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1.2.6 Receipt Facility

[NUREG-1804, Section 2.1.1.2.3: AC 1, AC 2, AC 6; Section 2.1.1.6.3: AC 1, AC 2; Section 2.1.1.7.3.1: AC 1; Section 2.1.1.7.3.2: AC 1; Section 2.1.1.7.3.3(I): AC 1, AC 2, AC 4; HLWRS-ISG-02 Section 2.1.1.2.3: AC 2]

The design and operation of the Receipt Facility (RF) and the systems within the facility are described in this section. Information specific to the generic features of structural design, mechanical handling design, and heating, ventilation, and air-conditioning (HVAC) design, is provided in Sections 1.2.2.1, 1.2.2.2, and 1.2.2.3. Information related to the electrical power, controls and monitoring, fire protection, plant services, and waste management is provided in Sections 1.4.1 to 1.4.5, respectively. The methodologies for shielding and nuclear criticality design are addressed in Sections 1.10.3 and 1.14, respectively. Logic diagrams for structures, systems, and components (SSCs) that are important to safety (ITS) used in facilities, including the RF, are provided in Section 1.2.4.2 where the discussion of the ITS equipment is addressed.

ITS SSCs in the mechanical handling system that are used in handling facilities, including the RF, are discussed in Section 1.2.4.2. Table 1.2.6-1 lists the non-ITS mechanical handling SSCs used in the RF, which are similar to those in other handling facilities. RF-specific non-ITS SSCs in the mechanical handling system are summarized in Table 1.2.6-2. Non-ITS SSCs in the mechanical handling system that are used in handling facilities, including the RF, are described in Table 1.2.4-1.

1.2.6.1 Receipt Facility Description

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2, AC 6; Section 2.1.1.6.3: AC 1(2)(e), (2)(h), AC 2(2); Section 2.1.1.7.3.1: AC 1(1), (2), (3), (5), (6), (9); Section 2.1.1.7.3.2: AC 1(1), (2); Section 2.1.1.7.3.3(I): AC 1(1), AC 2(1), (2), (3), AC 4(1)]

1.2.6.1.1 Facility Description

The RF provides the facility as well as necessary utilities and support systems to perform the following functions:

- Receive rail-based transportation casks containing commercial spent nuclear fuel (SNF) in transportation, aging, and disposal (TAD) canisters or dual-purpose canisters (DPCs).
- Prepare the transportation casks for unloading by removing impact limiters, inspecting, upending and removing casks from their conveyances, gas sampling, and unbolting the cask lid(s). For transportation casks containing vertically handled DPCs, the RF installs the DPC lifting fixture to the DPC lid.
- Transfer the TAD canisters from transportation casks to aging overpacks for movement to a Canister Receipt and Closure Facility (CRCF) or to the Aging Facility.
- Transfer vertically handled DPCs from transportation casks to aging overpacks for movement to the Wet Handling Facility (WHF) or to the Aging Facility.

- Transfer transportation casks containing horizontally handled DPCs to cask transfer trailers so they can be moved to the horizontal aging modules at the Aging Facility.
- Replace the lid(s) on the unloaded transportation casks. The transportation casks are inspected, surveyed, and decontaminated prior to leaving the facility.
- Install and fasten lids on the loaded aging overpacks.
- Conduct maintenance, radiological surveys, minor decontamination, and low-level radioactive waste collection, as required.
- Confine and control the radioactive waste sources during normal operations, off-normal operations, and event sequences.
- Control radiation exposure, temperature, human access, prevent criticality, and mitigate identified hazards.
- Provide adequate shielding.
- Monitor the facility operations and performance to ensure the health and safety of workers and the public.
- Withstand the effects of natural phenomena and nearby military and industrial hazards.

The RF is an ITS surface structure that is located between the CRCF 1 and CRCF 2 facilities northeast of the North Portal of the repository. The RF is physically separated from other surface buildings to isolate it from interactions with the other facilities during a seismic event. The location of the RF relative to the other surface facilities is shown in [Figures 1.2.1-1 and 1.2.1-2](#). The RF is located such that it is protected from external flooding as shown in [Figure 1.2.2-7](#). The distance of the geologic repository operations area facilities from the site boundary is shown in [Figure 1.1-1](#).

The RF is a reinforced concrete structure made of noncombustible materials with interior and exterior shear walls, concrete floor and roof slab diaphragms, and concrete mat foundation. The overall footprint of the RF is approximately 315 ft wide by 318 ft long. The ITS portion of the structure is approximately 200 ft wide by 240 ft long. The maximum height of the building is 100 ft above grade with other roofs 72 ft and 64 ft above grade. General arrangement floor plans for the various floors for the RF and the associated legend are shown in [Figures 1.2.6-1 to 1.2.6-4](#). The roof plan is shown in [Figure 1.2.6-5](#). Cross-section views of the facility are shown in [Figures 1.2.6-6 to 1.2.6-11](#). The ITS and non-ITS areas of the RF are shown on [Figure 1.2.6-2](#). Room or area numbers corresponding to the figures are given in parentheses to aid in understanding the location where processes are performed or where major equipment is located.

The foundation for the RF is a reinforced concrete mat having the necessary thickness to adequately support the superstructure. The foundation mat for the RF structure is 7 ft thick. The superstructure consists of 4 ft thick exterior and interior concrete walls. The internal shielded rooms are also made up of 4 ft thick concrete walls and slabs. Other elevated floor diaphragm slabs are generally 1 ft 6 in. thick.

The RF is designed to withstand the design basis ground motion (DBGM)-2 seismic event. The loads associated with the various cask and canister handling equipment are supported from the RF interior walls and slabs and then transferred to the foundation. The cask transfer trolley, site transporter, and cask transfer trailers are supported directly by the basemat foundation for the RF building.

Ancillary areas of the facility that are not categorized as ITS are constructed on separate slabs on grade using lighter concrete construction and/or insulated metal panels on steel framing. These ancillary areas/rooms are attached to, but fall outside, the footprint of the main RF structure. The mat foundations for the RF ancillary area non-ITS structures are reinforced concrete mats to adequately support the superstructures. The non-ITS portions of the RF will not compromise the integrity of the RF ITS structure in a DBGM-2 event.

The RF is divided into areas for handling operations and areas to support these activities. Handling activities are performed in the following areas: cask preparation room (Room 1017), cask unloading room (Room 1015), loading room (Room 1013), canister transfer room (Room 2007), site transporter vestibule (Room 1001), lid bolting room (Room 1002), and the transportation cask vestibule and vestibule annex (Rooms 1021A and 1021). The handling support areas include equipment rooms (Rooms 1215 and 1224), HVAC rooms (Rooms 1004, 1004A, 1019, 1019A, 2003, 2004, 2006, 2008, 2009, 2010, and 2011), the gas sampling room (Room 1223), electrical and battery rooms (Rooms 1005, 1005A, 1018, 1018A, 1020, and 1020A), maintenance room (Room 1014), the canister transfer machine maintenance room (Room 1016), the facility operations room (Room 1207) and communications room (Room 1208).

The radiation/radiological monitoring system provides for monitoring of dose rates and airborne radioactivity levels in the RF, as described in [Section 1.4.2](#). For airborne radioactivity monitoring, the system includes continuous air monitors and effluent monitors. The system includes area radiation monitors that measure gamma and neutron radiation levels. The system instruments include local alarms that provide audible and visible warnings. The system and alarms are monitored in the facility operations room and the Central Control Center.

The RF is designed to provide radiation protection to workers, the public, and the environment, and minimize occupational exposure in accordance with as low as is reasonably achievable dose principles. Features for minimization and control of radioactive contamination within the RF are incorporated into the design. Shielded work areas, as required, are incorporated into the design. [Section 1.10](#) addresses the design features to reduce occupational exposures to repository workers.

Interlocks on shield doors are provided to ensure that workers cannot be inadvertently exposed to high radiation.

Major mechanical handling equipment in the RF includes cranes, cask transfer trolley, canister transfer machine, and associated lifting fixtures and devices.

An overview of major areas within the RF is provided below.

1.2.6.1.1.1 Cask Receipt Area

1.2.6.1.1.1.1 Transportation Cask Vestibule and Annex (Rooms 1021 and 1021A)

The purpose of the transportation cask vestibule is to provide a receiving area for the railcar and transportation cask and the cask transfer trailer prior to entry into or leaving the cask preparation room. It provides environmental separation between the preparation area and the outside environment. The vestibule enables the cask preparation room to remain isolated from the outside environment when its receipt door is open.

1.2.6.1.1.1.2 Site Transporter Vestibule (Room 1001)

The site transporter vestibule serves as a staging area for the site transporter with an aging overpack. It also provides the environmental separation between the outside environment and the RF. This area also provides direct site transporter access for the delivery and removal of aging overpacks. The site transporter vestibule provides a receiving area for the site transporter containing an aging overpack prior to entry into or leaving the lid bolting room.

The site transporter vestibule is located on the north side of the building. Empty aging overpacks are moved into the site transporter vestibule from the outside, and loaded overpacks are moved in from the lid bolting room and transported out to their destinations.

1.2.6.1.1.2 Cask Preparation Room (Room 1017) and Annex (Room 1017A)

The cask preparation area is used to receive transportation casks, prepare them for canister unloading, and export the unloaded casks. Transportation casks are received in this area via railcar. The cask preparation room is equipped with a 200-ton bridge crane with a 20-ton auxiliary hoist; a cask tilting frame to upend certain transportation casks; a cask stand to temporarily place certain casks while removing impact limiters or installing lift trunnions; a cask transfer trolley to move casks into the cask unloading room; a mobile access platform to gain access to the transportation casks on the railcar; and a mobile lift to access cask operations on the cask stand and railcar, and stands for yokes, and transportation cask lids. The crane rails are supported by corbels cast into the concrete walls.

1.2.6.1.1.3 Cask Unloading Room (Room 1015) and Loading Room (Room 1013)

The cask unloading room and the loading room shield operating personnel in other rooms of the facility from radiation during canister transfer. The cask unloading room and loading room are located on the ground floor immediately below the canister transfer room. Transportation casks are moved from the cask preparation room to the cask unloading room on the cask transfer trolley. An empty aging overpack on a site transporter is positioned in the loading room.

1.2.6.1.1.4 Canister Transfer Room (Room 2007)

The canister transfer room is located on the second floor; the associated loading and unloading rooms and maintenance access room are located on the ground floor, directly below the canister transfer room. The canister transfer room is equipped with a canister transfer machine and shielded

slide gates in the floor of the canister transfer room. The canister transfer machine extracts the TAD canister or DPC from the transportation cask through a cask port in the ceiling of the cask unloading room. The canister transfer machine then inserts the removed TAD canister or DPC into the aging overpack through a loading port in the loading room ceiling.

1.2.6.1.1.5 Lid Bolting Room (Room 1002)

The lid bolting room has two purposes: (1) to receive and prepare unloaded aging overpacks and (2) to prepare loaded aging overpacks for export. Aging overpack lid bolts are removed and installed in the lid bolting room. The site transporter moves unloaded overpacks into the lid bolting room from the site transporter vestibule and moves loaded overpacks into the lid bolting room from the loading room. The room is equipped with a 10-ton bridge crane.

1.2.6.1.2 Operational Processes

Figure 1.2.6-12 illustrates the operational sequences and material flow paths through the RF. Figure 1.2.6-13 shows the inventory of waste forms in the RF at any one time. Figure 1.2.6-14 illustrates the major waste handling functions performed in the RF.

The major operational waste handling functions are summarized in the following sections.

1.2.6.1.2.1 Cask Handling

The transportation cask vestibule receives railcars carrying transportation casks containing TAD canisters or DPCs. In the cask preparation room, the transportation cask impact limiters are removed and the lifting trunnions are installed, as required. The cask transfer trolley is configured with the appropriate pedestal for the transportation cask, which is upended by the cask handling crane and moved into the trolley. Once the transportation cask is secured to the cask transfer trolley, the trolley is moved under the cask preparation platform, the cask cavity is sampled and depressurized, and the transportation cask lid bolts are removed. If the cask lid is not equipped with a lid lifting fixture, a fixture is installed. The cask transfer trolley is then moved to the cask unloading room.

For casks containing DPCs, the cask lid is removed and a canister lifting adapter is installed on the DPC. This operation is not required for casks containing TAD canisters because TAD canisters have an integral lifting feature. The cask transfer trolley is then used to move the cask into the cask unloading room and position it below the cask port.

In situations involving horizontal DPC casks, the horizontal lift and transfer option (of the cask only without impact limiters) is used to transfer horizontal DPC casks to the cask transfer trailer. Casks transferred to the cask transfer trailer are removed from the RF, and thereafter the DPC is transferred to a horizontal aging module at the Aging Facility as described in Section 1.2.7. If CRCF 1 were to become operational before the RF, CRCF 1 would have the capability of transferring horizontal DPC casks to the horizontal cask transfer trailer.

Aging overpacks are prepared to receive canisters transferred from loaded transportation casks. Typical preparation includes positioning the aging overpack and unbolting the closure lid.

The cask transfer trolley returns the unloaded transportation cask to the cask preparation area. After determining that the exterior of the transportation cask satisfies the requirements to return it to the transportation system, it is reassembled according to operating procedures and returned to its railcar.

Before departing the RF, the exterior surfaces of aging overpacks are surveyed for the presence of nonfixed contamination. Excessive nonfixed contamination is removed using hand wipes. Then, with the outer vestibule door closed, the inner vestibule door is opened. The site transporter exits the facility into the vestibule and the inner door is closed behind it. The outer vestibule door is opened and the site transporter exits the RF.

1.2.6.1.2.2 Canister Transfer

Canister transfer operations in the RF occur in the cask unloading room, canister transfer room, and the loading room. Canister transfer operations are performed in the canister transfer room using a canister transfer machine.

The canister transfer machine is moved to the cask port above the cask unloading room, the shield skirt is lowered, and the canister transfer machine slide gate and cask port slide gate are opened. The cask lid is then removed. The canister guide sleeve is lowered, the TAD canister or DPC is lifted into the canister transfer machine, the canister guide sleeve is raised, the canister transfer machine and cask port slide gates are closed, and the shield skirt is raised. The loaded canister transfer machine moves to the aging overpack port. Once the shield skirt is lowered, the canister transfer machine and aging overpack port slide gates are opened, the canister guide sleeve is lowered, and the canister is lowered into the aging overpack, which has been previously positioned below the aging overpack port with its lid removed. The canister guide sleeve is raised, the canister transfer machine and aging overpack port slide gates are closed, and the shield skirt is raised. The canister transfer machine then replaces the lids on the loaded aging overpack and the unloaded transportation cask, or the lid is replaced on the unloaded transportation cask in the cask preparation room.

1.2.6.1.3 Safety Category Classification

The overall RF is classified as ITS. The portions of the RF structure that do not contain ITS SSCs are classified as non-ITS. The ITS structure provides protection of SSCs from internal and external hazards.

The RF is designed such that the failures of portions, parts, subparts, or subsystems of non-ITS SSCs cannot adversely interact with an ITS SSC and prevent the safety function from being performed.

1.2.6.1.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

There are no procedural safety controls for the structural features of the RF.

1.2.6.1.5 Design Bases and Design Criteria

The nuclear safety design bases for ITS and important-to-waste-isolation (ITWI) SSCs and features are derived from the preclosure safety analysis presented in [Sections 1.6](#) through [1.9](#) and the

postclosure performance assessment presented in [Sections 2.1](#) through [2.4](#). The nuclear safety design bases identify the safety functions to be performed and the controlling parameters with values or ranges of values that bound the design.

The quantitative assessment of event sequences, including the evaluation of component reliability and the effects of operator action, is developed in [Section 1.7](#). SSCs or procedural safety controls appearing in an event sequence with a prevention or mitigation safety function are described in the applicable design section of the SAR.

[Section 1.9](#) describes the methodology for safety classification of SSCs and features of the repository. The tables in [Section 1.9](#) present the safety classification of the SSCs and features. These tables also list the preclosure and postclosure nuclear safety design bases for each structure, system, or major component.

To demonstrate the relationship between the nuclear safety design bases and the design criteria for the repository SSCs and features, the nuclear safety design bases are repeated in the appropriate SAR sections for each individual ITS/ITWI SSC or feature that performs a safety function. The design criteria are characteristics of the ITS/ITWI SSCs or features that are utilized to implement the assigned safety functions.

The nuclear safety design bases and their relationship to design criteria for the RF structure and the ITS/ITWI SSCs contained in the RF are provided in [Table 1.2.6-3](#).

1.2.6.1.6 Design Methodologies

The design methodologies for the RF structure are in accordance with codes and standards provided in [Section 1.2.2.1](#).

1.2.6.1.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of the RF structure are in accordance with codes and standards provided in [Section 1.2.2.1](#).

1.2.6.1.8 Design Codes and Standards

The principal codes and standards applicable to the RF structure are provided in [Table 1.2.2-12](#).

1.2.6.1.9 Design Load Combinations

The design load combinations for the RF structure are in accordance with codes and standards provided in [Section 1.2.2.1](#). These design load combinations are applicable to steel and reinforced concrete structures.

1.2.6.2 Mechanical Handling System

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2, AC 6; Section 2.1.1.6.3: AC 1(2)(h), AC 2(2); Section 2.1.1.7.3.1: AC 1(1), (2), (3), (5), (6), (9); Section 2.1.1.7.3.2: AC 1(1), (2); Section 2.1.1.7.3.3(I): AC 1(1), AC 2(1), (2), (3), AC 4(1)]

The mechanical handling system is divided into two subsystems: cask handling and canister transfer. ITS SSCs in the mechanical handling system are designed as described in [Section 1.2.2.2](#).

ITS SSCs in the RF mechanical handling system, which are also used in other handling facilities, are described in [Section 1.2.4.2](#). Non-ITS SSCs in the RF mechanical handling system that are also used in other handling facilities are described in summary in [Table 1.2.4-1](#). [Table 1.2.6-1](#) lists the non-ITS mechanical handling SSCs in the RF that are also used in other handling facilities. The non-ITS SSCs in the mechanical handling system that are specific to the RF are described in summary in [Table 1.2.6-2](#). [Table 1.2.6-3](#) provides the RF design bases and their relationship to design criteria. The rated capacity of the ITS mechanical handling equipment is provided in [Tables 1.2.2-10](#) and [1.2.2-11](#). The summary-level description for the Type 1-5 equipment and personnel shield doors is provided in [Table 1.2.4-3](#).

Logic diagrams for ITS SSCs are shown where the description of the ITS equipment is provided. Typical non-ITS logic diagrams, which show the interface with digital control and management information system (DCMIS) and programmable logic controller elements within the selected ITS logic diagrams, are shown in [Figures 1.2.4-15](#) to [1.2.4-18](#).

1.2.6.2.1 Cask Handling Subsystem

1.2.6.2.1.1 Subsystem Description

The cask handling subsystem prepares transportation casks and aging overpacks for waste transfer operations. The system also prepares unloaded transportation casks for leaving the facility. The cask handling subsystem SSCs associated with waste handling operations are classified as ITS.

1.2.6.2.1.1.1 Subsystem Functions

The functions of the cask handling subsystem are to:

- Receive transportation casks containing commercial SNF in TAD canisters or DPCs.
- Prepare loaded transportation casks for canister transfer operations.
- Prepare empty aging overpacks for canister transfer operations.
- Transfer transportation casks containing horizontally handled DPCs to cask transfer trailers so they can be moved to the horizontal aging module at the aging pad.
- Prepare unloaded transportation cask to leave the facility.

1.2.6.2.1.1.2 Subsystem Location and Functional Arrangement

The cask handling subsystem is located in the transportation cask vestibule (Rooms 1021 and 1021A), cask preparation room (Room 1017), site transporter vestibule (Room 1001), lid bolting room (Room 1002), and loading room (Room 1013). These areas are shown in [Figure 1.2.6-2](#).

1.2.6.2.1.1.3 Subsystem and Components

ITS SSCs in the RF cask handling subsystem, which are also used in other handling facilities, are listed below and described in [Section 1.2.4.2](#), including figures and logic diagrams:

Cask Handling Crane—The cask handling crane’s function is removing transportation casks from railcars and placing them into the cask transfer trolley or onto a cask transfer trailer. The cask handling crane is located in the cask preparation room. Due to the configuration of the crane in the facility, it is not possible for the cask handling crane to lift the bottom of a cask more than 30 ft above the floor. [Figure 1.2.6-15](#) shows detail of this equipment. [Figures 1.2.4-36](#) and [1.2.4-37](#) provide the logic diagrams for the cask handling crane.

Cask Transfer Trolley—The cask transfer trolley is used for moving a loaded transportation cask between the cask preparation room and the cask unloading room. See [Figures 1.2.4-26](#) and [1.2.4-27](#).

Loading Room Equipment Shield Door (Type 2)—The loading room equipment shield door is described in [Section 1.2.3.2.4](#). For details of equipment, refer to [Figure 1.2.3-36](#). The logic diagram for the IHF and RF equipment shield door (double) is shown in [Figure 1.2.3-38](#).

Cask Handling Yoke—The RF uses a cask handling yoke to upend a transportation cask and remove it from the conveyance. The cask handling crane uses the cask handling yoke to transfer transportation casks from the railcar to the cask transfer trolley. See [Figures 1.2.4-28](#) to [1.2.4-30](#) for details.

Cask Lid-Lifting Grapple—The cask lid-lifting grapple is used in the cask preparation room with the cask handling crane auxiliary hook for installing the lid adapter onto the transportation cask or DPC. See [Figures 1.2.4-31](#) to [1.2.4-32](#) for details.

DPC Lid Adapter—The function of the DPC lid adapter is to lift DPCs of various sizes. The adapter has multiple mounting positions that accommodate the various DPCs. The DPC lid adapter is designed to engage with the canister transfer machine canister grapple. See [Figure 1.2.4-38](#) for details.

Rail Cask Lid Adapter—This equipment is described in [Section 1.2.4.2](#) and [Figure 1.2.4-40](#).

Horizontal Lifting Beam—This equipment is used to lift and transfer horizontal casks. The lifting beam has a capacity of 150 tons. This equipment is described in [Section 1.2.4.2](#). For details of this equipment, refer to [Figure 1.2.4-39](#).

ITS SSCs that are unique to the RF cask handling subsystem are described below.

Cask Unloading Room Equipment Shield Door (Type 5)—The cask unloading room equipment shield door is located between the cask preparation room and the cask unloading room to protect personnel from radiation. The cask unloading room equipment shield door is a slide open type door, made up of two side-by-side steel panels. Each panel is operated by an electric motor turning a screw, which interacts with a panel-mounted bracket. The door overlaps the aperture on the top, bottom, and both sides to prevent streaming. A staggered door edge provides shielding between the door panels. The weight of the door is supported by rollers under the bottom of the door, which run in a floor-recessed channel. The channel is covered with hinged plates to provide a level floor for the cask transfer trolley air pallets to pass over. The plates are lifted by slide ramps as the door closes.

The equipment shield door is controlled from the facility operations room. A local emergency open button is provided. The equipment shield door is interlocked with the cask port slide gate such that the doors cannot be opened unless the slide gate is in the closed position. The equipment shield door is also interlocked with the equipment confinement door. The door is also provided with an obstruction sensor that halts door travel and opens the door when an obstacle is detected in the pathway of the door. For details of this equipment, see [Figures 1.2.6-16 and 1.2.4-20](#). The logic diagram for the cask unloading room equipment shield door (Types 2, 3, and 5) is shown in [Figure 1.2.3-38](#).

Cask Preparation Platform—The cask preparation platform is located in the cask preparation room (Room 1017). The main function is to provide personnel and tool access to the top of a transportation cask while the cask is restrained in the cask transfer trolley. The cask preparation platform consists of a fixed platform above the transportation cask with an opening to accommodate access to the cask or DPC within. Mounted over the opening is the platform shield plate. This plate is retracted to gain access to the top of the cask or DPC and closed for bolting operations. For details of the equipment, see [Figure 1.2.6-17](#).

Lid Bolting Room Platform—The lid bolting room platform is an elevated steel platform located in the lid bolting room that provides personnel and tool access to the top of the aging overpacks in the site transporter for lid bolting and unbolting operations. The platform consists of two sections that are anchored to the floor and separated from each other to allow the site transporter with an aging overpack to be located in the center. Each platform section has a hinged platform that rotates from the vertical orientation to the horizontal orientation such that the platform surrounds the upper portion of the aging overpack. For details of this equipment, refer to [Figure 1.2.6-18](#).

Lid Bolting Room Crane—The lid bolting room crane is an overhead crane with a 10-ton lifting capacity located in the lid bolting room. The lid bolting room crane is used for lifting activities relevant to the bolting and unbolting of aging overpack lids. For details of this equipment, refer to [Figures 1.2.6-19 and 1.2.6-20](#).

1.2.6.2.1.2 Operational Processes

The handling of transportation casks in the CRCF and the RF is the same and is described in [Section 1.2.4.2](#). The handling of aging overpacks is different in the RF and is described below.

Aging Overpacks—Unloaded aging overpacks are received in the lid bolting room on the site transporter. The lid bolts are removed from the aging overpack lid. The loading room equipment shield door is opened, the aging overpack is moved inside using the site transporter. The aging overpack is positioned with the site transporter for lid removal and to receive a canister. The site transporter is then deactivated. The electrical supply is disconnected, and the cable is retracted so that the loading room equipment shield door can be closed. The loading room equipment shield door is closed. The TAD canister or DPC is loaded into the empty aging overpack using the canister transfer subsystem.

Upon completion of the canister transfer and lid restoration, the loading room equipment shield door is opened, the aging overpack is returned to the lid bolting room using the site transporter, and the loading room equipment shield door is closed. The aging overpack lid bolts are installed using common tools and the lid bolting room platform. Once the lid bolts are reinstalled in the lid, the aging overpack is moved into the site transporter vestibule, the lid bolting room door is closed, the exterior door is opened, and the site transporter carries the aging overpack out of the RF.

1.2.6.2.1.3 Safety Category Classification

The cask handling crane, lid bolting room crane, cask transfer trolley, cask handling yoke, horizontal lifting beam, loading room equipment shield door, cask unloading room equipment shield door, DPC lid adapter, rail cask lid adapter, cask lid-lifting grapple, cask preparation platform, and lid bolting room platform in the cask preparation subsystem are categorized as ITS.

1.2.6.2.1.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

The preclosure safety analysis identifies three procedural safety controls related to the operation of components in the cask handling subsystem of the RF. [Table 1.9-10](#) identifies the unique numbering of the preclosure procedural safety controls, as well as the associated facility/operations area, SSCs, and bases.

PSC-1—To limit the spurious movement of the cask transfer trolley potentially resulting in canister impacts, the cask preparation and canister transfer operating procedures will include a warning that deflation of the RF cask transfer trolley is an important procedural step in the preclosure safety analysis. The cask preparation and canister transfer operating procedures will require that the cask transfer trolley be on the floor of the RF with the air pallet feature deactivated during loading of the cask onto the trolley, cask preparation activities while the cask is on the trolley, and during canister unloading activities. This requirement will be independently verified.

PSC-11—To ensure seismic stability of the transportation cask during cask preparation, the cask preparation operating procedure will include a warning that connection to the RF cask handling crane is an important procedural step in the preclosure safety analysis. The cask preparation operating procedure will require that a loaded transportation cask remain attached to the RF cask handling crane hoist and associated yoke until the cask is placed into the cask transfer trolley and the trolley's seismic restraints are properly engaged. The engagement of the seismic restraints will be independently verified prior to slacking the load on the RF cask handling crane.

PSC-12—To prevent the operator from attempting to remove the cask lid with the lid bolts still in place, the cask preparation operating procedure will include a warning that the removal of loaded transportation cask lid bolts is a procedural step important to the preclosure safety analysis. The cask preparation operating procedure will include a prerequisite to confirm lid bolt removal prior to movement of the cask from the RF cask preparation room (Room 1017) to the cask unloading room (Room 1015). The removal of the bolts will be independently verified.

1.2.6.2.1.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the cask handling subsystem in the RF are addressed in [Table 1.2.6-3](#).

1.2.6.2.1.6 Design Methodologies

The design methodologies for the ITS SSCs in the cask handling subsystem that are similar to those in other handling facilities, including the cask handling crane, lid bolting room crane, cask transfer trolley, cask handling yoke, horizontal lifting beam, DPC lid adapter, rail cask lid adapter, cask lid-lifting grapple, and cask preparation platform, are in accordance with codes and standards provided in [Section 1.2.2.2](#). The design methodologies used in the design of the equipment shield doors, and the lid bolting room platform are in accordance with Section Q1.2 of ANSI/AISC N690-1994.

1.2.6.2.1.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of ITS SSCs in the cask handling subsystem that are similar to those in other handling facilities, including the cask handling crane, lid bolting room crane, cask transfer trolley, cask handling yoke, horizontal lifting beam, DPC lid adapter, rail cask lid adapter, cask lid-lifting grapple, and cask preparation platform are in accordance with the codes and standards provided in [Section 1.2.2.2](#). Materials of construction used in the design of the equipment shield doors, and lid bolting room platform are in accordance with Section Q1.4 of ANSI/AISC N690-1994.

1.2.6.2.1.8 Design Codes and Standards

The principal codes and standards applicable to the cask handling subsystem are identified in [Table 1.2.2-12](#).

1.2.6.2.1.9 Design Load Combinations

The load combinations used in the analysis of ITS SSCs for the cask handling subsystem that are similar to those in other handling facilities, including the cask handling crane, lid bolting room crane, cask transfer trolley, cask handling yoke, horizontal lifting beam, DPC lid adapter, rail cask lid adapter, cask lid-lifting grapple, and cask preparation platform are in accordance with codes and standards provided in [Section 1.2.2.2](#). The design load combinations analyzed include normal conditions and event sequences and the effects of natural phenomena. The load combinations used in the design of the equipment shield doors, and lid bolting room platform are in accordance with Table Q1.5.7.1 of ANSI/AISC N690-1994.

1.2.6.2.2 Canister Transfer Subsystem

1.2.6.2.2.1 Subsystem Description

The canister transfer subsystem consists of SSCs that transfer the TAD canisters and DPCs from transportation casks into aging overpacks.

1.2.6.2.2.1.1 Subsystem Functions

The canister transfer subsystem transfers loaded TAD canisters and DPCs from transportation casks to aging overpacks for movement to the WHF, to a CRCF, or to an aging pad.

1.2.6.2.2.1.2 Subsystem Location and Functional Arrangement

The canister transfer subsystem is located in the canister transfer room, cask unloading room, loading room, lid bolting room, and site transporter vestibule. These rooms are shown in [Figures 1.2.6-2](#) and [1.2.6-3](#).

1.2.6.2.2.1.3 Subsystem and Components

Canister Transfer Subsystem—ITS SSCs in the RF canister transfer subsystem that are similar to those used in other handling facilities are listed below and described in detail in [Section 1.2.4.2](#), including figures and logic diagrams.

Canister Transfer Machine—The canister transfer machine is used to transfer a TAD canister or a DPC from a transportation cask to an aging overpack. Due to the configuration of the canister transfer machine in the facility, it is not possible for the canister transfer machine to lift the bottom of a canister more than 45 ft above the floor of the transportation cask and aging overpack. This equipment is described in [Section 1.2.4.2](#) and shown in [Figures 1.2.4-51](#) to [1.2.4-59](#).

Canister Transfer Machine Maintenance Crane—The canister transfer machine maintenance crane is an overhead crane rated at a 15-ton capacity and located in the canister transfer room. The canister transfer machine maintenance crane is mounted above the canister transfer machine. The crane supports canister transfer machine maintenance when required. The crane is also used to lift miscellaneous fixtures and items in support of canister transfer activities. For details of this equipment, refer to [Figure 1.2.6-21](#).

Port Slide Gates—The cask port slide gate and aging overpack port slide gate are located in the floor of the canister transfer room between the canister transfer room and the cask unloading room and loading room. See [Figures 1.2.4-57](#) to [1.2.4-59](#) for details. The design of the port slide gates is the same as the design used for the CRCF.

Canister Transfer Machine Canister Grapples—The grapples are used to lift lids from TAD transportation casks and aging overpacks and to lift TAD canisters and DPCs during canister transfer operations. See [Figures 1.2.4-47](#) to [1.2.4-49](#) for details.

1.2.6.2.2.2 Operational Processes

The canister transfer subsystem transfers TAD canisters and DPCs from transportation casks to aging overpacks.

After an aging overpack has been received in the loading room and a loaded transportation cask has been received in the cask unloading room, the aging overpack lid and cask lids are removed by the canister transfer machine and placed in the lid station. If the transportation cask contains a DPC, the cask lid has previously been removed by the cask handling subsystem in the cask preparation room.

The canister transfer machine moves to the cask port, the shield skirt is lowered, and the canister transfer machine slide gate and cask port slide gate are opened. The canister guide sleeve is lowered, the canister is raised into the canister transfer machine, the canister guide sleeve is raised, the canister transfer machine slide gate is closed, the cask port slide gate is closed, and the canister transfer machine shield skirt is raised. The canister transfer machine is moved to the aging overpack port, the shield skirt is lowered, and the canister transfer machine and aging overpack port slide gates are opened. The canister guide sleeve is lowered, the canister is placed in the aging overpack, the canister guide sleeve is raised, the slide gates are closed, and the shield skirt is raised. The canister transfer machine replaces the aging overpack lid, and the loaded aging overpack is moved out of the loading room.

A contamination survey of the canister is taken during the canister transfer operations to determine surface contamination levels. If not acceptable, the canister is sent to the WHF for decontamination activities.

For transportation casks that contained TAD canisters, the canister transfer machine retrieves the cask lid from the cask lid station and places it on the unloaded transportation cask before the cask is removed from the cask unloading room.

1.2.6.2.2.3 Safety Category Classification

The canister transfer machine, canister transfer machine maintenance crane, canister transfer machine grapples, cask port slide gate, and the aging overpack port slide gate in the canister transfer subsystem are categorized as ITS.

1.2.6.2.2.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

The preclosure safety analysis identifies two procedural safety controls related to the operation of components in the canister transfer subsystem of the RF. [Table 1.9-10](#) identifies the unique numbering of the preclosure procedural safety controls, as well as the associated facility/operations area, SSCs, and bases.

PSC-13—To limit the probability of personnel receiving direct radiation exposure during operations with the canister transfer machine, the canister transfer operating procedure will include a warning that workers entering the RF canister transfer room (Room 2007) could receive an inadvertent exposure if the canister transfer machine is away from a port with a waste form

present and the slide gate open. The procedures will require an independent verification that the port slide gates are closed at the completion of a canister transfer operation.

PSC-14—To limit the probability that a loaded canister is not in a vertical orientation during transfer, the canister transfer operating procedure will include a warning that the lowering of the RF canister transfer machine guide sleeve prior to lifting or lowering a DPC or TAD canister is a procedural step important to the preclosure safety analysis. The canister transfer operating procedure will include a prerequisite to confirm guide sleeve lowering prior to lifting or lowering a DPC or TAD canister. The lowering of the guide sleeve will be independently verified.

1.2.6.2.2.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the canister transfer subsystem in the RF are addressed in [Table 1.2.6-3](#).

1.2.6.2.2.6 Design Methodologies

The design methodologies for ITS SSCs in the canister transfer subsystem that are similar to those in other handling facilities, including the canister transfer machine, canister transfer machine maintenance crane, and canister transfer machine grapples, are in accordance with codes and standards provided in [Section 1.2.2.2](#). The methodologies used in the design of the cask port slide gate and the aging overpack port slide gate are in accordance with Section Q1.2 of ANSI/AISC N690-1994.

1.2.6.2.2.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of ITS SSCs in the canister transfer subsystem that are similar to those in other handling facilities, including the canister transfer machine, canister transfer machine maintenance crane, and canister transfer machine grapples, are in accordance with codes and standards provided in [Section 1.2.2.2](#). Materials of construction used in the design of the cask port slide gate and the aging overpack port slide gate in the canister transfer subsystem are in accordance with Section Q1.4 of ANSI/AISC N690-1994.

1.2.6.2.2.8 Design Codes and Standards

The principal codes and standards applicable to the canister transfer subsystem are identified in [Table 1.2.2-12](#).

1.2.6.2.2.9 Design Load Combinations

The load combinations used in the analysis of ITS SSCs for the canister transfer subsystem that are similar to those in other handling facilities, including the canister transfer machine, canister transfer machine maintenance crane, and canister transfer machine grapples, are in accordance with codes and standards provided in [Section 1.2.2.2](#). The design load combinations analyzed include normal operations and event sequences and the effects of natural phenomena. The load combinations and applicable stress limit coefficients used in the design of cask port slide gate and aging overpack port slide gate are in accordance with Table Q1.5.7.1 of ANSI/AISC N690-1994.

1.2.6.3 Process Systems

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2, AC 6]

1.2.6.3.1 Cask Cavity Gas Sampling Subsystem

The cask cavity gas sampling system samples the gas inside a loaded transportation cask before it is opened to obtain an indication of the condition of the waste inside. The presence of gaseous fission products or gases other than helium is indicative of off-normal conditions inside the cask. The cask cavity gas sampling system also vents the cask to the HVAC system to equalize pressure with the room prior to opening the cask.

The design and operation of the cask cavity gas sampling subsystem in the RF is functionally the same as that in the CRCF. Therefore, the system description, operational processes, and codes and standards provided in [Section 1.2.4.3.1](#) also apply to the RF. The RF cavity gas sampling system is located in the gas sampling room (Room 1223). The RF cask gas sampling piping and instrumentation diagram is shown in [Figure 1.2.6-22](#).

The cask cavity gas sampling subsystem is classified as non-ITS.

1.2.6.3.2 Water Collection Subsystem

The water collection subsystem provides floor drains to collect small amounts of water that are discharged or leak from process SSCs and to collect fire suppression water. The potentially contaminated effluents are collected in the tanks and removed by tanker truck from the RF. The system is classified as non-ITS.

The design and operation of the water collection subsystem in the RF is functionally similar to that in the CRCF. Therefore, the system description, operational processes, and codes and standards provided in [Section 1.2.4.3.2](#) also apply to the RF.

[Figure 1.2.6-23](#) shows the RF liquid low-level radioactive waste sampling and sump piping and instrumentation diagram.

1.2.6.4 Receipt Facility HVAC System

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2(1), (2), (3), AC 6;
Section 2.1.1.6.3: AC 1(2)(a), (2)(d), (2)(j)]

The RF HVAC system is designed to limit the release of radioactive airborne contaminants for the protection of the workers and public, and maintain the indoor environmental conditions required for operations and for the health and safety of the facility workers.

The ventilation confinement zoning in the RF is based upon normal operations. The RF is expected to remain clean during normal operations, and airborne contamination is not expected. The confinement zoning for the RF is tertiary as defined in [Table 1.2.2-13](#).

The remaining portions of the facility where there is no potential for contamination are classified as a nonconfinement zone. Figures 1.2.6-24 through 1.2.6-26 illustrate the confinement zoning for the RF.

The preclosure safety analysis for the RF has not identified category 1 or 2 event sequences that could result in the release of radionuclides. There is no requirement to remove heat from any rooms in the RF during an event sequence. Consequently, the RF HVAC system is non-ITS.

During normal operations, the HVAC system operates to dissipate the heat gain from various sources to maintain the required room temperature for proper operation of equipment and personnel comfort. Air handling units and fan coil units are utilized to supply conditioned air to various areas and the supply air is then returned and/or exhausted. The air handling units and fan coil units are sized to dissipate the heat generated from lights, solar loads, and operating mechanical and electrical equipment, as well as the decay heat generated from TAD canisters or DPCs that are present in the area served by the HVAC system.

The RF is designed such that waste form temperature limits are not exceeded during normal operation or under off-normal conditions. The thermal performance of commercial SNF in the areas of the RF where canisters are transferred from transportation casks to aging overpacks was evaluated. This evaluation bounds other locations in the facility. The heat load considered in this evaluation is 22 kW for commercial SNF canisters.

The evaluation shows that cladding temperature for commercial SNF does not exceed the limit of 400°C during normal operation, and does not exceed the limit of 570°C under off-normal conditions, when there is assumed to be no ventilation system air flow for 30 days.

1.2.6.4.1 System Description

The RF HVAC system includes the following subsystems:

- HVAC supply and exhaust subsystems serving tertiary confinement (waste handling) areas (Rooms 1013, 1015, 1017, and 1017A)
- HVAC subsystems serving the electrical equipment and battery rooms
- HVAC supply and exhaust subsystems serving tertiary confinement (non-waste handling) areas
- HVAC subsystems serving nonconfinement areas.

Each subsystem is provided with the necessary distribution ductwork and accessories, electrical power, and instrumentation and controls to operate, control, monitor, alarm, provide status, and verify that the required function is met.

HVAC Supply and Exhaust Subsystems Serving the Tertiary Confinement (Waste Handling) Areas—A separate supply and exhaust subsystem is provided for areas where a loaded canister is handled. Air is exhausted from these areas through two stages of high-efficiency particulate air

(HEPA) filters. The exhaust subsystem flow rate is greater than the supply air flow rate ensuring that the air flow is into the confinement areas.

Each exhaust HEPA filter train consists of three HEPA filter plenums with a bag-in/bag-out feature, demisters, prefilters, two stages of HEPA filters, and an exhaust fan with adjustable speed drive. The exhaust subsystem includes two sets of components, including ductwork. The exhaust subsystem is provided with instrumentation and controls to automatically start the standby fan should the running fan fail. Physical separation is provided so that damage to one train of exhaust equipment does not cause damage to the other train.

The RF exhaust system effluent is monitored for radioactivity downstream of the exhaust fans. Upon detection of high exhaust air radiation, a high radiation alarm is annunciated locally, in the facility operations room, and at the Central Control Center.

The tertiary confinement areas for waste handling are cooled by direct supply from air handling units, including cascaded air from cooler adjacent spaces to maintain the temperature required for the equipment and for the personnel present during the process operation. The supply units consist of once-through air handling units, each provided with prefilters and primary filters, heating and cooling coils, and a supply fan.

Figure 1.2.6-27 shows the composite ventilation flow diagram, and Figures 1.2.6-28 and 1.2.6-29 show the ventilation and instrumentation diagrams, for the exhaust subsystem serving tertiary confinement waste handling areas. Figures 1.2.6-30 and 1.2.6-31 show the ventilation and instrumentation diagrams, for the HVAC supply subsystems serving tertiary confinement waste handling areas.

HVAC Subsystems Serving the Electrical Equipment and Battery Rooms—Each group of electrical rooms and battery rooms (Train A and Train B) are served by two sets of HVAC supply and exhaust equipment. The supply air is conditioned using a split-type, direct expansion recirculating fan coil unit with a HEPA filter. This localized cooling ensures that electrical power is not lost due to overheating in these areas. A remote condensing unit is provided for each fan coil unit. Air is continuously exhausted from each battery room to preclude accumulation of hydrogen generated by the batteries during charging. Hydrogen concentrations are maintained well below the lower explosive limit. A single stage HEPA filter is provided in each exhaust path.

Figure 1.2.6-32 shows the composite ventilation flow diagram, and Figures 1.2.6-33 to 1.2.6-36 show the ventilation and instrumentation diagrams, for the HVAC subsystems serving the electrical equipment and battery rooms.

HVAC Supply and Exhaust Subsystems Serving the Tertiary Confinement (Non-Waste Handling) Areas—The confinement areas where waste is not handled are served by recirculating supply air units and exhaust HEPA filter assemblies. There are two supply subsystems, one serving the north confinement areas and corridors (two operating units, one standby unit) and another serving the south confinement areas (one operating unit, one standby unit).

A portion of the air supplied to these confinement areas is exhausted by the exhaust subsystem or cascaded to the waste handling confinement areas in order to maintain the appropriate negative

pressure in the confinement areas, and the remaining air is returned to the air handling unit. The exhaust air for the confinement areas is passed through a single stage of HEPA filters prior to discharging to the atmosphere at a release point. The exhaust subsystem effluent is continuously monitored for radioactivity downstream of the exhaust fans. Upon detection of high exhaust air radiation, a high radiation alarm is annunciated at the Central Control Center and facility operations room. An alarm is also generated upon detection of radiation monitor failure.

The normal power battery room is also continuously exhausted with sufficient volume changes per hour to preclude accumulation of hydrogen generated by the batteries during charging. Hydrogen concentrations are maintained well below the lower explosive limit. Air that is cascaded or supplied into the battery room is exhausted through the Train B battery room HEPA exhaust subsystem.

Figure 1.2.6-37 shows the composite ventilation flow diagram, and Figures 1.2.6-38 to 1.2.6-42 show the ventilation and instrumentation diagrams, for the HVAC supply and exhaust subsystems serving tertiary confinement (non-waste handling) areas.

HVAC Subsystem Serving the Nonconfinement Areas—The nonconfinement HVAC subsystem provides conditioned air for cooling, heating, and ventilation to meet the air quality standards required for the safety, health, and comfort of the personnel and maintains the environmental conditions suitable for the proper performance of SSCs in the noncontaminated areas of the RF.

The nonconfinement HVAC subsystem is provided for areas such as offices, vestibules, and facility operations rooms that have no potential for contamination. It is a recirculating HVAC system with no HEPA filter. The air handling units are provided with economizers, and the supply air is either returned or exhausted depending on the temperature of the outside air relative to the inside room temperature.

In addition, dedicated recirculating fan coil units are provided for the vestibules. The vestibules are classified as nonconfinement areas. Each supply unit consists of a recirculating air handling unit, which is provided with prefilters and high-efficiency primary filters, heating and cooling coils, and a supply fan.

Figure 1.2.6-43 shows the composite ventilation flow diagram for the HVAC subsystem serving nonconfinement areas.

1.2.6.4.1.1 System Functions

The functions of the RF HVAC system are to:

- Maintain airflow from areas of lesser contamination potential to areas of greater contamination potential
- Maintain space temperatures within acceptable limits
- Remove potentially contaminated airborne particulate from the exhaust
- Provide a release point to the atmosphere via monitored discharge.

1.2.6.4.1.2 System Location and Functional Arrangement

The location and arrangement of the HVAC supply and exhaust equipment are shown on the RF floor plan general arrangement (Figures 1.2.6-2 and 1.2.6-3).

Table 1.2.2-14 provides the typical HVAC system monitoring, status, and alarm functions.

Table 1.2.6-4 provides the HVAC exhaust components and system design data.

Table 1.2.6-5 provides the indoor design temperatures.

Table 1.2.6-6 provides the HVAC supply components and system design data.

The exhaust system components are located in separate rooms on the first level of the facility. The fan coil units serving the electrical rooms are located inside the rooms they serve while the condensing units are located in a missile protected area outdoors. The battery room exhausts are located in separate rooms on the first level. The air handling units serving the non-waste handling confinement areas are located in HVAC equipment rooms on the second level. The nonconfinement air handling units are located on the second floor, directly above the nonconfinement areas.

1.2.6.4.1.3 Systems and Components

The major components in the RF confinement and nonconfinement HVAC systems are also used in the CRCF confinement and nonconfinement HVAC systems, which are described in Section 1.2.4.4.1.3.

Additionally, the RF contains once-through air handling units serving the tertiary confinement waste handling areas. Each air handling unit consists of prefilters, primary filters, a supply fan, heating coils, and cooling coils. The fans for the air handling units are heavy-duty plenum-type, centrifugal fans with nonoverloading airfoil or backward-inclined blades. The air handling unit fans are equipped with adjustable speed drives to provide adjustment in the airflow to compensate for filter loading.

1.2.6.4.2 Operational Processes

The operational processes for the RF HVAC system are similar to the processes in the CRCF with respect to the non-ITS functions. These operational processes are described in Section 1.2.4.4.2.

1.2.6.4.3 Design Codes and Standards

SSCs in the RF confinement and nonconfinement HVAC systems are designed using the methods and practices in the codes and standards identified in Section 1.2.4.4.8.

1.2.6.5 General References

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Table 1.2.6-1. List of Non-ITS Mechanical Handling Structures, Systems, and Components in the Receipt Facility That are Also Used in Other Handling Facilities

List of Non-ITS Mechanical Handling SSCs in the RF That are Also Used in Other Handling Facilities	Location of Information
Cask Lid Stand	This equipment is used in the RF and described in Table 1.2.4-1 .
Nuclear Facilities Grapple Stand	This equipment is used in the RF and described in Table 1.2.4-1 .
Mobile Access Platform	This equipment is used in the RF and described in Table 1.2.4-1 .
Impact Limiter Lifting Device	This equipment is used in the RF and described in Table 1.2.4-1 .
Cask Handling Yoke Stand	This equipment is used in the RF and described in Table 1.2.4-1 .
Impact Limiter Stand	This equipment is used in the RF and described in Table 1.2.4-1 .
Horizontal Lifting Beam Stand	This equipment is used in the RF and described in Table 1.2.4-1 .
Cask Tilting Frame	This equipment is used in the RF and described in Table 1.2.4-1 .
Horizontal Cask Stand	This equipment is used in the RF and described in Table 1.2.4-1 .
Mobile Lift	This equipment is used in the RF and described in Table 1.2.4-1 .
Platform Shield Plate	This equipment is used in the RF and described in Table 1.2.4-1 .
Personnel Confinement Door	This equipment is used in the RF and described in Table 1.2.4-1 .

Table 1.2.6-2. RF-Specific Non-ITS Structures, Systems, and Components in the Mechanical Handling System

RF Specific Non-ITS SSCs in the Mechanical Handling System	Summary Description
DPC Lid Adaptor Stand	This equipment is used in the cask preparation room to store the DPC lid adaptor when it is not in use. This equipment is designed using the methods and practices provided in <i>Manual of Steel Construction, Allowable Stress Design</i> (AISC 1997). For details of the equipment, see Figure 1.2.4-126 .
Equipment Confinement Door	The cask preparation annex equipment confinement door provides equipment and personnel access to the cask preparation room from the transportation cask vestibule annex. The cask preparation annex equipment confinement door is a slide-open-type door, made up of two panels on separate rails. Each panel is operated independently by an electric motor turning a screw, which interacts with a panel-mounted bracket. The panels open independently, allowing either a rail car or a truck to pass through. The door overlaps the aperture on the top, bottom, and both sides to provide confinement. Sealing features are provided to limit air leakage. This equipment is designed using the methods and practices provided in <i>Manual of Steel Construction, Allowable Stress Design</i> (AISC 1997). For details of this equipment see Figures 1.2.6-44 and 1.2.4-23 .

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H)	Cask Handling	Cask Handling Yoke (200-HM00-BEAM-00001)	Protect against drop	H.RF.HM.01. The cask handling yoke is an integral part of the load-bearing path. See cask handling crane requirements.	<p>The special lifting device/adaptor is required to be designed in accordance with the requirements of ANSI N14.6-1993, as modified by NUREG-0612 (NRC 1980), Section 5.1.1(4).</p> <p>Special lifting devices are required to have an interlock to prevent special lifting device actuation if the special lifting device is not properly connected to the hoisting system and an interlock to prevent hoist motion if the special lifting device is not either fully engaged or fully disengaged.</p> <p>Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.</p>
		Cask Handling Crane; 200-ton (200-HM00-CRN-00001)	Protect against drop	H.RF.HM.02. The mean probability of dropping a loaded cask from less than the two-block height resulting from the failure of a piece of equipment within the load-bearing path shall be less than or equal to 3×10^{-5} per transfer with the cask yoke or 1×10^{-4} transfer with a sling.	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes.
				H.RF.HM.03. The mean probability of dropping a loaded cask from a two-block height resulting from the failure of a piece of equipment within the load-bearing path shall be less than or equal to 4×10^{-7} per transfer.	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes.
			Limit drop height	H.RF.HM.04. The two-block drop height shall not exceed 30 ft from bottom of shortest cask to the floor.	The crane, in conjunction with the special lifting device, is required to be designed such that the bottom of any cask cannot be more than 30 ft above the floor with the crane hoisting system in a two-block condition.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling (Continued)	Cask Handling Crane; 200-ton (200-HM00-CRN-00001) (Continued)	Protect against drop of a load onto a cask	H.RF.HM.05. The mean probability of dropping a load onto a loaded cask or its contents shall be less than or equal to 9×10^{-5} per cask handled.	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes.
			Limit speed	H.RF.HM.06. The speed of the trolley and bridge shall be limited to 20 ft/min.	The trolley and bridge are required to be designed to preclude speeds greater than 20 ft/min.
			Protect against crane collapse onto a waste container	H.RF.HM.07. The mean frequency of collapse of the cask handling crane due to the spectrum of seismic events shall be less than or equal to 8×10^{-6} per year.	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes, for loads and accelerations associated with a DBGM-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.
			Protect against a cask or heavy object drop from the crane	H.RF.HM.08. The mean frequency of a hoist system failure of the cask handling crane due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes, for loads and accelerations associated with a DBGM-2 seismic event.
		Cask Transfer Trolley and Pedestal (Trolley: 200-HM00-TRLY-00001) (Pedestal: 200-HM00-PED-00001)	Limit speed	H.RF.HM.09. The speed of the cask transfer trolley shall be limited to 2.5 mph.	The cask transfer trolley is required to be designed to preclude speeds greater than 2.5 mph.
			Protect against spurious movement	H.RF.HM.10. The mean probability of spurious movement of the cask transfer trolley while a canister is being lifted by the canister transfer machine shall be less than or equal to 1×10^{-9} per transfer.	The cask transfer trolley is required to be designed such that its pneumatic power supply must be disconnected for the cask unloading room equipment shield door to be closed.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling (Continued)	Cask Transfer Trolley and Pedestal (Trolley: 200-HM00-TRLY-00001) (Pedestal: 200-HM00-PED-00001) (Continued)	Protect against impact and inducing stresses on the waste container	H.RF.HM.11. The mean frequency of the sliding of the cask transfer trolley into a wall and inducing stresses that can breach the waste container due to the spectrum of seismic events shall be less than or equal to 1×10^{-6} per year.	Operating clearance and energy-absorbing features are required to be provided to minimize the likelihood of seismic-induced sliding impact and control impact loads as needed.
			Protect against rocking (which induces an impact into a wall) of a trolley holding a cask	H.RF.HM.12. The mean frequency of a rocking impact of the cask transfer trolley into a wall and inducing stresses that can breach the waste container due to the spectrum of seismic events shall be less than or equal to 1×10^{-6} per year.	Operating clearance and energy-absorbing features are required to be provided to minimize the likelihood of seismic-induced rocking impact and control impact loads as needed.
	Cask Handling/ Cask Receipt	Lid Bolting Room Crane (200-HMC0-CRN-00001)	Protect against collapse of the lid bolting room crane	H.RF.HMC.01. The mean frequency of collapse of the lid bolting room crane due to the spectrum of seismic events shall be less than or equal to 8×10^{-6} per year.	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type II cranes, for loads and accelerations associated with a DBGM-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.
Horizontal Lifting Beam (200-HMC0-BEAM-00001)		Protect against drop	H.RF.HMC.02. The horizontal lifting beam is an integral part of the load-bearing path. See cask handling crane requirements.	The special lifting device/adaptor is required to be designed in accordance with the requirements of ANSI N14.6-1993, as modified by NUREG-0612 (NRC 1980), Section 5.1.1(4). Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.	

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling/Cask Receipt (Continued)	Cask Lid-Lifting Grapples (DPC) (200-HMH0-HEQ-00008)	Protect against drop of a load onto a DPC	H.RF.HMH.01. The cask lid-lifting grapple is an integral part of the load-bearing path. See cask handling crane requirements.	<p>The special lifting device/adapter is required to be designed in accordance with the requirements of ANSI N14.6-1993, as modified by NUREG-0612 (NRC 1980), Section 5.1.1(4).</p> <p>Special lifting devices are required to have an interlock to prevent special lifting device actuation if the special lifting device is not properly connected to the hoisting system and an interlock to prevent hoist motion if the special lifting device is not either fully engaged or fully disengaged.</p> <p>Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.</p>
	Cask Handling/Cask Preparation	Rail Cask Lid Adapters (200-HMH0-HEQ-00002)	Protect against drop	H.RF.HMH.02. The rail cask lid adapters are an integral part of the load-bearing path. See cask handling crane requirements.	<p>The special lifting device/adapter is required to be designed in accordance with the requirements of ANSI N14.6-1993, as modified by NUREG-0612 (NRC 1980), Section 5.1.1(4).</p> <p>Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.</p>
		DPC Lid Adapter (200-HMH0-HEQ-00001)	Protect against drop of a DPC	H.RF.HMH.03. The DPC lid adapter is an integral part of the load-bearing path. See canister transfer machine requirements.	<p>The special lifting device/adapter is required to be designed in accordance with the requirements of ANSI N14.6-1993, as modified by NUREG-0612 (NRC 1980), Section 5.1.1(4).</p> <p>Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.</p>
	Waste Transfer/Canister Transfer	Canister Transfer Machine Maintenance Crane (200-HTC0-CRN-00001)	Protect against collapse of the canister transfer machine maintenance crane	H.RF.HTC.01. The mean frequency of collapse of the canister transfer machine maintenance crane due to the spectrum of seismic events shall be less than or equal to 8×10^{-6} per year.	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type II cranes, for loads and accelerations associated with a DBGM-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Waste Transfer/ Canister Transfer (Continued)	Canister Transfer Machine (200-HTC0-FHM-00001)	Protect against drop	H.RF.HTC.02. The mean probability of dropping a canister from below the two-block height due to the failure of a piece of equipment within the load-bearing path shall be less than or equal to 1×10^{-5} per transfer.	<p>The canister transfer machine is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes.</p> <p>The canister transfer machine is required to be designed with the following features:</p> <ul style="list-style-type: none"> • Two hoist upper limit switches • A hoist adjustable speed drive that stops the hoist at setpoints that are independent from the hoist upper limit switches • A load cell overload limit that stops the hoist • A sensor to stop the hoist when the load clears the canister transfer machine slide gate.
				H.RF.HTC.03. The mean probability of drop of a canister from the two-block height due to the failure of a piece of equipment within the load-bearing path shall be less than or equal to 3×10^{-8} per transfer.	<p>The canister transfer machine is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes.</p> <p>The canister transfer machine is required to be designed with the following features:</p> <ul style="list-style-type: none"> • Two hoist upper limit switches • A hoist adjustable speed drive that stops the hoist at setpoints that are independent from the hoist upper limit switches • A load cell overload limit that stops the hoist • A sensor to stop the hoist when the load clears the canister transfer machine slide gate.
			Limit drop height	H.RF.HTC.04. The two-block drop height shall not exceed 45 ft from the bottom of a canister to the cavity floor of the cask or aging overpack.	The canister transfer machine, in conjunction with the special lifting device(s), is required to be designed such that the bottom of any canister cannot be more than 45 ft above the cavity floor of the cask or aging overpack with the canister transfer machine hoisting system in a two-block condition.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Waste Transfer/ Canister Transfer (Continued)	Canister Transfer Machine (200-HTC0-FHM-00001) (Continued)	Protect against drop of a load onto a canister	H.RF.HTC.05. The mean probability of dropping a load onto a canister shall be less than or equal to 1×10^{-5} per transfer.	The canister transfer machine is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes. The canister transfer machine is required to be designed with the following features: <ul style="list-style-type: none"> • Two hoist upper limit switches • A hoist adjustable speed drive that stops the hoist at setpoints that are independent from the hoist upper limit switches • A load cell overload limit that stops the hoist • A sensor to stop the hoist when the load clears the canister transfer machine slide gate.
			Protect against spurious movement	H.RF.HTC.06. The mean probability of a spurious movement of the canister transfer machine while a canister is being lifted or lowered shall be less than or equal to 5×10^{-9} per transfer.	Interlocks are required to be provided to prevent operation of the canister transfer machine bridge and trolley drives unless the canister transfer machine shield skirt is raised, indicating that the canister is clear of the canister transfer machine slide gate. The circuit breakers that provide power to the adjustable speed drives for the bridge and trolley motors are required to have instantaneous over-current protection.
			Limit speed	H.RF.HTC.07. The speed of the canister transfer machine trolley and bridge shall be limited to 20 ft/min.	The trolley and bridge are required to be designed to preclude speeds greater than 20 ft/min.
			Preclude non-flat bottom drop of a DPC or TAD	H.RF.HTC.08. The canister transfer machine shall preclude non-flat-bottom drops of DPCs and TAD canisters.	The canister transfer machine is required to be designed with guide features for DPCs and TAD canisters to preclude non-flat bottom drops.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Waste Transfer/ Canister Transfer (Continued)	Canister Transfer Machine (200-HTC0-FHM-00001) (Continued)	Protect against direct exposure to personnel	H.RF.HTC.09. The mean probability of inadvertent radiation streaming resulting from the inadvertent opening of the canister transfer machine slide gate, the inadvertent raising of the canister transfer machine shield skirt, or an inadvertent motion of the canister transfer machine away from an open port shall be less than or equal to 1×10^{-6} per transfer.	The canister transfer machine is required to be designed with the following features: <ul style="list-style-type: none"> Shield skirt–hoist interlock (skirt must be down to permit hoist operation) Shield skirt–canister transfer machine slide gate interlock (either skirt must be down or gate must be closed) Shield skirt–port gate interlock (skirt must be down before port gate can be opened). PSC-13 (Section 1.2.6.2.2.4) addresses closure of the port slide gates at the completion of a canister transfer operation.
			Preclude canister breach	H.RF.HTC.10. Closure of the canister transfer machine slide gate shall be incapable of breaching a canister.	The canister transfer machine slide gate is required to be power-limited such that the maximum slide gate closing force is insufficient to breach a canister.
			Protect against collapse of the canister transfer machine	H.RF.HTC.11. The mean frequency of collapse of the canister transfer machine due to the spectrum of seismic events shall be less than or equal to 1×10^{-5} per year.	The canister transfer machine is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes, for loads and accelerations associated with a DBGM-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.
			Protect against a canister or heavy object drop from the canister transfer machine	H.RF.HTC.12. The mean frequency of a hoist system failure of the canister transfer machine due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The canister transfer machine is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes, for loads and accelerations associated with a DBGM-2 seismic event.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Waste Transfer/ Canister Transfer (Continued)	Canister Transfer Machine Grapples (200-HTC0-HEQ-00001)	Protect against canister drop	H.RF.HTC.13. The canister transfer machine grapple is an integral part of the load-bearing path of the canister transfer machine. See canister transfer machine requirements.	<p>The special lifting device/adaptor is required to be designed in accordance with the requirements of ANSI N14.6-1993, as modified by NUREG-0612 (NRC 1980), Section 5.1.1(4).</p> <p>The special lifting device is required to have mechanical features that prevent special lifting device disengagement when a load is suspended from the special lifting device.</p> <p>The special lifting device is required to have an interlock to prevent special lifting device actuation if the special lifting device is not properly connected to the hoisting system and an interlock to prevent hoist motion if the special lifting device is not either fully engaged or fully disengaged.</p> <p>Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.</p>
Receipt Facility (RF)	Receipt Facility (RF)	Structure	Maintain building structural integrity to protect ITS SSCs inside the building from external events	RF.01. The mean frequency of building collapse due to winds less than or equal to 120 mph shall not exceed 1×10^{-6} per year.	Structure is required to be designed to meet the wind and ash loads described in Table 1.2.2-1 .
				RF.02. The mean frequency of building collapse due to volcanic ash fall less than or equal to a roof load of 21 lb/ft ² shall not exceed 1×10^{-6} per year.	Structure is required to be designed to meet the wind and ash loads described in Table 1.2.2-1 .
				RF.03. The RF shall be located such that there is a distance of at least one-half mile between the RF and the repository heliport.	The heliport is located at least one-half mile from any ITS structure.
			Protect against building collapse onto waste containers	RF.04. The mean frequency of collapse of the RF structure due to the spectrum of seismic events shall be less than or equal to 2×10^{-6} per year.	Fragility assessment of building collapse is performed to develop the fragility curve for the structure. Convolution of the structure fragility curve and seismic hazard curve (as described in Section 1.7) is performed to demonstrate compliance.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Receipt Facility (RF) (Continued)	Receipt Facility (RF) (Continued)	Shield Doors (Including Anchorages)	Protect against direct exposure of personnel	RF.05. Equipment shield doors shall have a mean probability of inadvertent opening of less than or equal to 1×10^{-7} per waste container handled.	Equipment shield doors are required to be interlocked to prevent them from opening when associated transfer port slide gates that have a complementary shielding function are not closed.
			Preclude collapse onto waste containers	RF.06. An equipment shield door falling onto a waste container as a result of impact from a conveyance shall be precluded.	Equipment shield doors are required to be designed in accordance with the applicable provisions of ANSI/AISC N690-1994. Equipment shield doors are required to be designed to not collapse following an impact from a conveyance at its design speed.
			Protect against equipment shield door collapse onto a waste container	RF.07. The mean frequency of collapse of equipment shield doors (including attachment of door to wall and frame anchorages) due to the spectrum of seismic events shall be less than or equal to 6×10^{-6} per year.	Equipment shield doors are required to be designed in accordance with the applicable provisions of ANSI/AISC N690-1994 for loads and accelerations associated with a DBG-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.
		Cask Port Slide Gate (200-HTC0-HTCH-00001)	Protect against dropping a canister due to a spurious closure of the slide gate	RF.HTC.01. The mean probability of a canister drop resulting from a spurious closure of the slide gate shall be less than or equal to 5×10^{-6} per transfer.	The slide gate is required to be power-limited such that the maximum slide gate closing force is insufficient to sever the hoisting ropes.
			Protect against direct exposure to personnel	RF.HTC.02. The mean probability of occurrence of an inadvertent opening of a slide gate shall be less than or equal to 4×10^{-9} per transfer.	The slide gate is required to be interlocked to prevent it from opening when an associated equipment shield door that has a complementary shielding function is not closed. The slide gate is required to be interlocked to prevent it from opening unless a canister transfer machine is present above it with its shield skirt lowered.
			Preclude canister breach	RF.HTC.03. Closure of the slide gate shall be incapable of breaching a canister.	The slide gate is required to be power-limited such that the maximum slide gate closing force is insufficient to breach the canister.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Receipt Facility (RF) (Continued)	Receipt Facility (RF) (Continued)	Aging Overpack Port Slide Gate (200-HTC0-HTCH-00002)	Protect against dropping a canister due to a spurious closure of the slide gate	RF.HTC.04. The mean probability of a canister drop resulting from a spurious closure of the slide gate shall be less than or equal to 5×10^{-6} per transfer.	The slide gate is required to be power-limited such that the maximum slide gate closing force is insufficient to sever the hoisting ropes.
			Protect against direct exposure to personnel	RF.HTC.05. The mean probability of occurrence of an inadvertent opening of a slide gate shall be less than or equal to 4×10^{-9} per transfer.	The slide gate is required to be interlocked to prevent it from opening when an associated equipment shield door that has a complementary shielding function is not closed. The slide gate is required to be interlocked to prevent it from opening unless a canister transfer machine is present above it with its shield skirt lowered.
			Preclude canister breach	RF.HTC.06. Closure of the slide gate shall be incapable of breaching a canister.	The slide gate is required to be power-limited such that the maximum slide gate closing force is insufficient to breach the canister.
		Cask Preparation Platform (200-HMH0-PLAT-00001)	Protect against collapse	RF.HMH.01. The mean frequency of collapse of the cask preparation platform due to the spectrum of seismic events shall be less than or equal to 3×10^{-6} per year.	The platform is required to be designed in accordance with the applicable provisions of ANSI/AISC N690-1994 for loads and accelerations associated with a DBGM-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.
			Protect against platform collapse or waste container breach due to an impact from the cask transfer trolley	RF.HMH.02. The mean frequency of platform collapse or waste container breach from the impact of the cask transfer trolley into the platform due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The platform is required to be designed in accordance with the applicable provisions of ANSI/AISC N690-1994 for loads and accelerations associated with a DBGM-2 seismic event. Additional structural capacity is provided as required to preclude platform collapse. Energy absorbing features are required as necessary to limit the impact forces on the waste container.
		Lid Bolting Room Platform (200-HMC0-PLAT-00003)	Protect against platform collapse	RF.HMC.01. The mean frequency of collapse of the lid bolting room platform due to the spectrum of seismic events shall be less than or equal to 3×10^{-6} per year.	The platform is required to be designed in accordance with the applicable provisions of ANSI/AISC N690-1994 for loads and accelerations associated with a DBGM-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.

