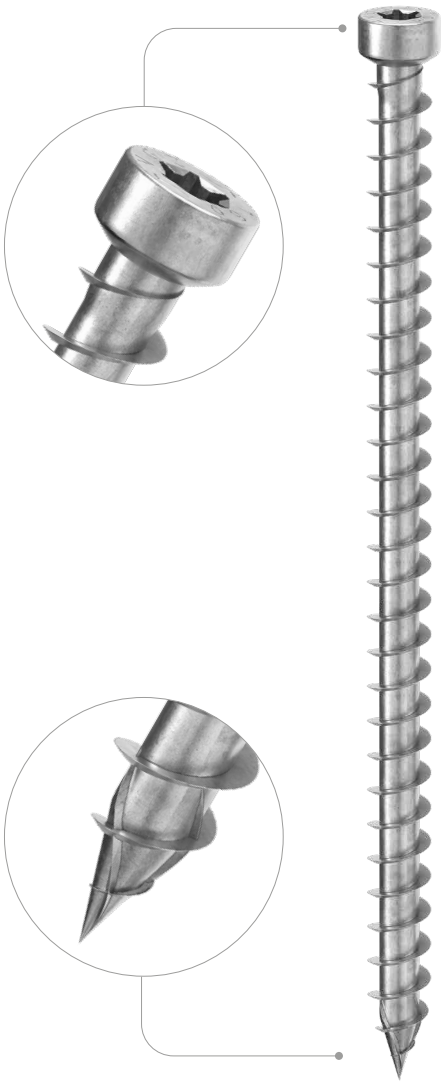
VGZ

FULL THREADED SCREW WITH CYLINDRICAL HEAD

ELC-4645 ESR-4645 UKTA-0836 22/6195 ETA-11/0030



3 THORNS TIP

Thanks to the 3 THORNS tip, minimum installation distances are reduced. More screws can be used in less space and larger screws in smaller elements. Costs and time for project implementation are reduced.

STRUCTURAL APPLICATIONS

Structural connector approved for timber applications subjected to stresses in any direction according to ICC ELC-4645 listing report in Canada. Cyclical SEISMIC-REV tests according to EN 12512.

CYLINDRICAL HEAD

It allows the screw to penetrate and pass through the surface of the wood substrate. Ideal for concealed joints, timber couplings and structural reinforcements. It is the right choice to ensure strength in fire conditions.

TIMBER FRAME

Also ideal for joining small timber elements such as the crossbeams and uprights of light frame structures.

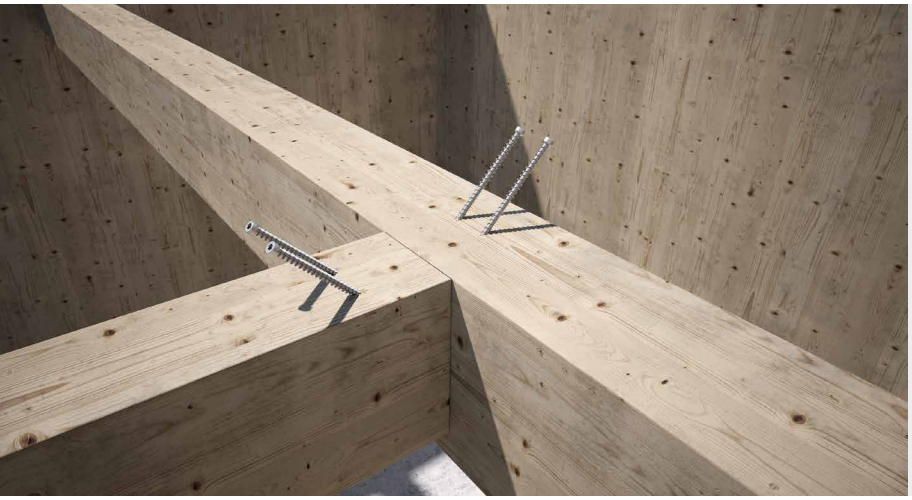
VIDEO

BIT INCLUDED

DIAMETER [mm]	5 — 7 — 11 — 11
LENGTH [mm]	80 — 80 — 1000 — 1000
SERVICE CONDITION	EC1 DRY
ATMOSPHERIC CORROSIVITY	C1 C2
WOOD CORROSIVITY	T1 T2
MATERIAL	Zn ELECTRO PLATED — electrogalvanized carbon steel
CORE HARDNESS	<390 HV — as required in CSA 086:24(1)

CANADIAN DESIGN VALUES

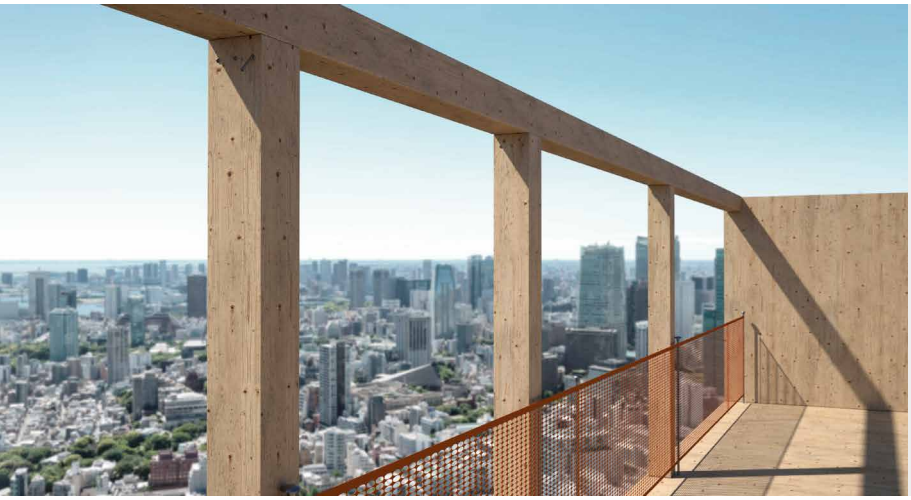
USA, EU and more design values available online.



FIELDS OF USE

- timber based panels
- solid timber
- glulam (Glued Laminated Timber)
- CLT and LVL
- high density woods

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



STRUCTURAL RESTORATION

Ideal for coupling beams in structural renovations and new works. Can also be used parallel to the grain thanks to the special approval.

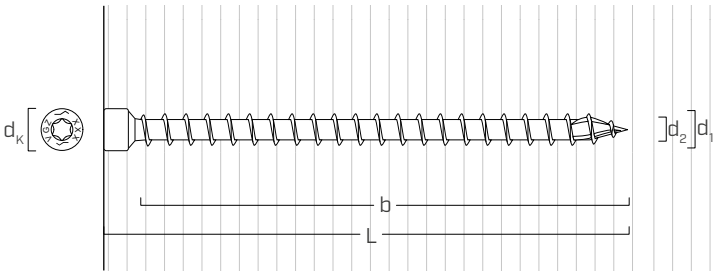
CLT, LVL

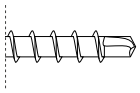
Values also tested, certified and calculated for CLT and high density woods such as LVL.

Very high stiffness in side-by-side joining of CLT floors. Application with double inclination at 45°, perfect combined with the JIG VGZ template.

Reinforcement orthogonal to grain for hanging load due to joining of main-secondary beams.

GEOMETRY AND MECHANICAL CHARACTERISTICS





Ø9 | L > 520 mm
Ø11 | L > 600 mm

GEOMETRY

Nominal diameter	**d_1**	**[mm]**	**7**	**9**	**11**
Head diameter	d_K	[mm]	9,50	11,50	13,50
Root diameter	d_2	[mm]	4,60	5,90	6,60
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	4,0	5,0	6,0
Pre-drilling hole diameter(2)	$d_{V,H}$	[mm]	5,0	6,0	7,0

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

MECHANICAL PARAMETERS

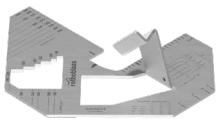
Nominal diameter	**d_1**	**[mm]**		**7**	**9**	**11**
Factored tensile strength	Φf_u	[kN]		10,64	17,84	23,17
Bending yield strength	F_{yb}	[MPa]		1111	1069	1026
Factored shear strength of the screw	Φv_s	[kN]		6,38	10,50	13,14
Specified withdrawal resistance per millimeter of threaded shank (tip included)	Y_w	[N/mm]	G=0.35	61,1	78,56	96,02
			G=0.42	70,7	90,9	111,1
			G=0.49	79,98	102,8	125,7
			G=0.55	87,72	112,8	137,9

CODES AND DIMENSIONS

d_1 [mm]	CODE	L [mm]	b [mm]	pcs	
7 TX 30	VGZ780	80	70	50	
	VGZ7100	100	90	50	
	VGZ7120	120	110	50	
	VGZ7140	140	130	50	
	VGZ7160	160	150	50	
	VGZ7180	180	170	50	
	VGZ7200	200	190	50	
	VGZ7220	220	210	50	
	VGZ7240	240	230	50	
	VGZ7260	260	250	50	
	VGZ7280	280	270	50	
	VGZ7300	300	290	50	
	VGZ7320	320	310	50	
	VGZ7340	340	330	50	
	VGZ7360	360	350	50	
	VGZ7380	380	370	50	
	VGZ7400	400	390	50	
9 TX 40	VGZ9160	160	150	50	
	VGZ9180	180	170	50	
	VGZ9200	200	190	50	
	VGZ9220	220	210	50	
	VGZ9240	240	230	50	
	VGZ9260	260	250	25	
	VGZ9280	280	270	50	
	VGZ9300	300	290	50	
	VGZ9320	320	310	50	
	VGZ9340	340	330	50	
	VGZ9360	360	350	50	
	VGZ9380	380	370	50	
	VGZ9400	400	390	50	
	VGZ9440	440	430	25	
	VGZ9480	480	470	25	
	VGZ9520	520	510	25	
	VGZ9560	560	550	25	
	VGZ9600	600	590	25	

d_1 [mm]	CODE	L [mm]	b [mm]	pcs	
11 TX 50	VGZ11150	150	140	25	
	VGZ11200	200	190	25	
	VGZ11250	250	240	25	
	VGZ11275	275	265	25	
	VGZ11300	300	290	25	
	VGZ11325	325	315	25	
	VGZ11350	350	340	25	
	VGZ11375	375	365	25	
	VGZ11400	400	390	25	
	VGZ11425	425	415	25	
	VGZ11450	450	440	25	
	VGZ11475	475	465	25	
	VGZ11500	500	490	25	
	VGZ11525	525	515	25	
	VGZ11550	550	540	25	
	VGZ11575	575	565	25	
	VGZ11600	600	590	25	
	VGZ11650	650	630	25	
	VGZ11700	700	680	25	
	VGZ11750	750	730	25	
	VGZ11800	800	780	25	
	VGZ11850	850	830	25	
	VGZ11900	900	880	25	
	VGZ11950	950	930	25	
	VGZ111000	1000	980	25	

RELATED PRODUCTS



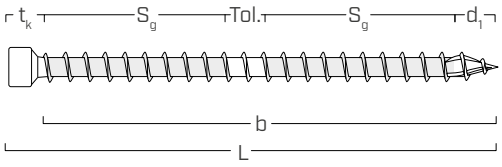
JIG VGZ 45°

TEMPLATE FOR 45° SCREWS

JIG VGZ 45° TEMPLATE

Installation at 45° using the JIG VGZ steel template.

EFFECTIVE THREAD USED IN CALCULATION



b = $S_{g,tot}$ = L - t_K represents the entire length of the threaded part (see table above)

S_g = (b - d_1 - Tol.)/2 represents the partial length of the threaded part net of a laying tolerance (Tol.) of 10 mm

t_K = 10 mm or 20 mm depending on screw length.

NOTES

- The length of the tip is equal to the nominal diameter of the respective fasteners, d_1, as specified in the ELC-4645 report.

