

STRONG-DRIVE® SCREW APPLICATIONS

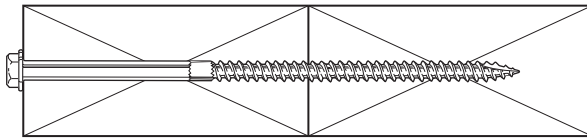


The purpose of this Bulletin is to provide basic guidelines for the design and use of Simpson Strong-Drive® wood screws for various typical structural applications.

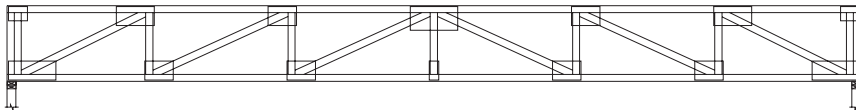
The Simpson Strong-Drive® screw provides strength, versatility and installation economy in many common structural applications.

This Bulletin applies to the use of Simpson Strong-Drive® wood screws only.

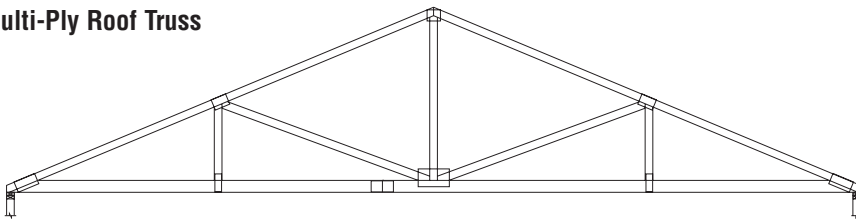
Two Ply Floor Truss Member



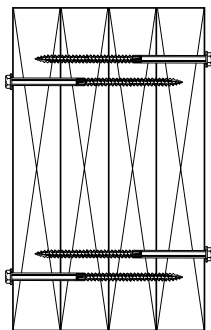
Two Ply Floor Truss



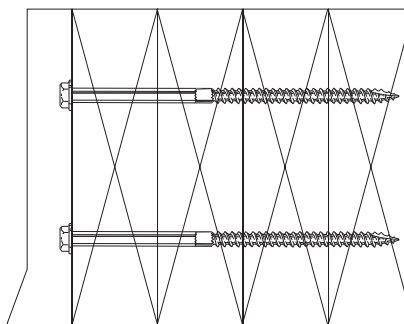
Multi-Ply Roof Truss



Multi-Ply Solid Sawn or LVL Member



Multi-Ply Roof Truss Member



800-999-5099
www.strongtie.com

STRONG-DRIVE[®] SCREW APPLICATIONS

GENERAL INFORMATION

Installation:

The Simpson Strong-Drive wood screw has a hex washer head for easy driving. The built-in reamer and Type 17 tip allows for installation without pre-drilling. Pre-drilling may be necessary depending on the type and moisture content of the wood.

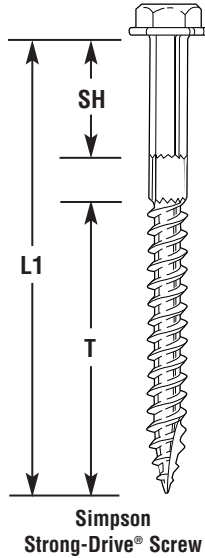
Edge distances, end distances and spacings of all Strong-Drive screws shall be sufficient to prevent splitting of the wood or as recommended in this bulletin, whichever is more restrictive.

The bottom of the screw head shall be installed flush to the surface of the member being connected. Do not over-drive the SDS screws. For best installation use a high torque, low speed (5 amp+) drill with a 3/8" hex head.

Design:

The information shown in this bulletin is intended for the use of a Professional Engineer. The Engineer shall be responsible for the design of all members and connections, which includes determining the number and location of all Strong-Drive screws to adequately transfer all required loadings.

