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Sandia National Laboratories



Sandia's RAM Transport Packaging Capabilities

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Sandia's RAM Packaging Capabilities

Sandia National Laboratories

- Design
- Analysis
  - Regulatory/Certification
  - Test Support
- Test
  - Certification Testing
  - Extra-Regulatory Testing
  - Scenario Testing
- Complimentary/Supporting Activities
  - Standards Development
  - Component/Materials Research
- Quality Assurance

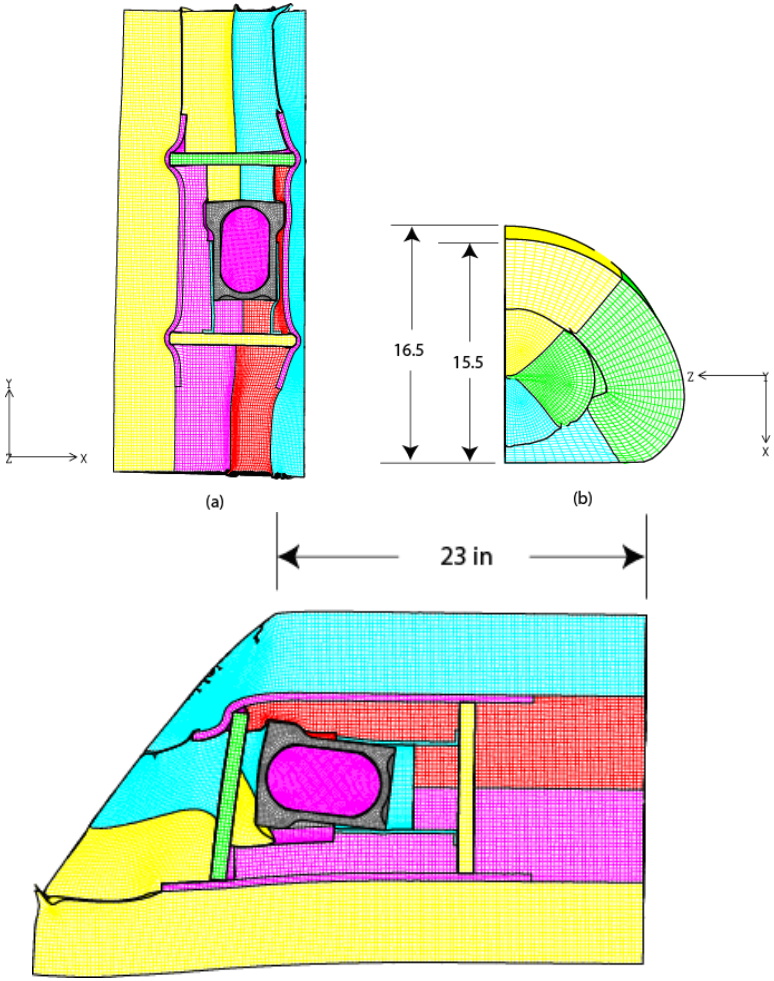
Package Certification Testing

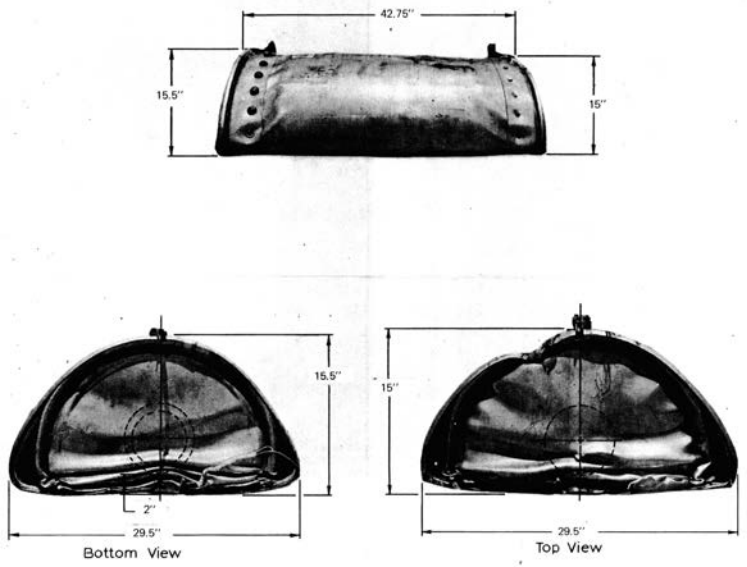
- Sandia has performed physical tests of all of the hypothetical accident condition environments.

