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1.2.5 Wet Handling 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 Wet Handling Facility (WHF) 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 WHF, 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 WHF, are discussed in Section 1.2.4.2. Table 1.2.5-1 lists the non-ITS mechanical handling SSCs used in the WHF, which are similar to those in other handling facilities. WHF-specific non-ITS SSCs in the mechanical handling system are summarized in Table 1.2.5-2. Non-ITS SSCs in the mechanical handling system that are used in handling facilities, including the WHF, are described in Table 1.2.4-1.

1.2.5.1 Wet Handling 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)]

1.2.5.1.1 Facility Description

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

- Receive transportation casks containing uncanistered commercial spent nuclear fuel (SNF) assemblies transported from the truck or rail buffer areas and rail-based transportation casks containing dual-purpose canisters (DPCs) from the rail buffer area. The casks or DPCs may contain failed commercial SNF assemblies that are handled in the WHF.

- Repackage commercial SNF from transportation casks and DPCs into transportation, aging, and disposal (TAD) canisters that are closed and transported to either the Aging Facility or a Canister Receipt and Closure Facility (CRCF).

- Receive vertical DPCs in aging overpacks from the Receipt Facility or the Aging Facility. Receive horizontal DPCs in horizontal shielded transfer casks from the Aging Facility.

- Transfer DPCs from aging overpacks and rail-based transportation casks into shielded transfer casks for the purpose of handling within the WHF.
- Receive empty TAD canisters contained in vertical shielded transfer casks for transfer into the pool to be loaded.
- Prepare transportation casks for unloading by removing impact limiters; inspecting, upending, and removing casks from their conveyances; gas sampling; and unbolting the cask lid(s).
- Transfer transportation casks into the pool for lid removal and transfer of commercial SNF to an empty TAD canister or to a staging rack in the pool.
- Transfer loaded TAD canisters contained within a vertical shielded transfer cask out of the pool to be closed.
- Open DPCs contained within a shielded transfer cask outside of the pool, move shielded transfer casks containing a DPC into the pool, and transfer commercial SNF inside the DPC to a TAD canister or to the staging rack in the pool.
- Replace the lid(s) on the unloaded transportation casks. The transportation casks are inspected, surveyed, and decontaminated prior to leaving the facility.
- Prepare unloaded DPCs contained within a shielded transfer cask for removal from the facility.
- Receive TAD canisters requiring rework or repair and provide the capability to open nonconforming TAD canisters.
- Control the water level and quality of the pool water to facilitate commercial SNF handling. Provide control, retention, and disposal of radioactive materials collected in the ion-exchange resins and disposable filters.
- Maintain commercial SNF criticality control in the pool using soluble and fixed neutron absorbers in the staging racks.
- Conduct maintenance, radiological surveys, minor decontamination, and low-level radioactive waste collection, as required.
- Confine and control the radioactive sources during normal operations, off-normal operations, and event sequences.
- Control radiation exposure, temperature, and 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 WHF is an ITS surface structure located south of CRCF 1 and the Emergency Diesel Generator Facility and east of the North Portal of the repository. The WHF is physically separated from other surface buildings to isolate it from interactions with the other facilities during a seismic event. The location of the WHF relative to the other surface facilities is shown in Figures 1.2.1-1 and 1.2.1-2. The WHF 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 WHF building is a reinforced concrete structure made of noncombustible materials with interior and exterior shear walls, concrete floor, concrete roof slab diaphragms, concrete mat foundations, and a pool. The overall footprint of the WHF is approximately 385 ft by 395 ft. The ITS portion of the structure is approximately 385 ft by 300 ft. The maximum height of the building is 100 ft above grade, with the majority of the building under a roof 80 ft above grade. The WHF also has a below-grade pool substructure, which is approximately 116 ft by 116 ft, including the rooms surrounding the pool that provide internal buttresses for the actual pool. The internal dimensions of the pool are 74 ft wide by 61 ft long. The concrete base mat for the basement structure (pool and surrounding rooms) mat is 52 ft below the top of the at-grade concrete mat.

The foundation for the WHF is reinforced concrete mat at grade and another reinforced concrete mat below the pool having the necessary thickness to adequately support the structure. The foundation mat at grade for the WHF structure is 6 ft thick and the pool foundation is an 8-ft-thick mat. The foundation mats at grade for the two vestibules are 4 ft thick. The vestibules are structural steel with metal siding. The superstructure consists of 4-ft-thick exterior and interior concrete walls, except in the pump and filter rooms where the nonstructural partition walls are 1-ft-thick walls. The internal shielded rooms are also made up of 4 ft-thick concrete walls and top slab. Other elevated floor diaphragm slabs are generally 2 ft thick. The below grade portion of the structure consists of 8-ft-thick exterior earth retaining walls and 4-ft-thick walls separating interior rooms from the pool. The nonstructural partition walls within the pool are 2 ft thick.

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

Ancillary areas of the facility that are not categorized as ITS include the low-level radioactive waste staging area and connecting personnel corridors and rooms (Rooms 1005, 1011A, 1012A, 1013, and 1014), the utility room and electrical room (Rooms 1017 and 1046), external elevators and stairway structures (Rooms 1028, 1030, and 1032A, 1034, and 1035), a portion of the general support area (Rooms 1026, 1036, 1037, 1202, 1203, 1204, and 1218A), and miscellaneous outdoor concrete pads supporting non-ITS equipment. Each of these structures is classified as non-ITS and is constructed on structurally independent foundations using lighter concrete construction. These ancillary areas and rooms are primarily made up of insulated metal panels on steel framing that are attached to, but fall outside the footprint of, the WHF main structure. The foundations for the WHF ancillary non-ITS structures and equipment are reinforced concrete slabs as necessary to adequately support the structures or equipment. The non-ITS portions of the WHF will not compromise the integrity of the WHF ITS main structure in a DBGM-2 event.

