Auto Body Supply, Inc.
2034 O Street Lincoln, NE 68510 402-477-3941
abodysupply2@neb.rr.com
www.autobodysupplylincoln.com

TECH TIPS – ALUMINUM REPAIR

The Process

For our project, we'll employ the use of an aluminum stud welder to enable us to remove a dent. Remember, this is an electrical welding process, so we need to follow the vehicle maker's recommendations regarding the disabling of electronics and safety restraint systems. Follow the process and photos. It'll be fun:

Step 1: Assess the damage and develop a repair plan. Gather all tools and lay them out in repair sequence. Our dent is softball size with a deeper center that will require stud welding.

Step 2: Apply heat. Notice the size of the dent is reducing because the heat is relieving stress that's locking the dent into position. Aluminum dent repair should always be heated. The heat range is between 400 and 570 degrees F. Aluminum loses its temper once you exceed 570 degrees F and becomes permanently soft. It will melt and fall through at 1,174 degrees F.

Step 3: Notice the size of the dent as you continue to bring the dented metal up to the heat repair range. Because aluminum is such a good conductor of heat, it'll warm up much faster than steel. Back off. Be gentle. Try not to burn the paint.

Step 4: Monitor your heat carefully during the heating process to avoid exceeding the upper range. Several methods are available for monitoring heat: heat crayons (two will be needed, one at 400 degrees F and another at 550 degrees F), a thermocouple (a wand that transmits digital readouts to a handheld calculator) and a non-contact thermometer (which reads heated surfaces at the point of a laser dot emitted from a thermometer). I have all three methods and prefer the non-contact thermometer for speed and utility.

A word about non-contact thermometers: They're sensitive to shiny surfaces because of how the surface is read by the thermometer. A painted surface will give an accurate reading, while a bare sanded surface will not. This is important! The higher the temperature, the bigger the discrepancy between the painted surface and the shiny bare surface. The difference can exceed 100 degrees F at the high range.

Solution: Don't point the non-contact thermometer at bare aluminum. If necessary, apply high heat black (barbeque paint works) to the repair area prior to heat. In the stud welding process, a black soot forms around the base of the stud that provides a suitable surface to use. You may also choose to reduce the area you grind paint from to allow for taking heat readings from nearby painted areas.

Note: I still like the non-contact thermometer. It's handy.

Step 5: Take your heat close to the upper range for better results. While aluminum heats up quickly, it dissipates heat rapidly so the closer to the higher limit you are, the more time the metal has to relax and return to its original contour.

Step 6: Allow to cool. If heat transfer is an issue, you can rapid cool with compressed air (air blower) or wet rag (messy). Be aware that any adhesive areas in the heat zone will have to be re-bonded at the conclusion of the repair, as well as applying corrosion protection from burned inner surfaces. Note the dented area in the photo has been reduced to a small deep dent by just heat stress relieving.

Step 7: Sand/grind paint from repair area using 80-grit disc in grind mode.

Step 8: Vacuum, don't blow. Cross contamination and galvanic corrosion are serious considerations when working with aluminum. Dissimilar metals (steel and aluminum) in contact with one another in the presence of an electrolyte (moisture) cause galvanic corrosion. It's very important to make sure you vacuum up your filings, grindings and dust and don't blow them around the shop, where they can land on cars of a dissimilar metal. Use fresh sanding abrasives to prevent cross contamination. Vacuum all your tools and wipe them down with a damp rag to remove all traces of metals.

Some manufacturers recommend separate tool sets marked "Aluminum Only."

Be diligent and be conscientious. Nobody wants to make a great repair and then have it come back with corrosion bubbling under the paint. It's ugly.

Step 9: Clean the sanded area, and you're ready for studs.

Step 10: Bring out the aluminum stud welding machine. Set it up correctly on an old part of comparable thickness. This is important to prevent "blow through." Start with a lower setting and test stud for pulling strength. This takes a little practice. These machines have a wide range of settings, so I recommend that when you find the proper range, mark it on the machine for future reference. The machine is unlike conventional steel stud welders and has two external ground cables that need to be applied to an area connected to the repair area. I used the hatch window weatherstrip pinchweld. My machine came without a cart, so I had to build one (another Saturday gone).

Step 11: Once the machine is properly set up, apply one or more studs to the dent area. I used two.

Step 12: Thread on pulling loops to threaded studs to allow for pull. Note the soot buildup around the base of stud. This will provide a suitable measuring surface for a non-contact thermometer, or you may apply high-heat paint in a nearby location.

Step 13: Heat the area of the dent carefully to the repair range of 400 to 570 degrees F. Monitor the heat accurately to avoid annealing.

Step 14: When the desired heat has been reached, apply the leverage bar and remove the dents while the panel is hot. Move quickly because aluminum cools quickly. That's why racers like it for oil tanks and pans.

Step 15: Remove the threaded studs with side cutters. Don't try to twist off, or you may tear a hole in the panel. Remember the physician's oath, "First do no harm."

Step 16: Grind down the remainder of the stud to the surface. Use 80 grit.

Step 17: For those of you who don't recognize this, it's a metalman's vixen file. If you have one, it must be dulled on a wire wheel so it won't remove too much metal. Dress off the area to reveal highs and lows. Use the file at a 3-degree angle and not straight back and forth to avoid file marks. Painters hate those.

Step 18: Grind the area with an 80-grit disc and check for highs and lows again. You may wish to apply an appropriate filler. In this case, it wasn't necessary.

Step 19: Featheredge the repair area and apply appropriate primers and primer surfacers. There you have it. This repair represents a significantly different repair process than a steel part, with different time considerations. It's a valuable process for any estimator to witness in order to properly understand the procedure.