

## **SPC6. Effect Of Weld Zone Chemical Composition On Structural Properties Of A97075 Weldments**

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### **Introduction**

A97075 is a lightweight, super strong aluminum alloy that is extremely sensitive to weld cracking. Many groups claim that this alloy is unweldable and advise against welding it at any cost, and many other groups claim to produce sound welds in their everyday designs. Although research has been done on this alloy in the past, there still seems to be a void in the knowledge of what procedures can be used to weld it and which can not. Better understanding this alloy and its behavior towards welding will help industry to better utilize this material and advance the welding industry.

### **Technical Approach & Results**

In order to offer a piece of the puzzle, it was decided to study the effects of filler metal dilution on the structural properties of A97075-T6 aluminum sheet. Using 1/8-inch clad aluminum sheet and aluminum filler ER5356, included joint angles were varied from 0deg., 25deg., 50deg., 75deg., and 90deg. Full penetration welds were made using a fully automated GTAW system and a regulated restraining system. Three batches of each joint angle were welded so that testing could be done in the as welded condition, naturally aged condition, and post weld heat-treated condition.

Structural analysis of the weldments was performed by side bends, tensile pulls, and metallography. Side bends gave information on the ductility and soundness of the weld. Tensile pulls showed the yield and ultimate strength, the percent elongation, and the mode of fracture. Metallography was used to identify the amount of liquation in the weld zone, the amount of particles and their size, and any other defects that resulted from welding. Because ER5356 filler alloy is not heat treatable and does not have a tensile strength near that of A97075-T6 base metal, dilution or chemical composition plays a large roll in the final strengths achieved.

### **Conclusions**

The results from this study indicate that the proper welding procedure can yield sound welds on A97075-T6 aluminum. Strengths of weldments on this alloy seem to be in check with other heat-treatable aluminums and depending on the heat-treating procedure used after welding, joint strengths approach that of the base metal could be achieved. Many filler metals are not suited for welding A97075 due to their tendency toward hot cracking, however, by using a filler that is easy to work with and by selecting the proper dilution ratios, strong, dependable welds can be produced on thin sheet.