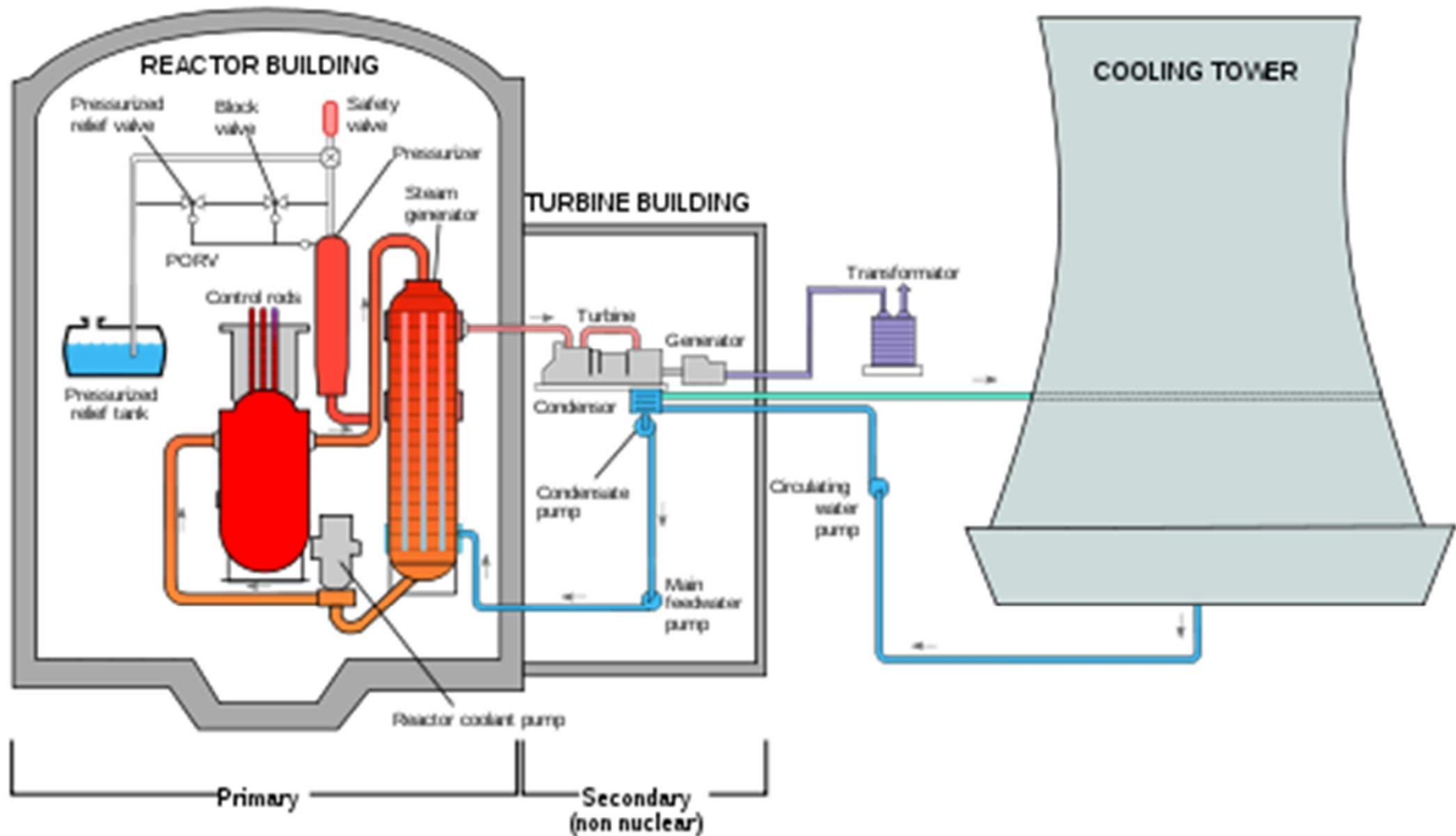


# Defueling TMI-2

Russ Green



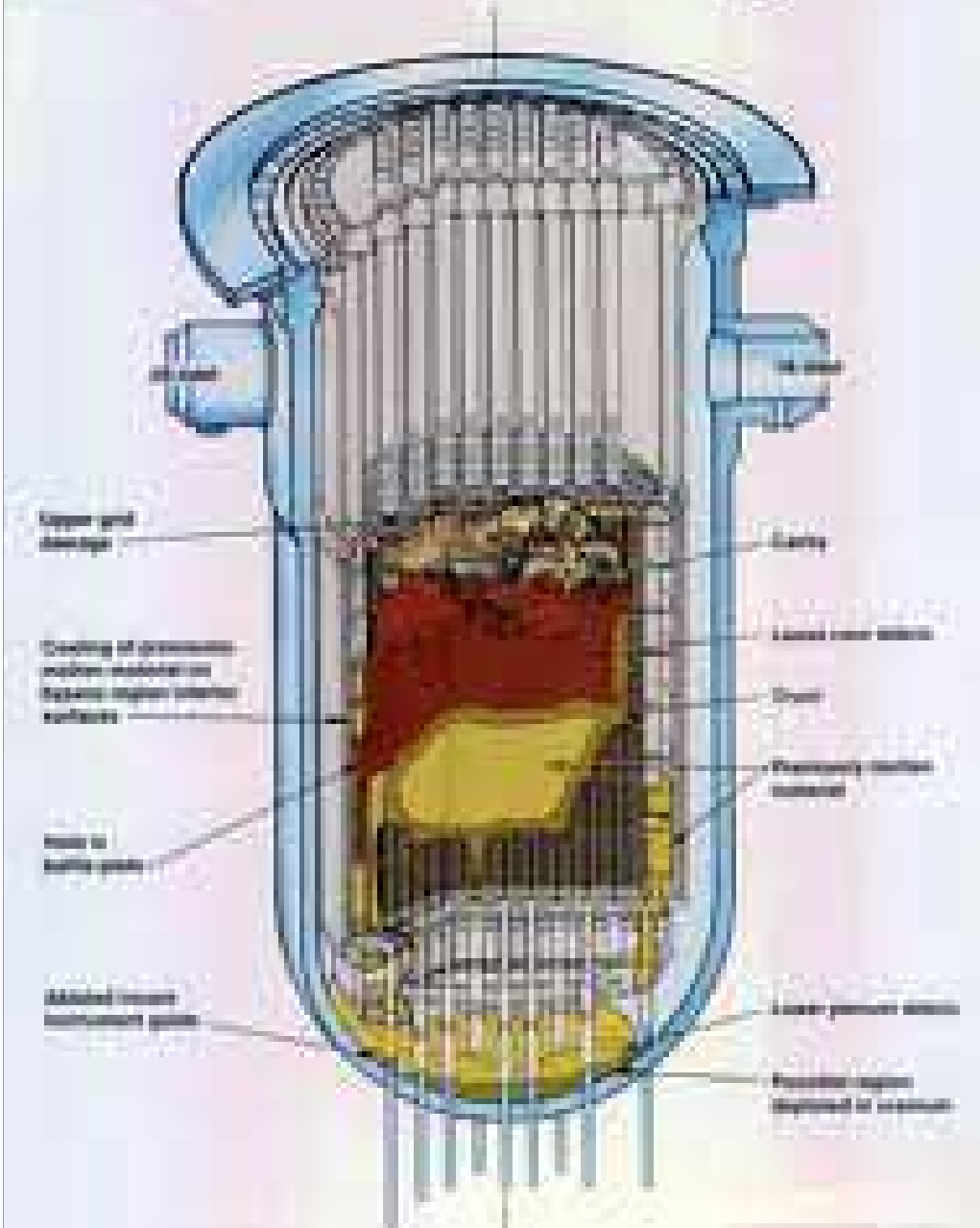
# B&W 177



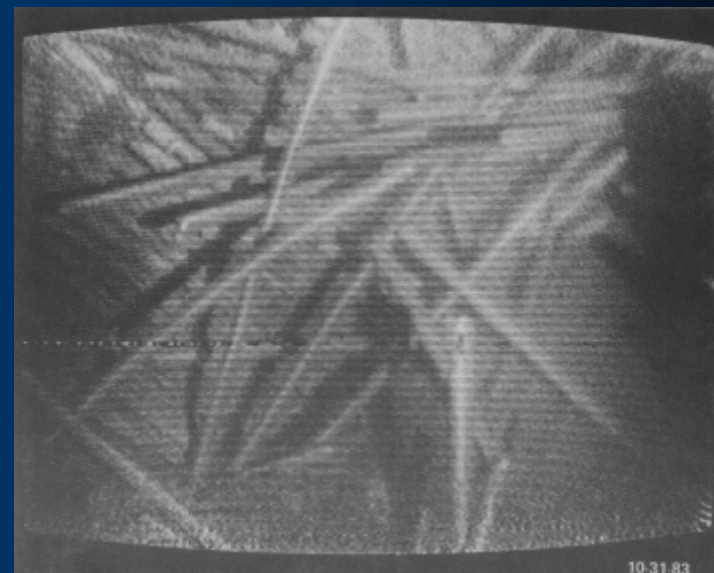
# TMI-2 Accident

- PORV leaking by with only indication in alarm
- Loss of Feedwater
- Rx tripped on High Pressure
  - Heat Production / Heat Removal Imbalance
- PORV Opens and does not close
- LOCA at the top of the Pressurizer w/ ES actuation
- PORV/HPI Cooling is defeated over concerns of excess inventory
- EFW not available due to Switching and Tagging mishap
- No heat removal capability results in core damage

