HBS

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

COUNTERSUNK SCREW

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.

FAST

With the 3 THORNS tip, screw grip becomes more reliable and faster, while maintaining the usual mechanical performance. More speed, less effort.

JOINTS WITH SOUNDPROOFING PROFILES

The screw has been tested and characterised in applications with sound-proofing layers (XYLOFON) interposed on the shear plane. The impact of acoustic profiles on the mechanical performance of the HBS screw. For more information see the "TIMBER SCREWS AND DECK FASTENING" catalogue at www.rothoblaas.com.

NEW-GENERATION WOODS

Tested and certified for use on a wide variety of engineered timbers such as CLT, and Glulam. Structural connector approved according to ICC ELC-4645 listing report in Canada. Extremely versatile, the HBS screw guarantees the use of new-generation woods for the creation of in-creasingly innovative and sustainable structures.

BIT INCLUDED

DIAMETER [mm]	3 — 3,5 — 12 — 12
LENGTH [mm]	12 — 30 — 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
- fibreboard, MDF, HDF and LDF
- plated and melamine faced 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.

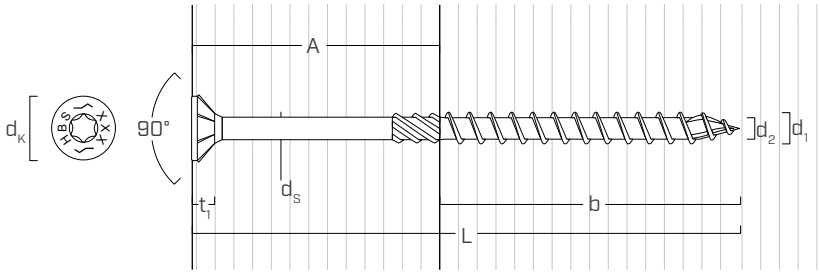
CLT, LVL AND HARDWOOD

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

Wall insulation boards fastening with THERMOWASHER and HBS 8 mm diameter.

Fastening CLT walls with 6 mm diameter HBS screws.

GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

Nominal diameter	**d_1**	**[mm]**	**3,5**	**4**	**4,5**	**5**	**6**	**8**	**10**	**12**
Head diameter	d_K	[mm]	7,00	8,00	9,00	10,00	12,00	14,50	18,25	20,75
Root diameter	d_2	[mm]	2,25	2,55	2,80	3,40	3,95	5,40	6,40	6,80
Shank diameter	d_S	[mm]	2,45	2,75	3,15	3,65	4,30	5,80	7,00	8,00
Head thickness	t_1	[mm]	2,20	2,80	2,80	3,10	4,50	4,50	5,80	7,20
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	2,0	2,5	2,5	3,0	4,0	5,0	6,0	7,0
Pre-drilling hole diameter(2)	$d_{V,H}$	[mm]	-	-	-	3,5	4,0	6,0	7,0	8,0

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

MECHANICAL PROPERTIES

Nominal diameter	**d_1**	**[mm]**		**3,5**	**4**	**4,5**	**5**	**6**	**8**	**10**	**12**
Factored tensile strength	Φf_u	[kN]		2,36	3,11	3,91	4,97	8,56	14,7	19,51	22,11
Bending yield strength	F_{yb}	[MPa]		1537	1482	1515	1315	1188	1047	1080	1114
Factored shear strength of the screw	Φv_s	[kN]		1,53	1,96	2,36	3,49	4,71	8,79	12,35	13,95
Specified withdrawal resistance per millimeter of threaded shank (tip included)	Y_w	[N/mm]	G=0.35	36,60	41,83	47,06	52,29	52,38	69,83	87,29	104,75
			G=0.42	42,35	48,40	54,45	60,50	60,60	80,80	101,00	121,20
			G=0.49	47,91	54,75	61,60	68,44	68,55	91,40	114,26	137,11
			G=0.55	52,55	60,05	67,56	75,07	75,19	100,25	125,32	150,38
Specified head pull-through resistance per screw	F_{pt}	[kN]	G=0.35	0,35	0,44	0,55	0,66	0,92	1,28	1,88	2,31
			G=0.42	0,42	0,53	0,66	0,80	1,10	1,53	2,25	2,77
			G=0.49	0,48	0,62	0,77	0,93	1,29	1,79	2,63	3,23
			G=0.55	0,54	0,70	0,86	1,04	1,45	2,01	2,95	3,63

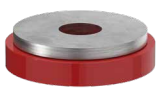
CODES AND DIMENSIONS

d_1 [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
3,5 TX 15	HBS3540	40	18	22	500
	HBS3545	45	24	21	400
	HBS3550	50	24	26	400
4 TX 20	HBS430	30	18	12	500
	HBS435	35	18	17	500
	HBS440	40	24	16	500
	HBS445	45	30	15	400
	HBS450	50	30	20	400
	HBS460	60	35	25	200
	HBS470	70	40	30	200
	HBS480	80	40	40	200
4,5 TX 20	HBS4540	40	24	16	400
	HBS4545	45	30	15	400
	HBS4550	50	30	20	200
	HBS4560	60	35	25	200
	HBS4570	70	40	30	200
	HBS4580	80	40	40	200
5 TX 25	HBS540	40	24	16	200
	HBS545	45	24	21	200
	HBS550	50	24	26	200
	HBS560	60	30	30	200
	HBS570	70	35	35	100
	HBS580	80	40	40	100
	HBS590	90	45	45	100
	HBS5100	100	50	50	100
	HBS5120	120	60	60	100
6 TX 30	HBS640	40	35	8	100
	HBS650	50	35	15	100
	HBS660	60	30	30	100
	HBS670	70	40	30	100
	HBS680	80	40	40	100
	HBS690	90	50	40	100
	HBS6100	100	50	50	100
	HBS6110	110	60	50	100
	HBS6120	120	60	60	100
	HBS6130	130	60	70	100
	HBS6140	140	75	65	100
	HBS6150	150	75	75	100
	HBS6160	160	75	85	100
	HBS6180	180	75	105	100
	HBS6200	200	75	125	100
	HBS6220	220	75	145	100
	HBS6240	240	75	165	100
	HBS6260	260	75	185	100
	HBS6280	280	75	205	100
	HBS6300	300	75	225	100
	HBS6320	320	75	245	100
	HBS6340	340	75	265	100
	HBS6360	360	75	285	100
	HBS6380	380	75	305	100
	HBS6400	400	75	325	100

d_1 [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
8 TX 40	HBS880	80	52	28	100
	HBS8100	100	52	48	100
	HBS8120	120	60	60	100
	HBS8140	140	60	80	100
	HBS8160	160	80	80	100
	HBS8180	180	80	100	100
	HBS8200	200	80	120	100
	HBS8220	220	80	140	100
	HBS8240	240	80	160	100
	HBS8260	260	80	180	100
	HBS8280	280	80	200	100
	HBS8300	300	100	200	100
	HBS8320	320	100	220	100
	HBS8340	340	100	240	100
	HBS8360	360	100	260	100
	HBS8380	380	100	280	100
	HBS8400	400	100	300	100
	HBS8440	440	100	340	100
	HBS8480	480	100	380	100
	HBS8520	520	100	420	100
	HBS8560	560	100	460	100
	HBS8580	580	100	480	100
	HBS8600	600	100	500	100
10 TX 40	HBS1080	80	52	28	50
	HBS10100	100	52	48	50
	HBS10120	120	60	60	50
	HBS10140	140	60	80	50
	HBS10160	160	80	80	50
	HBS10180	180	80	100	50
	HBS10200	200	80	120	50
	HBS10220	220	80	140	50
	HBS10240	240	80	160	50
	HBS10260	260	80	180	50
	HBS10280	280	80	200	50
	HBS10300	300	100	200	50
	HBS10320	320	100	220	50
	HBS10340	340	100	240	50
	HBS10360	360	100	260	50
	HBS10380	380	100	280	50
	HBS10400	400	100	300	50
	HBS10440	440	100	340	50
	HBS10480	480	100	380	50
	HBS10520	520	100	420	50
	HBS10560	560	100	460	50
	HBS10600	600	100	500	50
12 TX 50	HBS12120	120	80	40	25
	HBS12160	160	80	80	25
	HBS12200	200	80	120	25
	HBS12240	240	80	160	25
	HBS12280	280	80	200	25
	HBS12320	320	120	200	25
	HBS12360	360	120	240	25
	HBS12400	400	120	280	25
	HBS12440	440	120	320	25
	HBS12480	480	120	360	25
	HBS12520	520	120	400	25
	HBS12560	560	120	440	25
	HBS12600	600	120	480	25
	HBS12700	700	120	580	25
	HBS12800	800	120	680	25
	HBS12900	900	120	780	25
	HBS121000	1000	120	880	25

