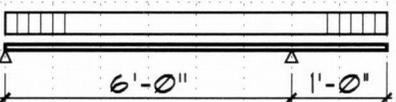
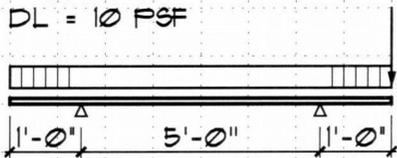
- SEE ATTACHED SHEETS FOR MORE INFORMATION ANALYSIS-

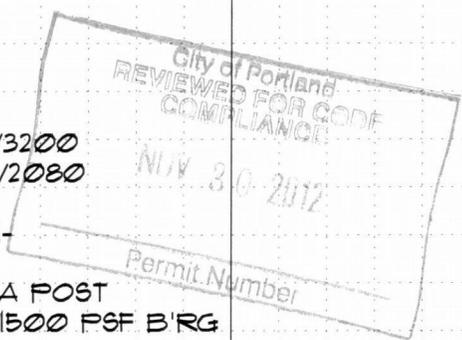


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FRAMING CALCULATIONS

<p>(R1) TYPICAL RAFTERS 2x6 @16" o/c</p> <p>TRIB = 133 FT DL = 12 PSF SL = 20 PSF</p>  <p>$f_v = 24 \text{ psi}$ $f_b = 413 \text{ psi}$</p> <p>$F_v = 207 \text{ psi}$ $F_b = 1,547 \text{ psi}$ $\Delta L = 0.04" = L/1943$ $\Delta T = 0.07" = L/1209$</p> <p style="text-align: center;">-OK-</p>	<p>(R2) DOOR HEADER 4x8 (DF-L#2)</p> <p>TRIB = 4 FT DL = 12 PSF SL = 20 PSF</p>  <p>$f_v = 25 \text{ psi}$ $f_b = 329 \text{ psi}$</p> <p>$F_v = 207 \text{ psi}$ $F_b = 1,345 \text{ psi}$ $\Delta L = 0.03" = L/2383$ $\Delta T = 0.00" = L/1490$</p> <p style="text-align: center;">-OK-</p>	<p>(F1) TYPICAL JOISTS 2x10 @24" o/c</p> <p>TRIB = 15 FT DL = 112 PSF LL = 40 PSF</p>  <p>$f_v = 43 \text{ psi}$ $f_b = 400 \text{ psi}$</p> <p>$F_v = 180 \text{ psi}$ $F_b = 1,139 \text{ psi}$ $\Delta L = 0.05" = L/1100$ $\Delta T = 0.02" = L/2900$</p> <p style="text-align: center;">-OK-</p>
<p>(F2) END JOISTS 2-2x10" o/c</p> <p>ROOF TRIB = 4 FT DL = 12 PSF SL = 20 PSF</p> <p>FLOOR TRIB = 1 FT DL = 12 PSF LL = 40 PSF</p> <p>WALL TRIB = 8 FT DL = 10 PSF</p>  <p>$f_v = 48 \text{ psi}$ $f_b = 343 \text{ psi}$</p> <p>$F_v = 120 \text{ psi}$ $F_b = 748 \text{ psi}$ $\Delta L = 0.02" = L/2800$ $\Delta T = 0.03" = L/1575$</p> <p style="text-align: center;">-OK-</p>	<p>(F3) BEAM ON POSTS 4x8 P.T. (HF-L#2)</p> <p>FLOOR TRIB = 4 FT DL = 12 PSF LL = 40 PSF</p> <p>ROOF $P_d = 168^*$ $P_s = 280^*$</p> <p>WALL TRIB = 8 FT DL = 10 PSF</p>  <p>$f_v = 43 \text{ psi}$ $f_b = 264 \text{ psi}$</p> <p>$F_v = 120 \text{ psi}$ $F_b = 884 \text{ psi}$ $\Delta L = 0.01" = L/3200$ $\Delta T = 0.02" = L/2080$</p> <p style="text-align: center;">-OK-</p> <p>$R = 1,570^*$ AT EA POST AT ASSUMED 1500 PSF B'RG CAPACITY AND 16" ϕ FTG $R_{cap} = 2,084^*$ -OK-</p>	<p>(A1) (2) 1/2" ϕ simpson "wedge bolts" @18" o/c at 2x ledger (2 1/2" concrete embed)</p> <p>ROOF TRIB = 3 FT DL = 12 PSF SL = 20 PSF</p> <p>FLOOR TRIB = 3 FT DL = 12 PSF LL = 40 PSF</p> <p>WALL TRIB = 8 FT DL = 10 PSF</p> <p>$V = 287 \text{ plf} = 215^*/\text{anchor}$</p> <p>$V_{cap} = 1,500^*$ -OK-</p>



$$V_{roof} = 12.7 \text{ psf} \cdot (8 \text{ ft} / 2) \cdot (6 \text{ ft} / 2) = 152 \text{ #} / \text{WALL LINE}$$

$$v = 152 / 7 = 22 \text{ PLF (MIN NAILING OK)}$$

$$T = (152 \cdot 8.75 - 6(200 \cdot 7^2 / 2)) / 5 = -320 \text{ # (NO H'LDN REQ'D)}$$

$$V_{floor} = 12.7 \text{ psf} \cdot (8 \text{ ft} / 2) \cdot (6 \text{ ft} / 2) = 152 \text{ #} / \text{WALL LINE}$$

