MyTiCon Timber Connectors Whitepaper

Roof-to-Wall Connections (Truss Uplift)

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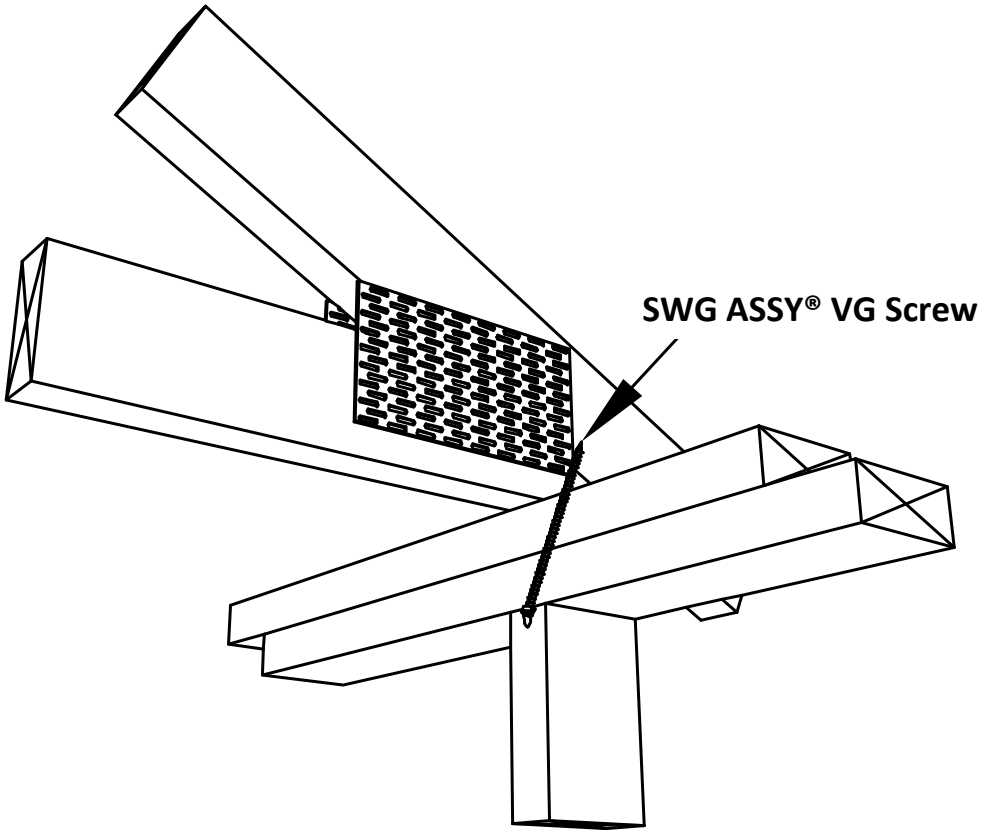

TYPICAL ASSY INSTALLATION-
TRUSS ALIGNED W/STUD

WOOD you like to CONNECT?