Factored resistances have been developed in accordance with 3.3.2 CSA O86-01 and are soft converted from allowable stress values based on the NDS 1997 and testing per ASTM D1761. Values shown assume standard term load duration ($K_D=1.00$) under dry service conditions installed into face grain or edge grain. Values may be adjusted for other load durations as per 4.3.2 CSA O86-01. Do not install SDS screws into the end grain of material.



Identification on all screw heads (SDS^{1/4}x3 shown)

U.S. Patent 6,109,850

Table 1 - Screw Dimensions

Model	L1 (in)	SH (in)	T (in)
SDS1/4x2	2	1/2	1 1/4
SDS1/4x2-1/2	2 1/2	3/4	1 1/2
SDS1/4x3	3	3/4	2
SDS1/4x3-1/2	3 1/2	1	2 1/4
SDS1/4x4-1/2	4 1/2	1 1/2	2 3/4
SDS1/4x6	6	2 1/2	3 1/4

FACTORED LATERAL RESISTANCES (N_r)

Table 2 - Steel Side Members

Model No.	SCL Allowable Use		Factored Lateral Resistance (lbs)								
			SCL (SG=0.50) ⁵			D. Fir-L			S-P-F		
			LVL & PSL ³	LSL ⁴	20 Ga	10 Ga	1/4"	20 Ga	10 Ga	1/4"	20 Ga
SDS1/4x2	OK	OK	370	430	460	365	420	450	320	370	400
SDS1/4x2 1/2	OK	OK	370	430	460	365	420	450	320	370	400
SDS1/4x3	OK	N/A	370	430	460	365	420	450	320	370	400
SDS1/4x3 1/2	OK	N/A	370	430	460	365	420	450	320	370	400
SDS1/4x4 1/2	N/A	N/A	—	—	—	365	420	450	320	370	400
SDS1/4x6	N/A	N/A	—	—	—	365	420	450	320	370	400

See notes below.

Table 3 - Wood Side Members

Model No.	SCL Allowable Use		Side Member Thickness (in)		Factored Lateral Resistance (lbs)			
					SCL		D. Fir-L	S-P-F
					LVL & PSL ³	LSL ⁴		
SDS1/4x3	OK	OK	—	1 1/2	—	—	260	205
SDS1/4x3 1/2	OK	OK	1 3/4	1 1/2	305	255	295	235
SDS1/4x4 1/2	OK	N/A	1 3/4	1 1/2	305	255	345	280
SDS1/4x6	OK	N/A	1 3/4	1 1/2	390	300	345	280
SDS1/4x6	OK	N/A	3 1/2	3 1/2	305	260	300	260

- Factored resistances shown are for standard term load duration ($K_D=1.00$) and may be increased for short term loading ($K_D=1.15$) as per 4.3.2.2 CSA O86-01.
- Values shown are for dry service conditions ($K_{SF}=1.00$). For wet service conditions, multiply the table values by 0.67 ($K_{SF}=0.67$) and specify hot dipped galvanized screws.
- PSL is Parallam PSL, a registered trademark of Trus Joist, A Weyerhaeuser Business.
- LSL is TimberStrand LSL, a registered trademark of Trus Joist, A Weyerhaeuser Business.
- For SCL with SG=0.42 to 0.48 using steel side plates, use S-P-F values.
- Values shown for steel side plates assume $F_{ij}=45$ ksi.
- Hole sizes in steel side plates shall be $\frac{3}{32}$ " diameter.
- When using Structural Composite Lumber, screws must be applied to the wide face.

STRONG-DRIVE® SCREW APPLICATIONS

JOINING MULTIPLE PLYS OF SOLID SAWN LUMBER, WOOD TRUSSES AND STRUCTURAL COMPOSITE LUMBER

Solid Sawn Lumber, Structural Composite Lumber and Wood Trusses:

1. The minimum recommended screw spacing shall be: 4" end distance, 1½" edge distance, 4" spacing parallel to grain, 2½" spacing perpendicular to grain. The maximum spacing parallel to grain shall not exceed 24 inches on centre.
2. All SCL or Lumber members shall be full length with no intermediate splices (trusses not included).
3. Strong-Drive screws shall be installed with the screw heads in the loaded ply for assemblies A, F, G and H.
4. Strong-Drive screws shall be installed in both outer plies for assemblies B₁, B₂, and C.
5. Individual screw locations may be adjusted up to ½ of the required screw spacing to avoid conflicts with other hardware or to avoid lumber defects.
6. The spacing of the applied uniform loads to the multi-ply member shall not exceed 24 inches on centre. (i.e. joist or hanger spacing).
7. Screws on the "backside" of members shall be staggered from "frontside" screws by ½ the required spacing (assemblies B₁, B₂ and C).
8. Do not over drive the screws.
9. The designer must check the structural capacity of the member based on the reduced cross section as per 10.2.2.5.1 CSA O86-01.

Wood Trusses:

10. All Strong-Drive screws must penetrate a minimum of 1 inch into the last truss ply.
11. A maximum gap of 1/8 inch is allowed between each truss ply as long as the penetration requirement in note 10 is maintained.
12. The Truss Engineer shall ensure that adequate lateral bracing is provided to prevent displacement of the truss and the bottom chord
13. Strong-Drive screws shall not be installed through metal truss plates unless approved by the Truss Engineer. Pre-drilling using a 5/32" bit is required.
14. Use 1 row of SDS's in 2x4 members, 2 rows in 2x6 and 2x8 members and 3 rows in 2x10 members. Rows should be staggered.

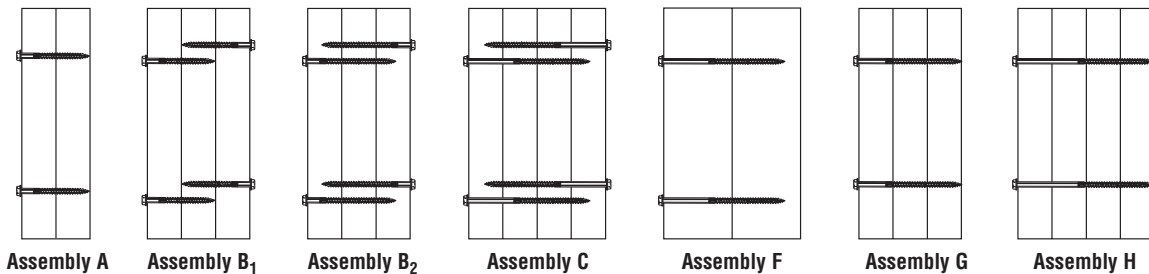


Table 4 - Maximum Factored Uniform Load per Assembly

Assembly	SDS Screw Length	Side Member Thickness	Maximum Factored Uniform Load Applied to Outer Member (plf)					
			SDS @12" o/c		SDS @16" o/c		SDS @24" o/c	
			2-Rows	3-Rows	2-Rows	3-Rows	2-Rows	3-Rows
SCL (SG=0.50)								
A	3½	1¼	1220	1830	915	1370	610	915
B ₁	3½	1¼	915	1370	685	1030	455	685
B ₂	4½	1¼	1455	2180	1090	1635	725	1090
C	6	1¼	1040	1560	780	1170	520	780
F	6	3½	1220	1830	915	1375	610	915
SCL (SG=0.42)								
A	3½	1¼	1020	1530	765	1150	510	765
B ₁	3½	1¼	765	1145	575	860	380	575
B ₂	4½	1¼	1225	1835	920	1375	610	920
C	6	1¼	800	1200	600	900	400	600
F	6	3½	1040	1560	780	1170	520	780
D.Fir-L								
A	3	1½	1040	1560	780	1170	520	780
B ₁	3	1½	780	1170	585	875	390	585
F	6	3½	1200	1800	900	1350	600	900
G	4½	1½	1035	1550	775	1165	515	775
H	6	1½	920	1380	690	1035	460	690
S-P-F								
A	3	1½	820	1230	615	925	410	615
B ₁	3	1½	615	920	460	690	305	460
F	6	3½	1040	1560	780	1170	520	780
G	4½	1½	840	1260	630	945	420	630
H	6	1½	745	1120	560	840	375	560