$V_{base} = 152 \text{ #} / \text{post}$
 by engineering judgement the $\frac{1}{4}$ " A36 plates and $\frac{1}{4}$ " ϕ screws of a simpson 'CBSQ44' column base and 16" ϕ x 18" concrete base are adequate to resist this loading.

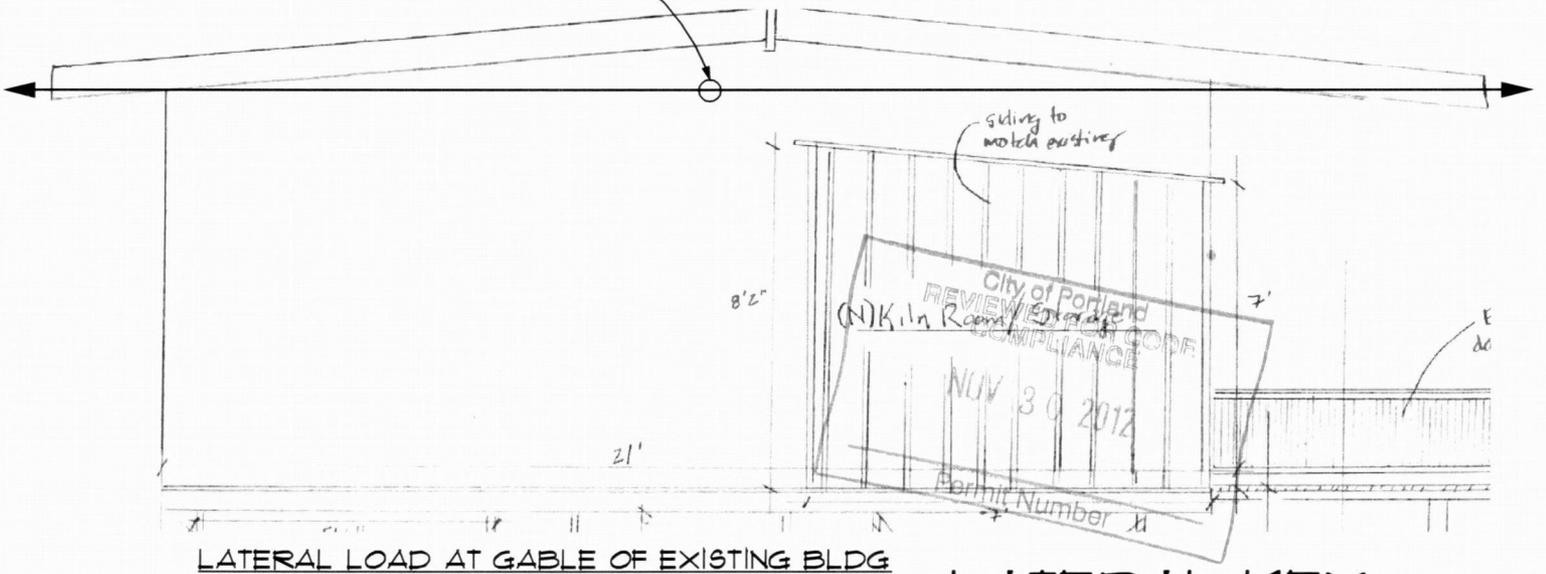
$$T = (304 \cdot 12.375 - 6(300 \cdot 7^2 / 2)) / 5 = -130 \text{ # (NO H'LDN REQ'D)}$$

$$V_{roof} = 12.7 \text{ psf} \cdot (28 \text{ ft} \cdot 9 \text{ ft} / 4 + 8 \text{ ft} \cdot 7 \text{ ft} / 4) = 980 \text{ # ON EXISTING WALL}$$

$$v = 980 / 10 = 98 \text{ PLF (MIN OK)}$$

$$T = 98 \cdot 8 - 6(200 \cdot 10^2 / 2 + 350) = -26 \text{ # (NO HOLD'N REQ'D)}$$

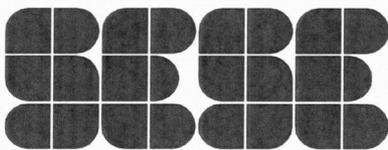
LATERAL LOAD AT GABLE WALL OF ADDITION



LATERAL LOAD AT GABLE OF EXISTING BLDG

LATERAL KEY

1/4" = 1'-0"



