

9.4.10 Switchgear Building Ventilation System

The switchgear building ventilation system (SGBVS) provides ventilation to the station blackout diesel generator (SBODG) divisions 1 and 2 located inside the Switchgear Building, including the diesel hall, fuel tank room, and associated electrical rooms. The SGBVS is available to operate during all plant operating conditions, and provides ventilation to remove heat generated by the SBODGs and associated electrical equipment when in operation. During normal operation, the SBODGs are in standby.

9.4.10.1 Design Bases

The SGBVS does not perform any safety-related function. All components of the SGBVS are non-safety related and Non-Seismic. The SBODGs are required only for beyond design basis events (BDBEs).

The SGBVS maintains acceptable ambient temperatures and air renewals in the station blackout (SBO) divisions to support operation of the SBODGs and associated electrical equipment which provide an onsite alternate AC (AAC) emergency power source to achieve and maintain the plant in a safe shutdown condition following a BDBE (refer to Section 8.4). The SGBVS maintains the following ambient conditions inside the SBO diesel divisions:

- Diesel hall and fuel tank room:
 - 50°F to 115°F.
 - No humidity control.
- Electric room:
 - 59°F to 95°F.
 - 35 to 70 percent humidity.

9.4.10.2 System Description

9.4.10.2.1 General Description

The SGBVS includes ventilation of the SBODG divisions 1 and 2. Each division has its own independent and identical heating, ventilation and air conditioning (HVAC) system. The SGBVS provides ventilation of the diesel hall, fuel tank room, and associated electrical rooms using outside air as the cooling medium.

The SGBVS consists of following subsystems for each SBODG division:

- Ventilation of diesel hall and fuel tank room.

- Ventilation of electrical rooms.

Ventilation of Diesel Hall and Fuel Tank Room

The outside air is drawn to the SBODG division through an air intake screen and grill, which prevents large objects from entering the air intake. The screen and grill are heated during cold weather to prevent ice buildup. The outside air is supplied through supply fans which are designed to provide the required air delivery flow rates. During winter conditions, when the SBODGs are not in operation, the air in the diesel hall is recirculated through the electric fan heaters to maintain the required minimum temperature. The exhaust air from the diesel hall and fuel tank room is exhausted outside the building.

Ventilation of Electrical Room

The inlet air supply for the electrical room is drawn from a common air supply shared with the diesel hall. The inlet air is then directed through an air conditioning unit. The conditioned air is supplied to the electrical room. The electric heaters increase the supply air temperature during cold weather conditions. The exhaust air from the electrical room is recirculated back through the air conditioning unit.

9.4.10.2.2 Component Description

The major components of the SGBVS are listed as follows, along with the applicable codes and standards. Refer to Section 3.2 for the seismic and system quality group classification of these components.

Ductwork and Accessories

The supply and exhaust air ducts are constructed of galvanized sheet steel and are structurally designed for fan shutoff pressures. The ductwork meets the design, testing and construction specifications of ASME AG-1-2003 (Reference 1).

Electric Heaters

The electric heaters are installed to maintain room ambient conditions, which are controlled by local room temperature sensors. The electric heaters are designed to commercial standards.

Prefilters

The prefilters are located upstream of the fans to prevent large particles from entering the system. The prefilters meet the specifications of ANSI/ASHRAE Standard 52.2-1999 (Reference 2).

Fans

The supply and exhaust fans include electric motor drivers. Fan performance is rated in accordance with ANSI/AMCA-210-99 (Reference 3), ANSI/AMCA-211-1987 (Reference 4), and ANSI/AMCA-300-1985 (Reference 5).

Isolation dampers

Manual dampers are adjusted during initial plant testing to establish accurate flow balance between the rooms. The motor-operated dampers fail to “close” or “open” position in case of power loss, depending on the safety function of the dampers. The performance and testing requirements of the dampers are per Reference 1.

Fire Dampers

Fire dampers are installed where ductwork penetrates a fire barrier. Fire damper design meets the requirements of UL 555 (Reference 6) and the damper fire rating is commensurate with the fire rating of the barrier penetrated.

Cooling Coils

The cooling coils are installed in the supply train for cooling the electrical room. The cooling coils are designed in accordance with Reference 1. A packaged chiller provides a cooling medium of cold water to the cooling coils.

Humidifiers

Humidifiers are installed to maintain ambient humidity conditions in the electrical room. Humidity levels are controlled by the humidity sensors in the room.

9.4.10.2.3 System Operation

Normal Plant Operation

The SGBVS maintains the required ambient conditions in the diesel hall, fuel tank room and electrical room of each of the SBODG divisions, 1 and 2. During normal plant operation, the SBODGs are in standby. However, outside air is supplied to the diesel hall to prepare for startup of the SBODGs and for personnel comfort. During cold weather conditions, the fan heaters are available to maintain the required minimum temperature. When the SBODGs are in operation, the exhaust air removes the excess heat generated in the diesel hall.

The electrical components are located in a separate room that has a separate air supply train. The electrical room air supply provides conditioned air to maintain the required ambient temperature and humidity. The outside air is mixed with the recycled air from the electrical room, and the mixed air is then processed through the air

conditioning train. The mixed air supply temperature and humidity are maintained by the electrical heater, cooling coils, and humidifier located in the air conditioning train.

The exhaust air is discharged through the duct to an exhaust fan, then exhausted from the Switchgear Building. Air renewals for the electrical room, diesel hall, and fuel tank room are maintained as needed to obtain the required ambient temperatures.

Fire dampers are located in the ventilation system to avoid fire propagation within the SBODG divisions. These rooms are completely isolated from each other in case of a fire in an individual room. Fire is detected by a fire alarm system, which automatically closes the corresponding fire damper.

Abnormal Operating Conditions

Failure of a Component

If one or more components of the SBODG division fail, the SGBVS is not able to maintain the required ambient conditions in the affected SBO diesel division. Because there are two redundant divisions, the failure of a component in one division does not affect the other division.

Station Blackout

In the event of SBO, the SBODGs are started. Each of the two SGBVS divisions receives power from its associated SBODG.

9.4.10.3 Safety Evaluation

There are no safety-related components for the SGBVS. The SBODGs are required only for BDBEs.

9.4.10.4 Inspection and Testing Requirements

Refer to Section 14.2 (test abstract #086) for initial plant startup test program.

9.4.10.5 Instrumentation Requirements

Indication of the operational status of the equipment, position of dampers, instrument indications and alarms are provided in the main control room (MCR). Fans, motor-operated dampers, heaters and cooling units are operable from the MCR. Local instruments are provided to measure differential pressure across filters, flow, temperature and pressure. The fire detection and sensors information is delivered to the fire detection system.

9.4.10.6**References**

1. ASME AG-1-2003, "Code on Nuclear Air and Gas Treatment," The American Society of Mechanical Engineers, 2003 [including the AG-1a, 2004 Addenda].
2. ANSI/ASHRAE Standard 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size," ANSI/American Society of Heating, Refrigerating and Air Conditioning Engineers, 1999.
3. ANSI/AMCA-210-99, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating," American National Standards Institute/AMCA, December 1999.
4. ANSI/AMCA-211-1987, "Certified Ratings Program—Air Performance," American National Standards Institute/AMCA, 1987.
5. ANSI/AMCA-300-1985, "Reverberant Room Method of Testing Fans for Rating Purposes," American National Standards Institute/AMCA, 1985.
6. UL 555, "Standard for Fire Dampers," Underwriter's Laboratories, Sixth Edition, June 1999.