Table 1.2.6-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Receipt Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Receipt Facility (RF) (Continued)	Receipt Facility (RF) (Continued)	Lid Bolting Room Platform (200-HMC0-PLAT-00003) (Continued)	Protect against collapse or waste container breach due to an impact from the site transporter	RF.HMC.02. The mean frequency of platform collapse or waste container breach from the impact of the site transporter into the platform due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The platform is required to be designed in accordance with the applicable provisions of ANSI/AISC N690-1994 for loads and accelerations associated with a DBG-2 seismic event. Additional structural capacity is provided as required to preclude platform collapse. Energy absorbing features are required as necessary to limit the impact forces on the waste container.
Balance of Plant (SB)	Flood Protection	Flood Control Features	Protect ITS SSCs from external flooding events	SB.01. The site flood control features will be designed to the probable maximum flood.	The flood protection features are required to be located and sized to prevent the inundation of the ITS structures due to a flood associated with the probable maximum precipitation event.

NOTE: "Protect against" in this table means either "reduce the probability of" or "reduce the frequency of."

For casks, canisters, and associated handling equipment that were previously designed, the component design will be evaluated to confirm that the controlling parameters and values are met.

Seismic control values shown represent the integration of the probability distribution of SSC failure (i.e., the loss of safety function) with the seismic hazard curve.

The numbers appearing in parentheses in the third column are component numbers.

Facility Codes: CR: Canister Receipt and Closure Facility; RF: Receipt Facility; SB: Balance of Plant.

System Codes: H: Mechanical Handling.

Subsystem Codes: HM: Cask Handling; HMC: Cask Receipt; HMC: Cask Preparation; HTC: Canister Transfer.

BWR= boiling water reactor; PWR = pressurized water reactor.

Table 1.2.6-4. RF HVAC Exhaust Components and System Design Data

Subsystem/ Components	Number of Units		Nominal Airflow Capacity cfm/unit	HEPA Filter Plenum Components (No. of Banks)		
	Operating	Standby		Demister	Prefilter	HEPA Filter
Confinement Areas Exhaust HEPA Filter Plenum—Train A (Equipment Number: 200-VCT0-FLT-00005/00006/00007)	3	0	13,500	1	1	2
Confinement Areas Exhaust Fan—Train A (Equipment Number: 200-VCT0-EXH-00005)	1	0	40,500	NA	NA	NA
Confinement Areas Exhaust HEPA Filter Plenum—Train B (Equipment Number: 200-VCT0-FLT-00008/00009/00010)	0	3	13,500	1	1	2
Confinement Areas Exhaust Fan—Train B (Equipment Number: 200-VCT0-EXH-00006)	0	1	40,500	NA	NA	NA
Battery Room Train A Exhaust HEPA Filter Plenum (Equipment Number: 200-VCT0-FLT-00003/00004)	1	1	2,000	NA	1	1
Battery Room Train A Exhaust Fan (Equipment Number: 200-VCT0-EXH-00009/00010)	1	1	2,000	NA	NA	NA
Battery Room Train B Exhaust HEPA Filter Plenum (Equipment Number: 200-VCT0-FLT-00011/00012)	1	1	4,000	NA	1	1
Battery Room Train B Exhaust Fan (Equipment Number: 200-VCT0-EXH-00011/00012)	1	1	4,000	NA	NA	NA
HEPA Exhaust Filter Plenum (Equipment Number: 200-VCT0-FLT-00001/00002/00013)	2	1	18,000	NA	1	1
HEPA Exhaust Fan (Equipment Number: 200-VCT0-EXH-00001/00002/00013)	2	1	18,000	NA	NA	NA
Nonconfinement Janitor Closet Exhaust Fan (Equipment Number: 200-VNI0-EXH-00001)	1	NA	1,000	NA	NA	NA
Nonconfinement Men's Locker/Shower/Restroom Exhaust Fan (Equipment Number: 200-VNI0-EXH-00002)	1	NA	750	NA	NA	NA

NOTE: Equipment numbers are shown in [Figures 1.2.6-27](#), [1.2.6-32](#), [1.2.6-37](#) and [1.2.6-43](#).
NA = not applicable.

Table 1.2.6-5. RF Indoor Design Temperatures

Area or Room	Maximum Summer Temperature (°F Dry Bulb)	Minimum Winter Temperature (°F Dry Bulb)
Cask Preparation Room	85 ^a	65
Cask Loading and Unloading Rooms	100 ^b	65
Lid Bolting Room	90 ^b	65
HEPA Rooms	90 ^b	65
Maintenance Room	85 ^a	65
Low Level Radioactive Waste Staging Room	90 ^b	65
Support Areas	75	70
Gas Sampling Room	90 ^b	65
Electrical Rooms	90 ^b	65
Battery Rooms	77	72
Corridors and Elevator Lobby	85	65
Vestibules	90 ^b	65
Operations/Maintenance Storage Room	85 ^a	65
Canister Transfer Room	85 ^a	65
Receiver/Dryer Equipment Room	90 ^b	65
Canister Transfer Machine Maintenance Room	90 ^b	65
Offices and Support Areas	75	70
Operations Room	75	70
Communications Room	75	70
Corridors	85	65
Instrument and Electrical Shop	85 ^a	65

NOTE: ^aThese areas are normally not occupied. However, these areas are designed to be at a maximum of 85°F since there is expected extended occupancy during operation.

^bThese areas are normally not occupied and the temperature limits are based on the electrical equipment located in the space.

Table 1.2.6-6. RF HVAC Supply Components and System Design Data

Subsystem/ Components	Number of Units		Nominal Unit Capacity
	Operating	Standby	
Confinement Areas Supply Air Handling Unit (Equipment Number: 200-VCT0-AHU-00006/00007)	1	1	30,000 cfm
Confinement Areas Air Handling Unit—North (Equipment Number: 200-VCT0-AHU-00001/00002/00003)	2	1	30,000 cfm
Confinement Areas Air Handling Unit—South (Equipment Number: 200-VCT0-AHU-0004/0005)	1	1	36,000 cfm
Nonconfinement Areas Supply Air Handling Unit (Equipment Number: 200-VNI0-AHU-00001/00002)	1	1	20,000 cfm
Nonconfinement Areas Return Fan (Integral to 200-VNI0-AHU-00001/00002)	1	1	20,000 cfm
Nonconfinement Transportation Cask Vestibule—Fan Coil Units (Equipment Number: 200-VNI0-FCU-00001/00002)	1	1	5,000 cfm
Nonconfinement Site Transporter Vestibule—Fan Coil Units (Equipment Number: 200-VNI0-FCU-00003/00004)	1	1	2,000 cfm
Nonconfinement Transportation Cask Vestibule Annex—Fan Coil Units (Equipment Number: 200-VNI0-FCU-00005/00006)	1	1	1,000 cfm
Nonconfinement Low Level Waste Vestibule—Fan Coil Units (Equipment Number: 200-VNI0-FCU-00007/00008)	1	1	2,000 cfm
Electrical Room Train A—Direct Expansion Fan Coil Units (Equipment Number: 200-VCT0-FCU-00001/00002)	1	1	6,000 cfm
Electrical Room Train A—Condensing Units (Equipment Number: 200-VCT0-CDU-00001/00002)	1	1	20 tons
Electrical Room Train B—Direct Expansion Fan Coil Units (Equipment Number: 200-VCT0-FCU-00003/00004)	1	1	6,000 cfm
Electrical Room Train B—Condensing Units (Equipment Number: 200-VCT0-CDU-00003/00004)	1	1	20 tons

NOTE: Equipment numbers are shown in [Figures 1.2.6-27, 1.2.6-32, 1.2.6-37, and 1.2.6-43](#).

ROOM LEGEND
RECEIPT FACILITY

GROUND FLOOR

1001 SITE TRANSPORTER VESTIBULE
 1002 LID BOLTING ROOM
 1003A CORRIDOR
 1003B CORRIDOR
 1003C CORRIDOR
 1003D CORRIDOR
 1003E CORRIDOR
 1003F CORRIDOR
 1003G CORRIDOR
 1003H UTILITY CHASE
 1004 HVAC ROOM (HEPA EXHAUST TRAIN A)
 1004A HVAC ROOM (HEPA EXHAUST FOR BATTERY ROOM TRAIN A)
 1005 ELECTRICAL ROOM (TRAIN A)
 1005A BATTERY ROOM (TRAIN A)
 1006
 THRU NOT USED
 1010
 1011 LLW VESTIBULE
 1012 LLW STAGING ROOM
 1013 LOADING ROOM
 1014 MAINTENANCE ROOM
 1015 CASK UNLOADING ROOM
 1016 CTM MAINTENANCE ROOM
 1017 CASK PREPARATION ROOM
 1017A CASK PREPARATION ANNEX
 1018 ELECTRICAL ROOM (NORMAL POWER)
 1018A BATTERY ROOM (NORMAL POWER)
 1019 HVAC ROOM (HEPA EXHAUST TRAIN B)
 1019A HVAC ROOM (HEPA EXHAUST FOR BATTERY ROOM TRAIN B)
 1020 ELECTRICAL ROOM (TRAIN B)
 1020A BATTERY ROOM (TRAIN B)
 1021 TRANSPORTATION CASK VESTIBULE ANNEX
 1021A TRANSPORTATION CASK VESTIBULE
 1021B PERSONNEL VESTIBULE
 1022 STAIR #1
 1023 STAIR #2
 1024 NOT USED
 1025 STAIR #3
 1026 STAIR #4
 1027 STAIR #5
 1028 FREIGHT ELEVATOR
 1028A VESTIBULE
 1029 ELEVATOR LOBBY
 1030 FIRE WATER RISER VALVE ROOM #1
 1031 FIRE WATER RISER VALVE ROOM #2

GROUND FLOOR SUPPORT AREA

1200 ENTRY/EXIT VESTIBULE
 1201A ENTRY LOBBY
 1201B CORRIDOR
 1202 SECURITY POST
 1203 RA CONTROL POINT
 1204 MENS LOCKER/SHOWER RESTROOM
 1205 RA EXIT VESTIBULE
 1206 WOMENS LOCKER/SHOWER RESTROOM
 1207 OPERATIONS ROOM
 1208 COMMUNICATIONS ROOM
 1209 RP STAFF WORK ROOM
 1210 BRIEFING/BREAK ROOM
 1211 JANITOR CLOSET
 1212 RP GEAR SUPPLY ROOM
 1212A RA ENTRANCE VESTIBULE
 1213 CHANGE ROOM 1
 1214 CHANGE ROOM 2
 1215 RP EQUIPMENT ROOM
 1216 RESPIRATOR ROOM
 1217 CORRIDOR
 1218 RP LAB/COUNT ROOM
 1219 RP LAB/SAMPLE PREPARATION ROOM
 1220 DECON ROOM
 1221 RA EXIT/PCM ROOM
 1222 JANITOR CLOSET
 1223 GAS SAMPLING ROOM
 1224 RP INSTRUMENT ROOM

SECOND FLOOR

2001 OPERATIONS/MAINTENANCE STORAGE ROOM
 2002A CORRIDOR
 2002B CORRIDOR
 2002C CORRIDOR
 2002D CORRIDOR
 2002E CORRIDOR
 2002F CORRIDOR
 2002G CORRIDOR
 2003 HVAC ROOM NORTH (PROCESS AREA SUPPLY)
 2004 HVAC ROOM NORTH (PROCESS AREA SUPPLY)
 2005 INSTRUMENT AND ELECTRICAL SHOP
 2006 HVAC ROOM (HEPA EXHAUST FOR SUPPORT, DECON AND LLW AREAS)
 2007 CANISTER TRANSFER ROOM
 2008 HVAC ROOM (OPERATIONS AND SUPPORT AREA SUPPLY)
 2009 HVAC ROOM SOUTH (PROCESS AREA SUPPLY)
 2010 HVAC ROOM SOUTH (PROCESS AREA SUPPLY)
 2011 HVAC ROOM SOUTH (PROCESS AREA SUPPLY)
 2012 RECEIVER/DRYER EQUIPMENT ROOM
 2013
 THRU NOT USED
 2021
 2022 STAIR #1
 2023 STAIR #2
 2024 NOT USED
 2025 STAIR #3
 2026 STAIR #4
 2027 STAIR #5
 2028 NOT USED
 2029 ELEVATOR LOBBY

THIRD FLOOR

3001 CORRIDOR
 3002
 THRU NOT USED
 3025
 3026 STAIR #4
 3027 NOT USED
 3028 NOT USED
 3029 ELEVATOR LOBBY





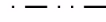
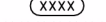





ROOF

R001 FREIGHT ELEVATOR MACHINE ROOM
 R026 FREIGHT ELEVATOR MACHINE STAIR

PIT

P001 LIQUID LLW SUMP

DRAWING LEGEND

--- GRID LINE
 CHECKERED PLATE
 FLOOR GRATING
 PARTITION WALL
 CONCRETE SECTION
 OVERHEAD CRANE HOOK APPROACH
 ROOM/AREA NUMBER
 GRADE SECTION
 BUILT UP ROOFING
 EYE WASH/SHOWER STATION
 METAL EXTERIOR PANEL SYSTEM
 CONFINEMENT DOOR

ABBREVIATIONS AND ACRONYMS

AO = AGING OVERPACK
 AUX = AUXILIARY
 COL = COLUMN
 CTM = CANISTER TRANSFER MACHINE
 DN = DOWN
 DOE = U.S. DEPARTMENT OF ENERGY
 EL = ELEVATION
 GA = GENERAL ARRANGEMENT
 HEPA = HIGH-EFFICIENCY PARTICULATE AIR
 HR = HANDRAIL
 HVAC = HEATING, VENTILATION AND AIR-CONDITIONING
 ITS = IMPORTANT TO SAFETY
 ITWI = IMPORTANT TO WASTE ISOLATION
 LLW = LOW-LEVEL (RADIOACTIVE) WASTE
 LC = LOAD CENTER
 MCC = MOTOR CONTROL CENTER
 PCM = PERSONNEL CONTAMINATION MONITOR
 RA = RADIOLOGICAL ACCESS
 RF = RECEIPT FACILITY
 RP = RADIOLOGICAL PROTECTION
 SSC = STRUCTURE, SYSTEM, OR COMPONENT
 TAD = TRANSPORTATION, AGING AND DISPOSAL
 TOC = TOP OF CONCRETE
 TOR = TOP OF RAIL
 TOS = TOP OF STEEL
 TYP = TYPICAL
 UNO = UNLESS NOTED OTHERWISE
 # = NUMBER
 CL = CENTER LINE

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Figure 1.2.6-1. RF General Arrangement Legend

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A and has been updated: Information Designated as Official Use Only, as [Figure A-67](#).

Figure 1.2.6-2. RF General Arrangement Ground Floor Plan

NOTE: AO = aging overpack; HR = handrail; LC = load center; MCC = motor control center.

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This figure is included in Appendix A and has been updated: Information Designated as Official Use Only, as [Figure A-68](#).

NOTE: The structure for Room 2008 is non-ITS.
AO = aging overpack; LC = load center; MCC = motor control center.

Figure 1.2.6-3. RF General Arrangement Second Floor Plan

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A and has been updated: Information Designated as Official Use Only, as [Figure A-69](#).

Figure 1.2.6-4. RF General Arrangement Third Floor Plan

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-70](#).

Figure 1.2.6-5. RF General Arrangement Roof Plan

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-71](#).

NOTE: AO = aging overpack; HR = handrail; LC = load center; MCC = motor control center.

Figure 1.2.6-6. RF General Arrangement Section A

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-72](#).

NOTE: AO = aging overpack; CTM = canister transfer machine; HR = handrail; LC = load center.

Figure 1.2.6-7. RF General Arrangement Section B

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-73](#).

NOTE: AO = aging overpack; LC = load center; MCC = motor control center.

Figure 1.2.6-8. RF General Arrangement Section C

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-74](#).

NOTE: CTM = canister transfer machine.

Figure 1.2.6-9. RF General Arrangement Section D

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-75](#).

NOTE: MCC = motor control center.

Figure 1.2.6-10. RF General Arrangement Section E

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-76](#).

NOTE: LC = load center.

Figure 1.2.6-11. RF General Arrangement Section F

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-77](#).

NOTE: AO = aging overpack.

Figure 1.2.6-12. RF Operational Sequences and Material Flow Paths (Sheet 1 of 2)

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-77](#).

Figure 1.2.6-12. RF Operational Sequences and Material Flow Paths (Sheet 2 of 2)

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-78](#).

NOTE: This figure is an example representing the number of waste forms that could be present in the facility at any one time. It does not define limits on number of waste forms that may be present in specific areas of the facility.

Figure 1.2.6-13. Inventory of Waste Forms in the Receipt Facility at Any One Time

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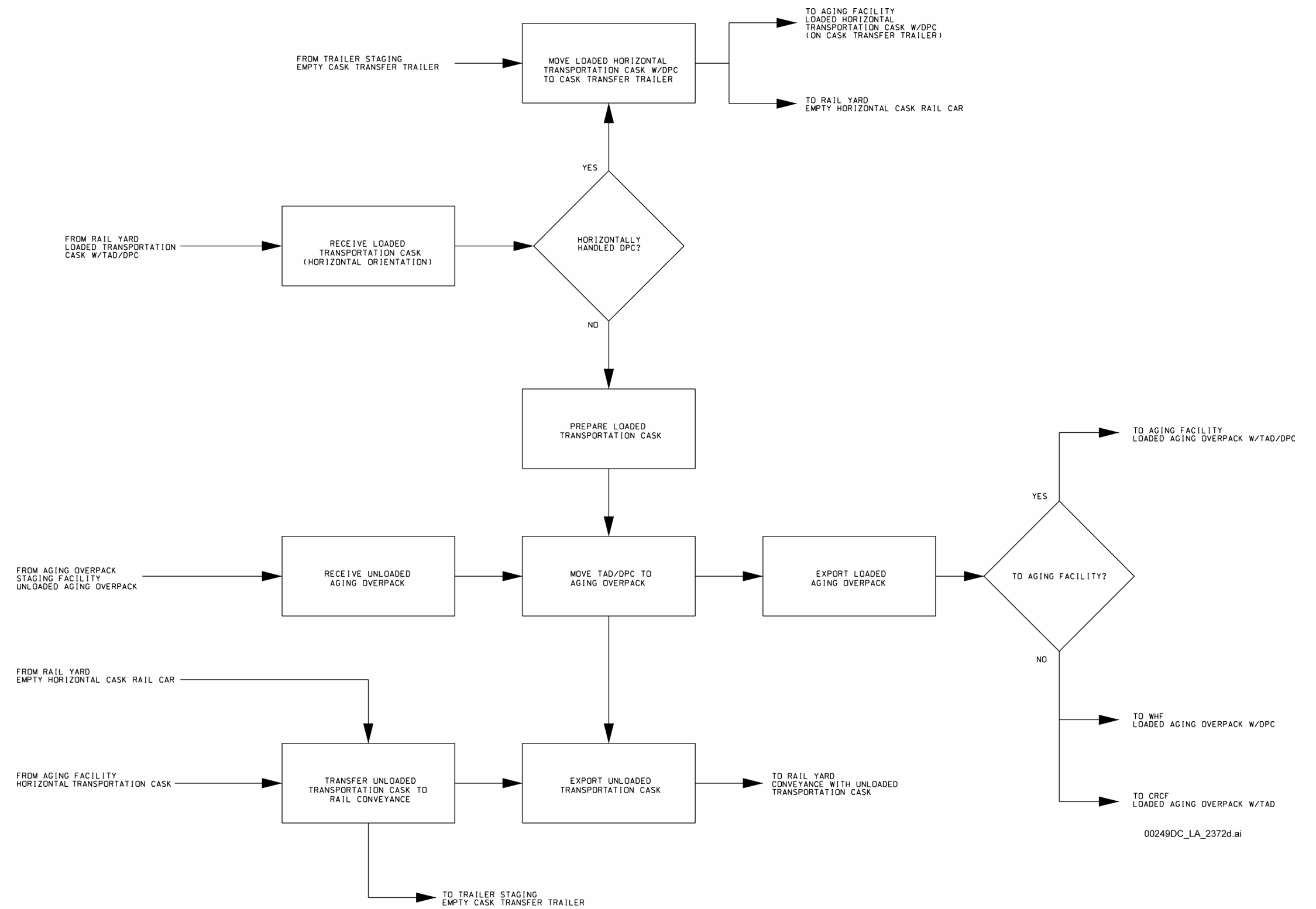


Figure 1.2.6-14. RF Major Waste Processing Functions

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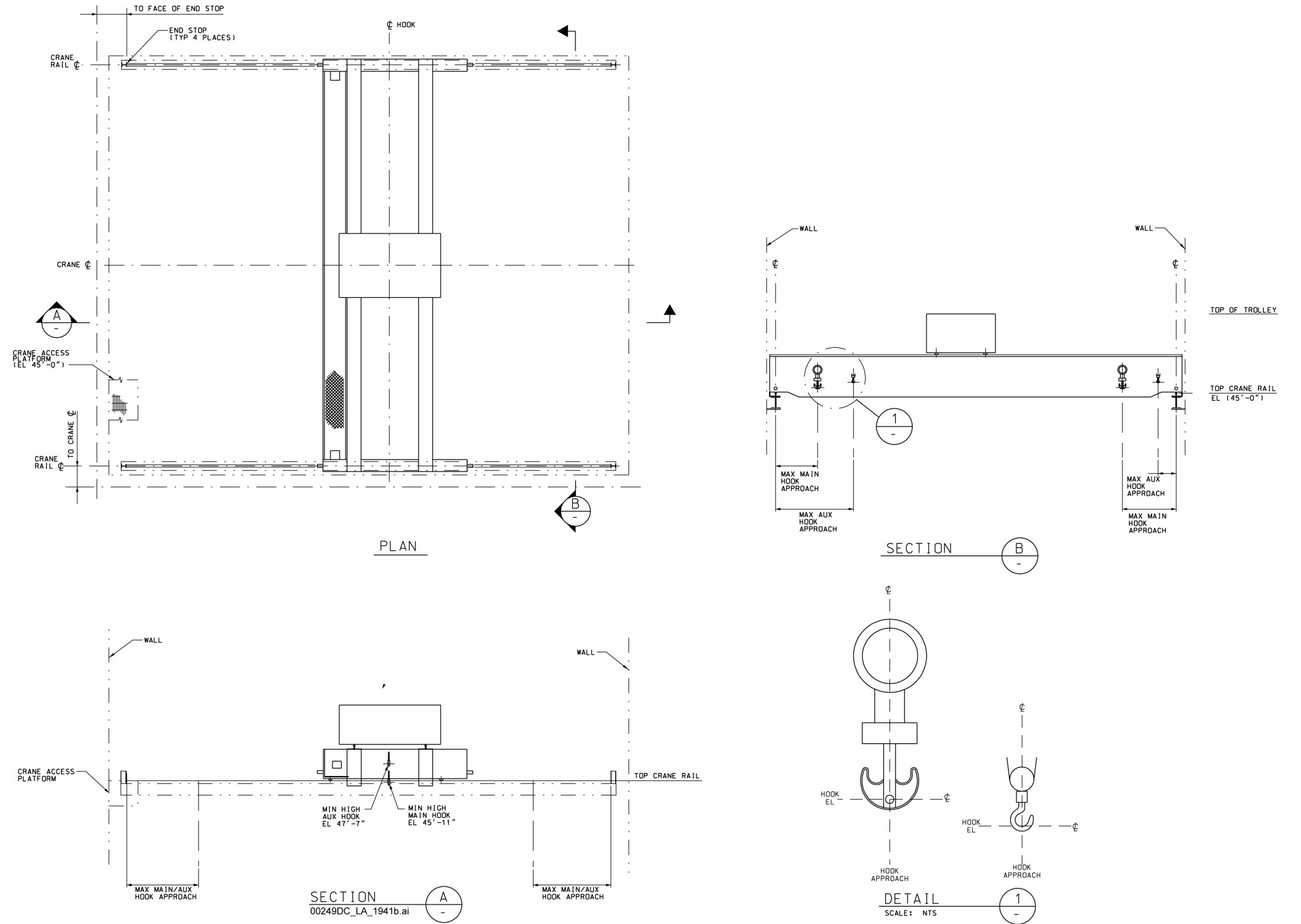
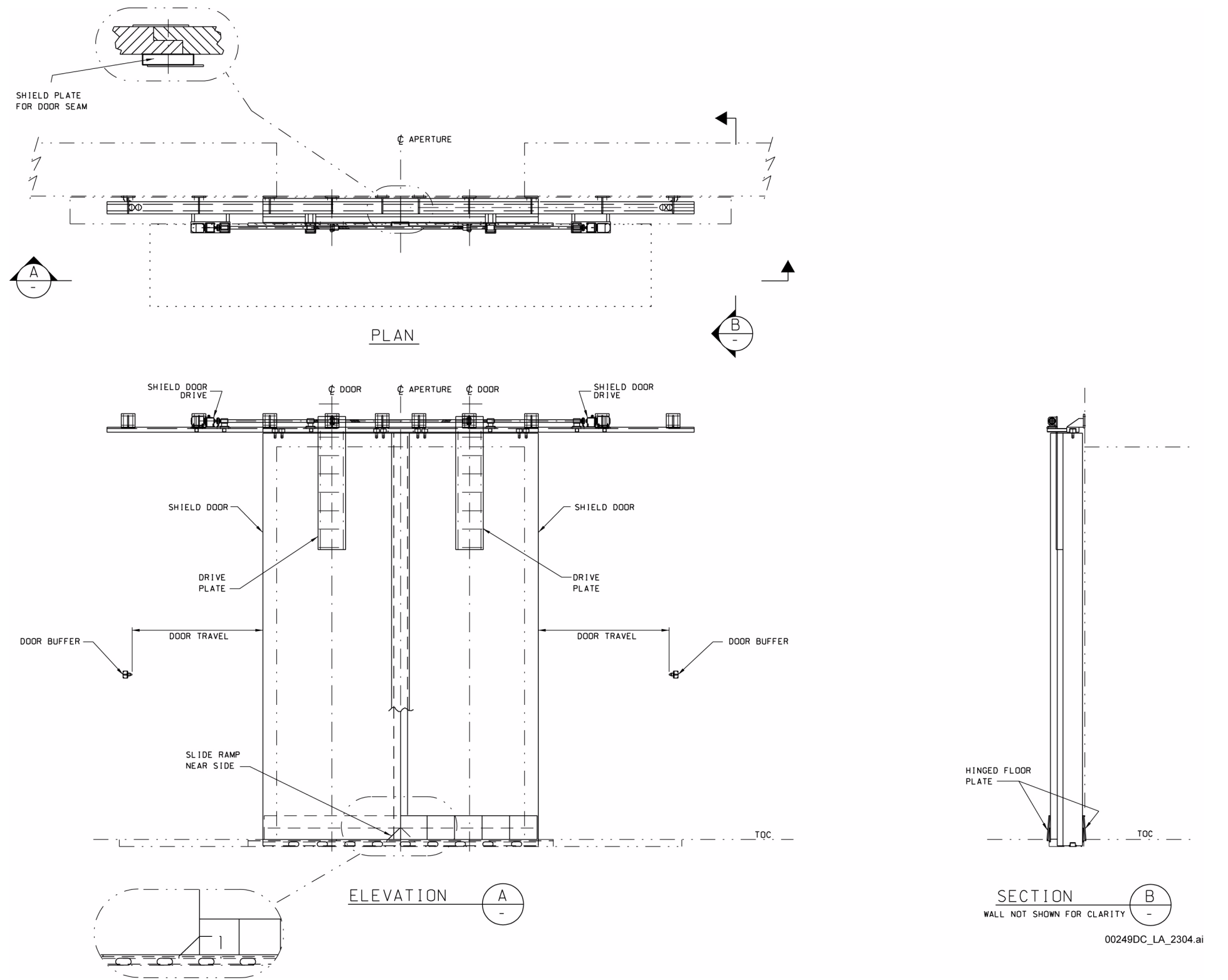


Figure 1.2.6-15. RF Cask Handling Crane Mechanical Equipment Envelope

Equipment Number: 200-HM00-CRN-00001.

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Equipment Number: 200-RF00-DR-00001.

Figure 1.2.6-16. RF Cask Unloading Room Equipment Shield Door—Type 5 Mechanical Equipment Envelope

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-79](#).

Equipment Number: 200-HMH0-PLAT-00002.

NOTE: The platform, in conjunction with the energy absorbing features, is designed so that the transportation cask is prevented from impacting the underside of the platform during a seismic event.

Figure 1.2.6-17. RF Cask Preparation Platform
Mechanical Equipment Envelope

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-80](#).

Figure 1.2.6-18. RF Lid Bolting Room Platform
Mechanical Equipment Envelope (Sheet
1 of 2)

Equipment Number: 200-HMC0-PLAT-00003.

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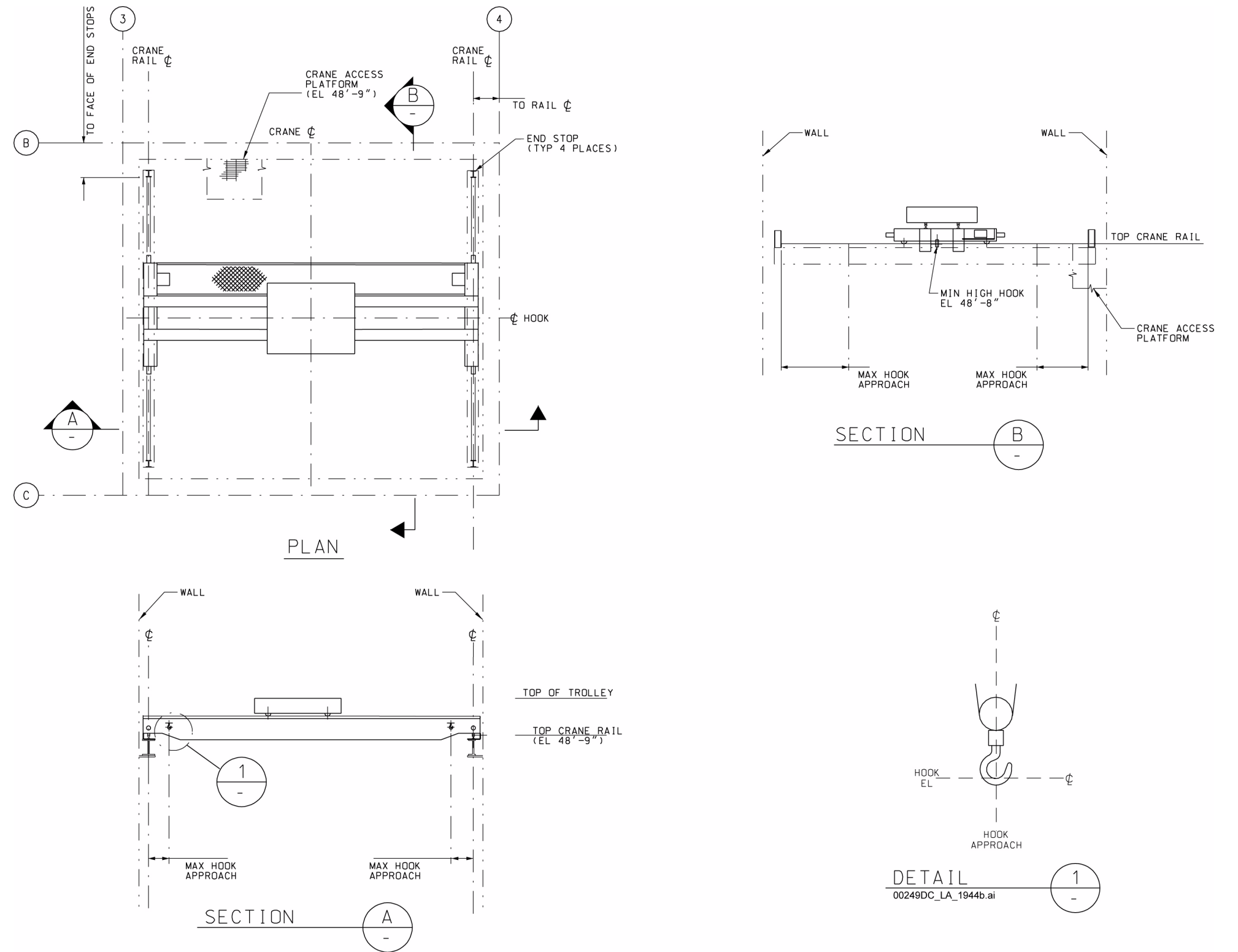
This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-80](#).

Figure 1.2.6-18. RF Lid Bolting Room Platform
Mechanical Equipment Envelope (Sheet
2 of 2)

Equipment Number: 200-HMC0-PLAT-00003.

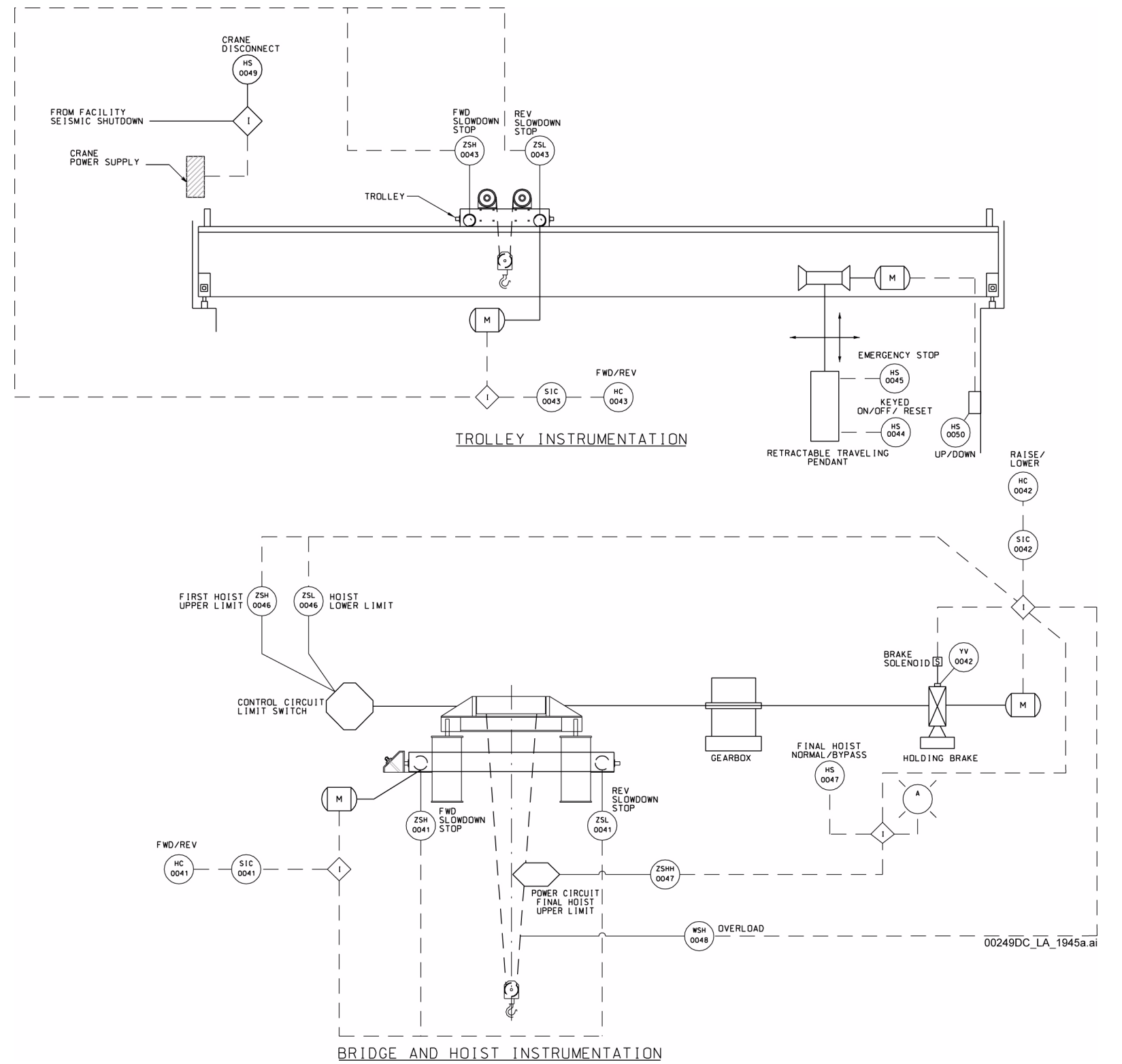
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Equipment Number: 200-HMC0-CRN-00001

Figure 1.2.6-19. RF Lid Bolting Room Crane Mechanical Equipment Envelope

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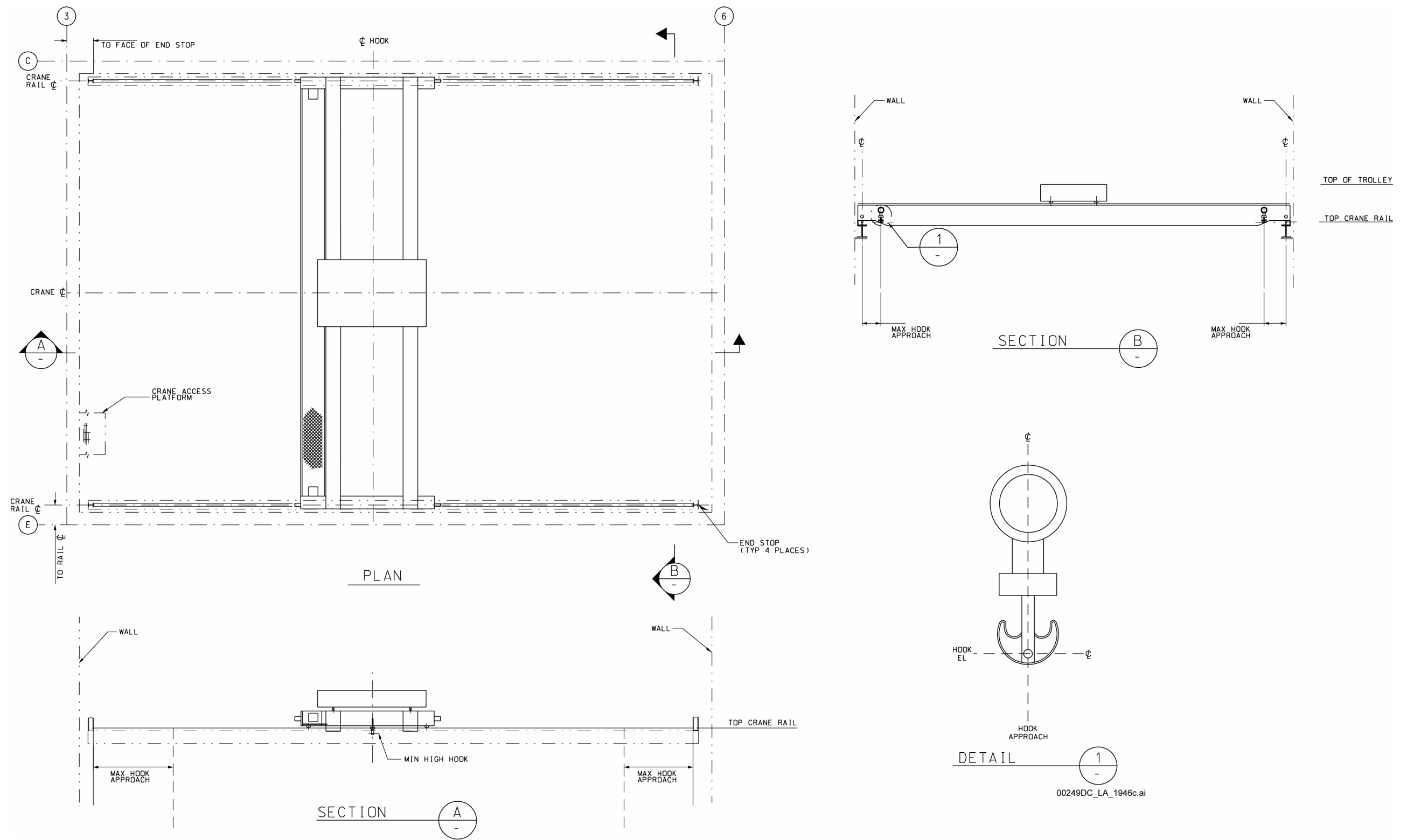


Equipment Number: 200-HMC0-CRN-00001, lid bolting room crane.

NOTE: This drawing includes the RF lid bolting room crane that has been classified as ITS. While the RF lid bolting room crane is ITS, the instrumentation, electrical and control devices shown herein are non-ITS and non-ITWI.

Figure 1.2.6-20. RF Lid Bolting Room Crane Process and Instrumentation Diagram

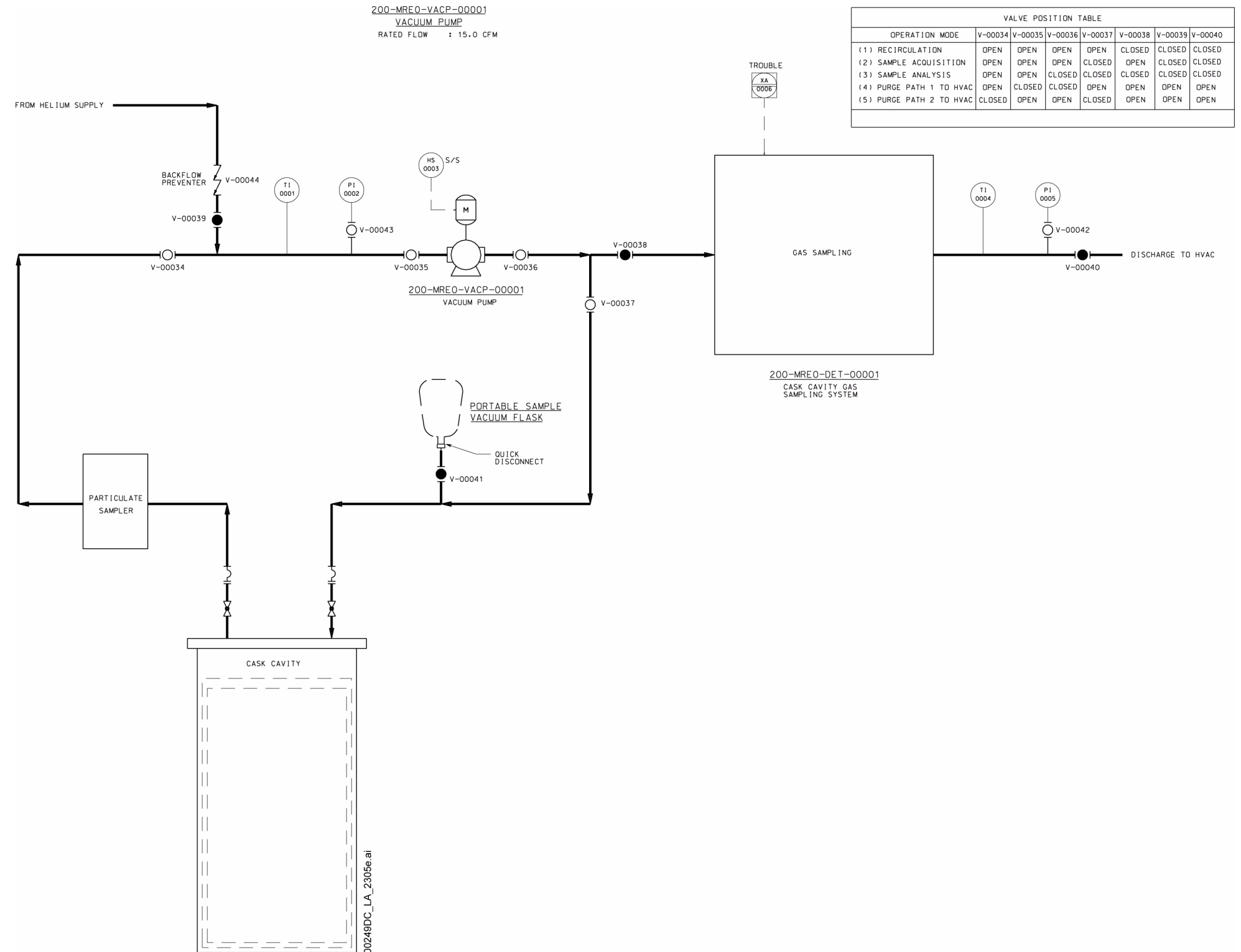
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Equipment Number: 200-HTC0-CRN-00001.

Figure 1.2.6-21. RF Canister Transfer Machine Maintenance Crane Mechanical Equipment Envelope

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NOTE: This figure includes no SSCs that are either ITS or ITWI. Valves that are not included in the valve position table maintain the position as indicated in the figure.

Figure 1.2.6-22. RF Cask Cavity Gas Sampling System Piping and Instrumentation Diagram

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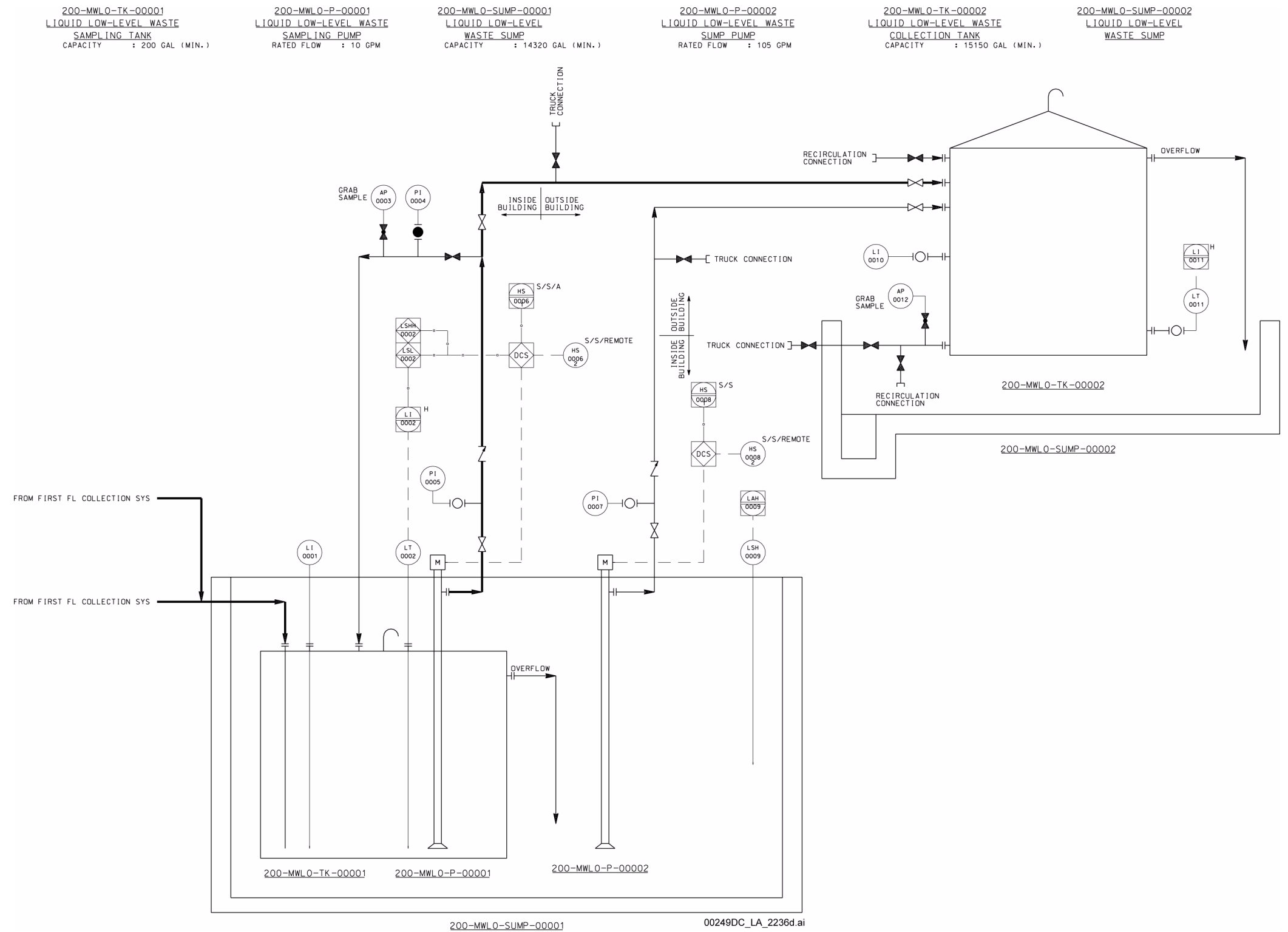


Figure 1.2.6-23. RF Liquid Low-Level Radioactive Waste Sampling and Sump Piping and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-81](#).

Figure 1.2.6-24. RF Confinement Zoning, Ground Floor

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-82](#).

Figure 1.2.6-25. RF Confinement Zoning, Second Floor

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-83](#).

Figure 1.2.6-26. RF Confinement Zoning, Third Floor

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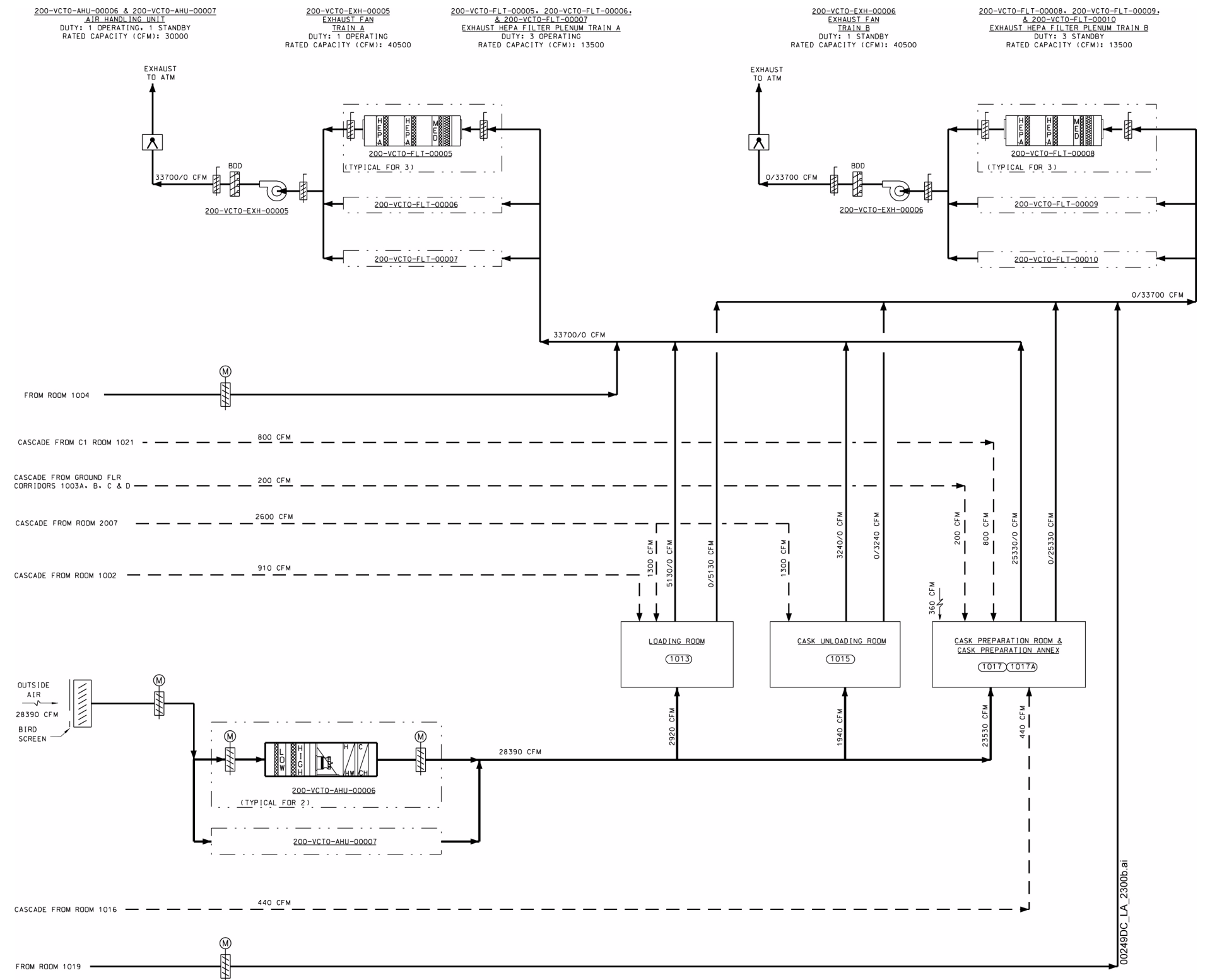
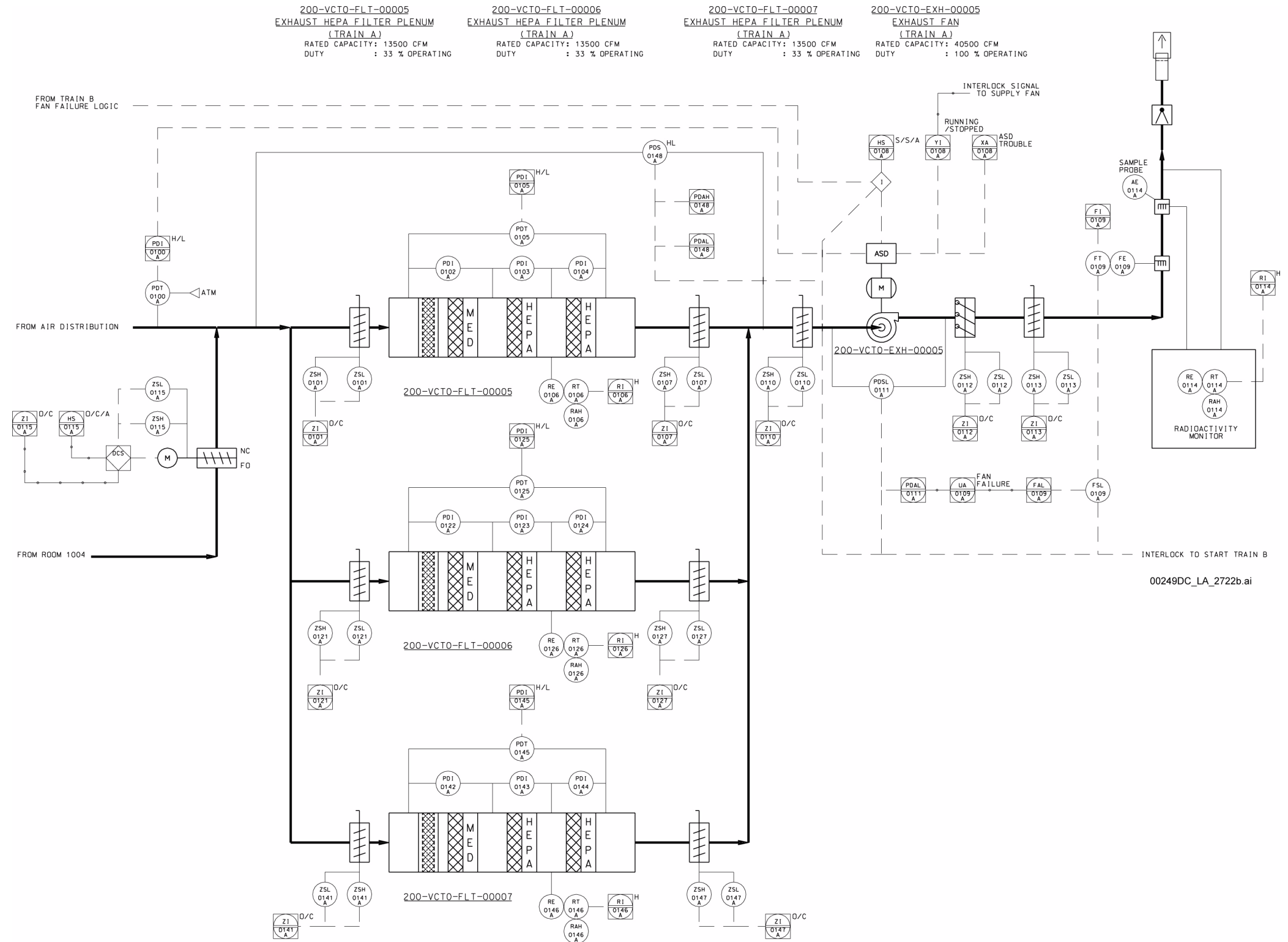


Figure 1.2.6-27. RF Composite Ventilation Flow Diagram, Tertiary Confinement HVAC Supply and Exhaust

NOTE: This figure includes no SSCs that are either ITS or ITWI.

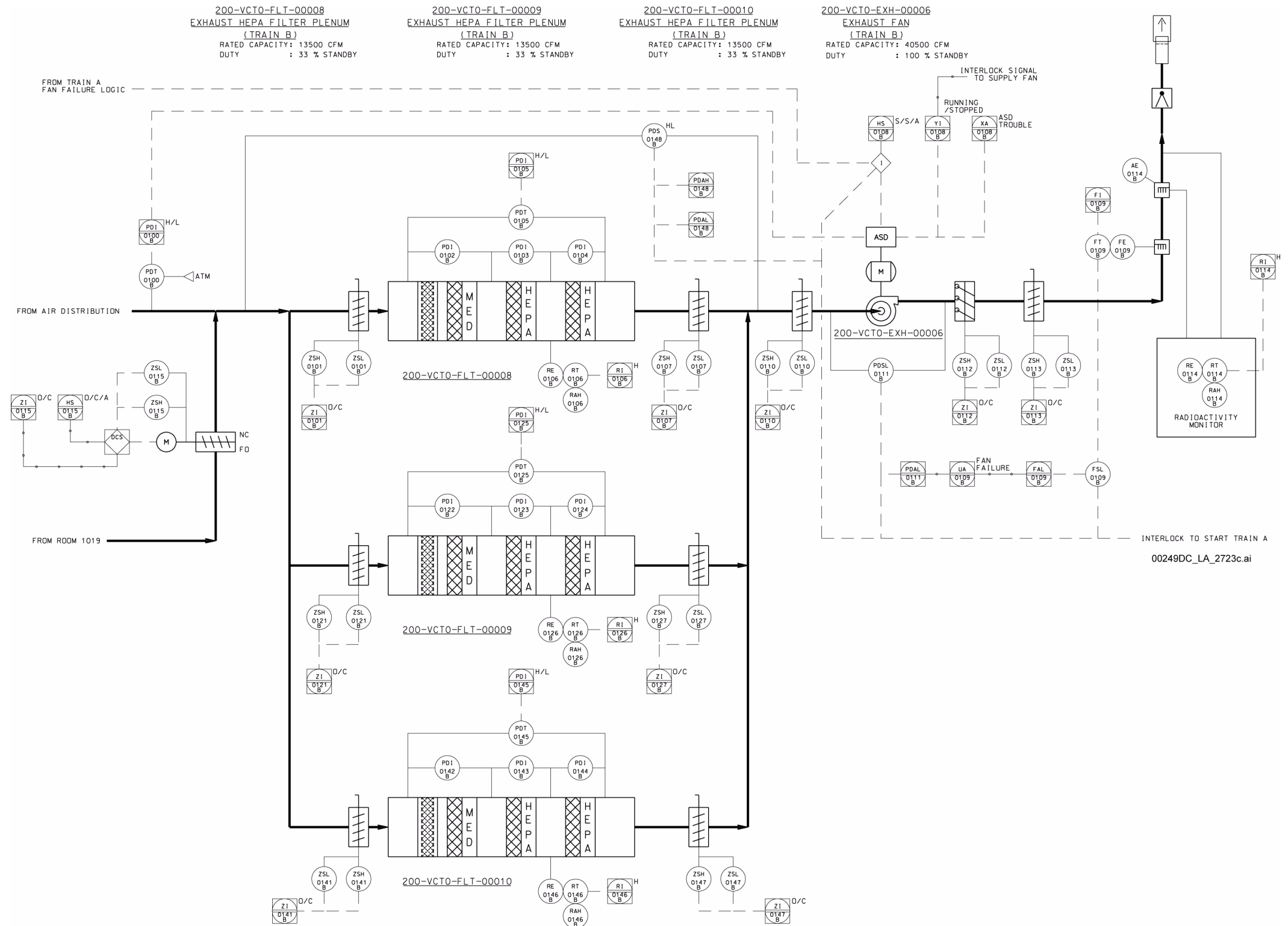
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NOTE: This figure includes no SSCs that are either ITS or ITWI.
 The isolation damper is closed and flow is zero during normal operation. The interlock will shut down the operating fan and start the standby unit upon detection of any of the following: low differential pressure across the fan coincident with low flow; high HEPA filter train differential pressure; or low HEPA filter train differential pressure.

Figure 1.2.6-28. RF Confinement Areas High-Efficiency Particulate Air Exhaust System—Train A Ventilation and Instrumentation Diagram

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NOTE: This figure includes no SSCs that are either ITS or ITWI.
 The isolation damper is closed and flow is zero during normal operation. The interlock will shut down the operating fan and start the standby unit upon detection of any of the following: low differential pressure across the fan coincident with low flow; high HEPA filter train differential pressure; or low HEPA filter train differential pressure.

Figure 1.2.6-29. RF Confinement Areas High-Efficiency Particulate Air Exhaust System—Train B Ventilation and Instrumentation Diagram

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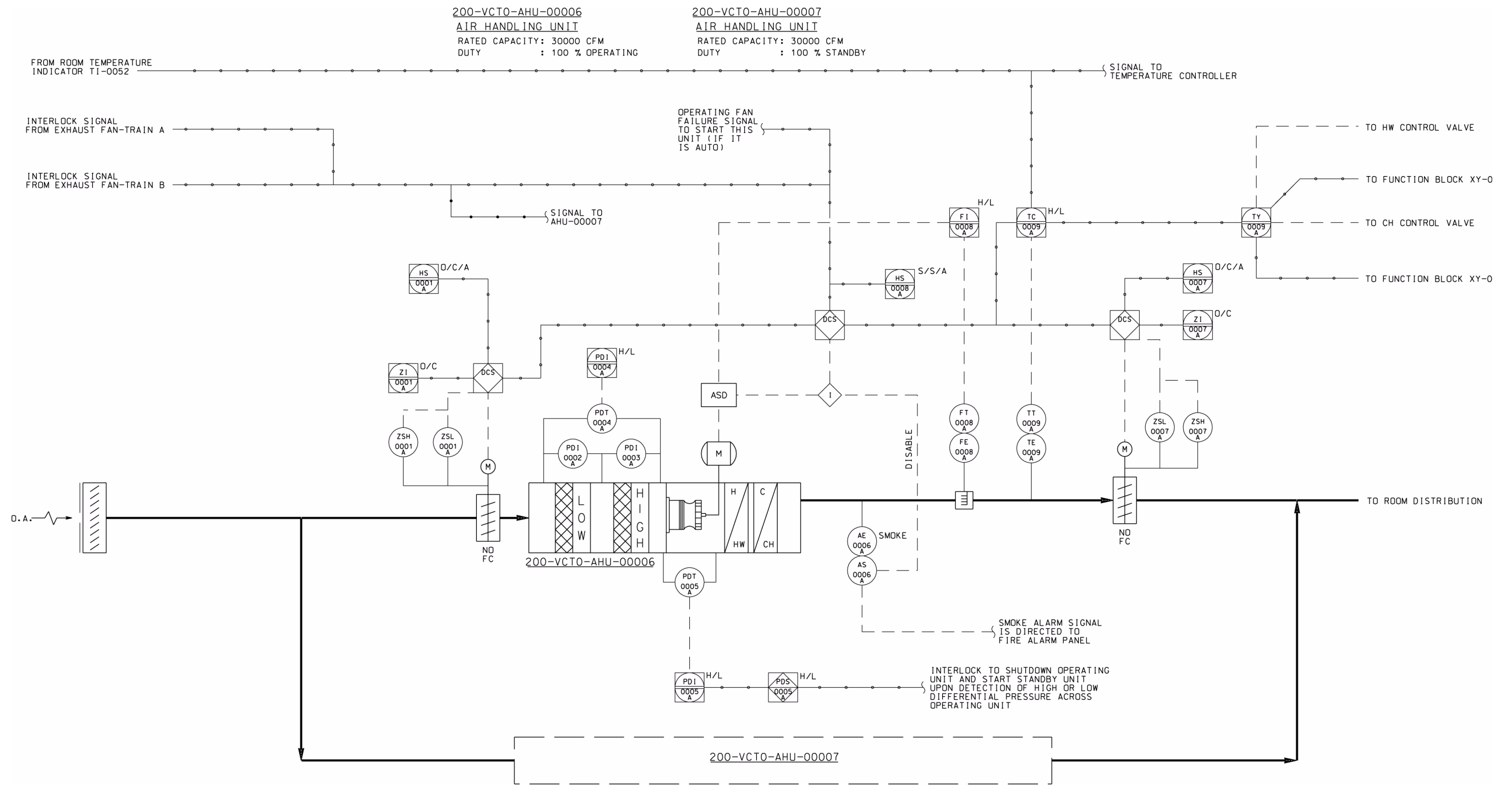


TABLE 1:

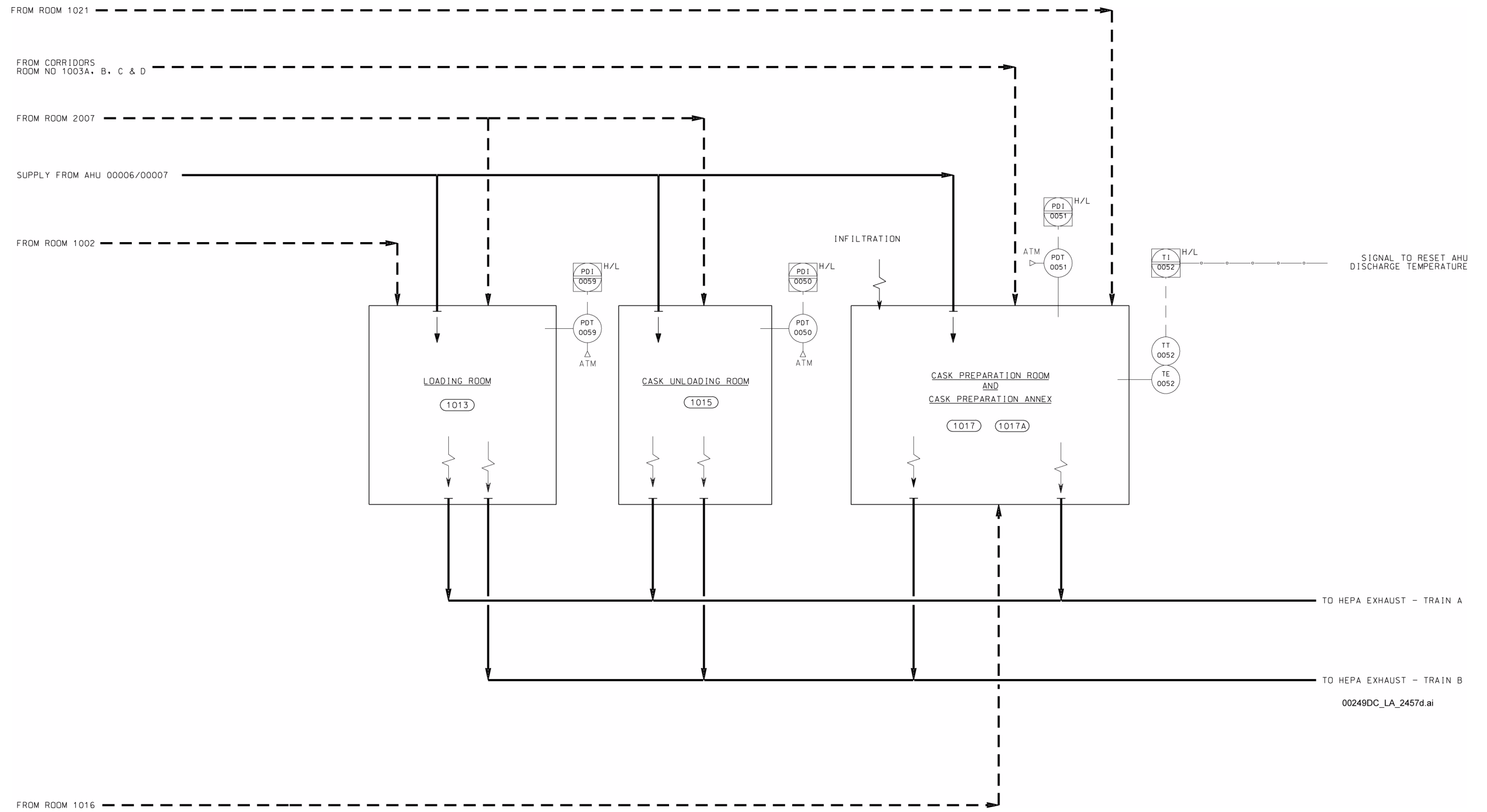
MECHANICAL COMPONENT	AIR HANDLING UNIT					INLET DAMPER				OUTLET DAMPER				SMOKE		FLOW			TEMPERATURE				FAN DP		
	HS	PD1	PD1	PDT	PD1	HS	ZI	ZSL	ZSH	HS	ZI	ZSL	ZSH	AE	AS	FE	FT	FI	TE	TT	TC	TY	PDT	PD1	PDS
200-VCTO-AHU-00006	0008A	0002A	0003A	0004A	0004A	0001A	0001A	0001A	0001A	0007A	0007A	0007A	0007A	0006A	0006A	0008A	0008A	0008A	0009A	0009A	0009A	0009A	0005A	0005A	0005A
200-VCTO-AHU-00007	0008B	0002B	0003B	0004B	0004B	0001B	0001B	0001B	0001B	0007B	0007B	0007B	0007B	0006B	0006B	0008B	0008B	0008B	0009B	0009B	0009B	0009B	0005B	0005B	0005B

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Figure 1.2.6-30. RF Confinement Areas HVAC Supply System Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.

