9.4.12 Main Steam and Feedwater Valve Room Ventilation System

The main steam and feedwater valve room ventilation system (VRVS) is designed to maintain ventilation and ambient temperatures to allow personnel access for the following areas:

- Main steam valve rooms.
- Feedwater valve rooms.
- Steam generator blowdown valve room.

9.4.12.1 Design Bases

The VRVS performs no safety-related functions and the system is not required to operate during a design basis accident (DBA). The safety and seismic classification of VRVS components is provided in Section 3.2.

For non-safety-related equipment located in the same room with safety-related equipment, the seismic classification for the non-safety-related equipment is described in Section 3.7.3.8 for interaction of Seismic Category I subsystems.

The VRVS is designed to maintain a minimum temperature of 50°F and a maximum temperature of 104°F in the valve rooms for personnel accessibility during normal plant operation and planned shutdowns.

9.4.12.2 System Description

9.4.12.2.1 General Description

A simplified diagram of the VRVS for divisions 1, 2, 3 and 4, is shown in Figure 9.4.12-1—Main Steam and Feedwater Valve Room Ventilation System.

The room air flow rates are calculated based on the heat released by operating equipment, lighting, external loads, and heat loads from adjacent rooms.

The recirculation cooling unit for each valve room is comprised of the following components:

- Recirculation ductwork to supply and extract air to and from the rooms.
- Cooling coils connected to operational chilled water system.
- Moisture separator.
- Recirculation fan.

The room hot air is recirculated by the recirculation fan through the air inlet duct and cooling coils. The cool air is supplied back to the room through the air outlet duct. Electric heaters are located in each room to maintain the minimum room temperature during normal operations.

9.4.12.2.2 Component Description

The major components of the VRVS, along with their applicable codes and standards, are described in the following paragraphs. Table 3.2.2-1 provides the seismic design and other design classifications for components in the VRVS.

Ductwork

The supply and exhaust air ducts are constructed of sheet steel and are structurally designed for the fan shutoff pressure. The ductwork meets the design, testing and construction requirements per ASME AG-1 (Reference 1).

Recirculation Cooling Units

The recirculation cooling units consist of a fan section and a water cooling section. The condensate from the cooling section is directed to the drain system. The cooling coils are designed in accordance with Reference 1.

Fans

The recirculation fans are centrifugal or vane-axial design with electrical motor driver. Fan performance is rated in accordance with ANSI/AMCA-210 (Reference 2), ANSI/ AMCA-211-1987 (Reference 3), and ANSI/AMCA-300 (Reference 4).

Electric Heater

The electric heaters have tubular sheathed elements arranged in a housing.

9.4.12.2.3 System Operation

Normal Plant Operation

The VRVS operates during normal operation and shutdown conditions. Recirculation cooling units for each valve room operate automatically. Room air is recirculated through the cooling units to maintain an acceptable room temperature. Operation of the recirculation fans is controlled by room temperature sensors. The recirculation cooling units start automatically when the room temperature exceeds 100°F, and stop when the temperature falls below 91°F.

Electric heater operation is controlled by room temperature sensors. Unit heaters start automatically when the room temperature drops below the temperature setpoint.

Abnormal Operating Conditions

Failure of Recirculation Cooling Units

In case of loss of a recirculation cooling unit for a specific room, equipment function will not be affected since the equipment is designed for higher temperatures. A high temperature alarm is generated in the main control room (MCR) for operator action.

Failure of Electric Heaters

Redundant heaters are provided in each of the main steam valve rooms. If a heater fails, the redundant heater in the room will operate to maintain the temperature above the minimum value of 50°F.

Redundant heaters are not provided in the feedwater valve rooms and the steam generator blowdown valve room. If a heater fails in a one of these rooms, equipment function will not be affected since the equipment is designed for lower temperatures. A low temperature alarm is generated in the MCR for operator action.

Loss of Offsite Power

Recirculation cooling units and electric heaters for the valve rooms are not provided with emergency power; these components will not operate during loss of offsite power (LOOP). The operation of these components is not required for equipment operability in these rooms.

Station Blackout

Recirculation cooling units and electric heaters for valve rooms are not supplied from the alternate alternating current (AAC) source; therefore these components will not operate during a station blackout (SBO). The operation of these components is not required for equipment operability in these rooms.

9.4.12.3 Safety Evaluation

The operation of VRVS is not required for the safe shutdown of the plant or for mitigating the consequences of a DBA; therefore the system has no safety-related function.

9.4.12.4 Inspection and Testing Requirements

The VRVS major components, such as motors, fans, coils, and ducts are located to provide access for initial and periodic testing to verify their integrity.

Initial in-place acceptance testing of the VRVS is performed as described in Section 14.2 (test abstracts #089 and #203), Initial Plant Test Program, to verify the system is built in accordance with applicable programs and specifications.

During normal plant operation, periodic testing of VRVS is performed to demonstrate system and component operability and integrity.

Fans are tested by the manufacturer in accordance with Air Movement and Control Association (AMCA) standards (References 2, 3, and 4). Cooling coils are hydrostatically tested and their performance is rated in accordance with the Air Conditioning and Refrigeration Institute (ARI) standards (Reference 5).

Housings and ductwork are leak-tested in accordance with the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) technical manual "HVAC Air Duct Leakage Test Manual" (Reference 6).

Periodic testing and inspections identify systems and components requiring corrective maintenance, and plant maintenance programs correct deficiencies.

9.4.12.5 Instrumentation Requirements

Indication of the operational status of the equipment, instrument indications and alarms are provided in the MCR. Fans, heaters and cooling units are operable from the MCR. Local instruments are provided to measure flow, temperature and pressure. The fire detection and sensors information is delivered to the fire detection system.

9.4.12.6 References

1. ASME AG-1, “Code on Nuclear Air and Gas Treatment,” The American Society of Mechanical Engineers, 1997 (including the AG-1a-2000, “Housings,” Addenda).

2. ANSI/AMCA-210-99, “Laboratory Methods of Testing Fans for Aerodynamic Performance Rating,” American National Standards Institute/Air Movement and Control Association International, December 1999.

3. ANSI/AMCA-211-1987, “Certified Ratings Program–Air Performance,” American National Standards Institute/Air Movement and Control Association International, 1987.

4. ANSI/AMCA-300-1985, “Reverberant Room Method of Testing Fans for Rating Purposes,” American National Standards Institute/Air Movement and Control Association International, 1985.

5. ANSI/ ARI Standard 410-2001, "Forced-Circulation Air-Cooling and Air-Heating Coils," Air Conditioning and Refrigeration Institute, 2001.

6. HVAC Air Duct Leakage Test Manual," Sheet Metal and Air Conditioning Contractors' National Association, 1985.

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