

CHECKING IN GLUED LAMINATED TIMBER

Number EWS R465E
November 2001

Checking

Checking is a natural occurrence in timber. The cause of checking is shrinkage of the wood fibers as moisture is lost to the surrounding atmosphere. As the outer fibers lose moisture and attempt to shrink, they are restrained by the inner portion of the member, which loses moisture at a much slower rate. Rapid drying increases this differential moisture content between the inner and outer fibers and increases the propensity for checking in the timber member.

Glued laminated timber (glulam) normally has fewer and smaller checks than solid-sawn timber since the individual laminations used to manufacture glulam have been dried to a maximum moisture content of 16% before manufacturing. This is one of the inherent advantages of glued laminated timber as compared to sawn timbers.

Identification of Checking

Checks are openings that occur parallel to the grain and usually follow the grain deviation around knots. Checks exhibit broken wood fiber on each surface.

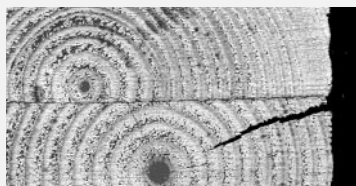
Although seasoning checks, as shown in Figure 1, are commonly found near a glue line in a glulam member (often along the first glue line adjacent to an outer lamination), checks should not be confused with delamination which occurs when the glue bond is not adequate. Inadequate glue bond causes openings that are straight separations between the laminations at a glue line. The faces of the separation are smooth and often appear as a dark surface reflective of the color of the adhesive. There is no or very little torn wood fiber on the surfaces of the separation. It should be emphasized that the occurrence of delamination is highly unlikely given modern wet-use adhesives and manufacturing technologies used in glulam production.

Significance of Checking

Checks normally have very little effect on the strength of a glued laminated member. Checks occurring on the bottom face of a bending member loaded in the direction perpendicular to the wide face of the laminations are of little or no structural concern when they are parallel to the grain. Checks appearing on the sides of glulam members can be significant if they are deep checks near the mid-height of the beam over beam supports or long checks that are of full beam width starting at the end of the beam (end checks or splits). If these types of checks are of sufficient depth or length, they can affect the strength of the beam.

FIGURE 1

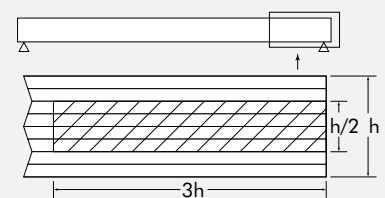
GLUED LAMINATED BEAM CROSS SECTION ILLUSTRATING CHECKING



Seasoning check
(uneven surfaces with torn wood fiber)

FIGURE 2

LOCATION OF THE SHEAR-CRITICAL ZONE FOR A SIMPLY SUPPORTED GLUED LAMINATED BEAM



For a simple span beam, the shear critical zone is shown in Figure 2. For continuous span beams or cantilevered beams, the shear critical zone may occur over interior supports. Checks outside this critical zone can be significantly larger than those within this zone without effecting beam capacity.

Another possible situation where a check may be of structural concern is in an axially loaded column. If the check develops into a split, it will reduce the capacity of the column by changing the l/d ratio.

If there is concern that the checking has reduced the strength of the glulam member, a qualified person should evaluate the situation. Additional information is available in Engineered Wood Systems Technical Note EWS R475, *Evaluation of Check Size in Glued Laminated Timber Beams*.

Minimizing Checking

Glulam members should be protected from extremes in temperature and humidity during transportation, storage, and installation. Good storage and installation

practices that minimize direct exposure to the elements will minimize the extent of checking. After installation, it is important that the members are not exposed to rapid movement of air or to concentrated heat sources such as furnace hot air outlets or jobsite heating units.

When the building is enclosed, the beams should be allowed to adjust slowly to the ambient temperature and humidity of the building. Rapid lowering of the humidity and/or exposure to high temperatures should be avoided. Unless there are significant changes in ambient temperature and humidity, additional checking generally will not occur after the first full cycle of environmental conditioning of the building.

Checking can be minimized in beams installed in unusually dry locations by specifying a moisture content of the laminations lower than the normal industry maximum of 16%. These might include beams installed in locations with an arid climate or in buildings that are maintained at extremely low humidity. The specifier should verify the availability of glulam with these lower moisture specifications with the manufacturer or supplier.

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APA – THE ENGINEERED WOOD ASSOCIATION HEADQUARTERS

7011 So. 19th St. ■ P.O. Box 11700
Tacoma, Washington 98411-0700
(253) 565-6600 ■ Fax: (253) 565-7265

(International Offices: Bournemouth, United Kingdom; Hamburg, Germany; Mexico City, Mexico; Tokyo, Japan.)



www.apawood.org

PRODUCT SUPPORT HELP DESK

(253) 620-7400
E-mail Address: help@apawood.org

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Form No. EWS R465E
Revised November 2001/0100