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NOTE: This figure includes no SSCs that are either ITS or ITWI.
 AHU = air handling unit.

Figure 1.2.6-31. RF Confinement Areas Air Distribution System Ventilation and Instrumentation Diagram

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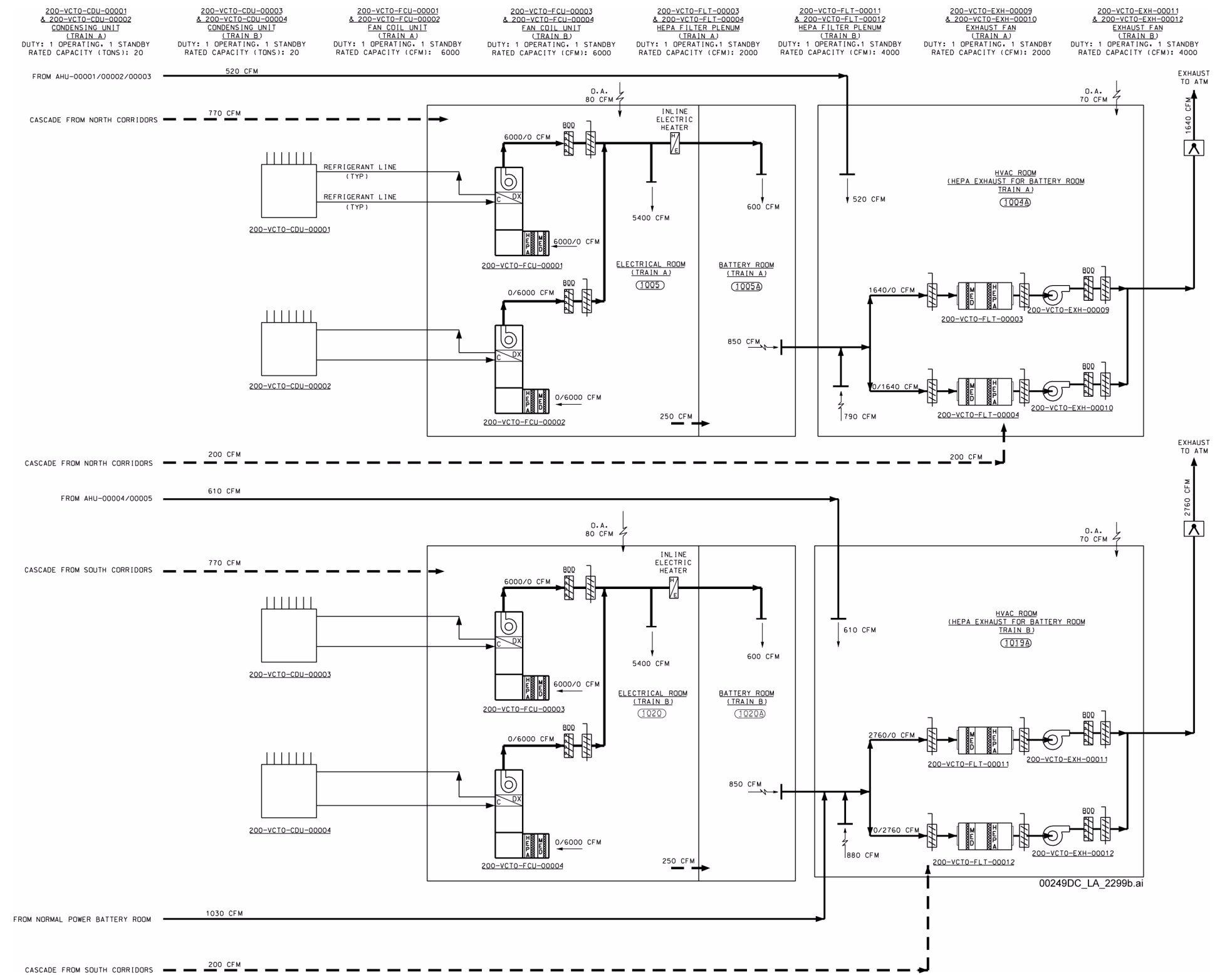


Figure 1.2.6-32. RF Composite Ventilation Flow Diagram, Tertiary Confinement HVAC Systems, Electrical and Battery Rooms

NOTE: This figure includes no SSCs that are either ITS or ITWI.

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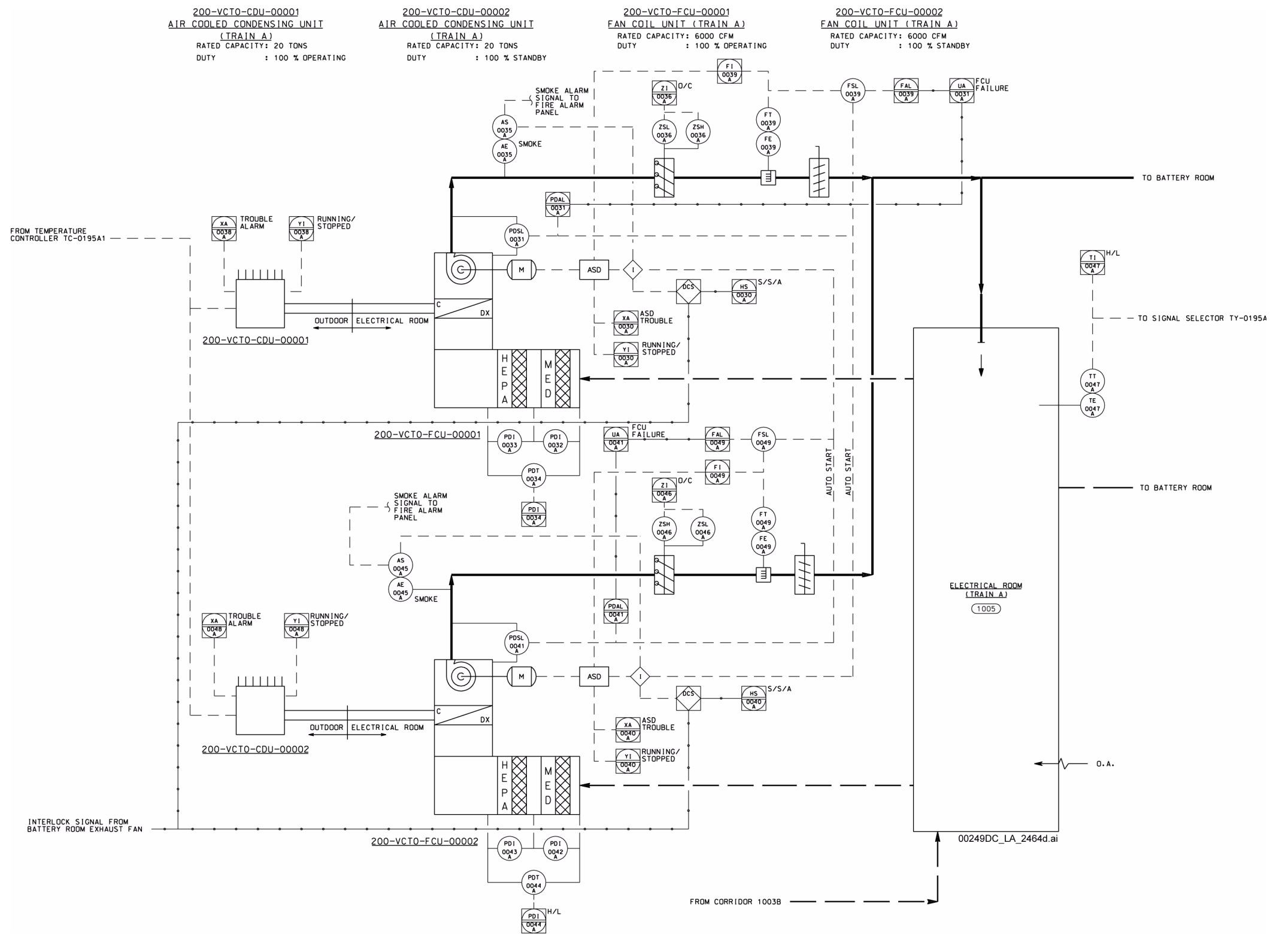
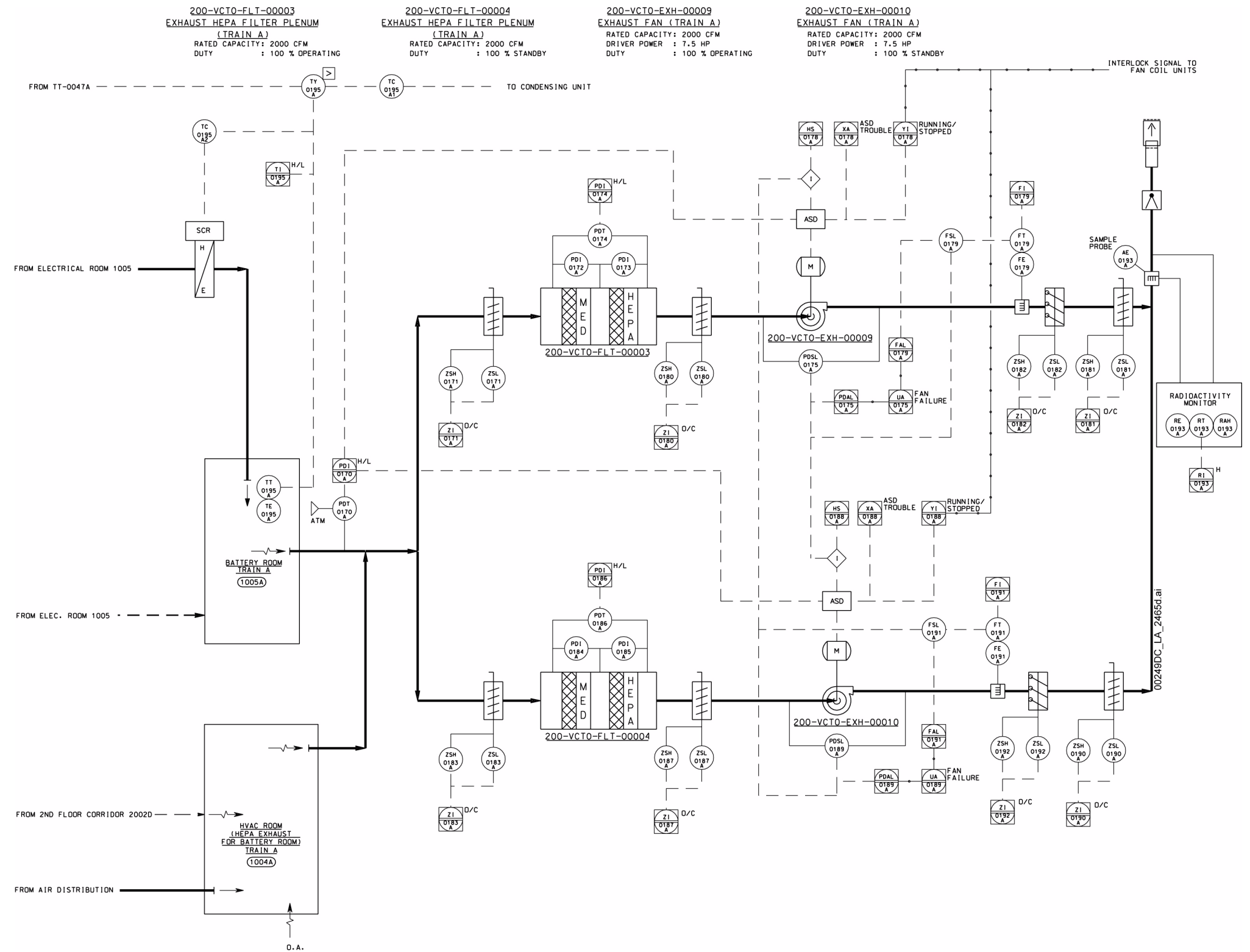


Figure 1.2.6-33. RF Confinement Electrical Room HVAC System—Train A Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.

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NOTE: This figure includes no SSCs that are either ITS or ITWI.
The silicon-controlled rectifier is integral to the electric heating coil and modulates heating in response to the temperature controller signal.

Figure 1.2.6-34. RF Confinement Battery Room Exhaust System—Train A Ventilation and Instrumentation Diagram

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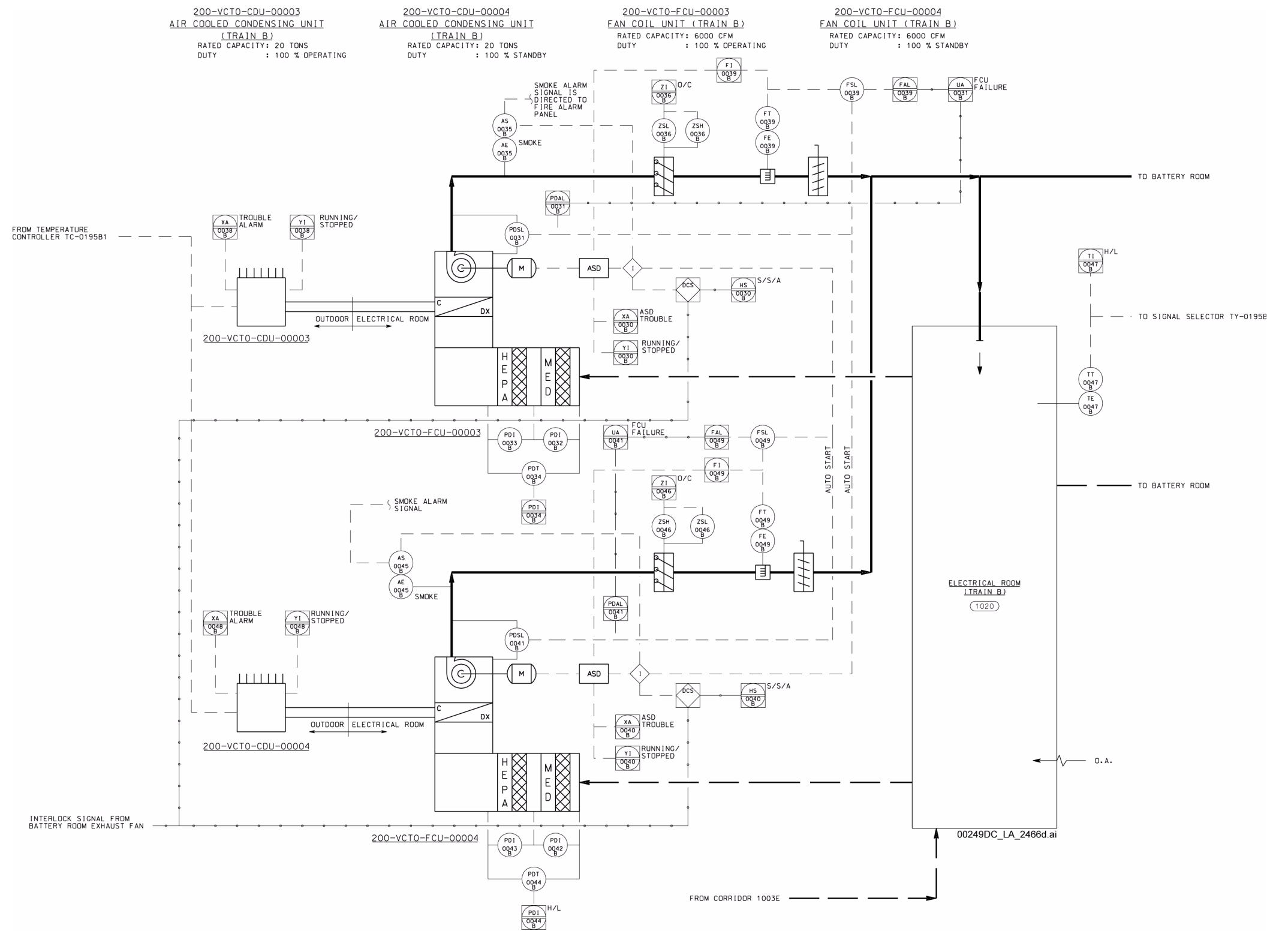
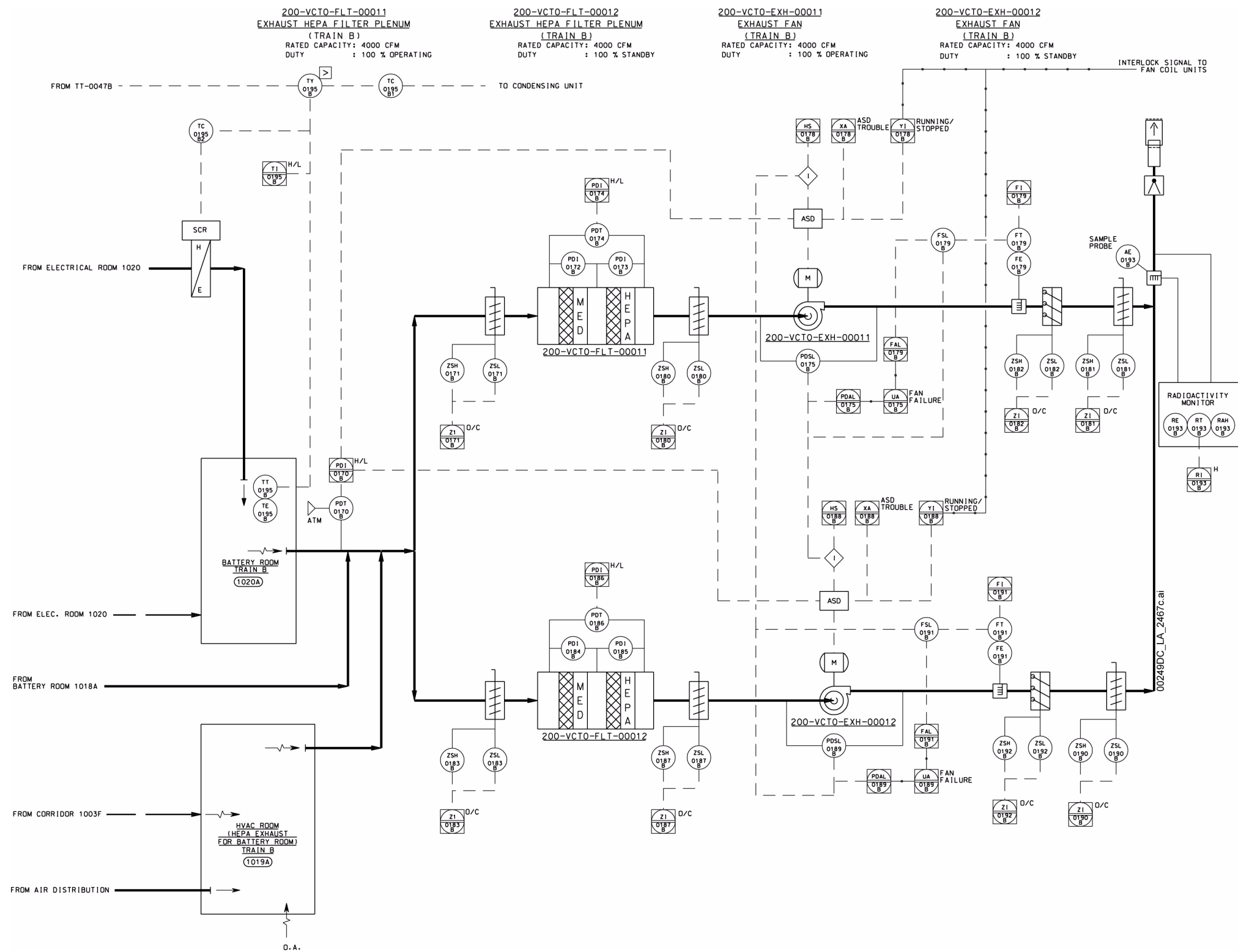


Figure 1.2.6-35. RF Confinement Electrical Room HVAC System—Train B Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.

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NOTE: This figure includes no SSCs that are either ITS or ITWI.
 The silicon-controlled rectifier is integral to the electric heating coil and modulates heating in response to the temperature controller signal.

Figure 1.2.6-36. RF Confinement Battery Room Exhaust System—Train B Ventilation and Instrumentation Diagram

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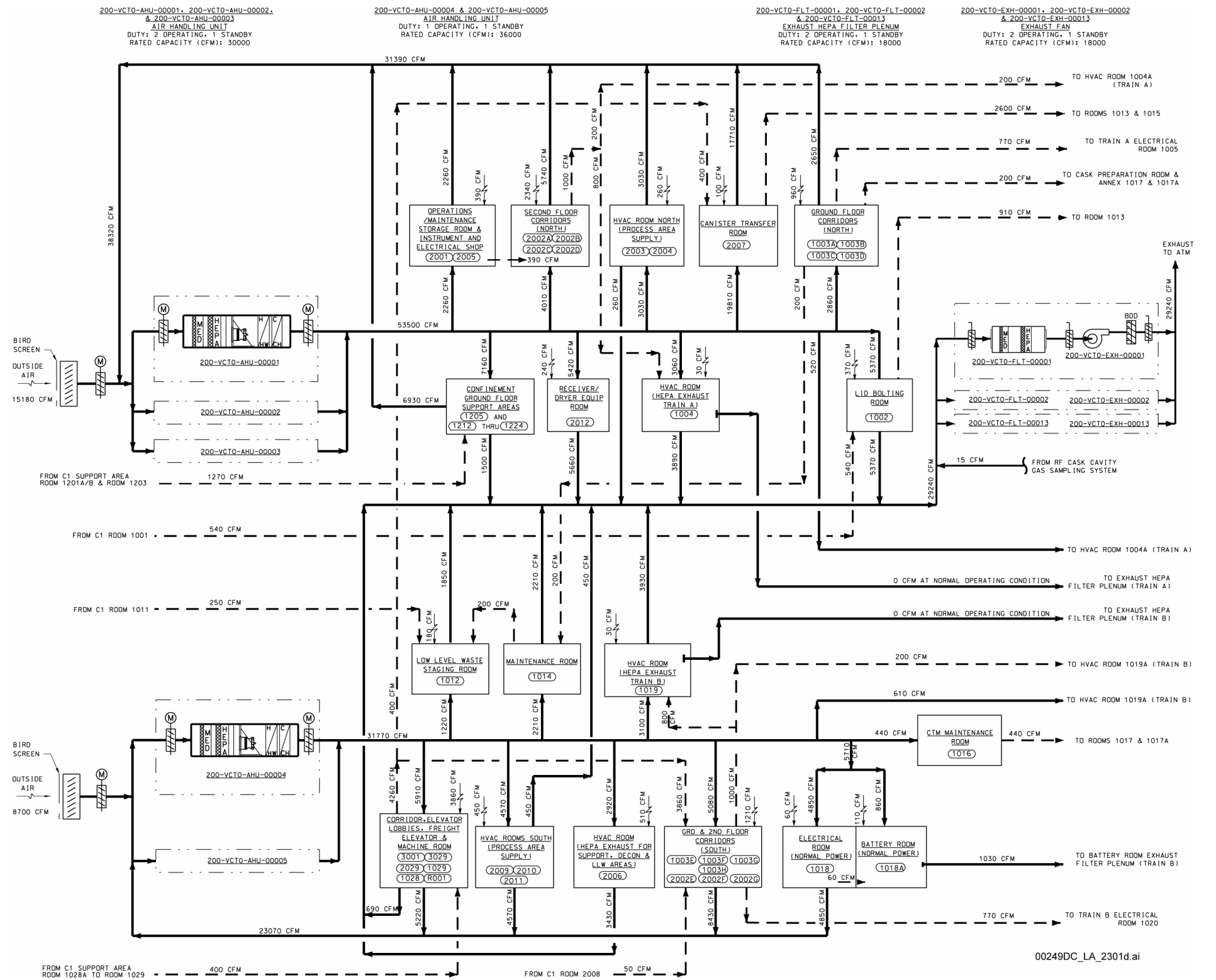


Figure 1.2.6-37. RF Composite Ventilation Flow Diagram, Tertiary Confinement HVAC Supply and Exhaust System

NOTE: This figure includes no SSCs that are either ITS or ITWI.

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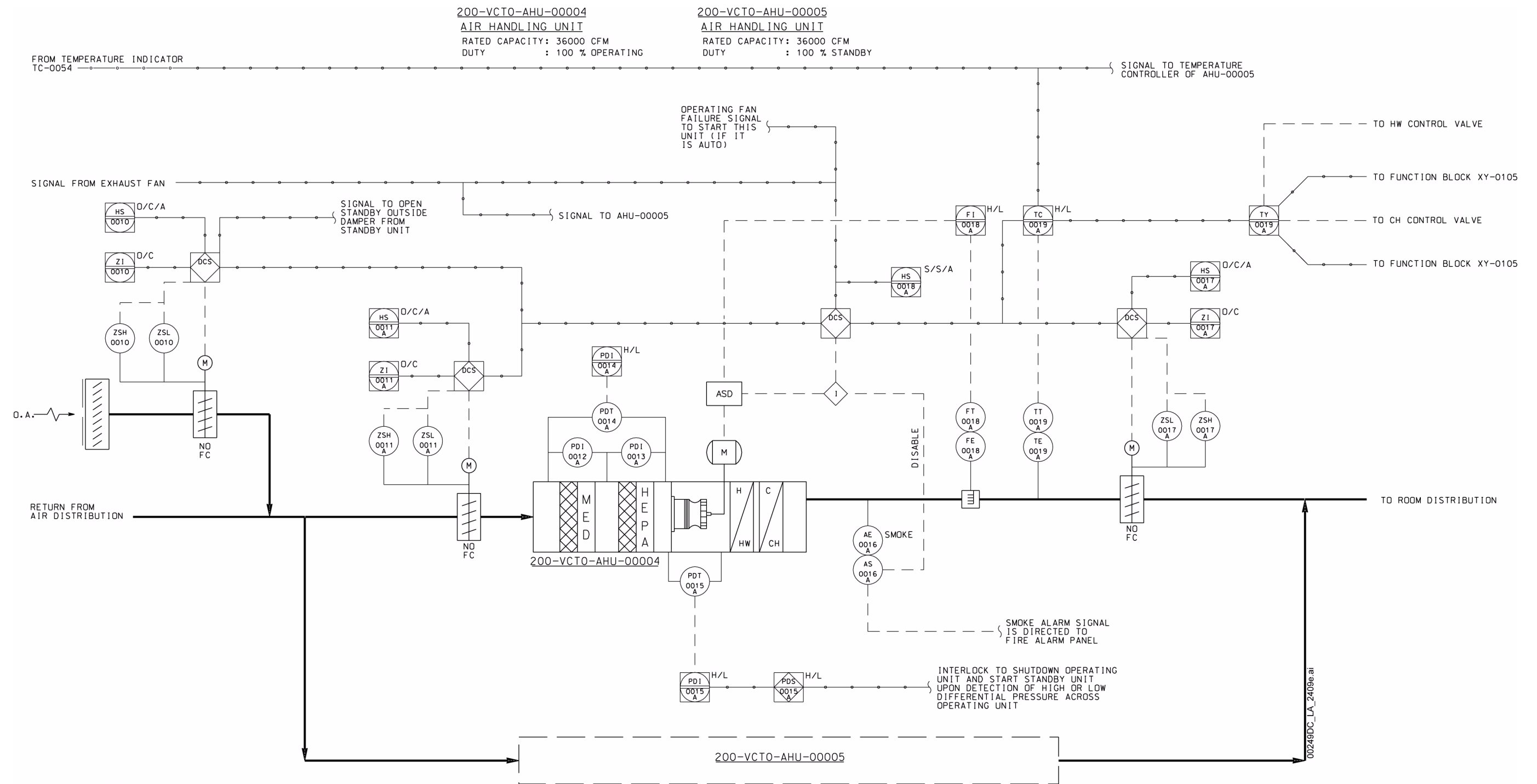


TABLE 1:

MECHANICAL COMPONENT	AIR HANDLING UNIT					INLET DAMPER				OUTLET DAMPER				SMOKE		FLOW				TEMPERATURE				FAN DP		
	HS	PD1	PD1	PDT	PD1	HS	ZI	ZSL	ZSH	HS	ZI	ZSL	ZSH	AE	AS	FE	FT	FI	TE	TT	TC	TY	PDT	PD1	PDS	
200-VCT0-AHU-00004	0018A	0012A	0013A	0014A	0014A	0011A	0011A	0011A	0011A	0017A	0017A	0017A	0017A	0016A	0016A	0018A	0018A	0018A	0019A	0019A	0019A	0019A	0015A	0015A	0015A	
200-VCT0-AHU-00005	0018B	0012B	0013B	0014B	0014B	0011B	0011B	0011B	0011B	0017B	0017B	0017B	0017B	0016B	0016B	0018B	0018B	0018B	0019B	0019B	0019B	0019B	0015B	0015B	0015B	

Figure 1.2.6-38. RF Confinement South Areas HVAC Supply System Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.

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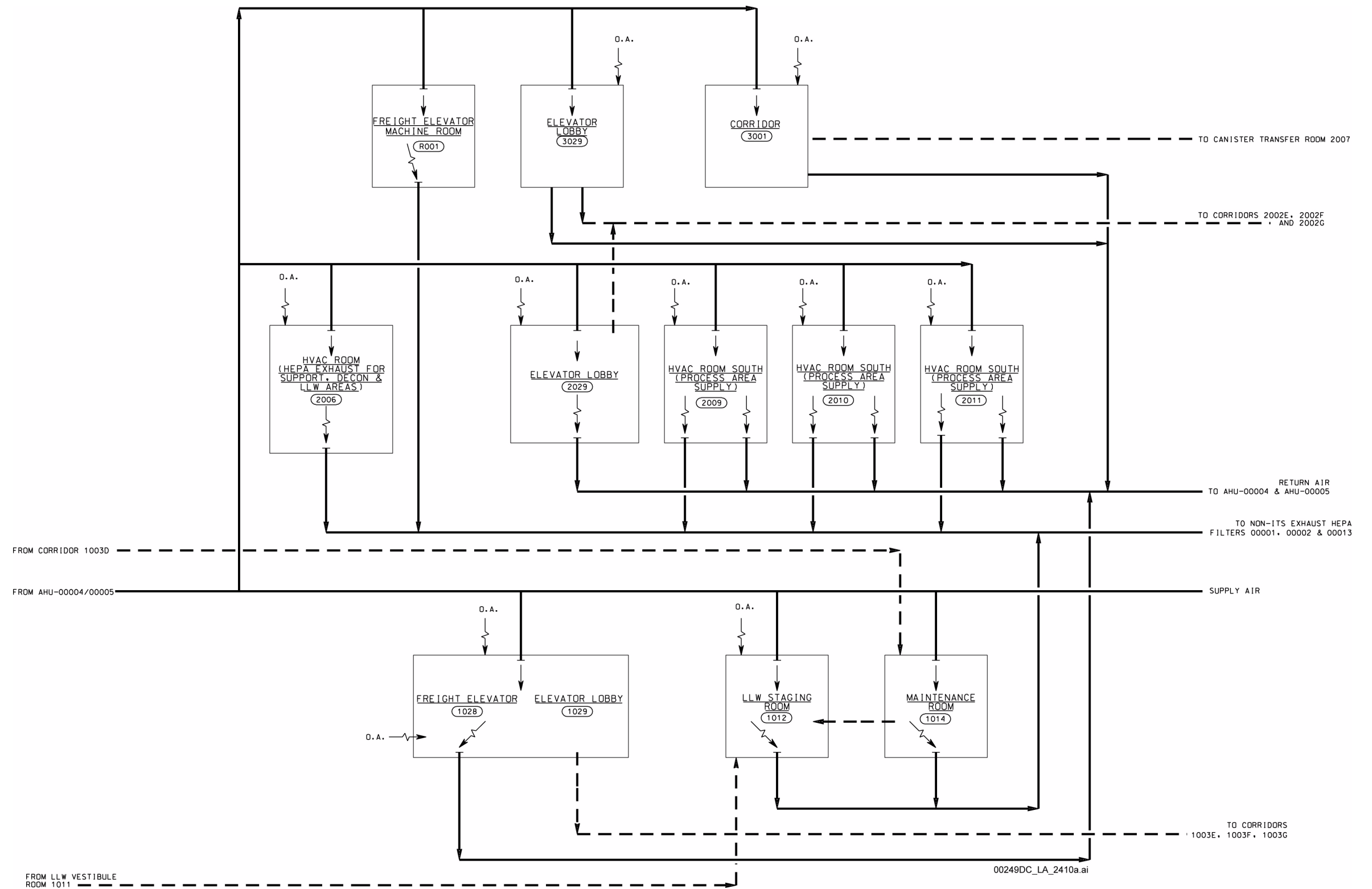
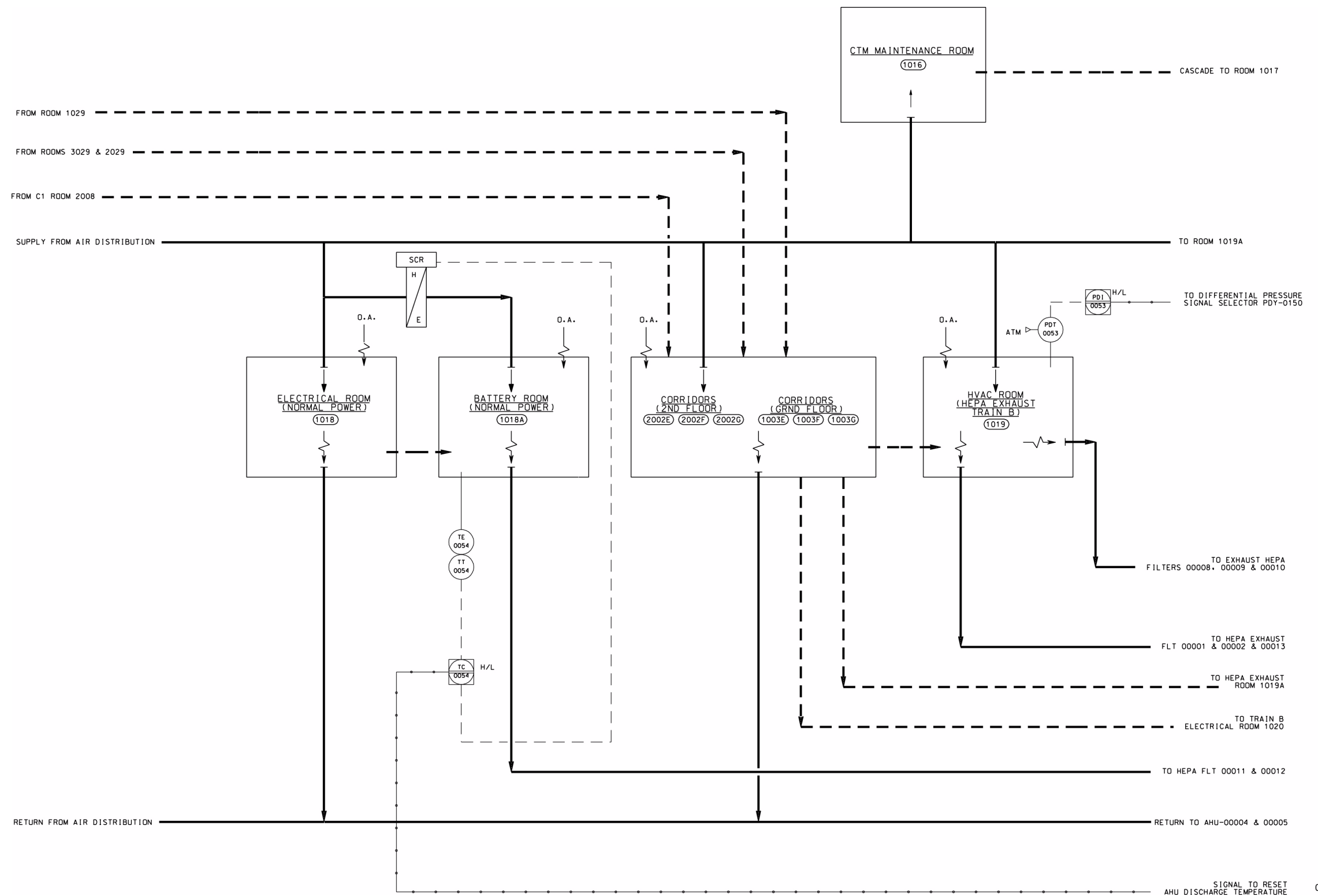


Figure 1.2.6-39. RF Confinement Southwest Areas Air Distribution System Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.

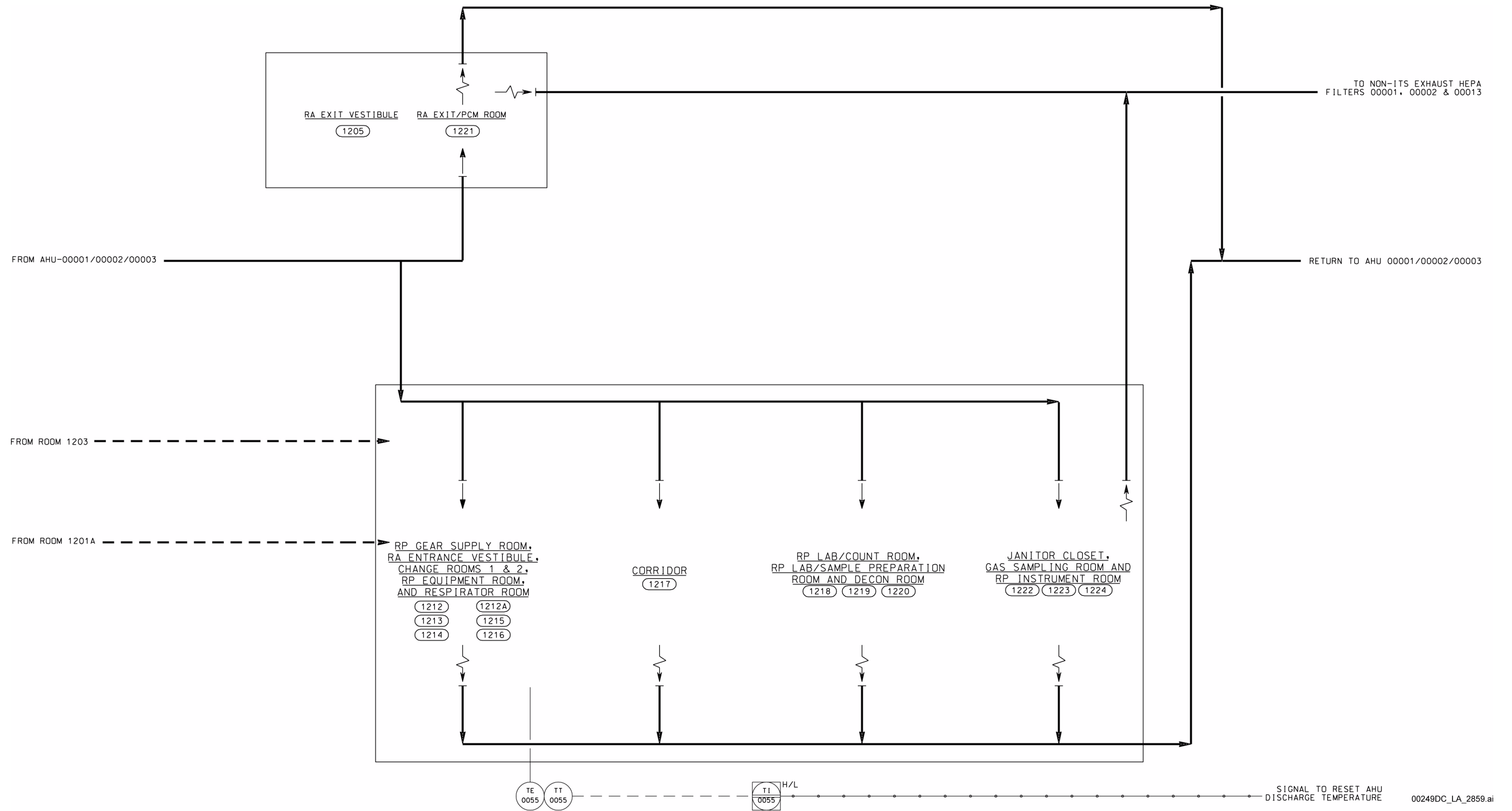
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NOTE: This figure includes no SSCs that are either ITS or ITWI.
 The silicon-controlled rectifier is integral to the electrical heating and modulates heating in response to the temperature controller signal.

Figure 1.2.6-40. RF Confinement South Areas Air Distribution System Ventilation and Instrumentation Diagram

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NOTE: This figure includes no SSCs that are either ITS or ITWI.

Figure 1.2.6-41. RF Confinement Ground Floor West Areas Air Distribution System Ventilation and Instrumentation Diagram

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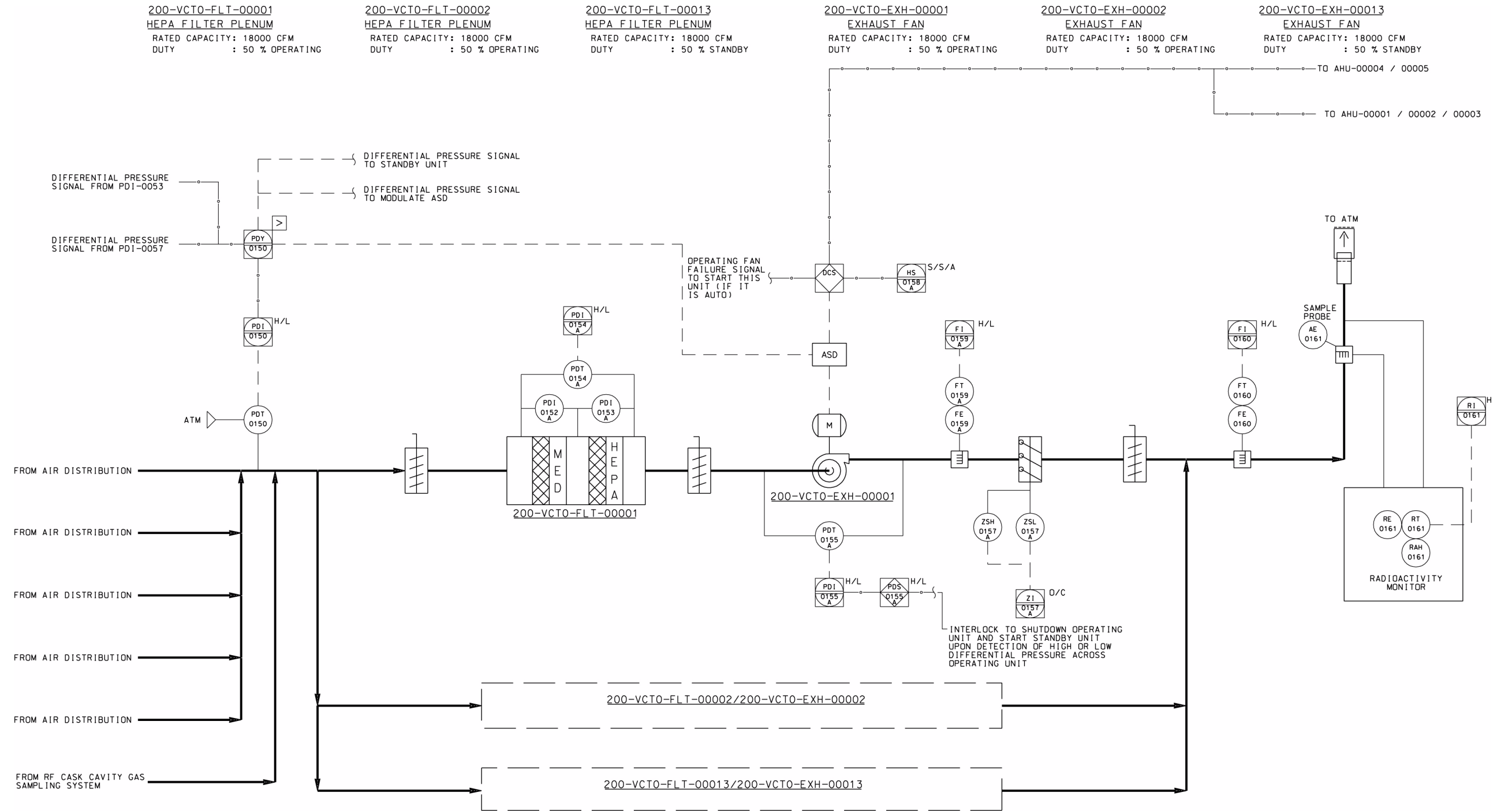


TABLE 1:

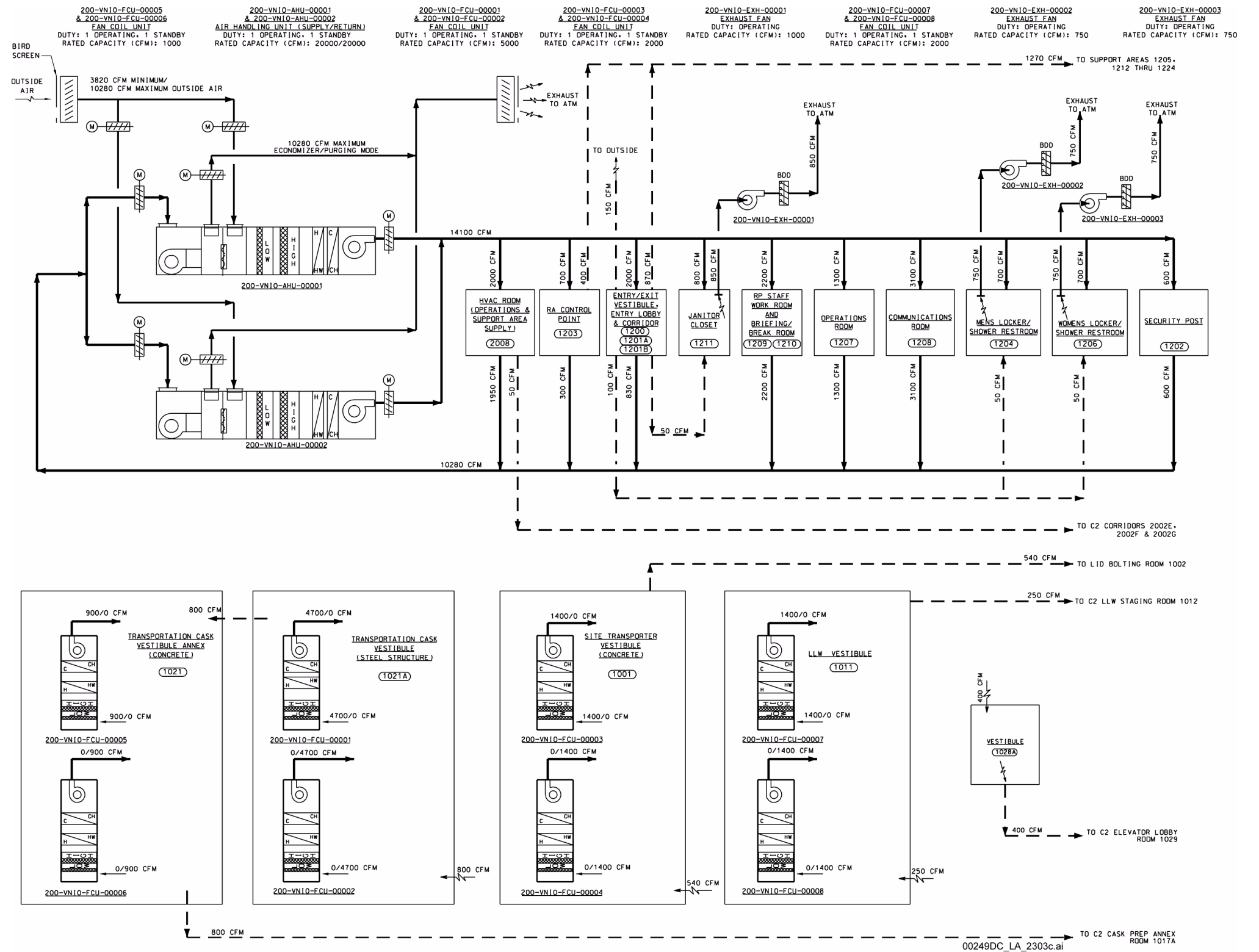
MECHANICAL COMPONENT	HEPA PLENUM				MECHANICAL COMPONENT	FAN DP				FLOW			BACKDRAFT DAMPER			
	FILTER	PDI	PDI	PDT		PDI	FAN	HS	PDT	PDI	PDS	FE	FT	F1	ZSL	ZSH
200-VCTO-FLT-00001	0152A	0153A	0154A	0154A	200-VCTO-EXH-00001	0158A	0155A	0155A	0155A	0159A	0159A	0159A	0157A	0157A	0157A	0157A
200-VCTO-FLT-00002	0152B	0153B	0154B	0154B	200-VCTO-EXH-00002	0158B	0155B	0155B	0155B	0159B	0159B	0159B	0157B	0157B	0157B	0157B
200-VCTO-FLT-00013	0152C	0153C	0154C	0154C	200-VCTO-EXH-00013	0158C	0155C	0155C	0155C	0159C	0159C	0159C	0157C	0157C	0157C	0157C

00249DC_LA_2412f.ai

Figure 1.2.6-42. RF Confinement High-Efficiency Particulate Air Exhaust System Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.

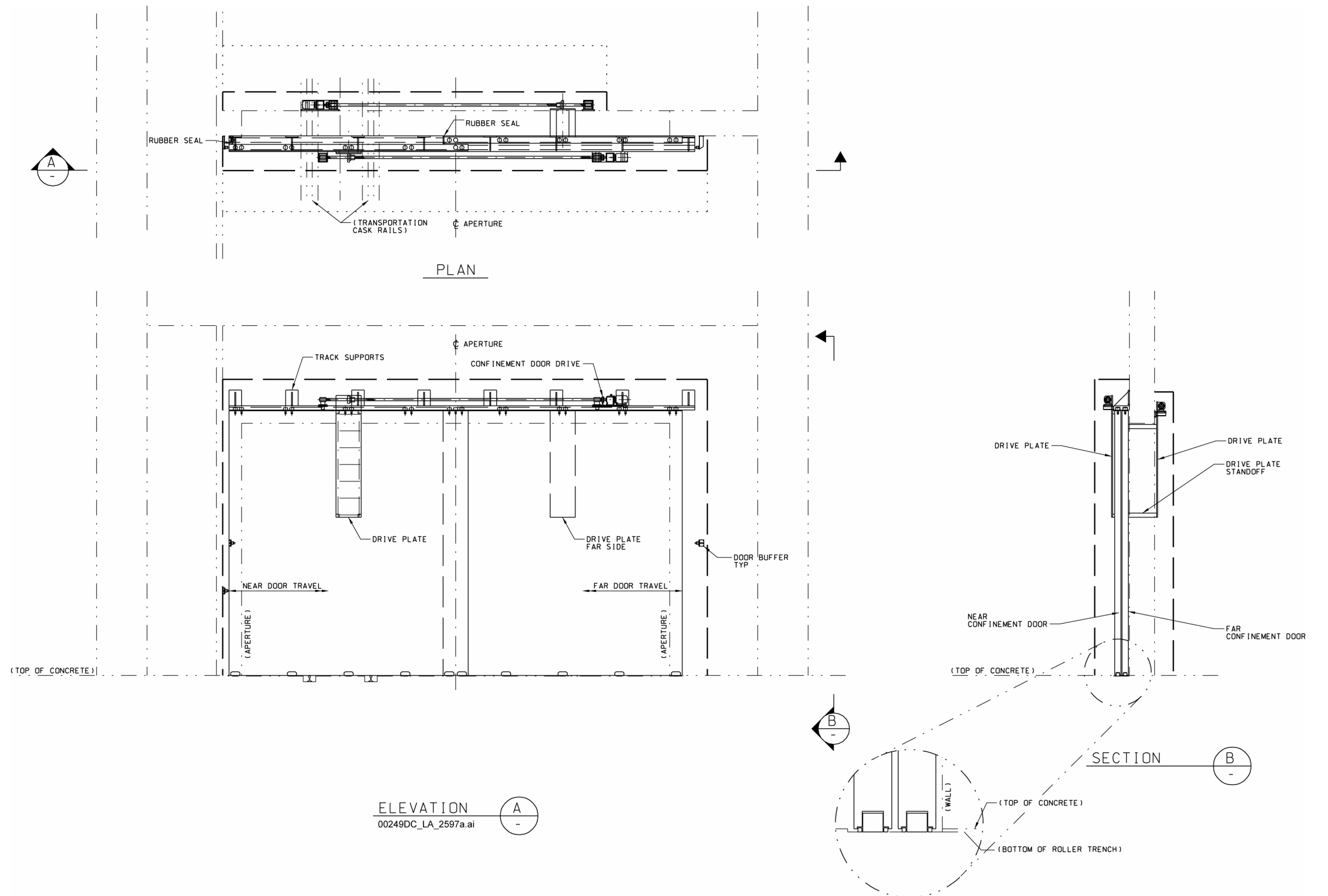
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NOTE: This figure includes no SSCs that are either ITS or ITWI.
LLW = low-level radioactive waste.

Figure 1.2.6-43. RF Composite Ventilation Flow Diagram, Nonconfinement HVAC System Support and Operations

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Equipment Number: 200-RF00-DR-00003.

Figure 1.2.6-44. Receipt Facility Cask Preparation Annex Equipment Confinement Door Mechanical Equipment Envelope

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1.2.7 Aging Facility

[NUREG-1804, Section 2.1.1.2.3: AC 1, AC 2, AC 6; Section 2.1.1.6.3: AC 1, AC 2; Section 2.1.1.7.3.1: AC 1; Section 2.1.1.7.3.2: AC 1; Section 2.1.1.7.3.3(I): AC 1, AC 2, AC 4; HLWRS-ISG-02 Section 2.1.1.2.3: AC 2]

The Aging Facility is designed to uncouple waste receipts from waste emplacement operations to accommodate repository temperature and thermal limits, operations workflow (differences in acceptance and emplacement rates), and maintenance outages. The principal components of the Aging Facility are aging overpacks that contain either transportation, aging, and disposal (TAD) canisters or dual-purpose canisters (DPCs) positioned on an aging pad. The DPCs are loaded, dried, inerted, and welded closed at the utilities. TAD canisters are loaded, dried, inerted, and welded closed at the utility or at the repository in the Wet Handling Facility (WHF).

The DPC or TAD canister is the primary barrier to radionuclide release for material contained in aging overpacks on the aging pad. The canister is relied upon to prevent release given the imposition of defined mechanical and thermal loads on the aging pads. The TAD canister containment boundary is designed to stress limits in accordance with *2004 ASME Boiler and Pressure Vessel Code* (ASME 2004, Section III, Subsection NB). DPCs are designed to the ASME code of various editions depending on the certificate of compliance issued by the U.S. Nuclear Regulatory Commission. The aging overpack protects TAD canisters and DPCs from external hazards and shields workers and the public from the TAD canisters or DPCs. [Section 1.2.7.1.3.2](#) provides additional details on the TAD canister and DPC overpack systems, and [Section 1.5.1](#) provides additional details on the DPC and TAD canister.

TAD canisters and vertical DPCs can be transferred from transportation casks to vertical aging overpacks in the Canister Receipt and Closure Facilities (CRCFs) and the Receipt Facility (RF) and then moved to an aging pad. TAD canisters loaded in the WHF that are being transferred to the Aging Facility can be transferred to a vertical aging overpack within the WHF. DPCs that require aging in a horizontal aging module will only be received in the RF and then moved to an aging pad. These processes are discussed for the CRCFs in [Section 1.2.4](#), for the WHF in [Section 1.2.5](#), and for the RF in [Section 1.2.6](#). The chart shown in [Figure 1.2.7-1](#) presents an overview of the relationship and major interfaces between surface facilities and represents the material flow paths. It is anticipated that a significant number of transportation casks containing TAD canisters or DPCs will be unloaded in the RF and transferred to aging overpacks. The RF is also used to transfer horizontal DPCs in transportation casks to a transfer trailer, so they can be moved to a horizontal aging module at an aging pad.

Management of TAD canisters or DPCs in the Aging Facility considers the thermal management and repository operational requirements, based on the type of canister in which the spent nuclear fuel (SNF) is packaged and the characteristics of the SNF contained in each aging overpack. For processing, the aging overpacks with their canisters are moved to either the CRCF or the WHF. TAD canisters designated for processing for emplacement are moved to the CRCF, where the TAD canisters are placed in a waste package, sealed, and loaded onto a transport and emplacement vehicle for subsequent underground emplacement. DPCs designated for processing into TAD canisters are moved to the WHF where the DPCs are opened and placed in the pool, and the commercial SNF contents are transferred to TAD canisters.

[Section 1.3.1](#) provides details on thermal management of repository operations. The U.S. Department of Energy has performed system studies that provide confidence that 2,500 storage spaces is a sufficient number to provide operational flexibility.

The Aging Facility is similar in design and operation to the SNF dry cask storage systems that have been in use for almost 20 years at commercial reactor sites and U.S. Department of Energy facilities. The Aging Facility incorporates a canister-based aging overpack. The majority of overpack systems utilized by the Aging Facility are TAD canister-based vertical overpack systems. The TAD canister-based vertical overpack system will be designed following the specifications in *Transportation, Aging and Disposal Canister System Performance Specification* (DOE 2008).

To demonstrate compliance with the preclosure safety requirements of 10 CFR Part 63, the preclosure safety analysis presented in [Sections 1.6 to 1.9](#) includes and bounds potential Aging Facility operations and configurations. Aging Facility components that are important to safety (ITS) and are anticipated for use at the repository are typical of components utilized at existing reactor sites and independent SNF storage installations. Aging Facility component reliability is obtained based on existing component designs and evaluated against the performance required by repository-specific conditions and the repository nuclear safety design bases. Details on the methodology and results for Aging Facility component reliability are presented in [Sections 1.6 to 1.9](#). Prior to the use of any specific aging overpack system (including associated canister) at the repository, analyses are performed to demonstrate compliance with the Yucca Mountain repository-specific criteria and repository nuclear safety design bases. The acceptability of aging overpack systems for repository usage is demonstrated through a combination of two important design aspects: (1) compliance with design code stress limits, leakage limits, and thermal limits given the imposition of loadings described in this section; and (2) fragility assessments described in [Section 1.7](#) that demonstrate adequate capacity exists to support regulatory compliance. [Section 5.10](#) provides additional discussion of the licensing process to be followed to authorize use of aging overpack systems.

The following sections describe the principal components of the Aging Facility, including pad locations and materials, overpack design requirements, overpack transportation requirements, overpack installation requirements, maintenance and operations requirements, and associated design analyses.

1.2.7.1 Aging Facility Description

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2, AC 6; Section 2.1.1.6.3: AC 1(2)(h); Section 2.1.1.7.3.2: AC 1(1); Section 2.1.1.7.3.3(I): AC 1(1), AC 2(1), (2), (3), AC 4(1), (2)]

The Aging Facility consists of three components:

- The aging pad component with monitoring
- The aging overpack component
- The overpack transfer component.

The aging pad areas are shown on [Figure 1.2.7-2](#). The total capacity of the two aging pad areas is 2,500 spaces. [Figure 1.2.7-3](#) shows the detailed layout of aging pad area 17P with seven pads for

about 1,250 vertical aging overpacks. [Figure 1.2.7-4](#) shows aging pad area 17R. Aging pad area 17R has eight pads with space for about 1,150 vertical aging overpacks, and two pads with space for 100 horizontal DPCs in horizontal aging modules, with 50 modules on each pad.

Vertical aging overpacks are arrayed in groups of 16 overpacks, spaced on 4-by-4 grids with a square center-to-center pitch of approximately 18 ft with a spacing between overpacks of 6 ft. This spacing was established to enable access for the site transporter and to permit air circulation for cooling. Horizontal aging modules are arranged side by side.

Aging overpacks include TAD canister-containing overpacks and commercially available overpacks containing DPCs. These aging overpacks consist of:

- **TAD Canister Overpack with TAD Canister**—This system is specifically designed to meet Aging Facility design criteria. This system consists of a vertical overpack that receives a TAD canister that is either loaded off site and shipped to the repository or is loaded in the WHF.
- **Overpack Systems for DPCs**—These systems are for commercial DPCs evaluated to meet Aging Facility design criteria and include the following:
 - Vertical overpack for DPCs, which consists of a concrete vertical overpack that receives a metal canister loaded at the originating utility
 - Horizontal module for DPCs, which consists of a concrete horizontal module that receives a metal canister loaded at the originating utility.

[Section 1.2.2.1](#) describes the flood control features of the repository site areas. Drainage channels transport flood water around the Aging Facility to preclude flooding interactions with the aging overpacks. The aging pad areas are located greater than one-half mile from the heliport ([Figure 1.2.1-1](#)). The aging pad areas will be surrounded by a security fence to control access, as shown in [Figure 1.2.7-2](#). Radiological posting will be utilized to delineate the distance at which public occupancy could result in a dose of 100 mrem/yr.

1.2.7.1.1 Functions

Aging is required at the repository to provide the operational flexibility necessary to efficiently maintain a flow of SNF to the repository from utilities and at the same time load waste packages within the temperature limits of the repository.

The Aging Facility performs the following waste handling functions:

- Provides up to 21,000 MTHM of aging capability for the repository in 2,500 aging spaces
- Protects TAD canisters and DPCs from external hazards

- Provides the capability to place commercial SNF in a location where it can be aged to appropriate thermal power levels, providing passive heat removal to preclude exceeding waste form temperature limits
- Provides the capability to uncouple receipt of commercial SNF from emplacement of commercial SNF by creating a location to temporarily place commercial SNF until the waste emplacement process can accommodate it
- Provides the capability to move commercial SNF between the Aging Facility and the handling facilities
- Protects the workers and the public from radiation.

1.2.7.1.2 Location and Functional Arrangement

The two aging pad areas designated 17P and 17R are shown in [Figure 1.2.7-2](#). The Aging Facility areas are located to avoid faults and flooding and are sufficiently distant from the handling facilities and construction workers to reduce direct shine and sky shine from the array of aging overpacks.

1.2.7.1.3 Major Components

The major components of the Aging Facility are described in this section. The aging pads, aging overpacks, and transfer components are classified as ITS.

1.2.7.1.3.1 Aging Pad

The Aging Facility provides the stable surface and associated monitoring components necessary for aging commercial SNF. An aging pad slab is an elongated, reinforced concrete mat foundation that is supported on existing soil and compacted fill where needed. The aging pads consist of nominally 3-ft-thick reinforced concrete slabs where the aging overpacks and horizontal aging modules are placed. In addition to space for storage, the pad includes aprons that allow approach to the aging overpacks for placement and retrieval. The aging pad includes space to maneuver the transfer equipment around the vertical aging overpacks, horizontal aging modules, and other support systems required for the safe operation and maintenance of each aging pad.

The concrete aging pads are designed and constructed to provide support for the aging overpacks during credible design events and to withstand loads and load combinations imposed by natural phenomena, such as earthquakes, extreme winds, and tornado winds. Flood drainage channels are sized to carry away water from a probable maximum flood surrounding the aging pads. This precludes the possibility that aging overpacks will be subject to the probable maximum flood. The distance of the aging pads from upslope hillsides and the location of the drainage channel preclude soil from sliding onto the concrete aging pads and contacting the aging overpacks. Each pad is a conventionally reinforced concrete mat providing for water runoff, and each is designed to consider concrete heating and transport equipment accessibility. [Section 1.2.2](#) provides further details on the structural design of the aging pads.

Additional features supporting the aging pads include normal and standby power supplies, lighting, video monitoring, and equipment for monitoring the overpack outlet vent temperatures and the environment (e.g., area ambient temperatures, wind speed and direction). Maintenance and support equipment for the aging pad subsystem includes debris removal equipment and platforms for checking aging overpack ventilation ports and performing maintenance. The standby diesel generators provide standby power. Portable, hand-held fire extinguishers are available at each aging pad.

Each aging pad is equipped with closed-circuit television cameras mounted around the perimeter, used for general awareness of conditions at the aging pad. These cameras are provided with pan, tilt, and zoom capabilities, and provide the operator in the Central Control Center Facility (CCCF) the ability to visually monitor activities and conditions at the aging pads.

Provisions are made at each aging pad to accommodate instrumentation to thermally monitor the aging overpacks and horizontal aging modules. Monitoring of aging overpacks or horizontal aging modules is provided to enable operators to remotely read the temperature of the outlet air. [Figure 1.2.7-5](#) shows the temperature monitoring system.

Temperature sensors attached to the exhaust air ports of the vertical aging overpacks and horizontal aging modules that monitor outlet air temperature are connected to the digital control and management information system remote input/output cabinets located in the electrical utility building at each aging pad area. This temperature information is available in the CCCF to enable monitoring by CCCF operators. The temperature data is displayed, recorded, and alarmed if the temperatures are above the setpoints as detailed by overpack-specific performance requirements specified in the Technical Requirements Manual for the approved aging overpack. Because no monitors are relied upon to protect against or mitigate the consequences of Category 1 or Category 2 event sequences, the aging overpack monitoring components are classified as non-ITS. Based on overpack system-specific design and analysis, normal cooling is verified with differential temperature readings in the CCCF, or visual inspections, or a combination of both. The installation of temperature sensors limits the need for visual inspections and minimizes radiation exposure associated with Aging Facility operations.

Operations following a high temperature alarm will be performed using approved off-normal operating procedures. The displays of the postevent monitoring variables will be developed to coordinate with these procedures. The initial event categorization and communications following an event occur in the CCCF.

1.2.7.1.3.2 Aging Overpack

The aging overpack component provides overpacks for aging commercial SNF within TAD canisters and DPCs. The DPC or TAD canister is the primary boundary against radionuclide release during the aging process. The aging overpack is a missile barrier and a radiation shield. It provides kinematic stability and passive cooling for the canister and cushions the canister against a drop or collision with mechanical loads. Aging overpacks are designed such that the TAD canisters or DPCs placed within the overpacks maintain containment of radioactive materials given the occurrence of natural phenomena described in [Table 1.2.2-1](#).

The Aging Facility consists of the following aging overpacks as discussed below:

- Vertical aging overpacks for DPCs and TAD canisters
- Horizontal aging modules for existing horizontal DPCs.

1.2.7.1.3.2.1 Vertical Aging Overpacks for DPCs and TAD Canisters

A vertical aging overpack is a right circular cylinder with a metal inner liner surrounded by concrete. The vertical aging overpack has a support structure to support the inserted canister during the aging process. The vertical aging overpack has a bolted lid on the top of the structure that provides shielding and protects the inserted canister during the aging process. The reinforced concrete sidewalls and top of the overpack provide shielding and protection against natural phenomena, such as tornadoes, earthquakes, high winds, and ambient-temperature extremes. The design of the vertical aging overpacks permits placement on the aging pads without the requirement for seismic restraints or other tie-downs. The vertical aging overpacks have a maximum fully loaded weight of 250 tons, a maximum overpack diameter of 12 ft, and a maximum overpack height of 22 ft. A conceptual vertical aging overpack is shown in [Figure 1.2.7-6](#).

