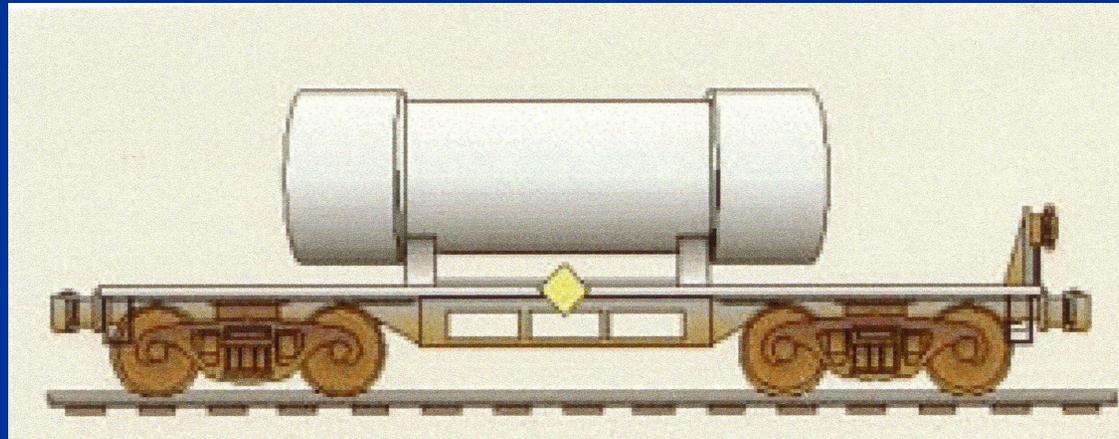


# The Safe Transportation of Spent Nuclear Fuel [10 CFR Part 71]



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- Spent fuel is shipped in the U.S.
- Nuclear Regulatory Commission's (NRC) role
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- NRC regulations are compatible with International Atomic Energy Agency standards
- Performance requirements of spent fuel shipping casks
- Typical truck and rail casks
- NRC security requirements for fuel shipments (10 CFR Part 73)
- Safety record
- Summary of approach to safe transportation



## Spent Fuel shipment by rail

U.S. – China PUNT, June 22, 2005, Beijing, China

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# NRC Roles in Regulating Commercial Spent Fuel Shipments

- Sets Standards and Certifies Shipping Casks
- Inspection of Cask Designers, Fabricators
- Oversight of NRC and Department Of Transportation safety rules
- Oversight of Physical Protection Measures
- Emergency Response – assistance to first responders

# Agencies Ensure Safe Transportation

## International Atomic Energy Agency (IAEA)

- Publishes standards

## Nuclear Regulatory Commission

- Licenses the commercial use of radioactive material

## Department of Transportation

- Regulates the transportation of all hazardous material, including spent fuel

# Agencies Ensure Safe Transportation, continued

## Department of Energy

- Transports non-commercial spent fuel and will conduct transportation of spent fuel to Yucca Mountain

## State and Local Governments (State of Nevada; Nye County)

- May enact additional requirements that are not incompatible with Department of Transportation requirements
- Have lead role in responding to emergencies

# Agencies Roles in Transportation of Spent Fuel and HLW to Yucca Mountain

## NRC

- **Certify Shipping Casks as accident resistant**
  - Effective containment
  - Limit radiation release
  - Prevent criticality
  - Adequate dissipation of heat
  
- **Evaluation of transportation impacts in DOE Environmental Impact Statement**

## Dept of Transportation (DOT)

- **Routing**
- **Safety**

# DOE's Role in Transportation of Spent Fuel and HLW to Yucca Mountain

- Inspection of Package Designers, Fabricators
- Assures compliance with DOE's and Department of Transportation's safety rules
- Enforcement of DOE's Physical Protection Measures
- Notify states of shipments
- Provides technical assistance and funds to states and tribes
- Emergency Response – assistance to first responders

