

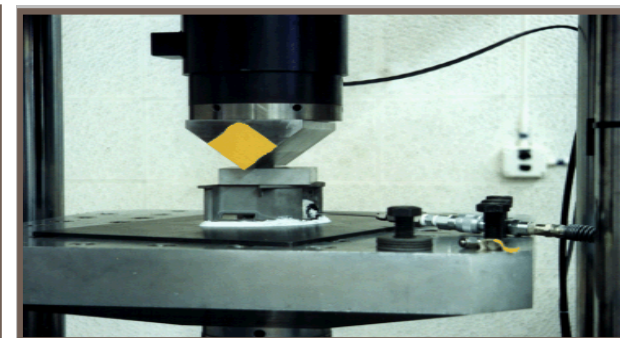
Exceptional service in the national interest



Shock



Climatic and Centrifuge



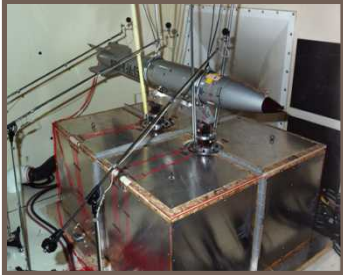
Structures

Engineered Safety

Darrick Jones, 1558

April 9, 2014

Environmental Test Facilities



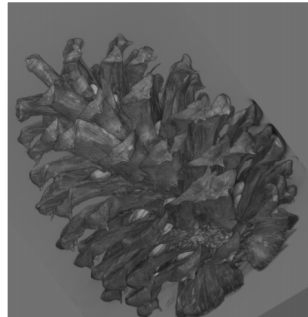
Vibration/Acoustic



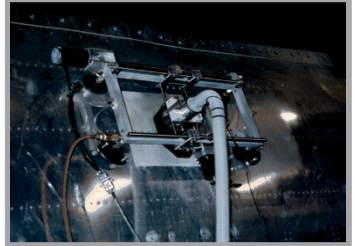
Electrodynamic Shaker



Electrohydraulic Shaker



Radiography



Ultrasonics



Vibration



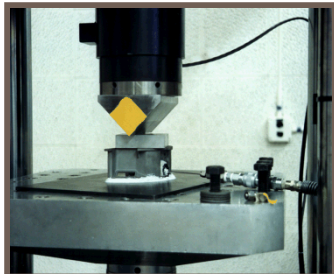
Hopkinson Bar



Centrifuge



Mass Properties



Structures



Shock



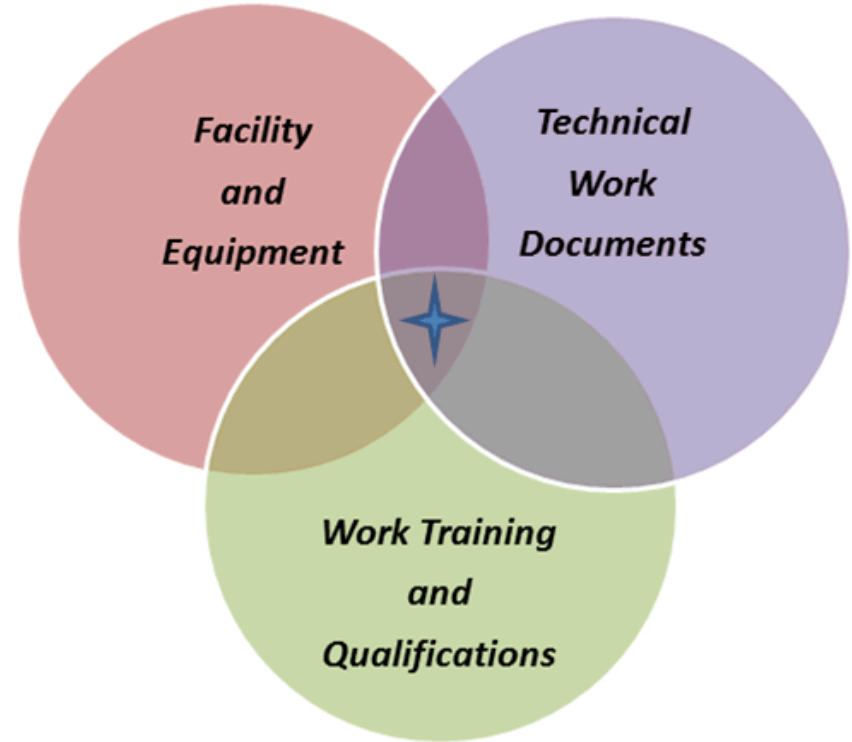
Modal



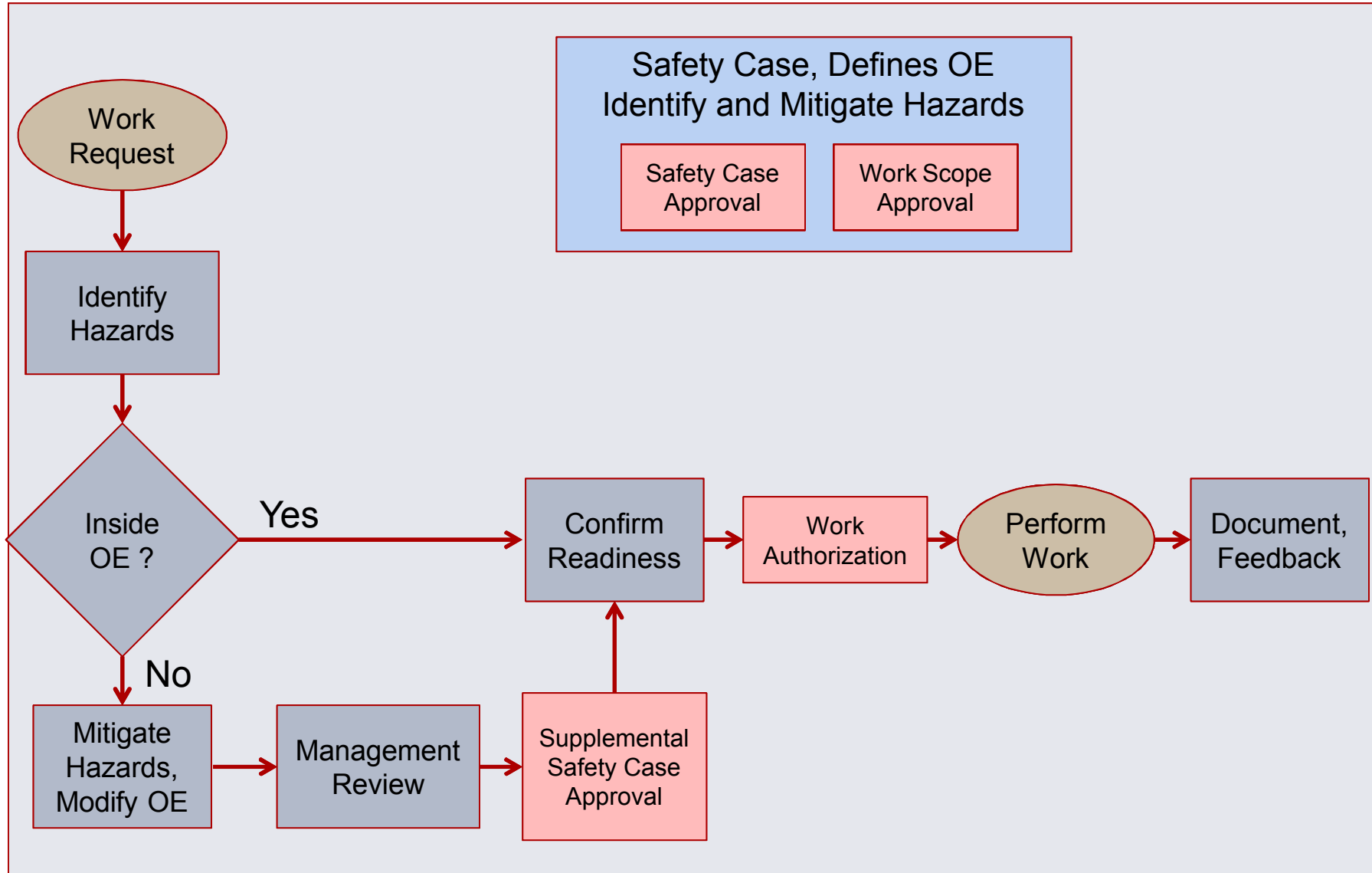
Climatic

Our Challenge

★ = Operating Envelope



Our Engineered Safety Framework



Shock Laboratory Safety Case

Shock Laboratory Introduction

The features of the 860 Mechanical Shock Lab are:

- Test equipment and instrumentation needed to generate and monitor shock simulations
- Equipment for extensive computerized data acquisition and analyses
- Expertise to analyze and evaluate data, tests, and test specifications
- The Shock Lab contains:
 - Drop-table testing machines
 - Air Gun Systems
 - Computer-based data acquisition and processing system

Decision Maker

- Senior Manager approves Safety Basis Narrative and authorizes work within the operating envelope