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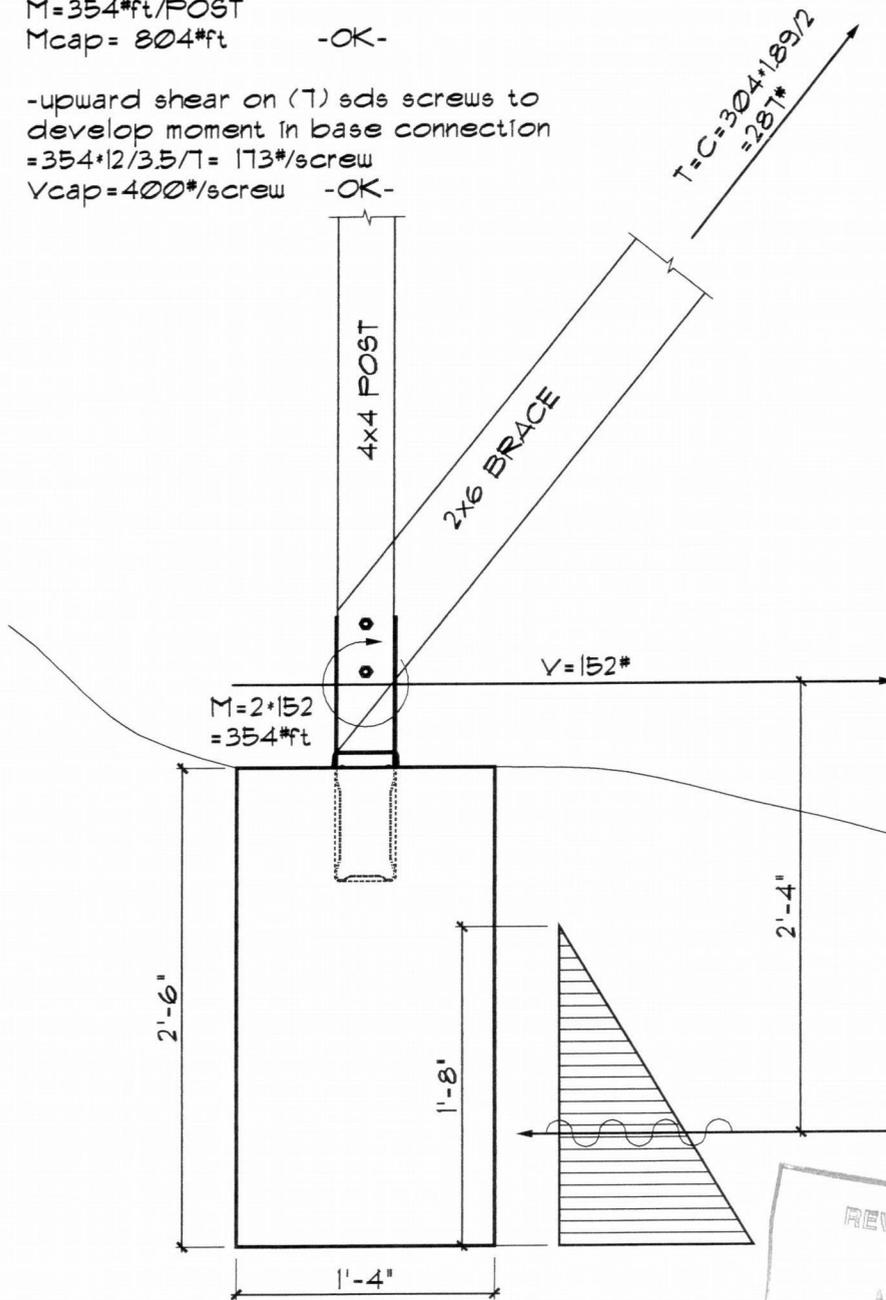
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PI 4x4 post in bending

$M = 354 \text{ #ft/POST}$
 $M_{cap} = 804 \text{ #ft} \quad \text{-OK-}$

-upward shear on (7) sds screws to develop moment in base connection
 $= 354 \cdot 12 / 3.5 / 7 = 173 \text{ #/screw}$
 $V_{cap} = 400 \text{ #/screw} \quad \text{-OK-}$



FI SOIL LATERAL BEARING CAPACITY

NOTE: THIS IS NOT AN EMBEDDED POST. ROTATION AT THE BASE IS RESTRAINED. THEREFORE, A CONSERVATIVE SOIL B'RG PROFILE HAS BEEN ASSUMED WHICH IGNORES THE TOP 10' OF SOIL.

