TBS MAX

XL FLANGE HEAD SCREW

ICC-ES ESR-4645 | UKCA UKTA-0836 22/6195 | CE ETA-11/0030

FLANGE HEAD OF INCREASED SIZE

The oversized head provides excellent head pull-through strength and joint tightening capacity.

LONGER THREAD

The oversized thread of the TBS MAX guarantees excellent withdrawal resistance and clamping strength of the joint.

RIBBED FLOORS

Thanks to its large head and oversized thread, it is the ideal screw in the production of ribbed floors (Rippendecke). Used in conjunction with SHARP METAL, it optimises the number of fasteners by avoiding the use of presses when gluing timber elements together.

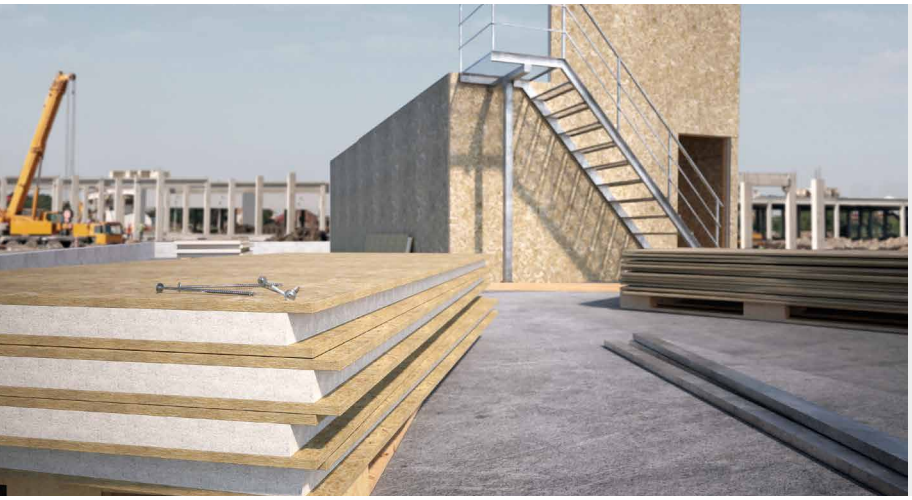
3 THORNS TIP

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.

MY PROJECT SOFTWARE

BIT INCLUDED

DIAMETER [in]	0.24 — **0.32** — 0.63
LENGTH [in]	1 9/16 — **4 3/4 15 3/4** — 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

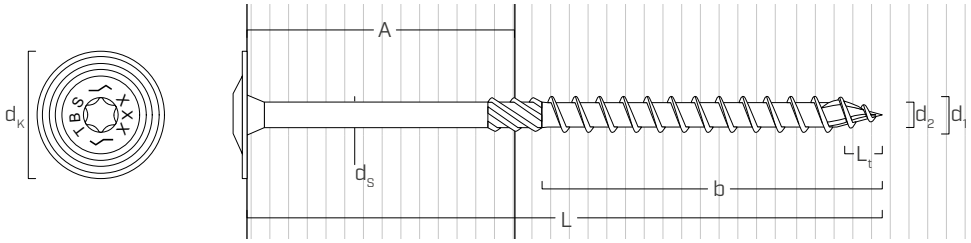
- timber based panels
- fibreboard and MDF panels
- SIP and ribbed panels.
- solid timber and glulam
- CLT and LVL
- high density woods

