

Versa-Lam® 2.1E – 3100F_b: Solid Columns

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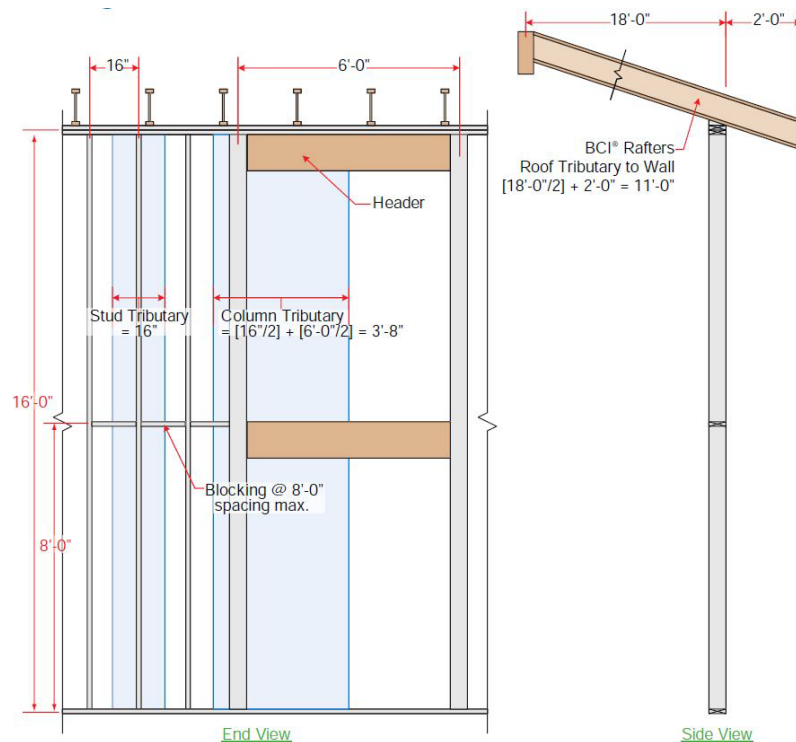
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Versa – Lam® 2.1E – 3100F_b: Design Properties

Versa-Lam® 2.1E - 3100F _b Specified Strengths / Stiffness									
Width	Depth	E _{true}	Inertia	f _b	f _v	f _c	f _{cp}	V _r	M _r
(in)	(in)	(x10 ⁶ psi)	(in ⁴)	(psi)	(psi)	(psi)	(psi)	(lb)	(lb-ft)
3 1/2	3 1/2	2.1	13	5,730	530	4,790	1,365	3,896	3,521
3 1/2	5 1/4	2.1	42	5,730	530	4,790	1,365	5,843	7,574
3 1/2	7	2.1	100	5,730	530	4,790	1,365	7,791	13,042
3 1/2	7-1/4	2.1	111	5,730	530	4,790	1,365	8,069	13,936
5 1/4	5 1/4	2.1	63	5,730	530	4,790	1,365	8,765	11,361
5 1/4	7	2.1	150	5,730	530	4,790	1,365	11,687	19,563
5 1/4	7-1/4	2.1	167	5,730	530	4,790	1,365	12,104	20,903
7	7	2.1	200	5,730	530	4,790	1,365	15,582	26,084

Engineering Design Assumptions:

Exterior Columns:



- Roof slope = 12/12
- Wall tributary width (from the roof) ≤ 18 ft. (including 2 ft. overhang)
- Roof standard dead load = 10 psf
- Roof standard live load = 10 psf
- Roof snow load ≤ 50 psf



- Wind load is acting on the face of the wall
- Load table values are based upon axial loads applied at the top of the column and lateral wind loads perpendicular to the wall (out of plane loading). Lateral loads parallel to the wall (in-plane loading), caused by seismic and wind, shall be designed by the project's design professional of record.
- Wind and axial loads are based upon the design provisions of Part 9 of 2020 National Building Code of Canada and CSA 086-19.
- The maximum factored axial loads assume a maximum eccentricity of either 1/6 column width or 1/6 column depth, whichever is worse.
- P - Δ effect was included in the analysis.
- Maximum opening height should be 75% of the column length or 10 feet, whichever is lower.
- Columns are considered fixed at both ends.
- The maximum deflection resulting from the specified wind and axial loads should not exceed:
 - L/360 for exterior walls with brick veneer
 - L/180 for other exterior walls

