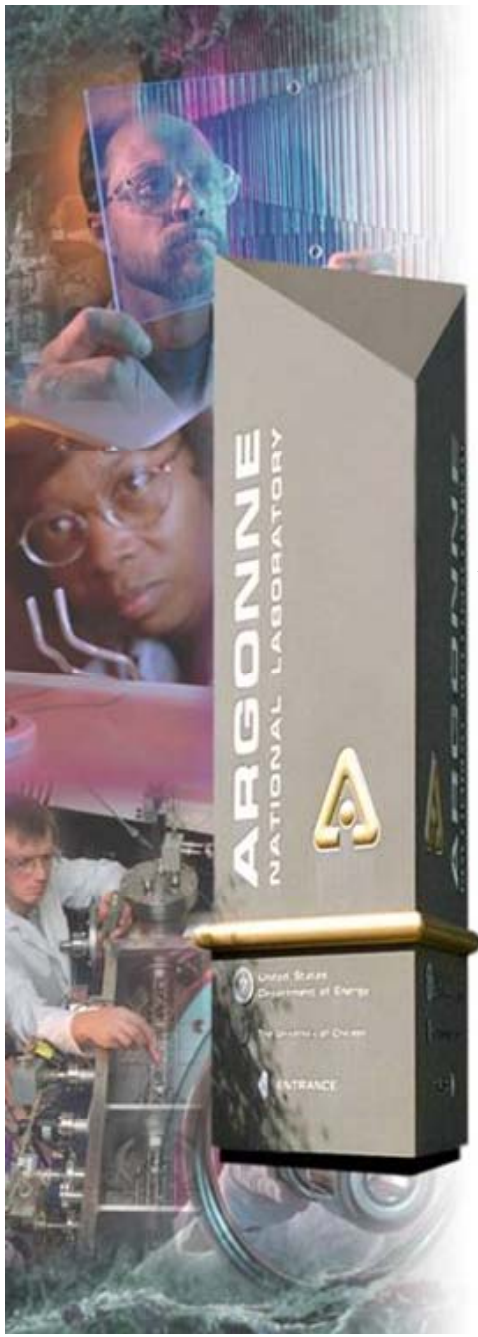

National Nuclear Security Administration

Accelerator Driven Sub-critical Assembly Facility

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Kharkov, Ukraine
February 24-25, 2005

Argonne National Laboratory

Office of Science
U.S. Department of Energy

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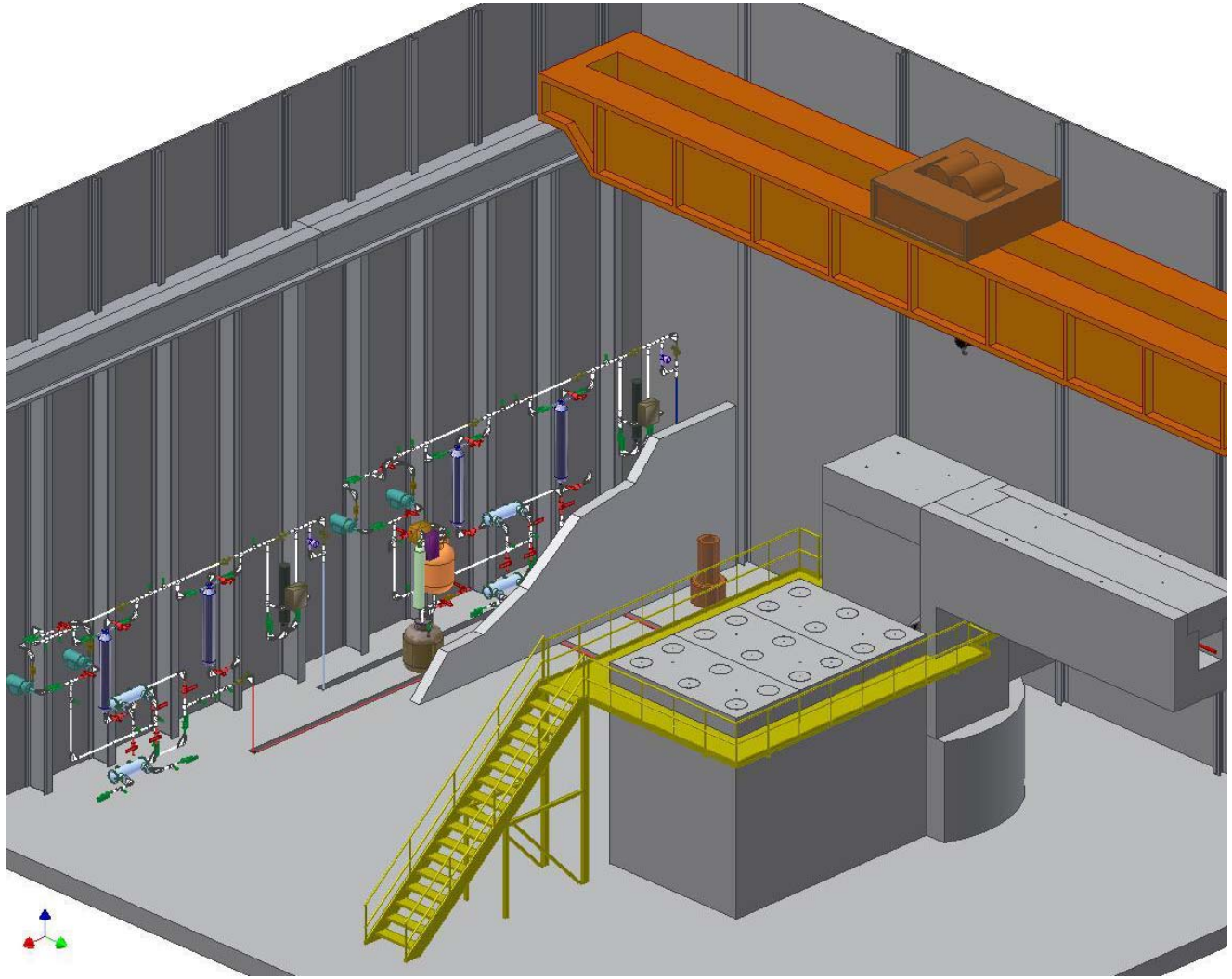
Accelerator Driven Sub-critical Assembly Facility

- **Facility Conceptual Design**
  - Target designs
  - Sub-critical assembly
  - Coolant loops
  - Facility layout
  - Operation and maintenance approach
- **Neutron Source Analyses**
  - Tungsten and uranium targets with electron beam
  - Beryllium target with deuteron beam
- **Target Conceptual Design and Performance**
  - Tungsten and uranium targets with electron beam
  - Beryllium target with deuteron beam
- **Sub-critical Assembly Analyses**
  - Tungsten and uranium targets with electron beam and beryllium reflector
  - Beryllium target with deuteron beam and beryllium reflector
  - Tungsten and uranium targets with electron beam and water reflector
- **Performance Comparison of LEU and HEU Sub-critical assemblies**
- **Conclusions**

