

Evaluation of Thermal Protection Systems for Insensitive Munitions

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Threat hazard analyses performed for insensitive munitions (IM) either being transported or stored are generally driven by either thermal or impact threats. Thermal threats originate from the presence of fire resulting in slow or fast cook-off of the munitions. Impact threats can be from a variety of sources. The U.S. Army, in collaboration with Hughes Associates, Inc. is evaluating thermal protection systems to improve munitions response to these types of threats. The impetus of the research is to provide a larger window of time between when a munitions store is subjected to a thermal threat and when the munitions react thus providing more time for suppression activities and/or egress from the area. A series of small-, intermediate-, and full-scale tests were conducted to evaluate the fire performance of both standard and prototype composite munitions containers as well as the insulating performance of various intumescent coating materials applied to these substrates. Full-scale testing involved the immersion of munitions containers within a fire test furnace following the UL 1709 fire growth curve to simulate conditions expected during the MIL-STD-2105C fast cook-off fire test. The thermal protection performance of each intumescent/substrate system was evaluated based upon temperature measurements collected within the furnace, on the internal surfaces of the munitions containers, on the surface of mortars in the container, and inside of the inert fill within the mortars. The additional thermal protection provided by the intumescent coating systems and composite substrates when compared to the current munitions container construction materials are presented in this research.