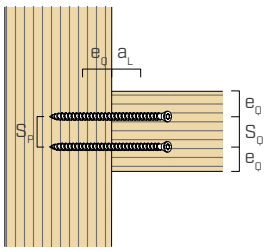
MINIMUM DISTANCES FOR AXIAL STRESSES | TIMBER

screws inserted **WITH and WITHOUT pre-drilled hole**

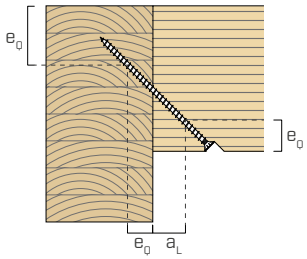
d_1		7 [mm]	*0.28 [in]*	9 [mm]	*0.36 [in]*	11 [mm]	*0.44 [in]*
S_P	**7·d†**	49	*1 15/16*	63	*2 1/2*	77	*3 1/16*
S_Q	**5·d**	35	*1 3/8*	45	*1 3/4*	55	*2 3/16*
a_L	**10·d†**	70	*2 3/4*	90	*3 1/2*	110	*4 3/8*
a	**7·d†**	49	*1 15/19*	63	*2 1/2*	77	*3 1/16*
e_Q	**4·d**	28	*1 1/8*	36	*1 7/16*	44	*1 3/4*

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

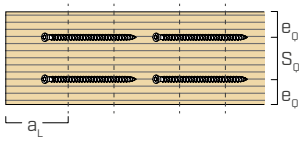
SCREWS UNDER TENSION INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



plan



front



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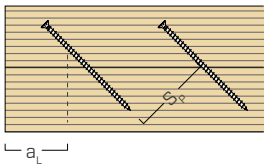
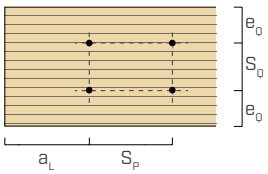


front

SCREWS INSERTED WITH α = 90° ANGLE WITH RESPECT TO THE GRAIN



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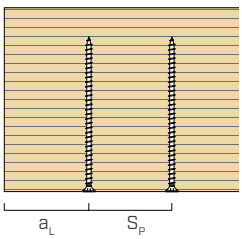
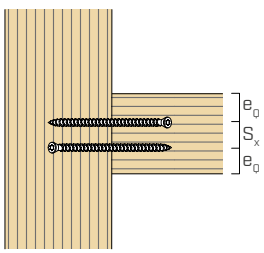


front

CROSSED SCREWS INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



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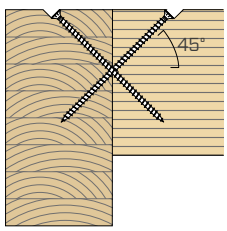
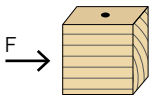


front

rothoblaas

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

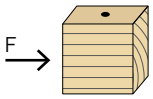
screws inserted **WITHOUT pre-drilled hole** — **G ≤ 0.44**



d_1		7 [mm]	*0.28 [in]*	9 [mm]	*0.36 [in]*	11 [mm]	*0.44 [in]*
S_P	**12·d‡**	84	*3 5/16*	108	*4 1/4*	132	*5 3/16*
S_Q	**5·d**	35	*1 3/8*	45	*1 3/4*	55	*2 3/16*
a_L	**15·d‡**	105	*4 1/8*	135	*5 5/16*	165	*6 1/2*
a	**10·d‡**	70	*2 3/4*	90	*3 1/2*	110	*4 3/8*
e_Q	**10·d**	70	*2 3/4*	90	*3 1/2*	110	*4 3/8*
e_P	**5·d**	35	*1 3/8*	45	*1 3/4*	55	*2 3/16*
S_x	**2·d**	14	*9/16*	18	*11/16*	22	*7/8*

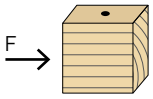
‡ For Western Red Cedar, this minimum spacing shall be increased by 50%.

screws inserted **WITHOUT pre-drilled hole** — **0.44 < G ≤ 0.50**



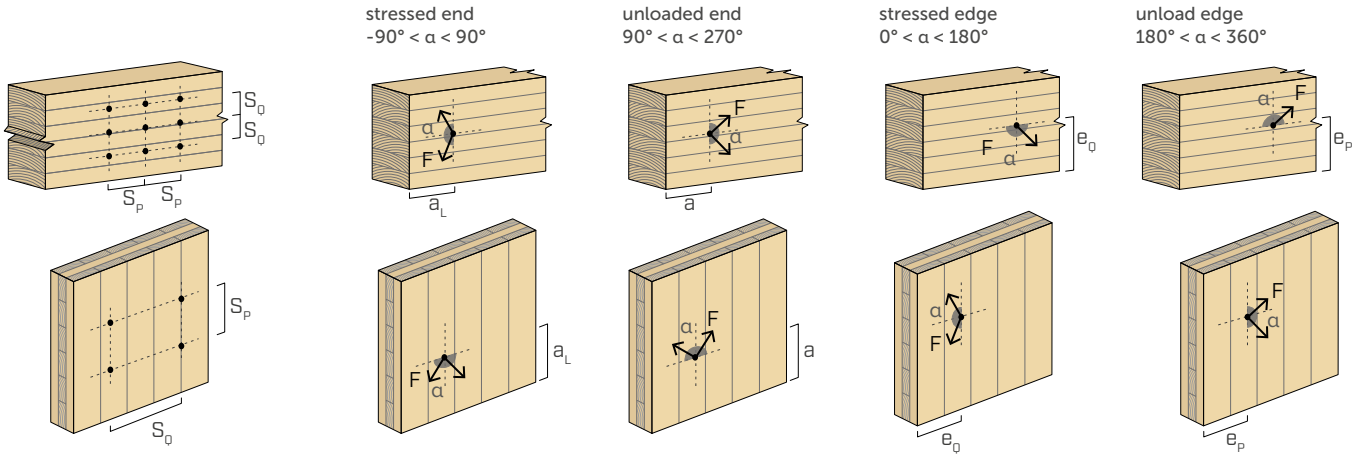
d_1		7 [mm]	*0.28 [in]*	9 [mm]	*0.36 [in]*	11 [mm]	*0.44 [in]*
S_P	**18·d**	126	*4 15/16*	162	*6 3/8*	198	*7 13/16*
S_Q	**7·d**	49	*1 15/16*	63	*2 1/2*	77	*3 1/16*
a_L	**22·d**	154	*6 1/16*	198	*7 13/16*	242	*9 1/2*
a	**15·d**	105	*4 1/8*	135	*5 5/16*	165	*6 1/2*
e_Q	**12·d**	84	*3 5/16*	108	*4 1/4*	132	*5 3/16*
e_P	**7·d**	49	*1 15/16*	63	*2 1/2*	77	*3 1/16*
S_x	**3·d**	21	*13/16*	27	*1 1/16*	33	*1 5/16*

screws inserted **WITH pre-drilled hole**



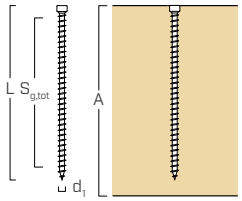
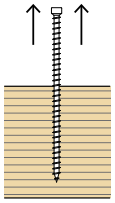
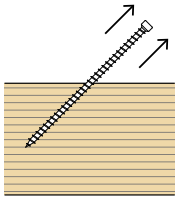
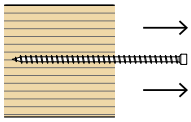
d_1		7 [mm]	*0.28 [in]*	9 [mm]	*0.36 [in]*	11 [mm]	*0.44 [in]*
S_P	**5·d†**	35	*1 3/8*	45	*1 3/4*	55	*2 3/16*
S_Q	**4·d**	28	*1 1/8*	36	*1 7/16*	44	*1 3/4*
a_L	**12·d†**	84	*3 5/16*	108	*4 1/4*	132	*5 3/16*
a	**7·d†**	49	*1 15/16*	63	*2 1/2*	77	*3 1/16*
e_Q	**7·d**	49	*1 15/16*	63	*2 1/2*	77	*3 1/16*
e_P	**3·d**	21	*13/16*	27	*1 1/16*	33	*1 5/16*
S_x	**1.5·d**	11	*7/16*	14	*9/16*	17	*11/16*

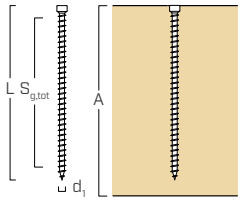
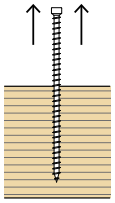
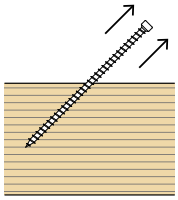
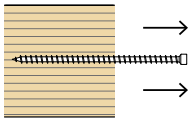
† For Douglas Fir–Larch and Western Red Cedar, this minimum spacing shall be increased by 50%.
d = d_1 = nominal diameter of the screw
α = load-to-grain angle



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.

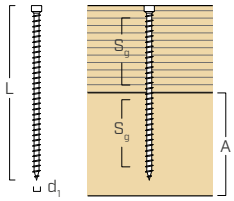
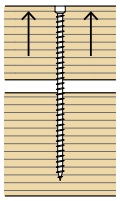
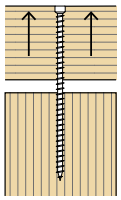
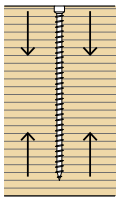
geometry				TENSION/COMPRESSION[1]											
				total thread withdrawal											
				α = 90°				α = 45°				end grain α = 0°			
															