General arrangement floor plans for the various floors of the WHF and the associated legend are shown in Figures 1.2.5-1 to 1.2.5-5. Cross-section views of the facility are shown in Figures 1.2.5-6 to 1.2.5-14. The roof plan is shown in Figure 1.2.5-15. The plan of the below-grade pool is shown in Figure 1.2.5-16. The ITS and non-ITS areas of the WHF are shown in Figure 1.2.5-2. 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 WHF provides the space, layout, structures, and systems to support commercial SNF handling operations and closure of TAD canisters. This facility also provides a safe environment for personnel and equipment involved in commercial SNF transfer operations. The WHF has a limited capacity, in-process SNF staging area in the pool. This consists of storage racks that can contain and segregate pressurized water reactor (PWR) SNF assemblies and boiling water reactor (BWR) SNF assemblies as well as damaged-fuel cans.

The WHF is divided into areas for handling activities and areas to support these activities. Handling activities are performed in the following areas: transportation cask vestibule and site transporter vestibule (Rooms 1001 and 1023), cask preparation area (Room 1016), loading room (Room 1007), cask unloading room (Room 1008), pool (Room P001), and canister transfer room (Room 2004). The support areas include the gas sampling room (Room 1010), operations room (Room 2012), decontamination pit (Room P002), various HVAC equipment rooms (Rooms 1004, 1006, 1021, M001, 2002, 2003, and 2010), various electrical equipment rooms (Rooms 1002, 1019, 1046, and 2001), battery rooms (Rooms 1003, 1020, and 2001A), a canister transfer machine maintenance room (Room 1009), a crane maintenance area (Room 2008), various pool cleanup equipment rooms (Rooms 1005, 1042A, B, and C, 1043A, B, and C, and 1044A, B, and C), a maintenance room (Room 1018), and a utility room (Room 1017).

The radiation/radiological monitoring system provides for monitoring of dose rates and airborne radioactivity levels in the WHF 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 if thresholds are exceeded. The system and alarms are monitored in the facility operations room and the Central Control Center.

The WHF is designed to provide radiation protection to workers, the public, and the environment, to minimize exposure in accordance with as low as is reasonably achievable dose principles. Features for minimization and control of radioactive contamination within the WHF 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 exposure to repository workers. Interlocks on shield doors are provided to ensure that workers are not inadvertently exposed to high radiation. Major mechanical handling equipment in the WHF includes cranes, the cask transfer trolley, the canister transfer machine, the spent fuel transfer machine, and associated lifting fixtures and devices.

An overview of the major areas in the WHF is provided below.

1.2.5.1.1.1 Cask Receipt Area

1.2.5.1.1.1.1 Transportation Cask Vestibule (Room 1001)

The transportation cask vestibule is used to receive trucks and railcars carrying loaded transportation casks from the truck or rail buffer areas and cask transfer trailers towed by a cask tractor carrying loaded horizontal shielded transfer casks from the aging facility. The transportation cask vestibule is also used to export unloaded casks and unloaded DPCs in shielded transfer casks.

1.2.5.1.1.1.2 Site Transporter Vestibule (Room 1023)

The site transporter vestibule is used to receive and export aging overpacks that are empty or contain DPCs and TAD canisters. The aging overpack lid bolts are removed and installed in this area. Site transporters move loaded aging overpacks out of the WHF via the site transporter vestibule.

1.2.5.1.1.2 Cask Preparation Area (Room 1016)

The cask preparation area includes areas for cask receipt, cask preparation, TAD canister closure, and DPC cutting, and the pool area.

The main equipment access ways into the cask preparation area are through the transportation cask vestibule and the cask unloading room. The cask preparation area is equipped with a 200-ton cask handling bridge crane, a 10-ton auxiliary pool crane, and a spent fuel transfer machine. Additionally, the rails of the 20-ton entrance vestibule from the transportation cask vestibule extend across the east end of the cask preparation area.

Spent Nuclear Fuel Assembly Transfer Area—The WHF pool (Room P001) is located in the cask preparation area (Room 1016), where the transfer of SNF assemblies takes place. The spent fuel transfer machine is used to transfer SNF assemblies from a DPC or transportation cask to either a TAD canister or the SNF staging rack. The bridge of the spent fuel transfer machine accommodates a viewing platform allowing personnel to observe pool operations and control the spent fuel transfer machine operations.

Dual-Purpose Canister Cutting Area—The DPC cutting station is located on the north side of the cask preparation area (Room 1016). The DPC cutting machine cuts open a DPC, which has been vented and filled with treated borated water, in a dry environment.

Transportation, Aging, and Disposal Canister Closure Area—The TAD canister closure station is located on the south side of the cask preparation area (Room 1016) and is used to close TAD canisters before they are inserted in an aging overpack and sent to the Aging Facility or moved to a CRCF for placement of the TAD canister into a waste package.

Pool Area—The pool area is located in the cask preparation area (Room 1016) and consists of the pool (Room P001) and decontamination pit (Room P002). The pool is used to transfer SNF assemblies into a TAD canister or stage SNF assemblies in a staging rack in the pool. The pool is a concrete structure with a stainless steel liner plate. The liner plate is flush with the walls and floor of the pool. All of the stainless steel joints are monitored for leakage with a system of channels and two collection sumps.

1.2.5.1.1.3 Canister Transfer Area

The canister transfer area includes the canister transfer room (Room 2004), loading room (Room 1007), and cask unloading room (Room 1008).

The canister transfer room is used for the transfer of DPCs and TAD canisters between transportation casks, shielded transfer casks, and aging overpacks.

The loading room receives aging overpacks with loaded DPCs for transfer to a shielded transfer cask and receives unloaded aging overpacks for the acceptance of loaded TAD canisters.

The cask unloading room receives transportation casks containing loaded DPCs for transfer to a shielded transfer cask; receives shielded transfer casks with loaded TAD canisters for transfer to an aging overpack; receives unloaded shielded transfer casks for the acceptance of a loaded DPC from an aging overpack or loaded DPC from the canister transfer machine; and exports unloaded shielded transfer casks and transportation casks.

1.2.5.1.2 Operational Processes

Figure 1.2.5-17 shows the operational sequences and material flow through the WHF. Figure 1.2.5-18 shows the inventory of waste forms in the WHF at any one time. Figure 1.2.5-19 illustrates the major waste processing functions performed in the WHF.