1. Quantity and spacing of screws in table are for each screw head side of the assembly as shown in the assembly figures above.
2. Values shown are for standard term load duration (K_D=1.00). Values may be increased 15% for short term load duration (K_D=1.15). Decrease values as per 4.3.2 of CSA O86-01 where other load durations govern.
3. Values shown are for dry service conditions (K_{SF}=1.00). For wet service conditions, multiply the table values by 0.67 (K_{SF}=0.67) and specify hot dipped galvanized screws.
4. Capacities shown in the table are for the connection only. Beam capacity must be verified by the engineer.
5. All members in assembly shall be of the same species and grade.
6. Factored resistances are based on all members in the assembly having the same thickness.

STRONG-DRIVE® SCREW APPLICATIONS

The following method is used when the designer assumes each ply supports equal portions of the load. (Example: In a 3 ply member, each ply carries 1/3 of the total applied load.) This method applies only to the connection. The beam capacity should be checked to ensure proper design.

Refer to page 3 for screw spacing requirements.

Design Examples - Uniform Loading:

2 Ply (Assembly "A"): Factored Uniform Load = 1000 plf ($K_D=1.00$)
Solid Sawn 2x S-P-F w/ SDS1/4x3
Use 3 rows of SDS's — Factored Resistance = 1230 plf (Table 4; @12" o/c)
Spacing required: $1230 / 1000 \times 12 = 14.8"$
Use 3 rows of SDS1/4x3 at 14" on centre.

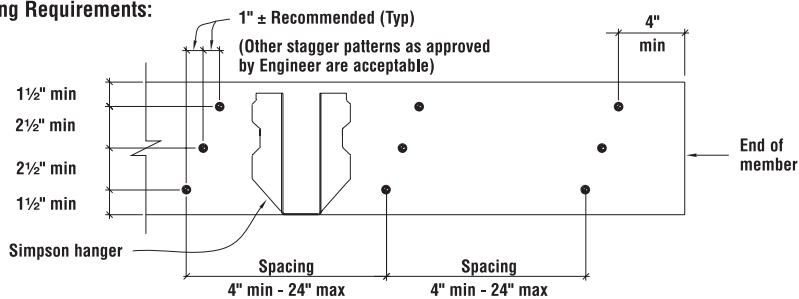


3 Ply (Assembly "B₁"): Factored Uniform Load = 1400 plf ($K_D=1.00$)
Structural Composite Lumber (SG=0.50) w/ SDS1/4x3 1/2
Use 3 rows of SDS's — Factored Resistance = 1370 plf (Table 4; @12" o/c)
Spacing required: $1370 / 1400 \times 12" = 11.7"$
Use 3 rows of SDS1/4x3 1/2 at 11" on centre through each face.



Note: It is recommended that screw spacings be in even multiples of joist or truss spacing to reduce the likelihood of interference from hangers.

Screw Spacing Requirements:



A minimum of 2 rows of screws shall be used for all members 2x6 and larger.

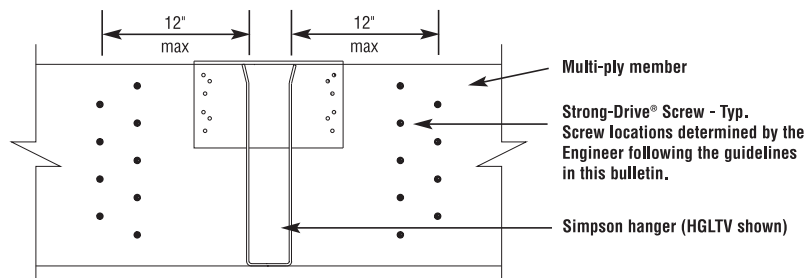
Design Examples - Concentrated Load:

2 Ply (Assembly "F"): Factored Concentrated Load = 10,500 lbs ($K_D=1.00$)
1/2 of the concentrated load must be transferred by the Strong-Drive® Screws.
3 1/2 x 14" Structural Composite Lumber (SG=0.50) w/ SDS 1/4x6
Factored lateral resistance per screw: 305 lbs (table 3)
No. of screws required: $1/2 \times 10,500 / 305 = 17.2$
Use 18- SDS1/4x6 screws through loaded face.