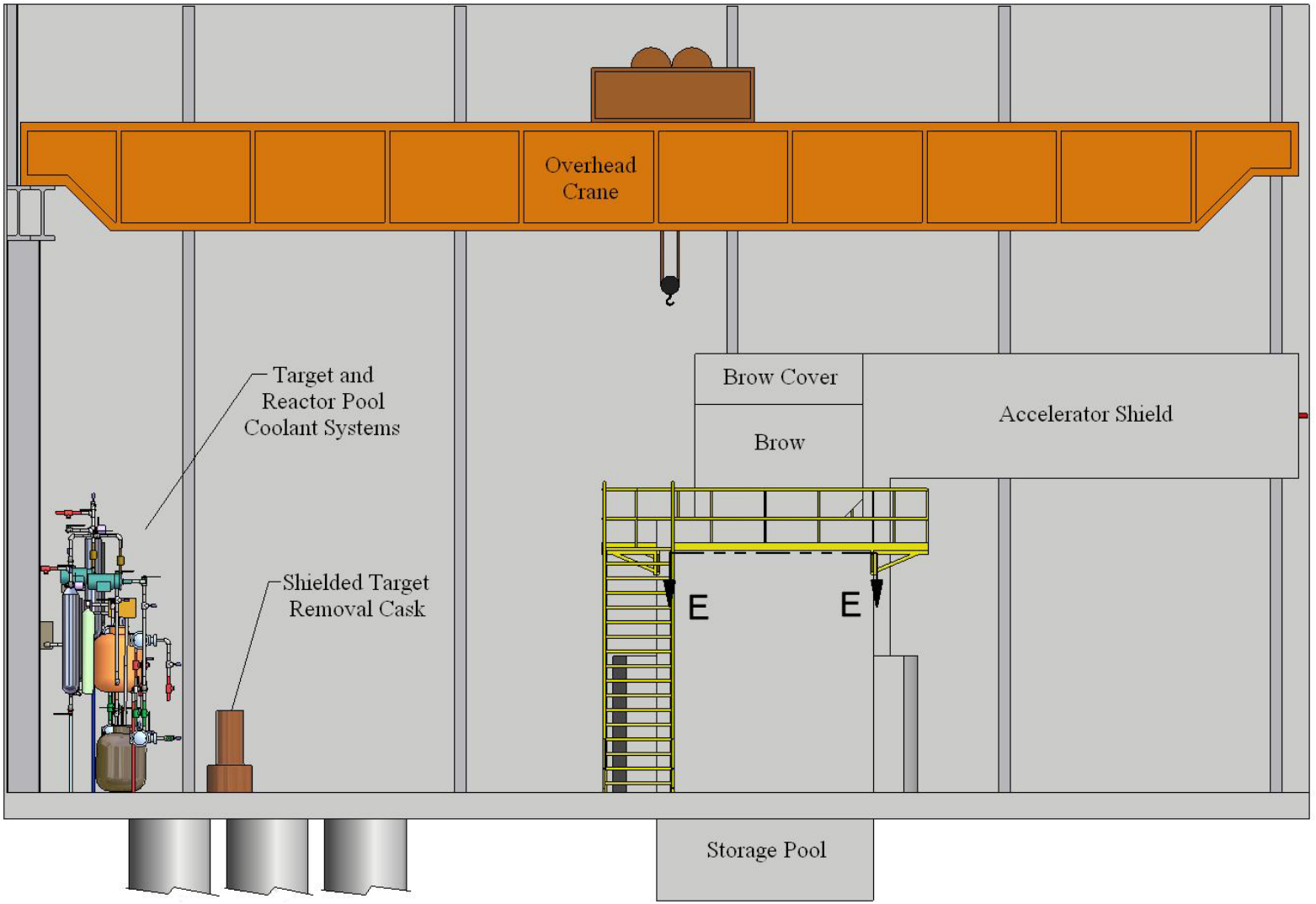
Facility Conceptual Design

- Facility is configured to maximize its utilization for medical isotope production, experimental studies, and material characterizations
- Configuration options capable of using different target materials, target designs, reflector materials, and beam parameters.
- Simple and efficient procedures are utilized for normal operations and maintenance procedures.
- Safety, reliability, and environmental considerations are included in the facility conceptual design.
- Proven designs and operating procedures are utilized in the conceptual design.
- The facility is configured to accommodate future design improvements, upgrades, and new missions.
- The facility has large design margins to accommodate different operating conditions and parameters.

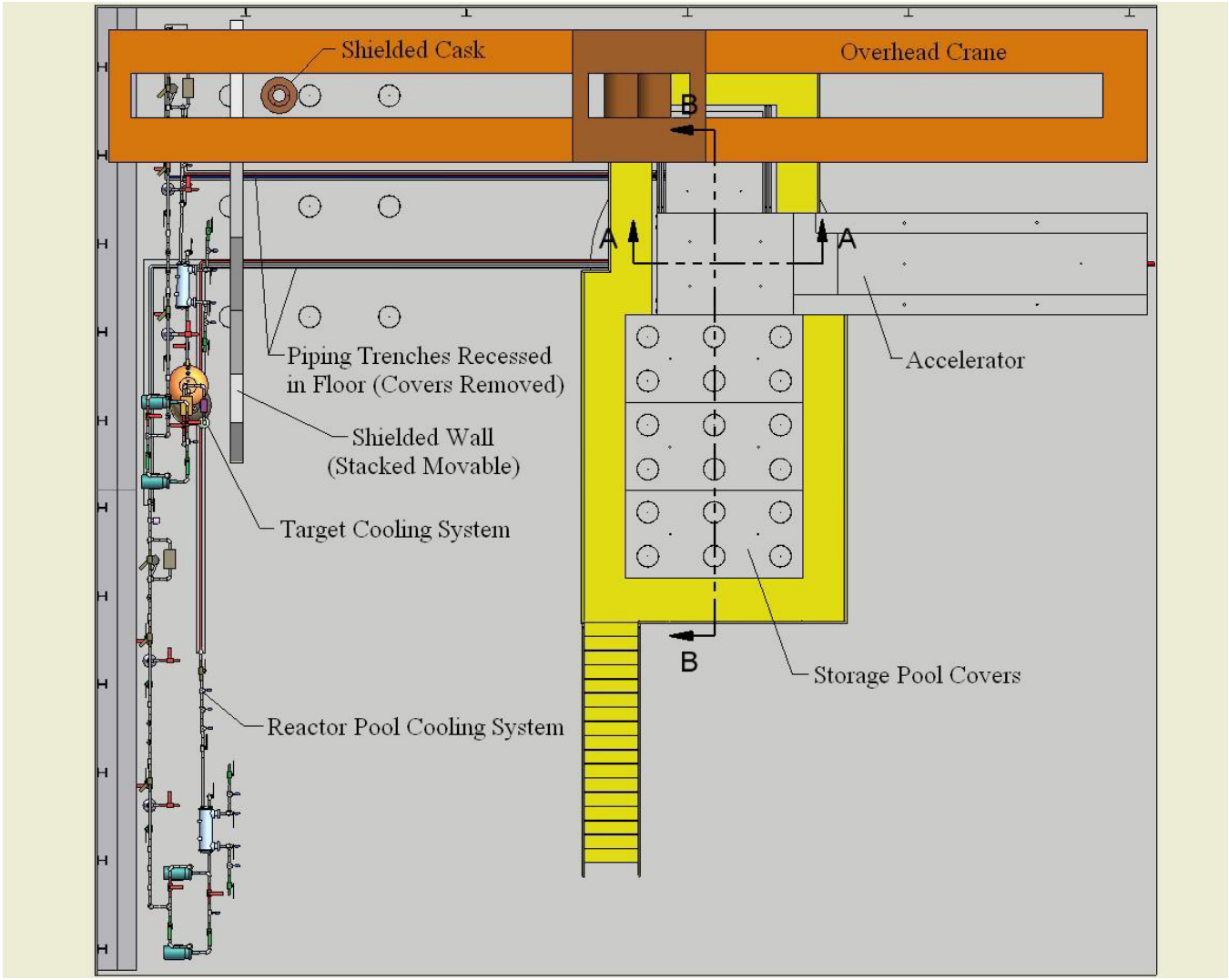
Isometric View of the Sub-Critical Assembly Facility



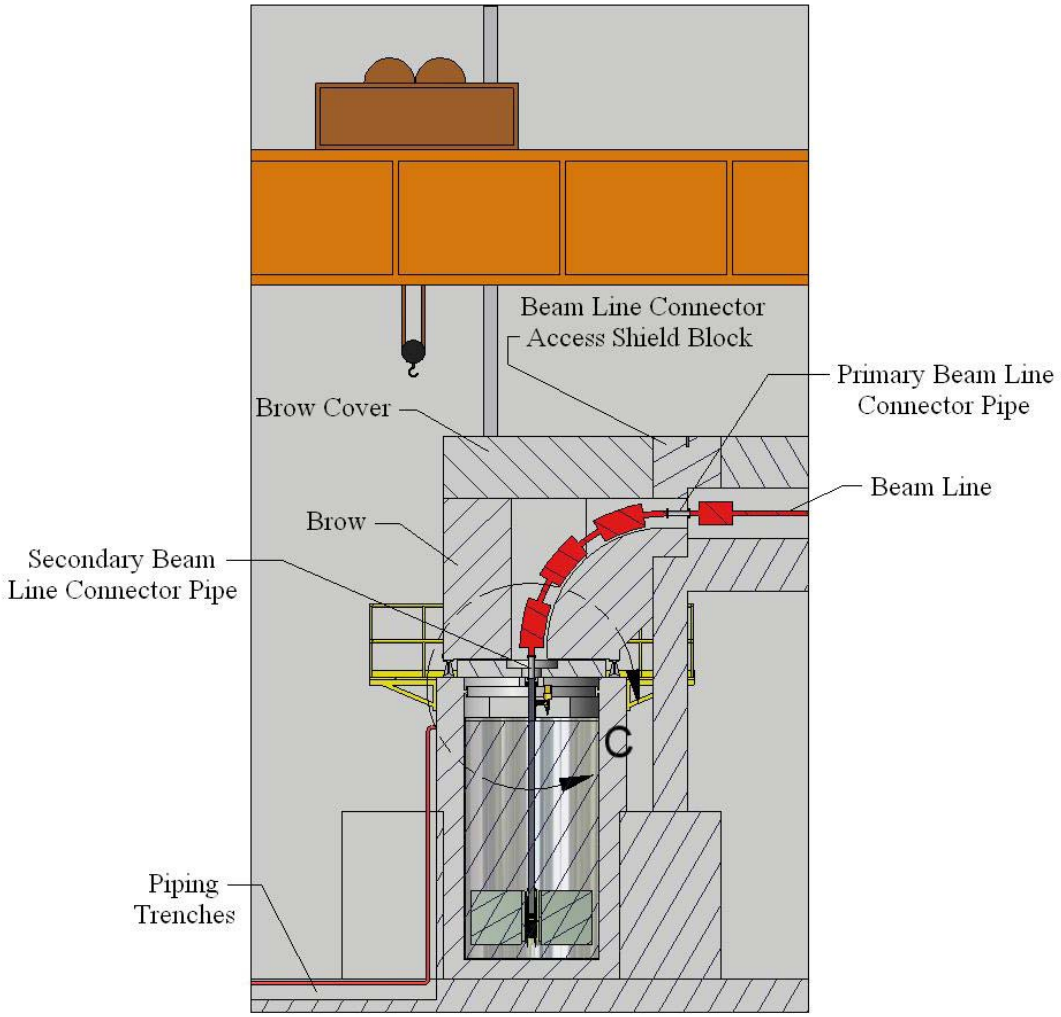
Front View of the Sub-Critical Assembly Facility



