

INFLUENCE OF THE THERMAL RADIATION PULSE SHAPE ON HEATING AND DAMAGE

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ABSTRACT

Full scale nuclear thermal testing of whole weapon systems or large equipment is only possible with a TRS, which produces the thermal radiation by the combustion of aluminum powder and liquid oxygen. Unfortunately this type of simulation facility is only able to produce a trapezoidal pulse shape. The irradiation parameters in TRS testing have to be adjusted to cause damage and heating equivalent to a nuclear pulse. For small scale thermal tests the correct nuclear pulse shape can be achieved with computer controlled solar furnaces or high power xenon arc lamps.

In a French-German co-operation samples with paint layers are exposed to thermal pulses with different shapes: Rectangular, trapezoidal and 2nd nuclear pulse. The resulting temperatures and mass losses are analyzed. For these investigations the French solar furnace at CEP Odeillo and the German large xenon lamp lab simulator at WIS in Munster are used. As the data show it is possible to define a rectangular or trapezoidal pulse equivalent to a certain nuclear weapon yield. The required pulse duration depends on the combination of substrate and paint. A generalization that a given pulse duration corresponds to a specific weapon yield is not possible.