Interior Columns:

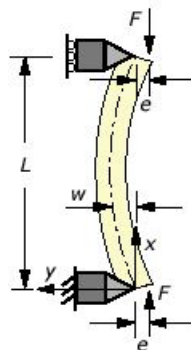


Figure 1: Axial load with eccentricity¹

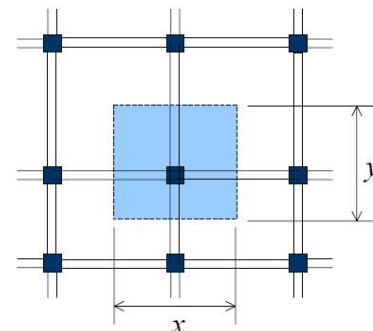


Figure 2: Tributary area for interior columns²

- The maximum factored axial loads assume an eccentricity of either 1/6 of column width or depth, whichever is worse.
- The effective column length is equal to the unsupported column length. The column is assumed to be unbraced laterally except at the column ends.
- When the column is used in a wall system, the bearing resistance requirements should be reviewed to ensure adequacy
- The column is subjected to a simple axial load.
- P - Δ effect was included in the analysis.

¹ www.efunda.com/formulae/solid_mechanics/columns/eccentric.cfm

² <http://www.assakkaf.com/Courses/ENCE355/Lectures/Part1/Chapter9a.pdf>



Interior Column Table (Maximum Factored Axial Loads):

Versa-Lam® 2.1E - 3100F _b								
Maximum Factored Axial Loads (lb)								
Unsupported length of column (ft)	Column Size (in)							
	3.5 x 3.5	3.5 x 5.25	3.5 x 7	3.5 x 7.25	5.25 x 5.25	5.25 x 7	5.25 x 7.25	7 x 7
4	27,884	41,825	55,767	57,759	68,173	90,897	94,144	123,781
4.5	26,593	39,890	53,186	55,086	67,142	89,522	92,719	122,971
5	25,131	37,696	50,261	52,057	65,892	87,857	90,995	121,973
5.5	23,539	35,308	47,078	48,759	64,423	85,897	88,965	120,774
6	21,629	32,443	43,257	44,803	62,738	83,651	86,638	119,363
6.5	19,628	29,441	39,255	40,657	60,849	81,133	84,030	117,734
7	17,775	26,662	35,550	36,820	58,777	78,369	81,168	115,885
7.5	16,080	24,120	32,160	33,171	56,544	75,392	78,085	113,816
8	14,541	21,812	28,963	29,988	54,182	72,243	74,823	111,534
8.5	13,151	19,727	26,188	27,115	51,723	68,964	71,427	109,049
9	11,899	17,848	23,690	24,528	48,665	64,886	67,203	106,372
9.5	10,772	16,158	21,445	22,203	45,628	60,837	63,009	103,524
10	9,759	14,639	19,426	20,113	42,734	56,978	59,013	100,523
10.5	8,849	13,238	17,613	18,235	39,994	53,325	55,229	97,392
11	8,030	12,013	15,983	16,547	37,411	49,882	51,663	94,156
11.5	7,294	10,912	14,518	15,030	34,987	46,650	48,315	90,713
12	6,632	9,922	13,200	13,667	32,717	43,623	45,181	86,515
14	4,587	6,863	9,133	9,456	25,053	33,403	34,596	71,099
16					19,274	25,698	26,616	58,164
18					14,921	19,854	20,560	47,595
20					11,642	15,493	16,044	39,038

Note:

- When the column is used in a wall system, the bearing resistance requirements should be reviewed to ensure adequacy.