$V = 152 \text{ #/POST}$
 $V_{cap} = 150 \text{ psf} \cdot 1.33 \cdot 1.67 / 2 = 165 \text{ #/post} \quad \text{-OK-}$



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LATERAL KEY

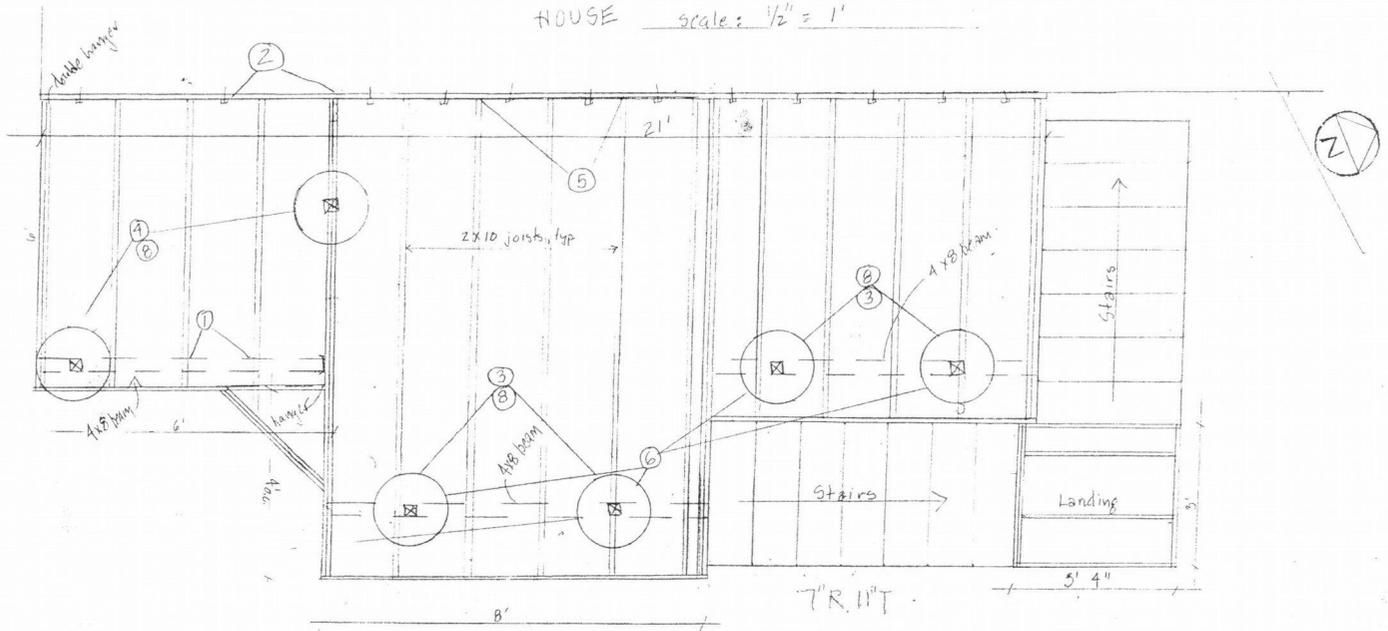
1' = 1'-0"



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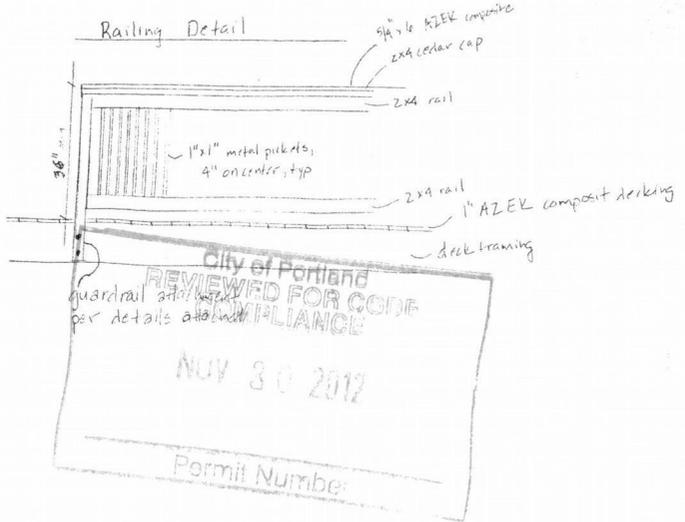
HOUSE scale: 1/2" = 1'