RELATED PRODUCTS

HUS

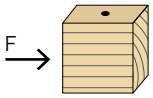


XYLOFON WASHER

THERMOWASHER

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

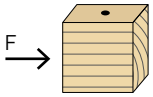
screws inserted **WITHOUT pre-drilled hole** — **G ≤ 0.44**



d_1		3,5 [mm]	*0.14 [in]*	4 [mm]	*0.16 [in]*	4,5 [mm]	*0.18 [in]*	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·d‡**	42	*1 5/8*	48	*1 7/8*	54	*2 1/8*	60	*2 3/8*	72	*2 13/16*	96	*3 3/4*	120	*4 3/4*	144	*5 11/16*
S_Q	**5·d**	18	*11/16*	20	*13/16*	23	*7/8*	25	*1*	30	*1 3/16*	40	*1 9/16*	50	*1 15/16*	60	*2 3/8*
a_L	**15·d‡**	53	*2 1/16*	60	*2 3/8*	68	*2 11/16*	75	*2 15/16*	90	*3 1/2*	120	*4 3/4*	150	*6*	180	*7 1/8*
a	**10·d‡**	35	*1 3/8*	40	*1 9/16*	45	*1 3/4*	50	*1 15/16*	60	*2 3/8*	80	*3 1/8*	100	*4*	120	*4 3/4*
e_Q	**10·d**	35	*1 3/8*	40	*1 9/16*	45	*1 3/4*	50	*1 15/16*	60	*2 3/8*	80	*3 1/8*	100	*4*	120	*4 3/4*
e_P	**5·d**	18	*11/16*	20	*13/16*	23	*7/8*	25	*1*	30	*1 3/16*	40	*1 9/16*	50	*1 15/16*	60	*2 3/8*

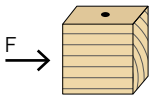
‡ For Western Red Cedar, this minimum spacing shall be increased by 50%.

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



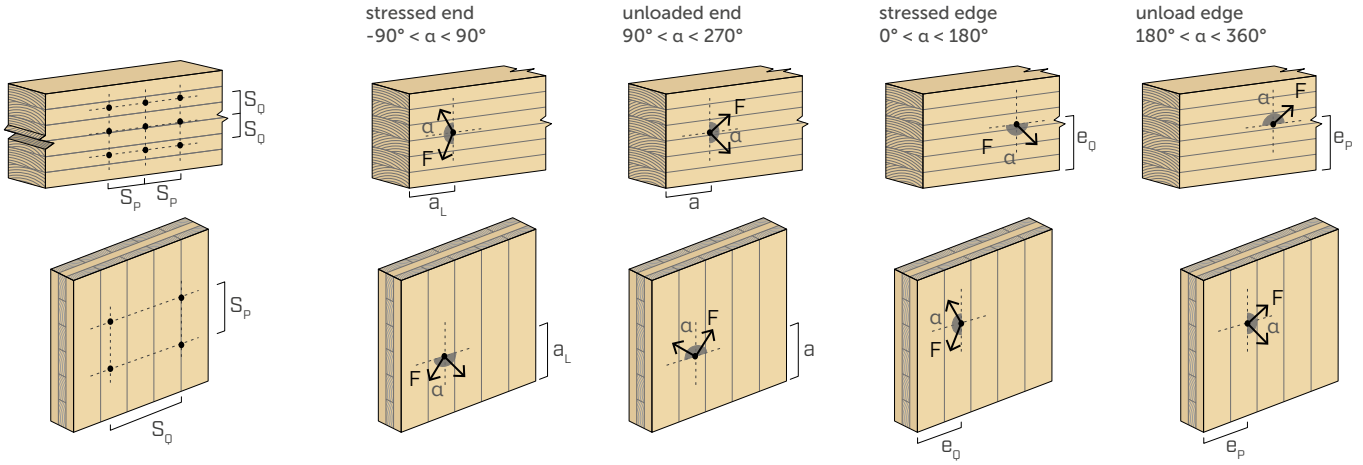
d_1		3,5 [mm]	*0.14 [in]*	4 [mm]	*0.16 [in]*	4,5 [mm]	*0.18 [in]*	5 [mm]	*0.20 [in]*	6 [mm]	*0.24 [in]*	8 [mm]	*0.32 [in]*	10 [mm]	*0.40 [in]*	12 [mm]	*0.48 [in]*
S_P	**18·d**	63	*2 1/2*	72	*2 13/16*	81	*3 3/16*	90	*3 1/2*	108	*4 1/4*	144	*5 11/16*	180	*7 1/8*	216	*8 1/2*
S_Q	**7·d**	25	*15/16*	28	*1 1/8*	32	*1 1/4*	35	*1 3/8*	42	*1 5/8*	56	*2 3/16*	70	*2 3/4*	84	*3 5/16*
a_L	**22·d**	77	*3 1/16*	88	*3 7/16*	99	*3 7/8*	110	*4 3/8*	132	*5 3/16*	176	*6 15/16*	220	*8 5/8*	264	*10 3/8*
a	**15·d**	53	*2 1/16*	60	*2 3/8*	68	*2 11/16*	75	*2 15/16*	90	*3 1/2*	120	*4 3/4*	150	*6*	180	*7 1/8*
e_Q	**12·d**	42	*1 5/8*	48	*1 7/8*	54	*2 1/8*	60	*2 3/8*	72	*2 13/16*	96	*3 3/4*	120	*4 3/4*	*144*	*5 11/16*
e_P	**7·d**	25	*15/16*	28	*1 1/8*	32	*1 1/4*	35	*1 3/8*	42	*1 5/8*	56	*2 3/16*	70	*2 3/4*	84	*3 5/16*

screws inserted **WITH pre-drilled hole**



d_1		3,5 [mm]	*0.14 [in]*	4 [mm]	*0.16 [in]*	4,5 [mm]	*0.18 [in]*	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·d†**	18	*11/16*	20	*13/16*	23	*7/8*	25	*1*	30	*1 3/16*	40	*1 9/16*	50	*1 15/16*	60	*2 3/8*
S_Q	**4·d**	14	*9/16*	16	*5/8*	18	*11/16*	20	*13/16*	24	*15/16*	32	*1 1/4*	40	*1 9/16*	48	*1 7/8*
a_L	**12·d†**	42	*1 5/8*	48	*1 7/8*	54	*2 1/8*	60	*2 3/8*	72	*2 13/16*	96	*3 3/4*	120	*4 3/4*	144	*5 11/16*
a	**7·d†**	25	*15/16*	28	*1 1/8*	32	*1 1/4*	35	*1 3/8*	42	*1 5/8*	56	*2 3/16*	70	*2 3/4*	84	*3 5/16*
e_Q	**7·d**	25	*15/16*	28	*1 1/8*	32	*1 1/4*	35	*1 3/8*	42	*1 5/8*	56	*2 3/16*	70	*2 3/4*	84	*3 5/16*
e_P	**3·d**	11	*7/16*	12	*1/2*	14	*9/16*	15	*9/16*	18	*11/16*	24	*15/16*	30	*1 3/16*	36	*1 7/16*

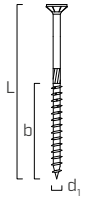
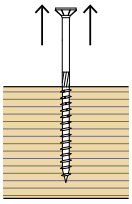
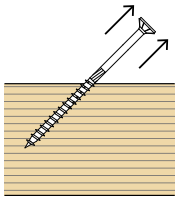
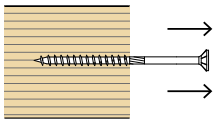
† For Douglas Fir–Larch and Western Red Cedar, this minimum spacing shall be increased by 50%.
d = d_1 = nominal diameter of the screw
α = load-to-grain angle



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.

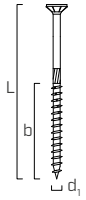
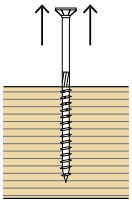
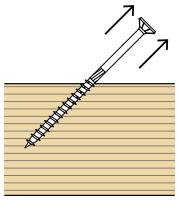
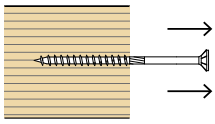
TENSION[1]

