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Structural Damage Equivalence of Selected Explosive Materials Based on the Response of Thin Circular Plates Subjected to Blast Loading

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Choose Explosive Material

Calculate Mass Factor (CHEETAH)

$$\alpha = \frac{E^D_{0_{C4}}}{E^D_{0_{Explosive}}}$$

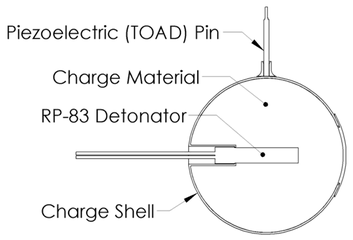
Use Mass Factor and Mass of Reference C-4 to Calculate Explosive Mass

$$mass_{Explosive} = \alpha \cdot mass_{C4\ Reference}$$

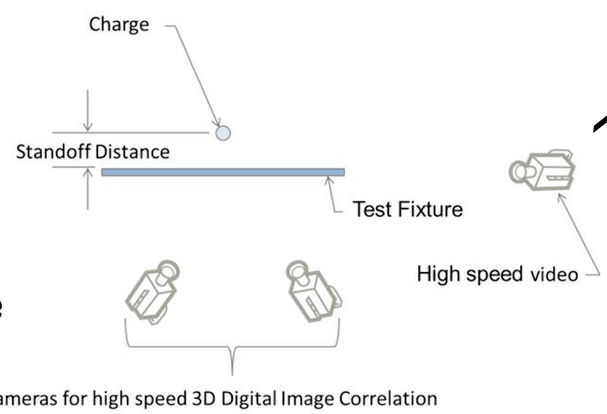
Inverse Mass Factor Gives C-4 Equivalence

$$C4\ Equivalence = \frac{1}{\alpha}$$

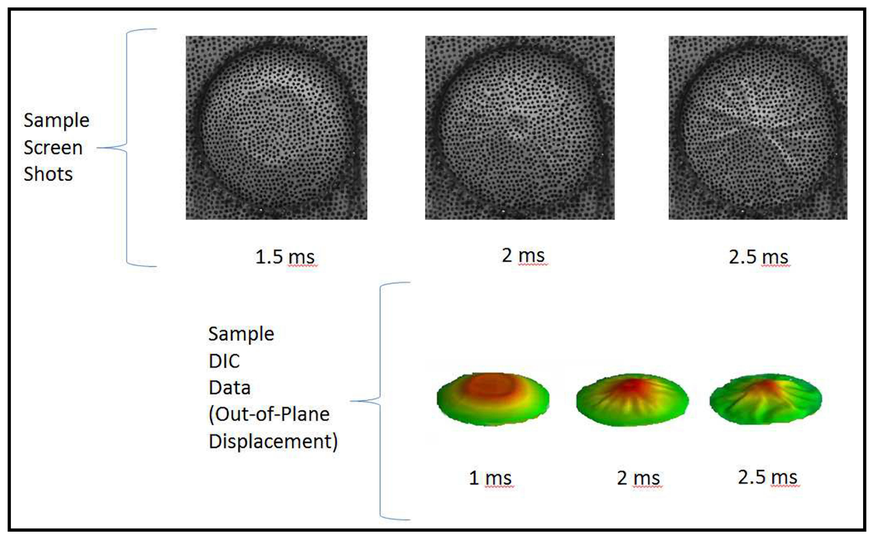
Form Material into Center-Initiated Sphere



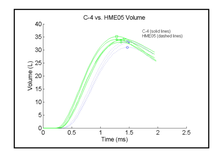
Test Using SNL Circular Plate Method

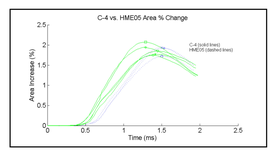


Collect and Analyze Digital Image Correlation Data



Calculate Damage Metrics

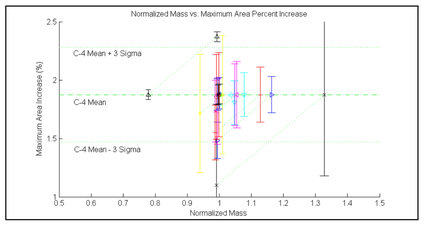


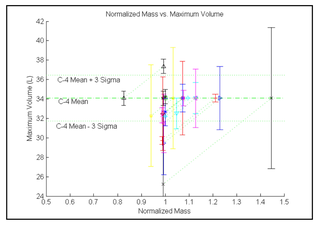


Calculate Normalized Mass of Explosive Based on Tested Mass and Density

$$mass_{normalized} = \frac{mass_{tested}}{\alpha \cdot mass_{C4\ Reference}}$$

Determine Experimental Damage Equivalence Based on Material Data, C-4 Data and Numerical Simulation Using C-4 Equation of State Data





Material	C-4 Equiv.	Experimental Equivalence (Area Metric) (Uncertainty)	Experimental Equivalence (Volume Metric) (Uncertainty)
HME14	0.30	0.23 (+0.07/-0.04)	0.21 (+0.07/-0.04)
HME17	0.48	0.44 (+0.04/-0.03)	0.42 (+/-0.03)
HME07	0.61	0.52 (+/-0.03)	0.49 (+0.06/-0.04)
HME04	0.56	0.53 (+0.07/-0.06)	0.50 (+0.06/-0.06)
HME05	0.48	0.46 (+0.09/-0.06)	0.44 (+0.10/-0.07)
HME06	0.34	0.43 (+/-0.01)	0.41 (+/-0.01)
HME07	0.62	0.62 (+0.04/-0.07)	0.58 (+/-0.04)
HME08	0.64	0.61 (+0.07/-0.06)	0.59 (+/-0.02)
HME09	0.63	0.61 (+0.06/-0.05)	0.57 (+/-0.02)
HME10	0.91	0.88 (?)	0.83 (?)
HME11	0.79	0.78 (+0.22/-0.14)	0.76 (+0.27/-0.16)
HME12	1.08	1.17 (+/-0.04)	1.17 (+0.05/-0.04)

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