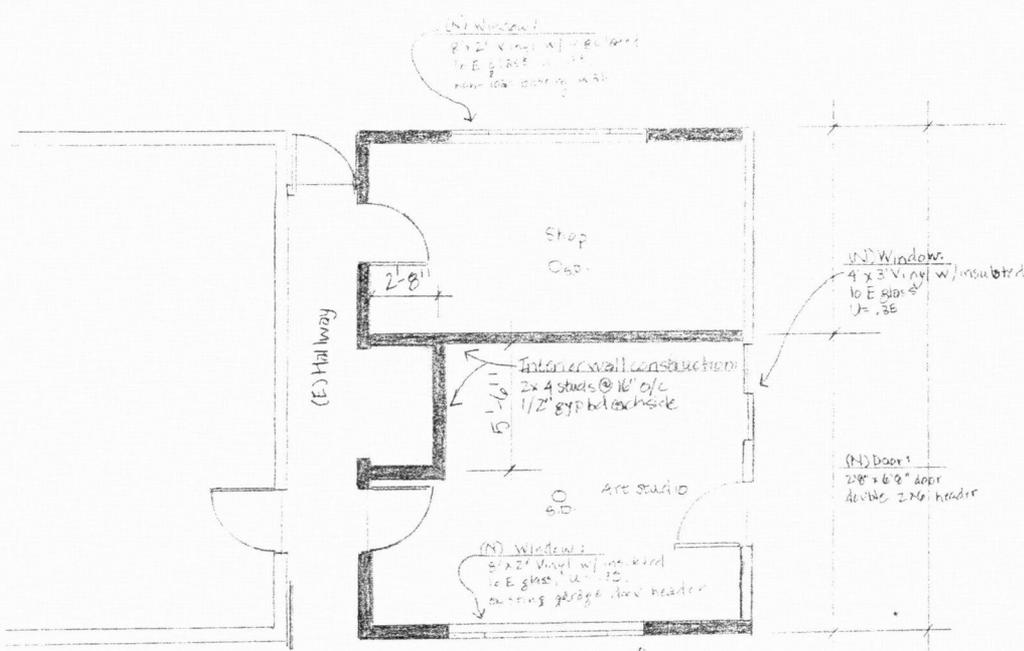
Notes:

- ① H2.5 ② all joist to beam locations
- ② 1/2"x6" expansion bolts ③ ledger, min 2 1/2" depth into foundation wall, max 15" spacing see kitchen detail
- ③ CBSA column bases
- ④ PBS44 post bases
- ⑤ LVS210 joist hangers, top
- ⑥ AC4 post cap, both sides of beam
- ⑦ ACE post cap, both sides of beam
- ⑧ 16" diameter factors, 24" depth, min. of 18" below grade

Railing Detail



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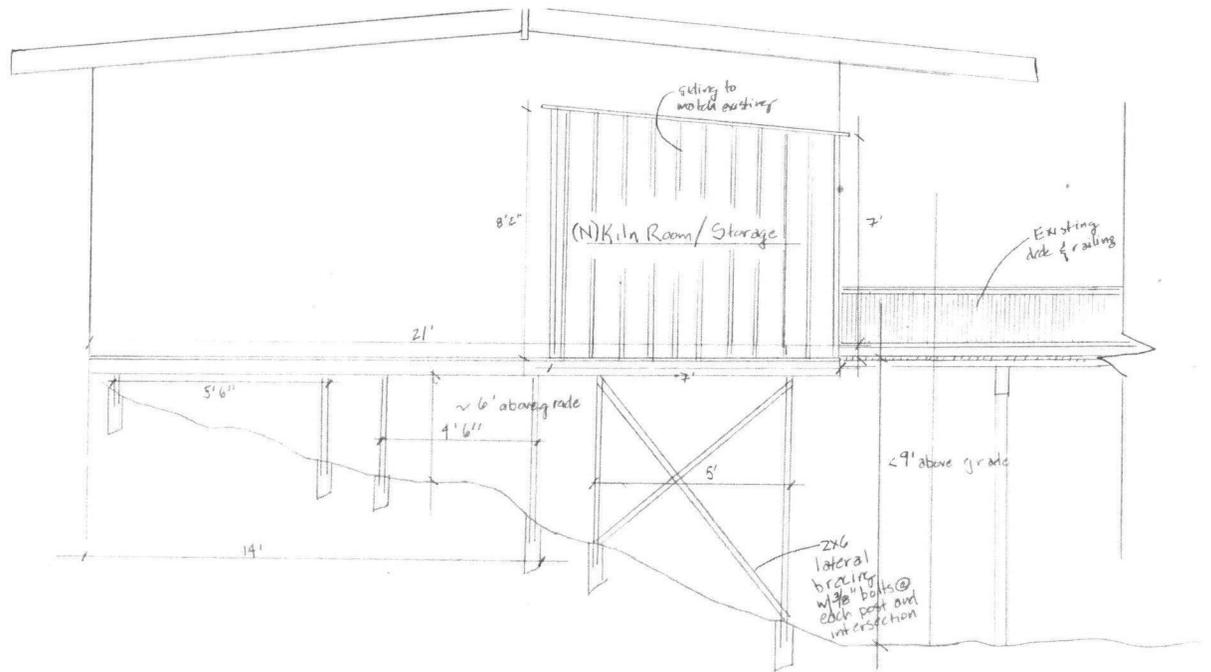