# TMI-2 Core End-State Configuration

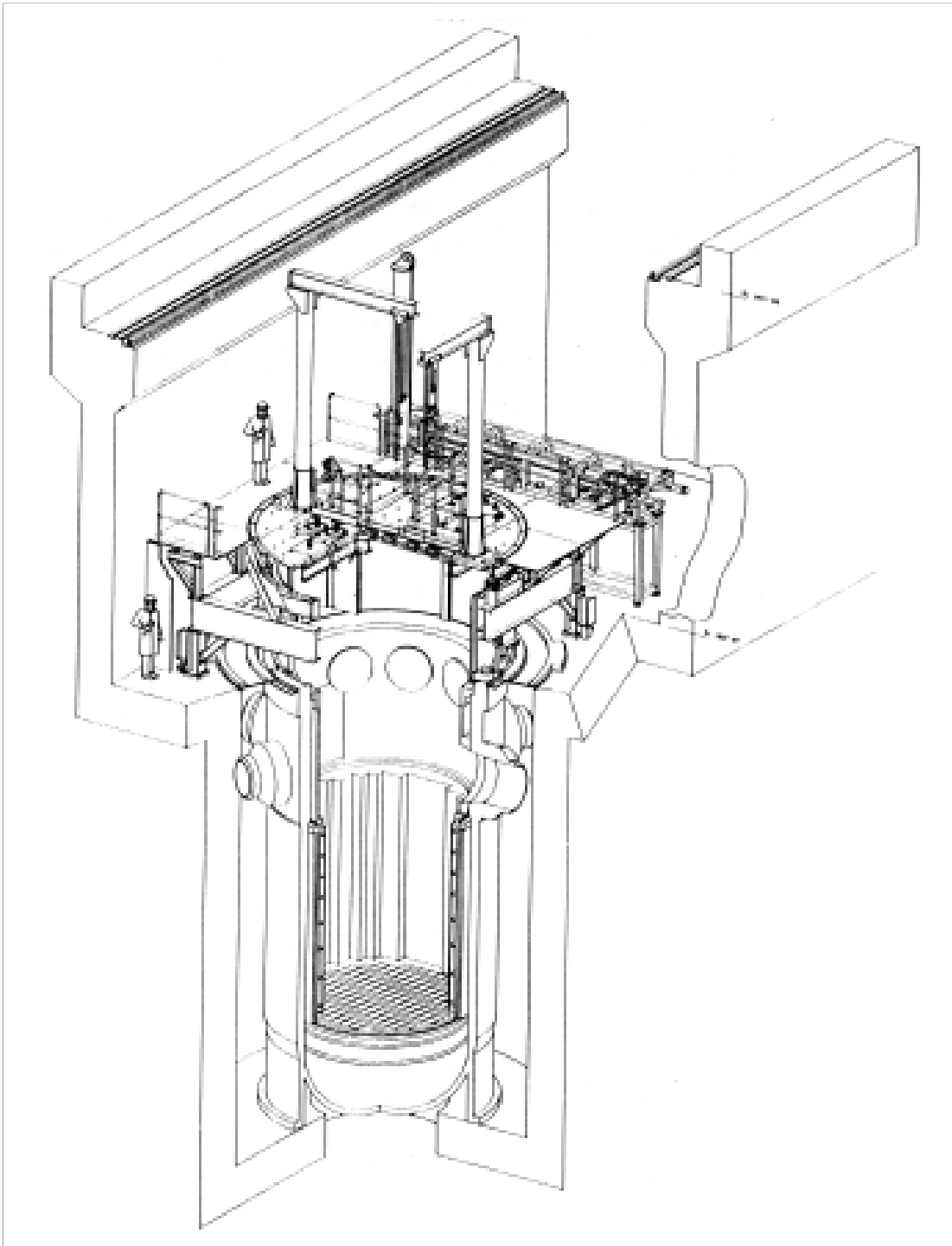


# Core Damage

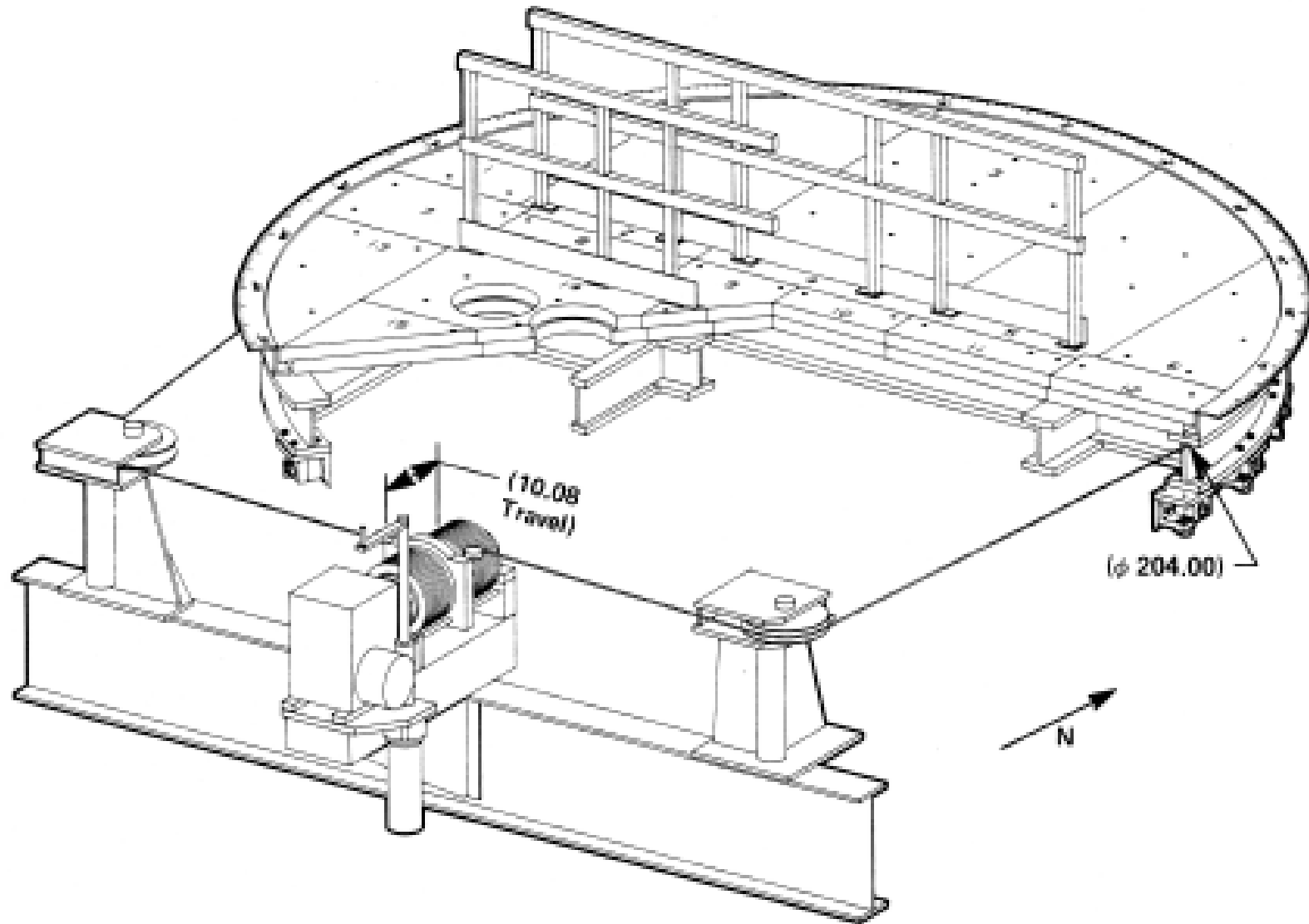


# Work Platform

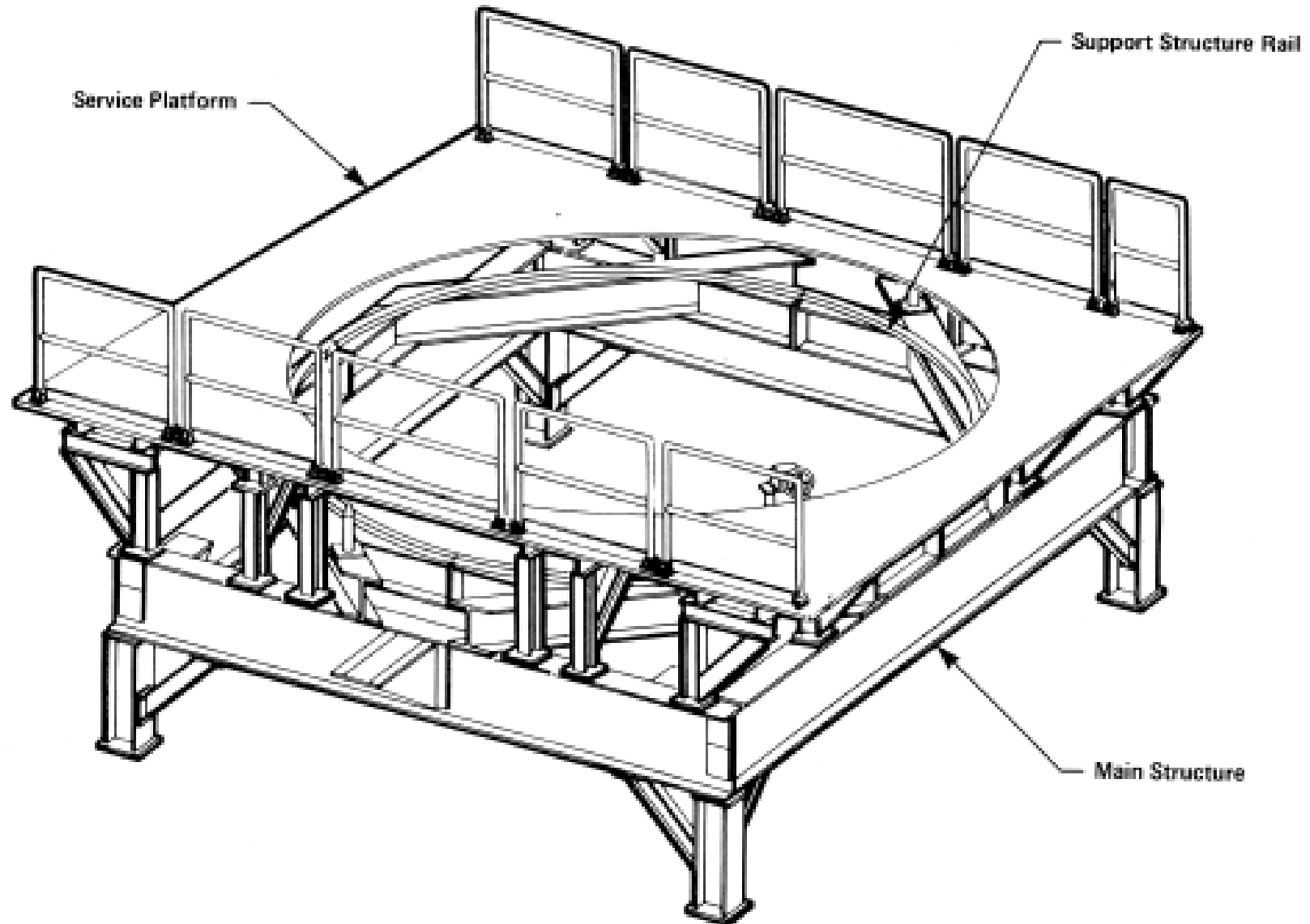
Internals Indexing Fixture  
Rotating Work Platform  
Rotating Service Platform