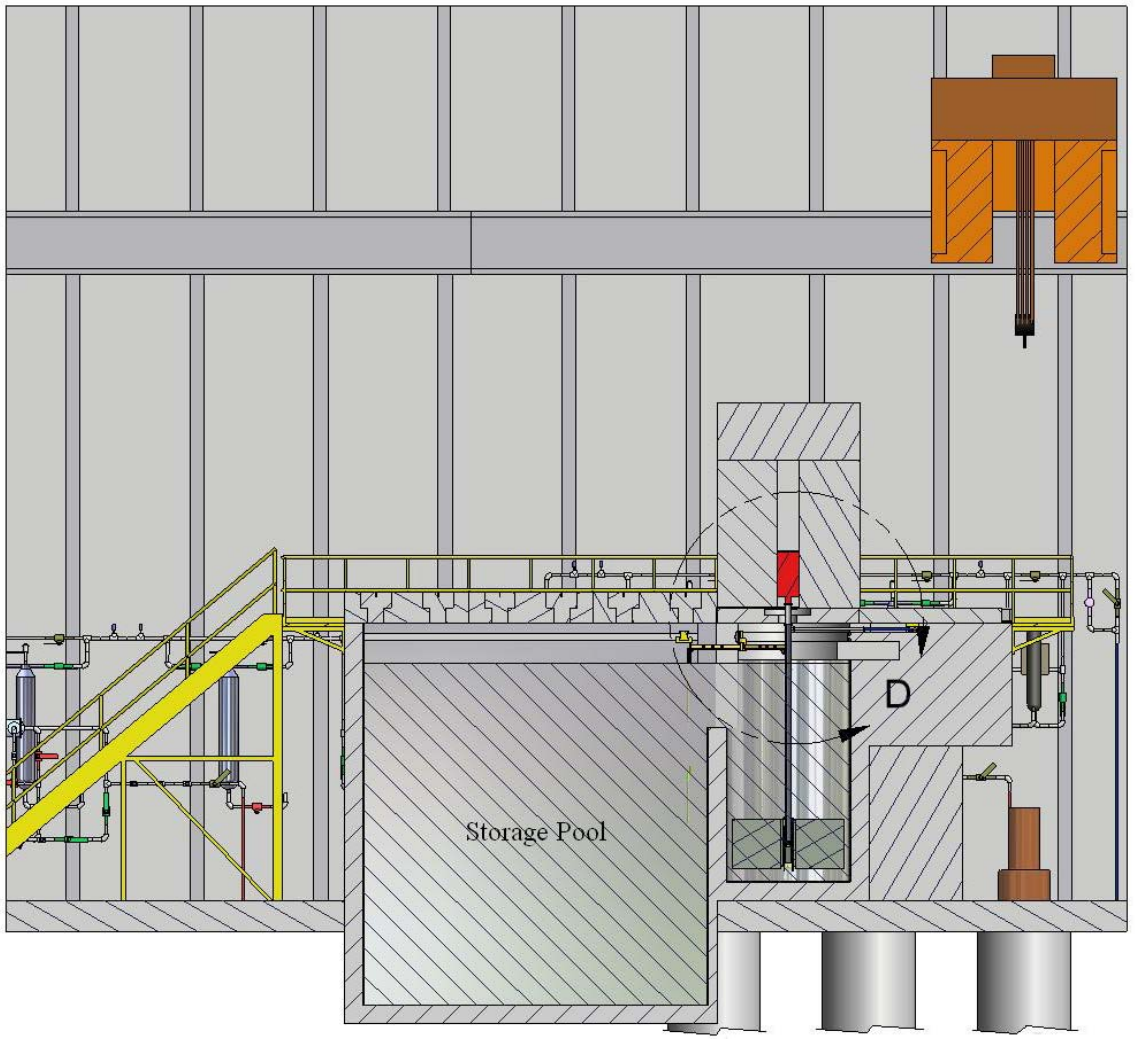
Plan View of the Sub-Critical Assembly Facility



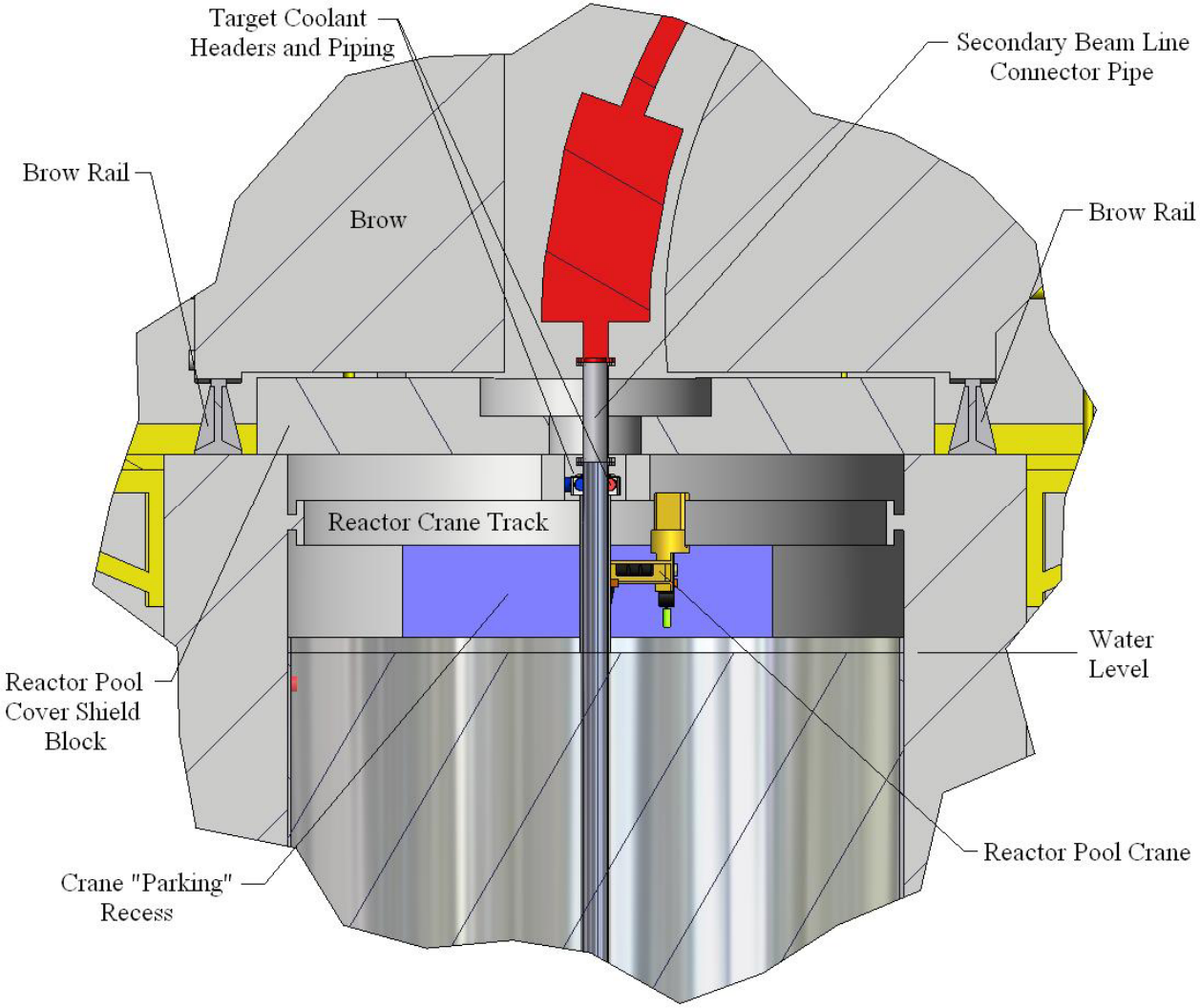
Section A-A through the Sub-Critical Assembly