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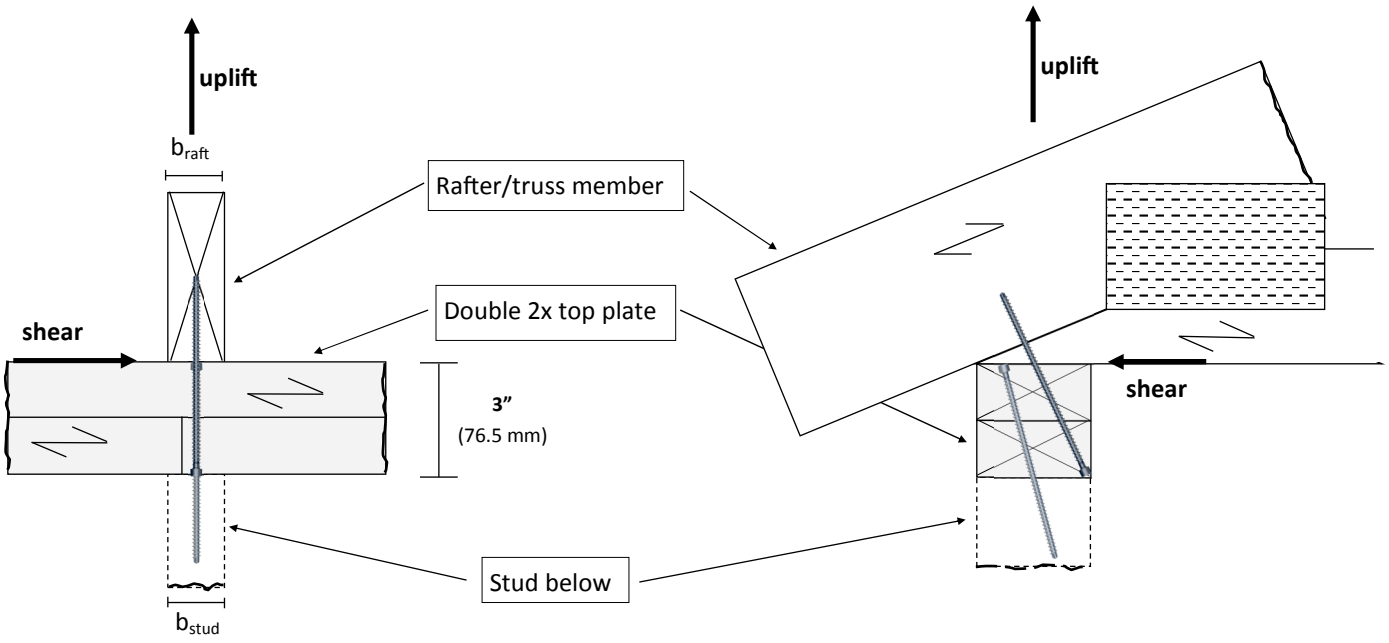
General information

This document provides design concepts for roof-to-wall connections using Code approved SWG ASSY® VG Cyl. screws. The recommendations are based on the following conditions:

- Rafters or truss members with a minimum cross section of 2x6” (38x140 mm)
- Studs from the framing below with a minimum cross section of 2x4” (38x89 mm) of No. 2 or better grade S-P-F lumber
- Double 2”x (38 mm x) wall top plate of No. 2 or better grade S-P-F lumber
- Continuous load path to other structural members to be provided by a registered design professional

Conditions of use

- Side member of the roof-to-wall connection is a 2x” (38 mm) wall top plate of No. 2 or better grade S-P-F lumber
- Main member of the roof-to-wall connection is a rafter, truss member or stud of No. 2 or better grade S-P-F lumber
- Splices in upper or lower plate with at least 1/4” (6 mm) offset to the center of the side member. The maximal width of the gap in the splice shall not be greater than the inner thread diameter: 0.15” (3.8 mm)



Suggested resistances for SWG ASSY® VG screws in roof-to-wall connections

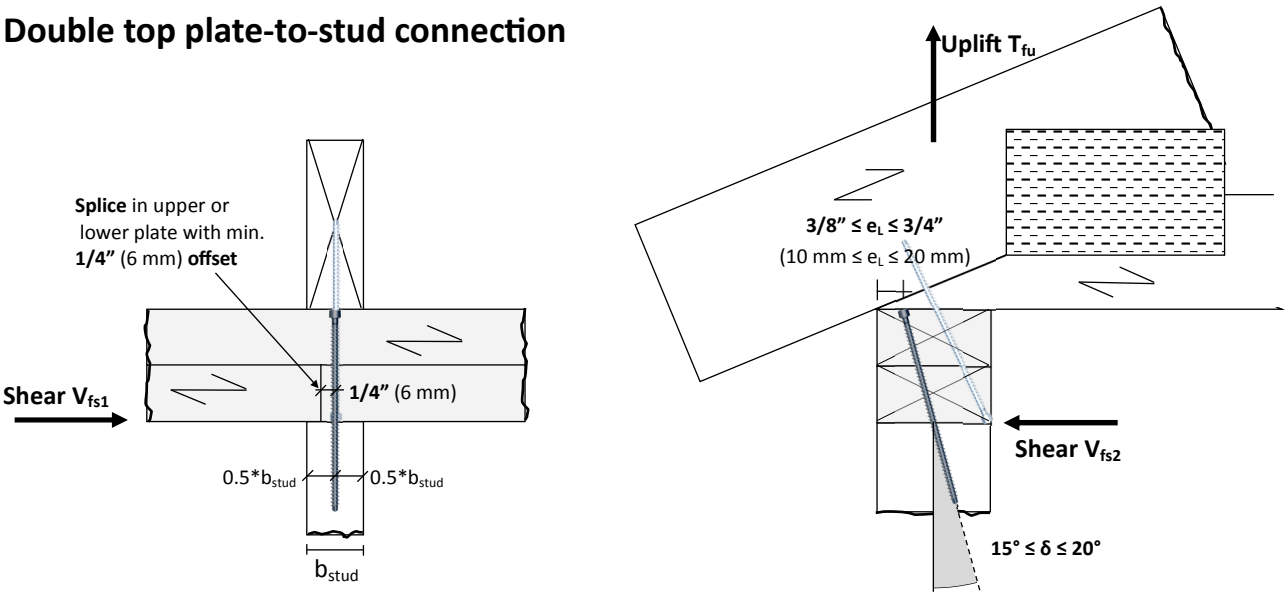
The outlined resistances are based on the CSA 086-09, the issued CCMC report "CCMC 13677-R" and boundary conditions outlined in the European Technical Approval "ETA-11/0190".

