

Pantex – High Explosive Mission

- National Nuclear Security Administration recognizes Pantex as the Production Agency (PA) for High Explosives (HE) production and manufacturing
- Pantex mission includes HE research and development
- Pantex Plant is the only site in the Nuclear Security Enterprise with cradle-to-grave responsibility for HE production in support of nuclear weapon assembly/disassembly
- The life cycle includes HE procurement, synthesis, formulation, pressing, machining, analytical testing, mechanical property testing, small component assembly, disassembly, test fire, and disposition



Primary Firing Site Missions

Qualification of New Production Explosives

- Baseline data (Dimensional Detonation Timing evaluation, Divergence, Rate Sticks, Enhanced Corner Turning, etc.)

High Explosives Surveillance Evaluations

- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory

Obsolete Explosive Component "Sanitization"

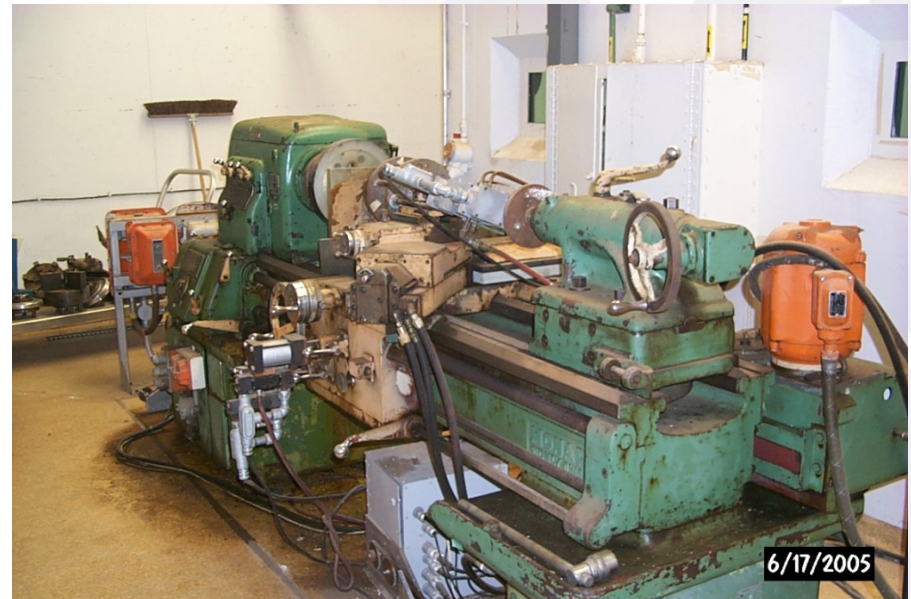
- Main charges
- Small Explosive Components

Campaign Work

- Enhanced Surveillance (ESC)
- Plant Directed Research and Development (PDRD)
- Component Maturation Development (CMD)

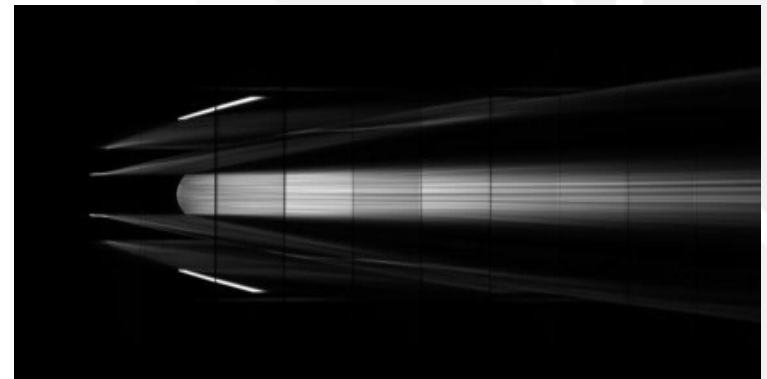
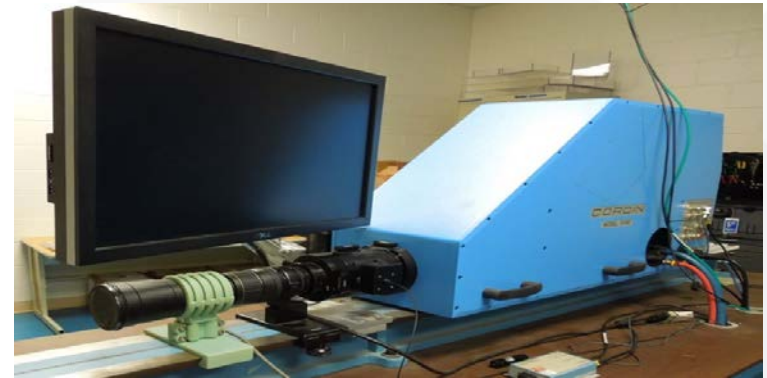
Primary Firing Site Missions (cont.)

