Containment & Containment Systems

Section 5.3-5.6

HRTD
Human Resources
Training & Development

Section 5.3 Objectives

1. State the purpose of the containment.

2. Briefly describe the function of the following:

   a. Containment liner
   b. Primary shield wall
   c. Secondary shield wall
   d. Refueling canal
   e. Containment sumps
   f. Containment recirculation sump
   g. Containment hydrogen analyzer

Section 5.3 Objectives

3. Briefly describe the methods of monitoring the containment environmental conditions.

Purposes Obj 1

- Provide a barrier to prevent the escape of radioactivity during normal and accident conditions,
- Provide protection against internally and/or externally generated missiles,
- Provide biological shielding during normal and accident conditions,
- Provide Seismic Category I supports for the reactor coolant and its associated systems.

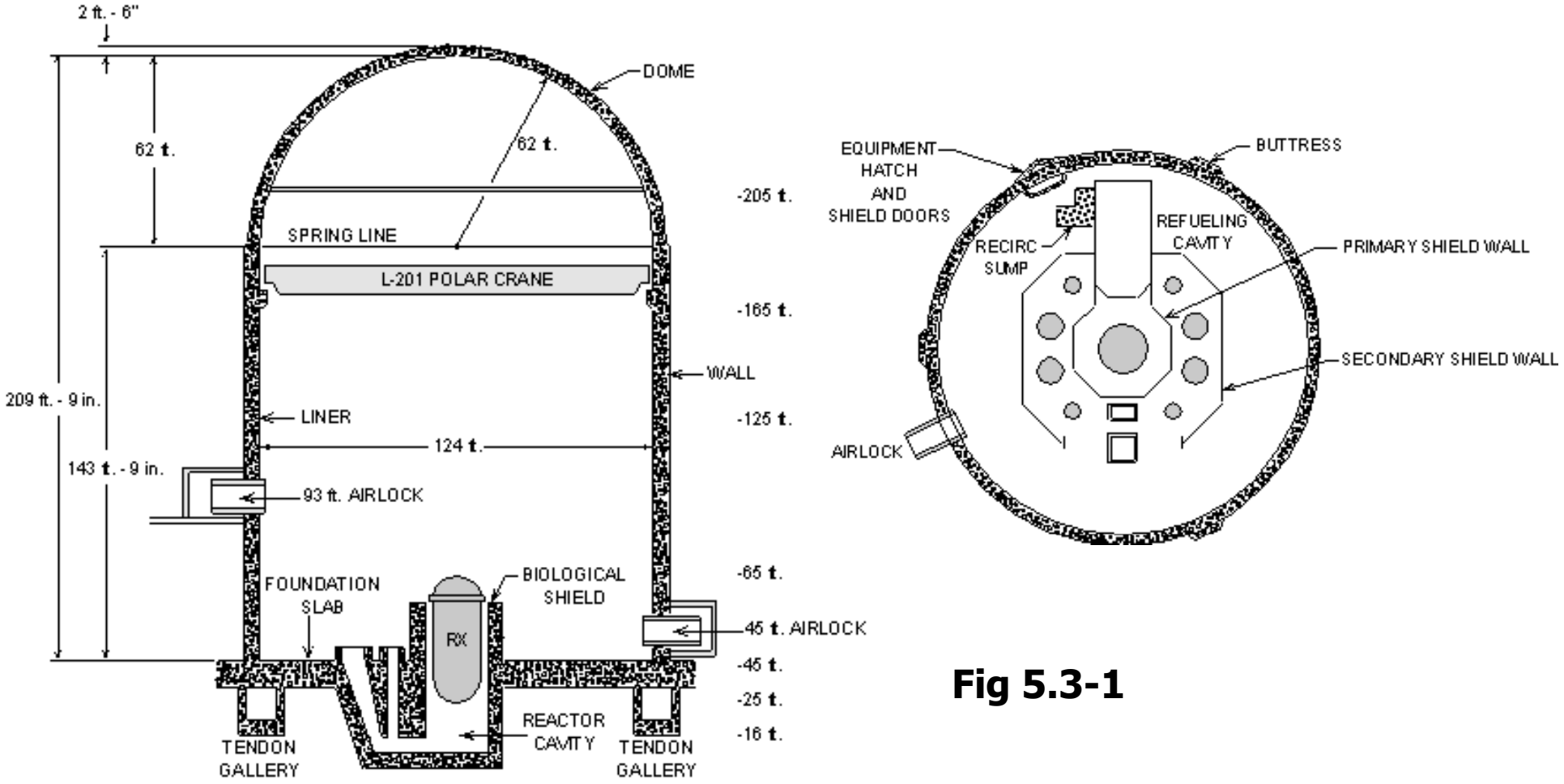
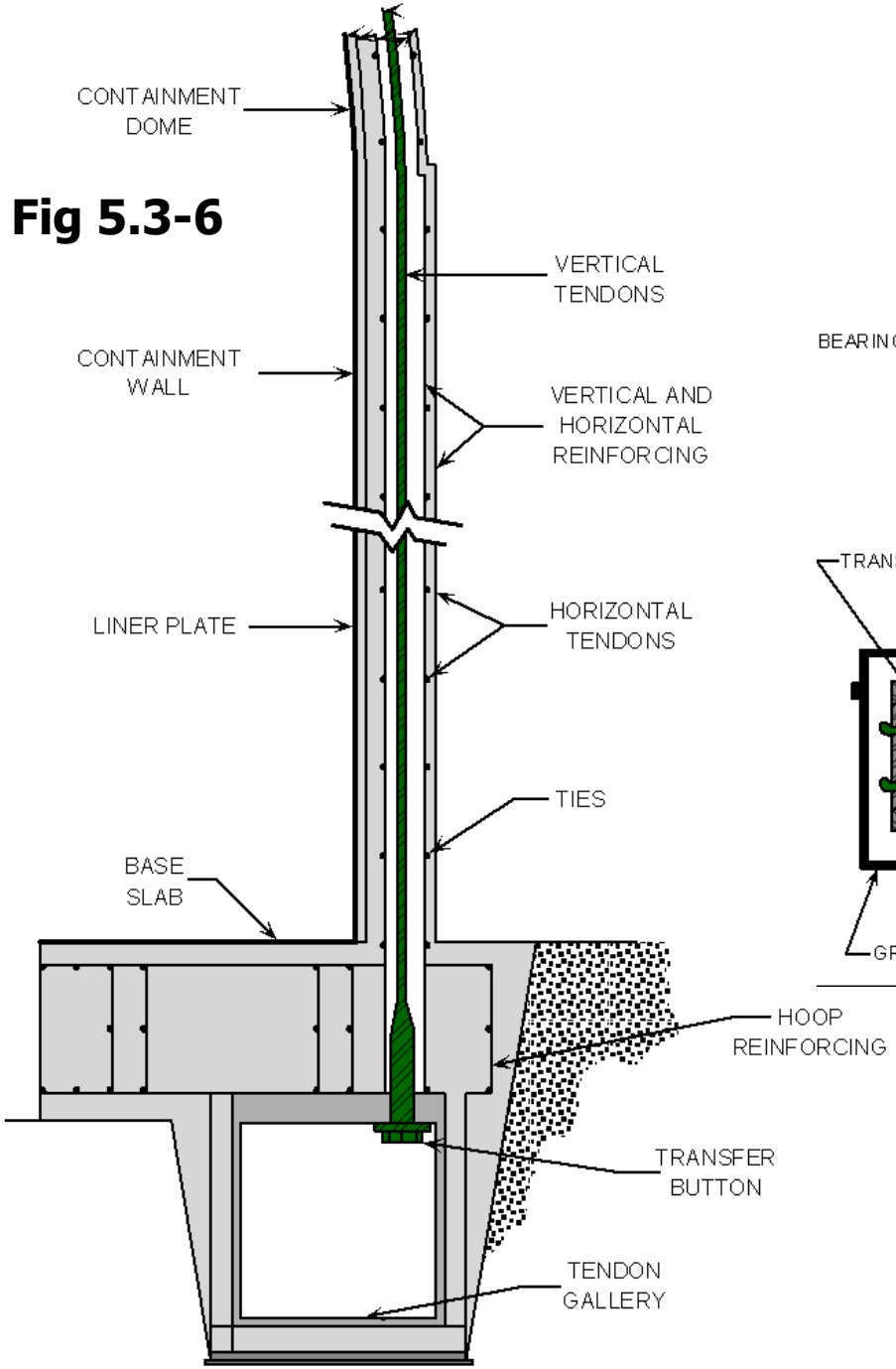
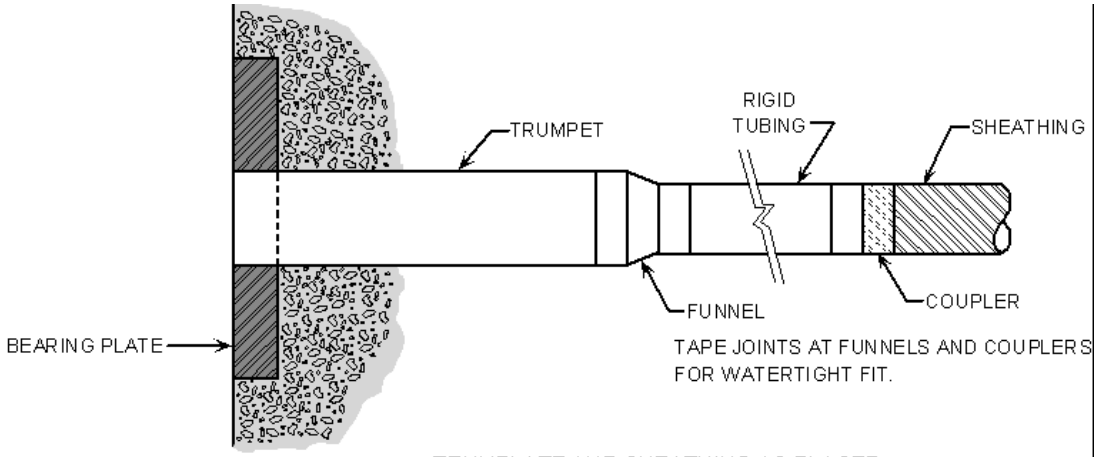

2 ft. - 6"
DOME
62 ft.
62 ft.
SPRING LINE
L-201 POLAR CRANE
-205 ft.
-165 ft.
WALL
209 ft. - 9 in.
LINER
-125 ft.
124 ft.
143 ft. - 9 in.
93 ft. AIRLOCK
FOUNDATION SLAB
BIOLOGICAL SHIELD
RX
-65 ft.
45 ft. AIRLOCK
-45 ft.
-25 ft.
-16 ft.
REACTOR CAVITY
TENDON GALLERY
TENDON GALLERY
EQUIPMENT HATCH AND SHIELD DOORS
BUTTRESS
RECIRC SUMP
REFUELING CAVITY
PRIMARY SHIELD WALL
SECONDARY SHIELD WALL
AIRLOCK