CODES AND DIMENSIONS

d_1 [mm] [in]	CODE	L [mm]	L [in]	b [mm]	b [in]	A [in]	pcs
8 **0.32** TX 40	**TBSMAX8120**	120	4 3/4	100	4	3/4	50
	TBSMAX8160	160	6 1/4	120	4 3/4	1 1/2	50
	TBSMAX8180	180	7 1/8	120	4 3/4	2 1/4	50
	TBSMAX8200	200	8	120	4 3/4	3	50
	TBSMAX8220	220	8 5/8	120	4 3/4	3 3/4	50

d_1 [mm] [in]	CODE	L [mm]	L [in]	b [mm]	b [in]	A [in]	pcs
8 **0.32** TX 40	**TBSMAX8240**	240	9 1/2	120	4 3/4	4 1/2	50
	TBSMAX8280	280	11	120	4 3/4	6 1/4	50
	TBSMAX8320	320	12 5/8	120	4 3/4	7 3/4	50
	TBSMAX8360	360	14 1/4	120	4 3/4	9 1/4	50
	TBSMAX8400	400	15 3/4	120	4 3/4	11	50

GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

Nominal diameter	d_1	**[in]**(1)	**0.32**
Outer thread diameter	d_1	[mm]	8
		[in]	**0.315**
Head diameter	d_K	[in]	0.965
Root diameter	d_2	[in]	0.213
Shank diameter	d_S	[in]	0.228
Tip Length	L_t	[in]	0.315
Pre-drilling hole diameter(2)	$d_{V,G\leq0.55}$	[in]	13/64
Pre-drilling hole diameter(3)	$d_{V,G>0.55}$	[in]	15/64

(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]	0.32
Tensile strength (allowable)	f_{tens}	[lbf]	2040
Bending yield strength (specified)	$F_{y,b}$	[psi]	180000

Nominal diameter	d_1	[in]		0.32
Withdrawal (design value)	W_{90}	[lbf/in]	G = 0.35	172
			G = 0.42	199
			G = 0.49	225
			G = 0.55	247
minimum embedded length		[in]		1 7/8
Head pull-through (design value)	W_H	[lbf]	G = 0.35	421
			G = 0.42	484
			G = 0.49	545
			G = 0.55	594
minimum side member thickness		[in]		1

TBS MAX FOR RIB TIMBER

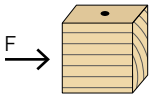
With its increased thread (4 3/4") and enlarged head (0.965 inch), the TBS MAX guarantees excellent grip and superb joint closure. Ideal for the production of ribbed floors (Rippendecke), optimising the number of fastenings.

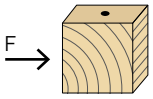
SHARP METAL

Ideal in combination with the SHARP METAL system, as the enlarged head guarantees excellent joint tightening, making the use of presses unnecessary when gluing wooden elements together.

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

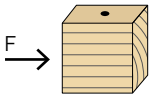
screws inserted **WITHOUT pre-drilled hole** — **G ≤ 0.48**

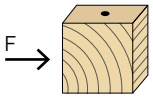




d_1	[in]		0.32		0.32
	[mm]		8		8
a_1	[in]	**15·d**	3 1/8	**10·d**	1 9/16
a_2	[in]	**5·d**	1 9/16	**5·d**	1 9/16
$a_{3,t}$	[in]	**15·d**	4 3/4	**15·d**	4 3/4
$a_{3,c}$	[in]	**10·d**	3 1/8	**10·d**	3 1/8
$a_{4,t}$	[in]	**10·d**	3 1/8	**10·d**	3 1/8
$a_{4,c}$	[in]	**5·d**	1 9/16	**5·d**	1 9/16

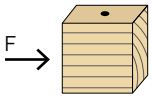
screws inserted **WITHOUT pre-drilled hole** — **0.48 < G ≤ 0.50**

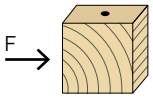




d_1	[in]		0.32		0.32
	[mm]		8		8
a_1	[in]	**15·d**	4 3/4	**10·d**	2 3/16
a_2	[in]	**5·d**	1 9/16	**5·d**	1 9/16
$a_{3,t}$	[in]	**15·d**	4 3/4	**15·d**	4 3/4
$a_{3,c}$	[in]	**10·d**	3 1/8	**10·d**	3 1/8
$a_{4,t}$	[in]	**10·d**	3 1/8	**10·d**	3 1/8
$a_{4,c}$	[in]	**5·d**	1 9/16	**5·d**	1 9/16