				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]			
				G				G				G			
d_1	L		$S_{g,tot}$	A_{min}	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
7 *0.28*	80	*3 1/8*	63	90	2,69	3,12	3,53	3,87	2,45	2,83	3,21	3,52	1,35	1,56	1,76	1,93
	100	*4*	83	110	3,55	4,11	4,65	5,10	3,23	3,73	4,22	4,63	1,77	2,05	2,32	2,55
	120	*4 3/4*	103	130	4,41	5,10	5,77	6,32	4,00	4,63	5,24	5,75	2,20	2,55	2,88	3,16
	140	*5 1/2*	123	150	5,26	6,09	6,89	7,55	4,78	5,53	6,26	6,87	2,63	3,04	3,44	3,78
	160	*6 1/4*	143	170	6,12	7,08	8,01	8,78	5,56	6,43	7,28	7,98	3,06	3,54	4,00	4,39
	180	*7 1/8*	163	190	6,97	8,07	9,13	10,01	6,34	7,33	8,30	9,10	3,49	4,03	4,56	5,00
	200	*8*	183	210	7,83	9,06	10,25	11,24	7,12	8,23	9,31	10,22	3,91	4,53	5,12	5,62
	220	*8 5/8*	203	230	8,68	10,05	11,37	12,47	7,89	9,13	10,33	11,33	4,34	5,02	5,68	6,23
	240	*9 1/2*	223	250	9,54	11,04	12,48	13,69	8,67	10,03	11,35	12,45	4,77	5,52	6,24	6,85
	260	*10 1/4*	243	270	10,39	12,03	13,60	14,92	9,45	10,93	12,37	13,56	5,20	6,01	6,80	7,46
	280	*11*	263	290	11,25	13,02	14,72	16,15	10,23	11,83	13,39	14,68	5,62	6,51	7,36	8,07
	300	*11 3/4*	283	310	12,10	14,01	15,84	17,38	11,00	12,73	14,40	15,80	6,05	7,00	7,92	8,69
	320	*12 5/8*	303	330	12,96	15,00	16,96	18,61	11,78	13,63	15,42	16,91	6,48	7,50	8,48	9,30
	340	*13 3/8*	323	350	13,81	15,99	18,08	19,83	12,56	14,53	16,44	18,03	6,91	7,99	9,04	9,92
	360	*14 1/4*	343	370	14,67	16,98	19,20	21,06	13,34	15,43	17,46	19,15	7,34	8,49	9,60	10,53
	380	*15*	363	390	15,53	17,96	20,32	22,29	14,11	16,33	18,48	20,26	7,76	8,98	10,16	11,14
	400	*15 3/4*	383	410	16,38	18,95	21,44	23,52	14,89	17,23	19,49	21,38	8,19	9,48	10,72	11,76
9 *0.36*	160	*6 1/4*	141	170	7,75	8,97	10,15	11,13	7,05	8,16	9,22	10,12	3,88	4,49	5,07	5,57
	180	*7 1/8*	161	190	8,85	10,24	11,59	12,71	8,05	9,31	10,53	11,56	4,43	5,12	5,79	6,36
	200	*8*	181	210	9,95	11,52	13,02	14,29	9,05	10,47	11,84	12,99	4,98	5,76	6,51	7,15
	220	*8 5/8*	201	230	11,05	12,79	14,46	15,87	10,05	11,63	13,15	14,43	5,53	6,39	7,23	7,94
	240	*9 1/2*	221	250	12,15	14,06	15,90	17,45	11,05	12,78	14,46	15,86	6,08	7,03	7,95	8,73
	260	*10 1/4*	241	270	13,25	15,33	17,34	19,03	12,05	13,94	15,77	17,30	6,63	7,67	8,67	9,51
	280	*11*	261	290	14,35	16,61	18,78	20,61	13,05	15,10	17,07	18,74	7,18	8,30	9,39	10,30
	300	*11 3/4*	281	310	15,45	17,88	20,22	22,19	14,05	16,25	18,38	20,17	7,73	8,94	10,11	11,09
	320	*12 5/8*	301	330	16,55	19,15	21,66	23,77	15,05	17,41	19,69	21,61	8,28	9,58	10,83	11,88
	340	*13 3/8*	321	350	17,65	20,43	23,10	25,35	16,05	18,57	21,00	23,04	8,83	10,21	11,55	12,67
	360	*14 1/4*	341	370	18,75	21,70	24,54	26,93	17,05	19,73	22,31	24,48	9,38	10,85	12,27	13,46
	380	*15*	361	390	19,85	22,97	25,98	28,50	18,05	20,88	23,62	25,91	9,93	11,49	12,99	14,25
	400	*15 3/4*	381	410	20,95	24,24	27,42	30,08	19,05	22,04	24,92	27,35	10,48	12,12	13,71	15,04
	440	*17 1/4*	421	450	23,15	26,79	30,30	33,24	21,05	24,35	27,54	30,22	11,58	13,39	15,15	16,62
	480	*19*	461	490	25,35	29,33	33,17	36,40	23,05	26,67	30,16	33,09	12,68	14,67	16,59	18,20
	520	*20 1/2*	501	530	27,55	31,88	36,05	39,56	25,05	28,98	32,77	35,96	13,78	15,94	18,03	19,78
	560	*22*	541	570	29,75	34,42	38,93	42,72	27,05	31,29	35,39	38,83	14,88	17,21	19,47	21,36
	600	*23 5/8*	581	610	31,95	36,97	41,81	45,88	29,05	33,61	38,01	41,71	15,98	18,48	20,90	22,94

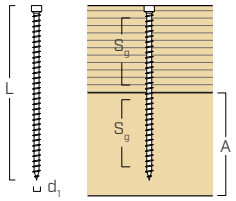
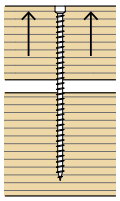
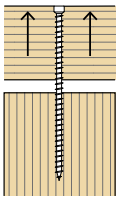
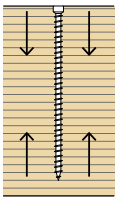
geometry				TENSION/COMPRESSION[1] total thread withdrawal α = 90°				α = 45°				end grain α = 0°			
															
				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]			
d_1	L		$S_{g,tot}$	A_{min}	G				G				G			
					0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
	150	*6*	129	160	8,67	10,03	11,35	12,45	7,88	9,12	10,32	11,32	4,34	5,02	5,68	6,23
	200	*8*	179	210	12,03	13,92	15,75	17,28	10,94	12,66	14,32	15,71	6,02	6,96	7,88	8,64
	250	*10*	229	260	15,39	17,81	20,15	22,11	13,99	16,19	18,32	20,10	7,70	8,90	10,07	11,05
	275	*10 7/8*	254	285	17,07	19,75	22,35	24,52	15,52	17,96	20,32	22,29	8,54	9,88	11,17	12,26
	300	*11 3/4*	279	310	18,75	21,70	24,55	26,93	17,05	19,73	22,32	24,48	9,38	10,85	12,27	13,47
	325	*12 3/4*	304	335	20,43	23,64	26,75	29,35	18,58	21,49	24,32	26,68	10,22	11,82	13,37	14,67
	350	*13 3/4*	329	360	22,11	25,59	28,95	31,76	20,10	23,26	26,32	28,87	11,06	12,79	14,47	15,88
	375	*14 3/4*	354	385	23,79	27,53	31,15	34,17	21,63	25,03	28,32	31,07	11,90	13,77	15,57	17,09
	400	*15 3/4*	379	410	25,47	29,47	33,35	36,58	23,16	26,80	30,32	33,26	12,74	14,74	16,67	18,29
	425	*16 3/4*	404	435	27,15	31,42	35,55	39,00	24,69	28,56	32,32	35,45	13,58	15,71	17,77	19,50
	450	*17 3/4*	429	460	28,83	33,36	37,75	41,41	26,21	30,33	34,32	37,65	14,42	16,68	18,87	20,71
	475	*18 11/16*	454	485	30,52	35,31	39,95	43,82	27,74	32,10	36,32	39,84	15,26	17,65	19,97	21,91
11 *0.44*	500	*19 3/4*	479	510	32,20	37,25	42,15	46,24	29,27	33,87	38,32	42,03	16,10	18,63	21,07	23,12
	525	*20 11/16*	504	535	33,88	39,20	44,35	48,65	30,80	35,63	40,32	44,23	16,94	19,60	22,17	24,33
	550	*21 5/8*	529	560	35,56	41,14	46,55	51,06	32,32	37,40	42,32	46,42	17,78	20,57	23,27	25,53
	575	*22 5/8*	554	585	37,24	43,08	48,75	53,48	33,85	39,17	44,31	48,62	18,62	21,54	24,37	26,74
	600	*23 5/8*	579	610	38,92	45,03	50,95	55,89	35,38	40,94	46,31	50,81	19,46	22,51	25,47	27,95
	650	*25 9/16*	619	660	41,61	48,14	54,47	59,75	37,82	43,76	49,51	54,32	20,80	24,07	27,23	29,88
	700	*27 1/2*	669	710	44,97	52,03	58,87	64,58	40,88	47,30	53,51	58,71	22,48	26,01	29,43	32,29
	750	*29 1/2*	719	760	48,33	55,92	63,26	69,41	43,93	50,83	57,51	63,10	24,16	27,96	31,63	34,70
	800	*31 1/2*	769	810	51,69	59,81	67,66	74,23	46,99	54,37	61,51	67,48	25,84	29,90	33,83	37,12
	850	*33 7/16*	819	860	55,05	63,69	72,06	79,06	50,04	57,90	65,51	71,87	27,52	31,85	36,03	39,53
	900	*35 1/2*	869	910	58,41	67,58	76,46	83,88	53,10	61,44	69,51	76,26	29,20	33,79	38,23	41,94
	950	*37 3/8*	919	960	61,77	71,47	80,86	88,71	56,15	64,97	73,51	80,65	30,88	35,74	40,43	44,36
	1000	*39 3/8*	969	1010	65,13	75,36	85,26	93,54	59,21	68,51	77,51	85,03	32,57	37,68	42,63	46,77

α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 26.

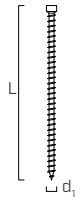
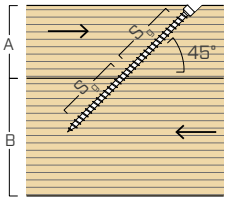
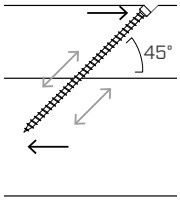
TENSION/COMPRESSION[1]

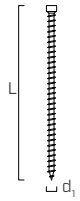
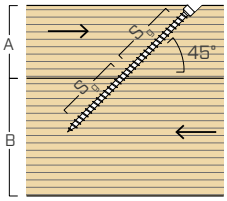
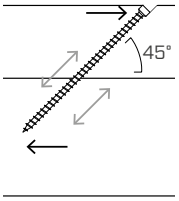
geometry				partial thread withdrawal α = 90°				partial thread withdrawal end grain α = 0°				steel tension	buckling α = 90°
													
				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]				factored tension resistance T_{rs}	factored buckling resistance P_{rb}
				G				G					
d_1	L		S_g	A_{min}	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
7 *0.28*	80	*3 1/8*	25	45	1,07	1,24	1,40	1,54	0,53	0,62	0,70	0,77	10,64	10,34
	100	*4*	35	55	1,50	1,73	1,96	2,15	0,75	0,87	0,98	1,07		
	120	*4 3/4*	45	65	1,92	2,23	2,52	2,76	0,96	1,11	1,26	1,38		
	140	*5 1/2*	55	75	2,35	2,72	3,08	3,38	1,18	1,36	1,54	1,69		
	160	*6 1/4*	65	85	2,78	3,22	3,64	3,99	1,39	1,61	1,82	2,00		
	180	*7 1/8*	75	95	3,21	3,71	4,20	4,61	1,60	1,86	2,10	2,30		
	200	*8*	85	105	3,64	4,21	4,76	5,22	1,82	2,10	2,38	2,61		
	220	*8 5/8*	95	115	4,06	4,70	5,32	5,83	2,03	2,35	2,66	2,92		
	240	*9 1/2*	105	125	4,49	5,20	5,88	6,45	2,25	2,60	2,94	3,22		
	260	*10 1/4*	115	135	4,92	5,69	6,44	7,06	2,46	2,85	3,22	3,53		
	280	*11*	125	145	5,35	6,19	7,00	7,68	2,67	3,09	3,50	3,84		
	300	*11 3/4*	135	155	5,77	6,68	7,56	8,29	2,89	3,34	3,78	4,14		
	320	*12 5/8*	145	165	6,20	7,18	8,12	8,90	3,10	3,59	4,06	4,45		
	340	*13 3/8*	155	175	6,63	7,67	8,68	9,52	3,31	3,84	4,34	4,76		
	360	*14 1/4*	165	185	7,06	8,17	9,24	10,13	3,53	4,08	4,62	5,07		
	380	*15*	175	195	7,48	8,66	9,80	10,75	3,74	4,33	4,90	5,37		
	400	*15 3/4*	185	205	7,91	9,16	10,36	11,36	3,96	4,58	5,18	5,68		
9 *0.36*	160	*6 1/4*	65	85	3,57	4,14	4,68	5,13	1,79	2,07	2,34	2,57	17,84	16,37
	180	*7 1/8*	75	95	4,12	4,77	5,40	5,92	2,06	2,39	2,70	2,96		
	200	*8*	85	105	4,67	5,41	6,12	6,71	2,34	2,70	3,06	3,36		
	220	*8 5/8*	95	115	5,22	6,04	6,84	7,50	2,61	3,02	3,42	3,75		
	240	*9 1/2*	105	125	5,77	6,68	7,56	8,29	2,89	3,34	3,78	4,15		
	260	*10 1/4*	115	135	6,32	7,32	8,28	9,08	3,16	3,66	4,14	4,54		
	280	*11*	125	145	6,87	7,95	9,00	9,87	3,44	3,98	4,50	4,94		
	300	*11 3/4*	135	155	7,42	8,59	9,71	10,66	3,71	4,30	4,86	5,33		
	320	*12 5/8*	145	165	7,97	9,23	10,43	11,45	3,99	4,61	5,22	5,72		
	340	*13 3/8*	155	175	8,52	9,86	11,15	12,24	4,26	4,93	5,58	6,12		
	360	*14 1/4*	165	185	9,07	10,50	11,87	13,03	4,54	5,25	5,94	6,51		
	380	*15*	175	195	9,62	11,14	12,59	13,82	4,81	5,57	6,30	6,91		
	400	*15 3/4*	185	205	10,17	11,77	13,31	14,61	5,09	5,89	6,66	7,30		
	440	*17 1/4*	205	225	11,27	13,04	14,75	16,19	5,64	6,52	7,38	8,09		
	480	*19*	225	245	12,37	14,32	16,19	17,77	6,19	7,16	8,10	8,88		
	520	*20 1/2*	245	265	13,47	15,59	17,63	19,35	6,74	7,79	8,82	9,67		
	560	*22*	265	285	14,57	16,86	19,07	20,92	7,29	8,43	9,53	10,46		
	600	*23 5/8*	285	305	15,67	18,13	20,51	22,50	7,84	9,07	10,25	11,25		

geometry				TENSION/COMPRESSION[1]									
				partial thread withdrawal								steel tension	buckling
				α = 90°				end grain α = 0°					α = 90°
													
