Makeup & Purification System

Chapter 3.0
B&W Cross-Training Course
R-326C

HRTD
Human Resources
Training & Development

OBJECTIVES

1. List and explain the purposes of the makeup and purification system.
2. List in flow path order and state the purpose of the following major components of the makeup and purification system:
   a. Letdown heat exchanger.
   b. Letdown flow control valve.
   c. Prefilter.
   d. Demineralizers (ion exchangers).
   e. Filter.
   f. Makeup tank.
   g. Makeup pumps.

OBJECTIVES

3. Identify the components in the makeup and purification system that are used to purify the reactor coolant and the types of contaminants each is designed to remove.
4. Define the following terms:
   a. Boration.
   b. Dilution.
   c. Batch.
   d. Feed and bleed.
5. Explain the feed and bleed interlocks.

OBJECTIVES

6. Explain why the following chemicals are added to the reactor coolant system and identify the plant conditions that would require their use:
   a. Lithium hydroxide
   b. Hydrogen
   c. Hydrazine
7. Explain how seal injection flow is maintained to the reactor coolant pumps on a loss of the operating makeup pump.
8. State the purpose of the connection between the decay heat removal system and the makeup and purification system.

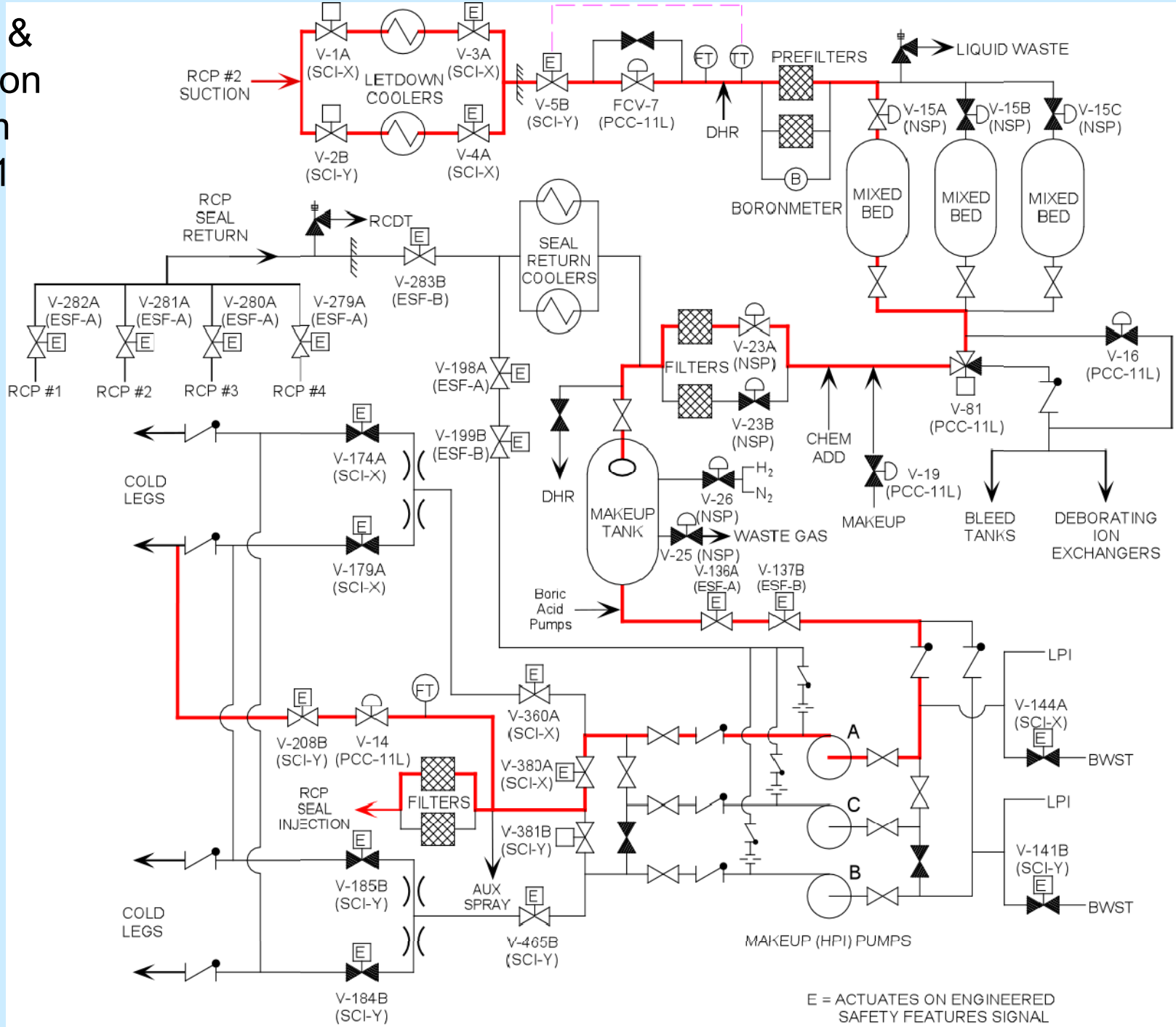
OBJECTIVES

9. List the plant operations that result in large amounts of influent into the boron recovery system.
10. Identify the changes in the makeup and purification system that occur on the receipt of an engineered safety features actuation signal.
11. Explain how the makeup and purification system is designed to prevent the following:
    a. Loss of suction to the makeup pumps.
    b. High temperature in the Demineralizers.
12. List the automatic action initiated by the makeup tank level instrumentation.