SD - Smoke detector

Floor Plan

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Elevation Plan: NTS



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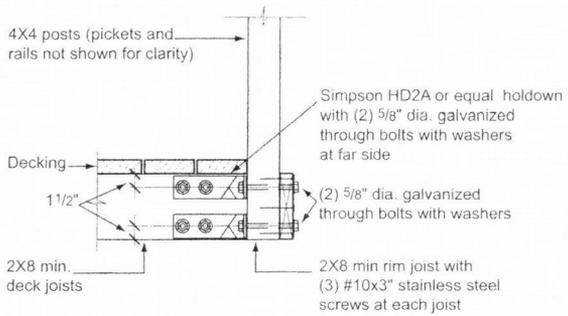
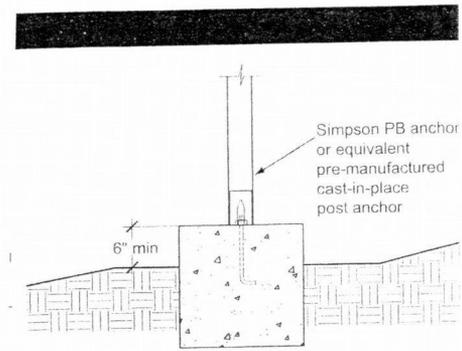


Fig. 26: Guardrail attachment option 2 - Deck joists perpendicular, rim joist on outside, manufactured connectors



② 16" diameter footings, min. 24" deep, min. 18" below grade, typ.

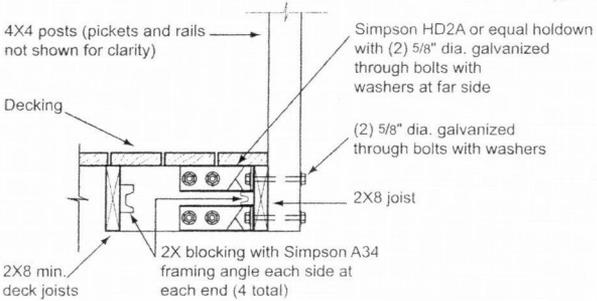


Fig. 27: Guardrail attachment option 3 - Deck joists parallel, post on outside, manufactured connectors



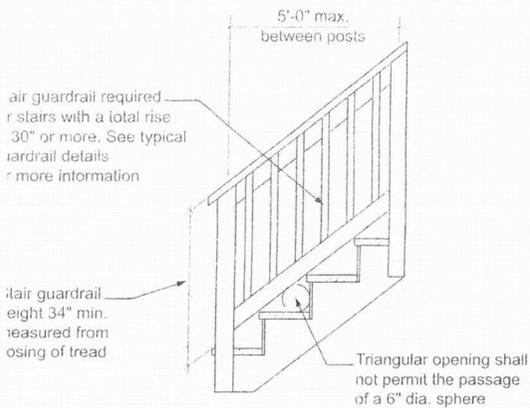


Fig. 35: Stair guard requirements

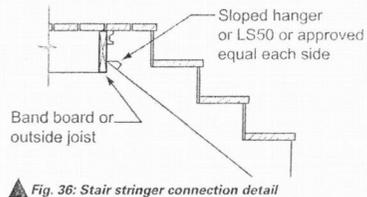


Fig. 36: Stair stringer connection detail

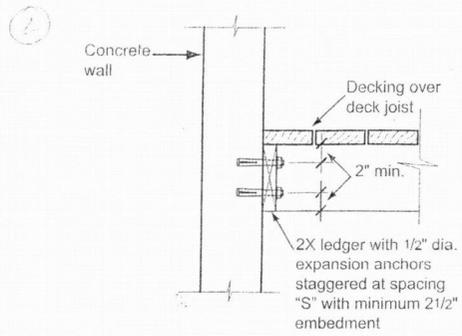


Fig. 8: Attachment of Ledger Board to Concrete Wall (See Fig. 12 for spacing and clearances)

Joist Span	Spacing
0' < span ≤ 8'	5"
8' < span ≤ 10'	18"
10' < span ≤ 14'	15"
14' < span ≤ 16'	10"
	9"