- Senior Manager delegates to the Manager the supplemental Scope of Work and Safety Case decision points documented in the EWP for any work requiring a Modified Operating Envelope.

Unacceptable Consequences

- Personal Safety:
No one shall be injured such that they need medical attention
- Environmental Safety:
No operation shall violate environmental regulations
- Equipment Safety:
No customer hardware will be damaged

Hazards

Facilities Based

- Stored kinetic energy
- Pressure hazards
- Equipment pinch points
- Material handling
- Tripping hazards
- Equipment
 - Operation of equipment
 - Age of equipment

Test Articles

- Stored kinetic energy
- Radioactive articles
- Explosive components
- Batteries
- Capacitors

Hazards Controls

- Safety Zone established and monitored during testing
- Room is locked and controlled during testing
- No personnel are present in testing room while testing is performed
- Detailed Work Instructions are followed
- Pressure Data Packages (PDPs)
- Technical Work Documents (TWDs)
- Two person rule for explosives
- Two person rule for lifting heavy items

Hazards Controls (continued)

- “Good Housekeeping” is actively performed
- Continuous awareness of tripping hazards, such as wires and cords – making adjustments when necessary
- Equipment maintenance and inspections are performed
- Use of mechanical lifting devices for larger items
- Proper PPE which includes:
 - shoes, gloves, ESD smocks and wrist straps, and safety glasses
- Tool replacement when compromised for safety reasons
- Bolts are regularly inspected and replaced as needed

Hazards Controls (continued)

Engineered Controls for Shock Lab

- Lexan windows between the testing area and the control room
- Lexan shields are placed in front of the equipment during testing
- Lab walls are lined with 16 gauge steel plating
- Thermal safety fuses installed in all thermal chambers

Hazards Controls (continued)

Drop Table

- Bungee cords are inspected prior to each use
- Bungees are replaced when necessary and discarded
- Three-way valve with independent hydraulic braking system
- Mechanical stops for guide rods
- Enhanced strain relief device on carriage
- Restraining line for hydraulic lines
- Simultaneous firing buttons

Hazards Controls (continued)

Air Gun System

- Manual control valve to pressurize the system
- Vent actuator closing switch in the control room
- Simultaneous firing buttons
- Pressure manifold regulator (max 300 psi)
- Additional line regulator in the system (max 300 psi)
- Two pressure-relief safety valves are utilized in the system

How do you Know ?

- Lexan shield tested for fragment containment
- Thermal chamber tested with explosive unit
- Thermal safety fuse functionally tested

Questions ?