geometry				thread withdrawal α = 90°				thread withdrawal α = 45°				thread withdrawal end grain α = 0°				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				
				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]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
3.5 *0.14*	40	*1 9/16*	18	0,37	0,43	0,49	0,53	0,34	0,39	0,44	0,48	0,19	0,21	0,24	0,27	2,36
	45	*1 3/4*	24	0,53	0,61	0,69	0,75	0,48	0,55	0,63	0,69	0,26	0,30	0,34	0,38	
	50	*1 15/16*	24	0,53	0,61	0,69	0,75	0,48	0,55	0,63	0,69	0,26	0,30	0,34	0,38	
4 *0.16*	30	*1 3/16*	18	0,41	0,47	0,54	0,59	0,37	0,43	0,49	0,53	0,20	0,24	0,27	0,29	3,11
	35	*1 3/8*	18	0,41	0,47	0,54	0,59	0,37	0,43	0,49	0,53	0,20	0,24	0,27	0,29	
	40	*1 9/16*	24	0,59	0,68	0,77	0,84	0,53	0,62	0,70	0,76	0,29	0,34	0,38	0,42	
	45	*1 3/4*	30	0,76	0,88	1,00	1,09	0,69	0,80	0,91	0,99	0,38	0,44	0,50	0,55	
	50	*1 15/16*	30	0,76	0,88	1,00	1,09	0,69	0,80	0,91	0,99	0,38	0,44	0,50	0,55	
	60	*2 3/8*	35	0,91	1,05	1,19	1,30	0,83	0,95	1,08	1,18	0,45	0,53	0,59	0,65	
	70	*2 3/4*	40	1,05	1,22	1,38	1,51	0,96	1,11	1,25	1,38	0,53	0,61	0,69	0,76	
	80	*3 1/8*	40	1,05	1,22	1,38	1,51	0,96	1,11	1,25	1,38	0,53	0,61	0,69	0,76	
4.5 *0.18*	40	*1 9/16*	24	0,64	0,74	0,84	0,92	0,58	0,68	0,76	0,84	0,32	0,37	0,42	0,46	3,91
	45	*1 3/4*	30	0,84	0,97	1,10	1,21	0,76	0,88	1,00	1,10	0,42	0,49	0,55	0,60	
	50	*1 15/16*	30	0,84	0,97	1,10	1,21	0,76	0,88	1,00	1,10	0,42	0,49	0,55	0,60	
	60	*2 3/8*	35	1,00	1,16	1,32	1,44	0,91	1,06	1,20	1,31	0,50	0,58	0,66	0,72	
	70	*2 3/4*	40	1,17	1,35	1,53	1,68	1,06	1,23	1,39	1,53	0,58	0,68	0,77	0,84	
	80	*3 1/8*	40	1,17	1,35	1,53	1,68	1,06	1,23	1,39	1,53	0,58	0,68	0,77	0,84	
5 *0.20*	40	*1 9/16*	24	0,70	0,80	0,91	1,00	0,63	0,73	0,83	0,91	0,35	0,40	0,46	0,50	4,97
	45	*1 3/4*	24	0,70	0,80	0,91	1,00	0,63	0,73	0,83	0,91	0,35	0,40	0,46	0,50	
	50	*1 15/16*	24	0,70	0,80	0,91	1,00	0,63	0,73	0,83	0,91	0,35	0,40	0,46	0,50	
	60	*2 3/8*	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	
	70	*2 3/4*	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	
	80	*3 1/8*	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	
	90	*3 1/2*	45	1,46	1,69	1,92	2,10	1,33	1,54	1,74	1,91	0,73	0,85	0,96	1,05	
	100	*4*	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	
	120	*4 3/4*	60	2,01	2,33	2,63	2,89	1,83	2,12	2,40	2,63	1,01	1,16	1,32	1,45	

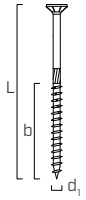
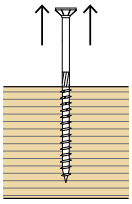
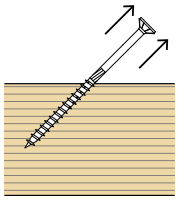
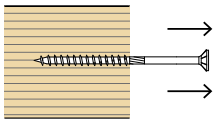
α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 19.

TENSION[1]

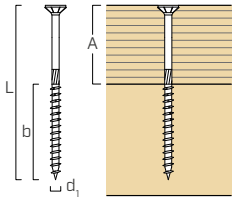
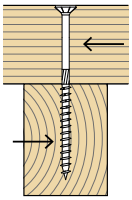
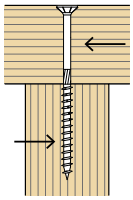
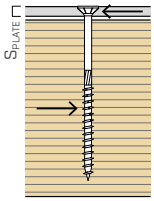
geometry			thread withdrawal α = 90°				thread withdrawal α = 45°				thread withdrawal end grain α = 0°				steel tension
															
			factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}				factored withdrawal resistance P_{rw}[2][3]				factored tension resistance T_{rs}
			G				G				G				
d_1	L		b	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]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
6 *0.24*	40	*1 9/16*	35	1,06	1,23	1,39	1,53	0,97	1,12	1,27	1,39	0,53	0,62	0,70	0,76	8,56
	50	*1 15/16*	35	1,06	1,23	1,39	1,53	0,97	1,12	1,27	1,39	0,53	0,62	0,70	0,76	
	60	*2 3/8*	30	0,88	1,02	1,15	1,26	0,80	0,93	1,05	1,15	0,44	0,51	0,58	0,63	
	70	*2 3/4*	40	1,25	1,44	1,63	1,79	1,13	1,31	1,48	1,63	0,62	0,72	0,82	0,89	
	80	*3 1/8*	40	1,25	1,44	1,63	1,79	1,13	1,31	1,48	1,63	0,62	0,72	0,82	0,89	
	90	*3 1/2*	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	
	100	*4*	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	
	110	*4 3/8*	60	1,98	2,29	2,59	2,84	1,80	2,08	2,36	2,58	0,99	1,15	1,30	1,42	
	120	*4 3/4*	60	1,98	2,29	2,59	2,84	1,80	2,08	2,36	2,58	0,99	1,15	1,30	1,42	
	130	*5 1/8*	60	1,98	2,29	2,59	2,84	1,80	2,08	2,36	2,58	0,99	1,15	1,30	1,42	
	140	*5 1/2*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	150	*6*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	160	*6 1/4*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	180	*7 1/8*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	200	*8*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	220	*8 5/8*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	240	*9 1/2*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	260	*10 1/4*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	280	*11*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	300	*11 3/4*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	320	*12 5/8*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	340	*13 3/8*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	360	*14 1/4*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	380	*15*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
	400	*15 3/4*	75	2,53	2,93	3,31	3,63	2,30	2,66	3,01	3,30	1,26	1,46	1,66	1,82	
8 *0.32*	80	*3 1/8*	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	14,7
	100	*4*	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	
	120	*4 3/4*	60	2,54	2,94	3,33	3,65	2,31	2,67	3,02	3,32	1,27	1,47	1,66	1,83	
	140	*5 1/2*	60	2,54	2,94	3,33	3,65	2,31	2,67	3,02	3,32	1,27	1,47	1,66	1,83	
	160	*6 1/4*	80	3,52	4,07	4,61	5,06	3,20	3,70	4,19	4,60	1,76	2,04	2,30	2,53	
	180	*7 1/8*	80	3,52	4,07	4,61	5,06	3,20	3,70	4,19	4,60	1,76	2,04	2,30	2,53	
	200	*8*	80	3,52	4,07	4,61	5,06	3,20	3,70	4,19	4,60	1,76	2,04	2,30	2,53	
	220	*8 5/8*	80	3,52	4,07	4,61	5,06	3,20	3,70	4,19	4,60	1,76	2,04	2,30	2,53	
	240	*9 1/2*	80	3,52	4,07	4,61	5,06	3,20	3,70	4,19	4,60	1,76	2,04	2,30	2,53	
	260	*10 1/4*	80	3,52	4,07	4,61	5,06	3,20	3,70	4,19	4,60	1,76	2,04	2,30	2,53	
	280	*11*	80	3,52	4,07	4,61	5,06	3,20	3,70	4,19	4,60	1,76	2,04	2,30	2,53	
	300	*11 3/4*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	320	*12 5/8*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	340	*13 3/8*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	360	*14 1/4*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	380	*15*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	400	*15 3/4*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	440	*17 1/4*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	480	*19*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	520	*20 1/2*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	560	*22*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	580	*22 13/16*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	
	600	*23 5/8*	100	4,50	5,20	5,89	6,46	4,09	4,73	5,35	5,87	2,25	2,60	2,94	3,23	

TENSION[1]

geometry			thread withdrawal α = 90°				thread withdrawal α = 45°				end grain α = 0°				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 0.35	G 0.42	G 0.49	G 0.55	G 0.35	G 0.42	G 0.49	G 0.55	G 0.35	G 0.42	G 0.49	G 0.55	
[mm] *[in]*	[mm]	*[in]*	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
10 *0.40*	80	*3 1/8*	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	19,51
	100	*4*	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	
	120	*4 3/4*	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	
	140	*5 1/2*	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	
	160	*6 1/4*	80	4,28	4,95	5,60	6,14	3,89	4,50	5,09	5,58	2,14	2,47	2,80	3,07	
	180	*7 1/8*	80	4,28	4,95	5,60	6,14	3,89	4,50	5,09	5,58	2,14	2,47	2,80	3,07	
	200	*8*	80	4,28	4,95	5,60	6,14	3,89	4,50	5,09	5,58	2,14	2,47	2,80	3,07	
	220	*8 5/8*	80	4,28	4,95	5,60	6,14	3,89	4,50	5,09	5,58	2,14	2,47	2,80	3,07	
	240	*9 1/2*	80	4,28	4,95	5,60	6,14	3,89	4,50	5,09	5,58	2,14	2,47	2,80	3,07	
	260	*10 1/4*	80	4,28	4,95	5,60	6,14	3,89	4,50	5,09	5,58	2,14	2,47	2,80	3,07	
	280	*11*	80	4,28	4,95	5,60	6,14	3,89	4,50	5,09	5,58	2,14	2,47	2,80	3,07	
	300	*11 3/4*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	320	*12 5/8*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	340	*13 3/8*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	360	*14 1/4*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	380	*15*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	400	*15 3/4*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	440	*17 1/4*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	480	*19*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	520	*20 1/2*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	560	*22*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
	600	*23 5/8*	100	5,50	6,36	7,20	7,89	5,00	5,78	6,55	7,18	2,75	3,18	3,60	3,95	
12 *0.48*	120	*4 3/4*	80	4,99	5,77	6,53	7,16	4,53	5,24	5,93	6,51	2,49	2,88	3,26	3,58	22,11
	160	*6 1/4*	80	4,99	5,77	6,53	7,16	4,53	5,24	5,93	6,51	2,49	2,88	3,26	3,58	
	200	*8*	80	4,99	5,77	6,53	7,16	4,53	5,24	5,93	6,51	2,49	2,88	3,26	3,58	
	240	*9 1/2*	80	4,99	5,77	6,53	7,16	4,53	5,24	5,93	6,51	2,49	2,88	3,26	3,58	
	280	*11*	80	4,99	5,77	6,53	7,16	4,53	5,24	5,93	6,51	2,49	2,88	3,26	3,58	
	320	*12 5/8*	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	
	360	*14 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	
	400	*15 3/4*	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	
	440	*17 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	
	480	*19*	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	
	520	*20 1/2*	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	
	560	*22*	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	
	600	*23 5/8*	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	
	700	*27 1/2*	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	
	800	*31 1/2*	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	
	900	*35 1/2*	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	
	1000	*39 3/8*	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	

