

HBS PLATE EVO

PAN HEAD SCREW

C4 EVO COATING

HBS PLATE EVO version designed for steel-timber joints outdoors. Atmospheric corrosion resistance class (C4) tested by the Research Institutes of Sweden - RISE. Coating suitable for use in applications on wood with an acidity level (pH) greater than 4, such as spruce, larch and pine (see the "TIMBER SCREWS AND DECK FASTENING" catalogue at www.rothoblaas.com)

NEW GEOMETRY

The inner core diameter of the Ø8, Ø10 and Ø12 mm screws has been increased to ensure higher performance in thick plate applications. In steel-timber connections, the new geometry achieves a strength increase of more than 15%.

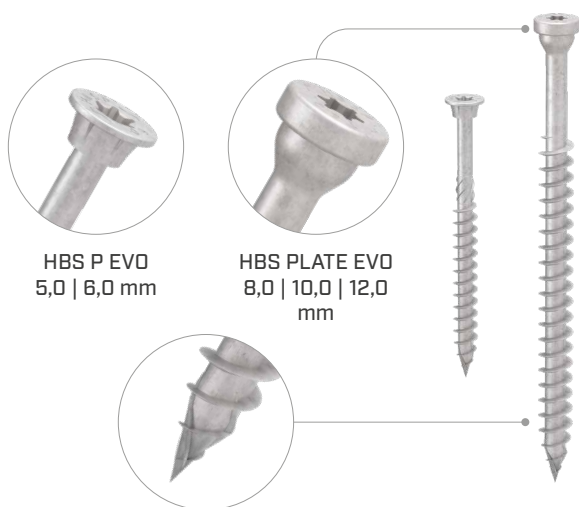
PLATE FASTENING

The under-head shoulder achieves an interlocking effect with the circular hole in the plate, thus guaranteeing excellent static performance. The edgeless geometry of the head reduces stress concentration points and gives the screw strength.



CANADIAN DESIGN VALUES

USA, EU and more design values available online.



HBS P EVO
5,0 | 6,0 mm

HBS PLATE EVO
8,0 | 10,0 | 12,0
mm



MANUALS



BIT INCLUDED

DIAMETER [mm]

3,5 ☒ 5 ☐ 12 ☐ 12

LENGTH [mm]

25 ☐ 50 ☒ 200 ☐ 200

SERVICE CONDITION



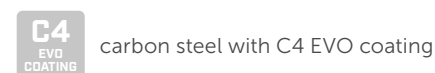
ATMOSPHERIC CORROSIVITY



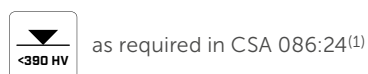
WOOD CORROSIVITY



MATERIAL



CORE HARDNESS



FIELDS OF USE

- timber based panels
- solid timber and glulam
- CLT and LVL
- high density woods
- ACQ, CCA treated timber

(1) Core hardness < 390 HV guaranteed for structural timber screws diameter 6 mm and above.

CODES AND DIMENSIONS

HBS P EVO

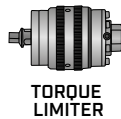
	d_1 [mm]	CODE	L [mm]	b [mm]	A_T [mm]	A_P [mm]	pcs
5 TX 25		HBSPEVO550	50	30	20	1-10	200
		HBSPEVO560	60	35	25	1-10	200
		HBSPEVO570	70	40	30	1-10	100
		HBSPEVO580	80	50	30	1-10	100
6 TX 30		HBSPEVO680	80	50	30	1-10	100
		HBSPEVO690	90	55	35	1-10	100



RAPTOR

TRANSPORT PLATE FOR TIMBER ELEMENTS

METAL-to-TIMBER recommended use:

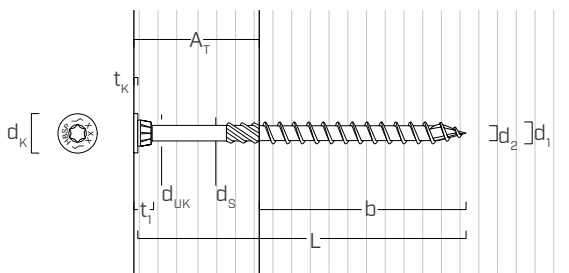


HBS PLATE EVO

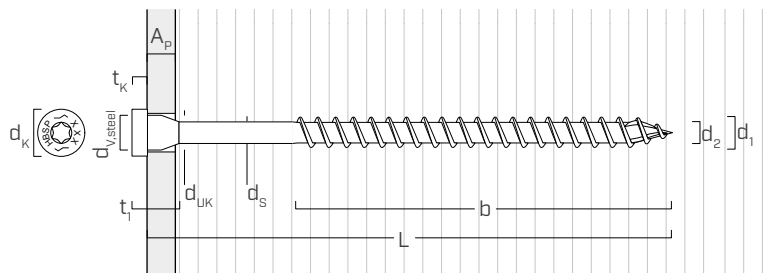
	d_1 [mm]	CODE	L [mm]	b [mm]	A_T [mm]	A_P [mm]	pcs
8 TX 40		HBSPLEVO840	40	32	8	1-10	100
		HBSPLEVO860	60	52	8	1-15	100
		HBSPLEVO880	80	55	25	1-15	100
		HBSPLEVO8100	100	75	25	1-15	100
		HBSPLEVO8120	120	95	25	1-15	100
		HBSPLEVO8140	140	110	30	1-20	100
		HBSPLEVO8160	160	130	30	1-20	100
		HBSPLEVO1060	60	52	8	1-15	50
10 TX 40		HBSPLEVO1080	80	60	20	1-15	50
		HBSPLEVO10100	100	75	25	1-15	50
		HBSPLEVO10120	120	95	25	1-15	50
		HBSPLEVO10140	140	110	30	1-20	50
		HBSPLEVO10160	160	130	30	1-20	50
		HBSPLEVO10180	180	150	30	1-20	50
		HBSPLEVO12120	120	90	30	1-15	25
		HBSPLEVO12140	140	110	30	1-20	25
12 TX 50		HBSPLEVO12160	160	120	40	1-20	25
		HBSPLEVO12180	180	140	40	1-30	25
		HBSPLEVO12200	200	160	40	1-30	25

GEOMETRY AND MECHANICAL PROPERTIES

HBS P EVO - 5,0 | 6,0 mm



HBS PLATE EVO - 8,0 | 10,0 | 12,0 mm



Nominal diameter	d_1	[mm]	5	6	8	10	12
Head diameter	d_K	[mm]	9,65	12,00	13,50	16,50	18,50
Root diameter	d_2	[mm]	3,40	3,95	5,90	6,60	7,30
Shank diameter	d_S	[mm]	3,65	4,30	6,30	7,20	8,55
Head thickness	t_1	[mm]	5,50	6,50	13,50	16,50	19,50
Washer thickness	t_K	[mm]	1,00	1,50	4,50	5,00	5,50
Underhead diameter	d_{UK}	[mm]	6,00	8,00	10,00	12,00	13,00
Hole diameter on steel plate	$d_{V,steel}$	[mm]	7,0	9,0	11,0	13,0	14,0
Pre-drilling hole diameter ⁽¹⁾	$d_{V,S}$	[mm]	3,0	4,0	5,0	6,0	7,0
Pre-drilling hole diameter ⁽²⁾	$d_{V,H}$	[mm]	4,0	5,0	6,0	7,0	8,0
Characteristic tensile strength	$f_{tens,k}$	[kN]	7,9	11,3	32,0	40,0	50,0
Characteristic yield moment	$M_{y,k}$	[Nm]	5,4	9,5	33,4	45,0	65,0

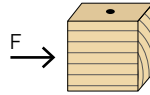
⁽¹⁾ Pre-drilling valid for softwood.

