

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

**PRESENTATION TO  
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

**SUBJECT: WASTE PACKAGE DESIGN  
APPROACH AND CONCEPTS**

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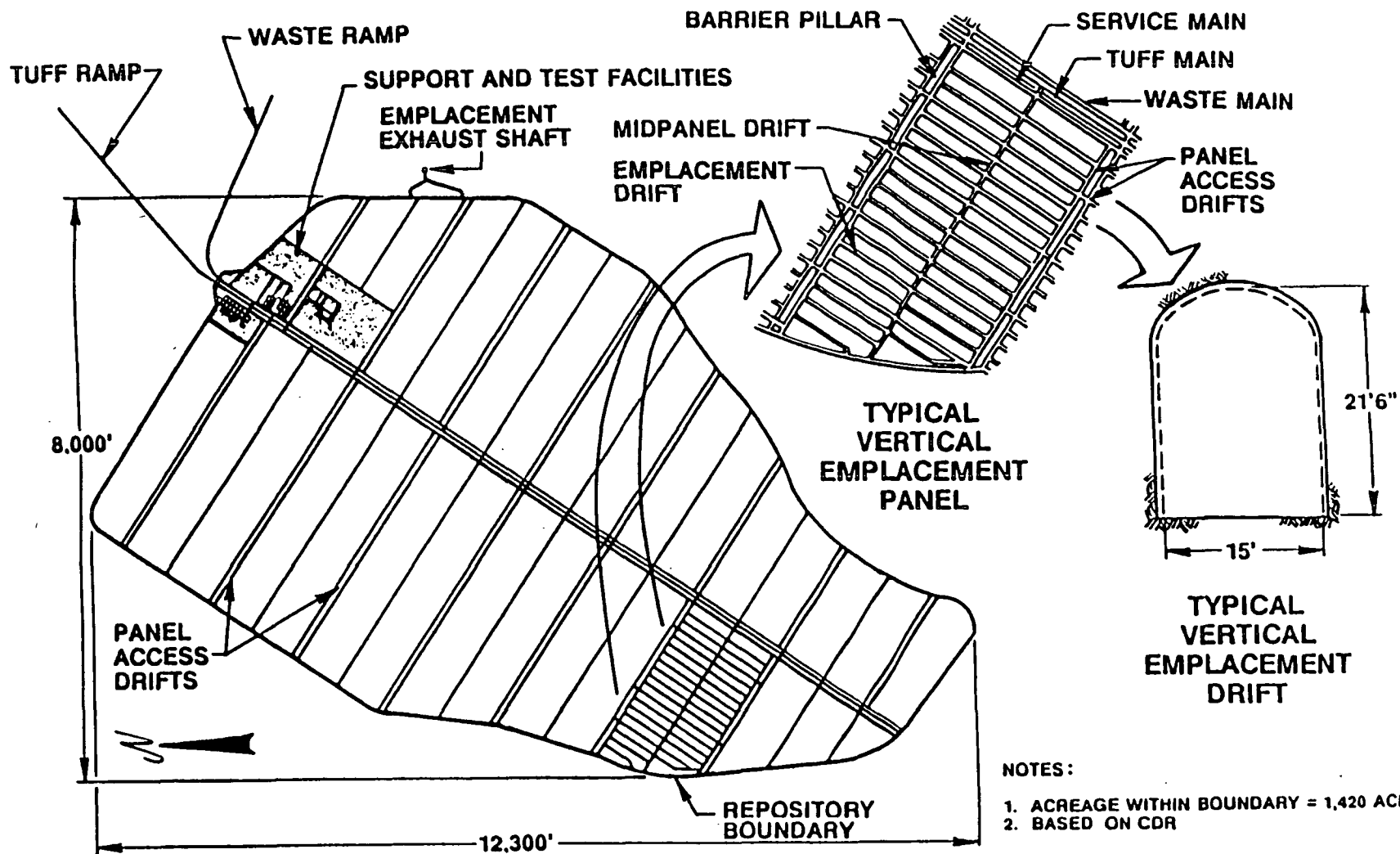
**PRESENTER'S  
TELEPHONE NUMBER: (415) 423-5032**