				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]				factored tension resistance T_{rs}	factored buckling resistance P_{rb}
				G				G					
d_1	L		S_g	A_{min}	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
	150	*6*	60	80	4,03	4,67	5,28	5,79	2,02	2,33	2,64	2,90		
	200	*8*	85	105	5,71	6,61	7,48	8,21	2,86	3,31	3,74	4,10		
	250	*10*	110	130	7,39	8,55	9,68	10,62	3,70	4,28	4,84	5,31		
	275	*10 7/8*	120	143	8,07	9,33	10,56	11,58	4,03	4,67	5,28	5,79		
	300	*11 3/4*	135	155	9,07	10,50	11,88	13,03	4,54	5,25	5,94	6,52		
	325	*12 3/4*	145	168	9,75	11,28	12,76	14,00	4,87	5,64	6,38	7,00		
	350	*13 3/4*	160	180	10,75	12,44	14,08	15,44	5,38	6,22	7,04	7,72		
	375	*14 3/4*	170	193	11,43	13,22	14,96	16,41	5,71	6,61	7,48	8,21		
	400	*15 3/4*	185	205	12,43	14,39	16,28	17,86	6,22	7,19	8,14	8,93		
	425	*16 3/4*	195	218	13,11	15,17	17,16	18,82	6,55	7,58	8,58	9,41		
	450	*17 3/4*	210	230	14,11	16,33	18,48	20,27	7,06	8,17	9,24	10,14		
	475	*18 11/16*	220	243	14,79	17,11	19,36	21,24	7,39	8,55	9,68	10,62		
11 *0.44*	500	*19 3/4*	235	255	15,80	18,28	20,68	22,68	7,90	9,14	10,34	11,34	23,17	19,66
	525	*20 11/16*	245	268	16,47	19,05	21,56	23,65	8,23	9,53	10,78	11,82		
	550	*21 5/8*	260	280	17,48	20,22	22,88	25,10	8,74	10,11	11,44	12,55		
	575	*22 5/8*	270	293	18,15	21,00	23,76	26,06	9,07	10,50	11,88	13,03		
	600	*23 5/8*	285	305	19,16	22,16	25,08	27,51	9,58	11,08	12,54	13,76		
	650	*25 9/16*	305	330	20,50	23,72	26,84	29,44	10,25	11,86	13,42	14,72		
	700	*27 1/2*	330	355	22,18	25,66	29,04	31,85	11,09	12,83	14,52	15,93		
	750	*29 1/2*	355	380	23,86	27,61	31,24	34,27	11,93	13,80	15,62	17,13		
	800	*31 1/2*	380	405	25,54	29,55	33,44	36,68	12,77	14,78	16,72	18,34		
	850	*33 7/16*	405	430	27,22	31,50	35,64	39,09	13,61	15,75	17,82	19,55		
	900	*35 1/2*	430	455	28,90	33,44	37,84	41,51	14,45	16,72	18,92	20,75		
	950	*37 3/8*	455	480	30,58	35,39	40,04	43,92	15,29	17,69	20,02	21,96		
	1000	*39 3/8*	480	505	32,26	37,33	42,24	46,33	16,13	18,66	21,12	23,17		

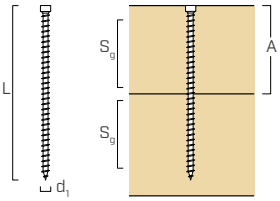
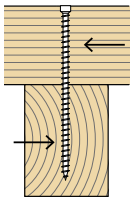
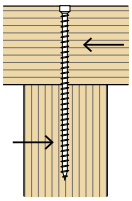
α = screw-to-grain angle

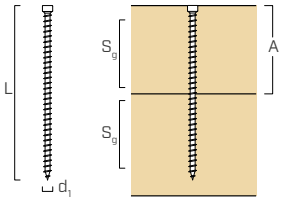
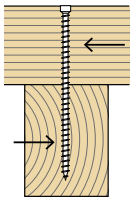
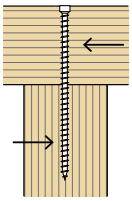
NOTES and GENERAL PRINCIPLES on page 26.

geometry			SLIDING[4]							steel tension
			timber-to-timber							
										
						factored lateral resistance N_r[5]				factored tension resistance T_{rs}
						G				
d_1	L		S_g	A	B_{min}	0.35	0.42	0.49	0.55	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]
7 *0.28*	80	*3 1/8*	25	35	50	0,82	0,95	1,08	1,18	7,52
	100	*4*	35	40	55	1,15	1,34	1,51	1,66	
	120	*4 3/4*	45	45	60	1,48	1,72	1,94	2,13	
	140	*5 1/2*	55	55	70	1,81	2,10	2,38	2,61	
	160	*6 1/4*	65	60	75	2,14	2,48	2,81	3,08	
	180	*7 1/8*	75	70	85	2,47	2,86	3,24	3,55	
	200	*8*	85	75	90	2,80	3,24	3,67	4,03	
	220	*8 5/8*	95	85	100	3,13	3,63	4,10	4,50	
	240	*9 1/2*	105	90	105	3,46	4,01	4,53	4,97	
	260	*10 1/4*	115	95	110	3,79	4,39	4,97	5,45	
	280	*11*	125	105	120	4,12	4,77	5,40	5,92	
	300	*11 3/4*	135	110	125	4,45	5,15	5,83	6,39	
	320	*12 5/8*	145	120	135	4,78	5,54	6,26	6,87	
	340	*13 3/8*	155	125	140	5,11	5,92	6,69	7,34	
	360	*14 1/4*	165	130	145	5,44	6,30	7,13	7,82	
	380	*15*	175	140	155	5,77	6,68	7,56	8,29	
	400	*15 3/4*	185	145	160	6,10	7,06	7,99	8,76	
9 *0.36*	160	*6 1/4*	65	60	75	2,76	3,19	3,61	3,96	12,61
	180	*7 1/8*	75	70	85	3,18	3,68	4,16	4,57	
	200	*8*	85	75	90	3,61	4,17	4,72	5,18	
	220	*8 5/8*	95	85	100	4,03	4,66	5,27	5,79	
	240	*9 1/2*	105	90	105	4,45	5,15	5,83	6,40	
	260	*10 1/4*	115	95	110	4,88	5,64	6,38	7,00	
	280	*11*	125	105	120	5,30	6,14	6,94	7,61	
	300	*11 3/4*	135	110	125	5,73	6,63	7,49	8,22	
	320	*12 5/8*	145	120	135	6,15	7,12	8,05	8,83	
	340	*13 3/8*	155	125	140	6,58	7,61	8,60	9,44	
	360	*14 1/4*	165	130	145	7,00	8,10	9,16	10,05	
	380	*15*	175	140	155	7,42	8,59	9,71	10,66	
	400	*15 3/4*	185	145	160	7,85	9,08	10,27	11,27	
	440	*17 1/4*	205	160	175	8,70	10,06	11,38	12,49	
	480	*19*	225	175	190	9,54	11,04	12,49	13,70	
	520	*20 1/2*	245	190	205	10,39	12,03	13,60	14,92	
	560	*22*	265	205	220	11,24	13,01	14,71	16,14	
	600	*23 5/8*	285	215	230	12,09	13,99	15,82	17,36	

geometry			SLIDING[4] timber-to-timber						steel tension
									
						factored lateral resistance N_r[5]			factored tension resistance T_{rs}
						G			
d_1	L		S_g	A	B_{min}	0.35	0.42	0.49	0.55	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]
	150	*6*	60	60	75	3,11	3,60	4,07	4,47	
	200	*8*	85	75	90	4,41	5,10	5,77	6,33	
	250	*10*	110	95	110	5,70	6,60	7,47	8,19	
	275	*10 7/8*	120	100	115	6,22	7,20	8,14	8,94	
	300	*11 3/4*	135	110	125	7,00	8,10	9,16	10,05	
	325	*12 3/4*	145	120	135	7,52	8,70	9,84	10,80	
	350	*13 3/4*	160	130	145	8,30	9,60	10,86	11,91	
	375	*14 3/4*	170	135	150	8,81	10,20	11,54	12,66	
	400	*15 3/4*	185	145	160	9,59	11,10	12,56	13,78	
	425	*16 3/4*	195	155	170	10,11	11,70	13,24	14,52	
	450	*17 3/4*	210	165	180	10,89	12,60	14,25	15,64	
	475	*18 11/16*	220	170	185	11,41	13,20	14,93	16,38	
11 *0.44*	500	*19 3/4*	235	180	195	12,18	14,10	15,95	17,50	16,38
	525	*20 11/16*	245	190	205	12,70	14,70	16,63	18,24	
	550	*21 5/8*	260	200	215	13,48	15,60	17,65	19,36	
	575	*22 5/8*	270	205	220	14,00	16,20	18,33	20,10	
	600	*23 5/8*	285	215	230	14,78	17,10	19,34	21,22	
	650	*25 9/16*	305	240	255	15,81	18,30	20,70	22,71	
	700	*27 1/2*	330	255	270	17,11	19,80	22,40	24,57	
	750	*29 1/2*	355	275	290	18,41	21,30	24,10	26,43	
	800	*31 1/2*	380	290	305	19,70	22,80	25,79	28,30	
	850	*33 7/16*	405	310	325	21,00	24,30	27,49	30,16	
	900	*35 1/2*	430	325	340	22,29	25,80	29,19	32,02	
	950	*37 3/8*	455	345	360	23,59	27,30	30,88	33,88	
	1000	*39 3/8*	480	360	375	24,89	28,80	32,58	35,74	

NOTES and GENERAL PRINCIPLES on page 26.

