

HBS

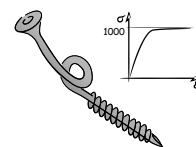
Countersunk screw

Galvanized carbon steel

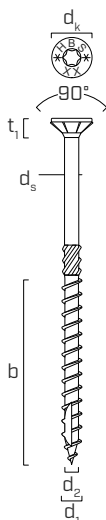


SPECIAL STEEL

Highly ductile (moves with the wood) and high-resistant steel ($f_{y,k} = 1000 \text{ N/mm}^2$).



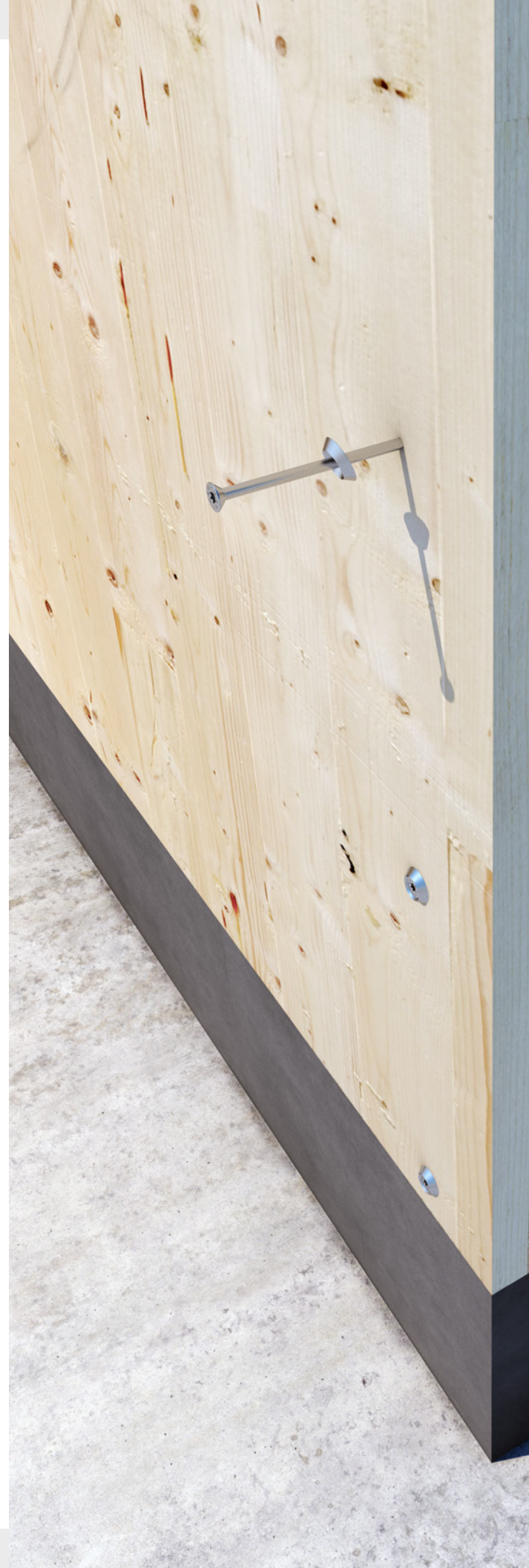
GEOMETRY AND MECHANICAL CHARACTERISTICS



HBS SCREW										
			3.5	4	4.5	5	6	8	10	12
Nominal diameter	d_1	[mm] [inch]	3.5 9/64"	4 10/64"	4.5 11/64"	5 12/64"	6 1/4"	8 5/16"	10 3/8"	12 1/2"
Head diameter	d_k	[mm] [inch]	7.00 0.276	8.00 0.315	9.00 0.354	10.00 0.394	12.00 0.472	14.50 0.571	18.25 0.719	20.75 0.817
Tip diameter	d_2	[mm] [inch]	2.25 2.25	2.55 2.55	2.80 2.80	3.40 3.40	3.95 3.95	5.40 5.40	6.40 6.40	6.80 6.80
Shank diameter	d_s	[mm] [inch]	2.45 0.096	2.75 0.108	3.15 0.124	3.65 0.144	4.30 0.169	5.80 0.228	7.00 0.276	8.00 0.315
Head thickness	t_1	[mm] [inch]	2.20 0.087	2.80 0.110	2.80 0.110	3.10 0.122	4.50 0.177	4.50 0.177	5.80 0.228	7.20 0.283
Pre-drilling diameter	d_v	[mm] [inch]	2.00 2.00	2.50 2.50	3.00 3.00	3.00 3.00	4.00 4.00	5.00 5.00	6.00 6.00	7.00 7.00
Bending strength	F_{yb}	[N/mm²] [psi]	1000 145038	1000 145038	1000 145038	1000 145038	1000 145038	1000 145038	1000 145038	1000 145038
Characteristic tensile strength	$f_{tens,k}$	[kN] [lbf]	3.8 854	5 1.124	6.4 1.439	7.9 1.776	11.3 2.540	20.1 4.519	31.4 7.059	33.9 7.621

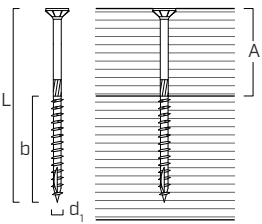
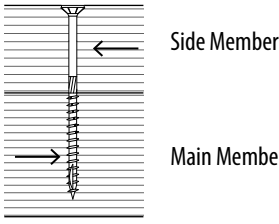
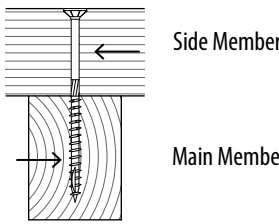
PRODUCT CODES AND PIECES PER PACKAGE