Exterior Column Tables:

Maximum Unsupported Column Heights (Deflection = L/360)

Versa-Lam® 2.1E - 3100F _b						
Maximum Column Height (ft-in): Max. deflection = L/360						
Snow load: ≤ 50 psf						
Solid Column Size	Tributary width (ft)	Wind load (psi)				
		20	25	30	35	40
3.5" x 5.25"	3'	13'-5"	12'-6"	11'-9"	11'-3"	10'-9"
	4'	12'-0"	11'-3"	10'-8"	10'-1"	9'-8"
	5'	11'-1"	10'-4"	9'-9"	9'-4"	8'-11"
	6'	10'-4"	9'-8"	9'-1"	8'-8"	8'-4"
3.5" x 7"	3'	18'-1"	16'-10"	15'-11"	15'-1"	14'-6"
	4'	16'-4"	15'-3"	14'-4"	13'-8"	13'-1"
	5'	15'-0"	14'-0"	13'-3"	12'-7"	12'-1"
	6'	14'-1"	13'-1"	12'-5"	11'-10"	11'-4"
	8'	12'-7"	11'-9"	11'-2"	10'-7"	10'-2"
	10'	11'-7"	10'-10"	10'-3"	9'-9"	9'-5"
3.5" x 7.25"	3'	18'-9"	17'-6"	16'-6"	15'-8"	15'-0"
	4'	16'-11"	15'-9"	14'-10"	14'-2"	13'-7"
	5'	15'-8"	14'-6"	13'-8"	13'-1"	12'-6"
	6'	14'-7"	13'-7"	12'-10"	12'-3"	11'-9"
	8'	13'-1"	12'-3"	11'-6"	11'-0"	10'-7"
	10'	12'-0"	11'-3"	10'-7"	10'-2"	9'-9"
5.25" x 5.25"	3'	15'-6"	14'-6"	13'-8"	13'-0"	12'-5"
	4'	14'-0"	13'-1"	12'-4"	11'-9"	11'-3"
	5'	12'-11"	12'-0"	11'-4"	10'-10"	10'-4"
	6'	12'-0"	11'-3"	10'-8"	10'-1"	9'-8"
	8'	10'-10"	10'-1"	9'-7"	9'-1"	8'-9"
	10'	9'-11"	9'-3"	8'-9"	8'-4"	8'-0"
5.25" x 7"	3'	20'-10"	19'-5"	18'-4"	17'-5"	16'-8"
	4'	18'-10"	17'-7"	16'-7"	15'-9"	15'-1"
	5'	17'-5"	16'-3"	15'-4"	14'-7"	13'-11"
	6'	16'-4"	15'-3"	14'-4"	13'-8"	13'-1"
	8'	14'-8"	13'-8"	12'-11"	12'-4"	11'-10"
	10'	13'-6"	12'-7"	11'-11"	11'-4"	10'-11"
5.25" x 7.25"	3'	21'-8"	20'-2"	19'-0"	18'-1"	17'-3"
	4'	19'-7"	18'-2"	17'-2"	16'-4"	15'-8"
	5'	18'-1"	16'-10"	15'-10"	15'-1"	14'-6"
	6'	16'-11"	15'-9"	14'-10"	14'-2"	13'-7"
	8'	15'-3"	14'-2"	13'-5"	12'-9"	12'-3"
	10'	14'-0"	13'-1"	12'-4"	11'-9"	11'-3"
7" x 7"	3'	23'-1"	21'-5"	20'-3"	19'-3"	18'-5"
	4'	20'-10"	19'-5"	18'-4"	17'-5"	16'-8"
	5'	19'-4"	18'-0"	16'-11"	16'-2"	15'-5"
	6'	18'-1"	16'-10"	15'-11"	15'-1"	14'-6"
	8'	16'-4"	15'-3"	14'-4"	13'-8"	13'-1"
	10'	15'-0"	14'-0"	13'-3"	12'-7"	12'-1"



Maximum Unsupported Column Heights (Deflection = L/180)

