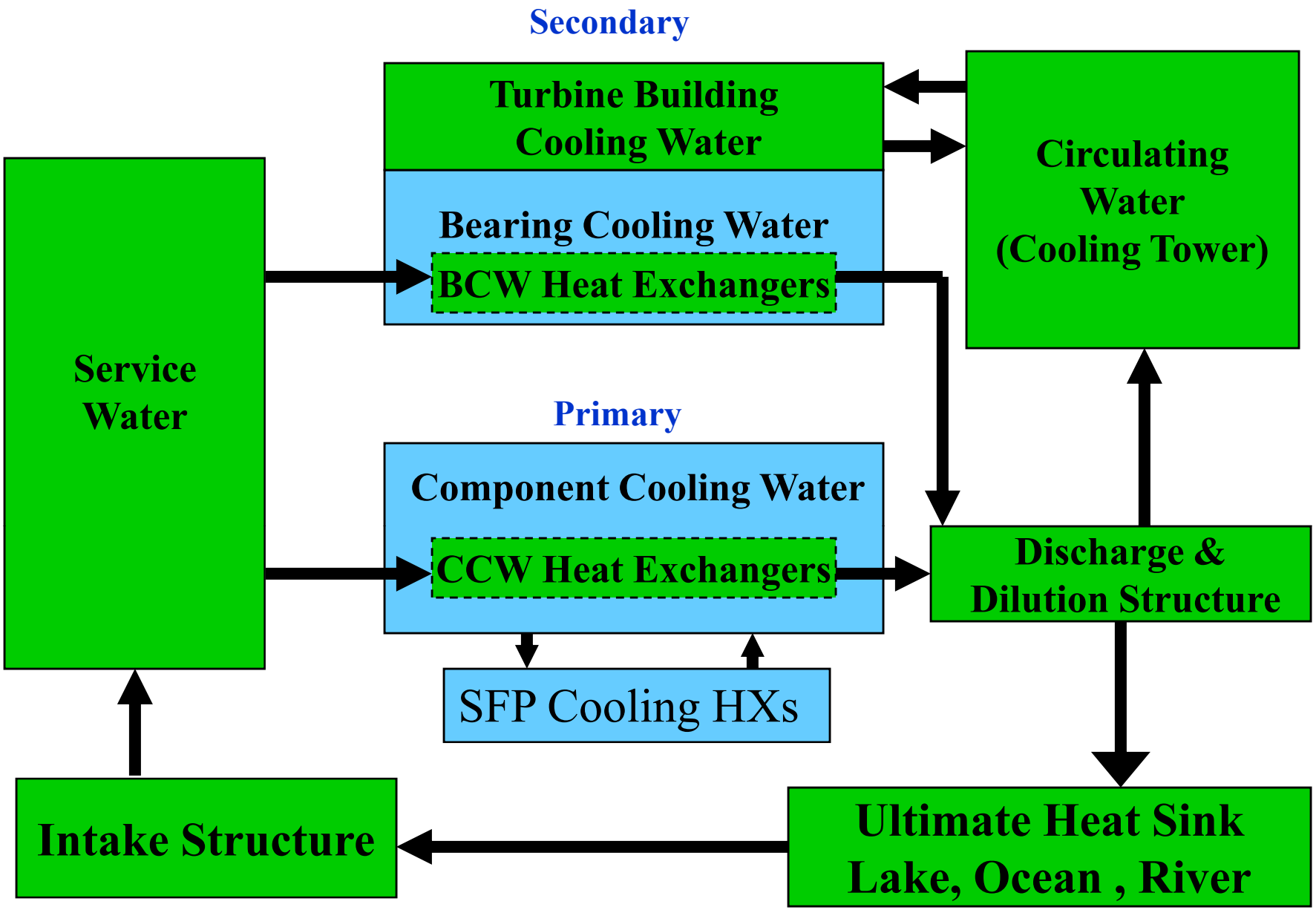
U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Cooling Water Systems

Sections 14.4 / 5 / 6 / 7

HRTD
Human Resources
Training & Development



Cooling Water Systems

Service Water System (SWS)

Objectives:

1. State the purposes of SWS.

2. List two nonsafety-related loads supplied by SWS.

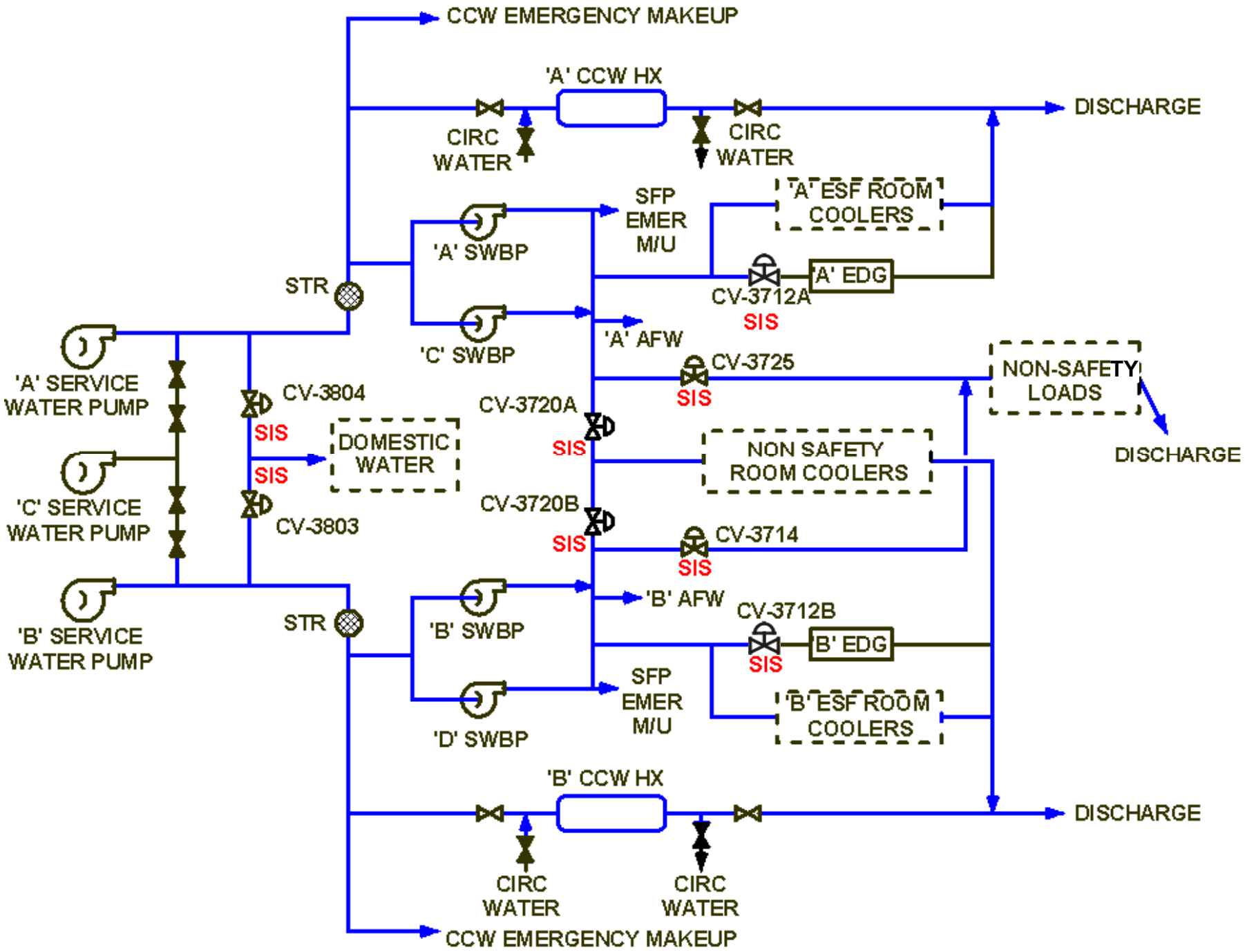
3. List four safety-related loads supplied by SWS.

Purpose of SWS

- Supply cooling water to remove heat generated by safety- and nonsafety-related components during normal operations and safety-related components during accidents.

- Transfer this heat to the environment (ultimate heat sink).

Figure 14.6-1 Service Water System



List 2 nonsafety loads supplied by SW (Obj 2) and four safety loads supplied by SW (Obj 3)

- SGBD Heat Exch
- Radwaste Flush
- Process Steam
- Domestic Wtr/Water Treatment
- Isophase Bus Duct Cooling
- BCW Heat Exch
- Jockey Fire Pp
- Non-Essential Rm Coolers

- EDG
- CCW Heat Exch
- ESF Pp Rm Coolers
- ESF Pp Oil Coolers
- SFP Emer Makeup
- AFW Suction Supply
- CCW Emer Makeup
- TB Bldg Switchgear Rm
- Control Bldg Rm Coolers