Fig 5.3-1

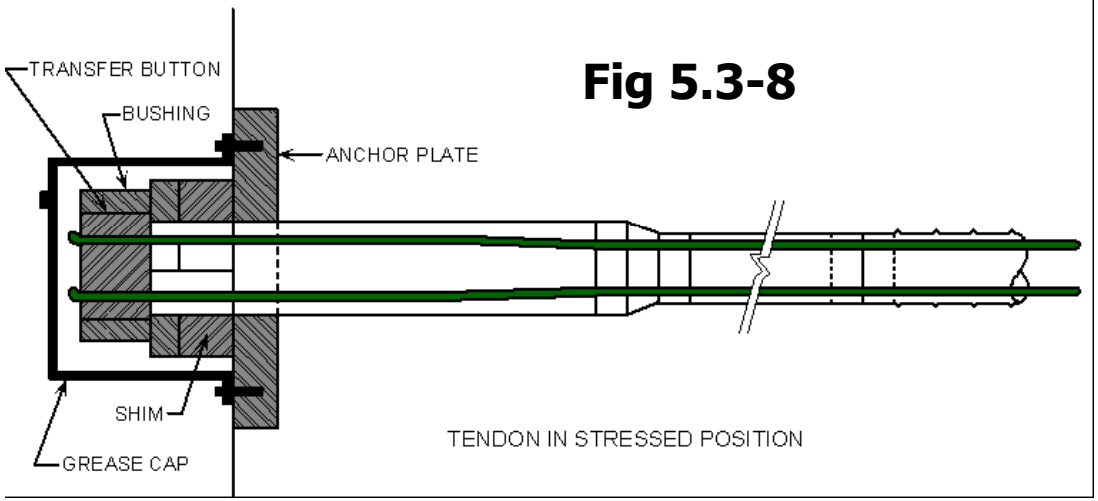
Fig 5.3-6





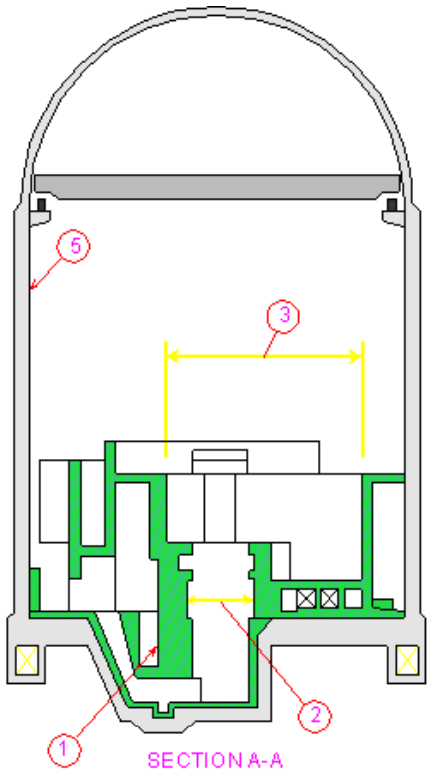
TRUMPLATE AND SHEATHING AS PLACED

Fig 5.3-8

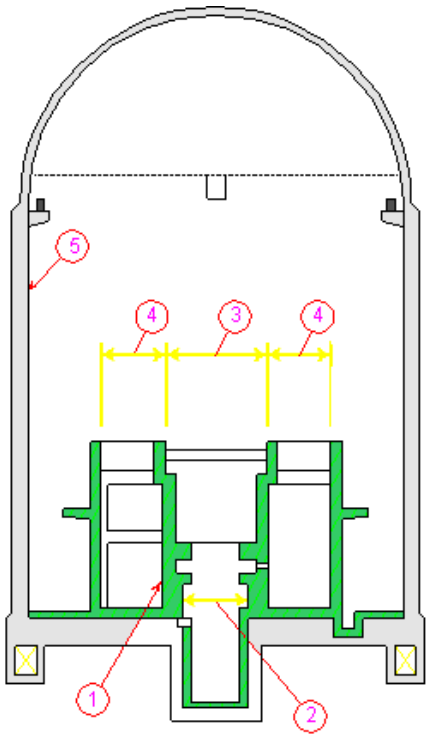


TENDON IN STRESSED POSITION

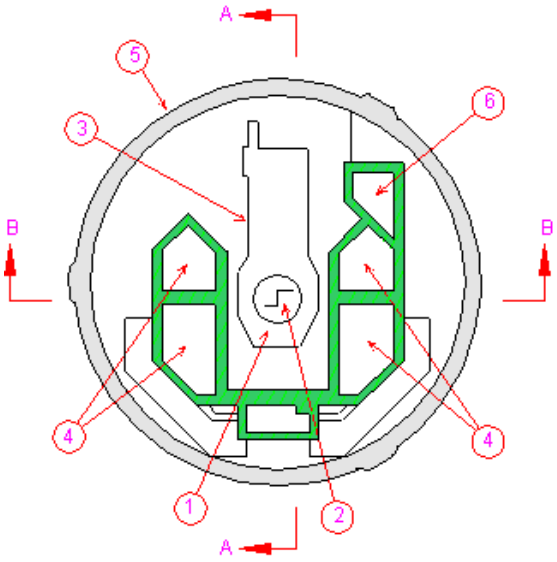
Fig 5.3-3



SECTION A-A



SECTION B-B



PLAN

1. BIOLOGICAL SHIELD
2. REACTOR CAVITY
3. REFUELING CANAL
4. STEAM GENERATOR
5. REACTOR CONTAINMENT
6. PRESSURIZER

INTERNALS CONSTRUCTED OF REINFORCED CONCRETE WALLS, SLABS, AND STRUCTURAL STEEL.

Containment and Recirc Sump Relationship

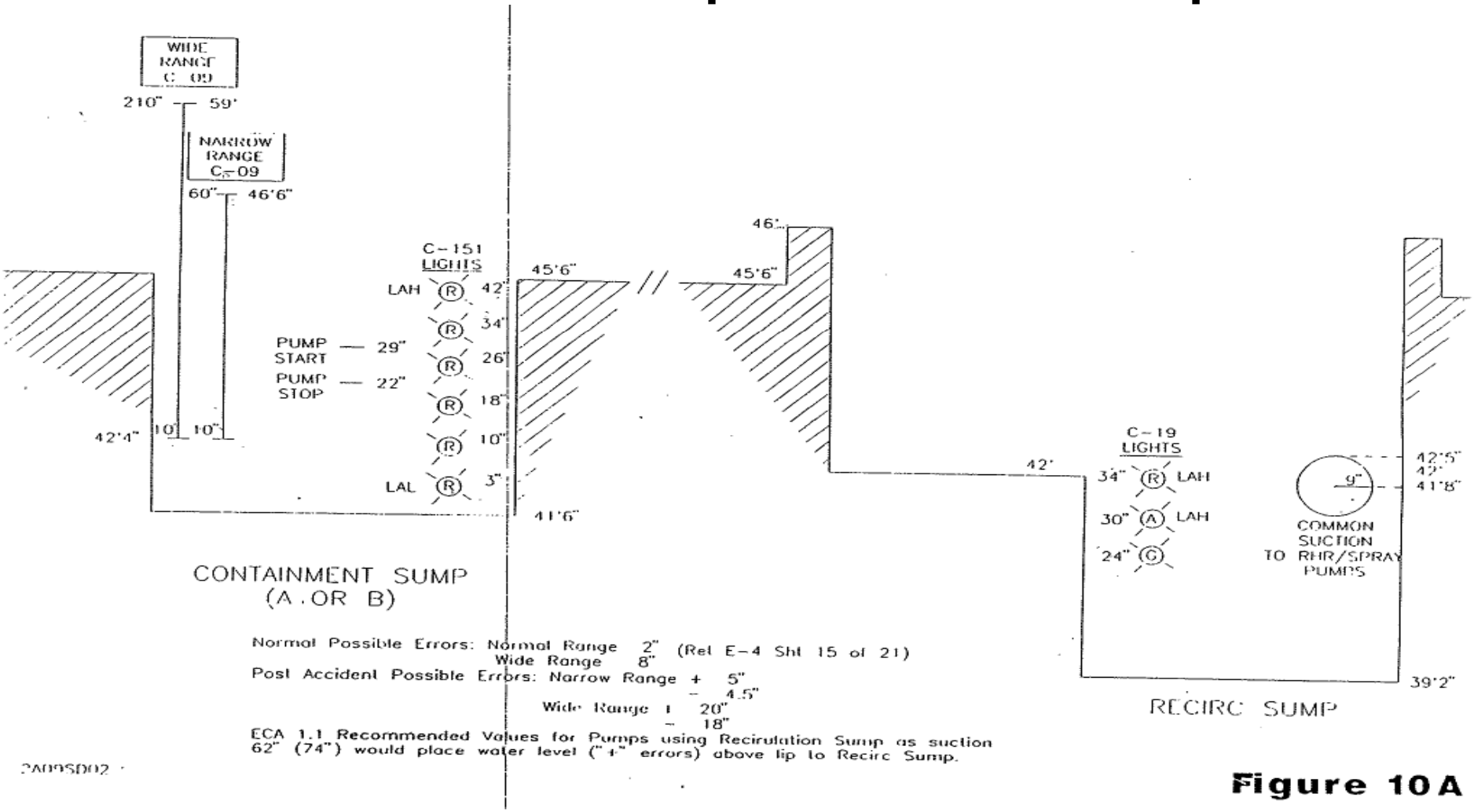


Figure 10A

Containment Environment Monitoring

- Pressure
- Temperature
- Humidity
- Radiation
- Hydrogen Concentration

CONTAINMENT TEMPERATURE, PRESSURE, AND COMBUSTIBLE GAS CONTROL

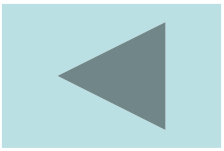
Section 5.4

Section 5.4 Objectives

1. State the purposes of the containment ventilation systems.
2. List the signals that automatically initiate isolation of the purge supply and exhaust systems.
3. State the purposes of the containment spray system.
4. List the signals that automatically initiate the containment spray system.
5. State the purposes of the containment combustible gas control systems.

Purposes Obj 1

1. **To control containment temperature and pressure during normal operations.**
2. **To protect the containment barrier and to minimize the leakage of radioactivity to the environment following an accident by reducing the containment temperature and pressure.**
3. **To remove hydrogen from the containment atmosphere to prevent explosive mixtures.**
4. **To remove radioactive iodine from the containment atmosphere after a LOCA.**