d _i	Length L	CODE	pcs	d _i	Length L	CODE	pcs
[mm] [inch]	[mm]			[mm] [inch]	[mm]		
3.5 9/64"	40	HBS3540	500	8 5/16"	80	HBS880	100
	45	HBS3545	400		100	HBS8100	100
	50	HBS3550	400		120	HBS8120	100
4 10/64"	30	HBS430	500		140	HBS8140	100
	35	HBS435	500		160	HBS8160	100
	40	HBS440	500		180	HBS8180	100
	45	HBS445	400		200	HBS8200	100
	50	HBS450	400		220	HBS8220	100
	60	HBS460	200		240	HBS8240	100
	70	HBS470	200		260	HBS8260	100
	80	HBS480	200		280	HBS8280	100
4.5 11/64"	40	HBS4540	400		300	HBS8300	100
	45	HBS4545	400		320	HBS8320	100
	50	HBS4550	200		340	HBS8340	100
	60	HBS4560	200		360	HBS8360	100
	70	HBS4570	200		380	HBS8380	100
	80	HBS4580	200		400	HBS8400	100
5 12/64"	40	HBS540	200		440	HBS8440	100
	45	HBS545	200		480	HBS8480	100
	50	HBS550	200		520	HBS8520	100
	60	HBS560	200	10 3/8"	80	HBS1080	50
	70	HBS570	100		100	HBS10100	50
	80	HBS580	100		120	HBS10120	50
	90	HBS590	100		140	HBS10140	50
	100	HBS5100	100		160	HBS10160	50
	120	HBS5120	100		180	HBS10180	50
6 1/4"	40	HBS640	100		200	HBS10200	50
	50	HBS650	100		220	HBS10220	50
	60	HBS660	100		240	HBS10240	50
	70	HBS670	100		260	HBS10260	50
	80	HBS680	100		280	HBS10280	50
	90	HBS690	100		300	HBS10300	50
	100	HBS6100	100		320	HBS10320	50
	110	HBS6110	100		340	HBS10340	50
	120	HBS6120	100		360	HBS10360	50
	130	HBS6130	100		380	HBS10380	50
	140	HBS6140	100		400	HBS10400	50
	150	HBS6150	100	12 1/2"	120	HBS12120	25
	160	HBS6160	100		160	HBS12160	25
	180	HBS6180	100		200	HBS12200	25
	200	HBS6200	100		240	HBS12240	25
	220	HBS6220	100		280	HBS12280	25
	240	HBS6240	100		320	HBS12320	25
	260	HBS6260	100		360	HBS12360	25
	280	HBS6280	100		400	HBS12400	25
	300	HBS6300	100		440	HBS12440	25
					480	HBS12480	25
					520	HBS12520	25
					560	HBS12560	25
					600	HBS12600	25

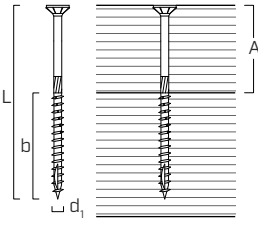
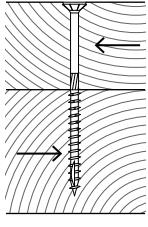


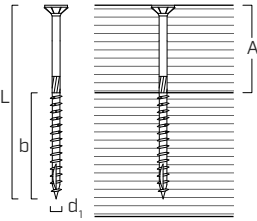
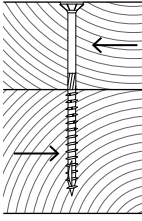
STATIC VALUES: SHEAR WOOD-WOOD

GEOMETRY							WOOD-WOOD Z//				WOOD-WOOD Z _{m⊥}			
d ₁	Length L		Thread length b		Side member A		REFERENCE LATERAL DESIGN VALUE (Z) FOR:				REFERENCE LATERAL DESIGN VALUE (Z) FOR:			
	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	G=0.35 Z//	G=0.42 Z//	G=0.50 Z//	G=0.55 Z//	G=0.35 Z _{m⊥}	G=0.42 Z _{m⊥}	G=0.50 Z _{m⊥}	G=0.55 Z _{m⊥}
3.5 9/64"	40	1 5/8"	18	11/16"	22	0.866	35	48	61	69	35	48	61	69
	45	1 5/8"	24	1"	21	0.827	39	52	63	69	39	52	63	69
	50	2"	24	1"	26	1.024	43	54	63	69	43	54	63	69
4 10/64"	30	1 1/8"	18	11/16"	12	0.472	30	42	58	68	30	42	58	68
	35	1 3/8"	18	11/16"	17	0.669	34	47	65	78	34	47	65	78
	40	1 5/8"	24	1"	16	0.630	40	54	68	77	40	54	68	77
	45	1 5/8"	30	1 1/8"	15	0.591	43	53	66	75	43	53	66	75
	50	2"	30	1 1/8"	20	0.787	47	60	76	87	47	60	76	87
	60	2 3/8"	35	1 3/8"	25	0.984	52	68	80	87	52	68	80	87
	70	2 3/4"	40	1 5/8"	30	1.181	57	68	80	87	57	68	80	87
4.5 11/64"	80	3 1/8"	40	1 5/8"	40	1.575	57	68	80	87	57	68	80	87
	40	1 5/8"	24	1"	16	0.630	46	64	84	95	46	64	84	95
	45	1 5/8"	30	1 1/8"	15	0.591	54	67	82	93	54	67	82	93
	50	2"	30	1 1/8"	20	0.787	57	74	93	106	57	74	93	106
	60	2 3/8"	35	1 3/8"	25	0.984	64	82	105	114	64	82	105	114
5 12/64"	70	2 3/4"	40	1 5/8"	30	1.181	70	89	105	114	70	89	105	114
	80	3 1/8"	40	1 5/8"	40	1.575	75	89	105	114	75	89	105	114
	40	1 5/8"	20	13/16"	20	0.787	51	72	99	118	51	72	99	118
	45	1 5/8"	24	1"	21	0.827	58	81	112	133	58	81	112	133
	50	2"	24	1"	26	1.024	64	90	124	146	64	90	124	146
	60	2 3/8"	30	1 1/8"	30	1.181	77	108	141	153	77	108	141	153
	70	2 3/4"	35	1 3/8"	35	1.378	90	120	141	153	90	120	141	153
	80	3 1/8"	40	1 5/8"	40	1.575	101	120	141	153	101	120	141	153
6 1/4"	90	3 4/8"	45	1 5/8"	45	1.772	101	120	141	153	101	120	141	153
	100	4"	50	2"	50	1.969	101	120	141	153	101	120	141	153
	120	4 3/4"	60	2 3/8"	60	2.362	101	120	141	153	101	120	141	153
	40	1 5/8"	35	1 3/8"	5	0.197	36	51	70	84	36	51	70	84
	50	2"	35	1 3/8"	15	0.591	86	119	142	158	86	119	142	158
	60	2 3/8"	30	1 1/8"	30	1.181	91	127	175	208	91	127	175	208
	70	2 3/4"	40	1 5/8"	30	1.181	107	143	182	210	107	143	182	210
	80	3 1/8"	40	1 5/8"	40	1.575	121	166	195	213	121	166	195	213
	90	3 4/8"	50	2"	40	1.575	128	166	195	213	128	166	195	213
	100	4"	50	2"	50	1.969	140	166	195	213	140	166	195	213
	110	4 3/8"	60	2 3/8"	50	1.969	140	166	195	213	140	166	195	213
	120	4 3/4"	60	2 3/8"	60	2.362	140	166	195	213	140	166	195	213
	130	5 1/8"	60	2 3/8"	70	2.756	140	166	195	213	140	166	195	213
	140	5 1/2"	75	2 3/4"	65	2.559	140	166	195	213	140	166	195	213
	150	6"	75	2 3/4"	75	2.953	140	166	195	213	140	166	195	213
	160	6 1/4"	75	2 3/4"	85	3.346	140	166	195	213	140	166	195	213
	180	7 1/8"	75	2 3/4"	105	4.134	140	166	195	213	140	166	195	213
8 5/16"	200	7 7/8"	75	2 3/4"	125	4.921	140	166	195	213	140	166	195	213
	220	8 5/8"	75	2 3/4"	145	5.709	140	166	195	213	140	166	195	213
	240	9 1/2"	75	2 3/4"	165	6.496	140	166	195	213	140	166	195	213
	260	10 1/4"	75	2 3/4"	185	7.283	140	166	195	213	140	166	195	213
	280	11"	75	2 3/4"	205	8.071	140	166	195	213	140	166	195	213
	300	11 7/8"	75	2 3/4"	225	8.858	140	166	195	213	140	166	195	213
	80	3 1/8"	52	2"	28	1.102	198	224	252	270	129	148	171	186
	100	4"	52	2"	48	1.890	254	282	308	323	150	181	218	239
	120	4 3/4"	60	2 3/8"	60	2.362	258	282	308	323	169	201	225	239
	140	5 1/2"	60	2 3/8"	80	3.150	258	282	308	323	179	201	225	239
	160	6 1/4"	80	3 1/8"	80	3.150	258	282	308	323	179	201	225	239
	180	7 1/8"	80	3 1/8"	100	3.937	258	282	308	323	179	201	225	239
	200	7 7/8"	80	3 1/8"	120	4.724	258	282	308	323	179	201	225	239
	220	8 5/8"	80	3 1/8"	140	5.512	258	282	308	323	179	201	225	239
	240	9 1/2"	80	3 1/8"	160	6.299	258	282	308	323	179	201	225	239
	260	10 1/4"	80	3 1/8"	180	7.087	258	282	308	323	179	201	225	239
	280	11"	80	3 1/8"	200	7.874	258	282	308	323	179	201	225	239
	300	11 7/8"	100	4"	200	7.874	258	282	308	323	179	201	225	239
8 5/16"	320	12 5/8"	100	4"	220	8.661	258	282	308	323	179	201	225	239
	340	13 3/8"	100	4"	240	9.449	258	282	308	323	179	201	225	239
	360	14 1/4"	100	4"	260	10.236	258	282	308	323	179	201	225	239
	380	15"	100	4"	280	11.024	258	282	308	323	179	201	225	239
	400	15 3/4"	100	4"	300	11.811	258	282	308	323	179	201	225	239
	440	17 1/4"	100	4"	340	13.386	258	282	308	323	179	201	225	239
	480	19"	100	4"	380	14.961	258	282	308	323	179	201	225	239
	520	20 1/2"	100	4"	420	16.535	258	282	308	323	179	201	225	239