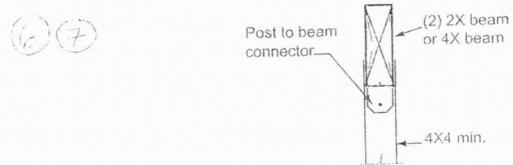
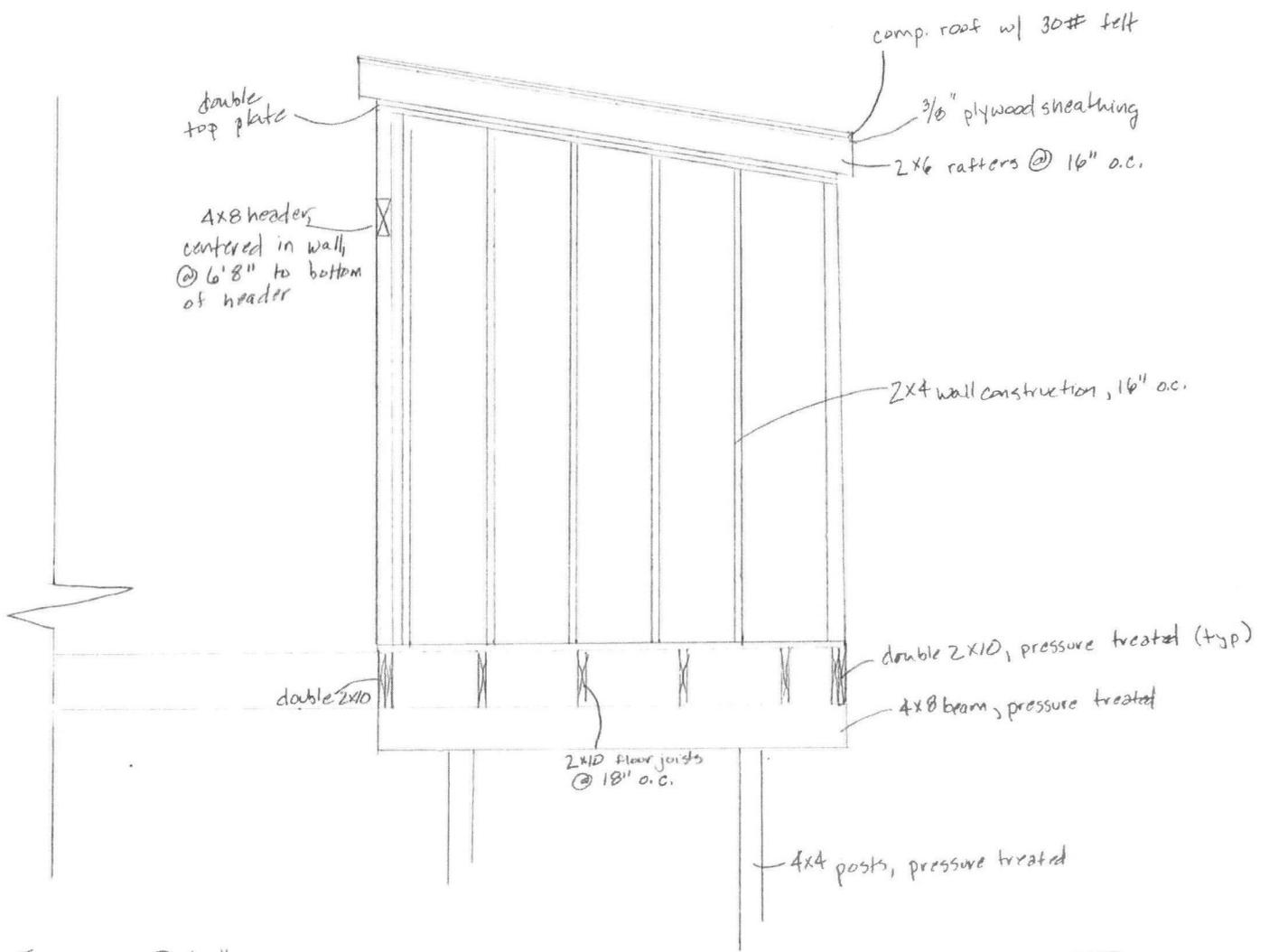


Fig. 20 - Post-to-beam connection

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double top plate

comp. roof w/ 30# felt

3/8" plywood sheathing

2x6 rafters @ 16" o.c.

4x8 header, centered in wall @ 6'8" to bottom of header

2x4 wall construction, 16" o.c.

double 2x10, pressure treated (tsp)

double 2x10

4x8 beam, pressure treated

2x10 floor joists @ 18" o.c.