Makeup & Purification System

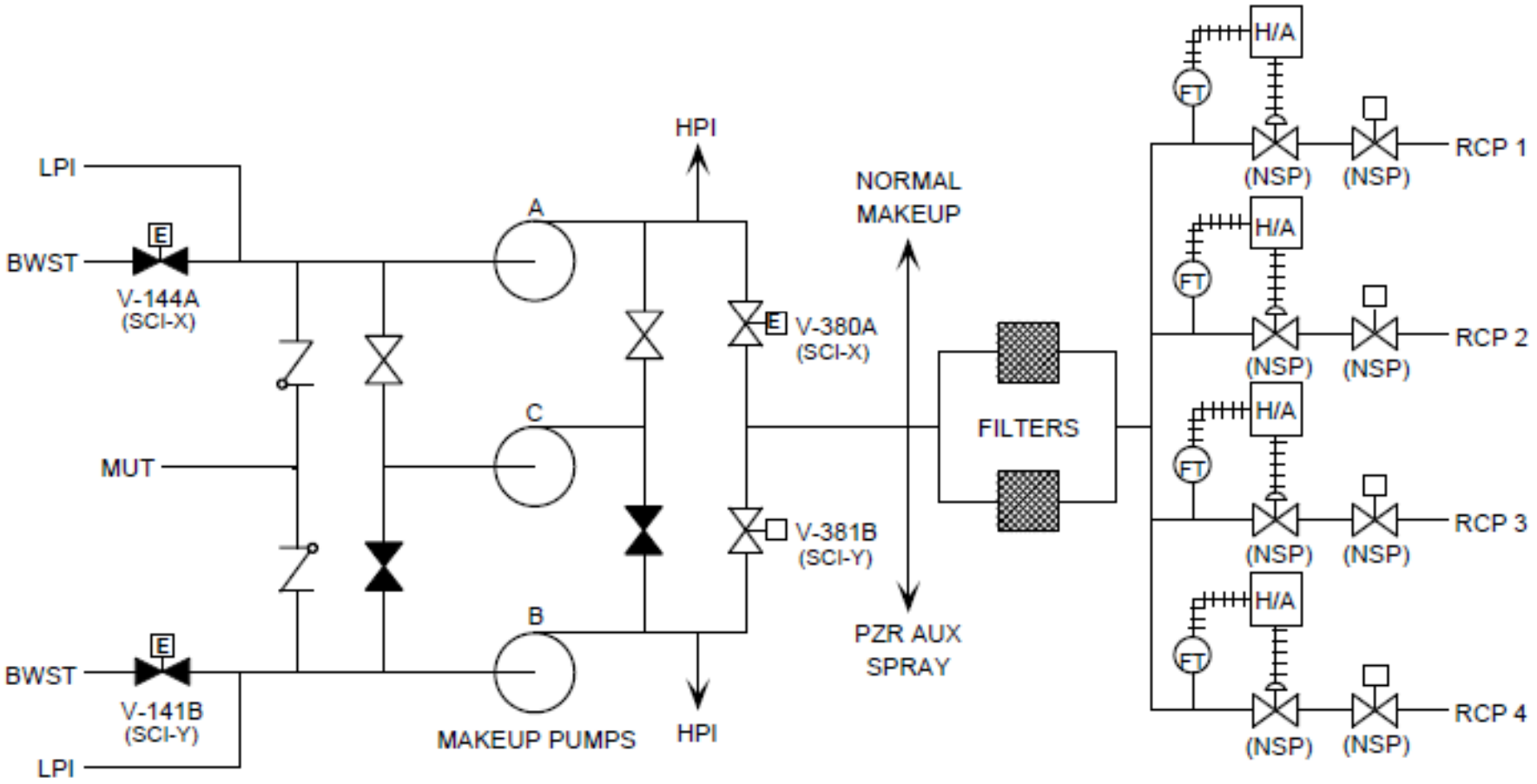
- Purposes:
  - o Purification of RCS.
    - ❑ Cross-connect to DHR
  - o Borate/dilute RCS.
  - o RCS chemistry control.
  - o RCS inventory control.
  - o RCP seal injection.
  - o ECCS - High pressure injection.