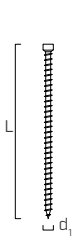
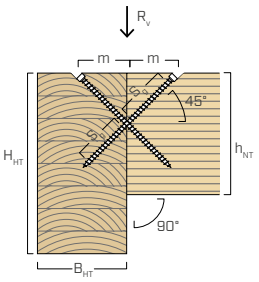
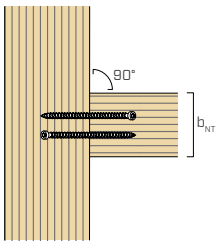
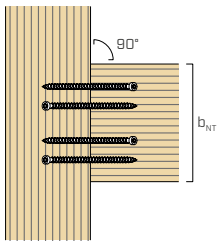
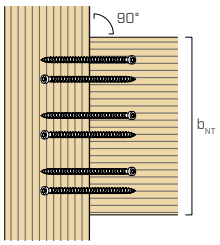
geometry				SHEAR[6] timber-to-timber							
				α = 90°				α = 0°			
											
				factored lateral resistance N_r				factored lateral resistance N_r[2][3]			
				G				G			
d_1	L		S_g	A[7]	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
7 *0.28*	80	*3 1/8*	25	40	1,14	1,36	1,57	1,76	0,76	0,90	1,00	1,08
	100	*4*	35	50	1,47	1,74	1,98	2,11	0,90	1,02	1,13	1,23
	120	*4 3/4*	45	60	1,74	1,93	2,12	2,26	0,99	1,13	1,26	1,38
	140	*5 1/2*	55	70	1,84	2,06	2,26	2,42	1,09	1,25	1,40	1,52
	160	*6 1/4*	65	80	1,95	2,18	2,40	2,57	1,19	1,36	1,53	1,67
	180	*7 1/8*	75	90	2,06	2,30	2,54	2,73	1,29	1,47	1,66	1,79
	200	*8*	85	100	2,16	2,43	2,68	2,88	1,38	1,58	1,74	1,87
	220	*8 5/8*	95	110	2,27	2,55	2,82	3,03	1,47	1,65	1,81	1,94
	240	*9 1/2*	105	120	2,38	2,67	2,96	3,15	1,53	1,71	1,88	2,02
	260	*10 1/4*	115	130	2,49	2,75	2,97	3,15	1,58	1,77	1,95	2,10
	280	*11*	125	140	2,51	2,75	2,97	3,15	1,63	1,83	2,02	2,17
	300	*11 3/4*	135	150	2,51	2,75	2,97	3,15	1,69	1,89	2,09	2,25
	320	*12 5/8*	145	160	2,51	2,75	2,97	3,15	1,74	1,96	2,16	2,33
	340	*13 3/8*	155	170	2,51	2,75	2,97	3,15	1,79	2,02	2,23	2,38
	360	*14 1/4*	165	180	2,51	2,75	2,97	3,15	1,85	2,08	2,25	2,38
	380	*15*	175	190	2,51	2,75	2,97	3,15	1,90	2,08	2,25	2,38
	400	*15 3/4*	185	200	2,51	2,75	2,97	3,15	1,90	2,08	2,25	2,38
9 *0.36*	160	*6 1/4*	65	80	2,85	3,17	3,48	3,73	1,61	1,83	2,05	2,23
	180	*7 1/8*	75	90	2,98	3,33	3,66	3,93	1,73	1,98	2,21	2,41
	200	*8*	85	100	3,12	3,49	3,84	4,13	1,85	2,12	2,38	2,59
	220	*8 5/8*	95	110	3,26	3,65	4,02	4,32	1,97	2,26	2,54	2,77
	240	*9 1/2*	105	120	3,40	3,81	4,20	4,52	2,09	2,40	2,70	2,90
	260	*10 1/4*	115	130	3,53	3,97	4,38	4,72	2,21	2,54	2,79	3,00
	280	*11*	125	140	3,67	4,13	4,56	4,90	2,33	2,62	2,88	3,09
	300	*11 3/4*	135	150	3,81	4,28	4,62	4,90	2,41	2,70	2,97	3,19
	320	*12 5/8*	145	160	3,91	4,28	4,62	4,90	2,48	2,78	3,06	3,29
	340	*13 3/8*	155	170	3,91	4,28	4,62	4,90	2,55	2,86	3,15	3,39
	360	*14 1/4*	165	180	3,91	4,28	4,62	4,90	2,62	2,94	3,24	3,49
	380	*15*	175	190	3,91	4,28	4,62	4,90	2,69	3,02	3,33	3,59
	400	*15 3/4*	185	200	3,91	4,28	4,62	4,90	2,76	3,10	3,42	3,69
	440	*17 1/4*	205	220	3,91	4,28	4,62	4,90	2,89	3,24	3,49	3,70
	480	*19*	225	240	3,91	4,28	4,62	4,90	2,95	3,24	3,49	3,70
	520	*20 1/2*	245	260	3,91	4,28	4,62	4,90	2,95	3,24	3,49	3,70
	560	*22*	265	280	3,91	4,28	4,62	4,90	2,95	3,24	3,49	3,70
	600	*23 5/8*	285	300	3,91	4,28	4,62	4,90	2,95	3,24	3,49	3,70

geometry					SHEAR[6] timber-to-timber							
					α = 90°				α = 0°			
												
					factored lateral resistance N_r				factored lateral resistance N_r[2][3]			
d_1	L		S_g	A[7]	G				G			
					0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
	150	*6*	60	75	3,24	3,81	4,17	4,47	1,86	2,12	2,37	2,57
	200	*8*	85	100	3,84	4,29	4,72	5,07	2,22	2,54	2,85	3,11
	250	*10*	110	125	4,26	4,78	5,27	5,68	2,58	2,97	3,34	3,62
	275	*10 7/8*	120	138	4,47	5,02	5,55	5,98	2,76	3,18	3,51	3,77
	300	*11 3/4*	135	150	4,68	5,27	5,75	6,09	2,94	3,31	3,65	3,92
	325	*12 3/4*	145	163	4,86	5,32	5,75	6,09	3,07	3,44	3,78	4,07
	350	*13 3/4*	160	175	4,86	5,32	5,75	6,09	3,17	3,56	3,92	4,22
	375	*14 3/4*	170	188	4,86	5,32	5,75	6,09	3,28	3,68	4,06	4,37
	400	*15 3/4*	185	200	4,86	5,32	5,75	6,09	3,38	3,80	4,20	4,52
	425	*16 3/4*	195	213	4,86	5,32	5,75	6,09	3,49	3,92	4,33	4,60
	450	*17 3/4*	210	225	4,86	5,32	5,75	6,09	3,59	4,02	4,35	4,60
	475	*18 11/16*	220	238	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
11	500	*19 3/4*	235	250	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
0.44	525	*20 11/16*	245	263	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	550	*21 5/8*	260	275	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	575	*22 5/8*	270	288	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	600	*23 5/8*	285	300	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	650	*25 9/16*	300	325	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	700	*27 1/2*	325	350	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	750	*29 1/2*	350	375	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	800	*31 1/2*	375	400	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	850	*33 7/16*	400	425	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	900	*35 1/2*	425	450	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	950	*37 3/8*	450	475	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60
	1000	*39 3/8*	475	500	4,86	5,32	5,75	6,09	3,67	4,02	4,35	4,60

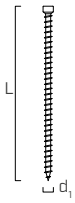
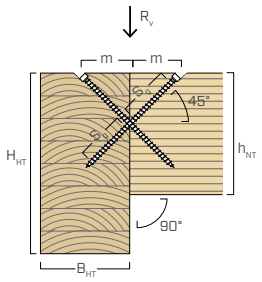
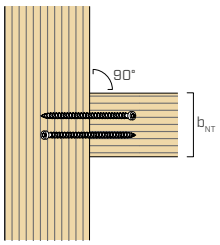
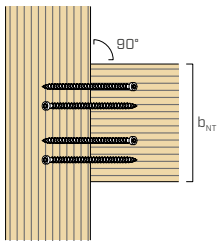
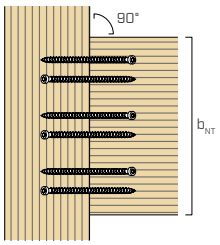
α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 26.

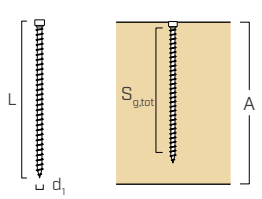
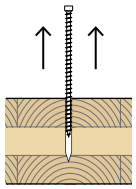
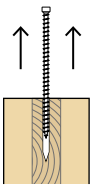
MAIN BEAM-SECONDARY BEAM SHEAR CONNECTION[8]

geometry			main beam secondary beam				1 pair			2 pairs			3 pairs		
															
d_1	L		$B_{HT,min}$	$H_{HT,min}$ $h_{NT,min}$	S_g	m	$b_{NT,min}$	factored shear resistance R_v [9] G		$b_{NT,min}$	factored shear resistance R_v [9] G		$b_{NT,min}$	factored shear resistance R_v [9] G	
								0.42	0.49		0.42	0.49		0.42	0.49
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[mm]	[mm]	[mm]	[kN]	[kN]	[mm]	[kN]	[kN]	[mm]	[kN]	[kN]
	80	*3 1/8*	45	70	25	31		1,59	1,80		3,18	3,60		4,77	5,40
	100	*4*	55	85	35	38		2,23	2,52		4,45	5,04		6,68	7,56
	120	*4 3/4*	60	100	45	45		2,86	3,24		5,73	6,48		8,59	9,72
	140	*5 1/2*	70	115	55	53		3,50	3,96		7,00	7,92		10,50	11,88
	160	*6 1/4*	75	130	65	60		4,14	4,68		8,27	9,36		12,41	14,04
	180	*7 1/8*	80	140	75	67		4,77	5,40		9,54	10,80		14,32	16,20
	200	*8*	90	155	85	74		5,41	6,12		10,82	12,24		16,22	18,35
	220	*8 5/8*	95	170	95	81		6,04	6,84		12,09	13,68		18,13	20,51
7 *0.28*	240	*9 1/2*	105	185	105	88	70	6,68	7,56	105	13,36	15,12	140	20,04	22,67
	260	*10 1/4*	110	200	115	95		7,32	8,28		14,63	16,56		21,95	24,83
	280	*11*	120	215	125	102		7,95	9,00		15,91	17,99		23,86	26,99
	300	*11 3/4*	125	225	135	109		8,59	9,72		17,18	19,43		25,77	29,15
	320	*12 5/8*	130	240	145	116		9,23	10,44		18,45	20,87		27,68	31,31
	340	*13 3/8*	140	255	155	123		9,86	11,16		19,72	22,31		29,59	33,47
	360	*14 1/4*	145	270	165	130		10,50	11,88		21,00	23,75		31,50	35,63
	380	*15*	155	285	175	137		11,13	12,60		22,27	25,19		33,40	37,79
	400	*15 3/4*	160	300	185	144		11,77	13,32		23,54	26,63		35,31	39,95
	160	*6 1/4*	75	130	65	60		5,32	6,01		10,63	12,03		15,95	18,04
	180	*7 1/8*	80	140	75	67		6,14	6,94		12,27	13,88		18,41	20,82
	200	*8*	90	155	85	74		6,95	7,86		13,91	15,73		20,86	23,59
	220	*8 5/8*	95	170	95	81		7,77	8,79		15,54	17,58		23,31	26,37
	240	*9 1/2*	105	185	105	88		8,59	9,71		17,18	19,43		25,77	29,14
	260	*10 1/4*	110	200	115	95		9,41	10,64		18,82	21,28		28,22	31,92
	280	*11*	120	215	125	102		10,23	11,56		20,45	23,13		30,68	34,69
	300	*11 3/4*	125	225	135	109		11,04	12,49		22,09	24,98		33,13	37,47
9	320	*12 5/8*	130	240	145	116	90	11,86	13,41	135	23,72	26,83	180	35,59	40,24
0.36	340	*13 3/8*	140	255	155	123		12,68	14,34		25,36	28,68		38,04	43,02
	360	*14 1/4*	145	270	165	130		13,50	15,27		27,00	30,53		40,49	45,80
	380	*15*	155	285	175	137		14,32	16,19		28,63	32,38		42,95	48,57
	400	*15 3/4*	160	300	185	144		15,13	17,12		30,27	34,23		45,40	51,35
	440	*17 1/4*	175	325	205	159		16,77	18,97		33,54	37,93		50,31	56,90
	480	*19*	190	355	225	173		18,41	20,82		36,81	41,63		55,22	62,45
	520	*20 1/2*	200	385	245	187		20,04	21,49		40,08	42,99		60,13	64,48
	560	*22*	215	410	265	201		21,49	21,49		42,99	42,99		64,48	64,48
	600	*23 5/8*	230	440	285	215		21,49	21,49		42,99	42,99		64,48	64,48