⁽²⁾ Pre-drilling valid for hardwood and beech LVL.

Nominal diameter	d_1	[mm]	5	6	8	10	12
Factored tensile strength	Φf_u	[kN]	4,97	8,56	19,18	24,17	31,08
Bending yield strength	F_{yb}	[MPa]	1315	1188	1018	969	1060
Factored shear strength of the screw	Φv_s	[kN]	3,49	4,71	10,51	13,14	16,07
Specified withdrawal resistance per millimeter of threaded shank (tip included)	Y_w	[N/mm]	G=0.35	52,29	52,38	69,83	87,29
			G=0.42	60,50	60,60	80,80	101,00
			G=0.49	68,44	68,55	91,40	114,26
			G=0.55	75,07	75,19	100,25	125,32
Specified head pull-through resistance per screw	F_{pt}	[kN]	G=0.35	0,62	0,92	1,13	1,59
			G=0.42	0,75	1,10	1,36	1,91
			G=0.49	0,87	1,29	1,58	2,23
			G=0.55	0,98	1,45	1,78	2,50

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

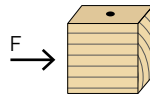
screws inserted **WITHOUT** pre-drilled hole $G \leq 0.44$



d_1		5 [mm]	0.20 [in]	6 [mm]	0.24 [in]	8 [mm]	0.32 [in]	10 [mm]	0.40 [in]	12 [mm]	0.48 [in]
S_p	$12 \cdot d^\dagger$	60	$2 \frac{3}{8}$	72	$2 \frac{13}{16}$	96	$3 \frac{3}{4}$	120	$4 \frac{3}{4}$	144	$5 \frac{11}{16}$
S_Q	$5 \cdot d$	25	1	30	$1 \frac{3}{16}$	40	$1 \frac{9}{16}$	50	$1 \frac{15}{16}$	60	$2 \frac{3}{8}$
a_L	$15 \cdot d^\dagger$	75	$2 \frac{15}{16}$	90	$3 \frac{1}{2}$	120	$4 \frac{3}{4}$	150	6	180	$7 \frac{1}{8}$
a	$10 \cdot d^\dagger$	50	$1 \frac{15}{16}$	60	$2 \frac{3}{8}$	80	$3 \frac{1}{8}$	100	4	120	$4 \frac{3}{4}$
e_Q	$10 \cdot d$	50	$1 \frac{15}{16}$	60	$2 \frac{3}{8}$	80	$3 \frac{1}{8}$	100	4	120	$4 \frac{3}{4}$
e_p	$5 \cdot d$	25	1	30	$1 \frac{3}{16}$	40	$1 \frac{9}{16}$	50	$1 \frac{15}{16}$	60	$2 \frac{3}{8}$

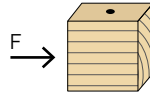
† For Western Red Cedar, this minimum spacing shall be increased by 50%.

screws inserted **WITHOUT** pre-drilled hole $0.44 < G \leq 0.50$



d_1		5 [mm]	0.20 [in]	6 [mm]	0.24 [in]	8 [mm]	0.32 [in]	10 [mm]	0.40 [in]	12 [mm]	0.48 [in]
S_p	$18 \cdot d^\dagger$	90	$3 \frac{1}{2}$	108	$4 \frac{1}{4}$	144	$5 \frac{11}{16}$	180	$7 \frac{1}{8}$	216	$8 \frac{1}{2}$
S_Q	$7 \cdot d$	35	$1 \frac{3}{8}$	42	$1 \frac{5}{8}$	56	$2 \frac{3}{16}$	70	$2 \frac{3}{4}$	84	$3 \frac{5}{16}$
a_L	$22 \cdot d^\dagger$	110	$4 \frac{3}{8}$	132	$5 \frac{3}{16}$	176	$6 \frac{15}{16}$	220	$8 \frac{5}{8}$	264	$10 \frac{3}{8}$
a	$15 \cdot d^\dagger$	75	$2 \frac{15}{16}$	90	$3 \frac{1}{2}$	120	$4 \frac{3}{4}$	150	6	180	$7 \frac{1}{8}$
e_Q	$12 \cdot d$	60	$2 \frac{3}{8}$	72	$2 \frac{13}{16}$	96	$3 \frac{3}{4}$	120	$4 \frac{3}{4}$	144	$5 \frac{11}{16}$
e_p	$7 \cdot d$	35	$1 \frac{3}{8}$	42	$1 \frac{5}{8}$	56	$2 \frac{3}{16}$	70	$2 \frac{3}{4}$	84	$3 \frac{5}{16}$