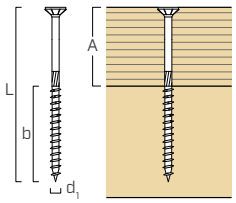
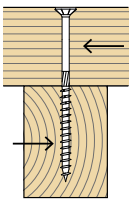
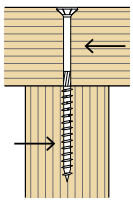
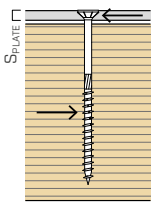
α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 19.

geometry					SHEAR[4]											
					timber-to-timber α = 90°				timber-to-timber α = 0°				steel-to-timber			
																
					factored lateral resistance N_r				factored lateral resistance N_r [2] [3]					factored lateral resistance N_r		
					G				G					G		
d_1	L		b	A[5]	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	S_{PLATE}	0.35	0.42	0.49	0.55
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm] *[in]*	[kN]	[kN]	[kN]	[kN]
3.5 *0.14*	40	*1 9/16*	18	22	0,33	0,40	0,46	0,52	0,24	0,28	0,31	0,33	1,6 *1/16*	0,63	0,72	0,78	0,83
	45	*1 3/4*	24	21	0,36	0,44	0,51	0,57	0,27	0,31	0,35	0,38		0,69	0,76	0,83	0,89
	50	*1 15/16*	24	26	0,40	0,48	0,55	0,59	0,27	0,31	0,35	0,38		0,69	0,76	0,83	0,89
4 *0.16*	30	*1 3/16*	18	12	0,30	0,36	0,42	0,47	0,19	0,23	0,27	0,30	1,6 *1/16*	0,66	0,75	0,84	0,91
	35	*1 3/8*	18	17	0,34	0,40	0,47	0,53	0,23	0,27	0,32	0,35		0,70	0,79	0,89	0,97
	40	*1 9/16*	24	16	0,37	0,45	0,52	0,59	0,26	0,31	0,36	0,40		0,78	0,89	1,00	1,08
	45	*1 3/4*	30	15	0,41	0,49	0,55	0,60	0,28	0,33	0,39	0,44		0,86	0,98	1,07	1,14
	50	*1 15/16*	30	20	0,45	0,54	0,61	0,66	0,31	0,38	0,44	0,49		0,88	0,98	1,07	1,14
	60	*2 3/8*	35	25	0,51	0,58	0,66	0,72	0,37	0,42	0,47	0,52		0,92	1,02	1,11	1,19
	70	*2 3/4*	40	30	0,55	0,63	0,69	0,74	0,38	0,44	0,49	0,54		0,96	1,06	1,16	1,24
	80	*3 1/8*	40	40	0,57	0,63	0,69	0,74	0,38	0,44	0,49	0,54		0,96	1,06	1,16	1,24
4.5 *0.18*	40	*1 9/16*	24	16	0,42	0,50	0,58	0,66	0,29	0,34	0,39	0,44	1,6 *1/16*	0,89	1,02	1,14	1,24
	45	*1 3/4*	30	15	0,46	0,55	0,64	0,71	0,31	0,38	0,44	0,49		0,98	1,12	1,26	1,35
	50	*1 15/16*	30	20	0,50	0,60	0,70	0,78	0,35	0,42	0,49	0,55		1,02	1,16	1,27	1,35
	60	*2 3/8*	35	25	0,58	0,68	0,77	0,84	0,41	0,49	0,56	0,61		1,09	1,21	1,32	1,41
	70	*2 3/4*	40	30	0,64	0,73	0,82	0,90	0,45	0,52	0,58	0,64		1,13	1,26	1,37	1,47
	80	*3 1/8*	40	40	0,69	0,77	0,84	0,90	0,45	0,52	0,58	0,64		1,13	1,26	1,37	1,47
5 *0.20*	40	*1 9/16*	24	16	0,46	0,55	0,65	0,73	0,31	0,37	0,42	0,47	1,6 *1/16*	1,05	1,19	1,33	1,45
	45	*1 3/4*	24	21	0,51	0,61	0,71	0,79	0,35	0,42	0,48	0,54		1,09	1,25	1,39	1,52
	50	*1 15/16*	24	26	0,55	0,66	0,77	0,86	0,39	0,47	0,54	0,61		1,14	1,30	1,45	1,59
	60	*2 3/8*	30	30	0,63	0,76	0,89	1,00	0,48	0,57	0,64	0,69		1,28	1,45	1,58	1,69
	70	*2 3/4*	35	35	0,72	0,87	1,01	1,13	0,53	0,60	0,68	0,74		1,36	1,51	1,64	1,75
	80	*3 1/8*	40	40	0,81	0,97	1,08	1,15	0,55	0,62	0,70	0,77		1,41	1,56	1,70	1,82
	90	*3 1/2*	45	45	0,89	0,98	1,08	1,15	0,56	0,65	0,73	0,79		1,45	1,61	1,76	1,88
	100	*4*	50	50	0,89	0,98	1,08	1,15	0,58	0,67	0,75	0,82		1,50	1,67	1,82	1,95
	120	*4 3/4*	60	60	0,89	0,98	1,08	1,15	0,62	0,71	0,80	0,87		1,59	1,77	1,94	2,08

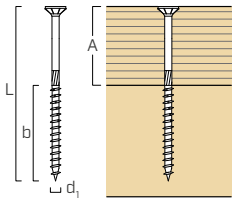
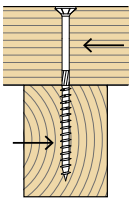
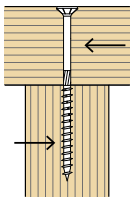
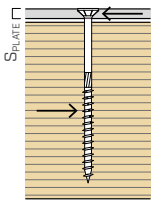
α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 19.

geometry					SHEAR[4] timber-to-timber α = 90°				SHEAR[4] timber-to-timber α = 0°				SHEAR[4] steel-to-timber				
																	