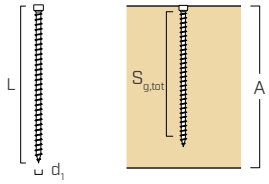
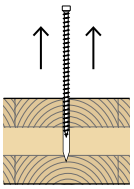
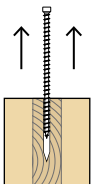
MAIN BEAM-SECONDARY BEAM SHEAR CONNECTION[8]

geometry			main beam secondary beam				1 pair			2 pairs			3 pairs		
															
d_1	L		$B_{HT,min}$	$H_{HT,min}$ $h_{NT,min}$	S_g	m	$b_{NT,min}$	factored shear resistance R_v [9]		$b_{NT,min}$	factored shear resistance R_v [9]		$b_{NT,min}$	factored shear resistance R_v [9]	
								G			G			G	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[mm]	[mm]	[mm]	0.42 [kN]	0.49 [kN]	[mm]	0.42 [kN]	0.49 [kN]	[mm]	0.42 [kN]	0.49 [kN]
	150	*6*	70	120	60	56		6,00	6,79		12,00	13,57		18,00	20,36
	200	*8*	90	155	85	74		8,50	9,62		17,00	19,23		25,50	28,85
	250	*10*	105	190	110	91		11,00	12,44		22,00	24,89		33,00	37,33
	275	*10 7/8*	115	210	120	98		12,00	13,57		24,00	27,15		35,99	40,72
	300	*11 3/4*	125	225	135	109		13,50	15,27		27,00	30,54		40,49	45,82
	325	*12 3/4*	130	245	145	116		14,50	16,40		29,00	32,81		43,49	49,21
	350	*13 3/4*	140	260	160	127		16,00	18,10		32,00	36,20		47,99	54,30
	375	*14 3/4*	150	280	170	134		17,00	19,23		33,99	38,46		50,99	57,69
	400	*15 3/4*	160	300	185	144		18,50	20,93		36,99	41,86		55,49	62,78
	425	*16 3/4*	165	315	195	152		19,50	22,06		38,99	44,12		58,49	66,18
	450	*17 3/4*	180	335	210	162		21,00	23,76		41,99	47,51		62,99	71,27
	475	*18 11/16*	185	350	220	169		22,00	24,89		43,99	49,77		65,99	74,66
11 ***0.44***	500	*19 3/4*	195	370	235	180	110	23,50	25,81	165	46,99	51,63	220	70,49	77,44
	525	*20 11/16*	200	385	245	187		24,50	25,81		48,99	51,63		73,49	77,44
	550	*21 5/8*	215	405	260	197		25,81	25,81		51,63	51,63		77,44	77,44
	575	*22 5/8*	220	420	270	205		25,81	25,81		51,63	51,63		77,44	77,44
	600	*23 5/8*	230	440	285	215		25,81	25,81		51,63	51,63		77,44	77,44
	650	*25 9/16*	245	475	305	229		25,81	25,81		51,63	51,63		77,44	77,44
	700	*27 1/2*	260	510	330	247		25,81	25,81		51,63	51,63		77,44	77,44
	750	*29 1/2*	280	545	355	265		25,81	25,81		51,63	51,63		77,44	77,44
	800	*31 1/2*	300	580	380	282		25,81	25,81		51,63	51,63		77,44	77,44
	850	*33 7/16*	315	615	405	300		25,81	25,81		51,63	51,63		77,44	77,44
	900	*35 1/2*	335	650	430	318		25,81	25,81		51,63	51,63		77,44	77,44
	950	*37 3/8*	350	685	455	335		25,81	25,81		51,63	51,63		77,44	77,44
	1000	*39 3/8*	370	720	480	353		25,81	25,81		51,63	51,63		77,44	77,44

NOTES and GENERAL PRINCIPLES on page 26.

geometry				TENSION[1]							
				total thread withdrawal							
				lateral α=90°				narrow α=0°			
											
				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]			
				G				G			
d_1	L		$S_{g,tot}$	A_{min}	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
7 *0.28*	80	*3 1/8*	63	90	2,69	3,12	3,53	3,87	1,35	1,56	1,76	1,93
	100	*4*	83	110	3,55	4,11	4,65	5,10	1,77	2,05	2,32	2,55
	120	*4 3/4*	103	130	4,41	5,10	5,77	6,32	2,20	2,55	2,88	3,16
	140	*5 1/2*	123	150	5,26	6,09	6,89	7,55	2,63	3,04	3,44	3,78
	160	*6 1/4*	143	170	6,12	7,08	8,01	8,78	3,06	3,54	4,00	4,39
	180	*7 1/8*	163	190	6,97	8,07	9,13	10,01	3,49	4,03	4,56	5,00
	200	*8*	183	210	7,83	9,06	10,25	11,24	3,91	4,53	5,12	5,62
	220	*8 5/8*	203	230	8,68	10,05	11,37	12,47	4,34	5,02	5,68	6,23
	240	*9 1/2*	223	250	9,54	11,04	12,48	13,69	4,77	5,52	6,24	6,85
	260	*10 1/4*	243	270	10,39	12,03	13,60	14,92	5,20	6,01	6,80	7,46
	280	*11*	263	290	11,25	13,02	14,72	16,15	5,62	6,51	7,36	8,07
	300	*11 3/4*	283	310	12,10	14,01	15,84	17,38	6,05	7,00	7,92	8,69
	320	*12 5/8*	303	330	12,96	15,00	16,96	18,61	6,48	7,50	8,48	9,30
	340	*13 3/8*	323	350	13,81	15,99	18,08	19,83	6,91	7,99	9,04	9,92
	360	*14 1/4*	343	370	14,67	16,98	19,20	21,06	7,34	8,49	9,60	10,53
	380	*15*	363	390	15,53	17,96	20,32	22,29	7,76	8,98	10,16	11,14
	400	*15 3/4*	383	410	16,38	18,95	21,44	23,52	8,19	9,48	10,72	11,76
9 *0.36*	160	*6 1/4*	141	170	7,75	8,97	10,15	11,13	3,88	4,49	5,07	5,57
	180	*7 1/8*	161	190	8,85	10,24	11,59	12,71	4,43	5,12	5,79	6,36
	200	*8*	181	210	9,95	11,52	13,02	14,29	4,98	5,76	6,51	7,15
	220	*8 5/8*	201	230	11,05	12,79	14,46	15,87	5,53	6,39	7,23	7,94
	240	*9 1/2*	221	250	12,15	14,06	15,90	17,45	6,08	7,03	7,95	8,73
	260	*10 1/4*	241	270	13,25	15,33	17,34	19,03	6,63	7,67	8,67	9,51
	280	*11*	261	290	14,35	16,61	18,78	20,61	7,18	8,30	9,39	10,30
	300	*11 3/4*	281	310	15,45	17,88	20,22	22,19	7,73	8,94	10,11	11,09
	320	*12 5/8*	301	330	16,55	19,15	21,66	23,77	8,28	9,58	10,83	11,88
	340	*13 3/8*	321	350	17,65	20,43	23,10	25,35	8,83	10,21	11,55	12,67
	360	*14 1/4*	341	370	18,75	21,70	24,54	26,93	9,38	10,85	12,27	13,46
	380	*15*	361	390	19,85	22,97	25,98	28,50	9,93	11,49	12,99	14,25
	400	*15 3/4*	381	410	20,95	24,24	27,42	30,08	10,48	12,12	13,71	15,04
	440	*17 1/4*	421	450	23,15	26,79	30,30	33,24	11,58	13,39	15,15	16,62
	480	*19*	461	490	25,35	29,33	33,17	36,40	12,68	14,67	16,59	18,20
	520	*20 1/2*	501	530	27,55	31,88	36,05	39,56	13,78	15,94	18,03	19,78
	560	*22*	541	570	29,75	34,42	38,93	42,72	14,88	17,21	19,47	21,36
	600	*23 5/8*	581	610	31,95	36,97	41,81	45,88	15,98	18,48	20,90	22,94

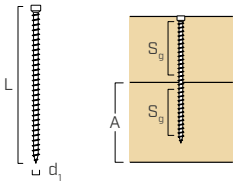
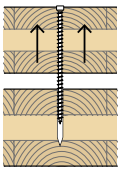
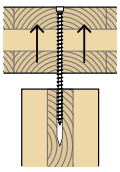
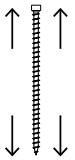
TENSION[1]

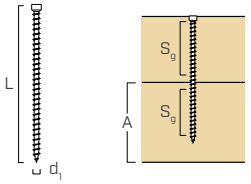
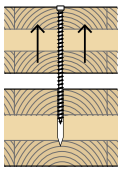
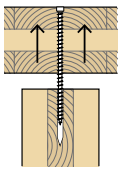
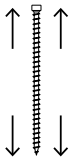
geometry				total thread withdrawal							
				lateral α=90°				narrow α=0°			
											
				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]			
				G				G			
d_1	L		$S_{g,tot}$	A_{min}	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
11 *0.44*	150	*6*	129	160	8,67	10,03	11,35	12,45	4,34	5,02	5,68	6,23
	200	*8*	179	210	12,03	13,92	15,75	17,28	6,02	6,96	7,88	8,64
	250	*10*	229	260	15,39	17,81	20,15	22,11	7,70	8,90	10,07	11,05
	275	*10 7/8*	254	285	17,07	19,75	22,35	24,52	8,54	9,88	11,17	12,26
	300	*11 3/4*	279	310	18,75	21,70	24,55	26,93	9,38	10,85	12,27	13,47
	325	*12 3/4*	304	335	20,43	23,64	26,75	29,35	10,22	11,82	13,37	14,67
	350	*13 3/4*	329	360	22,11	25,59	28,95	31,76	11,06	12,79	14,47	15,88
	375	*14 3/4*	354	385	23,79	27,53	31,15	34,17	11,90	13,77	15,57	17,09
	400	*15 3/4*	379	410	25,47	29,47	33,35	36,58	12,74	14,74	16,67	18,29
	425	*16 3/4*	404	435	27,15	31,42	35,55	39,00	13,58	15,71	17,77	19,50
	450	*17 3/4*	429	460	28,83	33,36	37,75	41,41	14,42	16,68	18,87	20,71
	475	*18 11/16*	454	485	30,52	35,31	39,95	43,82	15,26	17,65	19,97	21,91
	500	*19 3/4*	479	510	32,20	37,25	42,15	46,24	16,10	18,63	21,07	23,12
	525	*20 11/16*	504	535	33,88	39,20	44,35	48,65	16,94	19,60	22,17	24,33
	550	*21 5/8*	529	560	35,56	41,14	46,55	51,06	17,78	20,57	23,27	25,53
	575	*22 5/8*	554	585	37,24	43,08	48,75	53,48	18,62	21,54	24,37	26,74
	600	*23 5/8*	579	610	38,92	45,03	50,95	55,89	19,46	22,51	25,47	27,95
	650	*25 9/16*	619	660	41,61	48,14	54,47	59,75	20,80	24,07	27,23	29,88
	700	*27 1/2*	669	710	44,97	52,03	58,87	64,58	22,48	26,01	29,43	32,29
	750	*29 1/2*	719	760	48,33	55,92	63,26	69,41	24,16	27,96	31,63	34,70
	800	*31 1/2*	769	810	51,69	59,81	67,66	74,23	25,84	29,90	33,83	37,12
	850	*33 7/16*	819	860	55,05	63,69	72,06	79,06	27,52	31,85	36,03	39,53
	900	*35 1/2*	869	910	58,41	67,58	76,46	83,88	29,20	33,79	38,23	41,94
	950	*37 3/8*	919	960	61,77	71,47	80,86	88,71	30,88	35,74	40,43	44,36
	1000	*39 3/8*	969	1010	65,13	75,36	85,26	93,54	32,57	37,68	42,63	46,77

α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 26.