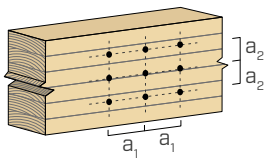
screws inserted **WITHOUT pre-drilled hole** — **G > 0.50**



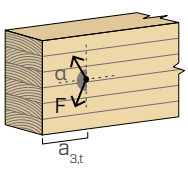


d_1	[in]		0.32		0.32
	[mm]		8		8
a_1	[in]	**15·d**	4 3/4	**10·d**	3 1/8
a_2	[in]	**7·d**	2 3/16	**7·d**	2 3/16
$a_{3,t}$	[in]	**20·d**	6 1/4	**20·d**	6 1/4
$a_{3,c}$	[in]	**15·d**	4 3/4	**15·d**	4 3/4
$a_{4,t}$	[in]	**12·d**	3 3/4	**12·d**	3 3/4
$a_{4,c}$	[in]	**7·d**	2 3/16	**7·d**	2 3/16

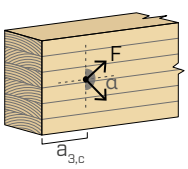
α = load-to-grain angle
d = d_1 = nominal diameter of the screw



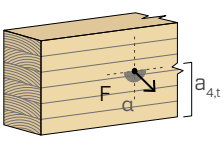
stressed end
-90° < α < 90°



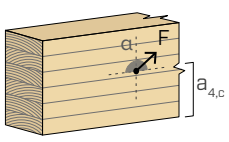
unloaded end
90° < α < 270°



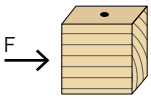
stressed edge
0° < α < 180°

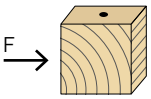


unload edge
180° < α < 360°



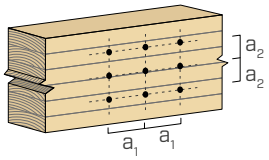
screws inserted **WITH pre-drilled hole**



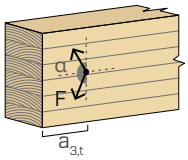


d_1	[in]		0.32		0.32
	[mm]		8		8
a_1	[in]	**10·d**	3 1/8	**5·d**	1 9/16
a_2	[in]	**4·d**	1 1/4	**4·d**	1 1/4
$a_{3,t}$	[in]	**12·d**	3 3/4	**12·d**	3 3/4
$a_{3,c}$	[in]	**7·d**	2 3/16	**7·d**	2 3/16
$a_{4,t}$	[in]	**7·d**	2 3/16	**7·d**	2 3/16
$a_{4,c}$	[in]	**3·d**	15/16	**3·d**	15/16

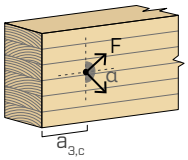
α = load-to-grain angle
d = d_1 = nominal diameter of the screw



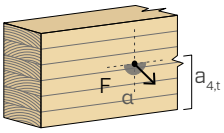
stressed end
-90° < α < 90°



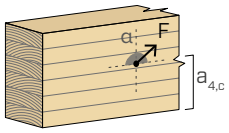
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



unload edge
180° < α < 360°

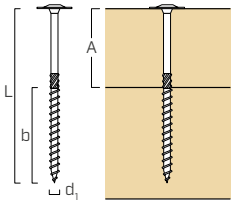
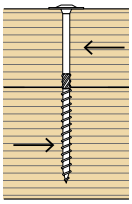
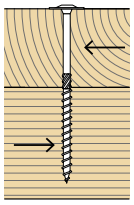
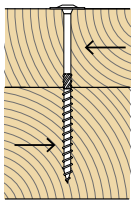


