VGZ

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

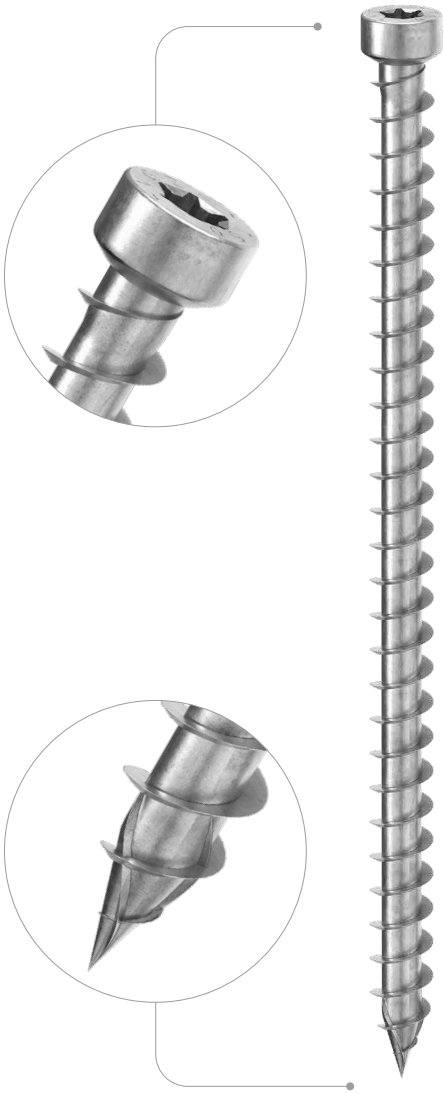
FULL THREADED SCREW WITH CYLINDRICAL HEAD

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
Approved for structural applications subject to stresses in any direction vs the grain (0° - 90°). 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.

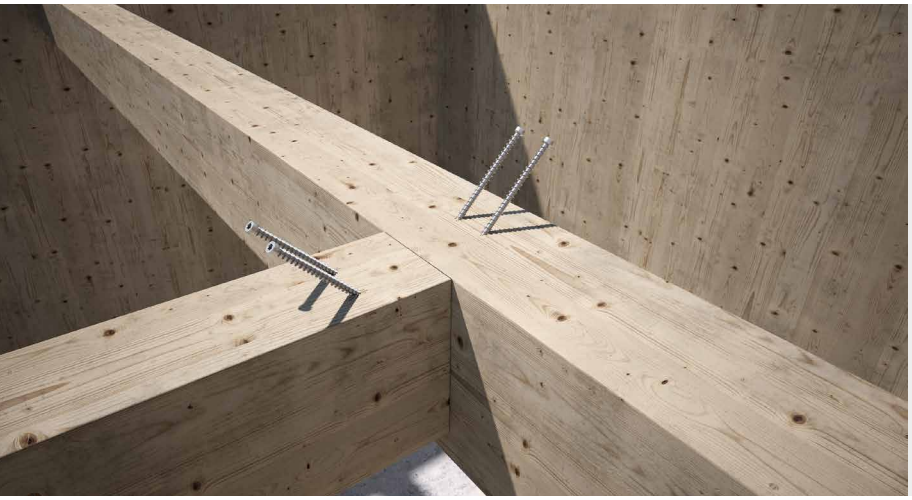
TIMBER FRAME
Also ideal for joining small timber elements such as the crossbeams and uprights of light frame structures.



MY PROJECT SOFTWARE | VIDEO

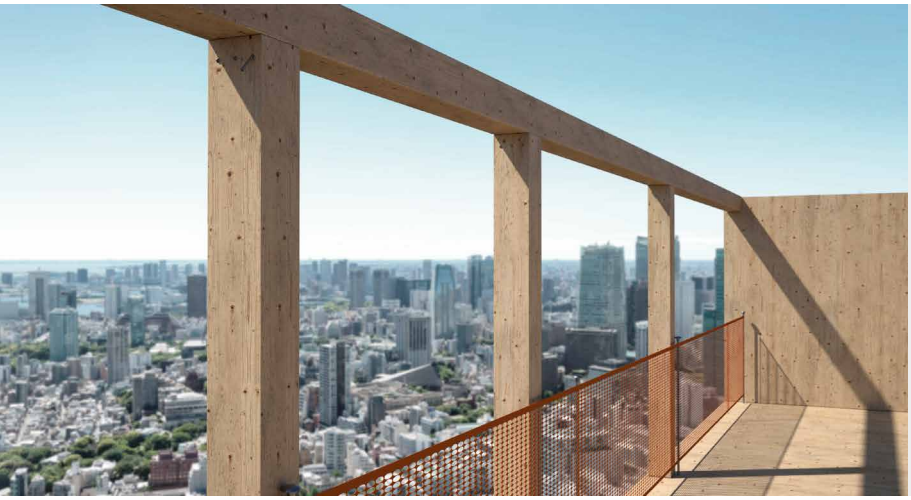
BIT INCLUDED

DIAMETER [in]	0.20		**0.28**	**0.44**	0.44
LENGTH [in]	3 1/8	**3 1/8**		**39 3/8**	39 3/8
EXPOSURE CONDITION	**EC1**	**DRY**			
ATMOSPHERIC CORROSIVITY	**C1**	**C2**			
WOOD CORROSIVITY	T1	T2			
MATERIAL	**Zn** ELECTRO PLATED	electrogalvanized carbon steel			



FIELDS OF USE

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



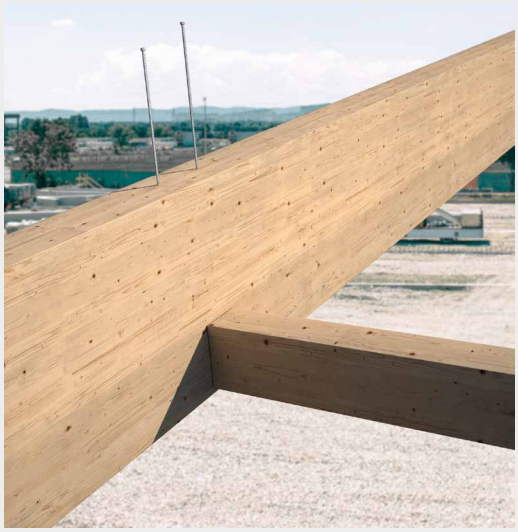
STRUCTURAL RESTORATION

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

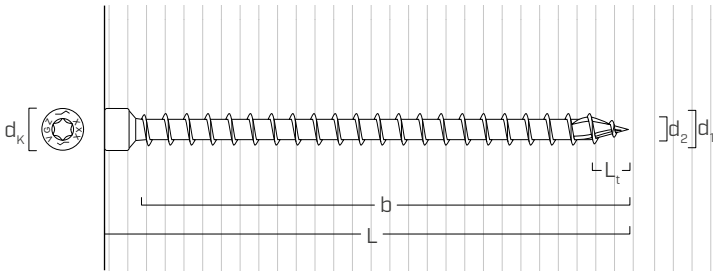
Values also tested, certified and calculated for CLT and high density woods such as LVL, Plywood or other laminated veneer products.

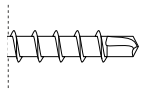
Very high stiffness in side-by-side joining of CLT floors. Application with double inclination at 45°, perfect combined with the JIG VGZ template.



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

GEOMETRY AND MECHANICAL CHARACTERISTICS





Ø0.36 in | L > 20 1/2"
Ø0.44 in | L > 23 5/8"

GEOMETRY

Nominal diameter	**d_1**	**[in](1)**	**0.28**	**0.36**	**0.44**
Outer thread diameter	**d_1**	[mm]	7	9	11
		[in]	**0.276**	**0.354**	**0.433**
Head diameter	d_K	[in]	0.374	0.453	0.531
Root diameter	d_2	[in]	0.181	0.232	0.260
Tip Length	L_t	[in]	0.276	0.354	0.433
Pre-drilling hole diameter(2)	$d_{V,G\leq0.55}$	[in]	5/32	13/64	15/64
Pre-drilling hole diameter(3)	$d_{V,G>0.55}$	[in]	13/64	15/64	9/32

(1) The nominal diameter of the screw is converted into imperial units and rounded up to the nearest decimal point.
(2) Pre-drilling applies to timber with G≤0.55 (optional).
(3) Pre-drilling applies to timber with G>0.55 (required).