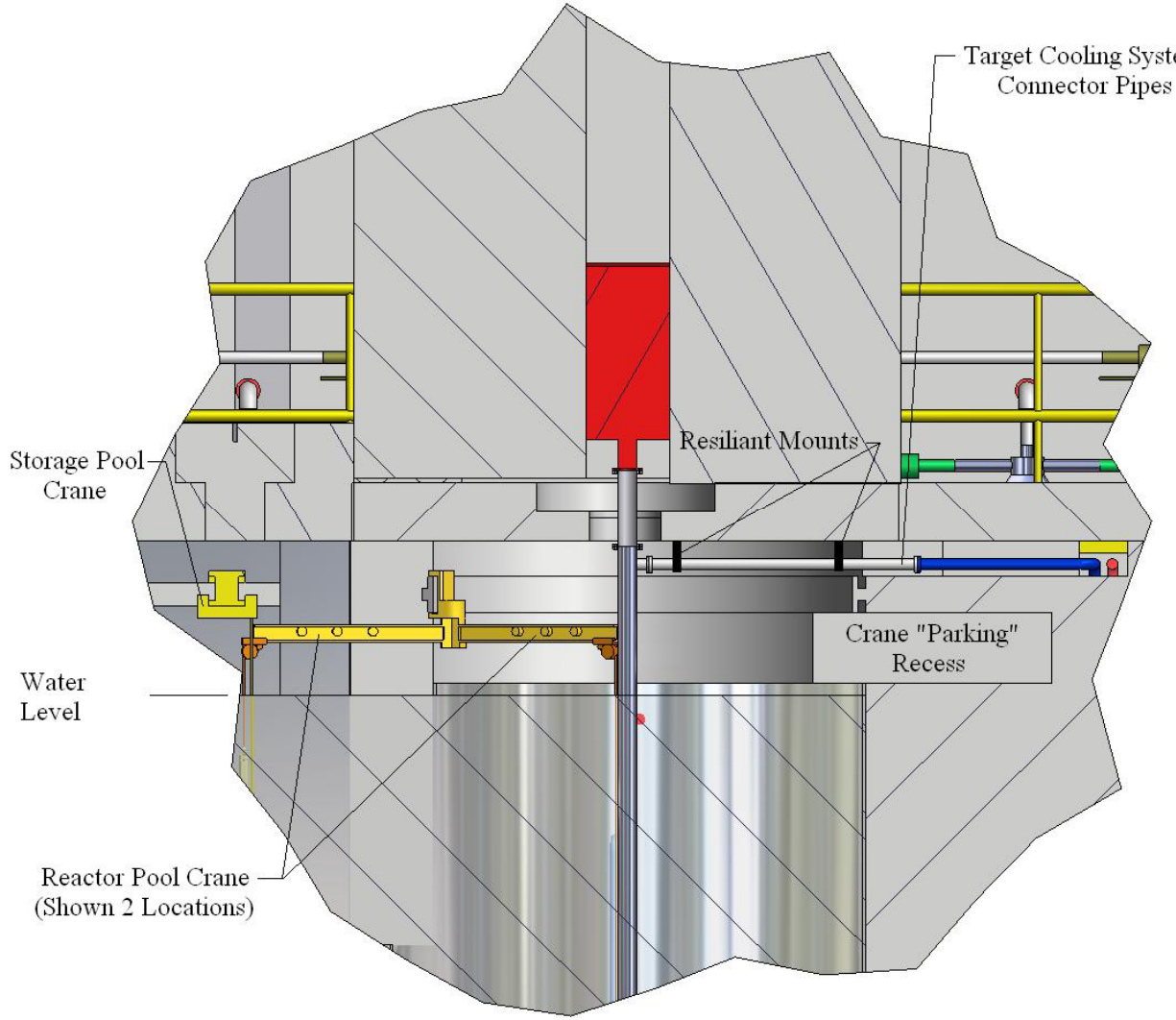
Section B-B through the Sub-Critical Assembly



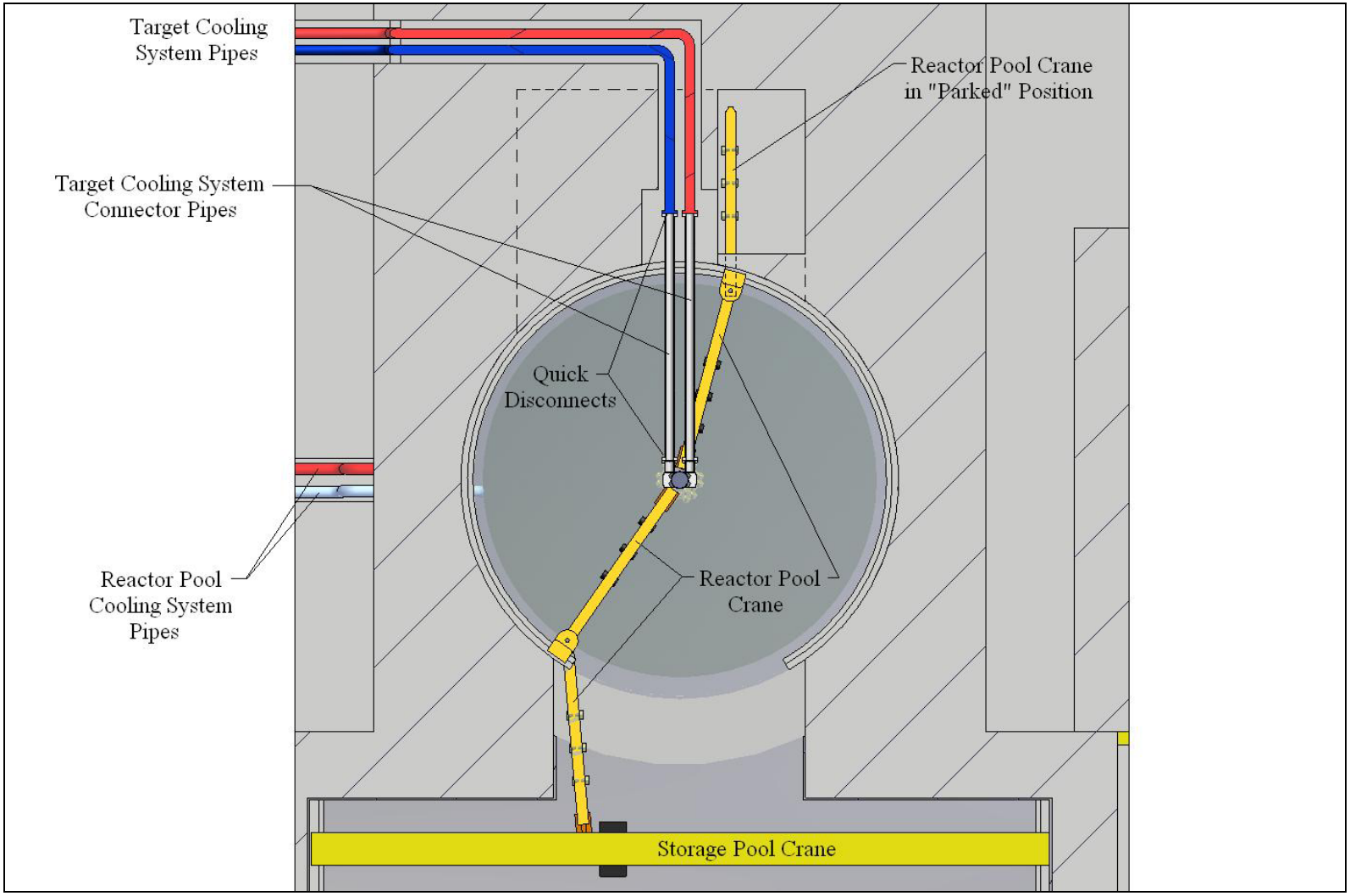
Detail C Featuring the Beam Tube Connections



