

Cooper Nuclear Station

LAR to Reduce Number of TS 3.4.3 Required SRV's



Nuclear Pressure Relief (NPR) System

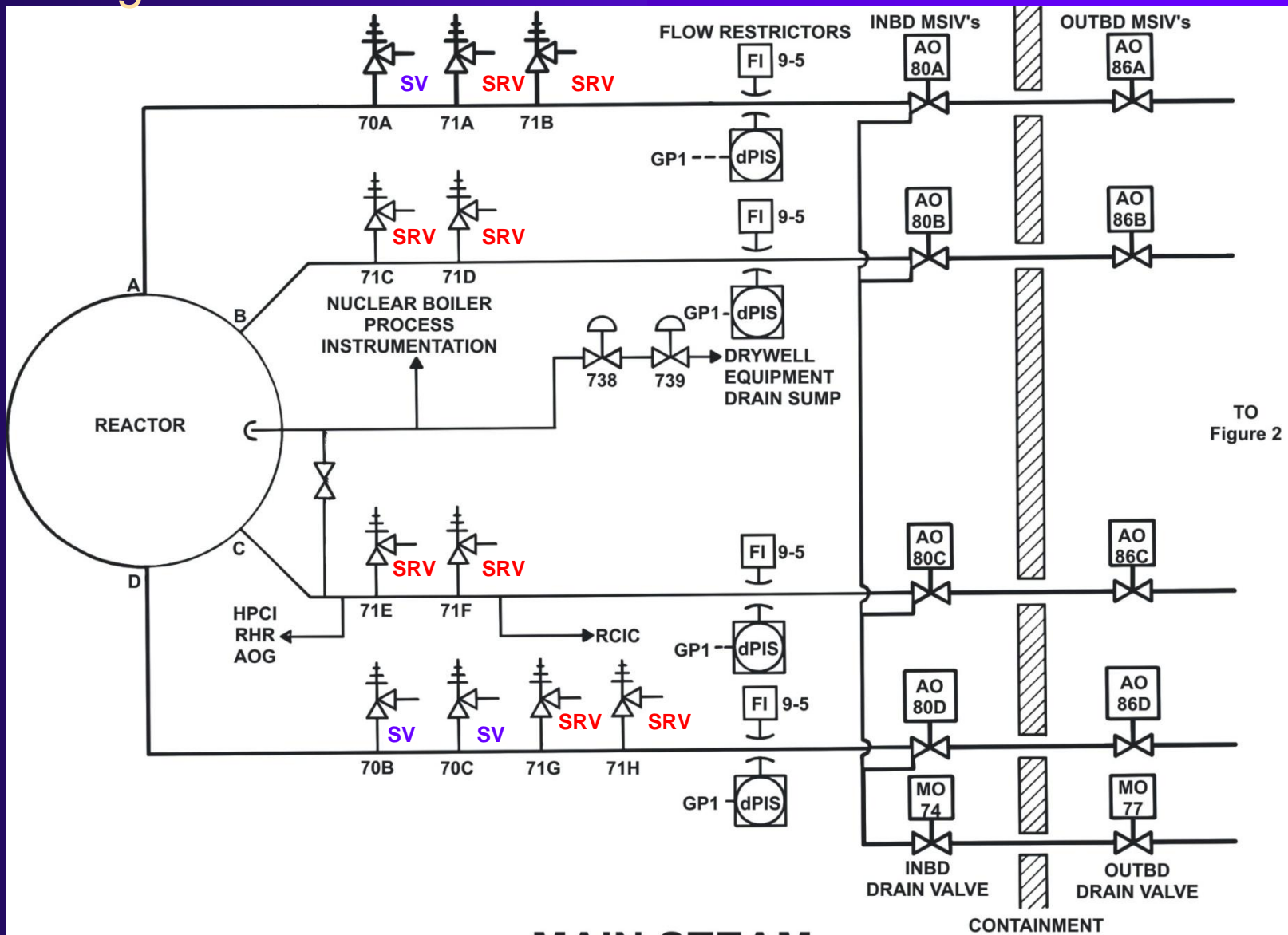
◆ Purpose

- To prevent over pressurization of the Reactor system in order to prevent a failure of the process barrier
- Automatic Depressurization System (ADS) operates as a backup to the High Pressure Coolant Injection (HPCI) System in case of a small line break LOCA
- Low-Low Set Relief Logic (LLS) reduces the number of Safety Relief Valve (SRV) actuations during Reactor isolation events

◆ Components

- Safety valves (3) – *in drywell upstream of Inboard MSIV*
- Safety Relief valves (8) – *in drywell upstream of Inboard MSIV*
- Auto Depressurization System (ADS) logic
- Low-Low Set logic

