

Testing Procedures and Products for Bonding Aluminum

Introduction: Previously, there was no battery compartment for Arctos, and that presented two problems; the batteries were transferring their heat via convection which overheated the other electronics, and the batteries were puncturable by PCBs. Thus, the proposed alternative is to create a metal basket for the battery and attach it to an aluminum lid, given that aluminum has greater thermal conductivity which improves heat transfer outwards from the hull and provides a protective barrier.

Parameters being tested: Weighted vs Free, Smooth vs Rough for Surface of Metal

Procedure (Sanding):

1. The samples are sanded using 120 grit sandpaper with no discernable pattern
2. The samples are cleaned with isopropyl alcohol
3. The samples are bound perpendicular to each other using two evenly applied adhesives: “steel reinforced epoxy” and “marine weld”
4. The samples are set aside for 48 hours to dry
5. The samples are pulled apart with tension until failure using hand force.

Procedure (Weight):

1. The samples with 80 grit sandpaper in an orthogonal sanding pattern,
2. The samples are cleaned them with acetone
3. The samples are bound perpendicular to each other using two evenly applied adhesives: “steel reinforced epoxy” and “marine weld”.
4. Progressive weight is added to one sample at a time.
5. The samples are set aside for 48 hours to dry
6. The samples are pulled apart with tension until failure using hand force.

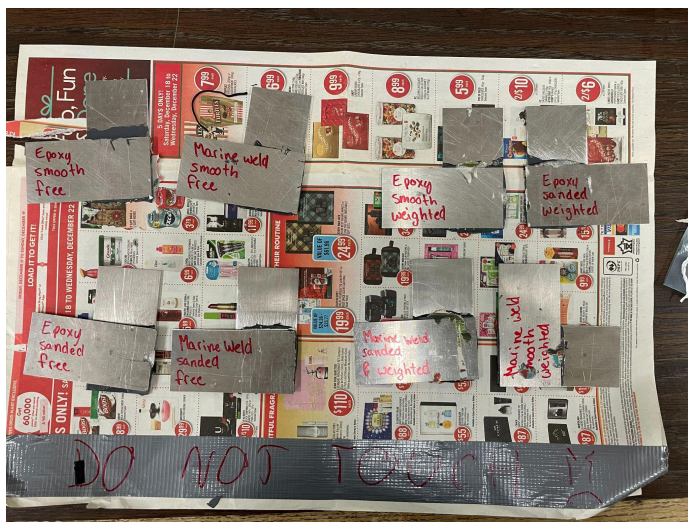


Figure 1. The assortment of the combination of tested parameters; each metal pair is held together by epoxy perpendicular to each other.

Results: The adhesion between the metal plates improved with more sanding since this process creates additional surface area. Thus, there are more points of contact between the adhesive and the metal.

For the comparison between weighted vs. free, there were no quantitative differences between these parameters. However, visually, weighted samples produced were noticeably thinner. This is due to increased weight causing a more even distribution. ARVP members reasonably concluded that as the quality of the bond increased proportionally to the weight placed on the bonding area.

Future Uses: With these tests completed, the results are extrapolated to other areas of the Arctos such as attaching the battery basket and Orin's (the computer's) mount. Additionally, the knowledge gained from metal bonding allows for increased protection of the battery as the metal basket prevents punctures from affecting the battery. With the move to "marine weld" as a standard adhesive, our inventory is more efficient with increased storage capacity.