MECHANICAL PARAMETERS

Nominal diameter	**d_1**	[in]	0.28	0.36	0.44
Tensile strength (allowable)	f_{tens}	[lbf]	1450	2450	3200
Bending yield strength (specified)	$F_{y,b}$	[psi]	195000	180000	170000

Nominal diameter	**d_1**	[in]		0.28	0.36	0.44
Withdrawal (design value)	W_{90}	[lbf/in]	G = 0.35	141	192	207
			G = 0.42	164	220	240
			G = 0.49	185	255	272
			G = 0.55	203	280	298
minimum embedded length		[in]		1 5/8	2 1/8	2 5/8

CODES AND DIMENSIONS

d_1 [mm] [in]	CODE	L [mm]	L [in]	b [mm]	b [in]	pcs	
7 **0.28 #16 TX 30**	**VGZ780**	80	3 1/8	70	2 3/4	50	
	VGZ7100	100	4	90	3 1/2	50	
	VGZ7120	120	4 3/4	110	4 3/8	50	
	VGZ7140	140	5 1/2	130	5 1/8	50	
	VGZ7160	160	6 1/4	150	6	50	
	VGZ7180	180	7 1/8	170	6 3/4	50	
	VGZ7200	200	8	190	7 1/2	50	
	VGZ7220	220	8 5/8	210	8 1/4	50	
	VGZ7240	240	9 1/2	230	9 1/16	50	
	VGZ7260	260	10 1/4	250	10	50	
	VGZ7280	280	11	270	10 5/8	50	
	VGZ7300	300	11 3/4	290	11 7/16	50	
	VGZ7320	320	12 5/8	310	12 3/16	50	
	VGZ7340	340	13 3/8	330	13	50	
	VGZ7360	360	14 1/4	350	13 3/4	50	
	VGZ7380	380	15	370	14 9/16	50	
	VGZ7400	400	15 3/4	390	15 3/8	50	
9 **0.36 TX 40**	**VGZ9160**	160	6 1/4	150	6	50	
	VGZ9180	180	7 1/8	170	6 3/4	50	
	VGZ9200	200	8	190	7 1/2	50	
	VGZ9220	220	8 5/8	210	8 1/4	50	
	VGZ9240	240	9 1/2	230	9 1/16	50	
	VGZ9260	260	10 1/4	250	10	50	
	VGZ9280	280	11	270	10 5/8	50	
	VGZ9300	300	11 3/4	290	11 7/16	50	
	VGZ9320	320	12 5/8	310	12 3/16	50	
	VGZ9340	340	13 3/8	330	13	50	
	VGZ9360	360	14 1/4	350	13 3/4	50	
	VGZ9380	380	15	370	14 9/16	50	
	VGZ9400	400	15 3/4	390	15 3/8	50	
	VGZ9440	440	17 1/4	430	16 15/16	25	
	VGZ9480	480	19	470	18 1/2	25	
	VGZ9520	520	20 1/2	510	20 1/16	25	
	VGZ9560	560	22	550	21 5/8	25	
	VGZ9600	600	23 5/8	590	23 1/4	25	

d_1 [mm] [in]	CODE	L [mm]	L [in]	b [mm]	b [in]	pcs	
11 **0.44 TX 50**	**VGZ11150**	150	6	140	5 1/2	25	
	VGZ11200	200	8	190	7 1/2	25	
	VGZ11250	250	10	240	9 1/2	25	
	VGZ11275	275	10 7/8	265	10 7/16	25	
	VGZ11300	300	11 3/4	290	11 7/16	25	
	VGZ11325	325	12 3/4	315	12 3/8	25	
	VGZ11350	350	13 3/4	340	13 3/8	25	
	VGZ11375	375	14 3/4	365	14 3/8	25	
	VGZ11400	400	15 3/4	390	15 3/8	25	
	VGZ11425	425	16 3/4	415	16 5/16	25	
	VGZ11450	450	17 3/4	440	17 1/4	25	
	VGZ11475	475	18 11/16	465	18 5/16	25	
	VGZ11500	500	19 3/4	490	19 5/16	25	
	VGZ11525	525	20 11/16	515	20 1/4	25	
	VGZ11550	550	21 5/8	540	21 1/4	25	
	VGZ11575	575	22 5/8	565	22 1/4	25	
	VGZ11600	600	23 5/8	590	23 1/4	25	
	VGZ11650	650	25 9/16	640	25 3/16	25	
	VGZ11700	700	27 1/2	690	27 3/16	25	
	VGZ11750	750	29 1/2	740	29 1/8	25	
	VGZ11800	800	31 1/2	790	31 1/8	25	
	VGZ11850	850	33 7/16	840	33 1/16	25	
	VGZ11900	900	35 1/2	890	35 1/16	25	
	VGZ11950	950	37 3/8	940	37	25	
	VGZ111000	1000	39 3/8	990	39	25	

RELATED PRODUCTS

JIG VGZ 45°

TEMPLATE FOR 45° SCREWS

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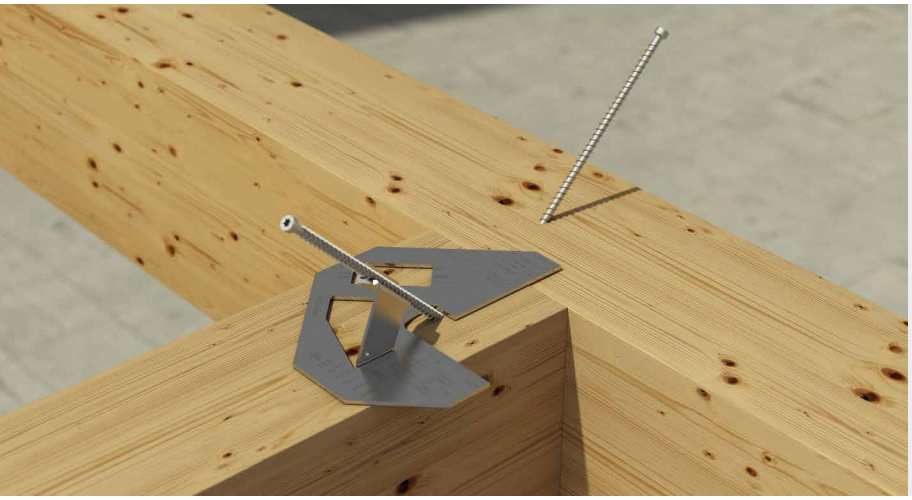
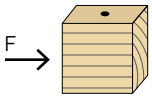


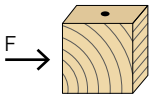
JIG VGZ 45° TEMPLATE

Installation at 45° using the JIG VGZ steel template.

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

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

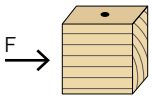


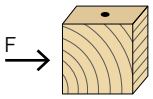


d_1	[in]		0.28	0.36	0.44
	[mm]		7	9	11
a_1	[in]	**15·d**	4 1/8	5 5/16	6 1/2
a_2	[in]	**5·d**	1 3/8	1 3/4	2 3/16
$a_{3,t}$	[in]	**15·d**	4 1/8	5 5/16	6 1/2
$a_{3,c}$	[in]	**10·d**	2 3/4	3 1/2	4 3/8
$a_{4,t}$	[in]	**10·d**	2 3/4	3 1/2	4 3/8
$a_{4,c}$	[in]	**5·d**	1 3/8	1 3/4	2 3/16

	0.28	0.36	0.44
	7	9	11
10·d	2 3/4	3 1/2	4 3/8
5·d	1 3/8	1 3/4	2 3/16
15·d	4 1/8	5 5/16	6 1/2
10·d	2 3/4	3 1/2	4 3/8
10·d	2 3/4	3 1/2	4 3/8
5·d	1 3/8	1 3/4	2 3/16

screws inserted **WITHOUT pre-drilled hole** — **G > 0.50**

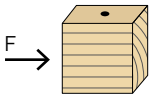


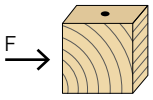


d_1	[in]		0.28	0.36	0.44
	[mm]		7	9	11
a_1	[in]	**15·d**	4 1/8	5 5/16	6 1/2
a_2	[in]	**7·d**	1 15/16	2 1/2	3 1/16
$a_{3,t}$	[in]	**20·d**	5 1/2	7 1/8	8 5/8
$a_{3,c}$	[in]	**15·d**	4 1/8	5 5/16	6 1/2
$a_{4,t}$	[in]	**12·d**	3 5/16	4 1/4	5 3/16
$a_{4,c}$	[in]	**7·d**	1 15/16	2 1/2	3 1/16

	0.28	0.36	0.44
	7	9	11
10·d	2 3/4	3 1/2	4 3/8
7·d	1 15/16	2 1/2	3 1/16
20·d	5 1/2	7 1/8	8 5/8
15·d	4 1/8	5 5/16	6 1/2
12·d	3 5/16	4 1/4	5 3/16
7·d	1 15/16	2 1/2	3 1/16

screws inserted **WITH pre-drilled hole**

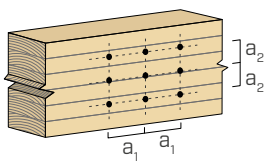




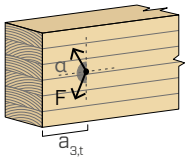
d_1	[in]		0.28	0.36		0.44
	[mm]		7	9		11
a_1	[in]	**10·d**	2 3/4	3 1/2	**5·d**	2 3/16
a_2	[in]	**4·d**	1 1/8	1 7/16	**5·d**	2 3/16
$a_{3,t}$	[in]	**12·d**	3 5/16	4 1/4	**7·d**	3 1/16
$a_{3,c}$	[in]	**7·d**	1 15/16	2 1/2	**4·d**	1 3/4
$a_{4,t}$	[in]	**7·d**	1 15/16	2 1/2	**4·d**	1 3/4
$a_{4,c}$	[in]	**3·d**	13/16	1 1/16	**3·d**	1 5/16

