DESIGN REPORT

For

Wind Lateral Load and Seismic Load Analysis

for

Mike Wnek's Garage

at

1719 Stanton Way NW

for

Michael & Carol Wnek

1665 NW Sherwood St.

Bremerton, WA 98311

Austin Engineering

2182 NE Eton Lane

Bremerton, WA 98311

360-698-1661

E. PAUL AUSTIN
STATE OF WASHINGTON
16968
REGISTERED
PROFESSIONAL ENGINEER

APR 21 2020

JN 20-18

TABLE OF CONTINENTS

Building Load Requirements
Per 2015 IBC

Project: Wnek's Garage AE: 20-18 Sht 3 of 26 Shts

Date: 25 March 2020

Wind Exposure: 'C' — on shore Dyes Inlet

Seismic Factors: 1.00 Wind Factor: 1.35

Per IRC 2015, IBC 2015 & ASCE STD 7

Dead and Live Loading per ASCE STD 07-10

LL= 40 psf Main Floors LL= 30 psf Sleeping Areas LL=20 psf Attic spaces w/ storage
Exterior deck LL= 60 psf office 50psf

DL= calc'd

Kitsap County Design Criteria

Roof Snow Load	25 pounds per square foot
Wind Speed	110 MPH Ultimate Wind Speed IRC 2015
Design Wind Speed	85 MPH IBC 2015 Eqa 16-33
Seismic Design Category	D2
Weathering	Moderate
Frost Line Depth	12"
Termite	Moderate to Sever Decay
Moderate to Severe Winter Design Temp	26 degrees Fahrenheit Ice
Shield Underlayment Requirement	None
Flood Hazards	(a) 1980, (b) 1980
Air Freezing Index	148
Mean Annual Temp	51.4 degrees Fahrenheit

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26 May 2015
Rev: 25 June 2018
Rev 09 January 2019

Project: Wnek's Garage

AE: 20-18

Date: 25 March 2020

Wind Loading

Lateral Force Analysis is in accordance with ASCE Std 7-16, IBC 2015, & IRC 2015.

The lateral analysis is based on the give parameters as noted on Sht. 3 of 26 Sheets.

The exposure for this building site is C. ASCE; Para 26.7.3

Building Category ASCE Table 1.5-1 = II

Basic Wind Speed (Vult) ASCE Fig. 26.5-1A 110 mph (Ultimate Design Wind)

Nominal design wind speed (Vnsd)= Vult x $\sqrt{0.6}$ = 85 mph IBC Eq 16-33

The wind loading is per ASCE Sec 28 Simplified Procedure, Part 2 and Fig. 28.5-1

Factors that affect the wind loading are:

Adjustment for height λ per ASCE Fig 28.5-1 = 1.35

Importance factor I_w per ASCE Table 1.5-2 = 1.00

Net Design Wind Pressure $P_{s\ 30}$

$P_{net} = \lambda I_w Ps_{30}$ Design Wind Pressure

See sheet 7 of 26 for wind pressure calculations.

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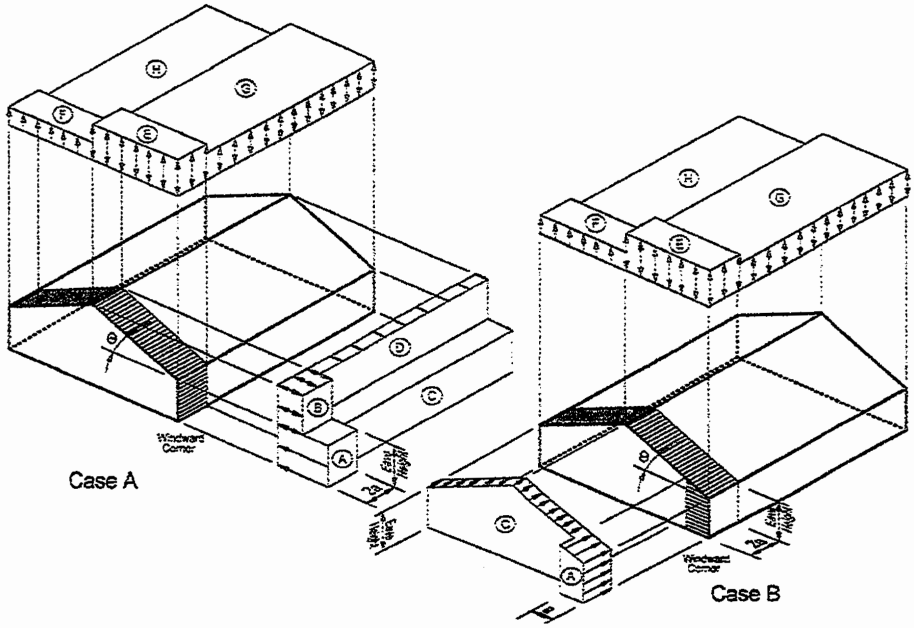
27 July 2017

Diagrams



Notation

a 10% of least horizontal dimension or $0.4h$, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m).
EXCEPTION: For buildings with $\theta = 0$ to 7° and a least horizontal dimension greater than 300 ft (90 m), dimension a shall be limited to a maximum of $0.8h$.

h Mean roof height, in ft (m), except that eave height shall be used for roof angles < 10°.

θ Angle of plane of roof from horizontal, in degrees.

Notes

1. Pressures shown are applied to the horizontal and vertical projections, for Exposure B, at $h = 30$ ft ($h = 9.1$ m). Adjust to other exposures and heights with adjustment factor λ.
2. The load patterns shown shall be applied to each corner of the building in turn as the reference corner (See Fig. 28.3-1).
3. For Case B, use $\theta = 0°$.
4. Load cases 1 and 2 must be checked for $25° < \theta \leq 45°$. Load case 2 at 25° is provided only for interpolation between 25° and 30°.
5. Plus and minus signs signify pressures acting toward and away from the projected surfaces, respectively.
6. For roof slopes other than those shown, linear interpolation is permitted.
7. The total horizontal load shall not be less than that determined by assuming $p_s = 0$ in Zones B and D.
8. Where Zone E or G falls on a roof overhang on the windward side of the building, use E_{OH} and G_{OH} for the pressure on the horizontal projection of the overhang. Overhangs on the leeward and side edges shall have the basic zone pressure applied.
9. Unit conversions for tables:

Adjustment Factor for Building Height and Exposure, λ

	Exposure		
Mean roof height (ft)	B	C	D
15	1.00	1.21	1.47
20	1.00	1.29	1.55
25	1.00	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	1.09	1.49	1.74
45	1.12	1.53	1.78
50	1.16	1.56	1.81
55	1.19	1.59	1.84
60	1.22	1.62	1.87

Note: Unit conversions for tables: 1.0 ft = 0.3048 m; 1.0 lb/ft² = 0.0479 kN/m²; 1 mph = 1.6 km/h

FIGURE 28.5-1 Main Wind Force Resisting System, Part 2 [$h \leq 60$ ft ($h \leq 18.3$ m)]: Design Wind Pressures for Enclosed Buildings—Walls and Roofs