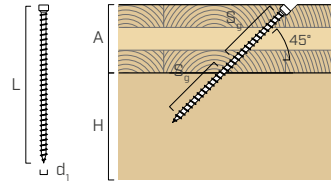
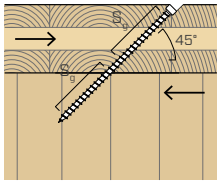
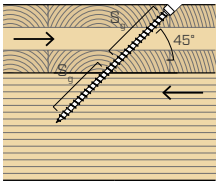
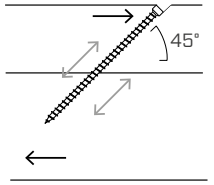
TENSION[1]

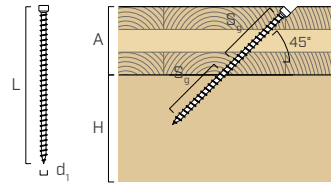
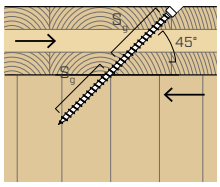
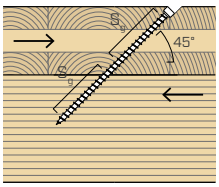
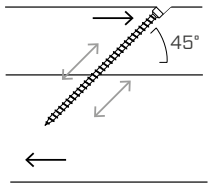
geometry					partial thread withdrawal								steel tension
					lateral α=90°				narrow α=0°				
													
					factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]				factored tension resistance T_{rs}
					G				G				
d_1	L		S_g	A_{min}	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
7 *0.28*	80	*3 1/8*	25	45	1,07	1,24	1,40	1,54	0,53	0,62	0,70	0,77	10,64
	100	*4*	35	55	1,50	1,73	1,96	2,15	0,75	0,87	0,98	1,07	
	120	*4 3/4*	45	65	1,92	2,23	2,52	2,76	0,96	1,11	1,26	1,38	
	140	*5 1/2*	55	75	2,35	2,72	3,08	3,38	1,18	1,36	1,54	1,69	
	160	*6 1/4*	65	85	2,78	3,22	3,64	3,99	1,39	1,61	1,82	2,00	
	180	*7 1/8*	75	95	3,21	3,71	4,20	4,61	1,60	1,86	2,10	2,30	
	200	*8*	85	105	3,64	4,21	4,76	5,22	1,82	2,10	2,38	2,61	
	220	*8 5/8*	95	115	4,06	4,70	5,32	5,83	2,03	2,35	2,66	2,92	
	240	*9 1/2*	105	125	4,49	5,20	5,88	6,45	2,25	2,60	2,94	3,22	
	260	*10 1/4*	115	135	4,92	5,69	6,44	7,06	2,46	2,85	3,22	3,53	
	280	*11*	125	145	5,35	6,19	7,00	7,68	2,67	3,09	3,50	3,84	
	300	*11 3/4*	135	155	5,77	6,68	7,56	8,29	2,89	3,34	3,78	4,14	
	320	*12 5/8*	145	165	6,20	7,18	8,12	8,90	3,10	3,59	4,06	4,45	
	340	*13 3/8*	155	175	6,63	7,67	8,68	9,52	3,31	3,84	4,34	4,76	
	360	*14 1/4*	165	185	7,06	8,17	9,24	10,13	3,53	4,08	4,62	5,07	
	380	*15*	175	195	7,48	8,66	9,80	10,75	3,74	4,33	4,90	5,37	
	400	*15 3/4*	185	205	7,91	9,16	10,36	11,36	3,96	4,58	5,18	5,68	
9 *0.36*	160	*6 1/4*	65	85	3,57	4,14	4,68	5,13	1,79	2,07	2,34	2,57	17,84
	180	*7 1/8*	75	95	4,12	4,77	5,40	5,92	2,06	2,39	2,70	2,96	
	200	*8*	85	105	4,67	5,41	6,12	6,71	2,34	2,70	3,06	3,36	
	220	*8 5/8*	95	115	5,22	6,04	6,84	7,50	2,61	3,02	3,42	3,75	
	240	*9 1/2*	105	125	5,77	6,68	7,56	8,29	2,89	3,34	3,78	4,15	
	260	*10 1/4*	115	135	6,32	7,32	8,28	9,08	3,16	3,66	4,14	4,54	
	280	*11*	125	145	6,87	7,95	9,00	9,87	3,44	3,98	4,50	4,94	
	300	*11 3/4*	135	155	7,42	8,59	9,71	10,66	3,71	4,30	4,86	5,33	
	320	*12 5/8*	145	165	7,97	9,23	10,43	11,45	3,99	4,61	5,22	5,72	
	340	*13 3/8*	155	175	8,52	9,86	11,15	12,24	4,26	4,93	5,58	6,12	
	360	*14 1/4*	165	185	9,07	10,50	11,87	13,03	4,54	5,25	5,94	6,51	
	380	*15*	175	195	9,62	11,14	12,59	13,82	4,81	5,57	6,30	6,91	
	400	*15 3/4*	185	205	10,17	11,77	13,31	14,61	5,09	5,89	6,66	7,30	
	440	*17 1/4*	205	225	11,27	13,04	14,75	16,19	5,64	6,52	7,38	8,09	
	480	*19*	225	245	12,37	14,32	16,19	17,77	6,19	7,16	8,10	8,88	
	520	*20 1/2*	245	265	13,47	15,59	17,63	19,35	6,74	7,79	8,82	9,67	
	560	*22*	265	285	14,57	16,86	19,07	20,92	7,29	8,43	9,53	10,46	
	600	*23 5/8*	285	305	15,67	18,13	20,51	22,50	7,84	9,07	10,25	11,25	

geometry					TENSION[1]								steel tension
					total thread withdrawal								
					lateral α=90°				narrow α=0°				
													
					factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]				factored tension resistance T_{rs}
					G				G				
d_1	L		S_g	A_{min}	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
	150	*6*	60	80	4,03	4,67	5,28	5,79	2,02	2,33	2,64	2,90	
	200	*8*	85	105	5,71	6,61	7,48	8,21	2,86	3,31	3,74	4,10	
	250	*10*	110	130	7,39	8,55	9,68	10,62	3,70	4,28	4,84	5,31	
	275	*10 7/8*	120	143	8,07	9,33	10,56	11,58	4,03	4,67	5,28	5,79	
	300	*11 3/4*	135	155	9,07	10,50	11,88	13,03	4,54	5,25	5,94	6,52	
	325	*12 3/4*	145	168	9,75	11,28	12,76	14,00	4,87	5,64	6,38	7,00	
	350	*13 3/4*	160	180	10,75	12,44	14,08	15,44	5,38	6,22	7,04	7,72	
	375	*14 3/4*	170	193	11,43	13,22	14,96	16,41	5,71	6,61	7,48	8,21	
	400	*15 3/4*	185	205	12,43	14,39	16,28	17,86	6,22	7,19	8,14	8,93	
	425	*16 3/4*	195	218	13,11	15,17	17,16	18,82	6,55	7,58	8,58	9,41	
	450	*17 3/4*	210	230	14,11	16,33	18,48	20,27	7,06	8,17	9,24	10,14	
	475	*18 11/16*	220	243	14,79	17,11	19,36	21,24	7,39	8,55	9,68	10,62	
11 *0.44*	500	*19 3/4*	235	255	15,80	18,28	20,68	22,68	7,90	9,14	10,34	11,34	23,17
	525	*20 11/16*	245	268	16,47	19,05	21,56	23,65	8,23	9,53	10,78	11,82	
	550	*21 5/8*	260	280	17,48	20,22	22,88	25,10	8,74	10,11	11,44	12,55	
	575	*22 5/8*	270	293	18,15	21,00	23,76	26,06	9,07	10,50	11,88	13,03	
	600	*23 5/8*	285	305	19,16	22,16	25,08	27,51	9,58	11,08	12,54	13,76	
	650	*25 9/16*	305	330	20,50	23,72	26,84	29,44	10,25	11,86	13,42	14,72	
	700	*27 1/2*	330	355	22,18	25,66	29,04	31,85	11,09	12,83	14,52	15,93	
	750	*29 1/2*	355	380	23,86	27,61	31,24	34,27	11,93	13,80	15,62	17,13	
	800	*31 1/2*	380	405	25,54	29,55	33,44	36,68	12,77	14,78	16,72	18,34	
	850	*33 7/16*	405	430	27,22	31,50	35,64	39,09	13,61	15,75	17,82	19,55	
	900	*35 1/2*	430	455	28,90	33,44	37,84	41,51	14,45	16,72	18,92	20,75	
	950	*37 3/8*	455	480	30,58	35,39	40,04	43,92	15,29	17,69	20,02	21,96	
	1000	*39 3/8*	480	505	32,26	37,33	42,24	46,33	16,13	18,66	21,12	23,17	

α = screw-to-grain angle

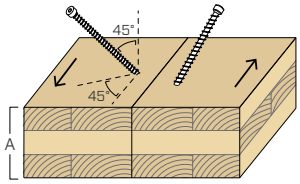
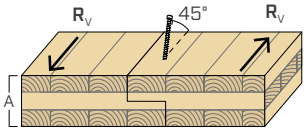
NOTES and GENERAL PRINCIPLES on page 26.

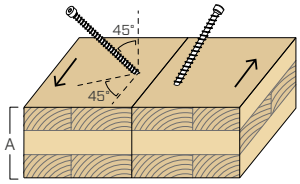
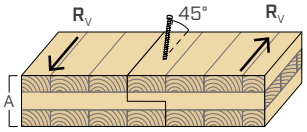
geometry					SLIDING[4]				steel tension
					CLT - CLT α=0°		CLT - timber α=45°		
									
					factored lateral resistance N_r[5]		factored lateral resistance N_r[5]		factored tension resistance T_{rs}
					G		G		
d_1	L		S_g	A	H_{min}	0.42	0.49	0.42	0.49	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]
7 *0.28*	80	*3 1/8*	25	35	50	0,44	0,49	0,87	0,99	7,52
	100	*4*	35	40	55	0,61	0,69	1,22	1,39	
	120	*4 3/4*	45	45	60	0,79	0,89	1,57	1,78	
	140	*5 1/2*	55	55	70	0,96	1,09	1,92	2,18	
	160	*6 1/4*	65	60	75	1,14	1,29	2,27	2,57	
	180	*7 1/8*	75	70	85	1,31	1,48	2,62	2,97	
	200	*8*	85	75	90	1,49	1,68	2,97	3,36	
	220	*8 5/8*	95	85	100	1,66	1,88	3,32	3,76	
	240	*9 1/2*	105	90	105	1,84	2,08	3,67	4,16	
	260	*10 1/4*	115	95	110	2,01	2,28	4,02	4,55	
	280	*11*	125	105	120	2,19	2,47	4,37	4,95	
	300	*11 3/4*	135	110	125	2,36	2,67	4,72	5,34	
	320	*12 5/8*	145	120	135	2,54	2,87	5,07	5,74	
	340	*13 3/8*	155	125	140	2,71	3,07	5,42	6,14	
	360	*14 1/4*	165	130	145	2,89	3,27	5,77	6,53	
	380	*15*	175	140	155	3,06	3,46	6,12	6,93	
	400	*15 3/4*	185	145	160	3,24	3,66	6,47	7,32	
9 *0.36*	160	*6 1/4*	65	60	75	1,46	1,65	2,92	3,31	12,61
	180	*7 1/8*	75	70	85	1,69	1,91	3,37	3,82	
	200	*8*	85	75	90	1,91	2,16	3,82	4,33	
	220	*8 5/8*	95	85	100	2,14	2,42	4,27	4,83	
	240	*9 1/2*	105	90	105	2,36	2,67	4,72	5,34	
	260	*10 1/4*	115	95	110	2,59	2,93	5,17	5,85	
	280	*11*	125	105	120	2,81	3,18	5,62	6,36	
	300	*11 3/4*	135	110	125	3,04	3,43	6,07	6,87	
	320	*12 5/8*	145	120	135	3,26	3,69	6,52	7,38	
	340	*13 3/8*	155	125	140	3,49	3,94	6,97	7,89	
	360	*14 1/4*	165	130	145	3,71	4,20	7,42	8,40	
	380	*15*	175	140	155	3,94	4,45	7,87	8,90	
	400	*15 3/4*	185	145	160	4,16	4,71	8,32	9,41	
	440	*17 1/4*	205	160	175	4,61	5,22	9,22	10,43	
	480	*19*	225	175	190	5,06	5,72	10,12	11,45	
	520	*20 1/2*	245	190	205	5,51	6,23	11,02	12,47	
	560	*22*	265	205	220	5,96	6,74	11,92	13,48	
	600	*23 5/8*	285	215	230	6,41	7,25	12,82	14,50	