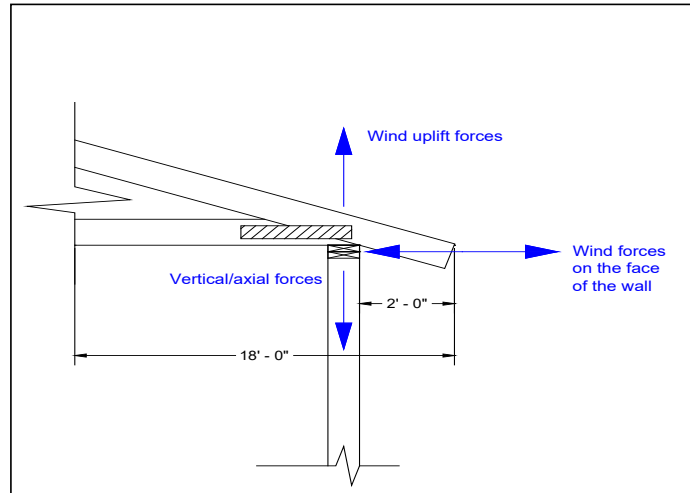
Versa-Lam® 2.1E - 3100F _b						
Maximum Column Height (ft-in): Max. deflection = L/180						
Snow load: ≤ 50 psf						
Solid Column Size	Tributary width (ft)	Wind load (psi)				
		20	25	30	35	40
3.5" x 5.25"	3'	17'-2"	16'-0"	15'-1"	14'-4"	13'-9"
	4'	15'-6"	14'-5"	13'-7"	13'-0"	12'-5"
	5'	14'-4"	13'-4"	12'-7"	12'-0"	11'-5"
	6'	13'-5"	12'-6"	11'-9"	11'-3"	10'-9"
3.5" x 7"	3'	23'-1"	21'-6"	20'-3"	19'-3"	18'-5"
	4'	20'-11"	19'-5"	18'-4"	17'-5"	16'-8"
	5'	19'-3"	17'-11"	16'-11"	16'-1"	15'-5"
	6'	18'-1"	16'-10"	15'-10"	15'-1"	14'-6"
	8'	15'-2"	15'-2"	14'-4"	13'-8"	12'-3"
3.5" x 7.25"	10'	15'-0"	14'-0"	13'-3"	12'-7"	12'-1"
	3'	23'-11"	22'-3"	21'-0"	19'-11"	19'-1"
	4'	21'-8"	20'-2"	18'-11"	18'-0"	17'-3"
	5'	20'-0"	18'-7"	17'-7"	16'-8"	16'-0"
	6'	18'-9"	17'-5"	16'-6"	15'-8"	15'-0"
5.25" x 5.25"	8'	16'-11"	15'-9"	14'-10"	14'-2"	13'-7"
	10'	15'-7"	14'-6"	13'-8"	13'-1"	12'-6"
	3'	19'-10"	18'-5"	17'-5"	16'-6"	15'-10"
	4'	17'-11"	16'-8"	15'-9"	14'-11"	14'-4"
	5'	16'-7"	15'-5"	14'-6"	13'-10"	13'-3"
5.25" x 7"	6'	15'-6"	14'-5"	13'-7"	13'-0"	12'-5"
	8'	14'-0"	13'-0"	12'-3"	11'-8"	11'-3"
	10'	12'-10"	12'-0"	11'-4"	10'-10"	10'-4"
	3'	26'-0"	24'-8"	23'-3"	22'-2"	21'-2"
	4'	24'-0"	22'-4"	21'-1"	20'-0"	19'-2"
5.25" x 7.25"	5'	22'-3"	20'-9"	19'-6"	18'-6"	17'-9"
	6'	20'-11"	19'-5"	18'-4"	17'-5"	16'-8"
	8'	18'-10"	17'-7"	16'-6"	15'-9"	15'-1"
	10'	17'-5"	16'-2"	15'-3"	14'-7"	13'-11"
	3'	26'-0"	25'-7"	24'-1"	22'-11"	21'-11"
7" x 7"	4'	24'-11"	23'-2"	21'-10"	20'-10"	19'-11"
	5'	23'-1"	21'-5"	20'-3"	19'-3"	18'-5"
	6'	21'-8"	20'-2"	18'-11"	18'-0"	17'-3"
	8'	19'-7"	18'-2"	17'-2"	16'-4"	15'-8"
	10'	18'-0"	16'-9"	15'-10"	15'-1"	14'-5"