# Rotating Shielded Work Platform

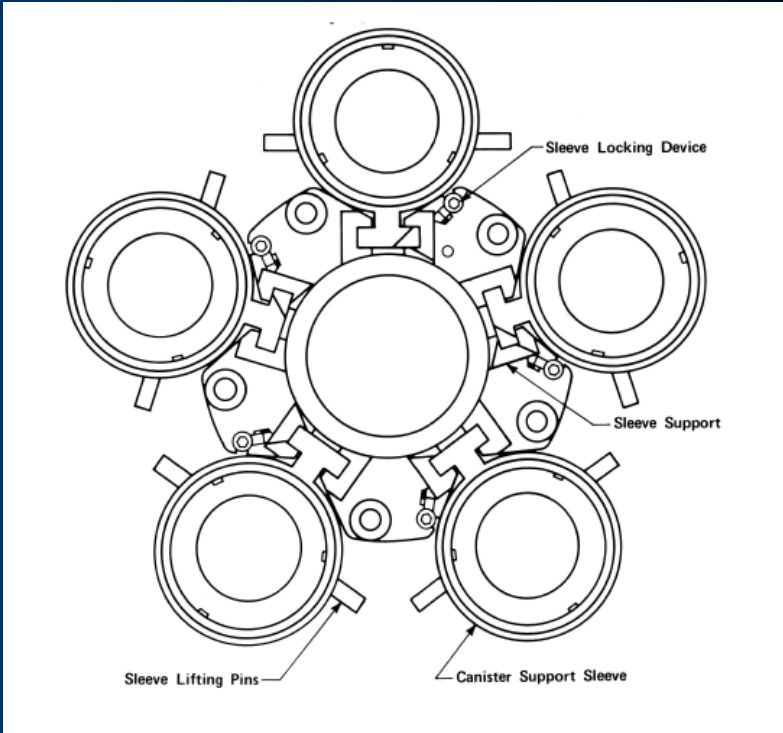
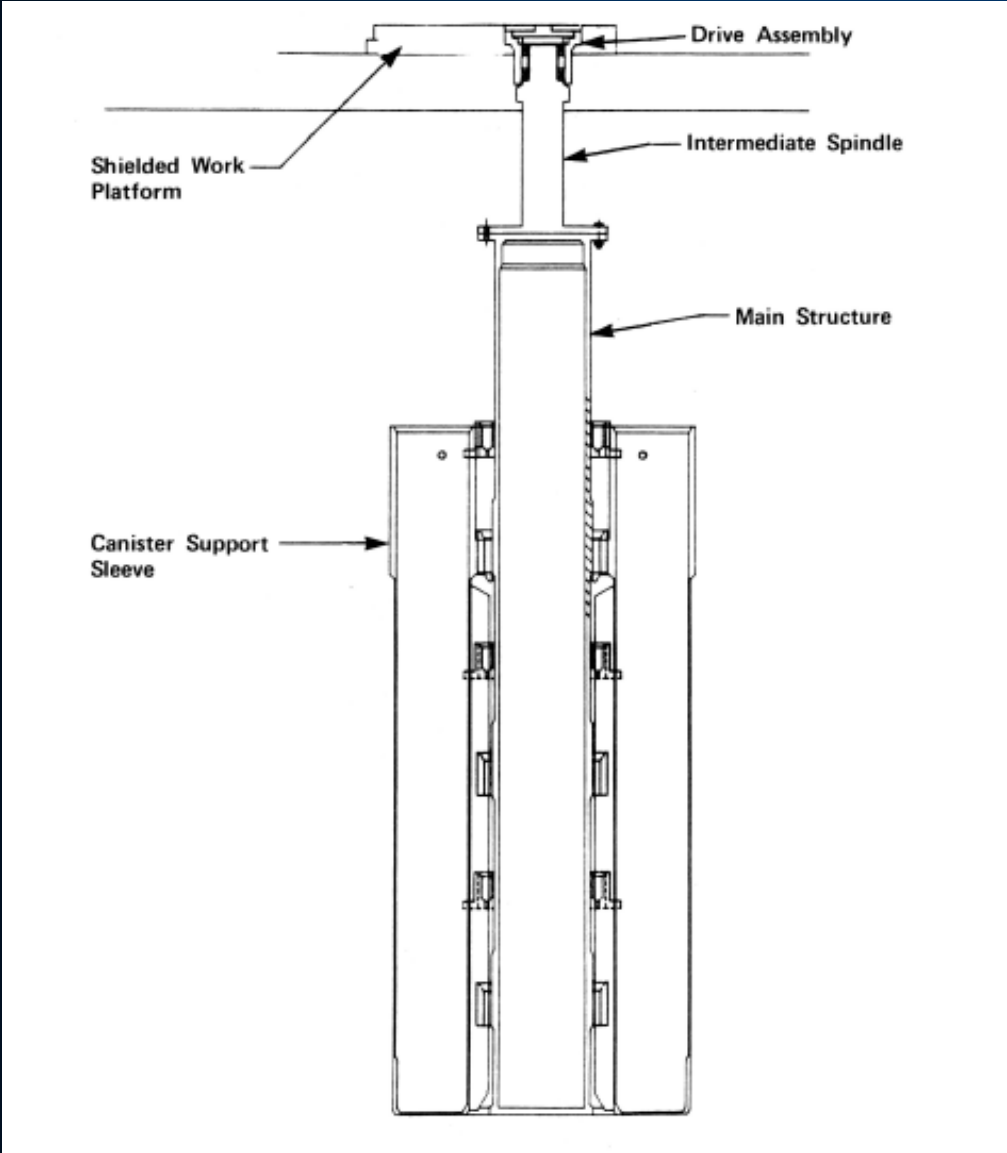