**MARCH 19-20, 1990**

# **DESIGN APPROACH AND CONCEPTS**

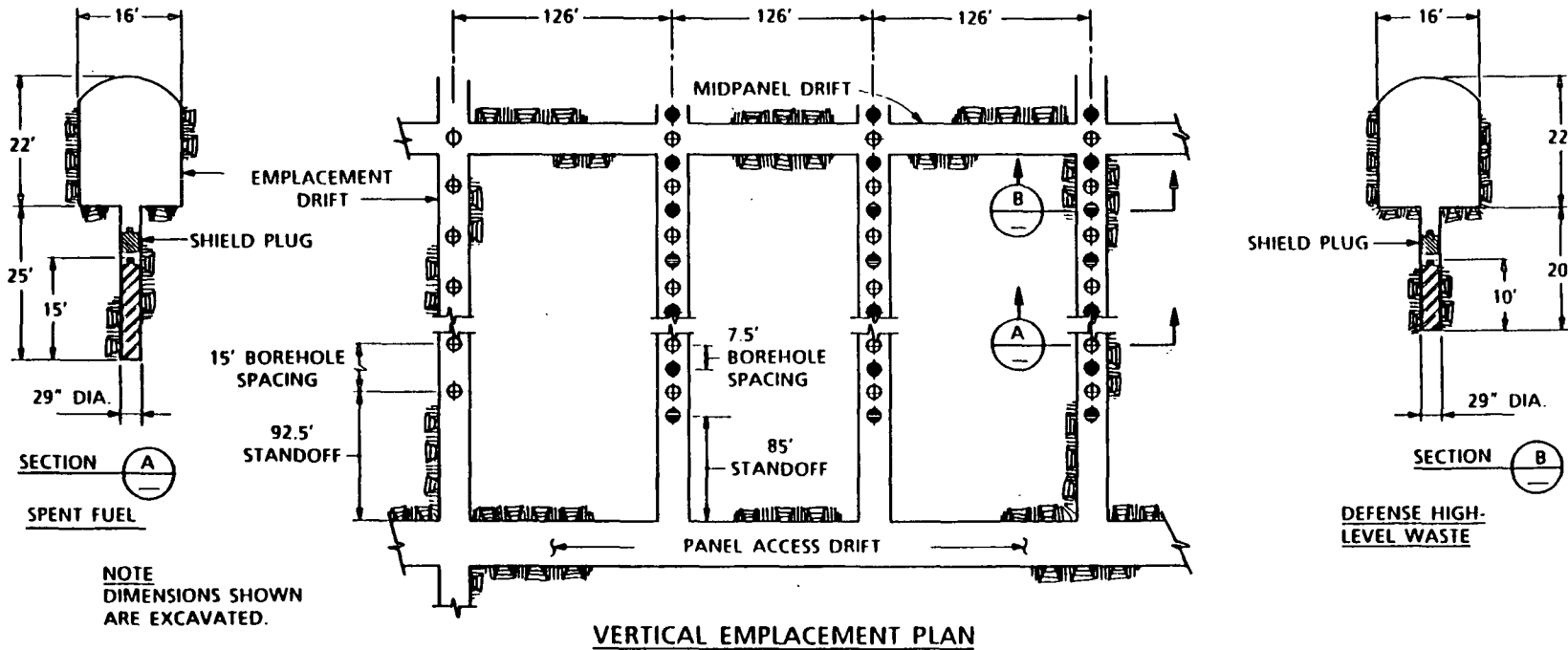
- **A HISTORY OF DESIGN CONCEPTS**
- **BASELINE DESIGN (SCP)**
  - **REFERENCE DESIGN**
  - **ALTERNATE DESIGN**