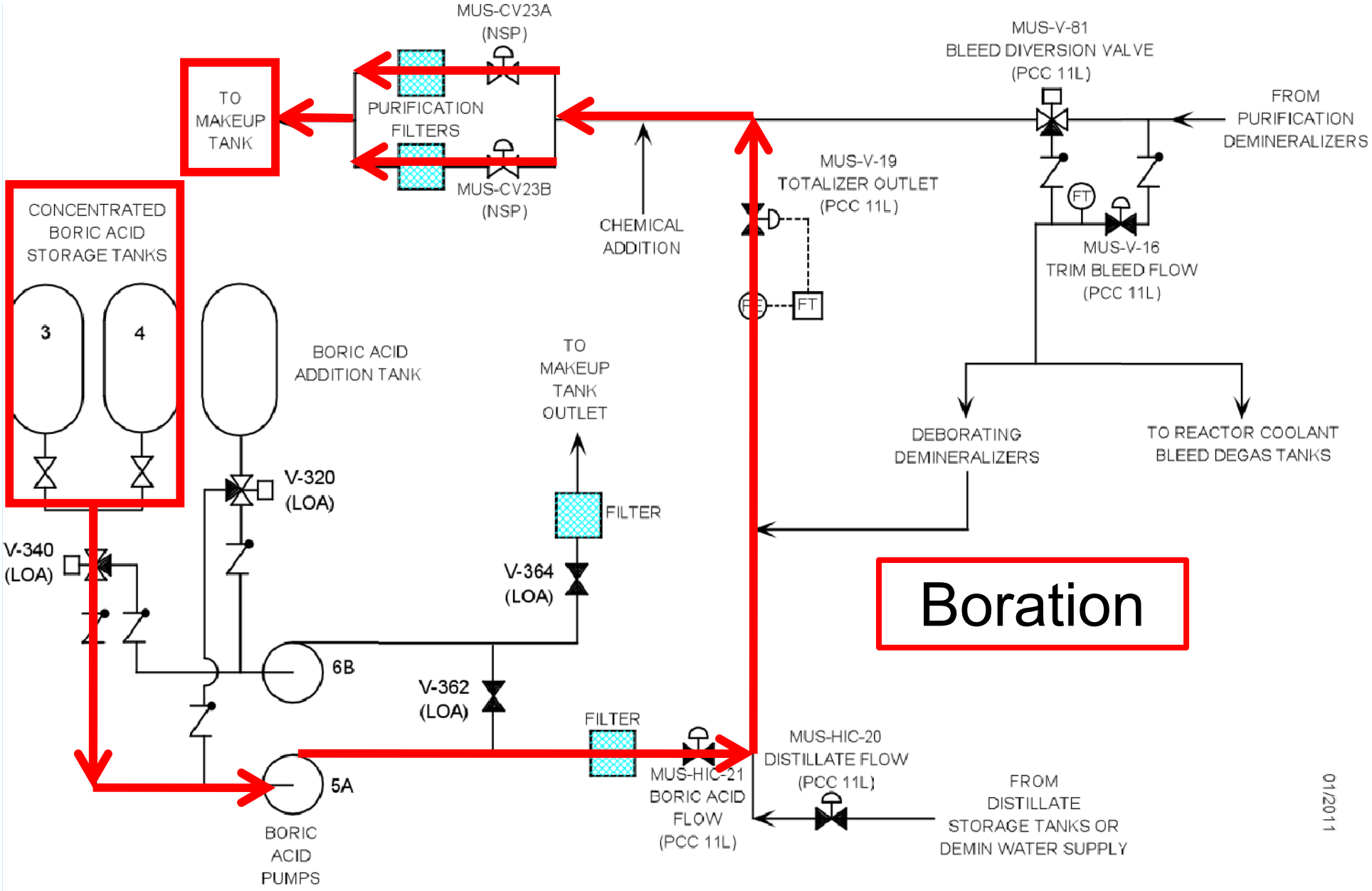
Makeup & Purification System Fig. 3-1



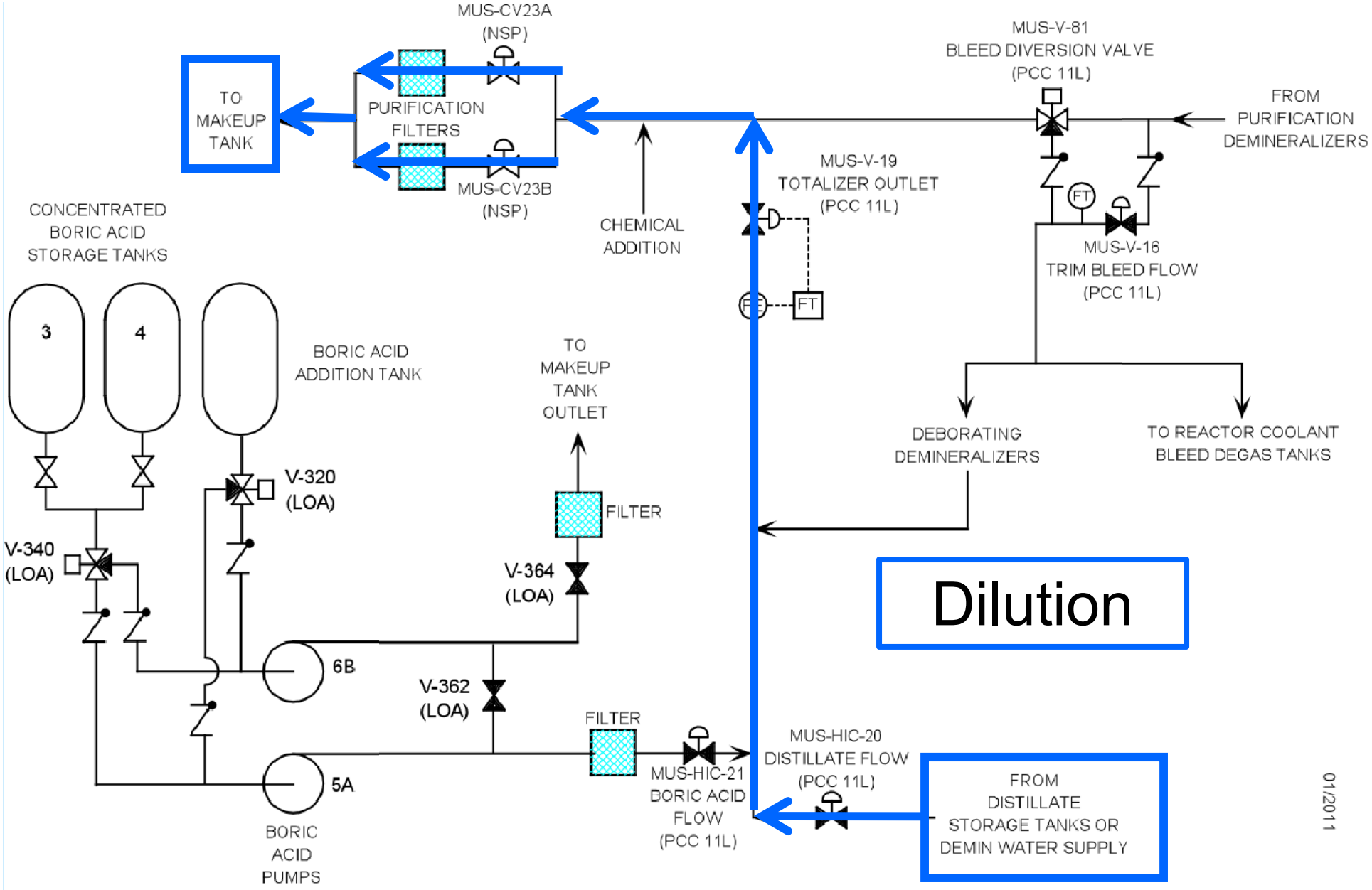
5/2011

Seal Injection System (Fig. 3-2)