NOTES

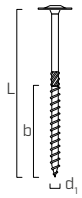
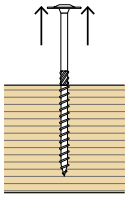
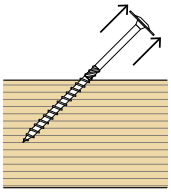
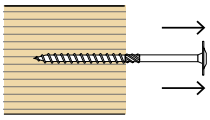
- Values in blue are from Table 10 of ESR-4645 (REDUCED CONNECTION GEOMETRY REQUIREMENTS BASED ON TESTING);
- The minimum spacing and distances comply with Table 8 of ESR-4645, where d refers to the nominal diameter of the screw;
- Wood member stresses must be checked in accordance with the corresponding Sections of the NDS; end distances, edge distances and fastener spacing may need to be increased accordingly.

NOTES and **GENERAL PRINCIPLES** on page 112.

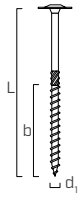
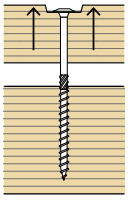
REFERENCE LATERAL DESIGN VALUES (Z) | WOOD-TO-WOOD

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]
8 **0.32**	120	4 3/4	4	3/4	146	174	202	228	117	139	162	182	117	139	162	182
	160	6 1/4	4 3/4	1 1/2	160	202	248	292	128	161	198	233	128	161	198	233
	180	7 1/8	4 3/4	2 1/4	191	245	282	313	153	196	225	251	153	196	225	251
	200-400	8-15 3/4	4 3/4	≥ 3	207	245	282	313	165	196	225	251	165	196	225	251

THREAD WITHDRAWAL (W) | WOOD

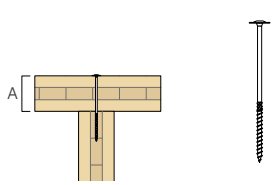
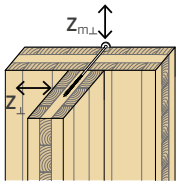
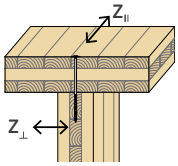
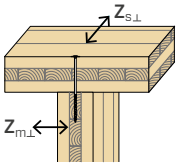
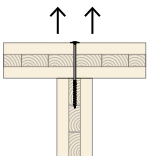
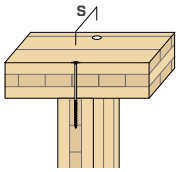
geometry				thread withdrawal α = 90°				thread withdrawal α = 45°				thread withdrawal α = 0°			
															
d_1	L		b	G				G				G			
				0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
[mm] [in]	[mm]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
8 **0.32**	120	4 3/4	4	623	721	815	895	567	656	742	814	187	216	244	268
	160	6 1/4	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327
	180	7 1/8	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327
	200	8	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327
	220	8 5/8	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327
	240	9 1/2	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327
	280	11	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327
	320	12 5/8	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327
	360	14 1/4	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327
	400	15 3/4	4 3/4	758	877	992	1089	690	799	903	991	228	263	298	327

HEAD PULL-THROUGH (W_H) | WOOD

geometry			head pull through 90° ≤ α ≤ 30°			
						
d_1		d_k	G			
			0.35	0.42	0.49	0.55
[mm]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]
8	0.32	0.96	421	484	545	594

NOTES and GENERAL PRINCIPLES on page 112.

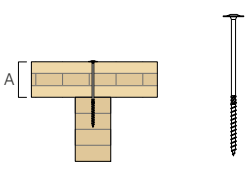
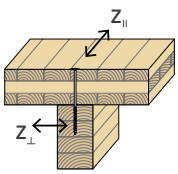
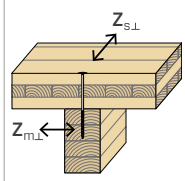
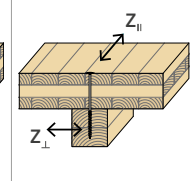
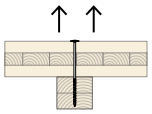
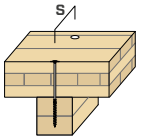
CLT | WALL-TO-WALL | FLOOR-TO-WALL