continues

Simplified Design Wind Pressure, P_{s30} (psf) for Exposure B at $h = 30$ ft ($h = 9.1$ m)												
Basic Wind Speed (mph)	Roof Angle (degrees)	Load Case	Zones									
			Horizontal Pressures				Vertical Pressures				Overhangs	
			A	B	C	D	E	F	G	H	E_{OH}	G_{OH}
85	0 to 5°	1	11.5	−5.9	7.6	−3.5	−13.8	−7.8	−9.6	−6.1	−19.3	−15.1
	10°	1	12.9	−5.4	8.6	−3.1	−13.8	−8.4	−9.6	−6.5	−19.3	−15.1
	15°	1	14.4	−4.8	9.6	−2.7	−13.8	−9.0	−9.6	−6.9	−19.3	−15.1
	20°	1	15.9	−4.2	10.6	−2.3	−13.8	−9.6	−9.6	−7.3	−19.3	−15.1
	25°	1	14.4	2.3	10.4	2.4	−6.4	−8.7	−4.6	−7.0	−11.9	−10.1
		2	—	—	—	—	−2.4	−4.7	−0.7	−3.0	—	—
	30 to 45	1	12.9	8.8	10.2	7.0	1.0	−7.8	0.3	−6.7	−4.5	−5.2
		2	12.9	8.8	10.2	7.0	5.0	−3.9	4.3	−2.8	−4.5	−5.2
90	0 to 5°	1	12.8	−6.7	8.5	−4.0	−15.4	−8.8	−10.7	−6.8	−21.6	−16.9
	10°	1	14.5	−6.0	9.6	−3.5	−15.4	−9.4	−10.7	−7.2	−21.6	−16.9
	15°	1	16.1	−5.4	10.7	−3.0	−15.4	−10.1	−10.7	−7.7	−21.6	−16.9
	20°	1	17.8	−4.7	11.9	−2.6	−15.4	−10.7	−10.7	−8.1	−21.6	−16.9
	25°	1	16.1	2.6	11.7	2.7	−7.2	−9.8	−5.2	−7.8	−13.3	−11.4
		2	—	—	—	—	−2.7	−5.3	−0.7	−3.4	—	—
	30 to 45	1	14.4	9.9	11.5	7.9	1.1	−8.8	0.4	−7.5	−5.1	−5.8
		2	14.4	9.9	11.5	7.9	5.6	−4.3	4.8	−3.1	−5.1	−5.8
95	0 to 5°	1	14.3	−7.4	9.5	−4.4	−17.2	−9.8	−12.0	−7.6	−24.1	−18.8
	10°	1	16.1	−6.7	10.7	−3.9	−17.2	−10.5	−12.0	−8.1	−24.1	−18.8
	15°	1	18.0	−6.0	12.0	−3.4	−17.2	−11.2	−12.0	−8.6	−24.1	−18.8
	20°	1	19.8	−5.2	13.2	−2.9	−17.2	−12.0	−12.0	−9.1	−24.1	−18.8
	25°	1	18.0	2.9	13.0	3.0	−8.0	−10.9	−5.8	−8.7	−14.9	−12.7
		2	—	—	—	—	−3.0	−5.9	−0.8	−3.8	—	—
	30 to 45	1	16.1	11.0	12.8	8.8	1.2	−9.8	0.4	−8.4	−5.6	−6.5
		2	16.1	11.0	12.8	8.8	6.2	−4.8	5.4	−3.4	−5.6	−6.5
100	0 to 5°	1	15.9	−8.2	10.5	−4.9	−19.1	−10.8	−13.3	−8.4	−26.7	−20.9
	10°	1	17.9	−7.4	11.9	−4.3	−19.1	−11.6	−13.3	−8.9	−26.7	−20.9
	15°	1	19.9	−6.6	13.3	−3.8	−19.1	−12.4	−13.3	−9.5	−26.7	−20.9
	20°	1	22.0	−5.8	14.6	−3.2	−19.1	−13.3	−13.3	−10.1	−26.7	−20.9
	25°	1	19.9	3.2	14.4	3.3	−8.8	−12.0	−6.4	−9.7	−16.5	−14.0
		2	—	—	—	—	−3.4	−6.6	−0.9	−4.2	—	—
	30 to 45	1	17.8	12.2	14.2	9.8	1.4	−10.8	0.5	−9.3	−6.3	−7.2
		2	17.8	12.2	14.2	9.8	6.9	−5.3	5.9	−3.8	−6.3	−7.2

FIGURE 28.5-1 (*Continued*). **Main Wind Force Resisting System, Part 2 [$h \leq 60$ ft ($h \leq 18.3$ m)]: Design Wind Pressures for Enclosed Buildings—Walls and Roofs**

continues

Permit Number: 20-02334

Wind Pressure:

Project: Wnek's Garage

AE: 20-18

L= 25.00 W= 45.00 Ld Fact. 1.35

Roof= 12/25 h= 13.50 Hr= 16.00

a= 3.00 2a= 6.00

A		B		C		D		Total Wind Pressure
Main Direction of wind load								
12.90	1410.62	8.80	1140.48	10.20	3532.01	7.00	2872.80	8,955.90
End of building wind load								
12.90	2246.54			10.20	11546.15			13,792.68
Roof Loading Uplift!								
E		F		G		H		
1.00	182.25	-7.80	-1421.55	0.30	173.14	-6.70	-3866.74	-4,932.90
	0.00		0.00		0.00		0.00	0.00

Note: Wind Load factors are ASCE Std 7-16

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Wnek Garage 20-18

8/26

Resisting Wind load :

Wall line 1

(10.25 + 3.33 + 3.33) × 380 plf = 6,422#
16.91'

Wall line 2

16 lf × 380 plf = 6,080 #

Total Resisting = 12,502# > 8,956#

OK

Wall line A

~~16 × 380~~

4 special Shear panels - see shts of shts

2×[600 plf × 3.4] + 2[600×3] = 7,680#
4080 + 3,600

Wall line B

(6.4 + 8 + 8 + 10.5) × 380# = 12,502#

Total Resisting = 20,182# > 13,793#

OK

Permit Number: 20-02334

KANE ROEDER DRAFTING
2605 C AVE
ANACORTES, WA 98221

MIKE AND CAROL WINEK
1655 SHERWOOD DRIVE
BREMERTON, WA 98311

PROJECT:
WINEK BARN

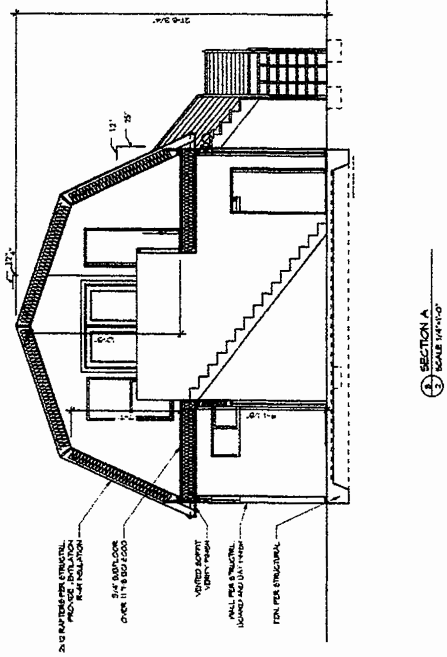
DRAWN BY:
KR

PLANS

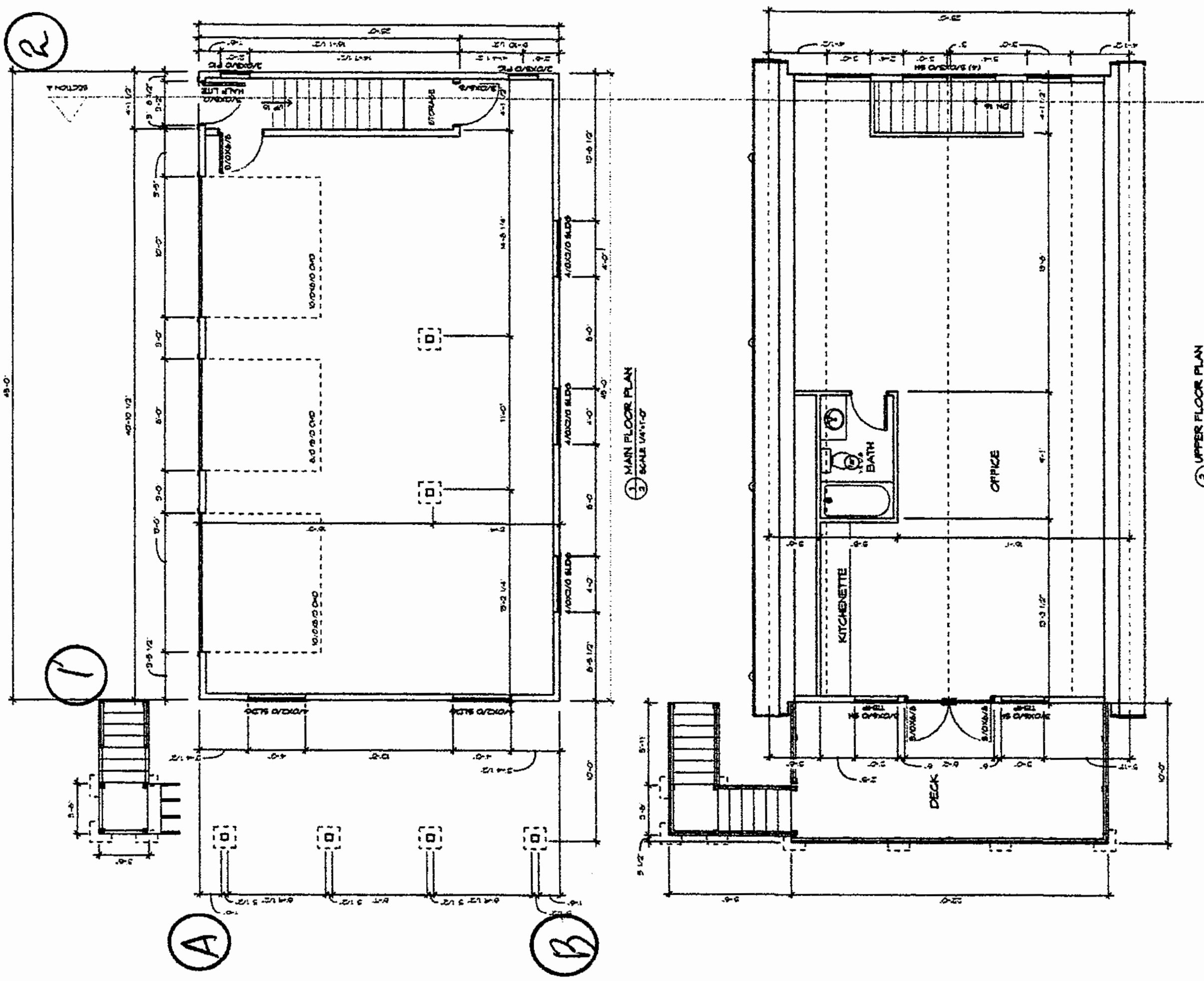
02

SHT. 9 OF 26
PROJ. NO. 20-18
FILE

Wall lines



SECTION A
SCALE 1/4"=1'-0"