	0.28	0.36		0.44
	7	9		11
5·d	1 3/8	1 3/4	**5·d**	2 3/16
4·d	1 1/8	1 7/16	**5·d**	2 3/16
12·d	3 5/16	4 1/4	**7·d**	3 1/16
7·d	1 15/16	2 1/2	**4·d**	1 3/4
7·d	1 15/16	2 1/2	**4·d**	1 3/4
3·d	13/16	1 1/16	**3·d**	1 5/16

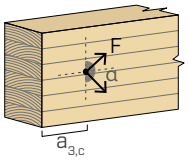
α = load-to-grain angle
d = d_1 = nominal diameter of the screw



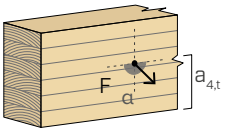
stressed end
-90° < α < 90°



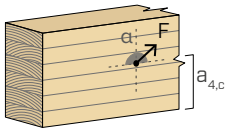
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



unload edge
180° < α < 360°



NOTE

- The minimum spacing and distances comply with Table 8 of ESR-4645, where d refers to the nominal diameter of the screw;
- Wood member stresses must be checked in accordance with the corresponding Sections of the NDS; end distances, edge distances and fastener spacing may need to be increased accordingly.

MINIMUM DISTANCES FOR AXIAL STRESSES | TIMBER

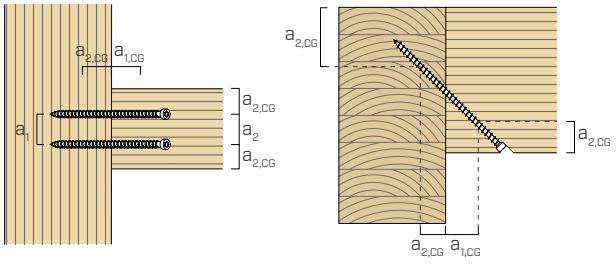
screws inserted **WITHOUT pre-drilled hole**

d_1	[in]		0.28	0.36		0.44
	[mm]		7	9		11
a_1	[in]	**7·d**	1 15/16	2 1/2	**7·d**	3 1/16
a_2	[in]	**4·d**	1 1/8	1 7/16	**5·d**	2 3/16
$a_{1,CG}$	[in]	**10·d**	2 3/4	3 1/2	**10·d**	4 3/8
$a_{2,CG}$	[in]	**4·d**	1 1/8	1 7/16	**4·d**	1 3/4
a_{CROSS}	[in]	**1,5·d**	7/16	9/16	**1,5·d**	11/16

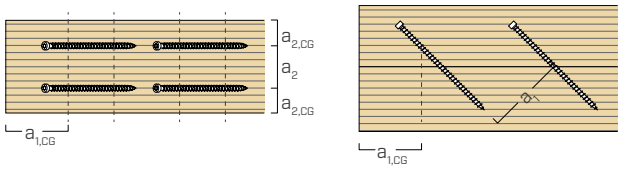
screws inserted **WITH pre-drilled hole**

d_1	[in]		0.28	0.36		0.44
	[mm]		7	9		11
a_1	[in]	**7·d**	1 15/16	2 1/2	**5·d**	2 3/16
a_2	[in]	**3·d**	13/16	1 1/16	**5·d**	2 3/16
$a_{1,CG}$	[in]	**7·d**	1 15/16	2 1/2	**4·d**	1 3/4
$a_{2,CG}$	[in]	**3·d**	13/16	1 1/16	**3·d**	1 5/16
a_{CROSS}	[in]	**1,5·d**	7/16	9/16	**1,5·d**	11/16

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

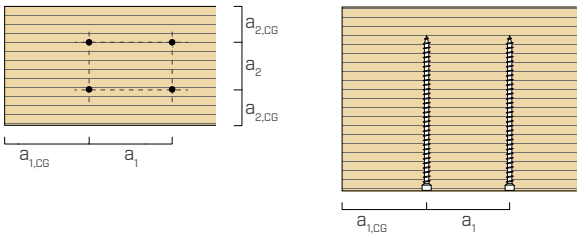


plan front



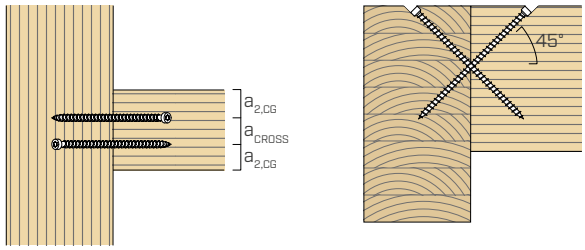
plan front

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



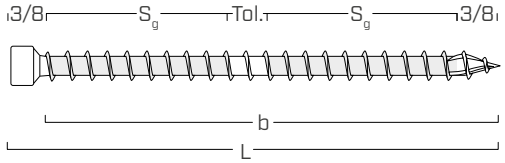
plan front

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



plan front

EFFECTIVE THREAD USED IN CALCULATION



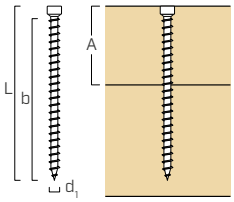
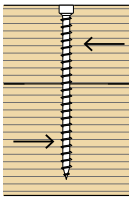
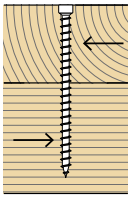
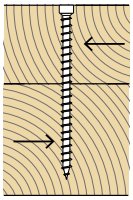
b = $\mathbf{S_{g,tot}}$ = L - 3/8" represents the entire length of the threaded part

$\mathbf{S_g}$ = (L - 3/8" - 3/8" - Tol.)/ 2 represents the partial length of the threaded part net of a laying tolerance (Tol.) of 3/8"

NOTE

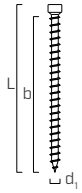
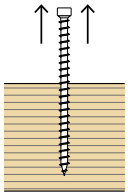
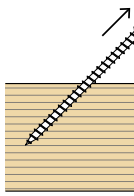
- The minimum spacing and distances comply with Table 8 of ESR-4645, where d refers to the nominal diameter of the screw;
- Wood member stresses must be checked in accordance with the corresponding Sections of the NDS; end distances, edge distances and fastener spacing may need to be increased accordingly.

REFERENCE LATERAL DESIGN VALUES (Z) | WOOD-TO-WOOD

geometry					$Z_{\parallel}$				$Z_{\perp/\parallel}$				$Z_{\perp}$			
																
d_1	L		b	A	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]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
7 **0.28**	80	3 1/8	2 3/4	1 9/16	118	165	219	263	94	132	175	211	94	132	175	211
	100	4	3 1/2	1 15/16	148	206	242	269	119	165	193	215	119	165	193	215
	120	4 3/4	4 3/8	2 3/8	174	210	242	269	140	168	193	215	140	168	193	215
	140-400	5 1/2-15 3/4	5 1/8-15 3/8	≥ 2 3/4	177	210	242	269	142	168	193	215	142	168	193	215
9 **0.36**	160-600	6 1/4-23 5/8	6-23 1/4	≥ 3 1/8	230	272	313	348	184	217	250	278	184	217	250	278
11 **0.44**	150	6	5 1/2	2 15/16	314	344	372	394	219	252	278	299	178	232	262	285
	200-1000	8-39 3/8	7 1/2-39	≥ 4	314	344	372	394	225	252	278	299	205	234	262	285

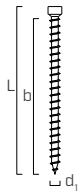
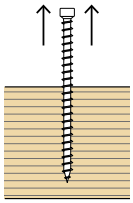
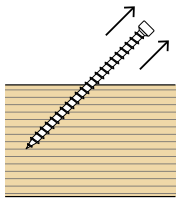
NOTES and **GENERAL PRINCIPLES** on page 163.