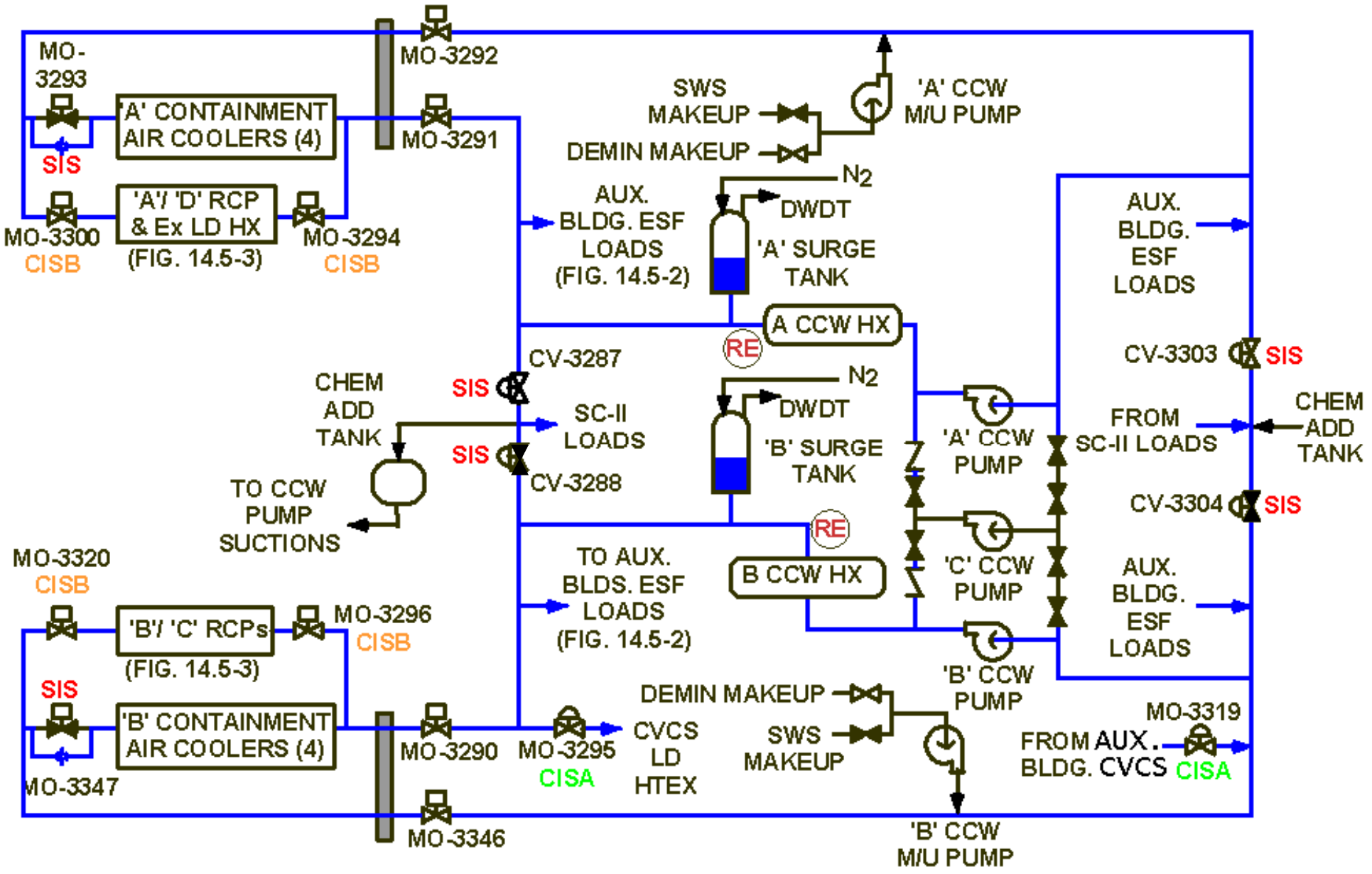
Objectives for Component Cooling Water System (CCW)

1. State the purposes of CCW.
2. List the loads served by CCW.
3. Explain how the design of CCW prevents the release of radioactivity to the environment.
4. Describe both methods of detecting leakage into the CCW system.
5. Describe how CCW is protected against leakage in the Thermal Barrier Heat Exchangers.

Purposes of CCW

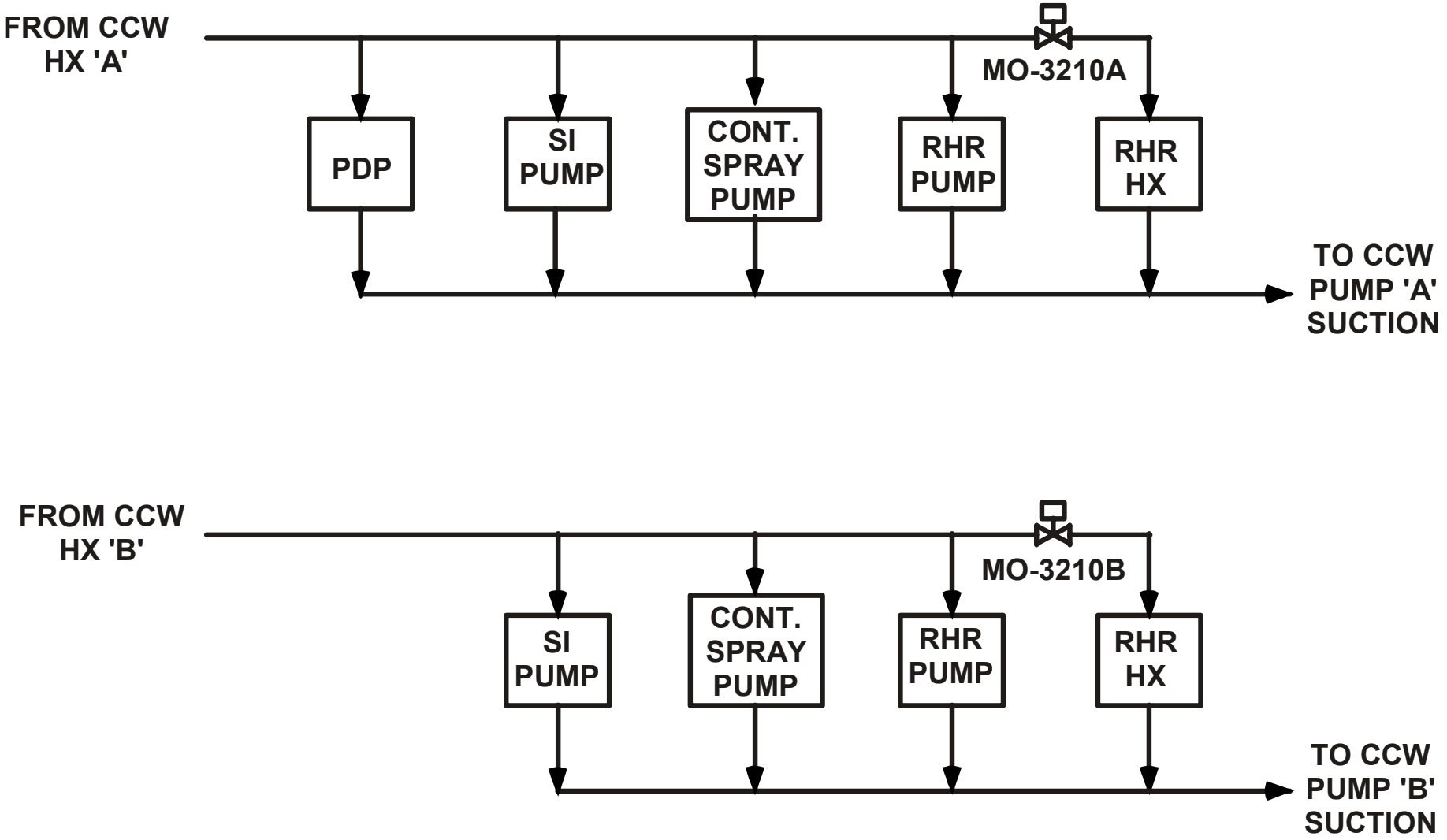
- Remove heat from systems and components which contain or may contain radioactive fluids.
- Transfer the heat from these loads to the service water system.
- Act as a barrier between radioactive systems and the environment.