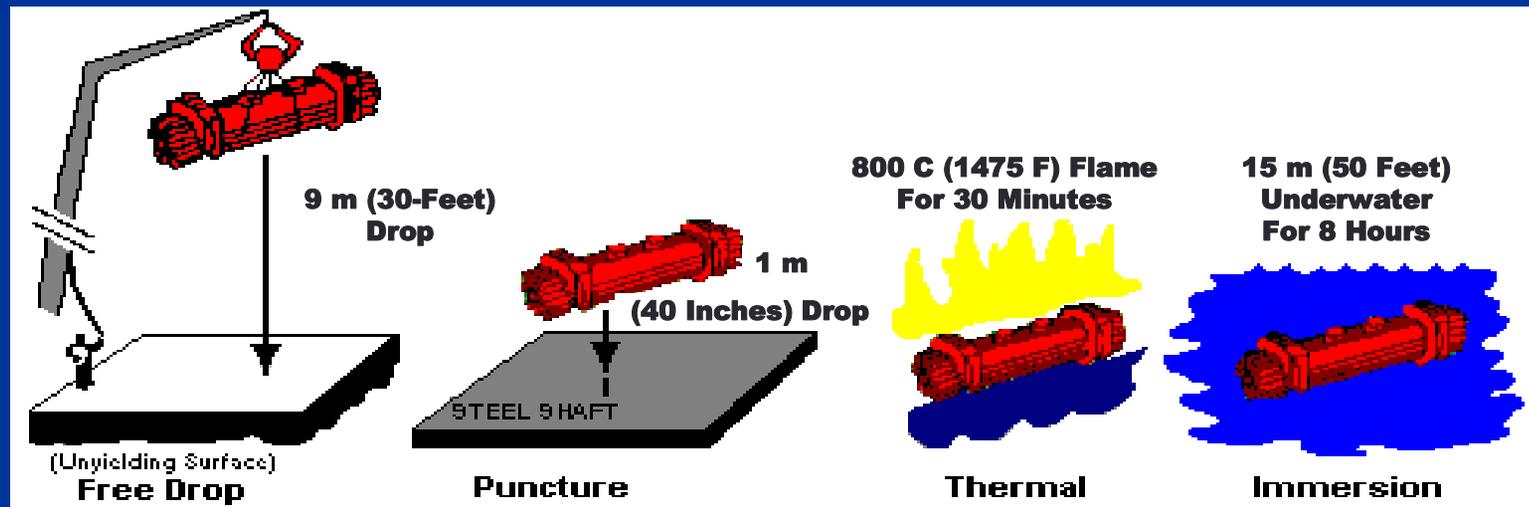
# NRC Regulations are Compatible with IAEA\* Standards

- NRC's Regulation (10 CFR Part 71) compatible with IAEA's\* (TS-R-1, Rev. 2003) for Type B material (Spent fuel and High-level waste)
- Consider cask performance under routine transport conditions
- Consider cask performance under specified accident conditions

\*International Atomic Energy Agency

# Performance Requirements of Spent Fuel Shipping Casks

- Spent Fuel Casks are certified to be accident resistant. They must withstand:
  - 9-meter drop onto unyielding surface with most damaging orientation
  - 1-meter drop onto a steel puncture bar with most damaging orientation
  - 30 minutes fully engulfing fire (1-meter above hydrocarbon fuel surface)
  - Immersion in water (15-meter depth)