Note: All screws must be located within 12 in. of the applied load to be considered effective.

It is also recommended that a min. of 2 rows of SDS screws be installed at a maximum of 24" on centre for the entire length of the member.



STRONG-DRIVE[®] SCREW APPLICATIONS

Design Examples - Multi-Ply Wood Trusses:

3 Ply Girder Truss (Assembly "G"):

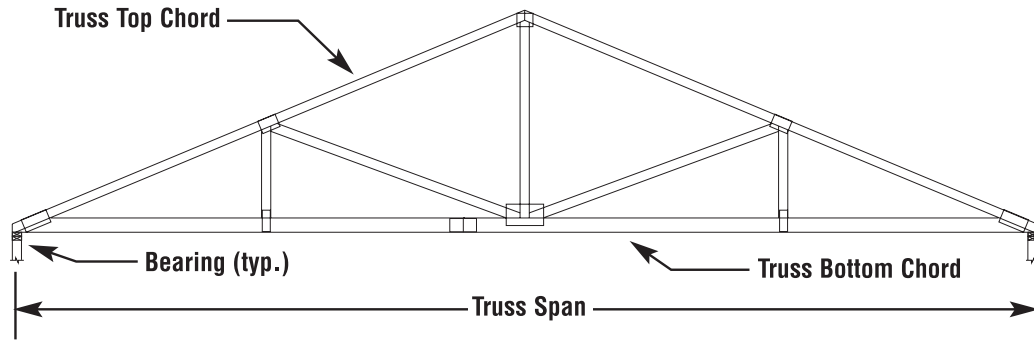
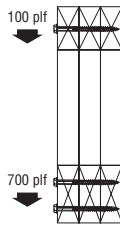
Factored uniform load ($K_D=1.00$):

Bottom Chord = 700 plf

Top Chord = 100 plf

Top Chord: 2x4 S-P-F No.1/No.2

Bottom Chord: 2x6 S-P-F No.1/No.2



Typical Truss Profile
(Profile may vary)

Bottom Chord Spacing:

Use 2 rows of SDS¹/₄x4¹/₂ - Factored Resistance = 840 plf (Table 4; @12" o/c)

Spacing required: $840 / 700 \times 12 = 14.4"$

Use 2 rows of SDS¹/₄x4¹/₂ at 14" on centre.

Note: It is recommended to use screw spacings at common multiples of the truss spacing to avoid conflict with hangers. Therefore 12" on centre would be recommended for this application, assuming trusses are spaced at 24" on centre.

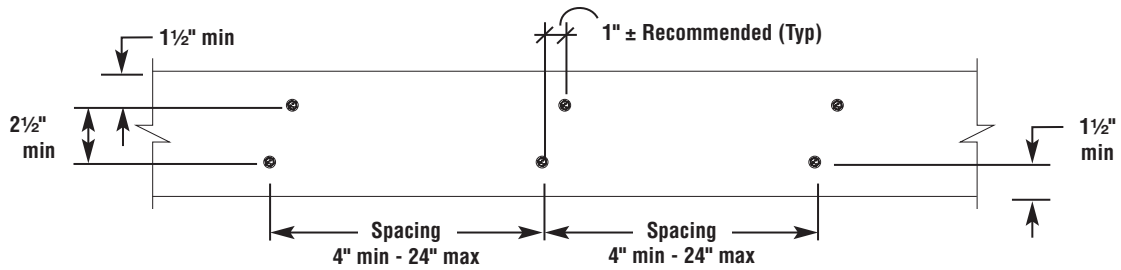
Top Chord Spacing:

Use 1 row of SDS¹/₄x4¹/₂ Factored Resistance = 280 lbs / screw (table 3)

(Only need to transfer $\frac{2}{3}$ of the load to the second ply)

Spacing required: $280 / 100 \times \frac{3}{2} \times 12 = 50.4" > 24"$

Use 1 row of SDS¹/₄x4¹/₂ at 24" on centre.