screws inserted **WITH** pre-drilled hole

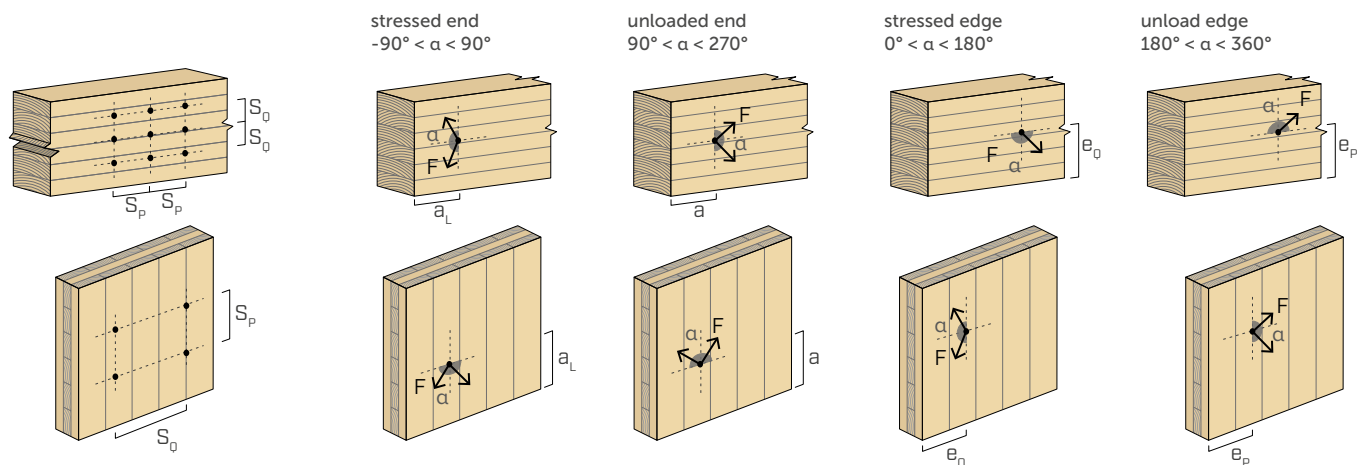


d_1		5 [mm]	0.20 [in]	6 [mm]	0.24 [in]	8 [mm]	0.32 [in]	10 [mm]	0.40 [in]	12 [mm]	0.48 [in]
S_p	$5 \cdot d^\dagger$	25	1	30	$1 \frac{3}{16}$	40	$1 \frac{9}{16}$	50	$1 \frac{15}{16}$	60	$2 \frac{3}{8}$
S_Q	$4 \cdot d$	20	$\frac{13}{16}$	24	$\frac{15}{16}$	32	$1 \frac{1}{4}$	40	$\frac{9}{16}$	48	$\frac{7}{8}$
a_L	$12 \cdot d^\dagger$	60	$2 \frac{3}{8}$	72	$2 \frac{13}{16}$	96	$3 \frac{3}{4}$	120	$4 \frac{3}{4}$	144	$5 \frac{11}{16}$
a	$7 \cdot d^\dagger$	35	$1 \frac{3}{8}$	42	$1 \frac{5}{8}$	56	$2 \frac{3}{16}$	70	$2 \frac{3}{4}$	84	$3 \frac{5}{16}$
e_Q	$7 \cdot d$	35	$1 \frac{3}{8}$	42	$1 \frac{5}{8}$	56	$2 \frac{3}{16}$	70	$2 \frac{3}{4}$	84	$3 \frac{5}{16}$
e_p	$3 \cdot d$	15	$\frac{9}{16}$	18	$\frac{11}{16}$	24	$\frac{15}{16}$	30	$\frac{13}{16}$	36	$\frac{17}{16}$

† For Douglas Fir–Larch and Western Red Cedar, this minimum spacing shall be increased by 50%.

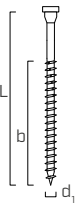
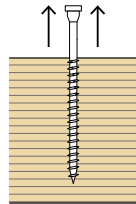
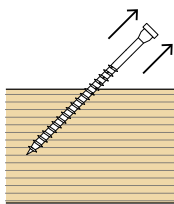
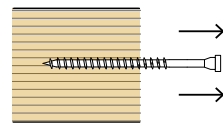
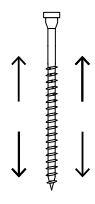
$d = d_1$ = nominal diameter of the screw

α = load-to-grain angle

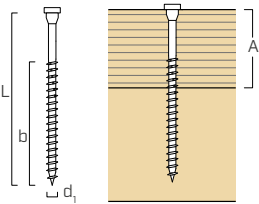
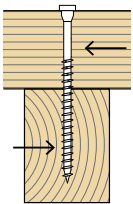
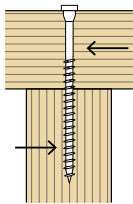


NOTES

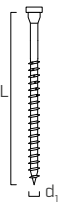
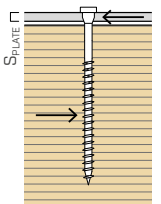
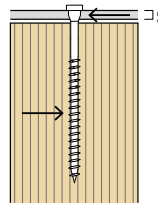
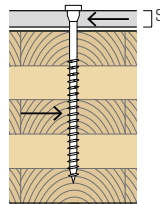
- The minimum spacing and distances comply with Clause 12.12.5 of CSA O86:24, where d_1 refers to the nominal diameter of the self-tapping screw.
- The spacing, end, and edge distances for Rothoblaas screws installed in the narrow face of CLT panels shall comply with the specifications outlined in ETA-11/0030.
- The placement of fasteners subjected to axial loading shall be determined in accordance with Clause 12.12.5 of CSA O86:24.

		TENSION ⁽¹⁾														
geometry				$\alpha = 90^\circ$				thread withdrawal $\alpha = 45^\circ$				end grain $\alpha = 0^\circ$				steel tension
																
				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}				factored withdrawal resistance $P_{rw}^{(2)(3)}$				factored tension resistance T_{rs}
d_1	L	b		G				G				G				
[mm] [in]	[mm] [in]	[mm]		0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	[kN]
5 0.20	50	1 15/16	30	0,92	1,06	1,20	1,31	0,83	0,96	1,09	1,19	0,46	0,53	0,60	0,66	4,97
	60	2 3/8	35	1,10	1,27	1,44	1,58	1,00	1,16	1,31	1,43	0,55	0,64	0,72	0,79	
	70	2 3/4	40	1,28	1,48	1,68	1,84	1,16	1,35	1,52	1,67	0,64	0,74	0,84	0,92	
	80	3 1/8	50	1,65	1,91	2,16	2,36	1,50	1,73	1,96	2,15	0,82	0,95	1,08	1,18	
6 0.24	80	3 1/8	50	1,61	1,87	2,11	2,32	1,47	1,70	1,92	2,11	0,81	0,93	1,06	1,16	8,56
	90	3 1/2	55	1,80	2,08	2,35	2,58	1,63	1,89	2,14	2,34	0,90	1,04	1,18	1,29	
8 0.32	40	1 9/16	32	1,17	1,36	1,54	1,68	1,07	1,23	1,40	1,53	0,59	0,68	0,77	0,84	19,18
	60	2 3/8	52	2,15	2,49	2,82	3,09	1,96	2,26	2,56	2,81	1,08	1,24	1,41	1,54	
	80	3 1/8	55	2,30	2,66	3,01	3,30	2,09	2,42	2,73	3,00	1,15	1,33	1,50	1,65	
	100	4	75	3,28	3,79	4,29	4,70	2,98	3,45	3,90	4,27	1,64	1,89	2,14	2,35	
	120	4 3/4	95	4,25	4,92	5,57	6,11	3,87	4,47	5,06	5,55	2,13	2,46	2,78	3,05	
	140	5 1/2	110	4,99	5,77	6,53	7,16	4,53	5,24	5,93	6,51	2,49	2,88	3,26	3,58	
	160	6 1/4	130	5,96	6,90	7,81	8,56	5,42	6,27	7,10	7,78	2,98	3,45	3,90	4,28	
10 0.40	60	2 3/8	52	2,57	2,97	3,36	3,68	2,33	2,70	3,05	3,35	1,28	1,48	1,68	1,84	24,17
	80	3 1/8	60	3,06	3,54	4,00	4,39	2,78	3,21	3,64	3,99	1,53	1,77	2,00	2,19	
	100	4	75	3,97	4,60	5,20	5,70	3,61	4,18	4,73	5,18	1,99	2,30	2,60	2,85	
	120	4 3/4	95	5,19	6,01	6,80	7,46	4,72	5,46	6,18	6,78	2,60	3,00	3,40	3,73	
	140	5 1/2	110	6,11	7,07	8,00	8,77	5,55	6,43	7,27	7,97	3,06	3,54	4,00	4,39	
	160	6 1/4	130	7,33	8,48	9,60	10,53	6,67	7,71	8,73	9,57	3,67	4,24	4,80	5,26	
	180	7 1/8	150	8,55	9,90	11,20	12,28	7,78	9,00	10,18	11,16	4,28	4,95	5,60	6,14	
12 0.48	120	4 3/4	90	5,72	6,62	7,49	8,21	5,20	6,02	6,81	7,46	2,86	3,31	3,74	4,11	31,08
	140	5 1/2	110	7,19	8,31	9,41	10,32	6,53	7,56	8,55	9,38	3,59	4,16	4,70	5,16	
	160	6 1/4	120	7,92	9,16	10,37	11,37	7,20	8,33	9,42	10,34	3,96	4,58	5,18	5,68	
	180	7 1/8	140	9,39	10,86	12,29	13,47	8,53	9,87	11,17	12,25	4,69	5,43	6,14	6,74	
	200	8	160	10,85	12,56	14,20	15,58	9,87	11,41	12,91	14,16	5,43	6,28	7,10	7,79	