- Safety Testing
 - Explosive Machining High Speed Overtest
 - Insensitive High Explosive Qualification Tests
 - Main Charge "Skid" testing (e.g. flooring/mat approval)
 - Disassembly Safety
- Department of Transportation (DOT)
 - Package Qualification Testing
- Work for Others
 - Component Sanitization
 - Detonation Timing Evaluation



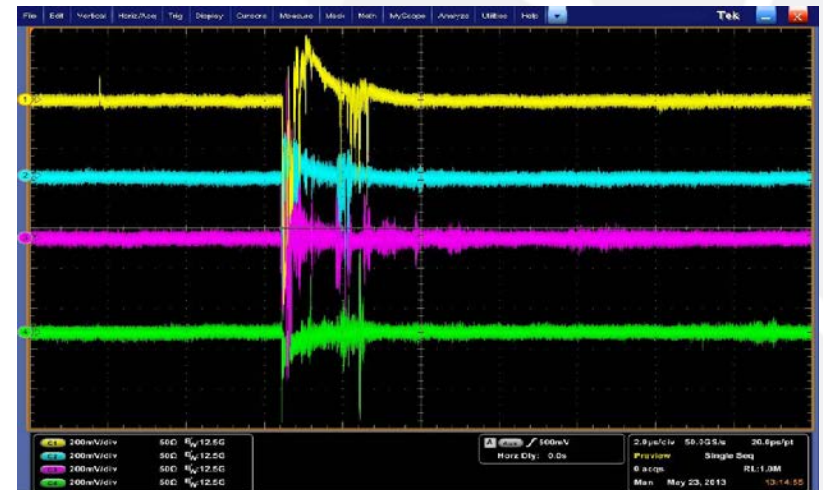
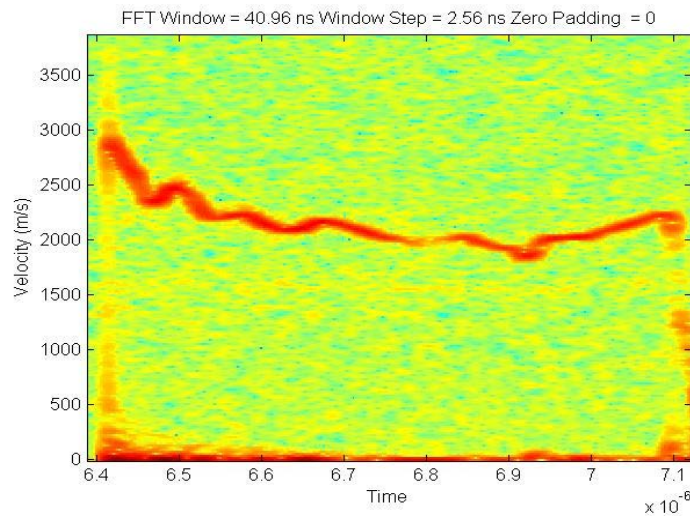
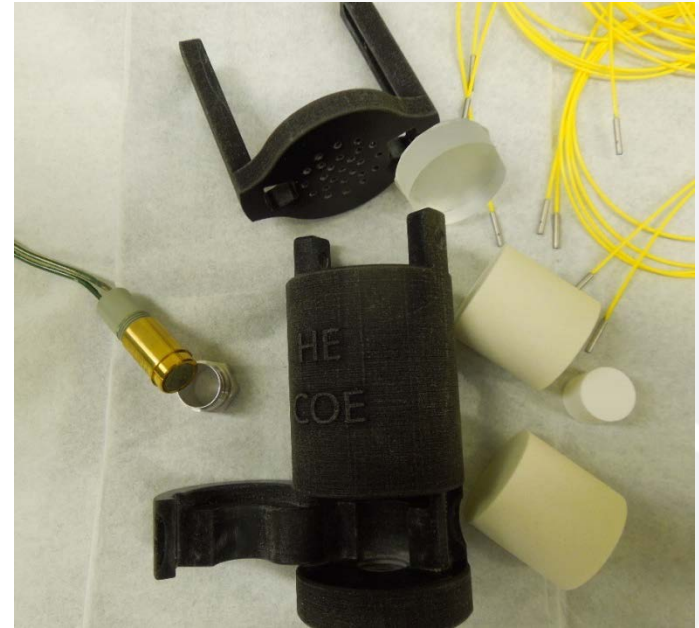
HE Performance Testing Element