Maximum suggested resistances are provided in *table 1 & 2*.

Suggested resistances are based on the following conditions:

- Listed factored resistances apply to mean oven dry relative density and specific gravity (SG) as outlined in respective tables
- Angle between screw axis and wood grain in the side member is $\alpha = 90°$.
  Angle between screw axis and wood grain of rafter/truss member not to be smaller than $\alpha = 45°$.
  In studs angle between screw axis and wood grain shall not be less than $\alpha = 15°$.
- A wood moisture content of 12% ±2%
- Applied modification factors are $K_{SF} = 1$, $K_T = 1$ and either $K_D = 1.15$ for wind uplift ("short term loading") or $K_D = 1.00$ for lateral loads ("standard term loading")
- For withdrawal resistance the threaded length only less one diameter for the tip is considered.

Double top plate-to-stud connection



Design and installation procedure

- Suggested factored resistances (uplift and lateral load) are outlined in *table 1.*
- SWG ASSY® VG Screws to be installed in the center of the stud width b_{stud} at an installation angle of 15° ≤ δ ≤ 20°
- Spacing end and edge distance requirements as per *table 4* shall be followed.
- SWG ASSY® VG Screws are to be driven top flush to the surface of the double top plate. Do not over-drive screw head in side member.
- Splices in upper or lower plate shall be set off to the SWG ASSY® VG Screw axis of min. 1/4" (6 mm)

Table 1: factored uplift and shear resistances for SWG ASSY® VG screws in double top plate-to-stud connections

Factored shear and uplift resistance [1] per SWG ASSY® VG Cyl. Screw [2] in connections of top plates to studs								
Diameter	**Minor-Ø**	**Screw length**	**Uplift resistance $P_{r,u}$ [1,3]**		**Shear resistance $P_{r,s1}$ [1,4]**		**Shear resistance $P_{r,s2}$ [1,4]**	
in (mm)	**in** (mm)	**in** (mm)	kN	**lbs**	kN	**lbs**	kN	**lbs**
1/4 (6)	**0.15** (3.8)	**7-7/8** (200)	3.11	**701**	0.55	**123**	0.46	**104**

Notes: [1] For load combinations of withdrawal and shear the following condition shall apply:

$$(T_{fu}/P_{r,u})^2 + (V_{fs1}/P_{r,s1})^2 + (V_{fs2}/P_{r,s2})^2 \leq 1$$

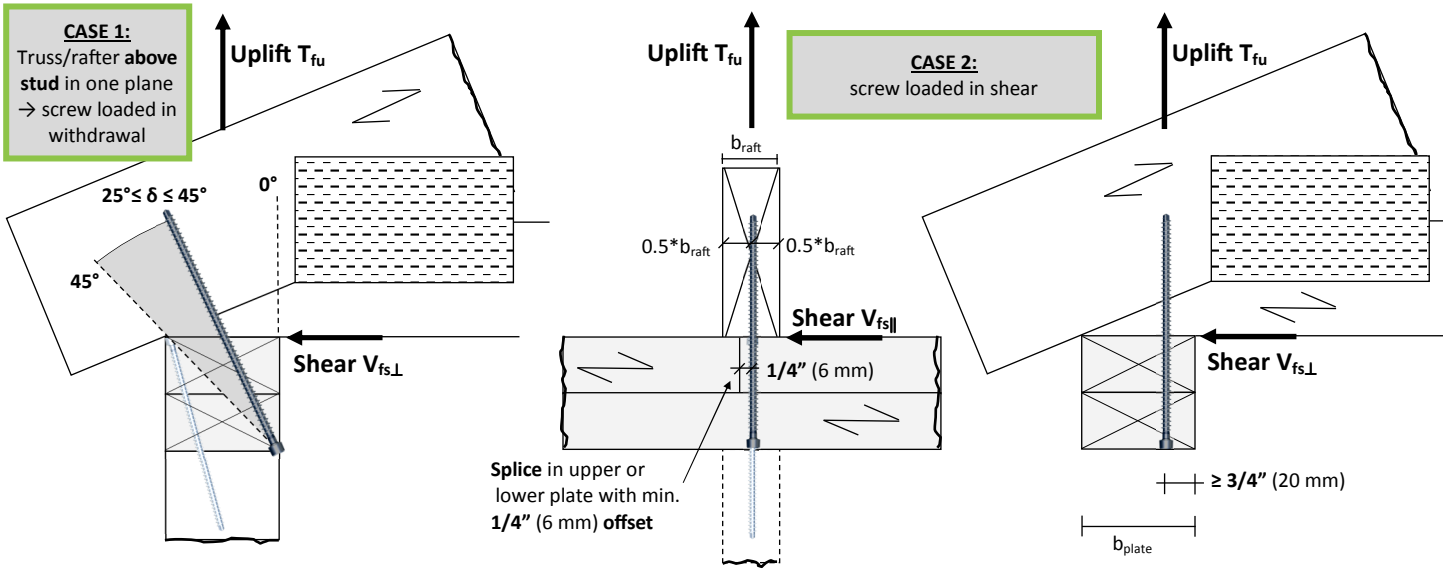
T_{fu} : uplift load
$P_{r,u}$: factored uplift resistance [3]
$V_{fs1(2)}$: shear load as per picture above
$P_{r,s1(2)}$: factored shear resistance [4]

[2] Installation angle δ limited to: 15° ≤ δ ≤ 20°. Install screw in the center of the stud width b_{stud}

[3] K_{SF} = 1.0, K_T = 1.0, K_D = 1.15 and SWG ASSY® VG Cyl. Screws assembled as per *design and installation procedure*

[4] K_{SF} = 1.0, K_T = 1.0, K_D = 1.00 and SWG ASSY® VG Cyl. Screws assembled as per *design and installation procedure*

Double top plate-to-rafter/truss member connection



Design and installation procedure

- Suggested factored resistances (uplift load) are outlined in *table 2.*
- SWG ASSY® VG Screws to be installed in the center of rafter or truss member width b_{raft}
- When Truss/rafters **above** stud SWG ASSY® VG Screws to be installed at an installation angle δ: 25° ≤ δ ≤ 45°.
- When Truss/rafters are **offset** to stud SWG ASSY® VG Screws to be installed perpendicular and top flush to the surface of the lower plate with a minimum edge distance of 3/4" (20 mm).
- Do not over-drive screw head in side member.
- Spacing, end and edge distance requirements as per *table 4* shall be followed.