THREAD WITHDRAWAL (W) | WOOD

geometry				thread withdrawal α = 90°				thread withdrawal α = 45°				thread withdrawal α = 0°			
															
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]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
7 **0.28**	80	3 1/8	2 3/4	350	407	459	504	318	370	418	458	105	122	138	151
	100	4	3 1/2	461	536	605	663	419	488	550	604	138	161	181	199
	120	4 3/4	4 3/8	572	665	750	823	520	605	683	749	172	200	225	247
	140	5 1/2	5 1/8	683	794	896	983	621	723	815	895	205	238	269	295
	160	6 1/4	6	794	923	1042	1143	722	840	948	1040	238	277	312	343
	180	7 1/8	6 3/4	905	1052	1187	1303	823	958	1080	1185	271	316	356	391
	200	8	7 1/2	1016	1182	1333	1463	924	1075	1213	1331	305	354	400	439
	220	8 5/8	8 1/4	1127	1311	1479	1622	1025	1193	1345	1476	338	393	444	487
	240	9 1/2	9 1/16	1238	1440	1624	1782	1127	1310	1478	1622	371	432	487	535
	260	10 1/4	10	1349	1569	1770	1942	1228	1428	1611	1767	405	471	531	583
	280	11	10 5/8	1460	1698	1916	2102	1329	1545	1743	1913	438	509	575	631
	300	11 3/4	11 7/16	1571	1827	2061	2262	1430	1663	1876	2058	471	548	618	679
	320	12 5/8	12 3/16	1682	1956	2207	2422	1531	1780	2008	2204	505	587	662	726
	340	13 3/8	13	1793	2086	2353	2581	1632	1898	2141	2349	538	626	706	774
	360	14 1/4	13 3/4	1904	2215	2498	2741	1733	2015	2273	2495	571	664	749	822
	380	15	14 9/16	2015	2344	2644	2901	1834	2133	2406	2640	605	703	793	870
	400	15 3/4	15 3/8	2126	2473	2790	3061	1935	2250	2539	2785	638	742	837	918
9 **0.36**	160	6 1/4	6	1066	1221	1416	1554	970	1111	1288	1414	320	366	425	466
	180	7 1/8	6 3/4	1217	1394	1616	1775	1107	1269	1471	1615	365	418	485	532
	200	8	7 1/2	1368	1568	1817	1995	1245	1427	1654	1816	410	470	545	599
	220	8 5/8	8 1/4	1519	1741	2018	2216	1383	1584	1836	2016	456	522	605	665
	240	9 1/2	9 1/16	1671	1914	2219	2436	1520	1742	2019	2217	501	574	666	731
	260	10 1/4	10	1822	2087	2419	2657	1658	1900	2202	2418	547	626	726	797
	280	11	10 5/8	1973	2261	2620	2877	1795	2057	2384	2618	592	678	786	863
	300	11 3/4	11 7/16	2124	2434	2821	3098	1933	2215	2567	2819	637	730	846	929
	320	12 5/8	12 3/16	2275	2607	3022	3318	2071	2372	2750	3019	683	782	907	995
	340	13 3/8	13	2426	2780	3223	3539	2208	2530	2933	3220	728	834	967	1062
	360	14 1/4	13 3/4	2578	2954	3423	3759	2346	2688	3115	3421	773	886	1027	1128
	380	15	14 9/16	2729	3127	3624	3980	2483	2845	3298	3621	819	938	1087	1194
	400	15 3/4	15 3/8	2880	3300	3825	4200	2621	3003	3481	3822	864	990	1148	1260
	440	17 1/4	16 15/16	3182	3646	4227	4641	2896	3318	3846	4223	955	1094	1268	1392
	480	19	18 1/2	3485	3993	4628	5082	3171	3634	4212	4625	1045	1198	1388	1525
	520	20 1/2	20 1/16	3787	4339	5030	5523	3446	3949	4577	5026	1136	1302	1509	1657
	560	22	21 5/8	4089	4686	5431	5964	3721	4264	4942	5427	1227	1406	1629	1789
	600	23 5/8	23 1/4	4392	5032	5833	6405	3997	4579	5308	5828	1318	1510	1750	1921

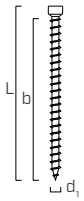
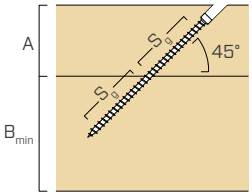
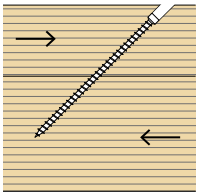
NOTES and GENERAL PRINCIPLES on page 163.

THREAD WITHDRAWAL (W) | WOOD

geometry				thread withdrawal α = 90°				thread withdrawal α = 45°				thread withdrawal α = 0°			
															
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]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
	150	6	5 1/2	1051	1219	1381	1513	957	1109	1257	1377	315	366	414	454
	200	8	7 1/2	1459	1691	1917	2100	1327	1539	1744	1911	438	507	575	630
	250	10	9 1/2	1866	2164	2452	2687	1698	1969	2232	2445	560	649	736	806
	275	10 7/8	10 7/16	2070	2400	2720	2980	1884	2184	2475	2712	621	720	816	894
	300	11 3/4	11 7/16	2274	2636	2988	3273	2069	2399	2719	2979	682	791	896	982
	325	12 3/4	12 3/8	2477	2872	3255	3567	2255	2614	2962	3246	743	862	977	1070
	350	13 3/4	13 3/8	2681	3109	3523	3860	2440	2829	3206	3513	804	933	1057	1158
	375	14 3/4	14 3/8	2885	3345	3791	4153	2625	3044	3450	3779	865	1003	1137	1246
	400	15 3/4	15 3/8	3089	3581	4059	4447	2811	3259	3693	4046	927	1074	1218	1334
	425	16 3/4	16 5/16	3292	3817	4326	4740	2996	3474	3937	4313	988	1145	1298	1422
	450	17 3/4	17 1/4	3496	4054	4594	5033	3182	3689	4181	4580	1049	1216	1378	1510
	475	18 11/16	18 5/16	3700	4290	4862	5326	3367	3904	4424	4847	1110	1287	1459	1598
11 **0.44**	500	19 3/4	19 5/16	3904	4526	5129	5620	3552	4119	4668	5114	1171	1358	1539	1686
	525	20 11/16	20 1/4	4107	4762	5397	5913	3738	4334	4911	5381	1232	1429	1619	1774
	550	21 5/8	21 1/4	4311	4998	5665	6206	3923	4549	5155	5648	1293	1500	1699	1862
	575	22 5/8	22 1/4	4515	5235	5933	6500	4109	4764	5399	5915	1354	1570	1780	1950
	600	23 5/8	23 1/4	4719	5471	6200	6793	4294	4978	5642	6182	1416	1641	1860	2038
	650	25 9/16	25 3/16	5126	5943	6736	7380	4665	5408	6130	6715	1538	1783	2021	2214
	700	27 1/2	27 3/16	5534	6416	7271	7966	5036	5838	6617	7249	1660	1925	2181	2390
	750	29 1/2	29 1/8	5941	6888	7807	8553	5406	6268	7104	7783	1782	2066	2342	2566
	800	31 1/2	31 1/8	6349	7361	8342	9139	5777	6698	7591	8317	1905	2208	2503	2742
	850	33 7/16	33 1/16	6756	7833	8877	9726	6148	7128	8079	8851	2027	2350	2663	2918
	900	35 1/2	35 1/16	7164	8306	9413	10313	6519	7558	8566	9385	2149	2492	2824	3094
	950	37 3/8	37	7571	8778	9948	10899	6890	7988	9053	9918	2271	2633	2985	3270
	1000	39 3/8	39	7978	9250	10484	11486	7260	8418	9540	10452	2394	2775	3145	3446

NOTES and **GENERAL PRINCIPLES** on page 163.

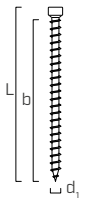
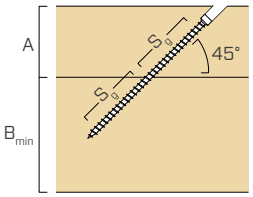
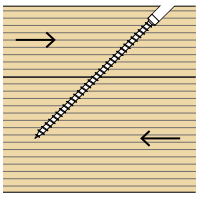
SLIDING RESISTANCE (R_v) | WOOD

