

# Recent Developments in the Full-Scale Testing of Spent Fuel Casks

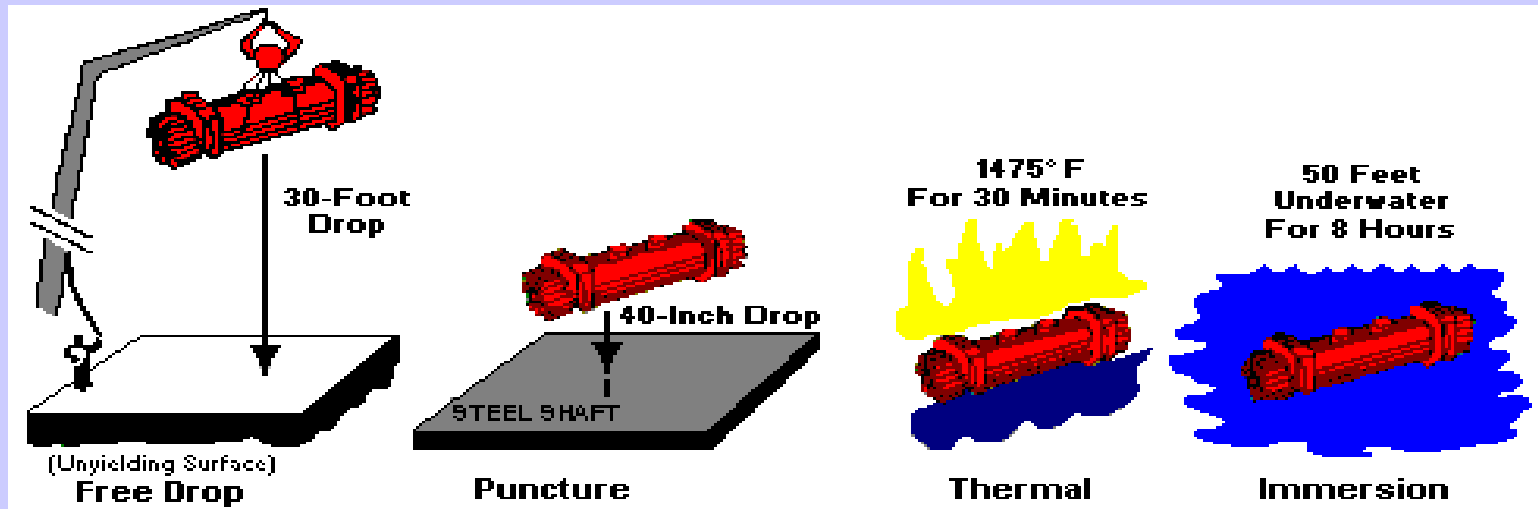


**Nuclear Waste Technical Review Board  
Salt Lake City, Utah  
October 12, 2004**

**Earl Easton  
Spent Fuel Project Office  
U.S. Nuclear Regulatory Commission**

# Approval Standards for Spent Fuel Shipping Casks

- Spent Fuel Casks are certified to be accident resistant. They must withstand:
  - Thirty foot drop onto unyielding surface.
  - Forty inch drop onto a steel puncture pin.
  - Thirty minute fully engulfing 1475 °F fire.
  - Immersion Test (50 feet).





The NRC periodically assesses the effectiveness of Type B standards in addressing real world accidents.

# Accident Studies by SANDIA, BAM, and CEGB



Operation Smash Hit  
CEGB - Britain



Rail Cask Collision - SANDIA



Rail Fire - SANDIA



Rail-Truck Collision - SANDIA



Propane Tank Explosion  
BAM - Germany



Truck Collision - SANDIA

# Package Performance Study

- Commission approved the testing of a full-scale, NRC certified rail transportation cask in May 2004
  - Authorized staff to purchase a single NRC certified rail cask
  - Realistically conservative test
  - Sufficient instrumentation to collect data for validating analytical methods, including scaling
  - Fully engulfing fire

# Full-Scale Impact Testing

- Completion of new drop test facility in Horstwalde, Germany
- Full-scale drop tests
  - GNB-CONSTOR V/TC Cask
  - MHI-MSF69 BG Cask