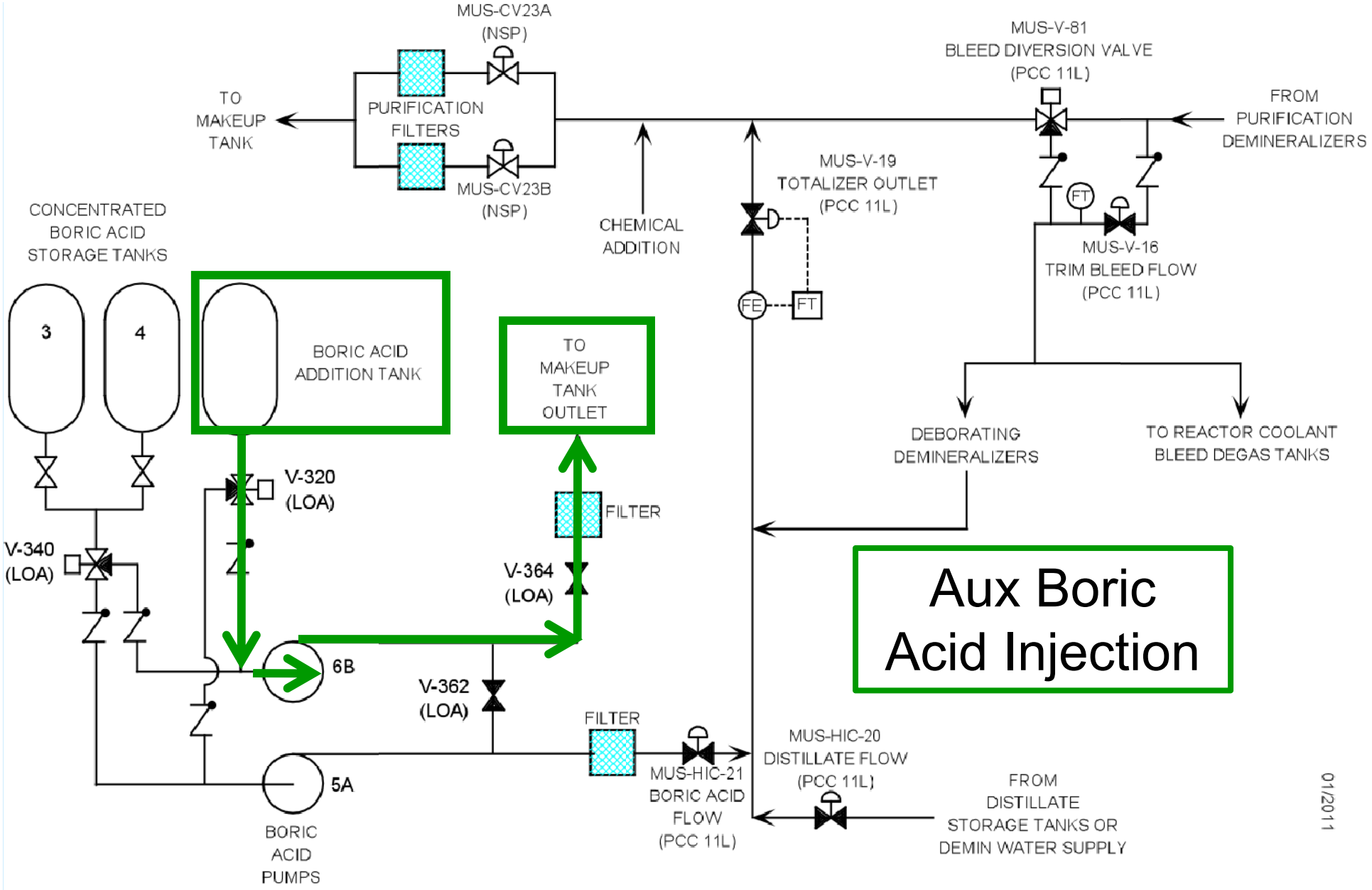




Soluble Poison Control (Fig. 3.3)

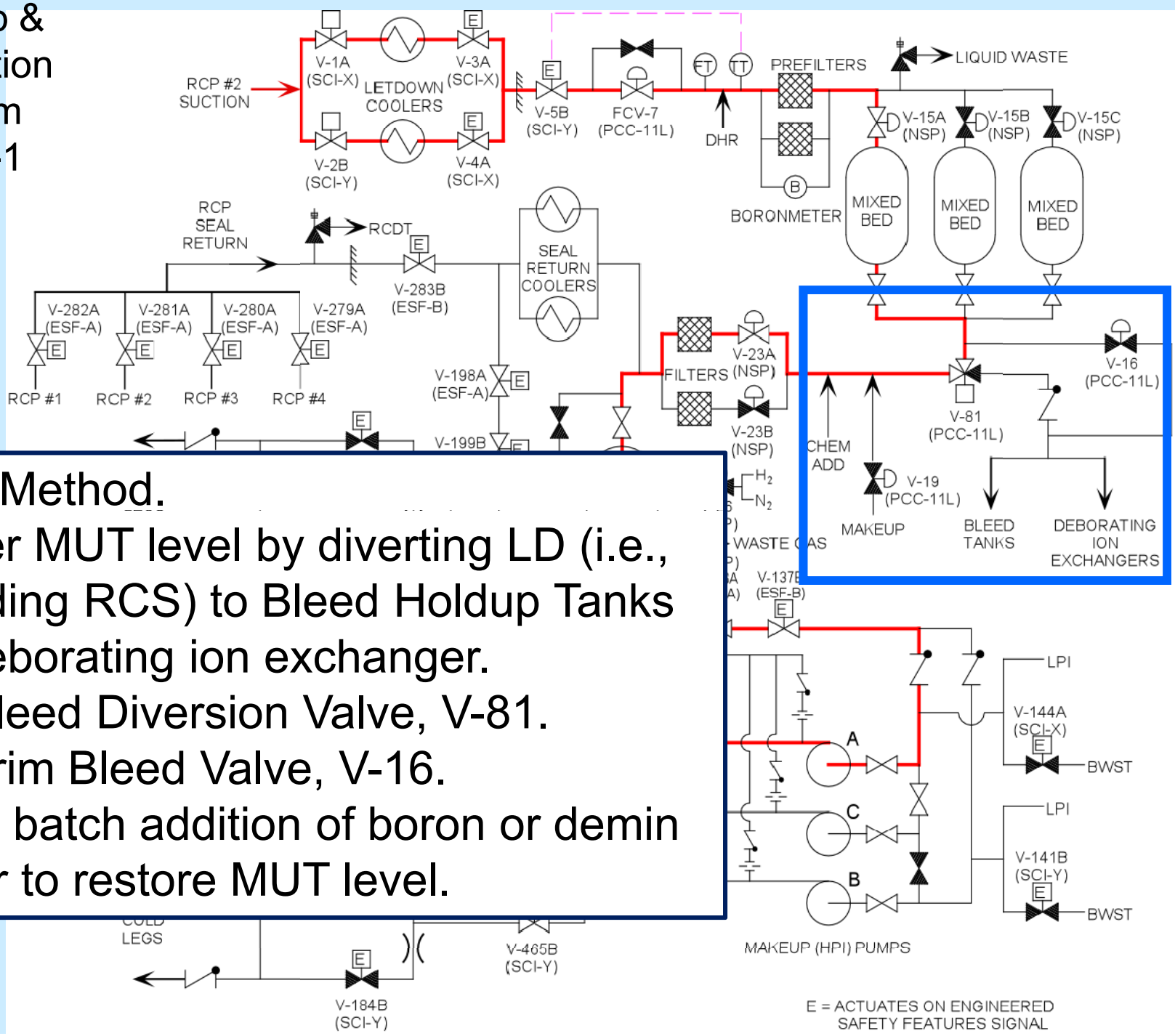


Soluble Poison Control (Fig. 3.3)



Soluble Poison Control (Fig. 3.3)