The vertical aging overpacks are equipped with air inlets and outlets at the tops and bottoms to permit removal of heat. The ventilation air is passively drawn through the bottom air inlets of the overpack into the annular area between the canister and the metal wall of the aging overpack internal cavity. It then passes up the side of the canister by thermosiphon action (convective movement) and is discharged from the outlet vents. The inlet and outlet vent designs are offset such that radiation streaming is precluded. The vertical aging overpacks are equipped with temperature sensors to measure outlet air temperature. Temperature measurement and monitoring is used to ensure adequate, passive-cooling thermal performance. The vertical aging overpack is provided with removable screens at the inlet to the lift slots and in the air outlets to keep wildlife and debris from disturbing the airflow. Worker exposure during setup at the aging pad is minimized with a single-point sensor plug connection to the temperature monitors. Contact dose rates on the vertical aging overpack surface and vents do not exceed 40 mrem/hr.

The vertical aging overpack is designed such that its center of gravity and the coefficient of friction between the concrete pad and the bottom of the overpack are sufficiently low to ensure that it will not tip over during a seismic event.

The vertical aging overpack systems withstand a beyond design basis ground motion (DBGM) seismic event, as defined in [Table 1.2.2-3](#), without tipover, without exceeding canister stress or normal leakage limits, without sliding into other overpacks, and without exceeding short-term waste form temperature limits. The vertical aging overpack systems must withstand a seismic event characterized by horizontal and vertical peak ground accelerations of 96.52 ft/s² (3 g) without tipover and without exceeding canister leakage rates.

1.2.7.1.3.2.2 Horizontal Aging Modules for Dual-Purpose Canisters

The horizontal aging modules are used solely for horizontal DPCs. The horizontal DPC is a right circular cylinder with metal walls. Like the vertical DPC, it has an internal basket to support the SNF

and to maintain a critically safe geometry. The horizontal aging module cavity has rails to cradle the DPC. The horizontal aging modules are designed to accommodate a range of horizontal DPCs. When the horizontal aging module is to receive a DPC shorter than the length of the rails, a fixed position stop is preinstalled in the horizontal aging module. This stop is used to limit the axial shift of the DPC during seismic events.

The horizontal aging module is a box-like, thick-walled reinforced concrete structure with a removable access door in the front to permit horizontal loading of the canister. The horizontal aging module is loaded and unloaded at the aging pad area. Inside the module, the canisters rest on rails. The heavily reinforced concrete sidewalls and top provide shielding and protection against natural phenomena, such as tornadoes, earthquakes, high winds, and ambient temperature extremes. The horizontal aging modules are designed to protect the canister from exceeding canister stress limits and leakage rates or short-term temperature limits given a beyond DBGM seismic event.

The horizontal aging module protects the canister from breach given a drop of a load such as an end plate cover (lid) from a horizontal shielded transfer cask or the mobile crane boom onto the horizontal aging module. A shield wall is used behind each horizontal aging module and at each end of the rows to supplement the shielding and reduce the radiation dose emanating from the horizontal aging modules. Contact dose rates on accessible surfaces of the horizontal aging modules do not exceed 40 mrem/hr. The horizontal aging modules have a minimum concrete shielding thickness of nominally 3 ft. The maximum height of a horizontal aging module is nominally 21 ft. The maximum width of a horizontal aging module is nominally 8 ft 6 in. The minimum length (with the minimum of 3 ft of shielding) of a horizontal aging module is nominally 23 ft 4 in.

The horizontal aging modules are configured with vents and flow paths to permit natural circulation airflow to transfer the heat from the canister to the atmosphere. The horizontal aging modules containing DPCs are equipped with temperature sensors to measure outlet air temperature. The horizontal aging module is provided with removable screens at the air inlet and at the air outlet to keep wildlife and debris from disturbing the airflow. Worker exposure during placement of a canister into a horizontal aging module is minimized with a single-point sensor plug connection to the temperature monitors. [Figure 1.2.7-7](#) shows operations associated with horizontal aging modules.

1.2.7.1.3.3 Overpack Transfer

The overpack transfer component includes equipment capable of moving aging overpacks and transportation casks containing horizontal DPCs between the handling facilities and the aging pads.

Loaded, vertical aging overpacks are moved to and from the aging pads using a bottom-lift site transporter. [Section 1.2.8.4](#) provides further details for the bottom-lift site transporter.

For the horizontal DPCs going to aging, transportation casks, including the support skid designed for shipping horizontal canisters by rail, are removed from the railcars and placed on horizontal transfer trailers at the RF. The horizontal transfer trailers are designed for docking at the portal of the horizontal aging modules. The positioning equipment is an integral part of the transfer trailer.

Additional equipment is needed to facilitate the transfer of canisters to the horizontal aging modules. This includes a hydraulic ram system that inserts through a portal in the appropriate end of the transportation cask and pushes the loaded canister into the horizontal aging module. A ram is also used to withdraw the horizontally placed DPCs from the horizontal aging module to a shielded transfer cask to enable the DPC to be moved to the WHF. [Figure 1.2.7-7](#) shows the transfer process for horizontal DPCs. The unloading process is the reverse of loading. The hydraulic ram is specifically designed to limit the maximum push and pull forces to prevent permanent deformation to the DPCs handled by the unit.

A shielded transfer cask is used for movement of horizontal DPCs from the horizontal aging modules at the aging pad to the WHF. The shielded transfer cask is compatible with the horizontal transfer trailer. The shielded transfer cask is designed to dock to the horizontal aging module in a manner similar to that of the transportation cask. The shielded transfer cask, like the transportation cask, is a heavy-walled, right circular cylinder that provides shielding to the personnel working around the cask. [Section 1.2.8.4](#) provides detail on site transportation equipment.

1.2.7.2 Operational Processes

[NUREG-1804, Section 2.1.1.2.3: AC 6]

The Aging Facility provides for aging commercial SNF. Overpacks used by the Aging Facility will be loaded in accordance with an overpack-specific loading plan. Prior to receipt of a DPC or TAD canister, detailed analyses will be performed to develop aging overpack-specific performance requirements to define the loading limits associated with the aging overpack system. These performance requirements will be maintained in the Technical Requirements manual and will define the range of waste form characteristics that are acceptable for the aging overpack system such that the waste form within a specific aging overpack system meets both the thermal and shielding limits of the system and the nuclear safety design bases. Only those canisters that meet the defined performance requirement will be loaded into an appropriate aging overpack. Each aged canister will have an individual aging plan that, based on reactor records and heat generation decay curves, will have a predetermined aging time on the pad. Once the thermal output of the canister is below defined emplacement limits it will be made available for emplacement. The operations group will determine the appropriate time to move the canister into the WHF or a CRCF for placement into a waste package and subsequent emplacement based on emplacement drift loading plans described in [Section 1.3.1](#). [Figure 1.2.7-1](#) illustrates the Aging Facility operational interfaces and processes. Each canister placed in an overpack will be recorded in plant records to ensure that accurate later recovery and placement in a waste package can be performed and that traceability of waste is maintained.

Processing DPCs received from a utility requires opening the DPCs and transferring the SNF contents to a TAD canister. To accomplish this, the DPC will be opened and unloaded in the WHF, and the SNF assemblies will be moved one at a time into the TAD canister. Some DPCs that contain high-heat assemblies may be placed directly on the aging pad after they are placed in aging overpacks. The aging of these DPCs will continue until the thermal power of the assemblies permits emplacement.

As the maintenance and repair activities associated with the aging pads are expected to occur only on an as-needed basis, no regularly scheduled maintenance is planned. The aging overpacks are expected to be inspected quarterly.

The Aging Facility interfaces with the following facilities and systems that perform or support waste handling operations:

- RF
- CRCFs
- WHF
- CCCF
- Support systems, such as electrical power, electrical support, communications, digital control and management information, fire protection, environmental and meteorological monitoring, radiation and radiological monitoring, and handling
- Miscellaneous repository facilities (e.g., utilities)
- Safeguards and security systems and programs.

1.2.7.2.1 Aging and Staging in Vertical Orientation

The aging process for vertical aging overpacks involves preparation of vertical aging overpacks for loading, transferring canisters into the vertical aging overpacks, and moving vertical aging overpacks to the aging pad.

Empty vertical aging overpacks are stored in the Aging Overpack Staging Facility ([Section 1.2.8](#)) until needed for loading at one of the handling facilities. When needed, a vertical aging overpack is delivered to a handling facility for loading. Canistered commercial SNF is transferred to and from overpacks in the RF, WHF, and CRCF.

At the handling facilities, vertical DPCs or TAD canisters containing commercial SNF are loaded into vertical aging overpacks. Overpacks containing TAD canisters or DPCs do not require seal monitoring or cavity inerting because the sealed canister provides the containment function and the canister has been previously inerted. The vertical aging overpack lids are manually bolted within the handling facilities. The location and contents of each aging overpack on the aging pad will be identified and maintained consistent with the Material Control and Accounting Plan as described in [GI Section 4](#). Unique identifiers are recorded and checklists are completed to ensure that the aging overpacks comply with loading parameters and limits.

At the aging pad, shielding and loading plans are utilized to reduce the amount of radiation exposure to the workers by reducing the amount of time that they are in proximity to multiple aging overpacks on the same pad.

1.2.7.2.2 Aging in Horizontal Orientation

A transportation cask that arrives with a commercial DPC that is to be aged in a horizontal aging module is unloaded directly from the railcar at the RF onto a horizontal transfer trailer. The cask and trailer are then towed to the appropriate aging pad. The contents of each horizontal canister are recorded, along with the horizontal aging module used to age each canister. The location and contents of each horizontal aging module on the aging pad will be identified and maintained consistent with the Material Control and Accounting Plan as described in GI [Section 4](#). Unique identifiers are recorded and checklists are completed to ensure that the horizontal aging modules comply with loading parameters and limits.

The transportation cask lid bolts and lid are removed manually at the pad with the aid of a mobile crane, and the transportation cask is aligned to a horizontal aging module. The horizontal aging module access door is opened using the mobile crane, and the transportation cask is docked to the horizontal aging module to provide shielding ([Figure 1.2.7-7](#)). Leveling jacks are used to stabilize the transfer trailer while transferring the canister to a horizontal aging module. A hydraulic ram driven by a hydraulic power unit is aligned behind the transportation cask so that the hydraulic ram can be engaged to grapple rings on the appropriate end of the horizontal DPC. The hydraulic ram cylinders are actuated to insert the horizontal DPC into the horizontal aging module. Transfer is accomplished using guide rails inside the horizontal aging module. Once the canister is transferred to the horizontal aging module, the empty transportation cask and trailer are removed. The horizontal aging module access door is closed. When the aging process is complete, the process is reversed, using a shielded transfer cask and horizontal transfer trailer. The shielded transfer cask is similar in construction to the transportation cask. The horizontal transfer trailer moves the loaded cask to the WHF.

1.2.7.3 Safety Category Classification

[NUREG-1804, Section 2.1.1.6.3: AC 2(2)]

The aging pads, aging overpacks with TAD canisters or DPCs, and cask transfer equipment are classified as ITS ([Table 1.9-1](#)).

1.2.7.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

[NUREG-1804, Section 2.1.1.6.3: AC 2(2)]

There is a procedural safety control to limit the acceptable surface contamination of TADs and DPCs placed on the aging pads in aging overpacks or horizontal aging modules. In most cases, the procedural safety control is performed in the waste handling facilities during canister transfer. For horizontal DPCs, the procedural safety control is performed when the horizontal DPCs are transferred to the horizontal aging modules. Because this procedural safety control is not specific to the Aging Facility, it is addressed in [Table 1.2.1-3](#).

1.2.7.5 Design Bases and Design Criteria

[NUREG-1804, Section 2.1.1.6.3: AC 1(2)(h), AC 2(2); 2.1.1.7.3.1: AC 1(1), (2), (3), (5), (6), (9)]

The nuclear safety design bases for ITS and important-to-waste-isolation (ITWI) structures, systems, and components (SSCs) and features are derived from the preclosure safety analysis presented in Sections 1.6 through 1.9 and the postclosure performance assessment presented in Sections 2.1 through 2.4. The nuclear safety design bases identify the safety functions to be performed and the controlling parameters with values or ranges of values that bound the design.

The quantitative assessment of event sequences, including the evaluation of component reliability and the effects of operator action, is developed in Section 1.7. SSCs or procedural safety controls appearing in an event sequence with a prevention or mitigation safety function are described in the applicable design section of the SAR.

Section 1.9 describes the methodology for safety classification of SSCs and features of the repository. The tables in Section 1.9 present the safety classification of the SSCs and features. These tables also list the preclosure and postclosure nuclear safety design bases for each structure, system, or major component.

To demonstrate the relationship between the nuclear safety design bases and the design criteria for the repository SSCs and features, the nuclear safety design bases are repeated in the appropriate SAR sections for each individual ITS/ITWI SSC or feature that performs a safety function. The design criteria are characteristics of the ITS/ITWI SSCs or features that are utilized to implement the assigned safety functions.

The nuclear safety design bases and their relationship to design criteria for the Aging Facility are provided in Table 1.2.7-1.

1.2.7.6 Design Methodologies

[NUREG-1804, Section 2.1.1.7.3.2: AC 1(1), (2)]

1.2.7.6.1 Seismic Design

The seismic design of the aging pads applies the same design methodologies used to design other structures at the geologic repository operations area that are classified as ITS. The seismic design of the equipment used by the cask transfer subsystem is consistent with the design methodologies applied to the design of mechanical handling equipment classified as ITS. Section 1.2.2 provides detailed discussion of the seismic design methodology used for the design of ITS repository surface facilities.

1.2.7.6.2 Structural Design

Each aging pad slab is a reinforced concrete mat supported on grade. The pads are designed to withstand loads and load combinations imposed by natural phenomena, such as earthquakes, extreme winds, and tornado winds. Section 1.2.2 provides further detail on the structural design of the aging pad slabs.

Prior to the use of any specific aging overpack system (including associated canister) at the repository, the canister and overpack systems are evaluated for normal handling loads, dead loads, thermal loads, and event sequence loads. The canister and overpack system loadings are compared with allowable stress and leakage rate limits. A TAD canister in a system aging overpack shall maintain a maximum leakage rate of 1.5×10^{-12} fraction of canister free volume per second (normal). The maximum leakage rate of a TAD canister shall be 9.3×10^{-10} fraction of canister free volume per second (off-normal). For DPCs in an aging overpack, the maximum canister leakage rate is equal to that for which it was designed. The TAD canister containment boundary is designed, fabricated, and inspected in accordance with the *2004 ASME Boiler and Pressure Vessel Code* (ASME 2004, Section III, Subsection NB). DPCs are designed to the ASME code of various editions depending on the certificate of compliance issued by the U.S. Nuclear Regulatory Commission. Details on the structural design of DPCs are provided in [Section 1.5.1](#).

1.2.7.6.3 Shielding Design

The aging overpacks are designed to limit dose rates to less than 40 mrem/hr on contact. Aging overpack-specific performance requirements will be developed to define loading limits. These overpack-specific performance requirements will be maintained in the Technical Requirements Manual for approved aging overpacks. Physical separation between the aging pads and other process facilities provides further radiation control to minimize radiation exposures to personnel and to meet as low as is reasonably achievable (ALARA) goals.

The aging overpacks are designed to preclude gross shielding failure given the imposition of mechanical and thermal loads as described in this section.

Canister source terms and shielding methodology are discussed in [Section 1.10.3](#). Aging overpacks are designed so that the combined neutron and gamma contact dose rate on any accessible exterior surface does not exceed 40 mrem/hr at any location. This is inclusive of any joints, ventilation ducts, and penetrations. Shielding and external dose calculations are performed using flux-to-dose conversion factors in accordance with ICRP Publication 60 (ICRP 1991) recommendations as implemented in ICRP Publication 74, *Conversion Coefficients for Use in Radiological Protection Against External Radiation* (ICRP 1997) and in ANSI/ANS-6.1.1-1991, *American National Standard for Neutron and Gamma-Ray Fluence-to-Dose Factors*.

1.2.7.6.4 Criticality Design

Each canister is designed to preclude the potential for criticality of the commercial SNF contained within the canister. Criticality control measures are integral to the canister. The canister design prevents the potential for criticality during aging. Criticality safety for the Aging Facility is discussed in [Section 1.14](#).

1.2.7.6.5 As Low as is Reasonably Achievable Design

As described in [Section 1.10](#), the design of the Aging Facility incorporates features and principles that ensure occupational and public radiation doses are kept ALARA. This principle is part of the overall radiation protection program established for the geologic repository operations area, in

accordance with the requirements of 10 CFR Part 20. The Aging Facility is designed to ensure that individual and collective annual doses are maintained ALARA during normal operations.

Specific ALARA considerations incorporated in the design of the Aging Facility include:

- Using a shield wall behind each horizontal aging module at each end of the rows to supplement the shielding and reduce the radiation dose emanating from the horizontal aging module
- Using remotely monitored temperature-sensing components
- Spacing of aging overpacks to reduce dose rates to workers and to reduce the time required for placement and removal of overpacks
- Minimizing worker exposure during setup at the aging pad with a single-point sensor plug connection to the temperature monitors
- Designing of vertical aging overpacks to remain stable without anchor bolts or straps to minimize setup time
- Locating the Aging Facility a sufficient distance from the handling and miscellaneous repository facilities to minimize doses. Posting or fencing surrounding the aging pad area indicates the boundary where a hypothetical nonradiological worker would receive a dose of 100 mrem/yr
- Locating the Aging Facility a sufficient distance from handling and support facility construction activities so that exposures are a small fraction of the 10 CFR Part 20 limits for the onsite public.

1.2.7.6.6 Thermal Design

Aging overpacks are designed to ensure adequate passive cooling to maintain waste form and material temperature limits. Aging overpack-specific performance requirements will be developed to define thermal loading limits. These performance requirements will be maintained in the Technical Requirements Manual for approved aging overpacks. Waste form temperature limits are provided in [Section 1.5.1](#). Material temperature limits are from design codes and standards listed in [Section 1.2.7.8](#).

A canister in an aging overpack maintains off-normal leakage rates when exposed to a fire supplied by 100 gal of diesel fuel with an additional surrogate fully engulfing fire of twice the duration of the fuel fire with a steady state release rate of 10 MW. The aging overpack and canister protects the cladding from exceeding the short-term cladding temperature limits given the occurrence of this fire. Combustible material control is described in [Section 1.4.3](#).

1.2.7.7 Consistency of Materials with Design Methodologies

[NUREG-1804, Section 2.1.1.7.3.3(I): AC 2(1), (2), (3)]

The selection of construction materials for the Aging Facility SSCs is consistent with the recommendations contained in the industry codes and standards identified in [Section 1.2.7.8](#). There are no unique or first-of-a-kind material applications for the Aging Facility SSCs. The aging pads consist of reinforced concrete designed and constructed in accordance with ACI 349-01/349R-01, *Code Requirements for Nuclear Safety Related Concrete Structures (ACI 349-01) and Commentary (ACI 349R-01)*. Concrete for aging overpacks is formulated per ACI 349-01/349R-01. Reinforcing steel complies with ASTM A 706/A 706M-06a, *Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement*, or ASTM A 615/A 615M-06a, *Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement*.

1.2.7.8 Design Codes and Standards

[NUREG-1804, Section 2.1.1.7.3.3(I): AC 1(1)]

The principal codes and standards applicable to the design of the aging pads, concrete vertical overpacks, concrete horizontal aging modules, and reinforcing steel are:

- ASCE/SEI 43-05, *Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities*
- ACI 349-01/349R-01, *Code Requirements for Nuclear Safety Related Concrete Structures (ACI 349-01) and Commentary (ACI 349R-01)*
- ANSI/ANS-6.4-1997, *Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants*, Appendix A.

The principal codes and standards applicable to the design of the cask tractor and trailer mechanical handling components are:

- ANSI/ITSDF B56.9, *Safety Standard for Operator Controlled Industrial Tow Tractors*
- ANSI N14.30-1992, *Semi-Trailers Employed in the Highway Transport of Weight-Concentrated Radioactive Loads—Design, Fabrication, and Maintenance*, Nuclear Materials.

1.2.7.9 Design Load Combinations

[NUREG-1804, Section 2.1.1.7.3.3(I): AC 4(1), (2)]

The structural loads and load combinations used in the design of ITS structures, including the aging pads, are presented in [Section 1.2.2](#).

The canister and overpack system will be evaluated for normal handling loads, dead loads, thermal loads, and event sequence loads. The aging overpack systems will withstand the natural-phenomena loading parameters at Yucca Mountain as shown in [Table 1.2.2-1](#) without tipover, without sliding

into other overpacks, without exceeding canister stress and leakage limits, and without exceeding waste form or material temperature limits.

1.2.7.10 General References

ACI 349-01/349R-01. 2001. *Code Requirements for Nuclear Safety Related Concrete Structures (ACI 349-01) and Commentary (ACI 349R-01)*. Farmington Hills, Michigan: American Concrete Institute. TIC: 252732.

ANSI N14.30-1992. 1993. *Semi-Trailers Employed in the Highway Transport of Weight-Concentrated Radioactive Loads—Design, Fabrication, and Maintenance*. New York, New York: American National Standard Institute. TIC: 10032.

ANSI/ANS-6.1.1-1991. 1992. *American National Standard for Neutron and Gamma-Ray Fluence-to-Dose Factors*. La Grange Park, Illinois: American Nuclear Society. TIC: 236033.

ANSI/ANS-6.4-1997. 2004. *Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants*. La Grange Park, Illinois: American Nuclear Society. TIC: 257554.

ANSI/ITSDF B56.9-2006. *Safety Standard for Operator Controlled Industrial Tow Tractors*. Washington, D.C.: Industrial Truck Standards Development Foundation. TIC: 259777.

ASCE/SEI 43-05. 2005. *Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities*. Reston, Virginia: American Society of Civil Engineers. TIC: 257275.

ASME (American Society of Mechanical Engineers) 2004. *2004 ASME Boiler and Pressure Vessel Code*. 2004 Edition. New York, New York: American Society of Mechanical Engineers. TIC: 256479.

ASTM A 615/A 615M-06a. 2006. *Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement*. West Conshohocken, Pennsylvania: American Society for Testing and Materials. TIC: 258705.

ASTM A 706/A 706 M-06a. 2006. *Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement*. West Conshohocken, Pennsylvania: American Society for Testing and Materials. TIC: 258719.

DOE (U.S. Department of Energy) 2008. *Transportation, Aging and Disposal Canister System Performance Specification*. WMO-TADCS-000001, Rev. 1 ICN 1. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20080331.0001.

ICRP (International Commission on Radiological Protection) 1991. *1990 Recommendations of the International Commission on Radiological Protection*. Volume 21, Nos. 1-3 of *Annals of the ICRP*. ICRP Publication 60. New York, New York: Pergamon Press. TIC: 235864.

ICRP 1997. *Conversion Coefficients for Use in Radiological Protection Against External Radiation*. Volume 26, No. 3/4 of *Annals of the ICRP*. ICRP Publication 74. Tarrytown, New York: Elsevier. TIC: 248792.

Table 1.2.7-1. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Aging Facility

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging Facility (AP)	Aging Handling/ Aging Overpack	Aging Overpack (TAD: 170-HAC0-ENCL-00003) (Vertical DPC: 170-HAC0-ENCL-00002)	Protect against direct exposure to personnel	AP.CR.HAC.01. The mean conditional probability of loss of shielding of the aging overpack resulting from an impact or collision shall be less than or equal to 1×10^{-5} per impact.	The aging overpack is required to be designed for loads associated with impact or collision.
				AP.CR.HAC.02. The mean conditional probability of loss of shielding of the aging overpack resulting from a drop shall be less than or equal to 5×10^{-6} per drop.	The aging overpack is required to be designed for loads associated with drops.
				AP.WH.HAC.01. The mean conditional probability of loss of shielding of the aging overpack resulting from an impact or collision shall be less than or equal to 1×10^{-5} per impact.	The aging overpack is required to be designed for loads associated with impact or collision.
				AP.WH.HAC.02. The mean conditional probability of loss of shielding of the aging overpack resulting from a drop shall be less than or equal to 5×10^{-6} per drop.	The aging overpack is required to be designed for loads associated with drops.
				AP.RF.HAC.01. The mean conditional probability of loss of shielding of the aging overpack resulting from an impact or collision shall be less than or equal to 1×10^{-5} per impact.	The aging overpack is required to be designed for loads associated with impact or collision.
				AP.RF.HAC.02. The mean conditional probability of loss of shielding of the aging overpack resulting from a drop shall be less than or equal to 1×10^{-5} per drop.	The aging overpack is required to be designed for loads associated with drops.

Table 1.2.7-1. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Aging Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging Facility (AP)	Aging Handling/ Aging Pad	Aging Pad	Protect ITS SSCs from external events	AP.SB.01. The aging pads shall be located such that there is a distance of at least one-half mile between the aging pads and the repository heliport.	The aging pads shall be located such that there is a distance of at least one-half mile between the aging pads and the repository heliport.
			Protect against aging overpack tipover	AP.SB.02. The mean frequency of aging pad structure failure causing aging overpack tipover due to the spectrum of seismic events shall be less than or equal to 1×10^{-5} per year.	Fragility assessment of the pad is performed to develop the fragility curve. Convolution of the fragility curve and seismic hazard curve (as described in Section 1.7) is performed to demonstrate compliance.
	Aging Handling/ Aging Overpack	Horizontal Aging Module (170-HAC0-ENCL-00001)	Protect against direct exposure to personnel	AP.SB.HAC.01. The mean conditional probability of loss of horizontal aging module gamma shielding due to an impact or collision shall be less than or equal to 1×10^{-5} per impact.	The horizontal aging modules are required to be designed in accordance with ACI 349-01/349R-01 for loads associated with impact or collision.
			Protect against structural collapse onto a waste container	AP.SB.HAC.02. The mean frequency of collapse of the horizontal aging module structure due to the spectrum of seismic events shall be less than or equal to 2×10^{-6} per year.	The horizontal aging modules are required to be designed in accordance with ACI 349-01/349R-01 for loads and accelerations associated with a beyond DBGM seismic event.
		Aging Overpack (TAD: 170-HAC0-ENCL-00003) (Vertical DPC: 170-HAC0-ENCL-00002)	Protect against direct exposure to personnel	AP.SB.HAC.06. The mean conditional probability of loss of shielding of the aging overpack resulting from an impact or collision shall be less than or equal to 1×10^{-5} per impact.	The aging overpack is required to be designed for loads associated with impact or collision.

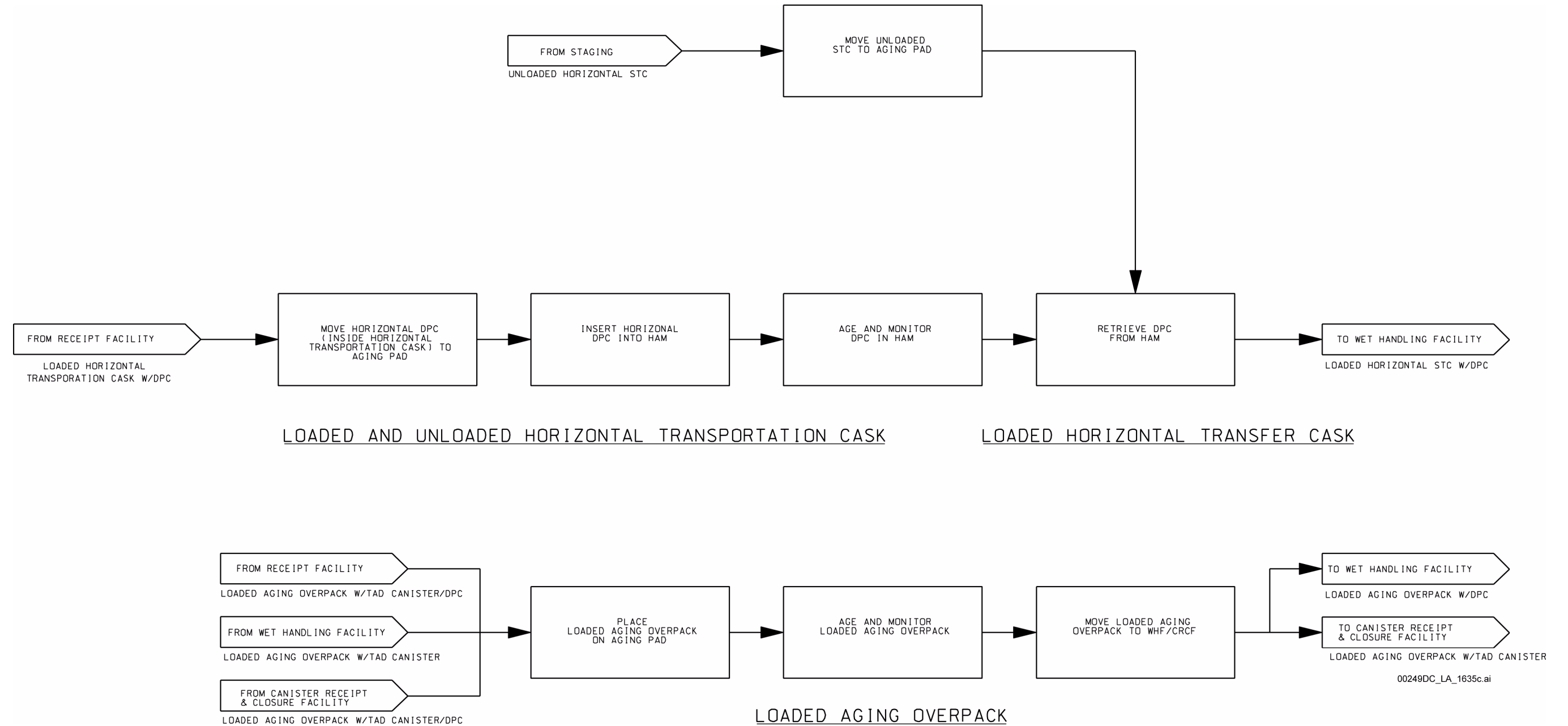
Table 1.2.7-1. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Aging Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging Facility (AP) (Continued)	Aging Handling/ Aging Overpack (Continued)	Aging Overpack (TAD: 170-HAC0-ENCL-00003) (Vertical DPC: 170-HAC0-ENCL-00002) (Continued)	Protect against direct exposure to personnel (Continued)	AP.SB.HAC.07. The mean conditional probability of loss of shielding of the aging overpack resulting from a drop at the equipment base shall be less than or equal to 5×10^{-6} per drop.	The aging overpack is required to be designed for loads associated with drops.
			Protect against sliding of an aging overpack	AP.SB.HAC.08. The mean frequency of sliding of an aging overpack (with a waste container) into another aging overpack on the aging pad due to the spectrum of seismic events shall be less than or equal to 5×10^{-6} per year.	The aging overpack is required to be designed to prevent it from sliding into another aging overpack on an aging pad for a beyond DBGM seismic event.
			Protect against tipover of an aging overpack	AP.SB.HAC.09. The mean frequency of tipover of the aging overpack on the aging pad due to the spectrum of seismic events shall be less than or equal to 5×10^{-8} per year.	The aging overpack is required to remain upright and free standing during and after a seismic event characterized by the horizontal and vertical peak ground accelerations of 96.52 ft/s ² (3 g).
Balance of Plant (SB)	Flood Protection	Flood Control Features	Protect ITS SSCs from external flooding events	SB.01. The site flood control features will be designed to the probable maximum flood.	The flood protection features are required to be located and sized to prevent the inundation of the ITS structures due to a flood associated with the probable maximum precipitation event.

Table 1.2.7-1. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Aging Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
DOE and Commercial Waste Package System (DS)	Canistered Spent Nuclear Fuel	DPC and TAD Canister (Both Analyzed as a Representative Canister)	Provide containment	DS.SB.03. The mean conditional probability of breach of a canister within an aging overpack following a drop shall be less than or equal to 1×10^{-5} per drop.	The aging overpack and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				DS.SB.04. The mean conditional probability of breach of a canister within an aging overpack resulting from a side impact or collision shall be less than or equal to 1×10^{-8} per event	The aging overpack and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
DOE and Commercial Waste Package System (DS) (Continued)	Canistered Spent Nuclear Fuel (Continued)	DPC and TAD Canister (Analyzed as a Representative Canister) (Continued)	Provide containment (Continued)	DS.SB.05. The mean conditional probability of breach of a canister in a horizontal aging module resulting from a collision or side impact shall be less than or equal to 1×10^{-8} per event.	The horizontal aging module and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				DS.SB.06. The mean conditional probability of breach of a canister resulting from a drop of a load onto a horizontal aging module shall be less than or equal to 1×10^{-5} per drop.	The horizontal aging module and canister are required to be designed such that the canister maximum effective plastic strain from low speed impact or collisions meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)

NOTE: "Protect against" in this table means either "reduce the probability of" or "reduce the frequency of."
 For casks, canisters, and associated handling equipment that were previously designed, the component design will be evaluated to confirm that the controlling parameters and values are met.
 Seismic control values shown represent the integration of the probability distribution of SSC failure (i.e., the loss of safety function) with the seismic hazard curve.
 The numbers appearing in parentheses in the third column are component numbers.
 Facility Codes: AP: Aging Facility; CR: Canister Receipt and Closure Facility; RF: Receipt Facility; SB: Balance of Plant; WH: Wet Handling Facility.
 System Codes: DS: DOE and Commercial Waste Package.
 Subsystem Codes: HAC: Aging Overpack.



NOTE: HAM = horizontal aging module; STC = shielded transfer cask.

Figure 1.2.7-1. Surface Facilities Overview and Interface Relationship Chart

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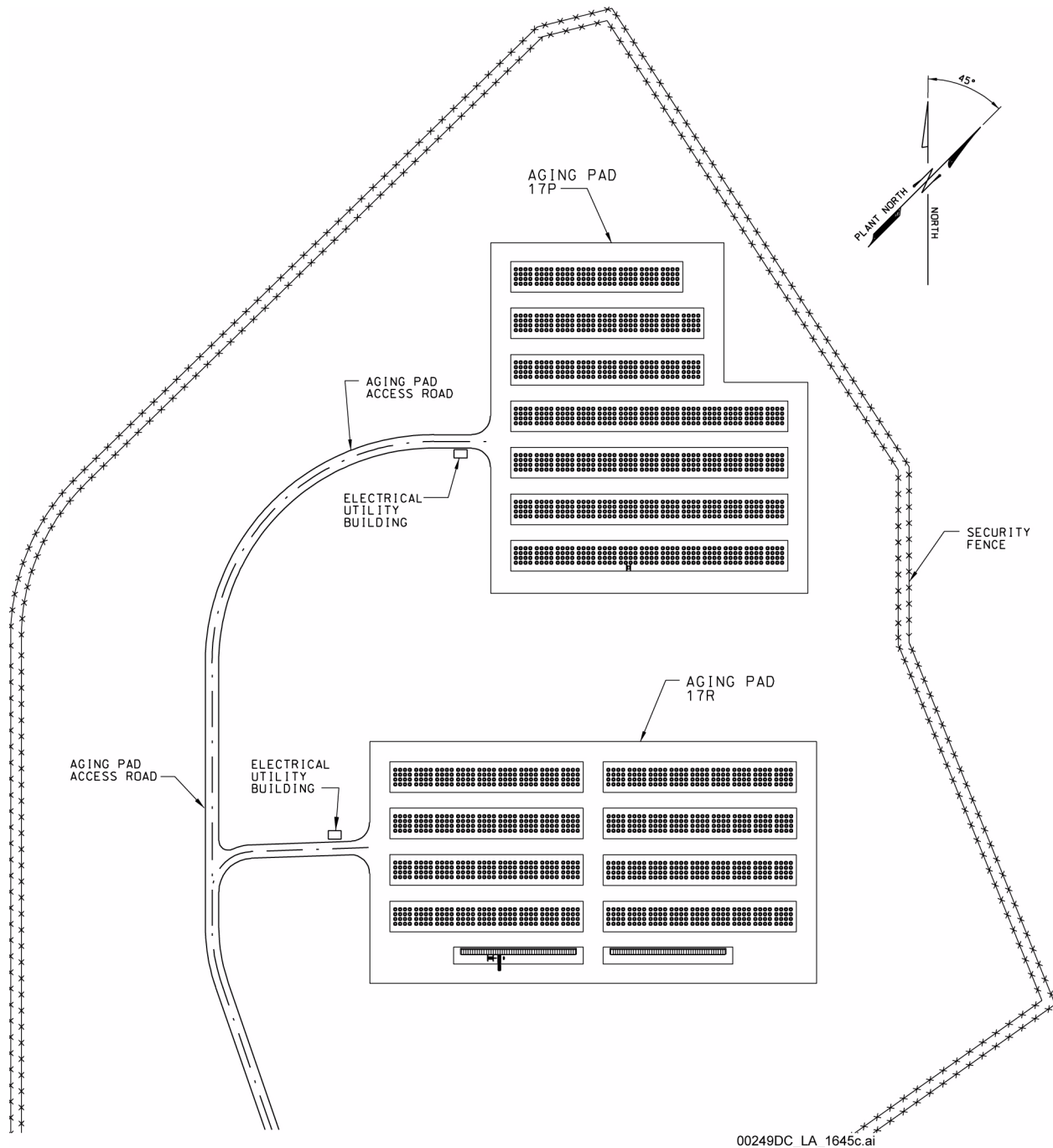
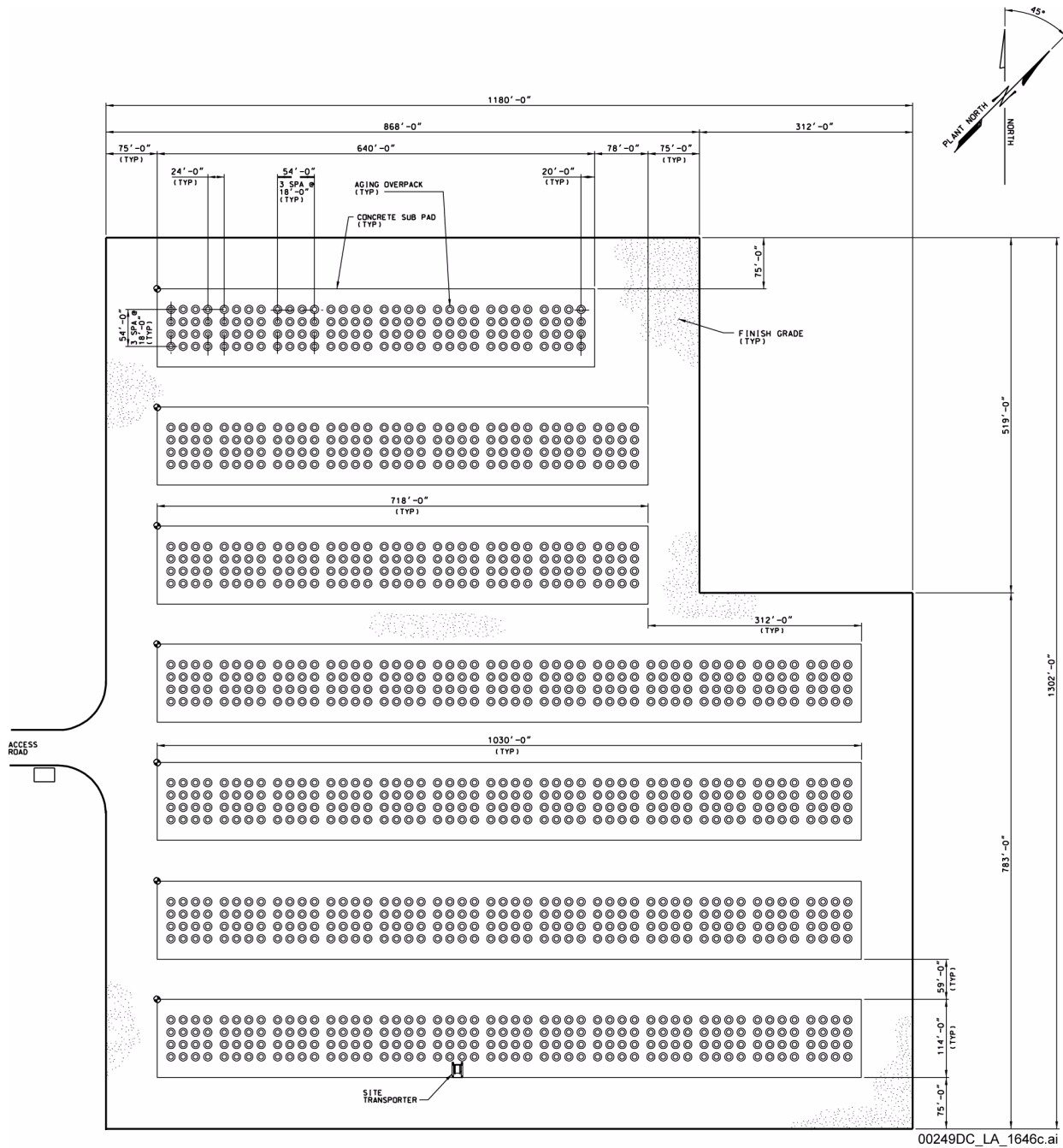


Figure 1.2.7-2. Aging Pad Area Locations

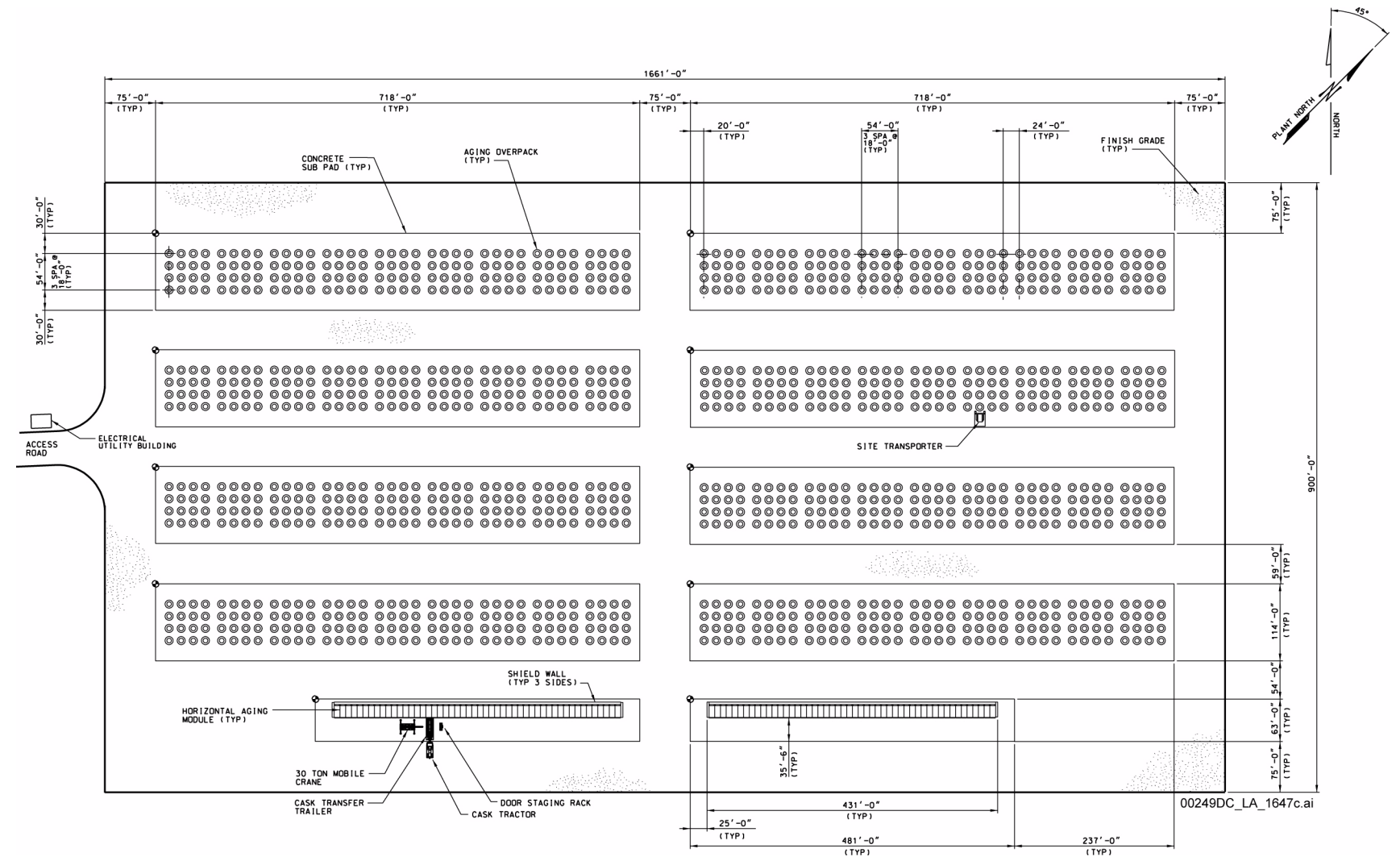
NOTE: Security fence is the protected area barrier. This figure is truncated for clarity. The surface elevations of the individual pads are arranged to assist site drainage.



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Figure 1.2.7-3. Aging Pad 17P Plan

NOTE: Dimensions shown are nominal.



NOTE: Dimensions shown are nominal.

Figure 1.2.7-4. Aging Pad 17R Plan

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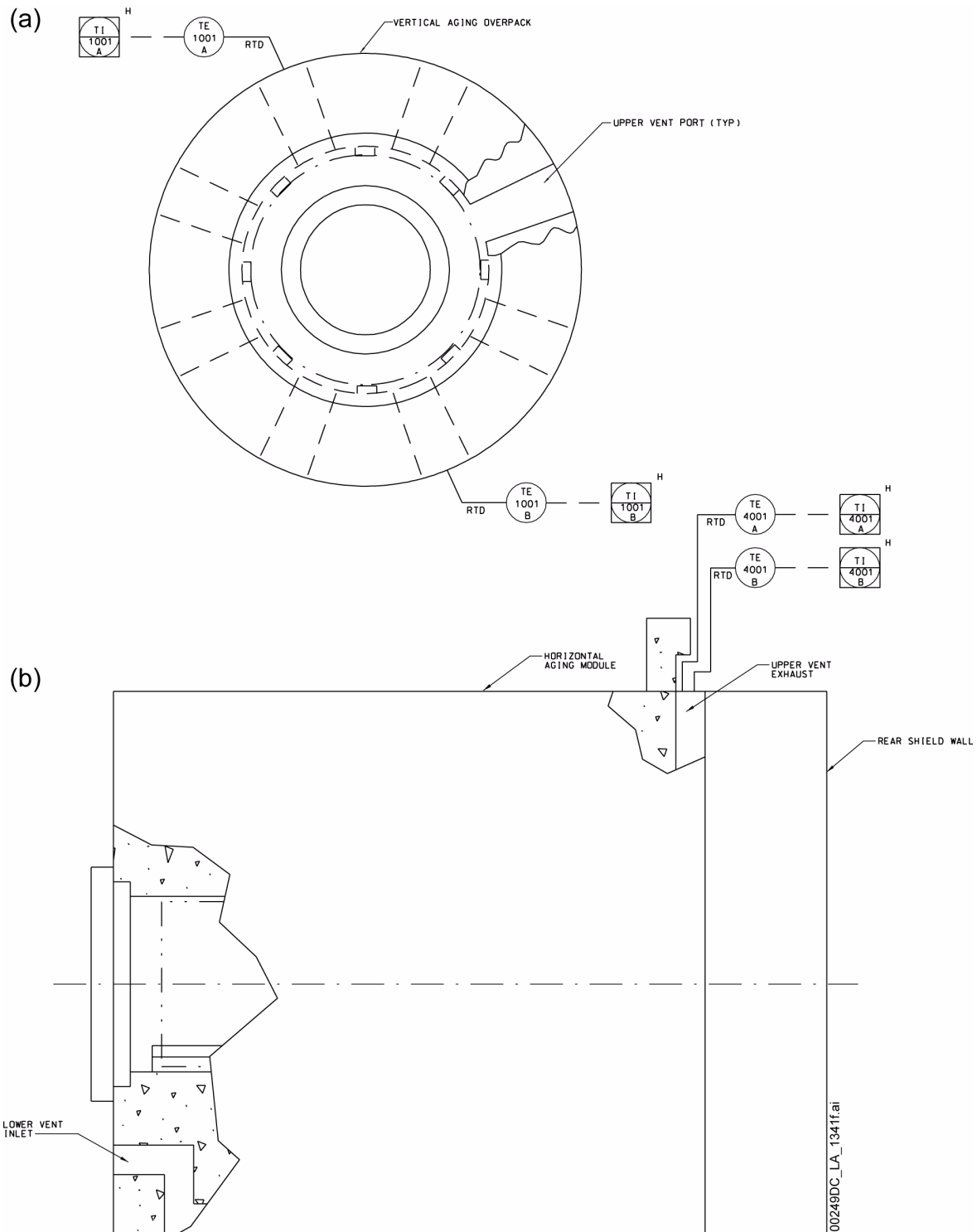


Figure 1.2.7-5. Temperature Monitoring System for Vertical Aging Overpack (a) and Horizontal Aging Module (b)

NOTE: H = high temperature alarm in the CCCF.

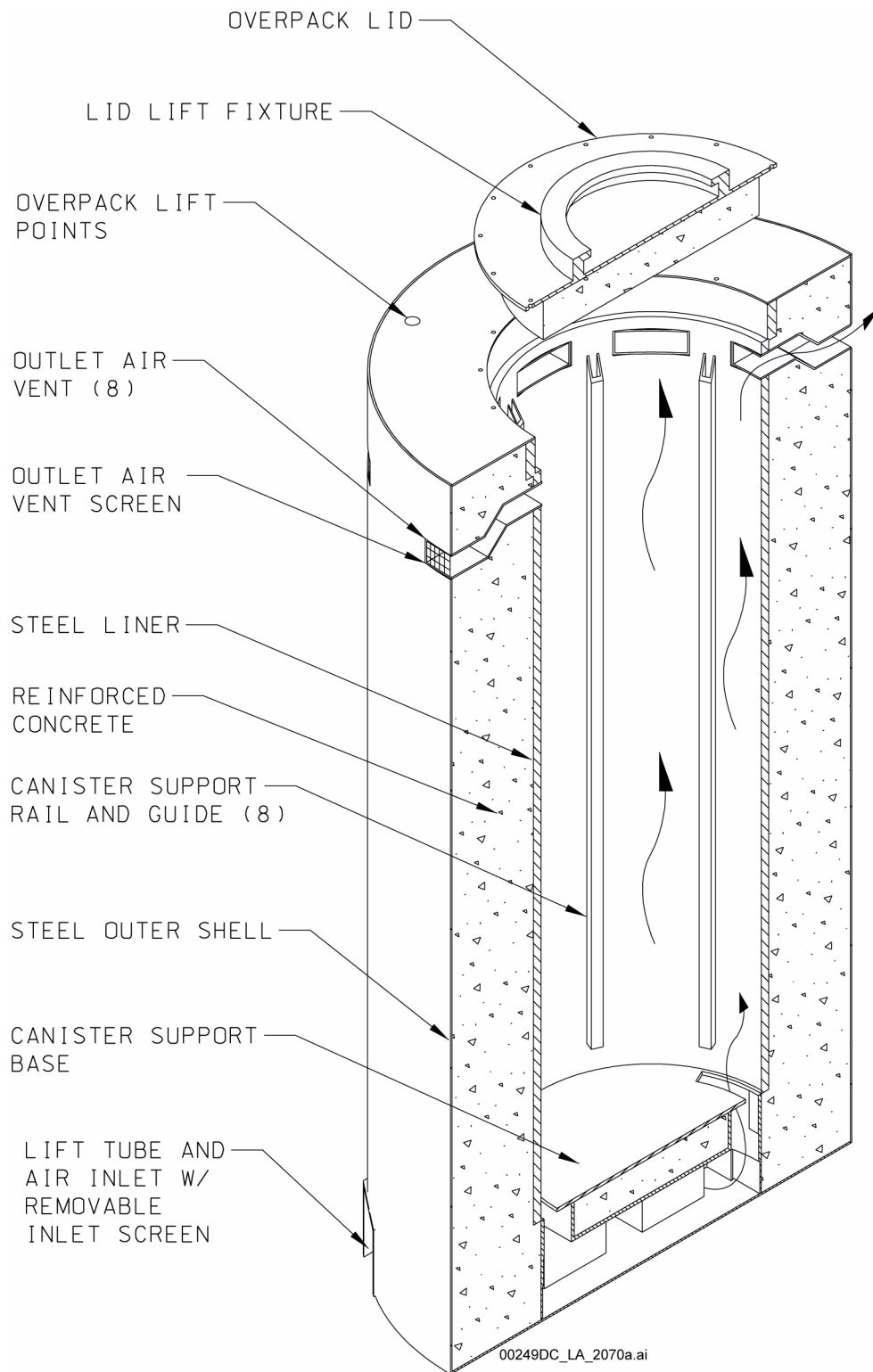
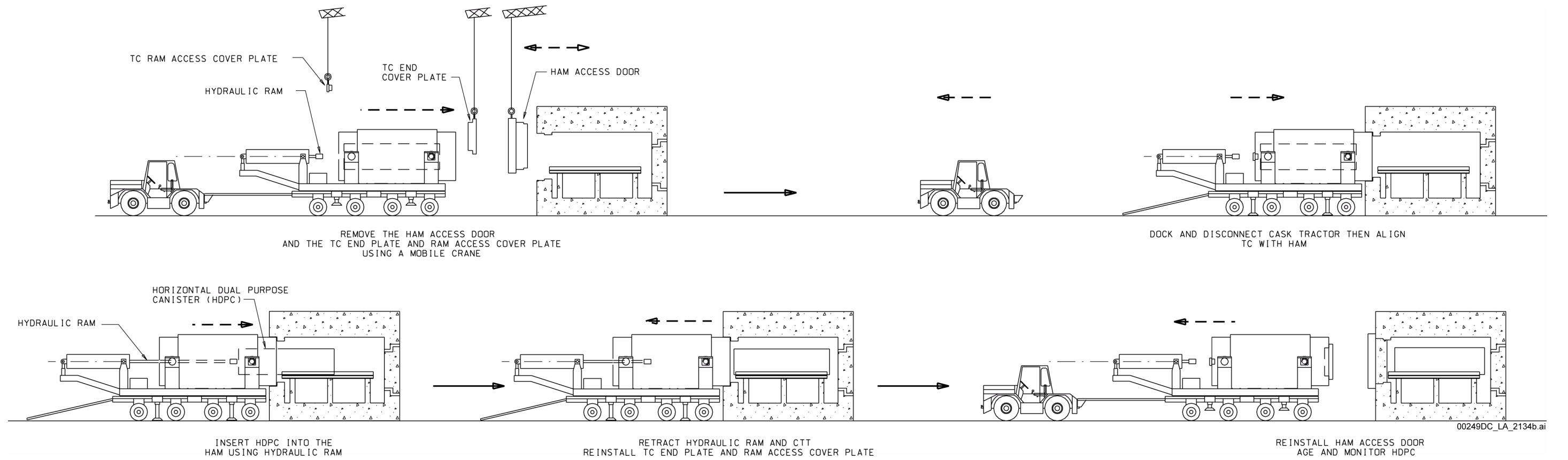


Figure 1.2.7-6. Typical Vertical Aging Overpack



NOTE: Solid, horizontal arrows show progression of operations.
 Dashed-line, horizontal arrows indicate direction of travel.
 CTT = cask transfer trailer; HAM = horizontal aging module; HDPC = horizontal dual-purpose canister; HTC = horizontal transfer cask; TC = transportation cask.

Figure 1.2.7-7. Loading/Retrieval Typical Horizontal Aging Module

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1.2.8 Balance of Plant Facilities

[NUREG-1804, Section 2.1.1.2.3: AC 1, AC 2, AC 6; Section 2.1.1.6.3: AC 1, AC 2; Section 2.1.1.7.3.1: AC 1; Section 2.1.1.7.3.2: AC 1; Section 2.1.1.7.3.3(I): AC 1, AC 2, AC 4; HLWRS-ISG-02 Section 2.1.1.2.3: AC 2]

The design and operation of the balance of plant facilities and the systems within those facilities are described in this section. Information related to the generic features of structural design and heating, ventilation, and air-conditioning (HVAC) design, as applicable to the important to safety (ITS) structures, systems, and components (SSCs) in balance of plant facilities, is provided in [Sections 1.2.2.1](#) and [1.2.2.3](#), respectively. Infrastructure information specific to the balance of plant facilities related to the electrical power, controls and monitoring, fire protection, plant service, and waste management is provided in [Sections 1.4.1](#) to [1.4.5](#), respectively.

The location of the balance of plant facilities relative to other surface facilities is shown in [Figures 1.2.1-1](#) and [1.2.1-2](#); the numbers in parentheses below for balance of plant facilities are the area numbers identified in [Figures 1.2.1-1](#) and [1.2.1-2](#). The distance of the geologic repository operations area (GROA) facilities from the site boundary is shown in [Figure 1.1-1](#).

1.2.8.1 Balance of Plant Facility Descriptions

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2(1), (2), (3), AC 6; Section 2.1.1.6.3 AC 1(2)(e)]

The list provided in [Table 1.2.8-1](#) represents the balance of plant facilities and identifies the balance of plant facilities that are classified as non-ITS. There are no nuclear safety design bases for the structures of the balance of plant facilities.

In surface transportation facilities, the site transporter, cask tractor and cask transfer trailers, site prime mover, and transportation casks are classified as ITS. The site roads and rails are classified as non-ITS.

1.2.8.1.1 Facility Descriptions

1.2.8.1.1.1 Emergency Diesel Generator Facility

The Emergency Diesel Generator Facility (EDGF) (Area 26D) is designed to house the two independent 13.8 kV ITS diesel generators (Trains A and B) and the supporting mechanical systems for those two diesel generators. The system design and operations for the ITS electric power system and description of the interfaces between the ITS electric power system with the various Yucca Mountain electrical equipment are provided in [Section 1.4.1](#). No radioactive material is present within the EDGF, and radioactive waste management, shielding, and criticality design are not applicable to the EDGF and its systems.

The EDGF is a non-ITS surface structure that is located between the Wet Handling Facility (WHF) and Canister Receipt and Closure Facility 1 (CRCF 1) northeast of the North Portal of the repository. In the event of loss of power from an offsite source, the ITS diesel generators in the EDGF are designed to provide 13.8 kV power to ITS loads in the CRCFs and the WHF. The EDGF is physically separated from the other surface buildings to isolate it from interactions with the other

facilities during a seismic event. The location of the EDGF relative to the other surface facilities is shown on [Figure 1.2.1-2](#).

The general arrangement floor plan for the ground floor and the associated legend are shown on [Figures 1.2.8-1](#) and [1.2.8-2](#). The roof plan is shown in [Figure 1.2.8-3](#). Cross-section views of the facility are shown in [Figures 1.2.8-4](#) through [1.2.8-7](#).

The overall footprint of the EDGF is approximately 174 ft wide by 98 ft long. The height of the building is 23 ft above grade.

The foundation of the EDGF is a reinforced concrete mat having the necessary thickness to support the superstructure and the ITS diesel generators. The foundation mat for the EDGF structure is 4 ft thick. The ITS diesel generators are founded on the foundation mat of the main structure. The superstructure consists of 3-ft-thick exterior walls and 2-ft-thick interior concrete shear walls. Concrete walls that are 2 ft thick separate internal rooms. The roof diaphragm slab is a 3-ft-thick concrete slab. The ancillary items near the EDGF structure are external pads near the structure that support equipment such as normal power transformers. These ancillary equipment pads are structurally independent of the main concrete structure.

A monorail hoist with a capacity of 2 tons provides the capability for lifting equipment in each generator room and is used to transfer parts to and from the ITS diesel generators and to and from maintenance areas within the EDGF. The hoist is capable of handling the largest serviceable part of the ITS diesel generator. The hoist is not used when the ITS diesel generator is operating. It is parked away from the ITS diesel generators when not in use. The monorail hoist has been classified as non-ITS.

Each ITS diesel generator, including the turbocharger, is housed within its own generator room. The generator rooms include a suitable allowance for piping connections and auxiliary equipment that is mounted on the engine frame (e.g., connection box, lubrication oil equipment, cooling water piping, and governor and generator auxiliaries). The diesel generator set is provided with a turbocharger, inlet air filter and silencer, exhaust gas silencer, muffler, and stack. The controls for each ITS diesel generator are provided in the adjacent, dedicated switchgear room. The controls and instrumentation are sufficient to monitor the performance of the generator and engine as well as the condition of both the ITS and normal electrical buses from within each switchgear room of the EDGF. Sufficient 125 V DC batteries and inverters are provided to ensure that the ITS demands for the EDGF itself are met whenever there is an interruption of normal power.

The two ITS diesel generators are designed as stationary backup units and are capable of meeting the ITS equipment electrical loads. In the event of a loss of normal power, the ITS diesel generators in the EDGF are designed to provide 13.8 kV power to the ITS power demands via separate ITS transformers, load centers, and motor control centers that are located in the CRCFs and WHF. Each of the two ITS diesel generators is sized to accommodate ITS loads from the handling facilities.

An overview of the major areas within the EDGF is provided below.

Generator Rooms (Rooms 1001 and 1011)—The generator room for each train contains the ITS diesel generator and turbocharger, 2-ton monorail hoist, jacket water pumps, fuel oil day tank, engine combustion air intake silencer, and the air start skid.

Switchgear Rooms (Rooms 1002 and 1012)—The switchgear room for each train contains a transformer, 13.8 kV ITS switchgear, transformer, battery charger, uninterruptible power supply, and motor control center.

Battery Rooms (Rooms 1003 and 1013)—The battery room for each train is located within the switchgear rooms and contains a battery rack of ITS uninterruptible power supply batteries.

Mechanical Rooms (Rooms 1004 and 1014)—The mechanical room for each train contains the air handling unit and fan coil unit.

1.2.8.1.1.2 Administration Facility (Area 620)

The Administration Facility is a multifunctional area that provides space and layout for offices, food services, training, computer operations, and emergency operations. Two major areas within the facility are the computer operations center and the Emergency Operations Center. The computer operations center provides space and services for local network equipment and functions. The Emergency Operations Center provides space for emergency management services and functions so that it is fully capable of functioning as an alternate technical support center and as a near-site emergency operations facility if, or when, activated by the emergency plan.

In order to facilitate management and operation of the Emergency Operations Center, dedicated computers and phone lines are provided to support the Emergency Operations Center functions. Video-teleconference capability is provided for an Emergency Operations Center secure conference room.

Radiation monitoring systems are provided in the Emergency Operations Center composed of installed monitors or portable monitoring equipment dedicated to the Emergency Operations Center. These systems continuously indicate radiation dose rates and airborne radioactivity concentrations inside the Emergency Operations Center while it is in use during an emergency. These monitoring systems include local alarms with trip levels set to provide early warning to Emergency Operations Center personnel of adverse conditions that may affect the habitability of the Emergency Operations Center.

The Emergency Operations Center has reliable voice communications to the Central Control Center, Emergency Operations Facility, the facility operations rooms, U.S. Nuclear Regulatory Commission, and state and local emergency operations centers. The normal communication path between the Emergency Operations Center and the facility operations rooms is through the Central Control Center.

1.2.8.1.1.3 Security Facilities (Areas 30A, 30B, 30C, 65A, and 65B)

The security facilities include areas that provide space and layout for security staff. These include the Central Security Station (Area 30A), Cask Receipt Security Station (Area 30B), North Perimeter Security Station (Area 30C), and administration security stations (Areas 65A and 65B). The North Perimeter Security Station only functions as an exit facility from the protected area. The Cask Receipt Security Station also functions, for the receipt of cask shipments, as the point of custody transfer (from the transportation system to the repository). The secondary alarm station is located in the Cask Receipt Security Station.

1.2.8.1.1.4 Central Control Center Facility (Area 240)

The CCCF is constructed of concrete and structural steel.

The facility is designed with entrances and exits by means of a central facility corridor that physically separates the operational area of the primary alarm station from all other facility features. The roof is a concrete slab on metal decking. [Figure 1.2.8-8](#) presents the architectural floor plan of the CCCF. The CCCF provides a central location for the monitoring of selected repository operations and systems.

The CCCF provides functional space, structures, and internal systems that support the Central Control Center, primary alarm station, HVAC rooms, electrical rooms, and central communications room. The Central Control Center functions as the technical support center for conducting emergency management activities. The technical support center monitors important parameters and has redundant emergency communications, a backup power supply, a GROA-wide emergency alarm notification system, and an electronic system to provide personnel accountability.

The Central Control Center provides capability to transfer the functions of the technical support center (located in the Central Control Center) to the near-site emergency operations facility located in the Administration Facility.

The Central Control Center contains human-machine interface consoles, printers, and other operational support equipment. A separate engineering configuration room houses other support equipment. Central Control Center personnel are protected from radiological hazards, including direct radiation and airborne radioactivity from event sequences, to the same degree as personnel in handling facility operations rooms. Radiation monitoring systems are provided in the Central Control Center, that are composed of installed monitors or portable monitoring equipment dedicated to the Central Control Center. These systems continuously indicate radiation dose rates and airborne radioactivity concentrations inside the Central Control Center while it is in use during an emergency. These monitoring systems include local alarms with trip levels set to provide early warning to Central Control Center personnel of adverse conditions that may affect the habitability of the Central Control Center. The Central Control Center includes the site communications system, which is described in [Section 1.4.2.4](#). The Central Control Center and central communications room share an HVAC system and electrical system. The CCCF complies with the applicable functional criteria for emergency response facilities provided in NUREG-0696, *Functional Criteria for Emergency Response Facilities, Final Report* (NRC 1981), Section 2.5.

The primary alarm station is in the CCCF and accommodates key security personnel with work areas, security computers, security alarm communication and display system for monitoring alarm equipment, on and off-site redundant communication equipment, and a video assessment system consisting of closed circuit television cameras and recording system.

1.2.8.1.1.5 Low-Level Waste Facility (Area 160)

The Low-Level Waste Facility (LLWF) is a multistory building designed to accept, manage, and store dry active waste and liquid radioactive waste. The general arrangement floor plans and associated legend for the LLWF are shown in [Figures 1.2.8-9 to 1.2.8-11](#). The LLWF general arrangement sections are shown in [Figures 1.2.8-12 to 1.2.8-14](#). The building is designed as a structural steel structure with concrete floor, concrete mat foundation, concrete shield walls, steel roof truss system, and interior and external structural steel bracing. Four separate, part-height, walled, shielded storage bays are located inside of the building. The four bays provide space and concrete shielding for interim storage of packaged waste. Storage is provided in the LLWF for wastes contained in boxes, drums, high-efficiency particulate air (HEPA) filters, and high-integrity containers. Unloaded dual-purpose canisters (DPCs) are also stored in the LLWF for eventual disposal.

The LLWF is physically separated from other buildings to isolate it from interactions with the other facilities during a seismic event. The low-level radioactive waste is transported to the facility from the Initial Handling Facility (IHF), CRCFs, WHF, and Receipt Facility (RF) via standard vehicular transport (e.g., an open flatbed truck), and radiation shielding is provided as needed to transfer items (e.g., radioactive filters from the handling facilities). This area has hatches through which waste containers are moved. Used DPCs are sent to the LLWF in a shielded transfer cask or other acceptable container. A 50-ton-capacity bridge crane has the capability to access the facility to move large waste containers. An open process area, located adjacent to the receipt area, contains a scale and supply storage area.

Liquid low-level radioactive waste is transported to the LLWF from the IHF, CRCFs, and RF by tanker truck or in containers placed on standard vehicular transport, such as an open flatbed truck. Liquid low-level radioactive waste from the WHF collection tanks is hard piped directly to the low-level radioactive waste collection tanks. Liquid low-level radioactive waste is sampled, characterized, and processed by mobile equipment as described in [Section 1.4.5](#).

1.2.8.1.1.6 Warehouse and Non-Nuclear Receipt Facility (Area 230)

The Warehouse and Non-Nuclear Receipt Facility (WNNRF) is a single-story building on a reinforced concrete foundation. It provides space, structures, and enclosures for systems that support empty waste package storage operations. The WNNRF stores empty new waste packages; transportation, aging, and disposal (TAD) canisters; lids; pallets; spread rings; and shield plugs until needed. There is no radioactive material contained in the waste packages or TAD canisters received or stored in this building. Operations at the WNNRF include receiving and inspecting empty waste packages and TAD canisters, pallets, and associated fixtures and handling supplies and storing them until needed. [Figure 1.2.8-15](#) shows the WNNRF architectural floor plan. The WNNRF is also designated as the operational support center.