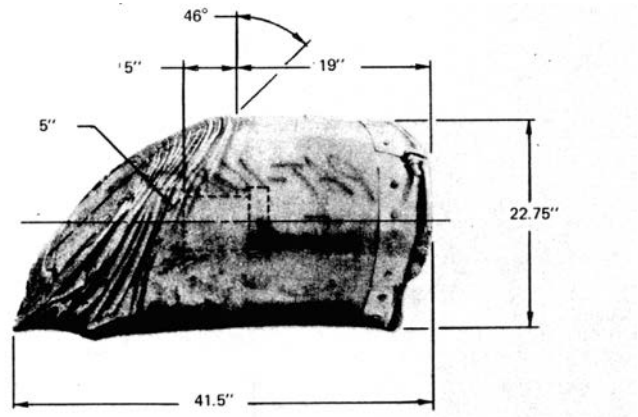
ute fire

200-meter immersion

Regulatory Package Analysis – PAT1 Impact

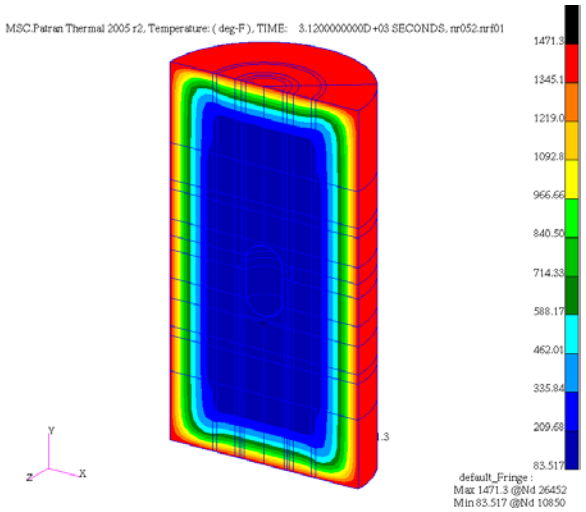


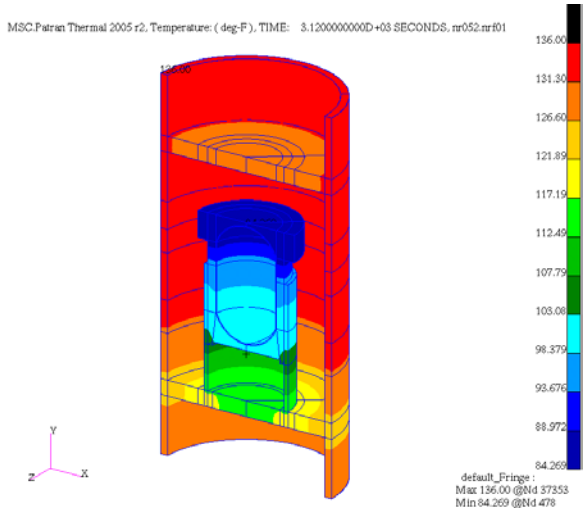




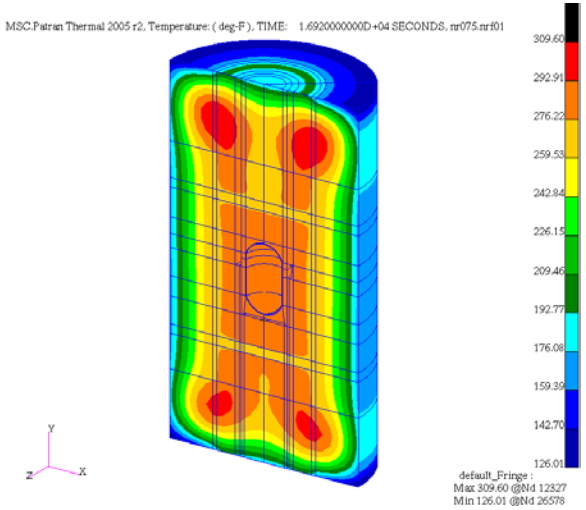
Regulatory Package Analysis – PAT1 Thermal

