Boise Cascade
Engineered Wood Products

Technical Note

Inverted Installation of BOISE GLULAM® Beams in Simple Span Applications

BOISE GLULAM 24F-V4, 20F-V12, 20F-V14, and 22F-V14 grade beams are manufactured with an unbalanced layup, meaning that higher strength laminations are installed in the bottom of the beam. In simple span applications, the bottom edge of the beam is in tension. Unfortunately, unbalanced glulams are sometimes installed inverted (the "TOP" stamp is visible when looking up at the beam from below). The glulam's load-carrying capacity is reduced when installed in this manner.

When installed upside down, only the bending design value of unbalanced glulam grades is actually affected. Reduction factors for Boise Glulam unbalanced grades are shown in Table 1. For example, the allowable bending value of a 24F-V4 beam is 1850 psi when inverted, compared to 2400 psi when installed properly. Thus the reduction in bending is approximately 23%.

Table 1: Boise Glulam Bending Stress Reduction Factor for Inverted Installations

Grade & Species	Bending Stress [lb/in^2]	Inverted Bending Stress [lb/in^2]	Reduction Factor
24F-V4 DF	2400	1850	0.77
20F-V12 AYC	2000	1400	0.70
20F-V14 POC	2000	1450	0.725
22F-V14 POC	2200	1650	0.75

If the beam is uniformly loaded simple span application, there is a simple method of determining the reduced load capacity of the inverted beam. Simply multiply the allowable PLF load (found in the BOISE GLULAM Specifier's Guide) by the reduction factor shown above for the beam application. This reduced value is the allowable PLF load for the non-cambered, uniformly loaded, and inverted beam.

For non-cambered beams with non-uniform loads, the beam design may be analyzed with the BC Calc™ sizing software. To properly account for the reverse installation, the allowable moment is multiplied by the reduction factor. Thus in the analysis results, the moment % allowable must be less than reduction factor for an inverted installation to be valid. For continuous span applications, BC Calc calculates both positive and negative moments and compares the actual values to the corresponding allowable bending values.

For more information or for assistance with cambered or non-uniform load applications, please contact your local Boise Cascade EWP representative.