					SHEAR						TENSION	SPACING	
geometry					wall-to-wall		floor-to-wall orientation 1		floor-to-wall orientation 2		withdrawal / head pull-through	fastener in a row	
													
side member thickness (wall/floor) = A		suggested screw			$Z_{\perp}$	$Z_{m\perp}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{m\perp}$	$Z_{s\perp}$	W(*)	minimum	typical
[mm]	[in]	CODE			[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[in]
3 PLY													
60	2 3/8	TBSMAX8180	or longer		131	131	131	164	131	131	484	3 1/8	6
79	3 1/8	TBSMAX8200	or longer		131	131	131	164	131	131	484	3 1/8	6
105	4 1/8	TBSMAX8240	or longer		131	131	131	164	131	131	484	3 1/8	6
120	4 3/4	TBSMAX8240	or longer		131	131	131	164	131	131	484	3 1/8	6
5 PLY													
100	3 15/16	TBSMAX8220	or longer		131	131	131	164	131	131	484	3 1/8	6
140	5 1/2	TBSMAX8280	or longer		131	131	131	164	131	131	484	3 1/8	6
175	6 7/8	TBSMAX8320	or longer		131	131	131	164	131	131	484	3 1/8	6
200	7 7/8	TBSMAX8320	or longer		131	131	131	164	131	131	484	3 1/8	6
7 PLY													
140	5 1/2	TBSMAX8280	or longer		131	131	131	164	131	131	484	3 1/8	6
191	7 1/2	TBSMAX8320	or longer		131	131	131	164	131	131	484	3 1/8	6
244	9 5/8	TBSMAX8400	or longer		131	131	131	164	131	131	484	3 1/8	6
280	11	TBSMAX8400	or longer		131	131	131	164	131	131	484	3 1/8	6

(*) Minimum between head pull-through and withdrawal resistance

NOTES and GENERAL PRINCIPLES on page 112.

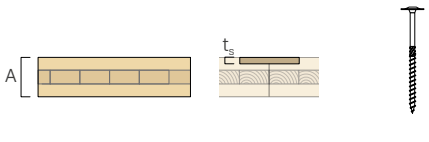
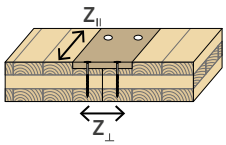
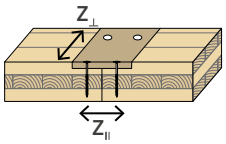
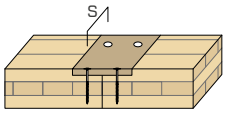
CLT | FLOOR-TO-BEAM

geometry				SHEAR								TENSION	SPACING	
				floor-to-beam orientation 1		floor-to-beam orientation 2		floor-to-double lumber 2" orientation 1		floor-to-double lumber 2" orientation 2		withdrawal / head pull-through	fastener in a row	
														
side member thickness (wall/floor) = A		suggested screw	$Z_{\perp}$	$Z_{\parallel}$	$Z_{m\perp}$	$Z_{s\perp}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{m\perp}$	$Z_{s\perp}$	W(*)	minimum	typical
[mm]	[in]	CODE	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[in]
5 PLY	100	3 15/16	TBSMAX8200	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8220	196	245	131	196	-	-	-	-	484	3 1/8	6
	140	5 1/2	TBSMAX8240	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8280	196	245	131	196	-	-	-	-	484	3 1/8	6
	175	6 7/8	TBSMAX8240	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8320	196	245	131	196	-	-	-	-	484	3 1/8	6
	200	7 7/8	TBSMAX8280	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8320	196	245	131	196	-	-	-	-	484	3 1/8	6
7 PLY	140	5 1/2	TBSMAX8240	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8280	196	245	131	196	-	-	-	-	484	3 1/8	6
	191	7 1/2	TBSMAX8280	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8320	196	245	131	196	-	-	-	-	484	3 1/8	6
	244	9 5/8	TBSMAX8320	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8400	196	245	131	196	-	-	-	-	484	3 1/8	6
	280	11	TBSMAX8360	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8400	196	245	131	196	-	-	-	-	484	3 1/8	6
9 PLY	180	7 1/16	TBSMAX8240	196	245	131	196	196	245	131	196	484	3 1/8	6
			TBSMAX8320	196	245	131	196	-	-	-	-	484	3 1/8	6
	267	10 1/2	TBSMAX8320	185	231	124	185	185	231	124	185	484	3 1/8	6
			TBSMAX8400	196	245	131	196	-	-	-	-	484	3 1/8	6