					factored lateral resistance N_r				factored lateral resistance N_r[2] [3]					factored lateral resistance N_r			
d_1	L		b	A[5]	G				G				S_{PLATE}	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]	[mm] *[in]*	[kN]	[kN]	[kN]	[kN]
	40	*1 9/16*	35	10	0,55	0,66	0,77	0,87	0,33	0,39	0,45	0,50		1,32	1,50	1,67	1,81
	50	*1 15/16*	35	15	0,65	0,78	0,91	1,02	0,42	0,50	0,57	0,64		1,41	1,61	1,81	1,97
	60	*2 3/8*	30	30	0,75	0,90	1,05	1,18	0,52	0,62	0,72	0,81		1,47	1,68	1,88	2,04
	70	*2 3/4*	40	30	0,85	1,02	1,19	1,33	0,61	0,72	0,84	0,93		1,66	1,87	2,04	2,17
	80	*3 1/8*	40	40	0,95	1,14	1,32	1,48	0,68	0,77	0,86	0,93		1,69	1,87	2,04	2,17
	90	*3 1/2*	50	40	1,04	1,20	1,35	1,48	0,73	0,83	0,94	1,03		1,78	1,98	2,16	2,30
	100	*4*	50	50	1,14	1,27	1,38	1,48	0,73	0,83	0,94	1,03		1,78	1,98	2,16	2,30
	110	*4 3/8*	60	50	1,14	1,27	1,38	1,48	0,77	0,88	0,99	1,09		1,87	2,08	2,28	2,43
	120	*4 3/4*	60	60	1,14	1,27	1,38	1,48	0,77	0,88	0,99	1,09		1,87	2,08	2,28	2,43
	130	*5 1/8*	60	70	1,14	1,27	1,38	1,48	0,77	0,88	0,99	1,09		1,87	2,08	2,28	2,43
	140	*5 1/2*	75	65	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	150	*6*	75	75	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
6	160	*6 1/4*	75	85	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18	3,2	2,01	2,24	2,46	2,63
0.24	180	*7 1/8*	75	105	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18	*1/8*	2,01	2,24	2,46	2,63
	200	*8*	75	125	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	220	*8 5/8*	75	145	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	240	*9 1/2*	75	165	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	260	*10 1/4*	75	185	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	280	*11*	75	205	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	300	*11 3/4*	75	225	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	320	*12 5/8*	75	245	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	340	*13 3/8*	75	265	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	360	*14 1/4*	75	285	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	380	*15*	75	305	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	400	*15 3/4*	75	325	1,14	1,27	1,38	1,48	0,83	0,95	1,08	1,18		2,01	2,24	2,46	2,63
	80	*3 1/8*	52	28	1,18	1,42	1,66	1,86	0,81	0,97	1,13	1,27		2,60	2,98	3,35	3,63
	100	*4*	52	48	1,42	1,71	1,99	2,24	1,05	1,24	1,39	1,51		2,83	3,13	3,41	3,63
	120	*4 3/4*	60	60	1,66	2,00	2,23	2,39	1,13	1,29	1,44	1,57		2,92	3,24	3,54	3,77
	140	*5 1/2*	60	80	1,76	2,02	2,23	2,39	1,13	1,29	1,44	1,57		2,92	3,24	3,54	3,77
	160	*6 1/4*	80	80	1,85	2,05	2,23	2,39	1,22	1,40	1,58	1,72		3,17	3,52	3,86	4,13
	180	*7 1/8*	80	100	1,85	2,05	2,23	2,39	1,22	1,40	1,58	1,72		3,17	3,52	3,86	4,13
	200	*8*	80	120	1,85	2,05	2,23	2,39	1,22	1,40	1,58	1,72		3,17	3,52	3,86	4,13
	220	*8 5/8*	80	140	1,85	2,05	2,23	2,39	1,22	1,40	1,58	1,72		3,17	3,52	3,86	4,13
	240	*9 1/2*	80	160	1,85	2,05	2,23	2,39	1,22	1,40	1,58	1,72		3,17	3,52	3,86	4,13
	260	*10 1/4*	80	180	1,85	2,05	2,23	2,39	1,22	1,40	1,58	1,72		3,17	3,52	3,86	4,13
	280	*11*	80	200	1,85	2,05	2,23	2,39	1,22	1,40	1,58	1,72		3,17	3,52	3,86	4,13
8	300	*11 3/4*	100	200	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88	3,2	3,41	3,81	4,17	4,48
0.32	320	*12 5/8*	100	220	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88	*1/8*	3,41	3,81	4,17	4,48
	340	*13 3/8*	100	240	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	360	*14 1/4*	100	260	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	380	*15*	100	280	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	400	*15 3/4*	100	300	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	440	*17 1/4*	100	340	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	480	*19*	100	380	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	520	*20 1/2*	100	420	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	560	*22*	100	460	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	580	*22 13/16*	100	480	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48
	600	*23 5/8*	100	500	1,85	2,05	2,23	2,39	1,32	1,52	1,71	1,88		3,41	3,81	4,17	4,48

α = screw-to-grain angle

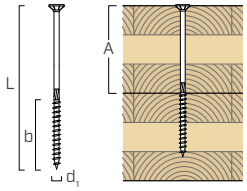
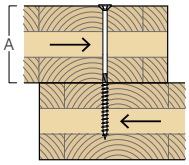
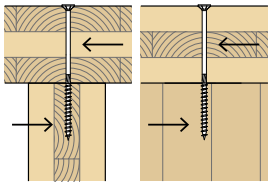
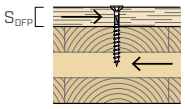
SHEAR[4]

geometry					timber-to-timber α = 90°				timber-to-timber α = 0°				steel-to-timber					
																		
					factored lateral resistance N_r				factored lateral resistance N_r[2] [3]					factored lateral resistance N_r				
					G				G					G				
d_1	L		b	A[5]	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	S_{PLATE}	0.35	0.42	0.49	0.55	
[mm] *[in]*	[mm]	*[in]*	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm] *[in]*	[kN]	[kN]	[kN]	[kN]	
	80	*3 1/8*	52	28	1,45	1,74	2,03	2,28	1,01	1,19	1,38	1,54		3,30	3,76	4,20	4,57	
	100	*4*	52	48	1,73	2,08	2,42	2,72	1,29	1,53	1,77	1,98		3,58	4,09	4,60	4,98	
	120	*4 3/4*	60	60	2,01	2,42	2,82	3,16	1,51	1,75	1,96	2,14		3,98	4,43	4,83	5,15	
	140	*5 1/2*	60	80	2,29	2,67	3,00	3,28	1,54	1,75	1,96	2,14		4,01	4,43	4,83	5,15	
	160	*6 1/4*	80	80	2,57	2,92	3,18	3,40	1,65	1,89	2,12	2,31		4,31	4,79	5,23	5,59	
	180	*7 1/8*	80	100	2,60	2,92	3,18	3,40	1,65	1,89	2,12	2,31		4,31	4,79	5,23	5,59	
	200	*8*	80	120	2,60	2,92	3,18	3,40	1,65	1,89	2,12	2,31		4,31	4,79	5,23	5,59	
	220	*8 5/8*	80	140	2,60	2,92	3,18	3,40	1,65	1,89	2,12	2,31		4,31	4,79	5,23	5,59	
	240	*9 1/2*	80	160	2,60	2,92	3,18	3,40	1,65	1,89	2,12	2,31		4,31	4,79	5,23	5,59	
	260	*10 1/4*	80	180	2,60	2,92	3,18	3,40	1,65	1,89	2,12	2,31		4,31	4,79	5,23	5,59	
10	280	*11*	80	200	2,60	2,92	3,18	3,40	1,65	1,89	2,12	2,31	6,4	4,31	4,79	5,23	5,59	
0.40	300	*11 3/4*	100	200	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49	*1/4*	4,62	5,14	5,63	6,03	
	320	*12 5/8*	100	220	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	340	*13 3/8*	100	240	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	360	*14 1/4*	100	260	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	380	*15*	100	280	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	400	*15 3/4*	100	300	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	440	*17 1/4*	100	340	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	480	*19*	100	380	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	520	*20 1/2*	100	420	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	560	*22*	100	460	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	600	*23 5/8*	100	500	2,63	2,92	3,18	3,40	1,76	2,02	2,28	2,49		4,62	5,14	5,63	6,03	
	120	*4 3/4*	80	40	2,32	2,74	3,07	3,35	1,55	1,86	2,17	2,44		4,98	5,65	6,18	6,60	
	160	*6 1/4*	80	80	2,95	3,47	3,79	4,06	1,95	2,23	2,50	2,73		5,09	5,65	6,18	6,60	
	200	*8*	80	120	3,04	3,47	3,79	4,06	1,95	2,23	2,50	2,73		5,09	5,65	6,18	6,60	
	240	*9 1/2*	80	160	3,04	3,47	3,79	4,06	1,95	2,23	2,50	2,73		5,09	5,65	6,18	6,60	
	280	*11*	80	200	3,04	3,47	3,79	4,06	1,95	2,23	2,50	2,73		5,09	5,65	6,18	6,60	
	320	*12 5/8*	120	200	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
	360	*14 1/4*	120	240	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
	400	*15 3/4*	120	280	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
12	440	*17 1/4*	120	320	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13	6,4	5,83	6,50	7,14	7,65	
0.48	480	*19*	120	360	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13	*1/4*	5,83	6,50	7,14	7,65	
	520	*20 1/2*	120	400	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
	560	*22*	120	440	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
	600	*23 5/8*	120	480	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
	700	*27 1/2*	120	580	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
	800	*31 1/2*	120	680	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
	900	*35 1/2*	120	780	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	
	1000	*39 3/8*	120	880	3,13	3,47	3,79	4,06	2,20	2,53	2,86	3,13		5,83	6,50	7,14	7,65	

α = screw-to-grain angle

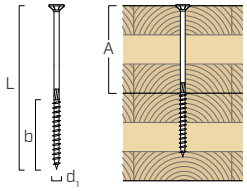
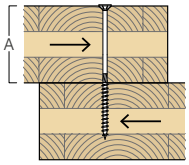
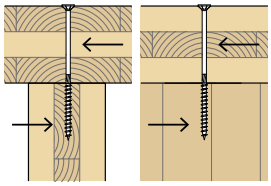
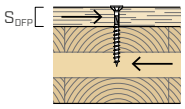
NOTES and GENERAL PRINCIPLES on page 19.