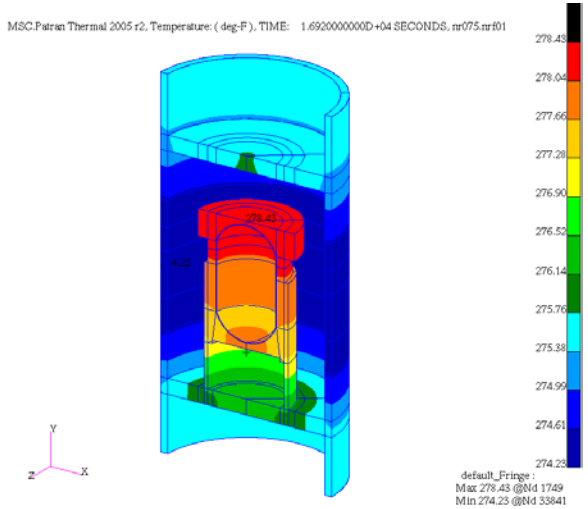
At end of fire



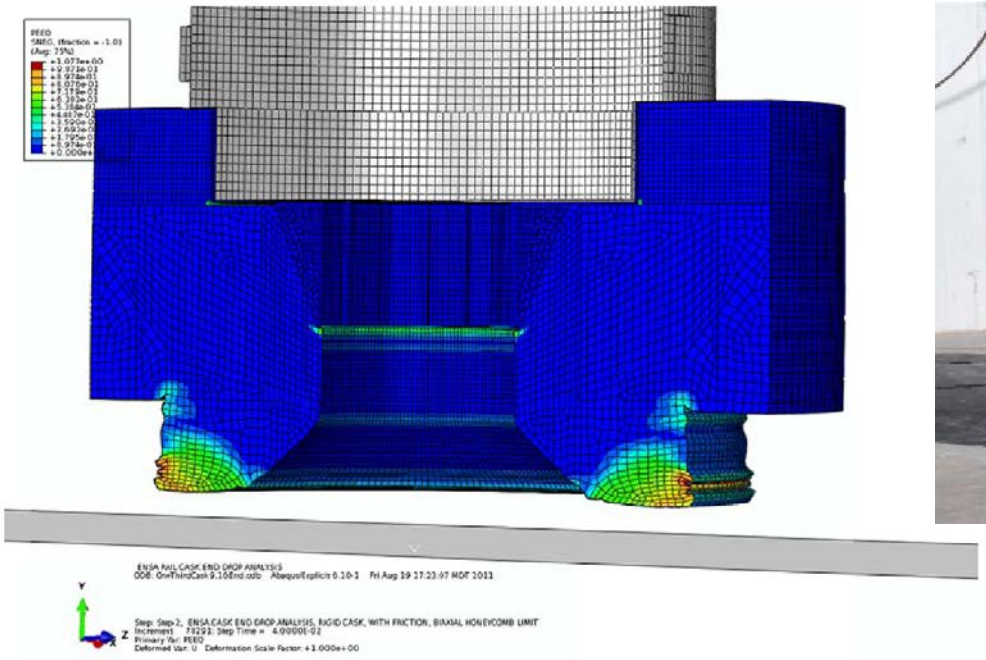


After 230 min. of cool-down





Regulatory Package Analysis - ENSA



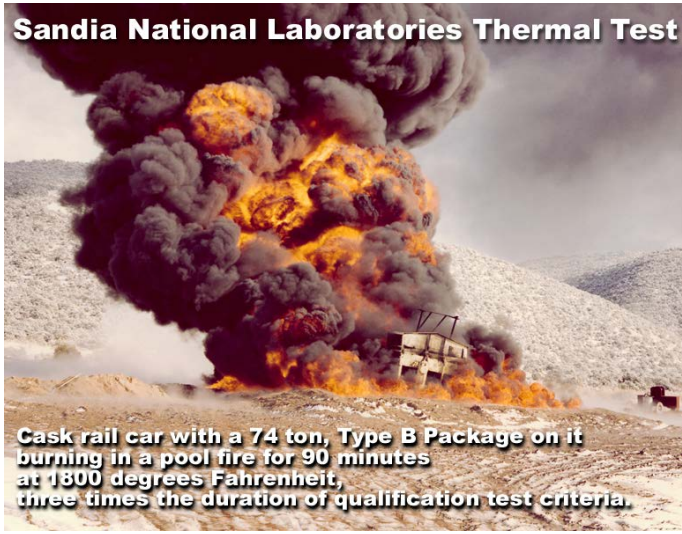
Extra-Regulatory Testing

- For many aspects of the Sandia transportation program, package response to environments more severe than the regulatory accidents is needed.

36-meter drop

1.5-meter puncture

90-minute fire



Scenario Testing