SDS Typical Spacing

STRONG-DRIVE[®] SCREW APPLICATIONS

JOINING TWO-PLY FLOOR TRUSSES

2 ply floor trusses may be joined using Strong-Drive[®] wood screws

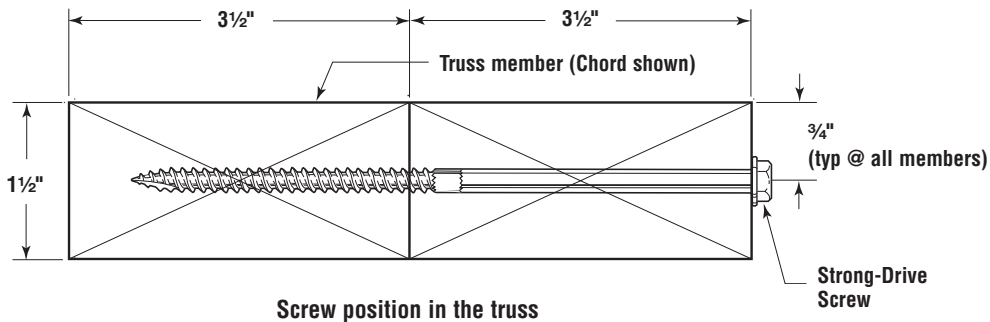
The use of Strong-Drive[®] screws insures that loads are adequately supported by both trusses.

In addition differential deflection between the two trusses is reduced.

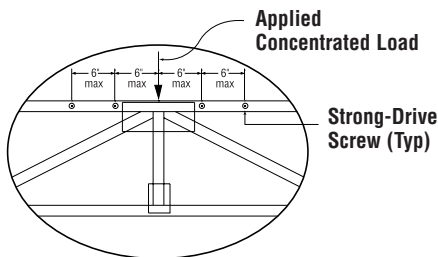
(Testing has shown that most currently available light gauge steel connectors do not uniformly distribute applied loads to both trusses.)

Design & Installation:

- No pre-drilling required.
- Screws are installed from one side of the truss.
- Screws shall be installed with the screw heads in the loaded truss.
- Screws may be used to field-join trusses if specified by the Truss Engineer.
- Do not overdrive the screws.
- Screws may be installed in the truss top chord and webs. (Installation in truss bottom chords is not recommended but is acceptable if designed and certified by the Truss Engineer.)



Installation Method 1 - Top Chord



Installation Method 2 - Vertical Web

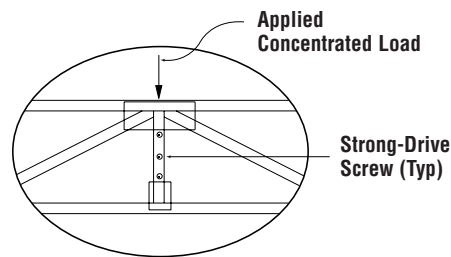


Table 5

Model No.	Member Size	Factored Lateral Resistance (lbs)	
		D. Fir-L	S-P-F
SDS ¹ / ₄ x4 ¹ / ₂	3x2	300	260
SDS ¹ / ₄ x6	4x2	300	260

1. Factored resistances shown are for standard term load duration ($K_D=1.00$) and may be increased for short term loading ($K_D=1.15$) as per 4.3.2.22 CSA 086-01.

STRONG-DRIVE® SCREW APPLICATIONS

Page 7 of 8

JOINING TWO-PLY FLOOR TRUSSES

Design Examples - Concentrated Load:

Example 1:

2 Ply 4x2 DFL Truss:
Factored concentrated load applied at top chord panel point: 2200 lbs ($K_D=1.00$)

Design Strong-Drive® screws to transfer ½ of the applied load.