SHEAR[4]

geometry				CLT-CLT lateral face α = 90°				CLT-CLT α = 0°				spline joint lateral face α = 90°				
																
d_1	L		b	A	factored lateral resistance N_r [6] G				factored lateral resistance N_r [2][3] G				S_{DFP}	factored lateral resistance N_r 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]	[mm] *[in]*	[kN]	[kN]	[kN]	[kN]
6 *0.24*	60	*2 3/8*	30	30	0,69	0,83	0,97	1,09	0,48	0,57	0,66	0,74	12,7 *1/2*	0,91	1,00	1,08	1,14
	70	*2 3/4*	40	40	0,78	0,94	1,09	1,22	0,57	0,64	0,71	0,76		1,00	1,09	1,12	1,14
	80	*3 1/8*	40	40	0,87	1,04	1,21	1,36	0,65	0,73	0,82	0,89		1,05	1,09	1,12	1,14
	90	*3 1/2*	50	50	0,96	1,13	1,27	1,39	0,65	0,73	0,82	0,89		1,05	1,09	1,12	1,14
	100	*4*	50	50	1,04	1,21	1,32	1,42	0,69	0,79	0,89	0,97		1,05	1,09	1,12	1,14
	110	*4 3/8*	60	60	1,07	1,21	1,32	1,42	0,69	0,79	0,89	0,97		1,05	1,09	1,12	1,14
	120	*4 3/4*	60	60	1,09	1,21	1,32	1,42	0,72	0,83	0,94	1,03		1,05	1,09	1,12	1,14
	130	*5 1/8*	60	70	1,09	1,21	1,32	1,42	0,72	0,83	0,94	1,03		1,05	1,09	1,12	1,14
	140	*5 1/2*	75	75	1,09	1,21	1,32	1,42	0,74	0,85	0,96	1,05		1,05	1,09	1,12	1,14
	150	*6*	75	75	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	160	*6 1/4*	75	85	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	180	*7 1/8*	75	105	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	200	*8*	75	125	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	220	*8 5/8*	75	145	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	240	*9 1/2*	75	165	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	260	*10 1/4*	75	185	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	280	*11*	75	205	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	300	*11 3/4*	75	225	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	320	*12 5/8*	75	245	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	340	*13 3/8*	75	265	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	360	*14 1/4*	75	285	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	380	*15*	75	305	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
	400	*15 3/4*	75	325	1,09	1,21	1,32	1,42	0,78	0,90	1,01	1,11		1,05	1,09	1,12	1,14
8 *0.32*	80	*3 1/8*	52	45	1,09	1,31	1,52	1,71	0,80	0,96	1,11	1,20	19,1 *3/4*	1,47	1,60	1,73	1,85
	100	*4*	52	55	1,30	1,56	1,83	2,05	1,00	1,13	1,26	1,36		1,69	1,79	1,84	1,88
	120	*4 3/4*	60	60	1,52	1,82	2,13	2,28	1,07	1,22	1,37	1,49		1,73	1,79	1,84	1,88
	140	*5 1/2*	60	80	1,64	1,89	2,13	2,28	1,07	1,22	1,37	1,49		1,73	1,79	1,84	1,88
	160	*6 1/4*	80	80	1,76	1,96	2,14	2,28	1,15	1,32	1,49	1,62		1,73	1,79	1,84	1,88
	180	*7 1/8*	80	100	1,76	1,96	2,14	2,28	1,15	1,32	1,49	1,62		1,73	1,79	1,84	1,88
	200	*8*	80	120	1,76	1,96	2,14	2,28	1,15	1,32	1,49	1,62		1,73	1,79	1,84	1,88
	220	*8 5/8*	80	140	1,76	1,96	2,14	2,28	1,15	1,32	1,49	1,62		1,73	1,79	1,84	1,88
	240	*9 1/2*	80	160	1,76	1,96	2,14	2,28	1,15	1,32	1,49	1,62		1,73	1,79	1,84	1,88
	260	*10 1/4*	80	180	1,76	1,96	2,14	2,28	1,15	1,32	1,49	1,62		1,73	1,79	1,84	1,88
	280	*11*	80	200	1,76	1,96	2,14	2,28	1,15	1,32	1,49	1,62		1,73	1,79	1,84	1,88
	300	*11 3/4*	100	200	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	320	*12 5/8*	100	220	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	340	*13 3/8*	100	240	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	360	*14 1/4*	100	260	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	380	*15*	100	280	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	400	*15 3/4*	100	300	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	440	*17 1/4*	100	340	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	480	*19*	100	380	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	520	*20 1/2*	100	420	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	560	*22*	100	460	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	580	*22 13/16*	100	480	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88
	600	*23 5/8*	100	500	1,76	1,96	2,14	2,28	1,24	1,42	1,61	1,76		1,73	1,79	1,84	1,88

α = screw-to-grain angle

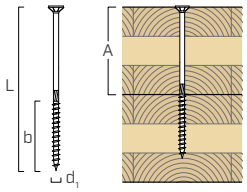
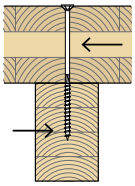
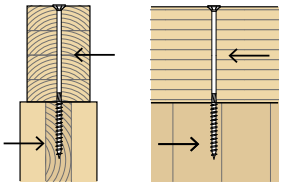
SHEAR[4]

geometry					CLT-CLT lateral face α = 90°				CLT-CLT α = 0°				spline joint lateral face α = 90°				
																	
					factored lateral resistance N_r (6)				factored lateral resistance N_r (2)(3)					factored lateral resistance N_r			
d_1	L		b	A	G				G				S_{DFP}	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]	[mm] *[in]*	[kN]	[kN]	[kN]	[kN]
	80	*3 1/8*	52	45	1,34	1,61	1,87	2,10	0,94	1,12	1,29	1,45		1,93	2,07	2,20	2,32
	100	*4*	52	55	1,59	1,91	2,23	2,50	1,19	1,42	1,64	1,78		2,18	2,37	2,56	2,72
	120	*4 3/4*	60	60	1,84	2,21	2,58	2,90	1,39	1,66	1,86	2,03		2,43	2,62	2,69	2,75
	140	*5 1/2*	60	80	2,10	2,50	2,81	3,08	1,46	1,66	1,86	2,03		2,54	2,62	2,69	2,75
	160	*6 1/4*	80	80	2,35	2,79	3,04	3,25	1,56	1,78	2,00	2,19		2,54	2,62	2,69	2,75
	180	*7 1/8*	80	100	2,43	2,79	3,04	3,25	1,56	1,78	2,00	2,19		2,54	2,62	2,69	2,75
	200	*8*	80	120	2,43	2,79	3,04	3,25	1,56	1,78	2,00	2,19		2,54	2,62	2,69	2,75
	220	*8 5/8*	80	140	2,43	2,79	3,04	3,25	1,56	1,78	2,00	2,19		2,54	2,62	2,69	2,75
	240	*9 1/2*	80	160	2,43	2,79	3,04	3,25	1,56	1,78	2,00	2,19		2,54	2,62	2,69	2,75
	260	*10 1/4*	80	180	2,43	2,79	3,04	3,25	1,56	1,78	2,00	2,19		2,54	2,62	2,69	2,75
10	280	*11*	80	200	2,43	2,79	3,04	3,25	1,56	1,78	2,00	2,19	25,4	2,54	2,62	2,69	2,75
0.40	300	*11 3/4*	100	200	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34	*1*	2,54	2,62	2,69	2,75
	320	*12 5/8*	100	220	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	340	*13 3/8*	100	240	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	360	*14 1/4*	100	260	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	380	*15*	100	280	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	400	*15 3/4*	100	300	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	440	*17 1/4*	100	340	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	480	*19*	100	380	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	520	*20 1/2*	100	420	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	560	*22*	100	460	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	600	*23 5/8*	100	500	2,51	2,79	3,04	3,25	1,66	1,90	2,14	2,34		2,54	2,62	2,69	2,75
	120	*4 3/4*	80	65	2,18	2,60	3,01	3,36	1,64	1,91	2,12	2,29		2,81	3,08	3,17	3,24
	160	*6 1/4*	80	80	2,70	3,24	3,63	3,88	1,84	2,11	2,37	2,58		2,99	3,09	3,17	3,24
	200	*8*	80	120	2,85	3,28	3,63	3,88	1,84	2,11	2,37	2,58		2,99	3,09	3,17	3,24
	240	*9 1/2*	80	160	2,85	3,28	3,63	3,88	1,84	2,11	2,37	2,58		2,99	3,09	3,17	3,24
	280	*11*	80	200	2,85	3,28	3,63	3,88	1,84	2,11	2,37	2,58		2,99	3,09	3,17	3,24
	320	*12 5/8*	120	200	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
	360	*14 1/4*	120	240	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
	400	*15 3/4*	120	280	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
12	440	*17 1/4*	120	320	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94	25,4	2,99	3,09	3,17	3,24
0.48	480	*19*	120	360	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94	*1*	2,99	3,09	3,17	3,24
	520	*20 1/2*	120	400	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
	560	*22*	120	440	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
	600	*23 5/8*	120	480	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
	700	*27 1/2*	120	580	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
	800	*31 1/2*	120	680	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
	900	*35 1/2*	120	780	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24
	1000	*39 3/8*	120	880	2,99	3,32	3,63	3,88	2,07	2,38	2,69	2,94		2,99	3,09	3,17	3,24

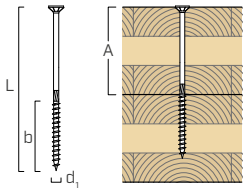
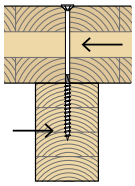
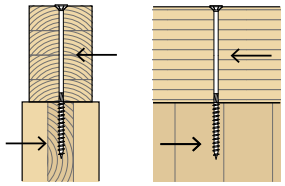
α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 19.