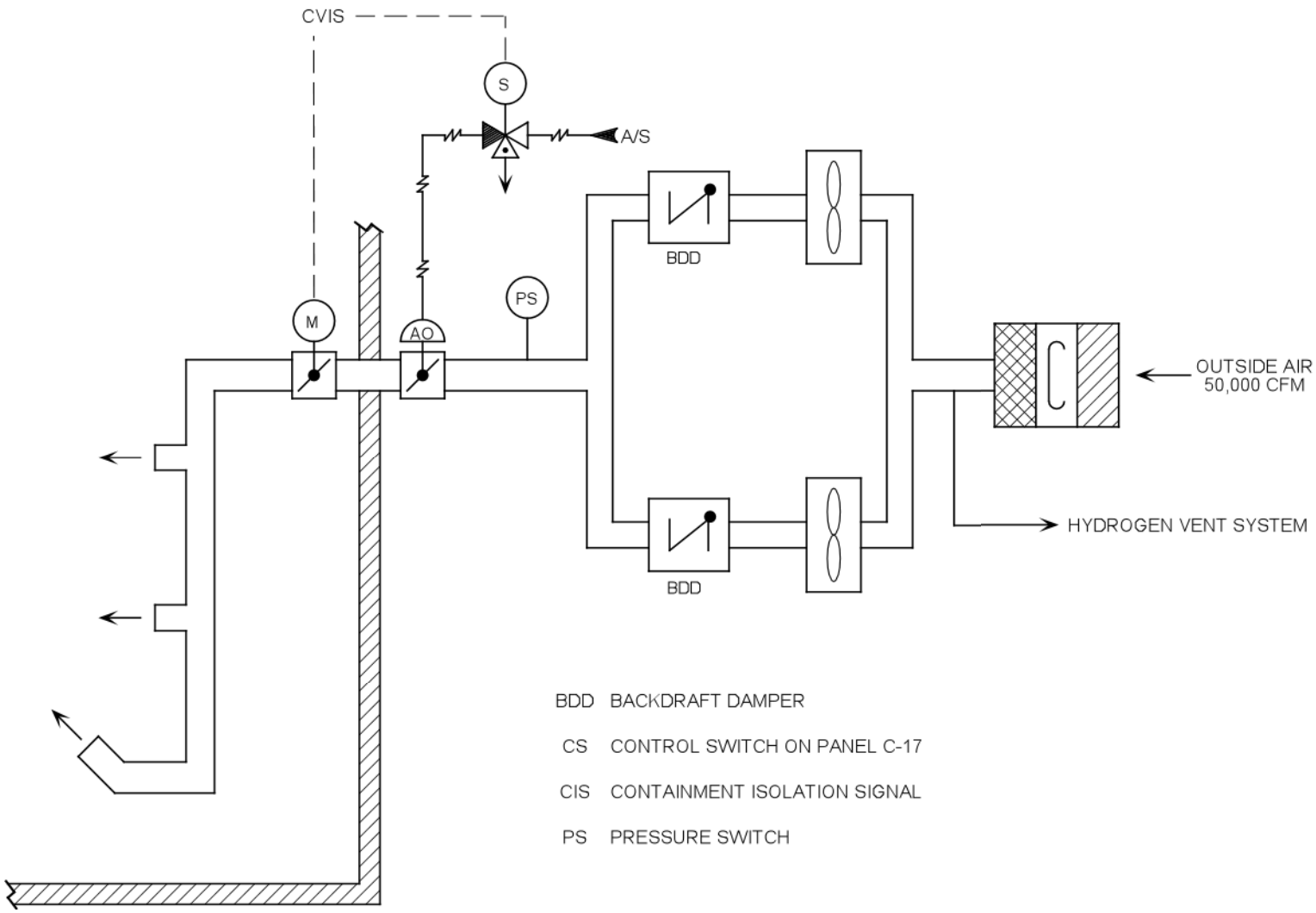


Figure 5.4-1 Purge Supply System

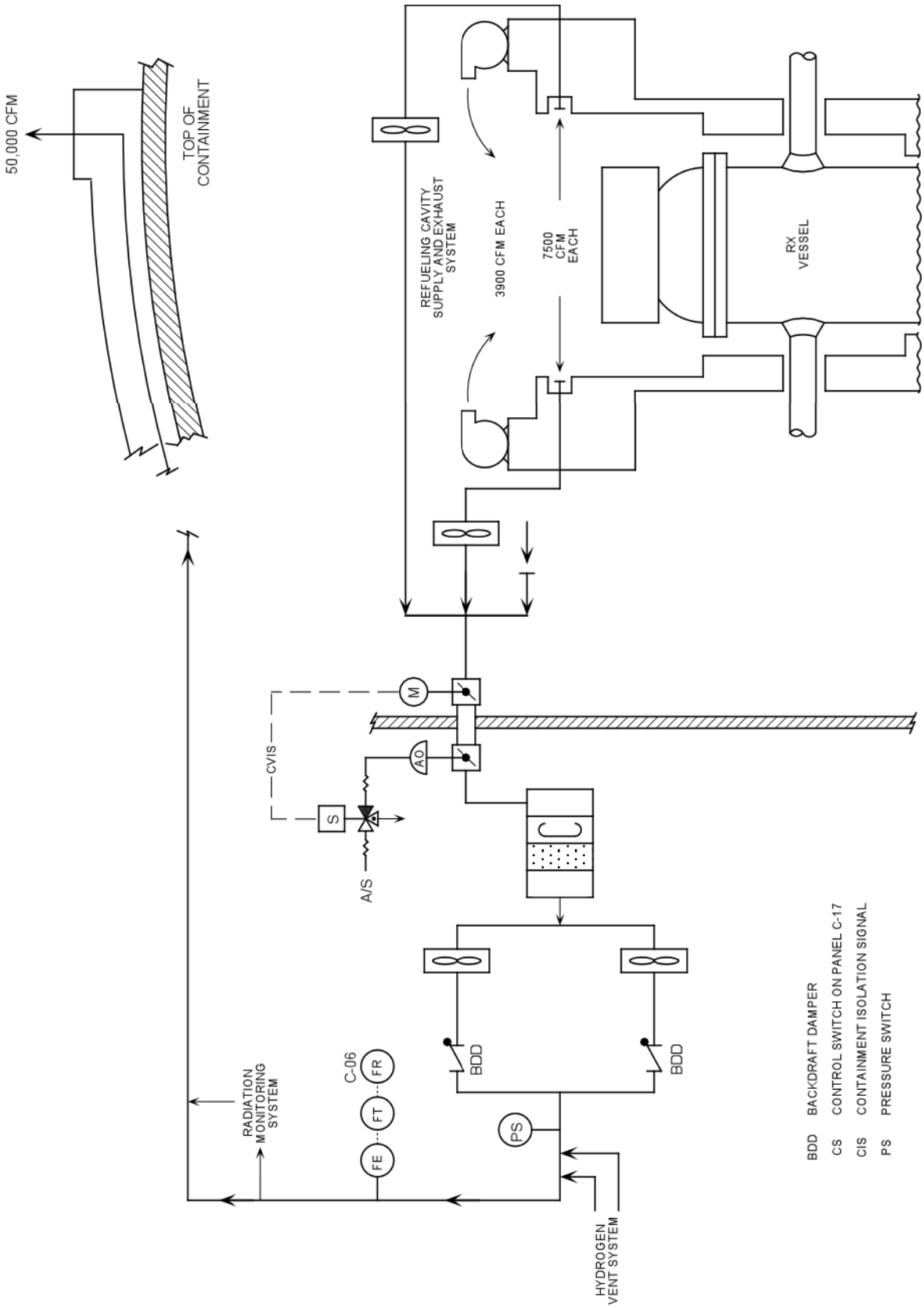


Figure 5.4-2 Purge Exhaust and Refueling Cavity Supply and Exhaust System

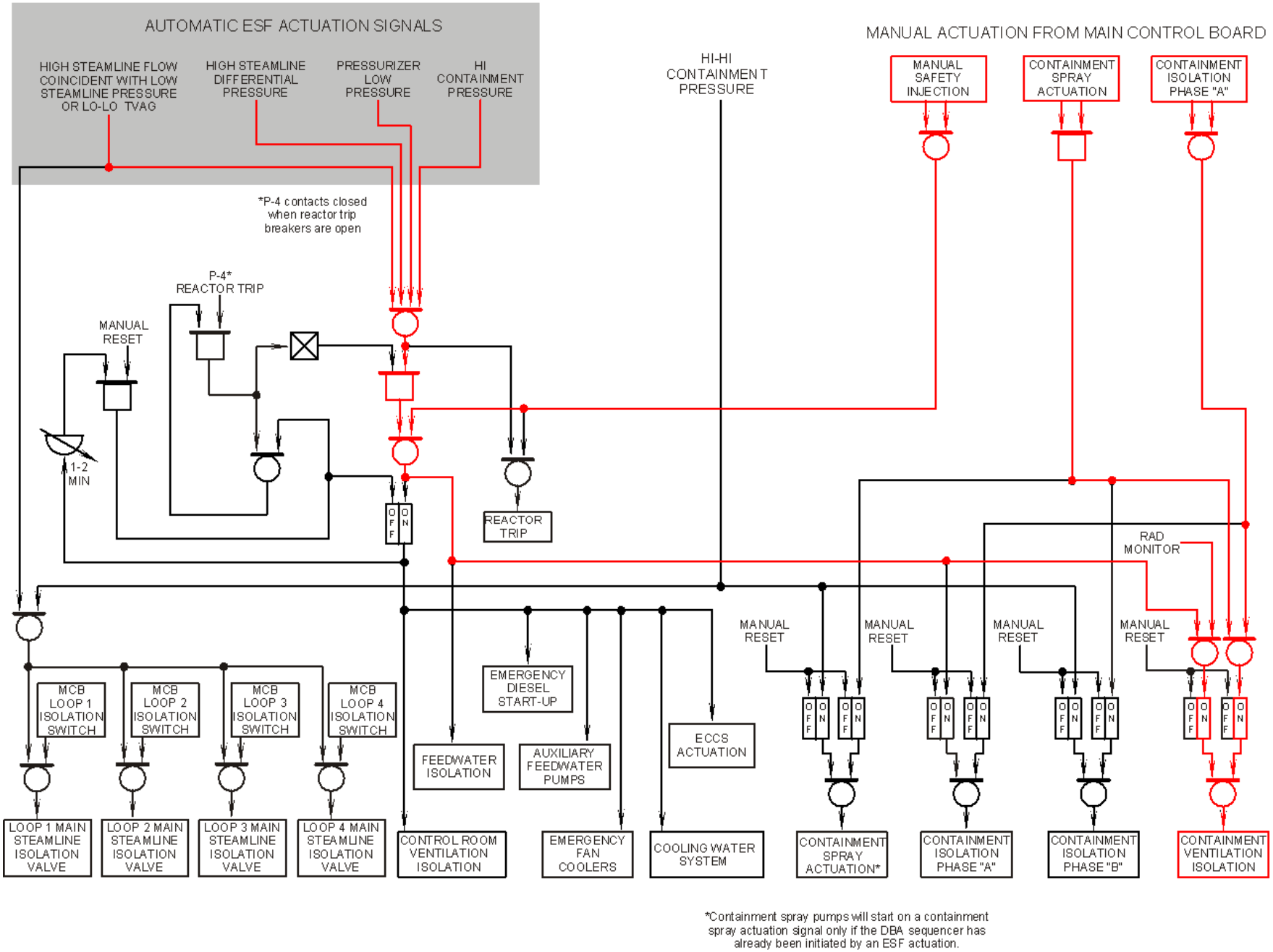

AUTOMATIC ESF ACTUATION SIGNALS
HIGH STEAMLINE FLOW COINCIDENT WITH LOW STEAMLINE PRESSURE OR LO-LO TVAG
HIGH STEAMLINE DIFFERENTIAL PRESSURE
PRESSURIZER LOW PRESSURE
HI CONTAINMENT PRESSURE
HI-HI CONTAINMENT PRESSURE
MANUAL ACTUATION FROM MAIN CONTROL BOARD
MANUAL SAFETY INJECTION
CONTAINMENT SPRAY ACTUATION
CONTAINMENT ISOLATION PHASE "A"
*P-4 contacts closed when reactor trip breakers are open
P-4* REACTOR TRIP
MANUAL RESET
1-2 MIN
OFF
ON
REACTOR TRIP
RAD MONITOR
MANUAL RESET
MANUAL RESET
MANUAL RESET
MANUAL RESET
MCB LOOP 1 ISOLATION SWITCH
MCB LOOP 2 ISOLATION SWITCH
MCB LOOP 3 ISOLATION SWITCH
MCB LOOP 4 ISOLATION SWITCH
EMERGENCY DIESEL START-UP
FEEDWATER ISOLATION
AUXILIARY FEEDWATER PUMPS
ECCS ACTUATION
LOOP 1 MAIN STEAMLINE ISOLATION VALVE
LOOP 2 MAIN STEAMLINE ISOLATION VALVE
LOOP 3 MAIN STEAMLINE ISOLATION VALVE
LOOP 4 MAIN STEAMLINE ISOLATION VALVE
CONTROL ROOM VENTILATION ISOLATION
EMERGENCY FAN COOLERS
COOLING WATER SYSTEM
CONTAINMENT SPRAY ACTUATION*
CONTAINMENT ISOLATION PHASE "A"
CONTAINMENT ISOLATION PHASE "B"
CONTAINMENT VENTILATION ISOLATION
*Containment spray pumps will start on a containment spray actuation signal only if the DBA sequencer has already been initiated by an ESF actuation.