geometry					SLIDING[4]				steel tension
					CLT - CLT α=0°		CLT - timber α=45°		
									
					factored lateral resistance N_r[5]		factored lateral resistance N_r[5]		factored tension resistance T_{rs}
					G		G		
d_1	L		S_g	A	H_{min}	0.42	0.49	0.42	0.49	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]
11 *0.44*	150	*6*	60	60	75	1,65	1,87	3,30	3,73	16,38
	200	*8*	85	75	90	2,34	2,64	4,67	5,29	
	250	*10*	110	95	110	3,02	3,42	6,05	6,84	
	275	*10 7/8*	120	100	115	3,30	3,73	6,60	7,47	
	300	*11 3/4*	135	110	125	3,71	4,20	7,42	8,40	
	325	*12 3/4*	145	120	135	3,99	4,51	7,97	9,02	
	350	*13 3/4*	160	130	145	4,40	4,98	8,80	9,95	
	375	*14 3/4*	170	135	150	4,67	5,29	9,35	10,58	
	400	*15 3/4*	185	145	160	5,09	5,76	10,17	11,51	
	425	*16 3/4*	195	155	170	5,36	6,07	10,72	12,13	
	450	*17 3/4*	210	165	180	5,77	6,53	11,55	13,07	
	475	*18 11/16*	220	170	185	6,05	6,84	12,10	13,69	
	500	*19 3/4*	235	180	195	6,46	7,31	12,92	14,62	
	525	*20 11/16*	245	190	205	6,74	7,62	13,47	15,24	
	550	*21 5/8*	260	200	215	7,15	8,09	14,30	16,18	
	575	*22 5/8*	270	205	220	7,42	8,40	14,85	16,80	
	600	*23 5/8*	285	215	230	7,84	8,87	15,67	17,73	
	650	*25 9/16*	305	240	255	8,39	9,49	16,77	18,98	
	700	*27 1/2*	330	255	270	9,07	10,27	18,15	20,53	
	750	*29 1/2*	355	275	290	9,76	11,04	19,52	22,09	
	800	*31 1/2*	380	290	305	10,45	11,82	20,90	23,64	
	850	*33 7/16*	405	310	325	11,14	12,60	22,27	25,20	
	900	*35 1/2*	430	325	340	11,82	13,38	23,65	26,75	
	950	*37 3/8*	455	345	360	12,51	14,15	25,02	28,31	
	1000	*39 3/8*	480	360	375	13,20	14,93	26,40	29,86	

α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 26.

geometry					SLIDING[4]				
					butt joint (double inclination at 45° + 45°)[10]			half-lap joint α=45°	
									
					factored lateral resistance N_r[5]		factored tension resistance T_{rs}	factored lateral resistance N_r[5]	factored tension resistance T_{rs}
					G			G	
d_1	L		S_g	A	0.42	0.49		0.42	0.49	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
	80	*3 1/8*	25	65	0,77	0,87		0,95	1,08	
	100	*4*	35	80	1,07	1,21		1,34	1,51	
	120	*4 3/4*	45	95	1,38	1,56		1,72	1,94	
	140	*5 1/2*	55	110	1,69	1,91		2,10	2,38	
	160	*6 1/4*	65	125	1,99	2,25		2,48	2,81	
	180	*7 1/8*	75	135	2,30	2,60		2,86	3,24	
	200	*8*	85	150	2,60	2,95		3,24	3,67	
	220	*8 5/8*	95	165	2,91	3,29		3,63	4,10	
7 *0.28*	240	*9 1/2*	105	180	3,22	3,64	5,32	4,01	4,53	7,52
	260	*10 1/4*	115	195	3,52	3,99		4,39	4,97	
	280	*11*	125	210	3,83	4,33		4,77	5,40	
	300	*11 3/4*	135	220	4,14	4,68		5,15	5,83	
	320	*12 5/8*	145	235	4,44	5,03		5,54	6,26	
	340	*13 3/8*	155	250	4,75	5,37		5,92	6,69	
	360	*14 1/4*	165	265	5,06	5,72		6,30	7,13	
	380	*15*	175	280	5,36	6,07		6,68	7,56	
	400	*15 3/4*	185	295	5,67	6,41		7,06	7,99	
	160	*6 1/4*	65	125	2,56	2,90		3,19	3,61	
	180	*7 1/8*	75	135	2,95	3,34		3,68	4,16	
	200	*8*	85	150	3,35	3,79		4,17	4,72	
	220	*8 5/8*	95	165	3,74	4,23		4,66	5,27	
	240	*9 1/2*	105	180	4,14	4,68		5,15	5,83	
	260	*10 1/4*	115	195	4,53	5,12		5,64	6,38	
	280	*11*	125	210	4,92	5,57		6,14	6,94	
	300	*11 3/4*	135	220	5,32	6,01		6,63	7,49	
9 *0.36*	320	*12 5/8*	145	235	5,71	6,46	8,92	7,12	8,05	12,61
	340	*13 3/8*	155	250	6,11	6,90		7,61	8,60	
	360	*14 1/4*	165	265	6,50	7,35		8,10	9,16	
	380	*15*	175	280	6,89	7,80		8,59	9,71	
	400	*15 3/4*	185	295	7,29	8,24		9,08	10,27	
	440	*17 1/4*	205	320	8,07	9,13		10,06	11,38	
	480	*19*	225	350	8,86	10,02		11,04	12,49	
	520	*20 1/2*	245	380	9,65	10,91		12,03	13,60	
	560	*22*	265	405	10,44	11,80		13,01	14,71	
	600	*23 5/8*	285	435	11,23	12,70		13,99	15,82	

geometry					SLIDING[4]				
					butt joint (double inclination at 45° + 45°)[10]			half-lap joint α=45°	
									
					factored lateral resistance N_r[5]		factored tension resistance T_{rs}	factored lateral resistance N_r[5]	factored tension resistance T_{rs}
					G			G	
d_1	L		S_g	A	0.42	0.49		0.42	0.49	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
	150	*6*	60	115	2,89	3,27		3,60	4,07	
	200	*8*	85	150	4,09	4,63		5,10	5,77	
	250	*10*	110	185	5,30	5,99		6,60	7,47	
	275	*10 7/8*	120	205	5,78	6,54		7,20	8,14	
	300	*11 3/4*	135	220	6,50	7,35		8,10	9,16	
	325	*12 3/4*	145	240	6,98	7,90		8,70	9,84	
	350	*13 3/4*	160	255	7,70	8,72		9,60	10,86	
	375	*14 3/4*	170	275	8,18	9,26		10,20	11,54	
	400	*15 3/4*	185	295	8,91	10,08		11,10	12,56	
	425	*16 3/4*	195	310	9,39	10,62		11,70	13,24	
	450	*17 3/4*	210	330	10,11	11,44		12,60	14,25	
	475	*18 11/16*	220	345	10,59	11,98		13,20	14,93	
11 *0.44*	500	*19 3/4*	235	365	11,31	12,80	11,59	14,10	15,95	16,38
	525	*20 11/16*	245	380	11,80	13,35		14,70	16,63	
	550	*21 5/8*	260	400	12,52	14,16		15,60	17,65	
	575	*22 5/8*	270	415	13,00	14,71		16,20	18,33	
	600	*23 5/8*	285	435	13,72	15,52		17,10	19,34	
	650	*25 9/16*	305	470	14,68	16,61		18,30	20,70	
	700	*27 1/2*	330	505	15,89	17,98		19,80	22,40	
	750	*29 1/2*	355	540	17,09	19,34		21,30	24,10	
	800	*31 1/2*	380	575	18,29	20,70		22,80	25,79	
	850	*33 7/16*	405	610	19,50	22,06		24,30	27,49	
	900	*35 1/2*	430	645	20,70	23,42		25,80	29,19	
	950	*37 3/8*	455	680	21,91	24,78		27,30	30,88	
	1000	*39 3/8*	480	715	23,11	26,15		28,80	32,58	

α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 26.

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 factored thread withdrawal resistance were evaluated considering a penetration length of $S_{g,tot}$ or S_g, as shown in the table. For intermediate values of S_g it is possible to linearly interpolate
- 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.
- VGZ 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

(1) 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_α, 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}) and the steel strength (T_{rs}). Similarly, the factored compression resistance of the connector (P_{rc}) is determined as the lower value between the withdrawal resistance (P_{rw}) and the buckling capacity (P_{rb}).

(2) 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.

(3) VGZ 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.

(4) For fully threaded screws, head pull-through does not govern the connection capacity, instead, thread withdrawal governs. The governing axial resistance is taken as the minimum of the screw's shear, thread withdrawal, and tensile resistances. In this case, the tensile resistance is always lower than the shear resistance, so the governing value is the minimum between thread withdrawal and tensile resistance.

(5) The 45° inclined screw is intended to work in withdrawal and the resulting resistance of the connection is given by the projection of the withdrawal resistance (along screw axis) onto the shear plane.

(6) 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.

(7) The fixable thickness (A) is considered as half the length of the screw (L/2).

(8) The number of cross pairs, n_F, has been taken as 2.0 and 3.0 for configurations with two and three screw pairs, respectively, in accordance with CSA O86:24. However, when evaluating the effective number of screws in axially stressed connector pairs, Rothoblaas recommends using reduced values of 1.9 and 2.7 for two and three pairs, respectively. This recommendation accounts for the fact that the load-bearing capacity of a multi-screw connection—with screws of the same size and type—may be lower than the sum of the individual screw capacities, due to group effects and non-uniform load distribution within the connection. Discretion and engineering judgment must be exercised.

(9) The factored shear resistance, R_v, of crossed screws is determined by taking the minimum of $2.P_{rt}.\cos(\beta)$, $2.P_{rc}.\cos(\beta)$, and $V_{rs}/\sin(\beta)$, where P_{rt} represents the factored axial resistance of screws loaded in tension, P_{rc} represents the factored axial resistance of screws loaded in compression, and V_{rs} represents the factored shear resistance of screws. This approach accounts for the directional component of the axial forces relative to the shear plane and ensures a conservative estimate by considering the governing case among all conditions.

(10) The sliding strengths of the connectors inserted with double inclination (45°-45°) were evaluated considering an α angle of 60° between the grain and the connector; in fact, the geometry of the joint requires that the connectors have to be inserted at an angle of 45° with respect to the face of the CLT panel and at an angle of 45° with respect to the shear plane between the two panels. The use of the JIG VGZ 45 template is recommended for professional installation of the connectors in this application.

INSTALLATION SUGGESTIONS

TIMBER-TO-TIMBER JOINT WITH CROSSED CONNECTORS

TIGHTENING THE JOINT

For correct installation of the joint, we recommend tightening the elements before inserting the connectors.

Insert a partially threaded screw (e.g. HBS680) to bring the elements closer together.

The HBS screw eliminated the initial gap between the elements.
After positioning the VGZ connectors, it can be removed.

INSERTION OF CONNECTORS

To ensure the correct positioning and inclination of the VGZ screws, we recommend using the JIGVGZ45 template.

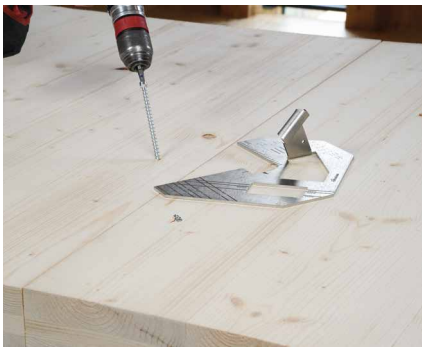
After tightening about one third of the screw, remove the JIGVGZ45 template and continue with the installation.

Repeat the procedure to install the inserted screw from the main beam to the secondary beam.

JOINT BETWEEN CLT PANELS WITH CONNECTORS INCLINED IN BOTH DIRECTIONS (45°-45°)

To ensure the correct positioning and inclination of the VGZ screws, we recommend using the JIGVGZ45 template positioned at 45° to the panel head.

After tightening about one third of the screw, remove the JIGVGZ45 template and continue with the installation.



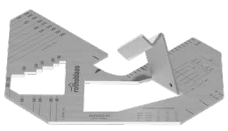
Repeat the procedure to install the screw in the adjoining panel and continue this alternating sequence according to the distances provided in the design.

RELATED PRODUCTS

HBS

CATCH

BIT



JIG VGZ 45°