1.2.8.1.1.7 Facilities for Utilities (Areas 25A, 25B, 25C, 26B, 27A, 27B, 28A, 28B, 28E, and 90A)

The facilities for utilities include individual facilities and areas that provide functional space and layout for plant services, electrical power distribution and support, fire water facilities, an evaporation pond, a stormwater retention pond, and cooling towers.

The systems and equipment that support repository operations are housed in a separate Utilities Facility (Area 25A) and include equipment for the heating and cooling systems and a deionized water system.

The normal electrical power system includes the switchyard (138 kV) (Area 27A), the 13.8 kV Switchgear Facility (Area 27B), and a Standby Diesel Generator Facility (Area 26B). The switchyard provides interface between offsite and onsite electrical power systems. The switchyard contains, within the switchyard fence, transmission line towers for the 138 kV offsite power sources, main step-down transformers, high-voltage circuit breakers, disconnect switches, and surge arrestors. The 13.8 kV Switchgear Facility is located outside the switchyard fence.

Fire water facilities (Areas 28A, 28B, and 28E) include tanks and pump houses.

The evaporation pond (Area 25C) is a lined pond used to collect cooling-tower water (Area 25B), deionized water processing packages, blowdown, and treated water from the liquid low-level radioactive waste process tank outside the LLWF. The treated water may be discharged to the evaporation pond after the water is confirmed to be below the limits prescribed by the operational radiation protection program.

A stormwater retention pond (Area 90A) is a lined pond that is used to collect stormwater runoff.

1.2.8.1.1.8 Fire, Rescue, and Medical Facility (Area 63A)

The Fire, Rescue, and Medical Facility is a multifunctional facility that provides space and layout for fire protection and fire-fighting services, underground rescue services, and emergency and occupational medical services.

1.2.8.1.1.9 Materials and Consumables Facilities (Areas 68A, 68B, and 71B)

Warehouse/central receiving (Area 68A) provides functional space for warehousing and receiving materials. The materials and yard storage area (Area 68B) provides functional space for storing materials.

The equipment yard/storage (Area 71B) provides functional space for storing equipment.

1.2.8.1.1.10 Maintenance and Repair Facilities (Areas 71A and 220)

The maintenance and repair facilities provide space and layout for craft shops, heavy equipment maintenance, and vehicle maintenance.

The craft shops (Area 71A) include facilities and functional space to provide shop environment work areas for trade and craft personnel. The craft shops furnish workspace, shop equipment, consumables, tool storage and maintenance, management office, and personnel space.

The Heavy Equipment Maintenance Facility (Area 220) includes facility and functional space for performing preventive maintenance and equipment repair associated with the fleet of mobile (wheeled and tracked) operational transport equipment used within the GROA. Space is provided for maintenance and repair of the TEV, site transporter, and other surface and subsurface transportation equipment. If it is deemed necessary to perform work on contaminated equipment in the Heavy Equipment Maintenance Facility, it will be performed in accordance with the radiation protection program. [Figure 1.2.8-16](#) shows the Heavy Equipment Maintenance Facility architectural floor plan.

1.2.8.1.1.11 Aging Overpack Staging Facility (Area 290)

The aging overpack staging facility is an outdoor area for storing empty aging overpacks and unloaded (noncontaminated) aging overpacks. The aging overpack staging pad is located southeast of CRCF 1 (Area 060). The reinforced concrete pad has sufficient space for storing 18 empty or unloaded aging overpacks.

An electrically-operated, rail-mounted, safe-lift double gantry crane (rated at approximately 300 tons) is used to handle the aging overpacks and place the aging overpack on the designated space for inspection. The site transporter is used for transporting the aging overpack to the designated staging location on the staging pad and transporting the aging overpack to the CRCF, WHF, or RF for use in canister transfer operations.

Area lighting is provided to facilitate 24-hour operation support. Area drainage is provided to prevent potential water buildup in the area.

1.2.8.1.1.12 Other Facilities and Areas

The diesel fuel oil storage (Area 70A) and fueling stations (Area 70B) provide storage for fuel oil. The vehicle maintenance and motor pool (Area 690) provides functional space for storage and maintenance of motor vehicles. The helicopter pad (Area 66A) provides space for the landing and takeoff of helicopters. The railcar buffer area (Area 33A) provides space for the staging of railcars. The truck buffer area (Area 33B) provides space for the staging of trucks and responds to system changes such as surges in cask delivery or facility outages. Space is provided for wastewater treatment in Area 35A.

1.2.8.1.2 Facility Operations

The facilities provide space and infrastructure to support repository operations, including waste handling and waste emplacement. The principle of operation for each facility is in accordance with the functional purpose of each facility, as described in [Section 1.2.8.1.1](#).

1.2.8.1.3 Design Codes and Standards

The facilities are designed using the methods and practices in the following codes and standards:

- ACI 349-01/349R-01, *Code Requirements for Nuclear Safety Related Concrete Structures (ACI 349-01) and Commentary (ACI 349R-01)*
- ACI 318-02/318R-02, *Building Code Requirements for Structural Concrete (ACI 318-02) and Commentary (ACI 318R-02)*
- *Manual of Steel Construction, Allowable Stress Design* (AISC 1997)
- ASCE 7-98, *Minimum Design Loads for Buildings and Other Structures*
- API Std 620, *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*
- AWS D1.1/D1.1M, *Structural Welding Code—Steel*
- *International Building Code 2000* (ICC 2003).

1.2.8.2 ITS Diesel Generator Mechanical Support Systems

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2, AC 6; Section 2.1.1.6.3: AC 1(2)(h), (2)(k), (2)(l), AC 2(2); Section 2.1.1.7.3.1: AC 1(1), (2), (3), (5), (9); Section 2.1.1.7.3.2: AC 1(1), (2); Section 2.1.1.7.3.3(I): AC 1(1), AC 2(1), (2), (3), AC 4(1)]

The equipment associated with each ITS diesel generator mechanical and electrical support system is classified as ITS. The seismic design of this equipment is addressed in [Section 1.2.2.1](#). The mechanical systems of one ITS diesel generator are physically separated from the other ITS diesel generator by multiple concrete walls that meet or exceed a three-hour fire barrier (concrete wall).

For each train (Train A and Train B) the EDGF houses one ITS diesel generator with an ITS fuel oil day tank, ITS engine air startup subsystem, ITS lubricating subsystem, ITS engine jacket cooling water subsystem (excluding the air coolers), and ITS air intake and exhaust subsystem located in the generator room (Room 1001 or 1011); one ITS 13.8 kV switchgear and associated ITS control panels, load center, and motor control centers in the switchgear room (Room 1002 or 1012); ITS batteries to serve the EDGF ITS instrumentation, controls, and ITS equipment demands in the battery room (Room 1003 or 1013); and ITS mechanical ventilation equipment and cooling equipment in the mechanical room (Room 1004 or 1014).

Because Train A and Train B are functionally the same for each of the mechanical support systems, process and instrumentation diagrams and descriptions are provided only for Train A in [Sections 1.2.8.2.1 to 1.2.8.2.5](#). [Figure 1.2.8-17](#) illustrates the interfaces between the EDGF ITS diesel generator Train A and the mechanical systems that support it.

The EDGF HVAC systems that provide ventilation for each of the generator rooms and ventilation and cooling for each of the switchgear rooms and battery rooms are independent and are classified as ITS. The EDGF HVAC system is addressed in [Section 1.2.8.3](#).

Typical non-ITS logic diagrams, which show the interface with digital control and management information system (DCMIS) and programmable logic controller elements within the selected ITS logic diagrams, are shown in [Figures 1.2.4-15 to 1.2.4-18](#).

1.2.8.2.1 ITS Diesel Generator Fuel Oil System

1.2.8.2.1.1 System Description

The ITS diesel generator fuel oil system is classified as ITS and consists of two independent, underground diesel fuel oil storage tanks, from which fuel is drawn through duplex basket filters by diesel fuel oil transfer pumps to the diesel fuel oil day tank. A diesel-engine-driven fuel oil pump draws fuel from the day tank through another set of duplex basket strainers to the ITS diesel generator. There is one underground diesel fuel oil storage tank per ITS diesel generator, providing diesel fuel to the dedicated day tank that supports each ITS diesel generator. There are two fuel oil pumps for each ITS diesel generator. Each ITS diesel generator is equipped with a fuel oil system. [Figure 1.2.8-17](#) shows the engine-mounted fuel oil pump and the connections to the engine. [Figure 1.2.8-18](#) shows the EDGF ITS diesel fuel oil system Train A piping and instrumentation diagram. [Figure 1.2.8-19](#) shows the ITS diesel generator fuel oil transfer pump logic diagram.

The components in the ITS diesel generator fuel oil system are described below.

Diesel Fuel Oil Storage Tanks—The two diesel fuel oil storage tanks for the ITS diesel generators are located underground, outside the EDGF. Each has double-walled construction. Fittings are provided on each tank for level instrumentation, ventilation, sampling for quality of oil, water removal, and sounding. Two flanged openings provide for mounting transfer pumps. In addition, each tank is equipped with an internal sump and a connection leading to a manway. Above each tank, there is a concrete vault, with the roof above plant grade. This vault houses the instruments, pumps, and the manway. Each diesel fuel oil storage tank is carbon steel with a 1/8-in. corrosion allowance. The tank is coated with a high-performance coating (coal tar epoxy or other suitable material) that is compatible for underground service. The tank is also provided with cathodic and lightning protection. Each tank is vented to the atmosphere with the vent line containing a flame arrestor and a bird screen. The vent line and the flame arrestor are missile protected. Since venting is to the outside atmosphere, there is no buildup of combustible gases.

The design of the fuel oil system allows replenishment of fuel without interrupting operation of the ITS diesel generator. The tank capacity provides enough fuel oil to operate one ITS diesel generator for at least 14 days with margin. For extended operation of the generator beyond 14 days, the diesel fuel oil storage tank will be refilled.

The design of the tank also prevents turbulence of sediment in the bottom of the storage tank from degrading overall fuel quality to an unacceptable level. To prevent detrimental effects of sediment on diesel performance, a strainer on the fill port to the underground storage tank and duplex fuel oil

strainers in the diesel fuel oil piping from the underground storage tank to the day tank and from the day tank to the diesel engine are provided.

The tops of the tanks are located below ground level. Each tank has an internal sump and a sampling line from which water and sediment are removed. A connection is provided to empty the tank sump using a portable pump.

Diesel Fuel Oil Transfer Pumps—Two gear-driven, positive-displacement diesel fuel oil transfer pumps are provided to transfer fuel oil from each diesel fuel oil storage tank to the associated diesel fuel oil day tank. A pump house encloses the transfer pumps and associated piping above the storage tank. The transfer pump inlet is located away from the sump inside the diesel fuel oil storage tank, but near the bottom of the tank. The transfer pump suction contains duplex fuel oil strainers. The performance of the strainers is monitored by pressure drop across the strainers.

Diesel Fuel Oil Day Tanks—The diesel fuel oil day tanks are sized for 4 hours of full-demand operation of the ITS diesel generators. The tanks are located within a corner of the diesel generator room, as shown in [Figure 1.2.8-2](#). The day tanks are elevated to ensure that a slight positive pressure exists at the suction of the engine-driven fuel oil pumps. The pump suction contains duplex fuel oil strainers and the performance of the strainers is monitored by pressure drop across the strainers. The day tanks are separated from any sources of ignition or high-temperature surfaces. The fuel oil piping is run from the tank to the engine and the fuel oil piping on the engine is located away from hot surfaces. Tank fittings provide for draining, sampling, recirculation, and instrumentation. Alarms on the diesel engine annunciate on conditions of high or low fuel oil pressure.

The fuel oil day tank is vented to the atmosphere outside of the building with a flame arrestor and bird screen. The vent line and the flame arrestor are missile protected. Since venting is to the outside atmosphere, there is no buildup of combustible gases.

Piping—The fuel oil system piping is designed in accordance with ASME B31.3-2004, *Process Piping*. Portions of the diesel fuel oil piping between the fuel oil storage tank and the day tank are routed underground. The underground piping is double walled, with carbon steel material of construction for the core piping and jacket piping, and provides 1/8-in. corrosion allowance. The jacket piping is coated with a high-performance coating such as coal tar epoxy or other suitable material that is compatible for underground service. The piping is also provided with cathodic protection and leak detection features.

1.2.8.2.1.2 Operational Processes

The fuel oil storage tanks for the diesel generators are replenished from trucks (or other mobile suppliers) as required to maintain an adequate supply. The fuel oil meets ASTM D 975-06, *Standard Specification for Diesel Fuel Oils*. Prior to adding fuel oil to the storage tanks, the contents of the tanks are tested for specific gravity, viscosity, water content, and sediment content at a minimum in accordance with Regulatory Guide 1.137. Periodic manual sampling of the oil is performed in accordance with the requirements of ASTM D 4057-06, *Standard Practice for Manual Sampling of Petroleum and Petroleum Products*.

Each transfer pump takes suction from a diesel generator fuel oil storage tank and discharges fuel oil to a diesel generator fuel oil day tank. Each pump is capable of supplying its diesel generator and, simultaneously, increasing the inventory in the fuel oil day tank. One of two redundant fuel oil transfer pumps is automatically started and stopped by a day tank high-low level switch; the second pump is turned on automatically on a day tank low-low level. Any overflow is returned to the storage tank via the recirculation line. The capacity of the recirculation line exceeds that of the transfer pumps.

Biocides and other fuel additives are introduced to the fuel oil to prevent deterioration of the oil, accumulation of sludge in the storage tanks, and the growth of algae and fungi. In the event the diesel fuel oil degrades during storage or is to be pumped out of the diesel fuel oil storage tank for tank inspection, it can be transferred using a portable pump and provided connections to the plant's auxiliary fuel oil tank for use in the standby generators or to a fuel oil tanker truck. After inspection of the diesel fuel oil storage tank, the nondegraded fuel oil may be transferred back to the diesel fuel oil storage tank.

1.2.8.2.1.3 Safety Category Classification

The ITS diesel generator fuel oil system is classified as ITS.

1.2.8.2.1.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

There are no procedural safety controls for the ITS diesel generator fuel oil system.

1.2.8.2.1.5 Design Bases and Design Criteria

The nuclear safety design bases for ITS SSCs and for SSCs important to waste isolation (ITWI) and features are derived from the preclosure safety analysis presented in [Sections 1.6 through 1.9](#) and the postclosure performance assessment presented in [Sections 2.1 through 2.4](#). The nuclear safety design bases identify the safety functions to be performed and the controlling parameters with values or ranges of values that bound the design.

The quantitative assessment of event sequences, including the evaluation of component reliability and the effects of operator action, is developed in [Section 1.7](#). SSCs or procedural safety controls appearing in an event sequence with a prevention or mitigation safety function are described in the applicable design section of the SAR.

[Section 1.9](#) describes the methodology for safety classification of SSCs and features of the repository. The tables in [Section 1.9](#) present the safety classification of the SSCs and features. These tables also list the preclosure and postclosure nuclear safety design bases for each structure, system, or major component.

To demonstrate the relationship between the nuclear safety design bases and the design criteria for the repository SSCs and features, the nuclear safety design bases are repeated in the appropriate SAR sections for each individual ITS/ITWI SSC or feature that performs a safety function. The

design criteria are characteristics of the ITS/ITWI SSCs or features that are utilized to implement the assigned safety functions.

The nuclear safety design bases for the ITS mechanical support systems associated with the ITS diesel generators are addressed in [Table 1.4.1-1](#).

1.2.8.2.1.6 Design Methodologies

The design methodologies used in the design of ITS SSCs in the ITS diesel generator fuel oil system are in accordance with codes and standards provided in [Section 1.2.8.2.1.8](#).

1.2.8.2.1.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of the ITS SSCs in the ITS diesel generator fuel oil system are in accordance with the codes and standards provided in [Section 1.2.8.2.1.8](#).

1.2.8.2.1.8 Design Codes and Standards

The ITS diesel generator fuel oil system and its components are designed in accordance with the following codes and standards:

- *2004 ASME Boiler and Pressure Vessel Code (ASME 2004), Section VIII*
- *ASME B31.3-2004, Process Piping*
- *ANSI/ANS-59.51-1997, Fuel Oil Systems for Safety-Related Emergency Diesel Generators*
- *ASTM D 4057-06, Standard Practice for Manual Sampling of Petroleum and Petroleum Products*
- *ASTM D 975-06, Standard Specification for Diesel Fuel Oils*
- *NFPA 30, Flammable and Combustible Liquids Code*
- *NFPA 70, National Electrical Code*
- *NFPA 780, Standard for the Installation of Lightning Protection Systems*
- *IEEE Std 344-2004, IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations*
- *IEEE Std 387-1995, Standard Criteria for Diesel-Generator Units Applied as Standby Power Generating Stations*
- *Regulatory Guide 1.137, Fuel-Oil Systems for Standby Diesel Generators.*

1.2.8.2.1.9 Design Load Combinations

The load combinations used in the analysis of ITS SSCs in the ITS diesel generator fuel oil system are in accordance with the codes and standards provided in [Section 1.2.8.2.1.8](#). The design load combinations analyzed include normal conditions, event sequences, and the effects of natural phenomena.

1.2.8.2.2 ITS Diesel Generator Air Start System

1.2.8.2.2.1 System Description

Each ITS diesel generator is equipped with an air start system. Each air start system consists of one air compressor, aftercooler, air dryer, air receiver, compressor air intake filter, piping, valves, associated instrumentation, and an air distribution system on the diesel engine. For each air start system, the system is classified as ITS downstream of the ITS isolation gate valve; the upstream components (the compressor, aftercooler, and air dryer) are non-ITS. [Figure 1.2.8-20](#) shows the EDGF ITS diesel generator air start system Train A piping and instrumentation diagram. [Figure 1.2.8-21](#) shows the ITS diesel generator air compressor logic diagram.

The components in the ITS diesel generator air start system are described below.

Air Compressors—One motor-driven compressor is provided for each ITS diesel generator air start system. The compressor control is integrated with the receiver air pressure to ensure adequate pressure in the receiver. The air to the compressor is drawn from the generator room.

Aftercoolers—Each air start system is equipped with an aftercooler to cool the air after compression and to condense any moisture in the air to aid the air dryers in removing moisture. The aftercooler is installed between the compressor and the dryer.

Air Dryers—Each air start system is equipped with an air dryer that dries the air to a dew point of either 50°F or 10°F below the lowest expected ambient temperature, whichever is more restrictive.

Air Receivers—Each air start system is equipped with one air receiver. Each air receiver is capable of providing starting air for five consecutive engine starts without recharging the receiver. Features are provided for blowdown of air receivers to eliminate any moisture that might accumulate.

Air Start Distributor—Each ITS diesel generator is equipped with an air start distributor which consists of an air start control valve, a distributor valve, air-operated piston check valves, and air distribution piping. The air start control valve, when energized, opens to allow air into the distribution piping and into the distributor valve. The distributor valve distributes air to open the piston check valves, depending on the power stroke position of the pistons.

1.2.8.2.2.2 Operational Processes

The air receiver for each diesel engine is maintained at operating pressure by an individual compressor. The compressor automatically starts when air receiver pressure drops to a nominal set

point and stops when the upper set point is achieved. Alarms are provided if the air pressure drops to a set low level. The check valve in the air receiver charging line ensures that a broken line from the compressor does not affect the receiver. The isolation valve upstream of the check valve and the equipment downstream of the check valve are ITS. The air dryer and aftercooler are utilized to keep water out of the diesel engine.

When the ITS diesel generator receives a start signal, the air start distributor is energized, allowing starting air to flow to the cylinders, using air from the air receiver. As soon as the engine has fired and is running on its own power, a speed switch cuts the electrical circuit to the starting air valves and causes the valves to close.

1.2.8.2.2.3 Safety Category Classification

The ITS diesel generator air start system downstream of the ITS isolation valve is classified as ITS.

1.2.8.2.2.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

There are no procedural safety controls for the ITS diesel generator air start system.

1.2.8.2.2.5 Design Bases and Design Criteria

The nuclear safety design bases for the ITS mechanical support systems associated with the ITS diesel generators are addressed in [Table 1.4.1-1](#).

1.2.8.2.2.6 Design Methodologies

The design methodologies used in the design of ITS SSCs in the ITS diesel generator air start system are in accordance with the codes and standards provided in [Section 1.2.8.2.2.8](#).

1.2.8.2.2.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of ITS SSCs in the ITS diesel generator air start system are in accordance with the codes and standards provided in [Section 1.2.8.2.2.8](#).

1.2.8.2.2.8 Design Codes and Standards

The ITS diesel generator air start system is designed in accordance with the following codes and standards:

- *2004 ASME Boiler and Pressure Vessel Code* (ASME 2004), Section VIII
- ASME B31.3-2004, *Process Piping*
- CGA G-7.1-2004, *Commodity Specification for Air*.

1.2.8.2.2.9 Design Load Combinations

The design load combinations used in the analysis of ITS SSCs in the ITS diesel generator air start system are in accordance with the codes and standards provided in [Section 1.2.8.2.2.8](#). The design load combinations analyzed include normal conditions, event sequences, and the effects of natural phenomena.

1.2.8.2.3 ITS Diesel Generator Jacket Water Cooling System

1.2.8.2.3.1 System Description

Each diesel engine has an independent jacket water cooling subsystem. Major components include aftercoolers (engine-mounted combustion air coolers), a lube oil cooler, a jacket water air cooler, jacket water pumps, a jacket water expansion tank, an electric immersion heater, and a keep-warm circulating pump. The system is designed such that the cooling water chemistry criteria are compatible with the materials of the system's various components. The EDGF jacket water cooling system is classified as ITS. [Figure 1.2.8-17](#) shows the connections to the engine. The ITS diesel generator jacket water cooling system Train A piping and instrumentation diagram is shown in [Figure 1.2.8-22](#).

The components of the ITS diesel generator jacket water cooling system are described below.

Jacket Water Pumps—The jacket water cooling system includes two independent circulation pumps that are backed up by an engine-mounted, gear-driven pump. Each jacket water pump circulates the jacket water through the ITS diesel generator coolant loop during periods of diesel operation to remove heat from the engine.

Jacket Water Air Cooler—The jacket water air cooler for the ITS diesel generator is a forced-air radiator that provides the means for removing heat from the ITS diesel generator coolant loop during periods of diesel operation. The jacket water air cooler also has two electric fans (one operating and one standby) that are utilized to provide the forced air flow. The jacket water air cooler is located outside of the EDGF structure.

Expansion Tank—The jacket water expansion tank is connected to the ITS diesel generator coolant loop to allow for coolant volumetric changes due to temperature variations, to provide makeup water, and to absorb pump pressure variations.

Thermostatic Valve—A three-way thermostatic valve is installed in the ITS diesel generator coolant loop at the inlet to the jacket water cooler. This valve provides the capability to bypass the jacket water around the cooler depending on the temperature of the jacket water.

Aftercoolers—The aftercooler is an engine-mounted, air-to-water heat exchanger. At the diesel engine, a portion of the jacket water is diverted to the aftercoolers. The aftercooler cools the combustion air after it has passed through the turbocharger. The aftercooler is internal to the diesel engine and is not depicted on [Figure 1.2.8-22](#).

Lube Oil Cooler—The ITS diesel generator lube oil cooler provides the means of removing heat from the engine lube oil. The lube oil cooler utilizes the jacket water air cooler as its heat sink.

Jacket Water Keep-Warm Pump and Inline Heater—The jacket water keep-warm system consists of a keep-warm circulating pump and an inline heater. The circulation pump and inline heater start automatically based on the diesel temperature. The circulation pump and inline heater automatically stop when the engine is started.

1.2.8.2.3.2 Operational Processes

When the ITS diesel generator is not in operation, the unit is maintained at a set temperature to ensure quick starting. The keep-warm circulating pump and inline heater operate continuously to maintain the engine at this temperature by circulating warmed water through the engine water jackets. A thermostat on the heater maintains the temperature of the circulating water at 135°F. The keep-warm circulating pump and inline heater are automatically deenergized when the diesel engine is started.

The ITS diesel generator jacket water cooling system provides a sufficient heat sink to permit the diesel engine to start and operate without the need for external cooling water. The jacket water air cooler contains two fans (one operating and one standby).

The ITS diesel generator jacket water is treated to maintain the compatibility of the water chemistry and the system materials and to preclude long-term corrosion and organic fouling. The ITS diesel generator jacket water cooling system is vented to ensure that internal spaces are filled with cooling water.

During operation of the diesel engine, temperature regulation of the jacket water is accomplished through action of the thermostatic valve that modulates coolant flow between the ITS diesel generator jacket water cooler and its associated bypass line. In this manner, the engine jacket water is maintained at the proper temperature for maximum engine efficiency. The diesel engine jacket water is monitored for temperature and has a high jacket water temperature alarm and a high-high jacket water temperature trip.

1.2.8.2.3.3 Safety Category Classification

The ITS diesel generator jacket water cooling system is classified as ITS.

1.2.8.2.3.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

There are no procedural safety controls for the ITS diesel generator jacket water cooling system.

1.2.8.2.3.5 Design Bases and Design Criteria

The nuclear safety design bases for the ITS mechanical support systems associated with the ITS diesel generators are addressed in [Table 1.4.1-1](#).

1.2.8.2.3.6 Design Methodologies

The design methodologies used in the design of ITS SSCs in the ITS diesel generator jacket water cooling system are in accordance with the codes and standards provided in [Section 1.2.8.2.3.8](#).

1.2.8.2.3.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of ITS SSCs in the ITS diesel generator jacket water cooling system are in accordance with codes and standards provided in [Section 1.2.8.2.3.8](#).

1.2.8.2.3.8 Design Codes and Standards

The ITS diesel generator jacket water cooling system is designed in accordance with the following codes and standards:

- *2004 ASME Boiler and Pressure Vessel Code* (ASME 2004), Section VIII
- ASME B31.3-2004, *Process Piping*
- *Pump Standards* (HI 2005)
- *Standards of the Tubular Exchanger Manufacturers Association* (TEMA 2007).

1.2.8.2.3.9 Design Load Combinations

The load combinations used in the analysis of ITS SSCs in the ITS diesel generator jacket water cooling system are in accordance with the codes and standards provided in [Section 1.2.8.2.3.8](#). The design load combinations analyzed include normal conditions and event sequences and the effects of natural phenomena.

1.2.8.2.4 ITS Diesel Generator Lubricating Oil System

1.2.8.2.4.1 System Description

Each ITS diesel generator is provided with a lubricating oil system. Major components of the system include one engine-driven pump; an engine-mounted lube oil collection sump; a full-flow filter; a full-flow strainer; a lube oil cooler; an electric keep-warm heater; an electric motor-driven, keep-warm circulating pump; an electric motor-driven, prelubricating pump; and associated valves, piping, and instrumentation. The EDGF lubricating oil system is classified as ITS. The EDGF ITS diesel generator lubricating oil system Train A piping and instrumentation diagram is shown in [Figure 1.2.8-23](#). [Figure 1.2.8-17](#) shows the engine-mounted lubricating oil pump, the lubricating oil sump, and the connections to the engine.

The components of the ITS diesel generator lubricating oil system are described below.

Lubricating Oil Pump—The lubricating oil pump is mounted on the ITS diesel generator. The engine-driven pump provides lubricating oil to the engine and generator bearings during engine operation. Oil is kept at a constant pressure and temperature by use of regulating valves, recirculation lines, and a lube oil cooler.

Lubricating Oil Sump—Each ITS diesel generator has a lubricating oil collection sump. The collection sump is sized to contain the minimum amount of lubricating oil plus the amount of lubricating oil expected to be consumed over the duration of operation.

Full Flow Filter and Strainer—The full lubricating oil flow passes through a filter to remove solids. The strainer is located downstream of the filter to protect the bearings from any solids that pass the filter and any degraded filter media. The performance of the full flow filter and strainer is monitored by the pressure drop across each of them.

Lube Oil Cooler—The lube oil cooler is discussed in [Section 1.2.8.2.3.1](#).

Lubricating Oil Keep-Warm System—The lubricating oil keep-warm system consists of an electric keep-warm circulating pump and an inline heater. The circulation pump and inline heater start automatically based on the diesel lubricating oil sump temperature. The circulating pump and inline heater automatically stop when the engine is started. The keep-warm system is utilized to ensure the early and adequate supply of warm lubricating oil in order to minimize the potential for degradation of metal-to-metal engine parts during engine starts.

Prelubricating Pump—The prelubricating oil pump is an electric pump. Prelubrication ensures that the engine and bearings are lubricated prior to starting the diesel.

1.2.8.2.4.2 Operational Processes

When the engine is operating, circulation is accomplished by an engine-driven gear pump that draws oil from the sump and passes it through a lube oil cooler, filter, and strainer before distribution to the bearings. Oil returns to the sump by gravity drain. During this process, the lube oil cools internal components, such as pistons, by splashing against hot surfaces. Heat transferred to the lube oil is absorbed into the ITS diesel generator jacket water cooling system. The diesel engine has high and low oil pressure alarms, high-high and low-low pressure trips, and a high lube oil temperature trip.

During standby periods, the lubricating oil is circulated through an inline heater and then through the entire engine by an electric motor-driven, keep-warm pump. The keep-warm circulating pump operates continuously to maintain the engine at temperature by circulating the lubricating oil through the heater and back to the lubricating oil sump. A thermostat on the heater maintains the temperature of the lubricating oil at nominally 135°F. The keep-warm circulating pump and inline heater are automatically deenergized when the diesel engine is started.

The prelubricating pump provides lubricating oil to the diesel motor prior to cranking and is part of the startup sequence for the diesel generator. The prelubricating step utilizes an electric-motor-driven pump. After the diesel starts, the prelubricating pump is not utilized.

1.2.8.2.4.3 Safety Category Classification

The ITS diesel generator lubricating oil system is classified as ITS.

1.2.8.2.4.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

There are no procedural safety controls for the ITS diesel generator lubricating oil system.

1.2.8.2.4.5 Design Bases and Design Criteria

The nuclear safety design bases for the ITS mechanical support systems associated with the ITS diesel generators are addressed in [Table 1.4.1-1](#).

1.2.8.2.4.6 Design Methodologies

The methodologies used in the design of ITS SSCs in the ITS diesel generator lubricating oil system are in accordance with the codes and standards provided in [Section 1.2.8.2.4.8](#).

1.2.8.2.4.7 Consistency of Materials with Design Methodologies

The materials of construction used in the design of ITS SSCs in the ITS diesel generator lubricating oil system are in accordance with the codes and standards provided in [Section 1.2.8.2.4.8](#).

1.2.8.2.4.8 Design Codes and Standards

The ITS diesel generator lubricating oil system is designed in accordance with ANSI/ANS-59.52-1998, *American National Standard, Lubricating Oil Systems for Safety-Related Emergency Diesel Generators*.

1.2.8.2.4.9 Design Load Combinations

The load combinations used in the analysis of ITS SSCs in the design of ITS diesel generator lubricating oil system are in accordance with the codes and standards provided in [Section 1.2.8.2.4.8](#). The design load combinations analyzed include normal conditions and event sequences and the effects of natural phenomena.

1.2.8.2.5 ITS Diesel Generator Air Intake and Exhaust System

1.2.8.2.5.1 System Description

Each ITS diesel generator is provided with an air intake and exhaust system. The sizing, location of air intake, and piping arrangement of air intake and exhaust are designed to prevent the degradation of diesel engine power output. The major components of the system include an intake air filter, intake and exhaust silencers, and piping and expansion joints. The EDGF air intake and exhaust system is classified as ITS. The air intake filter, intake and exhaust silencers, and piping and expansion joints are sized to supply an adequate supply of air to the ITS diesel generator without an excessive pressure drop. [Figure 1.2.8-24](#) shows the EDGF air intake and exhaust system Train A piping and instrumentation diagram.

The components in the ITS diesel generator air intake and exhaust system are described below.

Intake Air Filter—A filter is used in the air intake system to remove particulates from the combustion air before it enters the diesel engine.

Intake and Exhaust Silencers—A silencer is installed in the air intake system to minimize the noise level within the generator room. An exhaust silencer is installed in the exhaust system outside of the EDGF to reduce the noise emitted from the system.

Piping—Expansion joints are located to accommodate the thermal growth of the exhaust piping.

1.2.8.2.5.2 Operational Processes

Upon initiation of an ITS diesel generator start signal, air is drawn into the air intake filter and passes through the intake piping and silencer to the turbocharger and then through the aftercooler to the engine intake manifolds. The air intake filter, silencers, and the air piping are sized to supply an adequate supply of air to the ITS diesel generator. After the exhaust gases pass through the turbocharger, the exhaust gas enters the exhaust pipe and passes through the exhaust silencer (located outside of the EDGF). The exhaust and intake piping outside the EDGF are designed to reduce the potential of exhaust gases entering the intake.

The exhaust is monitored for pressure and temperature. A high temperature alarm and high back pressure cause the diesel engine to trip.

1.2.8.2.5.3 Safety Category Classification

The ITS diesel generator air intake and exhaust system is classified as ITS.

1.2.8.2.5.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

There are no procedural safety controls for the ITS diesel generator air intake and exhaust system.

1.2.8.2.5.5 Design Bases and Design Criteria

The nuclear safety design bases for the ITS mechanical support systems associated with the ITS diesel generators are addressed in [Table 1.4.1-1](#).

1.2.8.2.5.6 Design Methodologies

The design methodologies used in the design of ITS SSCs in the ITS diesel generator air intake and exhaust system are in accordance with the codes and standards provided in [Section 1.2.8.2.5.8](#).

1.2.8.2.5.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of ITS SSCs in the ITS diesel generator air intake and exhaust system are in accordance with the codes and standards provided in [Section 1.2.8.2.5.8](#).

1.2.8.2.5.8 Design Codes and Standards

The ITS diesel generator air intake and exhaust subsystem is designed in accordance with the following codes and standards:

- ASME B31.3-2004, *Process Piping*
- NUREG/CR-0660, *Enhancement of On-site Emergency Diesel Generator Reliability* (Boner and Hanners 1979).

1.2.8.2.5.9 Design Load Combinations

The load combinations used in the analysis of ITS SSCs in the ITS diesel generator air intake and exhaust system are in accordance with the codes and standards provided in [Section 1.2.8.2.5.8](#). The design load combinations analyzed include normal conditions and event sequences and the effects of natural phenomena.

1.2.8.3 Balance of Plant Facilities Heating, Ventilation, and Air-Conditioning

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2, AC 6; Section 2.1.1.6.3: AC 1(2)(a), (2)(d), (2)(h), (2)(j), AC 2(2); Section 2.1.1.7.3.1: AC 1(1), (2), (3), (5), (9); Section 2.1.1.7.3.2: AC 1(1), (2); Section 2.1.1.7.3.3(I): AC 1(1), AC 2(1), (2), (3), AC 4(1)]

1.2.8.3.1 Emergency Diesel Generator Facility Heating, Ventilation, and Air-Conditioning Systems

The EDGF HVAC system is designed to maintain the indoor environmental conditions required for equipment located in the facility. Separate but identical HVAC subsystems support the Train A and Train B generator rooms, switchgear rooms and battery rooms. During an event sequence, the safety function of the ITS HVAC subsystems is to provide cooling of the ITS electrical and controls equipment.

1.2.8.3.1.1 System Description

The EDGF HVAC system includes the following subsystems:

- ITS HVAC subsystems serving nonconfinement ITS generator rooms
- ITS HVAC subsystems serving nonconfinement ITS switchgear and battery rooms
- Non-ITS HVAC subsystem serving nonconfinement non-ITS mechanical rooms
- Non-ITS HVAC subsystem serving nonconfinement non-ITS electrical room.

The HVAC subsystems that support the cooling of generator room, electrical switchgear room, and battery room equipment for the EDGF are classified as ITS. The basis for classification is to prevent loss of electrical power to ITS components due to overheating.

ITS HVAC Subsystems Serving Nonconfinement ITS Generator Rooms—The ITS generator rooms (Train A and Train B) are each provided with room temperature-activated ITS exhaust fans to provide outdoor air ventilation in order to maintain the temperature below 120°F in the rooms.

ITS HVAC Subsystems Serving Nonconfinement ITS Switchgear and Battery Rooms—The ITS switchgear and battery rooms (Train A and Train B) are each provided with an ITS split-type, direct expansion recirculating air handling unit. Remote condensing units are provided for each air handling unit. The air handling units provide localized cooling in the switchgear and battery rooms to ensure that ITS electrical power is not lost due to overheating in these areas. Each battery room is continuously exhausted through redundant exhaust fans in order to ensure that there is no accumulation of hydrogen in the battery room.

Non-ITS HVAC Subsystem Serving Nonconfinement Non-ITS Mechanical Rooms—The mechanical rooms and exit corridors A and B are each provided with split-type, direct expansion fan coil units. Remote condensing units (heat pumps) are provided for each fan coil unit. The fan coil units provide localized cooling in the mechanical rooms and exit corridors to maintain the environmental conditions suitable for the proper performance of SSCs in the rooms.

Non-ITS HVAC Subsystem Serving Nonconfinement Non-ITS Electrical Room—The non-ITS electrical room and entry corridor are provided with split-type, direct expansion fan coil units. Remote condensing units (heat pumps) are provided for each fan coil unit. The fan coil units provide localized cooling in the electrical room and entry corridor to maintain the environmental conditions suitable for the proper performance of SSCs in the rooms.

The EDGF support areas such as the fire protection room and entry and exit corridors are provided with unit heaters in order to prevent freezing of the fire water sprinkler piping.

Each subsystem is provided with the necessary air distribution ductwork and accessories, electrical power, instrumentation and controls to operate, control, monitor, alarm, provide status, and verify that the required functions are met.

1.2.8.3.1.1.1 System Functions

The EDGF HVAC system maintains space temperatures within acceptable limits for operations of equipment.

1.2.8.3.1.1.2 System Location and Functional Arrangement

The location and arrangement of the EDGF HVAC system is shown on [Figure 1.2.8-2](#). The ITS air handling unit and exhaust fans serving the ITS switchgear room A and battery room A are located in mechanical room A, and the ITS air handling unit and exhaust fans serving the ITS switchgear room B and battery room B are located in mechanical room B. The ITS generator room exhaust fans are wall-mounted and are located in the generator room they serve. The fan coil units serving the mechanical rooms are located inside the room they serve. There are two fan coil units serving the non-ITS electrical room, an unassigned room, and entry area; one is located in mechanical room A and the other is located in mechanical room B. The air-cooled condensing units are located outside the EDGF facility. The ITS condensing units are provided with missile protection.

Table 1.2.8-2 provides the design bases and their relationship to design criteria for the balance of plant facilities. Table 1.2.8-3 provides the EDGF indoor design temperatures. Table 1.2.8-4 provides the EDGF ITS HVAC components and system design data. Table 1.2.8-5 provides the EDGF non-ITS HVAC components and system design data.

The Train A and Train B HVAC systems in the EDGF are identical. The ventilation flow diagram for both trains of the EDGF nonconfinement generator rooms is shown in Figure 1.2.8-25. The ventilation flow diagram for both trains of the EDGF nonconfinement switchgear and battery rooms is shown in Figure 1.2.8-26. The ventilation and instrumentation diagram for the EDGF nonconfinement generator room A ITS HVAC system is shown in Figure 1.2.8-27. The ventilation and instrumentation diagram for the EDGF nonconfinement switchgear room A ITS HVAC system is shown in Figure 1.2.8-28. The ventilation and instrumentation diagram for the EDGF nonconfinement battery room A ITS exhaust system is shown in Figure 1.2.8-29. The ventilation and instrumentation diagram for the EDGF nonconfinement mechanical room A non-ITS HVAC system is shown in Figure 1.2.8-30. The Train B ventilation and instrumentation diagrams are the same as for Train A. The ventilation and instrumentation diagram for the EDGF nonconfinement non-ITS electrical room HVAC system is shown in Figure 1.2.8-31. The EDGF nonconfinement generator room ITS exhaust fans and dampers logic diagram is shown in Figure 1.2.8-32. The EDGF nonconfinement switchgear room ITS air handling unit and inlet damper room logic diagram is shown in Figure 1.2.8-33. The EDGF nonconfinement battery room exhaust fan logic diagram is shown in Figure 1.2.8-34.

1.2.8.3.1.1.3 Systems and Components

Major components are described below.

ITS Air Handling Units—Each recirculating air handling unit serving the ITS switchgear and battery rooms is a draw-through-type unit consisting of prefilters, high-efficiency primary filters, centrifugal fan, electric heating coils, and refrigerant (direct expansion) cooling coils. The fans for the air handling units are centrifugal-type fans with nonoverloading backward-inclined or airfoil blades. The fans are equipped with adjustable speed drives to provide adjustment in the airflow to compensate for filter loading. The outdoor air supply inlet is through a roof-mounted, louvered penthouse. Where necessary, the outdoor air inlet is provided with tornado dampers and missile barriers to preclude entry of missiles into the building.

ITS Exhaust Fans—The exhaust fans serving the battery rooms are vaneaxial-type units with spark-resistant construction and explosion-proof motors. The exhaust fans serving the generator rooms are tubular-type units.

Non-ITS Fan Coil Units—Each fan coil unit is a recirculating blow-through-type unit consisting of primary filters, supply fan, direct expansion cooling coil, and electric heating coil. The outdoor air supply inlet is provided with bird screen and storm-type louvers or a rain hood for protection from the environmental elements.

Dampers—Parallel-blade dampers are used for isolating systems or portions of a system. Opposed blade-type volume dampers are used to provide system balancing. Backdraft dampers are used to maintain the proper direction of air flow and prevent reversal of the air flow. ITS

tornado dampers are provided in the ITS exhaust ductwork discharging to the atmosphere and outside air intake ductwork to prevent damage to the ITS SSCs caused by rapid depressurization during a tornado event. Backdraft dampers are provided at the discharge of each ITS exhaust fan to prevent backflow through the standby unit and at the discharge of each non-ITS fan coil unit to prevent backflow through a non-operating unit.

Ductwork—Ductwork classified as ITS is designed to minimize leakage.

Controls and Instrumentation—The HVAC system parameters are monitored and controlled by temperature, pressure, and flow instrumentation.

The design of the instrumentation and controls for the HVAC system is based on the following considerations:

- The supply air handling units are interlocked with the exhaust fans when applicable to prevent the air handling unit from operating until the exhaust fans are operating.
- The supply air handling units and fan coil units are controlled by individual temperature controllers with room-mounted temperature sensors and transmitters.
- The air handling unit fan airflow rate is maintained at its setpoint by using the adjustable speed drive controlled by discharge duct flow controller with a duct-mounted flow sensor and transmitter.
- The reheat coils are controlled by individual temperature controllers with room-mounted temperature sensors and transmitters.

1.2.8.3.1.2 Operational Processes

ITS Air Handling Units during Normal Operation—ITS direct expansion air handling units with remote ITS air-cooled condensing units are utilized to maintain space temperatures in each of the Train A and Train B ITS switchgear and battery rooms. The exhaust fans for the battery room are interlocked with the air handling unit such that the air handling unit cannot be operated unless one battery room exhaust fan is running (to preclude pressurizing the battery rooms). The operation of the refrigerant compressor in the condensing unit is controlled by either the signal from the temperature sensors and transmitters located in the switchgear room or the battery room (whichever is higher) as determined by a signal selector.

During normal as well as emergency operation, the air handling unit for Train A and air handling unit for Train B are both operating. Normal control of the supply air handling unit is through an adjustable speed drive receiving start/stop commands from the DCMIS as initiated by an operator. The supply unit is interlocked to operate only when an associated exhaust fan is operating. Once started, supply fan speed will be controlled by the adjustable speed drive via an analog input from the ITS flow transmitter at the discharge duct. A smoke detector mounted on the discharge of the air handling unit will shut down the unit upon detection of smoke. An alarm is then sent to the Central Control Center, and to the facility fire protection alarm panel.

Failure of an operating supply unit, as determined by the differential pressure switch across the fan coupled with the low-flow signal from the ITS flow switch, shuts down the fan and closes its associated outdoor air damper. The other train's unit will continue to run.

The battery room exhaust operates continuously to preclude accumulation of hydrogen. Redundant exhaust fans are provided for each battery room with the standby unit starting automatically when either of the following occurs: (1) low differential pressure across the operating fan coincident with low air flow (fan failure); (2) fan trip. The exhaust fans have spark-resistant construction and are equipped with explosion-proof motors.

ITS Generator Room Exhaust Fans during Normal Operation—Wall-mounted ITS in-line exhaust fans are utilized to maintain space temperatures in the Train A and Train B ITS generator rooms. The operation of the exhaust fans is controlled by the signal from the temperature sensors and transmitters located in the generator room; the outlet damper for each fan opens and closes based upon fan operation. The intake dampers are also controlled by the temperature signal, opening on high temperature and closing on low temperature. In addition, the diesel generator startup also causes the intake dampers to open to allow outdoor air to be drawn in by the diesel generator combustion air inlet. The operation of the exhaust fans is controlled by the signal from the temperature sensors and transmitters located in the generator room.

Non-ITS Supply Subsystems during Normal Operation—Conditioned air is delivered to the non-ITS areas (mechanical and electrical rooms, entry and exit corridors and an unassigned room) via the corresponding direct expansion fan coil units. The supply air to the mechanical and unassigned room as well as the electrical room is returned to their corresponding fan coil units and mixes with outdoor makeup air and cooled or heated prior to redistribution.

Normal operation of the fan coil units is initiated by receiving start/stop commands from the DCMIS as initiated by an operator from the Central Control Center. Once started, the fan coil units operate continuously and maintain the required room temperature via an analog input from the DCMIS for the room temperature in the main room served.

Interlocks, Trips, and Alarms—Each ITS supply fan is interlocked with its corresponding outdoor air inlet damper such that the damper opens or closes upon fan start or stop. Each ITS supply fan is also interlocked with the ITS battery room exhaust fans to prevent operation unless an exhaust fan is running.

Each switchgear room supply air handling unit is provided with a duct-mounted smoke detector located downstream of the filters to shut down the unit whenever smoke is detected in the airstream.

The ITS generator room temperature instruments provide a signal to start the wall-mounted exhaust fans and open the inlet dampers when the temperature high setpoint is reached. A high-high temperature alarm is sent to the local control panel as well as to the Central Control Center. Low generator room temperature turns off the exhaust fans and closes the inlet dampers (unless the ITS diesel generator is running).

1.2.8.3.1.3 Safety Classification

Portions of the EDGF HVAC system that support the ventilation of the generator and associated equipment in the generator rooms and the cooling of ITS electrical and controls equipment are classified as ITS.

1.2.8.3.1.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

There are no procedural safety controls for the EDGF HVAC system.

1.2.8.3.1.5 Design Bases and Design Criteria

The nuclear safety design bases for the ITS mechanical support systems associated with the ITS diesel generators are addressed in [Table 1.4.1-1](#).

1.2.8.3.1.6 Design Methodologies

The methodologies used in the design of ITS SSCs in the EDGF HVAC system are in accordance with the codes and standards provided in [Section 1.2.2.3](#).

1.2.8.3.1.7 Consistency of Materials with Design Methodologies

The materials of construction used in the design of the ITS SSCs of the EDGF HVAC system are in accordance with the codes and standards provided in [Section 1.2.2.3](#).

1.2.8.3.1.8 Design Codes and Standards

The principal codes and standards applicable to the ITS SSCs in the EDGF HVAC system are provided in [Table 1.2.2-12](#).

Non-ITS SSCs in the EDGF HVAC system are designed using the methods and practices in the codes and standards provided in [Section 1.2.4.4](#).

1.2.8.3.1.9 Design Load Combinations

The design load combinations used in the analysis of SSCs classified as ITS for the EDGF HVAC system are in accordance with codes and standards provided in [Section 1.2.2.3](#).

1.2.8.3.2 Facilities HVAC

1.2.8.3.2.1 System Description

Each facility that is normally occupied is provided with a nonconfinement non-ITS HVAC system. The normally occupied areas of the facilities (e.g., the Administration Facility, security facilities, emergency response facilities, maintenance and repair facilities, WNNRF, and the Utilities Facility) are provided with HVAC systems that include recirculating supply air handling units with an

integral supply fan, return-exhaust fans, and associated distribution ductwork, dampers, and controls. Each air handling unit consists of prefilters, high-efficiency primary filters, fans, heating coils, and cooling coils.

1.2.8.3.2.1.1 System Functions

The nonconfinement, non-ITS HVAC system serving the facilities are designed to perform the following functions:

- Maintain proper temperature, air pressure, relative humidity, and other environmental conditions in the facility, including filtered and conditioned air for cooling, heating, and ventilation to meet air quality standards required for the safety, health, and comfort of workers.
- Maintain a slightly positive differential air pressure relative to ambient pressure to minimize infiltration of unconditioned air and dust into the facility.

1.2.8.3.2.1.2 System Location and Functional Arrangement

The facilities are configured to provide the space and layout necessary for the nonconfinement, non-ITS HVAC and other support systems that serve the facilities. The location of the outdoor intakes is such that the possibility of outdoor contaminants entering the facilities is minimized.

1.2.8.3.2.1.3 Systems and Components

The facilities except for the LLWF are served by nonconfinement non-ITS HVAC systems for which ventilation zoning of the facilities is not required.

1.2.8.3.2.1.3.1 Low-Level Waste Facility and Central Control Center Facility HVAC Systems

The HVAC systems for the LLWF and the CCCF are described below.

1.2.8.3.2.1.3.2 Low-Level Waste Facility HVAC System

The LLWF HVAC system is designed to limit the release of radioactive airborne contaminants for the protection of the workers and public, condition air to support the operation of SSCs, and maintain the indoor environmental conditions required for operations and for the health and safety of the facility workers. The LLWF HVAC system includes tertiary confinement areas. The LLWF HVAC system is non-ITS.

The components used in the LLWF non-ITS confinement, HEPA exhaust system and non-ITS nonconfinement HVAC system are also used in the CRCF confinement HEPA exhaust system and nonconfinement HVAC system as described in [Section 1.2.4.4.1.3](#). Additionally, the LLWF contains a non-ITS confinement, once-through air handling unit with prefilters, high-efficiency primary filters, a plenum fan, heating coils, and cooling coils. The fans for the air handling units are heavy-duty, centrifugal-type fans with nonoverloading backward-inclined or airfoil blades. The air

handling unit fans are equipped with adjustable speed drives to provide adjustment in the airflow to compensate for filter loading.

Table 1.2.8-6 provides the LLWF indoor design temperatures. Table 1.2.8-7 provides the LLWF HVAC components and system design data. Table 1.2.8-8 provides the LLWF exhaust components and system design data.

Figure 1.2.8-35 shows the LLWF confinement zone for the ground floor. Figure 1.2.8-36 shows the LLWF confinement zone for the second floor. Figure 1.2.8-37 provides the composite ventilation flow diagram for the confinement non-ITS supply and exhaust HVAC system in the LLWF. Figure 1.2.8-38 provides the composite ventilation flow diagram for the nonconfinement non-ITS supply and exhaust HVAC system in the LLWF. Figure 1.2.8-39 shows the LLWF confinement areas HVAC supply system ventilation and instrumentation diagram. Figure 1.2.8-40 shows the LLWF confinement areas air distribution system ventilation and instrumentation diagram. Figure 1.2.8-41 shows the LLWF confinement non-ITS areas HEPA exhaust system ventilation and instrumentation diagram.

1.2.8.3.2.1.3.3 Central Control Center Facility HVAC System

The CCCF consists of two main areas: the Central Control Center area and the primary alarm station area. The Central Control Center area consists of the Central Control Center, communication rooms, supporting rooms, and mechanical, electrical equipment, and battery rooms. The primary alarm station consists of safeguards and security and supporting mechanical, electrical equipment, and battery rooms. Communication rooms that are part of the Central Control Center area have their own separate computer room air-conditioning units.

All of the above HVAC systems serving the CCCF are nonconfinement and are classified as non-ITS.

Central Control Center Area HVAC System—The Central Control Center HVAC system is a split HVAC system with variable air volume air handling units located inside the mechanical room, and remote air-cooled condensing units associated with each air handling unit located outside. The air handling unit consists of prefilters, high-efficiency primary filters, electric heating coil, direct expansion cooling coil, and a variable volume supply fan to conserve energy. Variable air volume terminal units with an electric reheat coil controlled by a room thermostat are provided for space temperature control. Constant air volume terminal units with reheat are provided for rooms requiring a fixed amount of exhaust air, such as battery rooms. Humidity is maintained in the Central Control Center and supporting rooms by means of a humidifier.

Return air fans are also provided with a variable air volume control, with return air flow maintained to be less than the supply air flow by a constant differential.

Smoke purge capability is provided with once-through exhaust with no recirculation.

A minimum amount of outside air is supplied to satisfy ventilation air requirements. Outside air is monitored, and when high levels of radioactivity are detected in the incoming outside air, the normal path of outside air is closed, and outside air is redirected to pass through an emergency outside air

filter unit, consisting of prefilters, HEPA filters, and an outside air fan. The Central Control Center is designated as the technical support center, and it is in accordance with the applicable criteria for emergency response facilities in NUREG-0696 (NRC 1981).

Communication rooms are provided with independent recirculating computer-room-type air-conditioning units that are located inside the communication rooms, supplying air under the raised floor. Remote air-cooled condensing units associated with each unit are located outside. A constant amount of air for ventilation from the main air handling unit is provided by means of a constant air volume terminal unit.

The equipment (including air handling units, computer-room-type air-conditioning units, air-cooled condensing units, return fans, battery room exhaust fans), except toilet and kitchen exhaust fans, is provided with a standby unit to account for failure or maintenance of the operating unit.

Battery rooms are constantly exhausted using spark-resistant construction exhaust fans with explosion-proof motors to limit hydrogen accumulation during battery charging.

The Central Control Center HVAC system is provided with the necessary distribution ductwork and accessories, electrical power, and instrumentation and controls to operate, control, monitor, alarm, and provide status to verify that the required function is met.

HVAC equipment and components are powered by the normal power systems backed by the standby diesel generators.

Primary Alarm Station Area HVAC System—The HVAC system for the primary alarm station serving the safeguards and security areas will be described in the physical protection plan.

Table 1.2.8-9 shows the CCCF and primary alarm station indoor design temperatures.

Table 1.2.8-10 shows the CCCF and primary alarm station HVAC components and system design data.

Figure 1.2.8-42 shows the CCCF Central Control Center areas HVAC system ventilation flow diagram. Figure 1.2.8-43 shows the CCCF primary alarm station areas HVAC system ventilation flow diagram. Figure 1.2.8-44 shows the ventilation and instrumentation diagram for the return/exhaust HVAC system for the CCCF Central Control Center areas. Figure 1.2.8-45 shows the ventilation and instrumentation diagram for the air handling unit HVAC system for the CCCF Central Control Center areas. Figure 1.2.8-46 shows the ventilation and instrumentation diagram for the return/exhaust fan HVAC system for the CCCF Central Control Center areas. Figure 1.2.8-47 shows the ventilation and instrumentation diagram for the communication room HVAC system for the CCCF Central Control Center areas. Figure 1.2.8-48 shows the ventilation and instrumentation diagram for the safeguards and security for the CCCF primary alarm station areas.

1.2.8.3.2.2 Operational Processes

1.2.8.3.2.2.1 Facilities HVAC Systems

The HVAC systems for the facilities provide filtered and conditioned air for cooling, heating, and ventilation to meet air quality standards required for the safety, health, and comfort of the workers and for the operability of the equipment. The supply air is conditioned by the air handling unit prior to distribution to different areas of the facilities. The supply air temperature from the air handling units is maintained by controlling the condensing units. Temperature controllers, with sensors located in various spaces, maintain desired room temperatures. Exhaust air from the facility is discharged to the outside environment by exhaust fans and associated ductwork. The HVAC system parameters are monitored and controlled by temperature, pressure, and flow instrumentation. Operations of the supply, exhaust, and return fans are controlled from the facility operations room at each facility.

1.2.8.3.2.2.2 Central Control Center Facility HVAC System

Central Control Center Areas during Normal Operation—A variable air volume air handling unit supplies conditioned air to Central Control Center areas. Air is returned by means of return fans, mixed with outside air, and then is filtered and heated, or cooled prior to redistribution. An outside air damper modulates the amount of outside air to maintain the minimum ventilation airflow required.

The conditioned air temperature is maintained by means of an electric heating coil, a direct expansion cooling coil, and a remote air-cooled condensing unit. The condensing unit run/stop status and common trouble alarm is indicated at the DCMIS.

The DCMIS provides control and operation monitoring to Central Control Center HVAC equipment; it monitors the status of the operating and standby units and provides alarms and an automatic start of the standby unit. Duct-mounted smoke detectors, located downstream of the air handling unit, shut down the operating unit upon detection of smoke. A smoke alarm signal is sent to the facility fire protection alarm panel. Instrumentation for monitoring and controlling the CCCF HVAC system is provided in the Central Control Center.

A permissive signal from an air handling unit supply fan is provided to allow start of the return fan only when the supply fan is in operation. Automatic isolation dampers on the inlet and discharge open when the unit is started and close when the unit is shut down. Open and closed status is indicated at the DCMIS. Return air volume is tracked to the supply air volume by a constant differential; the adjustable speed drive of the return fan is controlled by means of a computing relay that receives flow signals from both supply and return fans. Room temperatures are controlled via a room thermostat controlling a variable air volume terminal unit with a reheat coil. Humidity in the Central Control Center and other occupied areas is maintained by means of a humidifier.

The battery rooms are supplied by means of constant air volume terminal units. One exhaust fan operates constantly with one standby fan provided to maintain negative pressure in the battery rooms to prevent the hydrogen concentration reaching flammability limits. The standby fan starts automatically upon failure of the operating fan.

The constant air volume recirculating air conditioning unit for the communication rooms operates similarly to the air handling unit serving Central Control Center areas, as described above, with the exception that the ventilation air is drawn from Central Control Center areas instead of being taken directly from outside.

The janitorial room, toilets, and kitchen are provided with once-through exhaust by means of their respective exhaust fans.

Central Control Center Areas during Emergency Operation—When high levels of radioactivity are detected by means of a radioactivity monitor in the incoming outside air, an alarm is indicated at the DCMIS and a signal is sent to fully close the normal outside air damper. This signal also starts the emergency outside air supply fan to direct the minimum outside air through a prefilter and a HEPA filter. Automatic isolation dampers on the inlet and discharge open when the unit is started and close when the unit is shut down. The open and closed status is indicated on the DCMIS. In order to compensate for a pressure drop across the HEPA filter, the adjustable speed drive of the outside air fan is increased to maintain constant airflow. Differential pressure across filters is indicated and alarmed on the DCMIS.

Central Control Center Areas during Smoke Purge Operation—In the event of a smoke purge, the outside and exhaust air dampers open fully, and the return air damper is fully closed to provide once-through exhaust with no recirculation. The amount of air drawn from outside is reduced to approximately 30% of the supply airflow by reducing the speed of the adjustable speed drive of the air handling unit supply fan in order not to overcool during winter.

Primary Alarm Station Areas—The operational processes for the primary alarm station area HVAC system will be discussed in the physical protection plan.

1.2.8.3.2.2.3 Low-Level Waste Facility HVAC System

The operational processes for the LLWF HVAC system are similar to the operational processes in the CRCF with respect to non-ITS confinement and non-ITS nonconfinement functions. The CRCF HVAC operational processes are described in [Section 1.2.4.4.2](#).

1.2.8.3.2.3 Design Codes and Standards

The principal codes and standards applicable to the SSCs in HVAC systems of the facilities are designed using the methods and practices in the codes and standards provided in [Section 1.2.4.4.8](#).

1.2.8.4 Surface Transportation

[NUREG-1804, Section 2.1.1.2.3: AC 1(2), (3), (4), AC 2, AC 6; Section 2.1.1.6.3: AC 1(2)(h), AC 2(2); Section 2.1.1.7.3.1: AC 1(1), (2), (3), (5), (9); Section 2.1.1.7.3.2: AC 1(1), (2); Section 2.1.1.7.3.3(I): AC 1(1), AC 2(1), (2), (3), AC 4(1)]

The ITS surface transportation equipment includes the site transporters, the cask tractors, and the cask transfer trailers. The site prime movers for moving cask railcars and cask semi-trailers are also ITS. All other surface transportation equipment is non-ITS.

1.2.8.4.1 Site Transporter

1.2.8.4.1.1 Description

The site transporter is classified as ITS and is used to transport unloaded or loaded aging overpacks between surface handling facilities and the Aging Facility. It also transports unloaded DPCs inside shielded transfer casks or other acceptable containers to the LLWF. The site transporter is used in multiple locations, such as the CRCF, WHF, RF, aging overpack staging facility, Aging Facility, and LLWF. The site transporter is designed to withstand a DBGGM-2 seismic event.

The main frame of the site transporter has a horseshoe-shaped carbon steel superstructure that allows entry and full engagement of the overpacks or casks. The rear section contains the motive power source, fuel tank, lift forks, and the operator station with operating controls.

The site transporter has a self-contained, diesel-driven electric generator and a series of motors to drive the vehicle and to lift and lower the casks. Two types of casks are carried in a vertical orientation: a concrete-and-steel ventilated aging overpack or a steel shielded transfer cask. The site transporter is designed to lift aging overpacks or shielded transfer casks from the bottom so that access to the top of these casks is unobstructed.

The site transporter is self-propelled and powered by a diesel engine generator and electric motors when operated outdoors and by an electric cable when used inside buildings. The site transporter includes a cask restraint system to prevent uncontrolled cask movement during transport. The site transporter is designed to operate at a maximum speed of 2.5 mph. The site transporter drive and control system does not allow for a runaway situation or speeds in excess of 2.5 mph. The motor and gearboxes in the site transporter drive system are designed to use the horsepower of the motor for controlling the top speed. If an overspeed situation happens, the maximum allowable motor current is exceeded, which causes the current overload to trip, stopping the motor. The site transporter is capable of operating and stopping on roadways with a 5% grade and 2% cross-slope.

The site transporter is equipped with a movement warning light and an audible alarm, and carries a maximum of 100 gal of fuel. Fire suppression equipment is provided on the site transporter. The site transporter is designed for operation in the full range of anticipated weather conditions at the repository.

The site transporter is designed to withstand the natural phenomena loading parameters provided in [Table 1.2.2-1](#) as applicable. The horizontal and vertical ground response spectra are shown in [Figures 1.2.2-8 to 1.2.2-13](#). [Figure 1.2.8-49](#) shows an isometric view of the site transporter.

1.2.8.4.1.2 Operational Processes

Loaded aging overpacks are moved between the RF, CRCFs, WHF, and the Aging Facility using the site transporter. When the site transporter is in position for loading or unloading in the CRCF, RF, or WHF, the electric power supply is disconnected to allow the associated equipment shield door to close.

After the site transporter has engaged and lifted the aging overpack, the overpack is moved to the Aging Facility. The site transporter is deactivated with the brakes set while a loaded canister is being placed into or removed from the aging overpack. At the aging pad, the aging overpack is lowered into place, the lifting mechanism is disengaged, and the site transporter is moved away.

When aging is complete the process is reversed, and the aging overpack is moved from the Aging Facility to a handling facility using the site transporter.

The site transporter is designed to remain stable during normal operation or event sequences. The site transporter speed is limited, and the road grade to the Aging Facility is designed to ensure safe operations.

1.2.8.4.1.3 Safety Category Classification

The site transporter is classified as ITS.

1.2.8.4.1.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

The preclosure safety analysis identifies one procedural safety control related to the operation of the site transporter. [Table 1.9-10](#) identifies the unique numbering of the preclosure procedural safety controls, as well as the associated facility/operations area, SSCs, and bases.

PSC-2—To limit spurious movement potentially resulting in collision or tipover, the site transporter operating procedures will include a warning that deactivation of the site transporter is an important procedural step in the preclosure safety analysis. The site transporter operating procedure will require that the site transporter be deactivated with the brakes set while a loaded canister is being placed into or removed from the aging overpack. The deactivation of the site transporter will be independently verified.

1.2.8.4.1.5 Design Bases and Design Criteria

The nuclear safety design bases for ITS and ITWI SSCs and features are derived from the preclosure safety analysis presented in [Sections 1.6 through 1.9](#) and the postclosure performance assessment presented in [Sections 2.1 through 2.4](#). The nuclear safety design bases identify the safety functions to be performed and the controlling parameters with values or ranges of values that bound the design.

The quantitative assessment of event sequences, including the evaluation of component reliability and the effects of operator action, is developed in [Section 1.7](#). SSCs or procedural safety controls appearing in an event sequence with a prevention or mitigation safety function are described in the applicable design section of the SAR.

[Section 1.9](#) describes the methodology for safety classification of SSCs and features of the repository. The tables in [Section 1.9](#) present the safety classification of the SSCs and features. These tables also list the preclosure and postclosure nuclear safety design bases for each structure, system, or major component.

To demonstrate the relationship between the nuclear safety design bases and the design criteria for the repository SSCs and features, the nuclear safety design bases are repeated in the appropriate SAR sections for each individual ITS/ITWI SSC or feature that performs a safety function. The design criteria are characteristics of the ITS/ITWI SSCs or features that are utilized to implement the assigned safety functions.

The nuclear safety design bases and their relationship to design criteria for the site transporter are provided in [Table 1.2.8-2](#).

1.2.8.4.1.6 Design Methodologies

The design methodologies used in the design of ITS components in the site transporter are in accordance with the codes and standards provided in [Section 1.2.8.4.1.8](#).

1.2.8.4.1.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of ITS SSCs in the site transporter are in accordance with the codes and standards provided in [Section 1.2.8.4.1.8](#).

1.2.8.4.1.8 Design Codes and Standards

The principal code and standard applicable to the site transporter is ASME NOG-1-2004, Type I.

1.2.8.4.1.9 Design Load Combinations

The design load combinations used in the analysis of SSCs classified as ITS in the site transporter are in accordance with the codes and standards provided in [Section 1.2.8.4.1.8](#). The design load combinations analyzed include normal conditions and event sequence, and the effects of natural phenomena.

1.2.8.4.2 Cask Tractor and Cask Transfer Trailers

1.2.8.4.2.1 Description

The cask tractor is the tow vehicle that pulls a cask transfer trailer carrying a transportation cask containing a horizontal DPC from the RF to the aging pad, where the DPC is inserted into a horizontal aging module, or pulls a cask transfer trailer carrying a horizontal shielded transfer cask containing a horizontal DPC from the aging pad to the WHF.

The cask tractor is powered by a diesel engine and has four-wheel drive, four-wheel steering, and pneumatic tires. The fuel capacity of the engine is limited to 100 gallons. The maximum cask tractor loaded speed is 2.5 mph. The cask tractor is equipped with a dual-brake system designed to alert the driver to system failure. An interlock is provided to turn off the cask tractor engine if the driver leaves the seat.

There are two different cask transfer trailers to accommodate the different casks to be carried. Each cask transfer trailer is a heavy industrial trailer with a support skid mounted on top. The skid is

designed to support the transportation cask or horizontal shielded transfer cask containing a DPC. The cask transfer trailer and skid have a payload capacity sufficient for the maximum combined weight of the cask and DPC. The skid includes an integral hydraulic system, a hydraulic ram, and an optical alignment system. Hydraulic jacking units are used to raise, level, and stabilize the cask transfer trailer while transferring the DPC at the horizontal aging module.

The cask transfer trailer brakes are independent of those of the cask tractor, and are capable of holding the trailer on a 5% grade with a 2% cross-slope. The cask transfer trailer brakes are engaged when the trailer is disconnected from the cask tractor.

The cask tractor and cask transfer trailers are designed such that they will not puncture a transportation cask or horizontal shielded transfer cask during a collision, drop, tipover, or seismic event, either in the as-designed configuration or in a failed configuration. The transportation cask is constructed of an inner steel shell, a layer of dense gamma shielding material, and a thick outer steel shell that together is more than 7 in. thick, and has a thick steel lid. The horizontal shielded transfer cask is similarly robust. The inherent toughness of the casks provides puncture resistance. The cask tractor trailers are designed to minimize potential cask drop heights, and the limited speed of the cask tractor minimizes potential collision impact forces. The cask tractor and cask transfer trailers are designed to withstand the natural phenomena loading parameters provided in [Table 1.2.2-1](#), as applicable.

[Figure 1.2.8-50](#) shows the mechanical equipment envelope for the cask tractor and cask transfer trailer.