Figure 12.3-1

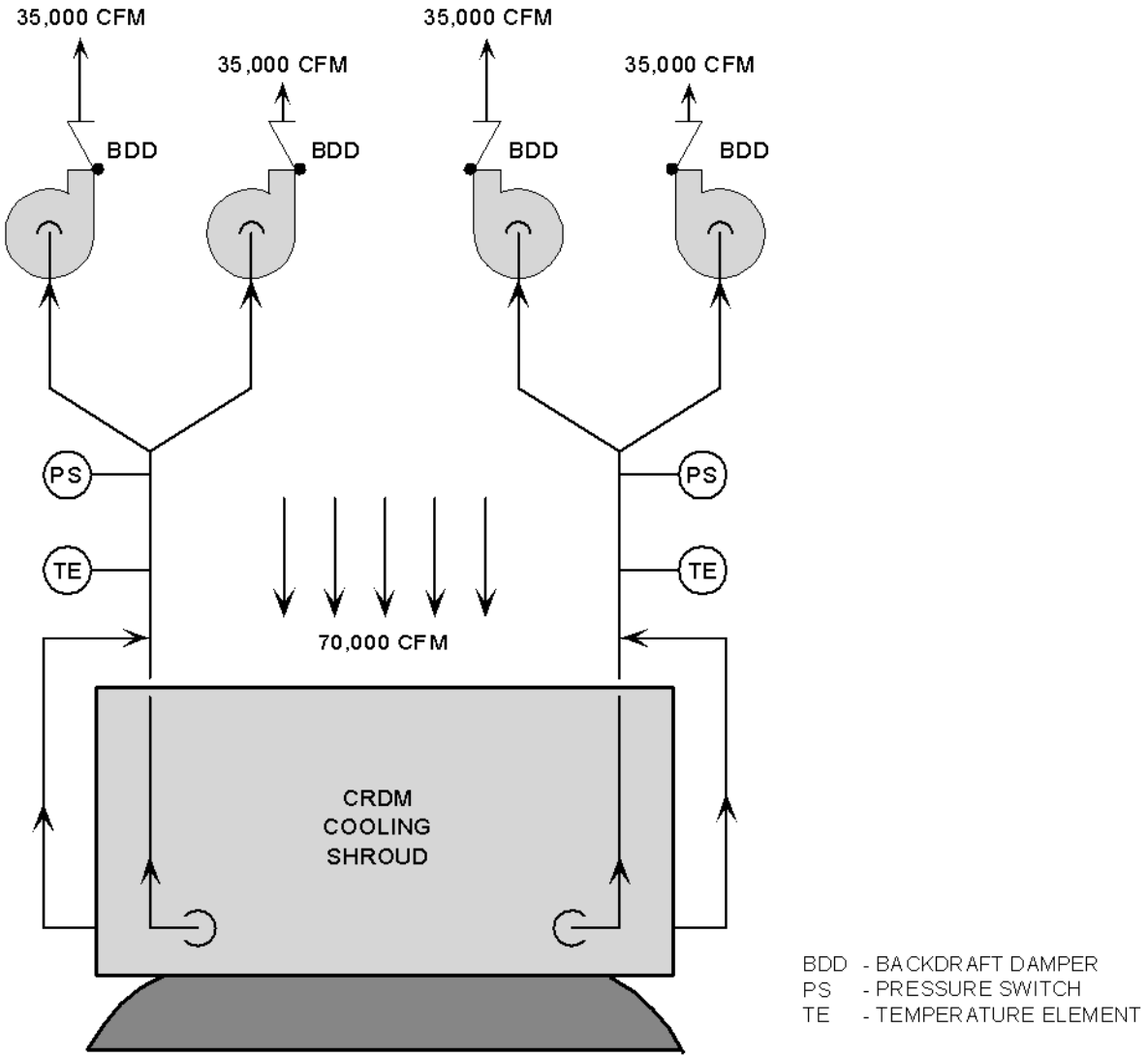


Figure 5.4-3 CRDM Cooling System

0199-3

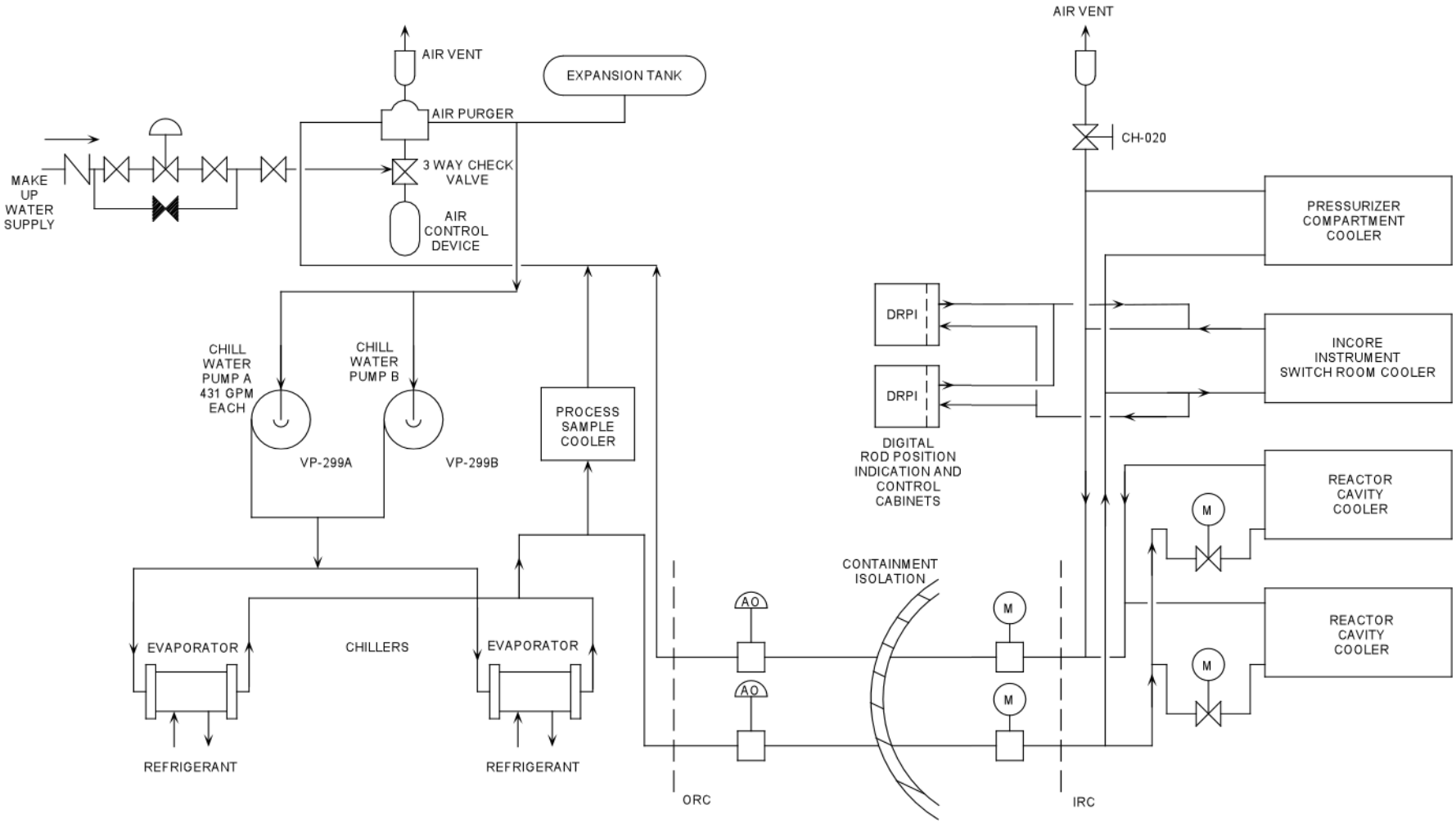


Figure 5.4-4 Chill Water System

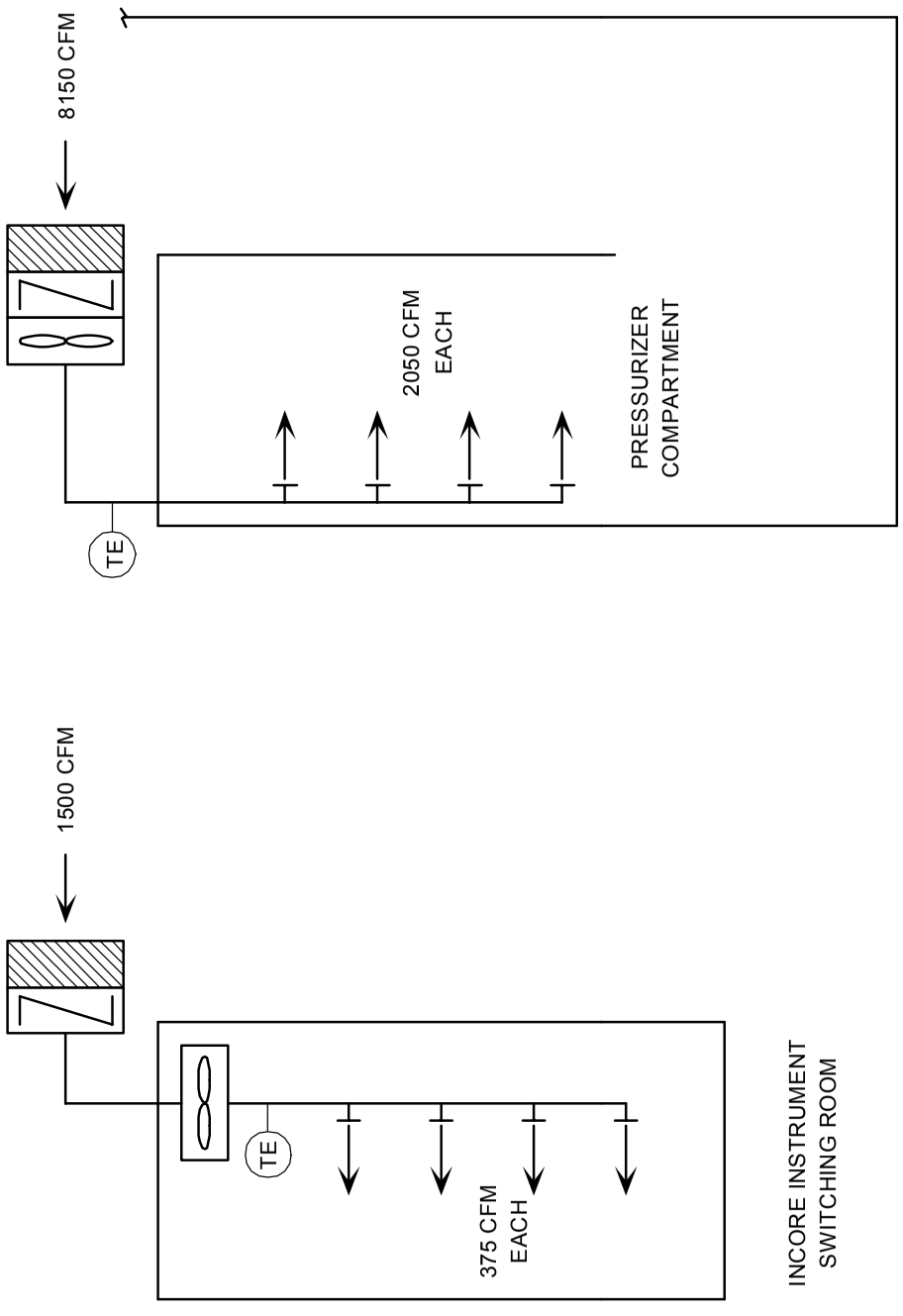


Figure 5.4-5 Pressurizer Compartment & Incore Instrument Switching Room Cooling