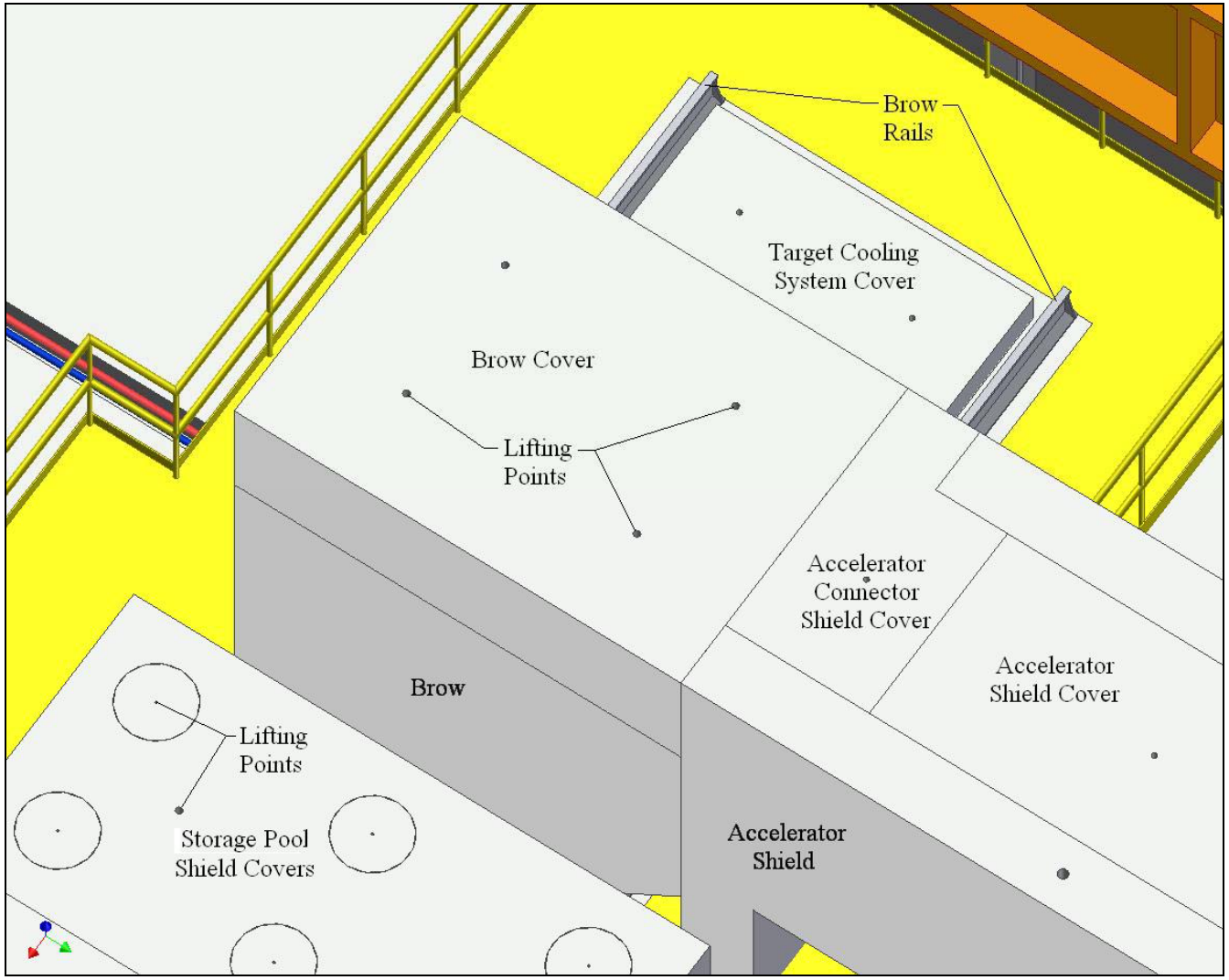
Detail D Featuring the Beam Tube Connections



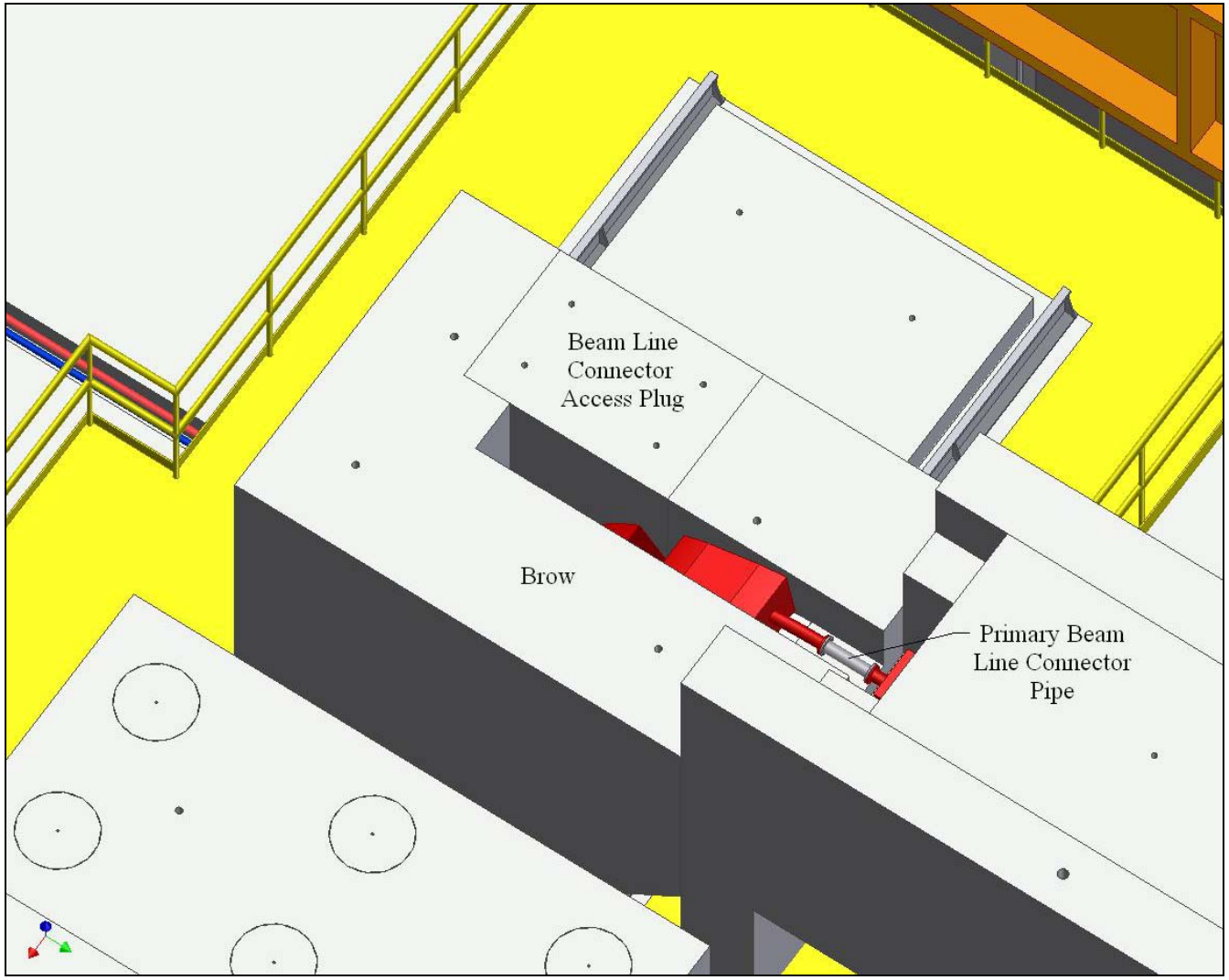
Section E-E Showing the Sub-Critical Pool