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

1.2.5.1.2.1 Cask Handling

The WHF normally receives DPCs contained in aging overpacks or horizontal shielded transfer casks and uncanistered SNF assemblies contained in transportation casks. The WHF has the capability of receiving DPCs in rail-based transportation casks, but these are normally handled by the Receipt Facility to expedite transportation cask turnaround time. The WHF has the capability to receive DPCs in horizontal shielded transfer casks from the Aging Facility. Once received, the horizontal shielded transfer casks containing DPCs are transferred to the DPC cutting station and treated as any other DPC. DPCs that are received in aging overpacks or rail-based transportation casks are transferred to shielded transfer casks in the cask unloading and loading rooms using the canister transfer machine. The shielded transfer cask containing the DPC is then moved to the cask preparation area. The DPC is sampled, vented, cooled if necessary, and filled and flushed with treated borated water prior to cutting open the final DPC lid and prior to placement in the pool. The treated borated water is used for shielding and cooling and to limit the impact on pool water cleanliness by crud contained within the DPC. The treated borated water piping is connected with and processed through the WHF pool water treatment system. The shielded transfer cask lid is removed before the DPC cutting operation and replaced before the shielded transfer cask is moved to the pool. Transportation casks containing uncanistered SNF assemblies are moved to the cask preparation area, where the casks are purged and filled with treated borated water prior to being placed in the pool. When unloaded, the transportation cask is removed from the pool and rinsed prior to it being drained; the transportation cask lid(s) is replaced and the transportation cask is surveyed for contamination and decontaminated, prior to leaving the WHF. Once in the pool, the shielded transfer cask and DPC or transportation cask is opened to access and retrieve the SNF. A TAD canister contained within a shielded transfer cask is loaded with SNF assemblies from the transportation cask, DPC, and/or the staging racks. After loading is complete, the shielded transfer cask containing the loaded TAD canister is removed from the pool and placed in the cask preparation area where the TAD canister is drained, dried, inerted, and welded closed. The loaded TAD canister is transferred from the shielded transfer cask into an aging overpack in the loading room and then transported to a CRCF or to the Aging Facility.

1.2.5.1.2.2 Spent Nuclear Fuel Assembly Transfer

The cask handling crane is used to lower a transportation cask or DPC contained within a shielded transfer cask to the bottom of the pool, where the transportation cask or shielded transfer cask containing a DPC is then opened to allow access to the SNF assemblies inside. The SNF assemblies consist of PWR or BWR fuel; therefore, the spent fuel transfer machine uses the PWR grapple or the BWR grapple to remove the SNF assemblies. The SNF assemblies are then transferred to a TAD canister or to the SNF staging rack. If the cask or canister contains damaged-fuel cans, these are transferred in the same manner. A limited number of special oversized cells are provided as part of the SNF staging racks to accommodate damaged-fuel cans or baskets shipped to the site or encountered during SNF transfer within the WHF pool.

1.2.5.1.2.3 Dual-Purpose Canister Cutting

DPC cutting is done at the DPC cutting station in the cask preparation area. The DPC contained within a shielded transfer cask is transferred to the DPC cutting station using the cask handling crane. To limit personnel radiation exposure, a shield ring is installed. The DPC cutting jib crane is used to remove the shielded transfer cask lid, and the DPC cutting machine is then placed onto the DPC outer lid. The DPC outer lid weld is then cut, and the DPC cutting jib crane is used to remove the DPC cutting machine and the outer lid. The DPC cutting machine has an integral vacuum system to remove metal cuttings during the cutting process. The DPC cutting machine is placed back onto the DPC to cut the siphon and vent port cover welds. The siphon and vent ports are used to sample and vent the DPC interior and fill the DPC with treated borated water in preparation for transfer to the pool. The DPC cutting machine is then used to cut the final weld on either the inner lid or the shield plug, depending on the DPC type. If the DPC is a type that has an inner lid, the inner lid is removed from the DPC after the weld is cut. A lifting adapter is then attached to the shield plug. The lid to the shielded transfer cask is replaced using the DPC cutting jib crane. The shield ring is removed. The shielded transfer cask containing the DPC is then transferred from the DPC cutting station to the pool, where the shielded transfer cask lid is removed. If the DPC is a type that has a siphon tube attached to the shield plug, the shield plug is raised above the shielded transfer cask and the siphon tube is detached from the shield plug using the siphon tube shear tool. The detached siphon tube remains in the DPC. The shield plug is placed in a staging area in the pool. The spent fuel transfer machine then accesses the interior of the DPC to remove the SNF assemblies.

1.2.5.1.2.4 Transportation, Aging, and Disposal Canister Closure

TAD canister closure is done at the TAD canister closure station in the cask preparation area. The shielded transfer cask containing a loaded TAD canister is moved from the pool to the TAD canister closure station using the cask handling crane. The TAD canister closure jib crane is used to remove the shielded transfer cask lid, a shield ring is installed to limit personnel radiation exposure, and the TAD canister is partially drained to the pool via the siphon port to lower the water level below the shield plug in preparation for welding. The TAD canister welding machine is then positioned onto the TAD canister shield plug using the TAD canister closure jib crane, and the shield plug is welded in place. A drying and inerting system is connected to the siphon and vent ports in the shield plug to drain and dry the interior of the TAD canister and backfill it with helium gas. The shield ring is removed. Port covers are placed over the siphon and vent ports and welded in place using the TAD canister welding machine. The outer lid is then placed onto the TAD canister using the TAD canister closure jib crane and welded in place. The lid to the shielded transfer cask is installed using the TAD canister closure jib crane. The shielded transfer cask lid is bolted and the annulus between the TAD canister and the shielded transfer cask, previously filled with treated borated water, is then drained. The shielded transfer cask is moved into the cask unloading room. The TAD canister is then transferred to an aging overpack and then exported from the WHF to a CRCF or to the Aging Facility.

1.2.5.1.2.5 Canister Transfer

The canister transfer room is used to perform the following operations.