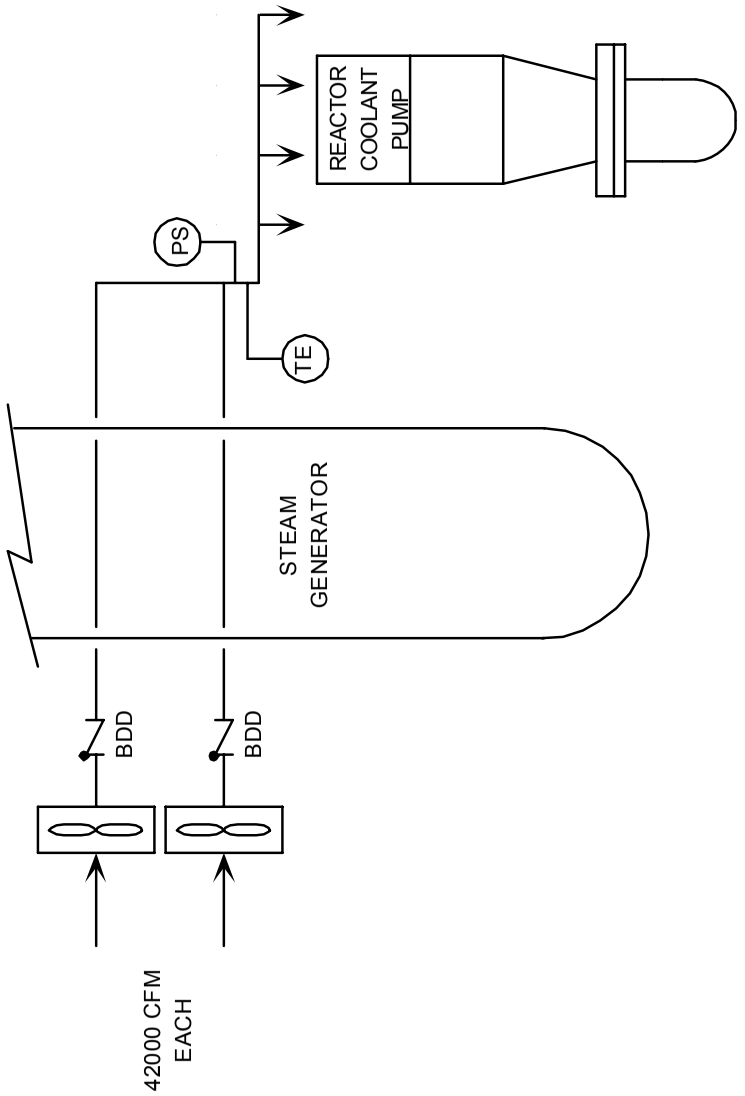
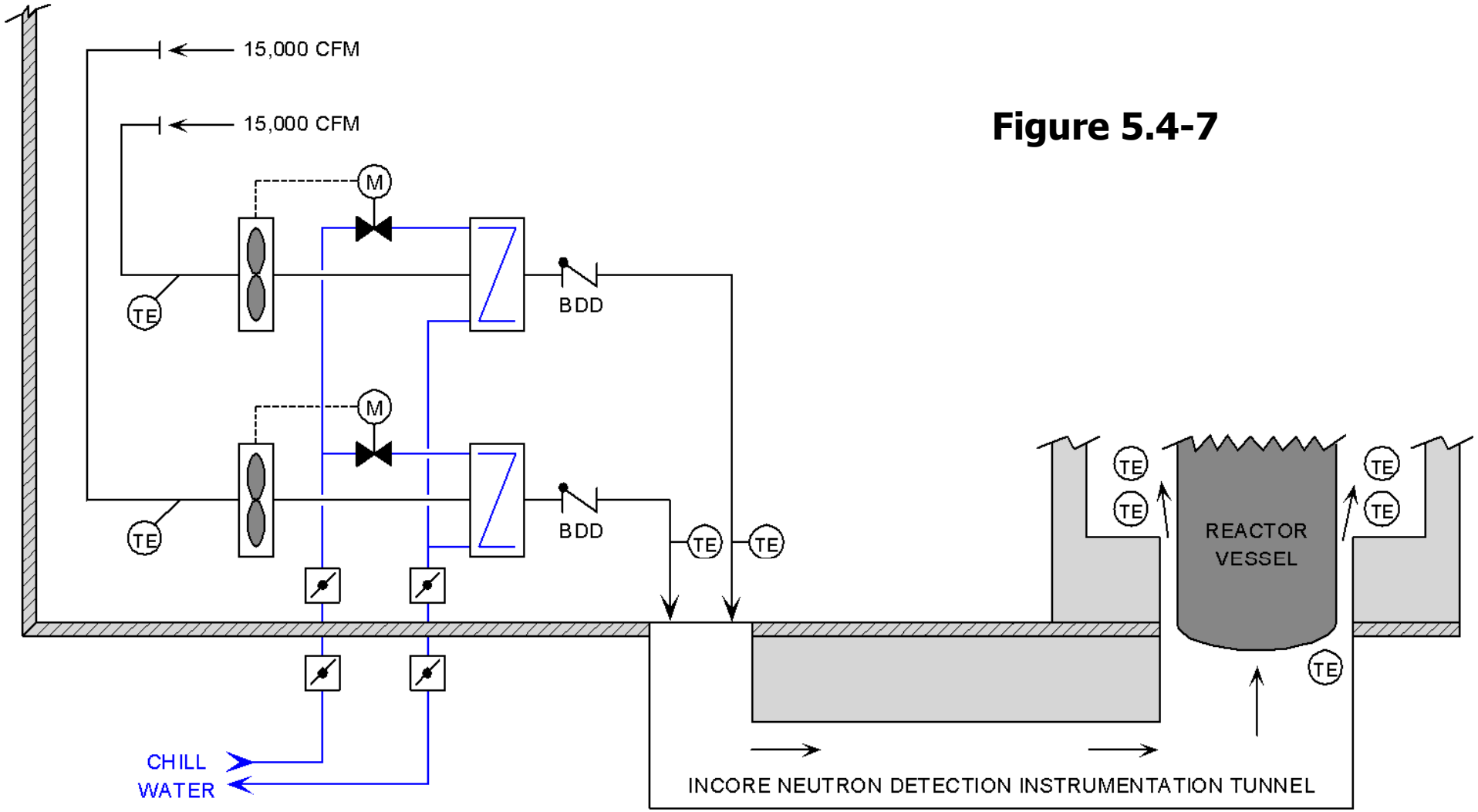
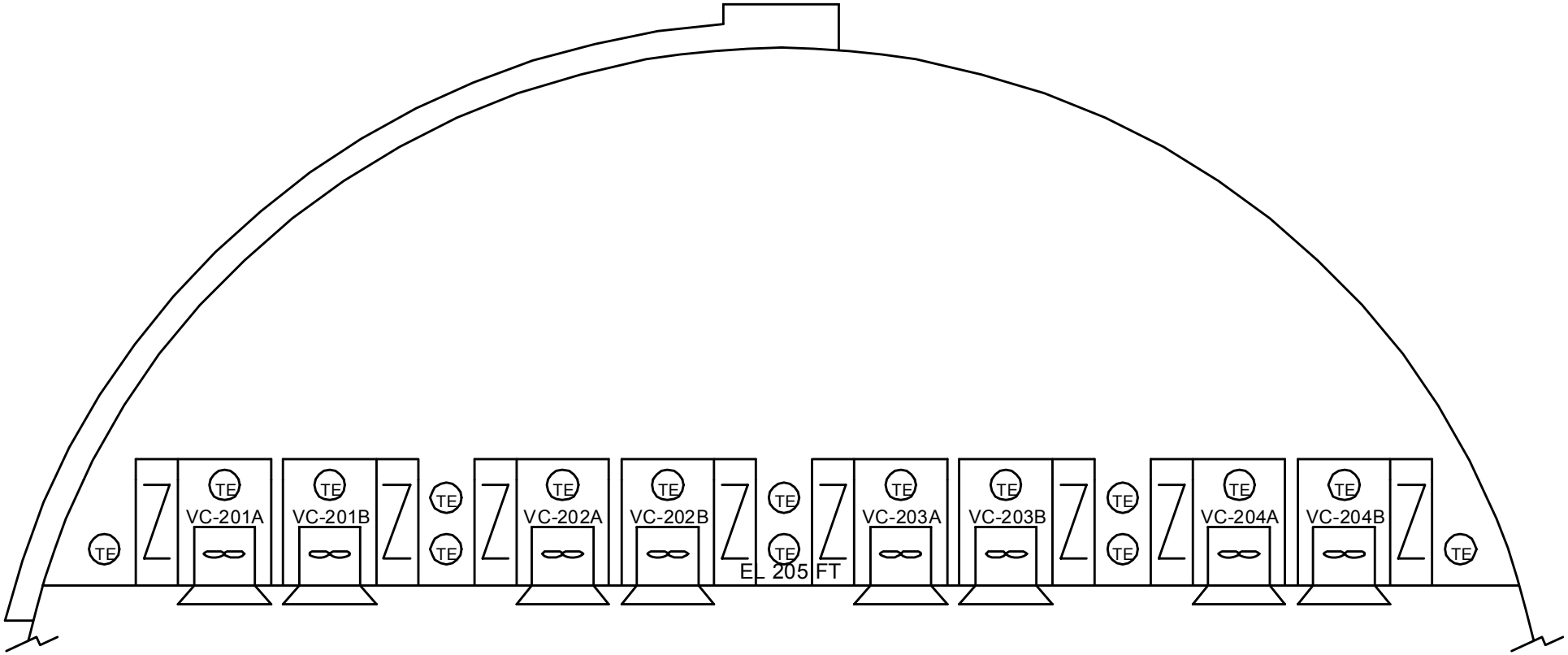


Figure 5.4-6 Reactor Coolant Pump Cooling System

Figure 5.4-7


15,000 CFM
15,000 CFM
M
TE
BDD
M
TE
BDD
TE
TE
TE
TE
TE
TE
TE
REACTOR
VESSEL
CHILL
WATER
INCORE NEUTRON DETECTION INSTRUMENTATION TUNNEL