geometry						R_v			
									
d_1	L		b	S_g	A	B_{min}	G			
							0.35	0.42	0.49	0.55
[mm] [in]	[mm]	[in]	[in]	[in]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]
7 **0.28**	80	3 1/8(1)	2 3/4	1	1 1/4	1 7/8	91	106	119	131
	100	4(1)	3 1/2	1 3/8	1 9/16	2 1/8	125	145	164	180
	120	4 3/4(1)	4 3/8	1 3/4	1 13/16	2 3/8	159	185	208	229
	140	5 1/2(1)	5 1/8	2 3/16	2 1/8	2 11/16	198	231	260	286
	160	6 1/4	6	2 9/16	2 3/8	3	232	270	305	335
	180	7 1/8	6 3/4	2 15/16	2 11/16	3 1/4	267	310	350	384
	200	8	7 1/2	3 3/8	2 15/16	3 1/2	306	356	402	441
	220	8 5/8	8 1/4	3 3/4	3 1/4	3 13/16	340	396	446	490
	240	9 1/2	9 1/16	4 1/8	3 1/2	4 1/8	374	435	491	539
	260	10 1/4	10	4 1/2	3 3/4	4 3/8	408	475	536	588
	280	11	10 5/8	4 15/16	4 1/16	4 5/8	448	521	588	645
	300	11 3/4	11 7/16	5 5/16	4 3/8	4 15/16	482	561	632	694
	320	12 5/8	12 3/16	5 11/16	4 5/8	5 3/16	516	600	677	743
	340	13 3/8	13	6 1/8	4 7/8	5 1/2	556	646	729	800
	360	14 1/4	13 3/4	6 1/2	5 3/16	5 3/4	590	686	774	849
	380	15	14 9/16	6 7/8	5 7/16	6	624	726	818	898
	400	15 3/4	15 3/8	7 1/4	5 11/16	6 1/4	658	765	863	947
9 **0.36**	160	6 1/4(1)	6	2 9/16	2 3/8	3	317	363	420	462
	180	7 1/8	6 3/4	2 15/16	2 11/16	3 1/4	363	416	482	529
	200	8	7 1/2	3 3/8	2 15/16	3 1/2	417	478	554	608
	220	8 5/8	8 1/4	3 3/4	3 1/4	3 13/16	463	531	615	676
	240	9 1/2	9 1/16	4 1/8	3 1/2	4 1/8	510	584	677	743
	260	10 1/4	10	4 1/2	3 3/4	4 3/8	556	637	738	811
	280	11	10 5/8	4 15/16	4 1/16	4 5/8	610	699	810	890
	300	11 3/4	11 7/16	5 5/16	4 3/8	4 15/16	656	752	872	957
	320	12 5/8	12 3/16	5 11/16	4 5/8	5 3/16	703	805	933	1025
	340	13 3/8	13	6 1/8	4 7/8	5 1/2	757	867	1005	1104
	360	14 1/4	13 3/4	6 1/2	5 3/16	5 3/4	803	920	1067	1171
	380	15	14 9/16	6 7/8	5 7/16	6	849	973	1128	1239
	400	15 3/4	15 3/8	7 1/4	5 11/16	6 1/4	896	1026	1190	1306
	440	17 1/4	16 15/16	8 1/16	6 1/4	6 7/8	996	1141	1323	1453
	480	19	18 1/2	8 7/8	6 7/8	7 7/16	1096	1256	1456	1599
	520	20 1/2	20 1/16	9 5/8	7 3/8	8 1/16	1189	1363	1579	1734
	560	22	21 5/8	10 7/16	8 1/16	8 5/8	1290	1478	1713	1881
	600	23 5/8	23 1/4	11 1/4	8 5/8	9 1/4	1390	1593	1846	2027

(1) The embedded thread length does not comply with the minimum requirement of ESR-4645 (8 times the outer thread diameter for screws installed at an angle 0°≤ α <90° to the grain).

NOTES and **GENERAL PRINCIPLES** on page 163.

SLIDING RESISTANCE (R_v) | WOOD

geometry						R_v			
									
d_1	L		b	S_g	A	B_{min}	G			
							0.35	0.42	0.49	0.55
[mm] [in]	[mm]	[in]	[in]	[in]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]
	150	6(1)	5 1/2	2 3/8	2 1/4	2 13/16	316	367	416	455
	200	8(1)	7 1/2	3 3/8	2 15/16	3 1/2	450	521	591	647
	250	10	9 1/2	4 3/8	3 5/8	4 3/16	583	676	766	839
	275	10 7/8	10 7/16	4 13/16	4	4 9/16	641	743	842	923
	300	11 3/4	11 7/16	5 5/16	4 3/8	4 15/16	708	820	930	1019
	325	12 3/4	12 3/8	5 13/16	4 11/16	5 1/4	774	898	1017	1115
	350	13 3/4	13 3/8	6 1/4	5 1/16	5 5/8	832	965	1094	1198
	375	14 3/4	14 3/8	6 3/4	5 3/8	6	899	1042	1181	1294
	400	15 3/4	15 3/8	7 1/4	5 11/16	6 1/4	966	1120	1269	1390
	425	16 3/4	16 5/16	7 3/4	6 1/16	6 5/8	1032	1197	1356	1486
	450	17 3/4	17 1/4	8 1/4	6 7/16	7	1099	1274	1444	1582
	475	18 11/16	18 5/16	8 5/8	6 3/4	7 3/8	1149	1332	1510	1654
11 **0.44**	500	19 3/4	19 5/16	9 1/4	7 1/8	7 11/16	1232	1428	1619	1774
	525	20 11/16	20 1/4	9 5/8	7 1/2	8 1/16	1282	1486	1685	1846
	550	21 5/8	21 1/4	10 1/4	7 13/16	8 7/16	1365	1583	1794	1965
	575	22 5/8	22 1/4	10 5/8	8 1/4	8 7/8	1415	1641	1860	2037
	600	23 5/8	23 1/4	11 1/4	8 5/8	9 1/4	1498	1737	1969	2157
	650	25 9/16	25 3/16	11 3/4	9 1/4	10	1565	1815	2057	2253
	700	27 1/2	27 3/16	12 3/4	10 1/16	10 5/8	1698	1969	2232	2445
	750	29 1/2	29 1/8	13 3/4	10 5/8	11 1/4	1831	2123	2407	2637
	800	31 1/2	31 1/8	14 3/4	11 7/16	12	1965	2278	2582	2828
	850	33 7/16	33 1/16	15 3/4	12	12 5/8	2098	2432	2757	3020
	900	35 1/2	35 1/16	16 3/4	12 3/4	13 3/8	2231	2587	2932	3212
	950	37 3/8	37	17 3/4	13 3/8	14	2364	2741	3107	3404
	1000	39 3/8	39	18 11/16	14 1/4	14 3/4	2489	2886	3271	3583

(1) The embedded thread length does not comply with the minimum requirement of ESR-4645 (8 times the outer thread diameter for screws installed at an angle 0°≤ α <90° to the grain).

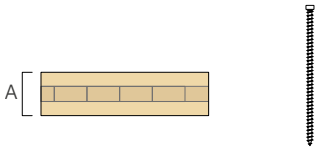
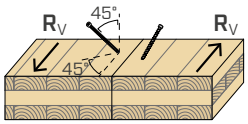
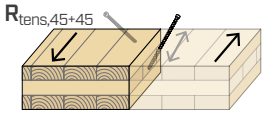
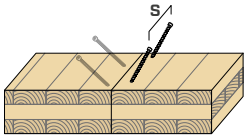
NOTES and **GENERAL PRINCIPLES** on page 163.

CLT | FLOOR-TO-BEAM | FLOOR-TO-WALL

geometry				SHEAR								SPACING	
				CLT-to-wood				CLT-to-CLT				steel tension	fastener in a row	
side member thickness (wall/floor) = A			suggested screw	R_v	$Z_\perp$	R_v	$Z_{m\perp}$	R_v	$Z_\perp$	R_v	$Z_{m\perp}$	$R_{tens,45}$	minimum	typical
[mm]		[in]	CODE	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[in]
3 PLY	60	2 3/8	VGZ7160	259	168	259	168	174	112	174	112	1025	4 1/8	6
			VGZ9160	352	217	352	217	236	146	236	146	1732	5 5/16	7
			VGZ11150	325	230	325	243	218	154	218	163	2263	6 1/2	9
	79	3 1/8	VGZ7220	394	168	394	168	264	112	264	112	1025	4 1/8	6
			VGZ9220	526	217	526	217	352	146	352	146	1732	5 5/16	7
			VGZ11250	571	234	571	252	383	157	383	169	2263	6 1/2	9
	105	4 1/8	VGZ7300	544	168	544	168	364	112	364	112	1025	4 1/8	6
			VGZ9300	726	217	726	217	486	146	486	146	1732	5 5/16	7
			VGZ11300	790	234	790	252	529	157	529	169	2263	6 1/2	9
	120	4 3/4	VGZ7340	633	168	633	168	424	112	424	112	1025	4 1/8	6
			VGZ9340	846	217	846	217	567	146	567	146	1732	5 5/16	7
			VGZ11350	921	234	921	252	617	157	617	169	2263	6 1/2	9
5 PLY	100	3 15/16	VGZ7280	516	168	516	168	346	112	346	112	1025	4 1/8	6
			VGZ9280	688	217	688	217	461	146	461	146	1732	5 5/16	7
			VGZ11300	749	234	749	252	502	157	502	169	2263	6 1/2	9
	140	5 1/2	VGZ7400	749	168	749	168	502	112	502	112	1025	4 1/8	6
			VGZ9400	1001	217	1001	217	671	146	671	146	1732	5 5/16	7
			VGZ11400	1090	234	1090	252	730	157	730	169	2263	6 1/2	9
	175	6 7/8	VGZ9480	1232	217	1232	217	825	146	825	146	1732	5 5/16	7
			VGZ11500	1390	234	1390	252	931	157	931	169	2263	6 1/2	9
	200	7 7/8	VGZ9560	1476	217	1476	217	989	146	989	146	1732	5 5/16	7
			VGZ11575	1608	234	1608	252	1078	157	1078	169	2263	6 1/2	9
7 PLY	140	5 1/2	VGZ7400	751	168	751	168	503	112	503	112	1025	4 1/8	6
			VGZ9400	1003	217	1003	217	672	146	672	146	1732	5 5/16	7
			VGZ11400	1093	234	1093	252	732	157	732	169	2263	6 1/2	9
	191	7 1/2	VGZ9560	1401	217	1401	217	939	146	939	146	1732	5 5/16	7
			VGZ11550	1527	234	1527	252	1023	157	1023	169	2263	6 1/2	9
	244	9 5/8	VGZ11700	1930	234	1930	252	1293	157	1293	169	2263	6 1/2	9
	280	11	VGZ11800	2235	234	2235	252	1498	157	1498	169	2263	6 1/2	9

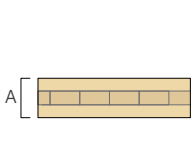
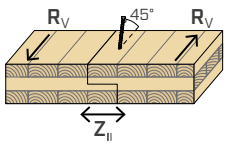
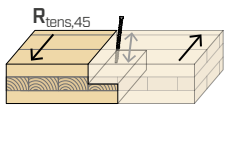
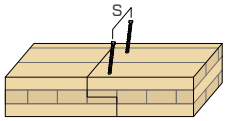
NOTES and GENERAL PRINCIPLES on page 163.