SHEAR[4]

geometry				CLT-timber lateral face α = 90°				timber-CLT narrow face α = 0°			
											
				factored lateral resistance N_r				factored lateral resistance N_r [2][3]			
				G				G			
d_1	L		b	A	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]
6 *0.24*	60	*2 3/8*	30	30	0,72	0,86	1,01	1,13	0,51	0,61	0,70	0,77
	70	*2 3/4*	40	40	0,82	0,98	1,15	1,27	0,59	0,70	0,81	0,89
	80	*3 1/8*	40	40	0,91	1,09	1,27	1,41	0,65	0,74	0,82	0,89
	90	*3 1/2*	50	50	0,99	1,14	1,28	1,41	0,69	0,80	0,89	0,98
	100	*4*	50	50	1,08	1,24	1,35	1,45	0,69	0,80	0,89	0,98
	110	*4 3/8*	60	60	1,08	1,24	1,35	1,45	0,73	0,84	0,94	1,03
	120	*4 3/4*	60	60	1,11	1,24	1,35	1,45	0,73	0,84	0,94	1,03
	130	*5 1/8*	60	70	1,11	1,24	1,35	1,45	0,73	0,84	0,94	1,03
	140	*5 1/2*	75	75	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	150	*6*	75	75	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	160	*6 1/4*	75	85	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	180	*7 1/8*	75	105	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	200	*8*	75	125	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	220	*8 5/8*	75	145	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	240	*9 1/2*	75	165	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	260	*10 1/4*	75	185	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	280	*11*	75	205	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	300	*11 3/4*	75	225	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	320	*12 5/8*	75	245	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	340	*13 3/8*	75	265	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	360	*14 1/4*	75	285	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	380	*15*	75	305	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
	400	*15 3/4*	75	325	1,11	1,24	1,35	1,45	0,78	0,90	1,02	1,12
8 *0.32*	80	*3 1/8*	52	45	1,15	1,38	1,61	1,81	0,78	0,94	1,10	1,23
	100	*4*	52	55	1,37	1,64	1,91	2,15	1,02	1,19	1,33	1,45
	120	*4 3/4*	60	60	1,59	1,91	2,16	2,33	1,07	1,23	1,38	1,50
	140	*5 1/2*	60	80	1,73	2,00	2,18	2,33	1,07	1,23	1,38	1,50
	160	*6 1/4*	80	80	1,80	2,00	2,18	2,33	1,16	1,33	1,50	1,64
	180	*7 1/8*	80	100	1,80	2,00	2,18	2,33	1,16	1,33	1,50	1,64
	200	*8*	80	120	1,80	2,00	2,18	2,33	1,16	1,33	1,50	1,64
	220	*8 5/8*	80	140	1,80	2,00	2,18	2,33	1,16	1,33	1,50	1,64
	240	*9 1/2*	80	160	1,80	2,00	2,18	2,33	1,16	1,33	1,50	1,64
	260	*10 1/4*	80	180	1,80	2,00	2,18	2,33	1,16	1,33	1,50	1,64
	280	*11*	80	200	1,80	2,00	2,18	2,33	1,16	1,33	1,50	1,64
	300	*11 3/4*	100	200	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	320	*12 5/8*	100	220	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	340	*13 3/8*	100	240	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	360	*14 1/4*	100	260	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	380	*15*	100	280	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	400	*15 3/4*	100	300	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	440	*17 1/4*	100	340	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	480	*19*	100	380	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	520	*20 1/2*	100	420	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	560	*22*	100	460	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	580	*22 13/16*	100	480	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77
	600	*23 5/8*	100	500	1,80	2,00	2,18	2,33	1,25	1,43	1,62	1,77

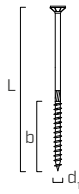
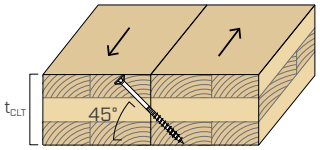
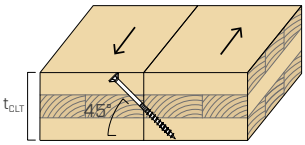
α = screw-to-grain angle

geometry					SHEAR[4]							
					CLT-timber lateral face α = 90°				timber-CLT narrow face α = 0°			
												
					factored lateral resistance N_r				factored lateral resistance N_r [2][3]			
					G				G			
d_1	L		b	A	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]
	80	*3 1/8*	52	45	1,41	1,69	1,98	2,22	0,98	1,16	1,34	1,49
	100	*4*	52	55	1,66	2,00	2,33	2,62	1,26	1,49	1,73	1,92
	120	*4 3/4*	60	60	1,93	2,31	2,70	3,03	1,47	1,68	1,88	2,04
	140	*5 1/2*	60	80	2,18	2,62	2,96	3,24	1,47	1,68	1,88	2,04
	160	*6 1/4*	80	80	2,46	2,83	3,11	3,32	1,57	1,80	2,02	2,20
	180	*7 1/8*	80	100	2,57	2,85	3,11	3,32	1,57	1,80	2,02	2,20
	200	*8*	80	120	2,57	2,85	3,11	3,32	1,57	1,80	2,02	2,20
	220	*8 5/8*	80	140	2,57	2,85	3,11	3,32	1,57	1,80	2,02	2,20
	240	*9 1/2*	80	160	2,57	2,85	3,11	3,32	1,57	1,80	2,02	2,20
	260	*10 1/4*	80	180	2,57	2,85	3,11	3,32	1,57	1,80	2,02	2,20
10	280	*11*	80	200	2,57	2,85	3,11	3,32	1,57	1,80	2,02	2,20
0.40	300	*11 3/4*	100	200	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	320	*12 5/8*	100	220	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	340	*13 3/8*	100	240	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	360	*14 1/4*	100	260	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	380	*15*	100	280	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	400	*15 3/4*	100	300	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	440	*17 1/4*	100	340	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	480	*19*	100	380	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	520	*20 1/2*	100	420	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	560	*22*	100	460	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	600	*23 5/8*	100	500	2,57	2,85	3,11	3,32	1,67	1,92	2,16	2,36
	120	*4 3/4*	80	65	2,25	2,63	2,94	3,20	1,50	1,80	2,10	2,36
	160	*6 1/4*	80	80	2,83	3,32	3,71	3,96	1,86	2,12	2,38	2,60
	200	*8*	80	120	3,01	3,39	3,71	3,96	1,86	2,12	2,38	2,60
	240	*9 1/2*	80	160	3,01	3,39	3,71	3,96	1,86	2,12	2,38	2,60
	280	*11*	80	200	3,01	3,39	3,71	3,96	1,86	2,12	2,38	2,60
	320	*12 5/8*	120	200	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	360	*14 1/4*	120	240	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	400	*15 3/4*	120	280	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
12	440	*17 1/4*	120	320	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
0.48	480	*19*	120	360	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	520	*20 1/2*	120	400	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	560	*22*	120	440	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	600	*23 5/8*	120	480	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	700	*27 1/2*	120	580	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	800	*31 1/2*	120	680	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	900	*35 1/2*	120	780	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96
	1000	*39 3/8*	120	880	3,06	3,39	3,71	3,96	2,09	2,40	2,70	2,96

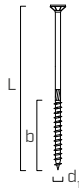
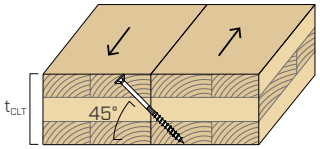
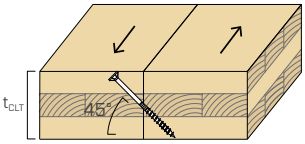
α = screw-to-grain angle

NOTES and **GENERAL PRINCIPLES** on page 19.