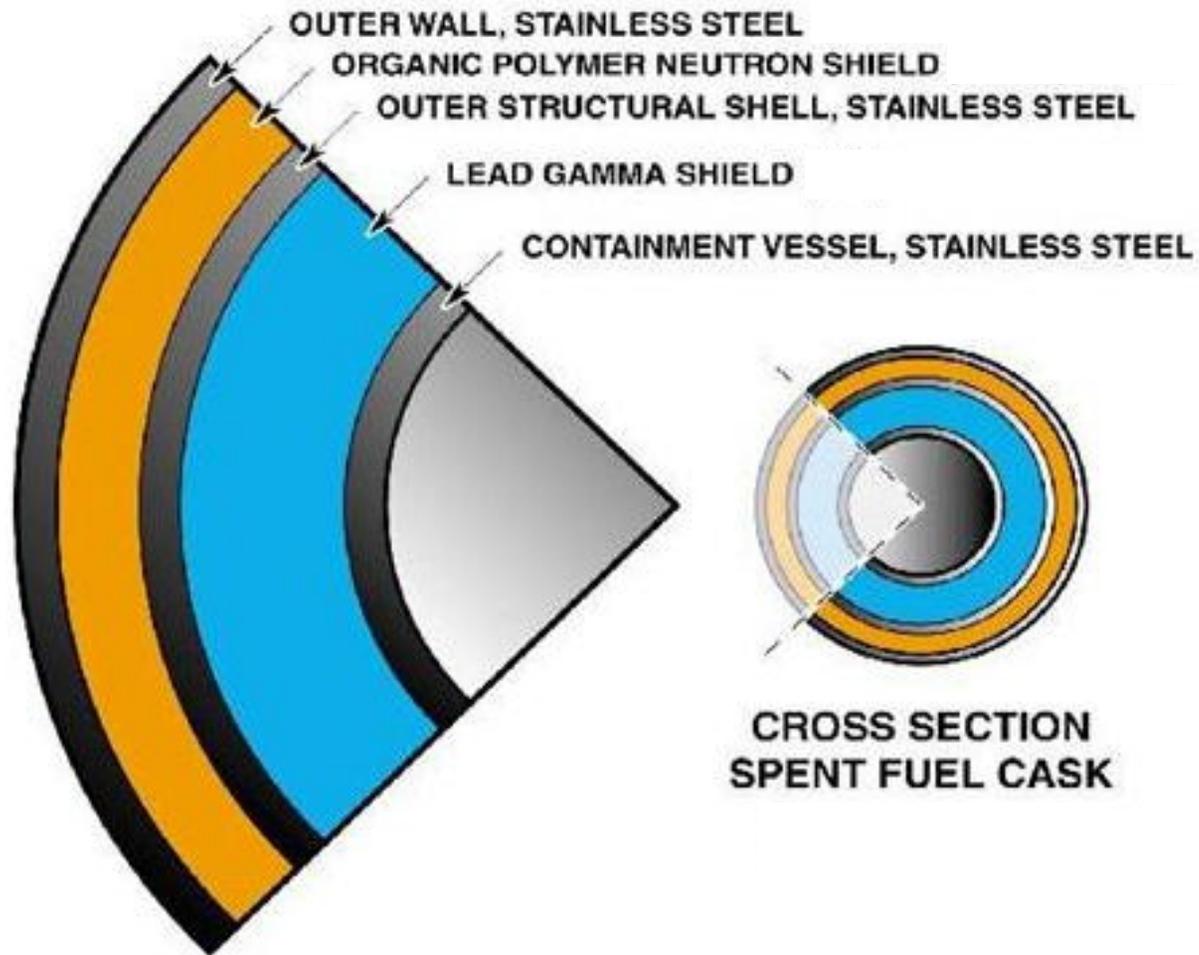
# TYPICAL SPENT FUEL CASK-TRUCK

(Overall Length 6 m or 20 ft.)



Typical Loaded Weight 22,600 kg (50,000 lbs) Fuel 1,800 kg (4,000 lbs)  
Typical Payload 4-9 Fuel Assemblies