Table 2: factored uplift resistance for SWG ASSY® VG Screws in double top plate-to-rafter or truss member connections

Factored resistance [1] per SWG ASSY® VG Cyl. Screw in connections of rafter/truss members to top plates							
Rafter/ truss member position	**Diameter**	**Minor-Ø**	**Screw length**	**Uplift resistance $P_{r,u}$ [1,3]**		**Shear resistance $P_{r,s}$ [1,4]**	
	in (mm)	**in** (mm)	**in** (mm)	kN	**lbs**	kN	**lbs**
CASE 1 [2]	**1/4** (6)	**0.15** (3.8)	**7-7/8** (200)	2.75	**617**	1.43	**321**
CASE 2 [5]	**1/4** (6)	**0.15** (3.8)	**7-7/8** (200)	3.65	**817**	0.55	**123**

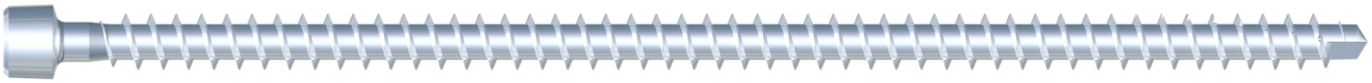
Notes: [1] For load combinations of withdrawal and shear the following condition shall apply:

$$(T_{fu} / P_{r,u})^2 + (V_{fs\parallel} / P_{r,s})^2 + (V_{fs\perp} / P_{r,s})^2 \leq 1$$

T_{fu} : uplift load
$P_{r,u}$: factored uplift resistance [3]
$V_{fs\parallel}$: shear force parallel to top plate grain direction
$V_{fs\perp}$: shear force perpendicular to top plate grain direction
$P_{r,s}$: factored shear resistance [4]

[2] Installation angle δ limited to: 25° ≤ δ ≤ 45°. Install screw in center of rafter/truss width b_{raft}
[3] K_{SF} = 1.0, K_T = 1.0, K_D = 1.15 and SWG ASSY® VG Screws assembled as per *design and installation procedure*.
[4] K_{SF} = 1.0, K_T = 1.0, K_D = 1.00 and SWG ASSY® VG Screws assembled as per *design and installation procedure*.
[5] Screw loaded in shear

SWG ASSY® VG CYL. specifications



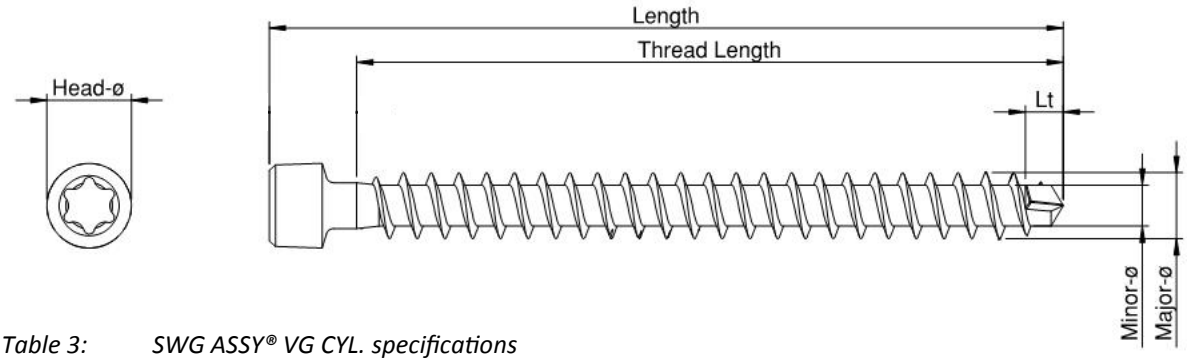


Table 3: SWG ASSY® VG CYL. specifications

Major Ø	Length	Thread Length	L_t	Head Ø	Minor Ø	Bit
mm						
6	**70**	63	6	8	3.8	AW 30
	80	73				
	100	93				
	120	113				
	140	133				
	160	153				
	180	173				
	200	193				

Note: values listed in the table above are average measurements between upper and lower tolerance boundary

Minimum spacing, end and edge distances for SWG ASSY® VG screws

Table 4: minimum spacing requirements for SWG ASSY® VG screws

Screws loaded **axially**				
Min. timber thickness = 4D	**S_P Spacing* parallel**	**S_Q Spacing* perpendicular to**	**a_L end distance***	**e_L edge distance***
SWG ASSY® VG	5D (7.5 in D-Fir)	2.5D	5D (7.5D in D-Fir)	3D

Note: * Spacing and distance measured from the center of gravity of the threaded part in each member
D = Major Ø (outer thread diameter)

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