1.2.8.4.2.2 Operational Processes

Horizontal DPCs are designed to be handled in the horizontal orientation. Transportation casks containing horizontal DPCs may go directly to the WHF or to the RF. In the RF, the transportation casks containing the horizontal DPCs are placed on a cask transfer trailer. The cask transfer trailer is towed to the Aging Facility by the cask tractor. The transportation casks containing the horizontal DPCs are unloaded at the aging pad and the DPCs are placed in horizontal aging modules.

When DPCs are removed from the horizontal aging module, the DPCs are transferred into a horizontal shielded transfer cask, which is mounted on a cask transfer trailer and taken to the WHF for canister transfer operations.

The retrieval from a horizontal aging module is initiated by removing the access door with a horizontal aging module door hoist or a mobile crane. The door is staged on the pad. The cask transfer trailer with an empty horizontal shield transfer cask placed on it is positioned with proper alignment with the horizontal aging module cavity.

Using a mobile crane, the lid is removed from the shielded transfer cask. The trailer is backed the remaining distance to the horizontal aging module, the cask tractor is disconnected, and the trailer brakes are engaged.

The DPC is pulled by the hydraulic ram from the horizontal aging module into the horizontal shielded transfer cask. Cask support skid restraints are installed on the cask transfer trailer so that the horizontal shielded transfer cask is secured. The shielded transfer cask lid is reinstalled, one end of the hydraulic ram is disconnected and lowered as shown in [Figure 1.2.8-50](#), and the hydraulic

ram port cover is closed. The horizontal shielded transfer cask is then transferred on a cask transfer trailer to the WHF. [Section 1.2.5](#) provides operational details for the WHF.

1.2.8.4.2.3 Safety Category Classification

The cask tractor and cask transfer trailers are classified as ITS.

1.2.8.4.2.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

The preclosure safety analysis identifies one procedural safety control related to the operation of the cask tractor and cask transfer trailers. [Table 1.9-10](#) identifies the unique numbering of the preclosure procedural safety controls, as well as the associated facility/operations area, SSCs, and bases.

PSC-2—To limit spurious movement potentially resulting in collision or tipover, the cask tractor and cask transfer trailers operating procedures will include a warning that deactivation of the cask tractor and cask transfer trailers is an important procedural step in the preclosure safety analysis. The cask tractor and cask transfer trailers operating procedure will require that the cask tractor and cask transfer trailers be deactivated with the brakes set during waste handling operations with loaded waste containers being placed on or taken off the cask tractor and cask transfer trailers. The deactivation of the cask tractor and cask transfer trailers will be independently verified.

1.2.8.4.2.5 Design Bases and Design Criteria

The nuclear safety design bases and their relationship to design criteria for the cask tractor and cask transfer trailers are provided in [Table 1.2.8-2](#).

1.2.8.4.2.6 Design Methodologies

The design methodologies used in the design of the cask tractor and cask transfer trailers are in accordance with the codes and standards provided in [Section 1.2.8.4.2.8](#).

1.2.8.4.2.7 Consistency of Material with Design Methodologies

Materials of construction used in the design of the cask tractor and cask transfer trailers are in accordance with the codes and standards provided in [Section 1.2.8.4.2.8](#).

1.2.8.4.2.8 Design Codes and Standards

The cask tractor is designed in accordance with the following standards:

- ANSI/ITSDF B56.8, *Safety Standard for Personnel and Burden Carriers*
- ANSI/ITSDF B56.9, *Safety Standard for Operator Controlled Industrial Tow Tractors*.

The cask transfer trailers are designed in accordance with the following standards:

- ANSI N14.30-1992, *Semi-Trailers Employed in the Highway Transport of Weight-Concentrated Radioactive Loads—Design, Fabrication, and Maintenance*.

1.2.8.4.2.9 Design Load Combinations

The design load combinations used in the analysis of SSCs classified as ITS in the cask tractor and cask transfer trailers are in accordance with the codes and standards in [Section 1.2.8.4.2.8](#).

1.2.8.4.3 Site Prime Movers

1.2.8.4.3.1 Description

There are three types of prime movers to support the movement of cask cars and trailers bearing casks from the buffer area to and from the handling facilities.

A rubber-tired truck tractor for moving truck-based casks and a steel-wheeled locomotive for moving rail-based casks are used as prime movers. The hybrid prime mover runs on both rubber tires and on tracks with steel wheels. The hybrid prime mover develops its rail traction power by transferring the load from the car being pulled to the prime mover through the coupler. All prime movers are diesel powered.

Truck tractors are able to pull the design load trailers carrying loaded truck casks. The truck tractor has an axle configuration and gross vehicle weight rating that is compatible with the trailers provided for movement of truck casks. The weight balance between the steering and driven axles is compatible with gross axle load ratings and industry practice for steering axle loading. The truck tractor has a conventional tractor-trailer fifth wheel with a coupler height that is adjustable to a height dimension compatible with the trailer. The truck tractor has conventional tractor-trailer interface connectors that facilitate electrical and air supply to the cask trailer. The air system has adequate capacity to support the trailer braking system.

A rail-based switcher locomotive is used with sufficient size and traction power to move the rail cars in the buffer area as well as moving rail cars to and from the waste handling facilities.

The site prime movers work in conjunction with buffer cars at each end to allow for rail cask cars to be placed in the building without the site prime mover entering the building.

Each of the site prime mover vehicles is provided with fail-safe equipment capable of limiting speed to 9 mph while traveling within the GROA and 2.75 mph while approaching the handling facilities. The site prime movers and cask conveyances are equipped with braking systems that operate in tandem when connected. These braking systems are designed to automatically apply the brakes whenever the 9 mph speed limit is exceeded while traveling within the GROA. The speed is limited so that if a collision should occur, the safety consequences are bounded by other event sequences and shown to be acceptable.

The diesel fuel capacity for site prime movers entering a waste handling facility is limited to 100 gallons of diesel fuel. The fuel tank for each site prime mover is designed to protect against fire explosions. The rail-based site prime mover does not enter the handling facilities, thereby preventing any fire or explosion inside the building from the diesel fuel tank. Therefore, the potential for an explosion causing breach of a cask carried by the site prime mover is eliminated. The site prime movers are designed to withstand the natural phenomena loading parameters provided in [Table 1.2.2-1](#), as applicable

1.2.8.4.3.2 Operational Processes

Upon receipt of a loaded legal-weight truck trailer or railcar at Gate B-30A, the trailer/railcar is dropped off by the offsite prime movers (locomotive or truck tractor) for security inspection and paper work turn over. The site prime mover picks up the trailer or railcar after it has been cleared and takes it either to the designated waste handling facility or to the railcar buffer area or truck buffer area for temporary storage until it can be taken into one of the waste handling facilities for processing. In that instance, when the waste handling facility is ready to process either the railcar or truck trailer from the buffer areas, the site prime mover travels to the designated waste handling facility.

The railcar or truck trailer is pushed by a site prime mover and is driven by the site prime mover operator located in the cab of the site prime mover. When the railcar or truck trailer approaches the waste handling facility, the conveyance is visually inspected, and a crew member directs the railcar or truck trailer into the transportation cask vestibule (or Cask Preparation Area for the IHF), ensuring there are no vehicles or obstructions in the path.

Once the railcar or truck trailer is in the transportation cask vestibule, the outer door of the vestibule is closed, inside door is opened and the railcar or truck trailer proceeds to the cask preparation room and stops. The site prime mover is deactivated, the railcar or truck trailer brakes are set, and the wheels are chocked. The site prime mover normally detaches from the railcar or truck trailer and proceeds back to the transportation cask vestibule. The vestibule inside door is then closed.

1.2.8.4.3.3 Safety Category Classification

The site prime movers are categorized as ITS.

1.2.8.4.3.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

The preclosure safety analysis identifies one procedural safety control related to the operation of the site prime mover. [Table 1.9-10](#) identifies the unique numbering of the preclosure procedural safety controls, as well as the associated facility or operations area, SSCs, and bases.

PSC-2—To limit spurious movement potentially resulting in collision or tipover, the rail-based site prime mover operating procedures will include a warning that detachment of the site prime mover from the railcar is an important procedural step in the preclosure safety analysis. The site prime mover operating procedure will require that the site prime mover be detached prior to waste handling operations with loaded waste containers being placed on or taken off the railcar. The detachment of the site prime mover will be independently verified.

For truck-based site prime movers, the site prime mover operating procedure will require that the site prime mover be detached or deactivated with its brakes set prior to waste handling operations with loaded waste containers being placed on or taken off the truck trailer. The detachment or deactivation of the site prime mover will be independently verified.

1.2.8.4.3.5 Design Bases and Design Criteria

The nuclear safety design bases and their relationship to design criteria for the site prime movers are provided in [Table 1.2.8-2](#).

1.2.8.4.3.6 Design Methodologies

The design methodologies used in the design of the site prime movers are in accordance with the codes and standards provided in [Section 1.2.8.4.3.8](#).

1.2.8.4.3.7 Consistency of Material with Design Methodologies

Materials of construction used in the design of the site prime movers are in accordance with the codes and standards provided in [Section 1.2.8.4.3.8](#).

1.2.8.4.3.8 Design Codes and Standards

The site prime movers are designed in accordance with the following codes and standards:

- 49 CFR 571.121 and 49 CFR 571.108
- *A Policy on Geometric Design of Highways and Streets* (AASHTO 2004)
- *Manual for Railway Engineering* (AREMA 2007).

1.2.8.4.3.9 Design Load Combinations

The design load combinations used in the analysis of SSCs classified as ITS in the site prime movers are in accordance with the codes and standards in [Section 1.2.8.4.3.8](#).

1.2.8.4.4 Roads and Rails

1.2.8.4.4.1 Surface Roads

1.2.8.4.4.1.1 System Description

The road and access-way system provides roads, parking areas, and walkways for the repository facilities.

The road and access-way system is physically and functionally compatible with transportation equipment to accommodate the movement of personnel, equipment, supplies, and waste packages. The road and access-way system is designed to handle traffic consistent with the cask receipt and return rates. Roads used by the site transporter, site prime movers, and cask tractor and cask transfer

trailers, have a maximum 5% grade with a maximum 2% cross-slope. Roads for firefighting apparatus have a maximum grade of 10%.

The site roads are classified as non-ITS.

1.2.8.4.4.1.2 Operational Processes

Roads located within the GROA provide for the delivery and pickup of casks and other commodities from the surface facilities. Site roads extend to all handling facilities, support facilities, warehouses, and parking and buffer areas. GROA roads have posted speed limits in order to prevent site accidents and provide adequate room for stopping. Roads are designed and constructed based on accepted industry standards and provide the necessary capacity to carry large and weight-concentrated loads and accommodate vehicles having turning radii larger than normal road traffic. Sufficient lighting is provided within the GROA for road operations, including in parking areas, to meet physical security and industrial health and safety requirements.

1.2.8.4.4.1.3 Design Codes and Standards

Surface roads are designed using the methods and practices in the following codes and standards:

- *Standard Plans for Road and Bridge Construction* (NDOT 2007)
- *Standard Specification for Road and Bridge Construction* (Stephens 2001)
- *A Policy on Geometric Design of Highways and Streets* (AASHTO 2004), as applicable, for design parameters not covered in the Nevada Department of Transportation documents
- *International Fire Code 2006* (ICC 2006), Section D.103.2.

1.2.8.4.4.2 Surface Rails

1.2.8.4.4.2.1 System Description

The surface rails are designed to receive transportation casks. Transportation casks and their conveyances are received at the interface with the Nevada Transportation System. The surface rails include passages through the GROA security gates and any buffer areas. The rail yard has a cask buffer area to maintain a cask inventory. The surface rails include a track for moving the site prime mover and transportation casks on conveyances into the handling facilities. The surface rails also provide for moving loaded waste packages from the handling facilities into the subsurface facility and the interface with the emplacement and retrieval equipment rail system.

The surface rails are designed similarly to a heavy-haul, freight railroad that is operated at low speeds. The surface rails are divided into two distinct rail systems:

1. Standard-gauge rail is provided to accommodate delivery and onsite transport of transportation casks and equipment, waste packages, TAD canisters, and site supplies.
2. Transport and emplacement vehicle rail is designed to accommodate transport of waste packages from the IHF and CRCFs to the emplacement drifts.

The surface rails are designed to accommodate the receipt of empty TAD canisters into the WNNRF, transportation casks into the handling facilities, and the receipt of empty aging overpacks at the aging overpack staging facility. Unloaded transportation casks utilize similar steps to leave the GROA following processing through the handling facilities. The surface rails are designed for a maximum grade less than 3%.

Surface rails for commercial railcars inside and outside the handling facilities are categorized as non-ITS. Surface rails for the TEV are categorized as non-ITS. The ITS rails in the IHF and CRCF are addressed in [Section 1.2.2](#).

1.2.8.4.4.2 Operational Processes

Rail lines are provided within the protected area of the GROA to provide for the delivery and pickup of casks and other commodities from the surface facilities. Rail lines extend to all handling facilities, support facilities, warehouses, and buffer areas. Rail lines are constructed to accepted industry standards and provide the necessary capacity to carry large and weight-concentrated loads. Vehicles are required to stop and yield to rail traffic at railroad grade crossings.

1.2.8.4.4.2.3 Design Codes and Standards

Surface rails are designed using the methods and practices in *Manual for Railway Engineering* (AREMA 2007).

1.2.8.4.5 Transportation Casks

Transportation casks are the primary mode of transporting SNF and high-level radioactive waste from utility generators and federal government sites to the repository. SNF and high-level radioactive waste remain in the transportation cask in the approved transportation configuration until the transportation cask is safely inside of a waste handling facility.

Transportation casks received at the repository are certified by the U.S. Nuclear Regulatory Commission under 10 CFR Part 71. The transportation casks are capable of withstanding the repository-specific natural phenomena and environmental conditions identified in [Table 1.2.2-1](#). The horizontal and vertical ground response spectra are shown in [Figures 1.2.2-8 to 1.2.2-13](#).

Structural failure analysis of representative transportation casks and canisters expected to be handled at the YMP site was performed to address design parameters, drop parameters, and containment failure modes. The analysis is discussed in [Section 1.7.2](#).

1.2.8.4.5.1 System Description

Transportation casks, which are certified under 10 CFR Part 71, are used to enclose TAD, naval SNF, HLW, and DOE SNF canisters and uncanistered commercial SNF for transportation. The transportation cask protects the SNF or HLW during transport and repository event sequences, dissipates decay heat from the contents, and protects workers and the public from radiation. Transportation casks are included in certain repository event sequences and consequently are classified as ITS.

To demonstrate compliance with the preclosure safety requirements of 10 CFR Part 63, the preclosure safety analysis presented in [Sections 1.6 to 1.9](#) includes and bounds potential transportation casks. Transportation cask reliability is obtained based on existing component designs and evaluated against the performance required by repository-specific conditions and the repository nuclear safety design bases. Details on the methodology and results for transportation cask reliability are presented in [Sections 1.6 to 1.9](#). Prior to the use of any transportation cask at the repository, analyses will be performed to demonstrate compliance with the Yucca Mountain repository-specific criteria and repository nuclear safety design bases. [Section 5.10](#) provides additional discussion of the licensing process to be followed to authorize use of transportation casks.

1.2.8.4.5.2 Operational Processes

The operational processes for the unloading of transportation casks at the IHF, CRCF, WHF, and RF are described in detail in [Sections 1.2.3.2, 1.2.4.2, 1.2.5.2, and 1.2.6.2](#), respectively. The transportation casks are returned to the national transportation system after they have been unloaded of SNF and high-level radioactive waste at the waste handling facilities.

1.2.8.4.5.3 Safety Category Classification

Transportation casks are certified by the U.S. Nuclear Regulatory Commission under 10 CFR Part 71 and are classified as ITS.

1.2.8.4.5.4 Procedural Safety Controls to Prevent Event Sequences or Mitigate Their Effects

There are no procedural safety controls associated with the transportation casks.

1.2.8.4.5.5 Design Bases and Design Criteria

The nuclear safety design bases and their relationship to design criteria for transportation casks are provided in [Table 1.2.8-2](#).

1.2.8.4.5.6 Design Methodologies

The design methodologies used in the design of ITS components of the transportation casks are in accordance with codes and standards used to meet the performance requirements of 10 CFR Part 71.

1.2.8.4.5.7 Consistency of Material with Design Methodologies

Materials of construction used in the design of ITS components of the transportation casks are in accordance with codes and standards used to meet the performance requirements of 10 CFR Part 71.

1.2.8.4.5.8 Design Codes and Standards

The transportation casks are designed in accordance with the codes and standards used to meet the performance requirements at 10 CFR Part 71.

1.2.8.4.5.9 Design Load Combinations

The design load combinations for the transportation casks are based on the requirements of codes and standards used to meet the performance requirements in 10 CFR Part 71. The design load combinations analyzed include normal conditions, event sequences, and the effects of natural phenomena.

1.2.8.5 General References

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Table 1.2.8-1. Balance of Plant Facilities Construction Description

Facility Name(s)	General Description of Construction
Aging Overpack Staging Facility (Area 290)	Reinforced concrete pad.
Administration Facility (Area 620)	Single-story, office-grade commercial structure with structural steel framing.
Central Security Station (Area 30A)	Single-story, office-grade commercial structure with structural steel framing, concrete walls, and foundation.
North Perimeter Security Station (Area 30C)	Single-story commercial structure with structural steel framing, concrete walls, and foundation.
Cask Receipt Security Station (Area 30B)	Single-story, office-grade commercial structure with structural steel framing, concrete walls, and foundation.
Administration Security Stations (Areas 65A and 65B)	These buildings consist of small, premanufactured, kiosk-style guard stations.
Central Control Center Facility (Area 240)	Single-story hardened structure constructed of concrete and structural steel. The roof is a concrete slab on metal deck.
Utilities Facility (Area 25A)	Single-story, industrial-grade structure with structural steel framing.
Cooling Tower (Area 25B)	Manufactured cooling towers with steel supporting structure.
Evaporation Pond (Area 25C)	Lined earthen pond.
Stormwater Retention Pond (Area 90A)	Lined earthen pond.
Fire Water Facilities (Areas 28A, 28B, and 28E)	Single-story, commercial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundations.
Fire, Rescue, and Medical Facility (Area 63A)	Single-story, industrial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundations.
Warehouse/Central Receiving (Area 68A)	Single-story, industrial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundations.
Materials/Yard Storage (Area 68B)	Open paved area with perimeter fencing.
Equipment/Yard Storage (Area 71B)	Open paved area with perimeter fencing.
Emergency Diesel Generator Facility (Area 26D)	Single-story reinforced concrete structure. The base slab, walls, and roof are constructed of reinforced concrete. ITS diesel generators are supported on the base slab.
Standby Diesel Generator Facility (Area 26B)	Single-story, industrial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundations.
Low-Level Waste Facility (Area 160)	The LLWF is a multistory structure that is designed as a structural steel structure with concrete floor, concrete mat foundation, concrete shield walls, steel roof truss system, and interior and external structural steel bracing.
Warehouse and Non-Nuclear Receipt Facility (Area 230)	Single-story, industrial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundations.

Table 1.2.8-1. Balance of Plant Facilities Construction Description (Continued)

Facility Name(s)	General Description of Construction
Craft Shops (Area 71A)	Single-story, industrial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundation.
Heavy Equipment Maintenance Facility (Area 220)	Single-story, industrial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundation.
Switchyard (138 kV) and 13.8 kV Switchgear Facility (Areas 27A and 27B)	Single-story, industrial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundation.
Diesel Fuel Oil Storage (Area 70A)	American Petroleum Institute code (API Std 650) petroleum storage vessel.
Fueling Stations (Area 70B)	Steel structure canopy above fuel island.
Railcar Buffer Area (Area 33A)	Heavy-freight railcar buffer area with a capacity of 25 railcars used to stage rail-mounted waste casks prior to processing in the waste handling buildings.
Truck Buffer Area (Area 33B)	Paved truck buffer area with a capacity of five trucks used to stage truck-mounted waste casks prior to processing in the waste handling buildings.
Wastewater Treatment (Area 35A)	Area for wastewater processing.
Helicopter Pad (Area 66A)	Federal Aviation Administration compliant heliport for day and night operation.
Vehicle Maintenance and Motor Pool (Area 690)	Single-story, industrial-grade structure with structural steel framing. Precast or tilt-up concrete walls on concrete foundation.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H)	Cask handling	Transportation Cask (Analyzed as a Representative Cask)	Provide containment	H.IH.01. The mean conditional probability of breach of a canister in a sealed cask resulting from a cask drop shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curve. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.IH.02. The mean conditional probability of breach of a canister in a sealed cask resulting from a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.IH.03. The mean conditional probability of breach of a canister contained within a sealed cask resulting from a side impact or collision shall be less than or equal to 1×10^{-8} per impact.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from low speed impacts or collisions meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
			Preclude lid contact with canisters	H.IH.04. The geometry of the casks that carry HLW canisters shall preclude lid contact with canisters following a drop of a cask lid.	Casks that carry DOE standard canisters shall incorporate physical features that prevent a dropped cask lid from contacting the internal canister.
			Protect against direct exposure to personnel	H.IH.05. The mean conditional probability of loss of cask gamma shielding resulting from a drop of a cask shall be less than or equal to 1×10^{-5} per drop.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask handling (Continued)	Transportation Cask (Analyzed as a Representative Cask) (Continued)	Protect against direct exposure to personnel (Continued)	H.IH.06. The mean conditional probability of loss of cask gamma shielding resulting from a collision or side impact to a cask shall be less than or equal to 1×10^{-8} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.
				H.IH.07. The mean conditional probability of loss of cask gamma shielding resulting from drop of a load onto a cask shall be less than or equal to 1×10^{-5} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.
		Site Prime Mover	Limit speed	H.IH.08. The speed of the site prime mover shall be limited to 9 mph.	The site prime movers are required to be designed to preclude speeds greater than 9 mph.
			Preclude fuel tank explosion	H.IH.09. The fuel tank of a site prime mover that enters the facility shall preclude fuel tank explosions.	Site prime mover fuel tanks are required to be designed to preclude a fuel tank explosion.
Aging (AP)	Aging Handling/ Cask Transfer	Site Transporter (170-HAT0-MEQ-00001)	Protect against spurious movement	AP.CR.HAT.01. The mean probability of spurious movement of the site transporter while the canister is being lifted or lowered shall be less than or equal to 1×10^{-9} per transfer.	The site transporter is required to be designed such that its electrical power supply must be disconnected for the cask unloading room equipment shield door to be closed.
			Limit speed	AP.CR.HAT.02. The speed of the site transporter shall be limited to 2.5 mph.	The site transporter is required to be designed to preclude speed greater than 2.5 mph.
			Preclude fuel tank explosion	AP.CR.HAT.03. The site transporter fuel tank shall preclude fuel tank explosions.	The site transporter fuel tank is required to be designed to preclude a fuel tank explosion.
			Reduce severity of a drop	AP.CR.HAT.04. The site transporter shall preclude a drop of an aging overpack from a height greater than 3 ft measured from the equipment base.	The site transporter is required to be designed such that it cannot lift an aging overpack more than 3 ft.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging (AP) (Continued)	Aging Handling/ Cask Transfer (Continued)	Site Transporter (170-HAT0-MEQ-00001) (Continued)	Protect against sliding impact and inducing stresses on the waste container	AP.CR.HAT.05. The mean frequency of a sliding impact of the site transporter into a wall and inducing stresses on the waste container due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	Operating clearance and energy-absorbing features are required to be provided to minimize the likelihood of seismic-induced sliding impact and control impact loads as needed.
			Protect against tipover of a site transporter	AP.CR.HAT.06. The mean frequency of a tipover of the site transporter due to the spectrum of seismic events shall be less than or equal to 2×10^{-6} per year.	The site transporter is required to have a wide base, such that it is inherently stable, will not tip over, but may slide if exposed to sufficiently high seismic forces.
Mechanical Handling System (H)	Cask Handling	Transportation Cask (Analyzed as a Representative Cask)	Provide containment	H.CR.01. The mean conditional probability of breach of a canister in a sealed cask resulting from a drop shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curve. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.CR.02. The mean conditional probability of breach of a canister in a sealed cask resulting from a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curve. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.CR.03. The mean conditional probability of breach of a canister in a sealed cask resulting from a side impact or collision shall be less than or equal to 1×10^{-8} per impact.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from low speed impact or collisions meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling (Continued)	Transportation Cask (Analyzed as a Representative Cask) (Continued)	Protect against direct exposure to personnel	H.CR.04. The mean conditional probability of loss of cask gamma shielding resulting from a drop of a cask shall be less than or equal to 1×10^{-5} per drop.	The cask is required to be designed such that the maximum effective plastic strain from drop, low speed impact, or collisions meets the required reliability when evaluated against the cask capacity curves.
				H.CR.05. The mean conditional probability of loss of cask gamma shielding resulting from a collision or side impact to a cask shall be less than or equal to 1×10^{-8} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.
				H.CR.06. The mean conditional probability of loss of cask gamma shielding resulting from a drop of a load onto a cask shall be less than or equal to 1×10^{-5} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.
			Preclude lid contact with canister	H.CR.07. The geometry of the casks that carry DOE standardized canisters or HLW canisters shall preclude lid contact with canisters following a drop of a cask lid.	Casks that carry DOE standard canisters shall incorporate physical features that prevent a dropped cask lid from contacting the internal canister.
	Site Prime Mover	Limit speed	H.CR.08. The speed of the site prime mover shall be limited to 9 mph.	The site prime movers are required to be designed to preclude speeds greater than 9 mph.	
		Preclude fuel tank explosion	H.CR.09. The fuel tank of a site prime mover shall preclude fuel tank explosions.	Site prime mover fuel tanks are required to be designed to preclude a fuel tank explosion.	

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging (AP)	Aging Handling/Cask Transfer	Site Transporter (170-HAT0-MEQ-00001)	Protect against spurious movement	AP.WH.HAT.01. The mean probability of spurious movement of the site transporter while the canister is being lifted or lowered shall be less than or equal to 1×10^{-9} per transfer.	The site transporter is required to be designed such that its electrical power supply must be disconnected for the loading room equipment shield door to be closed.
			Limit speed	AP.WH.HAT.02. The speed of the site transporter shall be limited to 2.5 mph.	The site transporter is required to be designed to preclude speed greater than 2.5 mph.
			Preclude fuel tank explosion	AP.WH.HAT.03. The site transporter fuel tank shall preclude fuel tank explosions.	The site transporter fuel tank is required to be designed to preclude a fuel tank explosion.
			Reduce severity of a drop	AP.WH.HAT.04. The site transporter shall preclude a vertical dropping of an aging overpack from a height greater than 3 ft measured from the equipment base.	The site transporter is required to be designed such that it cannot lift an aging overpack more than 3 ft.
			Protect against sliding impact and inducing stress on the waste container	AP.WH.HAT.05. The mean frequency of sliding impact of the site transporter into a wall and inducing stresses that can breach the waste container due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	Operating clearance and energy-absorbing features are required to be provided to minimize the likelihood of seismic-induced sliding impact and control impact loads as needed.
			Protect against tipover of the site transporter	AP.WH.HAT.06. The mean frequency of tipover of the site transporter due to the spectrum of seismic events shall be less than or equal to 2×10^{-6} per year.	The site transporter is required to have a wide base, such that it is inherently stable, will not tip over, but may slide if exposed to sufficiently high seismic forces.
	Cask Tractor (for use with the Cask Transfer Trailer) (170-HAT0-HEQ-00001)	Limit speed	AP.WH.HAT.07. The speed of the cask tractor shall be limited to 2.5 mph.	The cask tractor is required to be designed to preclude speed greater than 2.5 mph.	
		Preclude fuel tank explosion	AP.WH.HAT.08. The cask tractor fuel tank shall preclude fuel tank explosions.	The cask tractor fuel tank is required to be designed to preclude a fuel tank explosion.	

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging (AP) (Continued)	Aging Handling/Cask Transfer (Continued)	Cask Transfer Trailer (for use with Transportation Casks and Horizontal Shielded Transfer Casks (PWR DPC: 170-HAT0-TRLY-00001) (BWR DPC: 170-HAT0-TRLY-00002)	Preclude fuel tank explosion	AP.WH.HAT.09. The cask transfer trailer fuel tank shall preclude fuel tank explosions.	The cask transfer trailer fuel tank is required to be designed to preclude a fuel tank explosion.
			Reduce severity of a drop	AP.WH.HAT.10. The cask transfer trailer shall preclude dropping a cask from a height greater than 6 ft measured from the equipment base.	The cask transfer trailer is required to be designed such that it cannot drop a cask from a height of more than 6 ft.
			Preclude puncture of a cask	AP.WH.HAT.11. The cask transfer trailer shall preclude puncture of a cask due to collision.	The cask transfer trailer is required to be designed to preclude puncture of transportation casks and horizontal shielded transfer casks during collisions.
				AP.WH.HAT.12. The cask transfer trailer shall be designed to preclude puncture of a cask due to the spectrum of seismic events.	The cask transfer trailer is required to be designed to preclude puncture of transportation casks and horizontal shielded transfer casks during seismic events.
Mechanical Handling System (H)	Cask Handling	Transportation Cask (Analyzed as a Representative Cask) Shielded Transfer Cask (Analyzed as a Representative Cask) (TAD: 050-HT00-HEQ-00001) (DPC: 050-HT00-HEQ-00002) (Continued)	Provide containment	H.WH.01. The mean conditional probability of breach of a canister in a sealed cask resulting from a drop shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.WH.02. The mean conditional probability of breach of a sealed cask containing uncanistered SNF resulting from a drop shall be less than or equal to 1×10^{-5} per drop.	The cask is required to be designed such that the maximum effective plastic strain from a drop meets the required reliability when evaluated against the cask capacity curves.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling (Continued)	Transportation Cask (Analyzed as a Representative Cask) Shielded Transfer Cask (Analyzed as a Representative Cask) (TAD: 050-HT00-HEQ-00001) (DPC: 050-HT00-HEQ-00002) (Continued)	Provide containment (continued)	H.WH.03. The mean conditional probability of breach of a canister in a sealed cask resulting from a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.WH.04. The mean conditional probability of breach of a sealed cask containing uncanistered SNF resulting from a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop.	The cask is required to be designed such that the maximum effective plastic strain from a drop meets the required reliability when evaluated against the cask capacity curves.
				H.WH.05. The mean conditional probability of breach of a canister in a sealed cask resulting from a side impact or collision shall be less than or equal to 1×10^{-8} per impact.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from low speed impact or collisions meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.WH.06. The mean conditional probability of breach of a sealed cask containing uncanistered SNF resulting from a side impact or collision shall be less than or equal to 1×10^{-8} per impact.	The cask is required to be designed such that the maximum effective plastic strain from a low speed impact or collision meets the required reliability when evaluated against the cask capacity curves.
				H.WH.07. The mean conditional probability of breach of a sealed cask containing uncanistered SNF resulting from the spectrum of fires shall be less than or equal to 5×10^{-2} per fire event.	The cask is required to be designed such that the fire-induced failure hazard meets the required reliability when evaluated against the spectrum of fires.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling (Continued)	Transportation Cask (Analyzed as a Representative Cask) Shielded Transfer Cask (Analyzed as a Representative Cask) (TAD: 050-HT00-HEQ-00001) (DPC: 050-HT00-HEQ-00002) (Continued)	Protect against direct exposure to personnel	H.WH.08. The mean conditional probability of loss of cask gamma shielding resulting from a drop of a cask shall be less than or equal to 1×10^{-5} per drop.	The cask is required to be designed such that the maximum effective plastic strain from a drop or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.
				H.WH.09. The mean conditional probability of loss of cask gamma shielding resulting from a collision or side impact to a cask shall be less than or equal to 1×10^{-8} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.
				H.WH.10 The mean conditional probability of loss of cask gamma shielding resulting from a drop of a load onto a cask shall be less than or equal to 1×10^{-8} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.
		Site Prime Mover	Limit speed	H.WH.11. The speed of the site prime mover shall be limited to 9 mph.	The site prime movers are required to be designed to preclude speeds greater than 9 mph.
			Preclude fuel tank explosion	H.WH.12. The fuel tank of a site prime mover shall preclude fuel tank explosions.	Site prime mover fuel tanks are required to be designed to preclude a fuel tank explosion.
Aging (AP)	Aging Handling/ Cask Transfer	Site Transporter (170-HAT0-MEQ-00001)	Protect against spurious movement	AP.RF.HAT.01. The mean probability of spurious movement of the site transporter while the canister is being lifted or lowered shall be less than or equal to 1×10^{-9} per transfer.	The site transporter is required to be designed such that its electrical power supply must be disconnected for the loading room equipment shield door to be closed.
			Limit speed	AP.RF.HAT.02. The speed of the site transporter shall be limited to 2.5 mph.	The site transporter is required to be designed to preclude speed greater than 2.5 mph.
			Preclude fuel tank explosion	AP.RF.HAT.03. The site transporter fuel tank shall preclude fuel tank explosions.	The site transporter fuel tank is required to be designed to preclude a fuel tank explosion.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging (AP) (Continued)	Aging Handling/ Cask Transfer (Continued)	Site Transporter (170-HAT0-MEQ-00001) (Continued)	Reduce severity of a drop	AP.RF.HAT.04. The site transporter shall be incapable of dropping an aging overpack from a height greater than 3 ft measured from the equipment base.	The site transporter is required to be designed such that it cannot lift an aging overpack more than 3 ft.
			Protect against sliding impact and inducing stresses that can breach a waste container	AP.RF.HAT.05. The mean frequency of a sliding impact of the site transporter into a wall and inducing stresses that can breach the waste container due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	Operating clearance and energy-absorbing features are required to be provided to minimize the likelihood of seismic-induced sliding impact and control impact loads as needed.
			Protect against tipover of a site transporter	AP.RF.HAT.06. The mean frequency of a tipover of the site transporter due to the spectrum of seismic events shall be less than or equal to 2×10^{-6} per year.	The site transporter is required to have a wide base, such that it is inherently stable, will not tip over, but may slide if exposed to sufficiently high seismic forces.
		Cask Tractor (for use with the Cask Transfer Trailer) (170-HAT0-HEQ-00001)	Limit speed	AP.RF.HAT.07. The speed of the cask tractor shall be limited to 2.5 mph.	The cask tractor is required to be designed to preclude speed greater than 2.5 mph.
			Preclude fuel tank explosion	AP.RF.HAT.08. The cask tractor fuel tank shall preclude fuel tank explosions.	The cask tractor fuel tank is required to be designed to preclude a fuel tank explosion.
		Cask Transfer Trailer (for use with Transportation Casks and Horizontal Shielded Transfer Casks (PWR DPC: 170- HAT0-TRLY-00001) (BWR DPC: 170- HAT0-TRLY-00002)	Preclude fuel tank explosion	AP.RF.HAT.09. The cask transfer trailer fuel tank shall preclude fuel tank explosions.	The cask transfer trailer fuel tank is required to be designed to preclude a fuel tank explosion
			Reduce severity of a drop	AP.RF.HAT.10. The cask transfer trailer shall preclude dropping a cask from a height greater than 6 ft measured from the equipment base.	The cask transfer trailer is required to be designed such that it cannot drop a cask from a height greater than 6 ft.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging (AP) (Continued)	Aging Handling/ Cask Transfer (Continued)	Cask Transfer Trailer (for use with Transportation Casks and Horizontal Shielded Transfer Casks (PWR DPC:170- HAT0- TRLY-00001) (BWR DPC: 170- HAT0-TRLY-00002) (Continued)	Preclude puncture of a cask due to impact	AP.RF.HAT.11. The cask transfer trailer shall preclude puncture of a cask due to collision.	The cask transfer trailer is required to be designed to preclude puncture of transportation casks and horizontal shielded transfer casks during collision.
			Preclude puncture of a cask	AP.RF.HAT.12. The cask transfer trailer shall be designed to preclude puncture of casks due to the spectrum of seismic events.	The cask transfer trailer is required to be designed to preclude puncture of transportation casks and horizontal shielded transfer casks during seismic events
Mechanical Handling System (H)	Cask Handling	Transportation Cask (Analyzed as a Representative Cask)	Provide containment	H.RF.01. The mean conditional probability of breach of a canister in a sealed cask resulting from a drop shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curve. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.RF.02. The mean conditional probability of breach of a canister in a sealed cask resulting from a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curve. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.RF.03. The mean conditional probability of breach of a canister in a sealed cask resulting from a side impact or collision shall be less than or equal to 1×10^{-8} per impact.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from low speed impact or collisions meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling (Continued)	Transportation Cask (Analyzed as a Representative Cask) (Continued)	Protect against direct exposure to personnel	H.RF.04. The mean conditional probability of loss of cask gamma shielding resulting from a drop of a cask shall be less than or equal to 1×10^{-8} per drop.	The cask is required to be designed such that the maximum effective plastic strain from drop, low speed impact, or collisions meets the required reliability when evaluated against the cask capacity curves.
				H.RF.05. The mean conditional probability of loss of cask gamma shielding resulting from a collision or side impact to a cask shall be less than or equal to 1×10^{-8} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drop, low speed impact, or collisions meets the required reliability when evaluated against the cask capacity curves.
				H.RF.06. The mean conditional probability of loss of cask gamma shielding resulting from a drop of a load onto a cask shall be less than or equal to 1×10^{-5} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drop, low speed impact, or collisions meets the required reliability when evaluated against the cask capacity curves.
		Site Prime Mover	Limit speed	H.RF.07. The speed of the site prime mover shall be limited to 9 mph.	The site prime mover is required to be designed to preclude speed greater than 9 mph.
			Preclude fuel tank explosion	H.RF.08. The fuel tank of a site prime mover that enters the facility shall preclude fuel tank explosions.	The site prime mover fuel tank is required to be designed to preclude a fuel tank explosion.
Aging Facility (AP)	Aging Handling/Cask Transfer	Cask Tractor (for use with the Cask Transfer Trailer) (170-HAT0-MEQ-00001)	Limit speed	AP.SB.HAT.01. The speed of the cask tractor shall be limited to 2.5 mph.	The cask tractor is required to be designed to preclude speed greater than 2.5 mph.
			Preclude fuel tank explosion	AP.SB.HAT.02. The cask tractor fuel tank shall preclude fuel tank explosions.	The cask tractor fuel tank is required to be designed to preclude a fuel tank explosion.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging Facility (AP) (Continued)	Aging Handling/Cask Transfer (Continued)	Cask Transfer Trailer for use with Transportation Casks and Horizontal Shielded Transfer Casks (PWR DPC: 170-HAT0-TRLY-00001) (BWR DPC: 170-HAT0-TRLY-00002)	Preclude fuel tank explosion	AP.SB.HAT.03. The cask transfer trailer fuel tank shall preclude fuel tank explosions.	The cask transfer trailer fuel tank is required to be designed to preclude a fuel tank explosion.
			Reduce severity of a drop	AP.SB.HAT.04. The cask transfer trailer shall preclude dropping a cask from a height greater than 6 ft measured from the equipment base.	The cask transfer trailer is required to be designed such that it cannot drop a horizontal shielded transfer cask or horizontally oriented transportation cask from a height of more than 6 ft.
			Preclude puncture of a cask	AP.SB.HAT.05. The cask transfer trailer shall preclude puncture of a cask due to collision.	The cask transfer trailer is required to be designed to preclude puncture of transportation casks and horizontal shielded transfer casks during collisions.
			Preclude puncture of a canister	AP.SB.HAT.06. The cask transfer trailer shall preclude puncture of a canister by the hydraulic ram.	The cask transfer trailer (hydraulic ram) is required to be designed to preclude puncture or breach of the canister during canister transfer operations.
			Limit speed	AP.SB.HAT.07. The speed of the cask transfer trailer shall be limited to 2.5 mph.	The cask transfer trailer is required to be designed to preclude speed greater than 2.5 mph.
			Preclude puncture of a cask	AP.SB.HAT.08. The cask transfer trailer shall be designed to preclude puncture of a cask due to the spectrum of seismic events.	The cask transfer trailer is required to be designed to preclude puncture of transportation casks and horizontal shielded transfer casks during seismic events.
		Site Transporter (170-HAT0-MEQ-00001)	Limit speed	AP.SB.HAT.09. The speed of the site transporter shall be limited to 2.5 mph.	The site transporter is required to be designed to preclude speed greater than 2.5 mph.
			Preclude fuel tank explosion	AP.SB.HAT.10. The site transporter fuel tank shall preclude fuel tank explosions.	The site transporter fuel tank is required to be designed to preclude a fuel tank explosion.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Aging Facility (AP) (Continued)	Aging Handling/Cask Transfer (Continued)	Site Transporter (170-HAT0-MEQ-00001) (Continued)	Reduce severity of a drop	AP.SB.HAT.11. The site transporter shall preclude a vertical drop of an aging overpack from a height greater than 3 ft measured from the equipment base.	The site transporter is required to be designed such that it cannot lift an aging overpack more than 3 ft.
			Protect against tipover of the site transporter	AP.SB.HAT.12. The mean frequency of tipover of the site transporter due to the spectrum of seismic events shall be less than or equal to 2×10^{-6} per year.	The site transporter is required to have a wide base, such that it is inherently stable, will not tip over, but may slide if exposed to sufficiently high seismic forces.
Mechanical Handling System (H)	Cask Handling	Transportation Cask (Analyzed as a Representative Cask)	Provide containment	H.SB.01. The mean conditional probability of breach of a canister in a sealed cask on a railcar, truck trailer, or cask transfer trailer resulting from a drop shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.SB.02. The mean probability of breach of a canister in a sealed cask on a railcar, truck trailer, or cask transfer trailer resulting from a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of the reliabilities of each component.)
				H.SB.03. The mean conditional probability of breach of a canister in a sealed cask on a railcar, truck trailer, or cask transfer trailer resulting from a side impact or collision shall be less than or equal to 1×10^{-8} per impact.	The cask and canister are required to be designed such that the canister maximum effective plastic strain from a drop meets the required reliability when evaluated against the canister capacity curves. (Note: PCSA analysis depends on the combination of reliabilities of each component.)

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling (Continued)	Transportation Cask (Analyzed as a Representative Cask) (Continued)	Provide containment (Continued)	H.SB.04. The mean conditional probability of breach of a sealed cask containing uncanistered commercial spent nuclear fuel on a truck trailer resulting from a collision followed by a rollover/drop shall be less than or equal to 1×10^{-8} per drop.	The cask is required to be designed such that the maximum effective plastic strain from a drop meets the required reliability when evaluated against the cask capacity curves.
				H.SB.05. The mean conditional probability of breach of a sealed cask containing uncanistered commercial spent nuclear fuel resulting from a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop.	The cask is required to be designed such that the maximum effective plastic strain from a drop meets the required reliability when evaluated against the cask capacity curves.
			Protect against direct exposure to personnel	H.SB.06. The mean conditional probability of loss of gamma shielding resulting of a cask from a drop shall be less than or equal to 1×10^{-5} per drop.	The cask is required to be designed such that the maximum effective plastic strain from a drop, low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curve.
				H.SB.07. The mean conditional probability of loss of gamma shielding of a cask resulting from a collision or side impact shall be less than or equal to 1×10^{-8} per impact.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.
				H.SB.08. The mean conditional probability of loss of gamma shielding of a cask resulting from a drop of a load onto it shall be less than or equal to 1×10^{-5} per drop.	The cask is required to be designed such that the maximum effective plastic strain from drops or low speed impacts or collisions meets the required reliability when evaluated against the cask capacity curves.

Table 1.2.8-2. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Balance of Plant Facilities (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Mechanical Handling System (H) (Continued)	Cask Handling (Continued)	Site Prime Mover	Limit speed	H.SB.09. The speed of the site prime mover shall be limited to 9 mph.	The site prime movers are required to be designed to preclude speeds greater than 9 mph.
			Preclude fuel tank explosion	H.SB.10. The fuel tank of a site prime mover that enters a facility shall preclude fuel tank explosions.	Site prime mover fuel tanks are required to be designed to preclude a fuel tank explosion.

NOTE: "Protect against" in this table means either "reduce the probability of" or "reduce the frequency of."
 For casks, canisters, and associated handling equipment that were previously designed, the component design will be evaluated to confirm that the controlling parameters and values are met.
 Seismic control values shown represent the integration of the probability distribution of SSC failure (i.e., the loss of safety function) with the seismic hazard curve.
 The numbers appearing in parentheses in the third column are component numbers.
 Facility Codes: AP: Aging Facility; CR: Canister Receipt and Closure Facility; IH: Initial Handling Facility; RF: Receipt Facility; SB: Balance of Plant; WH: Wet handling Facility.
 System Codes: H: Mechanical Handling.
 Subsystem Codes: HAT: Cask Transfer.

Table 1.2.8-3. EDGF—Indoor Design Temperatures

Area or Room	Maximum Summer Temperature (°F Dry Bulb)	Minimum Winter Temperature (°F Dry Bulb)
Generator Room A	120 ^a	65
Generator Room B	120 ^a	65
Switchgear Room A	90 ^b	65
Battery Room A	77	72
Switchgear Room B	90 ^b	65
Battery Room B	77	72
Mechanical Rooms A and B	90 ^b	65
Entry Corridor	90 ^b	65
Exit Corridor A and B	120 ^c	45
Electrical Room	90 ^b	65
Fire Protection Room	120 ^c	45
Unassigned Room	90 ^b	65

NOTE: ^aThese areas are normally not occupied and are designed to have a summer maximum of 120°F when the diesel generator is running and outdoor air temperature is 102°F.

^bThese areas are normally not occupied and the temperature limits are based on the equipment located in the space.

^cThese areas are normally not occupied and the summer maximum of 120°F occurs when the outdoor air temperature is 102°F.

Table 1.2.8-4. EDGF ITS HVAC Components and System Design Data

Subsystem/Components	Number of Units		Nominal Unit Capacity
	Operating	Standby	
ITS Switchgear Room A—Direct Expansion Air Handling Unit (Equipment Number 26D-VNIO-AHU-00001)	1	0	8,000 cfm
ITS Switchgear Room A—Condensing Unit (Equipment Number 26D-VNIO-CDU-00001)	1	0	187,500 Btu/hr
ITS Switchgear Room B—Direct Expansion Air Handling Unit (Equipment Number 26D-VNIO-AHU-00002)	1	0	8,000 cfm
ITS Switchgear Room A—Condensing Unit (Equipment Number 26D-VNIO-CDU-00002)	1	0	187,500 Btu/hr
Battery Room A Exhaust Fans (Equipment Number 26D-VNIO-EXH-00001/00002)	1	1	450 cfm
Battery Room B Exhaust Fans (Equipment Number 26D-VNIO-EXH-00003/00004)	1	1	450 cfm
Generator Room A Exhaust Fans (Equipment Number 26D-VNIO-EXH-00005/00006/00007/00008)	4	0	22,000 cfm
Generator Room B Exhaust Fans (Equipment Number 26D-VNIO-EXH-00009/00010/00011/00012)	4	0	22,000 cfm

NOTE: Equipment numbers are shown in [Figures 1.2.8-25](#) and [1.2.8-26](#).

Table 1.2.8-5. EDGF Non-ITS HVAC Components and System Design Data

Subsystem/Components	Number of Units		Nominal Unit Capacity
	Operating	Standby	
Electrical Room—Direct Expansion Fan Coil Units (Equipment Number 26D-VNIO-FCU-00001/00002)	2	0	1,800 cfm
Electrical Room—Condensing Units (Equipment Number 26D-VNIO-CDU-00007/00008)	2	0	61,750 Btu/hr
Mechanical Room A—Direct Expansion Fan Coil Units (Equipment Number 26D-VNIO-FCU-00003/00004)	2	0	400 cfm
Mechanical Room A—Condensing Units (Equipment Number 26D-VNIO-CDU-00003/00004)	2	0	13,750 Btu/hr
Mechanical Room B—Direct Expansion Fan Coil Units (Equipment Number 26D-VNIO-FCU-00005/00006)	2	0	400 cfm
Mechanical Room B—Condensing Units (Equipment Number 26D-VNIO-CDU-00005/00006)	2	0	13,750 Btu/hr
Electric Unit Heaters for Fire Protection Room (Equipment Number 26D-VNIO-VUH-00001/00002)	1	1	1 kW
Electric Unit Heaters for Exit Corridor A (Equipment Number 26D-VNIO-VUH-00003/00004)	1	1	1 kW
Electric Unit Heaters for Exit Corridor B (Equipment Number 26D-VNIO-VUH-00005/00006)	1	1	1 kW
Electric Unit Heaters for Entry Corridor (Equipment Number 26D-VNIO-VUH-00007/00008)	2	0	3 kW
Electric Unit Heaters for Generator Room A (Equipment Number 26D-VNIO-VUH-00009/00010/00011/00012)	4	0	7.5 kW
Electric Unit Heaters for Generator Room B (Equipment Number 26D-VNIO-VUH-00013/00014/00015/00016)	4	0	7.5 kW

NOTE: Equipment numbers for Train A are shown in [Figures 1.2.8-25, 1.2.8-26, 1.2.8-30, and 1.2.8-31](#). The Train B ventilation and instrumentation diagrams are the same as for Train A; equipment numbers are unique for each train.

Table 1.2.8-6. LLWF—Indoor Design Temperatures

Area or Room	Maximum Summer Temperature (°F Dry Bulb)	Minimum Winter Temperature (°F Dry Bulb)
Packaging Area	90 ^a	65
Staging Rooms A, B, C, and D	90 ^a	65
HVAC Room	90 ^a	65
Equipment Decontamination Room	90 ^a	65
Sorting Rooms A and B	90 ^a	65
Glove Box Room	90 ^a	65
Support Areas	75	70
Truck Entrance Bay	85 ^b	65
Storage Room	90 ^a	65
Electrical Room	90 ^a	65
Battery Room	77	72
Vestibule	90	65

NOTE: ^aThese areas are normally not occupied and the temperature limits are based on the electrical equipment located in the space.

^bThese areas are normally not occupied. However, these areas are designed to be at a maximum of 85°F due to the expected extended occupancy during operation.

Table 1.2.8-7. LLWF HVAC Components and System Design Data

Subsystem/Components	Number of Units		Nominal Airflow Capacity (cfm/unit)
	Operating	Standby	
Confinement Area Once-Through Supply Air Handling Unit (Equipment Number 160-VCT0-AHU-00001/00002/00003)	2	1	20,000
Nonconfinement Truck Entrance Bay—Fan Coil Units (Equipment Number 160-VNI0-FCU-00001/00002)	1	1	12,000
Nonconfinement Air Handling Unit—Supply Fan (Equipment Number 160-VNI0-AHU-00001/00002)	1	1	20,000
Nonconfinement Air Handling Unit—Return Fan (Integral to unit 160-VNI0-AHU-00001/00002)	1	1	20,000

NOTE: Equipment numbers are shown in [Figures 1.2.8-37](#) and [1.2.8-38](#).

Table 1.2.8-8. LLWF Exhaust Components and System Design Data

Subsystem/Components	Number of Units		Nominal Airflow Capacity (cfm/unit)	HEPA Filter Plenum Components (No. of Banks)		
	Operating	Standby		Demister	Prefilter	HEPA Filter
Confinement Areas Exhaust HEPA Filter Plenum (Equipment Number: 160-VCT0-FLT-00001/00002/00003/00004)	3	1	18,000	NA	1	1
Non-ITS Confinement Areas Exhaust Fan (Equipment Number: 160-VCT0-EXH-00001/00002/00003/00004)	3	1	18,000	NA	1	1
Nonconfinement Battery Room Exhaust Fan (Equipment Number: 160-VN10-EXH-00001/00002)	1	1	1,500	NA	NA	NA
Nonconfinement Toilet/Janitors Room Exhaust Fan (Equipment Number: 160-VN10-EXH-00003)	1	NA	1,500	NA	NA	NA
Nonconfinement Break Room Exhaust Fan (Equipment Number: 160-VN10-EXH-00004)	1	NA	300	NA	NA	NA

NOTE: Equipment numbers are shown in [Figures 1.2.8-37](#) and [1.2.8-38](#).
NA = not applicable.

Table 1.2.8-9. CCCF and Primary Alarm Station Indoor Design Temperatures

Area or Room	Maximum Summer Temperature (°F Dry Bulb)	Minimum Winter Temperature (°F Dry Bulb)
Corridors and Vestibules	75	70
Central Control Center	75	70
Communication Rooms 1/2	75	70
Network Operations Room	75	70
Safeguards and Security Room	75	70
Battery Room 1/2/3	77	72
Kitchen and Break Rooms	75	70
HVAC Room 1/2	90 ^a	65
Electrical Equipment Rooms 1/2/3	90 ^a	65
Offices and Support Areas	75	70

NOTE: ^aThese areas are normally not occupied and the temperature limits are based on the electrical equipment located in the space.

Table 1.2.8-10. CCCF and Primary Alarm Station HVAC Components and System Design Data

Subsystem/Components	Number of Units		Nominal Unit Capacity
	Operating	Standby	
CCCF Outside Air Filter Unit (Equipment Number: 240-VNI0-FLT-00001)	0	1	2000 cfm
CCCF Outside Air Fan (Equipment Number: 240-VNI0-FAN-00001)	0	1	2000 cfm
CCCF Direct Expansion Air Handling Unit (Equipment Number: 240-VNI0-AHU-00001A/00001B)	1	1	12,000 cfm
CCCF Direct Expansion Condensing Unit (Equipment Number: 240-VNI0-CDU-00003A/00003B)	1	1	40 tons
CCCF Return Air Fan (Equipment Number: 240-VNI0-FAN-00002A/00002B)	1	1	10,000 cfm
CCCF Communications Room 1 Fan Coil Units (Equipment Number: 240-VNI0-ACU-00001A/00001B)	1	1	3,800 cfm
CCCF Communications Room 1 Condensing Units (Equipment Number: 240-VNI0-CDU-00001A/00001B)	1	1	10 tons
CCCF Communications Room 2 Fan Coil Units (Equipment Number: 240-VNI0-ACU-00002A/00002B)	1	1	3,800 cfm
CCCF Communications Room 2 Condensing Units (Equipment Number: 240-VNI0-CDU-00002A/00002B)	1	1	10 tons
CCCF Battery Room Exhaust Fan (Equipment Number: 240-VNI0-EXH-00001A/00001B)	1	1	700 cfm
CCCF Kitchen Exhaust Fan (Equipment Number: 240-VNI0-EXH-00003)	1	NA	550 cfm
CCCF Toilets and Janitors Closet Exhaust Fan (Equipment Number: 240-VNI0-EXH-00002)	1	NA	250 cfm
Primary Alarm Station Outside Air Filter Unit (Equipment Number: 240-VNI0-FLT-00002)	0	1	600 cfm
Primary Alarm Station Outside Air Fan (Equipment Number: 240-VNI0-FAN-00003)	0	1	600 cfm
Primary Alarm Station Direct Expansion Air Handling Unit (Equipment Number: 240-VNI0-AHU-00002A/00002B)	1	1	5,000 cfm
Primary Alarm Station Direct Expansion Condensing Unit (Equipment Number: 240-VNI0-CDU-00004A/00004B)	1	1	20 tons
Primary Alarm Station Return Air Fan (Equipment Number: 240-VNI0-FAN-00004A/00004B)	1	1	4,500 cfm
Primary Alarm Station Battery Room Exhaust Fan (Equipment Number: 240-VNI0-EXH-00004A/00004B)	1	1	350 cfm

Table 1.2.8-10. CCCF and Primary Alarm Station HVAC Components and System Design Data (Continued)

Subsystem/Components	Number of Units		Nominal Unit Capacity
	Operating	Standby	
Primary Alarm Station Toilets and Janitors Closet Exhaust Fan (Equipment Number: 240-VN10-EXH-00005)	1	NA	250 cfm










NOTE: Equipment numbers are shown in [Figures 1.2.8-42](#) and [1.2.8-43](#).
NA = not applicable.

ROOM LEGEND
EMERGENCY DIESEL GENERATOR FACILITY

GROUND FLOOR

1001	GENERATOR ROOM A
1002	SWITCHGEAR ROOM A
1003	BATTERY ROOM A
1004	MECHANICAL ROOM A
1005	FIRE PROTECTION ROOM
1006	EXHAUST AIR ROOM A
1007	EXIT CORRIDOR A
1008	UNASSIGNED
1009	VESTIBULE
1010	ENTRY CORRIDOR
1011	GENERATOR ROOM B
1012	SWITCHGEAR ROOM B
1013	BATTERY ROOM B
1014	MECHANICAL ROOM B
1015	NOT USED
1016	EXHAUST AIR ROOM B
1017	EXIT CORRIDOR B
1018	ELECTRICAL ROOM

DRAWING LEGEND

	GRID LINE
	CHECKERED PLATE
	FLOOR GRATING
	PARTITION WALL
	CONCRETE SECTION
	ROOM/AREA NUMBER
	GRADE SECTION
	MEMBRANE ROOFING
	EYE WASH/SHOWER STATION

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Figure 1.2.8-1. EDGF General Arrangement Legend

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-84](#).

Figure 1.2.8-2. EDGF General Arrangement Ground Floor Plan

NOTE: HR = handrail; MCC = motor control center.

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-85](#).

Figure 1.2.8-3. EDGF General Arrangement Roof Plan

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-86](#).

NOTE: MCC = motor control center.

Figure 1.2.8-4. EDGF General Arrangement Section A

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Figure 1.2.8-5. EDGF General Arrangement Section B

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Figure 1.2.8-6. EDGF General Arrangement Section C

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-89](#).

Figure 1.2.8-7. EDGF General Arrangement Section D

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-90](#).

Figure 1.2.8-8. Central Control Center Facility
Architectural Floor Plan

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<u>ROOM LEGEND</u>	
<u>LOW-LEVEL WASTE FACILITY</u>	
<u>GROUND FLOOR</u>	
1001	TRUCK ENTRANCE BAY
1002	PACKAGING AREA
1002A	VESTIBULE
1002B	STORAGE ROOM
1003	EQUIPMENT DECONTAMINATION ROOM
1004	SORTING ROOM A
1005	SORTING ROOM B
1006	GLOVE BOX ROOM
1007	CORRIDOR
1008	STAGING ROOM A
1009	STAGING ROOM B
1010	STAGING ROOM C
1011	STAGING ROOM D
1012	HVAC ROOM (SUPPLY AND HEPA/EXHAUST)
1013	ELECTRICAL ROOM
1014	BATTERY ROOM
1015	C-VAN STAGING AREA
1016	TANK FARM
1017	C-VAN LOADING AREA
1018	FIRE WATER RISER VALVE ROOM #2
 <u>GROUND FLOOR SUPPORT AREA</u>	
1200	VESTIBULE IN/OUT
1200A	CORRIDOR
1201	SECURITY POST
1202	OPERATIONS SUPERVISOR ROOM
1203	RADIOLOGICAL PROTECTION STAFF WORK ROOM
1204	BRIEFING ROOM
1205	RADIOLOGICAL PROTECTION LAB/COUNT ROOM
1205A	LAB STORAGE ROOM
1206	SAMPLE PREPARATION ROOM
1207	OPERATIONS ROOM
1208	BREAK ROOM & VENDING AREA
1209	CORRIDOR
1210	CORRIDOR
1211	CORRIDOR
1212	RADIOLOGICAL PROTECTION GEAR SUPPLY ROOM
1212A	CHANGE ROOM 1
1212B	CHANGE ROOM 2
1212C	CHANGE ROOM 3
1212D	CHANGE ROOM 4
1213	ENTRY/EXIT VESTIBULE
1214	COMMUNICATIONS ROOM
1215	RECEIVING ROOM
1216	RECEIVING WORK AREA
1217	FIRE WATER RISER VALVE ROOM #1
1218	MEN'S RESTROOM
1219	RADIOLOGICAL ACCESS CONTROL POINT
1220	JANITOR CLOSET
1221	WOMEN'S RESTROOM
1222	RADIOLOGICAL ACCESS EXIT/PERSONNEL CONTAMINATION MONITOR ROOM
1223	DECON ROOM
 <u>SECOND FLOOR</u>	
2001	HVAC ROOM (SUPPORT AREA SUPPLY)
 <u>MEZZANINE FLOOR</u>	
M001	EMPTY DPC WORK PLATFORM


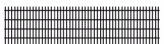


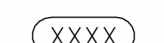




<u>DRAWING LEGEND</u>	
- - - - -	GRID LINE
	CHECKERED PLATE
	FLOOR GRATING
	PARTITION WALL
	CONCRETE SECTION
- . - . - . -	OVERHEAD CRANE HOOK APPROACH
	ROOM/AREA NUMBER
	GRADE SECTION
	MEMBRANE ROOFING
	EYE WASH/SHOWER STATION
	METAL EXTERIOR PANEL SYSTEM
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Figure 1.2.8-9. Low-Level Waste Facility General Arrangement Legend

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-91](#).

Figure 1.2.8-10. Low-Level Waste Facility General Arrangement Ground Floor Plan

NOTE: HIC = high integrity container; LC = load center; LLW = low-level radioactive waste; MCC = motor control center.

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-92](#).

Figure 1.2.8-11. Low-Level Waste Facility General Arrangement Second Floor and Mezzanine Plan

NOTE: HR = handrail; LLW = low-level radioactive waste.

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-93](#).

Figure 1.2.8-12. Low-Level Waste Facility General Arrangement Section A

NOTE: LLW = low-level radioactive waste.

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-94](#).

Figure 1.2.8-13. Low-Level Waste Facility General Arrangement Section B

NOTE: LLW = low-level radioactive waste.

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This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-95](#).

Figure 1.2.8-14. Low-Level Waste Facility General Arrangement Section C

NOTE: LLW = low-level radioactive waste.

