U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

NUCLEAR WASTE TECHNICAL REVIEW BOARD
FULL BOARD MEETING

SUBJECT: WASTE PACKAGE PHYSICAL CHARACTERISTICS

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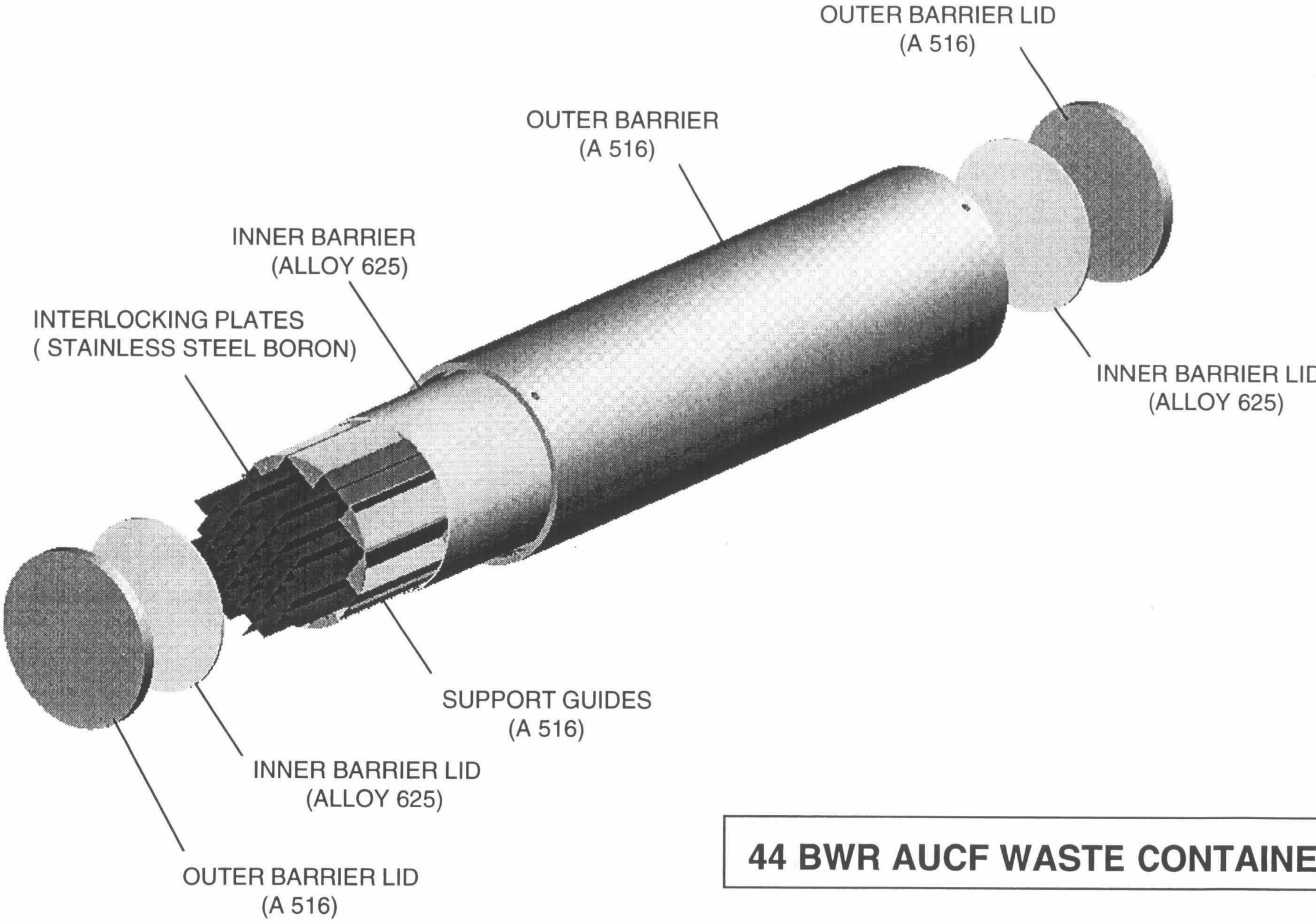
Outline

- Types of waste for disposal
- Disposal container dimensions
- Disposal container loaded weights
- Shielding considerations
- Changes from advanced conceptual design
- Future considerations