MAIN FLOOR PLAN
SCALE 1/4"=1'-0"

UPPER FLOOR PLAN
SCALE 1/4"=1'-0"

Permit Number: 20-02334

RECOMMENDED SHEAR (POUNDS PER FOOT) FOR APA PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE[a] FOR WIND OR SEISMIC LOADING[b]

Table **10.3**

Panel Grade	Minimum Nominal Panel Thickness (in.)	Minimum Nail Penetration in Framing (in.)	Panels Applied Direct to Framing: Nail Size (common or galvanized box)	Panels Applied Direct to Framing: Nail Spacing at Panel Edges (in.) 6	4	3	2[e]	Panels Applied Over ½" or ⅝" Gypsum Sheathing: Nail Size (common or galvanized box)	Panels Applied Over ½" or ⅝" Gypsum Sheathing: Nail Spacing at Panel Edges (in.) 6	4	3	2[e]
APA STRUCTURAL I grades	5/16	1¼	6d	200	300	390	510	8d	200	300	390	510
	3/8	1½	8d	230[d]	360[d]	460[d]	610[d]	10d	280	430	550[f]	730
	7/16			255[d]	395[d]	505[d]	670[d]					
	15/32			280	430	550	730					
	15/32	1⅝	10d	340	510	665[f]	870		—	—	—	—
APA RATED SHEATHING; APA RATED SIDING[g] and other APA grades except species Group 5	5/16 or 1/4[c]	1¼	6d	180	270	350	450	8d	180	270	350	450
	3/8			200	300	390	510		200	300	390	510
	3/8	1½	8d	220[d]	320[d]	410[d]	530[d]	10d	260	380	490[f]	640
	7/16			240[d]	350[d]	450[d]	585[d]					
	15/32			260	380	490	640					
	15/32	1⅝	10d	310	460	600[f]	770	—	—	—	—	—
	19/32			340	510	665[f]	870	—	—	—	—	—
APA RATED SIDING[g] and other APA grades except species Group 5			Nail Size (galvanized casing)					Nail Size (galvanized casing)				
	5/16[c]	1¼	6d	140	210	275	360	8d	140	210	275	360
	3/8	1½	8d	160	240	310	410	10d	160	240	310[f]	410

(a) For framing of other species: (1) Find specific gravity for species of lumber in the AFPA National Design Specification. (2)(a) For common or galvanized box nails, find shear value from table above for nail size for STRUCTURAL I panels (regardless of actual grade). (b) For galvanized casing nails, take shear value directly from table above. (3) Multiply this value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species.

(b) All panel edges backed with 2-inch nominal or wider framing. Install panels either horizontally or vertically. Space nails maximum 6 inches o.c. along intermediate framing members for ⅜-inch and 7/16-inch panels installed on studs spaced 24 inches o.c. For other conditions and panel thicknesses, space nails maximum 12 inches o.c. on intermediate supports.

(c) ⅜-inch or APA RATED SIDING 16 oc is minimum recommended when applied direct to framing as exterior siding.

(d) Shears may be increased to values shown for 15/32-inch sheathing with same nailing provided (1) studs are spaced a maximum of 16 inches o.c., or (2) if panels are applied with long dimension across studs.

(e) Framing at adjoining panel edges shall be 3-inch nominal or wider, and nails shall be staggered where nails are spaced 2 inches o.c.

(f) Framing at adjoining panel edges shall be 3-inch nominal or wider, and nails shall be staggered where 10d nails having penetration into framing of more than 1⅝ inches are spaced 3 inches o.c.

(g) Values apply to all-veneer plywood APA RATED SIDING panels only. Other APA RATED SIDING panels may also qualify on a proprietary basis. APA RATED SIDING 16 oc plywood may be 11/32 inch, ⅜ inch or thicker. Thickness at point of nailing on panel edges governs shear values.

Typical Layout for Shear Walls

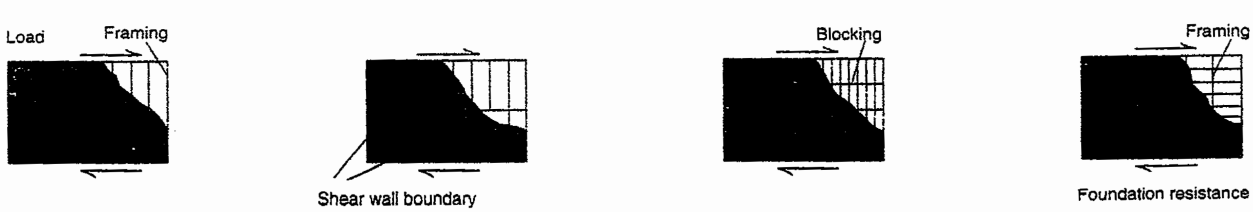


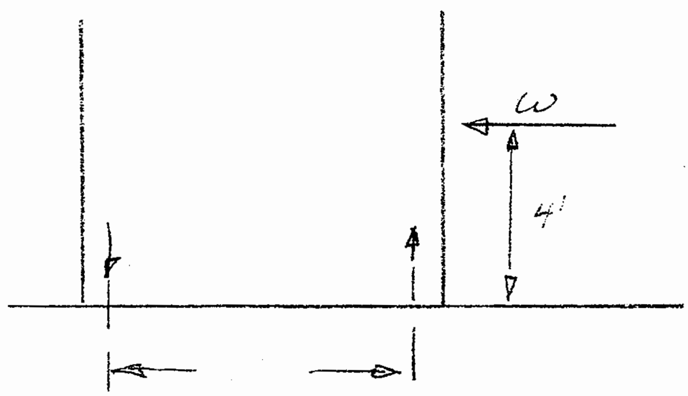
Table 10.3 courtesy of APA—The Engineered Wood Association, from *Residential & Commercial Guide*.

Special Shear Panel

Minimum Width = 30 inchs (2.5 ')

Maximum Width = 48 inches (4.0')

Use a Simpson SSTB16 anchor at both ends.



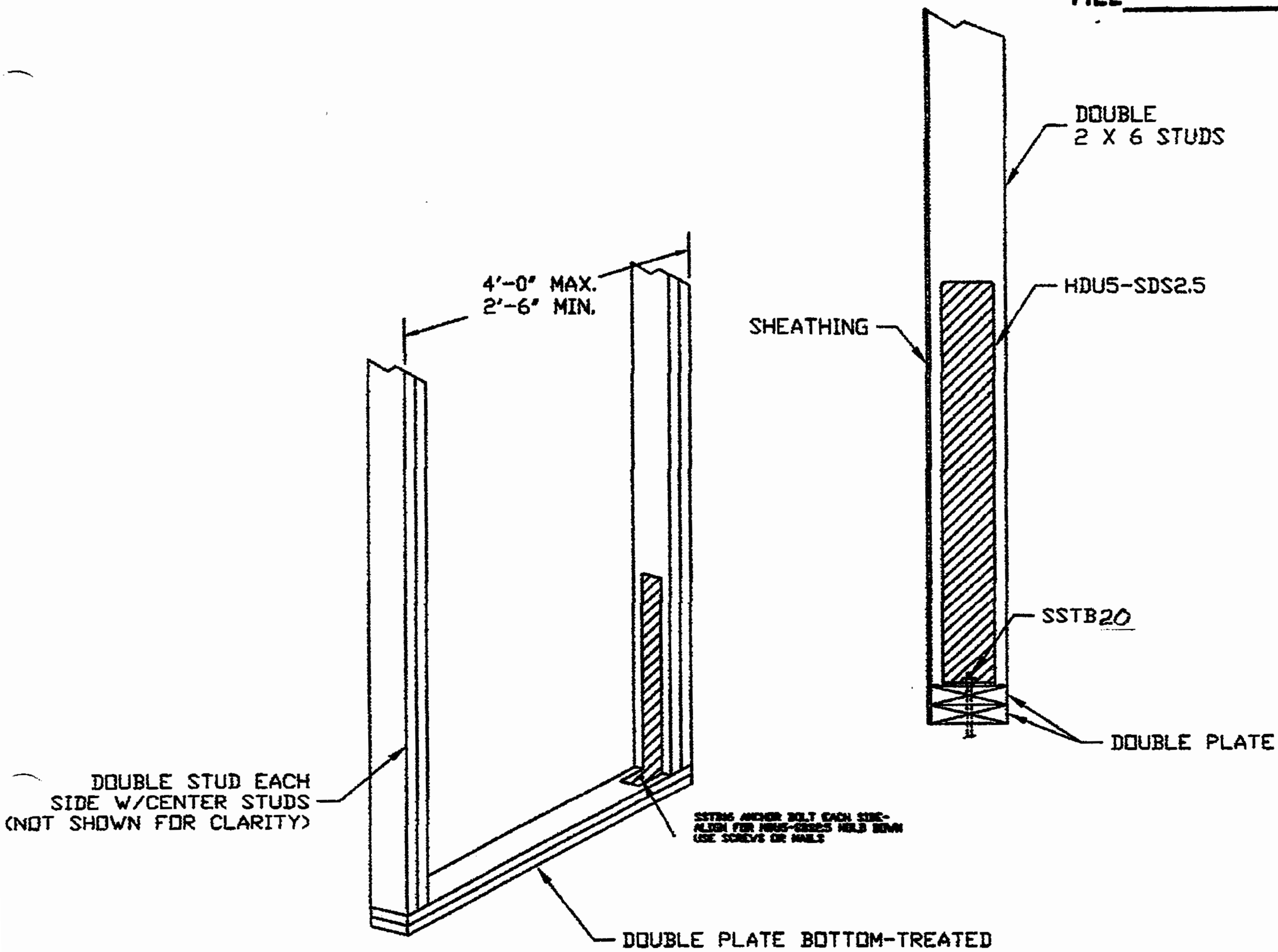
Use 15/32 APA Rated Paneling both sides – Nailing 3' o.c. through Simpson Coil Straping (CMST14) for full height as well as both plates.