Move DPC from Aging Overpack to Shielded Transfer Cask—After the aging overpack has been received in the loading room and the unloaded shielded transfer cask has been received in the cask unloading room, the canister transfer machine is moved to the overpack port. The canister transfer machine shield skirt is lowered, the canister transfer machine slide gate and the overpack port slide gate are opened, the canister guide sleeve is lowered, and the DPC is lifted out of the aging overpack into the canister transfer machine. The canister guide sleeve is raised, the canister transfer machine slide gate and the overpack port slide gate are closed, the canister transfer machine shield skirt is raised, and the canister transfer machine is then moved to the cask port. The canister transfer machine shield skirt is lowered, the canister transfer machine slide gate and the cask port slide gate are opened, the canister guide sleeve is lowered, and the canister transfer machine lowers the DPC into the shielded transfer cask. The canister guide sleeve is raised, the canister transfer machine slide gate and the cask port slide gate are closed, and the canister transfer machine shield skirt is raised.

Move DPC from Transportation Cask to Shielded Transfer Cask—After the transportation cask has been received in the cask unloading room, the canister transfer machine is moved to the cask port slide gate. The canister transfer machine shield skirt is lowered and the canister transfer machine slide gate and the cask port slide gate are then opened. The canister guide sleeve is lowered and the DPC is lifted out of the transportation cask into the canister transfer machine. The canister guide sleeve is raised, the canister transfer machine slide gate and the cask port slide gate are closed, and the canister transfer machine shield skirt is raised. After the empty transportation cask has been moved into the cask preparation area and an empty shielded transfer cask has been brought into the cask unloading room, the canister transfer machine shield skirt is lowered, the canister transfer machine slide gate and the cask port slide gate are opened, the canister guide sleeve is lowered, and the canister transfer machine lowers the DPC into the shielded transfer cask. The canister guide sleeve is raised, the canister transfer machine slide gate and the cask port slide gate are closed, and the canister transfer machine shield skirt is raised.

Move TAD Canister to Aging Overpack—After the shielded transfer cask has been received in the cask unloading room and the aging overpack has been received in the loading room, the canister transfer machine is moved to the cask port. The canister transfer machine shield skirt is lowered and the canister transfer machine slide gate and the cask port slide gate are opened. The canister guide sleeve is lowered, the canister transfer machine lifts the TAD canister out of the shielded transfer cask, the canister guide sleeve is raised, the canister transfer machine slide gate and the cask port slide gate are closed and the canister transfer machine shield skirt is raised. The canister transfer machine is moved to the overpack port, the canister transfer machine shield skirt is lowered, and the canister transfer machine slide gate and the overpack port slide gate are opened. The canister guide sleeve is lowered, the canister transfer machine lowers the TAD canister into the aging overpack, the canister guide sleeve is raised, the canister transfer machine slide gate and the overpack port slide gate are closed, and the canister transfer machine shield skirt is raised.

1.2.5.1.2.6 Pool

The WHF normally receives commercial SNF in DPCs and uncanistered commercial SNF in transportation casks. The uncanistered commercial SNF assemblies are staged in the pool before being transferred to a TAD canister or transferred directly from the transportation cask or DPC to a TAD canister. The transfer of the SNF assemblies is performed in the borated pool, which provides necessary radiation shielding, contamination control, criticality control, and cooling of the individual commercial SNF assemblies. Pool operational processes are described in detail in Section 1.2.5.3.

1.2.5.1.3 Safety Category Classification

The overall WHF is classified as ITS. The portions of the WHF 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 WHF is designed such that 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.

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

The preclosure safety analysis identifies three procedural safety controls related to the operations conducted in the WHF. 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-6—To limit the probability that a drop or tipover of a shielded transfer cask or transportation cask results in a radiological release or criticality, the WHF operating procedures will include warnings that the securing in place of the lids on loaded shielded transfer casks or transportation casks containing uncanistered SNF assemblies is an important procedural step in the preclosure safety analysis. The WHF cask preparation and SNF transfer operating procedures will include steps to secure the lids of loaded shielded transfer casks or transportation casks in place with a specified minimum number of fasteners. The installation of fasteners is to be independently verified. Shielded transfer casks or transportation casks with properly secured lids will be uniquely identified. The WHF operating procedures for handling equipment will include prerequisites to check that loaded shielded transfer casks or transportation casks have properly secured lids before any movement.

PSC-9—To ensure the appropriate conditions in the WHF pool to preclude critical configurations, the WHF operating procedures will identify the required boron concentration in the WHF pool and will specify the ongoing monitored condition for waste handling operations in the WHF. The pool water treatment and cooling system operating procedure will require periodic sampling of the pool water boron concentration. The frequency of sampling will be established to provide a high confidence that the pool water concentration remains above 2,500 mg/L (enriched to 90 wt % ^{10}B), with correct enrichment of enhanced boron, between samplings. The procedure will also require sampling following events that could significantly impact the concentration of boron in the pool.

PSC-22—To ensure that the pool level considered for offsite dose reduction and shielding of operators is available, the pool water treatment and cooling system operating procedures will include a warning that the height of water above the top of active portions of commercial SNF assemblies in the WHF pool is an important constraint in the preclosure safety analysis. The procedure for conducting operator rounds will include monitoring the pool level. Pool water treatment and cooling system operating procedures will provide for manual make-up as necessary to restore the pool level to or above the minimum specified level.

1.2.5.1.5 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 or ITWI SSC or feature that performs a safety function. The design criteria are characteristics of the ITS and 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 WHF structure and the ITS and ITWI SSCs contained in the WHF are provided in Table 1.2.5-3.

1.2.5.1.6 Design Methodologies

The design methodologies for the WHF structure are in accordance with codes and standards provided in Section 1.2.2.1.

1.2.5.1.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of the WHF structure are in accordance with codes and standards provided in Section 1.2.2.1.

1.2.5.1.8 Design Codes and Standards

The principal design codes and standards applicable to the design of the WHF structure are provided in Section 1.2.2.1.

1.2.5.1.9 Design Load Combinations

The design load combinations for the WHF structure are in accordance with the codes and standards provided in Section 1.2.2.1. These design load combinations are applicable to steel and reinforced concrete structures.