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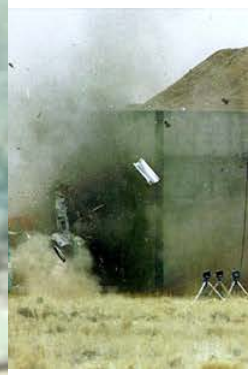


Standards Development

- Sandia participates in many of the standards writing activities for the radioactive material transportation industry:
  - ASTM E05.17
  - ASME Boiler and Pressure Vessel Code Section III, Division 3

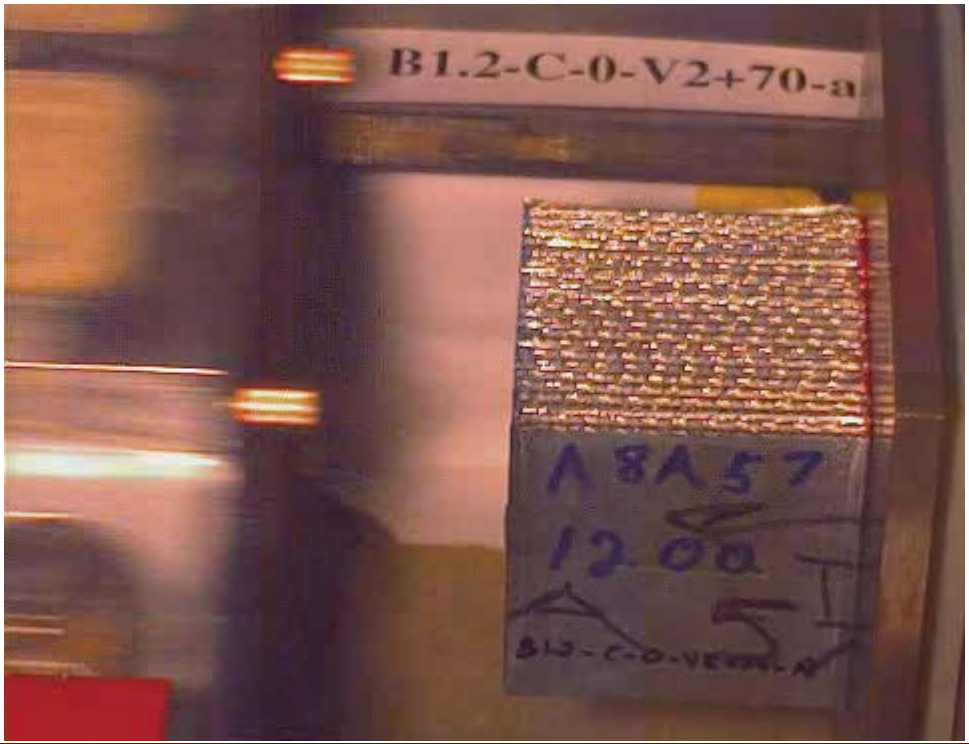
- These activities often require benchmark testing of packages or components to demonstrate that proposed standards provide the desired level of protection.