CLT | BUTT JOINT (double 45° inclination)

				SHEAR		SPACING	
geometry				butt joint	steel tension	fastener in a row	
							
	panel thickness = A		suggested screw	R_v	$R_{tens,45+45}$	minimum	typical
	[mm]	[in]	CODE	[lbf]	[lbf]	[in]	[in]
3 PLY	60	2 3/8	VGZ780	51	725	4 1/8	6
	79	3 1/8	VGZ7100	72	725	4 1/8	6
	105	4 1/8	VGZ7120	92	725	4 1/8	6
	120	4 3/4	VGZ7160	134	725	4 1/8	6
			VGZ9160	179	1225	5 5/16	7
			VGZ11150	180	1600	6 1/2	9
5 PLY	100	3 15/16	VGZ7120	92	725	4 1/8	6
	140	5 1/2	VGZ7180	154	725	4 1/8	6
			VGZ9180	207	1225	5 5/16	7
			VGZ11150	180	1600	6 1/2	9
	175	6 7/8	VGZ7220	195	725	4 1/8	6
			VGZ9220	262	1225	5 5/16	7
			VGZ11200	256	1600	6 1/2	9
	200	7 7/8	VGZ7260	236	725	4 1/8	6
			VGZ9260	317	1225	5 5/16	7
			VGZ11250	331	1600	6 1/2	9
7 PLY	140	5 1/2	VGZ7180	154	725	4 1/8	6
			VGZ9180	207	1225	5 5/16	7
			VGZ11150	180	1600	6 1/2	9
	191	7 1/2	VGZ7240	216	725	4 1/8	6
			VGZ9240	289	1225	5 5/16	7
			VGZ11250	331	1600	6 1/2	9
	244	9 5/8	VGZ7320	298	725	4 1/8	6
			VGZ9320	400	1225	5 5/16	7
			VGZ11300	406	1600	6 1/2	9
	280	11	VGZ7380	360	725	4 1/8	6
			VGZ9380	482	1225	5 5/16	7
			VGZ11350	481	1600	6 1/2	9
9 PLY	180	7 1/16	VGZ7220	195	725	4 1/8	6
			VGZ9220	262	1225	5 5/16	7
			VGZ11200	256	1600	6 1/2	9
	267	10 1/2	VGZ7360	339	725	4 1/8	6
			VGZ9360	455	1225	5 5/16	7
			VGZ11350	481	1600	6 1/2	9
	314	12 3/8	VGZ7400	380	725	4 1/8	6
			VGZ9400	510	1225	5 5/16	7
			VGZ11400	556	1600	6 1/2	9
	360	14 3/16	VGZ9480	620	1225	5 5/16	7
			VGZ11450	631	1600	6 1/2	9

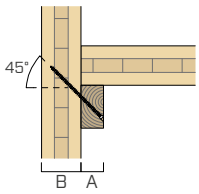
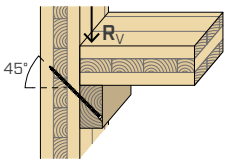
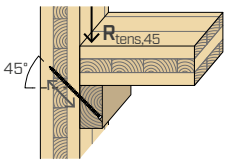
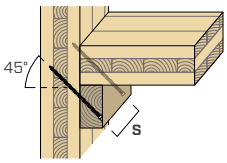
NOTES and GENERAL PRINCIPLES on page 163.

CLT | HALF LAP

				SHEAR					SPACING	
geometry				half lap orientation 1		half lap orientation 2		steel tension	fastener in a row	
											
panel thickness (wall/floor) = A			suggested screw	R_v	$Z_{\parallel}$	R_v	$Z_{\perp}$	$R_{tens,45}$	minimum	typical
[mm]		[in]	CODE	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[in]
3 PLY	60	2 3/8	VGZ780	103	165	103	132	1025	4 1/8	6
	79	3 1/8	VGZ7100	130	194	130	155	1025	4 1/8	6
	105	4 1/8	VGZ7120	138	199	138	159	1025	4 1/8	6
	120	4 3/4	VGZ7140	176	210	176	168	1025	4 1/8	6
			VGZ11150	325	344	325	230	2263	6 1/2	9
5 PLY	100	3 15/16	VGZ7120	152	208	152	166	1025	4 1/8	6
	140	5 1/2	VGZ7180	285	210	285	168	1025	4 1/8	6
			VGZ9180	385	272	385	217	1732	5 5/16	7
			VGZ11150	240	321	240	201	2263	6 1/2	9
	175	6 7/8	VGZ7220	348	210	348	168	1025	4 1/8	6
			VGZ9220	471	272	471	217	1732	5 5/16	7
			VGZ11200	394	344	394	234	2263	6 1/2	9
	200	7 7/8	VGZ7260	440	210	440	168	1025	4 1/8	6
			VGZ9260	594	272	594	217	1732	5 5/16	7
			VGZ11250	589	344	589	234	2263	6 1/2	9
7 PLY	140	5 1/2	VGZ7180	284	210	284	168	1025	4 1/8	6
			VGZ9180	384	272	384	217	1732	5 5/16	7
			VGZ11150	239	320	239	200	2263	6 1/2	9
	191	7 1/2	VGZ7240	385	210	385	168	1025	4 1/8	6
			VGZ9240	520	272	520	217	1732	5 5/16	7
			VGZ11250	630	344	630	234	2263	6 1/2	9
	244	9 5/8	VGZ7320	559	210	559	168	1025	4 1/8	6
			VGZ9320	753	272	753	217	1732	5 5/16	7
			VGZ11300	702	344	702	234	2263	6 1/2	9
	280	11	VGZ7380	703	210	703	168	1025	4 1/8	6
			VGZ9380	947	272	947	217	1732	5 5/16	7
			VGZ11350	853	344	853	234	2263	6 1/2	9
9 PLY	180	7 1/16	VGZ7220	332	210	332	168	1025	4 1/8	6
			VGZ9220	450	272	450	217	1732	5 5/16	7
			VGZ11200	371	344	371	234	2263	6 1/2	9
	267	10 1/2	VGZ7360	659	210	659	168	1025	4 1/8	6
			VGZ9360	888	272	888	217	1732	5 5/16	7
			VGZ11350	910	344	910	234	2263	6 1/2	9
	314	12 3/8	VGZ7400	686	210	686	168	1025	4 1/8	6
			VGZ9400	923	272	923	217	1732	5 5/16	7
			VGZ11400	1010	344	1010	234	2263	6 1/2	9
	360	14 3/16	VGZ9480	1189	272	1189	217	1732	5 5/16	7
			VGZ11450	1117	344	1117	234	2263	6 1/2	9

NOTES and GENERAL PRINCIPLES on page 163.

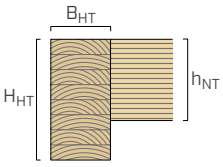
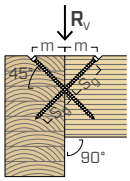
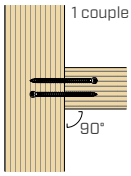
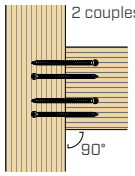
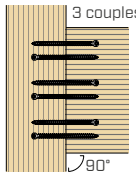
CLT | LEDGER CONNECTION

				SHEAR		SPACING	
geometry				CLT-to-ledger	steel tension	fastener in a row	
									
	main member thickness (wall) = B		side member thickness (ledger) = A	suggested screw	R_v	$R_{tens,45}$	minimum	typical
	[mm]	[in]	[in]	CODE	[lbf]	[lbf]	[in]	[in]
3 PLY	60	2 3/8	1 3/4	VGZ7120	246	1025	1 3/8	6
	79	3 1/8	1 3/4	VGZ7120	246	1025	1 3/8	6
	105	4 1/8	1 3/4	VGZ7120	246	1025	1 3/8	6
	120	4 3/4	1 3/4	VGZ7160	246	1025	1 3/8	6
			1 3/4	VGZ9160	340	1732	1 3/4	7
5 PLY	100	3 15/16	1 3/4	VGZ7120	246	1025	1 3/8	6
	140	5 1/2	3 1/2	VGZ7260	570	1025	1 3/8	6
			3 1/2	VGZ9260	786	1732	1 3/4	7
			3 1/2	VGZ11250	830	2263	2 3/16	9
	175	6 7/8	5 1/4	VGZ7380	874	1025	1 3/8	6
			5 1/4	VGZ9380	1172	1732	1 3/4	7
			5 1/4	VGZ11400	1314	2263	2 3/16	9
	200	7 7/8	5 1/4	VGZ7400	894	1025	1 3/8	6
			5 1/4	VGZ9400	1232	1732	1 3/4	7
			5 1/4	VGZ11400	1314	2263	2 3/16	9
7 PLY	140	5 1/2	3 1/2	VGZ7260	570	1025	1 3/8	6
			3 1/2	VGZ9260	786	1732	1 3/4	7
			3 1/2	VGZ11250	830	2263	2 3/16	9
	191	7 1/2	5 1/4	VGZ7400	894	1025	1 3/8	6
			5 1/4	VGZ9400	1232	1732	1 3/4	7
			5 1/4	VGZ11400	1314	2263	2 3/16	9
	244	9 5/8	6 1/2	VGZ9480	1510	1732	1 3/4	7
			6 1/2	VGZ11500	1654	2263	2 3/16	9
	280	11	6 1/2	VGZ9520	1551	1732	1 3/4	7
			6 1/2	VGZ11550	1654	2263	2 3/16	9

GENERAL PRINCIPLES and CONNECTIONS GENERAL NOTES on page 163.

