MyTiCon Timber Connectors

MyTiCon Timber Connectors

Field Testing of Timber Connections

WOOD you like to CONNECT?

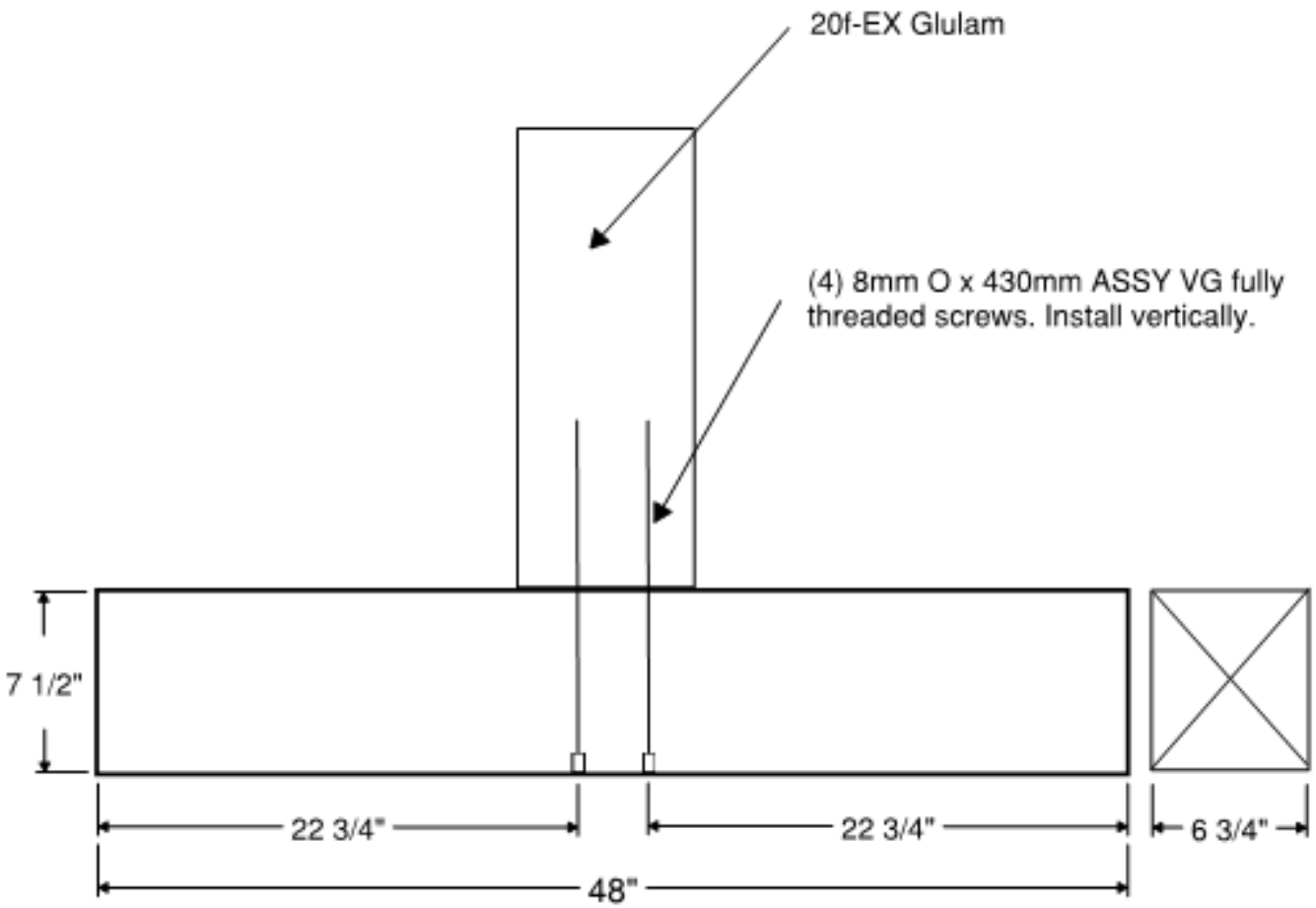
CONTACT US
sales@my-ti-con.com
1.866.899.4090