α = screw-to-grain angle

					SHEAR ⁽⁴⁾							
geometry					timber-to-timber $\alpha = 90^\circ$				timber-to-timber $\alpha = 0^\circ$			
												
					factored lateral resistance N_r				factored lateral resistance $N_r^{(2) (3)}$			
d_1 [mm] [in]	L		b		G				G			
	[mm]	[in]	[mm]	[mm]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]
5 0.20	50	1 15/16	30	20	0,54	0,65	0,76	0,85	0,39	0,46	0,54	0,60
	60	2 3/8	35	25	0,63	0,75	0,88	0,99	0,45	0,54	0,62	0,70
	70	2 3/4	40	30	0,71	0,86	0,97	1,06	0,51	0,61	0,69	0,75
	80	3 1/8	50	30	0,75	0,86	0,97	1,06	0,54	0,65	0,74	0,81
6 0.24	80	3 1/8	50	30	0,94	1,08	1,22	1,33	0,65	0,78	0,91	1,02
	90	3 1/2	55	35	0,99	1,14	1,29	1,41	0,72	0,86	0,97	1,06
8 0.32	40	1 9/16	32	10	0,68	0,81	0,95	1,07	0,40	0,47	0,55	0,61
	60	2 3/8	52	15	0,92	1,10	1,29	1,44	0,59	0,71	0,83	0,93
	80	3 1/8	55	25	1,16	1,39	1,62	1,82	0,76	0,91	1,07	1,20
	100	4	75	25	1,40	1,60	1,78	1,93	0,86	1,03	1,20	1,35
	120	4 3/4	95	25	1,41	1,60	1,78	1,93	0,95	1,14	1,34	1,50
	140	5 1/2	110	30	1,47	1,67	1,86	2,02	1,09	1,30	1,52	1,71
	160	6 1/4	130	30	1,47	1,67	1,86	2,02	1,18	1,42	1,60	1,74
10 0.40	60	2 3/8	52	15	1,12	1,34	1,57	1,76	0,74	0,89	1,04	1,16
	80	3 1/8	60	20	1,40	1,68	1,96	2,20	0,90	1,07	1,25	1,41
	100	4	75	25	1,68	2,01	2,23	2,42	1,05	1,26	1,47	1,65
	120	4 3/4	95	25	1,77	2,01	2,23	2,42	1,16	1,39	1,63	1,83
	140	5 1/2	110	30	1,84	2,09	2,33	2,53	1,32	1,58	1,84	2,07
	160	6 1/4	130	30	1,84	2,09	2,33	2,53	1,43	1,71	2,00	2,18
	180	7 1/8	150	30	1,84	2,09	2,33	2,53	1,54	1,78	2,00	2,18
12 0.48	120	4 3/4	90	30	2,25	2,60	2,89	3,14	1,39	1,67	1,94	2,18
	140	5 1/2	110	30	2,29	2,60	2,89	3,14	1,52	1,82	2,12	2,38
	160	6 1/4	120	40	2,45	2,79	3,11	3,39	1,74	2,09	2,43	2,73
	180	7 1/8	140	40	2,45	2,79	3,11	3,39	1,87	2,24	2,61	2,93
	200	8	160	40	2,45	2,79	3,11	3,39	1,99	2,39	2,69	2,93

α = screw-to-grain angle

geometry			SHEAR ^[4]												
			steel-to-timber α = 90°				steel-to-timber α = 0°				steel-to-timber α = 90°				
															
d ₁ [mm] [in]	L [mm] [in]		S _{PLATE} [mm] [in]	factored lateral resistance N _r				factored lateral resistance N _r ^{(2) (3)}				factored lateral resistance N _r			
				G				G				G			
				0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]
5 0.20	50	1 15/16	3,2 1/8	1,18	1,34	1,51	1,64	0,62	0,70	0,78	0,85	1,11	1,27	1,42	1,55
	60	2 3/8		1,31	1,50	1,64	1,75	0,68	0,77	0,86	0,94	1,23	1,41	1,58	1,68
	70	2 3/4		1,41	1,56	1,70	1,82	0,74	0,84	0,94	1,02	1,35	1,50	1,64	1,75
	80	3 1/8		1,50	1,67	1,82	1,95	0,82	0,93	1,05	1,14	1,44	1,60	1,76	1,88
6 0.24	80	3 1/8		1,78	1,98	2,16	2,30	0,94	1,07	1,20	1,31	1,71	1,90	2,07	2,22
	90	3 1/2		1,83	2,03	2,22	2,37	1,00	1,15	1,29	1,41	1,76	1,95	2,13	2,28
8 0.32	40	1 9/16		2,02	2,28	2,52	2,73	0,88	1,06	1,24	1,39	1,91	2,16	2,39	2,58
	60	2 3/8		2,51	2,85	3,18	3,46	1,36	1,53	1,70	1,84	2,37	2,70	3,01	3,27
	80	3 1/8		2,79	3,18	3,57	3,89	1,47	1,67	1,86	2,01	2,63	3,00	3,36	3,66
	100	4		3,27	3,75	4,12	4,40	1,69	1,93	2,15	2,34	3,09	3,54	3,96	4,24
	120	4 3/4		3,64	4,05	4,44	4,75	1,91	2,18	2,45	2,67	3,51	3,91	4,28	4,59
	140	5 1/2		3,82	4,26	4,68	5,01	2,10	2,40	2,70	2,94	3,69	4,12	4,52	4,85
10 0.40	160	6 1/4		4,07	4,55	5,00	5,36	2,32	2,65	2,91	3,12	3,94	4,40	4,84	5,20
	60	2 3/8		3,05	3,46	3,86	4,19	1,59	1,87	2,07	2,24	2,89	3,27	3,65	3,96
	80	3 1/8		3,45	3,94	4,41	4,80	1,83	2,08	2,31	2,50	3,26	3,72	4,16	4,53
	100	4		3,96	4,54	5,10	5,45	2,06	2,34	2,62	2,84	3,74	4,29	4,82	5,25
	120	4 3/4		4,52	5,02	5,50	5,89	2,32	2,65	2,97	3,24	4,30	4,84	5,31	5,68
	140	5 1/2		4,74	5,29	5,80	6,22	2,55	2,92	3,28	3,58	4,58	5,11	5,61	6,01
12 0.48	160	6 1/4		5,05	5,64	6,20	6,66	2,82	3,23	3,61	3,87	4,89	5,46	6,01	6,45
	180	7 1/8		5,36	6,00	6,60	7,09	3,08	3,47	3,81	4,09	5,19	5,82	6,41	6,89
	120	4 3/4		5,38	6,17	6,80	7,27	2,78	3,17	3,54	3,85	5,09	5,83	6,55	7,01
	140	5 1/2		5,97	6,65	7,28	7,80	3,09	3,53	3,96	4,32	5,74	6,41	7,03	7,53
	160	6 1/4		6,15	6,86	7,52	8,06	3,31	3,79	4,26	4,65	5,94	6,63	7,27	7,80
	180	7 1/8		6,52	7,28	8,00	8,59	3,62	4,16	4,66	5,00	6,31	7,05	7,75	8,32
200	8	6,89		7,71	8,48	9,12	3,93	4,47	4,90	5,26	6,67	7,47	8,23	8,85	
5 0.20	50	1 15/16	6,4 1/4	1,15	1,31	1,47	1,60	0,61	0,69	0,77	0,83	1,08	1,24	1,38	1,51
	60	2 3/8		1,28	1,47	1,64	1,75	0,67	0,76	0,85	0,92	1,21	1,38	1,55	1,68
	70	2 3/4		1,41	1,56	1,70	1,82	0,72	0,83	0,92	1,01	1,33	1,50	1,64	1,75
	80	3 1/8		1,50	1,67	1,82	1,95	0,80	0,92	1,03	1,13	1,44	1,60	1,76	1,88
6 0.24	80	3 1/8		1,78	1,98	2,16	2,30	0,93	1,06	1,19	1,29	1,71	1,90	2,07	2,22
	90	3 1/2		1,83	2,03	2,22	2,37	0,99	1,13	1,27	1,39	1,76	1,95	2,13	2,28
8 0.32	40	1 9/16		1,99	2,23	2,47	2,67	0,81	0,97	1,13	1,27	1,82	2,11	2,34	2,52
	60	2 3/8		2,47	2,81	3,13	3,40	1,29	1,51	1,68	1,81	2,34	2,66	2,96	3,21
	80	3 1/8		2,75	3,14	3,51	3,83	1,46	1,65	1,84	1,99	2,59	2,96	3,31	3,60
	100	4		3,23	3,71	4,12	4,40	1,68	1,91	2,13	2,32	3,05	3,50	3,93	4,24
	120	4 3/4		3,64	4,05	4,44	4,75	1,89	2,16	2,43	2,64	3,51	3,91	4,28	4,59
	140	5 1/2		3,82	4,26	4,68	5,01	2,08	2,39	2,68	2,93	3,69	4,12	4,52	4,85
10 0.40	160	6 1/4		4,07	4,55	5,00	5,36	2,30	2,64	2,91	3,12	3,94	4,40	4,84	5,20
	60	2 3/8		3,00	3,41	3,79	4,12	1,51	1,81	2,05	2,21	2,85	3,23	3,59	3,90
	80	3 1/8		3,41	3,88	4,35	4,73	1,81	2,05	2,28	2,47	3,22	3,67	4,11	4,47
	100	4		3,92	4,49	5,04	5,45	2,04	2,32	2,59	2,82	3,70	4,24	4,76	5,19
	120	4 3/4		4,50	5,02	5,50	5,89	2,31	2,63	2,95	3,21	4,26	4,84	5,31	5,68
	140	5 1/2		4,74	5,29	5,80	6,22	2,53	2,90	3,26	3,55	4,58	5,11	5,61	6,01
12 0.48	160	6 1/4		5,05	5,64	6,20	6,66	2,80	3,21	3,61	3,87	4,89	5,46	6,01	6,45
	180	7 1/8		5,36	6,00	6,60	7,09	3,06	3,47	3,81	4,09	5,19	5,82	6,41	6,89
	120	4 3/4		5,33	6,11	6,80	7,27	2,76	3,14	3,51	3,82	5,04	5,78	6,49	7,01
	140	5 1/2		5,97	6,65	7,28	7,80	3,07	3,51	3,93	4,29	5,69	6,41	7,03	7,53
	160	6 1/4		6,15	6,86	7,52	8,06	3,29	3,77	4,23	4,62	5,94	6,63	7,27	7,80
	180	7 1/8		6,52	7,28	8,00	8,59	3,60	4,13	4,65	5,00	6,31	7,05	7,75	8,32
200	8	6,89		7,71	8,48	9,12	3,91	4,47	4,90	5,26	6,67	7,47	8,23	8,85	