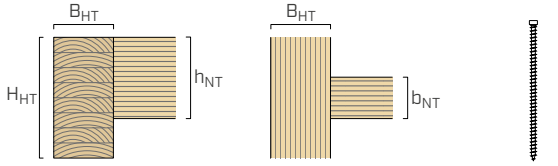
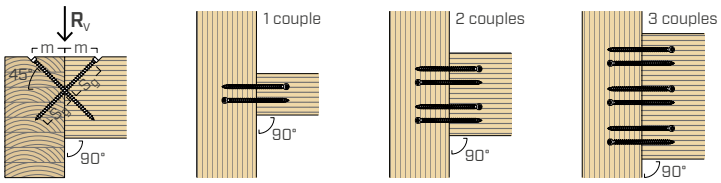
NOTES:

- Ledger Specific Gravity is considered as G = 0.49.
- The thread axial resistance to withdrawal has been evaluated considering an effective thread length equal to S_g. The connectors must be inserted at 45° with respect to the shear plane.
- Force-to-fastener angle is considered as 45°.
- The use of the JIG VGZ 45 template is recommended for professional installation of the connectors in this application.

geometry			crossed screws				
							

$H_{HT,min}$ $h_{NT,min}$	$B_{HT,min}$	$b_{NT,min}$	suggested screw	m	number of couples	R_v		$R_{tens,45}$
						SPF	D.Fir	
[in]	[in]	[in]	CODE	[in]		[lbf]	[lbf]	[lbf]
6	3 1/8	3 1/8	VGZ7200	2 15/16	1	712	804	2051
		3 1/2			2	1425	1607	4101
		5 1/8			3	2137	2411	6152
		3 1/2	VGZ9200	2 15/16	1	956	1108	3465
		5 1/8			2	1911	2215	6930
		5 1/2			3	2867	3323	10394
7 1/2	3 1/2	3 1/8	VGZ7260	3 3/4	1	950	1071	2051
		3 1/2			2	1900	2143	4101
		5 1/8			3	2849	3214	6152
		3 1/2	VGZ9260	3 3/4	1	1274	1477	3465
		5 1/8			2	2548	2954	6930
		5 1/2			3	3822	4430	10394
		5 1/8	VGZ11250	3 9/16	1	1351	1531	4525
		5 1/2			2	2703	3063	9051
		6 3/4			3	4054	4594	13576
9	5 1/8	3 1/8	VGZ7300	4 5/16	1	1121	1265	2051
		3 1/2			2	2242	2530	4101
		5 1/8			3	3364	3794	6152
		3 1/2	VGZ9300	4 5/16	1	1504	1743	3465
		5 1/8			2	3008	3487	6930
		5 1/2			3	4512	5230	10394
		5 1/8	VGZ11300	4 5/16	1	1641	1860	4525
		5 1/2			2	3282	3719	9051
		6 3/4			3	4923	5579	13576
10 1/2	5 1/2	3 1/8	VGZ7360	5 1/8	1	1372	1548	2051
		3 1/2			2	2744	3095	4101
		5 1/8			3	4116	4643	6152
		3 1/2	VGZ9360	5 1/8	1	1840	2133	3465
		5 1/8			2	3681	4266	6930
		5 1/2			3	5521	6399	10394
		5 1/8	VGZ11350	5	1	1930	2188	4525
		5 1/2			2	3861	4376	9051
		6 3/4			3	5791	6563	13576
12	6 3/4	3 1/8	VGZ7400	5 11/16	1	1530	1726	2051
		3 1/2			2	3060	3452	4101
		5 1/8			3	4590	5178	6152
		3 1/2	VGZ9400	5 11/16	1	2053	2379	3465
		5 1/8			2	4105	4758	6930
		5 1/2			3	6158	7138	10394
		5 1/8	VGZ11400	5 11/16	1	2239	2538	4525
		5 1/2			2	4479	5076	9051
		6 3/4			3	6718	7614	13576
13 1/2	6 3/4	3 1/2	VGZ9480	6 13/16	1	2513	2912	3465
		5 1/8			2	5025	5825	6930
		5 1/2			3	7538	8737	10394
		5 1/8	VGZ11475	6 13/16	1	2664	3019	4525
		5 1/2			2	5328	6038	9051
		6 3/4			3	7992	9057	13576

WOOD | CROSSED SCREW CONNECTION

geometry	crossed screws
	

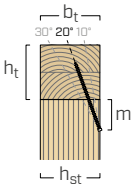
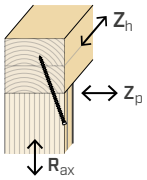
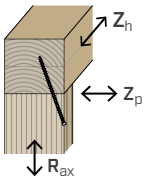
$H_{HT,min}$ $h_{NT,min}$ [in]	$B_{HT,min}$ [in]	$b_{NT,min}$ [in]	suggested screw CODE	m [in]	number of couples	R_v SPF [lbf]	R_v D.Fir [lbf]	$R_{tens,45}$ [lbf]
15	7 1/2	3 1/2	VGZ9520	7 3/8	1	2725	3159	3465
		5 1/8			2	5450	6317	6930
		5 1/2			3	8175	9476	10394
		5 1/8	VGZ11525	7 1/2	1	2973	3369	4525
		5 1/2			2	5946	6738	9051
		6 3/4			3	8918	10108	13576
16 1/2	9	3 1/2	VGZ9560	7 15/16	1	2955	3425	3465
		5 1/8			2	5910	6851	6930
		5 1/2			3	8865	10276	10394
		5 1/8	VGZ11575	8 3/16	1	3282	3719	4525
		5 1/2			2	6563	7438	9051
		6 3/4			3	9845	11158	13576
18	9	3 1/2	VGZ9600	8 7/16	1	3185	3692	3465
		5 1/8			2	6370	7384	6930
		5 1/2			3	9555	11076	10394
		5 1/8	VGZ11600	8 7/16	1	3475	3938	4525
		5 1/2			2	6949	7876	9051
		6 3/4			3	10424	11814	13576
19 1/2	10 1/2	5 1/8	VGZ11700	10	1	3938	4463	4525
		5 1/2			2	7876	8926	9051
		6 3/4			3	11814	13389	13576
21	10 1/2	5 1/8	VGZ11750	10 9/16	1	4247	4813	4525
		5 1/2			2	8494	9626	9051
		6 3/4			3	12741	14439	13576
22 1/2	12	5 1/8	VGZ11800	11 1/4	1	4556	5163	4525
		5 1/2			2	9111	10326	9051
		6 3/4			3	13667	15490	13576
24	12	5 1/8	VGZ11850	12	1	4865	5513	4525
		5 1/2			2	9729	11026	9051
		6 3/4			3	14594	16540	13576
24 1/2	13 1/2	5 1/8	VGZ11900	12 5/8	1	5173	5863	4525
		5 1/2			2	10347	11727	9051
		6 3/4			3	15520	17590	13576
27	15	5 1/8	VGZ11950	13 3/8	1	5482	6213	4525
		5 1/2			2	10965	12427	9051
		6 3/4			3	16447	18640	13576

GENERAL PRINCIPLES and **CONNECTIONS GENERAL NOTES** on page 163.

NOTES:

- The thread axial resistance to withdrawal has been evaluated considering an effective thread length equal to S_g. The connectors must be inserted at 45° with respect to the shear plane.
- The connector compression design strength is the lower between the withdrawal-side design strength and the instability design strength.
- Force-to-fastener angle is considered as 45°.
- The use of the JIG VGZ 45 template is recommended for professional installation of the connectors in this application.