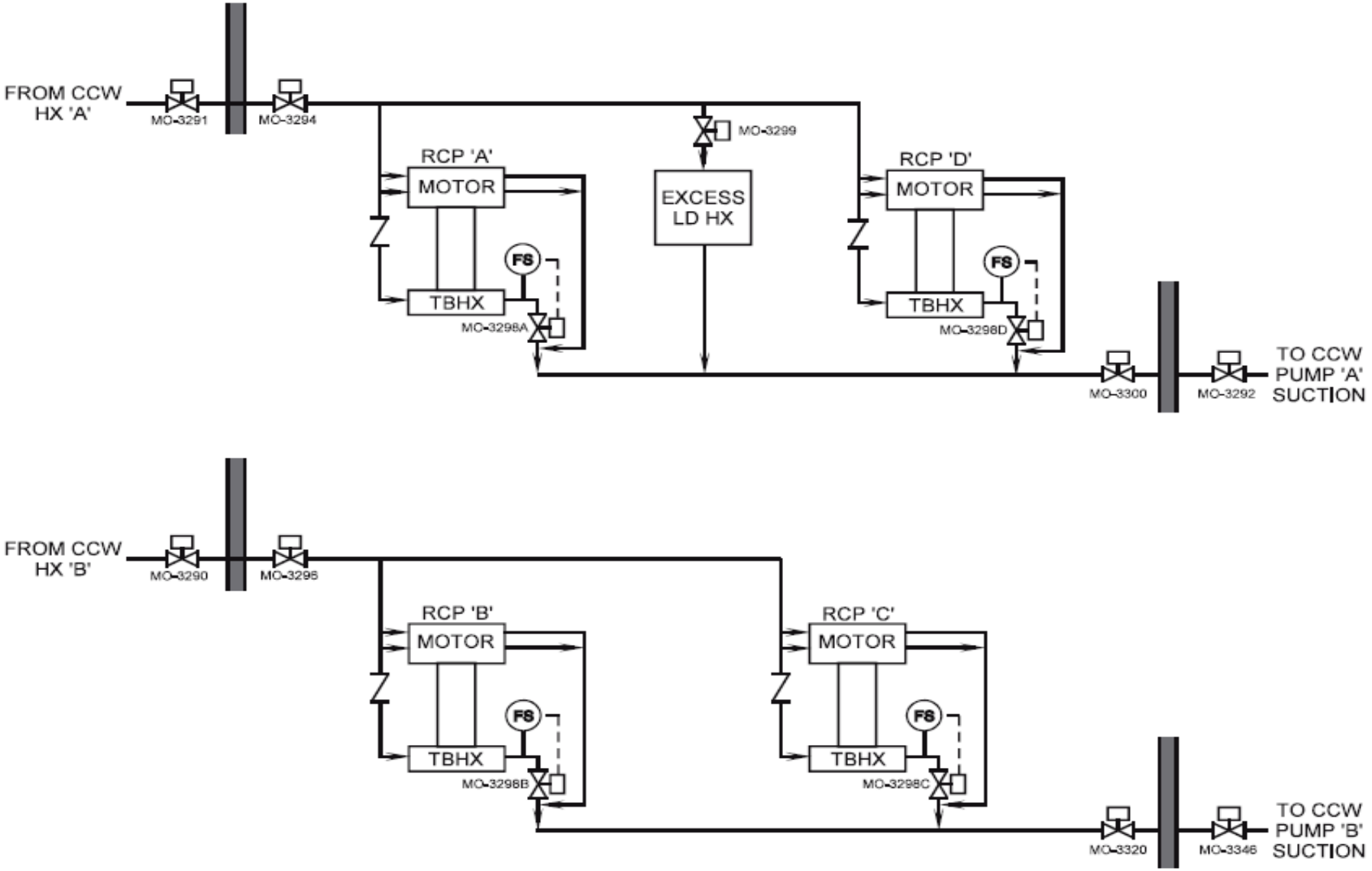
Figure 14.5-1 Component Cooling Water System