# Service Platform



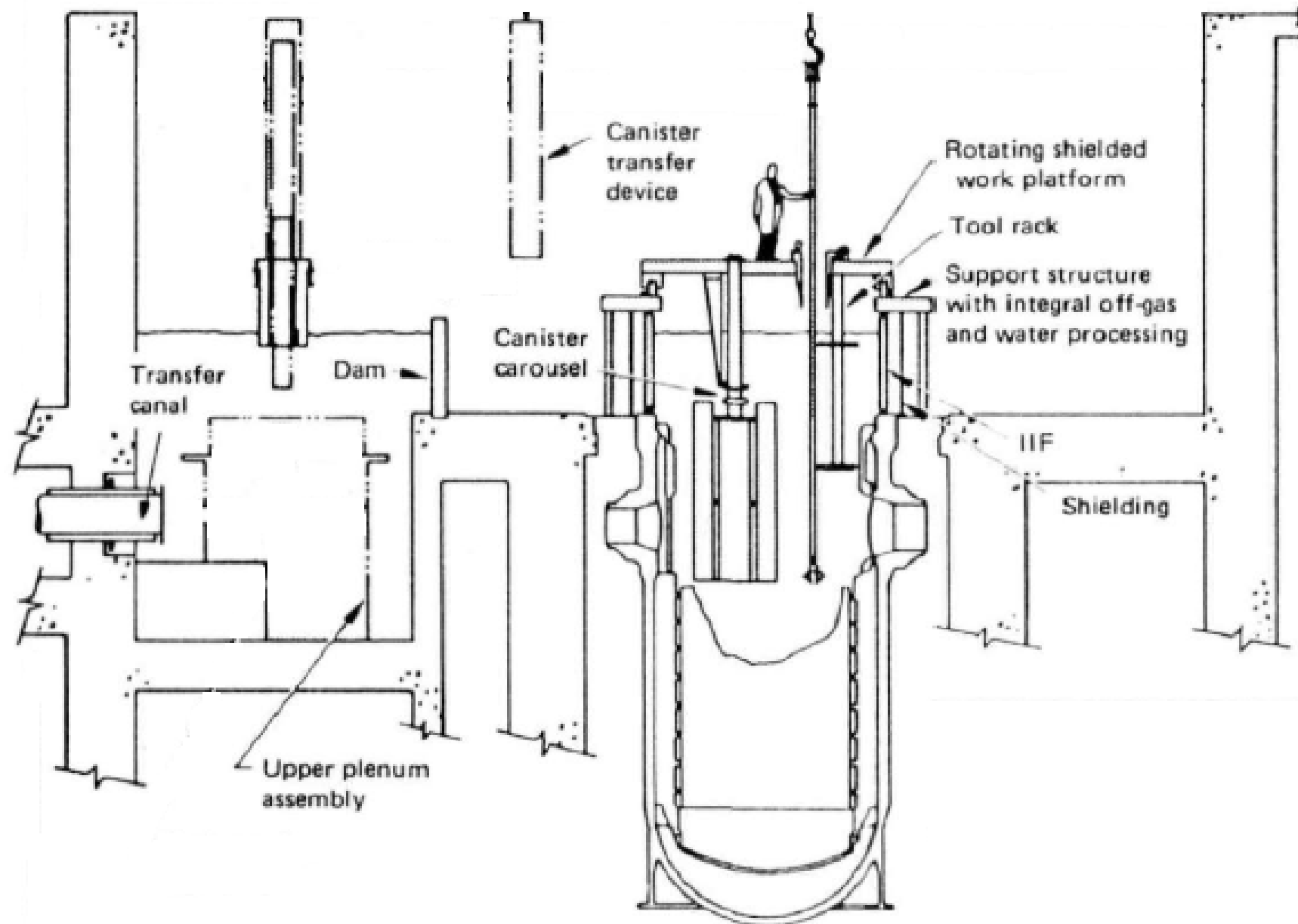


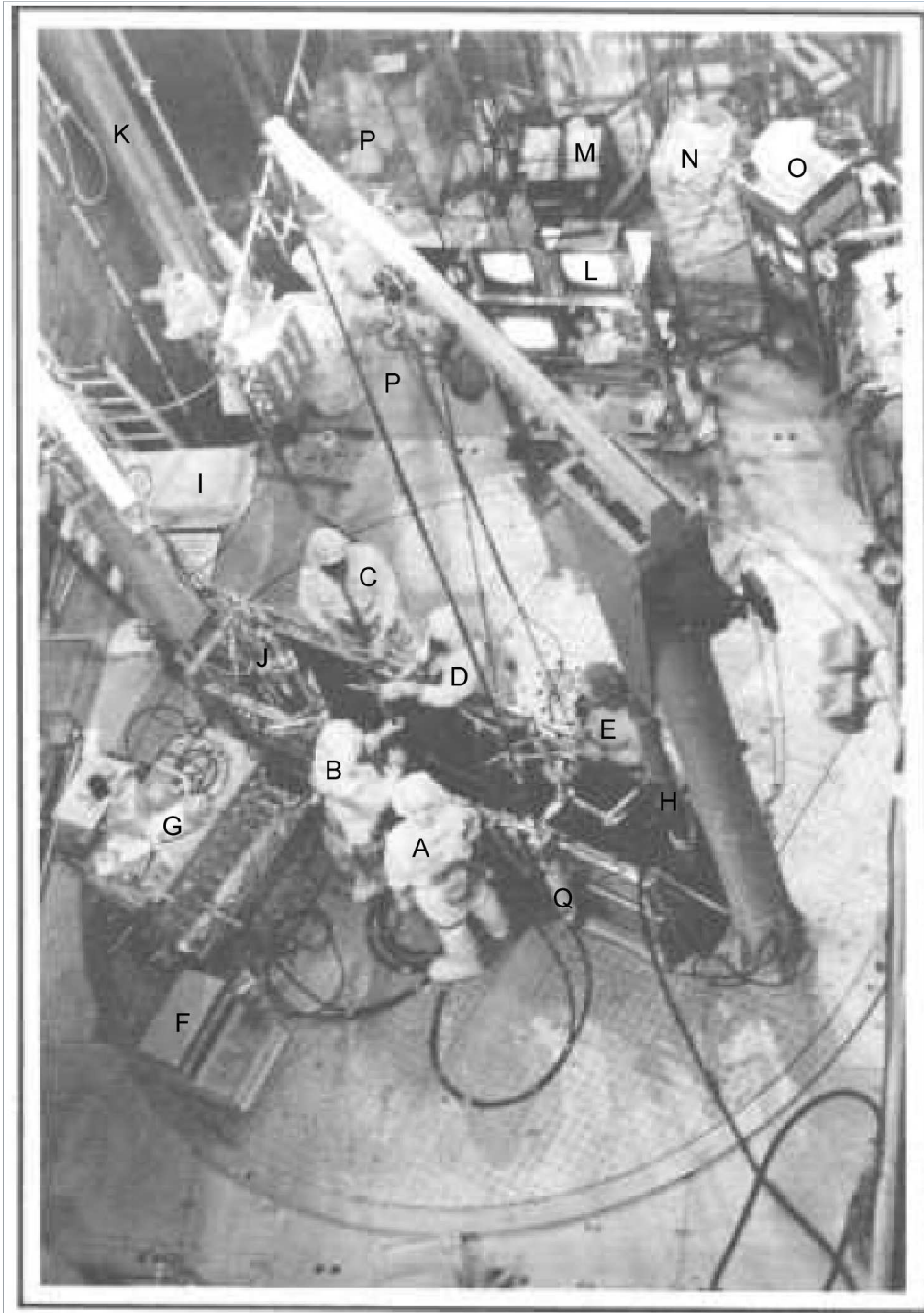
# Canister Carousel





# Work Platform





# Defueling

Key:

A: Camera Operator

B: Tool Operator

C: Crane Operator

D: Probably the Camera Controller acting as an assistant to the Tool Operator

E: Radiation Control Technician

F: Step Stool for disconnecting tools from the jib crane when tied off in the slot