Maximum Factored Axial Loads

Maximum Factored Axial Forces, (lb)					
Column Tributary Width (ft)					
3'	4'	5'	6'	8'	10'
5,005	6,673	8,341	10,009	13,346	16,682



Maximum Forces for Connectors



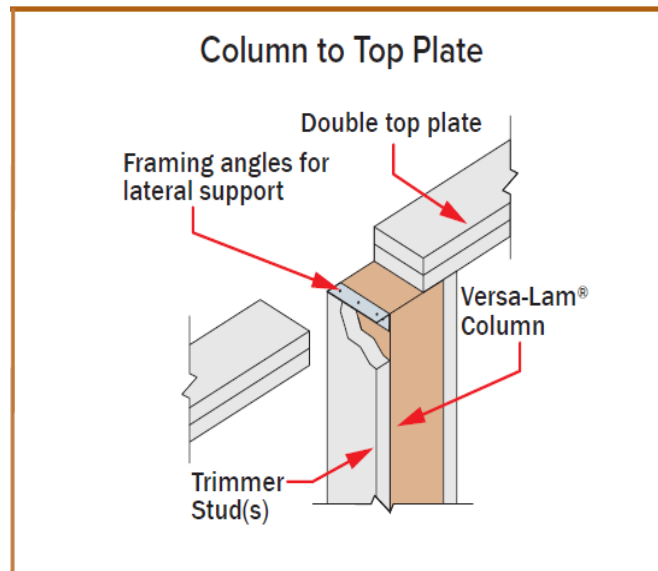
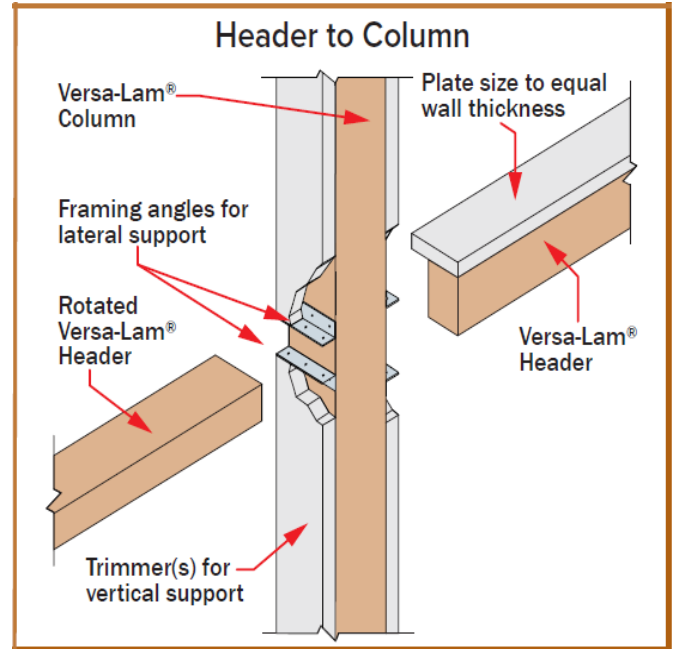
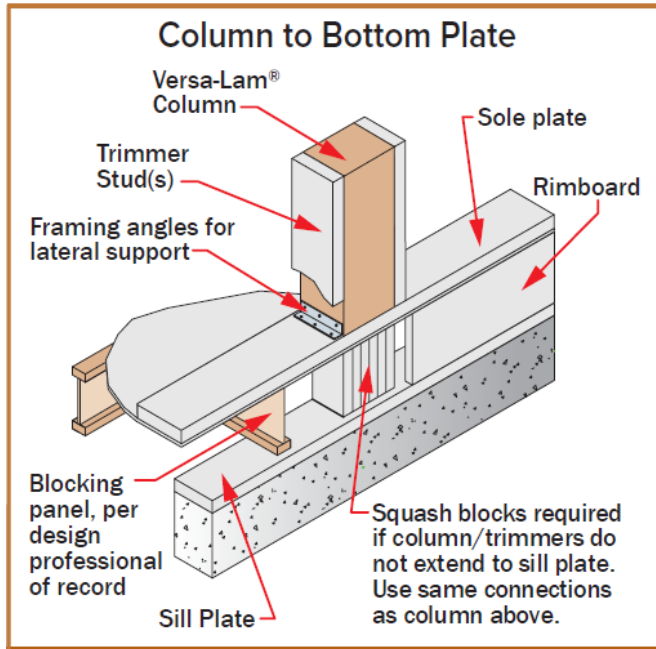
Maximum Factored Uplift Forces (for connectors) (lb)						
Wind load (psf)	Column Tributary Width (ft)					
	3'	4'	5'	6'	8'	10'
20	112	149	186	224	298	373
25	379	505	632	758	1,011	1,264
30	646	862	1,077	1,293	1,724	2,155
35	914	1,218	1,523	1,827	2,437	3,046
40	1,181	1,575	1,968	2,362	3,149	3,937