1.2.5.2 Mechanical Handling 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)(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 WHF mechanical handling system consists of the following subsystems: cask handling, SNF assembly transfer, DPC cutting, TAD canister closure, and canister transfer. ITS SSCs in the mechanical handling system are designed as described in Section 1.2.2.2.

ITS SSCs in the WHF mechanical handling system, which are also used in other handling facilities, are described in Section 1.2.4.2.

Non-ITS SSCs in the WHF mechanical handling system, which are also used in other handling facilities, are described in summary in Table 1.2.4-1. Table 1.2.5-1 lists the non-ITS mechanical handling SSCs in the WHF, which are also used in other handling facilities. The non-ITS SSCs in the mechanical handling system that are specific to the WHF are described in summary in

Table 1.2.5-2. Table 1.2.5-3 provides the WHF 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. Table 1.2.4-3 provides a summary description for equipment and personnel shield doors. Table 1.2.4-6 provides a summary description of ITS equipment confinement doors.

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.

1.2.5.2.1 Cask Handling Subsystem

1.2.5.2.1.1 Subsystem Description

The cask handling subsystem provides receipt and preparation operations for DPCs, shielded transfer casks, aging overpacks, and transportation casks. The cask handling subsystem also provides cask restoration activities for unloaded transportation casks, aging overpacks, and shielded transfer casks.

1.2.5.2.1.1.1 Subsystem Functions

The functions of the cask handling subsystem are to:

- Receive commercial SNF in vertically based DPCs and uncanistered SNF in transportation casks
- Receive empty aging overpacks from the aging overpack staging facility
- Receive loaded aging overpacks from the Aging Facility or the Receipt Facility
- Receive horizontal shielded transfer casks with horizontally based DPCs from the Aging Facility
- Receive empty shielded transfer casks
- Receive shielded transfer casks with empty TAD canisters
- Export unloaded transportation casks
- Export shielded transfer casks with unloaded DPCs
- Export aging overpacks with loaded TAD canisters.

1.2.5.2.1.1.2 Subsystem Location and Functional Arrangement

The cask handling subsystem is located in the transportation cask vestibule (Room 1001), cask preparation area (Room 1016), cask unloading room (Room 1008), loading room (Room 1007), and the site transporter vestibule (Room 1023).

These areas are shown in Figures 1.2.5-2 and 1.2.5-3.

1.2.5.2.1.1.3 Subsystem and Components

ITS SSCs in the WHF cask handling subsystem that are similar to those used in other handling facilities are listed below and are described in Section 1.2.4.2, including figures and logic diagrams, unless otherwise described below.

Cask Handling Crane—This equipment is described in Section 1.2.4.2 and shown in Figures 1.2.5-20 and 1.2.5-21. 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. Zone controls are provided to avoid collisions with other equipment. The logic diagram for the WHF cask handling crane hoist is shown in Figure 1.2.5-22.

Cask Handling Yoke—The cask handling yoke is used by the cask handling crane to transfer transportation casks and shielded transfer casks within the cask preparation area. This equipment is described in Section 1.2.4.2. See Figures 1.2.4-28 to 1.2.4-30 for details.

Cask Transfer Trolley—The cask transfer trolley is used to transfer shielded transfer casks and transportation casks between preparation station 1 located in the cask preparation area and the cask unloading room. This equipment is described in Section 1.2.4.2 and shown in Figures 1.2.4-26 and 1.2.4-27.

Cask Unloading Room Equipment Shield Door (Type 1)—The cask unloading room equipment shield door provides equipment and personnel access to the cask unloading room. The cask unloading room equipment shield door is a single slide-open-type door. This equipment is described in Section 1.2.4.2. See Figures 1.2.4-19 to 1.2.4-21 for details.

Site Transporter Vestibule Equipment Shield Door (Type 4)—The site transporter vestibule equipment shield door provides equipment and personnel access to the loading room. The site transporter vestibule equipment shield door is a single slide-open-type door. This equipment is described in Section 1.2.4.2 and shown in Figures 1.2.4-21 and 1.2.4-82.

DPC Lid Adapter—The function of the DPC lid adapter is to lift DPCs of various sizes. The DPC lid adapter is attached to the DPC lid to allow the DPC to be lifted from a transportation cask using the canister transfer machine. 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. The DPC lid adapter is installed at preparation station 1. This equipment is described in Section 1.2.4.2 and shown in Figure 1.2.4-38.

Horizontal Lifting Beam—This equipment is described in Section 1.2.4.2 and shown in Figure 1.2.4-39.

Truck Cask Lid Adapter—This equipment is described in Section 1.2.4.2 and shown in Figure 1.2.4-142.

Rail Cask Lid Adapter—This equipment is described in Section 1.2.4.2 and shown in Figure 1.2.4-40.

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

Entrance Vestibule Crane—The entrance vestibule crane is a 20-ton, semi-gantry crane that is used for transportation cask receipt operations. The entrance vestibule crane aids in the removal and replacement of the impact limiters to and from the transportation casks. The entrance vestibule crane is capable of traversing between the cask preparation area and the transportation cask vestibule. The entrance vestibule crane design ensures that a seismic event does not cause the crane to overturn, derail, lose any main structural components, or drop a load that could have an adverse impact on a transportation cask or shielded transfer cask that contains SNF. Additionally, loads carried by the entrance vestibule crane, the lift heights, and the load paths are restricted to ensure that the crane does not drop a load that could breach a loaded transportation cask. The rated capacity of the entrance vestibule crane exceeds the weight of the heaviest anticipated load. Engineered features prevent the entrance vestibule crane or the crane loads from colliding with structures or major SSCs. These engineered features include mechanical stops and bumpers as well as limit switches and interlocks in the crane control circuitry. For details of this equipment, refer to Figures 1.2.5-23 and 1.2.5-24.

