

## Checks and splits in preserved wood

Preservative-treated timbers, posts and beams play an important role in American infrastructure. These large wood products are used in timber bridges and as structural framing for decks, docks and other structures exposed to the elements.

All timbers, posts and beams are subject to some degree of natural drying until the wood acclimates to the conditions of the surrounding environment. This is particularly true for wood used in outdoor applications, where it must endure extreme weather conditions.

Checks and splits in the wood are the most common – and most misunderstood – occurrence of these natural changes. A check is a lengthwise separation of the wood across the growth rings, while a split is a deeper, wider separation extending through the wood from one surface to another.

The appearance of checks and splits in a timber, post or beam are often mis-characterized as an indicator that the wood is weakening and will not perform as expected. However, the reality is that checks and splits typically have little impact on the performance of the wood.

It is important to realize, checks and splits are naturally occurring and should not be considered “defects.”

### Water and wood

Wood is a hygroscopic material, which means it takes in and releases water depending on the environment where it is used. Wood naturally dries as the water in the wood cells evaporates over time.

The speed of this drying process depends on the temperature and moisture conditions of the environment; the warmer and drier the conditions, the faster the drying.

Depending on the outdoor conditions, this drying process can be uneven, with the wood cells in one portion shrinking faster than those nearby. Uneven drying leads to a separation of the wood fiber, which results in checks or splits along the length of a timber.

Wood shrinks more tangentially, or across the grain, than radially, or from the center out. This is due to the presence of rays, which are wood cells oriented perpendicular to the trunk of the tree. Western species groups such as Douglas fir and Hem-Fir have more rays within the fiber, which makes them more susceptible to checks and splits compared to other species.

Controlled drying using a kiln is common for typical construction lumber. However, the larger the wood product, the more difficult it is to kiln dry the wood. With thicker products such as timbers, it's often impractical or too costly to fully dry the wood in a way that eliminates checks and splits.



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### Utilizing checks in treating

Checks and splits are commonly seen in treated timbers, posts and beams in service. Yet, with decades of experience for these products in service, no evidence has been found to suggest checks and splits significantly impact the structural capabilities. In fact, wood treaters have used this experience to minimize potential impacts from this naturally occurring characteristic.

Given that all wood will eventually check and split over time, wood treaters have utilized such separations in timbers, posts and beams as part of the treating process.

The drying process may be done naturally by air seasoning or more controlled through partial drying in a kiln. During this drying, it is beneficial to have most of the checks and splits form prior to treating. These breaks can provide a pathway for preservatives to move deeper in the wood to create a protective barrier. While there may be further checking after the timber is in service, it is unlikely to create breaks in this barrier that allow decay fungi or insects to impact the wood.

### Impacts on strength

Checks and splits typically have little impact on the structural capabilities of a timber, post or beam. In lumber grading rules, checks are considered a natural characteristic and are already accounted for in the assigned design values for the product.

Seasoning checks do not affect the design strength of a member stressed in axial compression unless checks develop into a through-split that essentially separates the timber into two pieces. There's also no impact in members stressed in axial tension unless the checks are at an angle to the grain of the piece and tend to extend across adjacent faces separating the piece in two.

The shear stress in bending members is impacted by checks. However, shear stress is rarely a governing design value. Adjusted values for shear published in the National Design Specification for Wood Construction (NDS) takes into account any checks or splits that may occur due to drying in service.

### Fasteners, check repairs

Given the potential change in the wood as it reaches equilibrium moisture conditions, it's important to inspect for tightness of fasteners in the early years in service. Use caution in trying to reinforce splits or checks, as additional fasteners could exacerbate the separation as the wood will continue to shrink and swell over time in exposed conditions.

Care also should be taken in selecting fasteners when the wood has been treated with a copper-based preservative. For copper-based preservative treated products, the fasteners should be high-quality hot dipped galvanized or stainless steel to avoid potential corrosion. This requirement is defined by building codes as well as treating industry standards.

Applying caulk-type sealants to checks in wood used in outdoor exposures is not recommended. Filling a crack with sealant could potentially trap moisture inside the wood and lead to decay. A water repellent sealer is recommended to protect the wood from exposure and can further minimize weathering and seasoning characteristics.

Seasoning checks and splits are a natural characteristic of wood as it dries. These are accounted for in design values for timbers, posts and beams and typically do not impact the structural performance of the wood. When these wood products are treated, checks can provide benefits in protecting the wood if they are in the piece prior to pressure treating.