G: Hydraulic control skid used to power long handled tools.

H: Long Handled tool tied off in the slot

I: Step off pad to the Defueling Water Cleanup equipment.

J: Small Long Handled tools tied off in the slot

K: Long Handled tools tied off along the fuel canal wall

L: Monitor console

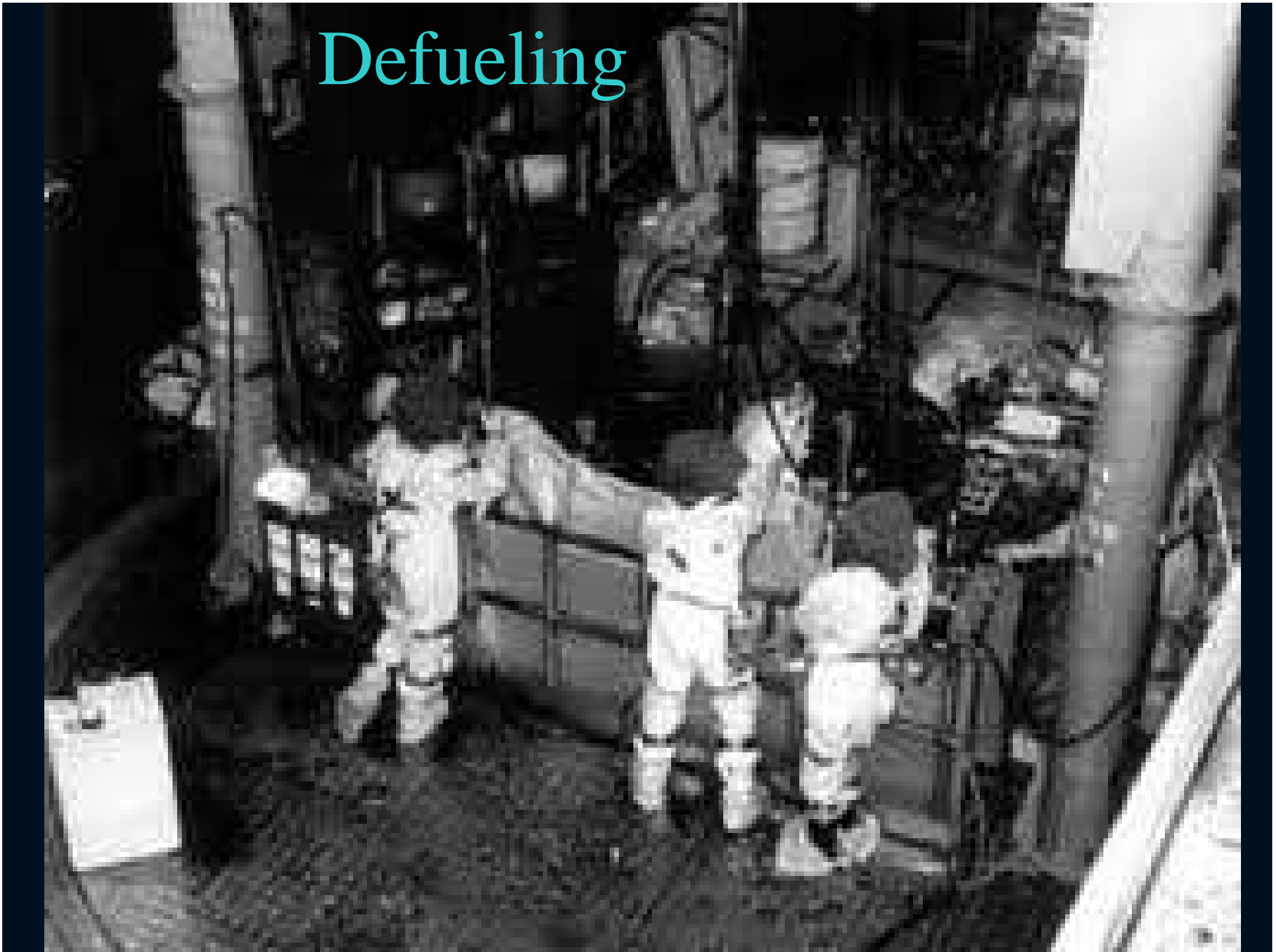
M: Rack containing disposable booties and gloves