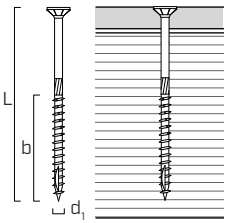
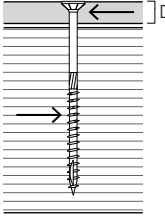
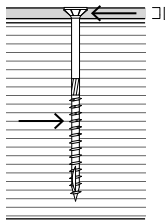
GEOMETRY							WOOD-WOOD Z//				WOOD-WOOD Z _{m⊥}			
														
							REFERENCE LATERAL DESIGN VALUE (Z) FOR:				REFERENCE LATERAL DESIGN VALUE (Z) FOR:			
d ₁ [mm] [inch]	Length L		Thread length b		Side member A		G=0.35 Z//	G=0.42 Z//	G=0.50 Z//	G=0.55 Z//	G=0.35 Z _{m⊥}	G=0.42 Z _{m⊥}	G=0.50 Z _{m⊥}	G=0.55 Z _{m⊥}
	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
10 3/8"	80	3 1/8"	52	2"	28	1.102	211	253	300	319	129	168	199	214
	100	4"	52	2"	48	1.890	245	294	350	385	152	188	231	256
	120	4 3/4"	60	2 3/8"	60	2.362	294	352	391	410	179	218	262	291
	140	5 1/2"	60	2 3/8"	80	3.150	327	358	391	410	197	246	275	293
	160	6 1/4"	80	3 1/8"	80	3.150	327	358	391	410	210	246	275	293
	180	7 1/8"	80	3 1/8"	100	3.937	327	358	391	410	219	246	275	293
	200	7 7/8"	80	3 1/8"	120	4.724	327	358	391	410	219	246	275	293
	220	8 5/8"	80	3 1/8"	140	5.512	327	358	391	410	219	246	275	293
	240	9 1/2"	80	3 1/8"	160	6.299	327	358	391	410	219	246	275	293
	260	10 1/4"	80	3 1/8"	180	7.087	327	358	391	410	219	246	275	293
	280	11"	80	3 1/8"	200	7.874	327	358	391	410	219	246	275	293
	300	11 7/8"	100	4"	200	7.874	327	358	391	410	219	246	275	293
	320	12 5/8"	100	4"	220	8.661	327	358	391	410	219	246	275	293
	340	13 3/8"	100	4"	240	9.449	327	358	391	410	219	246	275	293
	360	14 1/4"	100	4"	260	10.236	327	358	391	410	219	246	275	293
	380	15"	100	4"	280	11.024	327	358	391	410	219	246	275	293
	400	15 3/4"	100	4"	300	11.811	327	358	391	410	219	246	275	293
12 1/2"	120	4 3/4"	80	3 1/8"	40	1.575	332	375	424	454	192	226	260	282
	160	6 1/4"	80	3 1/8"	80	3.150	427	467	510	535	240	292	350	372
	200	7 7/8"	80	3 1/8"	120	4.724	427	467	510	535	278	312	350	372
	240	9 1/2"	80	3 1/8"	160	6.299	427	467	510	535	278	312	350	372
	280	11"	80	3 1/8"	200	7.874	427	467	510	535	278	312	350	372
	320	12 5/8"	120	4 3/4"	200	7.874	427	467	510	535	278	312	350	372
	360	14 1/4"	120	4 3/4"	240	9.449	427	467	510	535	278	312	350	372
	400	15 3/4"	120	4 3/4"	280	11.024	427	467	510	535	278	312	350	372
	440	17 1/4"	120	4 3/4"	320	12.598	427	467	510	535	278	312	350	372
	480	19"	120	4 3/4"	360	14.173	427	467	510	535	278	312	350	372
	520	20 1/2"	120	4 3/4"	400	15.748	427	467	510	535	278	312	350	372
	560	22"	120	4 3/4"	440	17.323	427	467	510	535	278	312	350	372
	600	23 5/8"	120	4 3/4"	480	18.898	427	467	510	535	278	312	350	372