α = screw-to-grain angle

geometry			SHEAR ⁽⁴⁾											
			steel-to-timber $\alpha = 90^\circ$				steel-to-timber $\alpha = 0^\circ$				steel-to-timber $\alpha = 90^\circ$			
d ₁ [mm] [in]	L [mm] [in]		factored lateral resistance N _r				factored lateral resistance N _r ^{(2) (3)}				factored lateral resistance N _r			
			G				G				G			
			0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]
5 0.20	50	1 15/16	1,12	1,28	1,43	1,56	0,60	0,68	0,75	0,82	1,06	1,21	1,35	1,47
	60	2 3/8	1,25	1,44	1,61	1,75	0,66	0,75	0,83	0,90	1,18	1,35	1,52	1,66
	70	2 3/4	1,39	1,56	1,70	1,82	0,71	0,81	0,91	0,99	1,31	1,50	1,64	1,75
	80	3 1/8	1,50	1,67	1,82	1,95	0,79	0,91	1,02	1,11	1,44	1,60	1,76	1,88
6 0.24	80	3 1/8	1,78	1,98	2,16	2,30	0,92	1,04	1,17	1,27	1,68	1,90	2,07	2,22
	90	3 1/2	1,83	2,03	2,22	2,37	0,98	1,12	1,25	1,37	1,76	1,95	2,13	2,28
8 0.32	40	1 9/16	1,83	2,17	2,39	2,58	0,73	0,88	1,02	1,15	1,65	1,98	2,27	2,44
	60	2 3/8	2,41	2,74	3,05	3,31	1,21	1,45	1,64	1,78	2,29	2,59	2,89	3,13
	80	3 1/8	2,71	3,09	3,46	3,77	1,44	1,63	1,82	1,97	2,56	2,92	3,26	3,55
	100	4	3,19	3,66	4,11	4,40	1,66	1,89	2,11	2,29	3,02	3,46	3,88	4,24
	120	4 3/4	3,64	4,05	4,44	4,75	1,88	2,15	2,40	2,62	3,48	3,91	4,28	4,59
	140	5 1/2	3,82	4,26	4,68	5,01	2,07	2,37	2,66	2,90	3,69	4,12	4,52	4,85
10 0.40	160	6 1/4	4,07	4,55	5,00	5,36	2,28	2,62	2,91	3,12	3,94	4,40	4,84	5,20
	60	2 3/8	2,94	3,33	3,70	4,01	1,42	1,70	1,98	2,17	2,78	3,15	3,51	3,80
	80	3 1/8	3,36	3,83	4,28	4,66	1,80	2,03	2,26	2,45	3,18	3,62	4,05	4,41
	100	4	3,87	4,43	4,98	5,43	2,02	2,30	2,57	2,79	3,66	4,19	4,70	5,13
	120	4 3/4	4,46	5,02	5,50	5,89	2,29	2,61	2,92	3,18	4,22	4,84	5,31	5,68
	140	5 1/2	4,74	5,29	5,80	6,22	2,52	2,88	3,23	3,52	4,58	5,11	5,61	6,01
12 0.48	160	6 1/4	5,05	5,64	6,20	6,66	2,78	3,19	3,59	3,87	4,89	5,46	6,01	6,45
	180	7 1/8	5,36	6,00	6,60	7,09	3,05	3,47	3,81	4,09	5,19	5,82	6,41	6,89
	120	4 3/4	5,28	6,05	6,80	7,27	2,74	3,12	3,49	3,79	5,00	5,72	6,43	7,01
	140	5 1/2	5,96	6,65	7,28	7,80	3,05	3,49	3,90	4,25	5,65	6,41	7,03	7,53
	160	6 1/4	6,15	6,86	7,52	8,06	3,27	3,74	4,20	4,59	5,94	6,63	7,27	7,80
	180	7 1/8	6,52	7,28	8,00	8,59	3,58	4,11	4,62	5,00	6,31	7,05	7,75	8,32
			6,89	7,71	8,48	9,12	3,89	4,47	4,90	5,26	6,67	7,47	8,23	8,85
5 0.20	50	1 15/16	1,09	1,25	1,39	1,51	0,59	0,66	0,74	0,80	1,03	1,18	1,31	1,43
	60	2 3/8	1,23	1,40	1,57	1,72	0,65	0,73	0,82	0,89	1,16	1,32	1,48	1,62
	70	2 3/4	1,36	1,56	1,70	1,82	0,70	0,80	0,89	0,97	1,28	1,47	1,64	1,75
	80	3 1/8	1,50	1,67	1,82	1,95	0,78	0,89	1,00	1,09	1,44	1,60	1,76	1,88
6 0.24	80	3 1/8	1,75	1,98	2,16	2,30	0,90	1,03	1,15	1,25	1,65	1,90	2,07	2,22
	90	3 1/2	1,83	2,03	2,22	2,37	0,97	1,10	1,24	1,35	1,76	1,95	2,13	2,28
8 0.32	40	1 9/16	1,64	1,97	2,29	2,47	0,66	0,79	0,92	1,03	1,47	1,77	2,06	2,32
	60	2 3/8	2,34	2,65	2,95	3,19	1,14	1,36	1,59	1,72	2,21	2,51	2,79	3,02
	80	3 1/8	2,67	3,04	3,40	3,71	1,43	1,61	1,79	1,94	2,52	2,88	3,21	3,50
	100	4	3,16	3,62	4,06	4,40	1,65	1,87	2,09	2,27	2,98	3,42	3,84	4,19
	120	4 3/4	3,64	4,05	4,44	4,75	1,86	2,13	2,38	2,60	3,45	3,91	4,28	4,59
	140	5 1/2	3,82	4,26	4,68	5,01	2,05	2,35	2,64	2,88	3,69	4,12	4,52	4,85
10 0.40	160	6 1/4	4,07	4,55	5,00	5,36	2,27	2,61	2,91	3,12	3,94	4,40	4,84	5,20
	60	2 3/8	2,84	3,22	3,58	3,87	1,33	1,59	1,86	2,09	2,69	3,05	3,39	3,67
	80	3 1/8	3,32	3,78	4,22	4,59	1,78	2,01	2,23	2,42	3,14	3,57	3,99	4,34
	100	4	3,83	4,38	4,92	5,36	2,01	2,28	2,54	2,76	3,62	4,14	4,65	5,07
	120	4 3/4	4,41	5,02	5,50	5,89	2,27	2,59	2,90	3,16	4,18	4,80	5,31	5,68
	140	5 1/2	4,74	5,29	5,80	6,22	2,50	2,86	3,21	3,50	4,58	5,11	5,61	6,01
12 0.48	160	6 1/4	5,05	5,64	6,20	6,66	2,76	3,17	3,56	3,87	4,89	5,46	6,01	6,45
	180	7 1/8	5,36	6,00	6,60	7,09	3,03	3,47	3,81	4,09	5,19	5,82	6,41	6,89
	120	4 3/4	5,23	5,99	6,73	7,27	2,72	3,10	3,46	3,76	4,95	5,67	6,37	6,95
	140	5 1/2	5,91	6,65	7,28	7,80	3,03	3,46	3,88	4,22	5,60	6,41	7,03	7,53
	160	6 1/4	6,15	6,86	7,52	8,06	3,25	3,72	4,17	4,55	5,94	6,63	7,27	7,80
	180	7 1/8	6,52	7,28	8,00	8,59	3,56	4,09	4,59	5,00	6,31	7,05	7,75	8,32
			6,89	7,71	8,48	9,12	3,87	4,45	4,90	5,26	6,67	7,47	8,23	8,85