CONTAINMENT AIR COOLER SYSTEM



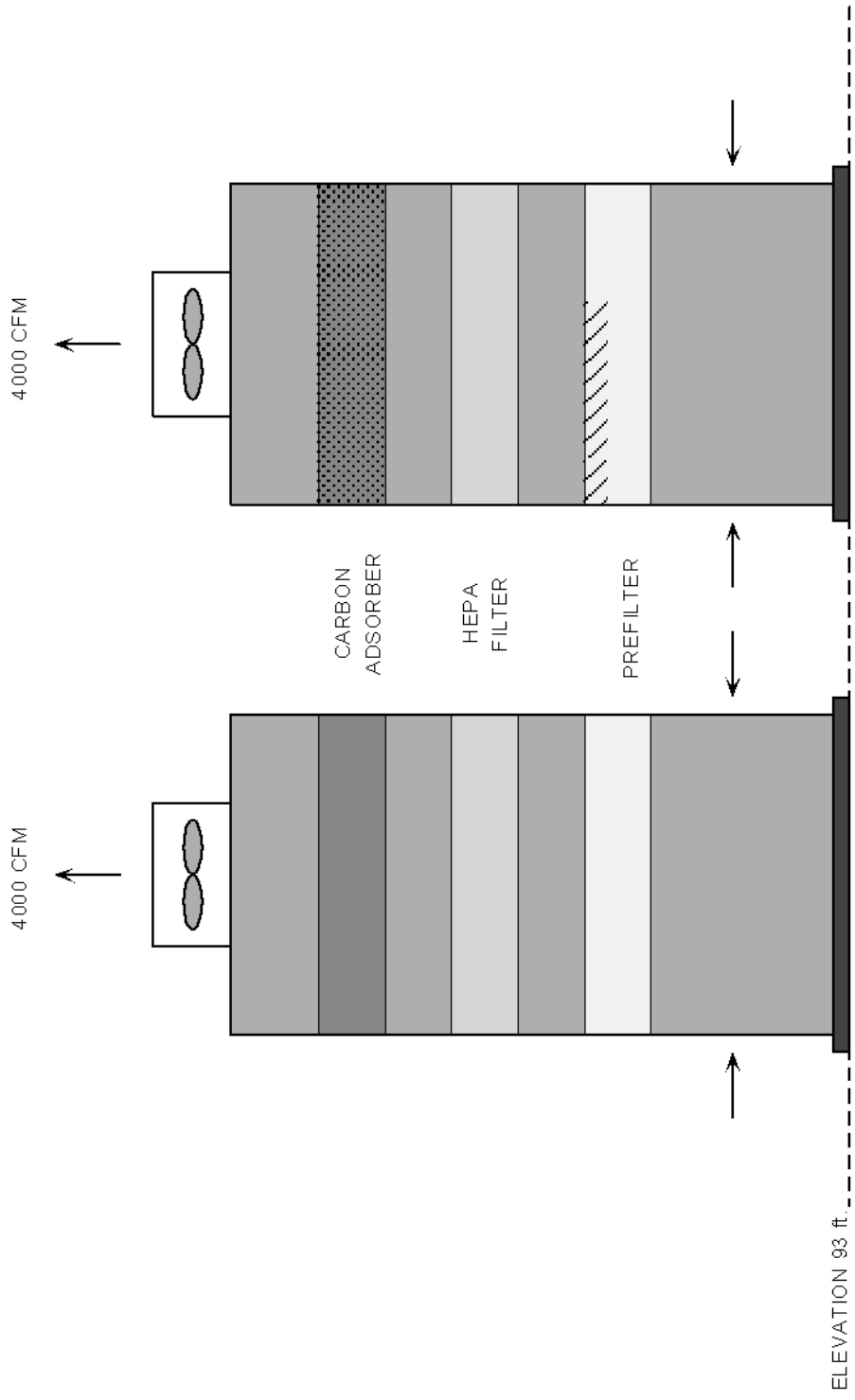
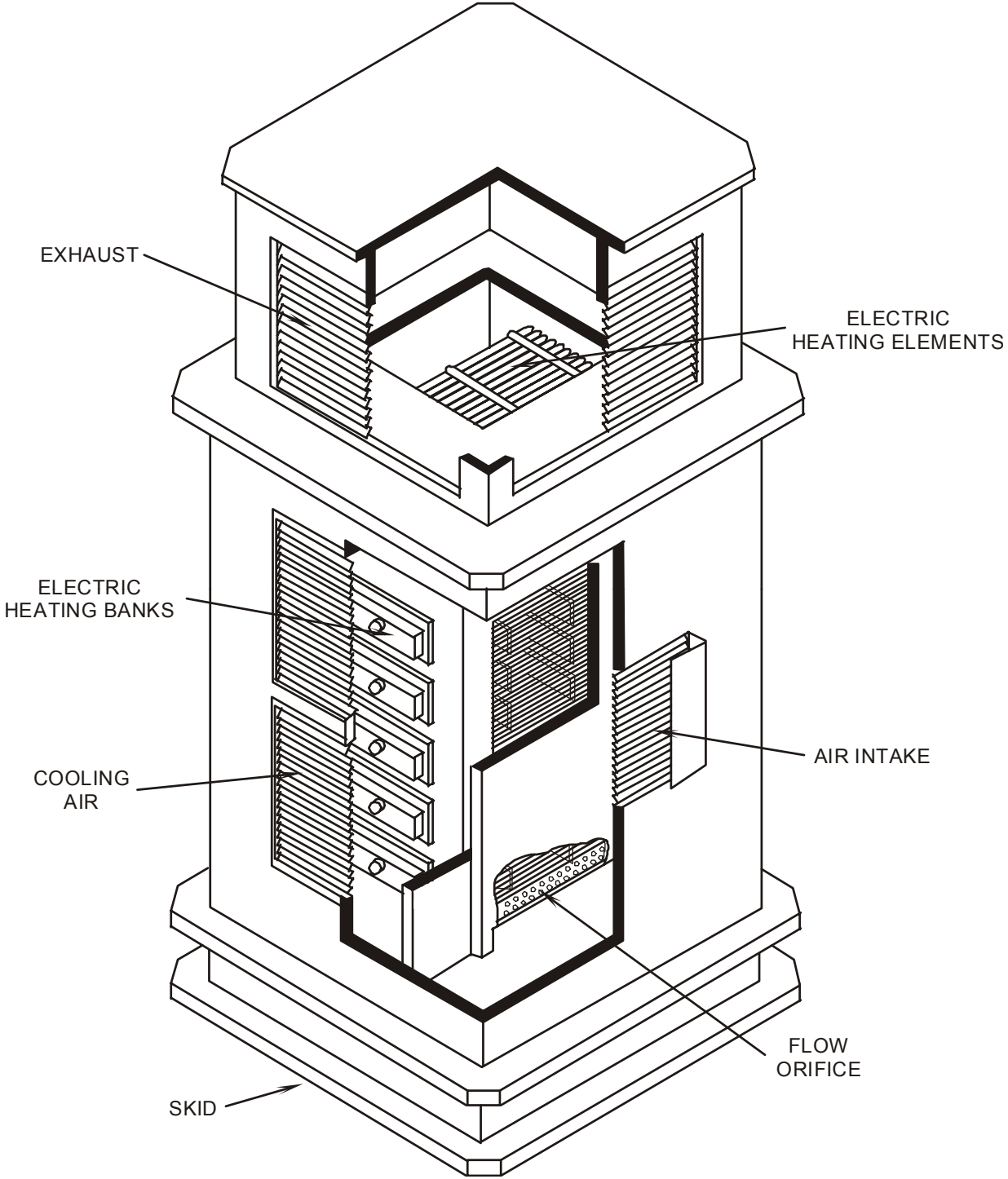
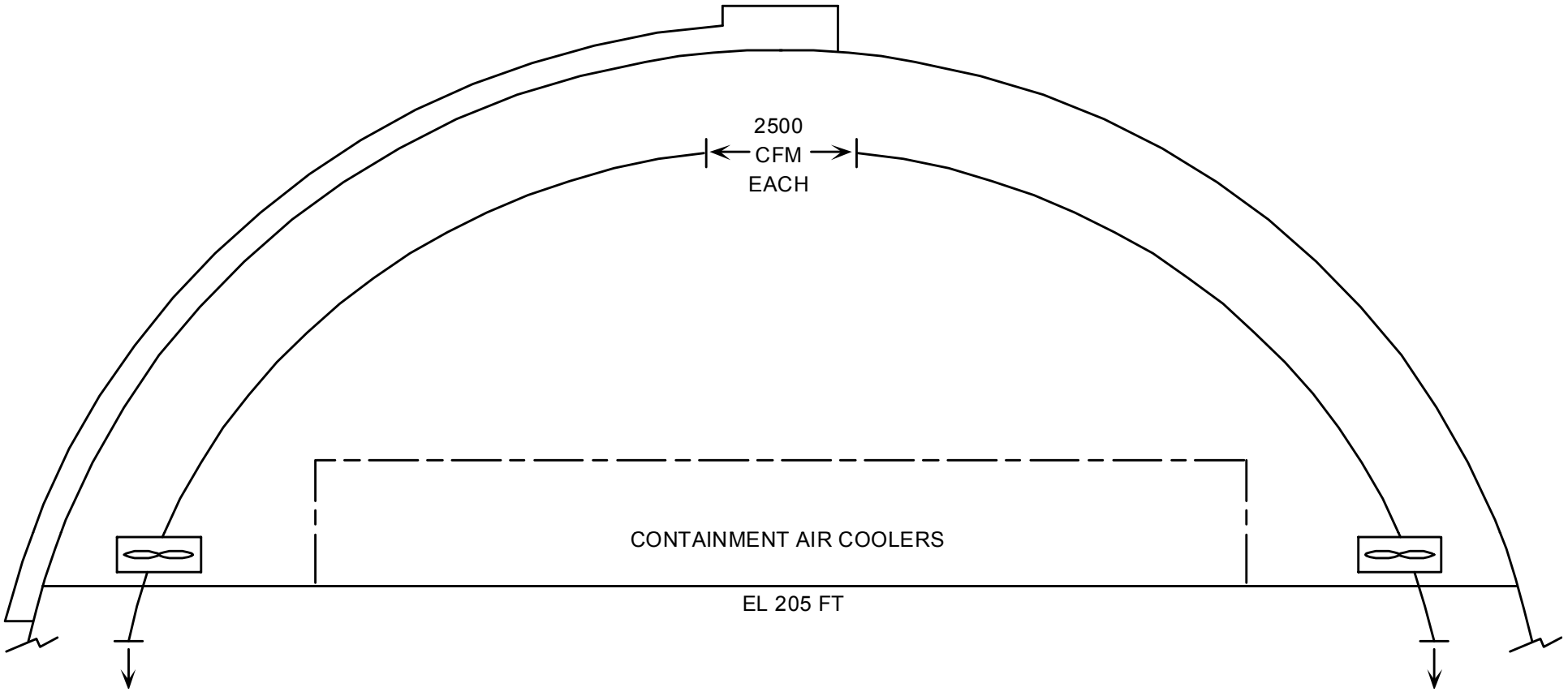