Lid-Lifting Grapples—The lid-lifting grapples are used for the removal and replacement of rail cask and shielded transfer cask lids. Six lid-lifting grapples are used in the WHF to support various operations. The grapples use three lifting jaws, equally spaced, to clamp onto the lid adapter or built-in lifting feature on the lid. Each grapple has a lifting capacity of 10 tons. The lid-lifting grapples interface with the DPC cutting jib crane, preparation station 1 jib crane, preparation station 2 jib crane, the TAD canister closure jib crane, the canister transfer machine maintenance crane, and the long-reach grapple adapter. When not in use, the grapples are staged on a lid-lifting grapple stand. For details of this equipment, Figure 1.2.4-31 shows the mechanical equipment envelope for the lid-lifting grapples and Figure 1.2.5-25 shows process and instrumentation diagram for the lid-lifting grapples applicable to the WHF application. The process and instrumentation diagram for the lid-lifting grapples includes the DPC cutting station lid-lifting grapple, preparation stations 1 and 2 lid-lifting grapples, preparation stations 1 and 2 truck cask lid-lifting grapples, TAD canister closure station lid-lifting grapple, and the transfer room lid-lifting grapple. The logic diagram for the lid-lifting grapples is shown in Figure 1.2.5-26.

Pool Cask Handling Yoke—The pool cask handling yoke is used with the pool yoke lift adapter and the cask handling crane to transfer transportation casks and shielded transfer casks between the pool staging shelf and the pool floor. The yoke has a lift capacity of 200 tons. The yoke has two lifting arms, which connect to the trunnions on the transportation cask or shielded transfer cask. The arm positions are adjustable to accommodate the various diameters. The arms are adjusted by an electric motor mounted in the yoke, which receives power through an electric connection from the cask handling crane. Interchangeable arms may be used (J hook or lift eye configuration) as shown in Figure 1.2.5-27.

Sensors on the yoke provide status on lifting arm engagement with the cask trunnions, lifting feature pin engagement with the crane hook, and lifting arm adjustment at the end of travel. When not in use, the pool cask handling yoke rests in the cask handling yoke stand. The process and instrumentation diagram is shown in Figure 1.2.5-28. The logic diagram is provided in Figure 1.2.5-29 and is applicable only to the WHF.

Pool Yoke Lift Adapter—The pool yoke lift adapter is used in the pool as an extension tool for the cask handling crane to aid in the transfer of transportation casks and shielded transfer casks between the staging shelf in the pool and the pool floor. The pool yoke lift adapter allows the cask handling crane hook to remain above the pool water level. The pool yoke lift adapter interfaces with the cask handling crane and the pool cask handling yoke and is rated to handle a load of 200 tons. The pool yoke lift adapter is staged on the pool yoke lift adapter stand at grade elevation on the east side of preparation station 1 when not in use. For details of this equipment, refer to Figure 1.2.5-30.

Truck Cask Lid-Lifting Grapples—The truck cask lid-lifting grapples are used for the removal and replacement of truck cask lids. Three truck cask lid-lifting grapples are used in the WHF to support various operations. The truck cask lid-lifting grapples use three lifting jaws, equally spaced, to clamp onto the truck cask lid adapter and have a minimum lifting capacity of 1 ton. The truck cask lid-lifting grapples are designed to interface with the preparation station 1 jib crane, the preparation station 2 jib crane, and the long-reach grapple adapter. When not in use, the truck cask lid-lifting grapples are staged on a truck cask lid-lifting grapple stand. For details of this equipment, refer to Figure 1.2.5-31.

WHF Cask Preparation Area Equipment Confinement Door—The cask preparation area equipment confinement door provides equipment and personnel access to the cask preparation room. The cask preparation room equipment confinement door is a single panel slide-open-type door. The door is operated by an electric motor turning a screw, which interacts with a door-mounted bracket. The door overlaps the aperture on the top, bottom, and both sides to provide confinement. The weight of the door is supported by rollers under the bottom of the door, which run in a floor-recessed channel. Details of this equipment are shown in Figure 1.2.5-32. The process and instrumentation diagram for equipment confinement doors is shown in Figure 1.2.4-23.

Operation of the WHF cask preparation area equipment confinement door is controlled from the facility operations room. Indication of the door being fully opened and fully closed is provided to the facility operations room. The door also has an obstruction sensor that halts door travel and opens the door when an obstacle is detected in the pathway of the door.

Aging Overpack Access Platform—The aging overpack access platform is a steel-structured platform that interfaces with the site transporter. The site transporter positions an aging overpack underneath the platform. The aging overpack access platform is accessed by stairs to allow personnel to access the top of the aging overpack for lid bolt removal and installation. A removable shield plate with access ports is located on the platform. The shield plate can be rotated to position the access ports over each of the aging overpack lid bolts. For details of this equipment, refer to Figure 1.2.5-33.

Preparation Station 1—Preparation station 1 is a steel-structured platform that interfaces with the cask transfer trolley. The cask transfer trolley positions a transportation cask or shielded transfer cask underneath the platform. Preparation station 1 is accessed by stairs to allow personnel to access the top of the cask and is used for the preparation of loaded and unloaded casks and canisters. A removable shield plate with access ports is located on the platform. The shield plate can be rotated to position the access ports over lid bolts and other lid features (e.g., ports). The platform structure incorporates energy-absorbing features to mitigate the effects of the cask transfer trolley impacting the platform during a seismic event. For details of this equipment, refer to Figures 1.2.5-34 and 1.2.5-35.

Preparation Station 2—Preparation station 2 is a steel structure used for the preparation of transportation casks and TAD canisters before placement in the pool and for DPC draining after the DPC is unloaded and removed from the pool. Preparation station 2 allows personnel to access the top of the transportation cask or the shielded transfer cask that contains the TAD canister or DPC. Preparation station 2 is accessed by stairs and has a hinged platform that can be raised to allow the cask handling crane to load and unload the transportation cask or shielded transfer cask. For details of this equipment, refer to Figures 1.2.5-36 and 1.2.5-37.