Makeup & Purification System Fig. 3-1

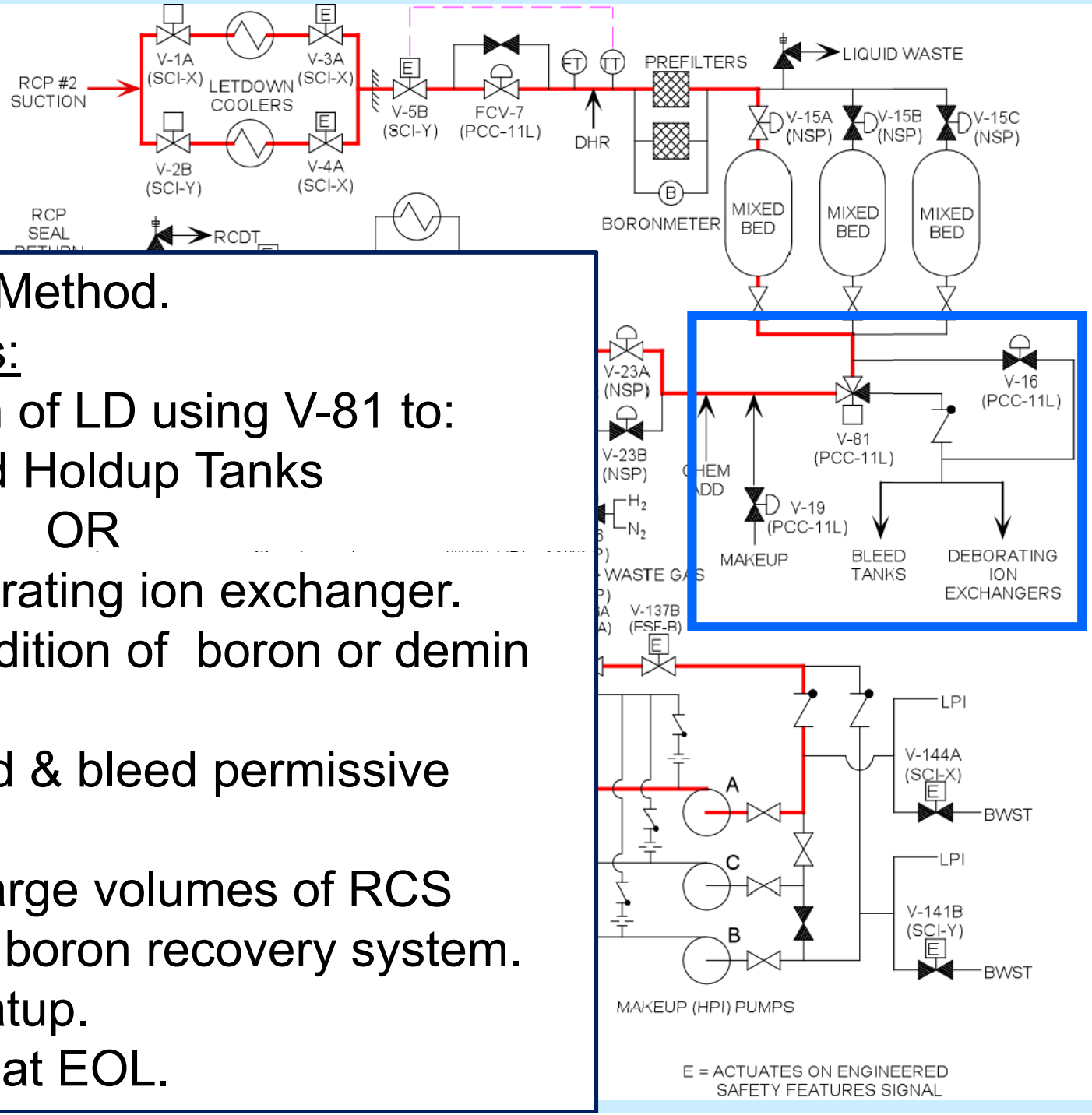


Batch Method.

- Lower MUT level by diverting LD (i.e., bleeding RCS) to Bleed Holdup Tanks or Deborating ion exchanger.
  - Bleed Diversion Valve, V-81.
  - Trim Bleed Valve, V-16.
- Then batch addition of boron or demin water to restore MUT level.

5/2011

Makeup & Purification System Fig. 3-1



Feed & Bleed Method.

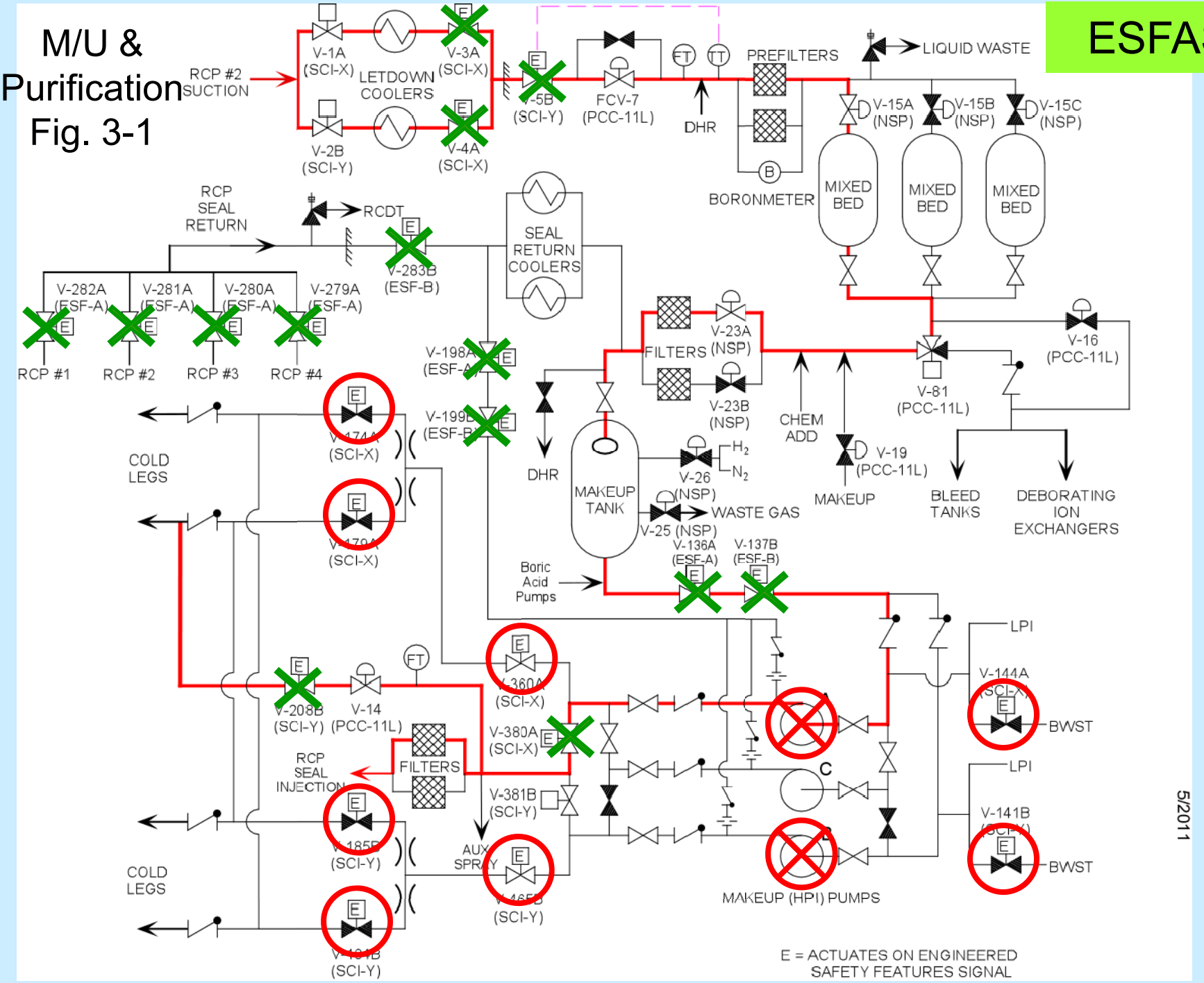
- <u>Simultaneous:</u>
  - Diversion of LD using V-81 to:
    - Bleed Holdup Tanks

      OR
    - Deborating ion exchanger.
  - Batch addition of boron or demin water.
- Requires feed & bleed permissive signal.
- Used when large volumes of RCS water sent to boron recovery system.
  - Plant heatup.
  - Dilutions at EOL.