Figure 5.4-9 Clean Up Recirculation Units


EXHAUST
ELECTRIC
HEATING ELEMENTS
ELECTRIC
HEATING BANKS
COOLING
AIR
AIR INTAKE
FLOW
ORIFICE
SKID

HYDROGEN MIXING SYSTEM



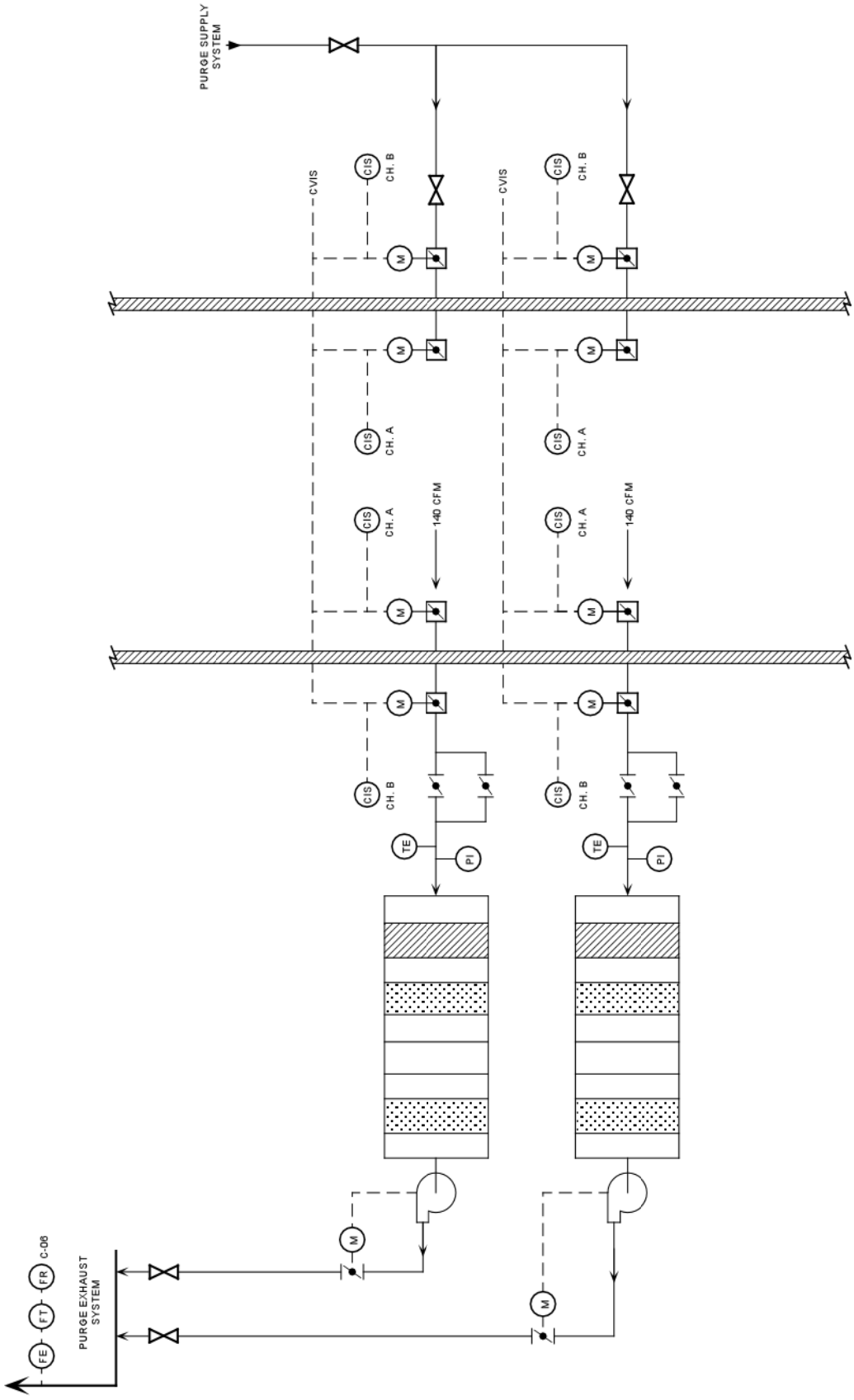
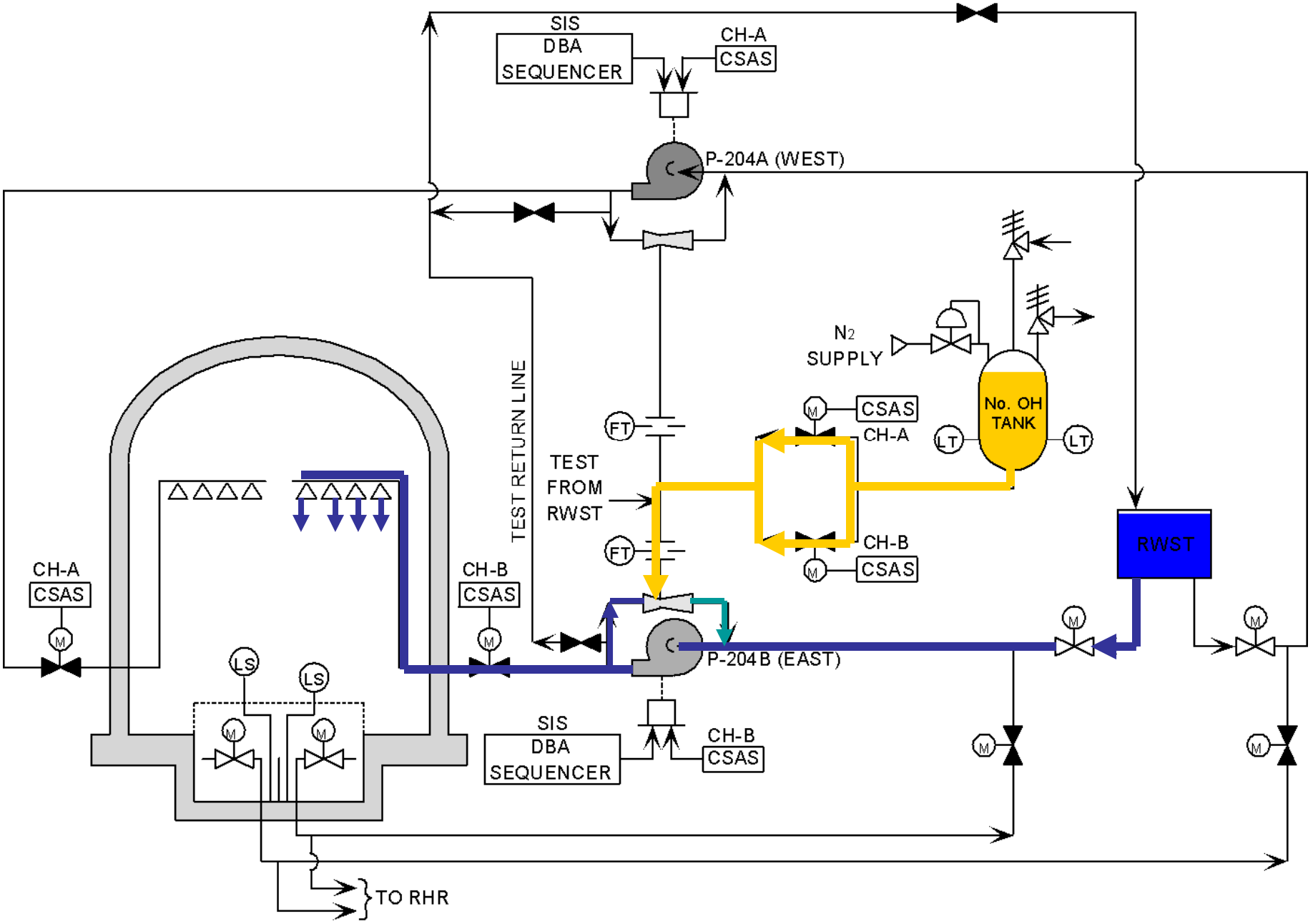


Figure 5.4-12 Hydrogen Vent System

Containment Spray System Obj 3

- Limits the peak containment pressure below its design pressure of 60 psig following a worst case LOCA.
- Reduces the concentration of fission product iodine in the containment atmosphere following a LOCA.
- Keeps spray entrained iodine in the containment recirculation sump while maintaining the sump water at a basic pH.

CONTAINMENT SPRAY SYSTEM



CONTAINMENT PENETRATION AND ISOLATION SYSTEMS

Section 5.6

Learning Objectives

1. State the purposes of the system.
2. Define the following:
   a. Deleted
   b. Containment Isolation Phase A
   c. Containment Isolation Phase B
3. List the signals that initiate phase A and phase B isolation.

Purpose Obj 1

- To isolate non-essential containment penetrations during accident conditions.

- To provide leak-tight mechanical and electrical containment penetrations.

Containment Penetration Types

- **Electrical Penetrations**
- **Piping Penetrations**
- **Equipment and Personnel Access Hatches**
- **Fuel Transfer Penetration**

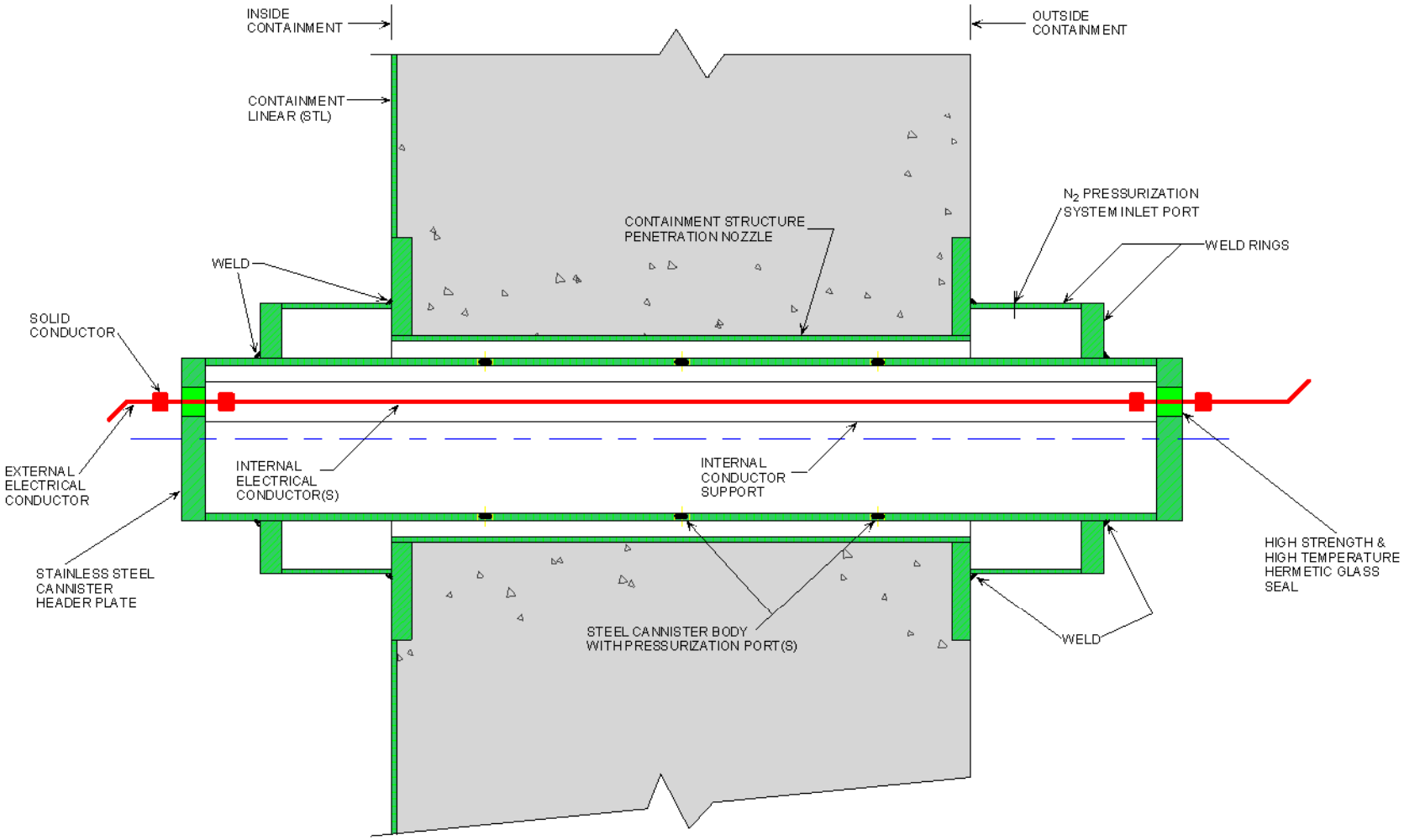
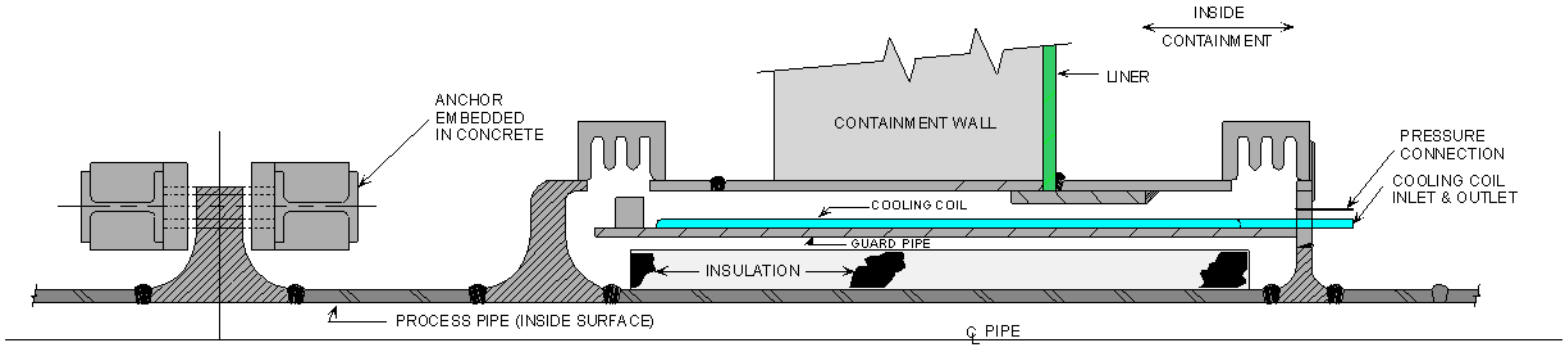
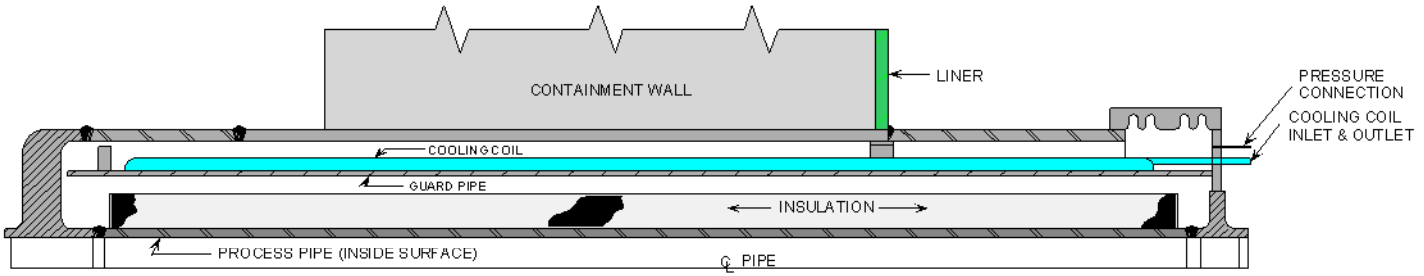