DWDT = Dirty Waste Drain Tank

Figure 14.5-2 Auxiliary Building ESF Loads




FROM CCW
HX 'A'
MO-3291
MO-3294
MO-3299
RCP 'A'
MOTOR
EXCESS
LD HX
RCP 'D'
MOTOR
FS
TBHX
MO-3298A
FS
TBHX
MO-3298D
MO-3300
MO-3292
TO CCW
PUMP 'A'
SUCTION
FROM CCW
HX 'B'
MO-3290
MO-3296
RCP 'B'
MOTOR
RCP 'C'
MOTOR
FS
TBHX
MO-3298B
FS
TBHX
MO-3298C
MO-3320
MO-3346
TO CCW
PUMP 'B'
SUCTION

Safety and Non-Safety Loads Served by CCW Obj 2

- RHR Heat Exchangers
- Safety Injection Pp Seal Coolers
- Containment Spray Pp Seal Coolers
- RHR Pp Seal Coolers
- Containment Air Coolers
- Reactor Coolant Pps
- Excess Letdown Ht Exch
- Seal Water Ht Exch
- Letdown Ht Exch
- SFP Ht Exch (Sect 14.4)
- Waste gas Compressors
- Boric Acid Evaporators
- Radwaste Evaporators
- Positive Displacement Charging Pp Lube oil Coolers

Note: All loads located in the Auxiliary Building and Containment.

CCW Release of Radioactivity

Obj 3

- Potentially radioactive components are cooled by CCW.
- CCW is a closed system to the environment.
- The CCW radiation monitor will indicate increasing radiation levels.
- RCP thermal barrier piping isolates on indication of high flow and is designed for full RCS pressure.

Detecting Leakage into CCW Obj 4

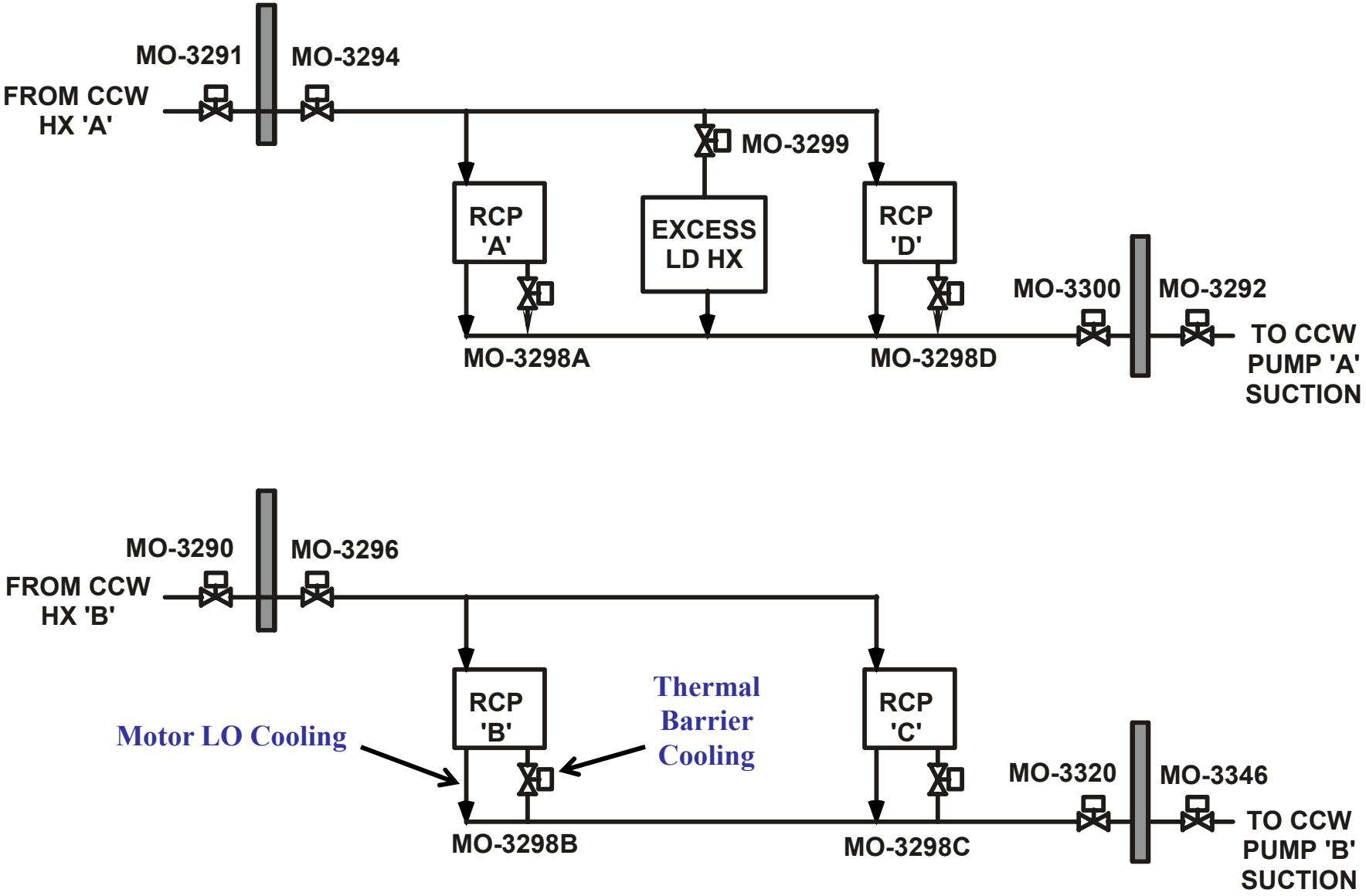
- The CCW radiation monitors will indicate increasing radiation levels.
- Surge tank level instruments will indicate increasing levels.
- RCP thermal barrier piping isolates on indication of high flow and is designed for full RCS pressure.