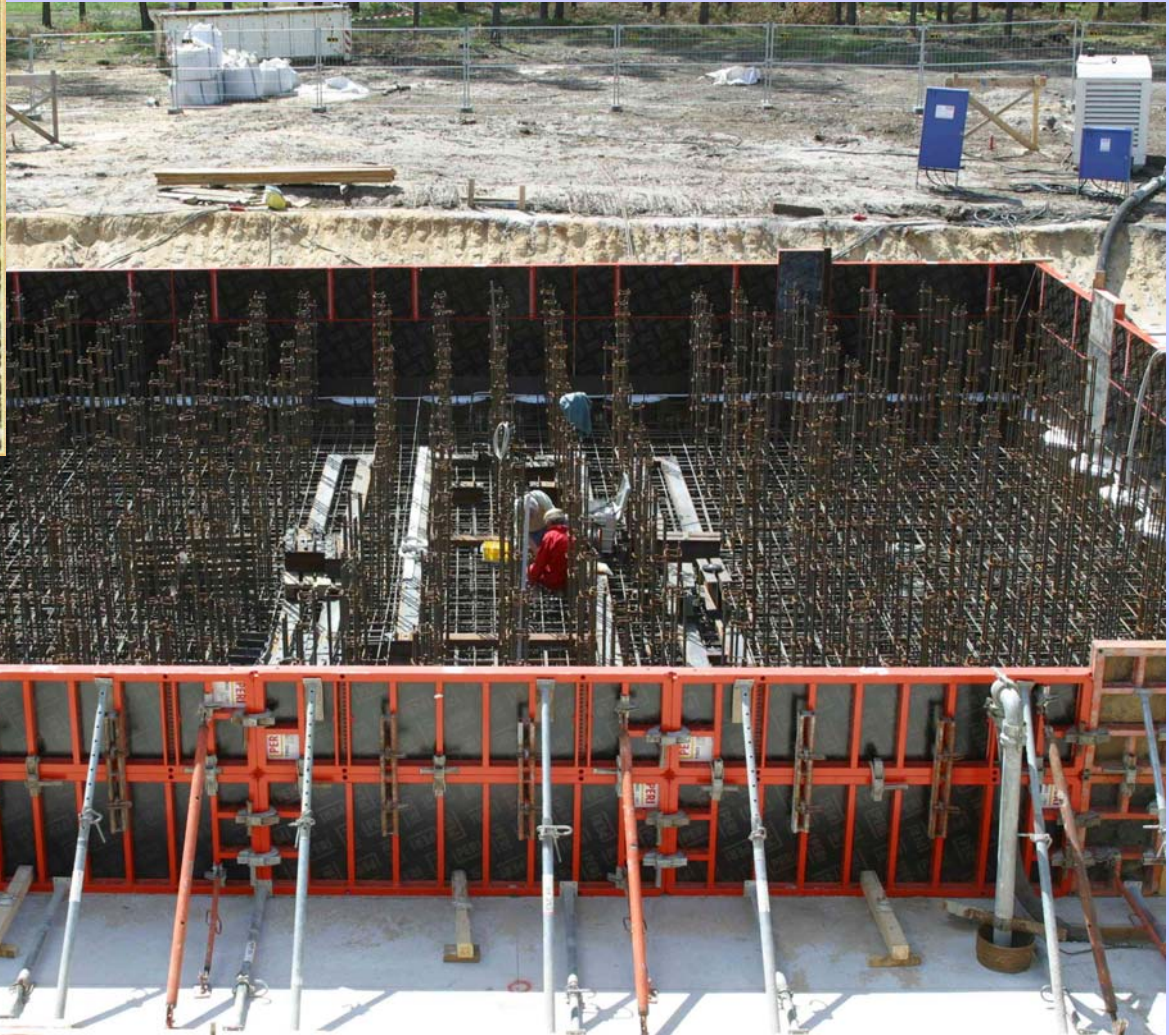
Initial ground excavation and soil preparation





Excavation and lining of a cavity for the unyielding surface . (46 ft x 46ft x 16.5 ft).





Placement of steel reinforcement bars, and test instrumentation (force and strain gauges)





Pouring concrete for the unyielding surface



Initial construction work on enclosed test building





Finished skeleton of enclosed test building (left)  
and top of drop tower (right)





Top of drop tower being hoisted into place by an 80-ton portable crane.



Left: 200- ton winch and cask release mechanism being hoisted into place at top of drop tower.



Right: Close-up of cask release mechanism





BAM Drop Test Facility in Horstwalde, Germany



# BAM Drop Test Facility in Horstwalde, Germany

Hoist Capacity		Unyielding Surface		
Maximum weight of test object	Maximum hook height	Impact pad area (steel plate)	Reinforced concrete block	Steel reinforcement
200 tons	30 feet	32x15x0.75 ft 170,000 lbs.	46x46x16.5 ft 5.4 million lbs	225,000 lbs



# GNB-CONSTOR V/TC Cask

Full-Scale Drop Test

Horstwalde, Germany

September 21, 2004

# Full-scale Drop Test **CONSTOR** weight: 182 t

## **III.3 / 0994**

**21.09.2004**



## GNB-CONSTOR V/TC Cask

Side view after 9-meter side drop test



End view after 9-meter side drop test



MHI-MSF69 BG Cask

Full-Scale Drop Test

Horstwalde, Germany

September 24, 2004



MHI-MSF69 BG Spent Fuel Cask being prepared for shallow angle drop test



Test preparation for MHI-MSF69 BG  
Spent Fuel Cask (shallow angle drop)



# MHI-MSF69 BG Spent Fuel Cask after shallow angle (10°) drop test



Side view



End view



# Concluding Remarks

- Type B accident condition tests provide a high degree of protection against real life accidents.
- NRC periodically re-assesses the effectiveness of Type B standards to reflect changes in package design and accident statistics.