Capacity 600plf

Note: that paneling both sides does not double capacity!

See attached sketch for additional details.

EPA 14 May 2013



COVER WITH 15/32 APA RATED SHEATHING,
NAILED WITH 10D SINKERS THRU CMSTC16
COILED STRAP FOR FULL HEIGHT AS WELL
ACROSS BOTTOM PLATES AND TOP DOUBLE
PLATES. NAILS 3" O.C. BOTH SIDES.

INSTALL ALL SIMPSON HARDWARE IN ACCORDANCE
WITH SIMPSON WRITTEN DIRECTIONS

SIMPSON STRONG-TIE CONNECTORS ARE SPECIFICALLY
REQUIRED TO MEET THE STRUCTURAL CALCULATIONS OF
PLAN. BEFORE SUBSTITUTING ANOTHER BRAND, CONFIRM
LOAD CAPACITY BASED ON RELIABLE PUBLISHED TESTING
DATA OR CALCULATIONS. THE DESIGNER/ENGINEER OF
RECORD SHOULD EVALUATE AND GIVE WRITTEN APPROVAL
FOR SUBSTITUTION PRIOR TO INSTALLATION

Seismic Analysis

Project: Wnek Garage

Project No: 20-18

Location: Silverdale

Date: 11 April/20

Lateral Force Analysis per ASCE Std 7-16, and local building department standards and conditions.

Analysis procedure used: Simplified- Std 7-16, 12.14.8 Simplified Lateral Force Analysis

Seismic Data:

Importance Factor: I= 1.00 per Table 1.5-2

Mapped response accelerations Ss = 1.32 per Figure 22-1

Site Class: D per Table 20.3-1

Value of Fa 1.00 Table 11.4-1

Spectral response coefficients: Sms=Ss(Fa): 1.32 (1.00)= 1.32 (11.4-1)

Sds=2/3 Sms=2/3 (1.32)= .88 (11.4-3)

Basic seismic-force-resisting system:

Response modification factor(s): R = 6.5 per Table 12.2-1

V=1.2Sds/R (W) $\dfrac{1.2 * .88}{6.5}$ (W) = 0.162 (12.14-12)

Design base shear: see Calc's – Sht. 16 of 26 Shts

References: ASCE Std 7 - 16

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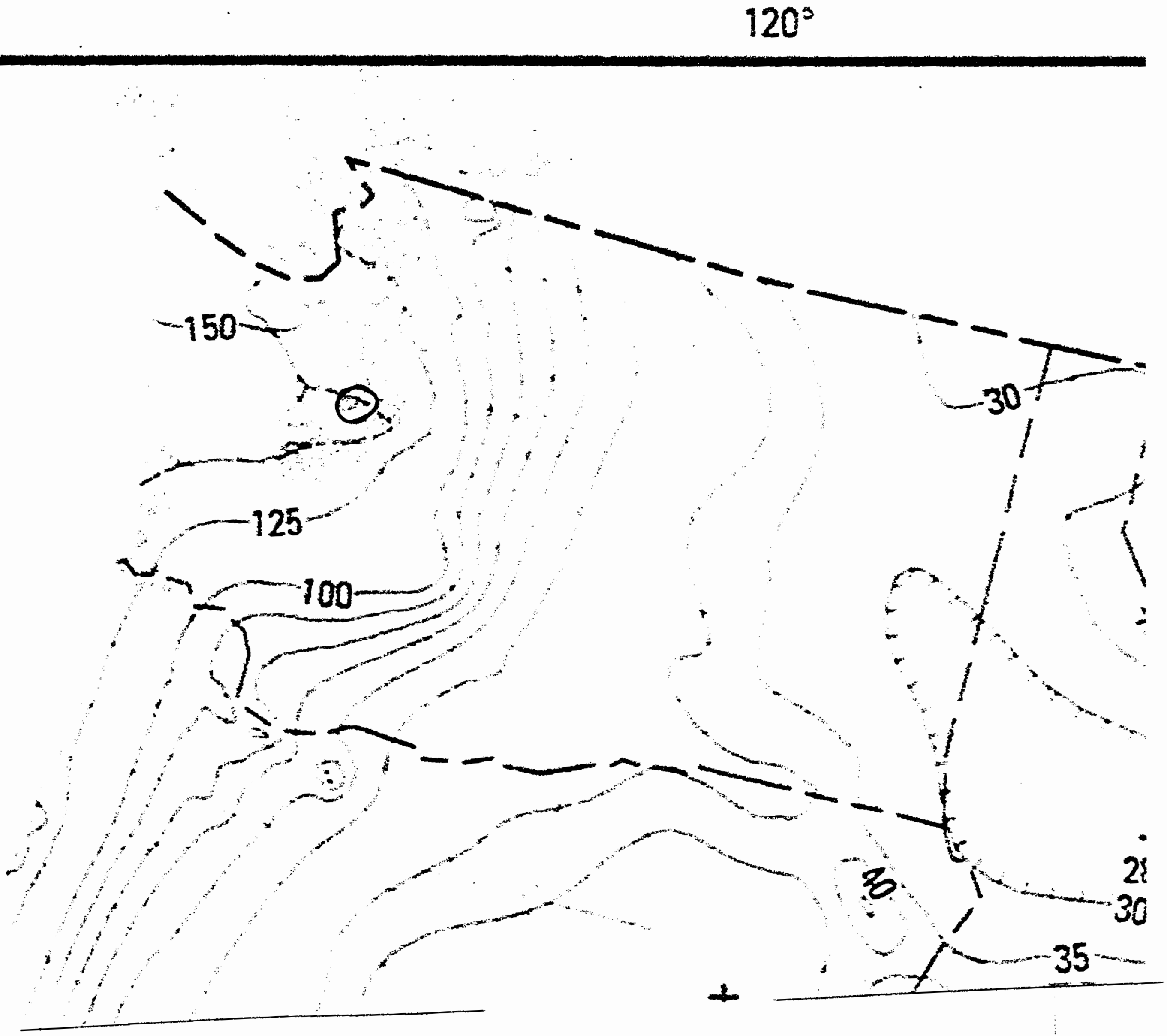
28 July 2017

An enlargement of Fig 22-1 ASCE 7-16

20-18

Value S_5 = 1,32

14/26



Wnek Garage 20-18

15/26

Dead loads for Seismic

Roof:

42' surface × 47' = 1974 #

Upper floor

Walls,

6'' (50' × 7.5') × 12.5 psf = 4,687.5 #

4'' (22 + 9 + 11 + 2) × 8' × 6.0 psf = 2,112 #

44

94 lf 72.3 plf

Floor 48 × 25 = 1200 #

Main floor

Walls

6'' (48+25)×2 = 75 lf × 9' × 12.5 = 8,437.5 #

4'' (20 lf × 9' × 6 = 1,080.0 #

95 lf 9,517.5 #

100.2 plf

Floor - 4" PCC Slab

Project: Wnek Garage

Seismic Loads and Shear Values

Job #: 20-18
Date: 11 April 20

Gross Weights:

Element	Symbol	Area sf	Unit Wt		Total Wt
Roof	Wr2	1974	17.5		34545
Roof	Wr1				
Floor 3	Wf3				0
Floor 2	Wf2	1200	15		18000
Floor 1	Wf1				0
		Lf	PLF		
Wall 3	Ww3				0
Wall 2	Ww2	94	72.3		6796
Wall 1	Ww3	95	100.2		9519

Shear Values:

		factor:	W total		Shear
	V3	0.162	34545		5596
	V2	0.162	41341		6697
	V1	0.162	68860.2		11155

Max. Base Shear:

		Wf1		V1	
Vmax		0		11155	11155

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18-Nov-16

Wnek Garage 20-18

Resisting Seismic Base Shear = 11,155#

Wall lines 1+2 = 12,502# > 11,155#

OK

Garage Door HDR

Span = 13' Trib. = 8.2' Floor LL = 50 DL = 15 psf

Roof LL = 20 psf (due to roof slope)

DL = 17.5 psf (×8'+4')

Load - Plf

6.25 × 50 = 312.5 6.25 × 65 = 406.25

12 × 20 = 240 12 × 37.5 = 450

LL = 552.5 lf TL = 856.25 plf

Use $5\frac{1}{2} \times 13\frac{1}{2}$ GLB 24F-V4

Support Posts

Load = 9609# H = 9' Use 4×6 DF #2

9' × 12" = 108" A_w = 19.25 □" E_{min} = 580,000 psi

F_c^* = 1350 psi × 1.1 (size) = 1485 psi

$\frac{l}{d} = \frac{108}{5.5} = 19.6$

		18	19.6	20	
Table 7.5 (WWUB)	1500	1026		911	
		1020.75	839.15	907.25	1485
	1400	991		886	

839.15 psi × 19.25 □" = 16,153.6# > 9609# OK

Use 4×6 DF #2

Use Simpson Base ABW46Z

" " Cap EPC6Z

BeamChek v2018 licensed to: E. Paul Austin / Austin Engineering Reg # 8551-66744

Wnek's Garage 13' Garage Door HDR

Date: 4/17/20

Selection **5-1/8x 12 GLB 24F-V4 DF/DF** Lu = 0.0 Ft

Conditions NDS 2015

Min Bearing Area R1= 8.7 in² R2= 8.7 in² (1.5) DL Defl= 0.23 in Recom Camber= 0.35 in

Data

Beam Span	13.0 ft	Reaction 1 LL	3591 #	Reaction 2 LL	3591 #
Beam Wt per ft	14.94 #	Reaction 1 TL	5663 #	Reaction 2 TL	5663 #
Bm Wt Included	194 #	Maximum V	5663 #		
Max Moment	18404 '#	Max V (Reduced)	4792 #		
TL Max Defl	L / 240	TL Actual Defl	L / 313		
LL Max Defl	L / 360	LL Actual Defl	L / 585		

Attributes

	Section (in³)	Shear (in²)	TL Defl (in)	LL Defl
Actual	123.00	61.50	0.50	0.27
Critical	92.02	29.95	0.65	0.43
Status	OK	OK	OK	OK
Ratio	75%	49%	77%	62%

Values / ***Adjustments***

	Fb (psi)	Fv (psi)	E (psi x mil)	Fc⊥ (psi)
Reference Values	2400	240	1.8	650
Adjusted Values	2400	240	1.8	650
Cv Volume	1.000			
Cd Duration	1.00	1.00		
Cr Repetitive	1.00			
Ch Shear Stress		N/A		
Cm Wet Use	1.00	1.00	1.00	1.00
Cl Stability	1.0000	Rb = 0.00	Le = 0.00 Ft	

Loads Uniform LL: 553 Uniform TL: 856 = A

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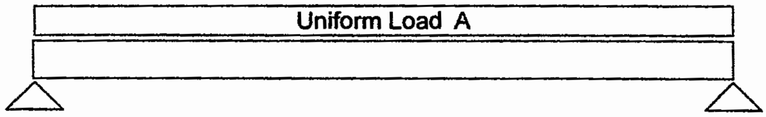

R1 = 5663 R2 = 5663

SPAN = 13 FT

Uniform and partial uniform loads are lbs per lineal ft.

Permit Number: 20-02334

Column Design

ALLOWABLE COMPRESSION DESIGN VALUE F_c' FOR COLUMNS (psi)

Table **7.4**

E_{min}' = 620,000

ℓ/d = 6 to 28

Multiply F_c' from table by the cross-sectional area (A) of column to obtain allowable axial load (P).

		ℓ/d											
E_{min}'	F_c*	6	8	10	12	14	16	18	20	22	24	26	28
620000	4000	3733	3466	3070	2589	2121	1728	1417	1176	988	840	722	627
	3500	3299	3104	2810	2432	2035	1680	1390	1159	977	833	717	623
	3000	2856	2718	2512	2235	1919	1615	1351	1136	962	823	710	618
	2700	2585	2476	2315	2094	1830	1562	1320	1117	950	814	704	614
	2400	2310	2227	2104	1934	1723	1496	1280	1092	934	804	697	609
	2100	2032	1970	1880	1755	1594	1412	1228	1059	913	790	687	602
	2000	1938	1883	1803	1691	1546	1379	1206	1045	904	784	683	599
	1900	1845	1795	1724	1624	1495	1343	1183	1030	894	777	679	596
	1800	1751	1707	1644	1556	1441	1304	1157	1013	883	770	673	592
	1700	1656	1618	1562	1485	1385	1262	1128	994	870	761	668	588
	1600	1561	1527	1479	1412	1325	1217	1096	973	856	752	661	583
	1500	1466	1437	1395	1337	1262	1168	1061	948	840	740	653	578
	1400	1371	1345	1309	1261	1196	1116	1022	921	821	727	644	571
	1300	1275	1253	1223	1182	1127	1059	978	889	799	712	633	564
	1200	1179	1160	1135	1101	1056	999	930	854	773	694	621	555
	1100	1082	1067	1046	1018	981	935	878	813	743	673	606	544
	1000	985	973	956	933	904	866	821	767	709	647	587	530
	900	888	878	865	847	824	794	759	716	668	617	564	514
	800	791	783	772	759	741	719	692	659	621	580	536	492
	700	693	687	679	669	656	639	619	595	567	536	501	465

ALLOWABLE COMPRESSION DESIGN VALUE F_c' FOR COLUMNS (psi)

Table **7.5**

E_{min}' = 580,000

ℓ/d = 6 to 28

Multiply F_c' from table by the cross-sectional area (A) of column to obtain allowable axial load (P).

		ℓ/d											
E_{min}'	F_c*	6	8	10	12	14	16	18	20	22	24	26	28
580000	4000	3711	3420	2992	2490	2020	1636	1337	1107	929	789	678	588
	3500	3284	3070	2750	2350	1945	1595	1314	1093	920	783	673	585
	3000	2844	2695	2469	2172	1844	1538	1281	1073	907	774	667	580
	2700	2576	2458	2281	2042	1765	1493	1254	1056	896	767	662	577
	2400	2303	2213	2079	1894	1669	1435	1220	1035	882	758	656	572
	2100	2027	1960	1862	1725	1552	1361	1174	1007	864	746	648	566
	2000	1934	1874	1786	1664	1508	1332	1155	995	857	741	644	564
	1900	1841	1787	1709	1600	1461	1300	1135	982	848	735	640	561
	1800	1747	1700	1631	1535	1411	1265	1112	967	839	729	636	558
	1700	1653	1611	1551	1467	1357	1227	1087	951	828	721	631	554
	1600	1558	1522	1469	1396	1301	1185	1058	932	815	713	625	550
	1500	1464	1432	1386	1324	1241	1140	1026	911	801	703	618	546
	1400	1368	1341	1302	1249	1178	1091	991	886	785	692	611	540
	1300	1273	1250	1217	1172	1112	1038	952	858	766	679	602	534
	1200	1177	1157	1130	1092	1043	981	908	826	743	664	591	526
	1100	1081	1065	1042	1011	971	920	859	790	717	645	578	517
	1000	984	971	952	928	896	855	805	748	686	622	561	505
	900	887	877	862	842	817	785	746	700	649	595	542	491
	800	790	782	770	755	736	712	682	647	606	562	517	472
	700	692	686	678	666	652	634	613	586	556	522	485	448
	600	594	590	584	576	566	553	538	520	498	473	446	417
	500	496	493	489	483	477	469	458	447	432	416	397	377

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Wnek Garage 20-18 Garage Door HDR 10

Date: 4/11/20

Selection	**5-1/8x 9 GLB 24F-V4 DF/DF**	Lu = 0.0 Ft
Conditions	NDS 2015	
	Min Bearing Area R1= 6.7 in² R2= 6.7 in² (1.5) DL Defl= 0.19 in Recom Camber= 0.28 in	