- Firing site conducts performance tests on all New Production and Field Return Explosives
- High Speed Rotating Mirror Camera
 - 5000 revolutions per second (rps)
 - Turbines use compressed air or nitrogen at lower speeds (2000 rps)
 - Helium used to achieve higher revolution speeds
 - Fiducial inputs used for precise image synchronization
 - Minimum resolution of 56 lp/mm at slit plane
- Film Streak Camera – Cordin 75C
 - Writing Rate – Up to 25 mm/ μ s
 - Record Size – 90 x 254 mm
- Digital streak camera – Cordin 131HD
 - Spatial resolution – 6400 pixels
 - Temporal resolution – Down to 1.0 ns
 - Recording rate – Up to 4462 pixels/ μ s
 - Record Length 46000 pixels



HE Performance Testing Element (cont.)

- Photon Doppler Velocimetry (PDV)
 - Measures the particle velocity of the explosive surface (as opposed to the shockwave velocity)
 - Fiber optics components
 - Laser based
 - High-Bandwidth Digital Oscilloscopes
 - Up to 50 GHz bandwidth
 - Sampling rates used are typically 50 GSa/s (gigasamples per second)

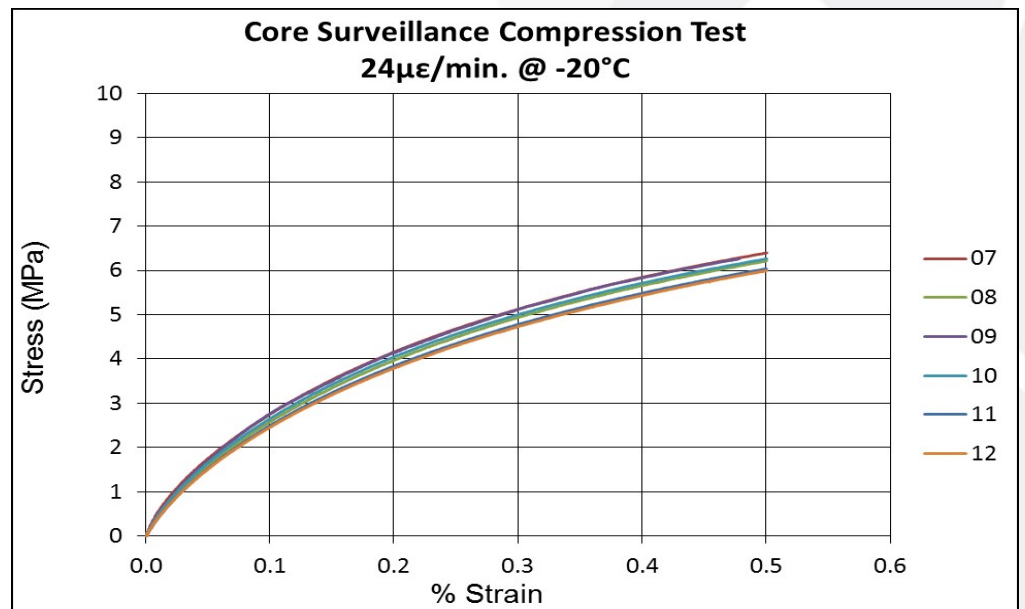
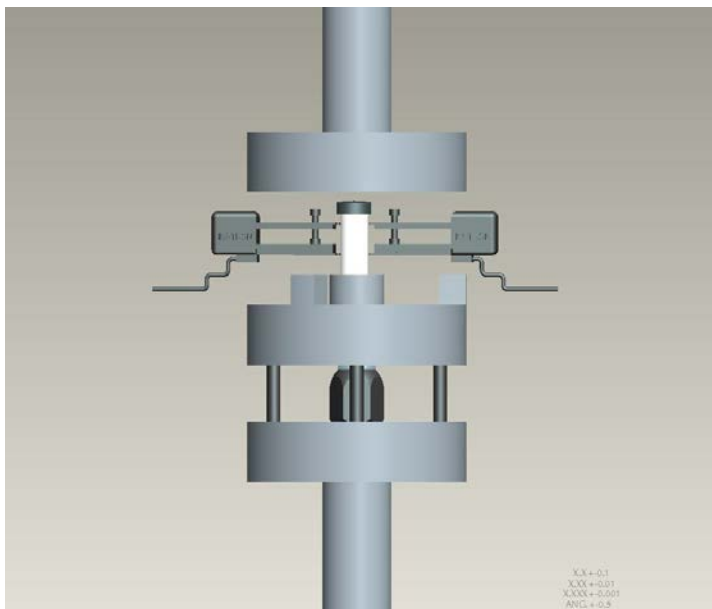
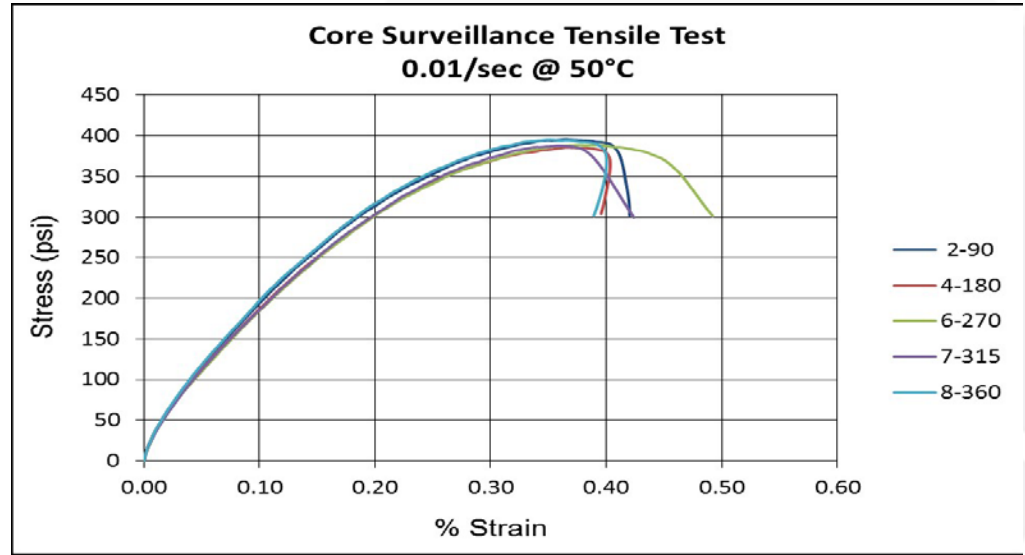
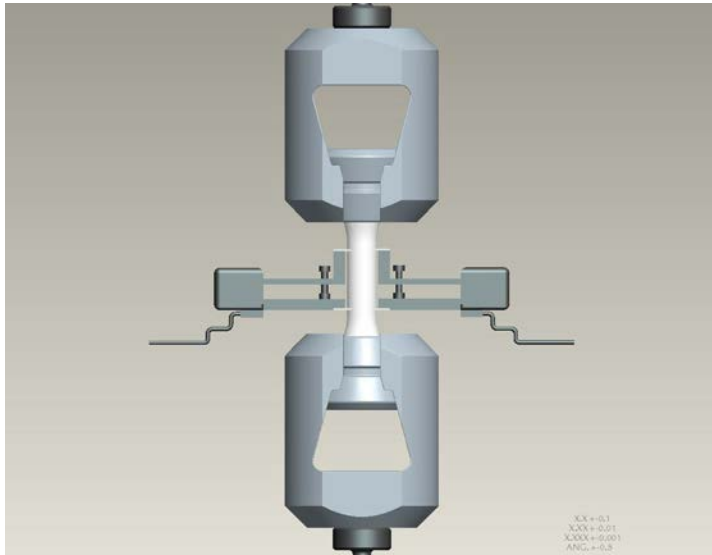