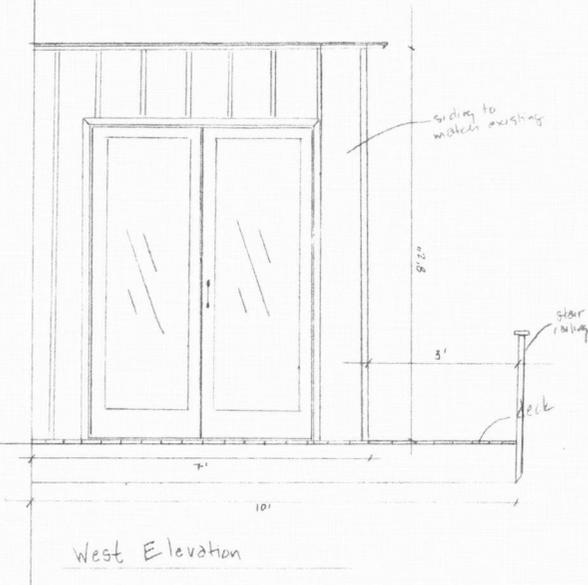
4x4 posts, pressure treated

Framing Details

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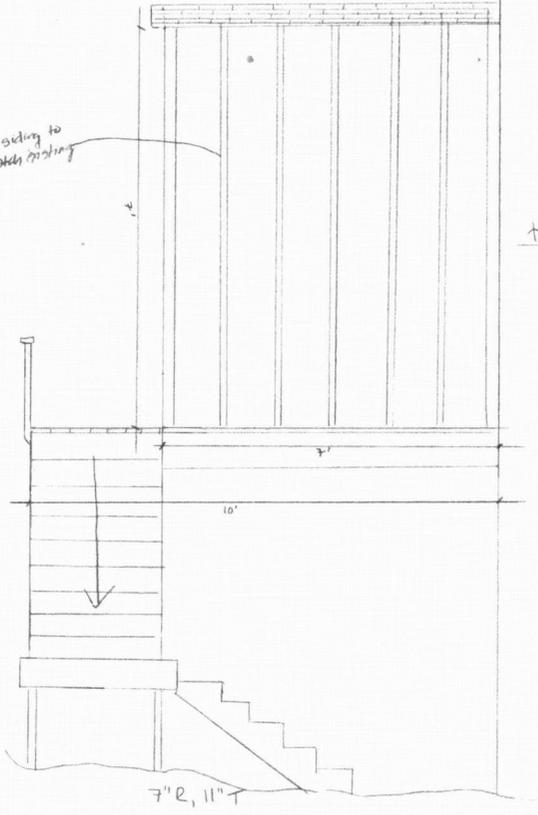


House



siding to match existing

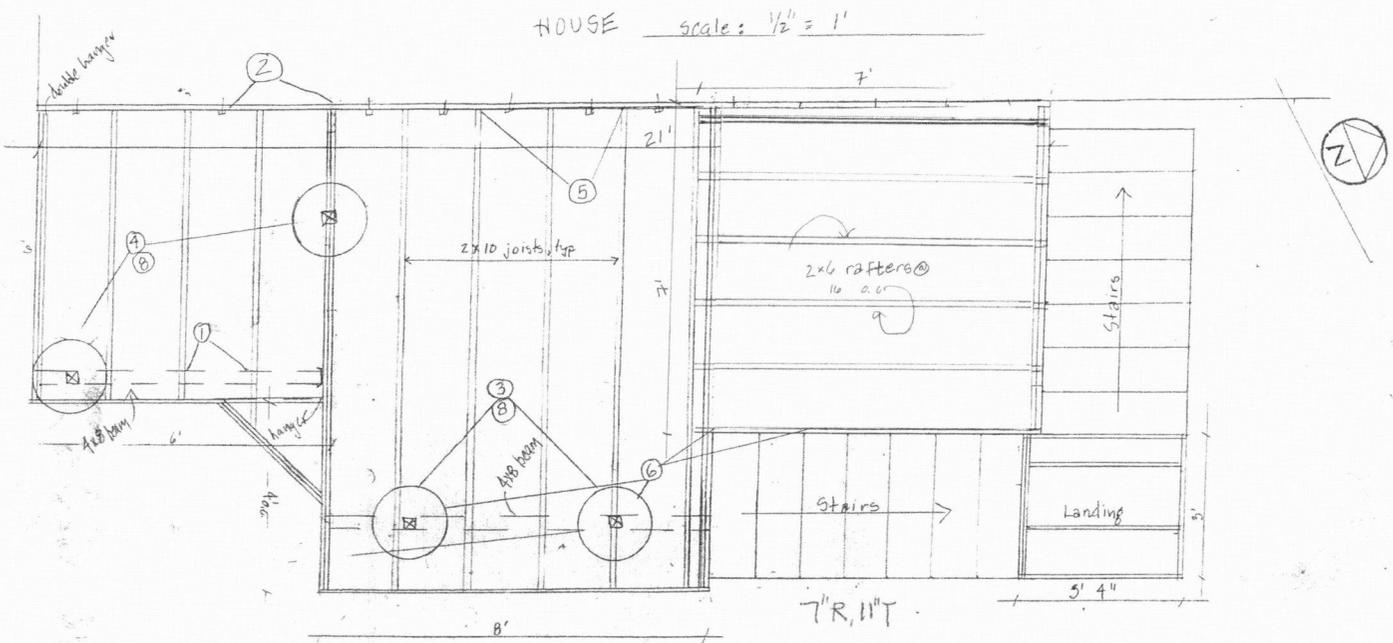
House



East Elevation

7'0", 11" T

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Framing Plan w/ Roof Plan

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