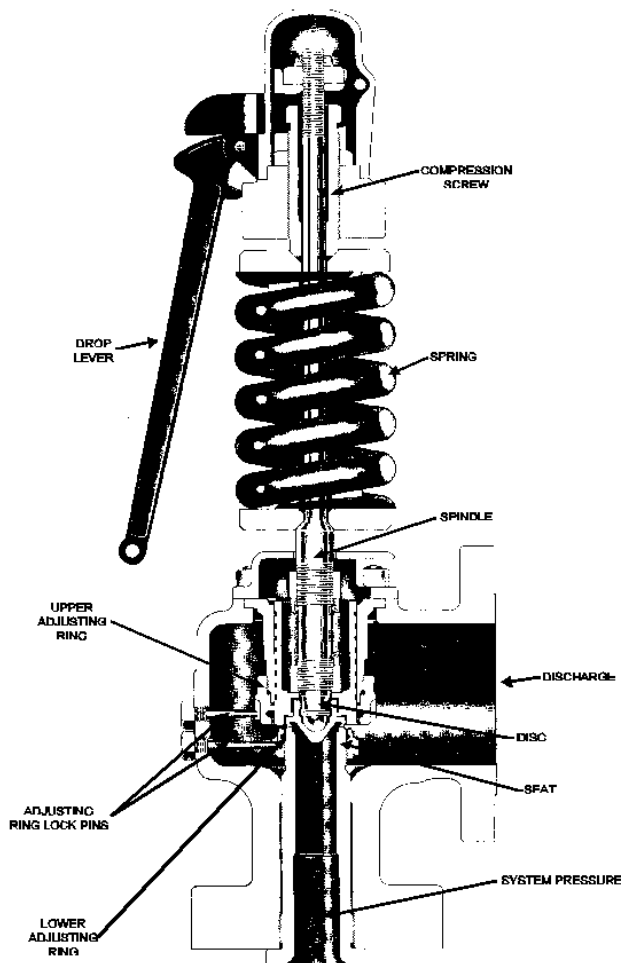
Background



MAIN STEAM
Figure 58, Rev. 1
COR001-28-01

Background

Safety Valve Design



SAFETY VALVE

Figure 2A, Rev. 0

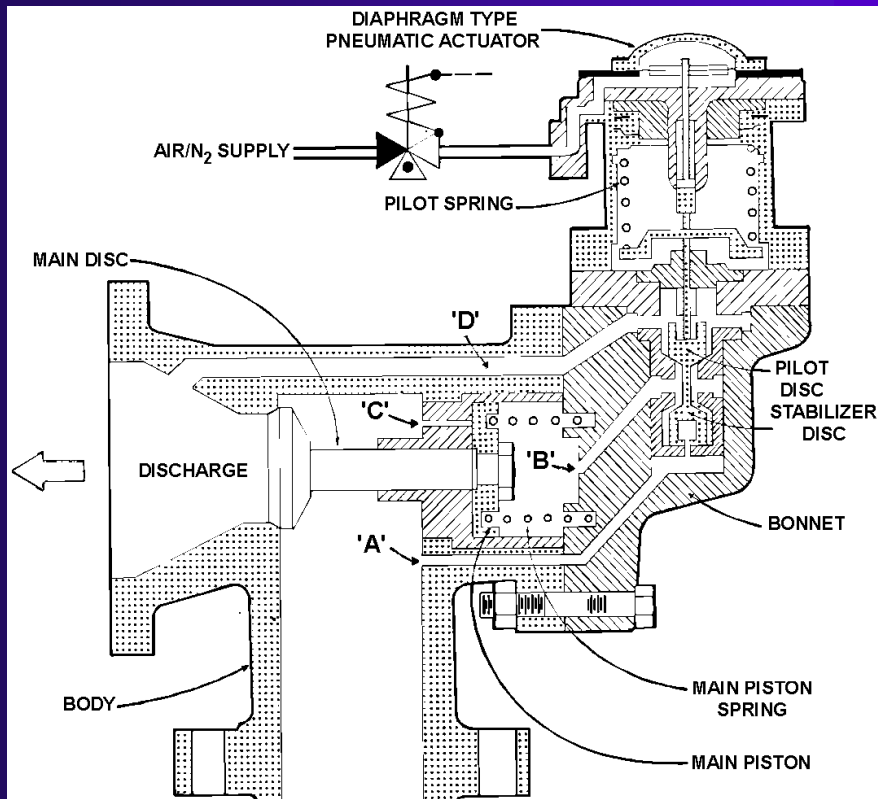
COR002-16

◆ Safety valves

- Provide over pressure protection (OPP) of the Reactor system
- Steam pressure acting against spring pressure
- Discharge directly to the primary containment atmosphere
- Each has a temp detector that indicates in Control Room

Background

Safety Relief Valve Design



SAFETY/RELIEF VALVE

Figure 2, Rev. 5

COR002-16-02

CXA04330

◆ Relief valves

- Steam pressure operation
 - No Operator action needed
 - Allows SRVs to be used with SVs to prevent or limit over-pressure.
- Pneumatic pressure operation
 - Allows manual operation of SRVs from Control Room
 - 6 of 8 SRVs are used by ADS to depressurize RPV for LP ECCS injection
 - Remaining 2 SRVs are used by Low-Low Set logic to open and close at lower pressures than relief mode

1. Why do you need this TS amendment?

- ◆ **LCO 3.4.3 is more restrictive than needed to meet SRV safety & support functions for OPP or ATWS.**
 - If LCO 3.4.3 is relaxed, it would provide the operational flexibility to avoid an unnecessary plant shutdown in the event up to 3 SRVs become inoperable.
 - Analysis results showed that Overpressure Protection (OPP) safety function & Anticipated Transient Without Scram (ATWS) support function will still be met with up to 3 less than full SRV complement.