Base and Top Factored Wind Reactions acting on the face of the wall (lb)						
20 psf Wind Load						
Height (ft)	Column Tributary Width (ft)					
	3'	4'	5'	6'	8'	10'
8	336	448	560	672	896	1,120
10	420	560	700	840	1,120	1,400
12	504	672	840	1,008	1,344	1,680
14	588	784	980	1,176	1,568	1,960
16	672	896	1,120	1,344	1,792	2,240
18	756	1,008	1,260	1,512	2,016	2,520
20	840	1,120	1,400	1,680	2,240	2,800
22	924	1,232	1,540	1,848	2,464	3,080
24	1,008	1,344	1,680	2,016	2,688	3,360
26	1,092	1,456	1,820	2,184	2,912	3,640

For the other wind loads, multiply the factored reaction value shown in the table by the following factors:
25 psf = 1.25; 30 psf = 1.5; 35 psf = 1.75; 40 psf = 2.0

Technical Note

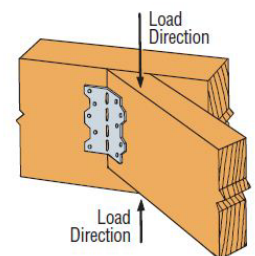
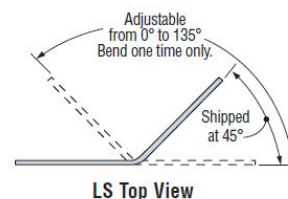
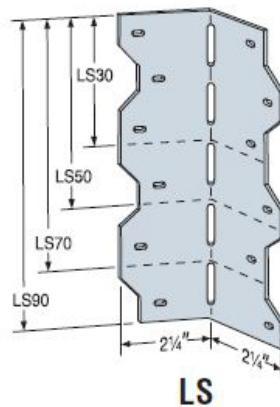
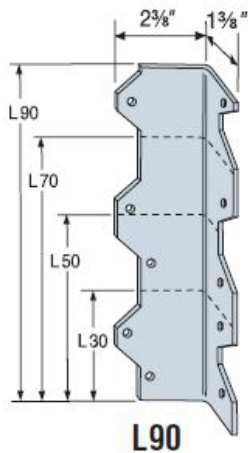
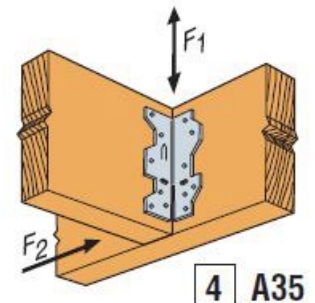
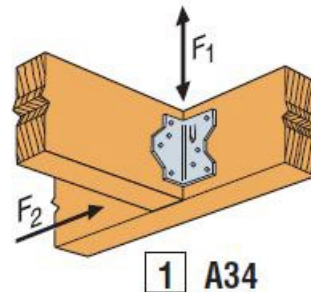
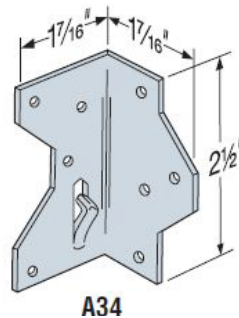
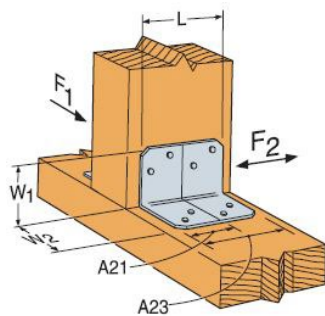
Column Connectors