Technical Support
info@my-ti-con.com
1.866.899.4090

www.my-ti-con.com

Glulam end grain tension connection example with SWG ASSY® VG screws

Geometry considered for example:



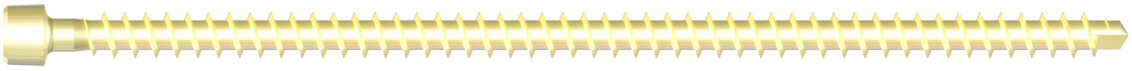
Glulam end grain tension connection with SWG ASSY® Full Thread screws

End grain tension connections are challenging and design codes around the globe do not explicitly permit or suggest the use of threaded fasteners in end grain applications. This is due to the fact that wood shrinkage or potential check development (parallel to grain) has not been investigated appropriately. In this type of application, due to the potential checking or expected shrinkage in the timber connection performance predictions may not be accurate. With appropriate research and measures such as reinforcement and deep thread embedment however it seems reasonable to assume that end grain tension connections can be designed in future practise. This field test example showcases the performance of an end grain tension connection with FT screws.

FIELD TEST DESIGN Example #3: Full thread screw in end grain tension connection	
Conditions of connection and connection requirements	The tension joint is to be tested in the BIG GREEN tension tester provided by UNBC. Short term loading is assumed for the design using K_D= 1.15. D-Fir glulam side member and D-Fir glulam sawn main member connection with SWG ASSY VG CYL 8mm x 430mm @ 0° and 90° angle (0° is parallel to grain application in main member)
Geometry	**t** = side/main member thickness 190mm **b** = side/min member width 190mm Min. timber thickness 10d —> 10* 8 = 80mm <190mm
Spacing, end and edge distance requirements in main and side member [1]	Screw spacing parallel = 7.5* d = 60mm End distance = 7.5* d = 60mm Edge distance = 3* d = 24mm Spacing perpendicular to grain = 2.5* d = 20mm
Effective thread embedment length	$\mathbf{L_{p,1}}$ = side member = 190mm - 8mm = 182mm $\mathbf{L_{p,2}}$ = main member = 430m - 190mm– 8mm = 232mm *Note: Effective thread embedment is reduced by 1*d where d = screw diameter*
Withdrawal resistance side member and main member [1], [2]	**Pr'w $_{side}$** = 1.6kN* (182mm/20mm) = 14.5 [kN] **Pr'w $_{main}$ at 0°** = 1.6kN* (232mm/20mm) * 0.3+ (0.7*α/45°)= 5.5 [kN] *Note: The screw in angle is measured between the fastener axis and the wood grain direction. Therefore in this end grain tension connection one must consider 90° in the side member and 0° in the main member to compute the withdrawal resistance values. In [2] an end grain reduction factor is provided.*
Tensile resistance check screw [1]	15.12 kN > 14.5 kN
Tension capacity [1], [2]	4 ASSY VG CYL 8x430 are installed in the connection. Derivation for connection capacity: $4^{0.9}$*5.5*1.15 = 22.26kN (Ultimate failure in field test occurred at 49kN) *Note: Group action factor reduction taken into account with $n^{0.9}$. Short term loading factor k_D =1.15 is applied*
Serviceability limit state connection stiffness estimate [2]	K_{ser} =780* d $^{0.2}$ · $L_{p,i}$ $^{0.4}$ = 10.44 N/mm Stiffness estimate= $4^{0.9}$ · 10.44kN/mm = **36.4kN/mm** (Deformation in field test recorded at less than 1mm at ultimate load) *Note: The assumptions to derive the factor K_{ser} may not be accurate due to the end grain application of the screw in this connection configuration!*

References:

[1] CCMC 13677-R; [2] ETA-11/0190



Find more resources for our modern timber connection systems, including technical design data, installation guides, CAD files, videos, research data and more white papers on our website

www.my-ti-con.com

Or

Contact us

sales@my-ti-con.com

1.866.899.4090

Technical Support

info@my-ti-con.com

1.866.899.4090