Data

Beam Span	10.0 ft	Reaction 1 LL	2763 #	Reaction 2 LL	2763 #
Beam Wt per ft	11.21 #	Reaction 1 TL	4337 #	Reaction 2 TL	4337 #
Bm Wt Included	112 #	Maximum V	4337 #		
Max Moment	10843 '#	Max V (Reduced)	3687 #		
TL Max Defl	L / 240	TL Actual Defl	L / 292		
LL Max Defl	L / 360	LL Actual Defl	L / 542		

Attributes	Section (in³)	Shear (in²)	TL Defl (in)	LL Defl
Actual	69.19	46.13	0.41	0.22
Critical	54.22	23.04	0.50	0.33
Status	OK	OK	OK	OK
Ratio	78%	50%	82%	66%

		Fb (psi)	Fv (psi)	E (psi x mil)	Fc⊥ (psi)
Values	Reference Values	2400	240	1.8	650
	Adjusted Values	2400	240	1.8	650
Adjustments	Cv Volume	1.000			
	Cd Duration	1.00	1.00		
	Cr Repetitive	1.00			
	Ch Shear Stress		N/A		
	Cm Wet Use	1.00	1.00	1.00	1.00
	Cl Stability	1.0000	Rb = 0.00	Le = 0.00 Ft	

Loads Uniform LL: 553 Uniform TL: 856 = A

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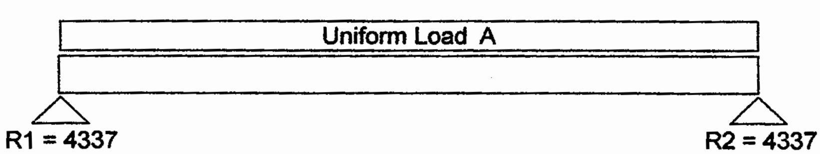

SPAN = 10 FT

Uniform and partial uniform loads are lbs per lineal ft.

Permit Number: 20-02334

Wnek Garage 20-18 Garage Door HDR 8

Date: 4/11/20

Selection — **5-1/8x 9 GLB 24F-V4 DF/DF** Lu = 0.0 Ft

Conditions — NDS 2015

Min Bearing Area R1= 5.3 in² R2= 5.3 in² (1.5) DL Defl= 0.08 in Recom Camber= 0.12 in

Data

Beam Span	8.0 ft	Reaction 1 LL	2210 #	Reaction 2 LL	2210 #
Beam Wt per ft	11.21 #	Reaction 1 TL	3470 #	Reaction 2 TL	3470 #
Bm Wt Included	90 #	Maximum V	3470 #		
Max Moment	6940 '#	Max V (Reduced)	2819 #		
TL Max Defl	L / 240	TL Actual Defl	L / 570		
LL Max Defl	L / 360	LL Actual Defl	L / >1000		

Attributes

	Section (in^3)	Shear (in^2)	TL Defl (in)	LL Defl
Actual	69.19	46.13	0.17	0.09
Critical	34.70	17.62	0.40	0.27
Status	OK	OK	OK	OK
Ratio	50%	38%	42%	34%

Values / **Adjustments**

	Fb (psi)	Fv (psi)	E (psi x mil)	Fc⊥ (psi)
Reference Values	2400	240	1.8	650
Adjusted Values	2400	240	1.8	650
Cv Volume	1.000			
Cd Duration	1.00	1.00		
Cr Repetitive	1.00			
Ch Shear Stress		N/A		
Cm Wet Use	1.00	1.00	1.00	1.00

Cl Stability 1.0000 Rb = 0.00 Le = 0.00 Ft

Loads Uniform LL: 553 Uniform TL: 856 = A

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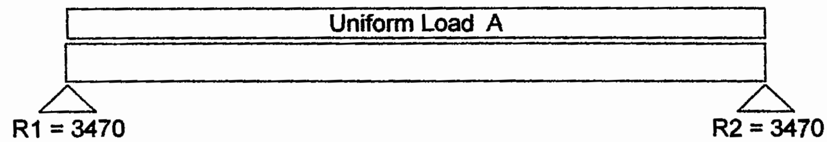

SPAN = 8 FT

Uniform and partial uniform loads are lbs per lineal ft.

Wnek Garage 20-18

22/26

Upper Floor Support

Max Span = 15.25'

LL = 50 psf Trib. = 12.5'

DL = 20 psf

Beam: $5\frac{1}{8}$ (or $\frac{1}{2}$) x $10\frac{1}{2}$ GLB 24F-V4 with

6x6 DF Select Posts in center 2 points.

Post Caps - Simpson CCQ 645 DS 2.5 - Centers

ECCQ 645 DS 2.5 - Ends

Post Base Simpson PBS 66

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Wnek Garage 20-18 Upper Floor Support

Date: 4/11/20

Selection	**5-1/8x 10-1/2 GLB 24F-V4 DF/DF**			Lu = 0.0 Ft		
Conditions	NDS 2015					
	Min Bearing Area	R1= 8.4 in²	R2= 8.4 in²	(1.5) DL Defl= 0.22 in	Recom Camber= 0.34 in	

Data

Beam Span	12.25 ft	Reaction 1 LL	3828 #	Reaction 2 LL	3828 #
Beam Wt per ft	13.08 #	Reaction 1 TL	5439 #	Reaction 2 TL	5439 #
Bm Wt Included	160 #	Maximum V	5439 #		
Max Moment	16658 '#	Max V (Reduced)	4662 #		
TL Max Defl	L / 240	TL Actual Defl	L / 254		
LL Max Defl	L / 360	LL Actual Defl	L / 414		

Attributes	Section (in³)	Shear (in²)	TL Defl (in)	LL Defl
Actual	94.17	53.81	0.58	0.36
Critical	83.29	29.14	0.61	0.41
Status	OK	OK	OK	OK
Ratio	88%	54%	95%	87%

		Fb (psi)	Fv (psi)	E (psi x mil)	Fc⊥ (psi)
Values	Reference Values	2400	240	1.8	650
	Adjusted Values	2400	240	1.8	650
Adjustments	Cv Volume	1.000			
	Cd Duration	1.00	1.00		
	Cr Repetitive	1.00			
	Ch Shear Stress		N/A		
	Cm Wet Use	1.00	1.00	1.00	1.00
	Cl Stability	1.0000	Rb = 0.00	Le = 0.00 Ft	

Loads Uniform LL: 625 Uniform TL: 875 = A

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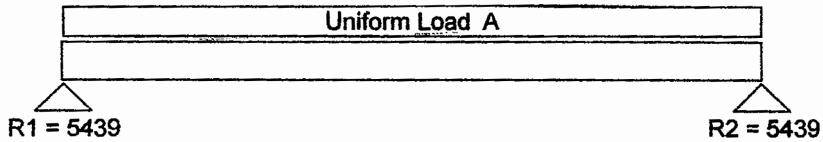

SPAN = 12.25 FT

Uniform and partial uniform loads are lbs per lineal ft.

Permit Number: 20-02334

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Wnek Garage 20-18 Center Beam Posts

Prepared by: Date: 4/11/20

Selection **6x 6 DF-L Select Solid Wood Column**

Conditions NDS 2015, Using values for 5x + solid sawn, Posts and Timbers.

Data

Load	10088 #	Column Area	30.25 in²	Kf	1.00
Actual Height	9.0 ft	le d1 Effective Ht	108 in	c	0.80
Unbraced L1	9.0 ft	le d2 Effective Ht	108 in	KcE	0.30
Unbraced L2	9.0 ft	Ke Buckling Mode	1.0	FcE	1246

Attributes and Values **Controlling d is 5.5 inches**

	le/d	psi	Area (in²)
Actual	20	333	30.25
Critical	50	826	12.22
Status	OK	OK	OK
Ratio	40%	40%	40%

	Fc ǁ (psi)	E (psi x mil)
Reference Values	1150	1.6
Adjusted Values	826	1.6
CF Size Factor	1.00	
Cd Duration	1.00	
Cm Wet Use	1.00	1.00
Cp Stability	0.72	

Note: A wood plate under this column must have an Fc value, perpendicular to the grain, greater than 333 psi.

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SIMPSON Strong-Tie®

LSTHD/STHD *Strap-Tie Holdown*

VALUE ENGINEERED

This product is preferable to similar connectors because of a) easier installation, b) higher loads, c) lower installed cost, or a combination of these features.

The STHD is an embedded strap-tie holdown offering high load capacity and a staggered nail pattern to help minimize splitting. The STHD incorporates many features that aid correct installation and improve performance. When installed on the forms with the StrapMate® strap holder the unique design of the STHD delivers enhanced stability before and during the pour to help prevent both parallel and perpendicular movement *(relative to the form)*. This results in accurate positioning of the strap and reduced possibility of spalling.