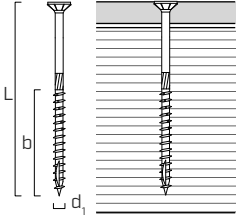
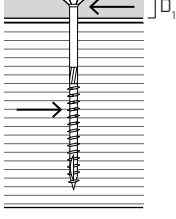
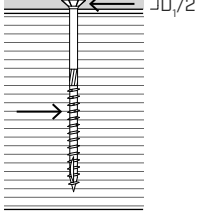
STATIC VALUES: SHEAR WOOD-WOOD

GEOMETRY							WOOD-WOOD $Z_{\perp}$			
										
							REFERENCE LATERAL DESIGN VALUE (Z) FOR:			
d_1	Length L		Thread length b		Side member A		G=0.35 $Z_{\perp}$	G=0.42 $Z_{\perp}$	G=0.50 $Z_{\perp}$	G=0.55 $Z_{\perp}$
$\frac{[mm]}{[inch]}$	$[mm]$	$[inch]$	$[mm]$	$[inch]$	$[mm]$	$[inch]$	$[lbf]$	$[lbf]$	$[lbf]$	$[lbf]$
3.5 9/64"	40	1 5/8"	18	11/16"	22	0.866	35	48	61	69
	45	1 5/8"	24	1"	21	0.827	39	52	63	69
	50	2"	24	1"	26	1.024	43	54	63	69
4 10/64"	30	1 1/8"	18	11/16"	12	0.472	30	42	58	68
	35	1 3/8"	18	11/16"	17	0.669	34	47	65	78
	40	1 5/8"	24	1"	16	0.630	40	54	68	77
	45	1 5/8"	30	1 1/8"	15	0.591	43	53	66	75
	50	2"	30	1 1/8"	20	0.787	47	60	76	87
	60	2 3/8"	35	1 3/8"	25	0.984	52	68	80	87
	70	2 3/4"	40	1 5/8"	30	1.181	57	68	80	87
4.5 11/64"	80	3 1/8"	40	1 5/8"	40	1.575	57	68	80	87
	40	1 5/8"	24	1"	16	0.630	46	64	84	95
	45	1 5/8"	30	1 1/8"	15	0.591	54	67	82	93
	50	2"	30	1 1/8"	20	0.787	57	74	93	106
	60	2 3/8"	35	1 3/8"	25	0.984	64	82	105	114
5 12/64"	70	2 3/4"	40	1 5/8"	30	1.181	70	89	105	114
	80	3 1/8"	40	1 5/8"	40	1.575	75	89	105	114
	40	1 5/8"	20	13/16"	20	0.787	51	72	99	118
	45	1 5/8"	24	1"	21	0.827	58	81	112	133
	50	2"	24	1"	26	1.024	64	90	124	146
	60	2 3/8"	30	1 1/8"	30	1.181	77	108	141	153
	70	2 3/4"	35	1 3/8"	35	1.378	90	120	141	153
6 1/4"	80	3 1/8"	40	1 5/8"	40	1.575	101	120	141	153
	90	3 4/8"	45	1 5/8"	45	1.772	101	120	141	153
	100	4"	50	2"	50	1.969	101	120	141	153
	120	4 3/4"	60	2 3/8"	60	2.362	101	120	141	153
	40	1 5/8"	35	1 3/8"	5	0.197	36	51	70	84
	50	2"	35	1 3/8"	15	0.591	86	119	142	158
	60	2 3/8"	30	1 1/8"	30	1.181	91	127	175	208
	70	2 3/4"	40	1 5/8"	30	1.181	107	143	182	210
	80	3 1/8"	40	1 5/8"	40	1.575	121	166	195	213
	90	3 4/8"	50	2"	40	1.575	128	166	195	213
	100	4"	50	2"	50	1.969	140	166	195	213
	110	4 3/8"	60	2 3/8"	50	1.969	140	166	195	213
	120	4 3/4"	60	2 3/8"	60	2.362	140	166	195	213
	130	5 1/8"	60	2 3/8"	70	2.756	140	166	195	213
	140	5 1/2"	75	2 3/4"	65	2.559	140	166	195	213
8 5/16"	150	6"	75	2 3/4"	75	2.953	140	166	195	213
	160	6 1/4"	75	2 3/4"	85	3.346	140	166	195	213
	180	7 1/8"	75	2 3/4"	105	4.134	140	166	195	213
	200	7 7/8"	75	2 3/4"	125	4.921	140	166	195	213
	220	8 5/8"	75	2 3/4"	145	5.709	140	166	195	213
	240	9 1/2"	75	2 3/4"	165	6.496	140	166	195	213
	260	10 1/4"	75	2 3/4"	185	7.283	140	166	195	213
	280	11"	75	2 3/4"	205	8.071	140	166	195	213
	300	11 7/8"	75	2 3/4"	225	8.858	140	166	195	213
	80	3 1/8"	52	2"	28	1.102	109	137	160	176
	100	4"	52	2"	48	1.890	127	166	206	223
	120	4 3/4"	60	2 3/8"	60	2.362	152	183	208	223
	140	5 1/2"	60	2 3/8"	80	3.150	155	183	208	223
	160	6 1/4"	80	3 1/8"	80	3.150	160	183	208	223
	180	7 1/8"	80	3 1/8"	100	3.937	160	183	208	223
8 5/16"	200	7 7/8"	80	3 1/8"	120	4.724	160	183	208	223
	220	8 5/8"	80	3 1/8"	140	5.512	160	183	208	223
	240	9 1/2"	80	3 1/8"	160	6.299	160	183	208	223
	260	10 1/4"	80	3 1/8"	180	7.087	160	183	208	223
	280	11"	80	3 1/8"	200	7.874	160	183	208	223
	300	11 7/8"	100	4"	200	7.874	160	183	208	223
	320	12 5/8"	100	4"	220	8.661	160	183	208	223
	340	13 3/8"	100	4"	240	9.449	160	183	208	223
	360	14 1/4"	100	4"	260	10.236	160	183	208	223
	380	15"	100	4"	280	11.024	160	183	208	223
	400	15 3/4"	100	4"	300	11.811	160	183	208	223
	440	17 1/4"	100	4"	340	13.386	160	183	208	223
	480	19"	100	4"	380	14.961	160	183	208	223
	520	20 1/2"	100	4"	420	16.535	160	183	208	223