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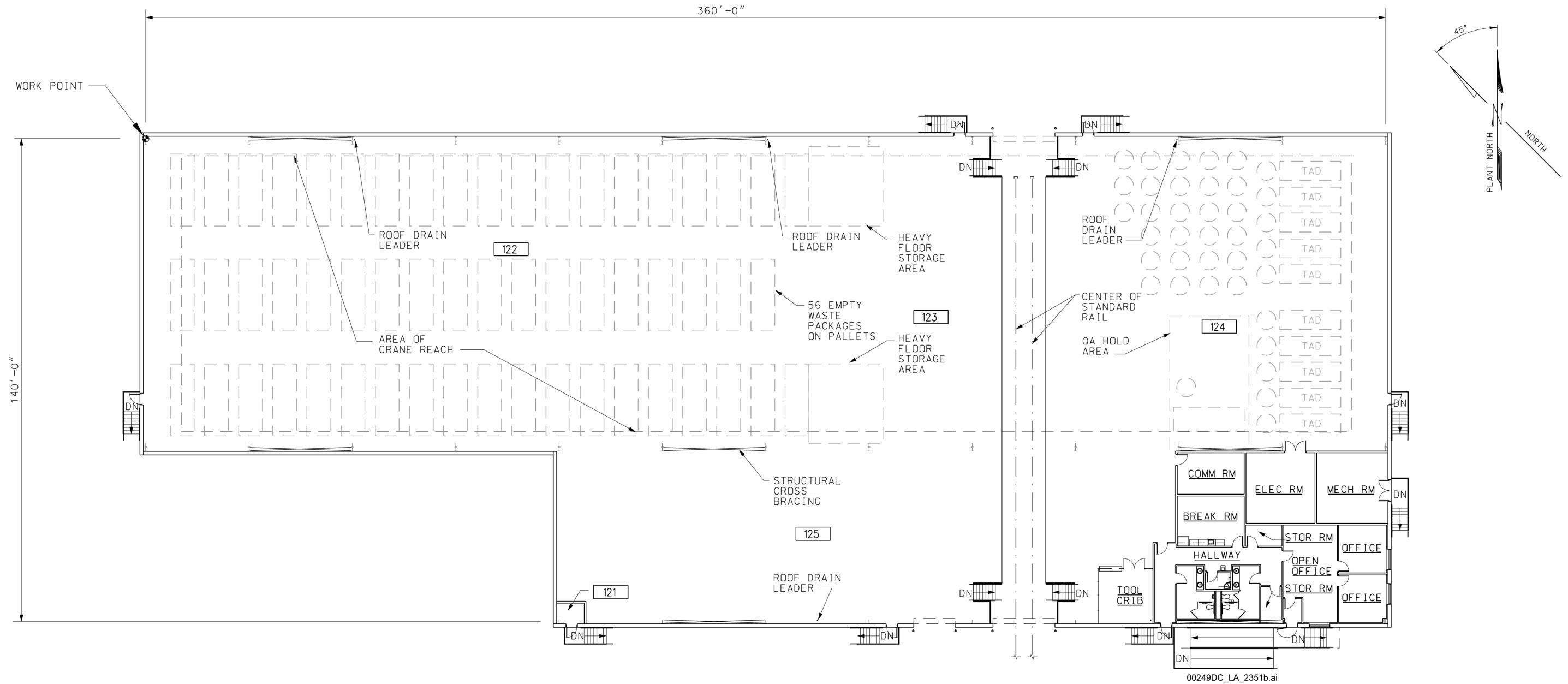


Figure 1.2.8-15. Warehouse and Non-Nuclear Receipt Facility Architectural Floor Plan

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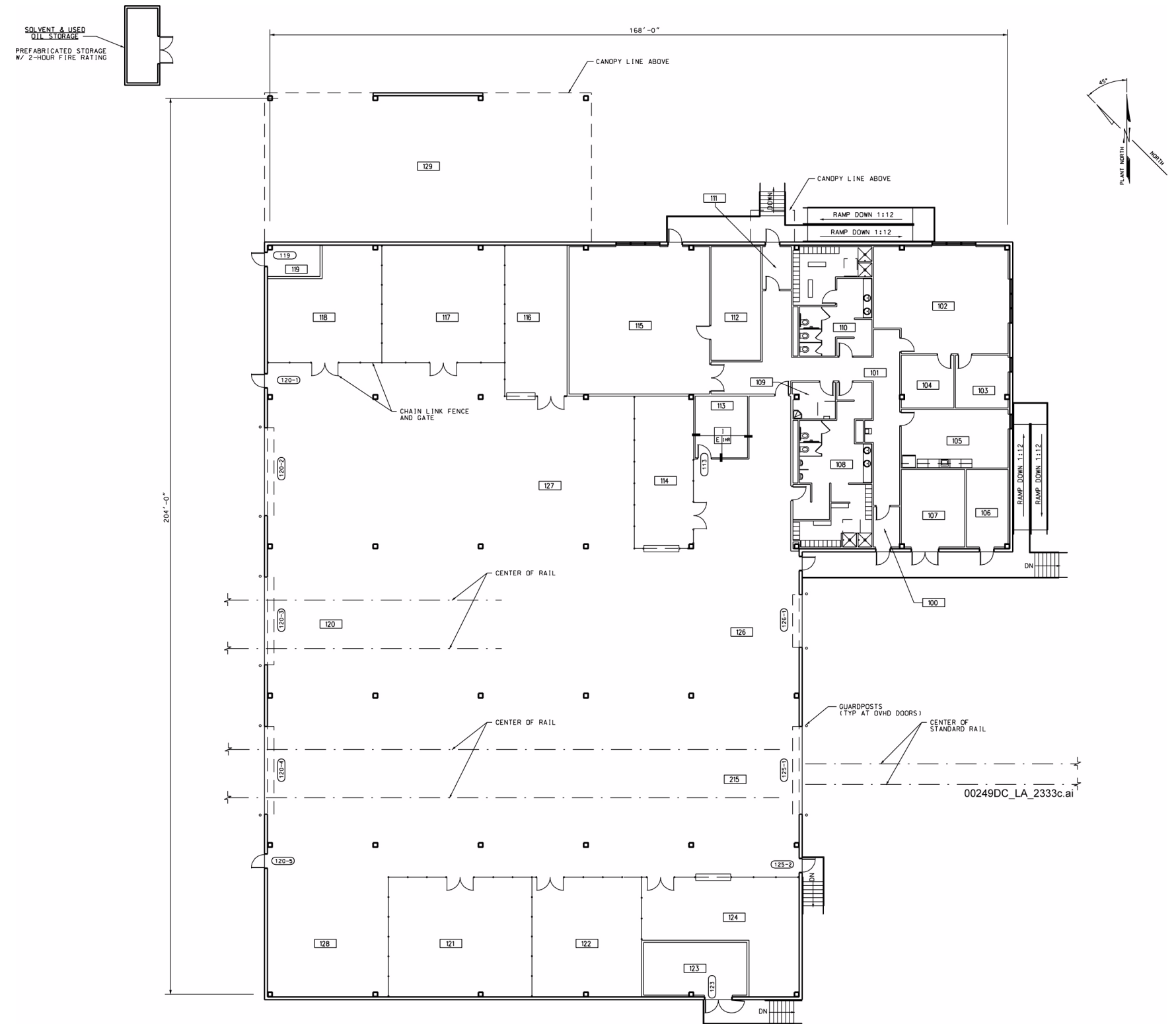
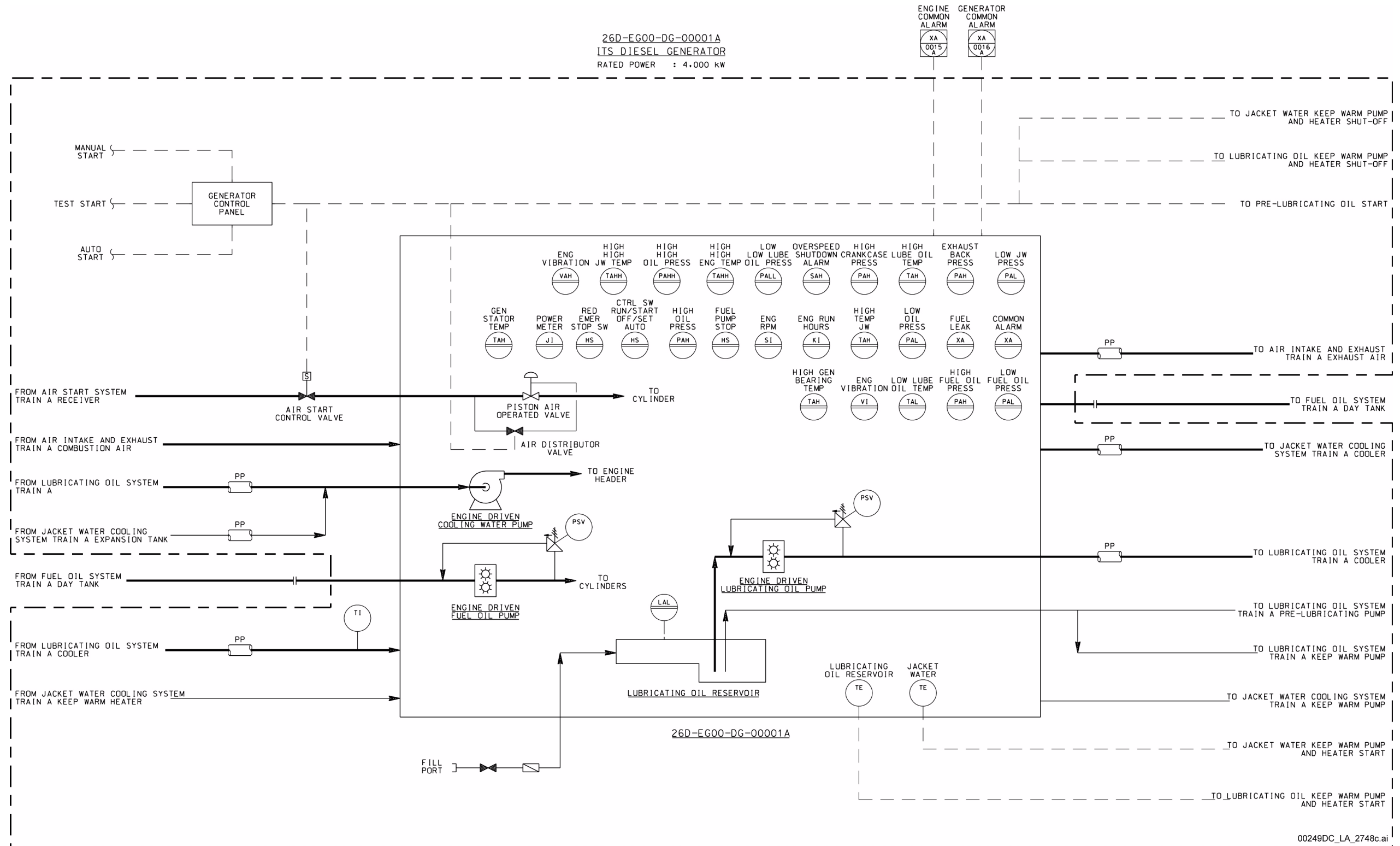


Figure 1.2.8-16. Heavy Equipment Maintenance Facility Architectural Floor Plan

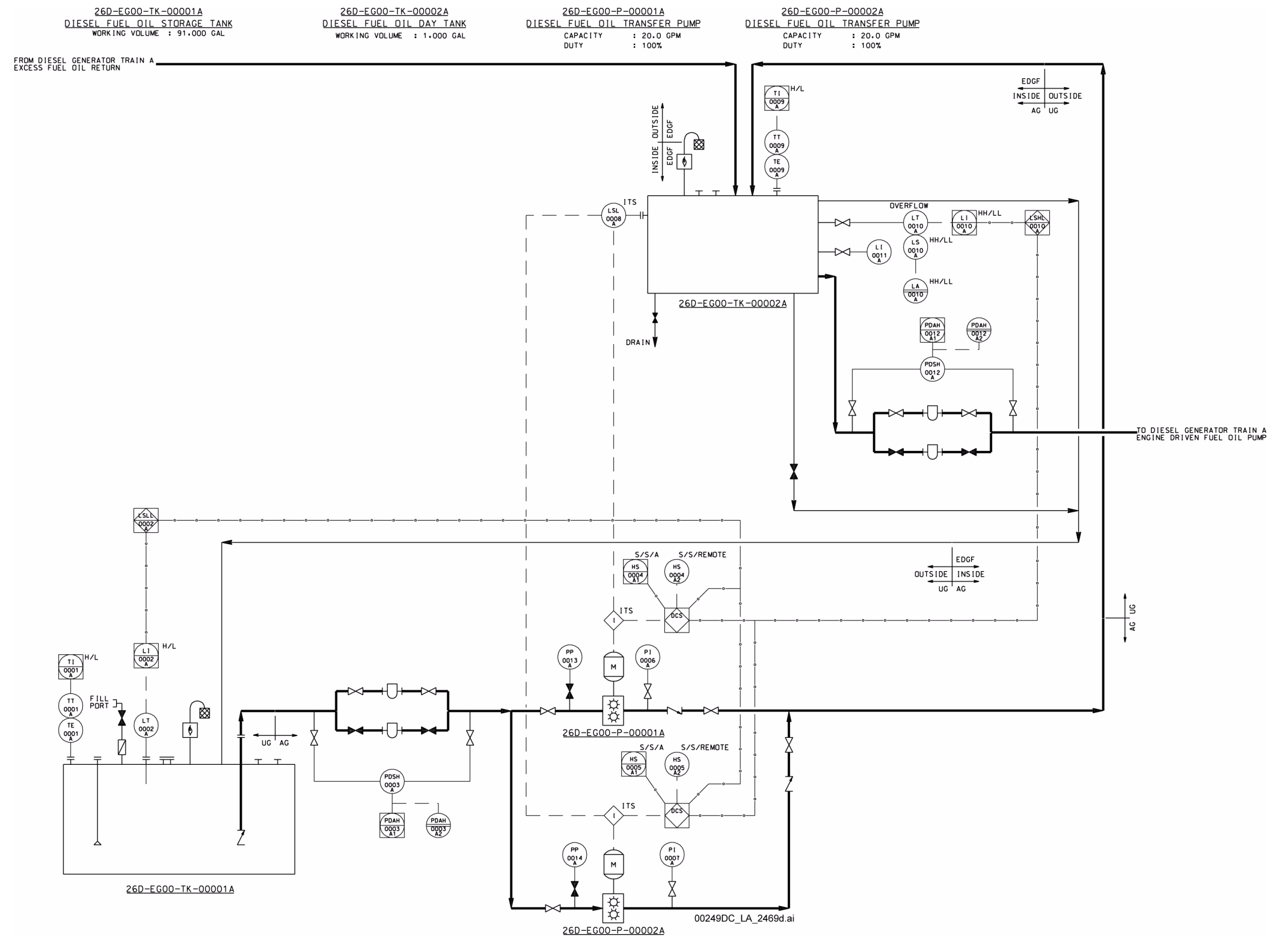
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NOTE: JW = jacket water; PP = personnel protection.

Figure 1.2.8-17. EDGF ITS Diesel Generator Train A Piping and Instrumentation Diagram

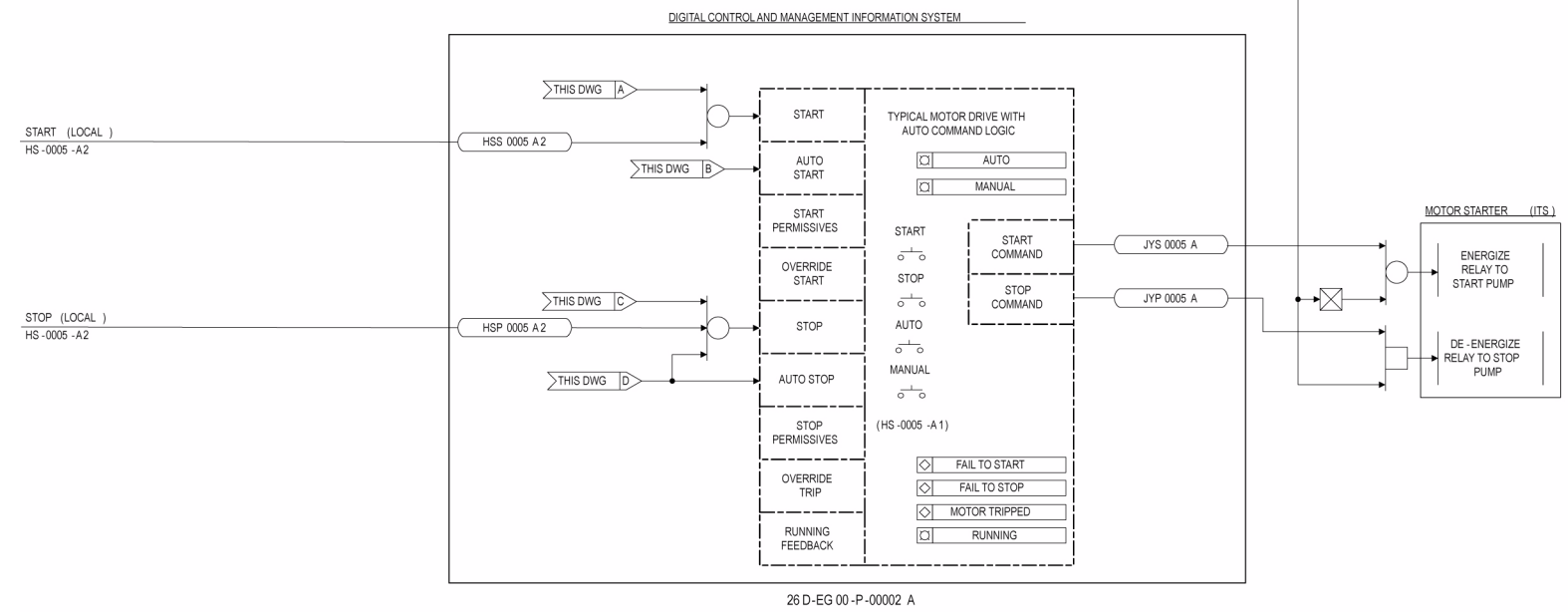
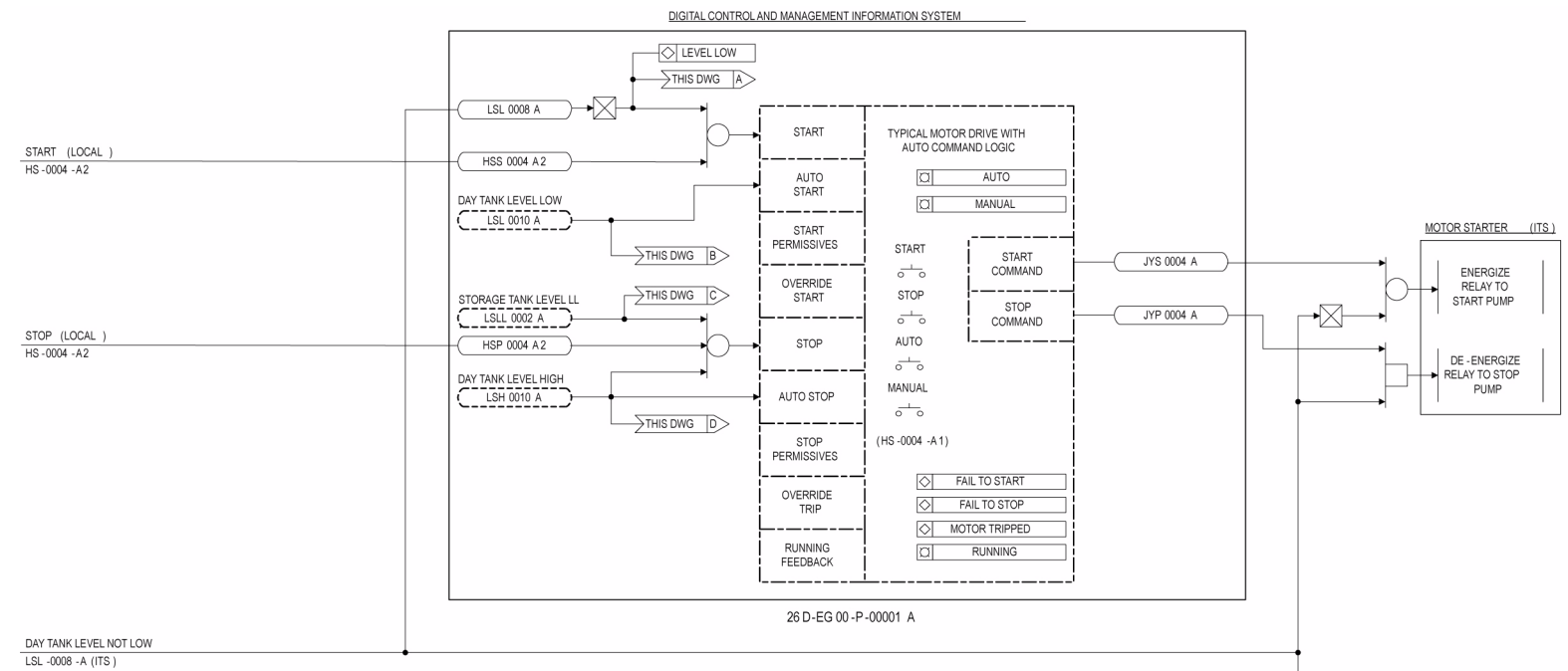
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NOTE: ITS controls and instrumentation are identified by the letters "ITS" after the instrumentation tag number or control device identifier.

Figure 1.2.8-18. EDGF ITS Diesel Generator Train A Fuel Oil System Piping and Instrumentation Diagram

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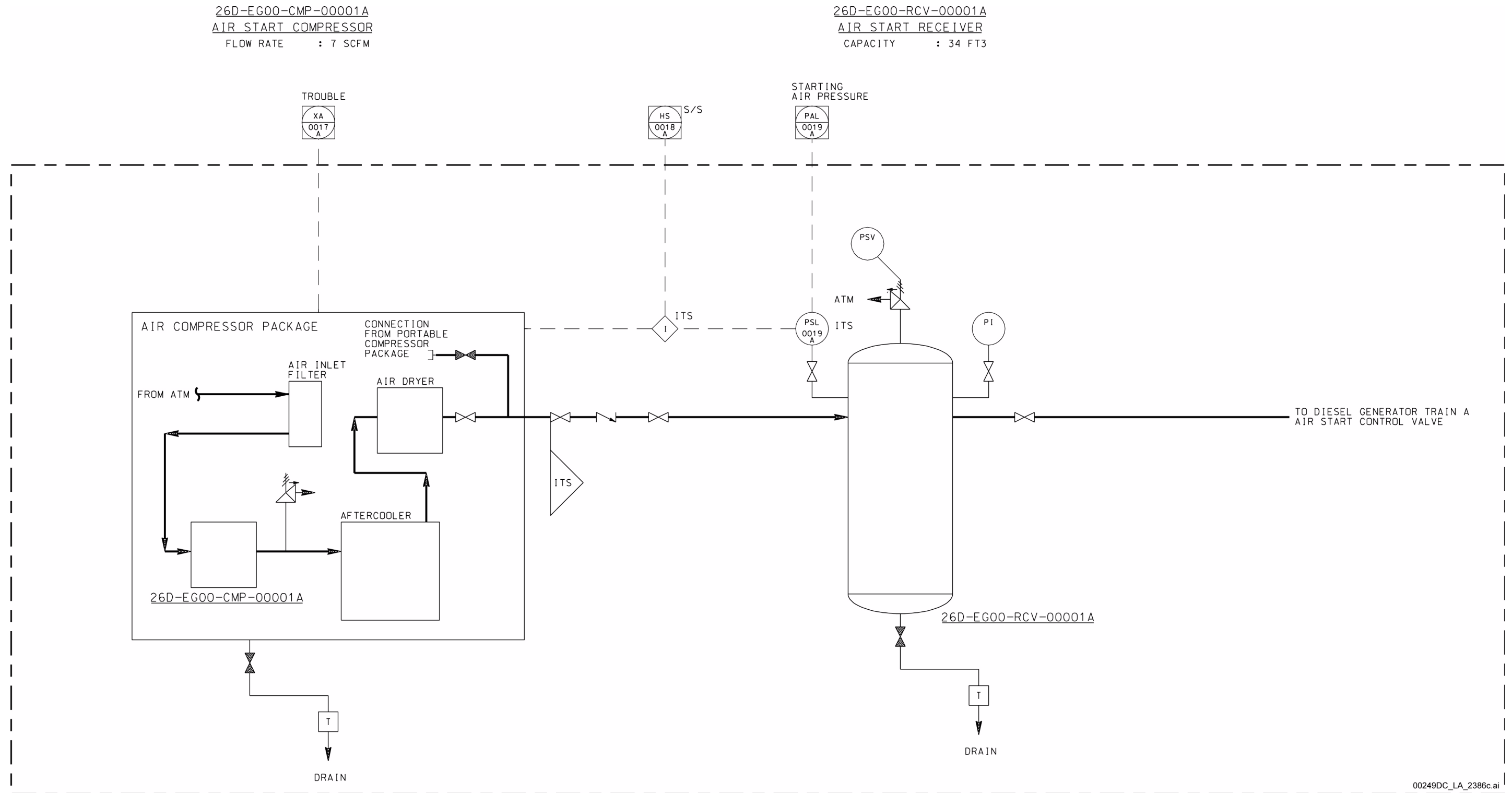
ITS DIESEL GENERATOR FUEL OIL SYSTEM	PUMP EQUIPMENT NUMBER	LOCAL HANDSWITCH	HS INPUT START	HS INPUT STOP	DCMIS HANDSWITCH	LOGIC OUTPUT START	LOGIC OUTPUT STOP	DAY TANK LEVEL	DAY TANK LEVEL SOFTWARE POINT	STORAGE TANK LEVEL SOFTWARE POINT
TRAIN A	26D-EG00-P-00001A	HS-0004-A2	HSS0004A2	HSP0004A2	HS-0004-A1	JYS0004A	JYP0004A	LSL-0008-A (ITS)	LSH0010A LSL0010A	LSLL0002A
	26D-EG00-P-00002A	HS-0005-A2	HSS0005A2	HSP0005A2	HS-0005-A1	JYS0005A	JYP0005A			
TRAIN B	26D-EG00-P-00001B	HS-0004-B2	HSS0004B2	HSP0004B2	HS-0004-B1	JYS0004B	JYP0004B	LSL-0008-B (ITS)	LSH0010B LSL0010B	LSLL0002B
	26D-EG00-P-00002B	HS-0005-B2	HSS0005B2	HSP0005B2	HS-0005-B1	JYS0005B	JYP0005B			

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NOTE: Important to safety controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The DCMIS is non-ITS and non-ITWI. Simultaneous DCMIS and local control is prevented by the "remote" position of the local handswitch. Instrumentation tag numbers are prefixed by "26D-EG00-." Software tag numbers are prefixed by "26DEG00."

Figure 1.2.8-19. ITS Diesel Generator Fuel Oil Transfer Pump Logic Diagram

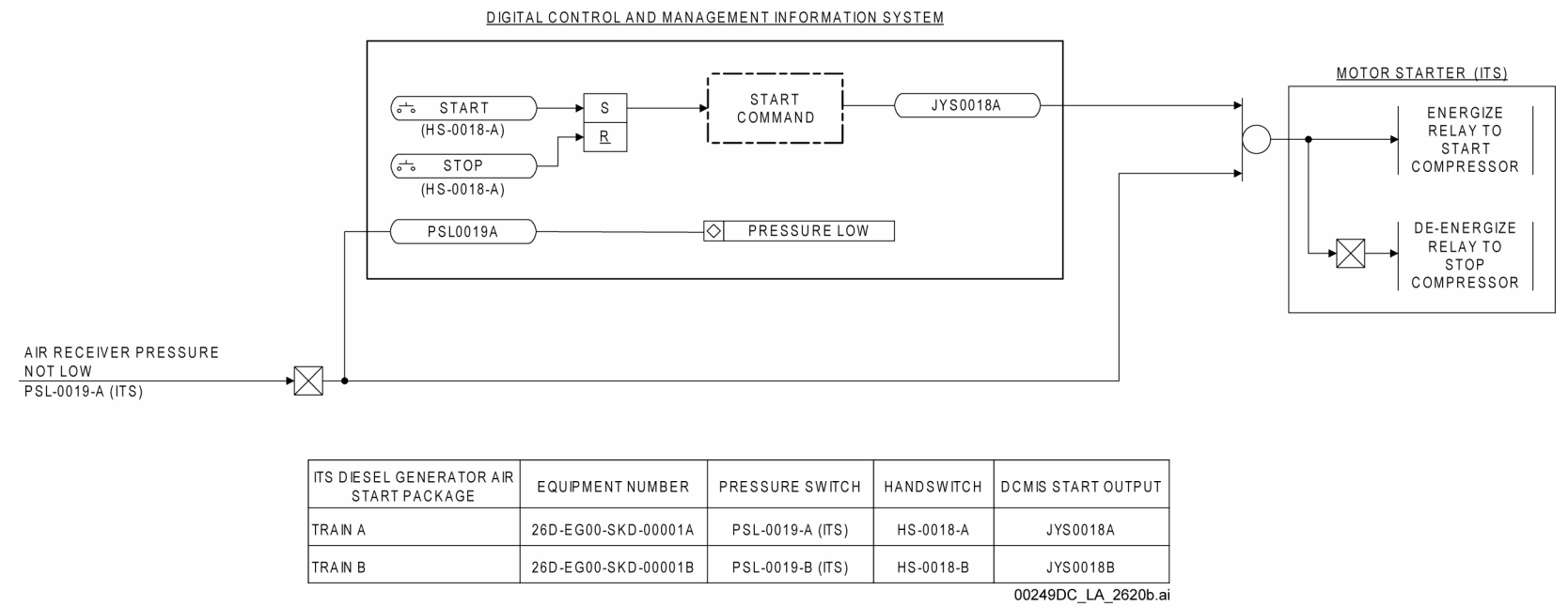
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NOTE: ITS controls and instrumentation are identified by the letters "ITS" after the instrumentation tag number or control device identifier.

Figure 1.2.8-20. EDGF ITS Diesel Generator Air Start System Train A Piping and Instrumentation Diagram

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NOTE: Important to safety controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The DCMIS is non-ITS and non-ITWI. Instrumentation tag numbers are prefixed by "26D-EG00-." Software tag numbers are prefixed by "26DEG00."

Figure 1.2.8-21. EDGF ITS Diesel Generator Air Compressor Logic Diagram

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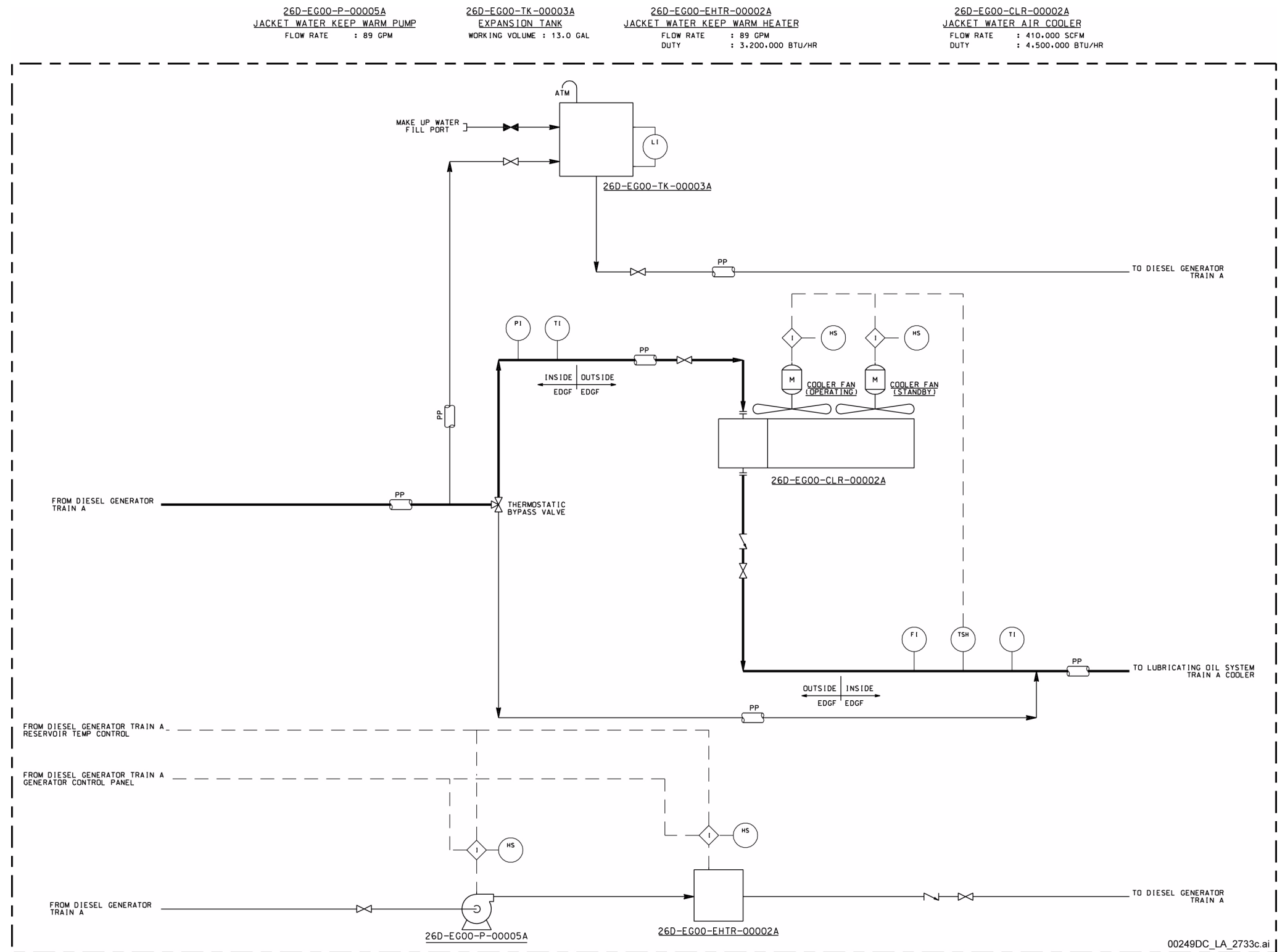


Figure 1.2.8-22. EDGF ITS Diesel Generator Jacket Water Cooling System Train A Piping and Instrumentation Diagram

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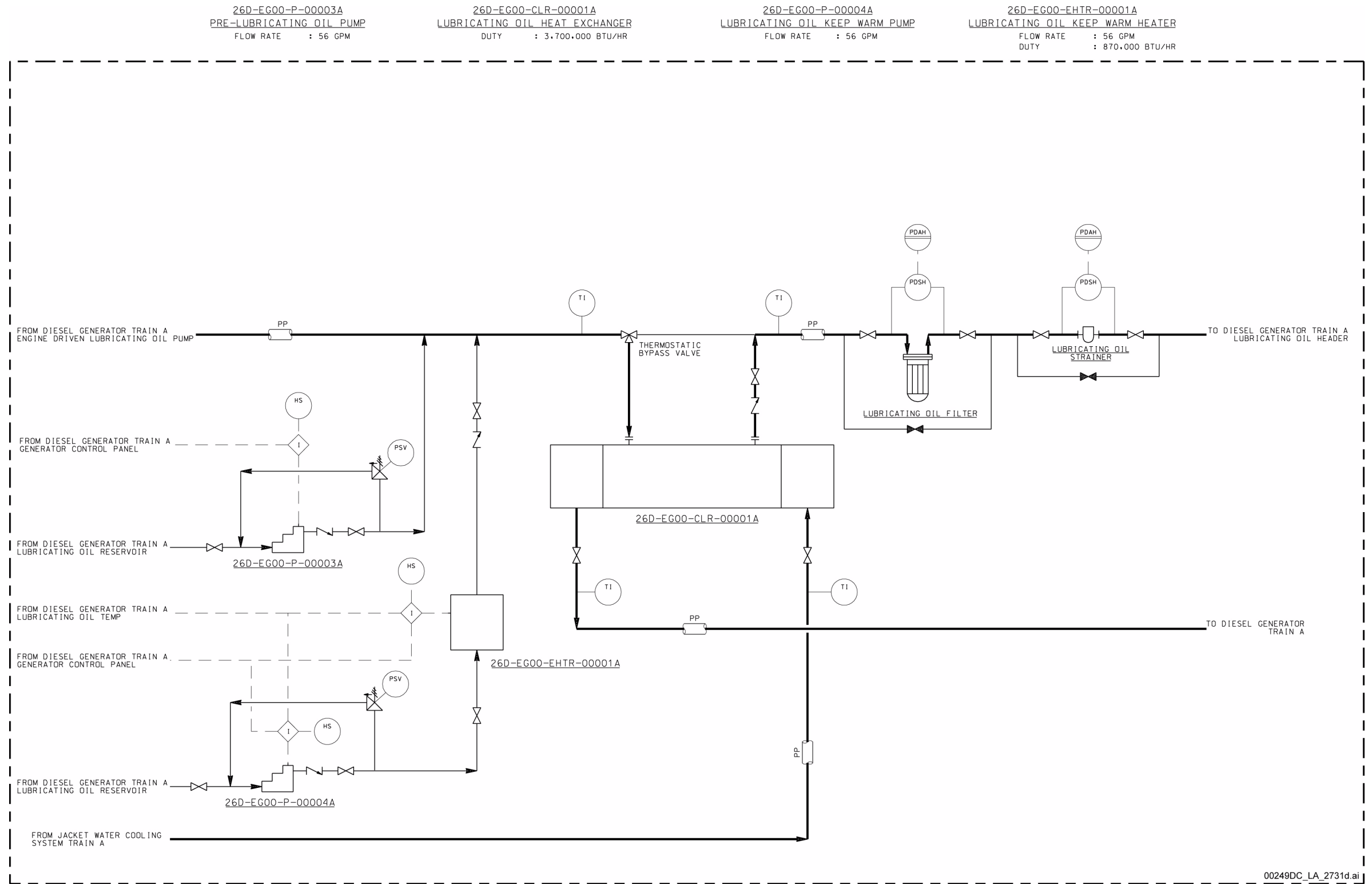


Figure 1.2.8-23. EDGF ITS Diesel Generator Lubricating Oil System Train A Piping and Instrumentation Diagram

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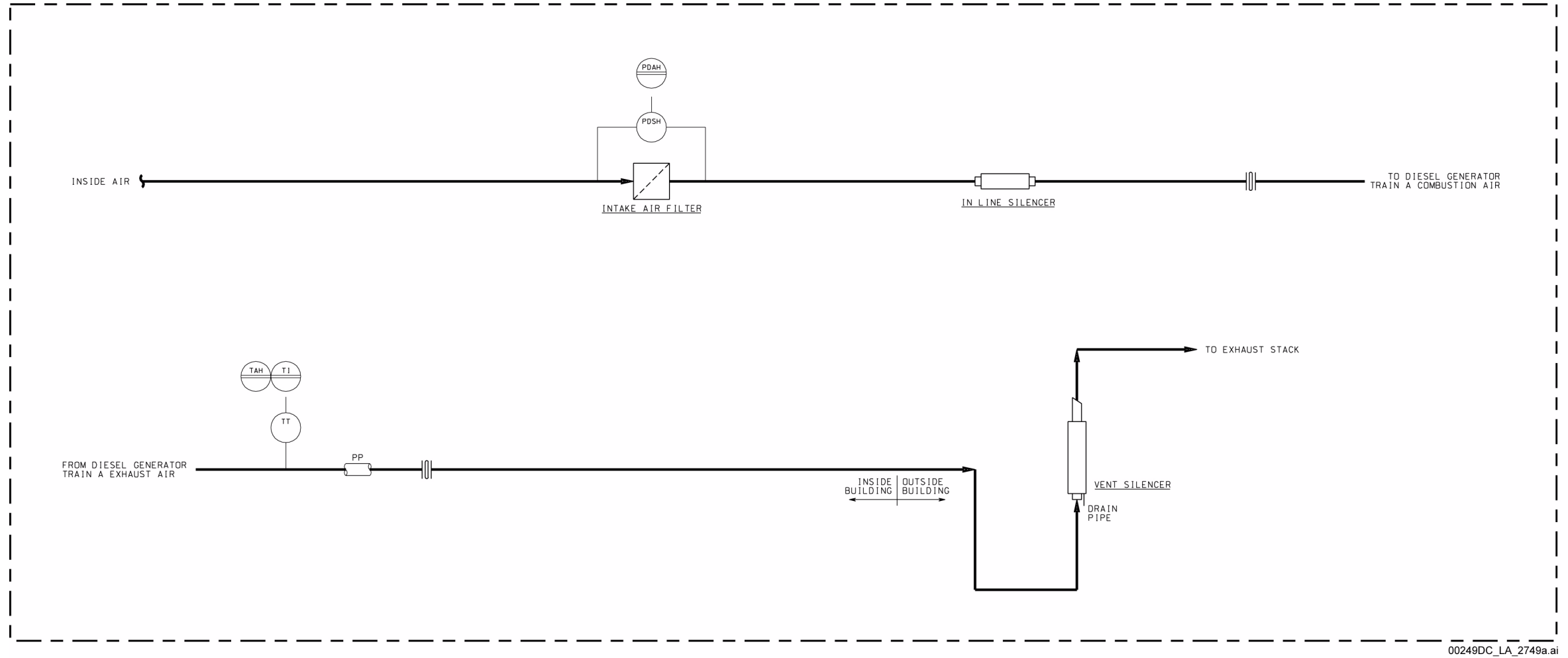


Figure 1.2.8-24. EDGF ITS Diesel Generator Air Intake and Exhaust Train A Piping and Instrumentation Diagram

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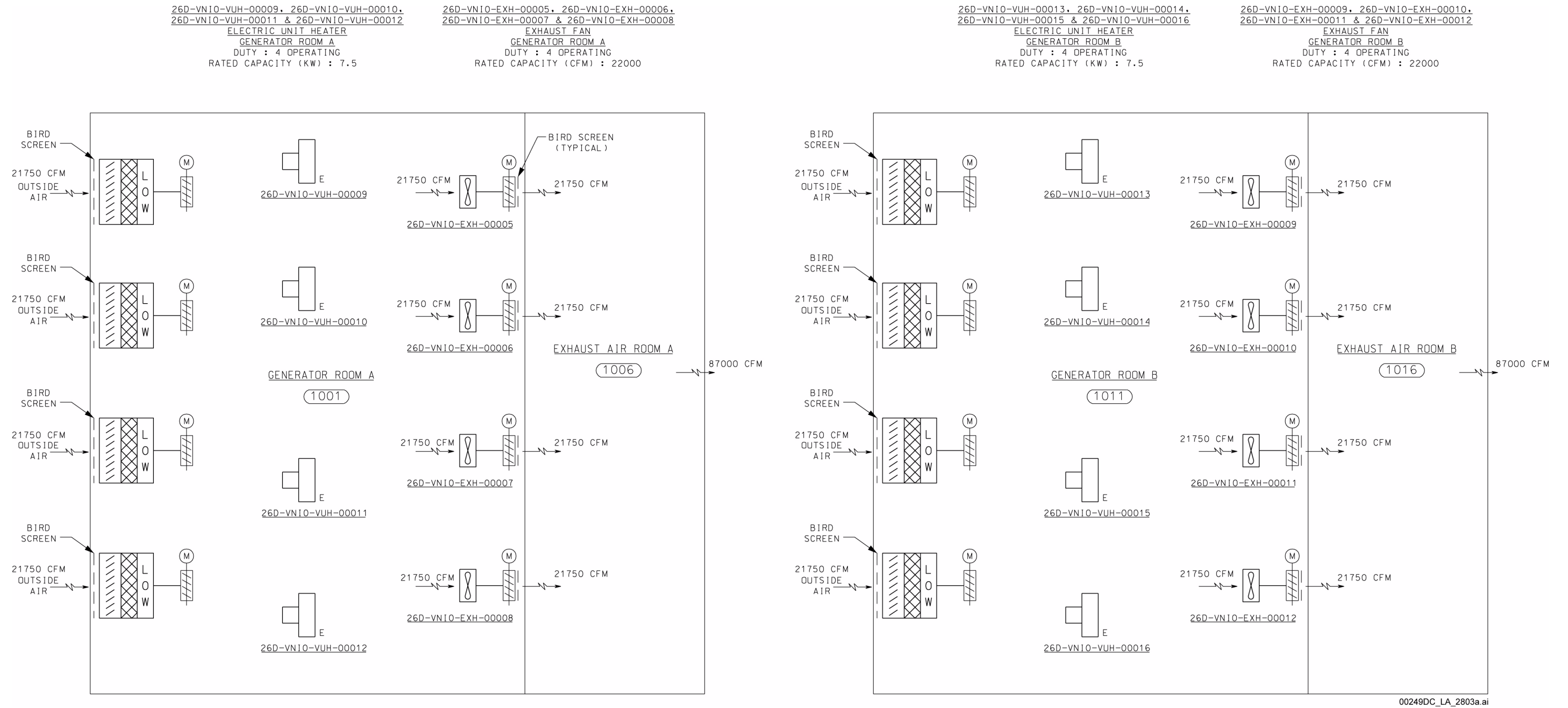


Figure 1.2.8-25. EDGF Nonconfinement Generator Rooms ITS HVAC Systems Ventilation Flow Diagram

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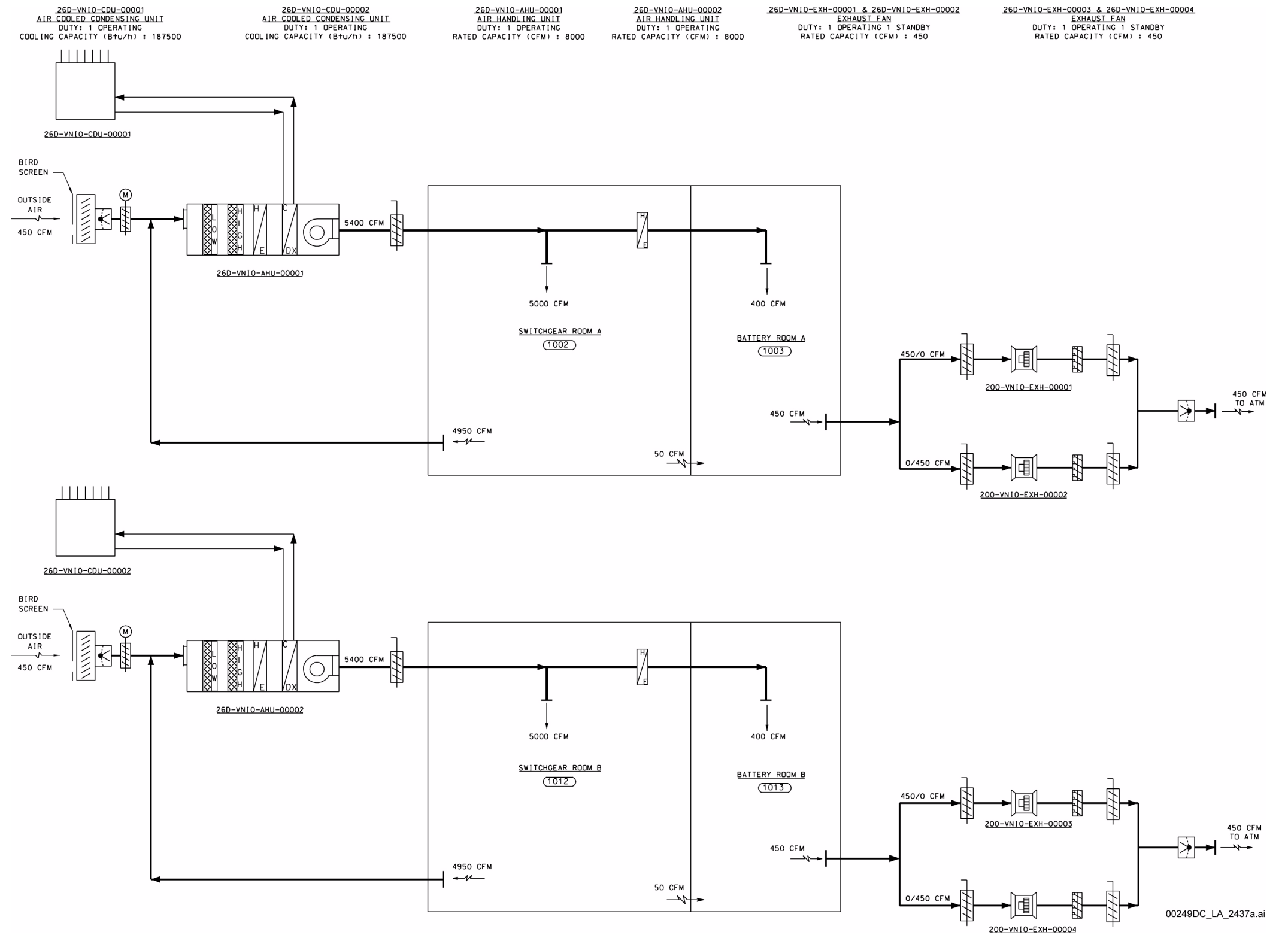
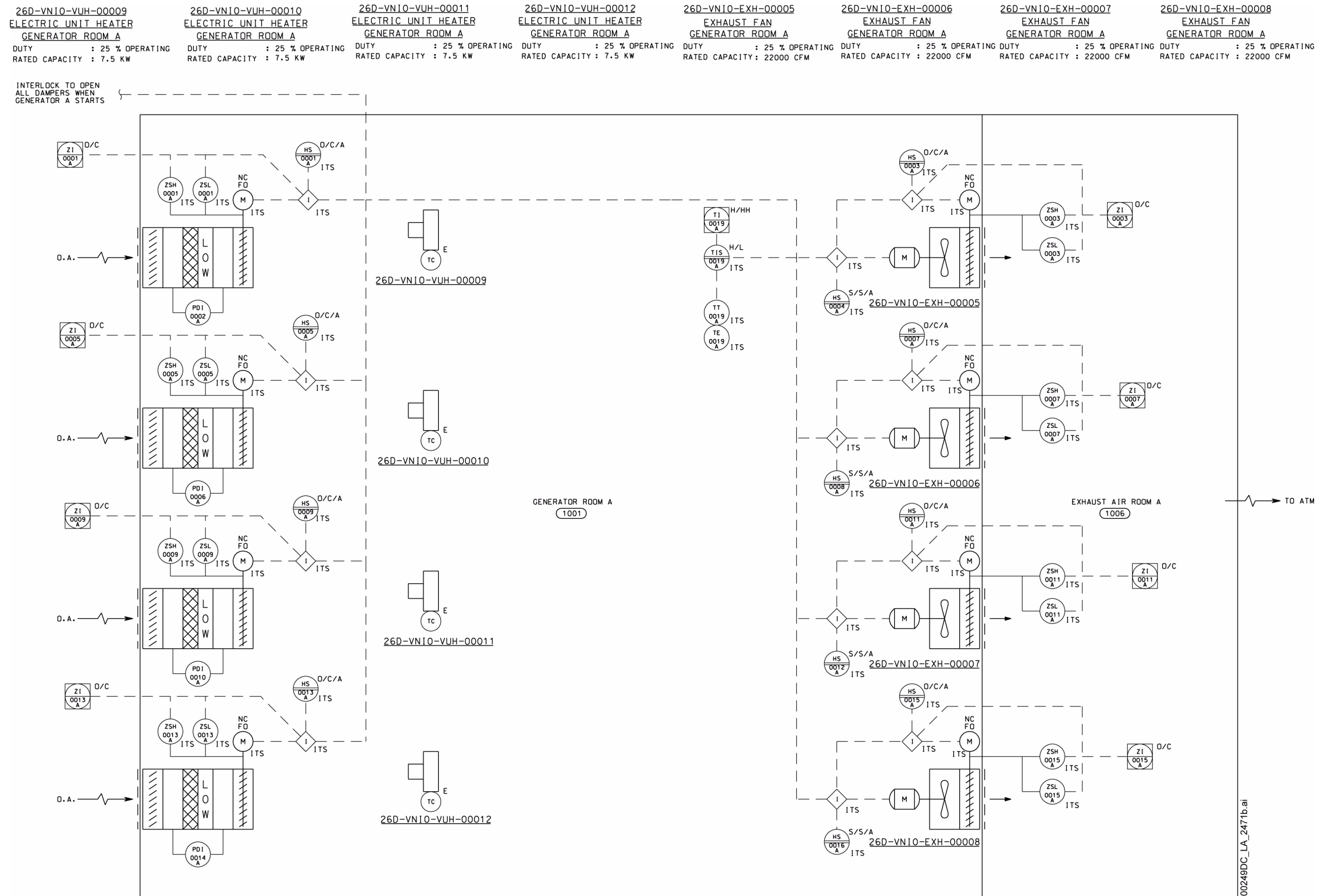


Figure 1.2.8-26. EDGF Nonconfinement Switchgear and Battery Rooms ITS HVAC Systems Ventilation Flow Diagram

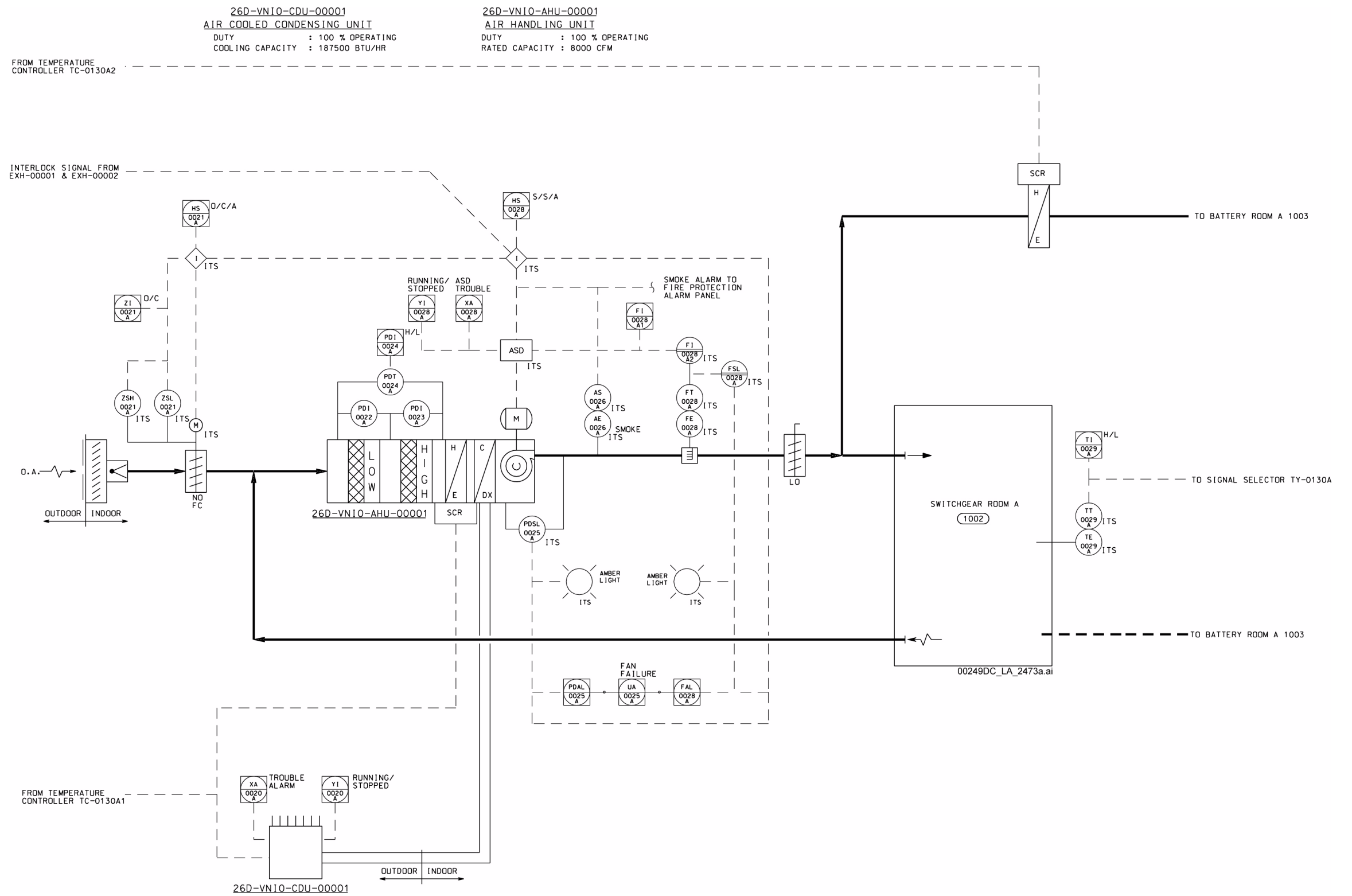
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NOTE: ITS controls and instrumentation are identified by the letters "ITS" after the instrumentation tag number or control device identifier.

Figure 1.2.8-27. EDGF Nonconfinement Generator Room A ITS HVAC System Ventilation and Instrumentation Diagram

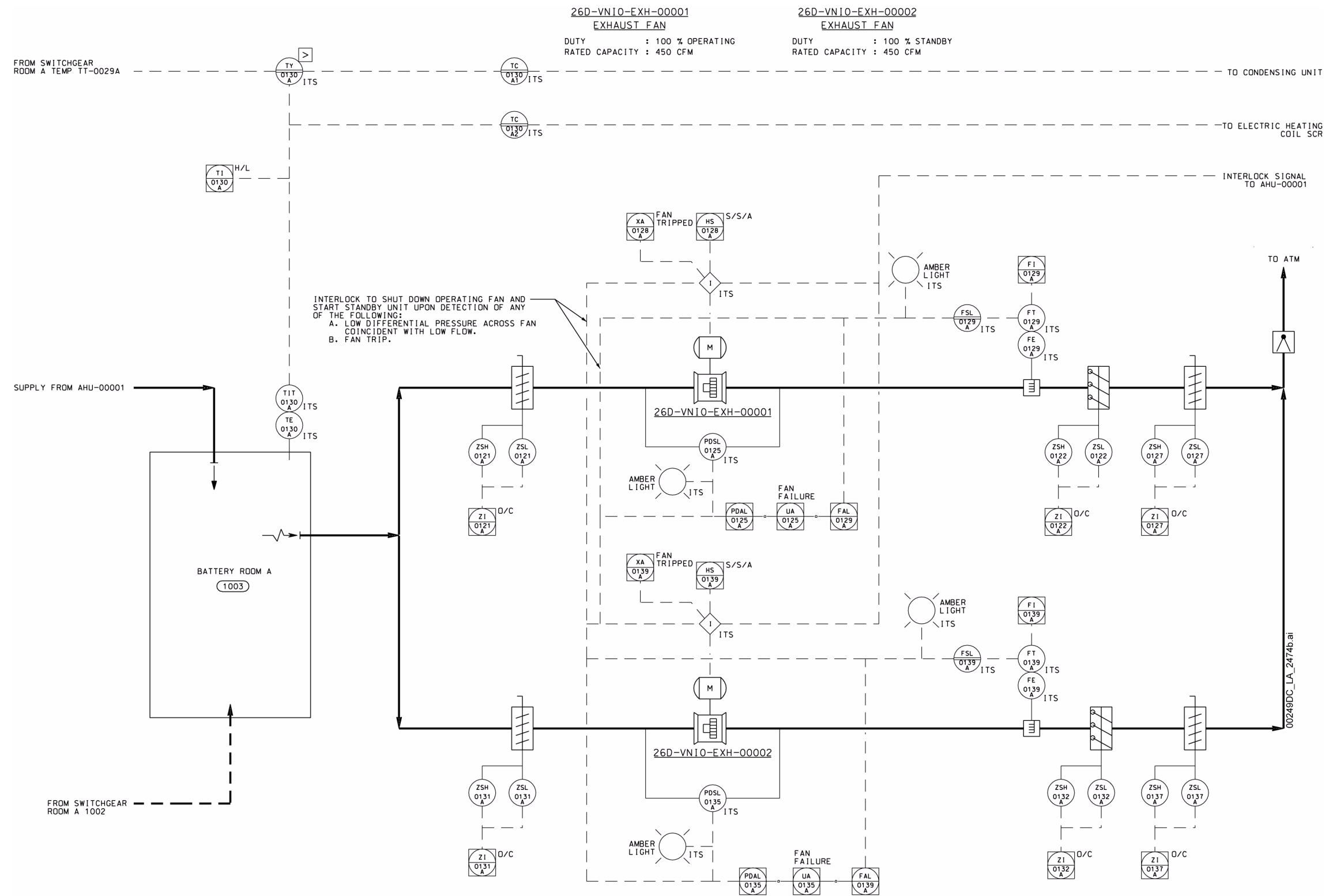
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NOTE: ITS controls and instrumentation are identified by the letters "ITS" after the instrumentation tag number or control device identifier.
 OA = outside air.

Figure 1.2.8-28. EDGF Nonconfinement Switchgear Room A ITS HVAC System Ventilation and Instrumentation Diagram

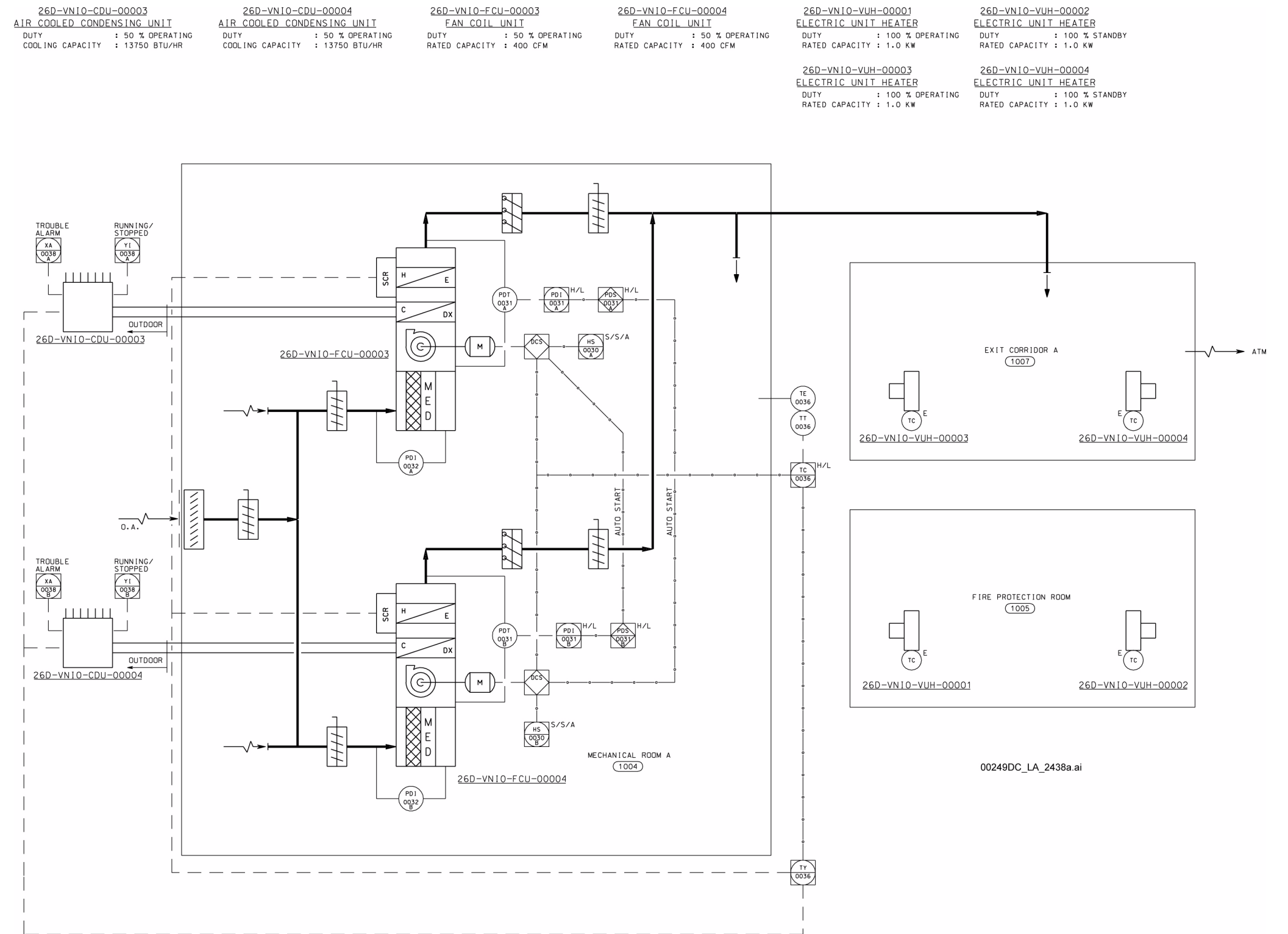
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NOTE: ITS controls and instrumentation are identified by the letters "ITS" after the instrumentation tag number or control device identifier.

Figure 1.2.8-29. EDGF Nonconfinement Battery Room A ITS Exhaust System Ventilation and Instrumentation Diagram

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NOTE: This figure includes no SSCs that are either ITS or ITWI.

Figure 1.2.8-30. EDGF Nonconfinement Non-ITS Mechanical Room A HVAC System Ventilation and Instrumentation Diagram

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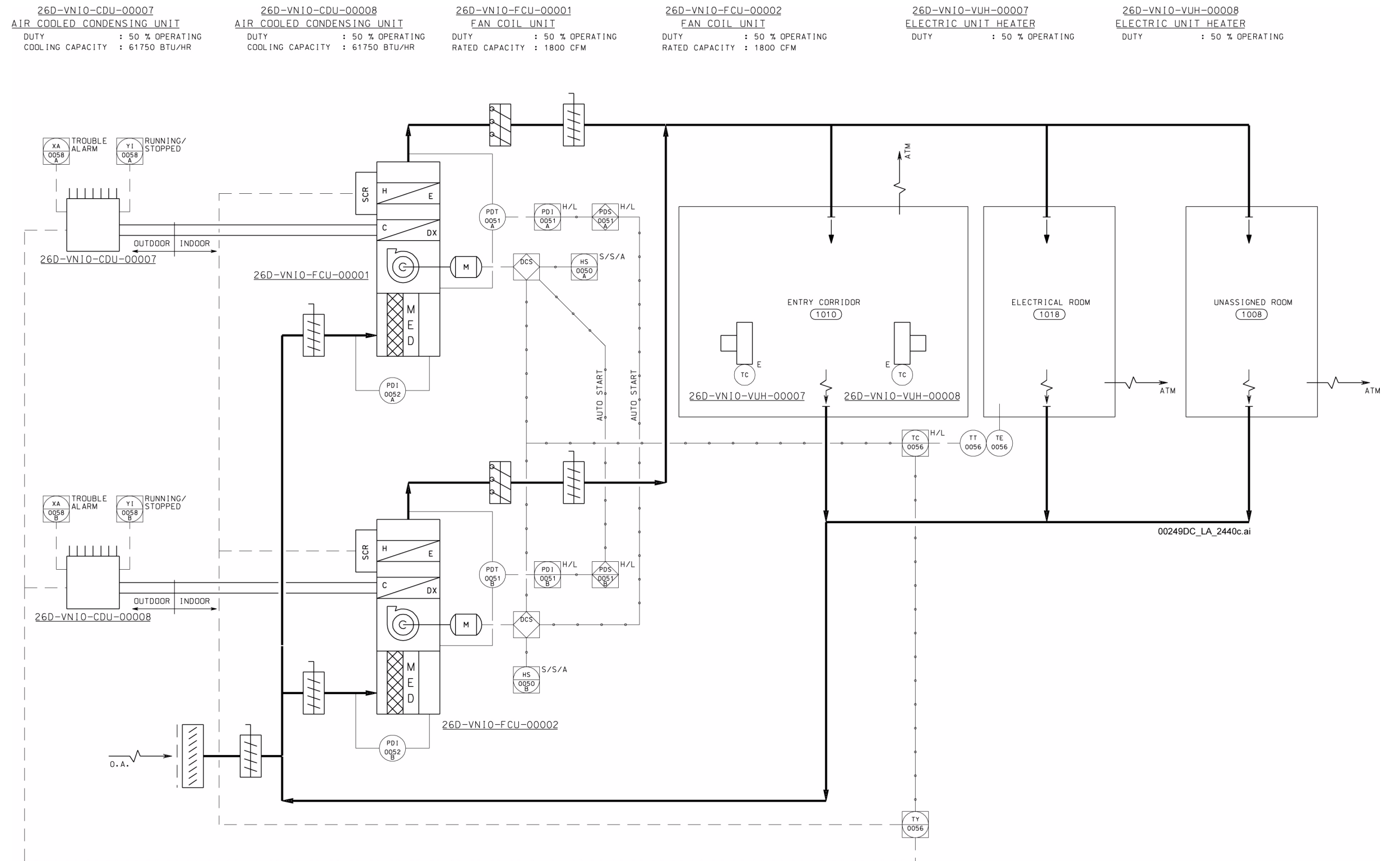
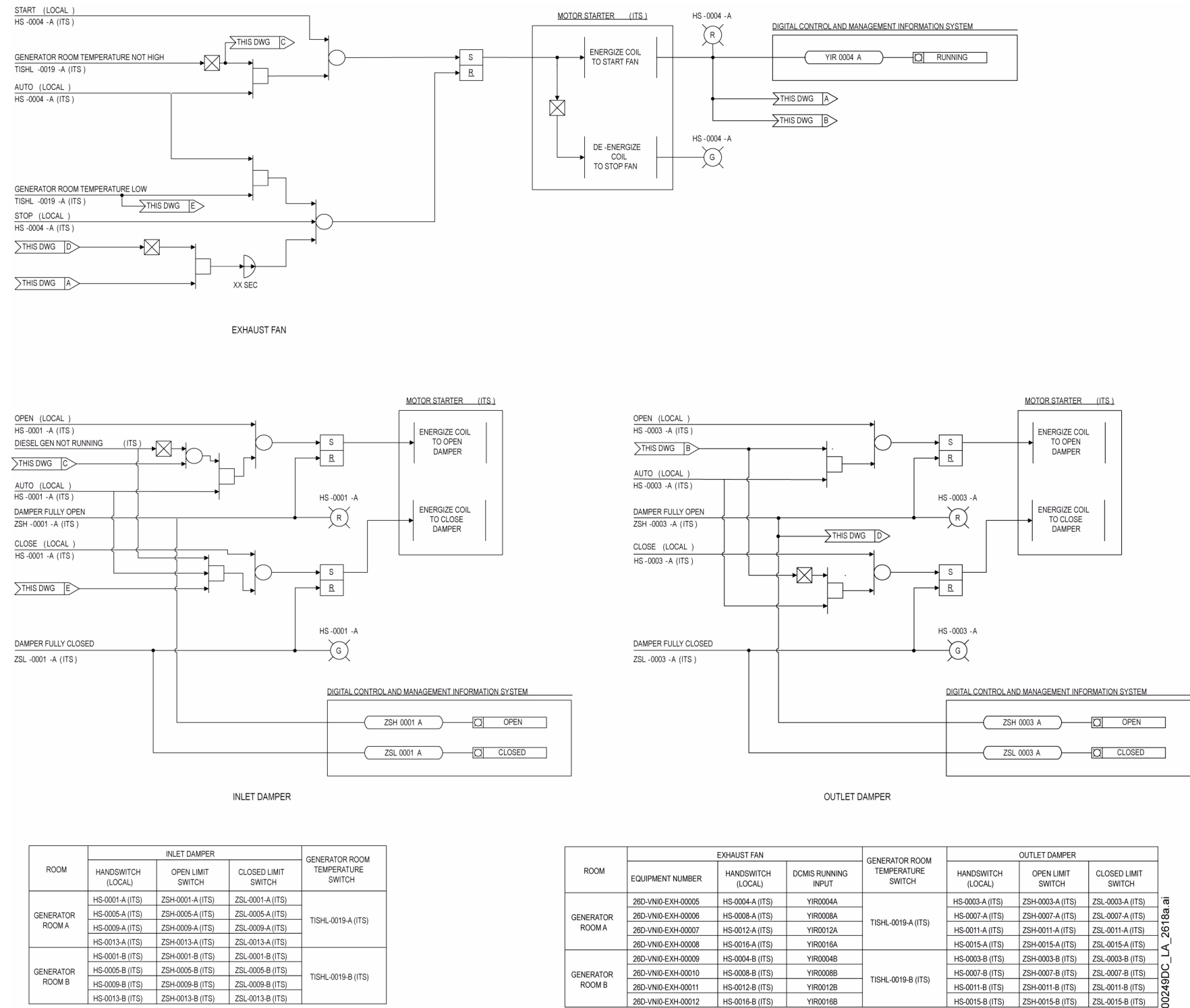


Figure 1.2.8-31. EDGF Nonconfinement Non-ITS Electrical Room HVAC System Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.

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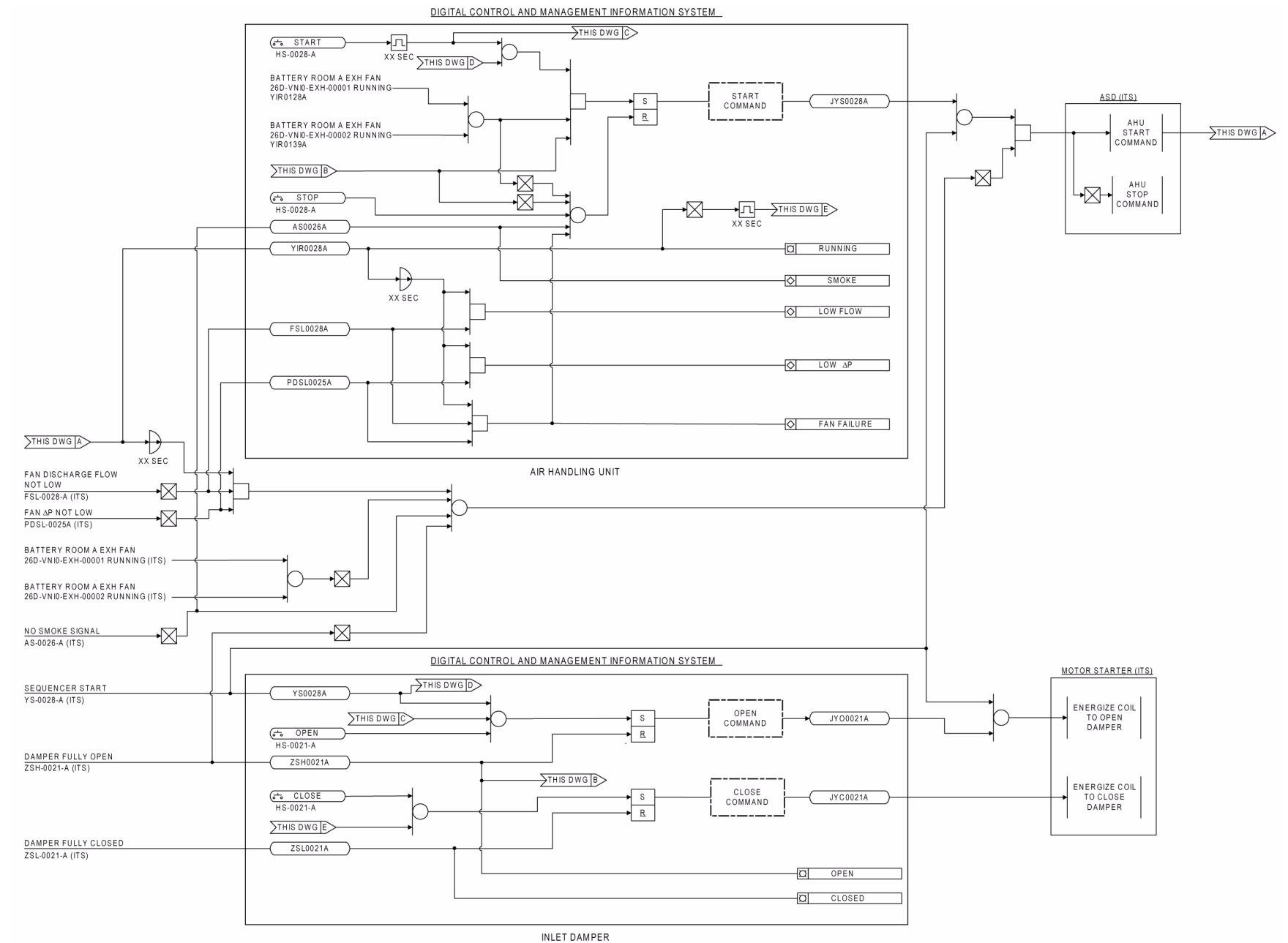


NOTE: Important to safety controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The DCMIS is non-ITS and non-ITWI. Instrumentation tag numbers are prefixed by "26D-VNIO-." Software tag numbers are prefixed by "26DVNIO."