FEATURES

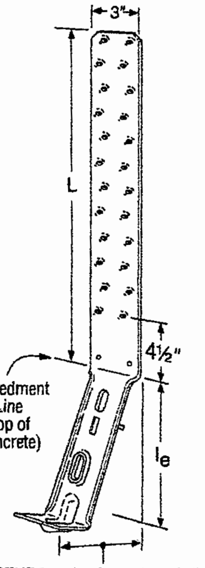
- The nailing pattern allows for nailing to the edges of double 2x's
- Strap nail slots are countersunk to provide a lower nail head profile
- The slots below the embedment line enable increased front-to-back concrete bond and help to reduce spalling
- Rim joist models accommodate up to a 17" clear span without any loss of strap nailing

MATERIAL: LSTHD8, LSTHD8RJ—14 gauge, all others—12 gauge

FINISH: Galvanized

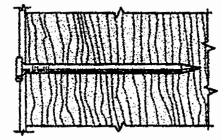
INSTALLATION: • Use all specified fasteners. See General Notes.

- Use table below for both standard concrete and post-tension slab installations.
- Install before concrete pour with a StrapMate, or other holding device.
- Nail strap from the bottom up.
- Strap may be bent one full cycle *(bent horizontal 90° then bent vertical)* to aid wall placement, but may cause spalling behind the strap. If the spall is 1" or less, measured from the embedment line to the bottom of the spall, full loads apply. 1" to 4" spalls for LSTHD8 achieve 0.9 times table loads. STHD10 and STHD14 achieve full load for spalls less than 4". Any portion of the strap left exposed should be protected against corrosion.
- Other than where noted in the two-pour detail, do not install where:
  (a) a horizontal cold joint exists within the embedment depth between the slab and foundation wall or footing beneath, unless provisions are made to transfer the load, or the slab is designed to resist the load imposed by the anchor; or
  (b) slabs are poured over concrete block foundation walls.
- Additional studs attached to the shearwall studs or post may be required by the Designer for wall sheathing nailing.
- Wood shrinkage after strap installation across horizontal members may cause strap to buckle outward.

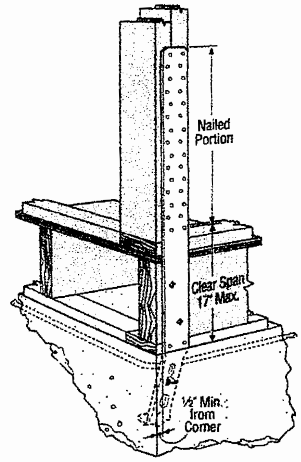


LSTHD8 varies from 4" to 4½"
STHD10, STHD14 varies from 4¾" to 5¼"

STHD
U.S. Patent 5,813,182



Nails are countersunk for a low-profile strap surface.



Typical STHD14RJ Rim Joist Application

For Two-Pour Installation for Downturn Footings

- For STHD10 installed through a 4" thick slab, use the equivalent 8" stemwall loads of the LSTHD8.
- For STHD14 installed through a 4" thick slab, use the equivalent 8" stemwall loads of the STHD10.
- For STHD14 installed through a 6" thick slab, use the equivalent 8" stemwall loads of the LSTHD8.

CODES: See page 13 for Code Reference Key Chart.

Tension Loads for STHD Installations

WIND AND SDC A & B – ALLOWABLE TENSION LOADS FOR DF/SP/SPF/HF (160)

Min. Stem Wall (in)	Model No.		Strap Length (L)		l_e (in)	Req'd Nails	Non Cracked			Cracked			Code Ref.
	Standard	Rim Joist	Standard (in)	Rim Joist (in)			Midwall	Corner	Endwall	Midwall	Corner	Endwall	
6	LSTHD8	LSTHD8RJ	18⅝	32⅛	8	20 -16d Sinkers	3115	2700	1690	2675	2320	1455	I25, F33
	STHD10	STHD10RJ	24⅝	38⅛	10	24 -16d Sinkers	3820	3820	2050	3140	3140	1705	
	STHD14	STHD14RJ	26⅛	39⅝	14	30 -16d Sinkers	5150	5150	3200	5150	5150	3200	
8	LSTHD8	LSTHD8RJ	18⅝	32⅛	8	20 -16d Sinkers	3115	2700	2230	2675	2320	1915	
	STHD10	STHD10RJ	24⅝	38⅛	10	28 -16d Sinkers	4755	4120	3145	4195	3500	2585	
	STHD14	STHD14RJ	26⅛	39⅝	14	30 -16d Sinkers	5345	5345	4210	5345	5345	4210	

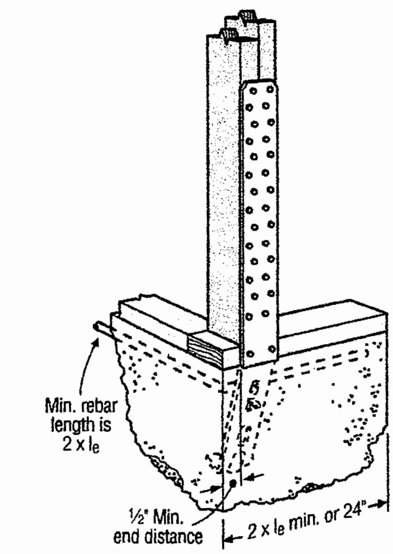
SDC C-F – ALLOWABLE TENSION LOADS FOR DF/SP/SPF/HF (160)

Min. Stem Wall (in)	Model No.		Strap Length (L)		l_e (in)	Req'd Nails	Non Cracked			Cracked			Code Ref.
	Standard	Rim Joist	Standard (in)	Rim Joist (in)			Midwall	Corner	Endwall	Midwall	Corner	Endwall	
6	LSTHD8	LSTHD8RJ	18⅝	32⅛	8	16 -16d Sinkers	2270	2090	1220	2250	1950	1220	I25, F33
	STHD10	STHD10RJ	24⅝	38⅛	10	18 -16d Sinkers	2750	2750	1615	2640	2640	1435	
	STHD14	STHD14RJ	26⅛	39⅝	14	22 -16d Sinkers	3695	3695	2685	3695	3695	2685	
8	LSTHD8	LSTHD8RJ	18⅝	32⅛	8	16 -16d Sinkers	2615	2125	1635	2250	1950	1610	
	STHD10	STHD10RJ	24⅝	38⅛	10	20 -16d Sinkers	3400	2940	2295	3400	2940	2175	
	STHD14	STHD14RJ	26⅛	39⅝	14	24 -16d Sinkers	3815	3815	3500	3815	3815	3500	

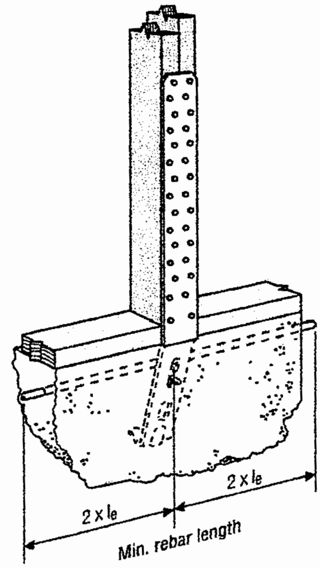
1. Allowable loads are for wind or seismic loading. Nail quantities reflect an increase for duration of load with no further increase allowed. Reduce where other loads govern.
2. Concrete shall have a minimum concrete strength, f'_c of 2500 psi.
3. 10d common (3" long x 0.148" diameter) nails may be used with no load reduction. 10dx2½ (2½" long x 0.148" diameter) nails may be used with no load reduction when installed directly over framing. For installation over structural sheathing, use 10d common or 16d sinkers.
4. Use the specified number of nails listed in table or as specified. In many cases, not all nail holes will be filled. Nail strap from the bottom up.
5. Deflection at highest allowable loads for install over wood double studs are as follows: Installed on framing: LSTHD8 = 0.089", STHD10 = 0.117" and STHD14 = 0.118". Installed over structural sheathing: LSTHD8 = 0.114", STHD10 = 0.146" and STHD14 = 0.164".
6. Multiply Seismic and Wind ASD load values by 1.4 or 1.6 respectively to obtain LRFD capacities.
7. Per 2009 and 2012 IBC Section 1613.1, detached one- and two-family dwellings in Seismic Design Category (SDC) C may use "Wind and SDC A&B" allowable loads.
8. Minimum center-to-center spacing is 3 times the required embedment ($S_{min} = 3xl_e$) for STHD's acting in tension simultaneously. Midwall install is based on $1.5xl_e$ end distance.
9. See T-SCLCOLUMN for installation on structural composite lumber posts or columns *(see page 232 for details)*.
10. For brick ledge applications, use full loads shown for STHD14 installed in 8" stemwall.
11. **NAILS:** 16d sinker = 0.148" dia. x 3¼" long. See page 22-23 for other nail sizes and information.