Cask Support Frame—Three cask support frames are used in the WHF to restrain rail casks, shielded transfer casks, and the truck cask handling frame during cask preparation, DPC cutting, and TAD canister closure operations. The cask support frames are located at the DPC cutting station, the TAD canister closure station, and preparation station 2. A cask support frame is not required at preparation station 1, as the cask transfer trolley is used there to restrain transportation casks and shielded transfer casks. The cask support frames are anchored to the floor and consist of a steel platform and structural steel framework, with remotely operated restraint arms that are used for securing the rail cask, the shielded transfer cask, or the truck cask handling frame. The framework and restraining arms are able to restrain the rail cask, shielded transfer cask, or truck cask handling frame in place during a DBGM-2 seismic event. Steel pedestals are used to position the truck cask handling frame and some of the smaller rail casks at the correct height. Figure 1.2.5-38 provides details of the equipment.

1.2.5.2.1.2 Operational Processes

Receive Transportation Cask with Uncanistered SNF—Transportation casks are brought into the receipt area in the cask preparation area by rail or truck. The mobile access platform is positioned around the railcar or truck trailer, and the tie-downs are removed. For certain transportation cask configurations, the cask is moved to the horizontal cask stand where the impact limiters are removed using the cask handling crane. The transportation cask is moved to the cask tilting frame and secured in place. The transportation cask is upended to the vertical position using the cask handling crane with the cask tilting frame and then released from the cask tilting frame.

For other transportation casks, the impact limiters are unbolted via the mobile access platform and then removed using the entrance vestibule crane. The cask handling crane is then used to upend the transportation cask to the vertical position. Once the transportation cask is vertical, it is moved laterally, using the cask handling crane, to preparation station 1 or 2.

If the transportation cask is a truck cask, it is placed into the truck cask handling frame, which is moved using the cask handling crane and staged at preparation station 1 or 2. The transportation cask is then prepared for placement in the pool by gas sampling, venting, and cooling (if required), followed by filling the interior with treated borated water. The transportation cask lid bolts are then removed, leaving a sufficient number of bolts in place to ensure the lid stays on in the event that the cask is dropped. The rail cask lid adapter or truck cask lid adapter is placed onto the transportation cask lid using the preparation station 1 or 2 jib crane and then attached to the transportation cask lid. The cask handling crane is then used to transfer the transportation cask into the pool in order to perform SNF assembly transfer operations.

Receive Rail Cask with DPC—Rail casks containing DPCs are brought into the receipt area of the cask preparation area on a railcar. The mobile access platform is positioned around the railcar and the impact limiters are removed using the entrance vestibule crane. The rail cask is then upended and moved, using the cask handling crane, to preparation station 1 and placed onto the cask transfer trolley. A lid-lifting adapter is placed onto the rail cask lid using the preparation station 1 jib crane and then installed onto the lid. The rail cask lid is then removed, and the preparation station 1 jib crane is used to place the DPC lid adapter onto the DPC inside the rail cask. The DPC lid adapter is installed, and the rail cask is then moved from preparation station 1 to the cask unloading room on the cask transfer trolley in order to perform canister transfer operations.

Receive Shielded Transfer Cask—Shielded transfer casks are brought into the receipt area of the cask preparation area by the site transporter. The shielded transfer cask is then upended and moved, using the cask handling crane, to preparation station 1 and placed into the cask transfer trolley. The shielded transfer cask lid bolts are removed, and the shielded transfer cask is then moved from preparation station 1 into the cask unloading room on the cask transfer trolley to be loaded with a DPC.

After loading, the shielded transfer cask is moved to preparation station 1 on the cask transfer trolley. The shielded transfer cask lid is removed using the preparation station 1 jib crane, and the DPC lid adapter is detached from the DPC lid and removed using the preparation station 1 jib crane. The shielded transfer cask lid is then placed onto the shielded transfer cask using the preparation station 1 jib crane and installed with a sufficient number of bolts to ensure that the lid stays on in the event that the shielded transfer cask is dropped. The cask handling crane is then used to transfer the shielded transfer cask containing a DPC to the DPC cutting station in order to perform DPC cutting operations.

Receive Shielded Transfer Cask with Empty TAD Canister—Shielded transfer casks containing the empty TAD canisters are brought into the receipt area in the cask preparation area by the site transporter. The shielded transfer cask is then moved to preparation station 1 or 2 using the cask handling crane. The preparation station 1 or 2 jib crane is used to remove the shielded transfer cask lid, followed by removal of the TAD canister lid. An inflatable seal between the TAD canister and the shielded transfer cask is put in place and inflated. The TAD canister is then filled with treated borated water. The shielded transfer cask fill port is opened, and the annulus between the TAD canister and the shielded transfer cask is filled with treated borated water. The shielded transfer cask lid is placed onto the shielded transfer cask using the preparation station 1 or 2 jib crane, and the cask handling crane is then used to transfer the shielded transfer cask containing the TAD canister into the pool in order to perform SNF assembly transfer operations.

Receive Horizontal Shielded Transfer Cask with DPC—Horizontal shielded transfer casks containing DPCs are brought into the receipt area on a cask transfer trailer towed by a cask tractor. The mobile access platform is positioned around the cask transfer trailer, and the tie-downs are removed. The horizontal shielded transfer cask is then upended and moved to the DPC cutting station in order to perform DPC cutting operations.

Receive Aging Overpack—Aging overpacks are brought into the site transporter vestibule by the site transporter. The site transporter positions the aging overpack underneath the aging overpack access platform, and the aging overpack lid bolts are removed. The site transporter then moves the aging overpack into the loading room in order to perform canister transfer operations and is deactivated. The electrical supply is then disconnected, and the cable is retracted so that the site transporter vestibule equipment shield door can be closed. The site transporter vestibule equipment shield door is closed.

Export Aging Overpack Containing TAD Canister—After completion of TAD canister closure operations, the shielded transfer cask containing the loaded TAD canister is transferred from the TAD canister closure station to preparation station 1 and placed onto the cask transfer trolley. The cask transfer trolley seismic restraints are engaged, the shielded transfer cask lid bolts are removed, and the shielded transfer cask containing the TAD canister is transferred from preparation station 1 to the cask unloading room on the cask transfer trolley in order to perform canister transfer operations. After the TAD canister is transferred into an aging overpack, the site transporter moves the aging overpack into position underneath the aging overpack access platform. The aging overpack lid bolts are installed, and the site transporter then exports the aging overpack from the WHF.