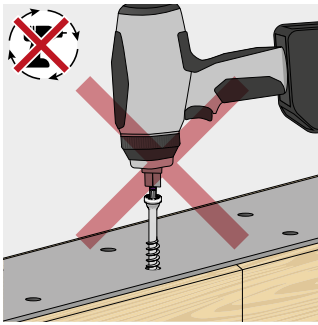
α = screw-to-grain angle

geometry			SHEAR ⁽⁴⁾											
			steel-to-timber $\alpha = 90^\circ$				steel-to-timber $\alpha = 0^\circ$				steel-to-timber $\alpha = 90^\circ$			
d ₁ [mm] [in]	L [mm] [in]		factored lateral resistance N _r				factored lateral resistance N _r ^{(2) (3)}				factored lateral resistance N _r			
			G				G				G			
			0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]
5 0.20	50	1 15/16	1,07	1,21	1,35	1,47	0,58	0,65	0,72	0,78	1,01	1,15	1,28	1,39
	60	2 3/8	1,20	1,37	1,53	1,67	0,63	0,72	0,80	0,87	1,13	1,29	1,45	1,58
	70	2 3/4	1,33	1,53	1,70	1,82	0,69	0,79	0,88	0,96	1,26	1,44	1,62	1,75
	80	3 1/8	1,50	1,67	1,82	1,95	0,77	0,88	0,99	1,08	1,43	1,60	1,76	1,88
6 0.24	80	3 1/8	1,72	1,98	2,16	2,30	0,89	1,01	1,13	1,23	1,62	1,86	2,07	2,22
	90	3 1/2	1,83	2,03	2,22	2,37	0,95	1,09	1,22	1,33	1,76	1,95	2,13	2,28
8 0.32	40	1 9/16	1,45	1,74	2,03	2,28	0,58	0,70	0,81	0,91	1,30	1,56	1,82	2,05
	60	2 3/8	2,26	2,56	2,84	3,08	1,06	1,27	1,48	1,66	2,14	2,42	2,69	2,91
	80	3 1/8	2,63	3,00	3,35	3,65	1,41	1,60	1,77	1,92	2,49	2,83	3,17	3,44
	100	4	3,12	3,57	4,01	4,37	1,63	1,85	2,07	2,25	2,95	3,38	3,79	4,13
	120	4 3/4	3,60	4,05	4,44	4,75	1,85	2,11	2,36	2,57	3,41	3,91	4,28	4,59
	140	5 1/2	3,82	4,26	4,68	5,01	2,04	2,33	2,62	2,85	3,69	4,12	4,52	4,85
10 0.40	160	6 1/4	4,07	4,55	5,00	5,36	2,25	2,59	2,91	3,12	3,94	4,40	4,84	5,20
	60	2 3/8	2,75	3,11	3,45	3,73	1,24	1,49	1,73	1,95	2,61	2,94	3,27	3,53
	80	3 1/8	3,27	3,72	4,16	4,52	1,76	1,99	2,21	2,39	3,10	3,53	3,94	4,28
	100	4	3,78	4,33	4,85	5,29	1,99	2,26	2,52	2,73	3,58	4,10	4,59	5,01
	120	4 3/4	4,37	5,02	5,50	5,89	2,25	2,57	2,87	3,13	4,14	4,75	5,31	5,68
	140	5 1/2	4,74	5,29	5,80	6,22	2,48	2,84	3,18	3,47	4,58	5,11	5,61	6,01
12 0.48	160	6 1/4	5,05	5,64	6,20	6,66	2,75	3,15	3,54	3,86	4,89	5,46	6,01	6,45
	180	7 1/8	5,36	6,00	6,60	7,09	3,01	3,46	3,81	4,09	5,19	5,82	6,41	6,89
	120	4 3/4	5,18	5,93	6,66	7,27	2,70	3,07	3,43	3,73	4,90	5,61	6,30	6,88
	140	5 1/2	5,86	6,65	7,28	7,80	3,01	3,44	3,85	4,19	5,56	6,38	7,03	7,53
	160	6 1/4	6,15	6,86	7,52	8,06	3,23	3,70	4,15	4,52	5,94	6,63	7,27	7,80
	180	7 1/8	6,52	7,28	8,00	8,59	3,54	4,06	4,56	4,99	6,31	7,05	7,75	8,32
			6,89	7,71	8,48	9,12	3,85	4,43	4,90	5,26	6,67	7,47	8,23	8,85
5 0.20	50	1 15/16	1,04	1,18	1,32	1,43	0,53	0,64	0,71	0,76	0,98	1,12	1,25	1,35
	60	2 3/8	1,17	1,34	1,50	1,63	0,62	0,71	0,78	0,85	1,11	1,26	1,41	1,54
	70	2 3/4	1,30	1,49	1,68	1,82	0,68	0,77	0,86	0,94	1,23	1,41	1,58	1,73
	80	3 1/8	1,48	1,67	1,82	1,95	0,76	0,87	0,97	1,06	1,40	1,60	1,76	1,88
6 0.24	80	3 1/8	1,69	1,94	2,16	2,30	0,88	1,00	1,12	1,21	1,60	1,83	2,05	2,22
	90	3 1/2	1,83	2,03	2,22	2,37	0,94	1,07	1,20	1,31	1,73	1,95	2,13	2,28
8 0.32	40	1 9/16	1,26	1,51	1,76	1,98	0,50	0,60	0,70	0,79	1,13	1,36	1,58	1,78
	60	2 3/8	2,18	2,47	2,74	2,96	0,98	1,18	1,38	1,54	2,07	2,34	2,59	2,80
	80	3 1/8	2,59	2,95	3,30	3,59	1,40	1,58	1,75	1,90	2,46	2,79	3,12	3,39
	100	4	3,08	3,52	3,95	4,31	1,61	1,83	2,05	2,22	2,92	3,34	3,74	4,08
	120	4 3/4	3,56	4,05	4,44	4,75	1,83	2,09	2,34	2,55	3,38	3,88	4,28	4,59
	140	5 1/2	3,82	4,26	4,68	5,01	2,02	2,31	2,59	2,83	3,69	4,12	4,52	4,85
10 0.40	160	6 1/4	4,07	4,55	5,00	5,36	2,24	2,57	2,89	3,12	3,94	4,40	4,84	5,20