# UNDERGROUND DESIGN FOR VERTICAL EMPLACEMENT

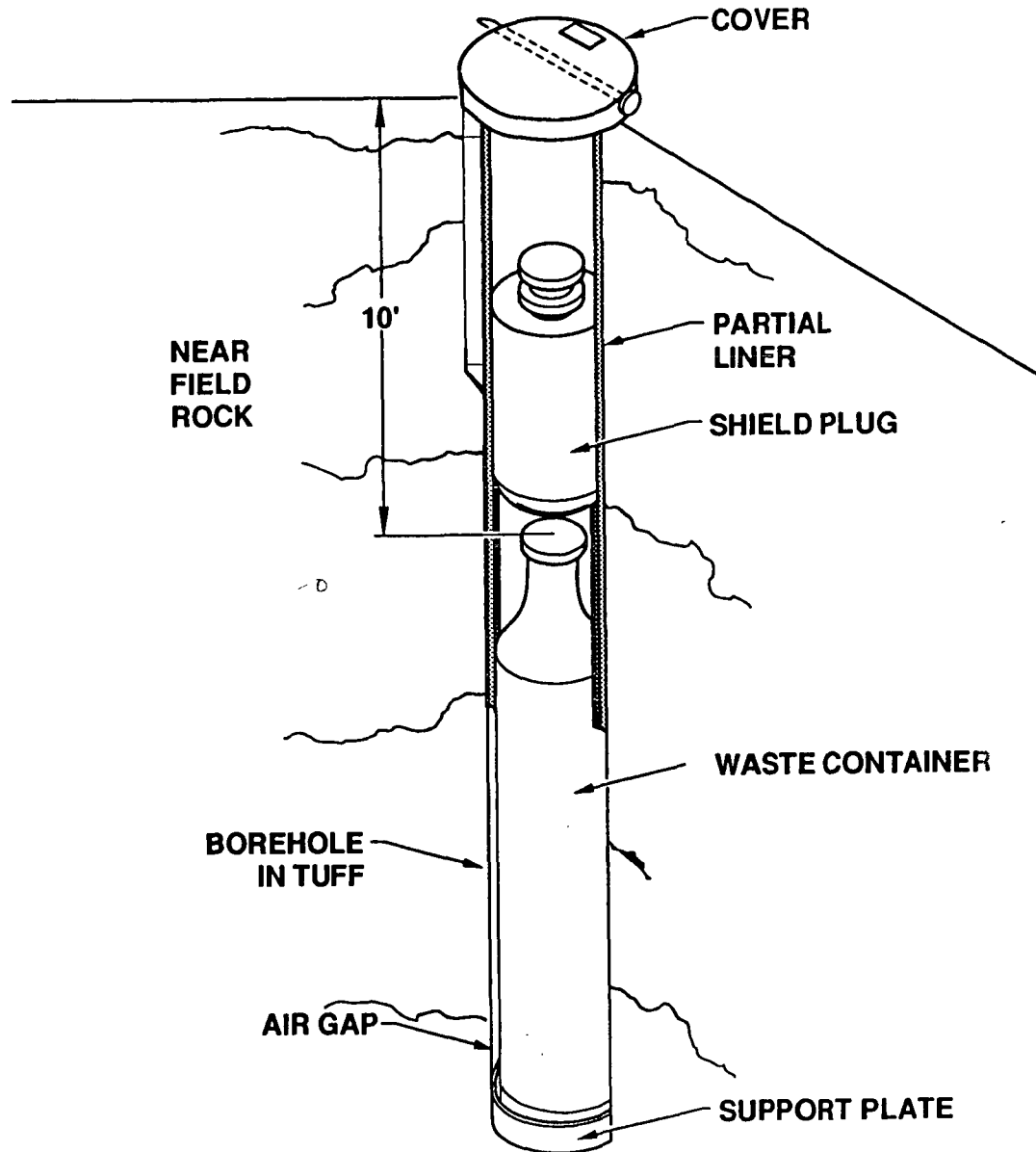


- NOTES:
1. ACREAGE WITHIN BOUNDARY = 1,420 ACRES
  2. BASED ON CDR

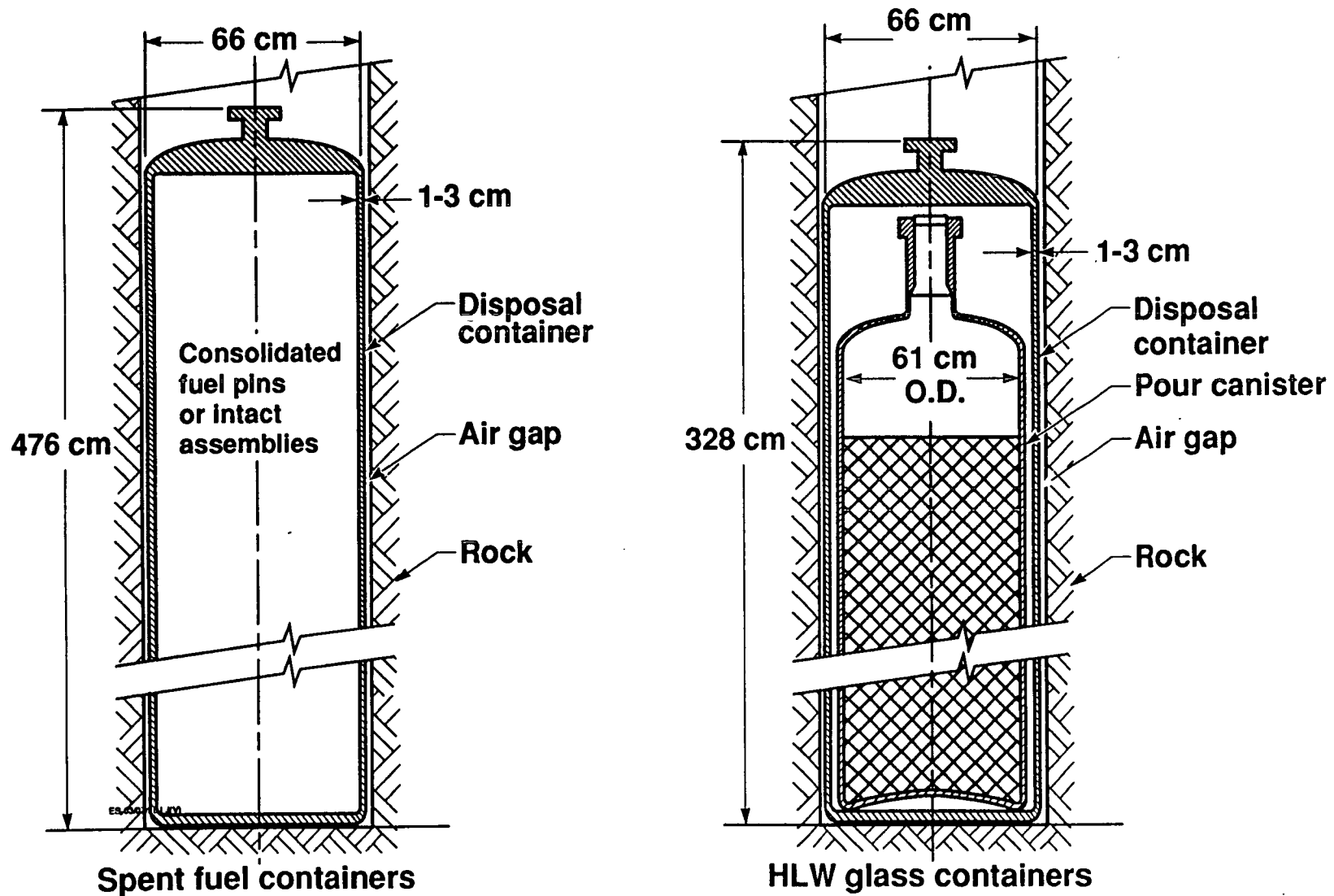
# PANEL DETAILS - VERTICAL EMPLACEMENT



# REFERENCE CONFIGURATION FOR VERTICAL PLACEMENT



# TWO TYPES OF WASTE CONTAINERS THAT WILL BE PLACED IN A GEOLOGIC REPOSITORY



# **IN THE LAST DECADE, A NUMBER OF DESIGN APPROACHES HAVE BEEN STUDIED**

## **● VARIOUS WASTE ARRANGEMENTS**

- CONSOLIDATED FUEL RODS AROUND CENTRAL HARDWARE**
  - \* 6 PWR, 18 BWR**
- INTACT ASSEMBLIES**
  - \* 3 OR 4 PWR**
  - \* 6, 7, OR 10 BWR**
  - \* 3 PWR PLUS 4 BWR**
- MRS CANISTERS**

