STRUCTURAL BUILDING COMPONENTS MAGAZINE
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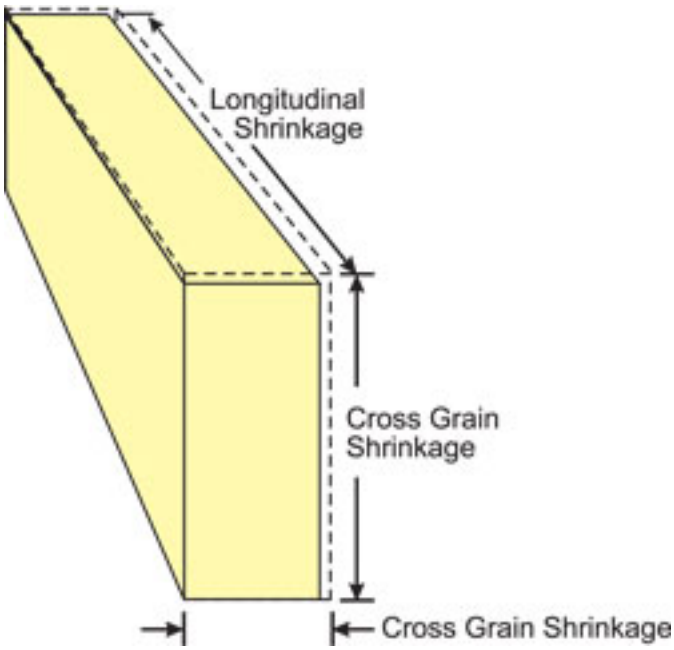
Frequently Asked Questions

Cross Grain & Longitudinal Shrinkage by Ryan Dexter

Readers may recall that the FAQ in the March 2001 issue of WOODWORDS addressed the issue of wet lumber. That article stated that the lumber used in truss design is kiln-dried or seasoned to a moisture content (MC) not exceeding 19 percent. There are many reasons for this, one of which is to minimize lumber shrinkage.

Chapter 3 of the Wood Handbook (Forest Products Laboratory, 1999) addresses the shrinkage and subsequent swell properties of lumber as it relates to changes in MC. The Wood Handbook is a comprehensive reference on wood that can be purchased from the Forest Products Society (800/890-7732) or downloaded, free of charge, at www.fpl.fs.fed.us/pubs.htm.



CROSS GRAIN SHRINKAGE TENDS TO BE MORE NOTICEABLE THAN LONGITUDINAL SHRINKAGE

Lumber shrinks as it dries from its fiber saturation point (28 to 30 percent MC) to the moisture level of the surrounding atmospheric conditions (equilibrium moisture content [EMC]). In the Continental U.S., the EMC level is between eight and 12 percent. Therefore, even if kiln-dried lumber is used, there will be some type of lumber shrinkage as the MC drops from about 19 percent to about ten percent.

QUESTION:

My home was constructed during a wet spell last summer. There are noticeable drywall cracks and nail pops around some of the window and door openings that utilize 2x12 headers. Upon investigation, I discovered that green Douglas Fir-Larch lumber was used for the header material. It seems the cracking is getting progressively worse. Is MC the cause? Did the header shrink?

ANSWER:

The following facts lead us to believe that you are experiencing a shrinkage problem: the condition is getting “progressively worse” and the header was installed at an MC higher than 19 percent.

Once the header is installed, it will gradually lose MC until it reaches its EMC, which averages between eight and 12 percent yearly depending on the area of the country (we will assume eight percent). Lumber experiences more shrinkage across its growth rings (cross grain) than it does along its length (longitudinally). So items like headers, joists, wall plates and rafters may see more overall shrinkage than a full-length wall stud.

According to the Western Wood Products Association's Western Lumber Product Use Manual, the shrinkage of western species is approximately six percent cross grain as it dries from 30 to zero percent MC. That is, the cross grain shrinkage is 0.2 percent of the dimension for every one percent change in MC. (By comparison, longitudinal shrinkage is only 0.2 percent as it dries from 30 to zero percent MC which is why the effects are usually unnoticeable.) The Western Lumber Product Use Manual can be downloaded, free of charge, at www.wwpa.org/publist.htm.

For the sake of argument, let's say the header was installed at an MC of 25 percent. Based upon the information above, the amount the header shrunk can be determined as the MC decreased from 25 to eight percent:

11.25" x 0.002 x 17 = 0.3823
(actual width of 2x12) (shrinkage factor = 0.2%) [change in % MC (25-8)]

The change in moisture content caused the header to shrink 0.3825" cross grain, thus causing enough movement around door and window openings to create cracks in the drywall finish.

The mix of wood based materials (e.g., trusses, wall panels, I-joists, LVL, etc.) and varying moisture con-tents causes movement in all wood frame buildings. Understanding these properties will help reduce moisture content related movement and result in a more stabile finished structure.

CORRECTION (APPEARING IN AUGUST 2002 ISSUE OF STRUCTURAL BUILDING COMPONENTS MAGAZINE)

In the FAQ in the May 2002 issue of SBC, the example of the 2”x12” shrinkage on page 42 should be from a net width of 11.50” rather than 11.25”, as green lumber is sized at 1-9/16” by 11-1/2”. Thank you to Rob Finch, President of Macdonald Inspection Services for writing to let us know of this error.

To pose a question for this column, email us at faq@woodtruss.com. To view other questions visit the WTCA website.

SBC HOME PAGE

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