	60	2 3/8	2,66	3,00	3,32	3,59	1,15	1,38	1,61	1,81	2,52	2,84	3,15	3,40
	80	3 1/8	3,23	3,67	4,10	4,45	1,71	1,97	2,18	2,36	3,06	3,48	3,88	4,22
	100	4	3,74	4,27	4,79	5,22	1,97	2,24	2,49	2,70	3,54	4,05	4,53	4,94
	120	4 3/4	4,32	4,96	5,50	5,89	2,24	2,55	2,85	3,10	4,10	4,70	5,29	5,68
	140	5 1/2	4,74	5,29	5,80	6,22	2,46	2,81	3,16	3,44	4,58	5,11	5,61	6,01
12 0.48	160	6 1/4	5,05	5,64	6,20	6,66	2,73	3,13	3,51	3,84	4,89	5,46	6,01	6,45
	180	7 1/8	5,36	6,00	6,60	7,09	2,99	3,44	3,81	4,09	5,19	5,82	6,41	6,89
	120	4 3/4	5,13	5,87	6,59	7,19	2,68	3,05	3,40	3,69	4,86	5,56	6,24	6,81
	140	5 1/2	5,81	6,65	7,28	7,80	2,99	3,41	3,82	4,16	5,51	6,33	7,03	7,53
	160	6 1/4	6,15	6,86	7,52	8,06	3,21	3,67	4,12	4,49	5,94	6,63	7,27	7,80
	180	7 1/8	6,52	7,28	8,00	8,59	3,52	4,04	4,54	4,95	6,31	7,05	7,75	8,32
			6,89	7,71	8,48	9,12	3,83	4,40	4,90	5,26	6,67	7,47	8,23	8,85

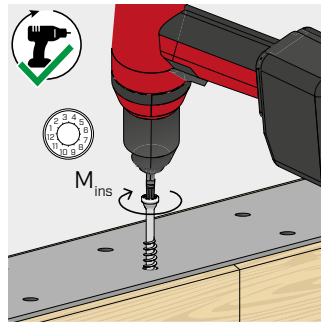
α = screw-to-grain angle

geometry			SHEAR ⁽⁴⁾											
			steel-to-timber $\alpha = 90^\circ$				steel-to-timber $\alpha = 0^\circ$				steel-to-timber $\alpha = 90^\circ$			
d ₁ [mm] [in]	L [mm] [in]		factored lateral resistance N _r				factored lateral resistance N _r ^{(2) (3)}				factored lateral resistance N _r			
			G				G				G			
			0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]	0.35 [kN]	0.42 [kN]	0.49 [kN]	0.55 [kN]
5 0.20	50	1 15/16	0,99	1,12	1,25	1,36	0,48	0,58	0,67	0,73	0,94	1,06	1,18	1,28
	60	2 3/8	1,14	1,30	1,46	1,59	0,61	0,69	0,77	0,83	1,08	1,23	1,38	1,50
	70	2 3/4	1,28	1,46	1,64	1,79	0,67	0,76	0,85	0,92	1,21	1,38	1,55	1,69
	80	3 1/8	1,45	1,67	1,82	1,95	0,75	0,85	0,96	1,04	1,38	1,58	1,76	1,88
6 0.24	80	3 1/8	1,66	1,90	2,14	2,30	0,87	0,98	1,10	1,19	1,57	1,80	2,02	2,20
	90	3 1/2	1,80	2,03	2,22	2,37	0,93	1,06	1,18	1,29	1,70	1,95	2,13	2,28
8 0.32	40	1 9/16	1,07	1,28	1,49	1,68	0,43	0,51	0,60	0,67	0,96	1,15	1,34	1,51
	60	2 3/8	2,11	2,38	2,63	2,85	0,91	1,09	1,27	1,43	1,99	2,25	2,49	2,69
	80	3 1/8	2,56	2,91	3,24	3,53	1,38	1,56	1,73	1,87	2,42	2,75	3,07	3,34
	100	4	3,04	3,48	3,90	4,25	1,60	1,82	2,02	2,20	2,88	3,29	3,69	4,03
	120	4 3/4	3,53	4,05	4,44	4,75	1,82	2,07	2,32	2,52	3,34	3,84	4,28	4,59
	140	5 1/2	3,82	4,26	4,68	5,01	2,01	2,29	2,57	2,81	3,69	4,12	4,52	4,85
	160	6 1/4	4,07	4,55	5,00	5,36	2,22	2,55	2,87	3,12	3,94	4,40	4,84	5,20
10 0.40	60	2 3/8	2,56	2,89	3,20	3,45	1,06	1,27	1,48	1,67	2,39	2,73	3,03	3,27
	80	3 1/8	3,15	3,58	3,99	4,33	1,62	1,93	2,14	2,31	2,99	3,39	3,78	4,10
	100	4	3,69	4,22	4,73	5,15	1,95	2,21	2,47	2,68	3,50	4,00	4,48	4,88
	120	4 3/4	4,28	4,91	5,50	5,89	2,22	2,53	2,82	3,07	4,06	4,66	5,23	5,68
	140	5 1/2	4,74	5,29	5,80	6,22	2,44	2,79	3,13	3,41	4,54	5,11	5,61	6,01
	160	6 1/4	5,05	5,64	6,20	6,66	2,71	3,11	3,49	3,81	4,89	5,46	6,01	6,45
	180	7 1/8	5,36	6,00	6,60	7,09	2,97	3,42	3,81	4,09	5,19	5,82	6,41	6,89
12 0.48	120	4 3/4	5,08	5,81	6,52	7,11	2,66	3,02	3,37	3,66	4,81	5,51	6,18	6,74
	140	5 1/2	5,76	6,62	7,28	7,80	2,97	3,39	3,79	4,13	5,47	6,27	7,03	7,53
	160	6 1/4	6,15	6,86	7,52	8,06	3,19	3,65	4,09	4,46	5,94	6,63	7,27	7,80
	180	7 1/8	6,52	7,28	8,00	8,59	3,50	4,01	4,51	4,92	6,31	7,05	7,75	8,32
	200	8	6,89	7,71	8,48	9,12	3,81	4,38	4,90	5,26	6,67	7,47	8,23	8,85