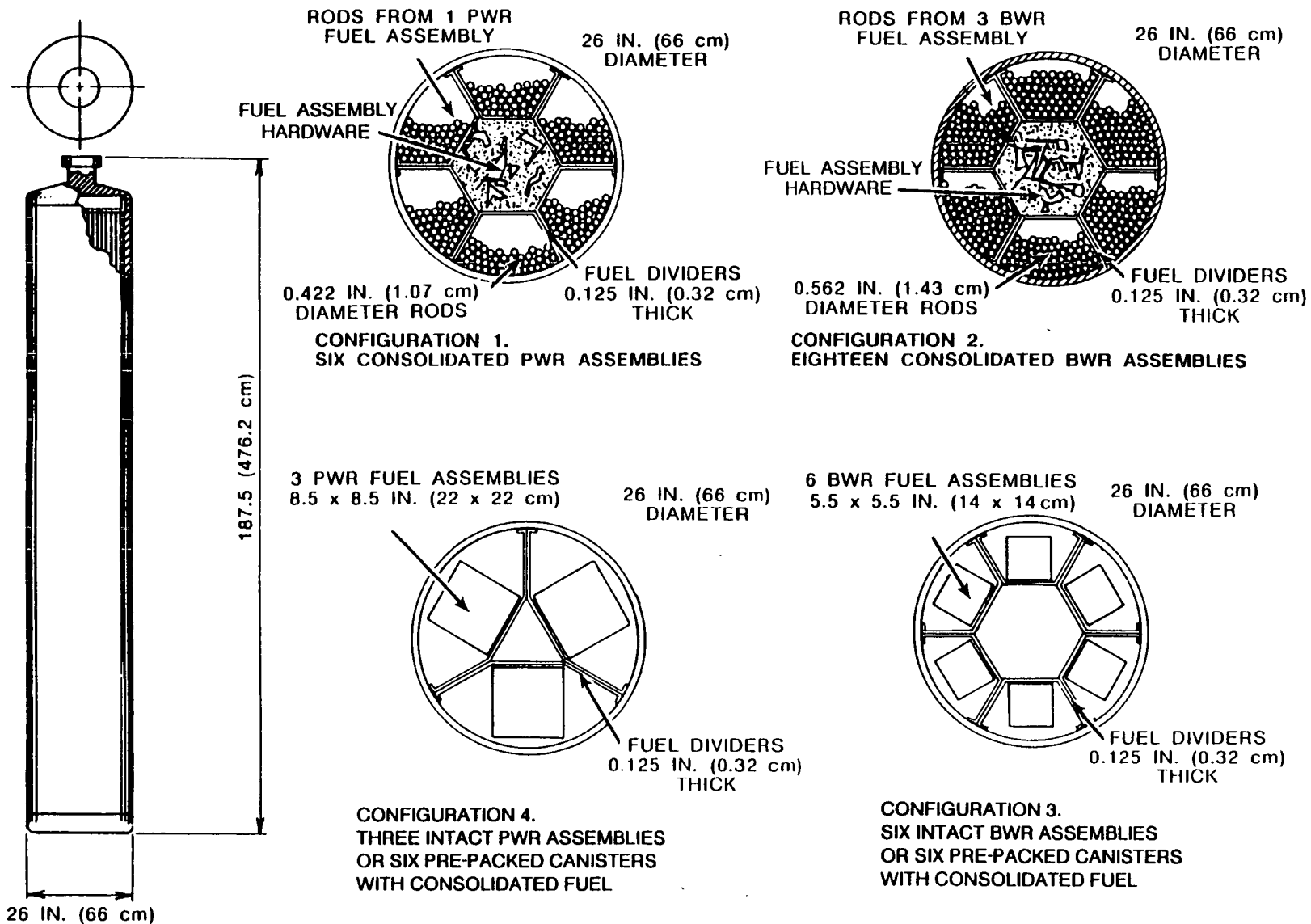
## **● THIN-WALLED CONTAINERS vs. THICK-WALLED (SELF-SHIELDED) CONTAINERS**

