Influence of 3D Printing on Safety-Critical Performance Properties

Thomas Fabian, PhD
Underwriters Laboratories (UL) LLC

Mechanical properties of 3D printed materials have repeatedly been demonstrated to significantly vary based on how test specimens were printed. These variations are substantially greater than for conventional injection molded samples. There is a lack of knowledge, however, on the influence of 3D printing on ignition, flammability and electrical material properties associated with UL safety standards. The influence of different combinations of material extrusion 3D print parameters and build strategies on ignition, flammability, electrical, and thermal distortion properties were investigated for two polymers, acrylonitrile-butadiene-styrene (ABS) and polyetherimide (PEI). Results from the 3D printed test specimens were compared to results measured for test specimens formed by traditional injection molding to address the knowledge gap in performance between 3D printed specimens and conventionally injected molded specimens. Based on these new findings combined with known mechanical behavior, UL will highlight an approach for acceptance of 3D printed materials and components in end products.