5/2011

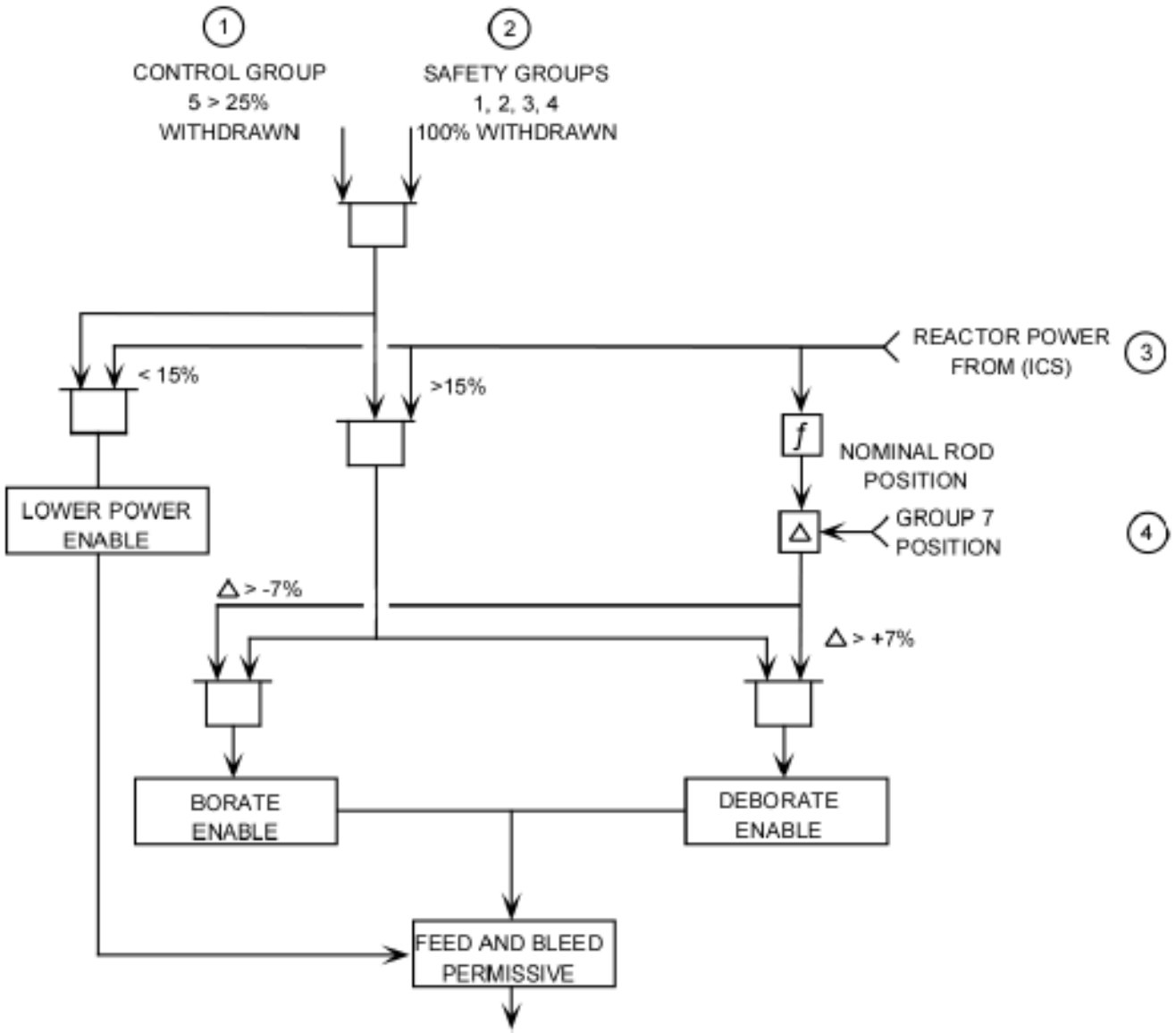
M/U & Purification Fig. 3-1

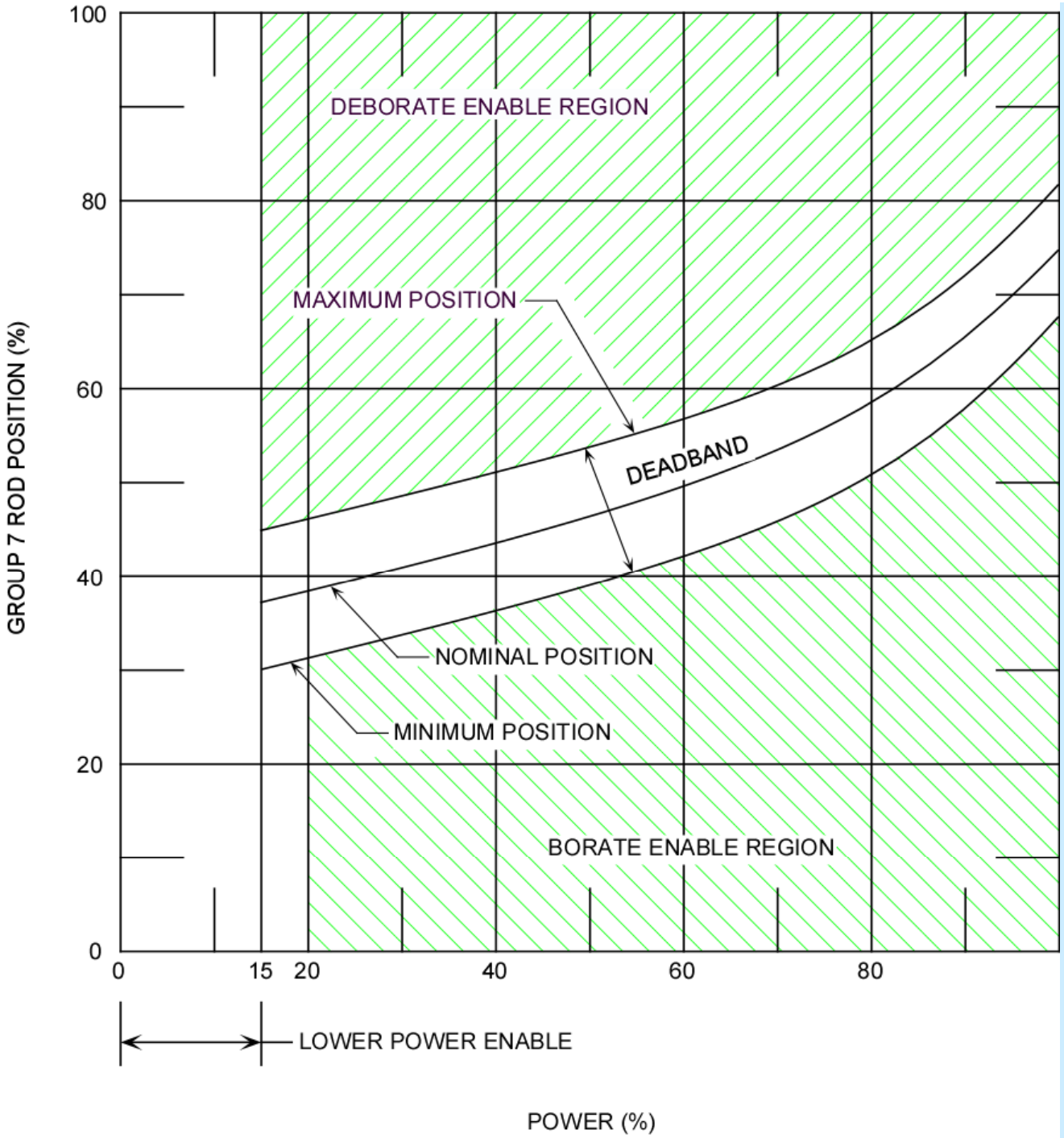
ESFAS



5/2011

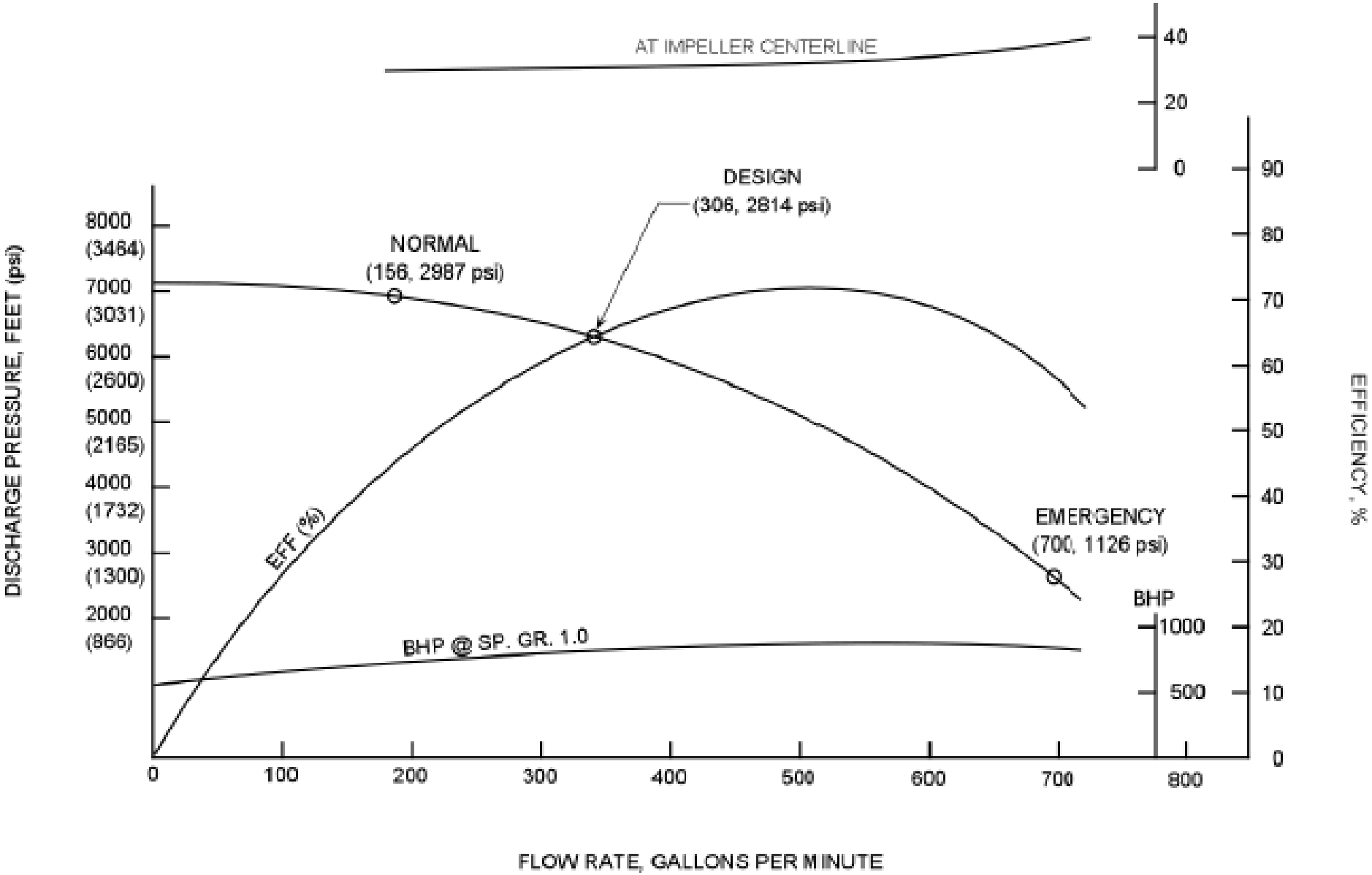