## **● VARIOUS CONTAINER MATERIALS**

- IRON-BASED METALS**
- COPPER-BASED METALS**
- CERAMICS**

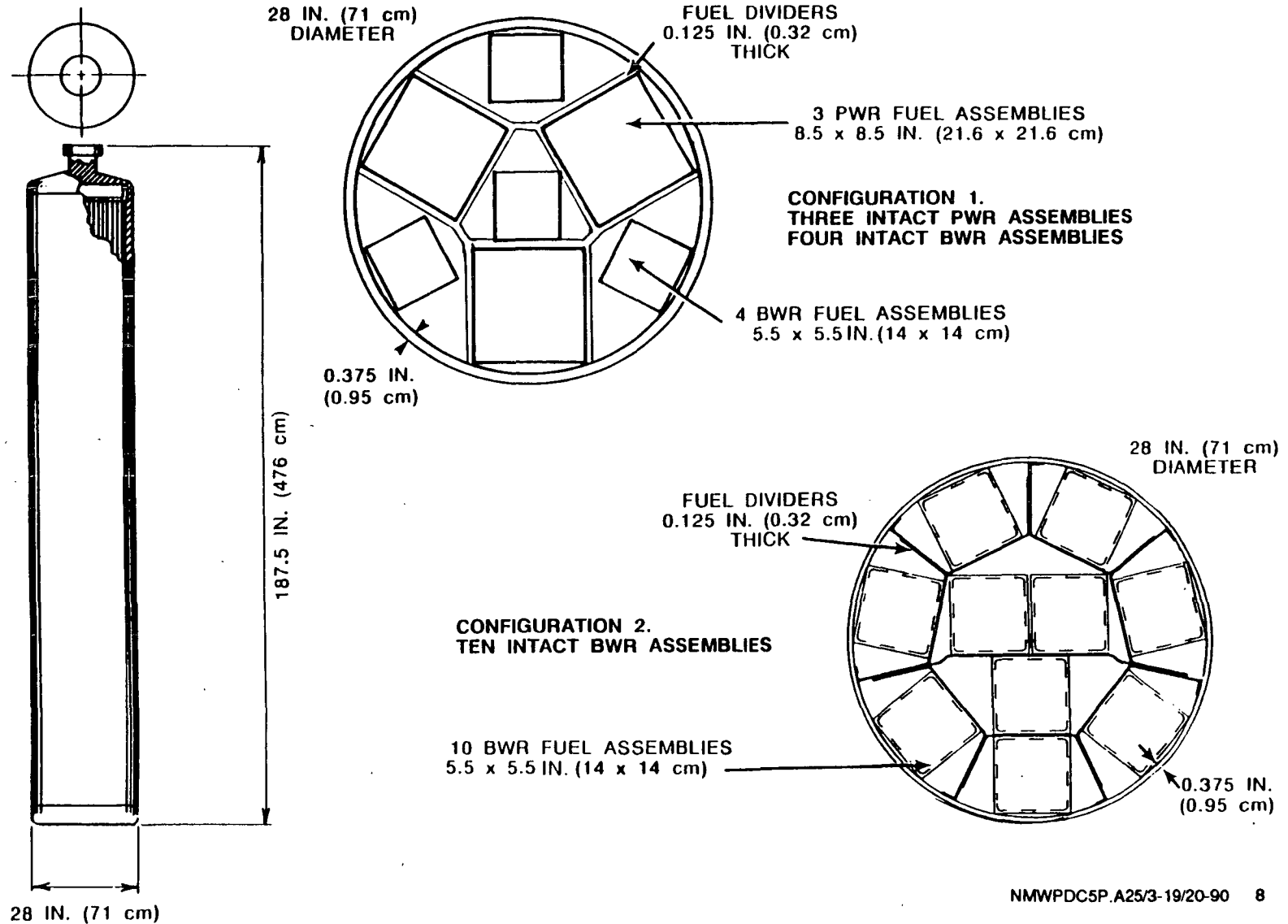
## **● VARIOUS MANUFACTURING PROCESSES**