N: Unknown but may be a container of discarded booties and gloves awaiting transfer

O: Camera control console and radio repeater equipment



# Defueling





# Work Platform

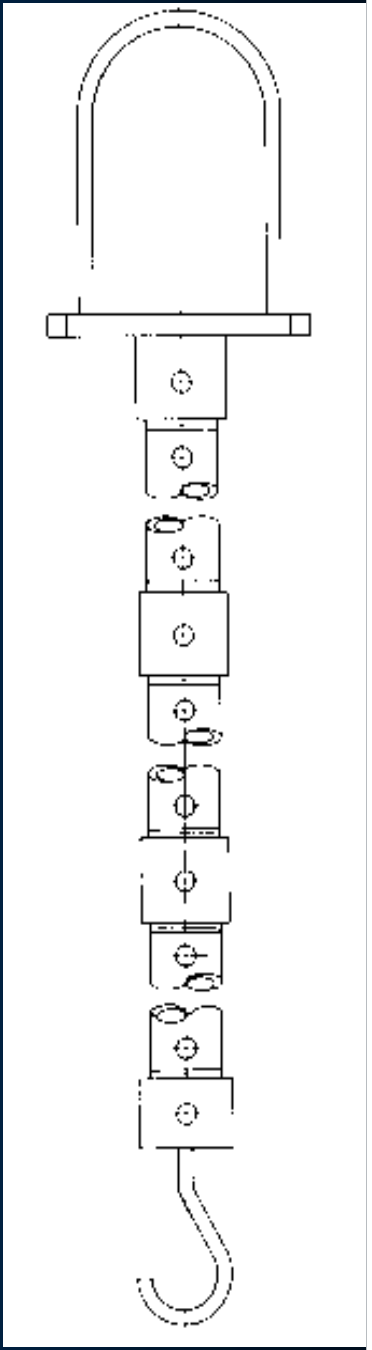
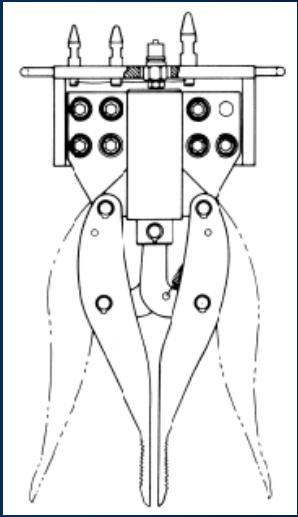
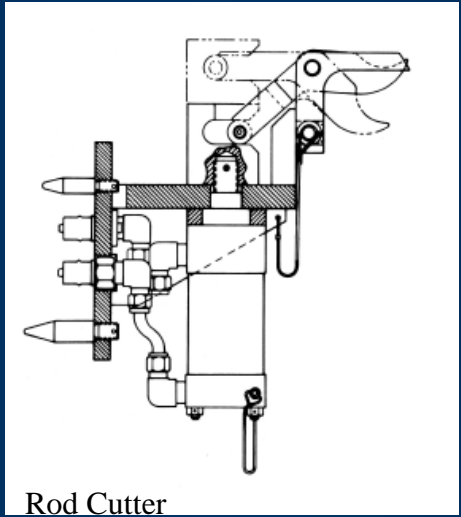
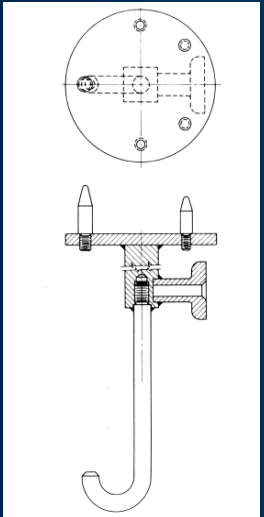
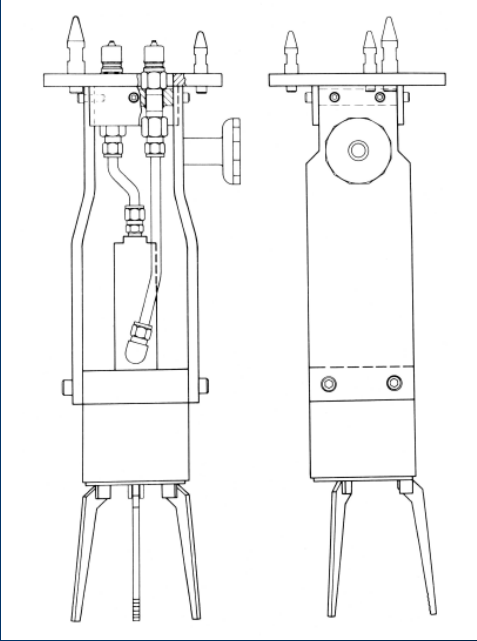
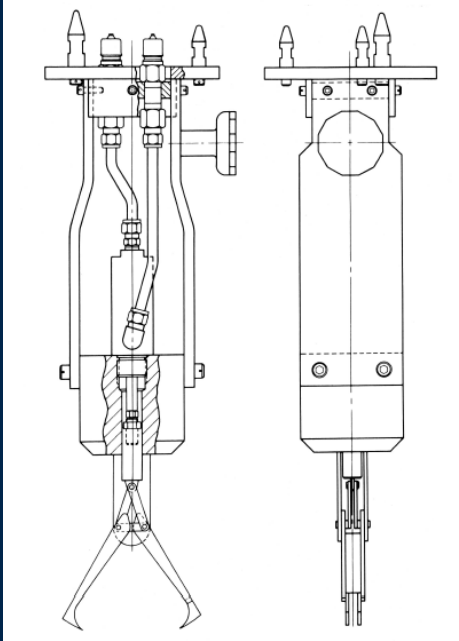
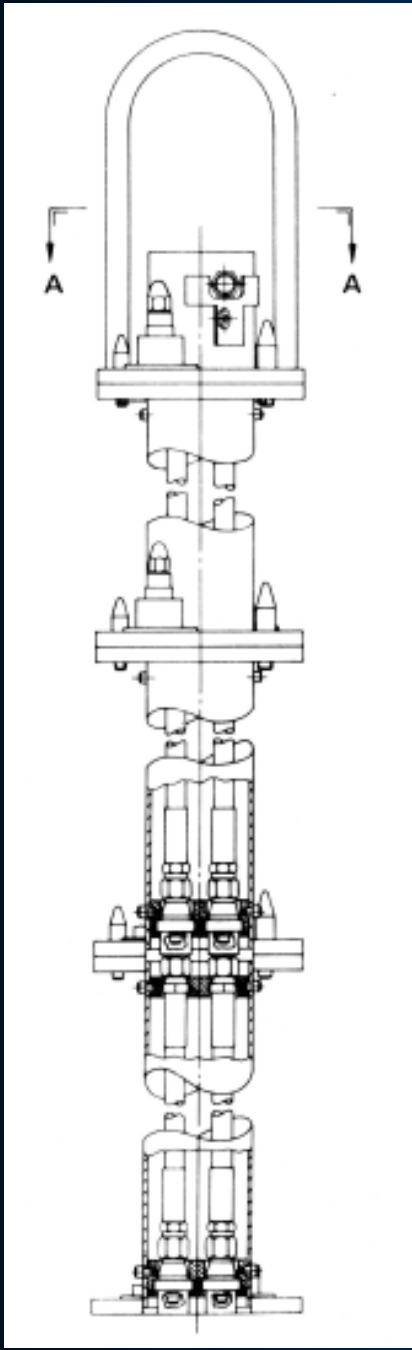




