

Safety Factors

ANSI A92.2 dictates that non-ductile materials (fiberglass, with about 3% elongation) must have a design stress of less than 20% of the minimum ultimate strength of the material. This translates (inverts) to a safety factor of 5:1 of the rated load. The specification further requires that the analysis consider the effects of stress concentration and dynamic loading (and loading on a 5 degree slope). Most designs we have seen and the calculations we have used referenced Canadian Standard CSA-225. The CSA defined dynamic loading as no less than 1.25 and stress concentration as no less than 1.1. If you perform an actual test to failure on the boom, you don't have to consider stress concentration.

Therefore it is common for some designs to use a 5 x 1.25 or 6.25:1 safety factor. Since we take the booms to failure, but may not completely simulate the stress concentration using our test fixtures, we typically recommend a minimum safety factor as 7:1. This would be 5 x 1.25 x 1.1 or 6.875:1, which is rounded up to 7:1. Where the customer does not specifically require the dynamic loading to be calculated in the analysis, most designers default to the 1.25 factor.