Technical Note

Framing Angles

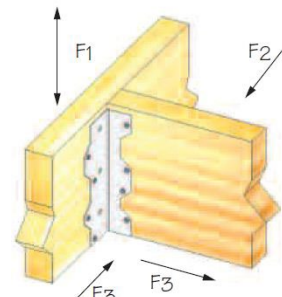
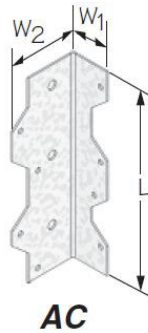
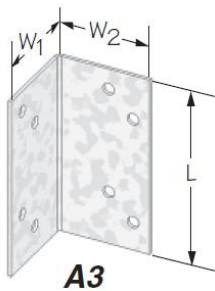
FRAMING ANGLES (Simpson Strong-Tie)								
Model No.	Dimensions			Column depth (in)	Nailing		Factored resistance (K _D = 1.15)	
	W1	W2	L		Base	Stud/Column	F1	F2
	(in)	(in)	(in)				(lb)	
A23	2	1 1/2	2 3/4	3 1/2	4-10d x 1 1/2	4-10d x 1 1/2	815	715
A34	1 7/16	1 7/16	2 1/2	3 1/2	4-8d x 1 1/2	4-8d x 1 1/2	735	640
A35	1 7/16	1 7/16	4 1/2	5 1/4	6-8d x 1 1/2	6-8d x 1 1/2	955	920
L30	2 3/8	1 3/8	3	3 1/2	2-10d	2-10d	480	
L50	2 3/8	1 3/8	5	5 1/4	3-10d	3-10d	720	
L70	2 3/8	1 3/8	7	7, 7 1/4	4-10d	4-10d	960	
LS30	2 1/4	2 1/4	3 3/8	3 1/2	3-10d	3-10d	555	
LS50	2 1/4	2 1/4	4 7/8	5 1/4	4-10d	4-10d	890	
LS70	2 1/4	2 1/4	6 3/8	7, 7 1/4	5-10d	5-10d	1090	
Heavy Angles								
HL35	3 1/4	3 1/4	5	5 1/4	4 bolts (1/2" diameter)		Connectors are not load rated. Contact Simpson Strong-Tie for more information.	
HL43	4 1/4	4 1/4	3	3 1/2	2 bolts (1/2" diameter)			
HL46	4 1/4	4 1/4	6	7, 7 1/4	4 bolts (1/2" diameter)			



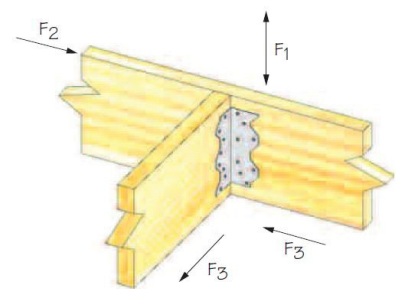
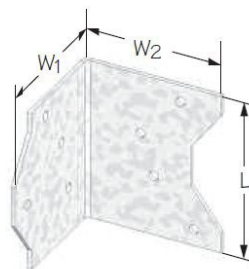
Typical LS70 Installation