Figure 1.2.8-32. EDGF Nonconfinement Generator Room ITS Exhaust Fans and Dampers Logic Diagram

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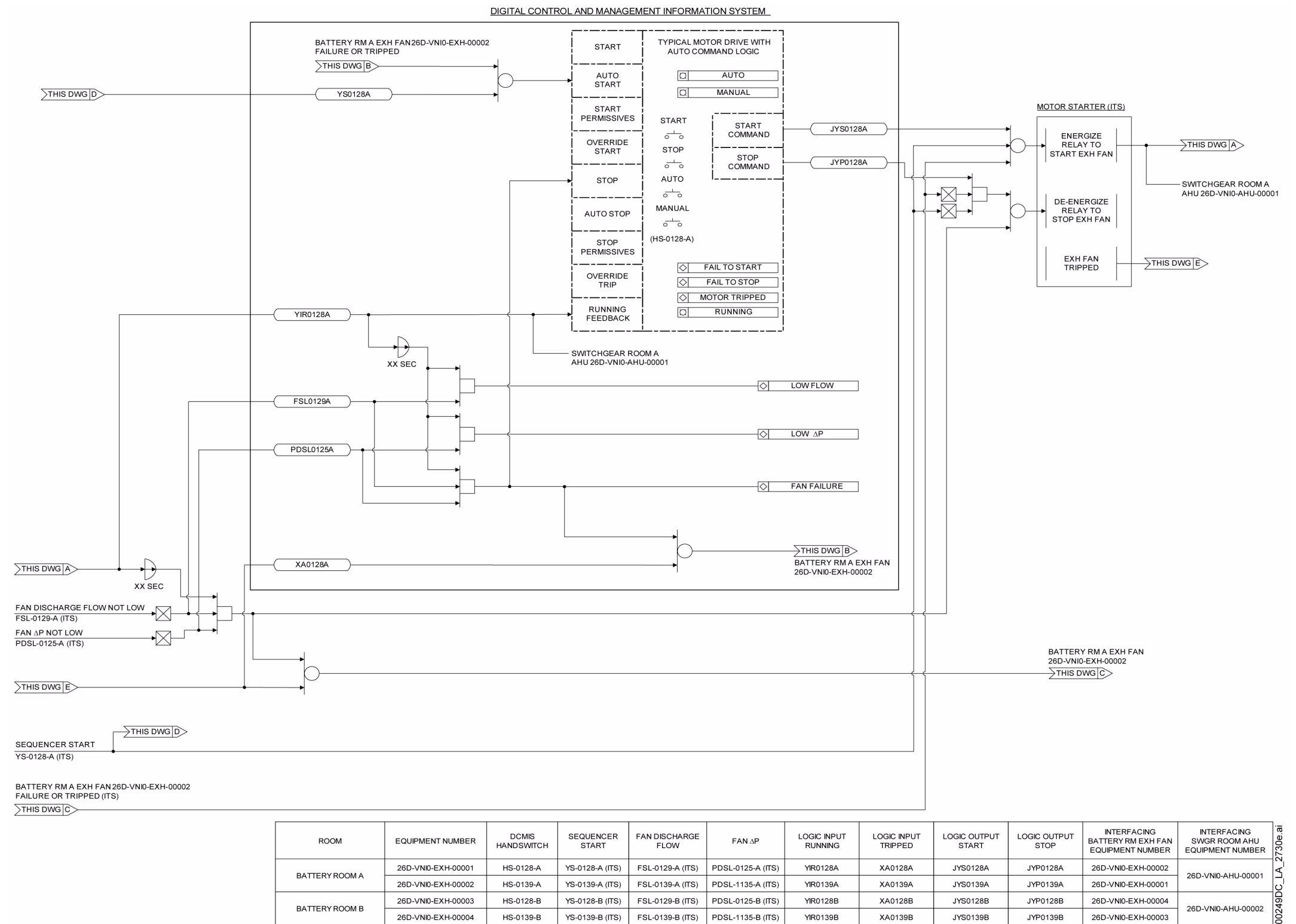
ROOM	AIR HANDLING UNIT							INLET DAMPER					SEQUENCER START		
	EQUIPMENT NUMBER	DCMIS HANDSWITCH	FAN DISCHARGE FLOW	FAN ΔP	SMOKE SWITCH	LOGIC INPUT RUNNING	LOGIC OUTPUT	INTERFACING BATTERY ROOM EXH FANS EQUIPMENT NUMBER / RUNNING SOFTWARE TAG NUMBER	DCMIS HANDSWITCH	OPEN LIMIT SWITCH	CLOSED LIMIT SWITCH	LOGIC OUTPUT OPEN		LOGIC OUTPUT CLOSE	
SWITCHGEAR ROOM A	26D-VNIO-AHU-00001	HS-0028-A	FSL-0028-A (ITS)	PDSL-0025-A (ITS)	AS-0026A (ITS)	YR0028A	JYS0028A	26D-VNIO-EXH-00001 YR0128A	26D-VNIO-EXH-00002 YR0139A	HS-0021-A	ZSH-0021-A (ITS)	ZSL-0021-A (ITS)	JY00021A	JYC0021A	YS-0028-A (ITS)
SWITCHGEAR ROOM B	26D-VNIO-AHU-00002	HS-0028-B	FSL-0028-B (ITS)	PDSL-0025-B (ITS)	AS-0026B (ITS)	YR0028B	JYS0028B	26D-VNIO-EXH-00003 YR0128B	26D-VNIO-EXH-00004 YR0139B	HS-0021-B	ZSH-0021-B (ITS)	ZSL-0021-B (ITS)	JY00021B	JYC0021B	YS-0028-B (ITS)

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NOTE: Important to safety controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The DCMIS is non-ITS and non-ITWI. Instrumentation tag numbers are prefixed by "26D-VNIO-." Software tag numbers are prefixed by "26DVNIO-." ASD = adjustable speed drive.

Figure 1.2.8-33. EDGF Nonconfinement Switchgear Room ITS Air Handling Unit and Inlet Damper Room Logic Diagram

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NOTE: Important to safety controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The DCMIS is non-ITS and non-ITWI. Instrumentation tag numbers are prefixed by "26D-VN10-." Software tag numbers are prefixed by "26DVN10."

Figure 1.2.8-34. EDGF Nonconfinement Battery Room ITS Exhaust Fan Digital Logic Diagram

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-96](#).

Figure 1.2.8-35. Low-Level Waste Facility Confinement Zoning Ground Floor Plan

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This figure has been designated Official Use Only under the Freedom of Information Act (5 U.S.C. 552), Exemption 2, Circumvention of Statute.

This figure is included in Appendix A: Information Designated as Official Use Only, as [Figure A-97](#).

Figure 1.2.8-36. Low-Level Waste Facility Confinement Zoning Second Floor Plan

NOTE: LLW = low-level radioactive waste.

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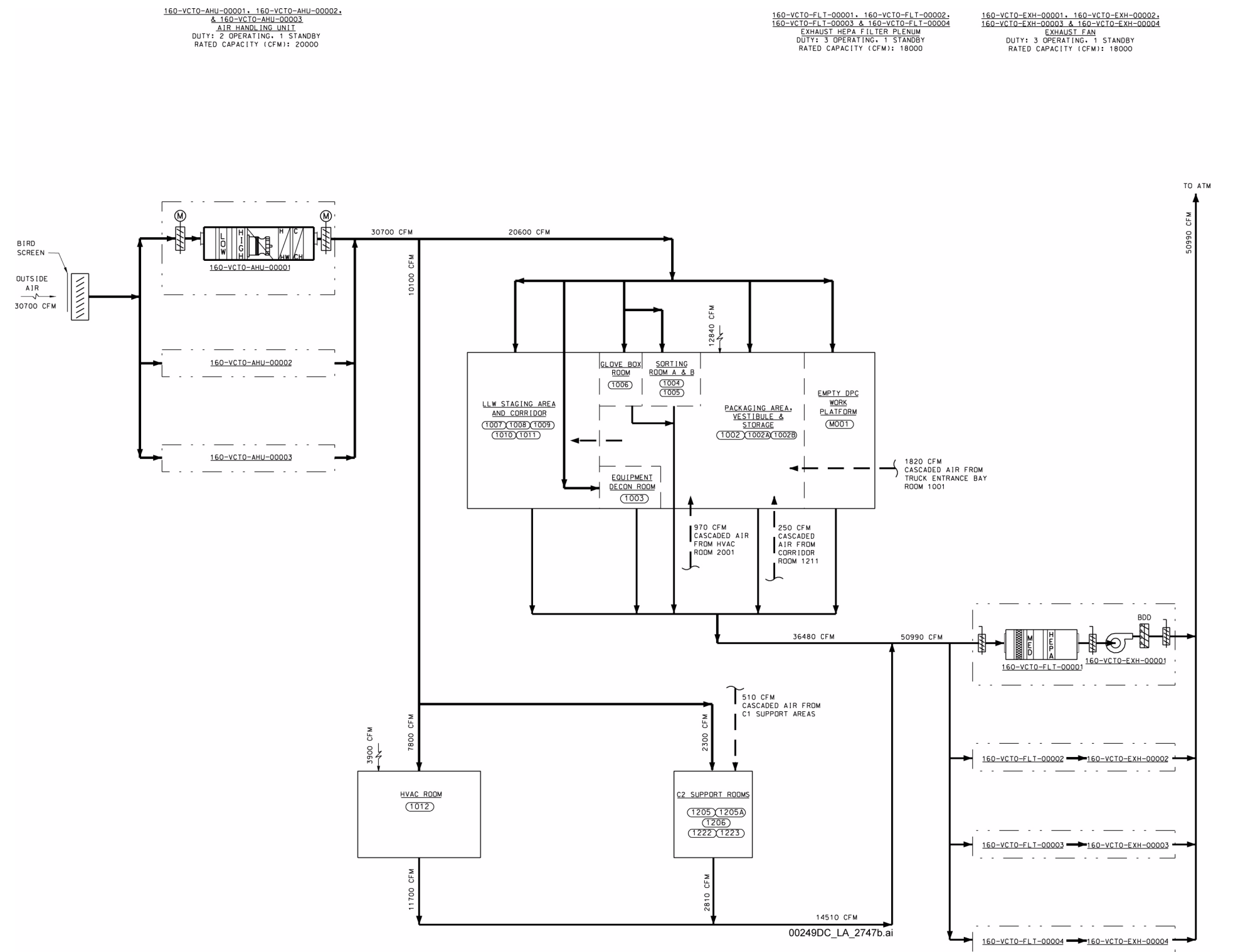


Figure 1.2.8-37. Low-Level Waste Facility Composite Ventilation Flow Diagram Confinement Non-ITS Supply and Exhaust HVAC System

NOTE: This figure contains no SSCs that are either ITS or ITWI.

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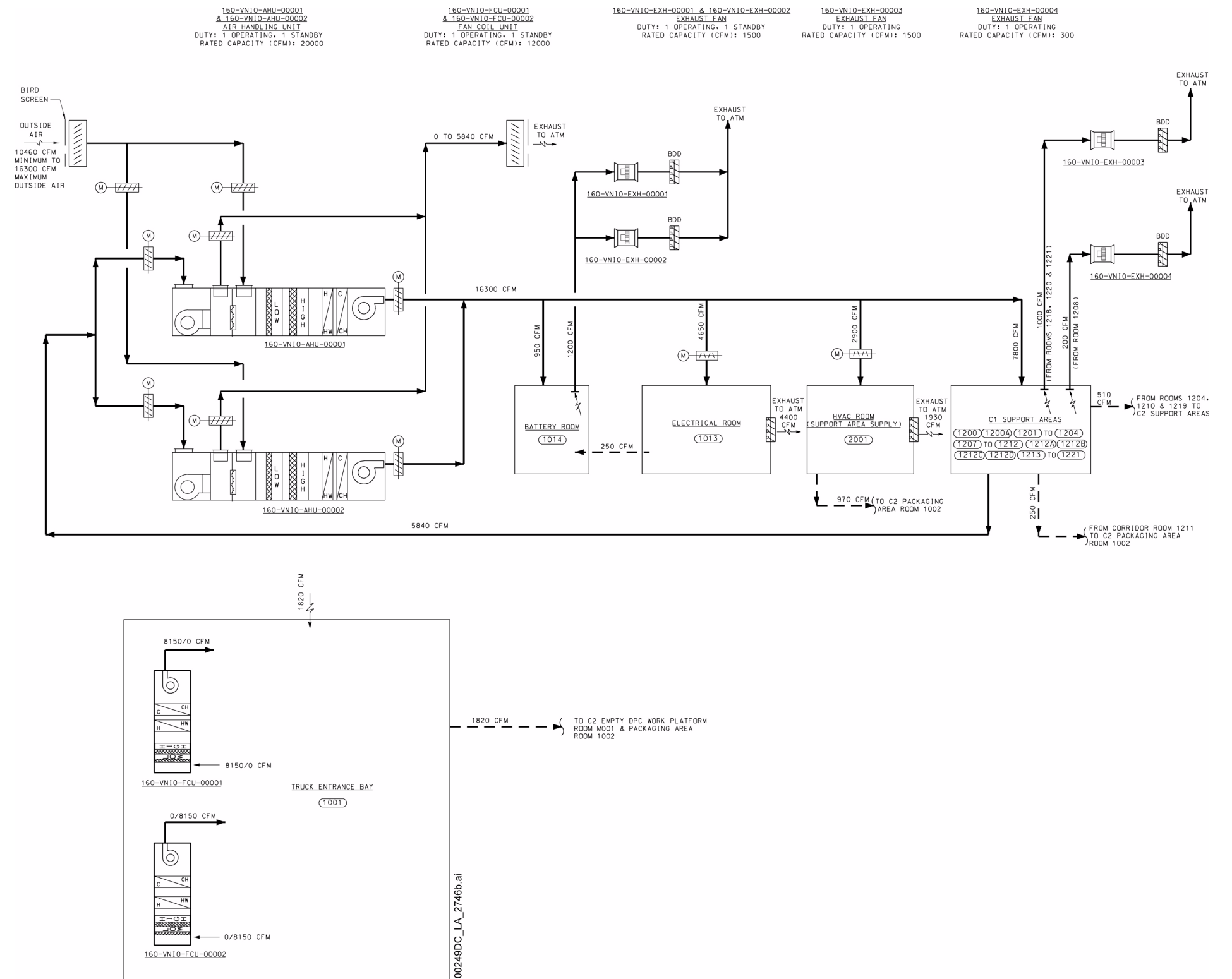


Figure 1.2.8-38. Low-Level Waste Facility Composite Ventilation Flow Diagram Nonconfinement Non-ITS Supply and Exhaust HVAC System

NOTE: This figure contains no SSCs that are either ITS or ITWI.

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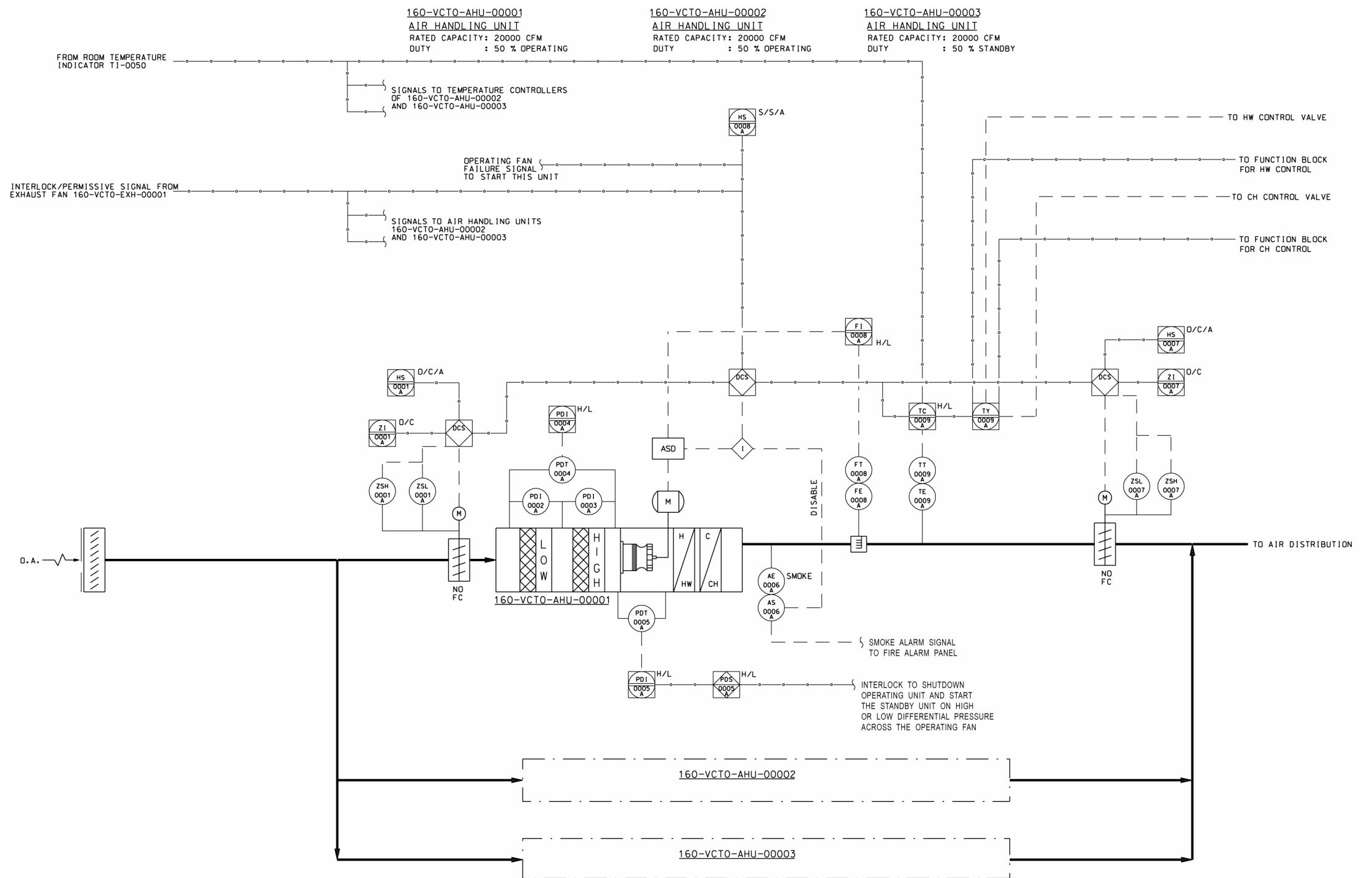


TABLE 1:

MECHANICAL COMPONENT	AIR HANDLING UNIT					INLET DAMPER				OUTLET DAMPER				SMOKE		FLOW				TEMPERATURE				FAN DP		
	HS	PD1	PD1	PDT	PD1	HS	ZI	ZSL	ZSH	HS	ZI	ZSL	ZSH	AE	AS	FE	FT	FI	TE	TT	TC	TY	PDT	PD1	PDS	
160-VCTO-AHU-00001	0008A	0002A	0003A	0004A	0004A	0001A	0001A	0001A	0001A	0007A	0007A	0007A	0007A	0006A	0006A	0008A	0008A	0008A	0009A	0009A	0009A	0009A	0005A	0005A	0005A	
160-VCTO-AHU-00002	0008B	0002B	0003B	0004B	0004B	0001B	0001B	0001B	0001B	0007B	0007B	0007B	0007B	0006B	0006B	0008B	0008B	0008B	0009B	0009B	0009B	0009B	0005B	0005B	0005B	
160-VCTO-AHU-00003	0008C	0002C	0003C	0004C	0004C	0001C	0001C	0001C	0001C	0007C	0007C	0007C	0007C	0006C	0006C	0008C	0008C	0008C	0009C	0009C	0009C	0009C	0005C	0005C	0005C	

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NOTE: This figure contains no SSCs that are either ITS or ITWI. If a smoke alarm is detected, the signal is directed to the fire alarm panel. An interlock is provided to shut down the operating fan and start the standby unit upon detection of high or low differential pressure across the operating fan. CH = chilled water; HW = hot water.

Figure 1.2.8-39. Low-Level Waste Facility Confinement Areas HVAC Supply System Ventilation and Instrumentation Diagram

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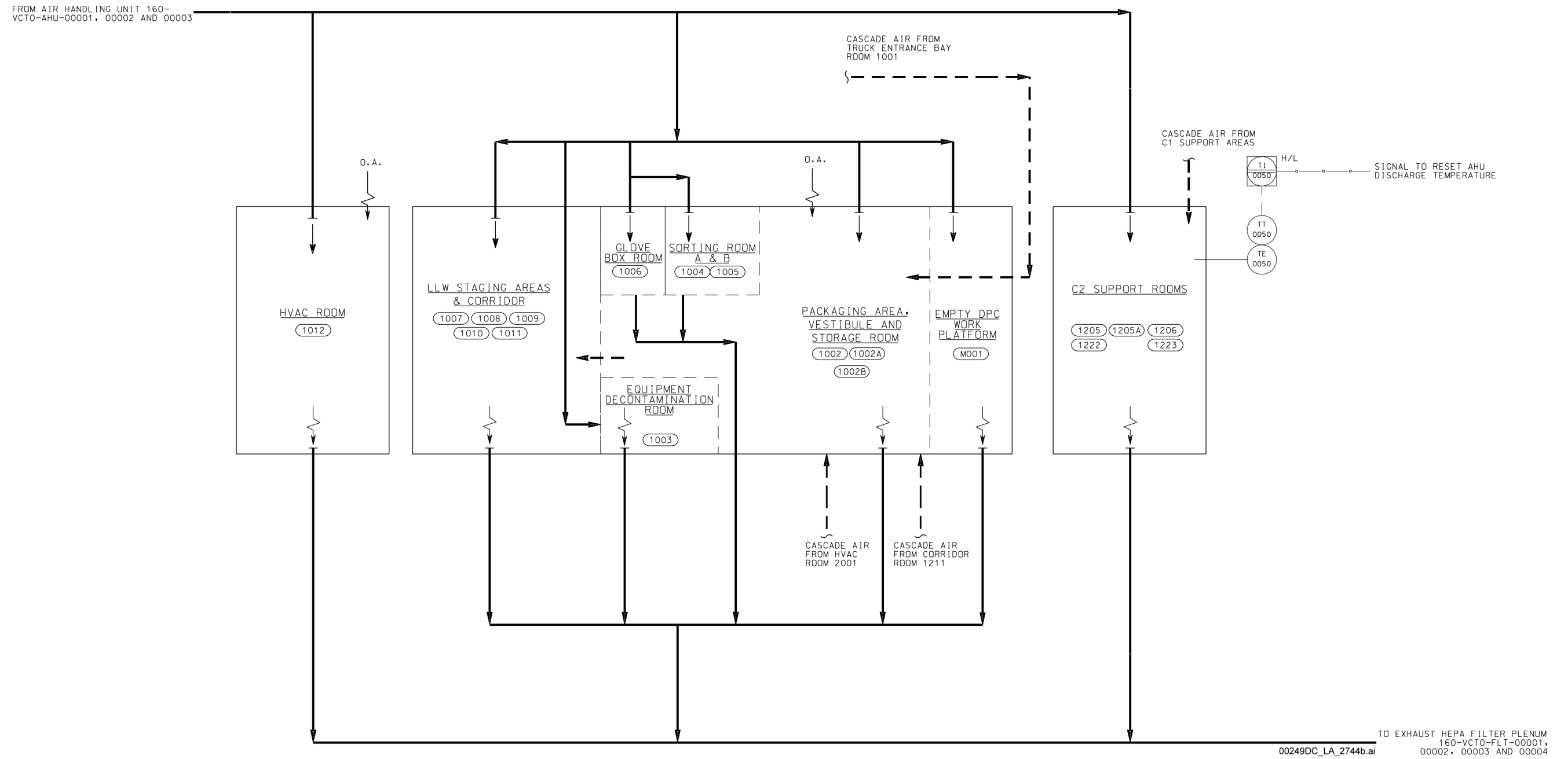


Figure 1.2.8-40. Low-Level Waste Facility Confinement Areas Air Distribution System Ventilation and Instrumentation Diagram

NOTE: This figure contains no SSCs that are either ITS or ITWI. AHU = air handling unit; LLW = low-level radioactive waste.

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160-VCTO-FLT-00001 HEPA FILTER PLENUM RATED CAPACITY : 18000 CFM DUTY : 33 % OPERATING	160-VCTO-FLT-00002 HEPA FILTER PLENUM RATED CAPACITY : 18000 CFM DUTY : 33 % OPERATING	160-VCTO-FLT-00003 HEPA FILTER PLENUM RATED CAPACITY : 18000 CFM DUTY : 33 % OPERATING	160-VCTO-FLT-00004 HEPA FILTER PLENUM RATED CAPACITY : 18000 CFM DUTY : 33 % STANDBY	160-VCTO-EXH-00001 EXHAUST FAN RATED CAPACITY : 18000 CFM DUTY : 33 % OPERATING	160-VCTO-EXH-00002 EXHAUST FAN RATED CAPACITY : 18000 CFM DUTY : 33 % OPERATING	160-VCTO-EXH-00003 EXHAUST FAN RATED CAPACITY : 18000 CFM DUTY : 33 % OPERATING	160-VCTO-EXH-00004 EXHAUST FAN RATED CAPACITY : 18000 CFM DUTY : 33 % STANDBY
---	---	---	---	--	--	--	--

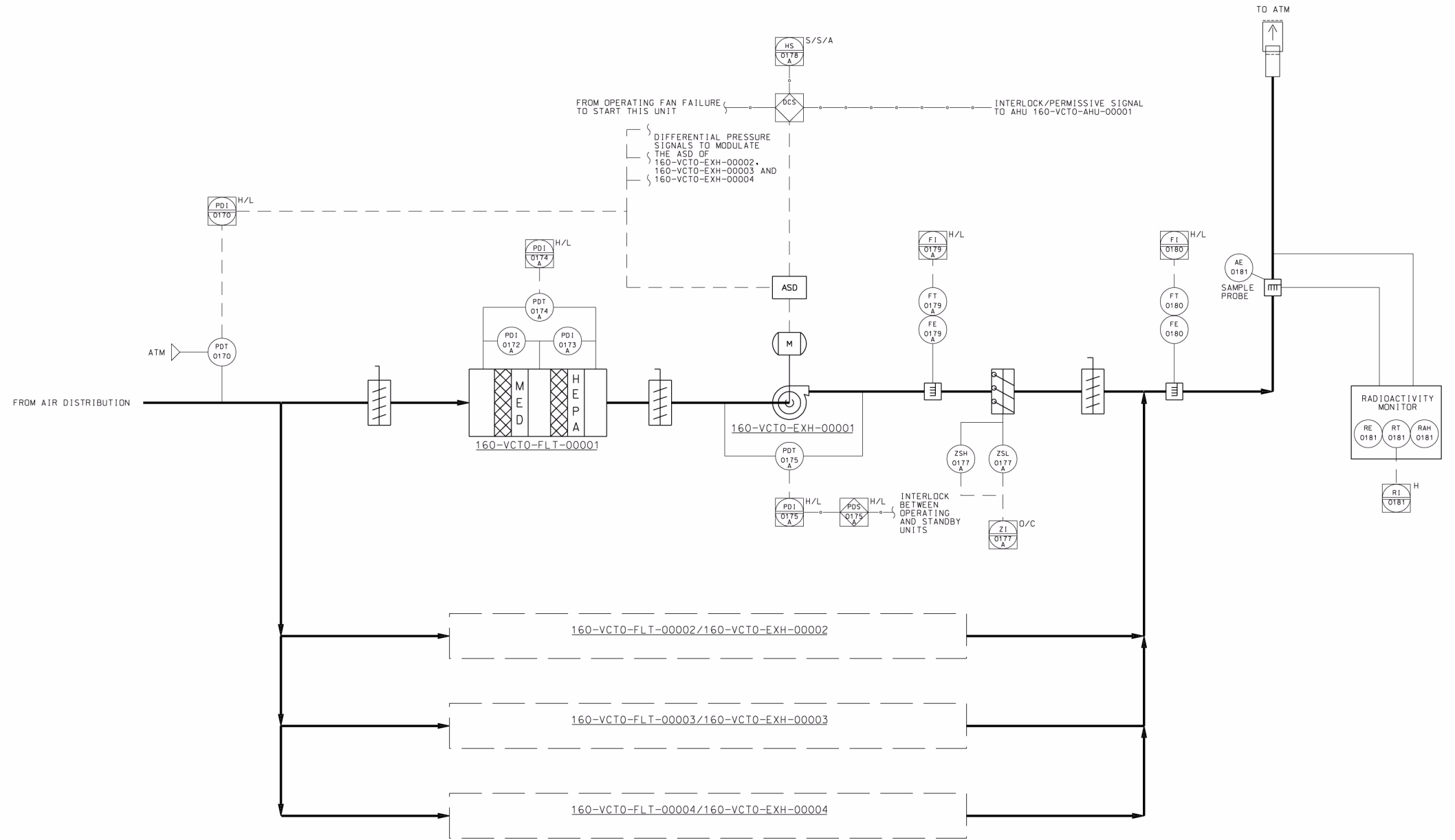


TABLE 1:

MECHANICAL COMPONENT	HEPA PLENUM				MECHANICAL COMPONENT	FAN DP				BACKDRAFT DAMPER			FLOW		
	PDI	PDI	PDT	PDI		FAN	PDT	PDI	PDS	HS	ZSL	ZSH	ZI	FE	FT
160-VCTO-FLT-00001	0172A	0173A	0174A	0174A	160-VCTO-EXH-00001	0175A	0175A	0175A	0178A	0177A	0177A	0177A	0179A	0179A	0179A
160-VCTO-FLT-00002	0172B	0173B	0174B	0174B	160-VCTO-EXH-00002	0175B	0175B	0175B	0178B	0177B	0177B	0177B	0179B	0179B	0179B
160-VCTO-FLT-00003	0172C	0173C	0174C	0174C	160-VCTO-EXH-00003	0175C	0175C	0175C	0178C	0177C	0177C	0177C	0179C	0179C	0179C
160-VCTO-FLT-00004	0172D	0173D	0174D	0174D	160-VCTO-EXH-00004	0175D	0175D	0175D	0178D	0177D	0177D	0177D	0179D	0179D	0179D

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NOTE: This figure contains no SSCs that are either ITS or ITWI. An interlock is provided to shut down the operating fan and start the standby unit upon detection of high or low differential pressure across the operating fan.
ASD = adjustable speed drive.

Figure 1.2.8-41. Low-Level Waste Facility Confinement Non-ITS Areas HEPA Exhaust System Ventilation and Instrumentation Diagram

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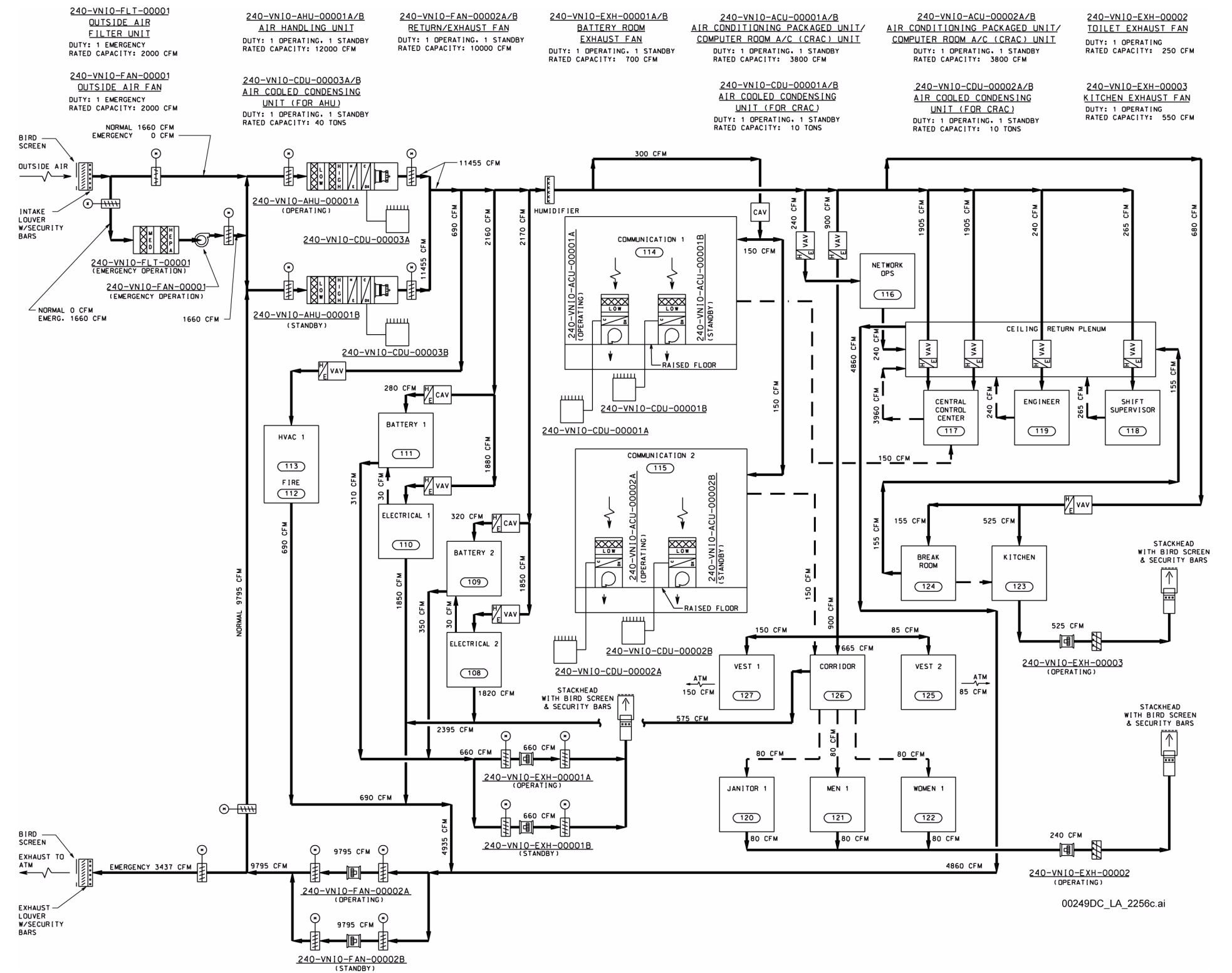


Figure 1.2.8-42. Central Control Center Facility Central Control Center Areas HVAC System Ventilation Flow Diagram

NOTE: This figure contains no SSCs that are either ITS or ITWI. AHU = air handling unit.

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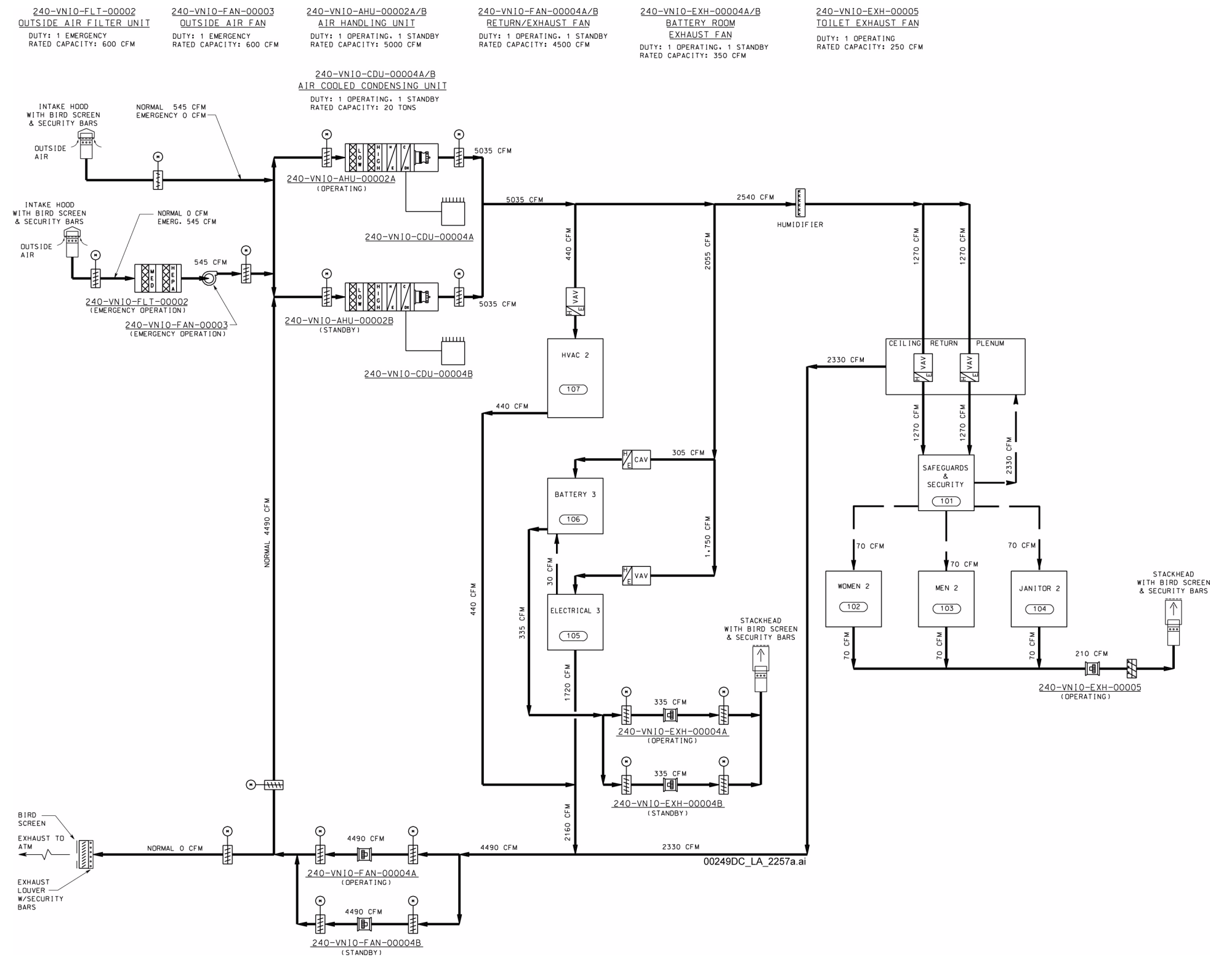


Figure 1.2.8-43. Central Control Center Facility Primary Alarm Station Areas HVAC System Ventilation Flow Diagram

NOTE: This figure contains no SSCs that are either ITS or ITWI.

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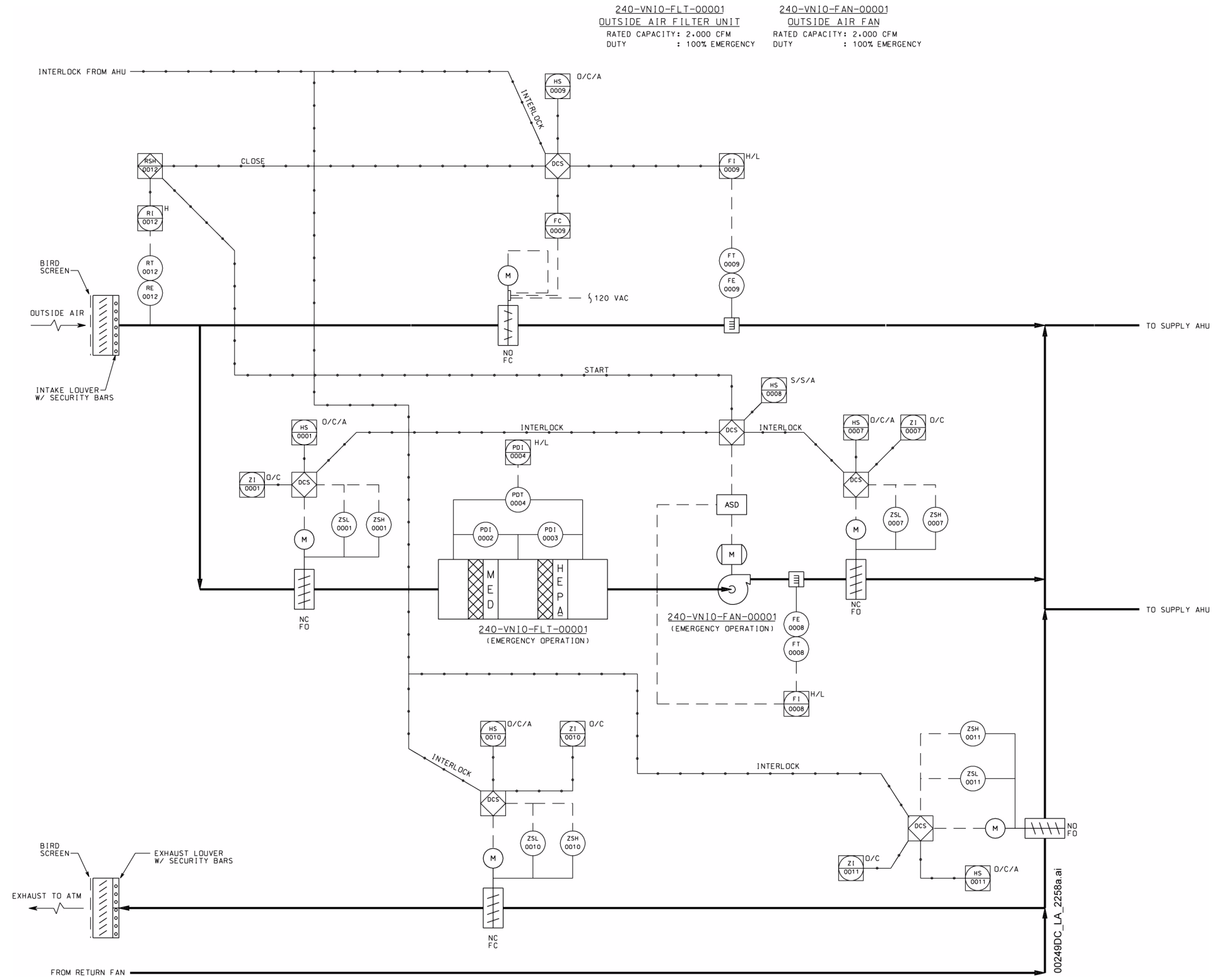
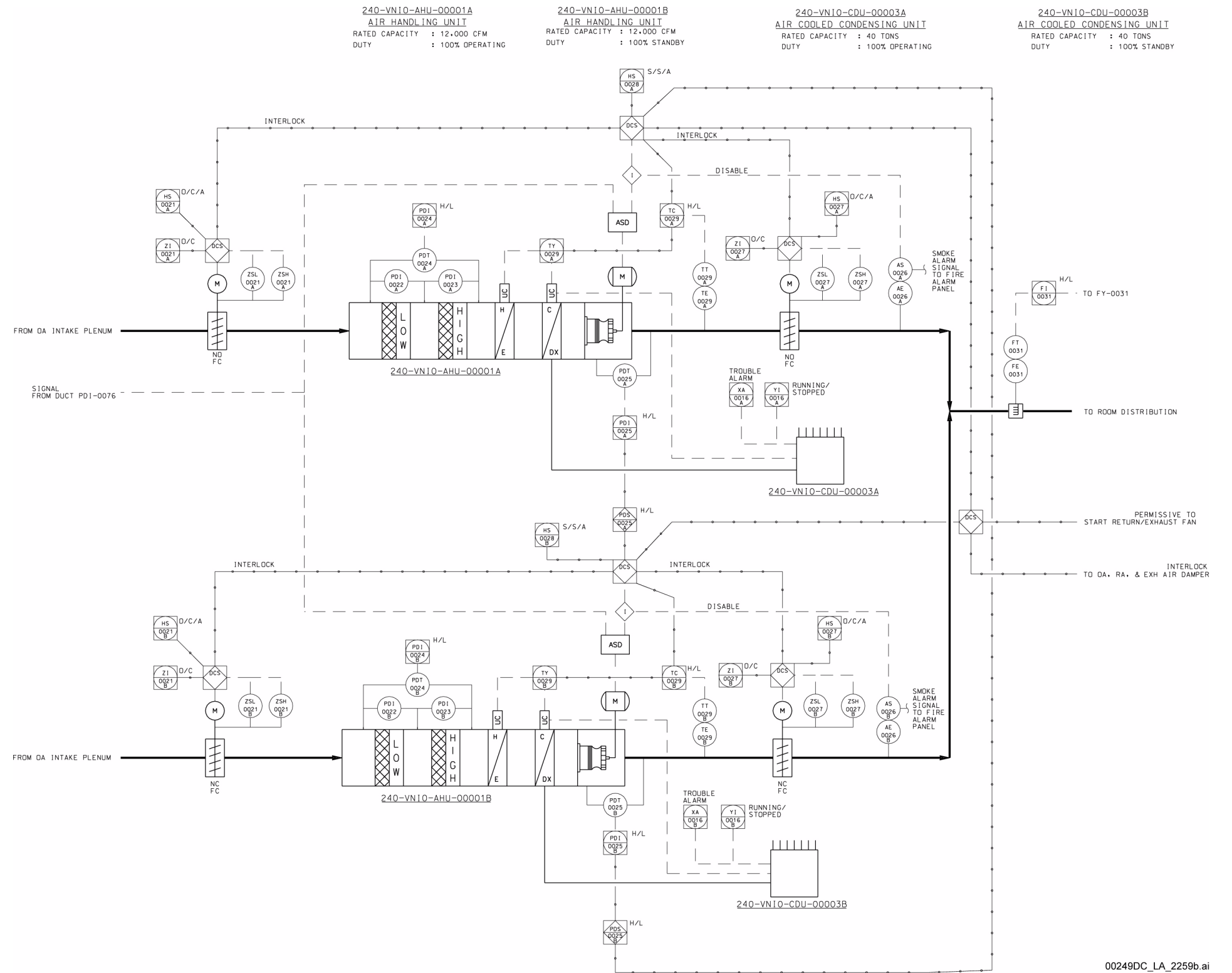


Figure 1.2.8-44. Central Control Center Facility Central Control Center Areas, Return/Exhaust HVAC System Ventilation and Instrumentation Diagram

NOTE: This figure contains no SSCs that are either ITS or ITWI. AHU = air handling unit.

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NOTE: This figure contains no SSCs that are either ITS or ITWI. If a smoke alarm is detected, the signal is directed to the fire alarm panel. An interlock is provided to shut down the operating fan and start the standby unit upon detection of high or low differential pressure across the operating fan. OA = outside air; RA = return air.

Figure 1.2.8-45. Central Control Center Facility Central Control Center Areas Air Handling Unit HVAC System Ventilation and Instrumentation Diagram

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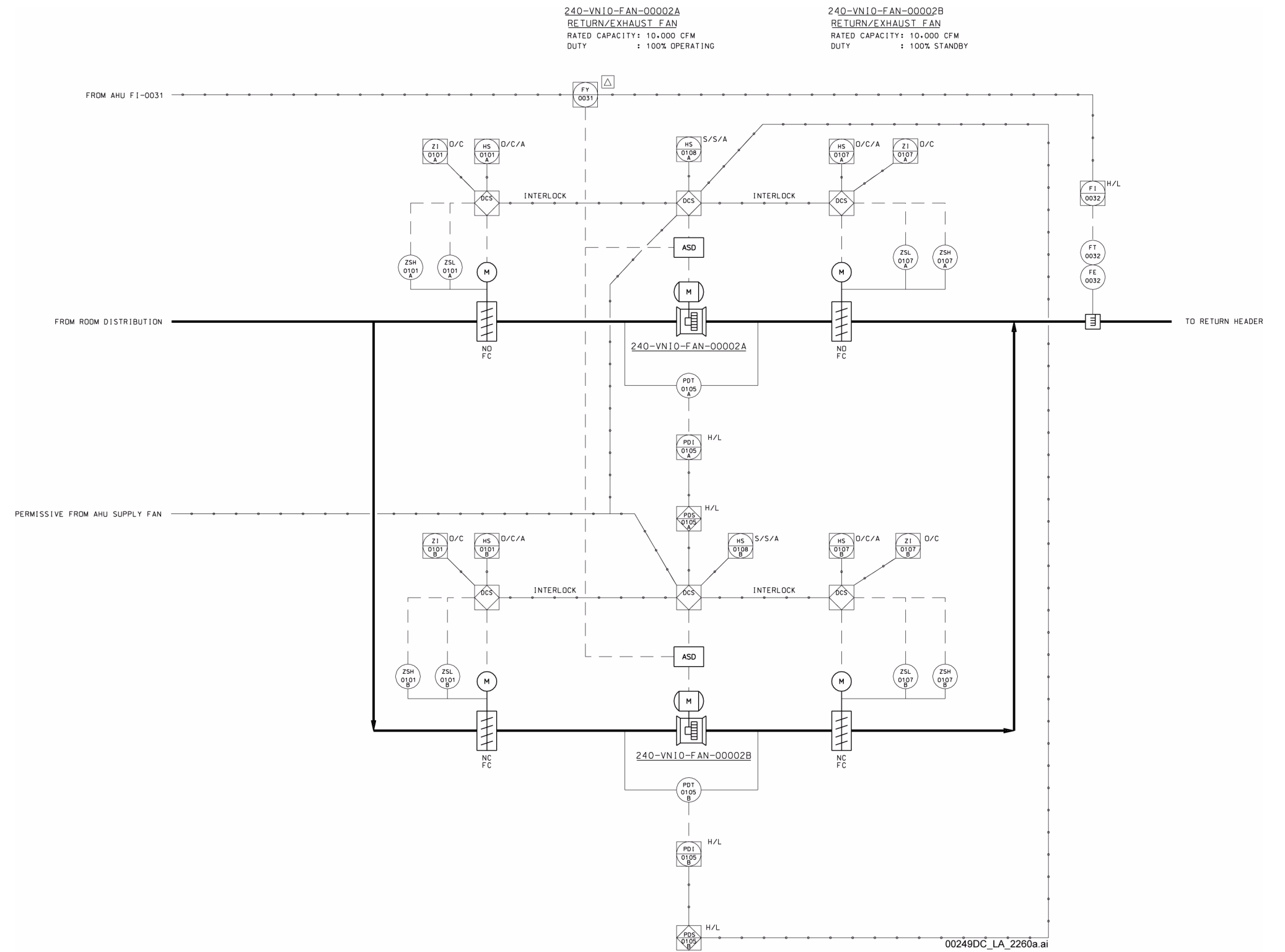
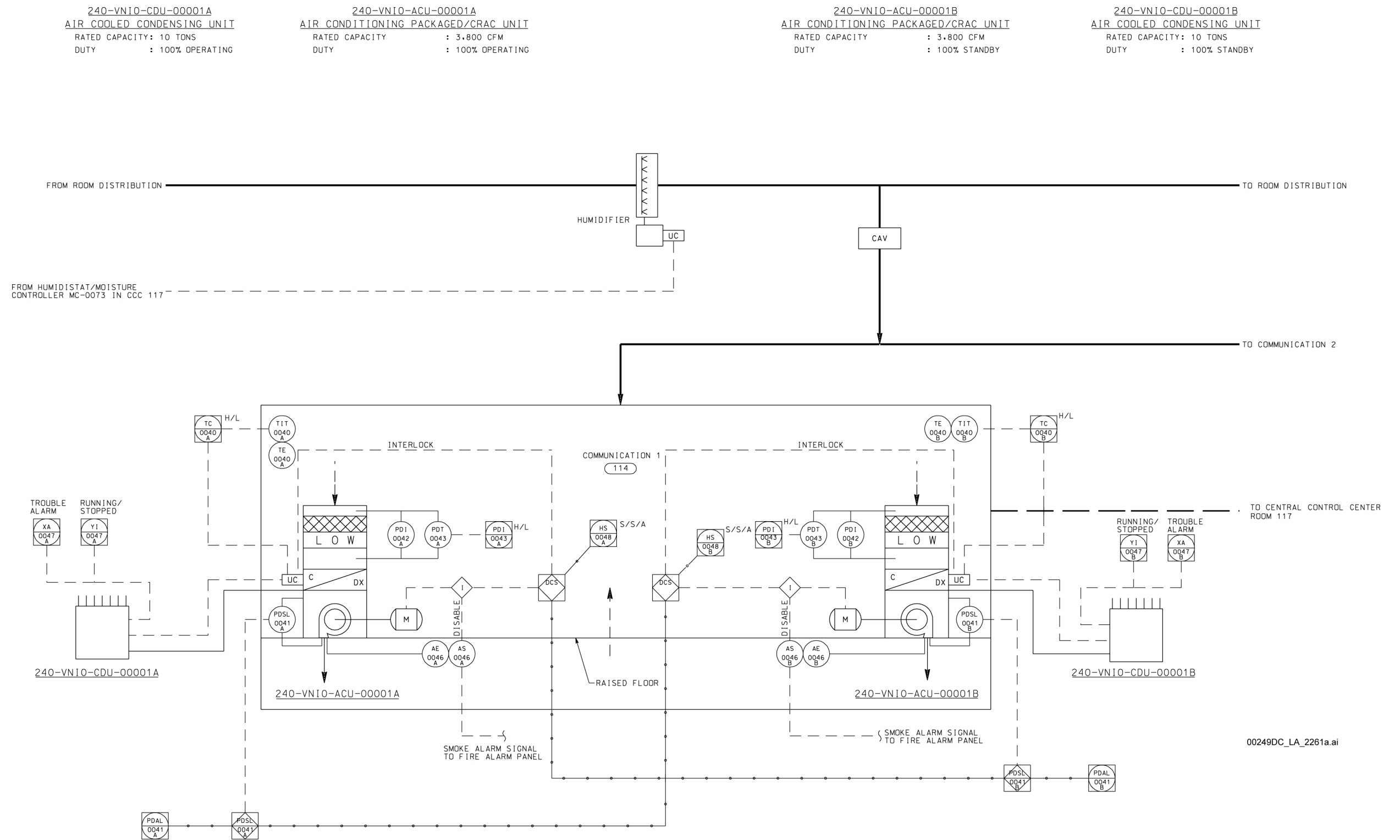


Figure 1.2.8-46. Central Control Center Facility Central Control Center Areas Return/Exhaust Fan HVAC System Ventilation and Instrumentation Diagram

NOTE: This figure contains no SSCs that are either ITS or ITWI. An interlock is provided to shut down the operating fan and start the standby unit upon detection of high or low differential pressure across the operating fan. AHU = air handling unit.

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NOTE: This figure contains no SSCs that are either ITS or ITWI. If a smoke alarm is detected, the signal is directed to the fire alarm panel. An interlock is provided to shut down the operating fan and start the standby unit upon detection of low differential pressure across the operating fan. CCC = Central Control Center.

Figure 1.2.8-47. Central Control Center Facility Central Control Center Areas, Communication Room HVAC System Ventilation and Instrumentation Diagram

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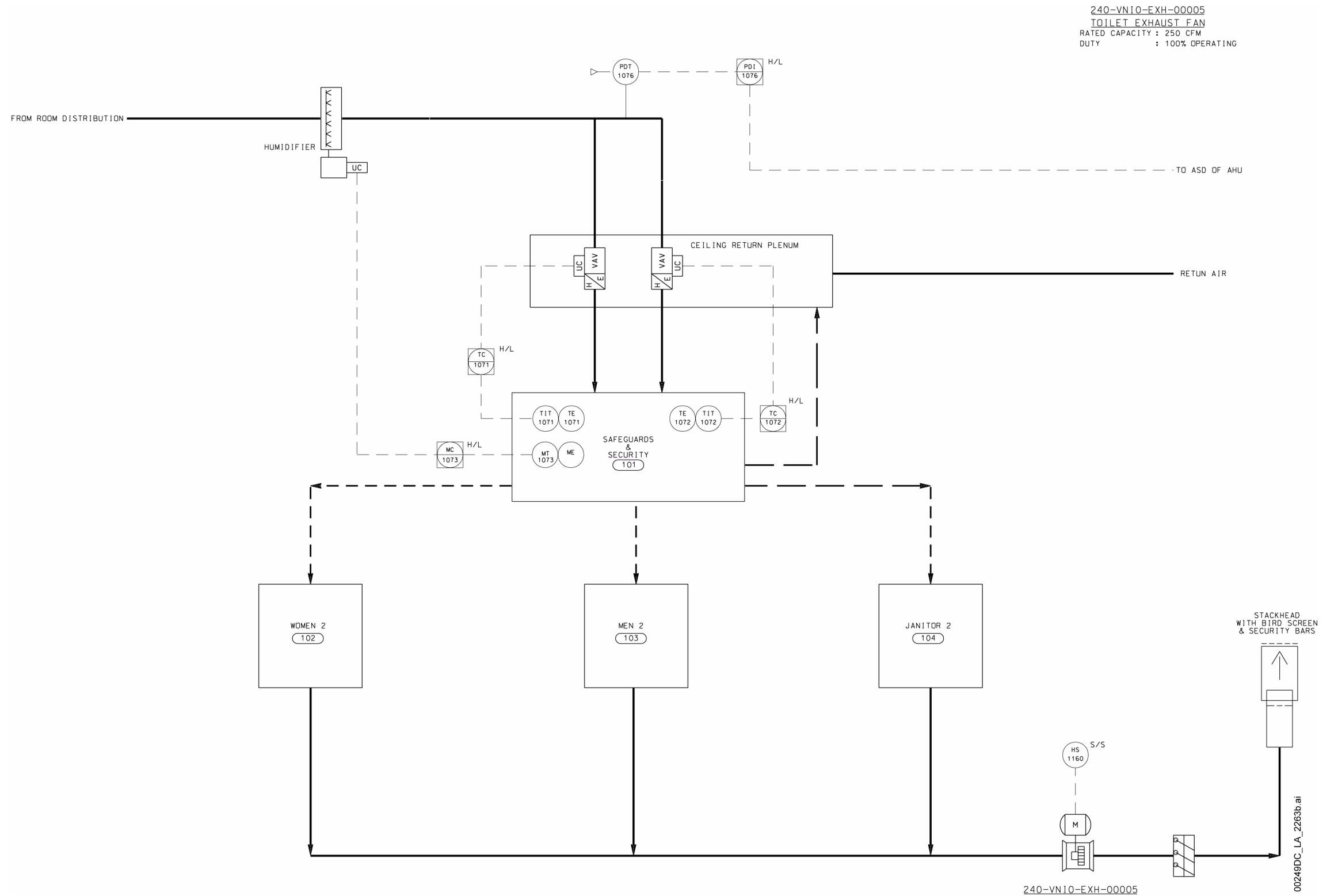


Figure 1.2.8-48. Central Control Center Facility Primary Alarm Station Areas Safeguards and Security Ventilation and Instrumentation Diagram

NOTE: This figure contains no SSCs that are either ITS or ITWI. ASD = adjustable speed drive; AHU = air handling unit.

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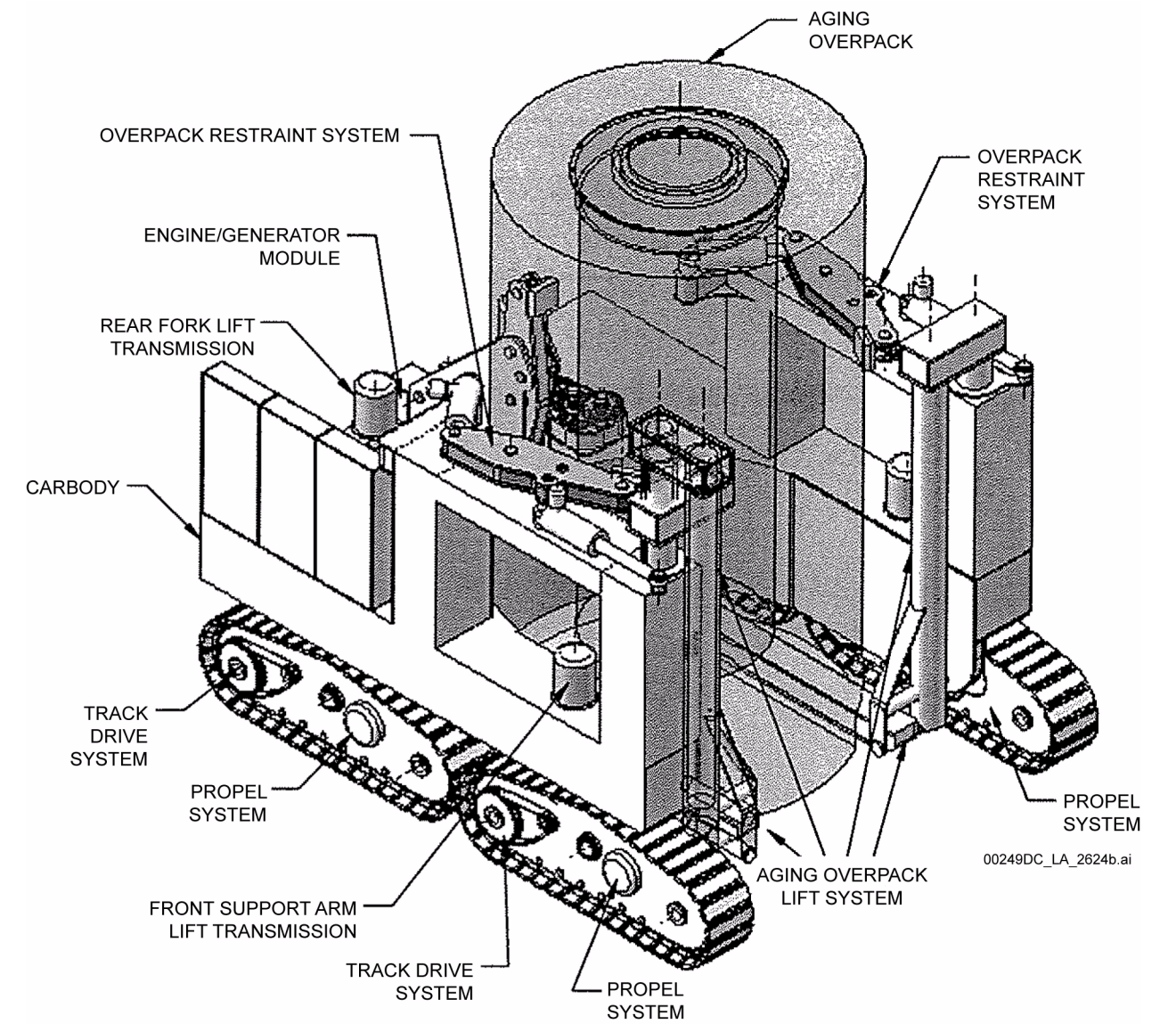
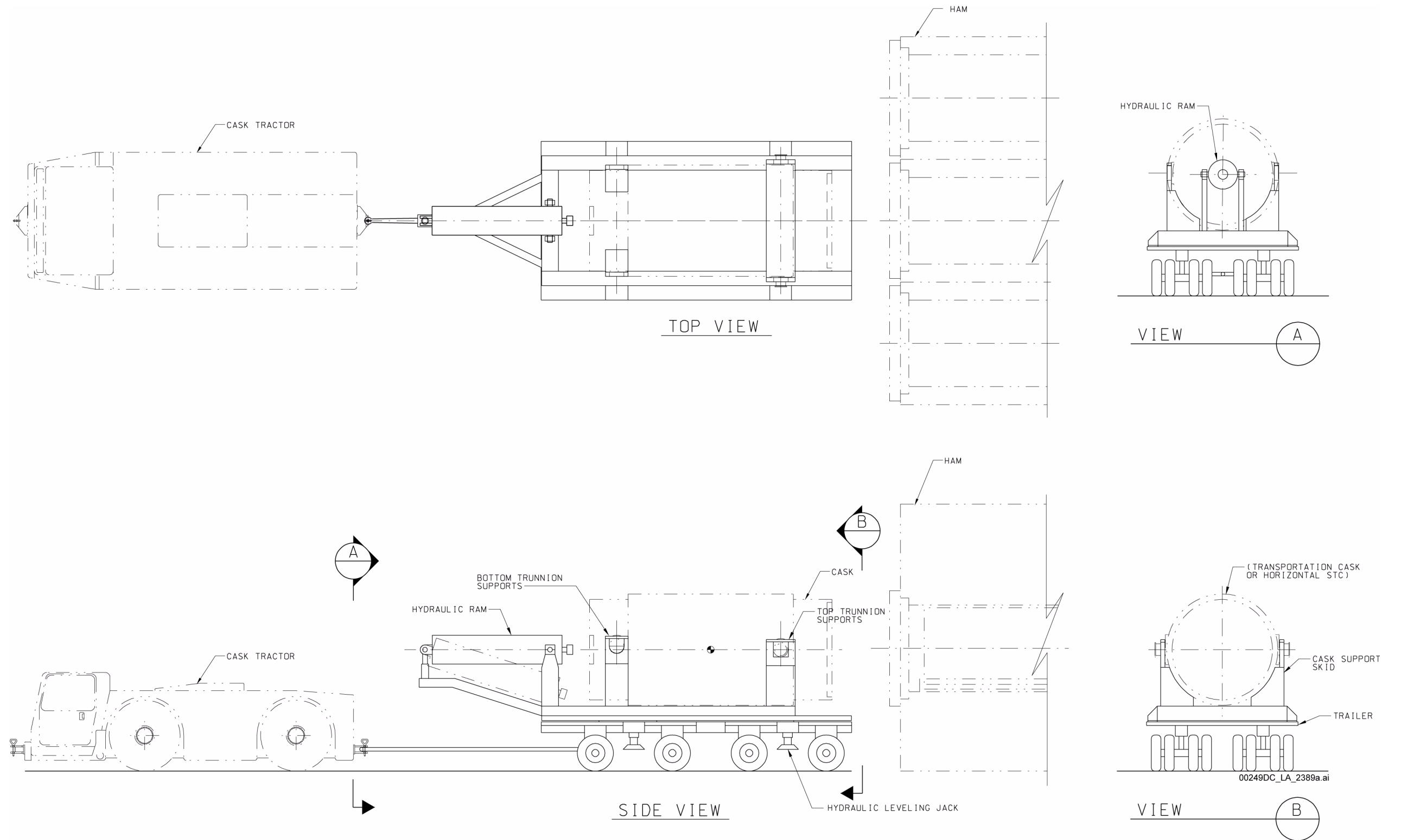


Figure 1.2.8-49. Site Transporter Mechanical Equipment Envelope

Equipment Number: 170-HAT0-MEQ-00001.

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NOTE: STC = shielded transfer cask.

Equipment Number: 170-HAT0-TRLY-00001, Pressurized Water Reactor DPC Cask Transfer Trailer; 170-HAT0-TRLY-00002, Boiling Water Reactor DPC Cask and Horizontal Shielded Transfer Cask Transfer Trailer.

Figure 1.2.8-50. Cask Tractor and Cask Transfer Trailer Mechanical Equipment Envelope

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