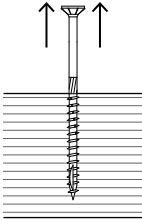
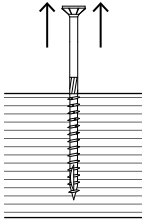
GEOMETRY							WOOD-WOOD $Z_{\perp}$			
										
							REFERENCE LATERAL DESIGN VALUE (Z) FOR:			
d_1	Length L		Thread length b		Side member A		$G=0.35$ $Z_{\perp}$	$G=0.42$ $Z_{\perp}$	$G=0.50$ $Z_{\perp}$	$G=0.55$ $Z_{\perp}$
$\frac{[mm]}{[inch]}$	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[lbf]	[lbf]	[lbf]	[lbf]
10 3/8"	80	3 1/8"	52	2"	28	1.102	91	119	153	176
	100	4"	52	2"	48	1.890	106	138	178	204
	120	4 3/4"	60	2 3/8"	60	2.362	127	166	213	245
	140	5 1/2"	60	2 3/8"	80	3.150	151	197	243	267
	160	6 1/4"	80	3 1/8"	80	3.150	170	219	249	267
	180	7 1/8"	80	3 1/8"	100	3.937	191	219	249	267
	200	7 7/8"	80	3 1/8"	120	4.724	191	219	249	267
	220	8 5/8"	80	3 1/8"	140	5.512	191	219	249	267
	240	9 1/2"	80	3 1/8"	160	6.299	191	219	249	267
	260	10 1/4"	80	3 1/8"	180	7.087	191	219	249	267
	280	11"	80	3 1/8"	200	7.874	191	219	249	267
	300	11 7/8"	100	4"	200	7.874	192	219	249	267
	320	12 5/8"	100	4"	220	8.661	192	219	249	267
	340	13 3/8"	100	4"	240	9.449	192	219	249	267
	360	14 1/4"	100	4"	260	10.236	192	219	249	267
	380	15"	100	4"	280	11.024	192	219	249	267
	400	15 3/4"	100	4"	300	11.811	192	219	249	267
12 1/2"	120	4 3/4"	80	3 1/8"	40	1.575	145	189	235	257
	160	6 1/4"	80	3 1/8"	80	3.150	177	230	297	333
	200	7 7/8"	80	3 1/8"	120	4.724	215	265	311	333
	240	9 1/2"	80	3 1/8"	160	6.299	215	265	311	333
	280	11"	80	3 1/8"	200	7.874	215	265	311	333
	320	12 5/8"	120	4 3/4"	200	7.874	240	274	311	333
	360	14 1/4"	120	4 3/4"	240	9.449	240	274	311	333
	400	15 3/4"	120	4 3/4"	280	11.024	240	274	311	333
	440	17 1/4"	120	4 3/4"	320	12.598	240	274	311	333
	480	19"	120	4 3/4"	360	14.173	240	274	311	333
	520	20 1/2"	120	4 3/4"	400	15.748	240	274	311	333
	560	22"	120	4 3/4"	440	17.323	240	274	311	333
	600	23 5/8"	120	4 3/4"	480	18.898	240	274	311	333

STATIC VALUES: SHEAR STEEL-WOOD

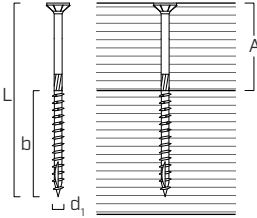
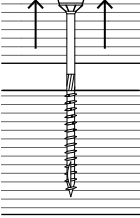
GEOMETRY					WOOD-STEEL (thickness= D_1) Z_{II}				WOOD-STEEL (thickness= $D_1/2$) Z_{II}			
												