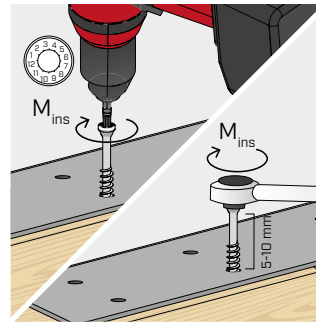
α = screw-to-grain angle



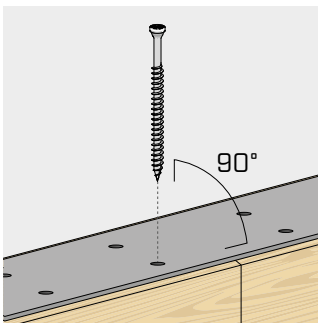
The use of pulse screw guns/impact wrenches is not permitted.



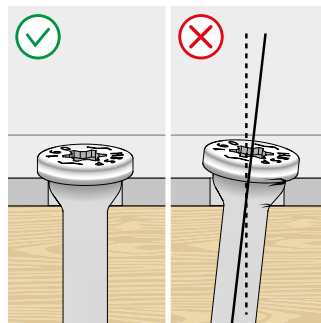
Ensure correct tightening. We recommend the use of torque-controlled screwdrivers, e.g. with TORQUE LIMITER. Alternatively, tighten with a torque wrench.



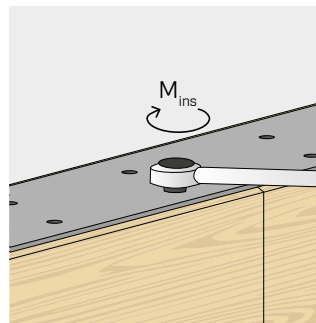
HBSP HBSP L	d ₁ [mm]	M _{ins,rec} [Nm]
Ø8	8	20
Ø10	10	30
Ø12	12	40



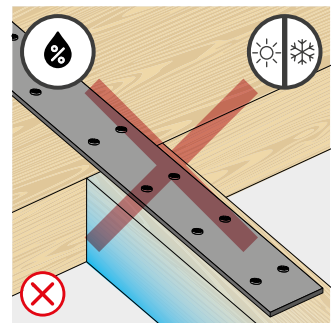
Respect the insertion angle. For very precise inclinations, the use of guide holes or pre-drilling is recommended.



Ensure full contact between the entire surface of the screw head and the metal element.



After installation, the fasteners can be inspected using a torque wrench.



Avoid dimensional changes to the metal and shrinkage and swelling of timber.

STRUCTURAL VALUES

GENERAL PRINCIPLES

- The reference factored lateral resistance for self-tapping screws has been determined following the guidelines in Clause 12.12 of the CSA O86:24 including the withdrawal restraint effect. Listed values are based on standard long term load duration factor ($K_D = 1.0$), dry service condition factor ($K_{SF} = 1.0$), and treatment factor ($K_T = 1.0$).
- The reference lateral design values are calculated for screws inserted without pre-drilling as per CSA O86:24 Clause 12.12.10.5.3. The direction of the bearing-to-grain angle does not influence lateral resistance. In the case of screws inserted with pre-drilling, greater resistance values can be obtained.
- The steel plate is assumed to be ASTM A36 with a minimum ultimate tensile strength, f_u , equal to 58 ksi (400 MPa).
- Head pull-through values have been determined in accordance with CSA O86:24, Clause A.12.12.8.3. Withdrawal and head pull-through values given in this datasheet are likewise applicable to CLT connections.
- Connection design requires comparing head pull-through resistance to both screw tensile capacity and thread withdrawal - the minimum of the three governs.
- Not all screw lengths satisfy the required embedment depth in either the side member ($4d_f$) or the main member ($8d_f$). Engineering discretion and judgment should be applied to evaluate the potential impact of reduced penetration on the connection's load-carrying capacity.
- HBSP screws must be positioned in accordance with the minimum distances.
- G is the mean relative density according to CSA O86:24 Table A12. Most common wood species are assumed such as Northern species ($G = 0.35$), Spruce-Pine-Fir ($G = 0.42$), Douglas Fir ($G = 0.49$), and Southern Pine ($G = 0.55$).
- The tabulated lateral design values are based on both wood members having the same specific gravity G.
- As part of the connection design, the designer must size and verify both the structural wood members and the steel plates separately.
- Combined shear and tensile stresses shall comply with the interaction criteria outlined in CSA O86:24 Clause 12.12.11.

NOTES

- Factored withdrawal resistances were calculated with the entire threaded portion of the screw, b (in millimeters), minus the tip length, L_{tip} . The length of the tip is equal to the nominal diameter of the respective fasteners, d_1 , as specified in the ELC-4645 report. Factor for fastener axis-to-grain angle, J_a , and the factor for dowel bearing effect for laterally loaded connections, J_w , varies according to connection geometry. The factored tensile resistance of the connector (P_{rt}) is governed by the lower value between the withdrawal resistance (P_{rw}), head pull-through resistance (P_{pt}) and the steel strength (T_{rs}).
- The angle between the fastener axis and the grain direction of the wood member, α , is taken as zero for the end grain calculations. Self-tapping screws installed perpendicular to the panel edge of CLT are assumed to be installed in the end grain of member.
- HBSP screws installed in the end grain may not meet the minimum penetration requirement for withdrawal (20 d_1) specified in CSA O86:24 Clause 12.12.6.1. Discretion and engineering judgment must be exercised to evaluate the impact of reduced penetration on the connection's capacity.
- Lateral resistances are factored and according to CSA O86:24 Clause 12.12.10. Values apply to dry service conditions and are representative of a single screw.
- The side-member thickness, A, for HBS PLATE 8 x 60 mm was set to 15 mm to ensure the connection is not governed by failure mode (a).