# REFERENCE SPENT-FUEL CONTAINERS

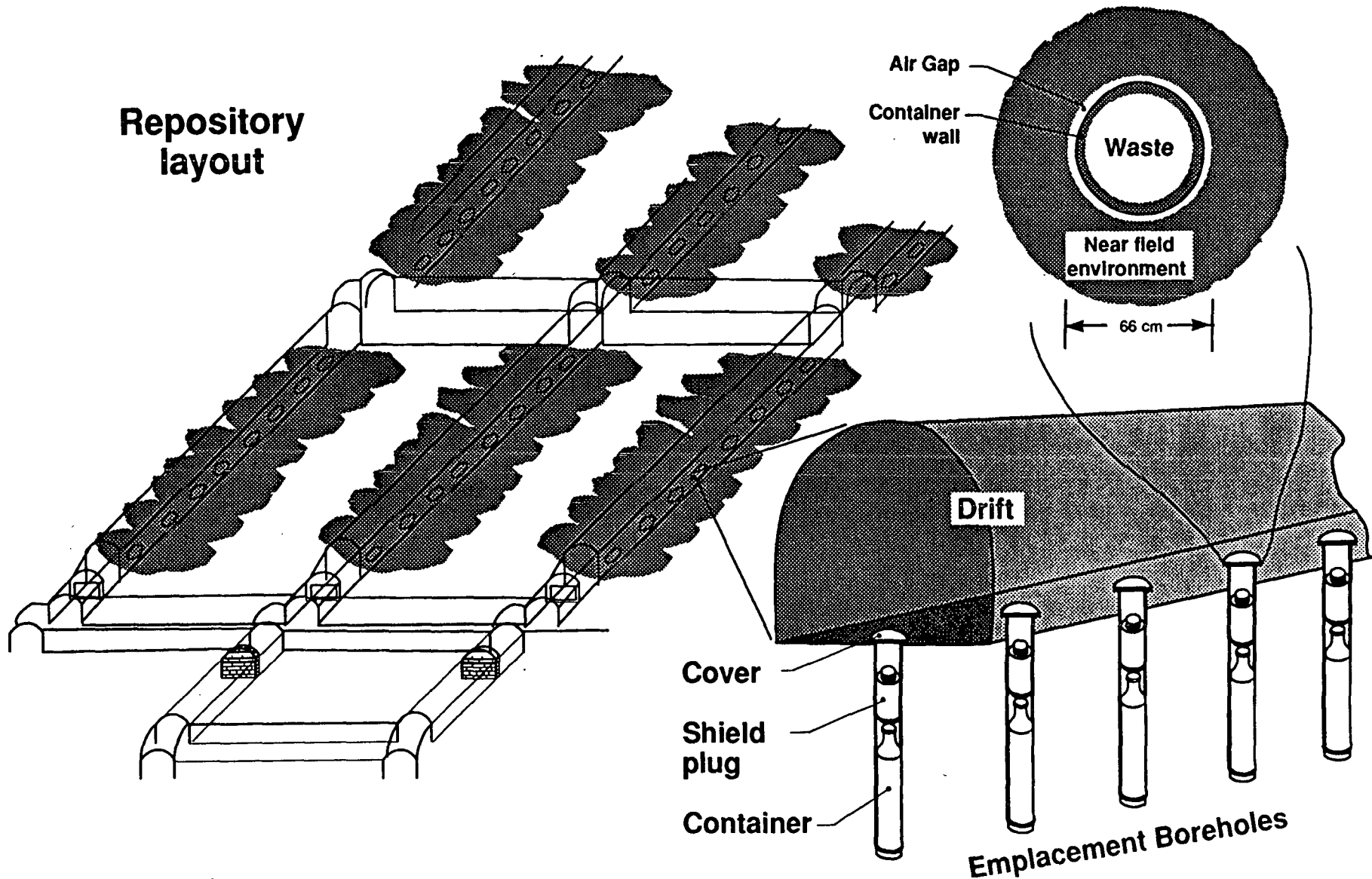




# ALTERNATE INTACT FUEL CONTAINERS (HYBRID)



# THE NEAR-FIELD ENVIRONMENT IS A LARGE FRACTION OF THE UNDERGROUND REPOSITORY



# THERMAL ANALYSIS METHODS

## ANALYTIC SOLUTIONS

- SUPERPOSITION OF POINT SOURCES
  - CONSTANT PROPERTIES
  - LARGE ARRAYS
  - VARIABLE MULTIPLE SOURCES
  - CONDUCTION ONLY

## NUMERICAL METHODS

- FINITE ELEMENT
- FINITE DIFFERENCE
  - LIMITED SIZE MODELS
  - VARIABLE PROPERTIES
  - MULTIPLE PROCESSES  
(CONVECTION, PHASE CHANGE, etc.)