SDS¼x6 factored resistance:
300 lbs each (Table 5)

Method 1: (Screws in truss top chord only)

No. of screws required: $2200 \times 0.5 / 300 = 3.67$

Use min. of 4

Method 2: (Screws in vertical web)

No. of screws required: $2200 \times 0.5 / 300 = 3.67$

Use min. of 4

Example 2:

2 Ply 3x2 SPF Truss:
Factored concentrated load applied at top chord panel point: 4200 lbs ($K_D=1.00$)

Design Strong-Drive® screws to transfer ½ of the applied load.

SDS¼x4½ factored resistance:
260 lbs each (Table 5)

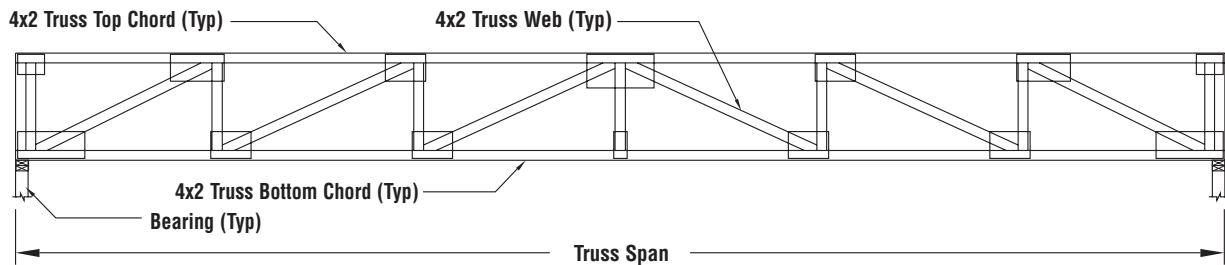
Combine Method 1 & Method 2:

(Install screws in truss top chord and vertical web)

No. of screws required: $4200 \times 0.5 / 260 = 8.1$

Use min. of 9.

Install 4 screws in truss top chord
(2 on each side of the applied load)
and 5 screws in the vertical web.



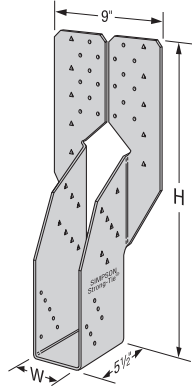
Typical Truss Profile (Web pattern may vary)

General Notes:

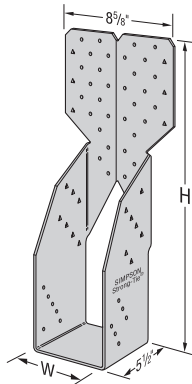
- Screw spacing shall not exceed 24 inches on center and shall not be less than 4 inches on center. A minimum end distance of 3 inches shall be provided at all truss members.
- Gap between the trusses shall not exceed 1/8 inch.
- Floor sheathing shall be screwed (or nailed) to each truss top chord.
(Fastener spacing per the applicable Code requirements, or 12 inches on center max.)
- If the screws are installed in the wrong truss face, install additional screws in the correct face with a maximum spacing of 2x the required spacing, not to exceed 24 inches on center. Offset the additional screws from the existing screws to help prevent splitting.
- Do not install Strong-Drive® screws through metal truss plates unless approved by the Truss Engineer. (Pre drilling is required.)
- The Truss Engineer shall ensure that each truss is designed for the **appropriate** load(s) considering the location of the applied load(s) and the location of the Strong-Drive® screws.
- The Truss Engineer shall design all trusses and the truss system to meet all Code and TPIC requirements.
- Individual screw locations may be adjusted up to 3 inches to avoid conflicts with other hardware or to avoid lumber defects.
- Strong-Drive® screws shall not be installed in areas where lumber wane exceeds 1/4 inch.
- All concentrated loads were assumed to be applied at truss panel points.
- The designer must check the structural capacity of the member based on the reduced cross section as per 10.2.2.5.1 CSA O86-01.