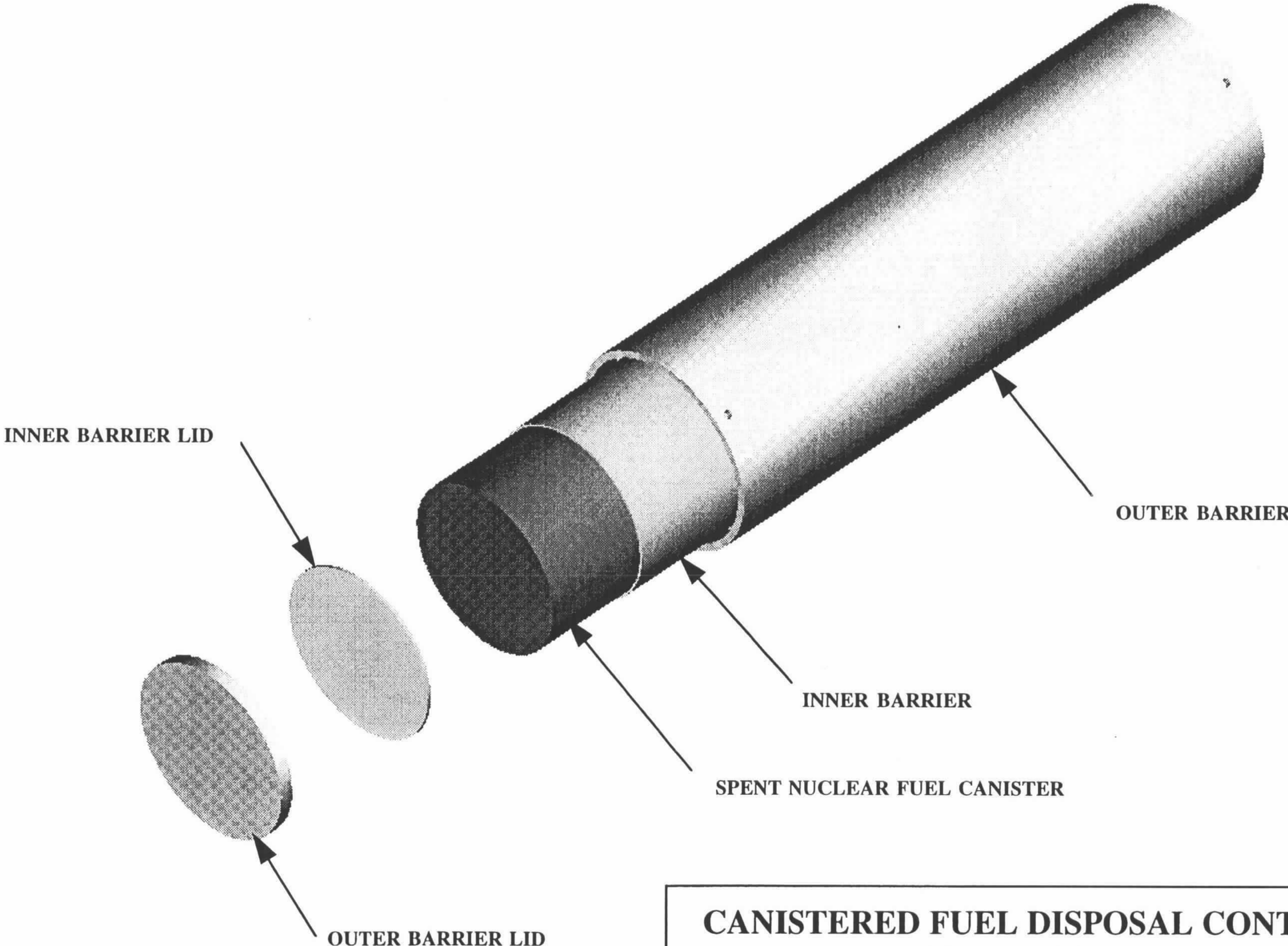
Types of Waste for Disposal

- Commercial spent fuel in bare assemblies
- Canisters of commercial spent fuel
- Canisters of vitrified Defense High-Level Waste (DHLW)
- Navy spent fuel
- Other DOE-owned spent fuel in canisters