HE Mechanical Testing Element

- Conduct tensile and compression testing for high explosives
 - Both Qualification and Surveillance testing
 - Quantify the strength of HE under high stress
 - Stress and strain limits
 - Constant strain-controlled rate applied to a sample (machined)
 - Stress applied to through the elastic phase and through the plastic phase to failure
 - Strain measured by a extensometers on opposite sides
 - Stress measured as a function of strain and curve produced

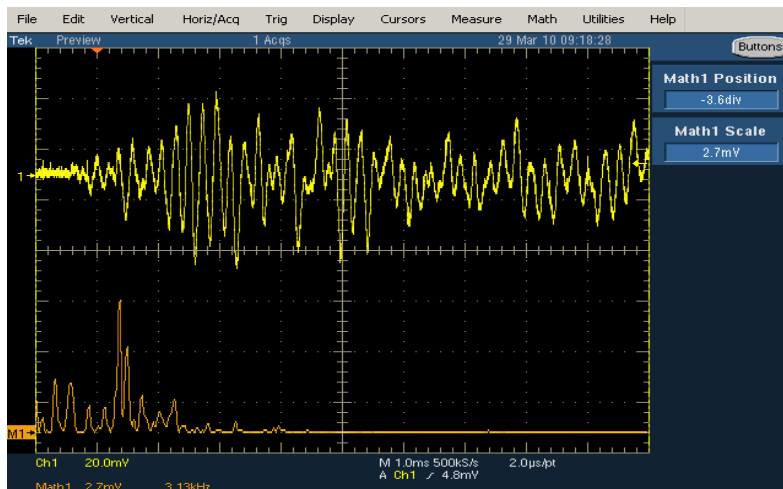


HE Mechanical Testing Element (cont.)



HE Drop Hammer Test

- Perform HE "drop hammer " sensitivity and safety testing
 - Determine the drop heights or probability of reaction
 - Using drop weight impact test
 - Explosive Sample
 - Placed on sandpaper
 - Standard Reference vs Sample
 - Dropping Striker Oscilloscope



HE Drop Hammer Test (cont.)

Analysis of Drop Hammer Data (Bruce-ton)

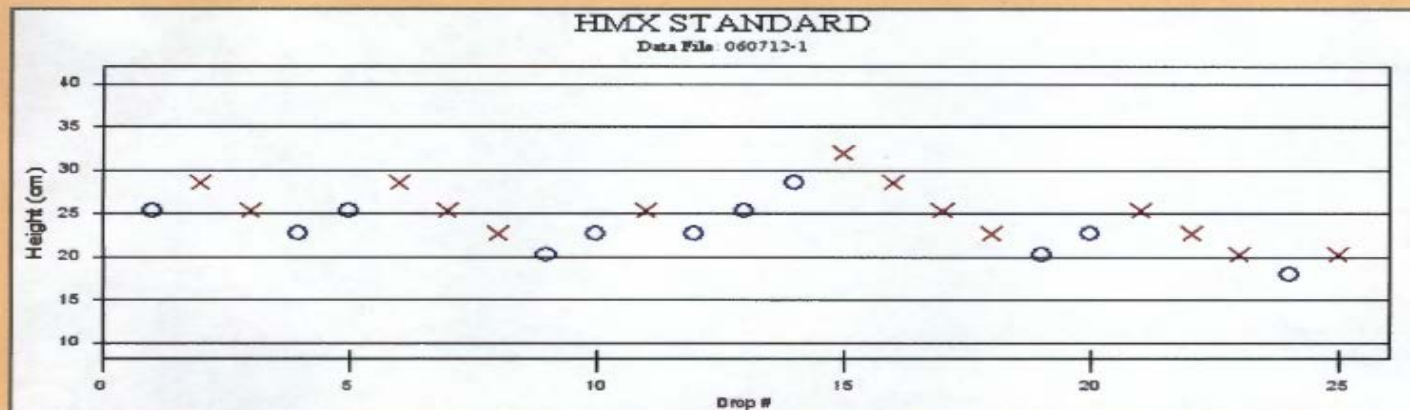
Data File: N:\Drop Hammer Existing\Dropham\Data\060712-1