# LAYERS OF PROTECTION



# Model TN-3 Truck Cask



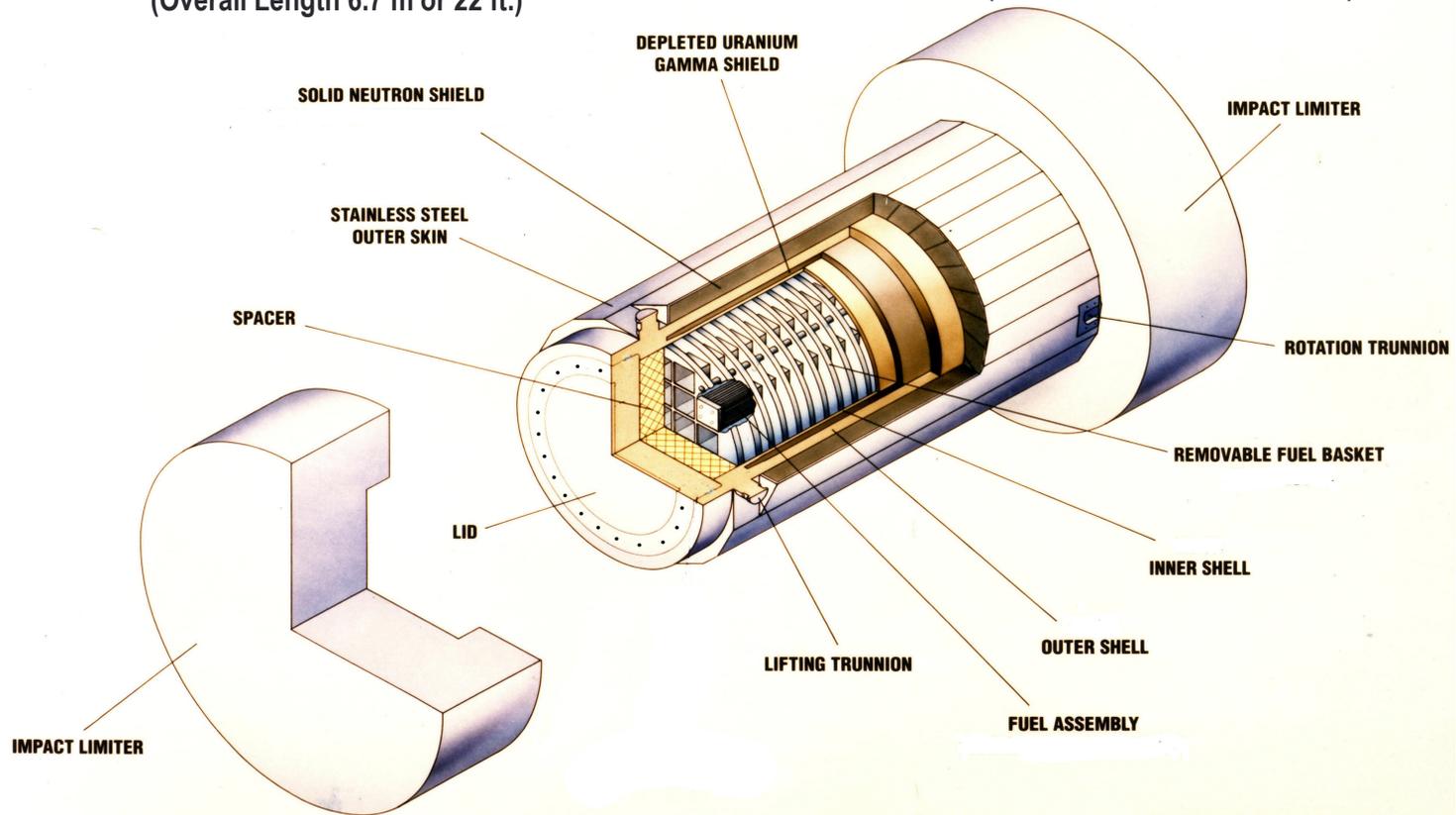
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# Typical Spent Fuel Cask - Rail

(Overall Length 6.7 m or 22 ft.)

(Diameter 2.4-3.6 m or 8-12 ft.)





## Spent Fuel Cask used for high-level waste shipment

# Model IF-300 Spent Fuel Shipping Cask



Left: The Model IF-300 Cask being lowered into a vertical position. Spent fuel is loaded under water while the cask is vertical.

The Model IF-300 Cask has been used to ship spent fuel since the mid-1970's.

Below: The Model IF-300 Cask on a flat bed rail car. Note the personnel barrier.





## Artistic Concept of Dual-Purpose Rail Cask

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# NRC Security Requirements for Fuel Shipments (10- CFR Part 73.37)

- After 9-11-2001 Enhanced Security Measures
  - Protect shipments against theft and diversion
  - Minimize the possibility of radiological sabotage

# Transportation Safety Record is Favorable

- Over 1,400 spent fuel shipments since 1979 in NRC-approved packages
- ZERO spent fuel package failures

# Summary

- Safe and secure transportation of spent fuel provided by:
  - **Robust cask and package designs** compatible with International Atomic Energy Agency performance standards
  - **Comprehensive regulations** for shipments
  - **Regulatory oversight** of safety and security requirements
  - **Periodic enhancements of standards and regulations** based on risk assessments, experience and testing