LSTHD/STHD *Strap-Tie Holdown*

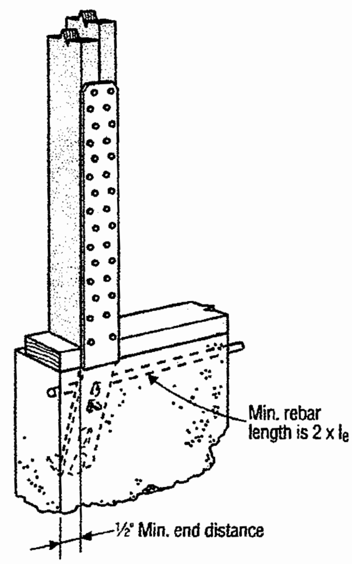
SIMPSON Strong-Tie®



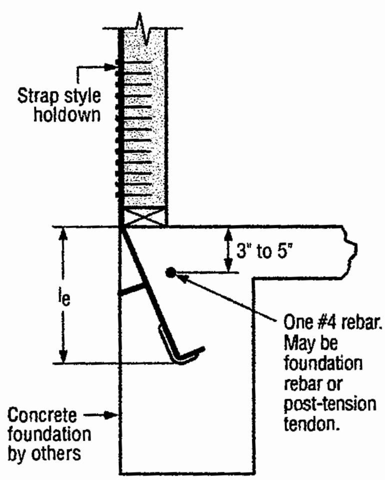
Typical STHD14
Corner Installation



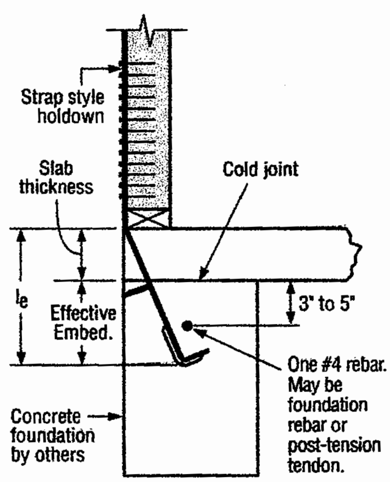
Typical STHD14
Mid Wall Installation



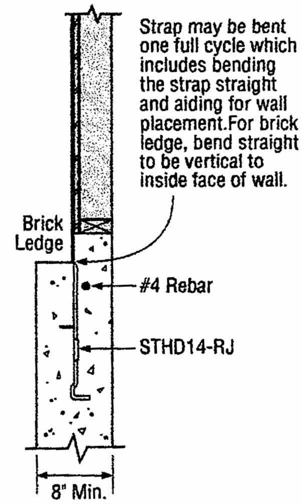
Typical STHD14
End Wall Installation



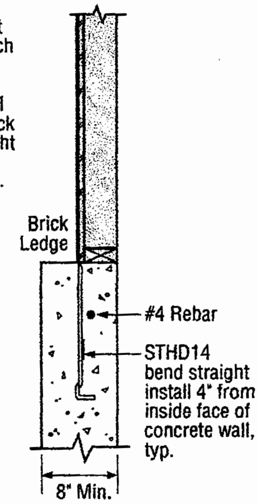
Single Pour Rebar Installation
**Maintain minimum rebar cover, per ACI-318 concrete code requirements.*



Two Pour Installation
for Downturn Footings



Brick Ledge Installation
with Step



Brick Ledge Installation
without Step

SPALL REDUCTION SYSTEM FOR STHD STRAP TIE HOLDOWN

FEATURES

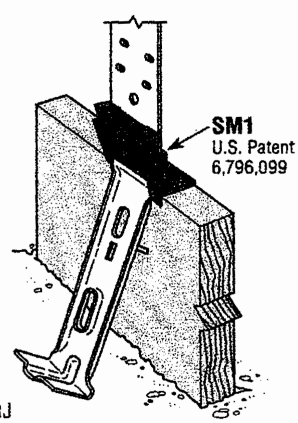
- Built-in tab.
- StrapMate® locator line.
- Additional diamond hole in RJ versions.

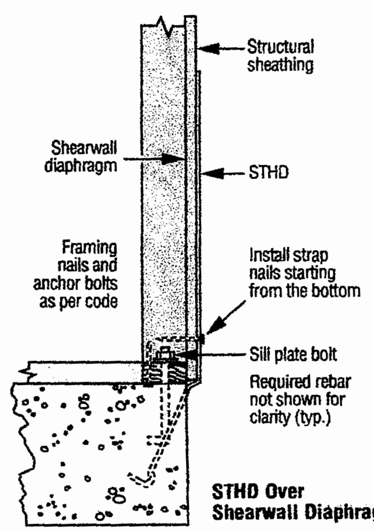
BENEFITS

Built-in Tab:
- Reduces spalling and costly retrofits.
- No additional labor to install.
- Holds STHD away from form board.

StrapMate Locator Line:
- Easy inspection to ensure proper location.
- Allows adjustment without removing STHD.

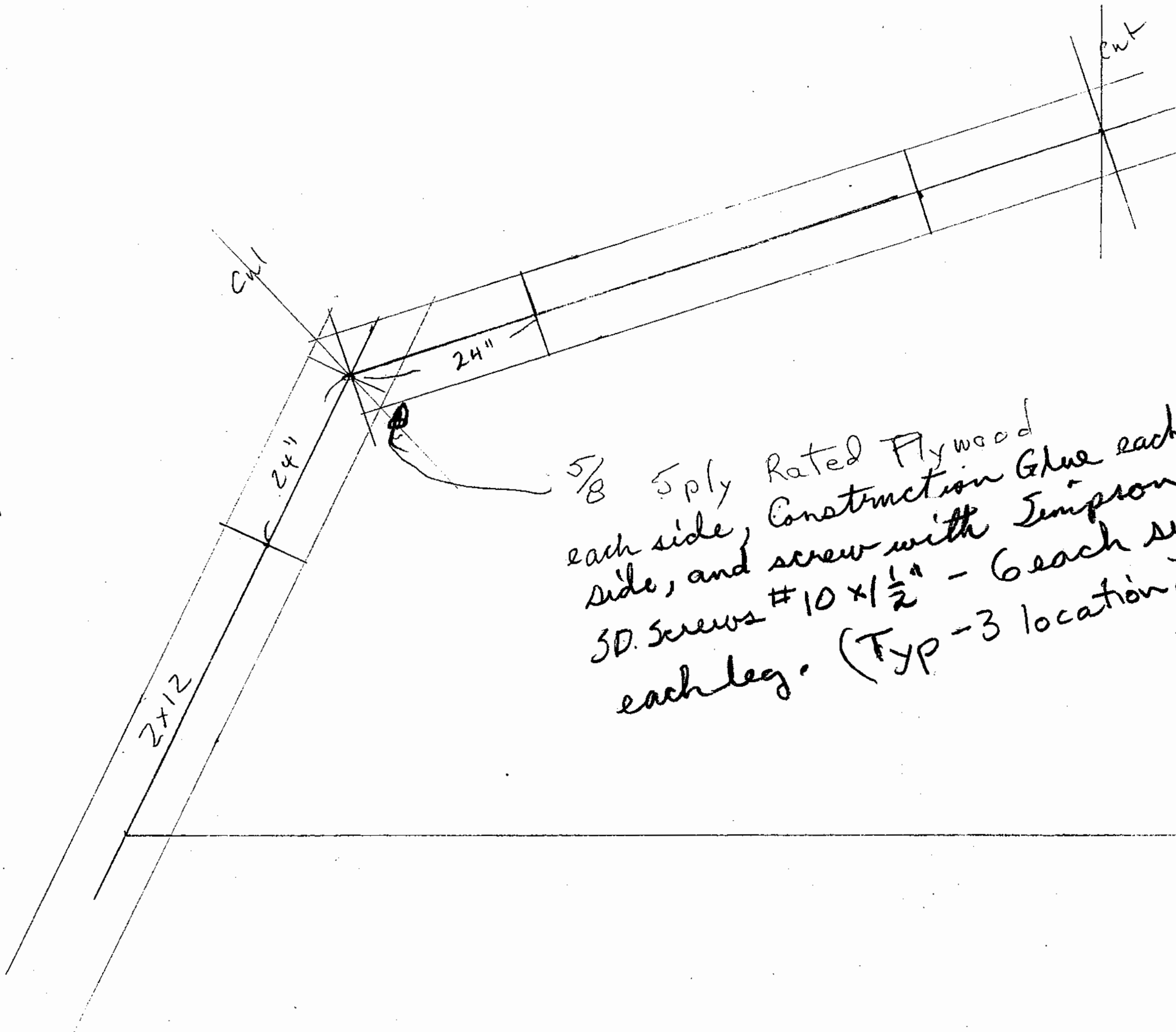
Additional Diamond Hole:
- One more fastener to help prevent the STHD RJ models from bowing out at the rim joist section.





STHD Over
Shearwall Diaphragm

$\frac{1}{2}$" = 1'0"



5/8 5ply Rated Plywood
each side, Construction Glue each
side, and screw with Simpson
SD. Screws #10 x $1\frac{1}{2}$" - 6 each side.
each leg. (Typ-3 location.)