ID: HMX STANDARD

Height (cm)	NOGOs	GOs
18.0	1	0
20.2	2	2
22.7	4	3
25.4	3	5
28.5	1	3
32.0	0	1

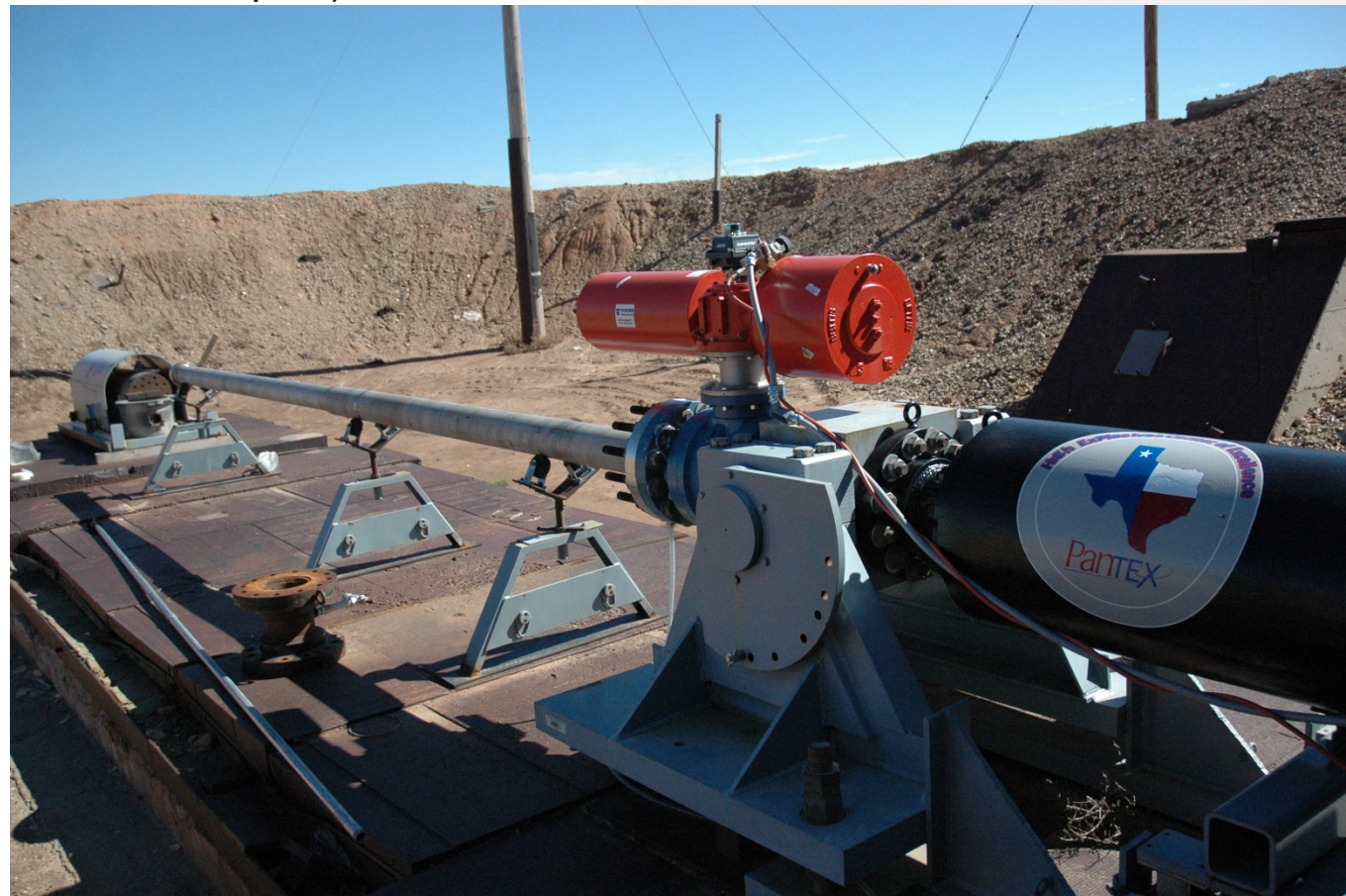
Number of Heights = 6 Number of Drops = 25

H50 = 24.2 cm H50 + Sigma = 30.3 cm AllFire = 48.5 cm
Sigma = 0.097 (Log Units) H50 - Sigma = 19.4 cm NoFire = 12.1 cm



