Inverted Installation of BOISE GLULAM® Beams in Simple Span Applications

BOISE GLULAM® 24F-V4/DF and 20F-V12/AYC 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 glulam beams 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/DF beam is 1850 psi when inverted, compared to 2400 psi when installed properly. Thus, the reduction in bending is 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

If the beam is a 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 BOISE GLULAM® literature) 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 the 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 further information or for assistance with cambered or non-uniform load applications, please contact Boise Cascade EWP Engineering at 800.232.0788.