2. Are all cases and transients analyzed?

- ◆ **The analysis was performed for the Limiting Cases of Accidents and Special Events, i.e. most bounding.**
 - Licensing-Basis OPP identifies the limiting transient to be Main Steam Isolation Valve (MSIV) fast closure followed by high neutron flux scram.
 - The limiting special event for OPP is the ATWS with MSIV closure or pressure regulator fails open (PRFO)

3. How many SRVs are needed for operation as described in design basis calcs?

- ◆ **5 SRVs are needed.**
- ◆ **The GEH Reports provided with the LAR are now the CNS design analysis for the required number of SRVs.**

4. Have these valves caused a plant shutdown in the past?

◆ No

5. How do the SRV's actuate over the full spectrum of transients? Which valves lift at which points?

- ◆ **SVs spring tension is set at 1240 ± 37.2 psig,**
 - 3 to 4% blowdown (approx range = 38 to 50 psig)
 - relieve > 644,543 lb_m/hr each

- ◆ **SRVs spring lift setpoints are:**
 - 3-valves set at **1100 ± 33.0 psig**
 - (RV71A, B and G) capacity > 877,900 lbs/hr each
 - 3-valves set at **1090 ± 32.7 psig**
 - (RV71C, E and H) capacity > 870,000 lbs/hr each
 - 2-valves set at **1080 ± 32.4 psig**
 - (RV71D and F), capacity > 862,100 lbs/hr each

5. How do the SRV's actuate over the full spectrum of transients? Which valves lift at which points? (cont'd)

- ◆ **Low-Low Set (LLS)** mitigates SRV subsequent actuation induced loads by lowering, upon initiation, the opening and closing setpoints of 2 SRVs.

- The LLS pressure setpoints are:

<u>Valve</u>	<u>Open</u>	<u>Close</u>	<u>Blowdown</u>
RV-71 F	1025 psig	875 psig	~150 psig
RV-71 D	1015 psig	875 psig	~140 psig

- ◆ **ADS Logic - 6 of the 8** SRVs (71A, B, C, E, G & H) will open and remain open upon concurrent signals of:
 - Low reactor water level (+3.0"), and
 - Low –Low reactor water level (-113.0"), and
 - CS or RHR pump discharge pressure > 108 psig
 - 109 second time delay relay timed out.

**6. Will human factors affect mitigation of an accident?
In other words, will manual actions be required, and
if so, have human factors been considered.**

- ◆ **No. Manual actions are not required for OPP or ATWS.**
- ◆ **No. Human Factors are not affected, because LCO 3.4.3 only affects the SRV pilot actuated spring function for OPP and ATWS.**

7. How is the Maintenance Rule taken into consideration?

- ◆ **MRFF Evaluations include 2 SRV functions**
 - **MS-F11** - Maintain Reactor Coolant pressure boundary
 - **ADS-PF02** Prevent overpressurization of the Nuclear System (Mechanical Components)
- ◆ **MRFF Considerations**
 - Design functions of SRVs are not being changed
 - MRFF Evals are performed for each failure, no matter how many SRVs are required in TS
 - Since MR became effective, all SRV Bench Tests have been evaluated for MRFF

8. How will reducing the required SRVs affect suppression pool heat load?

- ◆ **Suppression Pool loads are bounded by the CNS LOCA analysis values**

9. Discuss questions #1 and #3 in the No Significant Hazards Consideration.

#1. Do the proposed changes involve a significant increase in the probability or consequences of an accident previously evaluated?

- No change to physical configuration or SRV lift setpoint. Thus, probability of accident is unchanged.
- GEH analysis shows that reducing SRVs from eight to five continues to preserve the safety design bases of nuclear pressure relief system. Therefore, it does not involve a significant increase in consequences of accident previously evaluated.

9. Discuss questions #1 and #3 in the No Significant Hazards Consideration.

#3. Do the proposed changes involve a significant reduction in a margin of safety?

- The safety margins are OPP or ATWS pressure relief margins to the respective Reactor Coolant System Pressure Boundary safety limits, as defined by the ASME Code.
- GEH analysis demonstrates that the safety margin after the change is sufficient to ensure the maximum RPV pressure (and therefore, the steam relief capacity) is within analysis success criteria. Analysis success criteria are below the accident and transient limits. Thus, the margin reduction is not significant. The change does not exceed or alter a design basis or safety limit, and it does not significantly reduce the margin of safety.