Thermal barrier heat exchanger Leakage Obj 5

- Thermal barrier CCW piping designed for RCS pressure.

- High flow switch on outlet piping from thermal barrier heat exchanger closes outlet isolation valve.

Figure 14.5-3 RCP Loads



1. State the purposes of the spent fuel (SFP) cooling and cleanup system.

2. Describe the design features of the SFP cooling and cleanup system which prevent inadvertently lowering the water level in the SFP.

Purposes of the Spent Fuel Cooling and Cleanup System.

- Provides radiation shielding by maintaining ≥ 10’ of water over fuel assemblies during fuel movement.
- Provides cooling by removal of the decay heat generated by the stored fuel assemblies.
- Purifies the water in the system:
  - Maintains optical clarity of the spent fuel pool water.
  - Maintains radiation dose at acceptable levels.
- Maintains purity & clarity of fuel transfer canal, refueling cavity, RWST.

Figure 14.4-1 SFP Cooling and Cleanup System

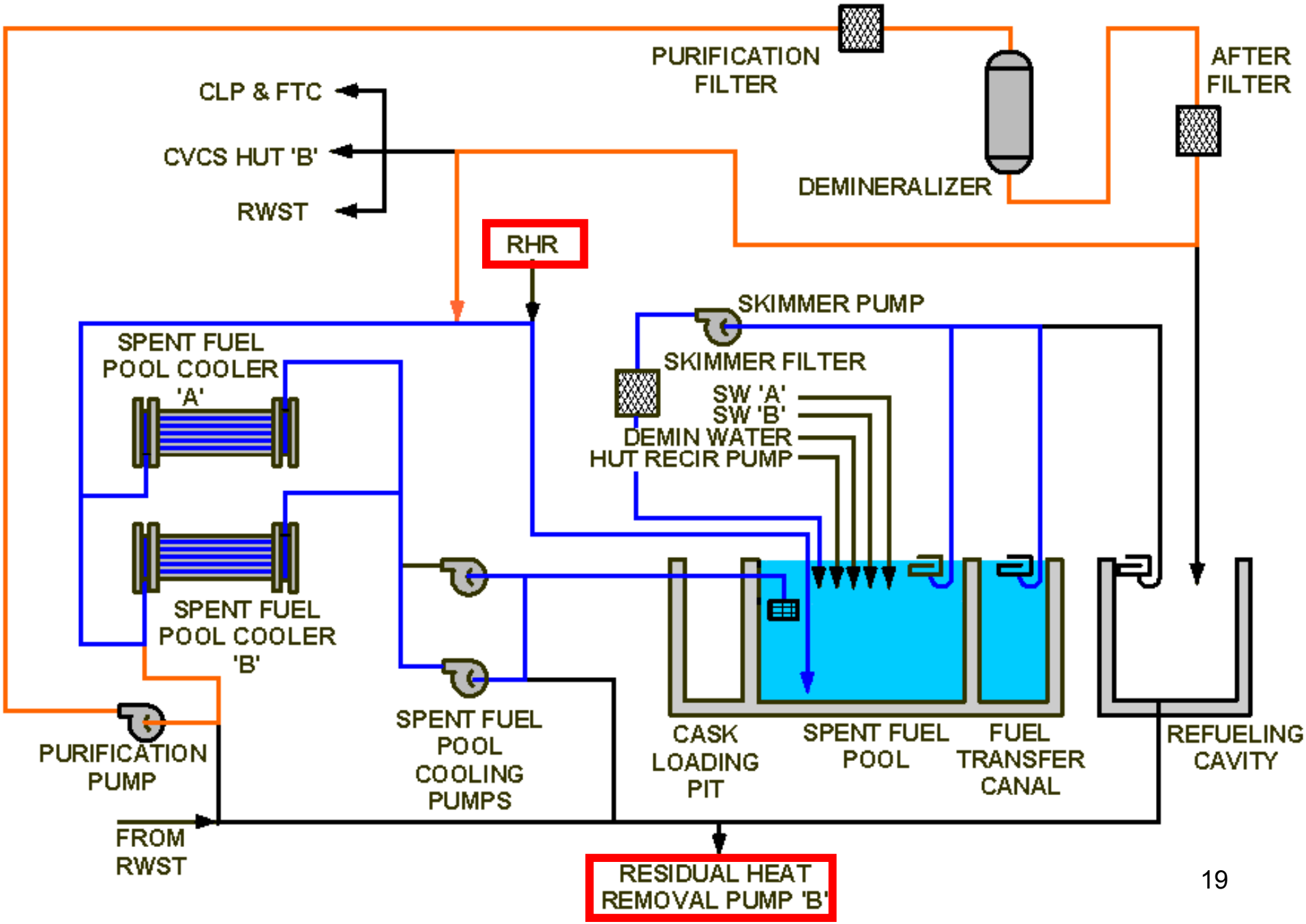
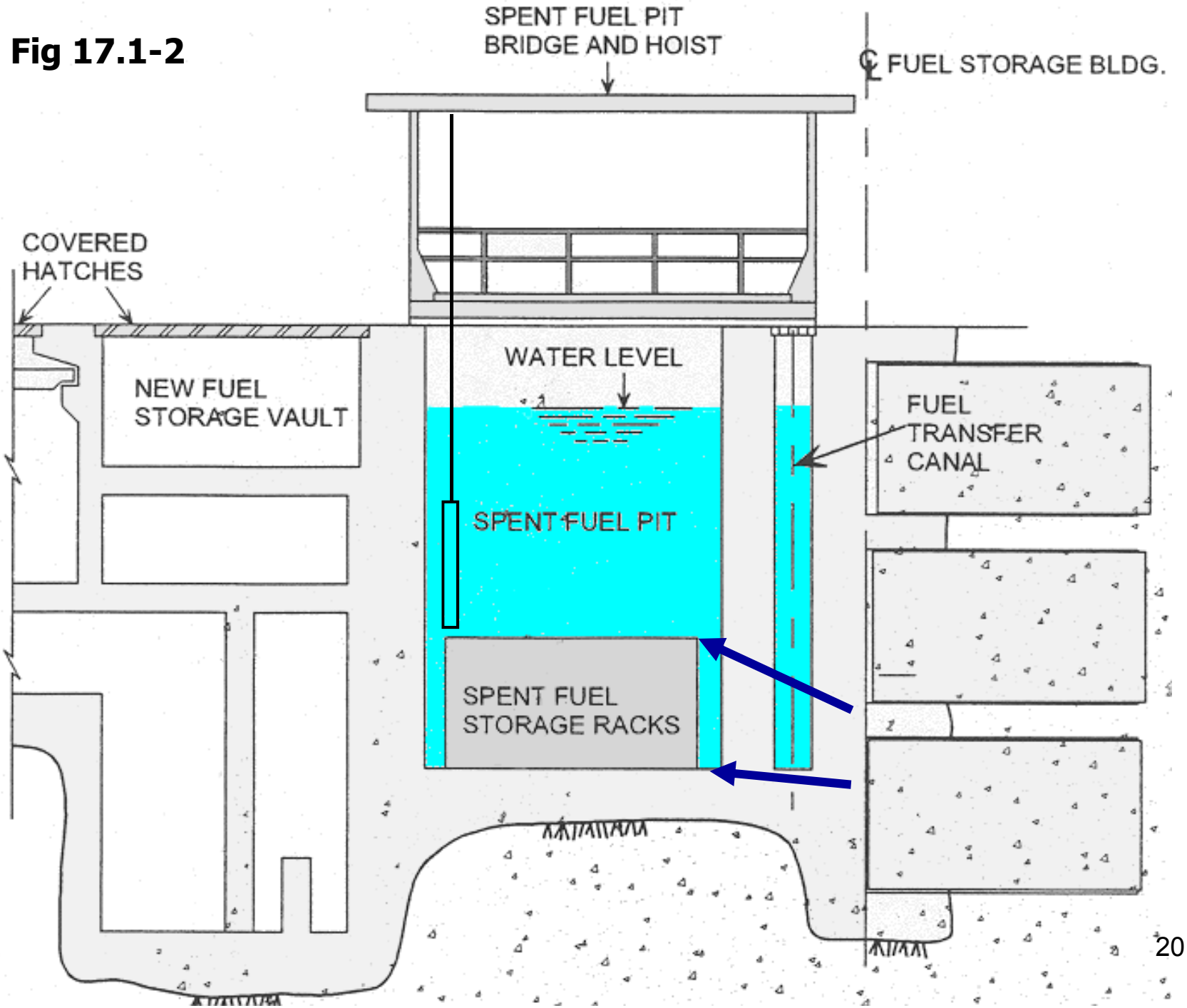


Fig 17.1-2


SPENT FUEL PIT
BRIDGE AND HOIST
℄ FUEL STORAGE BLDG.
COVERED
HATCHES
NEW FUEL
STORAGE VAULT
WATER LEVEL
FUEL
TRANSFER
CANAL
SPENT FUEL PIT
SPENT FUEL
STORAGE RACKS

Design features which prevent inadvertently lowering water level OBJ-2

- No drains in the bottom of the pool.