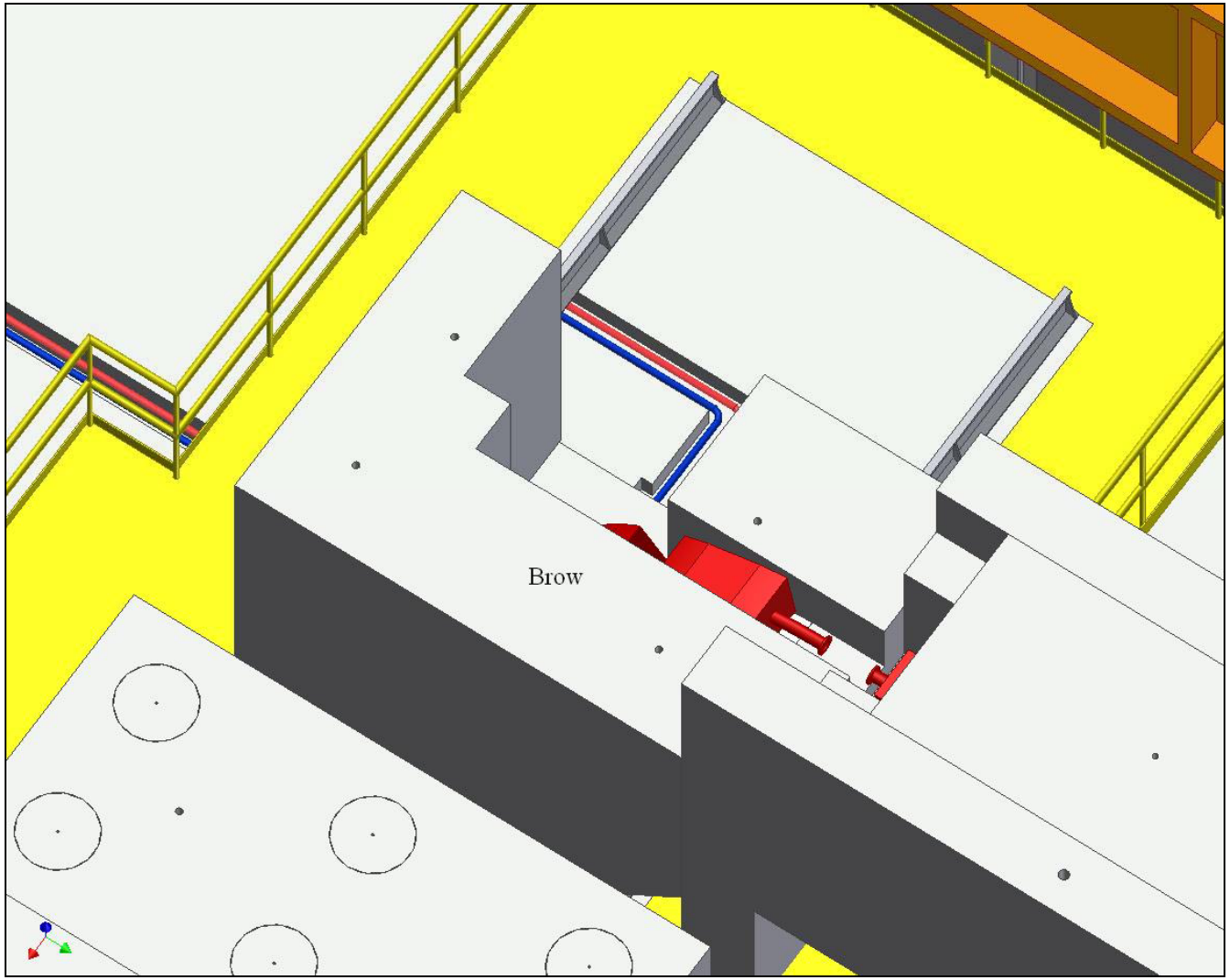
Target Change-out Procedure - I



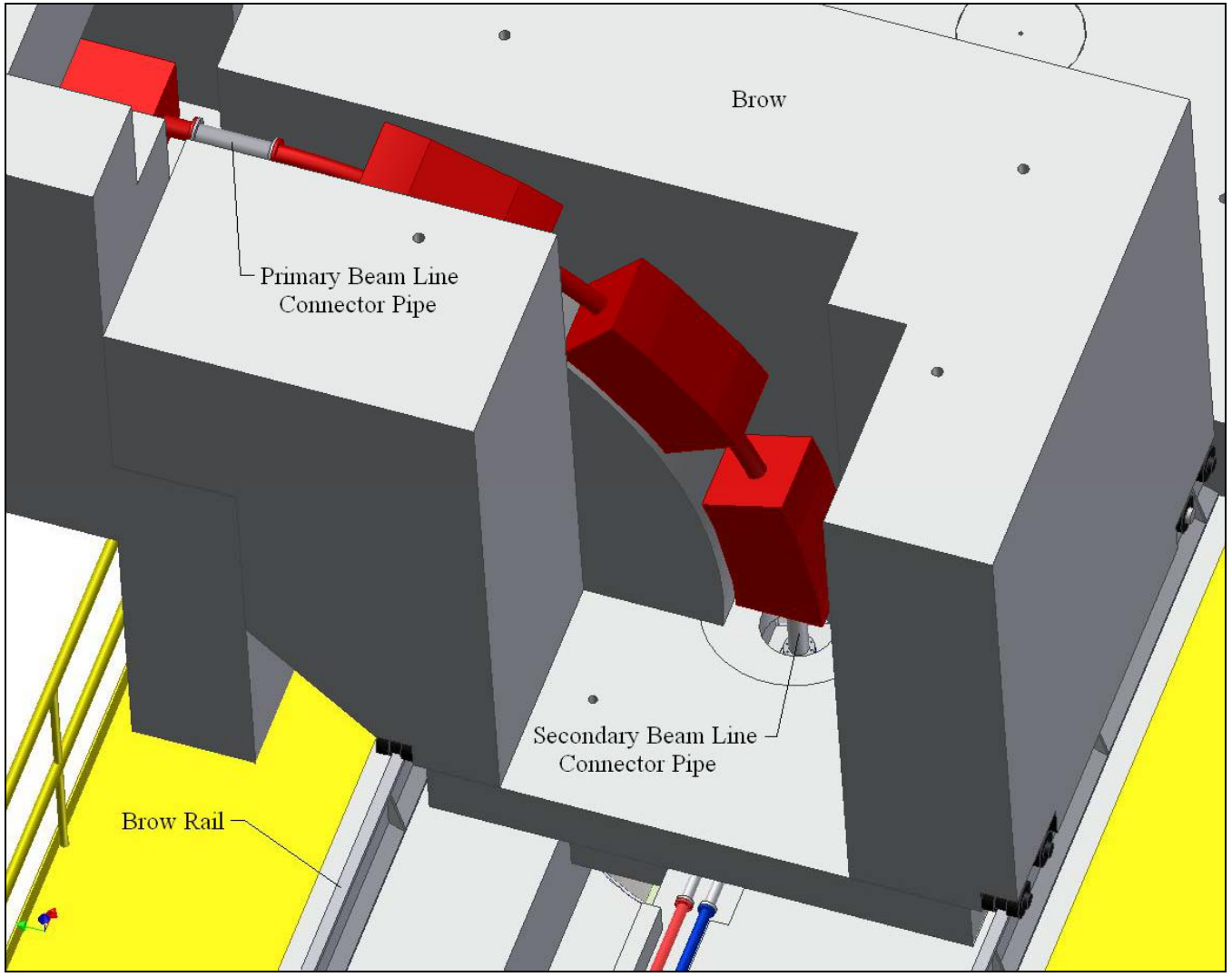
Target Change-out Procedure - II



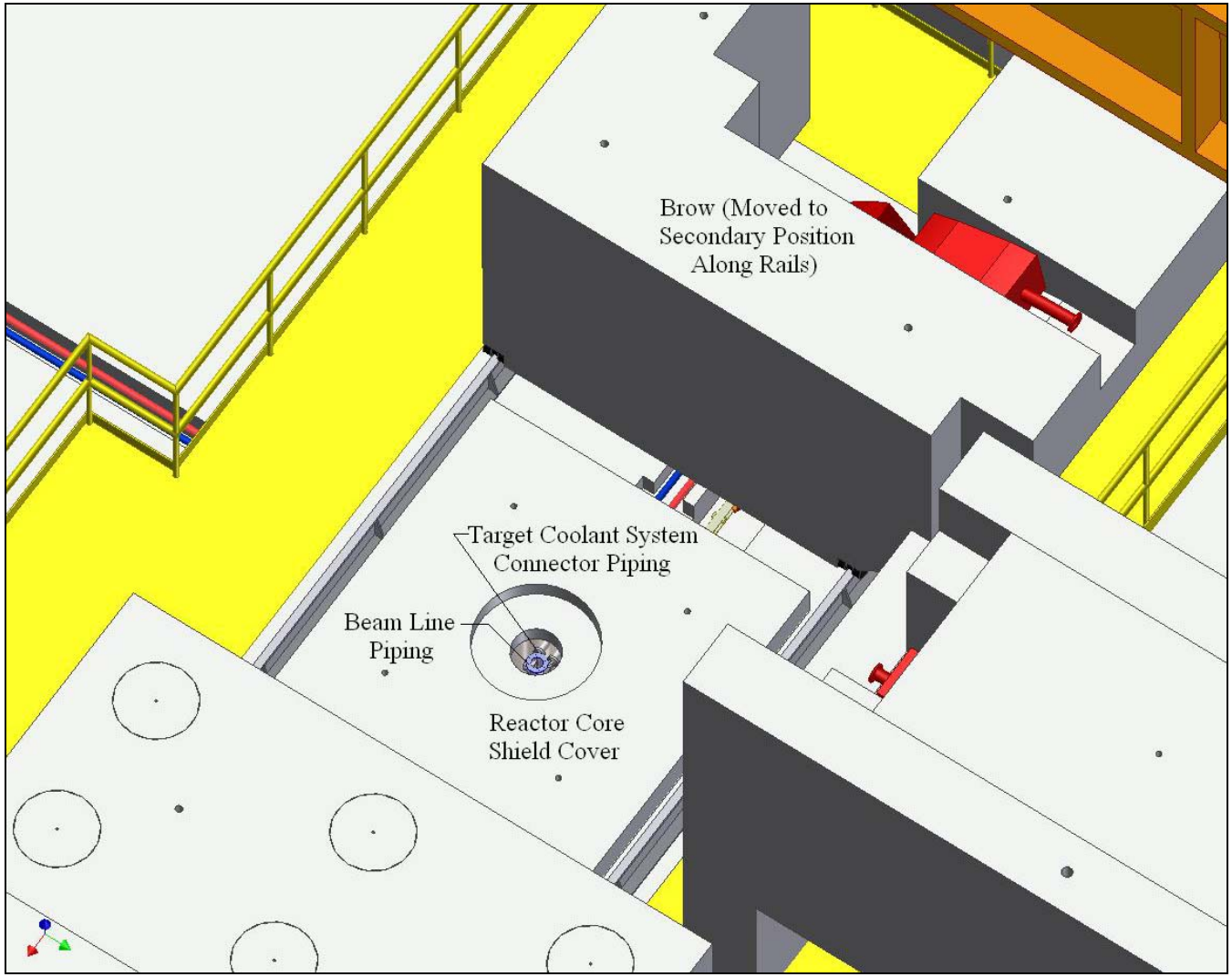
Target Change-out Procedure - III



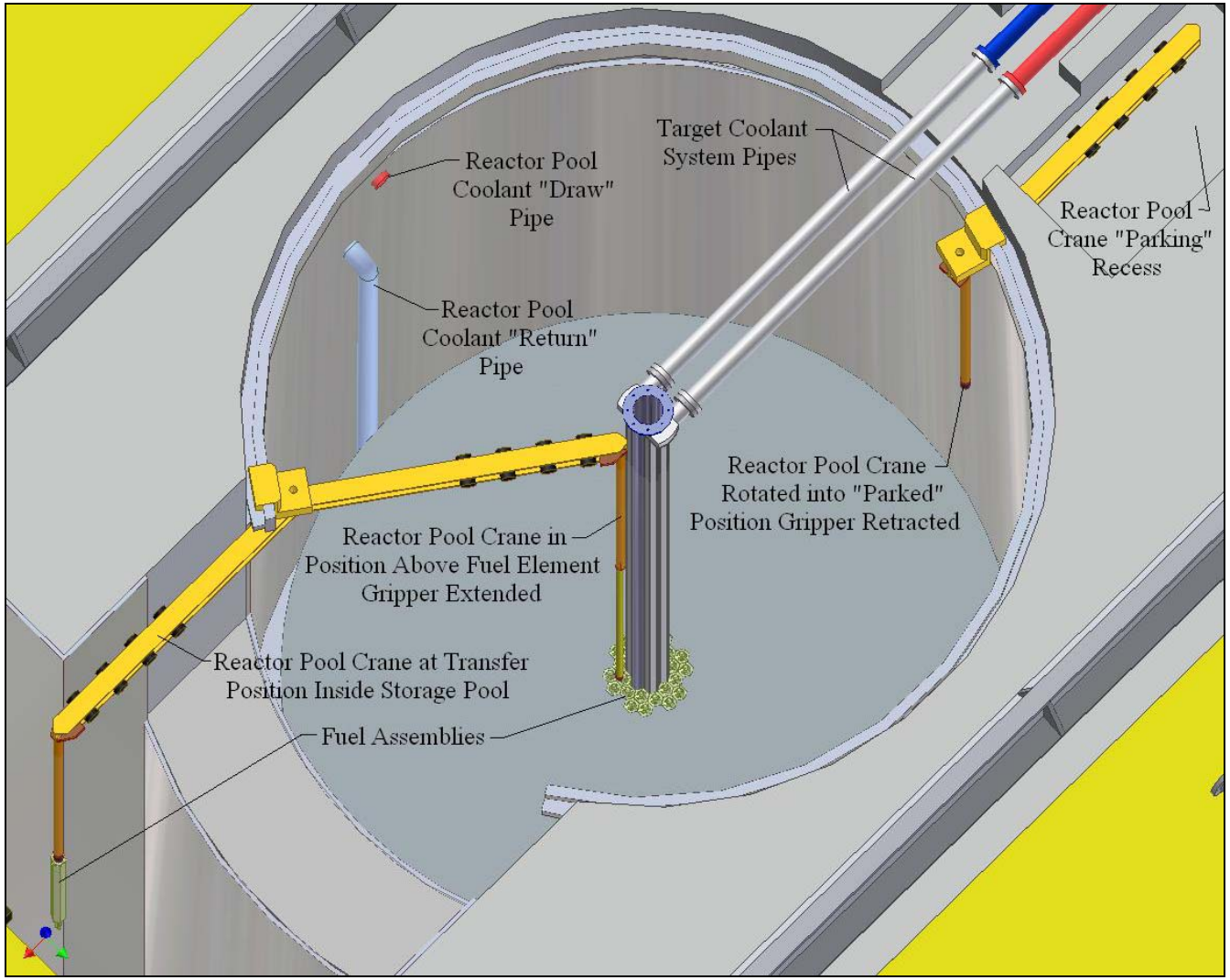
Target Change-out Procedure - IV



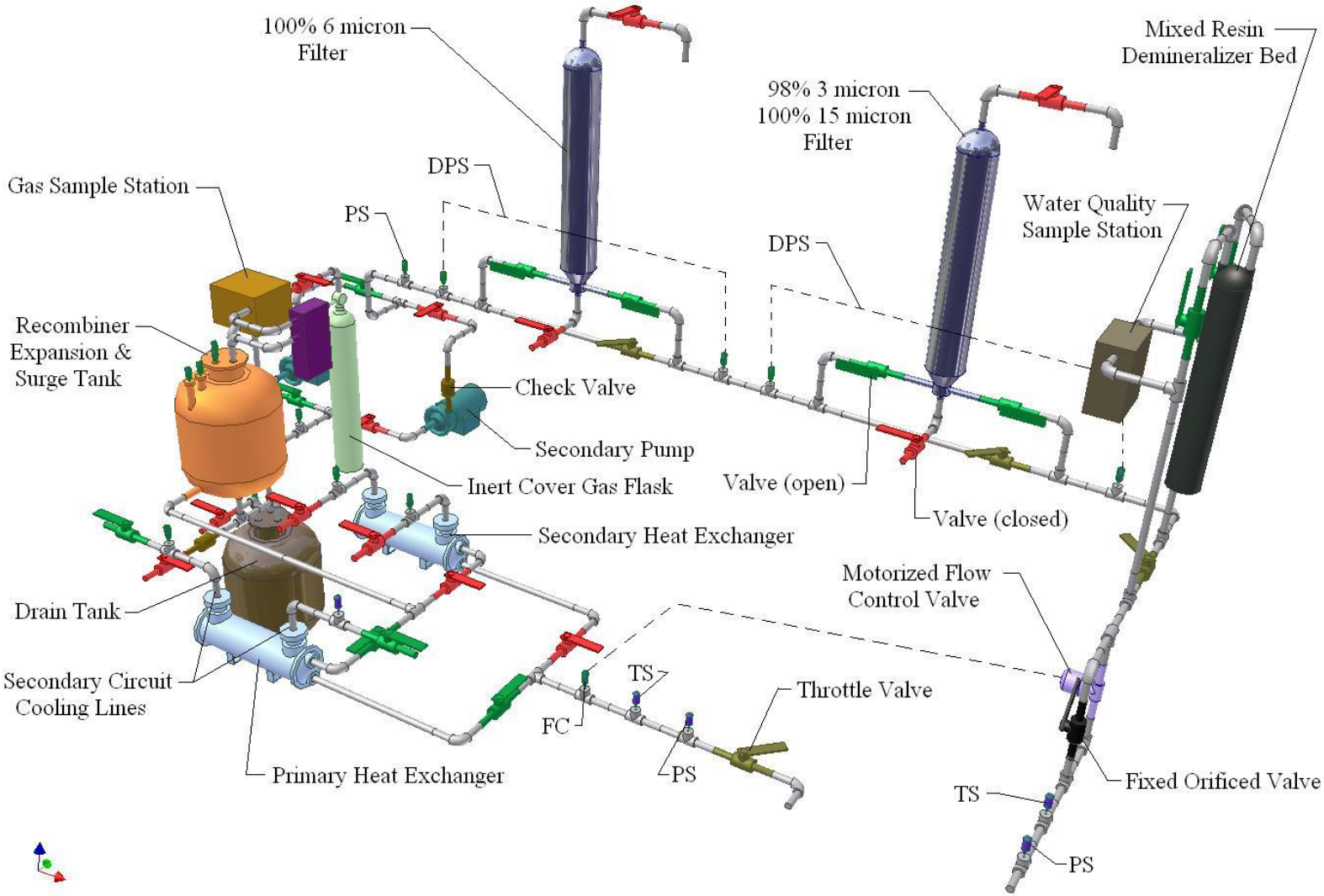
Target Change-out Procedure - V



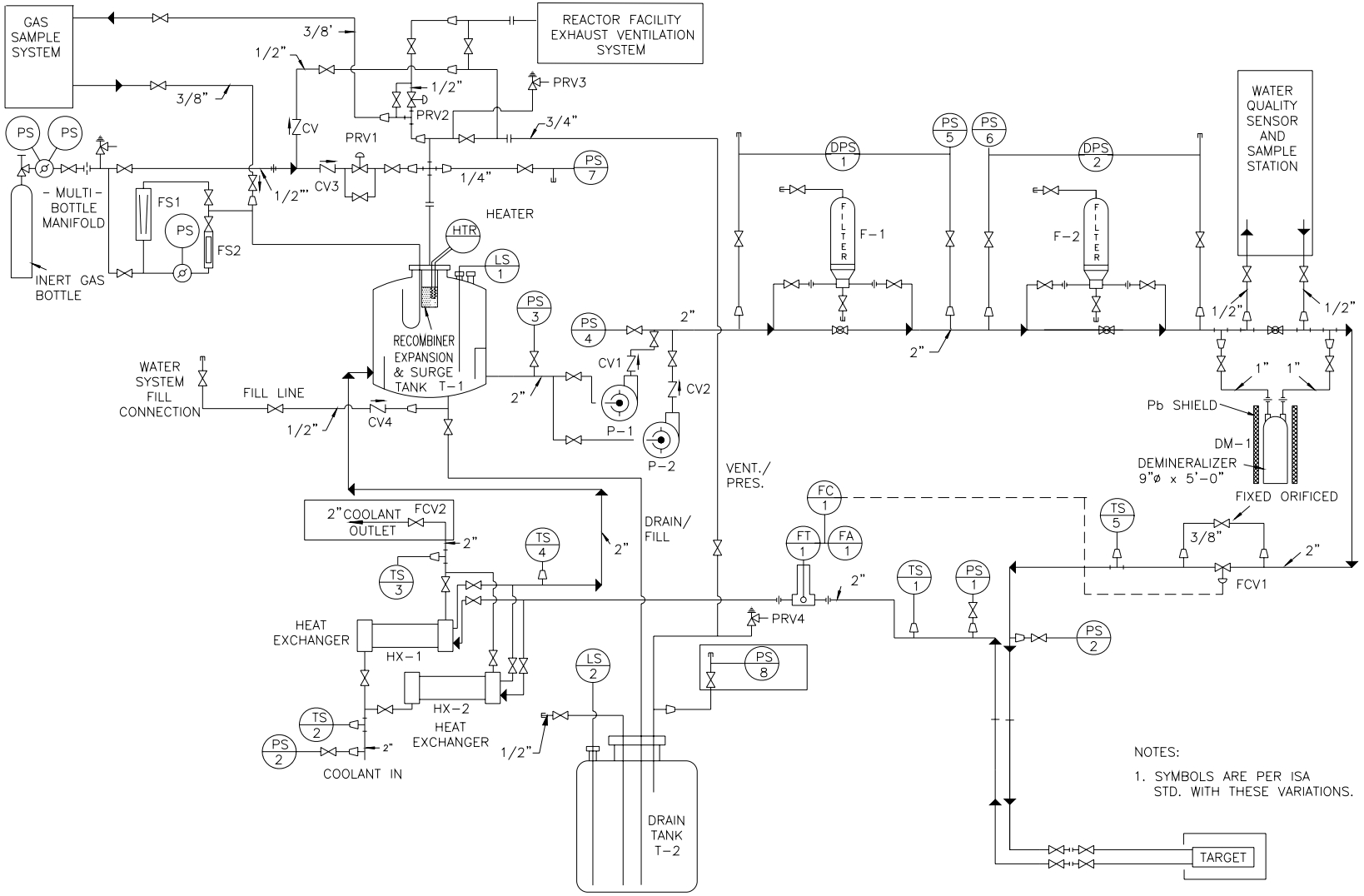
Fuel Replacement Procedure



Target Cooling System – Physical Layout



Target Cooling System – Flow Diagram