WOOD | TOE-NAIL CONNECTION

geometry					wooden frame (Northern species)			wooden frame (SPF)		
										
$b_{st,min}$	$h_{st}=b_{t,min}$	$h_{t,min}$	m	suggested screw	R_{ax}	Z_h	Z_p	R_{ax}	Z_h	Z_p
[in]	[in]	[in]	[in]	CODE	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
2	4	4	3	**VGZ7160**	211	142	142	245	168	168
			3	**VGZ7180**	211	142	142	245	168	168
2	4	4	4	**VGZ7200**	297	142	142	346	168	168
			4 3/4	**VGZ7220**	362	142	142	421	168	168
			5 1/2	**VGZ7240**	415	142	142	483	168	168
			6	**VGZ7260**	449	142	142	522	168	168

GENERAL PRINCIPLES and **CONNECTIONS GENERAL NOTES** on page 163.

NOTES:

- The static values were calculated assuming an insertion angle of the screw with respect to the vertical of 20°.
- For uplift loads, the screw is assumed to resist with an axial mechanism. For the other load directions (Z_h and Z_p) the screw is assumed to resist with pure shear.
- The density considered is G = 0.35 for Northern Species, G = 0.42 for SPF.
- For simultaneous loads, in different directions, on a screw, the allowable load must be evaluated using the following equation: (Design Uplift ÷ Allowable Uplift) + (Design F_1 ÷ Allowable F_1) + (Design F_2 ÷ Allowable F_2) ≤ 1.0, where the three terms in the unity equation represent the possible generated force directions. The number of terms that must be considered for simultaneous loading is the sole discretion of the designer and depends on the method of calculating wind forces and the utilization of the screws within the structural system.

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.

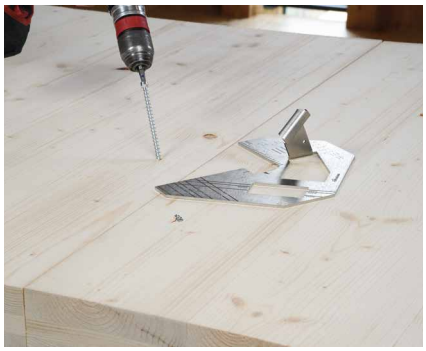
After tightening about one third of the screw, remove the JIGVGZ45 template and continue with the installation.

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
page 36

CATCH
page 436

BIT
page 446

JIG VGZ 45°
page 437

GENERAL PRINCIPLES

- Tabulated values comply with NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION in accordance with ESR-4645.
- To determine allowable loads for use with ASD, design loads for use with LRFD or both, tabulated values must be multiplied by all adjustment factors included in the NDS for dowel-type fasteners.
- As part of the connection design, the structural wood members, the steel plates must be sized and verified in accordance with the corresponding Section of the NDS and must be done separately by the designer.
- Connections with multiple screws must be designed in accordance with the corresponding Sections of the NDS and ESR-4645.
- VGZ screws must be installed and used in dry in-service conditions in accordance with the NDS (wet service factor for connection CM is 1.0).
- VGZ screws must be positioned in accordance with the minimum distances.
- In the case of combined axial and shear forces on a screw, for the determination of the load-bearing capacity refer to the Hankinson formula found in the NDS section 12.4.1.

REFERENCE LATERAL DESIGN VALUES

- Tabulated values are determined from the yield model equations in the corresponding Section of the NDS.
- Unless otherwise noted, the screw is intended to be inserted half in the main member and half in the side member.
- The screw penetration into the main member is minimum 6 times the outer thread diameter unless otherwise noted.
- The reference lateral design values may be determined for other connection configurations in accordance with the corresponding Section of NDS and ESR-4645.
- The reference lateral design values are calculated for screws inserted without pre-drilling hole. In the case of screws inserted with pre-drilling hole, greater resistance values can be obtained.

WOOD-TO-WOOD

- The wood main member thickness must be greater than the screw length minus the thickness of the wood side member.
- The tabulated lateral design values are based on both wood members having the same specific gravity G.

REFERENCE WITHDRAWAL DESIGN VALUES

- The reference withdrawal design values (W_{ref}) expressed in pounds-force per inch of thread penetration into the main member for screws installed at an angle of 90° to the grain can be found in the ESR-4645.
- The values for screws installed at an angle α to the grain are determined by multiplying the reference withdrawal design values with the effective thread penetration L_{eff} of the screw in the wood member and with the factor k_α:

  $W_\alpha = W_{ref} \cdot k_\alpha \cdot L_{eff}$

  Where:

  - W_{ref} is the reference withdrawal design value for screws installed at an angle of 90° to the grain, as shown in the table on the left;
  - k_α factor is calculated as:

$$k_\alpha = \begin{cases} 35^\circ < \alpha \leq 90^\circ & \dfrac{1}{1.2 \cdot \cos^2(\alpha) + \sin^2(\alpha)} \\ 0^\circ \leq \alpha \leq 35^\circ & 0.3 + 0.7 \cdot \dfrac{\alpha}{45} \end{cases}$$

  - α is the angle between the grain direction and screw axis.

  Tabulated values at page 151 are valid for L_{eff} equal to the screw thread length b minus the tip length L_t and $k_\alpha = 1$ for α=90°, $k_\alpha = 0.91$ for α= 45°, $k_\alpha = 0.3$ for α = 0°.
- The minimum embedded thread length is 6 times the outer thread diameter for screws installed at 90° to the grain, unless otherwise noted.
- The minimum embedded thread length for screws installed at an angle $0° \leq \alpha < 90°$ to the grain is 8 times the outer thread diameter, unless otherwise noted.
- At least four screws must be used in a connection with screws installed in the wood member with an angle between the grain direction and screw axis $\alpha \leq 15°$.
- The reference withdrawal design values must be inferior to f_{tens} of the screw.

REFERENCE WITHDRAWAL DESIGN VALUES

For fully-threaded screws the head pull-through resistanche is not relevant for the connection resistance, thread withdrawalis governing. these values must be compared with the tensile resistance of the screw; the lower value is the governing one.

SLIDING RESISTANCE

- Unless otherwise noted, the screws is inend to be inserted half in the main member and half in the side member.
- The 45° inclined screw is intended to work in withrawal and the resulting resistance of the connection is given by the projection of the withrawal resistance (along screw axis) onto the shear plane.
- The design values must be inferior to f_{tens} of the screw projected onto the shear plane.

CONNECTIONS

GENERAL NOTES

- Designed connections must respect all requirements on general principles and minimum distances.
- Calculations comply with the NDS in accordance with ESR 4645.
- Tabulated values, that are referred to a single fastener, are valid for Allowable Stress Design (ASD) considering a standard loading ($C_D = 1.0$).
- Timber element specific gravity is considered as G = 0.42, unless otherwise noted.
- Z_{II}: Force-to-grain angle in the shear plane is considered as 0°.
- $Z_\perp$: Force-to-grain angle in the shear plane is considered as 90°.
- $Z_{m\perp}$: Force-to-grain angle in the shear plane is considered as 0° for side member and as 90° for main member.
- R_v: withrawal resistance of the screws projected on the shear force axis.
- For the connectors inserted in the panel's face, it has been considered the same grain direction as the layer in the shear plane. For the connectors inserted in the panel's narrow edge, it has been considered the same grain direction as the layer in which the connector is installed.
- For lateral design values the force-to-fastener angle is always considered 90°.

FLOOR-TO-BEAM | FLOOR-TO-WALL

- The main grain direction of the CLT floor panel is considered both parallel and perpendicular to the beam's axis or wall plane.
- The main grain direction of the CLT wall panel is always considered as vertical.
- The threaded part of the screw has been always considered inserted in the central layer of the CLT panel.
- According to NDS, an end grain coefficient C_{eg}=0.67 is considered for the lateral resistance calculation due to fastener in narrow edge of CLT (FLOOR-TO-WALL).
- Beam element can be considered both solid wood or glulam.
- The width of the beams must comply with the minimum distance requirements.
- The proposed screw's length does not exceed the total thickness of the connection.
- The CLT side R_v resistance is calculated taking into account a screw-to-grain angle as the lowest between the involved layers. In this case the considered angle is 45°.

BUTT JOINT

- Force-to-fastener angle is considered to be 60°. The geometry of the joint requires that the connectors 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.
- An end grain coefficient C_{eg}=0.67 is considered for the withrawal resistance calculation due to fastener in narrow edge of CLT.
- Reported values represent the shear resistance of the connection along the shear plane for a single fastener.
- The proposed screw's length does not exceed the total thickness of the connection.
- The use of the JIG VGZ 45 template is recommended to ensure precise installation of the connectors in this application.

HALF LAP

- The main grain direction of the CLT floor panel is considered both parallel and perpendicular to the machining's direction.
- Force-to-fastener angle is considered as 45°. The screw are considered inserted at an angle of 45° with respect to the face of the CLT panel in the machining's direction. In this direction the the screw is intended to work in withrawal. In the opposite direction the screws are intended to work in shear.
- The width of half-lap machining on CLT panel must comply with the minimum distance requirements.
- The proposed screw's length does not exceed the total thickness of the connection.
- R_v resistance is calculated by taking into account the screw-to-grain angle as the lowest among the involved layers. In this case, the angle considered is 45°.