

Delamination vs Checking

In home construction, GLT beams are often chosen for their beauty in exposed applications. e.g. feature beams, alfresco. Because these GLT members are so visible in these open designs, normal seasoning characteristics are more noticeable and can raise concern with the building owner.

The unfortunate but common use of the word “delamination” to describe the appearance of GLT where there is some “opening” at or adjacent to a glue line immediately creates a perception of faulty product. In most cases, there has been no delamination, but what is being observed is normal timber checking.

Checking, the separation of continuous wood fibres, is a naturally occurring consequence of the seasoning process of wood. The outer fibres lose moisture to the surrounding atmosphere and attempt to shrink, but the inner portion of the timber member loses moisture at a much slower rate. The different rates of shrinkage can cause the wood to check or split. Rapid drying increases the differential moisture content between the inner and outer fibres and thus increases the propensity for checking in the timber.

The checking (and shrinkage) process will stabilize as the moisture content of the member reaches equilibrium with the surrounding environmental conditions.

Delamination, however, is an uncommon manufacturing fault which indicates a manufacturing process failure. In delamination, openings are separations between the laminations at a glue line, not the wood fibre. Delamination occurs when the glue bond is not adequate to resist moisture cycling. With delamination, the surfaces of the laminations at the opening are smooth and often reveal the dark colour of the phenol resorcinol adhesive typically used for face bonding of glulam. When lighter coloured adhesives have been used, it may be more difficult to verify the presence or absence of wood fibres on the lamination surfaces. The presence of wood fibre separation in these openings is the key distinguishing characteristic of seasoning checks.

Delamination is unlikely in GLT because they are manufactured with durable wet-use adhesives under closely controlled manufacturing procedures.

One of the many advantages of GLT is that while seasoning checks may occur for the same reasons that they do in sawn members, checking in GLT will generally occur to a much lesser degree because of careful control of the moisture content of timber used for laminating.

Checks in solid wood are separations along the fibres normally occurring across the rings of annual growth resulting from stresses developed during changes in moisture content.

Checks in glued laminated timber (GLT) may appear as openings parallel to the grain on the sides of members and often appear along the first glue line adjacent to the outmost lamination, and generally follow the grain direction around knots and along sloping grain, where the amount of surface exposed by the outmost lamination is greatest and differential drying stresses are the highest.

The influence of checks on the structural performance of GLT members is generally minor.

Minimising the likelihood of checking

Jobsite storage should be such that the members are protected from direct exposure to the elements. Members should be stored to ensure that there is no ground contact and blocked to provide ventilation around the members. Protective wrappings should be maintained intact but slit on the bottom side to allow for drainage of any entrapped water.

For GLT members, after the building is enclosed, it is critical that rapid lowering of the relative humidity be avoided. A gradual seasoning period of moderate temperature should be provided to allow the GLT's to slowly reach their equilibrium moisture content level and thus minimize checking. Direct blowing of heat on the members using temporary heating units should be avoided. Permanent heating outlets should be designed to deflect heat away from Glulam members.

Checking which occurs in members in enclosed buildings is usually completed within the first full cycle of environmental conditioning of the space. However, changes in the end use of the structure may affect future checking.

Can checking be repaired?

Since checking is a natural phenomenon associated with normal moisture cycling during transportation, job site storage, and installation – a sequence over which the manufacturer has no control – the manufacturer is not responsible for repairing checks.

If checking does occur and is deemed by the designer, contractor, or owner to be visually unacceptable, the checks can be filled with an elastomeric filler. When colour-tinted to match the finish colour of the glulam, these fillers will help to minimize the visual impact of the checks.

Fillers should not be applied until the glulam members have cycled through at least one full heating and cooling season.

Rigid epoxy-type fillers should not be used to fill checks since these can cause the checks to worsen during normal moisture cycle changes.

Is my beam structurally ok?

The question will then invariably focus on the point at which the checks are sufficiently large to present a structural problem.

The APA – The Engineered Wood Association in North America has a long and extensive experience in the use of GLT, and has produced a “Rule of Thumb” flow chart for all the industry professional to analyse the beam and determine whether further engineering advice is needed to determine the structural adequacy of a GLT beam. See Fig 1.

If, after the use of the flow chart in figure 1 it is determined that the checking needs engineering evaluation, there are analysis methods available to the engineer to evaluate whether the reductions in strength caused by the checking is significant enough to warrant replacement or reinforcement.

This information is generic in nature as an initial assessment for uniformly loaded beams only, and does not replace expert engineering advice on a case by case basis.

Figure 1
Is my GLT
Beam ok?

