

Joining Fiberglass to Steel Recommendations

When joining fiberglass booms to steel, Waco Boom (WB) recommends the following guidelines. WB in no way is responsible for the design of the joint, but these ideas are shared in good faith and are based on common industry practices. The responsibility of the design is on the manufacturer as it is their duty to ensure the lift is safe for industrial use. The following is also not a substitute for field testing. These guidelines should aid in designing of a joint based on common practice in the insulated aerial device industry.

- Insertion length for each side should be a minimum of 1.5 to 2 times the height of the boom. For example, a 5 x 7 OD fiberglass boom should be inserted ($7 \times 1.5 = 10.5$) ten and a half inches to ($7 \times 2 = 14$) fourteen inches inside the steel section.
- A structural MMA (Methyl Methacrylate) adhesive should be used with a mechanical fastening system (bolts, etc.). The adhesive should be mixed and applied according to the manufacturer's guidelines. We would recommend contacting Weld-On, Loc Tite, or for an appropriate material as these companies have products used in the aerial device market. The steel and the fiberglass surfaces should be cleaned and prepared according to the manufacturer's specifications. Be careful of additives that might be present in the adhesive as sometimes these can lead to deterioration of the integrity of the bond over time.
- The joint should be designed to so that the adhesive and the fasteners both are capable of solely supporting the load to ensure redundancy in case one system fails. The adhesive also helps by acting as a gasket.
- The steel edges should be rounded or beveled to prevent sharp edges from "cutting" into the fiberglass when the boom deflects. These sharp edges create substantial stress concentrations in the fiberglass.
- It is common to shim the fiberglass so that the bond gap is symmetric on all sides. Again, use the manufacturer's guidelines, but a typical gap would be around 0.03 inches or so.
- Bolts should be tight, but excessive torque is not necessary and over tightening the bolts can cause cracking in the gelcoat surface.

Bolt holes should be drilled a minimum of 2 times the hole's diameter away from any edge of the fiberglass. For example a 1 inch hole should be at least ($2 \times 1 = 2$) two inches away from any edge of the fiberglass section. Also, adequate spacing should be used between bolts to limit stress concentrations. There are many acceptable bolt patterns, but a suggested pattern would be a four point arrangement with four bolts being placed in a square pattern on all four sides for smaller sizes. For larger sizes a fifth bolt can be placed in the center of the previously described four bolt pattern.