Boron Feed and Bleed Logic Fig. 3-4

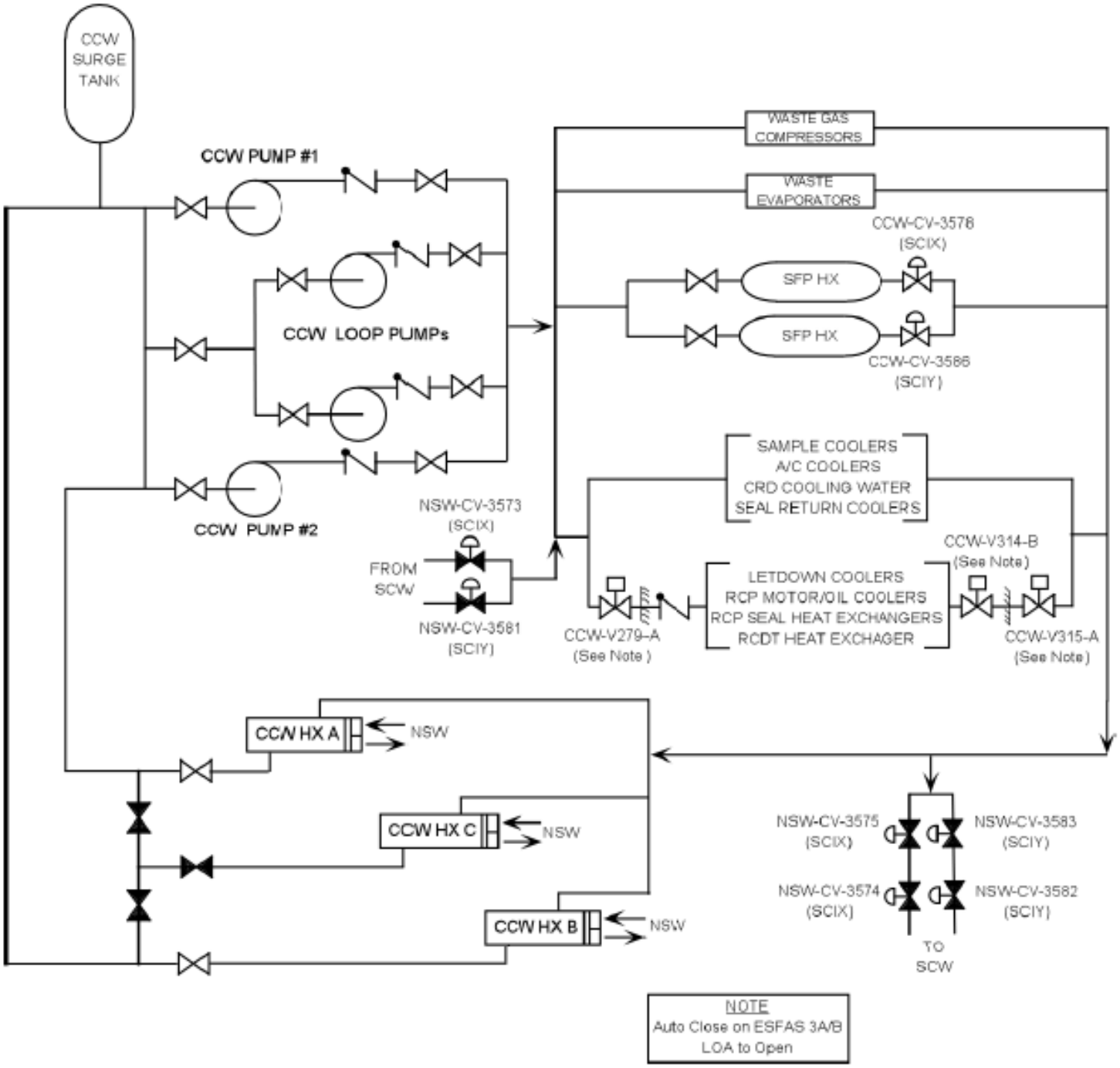




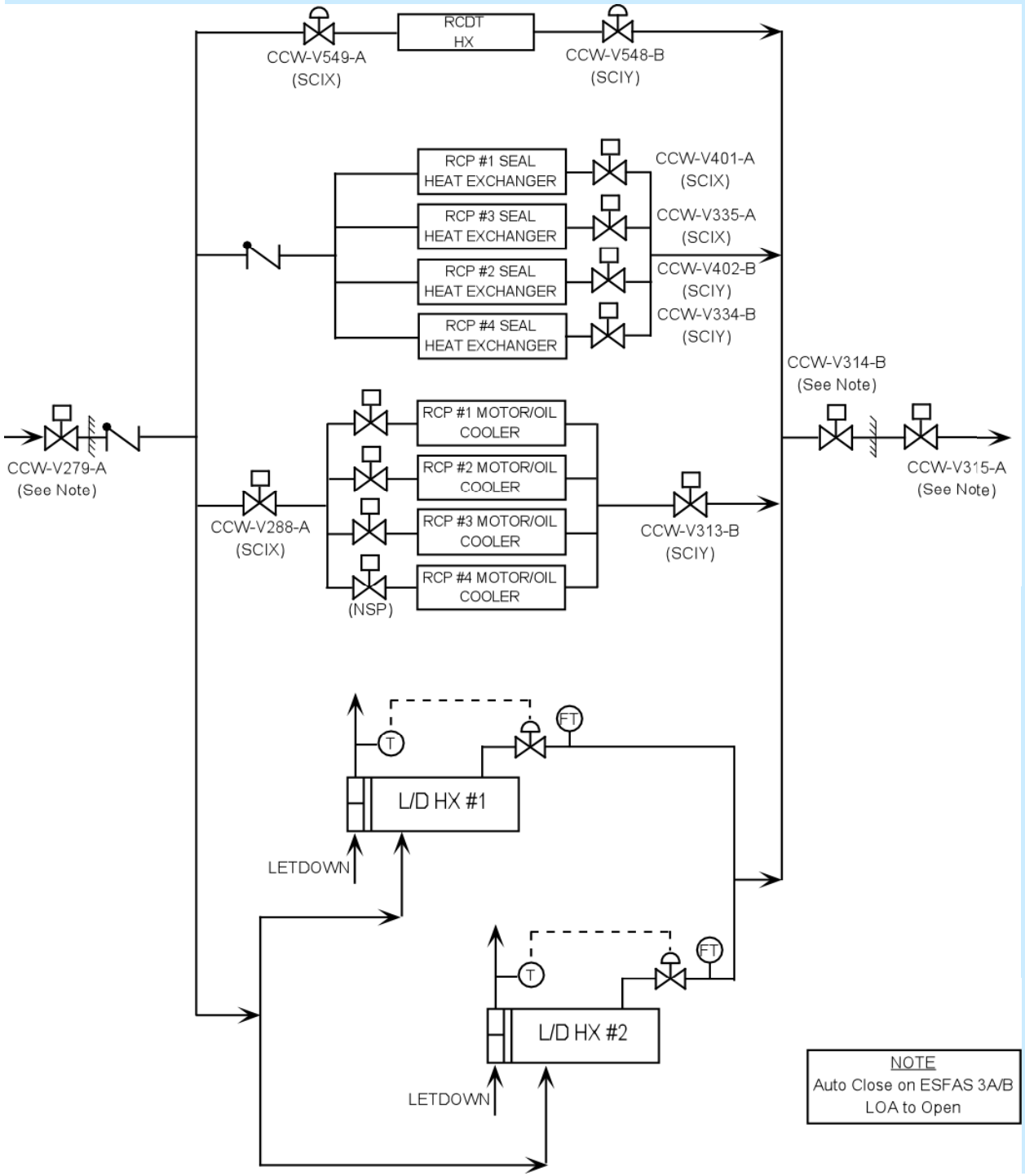
Nominal Control Rod Position vs. Reactor Power
Fig. 3-5

Makeup Pump Characteristic Curve (Fig. 3-6)





Component Cooling Water System
Fig. 3-7



CCW in Containment
Fig. 3-8