



Introduction: The American Metal Casting Consortium (AMC) and the North American Die Casting Association (NADCA) have sponsored research on mechanical properties of various section thicknesses of several production high pressure die cast alloys. Under the AMC Innovative Casting Technologies Program (ICT), additional testing and research has shown that thinner cross section thicknesses of die cast alloys have higher tensile and yield strength than thicker sections of the same alloys.

SUCCESS STORY

Problem: The design of die castings utilizes mechanical data that was developed from as-cast, round tensile specimens. For production die castings, the sections of the castings are typically rectangular in shape and design, resulting in varying properties from the as-cast specimens. Die casters have commonly seen a difference in the published values from the as-cast specimens to actual die castings.

Solution: The Properties vs Section Thickness research defined properties of aluminum alloys with specific casting wall thicknesses that provided properties more related to specific section thickness of production castings to reduce weight and improve performance. Better design guidance can be created for future castings by defining these properties. This will result in lighter, higher performing die cast parts.



Figure 1: Standard size tensile specimen from A380 die casting

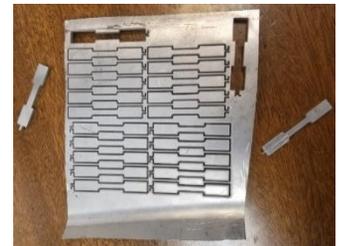


Figure 2: Subsize tensile specimens from B360 aluminum die castings

Benefits: RCM Industries has consistently utilized the project data to educate customer design engineers on the realistic material properties of die castings. Design engineers face uncertainty when determining the appropriate property values to use in their finite element analysis (FEA), sometimes defaulting to ASTM B85 values derived from separately cast tensile bars, occasionally resulting in unexpected component failures and increased production costs. RCM Engineering continually references the project data as an authoritative resource when discussing material properties with customers. Unbiased industry sampling and sound experimental methodology provide a credible baseline for developing casting designs and quality standards. The data affirms that these property values are representative of standard die castings and helps dispel misconceptions about observed properties lower than commercially published tensile bar values being solely due to "poor quality".

"The data quantifies a key phenomenon in high-pressure die casting—the improvement in material properties observed in thinner walls. This has led to the development of stronger and more reliable casting designs that maximize the inherent advantages of the die casting process. I'm hopeful that this valuable data will be incorporated into NADCA and ASTM standards, further advancing the casting industry." Robert Michael Marconi, Engineering Manager