

Information About Creep

A structural wood member subjected to an applied load will immediately deflect. This immediate deflection is also known as instantaneous deflection. After the initial deflection has occurred, additional deflection may occur under long-term loading. This additional deflection is known as “creep”. Initially, creep deflection occurs at a high rate and then decreases over time. The total amount of creep deflection is dependent on the environment and loading conditions. Increasing sustained loads will increase the amount of creep. However, moisture and temperature cycles have an even greater effect on creep deflection. The tendency of wood to creep is related to moisture content. The drier the member, the smaller the additional deflection under sustained load. According to the *National Design Specification® for Wood Construction* (NDS®), an unseasoned wood member will creep an amount approximately equal to the deflection under sustained load, and seasoned wood members will creep about half as much.

Although creep deflection sounds like a serious problem, it usually does not need to be accounted for because applied loads are typically less than the design loads. In addition, the magnitude of the dead load deflection is usually small. One benefit of Trus Joist® products is the smaller amount of variation in stiffness from piece to piece when compared to visually graded lumber. On average, the actual deflection of a Trus Joist® product will be closer to the calculated deflection when compared to visually graded lumber.

In certain applications it may be necessary to strictly limit the amount of long-term deflection to a specified level. One such application is flat-roof systems. In recent years there have been increasing concerns about the failure of flat-roof systems caused by the entrapment of water. This type of failure is known as ponding, and it represents a progressive collapse due to the accumulation of water on a flat roof. The initial deflection allows water to become trapped. The trapped water, in turn, causes additional deflection. A vicious cycle is generated, which can lead to failure if the roof is allowed to deflect too much.

Under sustained loading, the long-term deflection of members with stable moisture content will increase by approximately 50% over the initial deflection. However, the total deflection of the member (including creep) will often be lower than the allowable total load deflection because the sustained load is usually less than the design dead load. Most of the creep deflection a member will experience occurs within a week of receiving a sustained load. For example, approximately 20% to 25% of the total deflection occurs in about an hour, then another 25% over the next few hours, and another 25% within a few days. After a week, the creep rate is slow, but creep deflections continue for a long period of time. When the sustained load is removed, approximately ½ of the creep deflection will be recoverable, while all of the initial elastic deflection will recover.

Some things to remember about creep deflection:

- As discussed above, certain applications require checking creep deflection. Flat, un-cambered roof applications are of particular concern because they will experience ponding. At the very least, leaking may occur, and if left unchecked, progressive ponding failure may occur.
- Any application where the dead load is relatively high requires special consideration, especially cases where the dead load is greater than ⅓ of the live load.
- Long term deflection due to sustained loads may be greater than calculated, especially for green or unseasoned lumber.
- The longer the span, the greater the potential for a large creep deflection.
- Make every effort to keep the wood dry. If it gets wet, allow the wood to dry before applying load.
- Beware of conditions where creep deflections can eventually cause interference with other structural and non-structural components, including non-bearing partition walls, moveable partitions, large glazed areas, and members that affect the alignment or operation of special equipment. Members experiencing large creep deflections may cause windows and sliding glass doors to jam or break.

If you have any questions, please contact your Weyerhaeuser representative.