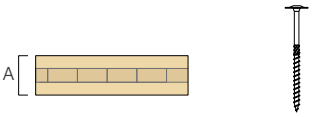
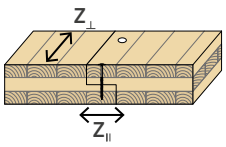
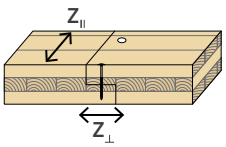
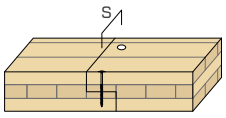
(*)Minumum between head pull-through and withdrawal resistance

NOTES and GENERAL PRINCIPLES on page 112.

CLT | SPLINE JOINT

geometry				SHEAR				SPACING	
				spline joint orientation 1		spline joint orientation 2		fastener in a row	
									
panel thickness (wall/floor) = A		spline thickness = t_s	suggested screw	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	minimum	typical
[mm]	[in]	[in]	CODE	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[in]
5 PLY	130	5 1/8	3/4	TBSMAX8120	173	139	173	139	3 1/8	4
			1	TBSMAX8120	179	143	179	143	3 1/8	4
	140	5 1/2	3/4	TBSMAX8120	173	139	173	139	3 1/8	4
			1	TBSMAX8120	179	143	179	143	3 1/8	4
	175	6 7/8	3/4	TBSMAX8120	173	139	173	139	3 1/8	4
			1	TBSMAX8160	179	143	179	143	3 1/8	4
7 PLY	191	7 1/2	3/4	TBSMAX8120	173	139	173	139	3 1/8	4
			1	TBSMAX8160	179	143	179	143	3 1/8	4
	220	8 5/8	3/4	TBSMAX8160	173	139	173	139	3 1/8	4
			1	TBSMAX8160	179	143	179	143	3 1/8	4
	244	9 5/8	3/4	TBSMAX8180	173	139	173	139	3 1/8	4
			1	TBSMAX8180	179	143	179	143	3 1/8	4

CLT | HALF LAP

geometry			SHEAR				SPACING	
			half lap orientation 1		half lap orientation 2		fastener in a row	
								
panel thickness (wall/floor) = A		suggested screw	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	minimum	typical
[mm]	[in]	CODE	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[in]
5 PLY	140	5 1/2	TBSMAX8120	178	222	178	222	3 1/8	6
	175	6 7/8	TBSMAX8160	196	245	196	245	3 1/8	6
	200	7 7/8	TBSMAX8180	196	245	196	245	3 1/8	6
7 PLY	140	5 1/2	TBSMAX8120	178	222	178	222	3 1/8	6
	191	7 1/2	TBSMAX8180	196	245	196	245	3 1/8	6
	244	9 5/8	TBSMAX8220	196	245	196	245	3 1/8	6
	280	11	TBSMAX8240	196	245	196	245	3 1/8	6
9 PLY	180	7 1/16	TBSMAX8160	196	245	196	245	3 1/8	6
	267	10 1/2	TBSMAX8240	196	245	196	245	3 1/8	6
	314	12 3/8	TBSMAX8280	196	245	196	245	3 1/8	6
	360	14 3/16	TBSMAX8320	196	245	196	245	3 1/8	6

NOTES and GENERAL PRINCIPLES on page 112.