					REFERENCE LATERAL DESIGN VALUE (Z) FOR:				REFERENCE LATERAL DESIGN VALUE (Z) FOR:			
d_1 [mm] [inch]	Length L		Thread length b		$G=0.35$ Z_{II}	$G=0.42$ Z_{II}	$G=0.50$ Z_{II}	$G=0.55$ Z_{II}	$G=0.35$ Z_{II}	$G=0.42$ Z_{II}	$G=0.50$ Z_{II}	$G=0.55$ Z_{II}
	[mm]	[inch]	[mm]	[inch]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
3.5 9/64"	40	1 5/8"	18	11/16"	64	75	87	95	52	60	69	75
	45	1 5/8"	24	1"	64	75	87	95	52	60	69	75
	50	2"	24	1"	64	75	87	95	52	60	69	75
4 10/64"	30	1 1/8"	18	11/16"	68	88	110	119	60	76	88	95
	35	1 3/8"	18	11/16"	75	94	110	119	65	76	88	95
	40	1 5/8"	24	1"	80	94	110	119	65	76	88	95
	45	1 5/8"	30	1 1/8"	80	94	110	119	65	76	88	95
	50	2"	30	1 1/8"	80	94	110	119	65	76	88	95
	60	2 3/8"	35	1 3/8"	80	94	110	119	65	76	88	95
	70	2 3/4"	40	1 5/8"	80	94	110	119	65	76	88	95
4.5 11/64"	80	3 1/8"	40	1 5/8"	80	94	110	119	65	76	88	95
	40	1 5/8"	24	1"	98	124	144	157	85	99	115	124
	45	1 5/8"	30	1 1/8"	105	124	144	157	85	99	115	124
	50	2"	30	1 1/8"	105	124	144	157	85	99	115	124
	60	2 3/8"	35	1 3/8"	105	124	144	157	85	99	115	124
5 12/64"	70	2 3/4"	40	1 5/8"	105	124	144	157	85	99	115	124
	80	3 1/8"	40	1 5/8"	105	124	144	157	85	99	115	124
	40	1 5/8"	20	13/16"	120	156	194	210	104	132	152	164
	45	1 5/8"	24	1"	129	166	194	210	113	132	152	164
	50	2"	24	1"	139	166	194	210	113	132	152	164
	60	2 3/8"	30	1 1/8"	141	166	194	210	113	132	152	164
	70	2 3/4"	35	1 3/8"	141	166	194	210	113	132	152	164
	80	3 1/8"	40	1 5/8"	141	166	194	210	113	132	152	164
	90	3 4/8"	45	1 5/8"	141	166	194	210	113	132	152	164
6 1/4"	100	4"	50	2"	141	166	194	210	113	132	152	164
	120	4 3/4"	60	2 3/8"	141	166	194	210	113	132	152	164
	40	1 5/8"	35	1 3/8"	153	194	248	284	126	168	211	228
	50	2"	35	1 3/8"	173	225	269	292	152	183	211	228
	60	2 3/8"	30	1 1/8"	196	231	269	292	157	183	211	228
	70	2 3/4"	40	1 5/8"	196	231	269	292	157	183	211	228
	80	3 1/8"	40	1 5/8"	196	231	269	292	157	183	211	228
	90	3 4/8"	50	2"	196	231	269	292	157	183	211	228
	100	4"	50	2"	196	231	269	292	157	183	211	228
	110	4 3/8"	60	2 3/8"	196	231	269	292	157	183	211	228
	120	4 3/4"	60	2 3/8"	196	231	269	292	157	183	211	228
	130	5 1/8"	60	2 3/8"	196	231	269	292	157	183	211	228
	140	5 1/2"	75	2 3/4"	196	231	269	292	157	183	211	228
	150	6"	75	2 3/4"	196	231	269	292	157	183	211	228
	160	6 1/4"	75	2 3/4"	196	231	269	292	157	183	211	228
	180	7 1/8"	75	2 3/4"	196	231	269	292	157	183	211	228
	200	7 7/8"	75	2 3/4"	196	231	269	292	157	183	211	228
	220	8 5/8"	75	2 3/4"	196	231	269	292	157	183	211	228
	240	9 1/2"	75	2 3/4"	196	231	269	292	157	183	211	228
	260	10 1/4"	75	2 3/4"	196	231	269	292	157	183	211	228
	280	11"	75	2 3/4"	196	231	269	292	157	183	211	228
	300	11 7/8"	75	2 3/4"	196	231	269	292	157	183	211	228
8 5/16"	80	3 1/8"	52	2"	357	389	423	442	281	305	329	343
	100	4"	52	2"	357	389	423	442	281	305	329	343
	120	4 3/4"	60	2 3/8"	357	389	423	442	281	305	329	343
	140	5 1/2"	60	2 3/8"	357	389	423	442	281	305	329	343
	160	6 1/4"	80	3 1/8"	357	389	423	442	281	305	329	343
	180	7 1/8"	80	3 1/8"	357	389	423	442	281	305	329	343
	200	7 7/8"	80	3 1/8"	357	389	423	442	281	305	329	343
	220	8 5/8"	80	3 1/8"	357	389	423	442	281	305	329	343
	240	9 1/2"	80	3 1/8"	357	389	423	442	281	305	329	343
	260	10 1/4"	80	3 1/8"	357	389	423	442	281	305	329	343
	280	11"	80	3 1/8"	357	389	423	442	281	305	329	343
	300	11 7/8"	100	4"	357	389	423	442	281	305	329	343
	320	12 5/8"	100	4"	357	389	423	442	281	305	329	343
	340	13 3/8"	100	4"	357	389	423	442	281	305	329	343
	360	14 1/4"	100	4"	357	389	423	442	281	305	329	343
	380	15"	100	4"	357	389	423	442	281	305	329	343
	400	15 3/4"	100	4"	357	389	423	442	281	305	329	343
	440	17 1/4"	100	4"	357	389	423	442	281	305	329	343
	480	19"	100	4"	357	389	423	442	281	305	329	343
	520	20 1/2"	100	4"	357	389	423	442	281	305	329	343

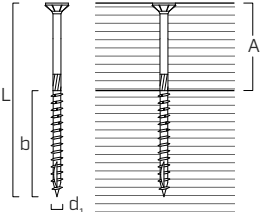
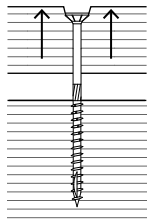
GEOMETRY					WOOD-STEEL (thickness= D_1) Z_{II}				WOOD-STEEL (thickness= $D_1/2$) Z_{II}			
												
					REFERENCE LATERAL DESIGN VALUE (Z) FOR:				REFERENCE LATERAL DESIGN VALUE (Z) FOR:			
d_1	Length L		Thread length b		$G=0.35$ Z_{II}	$G=0.42$ Z_{II}	$G=0.50$ Z_{II}	$G=0.55$ Z_{II}	$G=0.35$ Z_{II}	$G=0.42$ Z_{II}	$G=0.50$ Z_{II}	$G=0.55$ Z_{II}
$\frac{[mm]}{[inch]}$	$[mm]$	$[inch]$	$[mm]$	$[inch]$	$[lbf]$	$[lbf]$	$[lbf]$	$[lbf]$	$[lbf]$	$[lbf]$	$[lbf]$	$[lbf]$
10 3/8"	80	3 1/8"	52	2"	426	488	536	560	359	390	421	438
	100	4"	52	2"	452	493	536	560	359	390	421	438
	120	4 3/4"	60	2 3/8"	452	493	536	560	359	390	421	438
	140	5 1/2"	60	2 3/8"	452	493	536	560	359	390	421	438
	160	6 1/4"	80	3 1/8"	452	493	536	560	359	390	421	438
	180	7 1/8"	80	3 1/8"	452	493	536	560	359	390	421	438
	200	7 7/8"	80	3 1/8"	452	493	536	560	359	390	421	438
	220	8 5/8"	80	3 1/8"	452	493	536	560	359	390	421	438
	240	9 1/2"	80	3 1/8"	452	493	536	560	359	390	421	438
	260	10 1/4"	80	3 1/8"	452	493	536	560	359	390	421	438
	280	11"	80	3 1/8"	452	493	536	560	359	390	421	438
	300	11 7/8"	100	4"	452	493	536	560	359	390	421	438
	320	12 5/8"	100	4"	452	493	536	560	359	390	421	438
	340	13 3/8"	100	4"	452	493	536	560	359	390	421	438
	360	14 1/4"	100	4"	452	493	536	560	359	390	421	438
	380	15"	100	4"	452	493	536	560	359	390	421	438
	400	15 3/4"	100	4"	452	493	536	560	359	390	421	438
12 1/2"	120	4 3/4"	80	3 1/8"	590	644	700	732	475	515	556	580
	160	6 1/4"	80	3 1/8"	590	644	700	732	475	515	556	580
	200	7 7/8"	80	3 1/8"	590	644	700	732	475	515	556	580
	240	9 1/2"	80	3 1/8"	590	644	700	732	475	515	556	580
	280	11"	80	3 1/8"	590	644	700	732	475	515	556	580
	320	12 5/8"	120	4 3/4"	590	644	700	732	475	515	556	580
	360	14 1/4"	120	4 3/4"	590	644	700	732	475	515	556	580
	400	15 3/4"	120	4 3/4"	590	644	700	732	475	515	556	580
	440	17 1/4"	120	4 3/4"	590	644	700	732	475	515	556	580
	480	19"	120	4 3/4"	590	644	700	732	475	515	556	580
	520	20 1/2"	120	4 3/4"	590	644	700	732	475	515	556	580
	560	22"	120	4 3/4"	590	644	700	732	475	515	556	580
	600	23 5/8"	120	4 3/4"	590	644	700	732	475	515	556	580