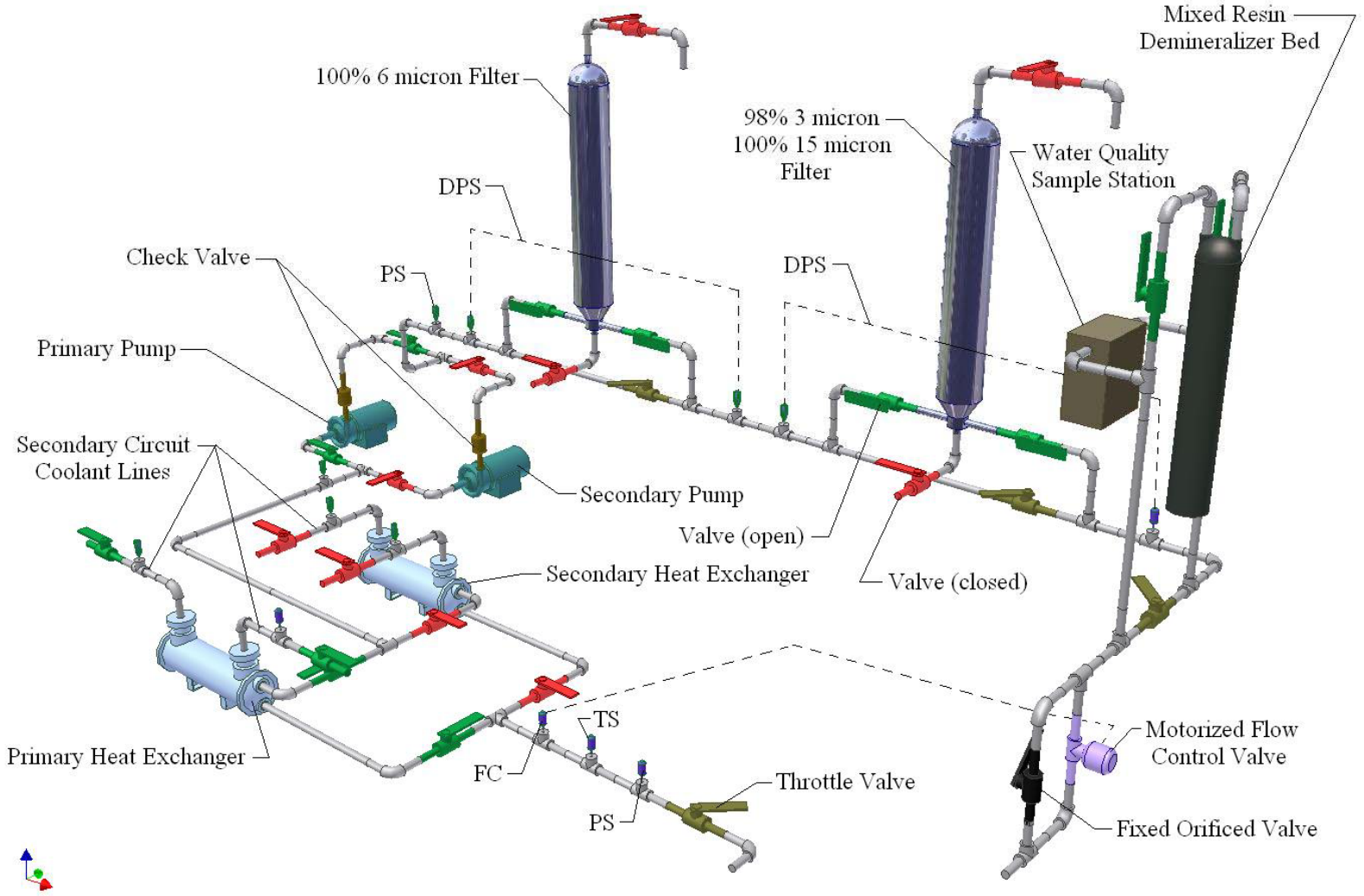
Component Description

Component	Description	Material
Recombiner (T2)	Capacity 500 liters	304 Stainless
Drain Tank (T1)	Capacity 500 liters	304 Stainless
Main Pumps (P1 & P2)	500 liters per minute @ 22 m Head 5 HP motor	Stainless Steel
Filter (F1)	Filter Area 1.5 m^2 ΔP = 11kPa @ 70 lpm	Replaceable 100%-6µm Paper Cartridge
Filter (F2)	Filter Area 1.5 m^2 ΔP = 14kPa @ 190 lpm	Replaceable 98%-3µm 100%-15µm Sintered Stainless Steel Cartridge
Demineralizer (Dm-1)	40 liters per minute	Replaceable Mixed Resin Bed
Heat Exchanger (HX-1 & HX-2)	100 kW Process Water 49°C Cooling Water 32°C Area 10 m^2	304 Stainless Steel

Component Symbols

Recombiner	(T2)
Drain Tank	(T1)
Main Pumps	(P1 & P2)
Filter	(F1)
Filter	(F2)
Demineralizer	(Dm-1)
Heat Exchanger	(HX-1 & HX-2)
Pressure Sensor	(PS)
Differential Pressure Sensor	(DPS)
Temperature Sensor	(TS)
Flow Transducer	(FT)
Flow Actuator	(FA)
Flow Control Valve	(FC/FCV)
Level Sensor	(LS)
Check Valve	(CV)
Pressure Relief Valve	(PRV)

Sub-Critical Assembly Cooling System – Physical Layout



Sub-Critical Assembly Cooling System – Flow Diagram