HE Sensitivity/Safety Tests for Explosives

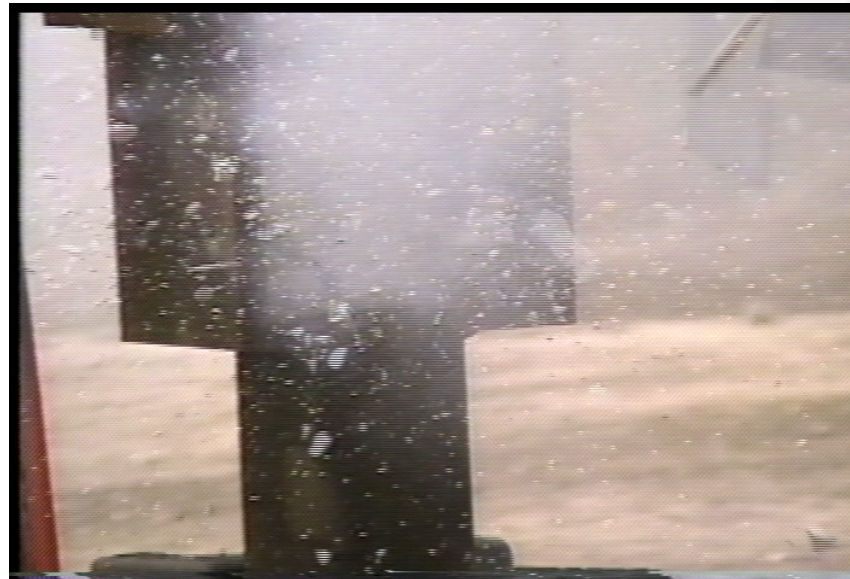
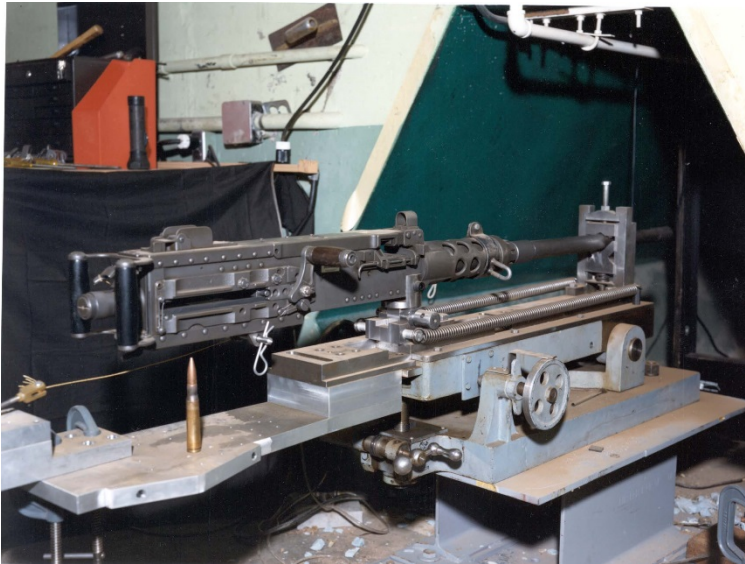
- Impact Testing
 - Gas Gun, Rifle Bullet, Drop Hammer, Extreme Impact
- Friction Testing
- High Speed Machining (Over-test)
- Relative (skid Test –both friction and impact)
- Electrostatic Sensitivity



HE Sensitivity/Safety Tests for Explosives (cont.)



HE Sensitivity/Safety Tests for Explosives (cont.)



HE Sensitivity/Safety Tests for Explosives (skid test both friction and impact)



Component “Sanitization” (removal of hazard/usefulness)



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Firing Site Facilities

• Three Outdoor Firing Pads

- Skid Test Apparatus at 2 Pads
- 40' Drop
- Gas Gun

• Two Indoor Tank Facilities

- 1 lb. Tank (Approx. 45,000 lbs.)
- 1 lb. Tank (Approx. 90,000 lbs.)
- 2 lb. Tank (Approx. 172,000 lbs.)

• Machining Overtest Facility

- Feed Rate
 - (slow feed rate generates more heat)
- Speed (rpm)
- Duration (sec)
- Sharpness (Sharp vs Dull)
- Coolant (with water and without)
- Clean-out (diameter of cutter)
- Normal Force (psi)



Summary of High Explosive Capabilities

- **Advanced technologies such as PDV and state-of-the-art diagnostic equipment are being used to evaluate high explosives**
- **Pantex is well positioned to support all HE performance and surveillance testing including Campaign Projects for current and future needs**

The End





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