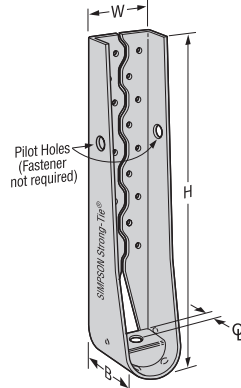
Some Simpson Connectors Using SDS Screws



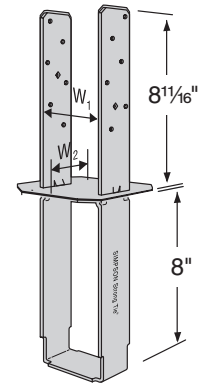
THGQH2-SDS3



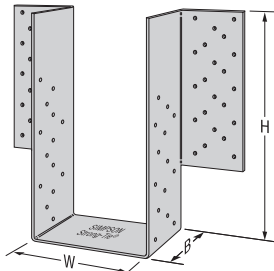
THGQH3-SDS3



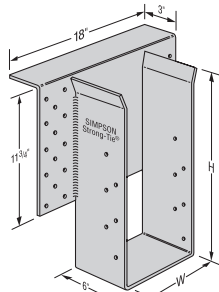
HDU



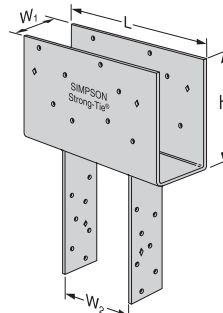
CBQ-SDS2



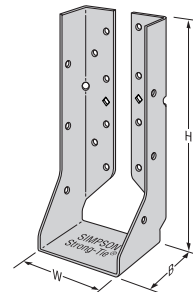
MGU



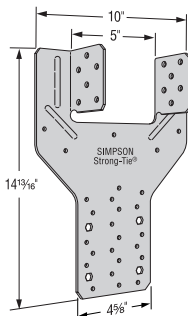
EGQ



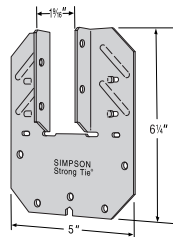
CCQ46SDS2.5



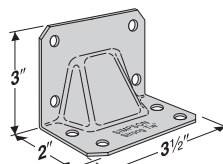
HUCQ410



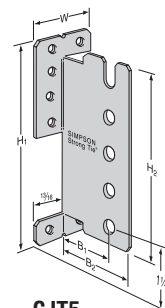
LGT3-SDS2.5



H9



HGA10



CJT5

See C-CAN06 Catalogue for additional information.

This technical bulletin is effective until June 30, 2008, and reflects information available as of April 1, 2006. This information is updated periodically and should not be relied upon after June 30, 2008; contact Simpson for current information and limited warranty or see www.strongtie.com.

Home Office
4120 Dublin Blvd., Ste 400
Dublin, CA 94568
FAX: 925/833-1496

Southwest USA
260 N. Palm Street
Brea, CA 92821
FAX: 714/871-9167

Southeast USA
2221 Country Lane
McKinney, TX 75069
FAX: 972/542-5379

Eastern Canada
5 Kenview Blvd.
Brampton, ON L6T 5G5
FAX: 905/458-7274

Warehouses:
Eagan, MN
Enfield, CT
Jacksonville, FL
Kent, WA
Langley, BC

Northwest USA
5151 S. Airport Way
Stockton, CA 95206
FAX: 209/234-3868

Northeast USA
2600 International Street
Columbus, OH 43228
FAX: 614/876-0636

Quik Drive Factory
436 Calvert Drive
Gallatin, TN 37066
FAX: 615/451-9806

Western Canada
11476 Kingston St.
Maple Ridge, BC V2X 0Y5
FAX: 604/465-0297

800-999-5099
www.strongtie.com

© Copyright 2005 Simpson Strong-Tie Company, Inc.

Printed in the USA

T-SCREWAPPLSD06 04/06 exp. 06/08