- Sandia prepared NUREG-2125, Spent Fuel Transportation Risk Assessment for the NRC.

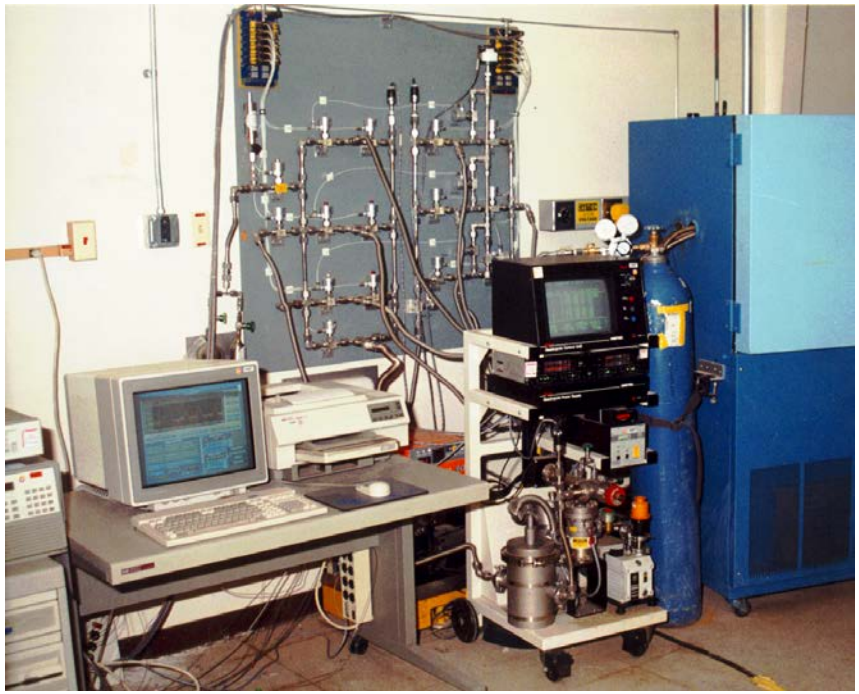
Component/Materials Testing

- Understanding the behavior of a packaging component/ material is often necessary for designers.

Dynamic crush testing of an energy absorber material



Characterization of seal behavior at high and low temperatures



Testing Capabilities - Mechanical

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- Aerial Cable Facility
  - 2,000,000 pound unyielding target (other targets available)
  - 55,000 pound lift capacity (for 30-foot drops)
  - Up to 600-foot drop height
- Drop tower
  - Guided drops up to 150 feet
  - 50,000+ pound unyielding target with 2,000 pound lift capacity
- Sled tracks
  - 2000-foot track with standard railroad gage – 3,000,000 lb target
  - 10,000-foot track with narrower gage – speeds up to 7000 fps
- Actuator Facility
  - Pneumatic actuator capable of speeds to 230 fps with a 1500-lb weight
  - Gas gun capable of speeds to 1000 fps with a 100-lb weight
- Centrifuge
- Vibration

Testing Capabilities - Thermal

- Open Pool Burn Site
  - Pool sizes up to 20 x 60 feet
  - Long duration fire
  - Wind fences can be erected around the pool
- Thermal Test Complex (TTC)
  - Cross-wind test facility – wind driven fires
  - FLAME – indoor pool or gas burner fires – 10-foot pool diameter
  - Radiant Heat – thermal environment controlled by quartz lamps – up to 500 kW/m^2 heat flux
  - Temperature conditioning chamber – -100 to 390F

Quality Assurance

- All of these activities require strict adherence to a formal QA program.
- Design, analysis, fabrication, and testing are performed using detailed procedures.

Summary

- Sandia has the demonstrated capability to design, analyze, fabricate, and test radioactive material transportation packages.
- Many of the capabilities leverage off of our nuclear weapons program activities.
- Sandia has the capability to provide solutions to any radioactive material transportation problem.