STATIC VALUES: TRACTION THREAD WITHDRAWAL

WITHDRAWAL					WITHDRAWAL				
									
d_1	$G=0.33$ W	$G=0.42$ W	$G=0.50$ W	$G=0.55$ W	d_1	$G=0.33$ W	$G=0.42$ W	$G=0.50$ W	$G=0.55$ W
$\frac{[mm]}{[inch]}$	$[lbs/in]$	$[lbs/in]$	$[lbs/in]$	$[lbs/in]$	$\frac{[mm]}{[inch]}$	$[lbs/in]$	$[lbs/in]$	$[lbs/in]$	$[lbs/in]$
3.5 9/64"	84	111	144	166	6 1/4"	126	166	216	249
4 10/64"	93	122	159	184	8 5/16"	157	206	268	309
4.5 11/64"	102	134	174	200	10 3/8"	185	244	316	365
5 12/64"	110	145	188	217	12 1/2"	212	279	363	418

STATIC VALUES: TRACTION HEAD PENETRATION

GEOMETRY							HEAD-PULL THROUGH W_H			
										
d_1	Length L		Head Diameter (d_k)		Side Member Thickness A		G=0.35 W_H	G=0.42 W_H	G=0.50 W_H	G=0.55 W_H
$\begin{matrix} [\text{mm}] \\ [\text{inch}] \end{matrix}$	$\begin{matrix} [\text{mm}] \\ [\text{inch}] \end{matrix}$	$\begin{matrix} [\text{mm}] \\ [\text{inch}] \end{matrix}$	$\begin{matrix} [\text{mm}] \\ [\text{inch}] \end{matrix}$	$\begin{matrix} [\text{mm}] \\ [\text{inch}] \end{matrix}$	$\begin{matrix} [\text{mm}] \\ [\text{inch}] \end{matrix}$	$\begin{matrix} [\text{mm}] \\ [\text{inch}] \end{matrix}$	[lbf]	[lbf]	[lbf]	[lbf]
3.5 9/64"	40	1 5/8"	7.00	0.276	22	0.866	50	73	103	124
	45	1 5/8"	7.00	0.276	21	0.827	50	73	103	124
	50	2"	7.00	0.276	26	0.945	50	73	103	124
4 10/64"	30	1 1/8"	8.00	0.315	12	0.472	39	57	81	98
	35	1 3/8"	8.00	0.315	17	0.669	56	81	114	138
	40	1 5/8"	8.00	0.315	16	0.630	53	76	107	130
	45	1 5/8"	8.00	0.315	15	0.591	49	71	101	122
	50	2"	8.00	0.315	20	0.787	66	95	134	163
	60	2 3/8"	8.00	0.315	25	0.945	66	95	134	163
	70	2 3/4"	8.00	0.315	30	1.181	66	95	134	163
	80	3 1/8"	8.00	0.315	40	1.575	66	95	134	163
4.5 11/64"	40	1 5/8"	9.00	0.354	16	0.630	59	85	121	146
	45	1 5/8"	9.00	0.354	15	0.591	56	80	113	137
	50	2"	9.00	0.354	20	0.787	74	107	151	183
	60	2 3/8"	9.00	0.354	25	0.945	83	120	170	206
	70	2 3/4"	9.00	0.354	30	1.181	83	120	170	206
5 12/64"	80	3 1/8"	9.00	0.354	40	1.575	83	120	170	206
	40	1 5/8"	10.00	0.394	20	0.787	82	118	168	203
	45	1 5/8"	10.00	0.394	21	0.827	86	124	176	213
	50	2"	10.00	0.394	26	0.945	103	148	210	254
	60	2 3/8"	10.00	0.394	30	1.181	103	148	210	254
	70	2 3/4"	10.00	0.394	35	1.378	103	148	210	254
	80	3 1/8"	10.00	0.394	40	1.575	103	148	210	254
	90	3 4/8"	10.00	0.394	45	1.575	103	148	210	254
	100	4"	10.00	0.394	50	1.969	103	148	210	254
	120	4 3/4"	10.00	0.394	60	2.362	103	148	210	254
6 1/4"	40	1 5/8"	12.00	0.472	5	0.197	25	36	50	61
	50	2"	12.00	0.472	15	0.591	74	107	151	183
	60	2 3/8"	12.00	0.472	30	1.181	148	213	302	366
	70	2 3/4"	12.00	0.472	30	1.181	148	213	302	366
	80	3 1/8"	12.00	0.472	40	1.575	148	213	302	366
	90	3 4/8"	12.00	0.472	40	1.575	148	213	302	366
	100	4"	12.00	0.472	50	1.969	148	213	302	366
	110	4 3/8"	12.00	0.472	50	1.969	148	213	302	366
	120	4 3/4"	12.00	0.472	60	2.362	148	213	302	366
	130	5 1/8"	12.00	0.472	70	2.756	148	213	302	366
	140	5 1/2"	12.00	0.472	65	2.362	148	213	302	366
	150	6"	12.00	0.472	75	2.756	148	213	302	366
	160	6 1/4"	12.00	0.472	85	3.150	148	213	302	366
	180	7 1/8"	12.00	0.472	105	3.937	148	213	302	366
	200	7 7/8"	12.00	0.472	125	4.724	148	213	302	366
	220	8 5/8"	12.00	0.472	145	5.512	148	213	302	366
	240	9 1/2"	12.00	0.472	165	6.299	148	213	302	366
	260	10 1/4"	12.00	0.472	185	7.087	148	213	302	366
	280	11"	12.00	0.472	205	7.874	148	213	302	366
	300	11 7/8"	12.00	0.472	225	8.661	148	213	302	366
8 5/16"	80	3 1/8"	14.50	0.571	28	0.945	167	241	341	412
	100	4"	14.50	0.571	48	1.575	216	311	441	534
	120	4 3/4"	14.50	0.571	60	2.362	216	311	441	534
	140	5 1/2"	14.50	0.571	80	3.150	216	311	441	534
	160	6 1/4"	14.50	0.571	80	3.150	216	311	441	534
	180	7 1/8"	14.50	0.571	100	3.937	216	311	441	534
	200	7 7/8"	14.50	0.571	120	4.724	216	311	441	534
	220	8 5/8"	14.50	0.571	140	5.512	216	311	441	534
	240	9 1/2"	14.50	0.571	160	6.299	216	311	441	534
	260	10 1/4"	14.50	0.571	180	7.087	216	311	441	534
	280	11"	14.50	0.571	200	7.874	216	311	441	534
	300	11 7/8"	14.50	0.571	200	7.874	216	311	441	534
	320	12 5/8"	14.50	0.571	220	8.661	216	311	441	534
	340	13 3/8"	14.50	0.571	240	9.449	216	311	441	534
	360	14 1/4"	14.50	0.571	260	10.236	216	311	441	534
	380	15"	14.50	0.571	280	11.024	216	311	441	534
	400	15 3/4"	14.50	0.571	300	11.811	216	311	441	534
	440	17 1/4"	14.50	0.571	340	13.386	216	311	441	534
	480	19"	14.50	0.571	380	14.961	216	311	441	534
	520	20 1/2"	14.50	0.571	420	15.748	216	311	441	534