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.
- TBS MAX screws must be positioned in accordance with the minimum distances.
- In case of combined axial and shear forces, the designer shall refer to the Hankinson formula, as specified in section 12.4.1 of the NDS, to evaluate the load-bearing capacity.

REFERENCE LATERAL DESIGN VALUES

- Tabulated values are determined from the yield model equations in the corresponding Section of the NDS.
- Unless otherwise noted, the threaded part of the screw is fully inserted in the main 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:

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

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

  Tabulated values at page 108 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° ≤ α < 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 α ≤ 15°.
- The reference withdrawal design values must be inferior to f_{tens} of the screw.

REFERENCE HEAD PULL-THROUGH DESIGN VALUES

While designing a connection the head pull-through values must be compared with the tensile resistance of the screw and, if necessary, thread withdrawal. The lower value is the governing one.

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.
- 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.
- $Z_{s\perp}$: Force-to-grain angle in the shear plane is considered as 90° for side member and as 0° for main member.
- 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°.
- Typical fastener spacings are declared considering a generic load condition; spacings should be verified and defined according to the real load conditions.

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

- The main grain direction of the CLT wall panel is always considered as vertical.
- The main grain direction of the CLT floor panel is considered both parallel and perpendicular to the wall plane.
- The threaded part of the screw has been always considered inserted in the central layer of the CLT panel.
- The withdrawal capacity has been considered as the minimum between thread withdrawal, head-pull through and tensile strength of the screw.
- 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.

CLT | FLOOR-TO-WOOD BEAM

- The main grain direction of the CLT floor panel is considered both parallel and perpendicular to the beam's axis.
- The threaded part of the screw has been always considered inserted in the central layer of the CLT panel.
- The withdrawal capacity has been considered as the minimum between thread withdrawal, head-pull through and tensile strength of the screw.
- 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.
- Beam element can be considered both solid wood or glulam.
- Double lumber is considered as two coupled element of 2 inches thick.
- 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. In configurations with no declared value (-) the fastener exceeds the main member depth.

SPLINE JOINT

- Spline thickness is considered to be thinner than the top CLT layer.
- For Root Diameter d_2>0.25 inch, the bearing strength of the spline is conservatively considered as 3350 psi according to NDS.
- The main grain direction of the CLT floor panel is considered both parallel and perpendicular to the spline's direction.
- The width of the spline and consequent machining on CLT panel must comply with the minimum distance requirements.

HALF LAP

- The main grain direction of the CLT floor panel is considered both parallel and perpendicular to the machining's direction.
- 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.

A breakthrough in fast, reliable, glue-free timber connections

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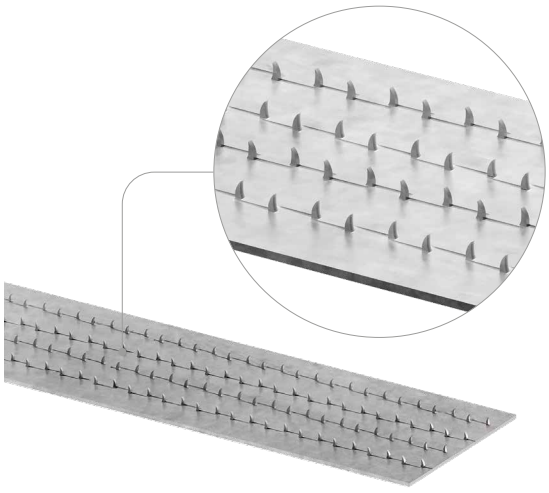
Ideal for ribbed or formwork floors: thanks to the SHARP METAL hooks and TBS MAX tightening, there is no need for glues, adhesives or presses.



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