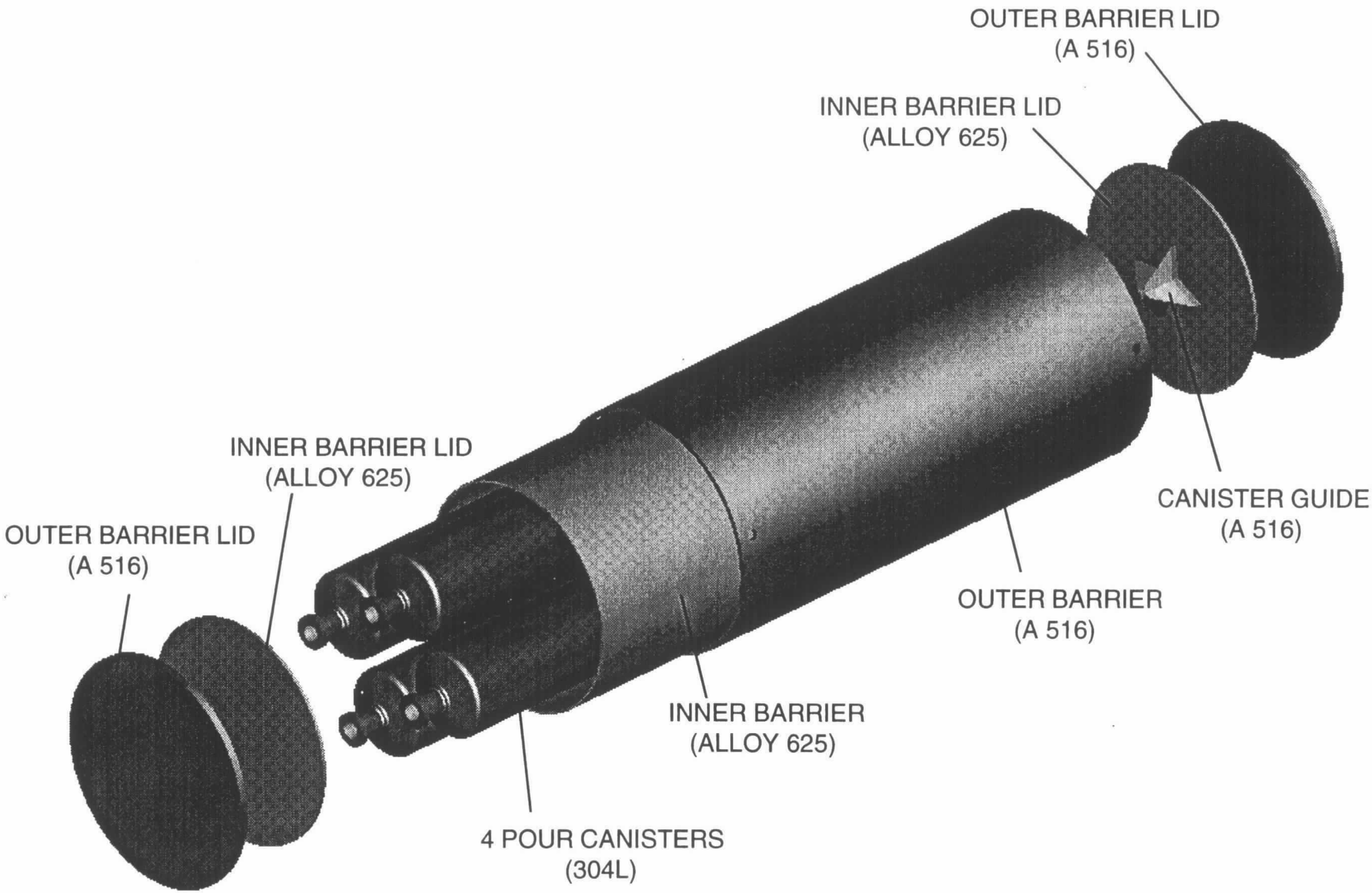
21 PWR Waste Container



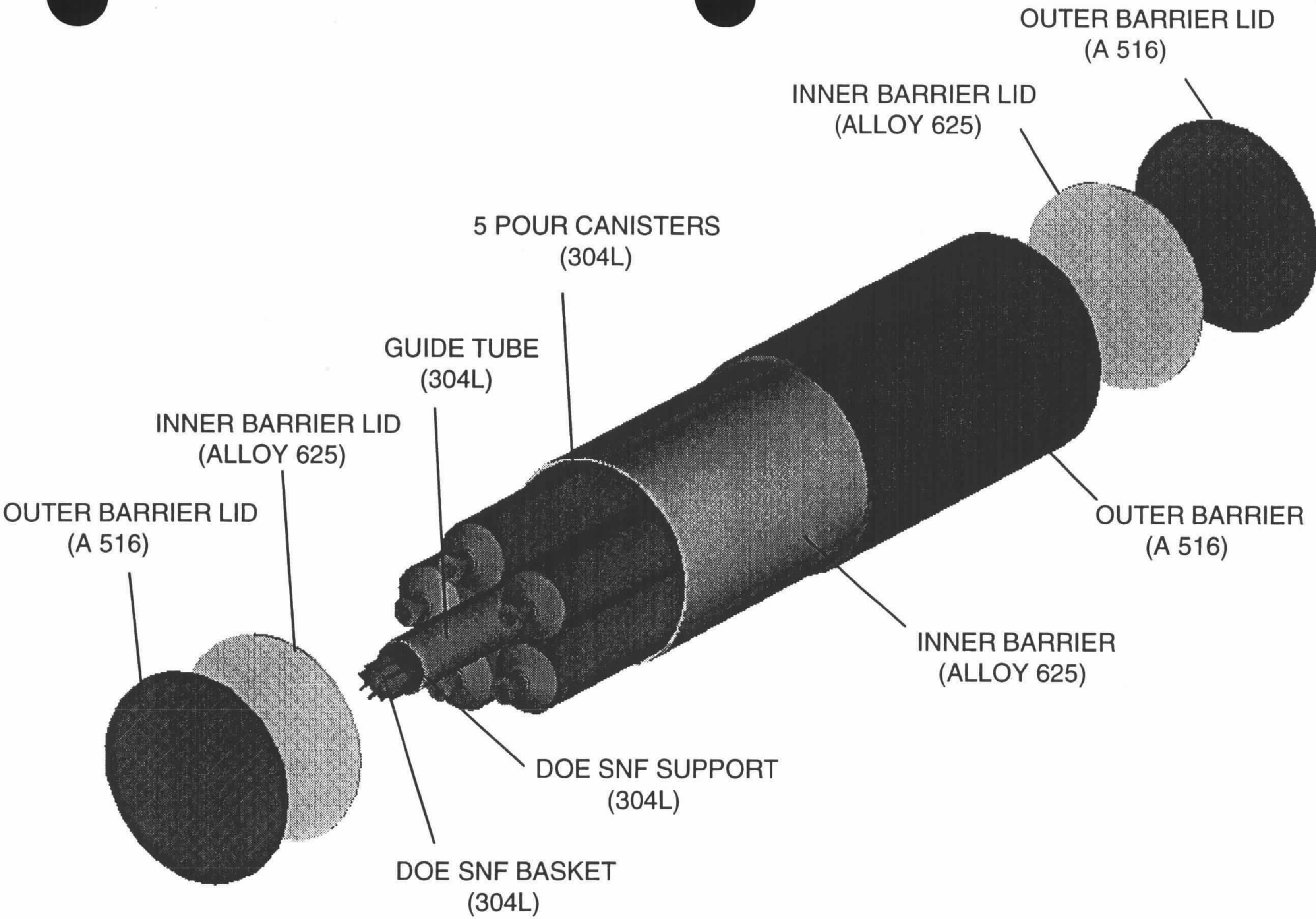
44 BWR AUCF WASTE CONTAINER



CANISTERED FUEL DISPOSAL CONTAINER
21-PWR / 40-BWR



DHLW WASTE CONTAINER



PROPOSED DEFENSE HIGH LEVEL WASTE/ DOE SNF WASTE CONTAINER

Loaded Disposal Container Dimensions (meters)

	Diameter	Length
• Commercial spent fuel 21PWR uncanistered	1.7	5.3
• Commercial spent fuel 44 BWR uncanistered	1.6	5.3
• Canistered 21 PWR commercial spent fuel	1.9	5.7
• Containers with 4 DHLW canisters	1.8	3.8
• Containers with 5 DHLW and 1 DOE spent fuel canister (Proposed)	2.0	3.8

Loaded Disposal Container Weights (tonnes)

• Commercial spent fuel 21PWR uncanistered	50.3
• Commercial spent fuel 44 BWR uncanistered	46.5
• Canistered 21 PWR commercial spent fuel	62.5
• Containers with 4 DHLW canisters	30.3
• Containers with 5 DHLW and 1 DOE spent fuel canister (Proposed)	35.5

Changes from Advanced Conceptual Design

- Heated outer shell inserted over inner shell (selected for reference design)
- Inner barrier material from alloy 825 to 625
  - More corrosion-resistant in severe environments
- Basket support and tubes from stainless steel to carbon steel
  - Less cost plus better strength and thermal conductivity
- Outer barrier for DHLW containers from copper nickel to carbon steel
  - Reduced cost and negligible impact on performance