- Anti-siphon holes (siphon breakers) in suction & return piping to ensure sufficient shielding depth (17’4”) above stored fuel assemblies.

Objectives for Circulating Water

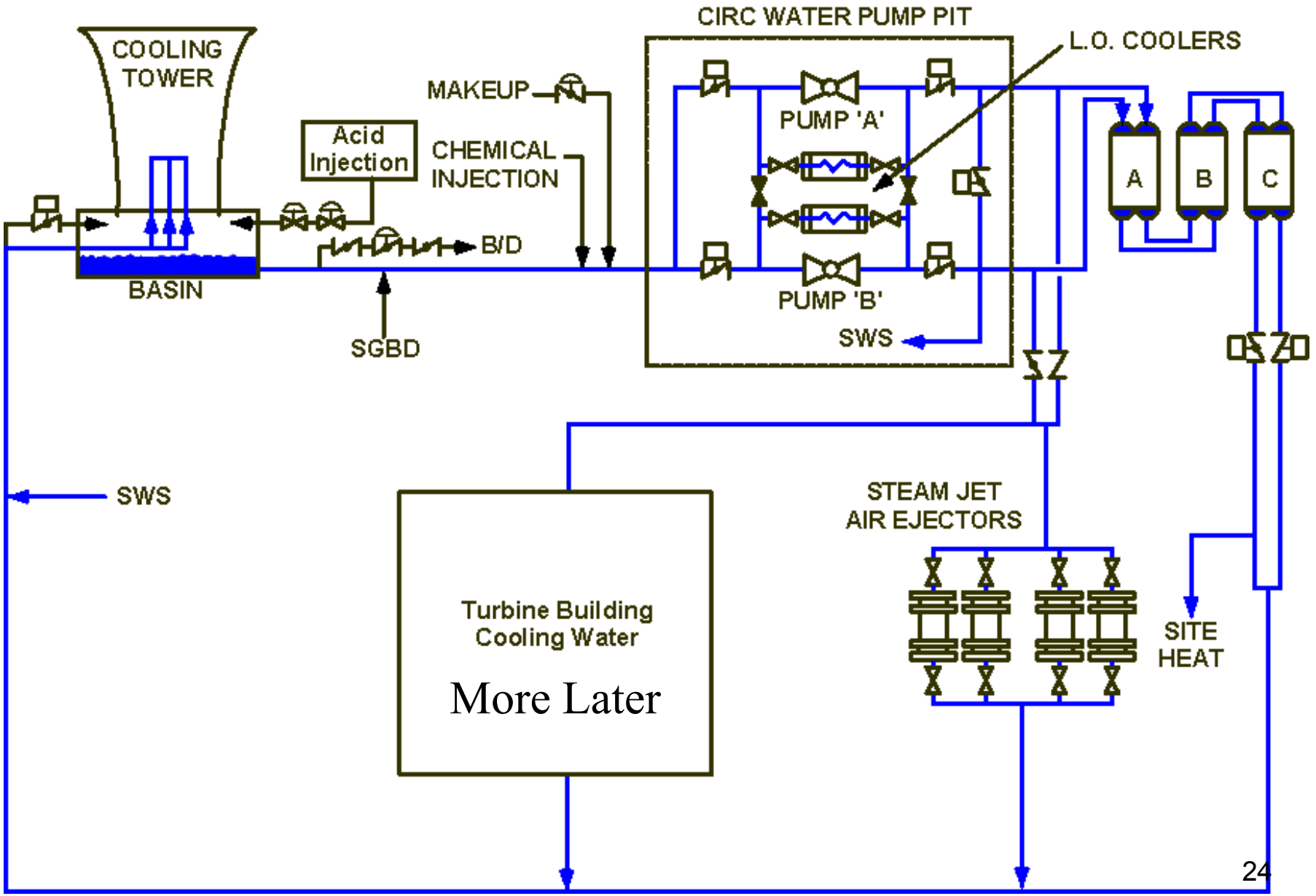
- State the purposes of Circulating Water System.

Purposes of Circulating Water System

Supplies water for auxiliary cooling equipment (via TBCW for some loads) and provide an efficient means of rejecting waste heat from the power generation cycle into the ambient surroundings.

Provides cooling water to main turbine condensers.

Figure 14.7-1 Circulating Water System



Objectives for Turbine Building Cooling Water System

- State the purpose of the Turbine Building Cooling Water System.

TBCW (Obj 1)

- Purpose: to cool auxiliary equipment used for power generation.

Figure 14.7-1 Turbine Building Cooling Water