GEOMETRY							HEAD-PULL THROUGH W_H			
										
d_1	Length L		Head Diameter (d_k)		Side Member Thickness A		$G=0.35$ W_H	$G=0.42$ W_H	$G=0.50$ W_H	$G=0.55$ W_H
$\frac{[mm]}{[inch]}$	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[lbf]	[lbf]	[lbf]	[lbf]
10 3/8"	80	3 1/8"	18.25	0.719	28	0.945	210	303	429	519
	100	4"	18.25	0.719	48	1.575	343	493	699	846
	120	4 3/4"	18.25	0.719	60	2.362	343	493	699	846
	140	5 1/2"	18.25	0.719	80	3.150	343	493	699	846
	160	6 1/4"	18.25	0.719	80	3.150	343	493	699	846
	180	7 1/8"	18.25	0.719	100	3.937	343	493	699	846
	200	7 7/8"	18.25	0.719	120	4.724	343	493	699	846
	220	8 5/8"	18.25	0.719	140	5.512	343	493	699	846
	240	9 1/2"	18.25	0.719	160	6.299	343	493	699	846
	260	10 1/4"	18.25	0.719	180	7.087	343	493	699	846
	280	11"	18.25	0.719	200	7.874	343	493	699	846
	300	11 7/8"	18.25	0.719	200	7.874	343	493	699	846
	320	12 5/8"	18.25	0.719	220	8.661	343	493	699	846
	340	13 3/8"	18.25	0.719	240	9.449	343	493	699	846
	360	14 1/4"	18.25	0.719	260	10.236	343	493	699	846
	380	15"	18.25	0.719	280	11.024	343	493	699	846
	400	15 3/4"	18.25	0.719	300	11.811	343	493	699	846
12 1/2"	120	4 3/4"	20.75	0.817	40	1.575	341	492	697	843
	160	6 1/4"	20.75	0.817	80	3.150	443	638	904	1093
	200	7 7/8"	20.75	0.817	120	4.724	443	638	904	1093
	240	9 1/2"	20.75	0.817	160	6.299	443	638	904	1093
	280	11"	20.75	0.817	200	7.874	443	638	904	1093
	320	12 5/8"	20.75	0.817	200	7.874	443	638	904	1093
	360	14 1/4"	20.75	0.817	240	9.449	443	638	904	1093
	400	15 3/4"	20.75	0.817	280	11.024	443	638	904	1093
	440	17 1/4"	20.75	0.817	320	12.598	443	638	904	1093
	480	19"	20.75	0.817	360	14.173	443	638	904	1093
	520	20 1/2"	20.75	0.817	400	15.748	443	638	904	1093
	560	22"	20.75	0.817	440	17.323	443	638	904	1093
	600	23 5/8"	20.75	0.817	480	18.898	443	638	904	1093

NOTES

- Values based on the "Technical Design Guide USA", download from www.rothoblaas.com
- Values were calculated considering the threaded part as being completely inserted into the wood
- Reference lateral design values (Z) are based on NDS 2018. Characteristic values of mechanical properties and geometries are in accordance with ETA-11/0030
- Reference lateral design values (W) are based on NDS 2018. Characteristic values of mechanical properties and geometries are in accordance with ETA-11/0030
- The axial thread-extraction resistance was calculated considering a 90° angle between the grain and the connector and for a fixing length of b
- The shear characteristic resistances are calculated considering the case of a thick plate ($S_{PLATE} \geq d_1$)
- The shear characteristic resistances are calculated considering the case of a thin plate ($S_{PLATE} \leq 0.5 d_1$)
- Reference lateral design values (W_H) are based on NDS 2018. Characteristic values of mechanical properties and geometries are in accordance with ETA-11/0030
- The axial resistance to head penetration was calculated using wood elements. In the case of steel-wood connections, generally the steel tensile strength is binding with respect to head separation or penetration
- Download the latest version of this document from www.rothoblaas.com

GENERAL PRINCIPLES

- The reference resistance values for connections shall be multiplied by all applicable adjustment factors (ref. NDS Table 11.3.1)
- Sizing and verification of the wooden elements, panels and steel plates must be done separately
- For different calculation methods, the My Project software is available free of charge. (www.rothoblaas.com)
- The characteristic resistances were calculated using solid wood or glulam. In the case of joints with CLT elements, the resistance values may be different and should be calculated taking into account the characteristics of the panel and the connection configuration
- ASTM A36 steel side plates. Bearing strength $F_e=87.000$ [psi]