Technical Note

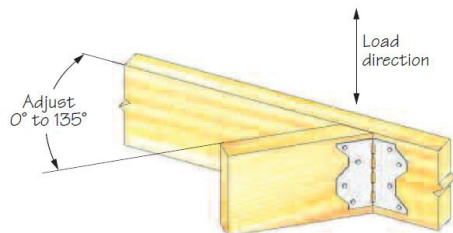
FRAMING ANGLES (MiTek)								
Model No.	Dimensions			Column depth (in)	Nailing		Factored resistance ($K_D = 1.15$)	
	W1	W2	L		Base	Stud/Column	F1	F2
	(in)	(in)	(in)				(lb)	
A3	1 7/16	1 7/16	2 3/4	3 1/2	4-10d x 1 1/2	4-10d x 1 1/2	1115	1130
MP3	2 1/4	2 1/4	3 3/8	3 1/2	3-10d	3-10d	715	
AC5	1 5/16	2 3/8	4 7/8	5 1/4	3-10d	3-10d	1145	1070
MP5	2 1/4	2 1/4	4 5/8	5 1/4	4-10d	4-10d	1010	
AC7	1 5/16	2 3/8	6 15/16	7	4-10d	4-10d	1285	1535
MP7	2 1/4	2 1/4	5 7/8	7	5-10d	5-10d	1315	
MP9	2 1/4	2 1/4	6 7/8	7	6-10d	6-10d	1410	
JA3	2 1/2	2 1/2	3	3 1/2	4-16d	4-10d x 1 1/2	1108	1005
JA5	2 1/2	2 1/2	5	5 1/4	6-16d	6-10d x 1 1/2	1790	1915
JA7	2 1/2	2 1/2	7	7	8-16d	8-10d x 1 1/2	3517	3064
JA9	2 1/2	2 1/2	9	9 1/4, 9 1/2	10-16d	10-10d x 1 1/2	4333	3102



Typical AC installation



Typical JA7 installation



Typical MP installation



Stud Plate Ties

Stud Plate Ties (Simpson Strong-Tie)			
Model No.	Nailing	Factored Uplift Resistance ($K_D = 1.15$) (lb)	
		Double top plate	Single sill plate
SSP	(7) 10d x 1 1/2	570	535
	(7) 10d	710	690
DSP	(14) 10d x 1 1/2	1,270	890
	(14) 10d	1,550	985
RSP4	(8) 8d x 1 1/2	670	595
SPH4	(12) 10d x 1 1/2	2,450	2,010
SP1	(10) 10d	--	810
SP2	(12) 10d	1,220	--

Stud Plate Ties (MiTek)		
Model No.	Nailing	Factored Uplift Resistance ($K_D = 1.15$) (lb)
RSPT4	(8) 8d x 1 1/2	585
RSPT6	(8) 10d x 1 1/2	740
RSPT6-2	(14) 10d x 1 1/2	1,115
SPT22	(8) 10d	755
SPT24	(12) 10d	1,125
SPTH4	(12) 10d x 1 1/2	1,275
SPTH6	(12) 10d x 1 1/2	1,275



Header Clips/Hangers

Header Clips/Hangers (Simpson Strong-Tie)			
Model No.	Width (in)	Nailing	Factored Vertical/Axial Resistance ($K_D = 1.00$) (lb)
FC4	3 9/16	(8) 16d	1,415
FC6	5 1/2	(10) 16d	1,415
HH4	3 1/2	(13) 16d	1,125
HH6	5 1/2	(18) 16d	1,690

Header Clips/Hangers (MiTek)			
Model No.	Width (in)	Nailing	Factored Vertical/Axial Resistance ($K_D = 1.00$) (lb)
SFC6	5 1/2	(10) 16d	775
HH44	3 9/16	(13) 16d	850
HH66	5 1/2	(18) 16d	1,365