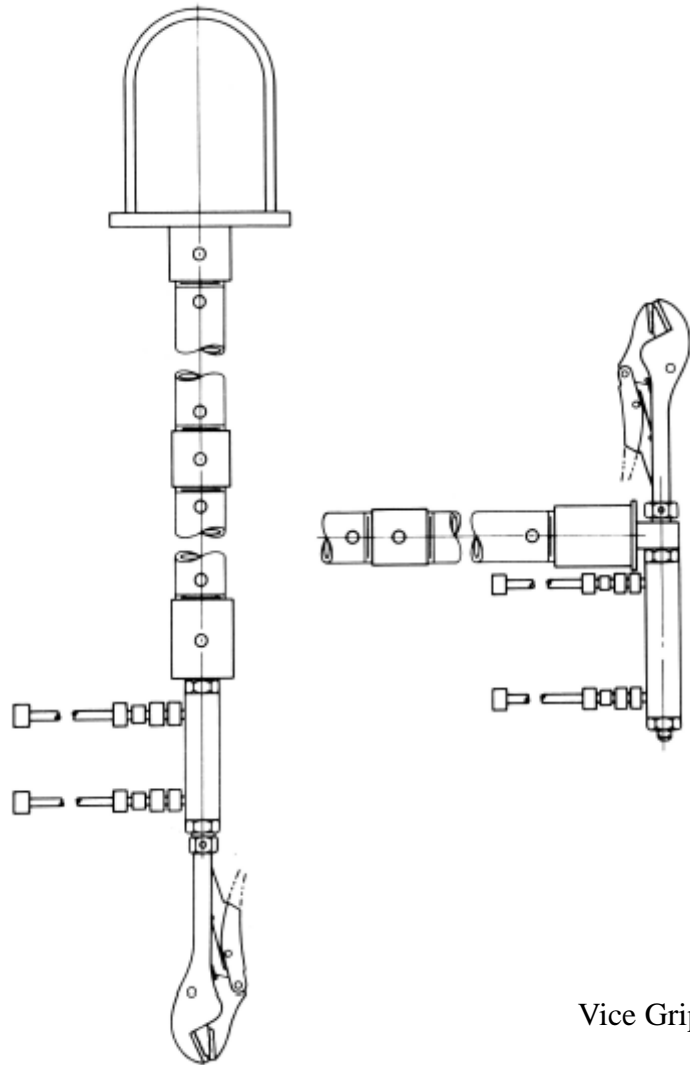
# Work Platform



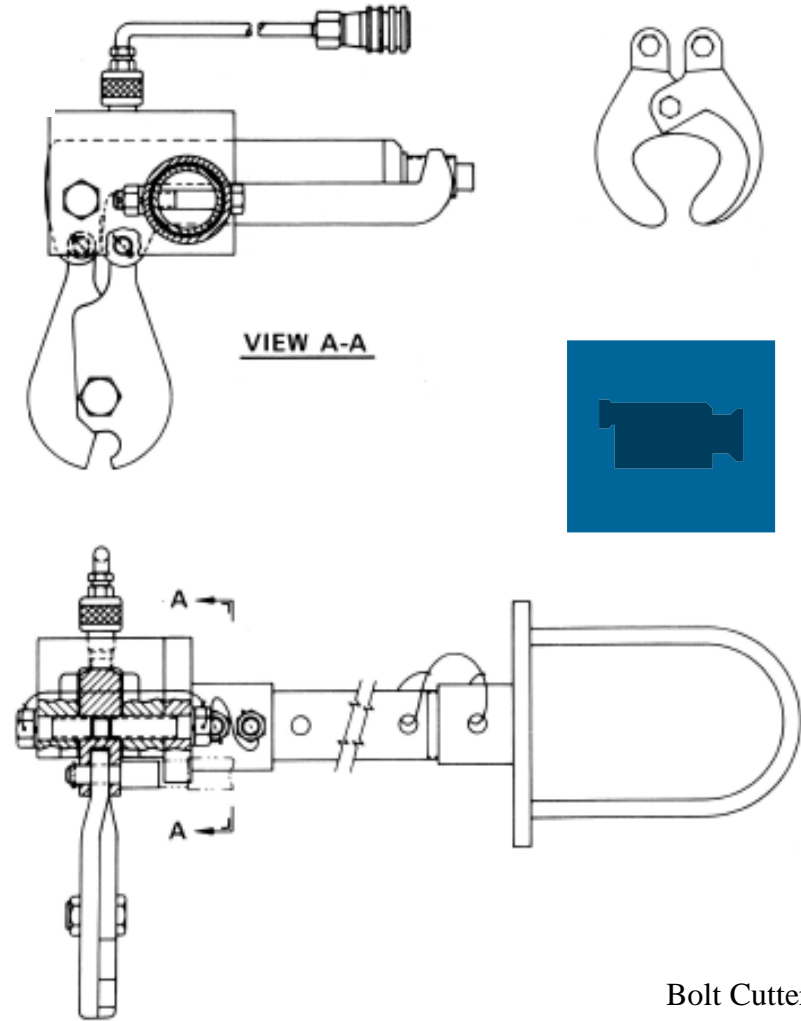
# Tools



# Tools



Vice Grip



Bolt Cutter

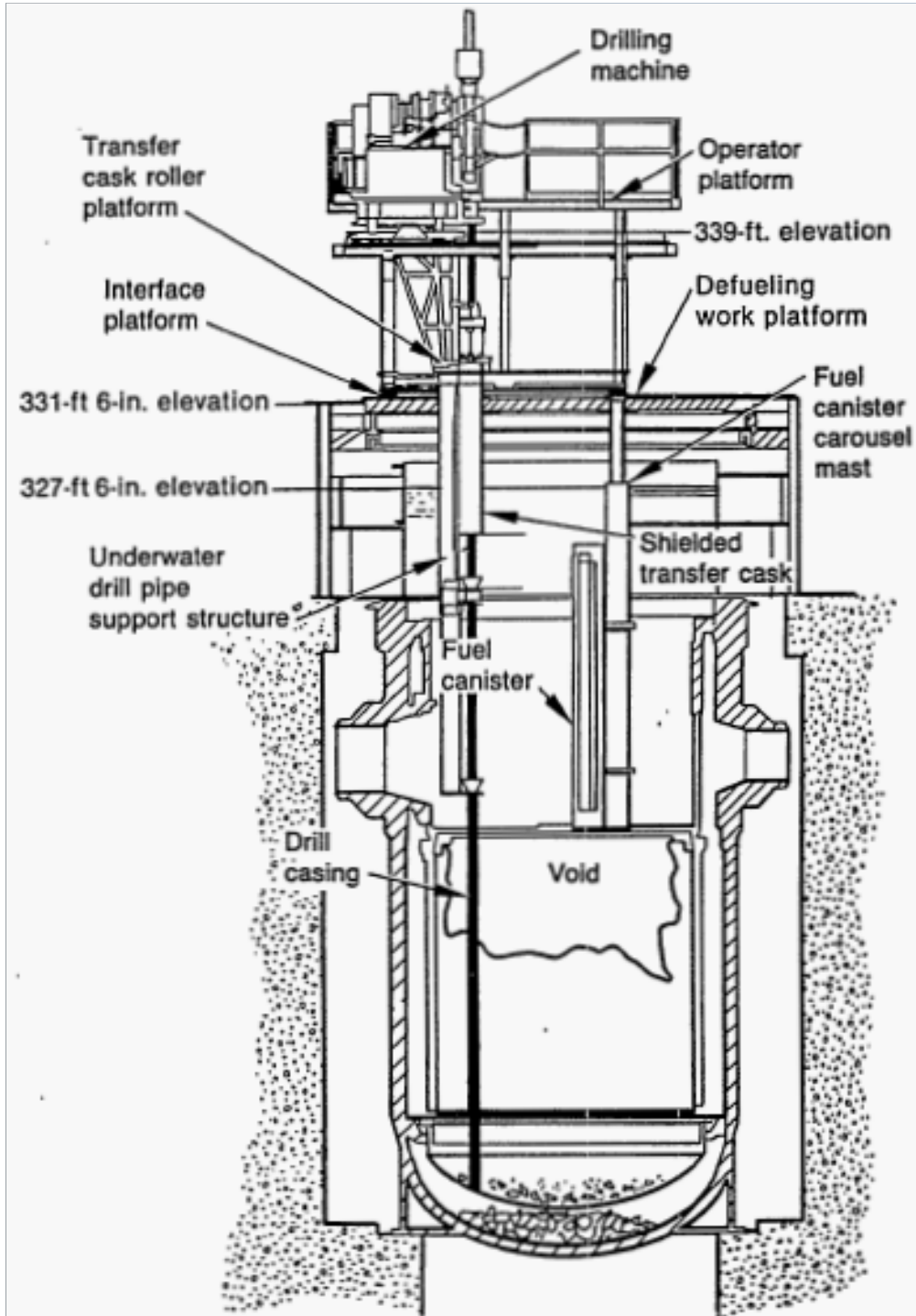
**Design & Fabrication crew on site for Fast Turnaround.** Many Tools: Lariat tool, Fuel Assembly Lifting tool, Hydraulic Fuel Assembly Clamps, Peters tool, Jet Pump Vacuum Cleaners, Frew Screw, Socket Wrench, All Bolts were Standardized w/ threaded receivers (no nuts), Rinse System, more



# Core Bore

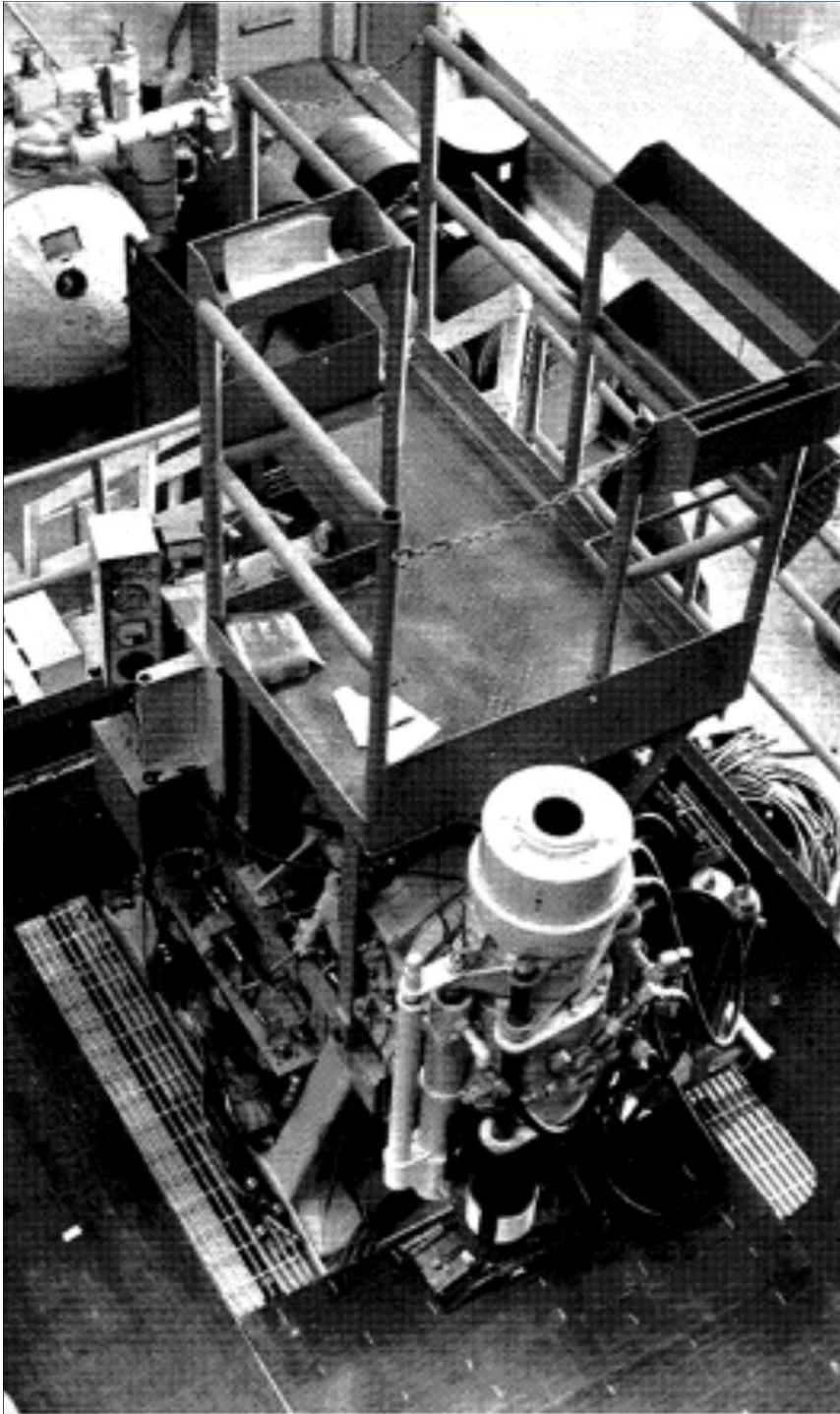
Data for Accident Analysis

Monolith Break up



Tungsten Carbide Teeth with Synthetic Diamond





# Core Bore

- Adapted from commercial mining drilling equipment
- One of the most important machines for the project
- First use with hollow core bits: 10 samples 1.8 m long x 6.4 cm diameter (figure below)
- Second use with solid face bits to chew through the hard once-molten mass in the core region
- Third use was assisting lower grid and instrument tubes by grinding metal (next viewgraph)



# Internals Cut Out

## Underwater Plasma Arc Cutter



# Water Clarity

- DWCS (Defueling Water Cleanup system)
  - Stopped Work
  - Design and Testing Under High Stress
  - Solution: Diatomaceous Earth Filter on a larger scale
  - Very Effective
  - Suggestion: Minimize Hoses
- Bacteria (Hydraulic Oil Leakage as Carbon Source)
  - Stopped Work
  - Testing Performed Under Stress
  - Solution: Addition of Oxidizing Biocide ( $H_2O_2$ )
  - Heavy Decontamination Required
  - Very Effective
  - Suggestion: Use UV light if possible



# Man Power

- Manpower Will be Critical
  - Apply Skilled and Unskilled labor effectively
  - Don't Overwork the Teams
    - Unsustainable in the long run
- Allow the crews learned experiences to benefit future work (defuel in series)
  - Defuel the least damaged unit first
  - Defuel the remaining two in parallel if desired
- Robots are useful but always require more work than human labor alone
  - Personnel Safety / Dose



# Questions?

Now or Future

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[russellgreen@comcast.net](mailto:russellgreen@comcast.net) 717-350-1513 (c)