Figure 5.6-1 Electrical Penetration

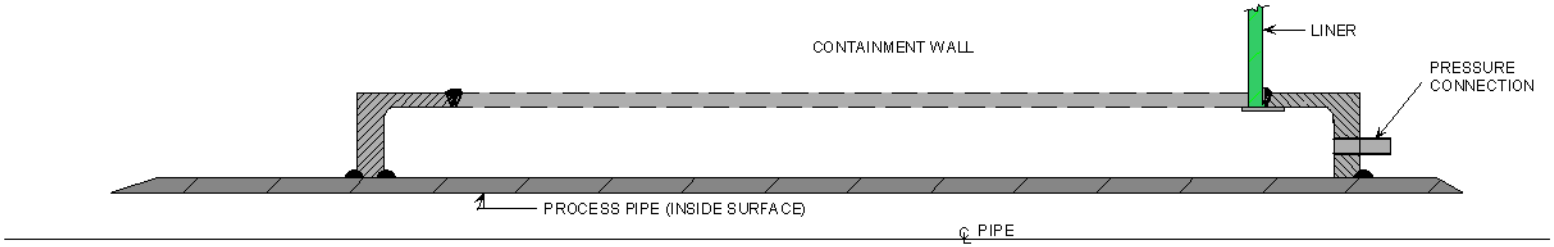
0199-3



MAIN STEAM & FEED WATER PENETRATION ASSEMBLY



TYPICAL HOT PENETRATION ASSEMBLY



TYPICAL COLD PENETRATION ASSEMBLY

Figure 5.6-2 Piping Penetration

0199-3

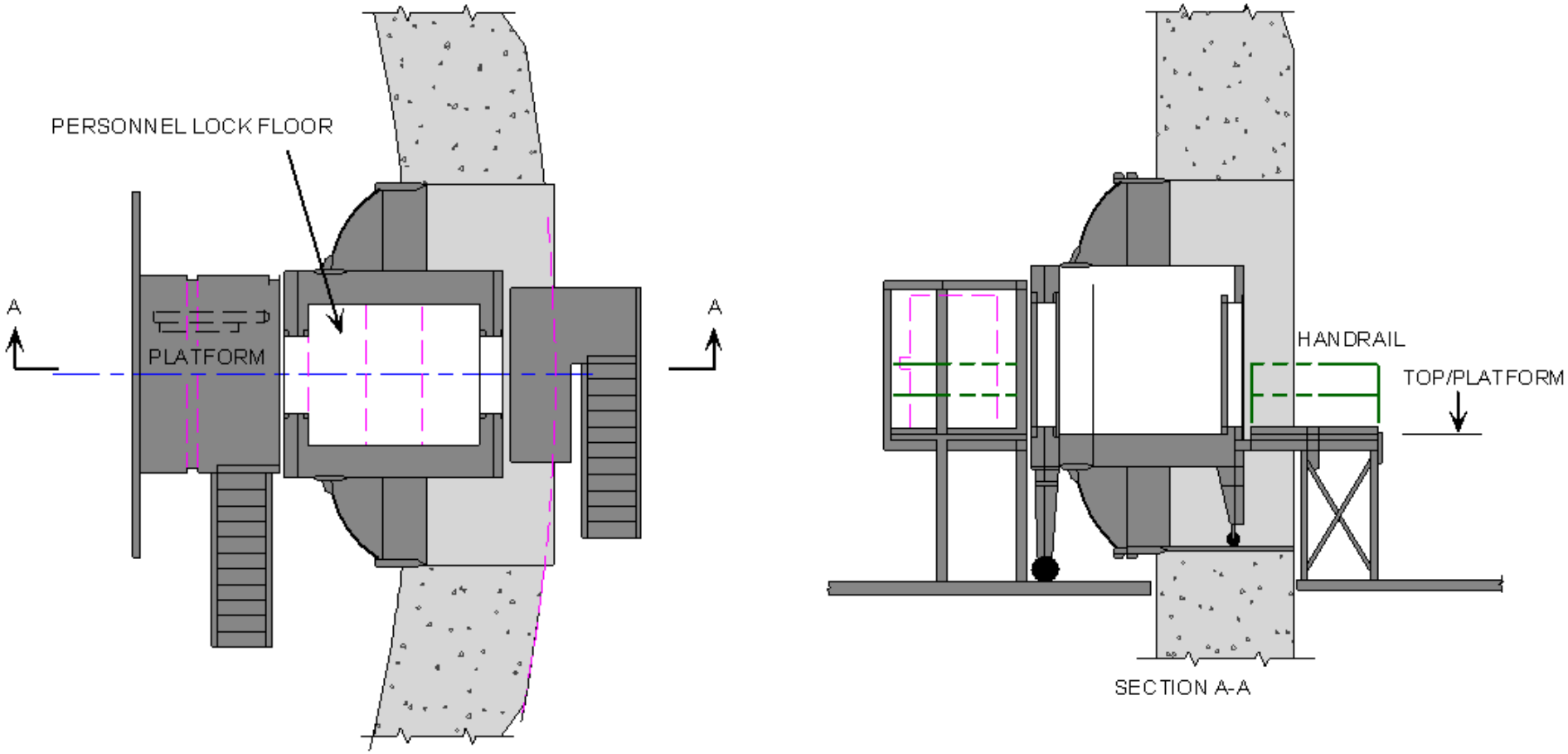

PERSONNEL LOCK FLOOR
A
PLATFORM
A
HANDRAIL
TOP/PLATFORM
SECTION A-A

Fig 5.6-3

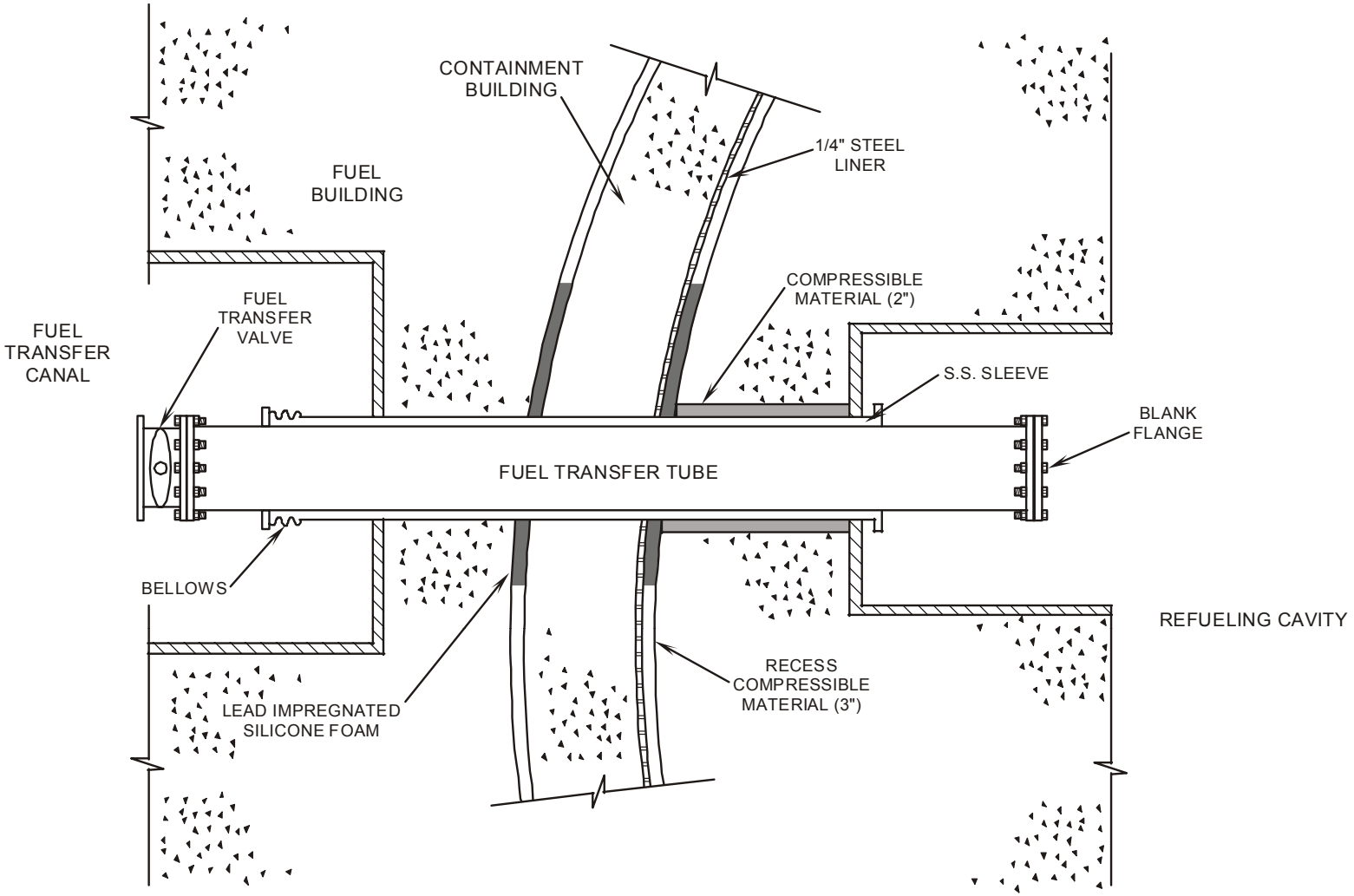


Figure 5.6-4 Fuel Transfer Tube

0796-32
5.2-4

Initiation Signals Obj 3

- Phase A Isolation: Initiated by any Safety Injection actuation signal or manually from the control room. (CISA)

- Phase B Isolation: Initiated by a hi-hi containment pressure signal or manually from the main control board. (CISB)