SHEAR[4][7]

geometry				butt-joint α = 90°				butt-joint α = 45°			
											
				factored lateral resistance N_r				factored lateral resistance N_r			
				G				G			
d_1	L		b	t_{CLT}	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]
	90	*3 1/2*	50	65	0,79	0,93	1,04	1,14	0,45	0,55	0,64	0,71
	100	*4*	50	70	0,88	1,02	1,10	1,16	0,50	0,61	0,71	0,79
	110	*4 3/8*	60	80	0,91	1,02	1,10	1,16	0,56	0,67	0,77	0,84
	120	*4 3/4*	60	85	0,93	1,02	1,10	1,16	0,61	0,73	0,83	0,88
	130	*5 1/8*	60	90	0,93	1,02	1,10	1,16	0,65	0,75	0,83	0,88
	140	*5 1/2*	75	100	0,93	1,02	1,10	1,16	0,68	0,77	0,83	0,88
	150	*6*	75	105	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	160	*6 1/4*	75	115	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	180	*7 1/8*	75	125	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
6	200	*8*	75	140	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
0.24	220	*8 5/8*	75	155	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	240	*9 1/2*	75	170	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	260	*10 1/4*	75	185	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	280	*11*	75	200	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	300	*11 3/4*	75	210	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	320	*12 5/8*	75	225	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	340	*13 3/8*	75	240	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	360	*14 1/4*	75	255	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	380	*15*	75	270	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	400	*15 3/4*	75	285	0,93	1,02	1,10	1,16	0,70	0,77	0,83	0,88
	80	*3 1/8*	52	55	0,86	1,04	1,21	1,36	0,49	0,59	0,69	0,78
	100	*4*	52	70	1,08	1,30	1,51	1,70	0,62	0,74	0,86	0,97
	120	*4 3/4*	60	85	1,30	1,56	1,81	1,93	0,74	0,89	1,04	1,16
	140	*5 1/2*	60	100	1,42	1,62	1,82	1,93	0,86	1,04	1,21	1,31
	160	*6 1/4*	80	115	1,54	1,69	1,82	1,93	0,99	1,19	1,38	1,46
	180	*7 1/8*	80	125	1,54	1,69	1,82	1,93	1,08	1,23	1,38	1,46
	200	*8*	80	140	1,54	1,69	1,82	1,93	1,08	1,23	1,38	1,46
	220	*8 5/8*	80	155	1,54	1,69	1,82	1,93	1,08	1,23	1,38	1,46
	240	*9 1/2*	80	170	1,54	1,69	1,82	1,93	1,08	1,23	1,38	1,46
	260	*10 1/4*	80	185	1,54	1,69	1,82	1,93	1,08	1,23	1,38	1,46
	280	*11*	80	200	1,54	1,69	1,82	1,93	1,08	1,23	1,38	1,46
8	300	*11 3/4*	100	210	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
0.32	320	*12 5/8*	100	225	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	340	*13 3/8*	100	240	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	360	*14 1/4*	100	255	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	380	*15*	100	270	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	400	*15 3/4*	100	285	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	440	*17 1/4*	100	310	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	480	*19*	100	340	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	520	*20 1/2*	100	370	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	560	*22*	100	395	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	580	*22 13/16*	100	410	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46
	600	*23 5/8*	100	425	1,54	1,69	1,82	1,93	1,16	1,28	1,38	1,46

α = screw-to-grain angle

geometry				SHEAR[4][7]							
				butt-joint α = 90°				butt-joint α = 45°			
											
				factored lateral resistance N_r				factored lateral resistance N_r			
				G				G			
d_1 [mm] *[in]*	L [mm]	L *[in]*	b [mm]	t_{CLT} [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]
10 *0.40*	80	*3 1/8*	52	55	1,01	1,21	1,41	1,59	0,58	0,69	0,81	0,91
	100	*4*	52	70	1,26	1,52	1,77	1,98	0,72	0,87	1,01	1,13
	120	*4 3/4*	60	85	1,52	1,82	2,12	2,38	0,87	1,04	1,21	1,36
	140	*5 1/2*	60	100	1,77	2,11	2,35	2,56	1,01	1,21	1,41	1,59
	160	*6 1/4*	80	115	2,02	2,39	2,58	2,74	1,15	1,39	1,62	1,81
	180	*7 1/8*	80	125	2,10	2,39	2,58	2,74	1,30	1,56	1,78	1,94
	200	*8*	80	140	2,10	2,39	2,58	2,74	1,40	1,60	1,78	1,94
	220	*8 5/8*	80	155	2,10	2,39	2,58	2,74	1,40	1,60	1,78	1,94
	240	*9 1/2*	80	170	2,10	2,39	2,58	2,74	1,40	1,60	1,78	1,94
	260	*10 1/4*	80	185	2,10	2,39	2,58	2,74	1,40	1,60	1,78	1,94
	280	*11*	80	200	2,10	2,39	2,58	2,74	1,40	1,60	1,78	1,94
	300	*11 3/4*	100	210	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	320	*12 5/8*	100	225	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	340	*13 3/8*	100	240	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	360	*14 1/4*	100	255	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	380	*15*	100	270	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	400	*15 3/4*	100	285	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	440	*17 1/4*	100	310	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	480	*19*	100	340	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	520	*20 1/2*	100	370	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	560	*22*	100	395	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
	600	*23 5/8*	100	425	2,18	2,39	2,58	2,74	1,55	1,77	1,95	2,07
12 *0.48*	120	*4 3/4*	80	85	1,72	2,07	2,34	2,52	0,98	1,18	1,38	1,55
	160	*6 1/4*	80	115	2,30	2,76	3,06	3,25	1,31	1,57	1,84	2,06
	200	*8*	80	140	2,44	2,80	3,06	3,25	1,63	1,86	2,08	2,26
	240	*9 1/2*	80	170	2,44	2,80	3,06	3,25	1,63	1,86	2,08	2,26
	280	*11*	80	200	2,44	2,80	3,06	3,25	1,63	1,86	2,08	2,26
	320	*12 5/8*	120	225	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	360	*14 1/4*	120	255	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	400	*15 3/4*	120	285	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	440	*17 1/4*	120	310	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	480	*19*	120	340	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	520	*20 1/2*	120	370	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	560	*22*	120	395	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	600	*23 5/8*	120	425	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	700	*27 1/2*	120	495	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	800	*31 1/2*	120	565	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	900	*35 1/2*	120	635	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45
	1000	*39 3/8*	120	705	2,59	2,84	3,06	3,25	1,96	2,14	2,32	2,45

α = screw-to-grain angle

NOTES and **GENERAL PRINCIPLES** on page 19.

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 specified head pull-through design values are taken from report ELC-4645. The withdrawal and head pull-through values provided in this datasheet are also applicable to CLT connections.
- The steel plate is assumed to be ASTM A36 with a minimum ultimate tensile strength, f_u, equal to 58 ksi (400 MPa).
- 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.
- HBS 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}), head pull-through resistance (P_{pt}) and the steel strength (T_{rs}).

(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) HBS 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) 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.

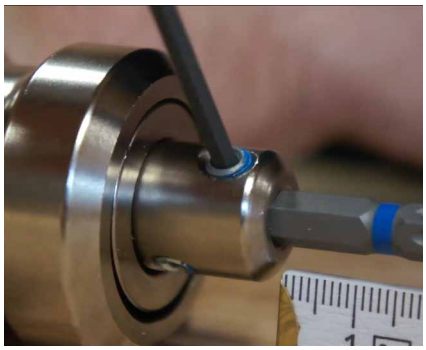
(5) The side-member thickness, A, for HBS 6 x 40 mm was set to 10 mm to ensure the connection is not governed by failure mode (a).

(6) The CLT-to-CLT boundary conditions are equally applicable to half-lap connections. Use the nearest connection geometry to determine the appropriate values.

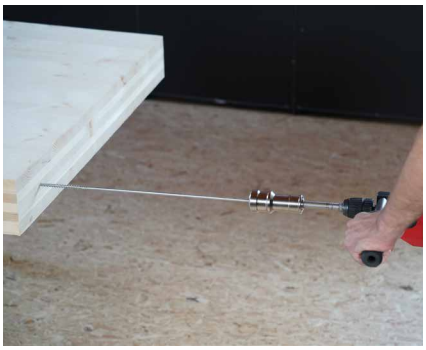
(7) The lateral resistance calculation for butt joints assumes the screws are installed on the CLT member's narrow face.

INSTALLATION SUGGESTIONS

SCREWING USING CATCH



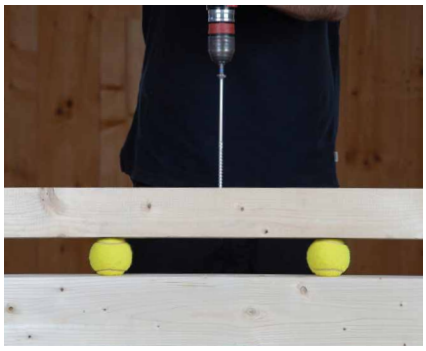
Place the bit inside the CATCH screwing device and fasten it to the correct depth depending on the chosen connector.



CATCH is suitable with long connectors where the insert would otherwise tend to come out of the screw head space.

Useful in case of screwing in corners, which usually do not allow exerting a great screwing force.

PARTIALLY THREADED SCREWS vs FULLY THREADED SCREW



Compressible elements are interposed between two timber beams and a screw is screwed centrally to evaluate its effect on the connection.

The partial thread screw (e.g. HBS) allows the joint to be closed. The threaded portion, inserted all the way inside the second element, allows the first element to slide on the smooth shank.

The fully threaded screw (e.g. VGZ) transfers the force by exploiting its axial strength and penetrates inside the timber elements without moving.

APPLICATION ON HARDWOODS

Pre-drill a hole of the required diameter ($d_{V,H}$) and length equal to the chosen connector size using the SNAIL tip.

Install the screw (e.g. HBS).

Alternatively, specific screws for hardwood applications (e.g. HBSH) can be used, which can be inserted without the aid of pre-drill hole.

RELATED PRODUCTS

CATCH

LEWIS

SNAIL

A 18 | ASB 18