- DOE-owned spent fuel containers being evaluated

Radiation Dose in Emplacement Drifts (Rem/Hour)

	Surface of Waste Package	At 2 Meters From Surface
Spent Nuclear Fuel Waste Packages	30	5
Defense High-Level Waste Packages	65	20

Shielding Individual Waste Packages

- Should shielding be provided on individual waste packages instead of on transporter?
  - Advantage of shielding on packages
    - » Permits limited personnel access to emplacement drifts after cooling
  - Disadvantages of shielding on packages
    - » Decreases thermal conductivity, increases fuel temperature, reduces cladding performance
    - » Increased size will require larger drifts
    - » Increased weight makes waste package handling more difficult
    - » Has no function after closure
    - » Increases waste package cost

Fully Shielded Waste Package Concepts

Shielding Type	Diameter Increase in (meters)	Weight Increase (Tonnes)	Cost Increase Per Container ($ Thousands)	Total cost Increase in ($Billions)
Concrete with stainless steel Sheathing	.4	68	100	1.6
Carbon steel 18" thick	.9	111	900	14.7

Future Considerations

- Increase from 21 PWR/44 BWR to 24 PWR/52BWR
- Add thermal shunts in baskets
- Reduce or eliminate baskets for some DOE-owned spent fuel
- Reduce stainless steel boron plates in BWR containers
- Consider an additional outer barrier for high humidity