



Application Summary Sheet 14

Title: GRP timber connections

Target Audience: Structural Engineers, Architects

Keywords: Bonded-in rods, glulam, LVL (laminated veneer lumber), timber connections.

Overview of application / summary:

Both bonded-in and un-bonded rods are an effective and attractive solution for timber to timber connections in structures. Such hidden connections are more aesthetically pleasing than the alternative of exposed plates and bolting. The use of Glue Laminated Timber (glulam) and Laminated Veneer Lumber (LVL) as a structural element, primarily for its visual appeal, has often been let down by the indelicate use of steel angle and suchlike for the connections.

Pultruded FRP rods offer a lightweight, corrosion resistant and elastically compatible alternative to steel rods. The performance of bonded-in FRP rods can be superior due to better resin bonding and ductility. FRP bonded-in rods may act as secondary reinforcement and also reduce stress concentrations which would otherwise cause the formation of fractures in the timber.

Impact of Application

Financial:

Marginally more expensive than steel, although GRP offers technical advantages.

Environmental:

Alternative to steel, although low volumes of material are used.

Social:

Hidden connections in timber structures can be aesthetically pleasing.

Engineering:

High strength, good ductility.

Corrosion resistant.

Excellent bond characteristics with resin

Rods easier to prepare for bonding than steel, requiring only sanding and cleaning with solvent.

Robustness:

Authoritative research with component testing

Where to get further information

Research:

Non-metallic, adhesiveless joints for timber structures

Drake R D, Ansell M P, Mettem C J, Bainbridge R J. (1999)
CIB W18/32-7-11, Graz, Austria.

Review: The paper examines the use of GRP pultruded dowels for connections in medium and large scale LVL timber structures and presents the results of test results and finite element analysis on moment resisting joints. Failure loads for GRP dowel joints were found to be marginally higher than corresponding steel connections, with failure occurring in the dowel and LVL rather than in the LVL alone (i.e. the GRP connection is more ductile, avoiding stress concentration in the timber).

also:

Evaluation of joints in timber structures using pultruded GRP dowels and implications for Eurocode 5-based design

Drake, R.D., Ansell, M.P.
The Structural Engineer, June 2000.

Evaluation of material combinations for bonded in rods to achieve improved timber connections

Mettem et al. (1999)
CIB W18/32-7-13 Graz, Austria.

Bonded-in Pultrusions for Moment-Resisting Timber Connections

Harvey K., et al. (2000)
CIB W18/33-7-11 Delft

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