Export Unloaded Transportation Cask—Unloaded transportation casks are handled after completion of SNF assembly transfer operations or after a DPC is removed from a rail cask using the canister transfer machine. After completion of SNF assembly transfer operations, the unloaded transportation cask is removed from the pool and transferred to preparation station 1 or 2 using the cask handling crane. After completion of DPC removal from a rail cask, the rail cask is transferred from the cask unloading room to preparation station 1 on the cask transfer trolley. In both cases, the lid adapter is then detached from the transportation cask lid and removed using the preparation station 1 or 2 jib crane. If the transportation cask was in the pool, the cask drain port is opened and the transportation cask is drained and decontaminated. The transportation cask lid bolts are then replaced, and the cask is transferred to the railcar and exported from the WHF.

Export Shielded Transfer Cask with Unloaded DPC—After completion of SNF assembly transfer operations, the shielded transfer cask containing the unloaded DPC is transferred from the pool to preparation station 1 or 2 using the cask handling crane. The exterior of the shielded transfer cask is washed down over the pool as it is being lifted up out of the pool. The drain and vent ports on the shielded transfer cask are opened, and the annulus between the DPC and the shielded transfer cask is drained. The access port in the shielded transfer cask lid is opened, and the DPC is drained by pumping out the water. Hoses are connected to the fill and drain ports on the shielded transfer cask, and the water is sampled for contamination. If the water is clean, the ports are opened to drain the annulus between the unloaded DPC and the shielded transfer cask. If the water is contaminated, then the annulus is flushed with treated borated water as needed. A drying system is then used to dry the annulus. The potential for contamination is kept to a minimum by the use of the inflatable seal. The lid access port is closed, and the shielded transfer cask containing the unloaded DPC is then transferred to the receipt area in the cask preparation area. The site transporter retrieves the shielded transfer cask and exports the shielded transfer cask containing the unloaded DPC from the WHF to the Low-Level Waste Facility.

1.2.5.2.1.3 Safety Category Classification

The cask handling crane, cask handling yoke, cask transfer trolley, equipment shield doors, lid-lifting grapples, truck cask lid-lifting grapples, truck cask lid adapter, rail cask lid adapter, DPC lid adapter, pool cask handling yoke, aging overpack access platform, entrance vestibule crane, preparation station 1, preparation station 2, equipment confinement doors, horizontal lifting beam, cask support frame, and the pool yoke lift adapter in the cask handling subsystem are categorized as ITS.

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

The preclosure safety analysis identifies four procedural safety controls related to the operation of components in the cask handling subsystem of the WHF. 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-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 WHF 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 WHF 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 loading and 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 WHF 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 or shielded transfer cask remain attached to the WHF cask handling crane hoist and associated yoke until the cask is placed into the cask transfer trolley or cask support frame and the associated seismic restraints are properly engaged. The engagement of the seismic restraints will be independently verified prior to slacking the load on the WHF 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 WHF cask preparation area (Room 1016) to the cask unloading room (Room 1008). The removal of the bolts will be independently verified.

PSC-27—To ensure that the secondary confinement boundary is intact when operations are being conducted with a potential for a drop or collision involving a loaded cask or canister outside of the pool, the WHF operating procedures will include a warning that the closure of the cask preparation area (Room 1016) equipment confinement door is a procedural step important to the preclosure safety analysis. The cask preparation and canister transfer operating procedures will include prerequisites to confirm that the cask preparation area equipment confinement door is closed prior to operations with a potential for a drop or collision involving a loaded cask or canister outside of the pool. The closure of the door will be independently verified.

1.2.5.2.1.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the cask handling subsystem in the WHF are addressed in Table 1.2.5-3.

1.2.5.2.1.6 Design Methodologies

The design methodologies for the ITS SSCs in the cask handling subsystem that are similar to those used in other handling facilities, including the cask handling crane, entrance vestibule crane, cask handling yoke, cask transfer trolley, lid-lifting grapples, truck cask lid-lifting grapples, pool cask handling yoke, DPC lid adapter, truck cask lid adapter, rail cask lid adapter, horizontal lifting beam, and pool yoke lift adapter, are in accordance with codes and standards provided in Section 1.2.2.2. The methodologies used in the design of the aging overpack access platform, preparation station 1, preparation station 2, cask support frame, equipment shield doors, and equipment confinement doors are in accordance with Section Q1.2 of ANSI/AISC N690-1994.

1.2.5.2.1.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of ITS SSCs in the WHF cask handling subsystem that are similar to those used in other handling facilities, including the cask handling crane, entrance vestibule crane, cask handling yoke, cask transfer trolley, lid-lifting grapples, truck cask lid-lifting grapples, pool cask handling yoke, DPC lid adapter, truck cask lid adapter, rail cask lid adapter, horizontal lifting beam, and pool yoke lift adapter, are in accordance with codes and standards provided in Section 1.2.2.2. Materials of construction used in the design of the aging overpack access platform, preparation station 1, preparation station 2, cask support frame, equipment shield doors, and equipment confinement doors are in accordance with Section Q1.4 of ANSI/AISC N690-1994.

1.2.5.2.1.8 Design Codes and Standards

The principal codes and standards applicable to the cask handling subsystem are identified in Table 1.2.2-12.

1.2.5.2.1.9 Design Load Combinations

The load combinations used in the analysis of ITS SSCs for the WHF cask handling subsystem for the cask handling crane, entrance vestibule crane, cask handling yoke, cask transfer trolley, lid-lifting grapples, truck cask lid-lifting grapples, pool cask handling yoke, DPC lid adapter, truck cask lid adapter, rail cask lid adapter, horizontal lifting beam, and pool yoke lift adapter, are in accordance with codes and standards provided in Section 1.2.2.2. The design load combinations analyzed include normal conditions, event sequences, and the effects of natural phenomena. The load combinations used in the design of the aging overpack access platform, preparation station 1, preparation station 2, cask support frame, equipment shield doors, and equipment confinement doors are in accordance with Table Q1.5.7.1 of ANSI/AISC N690-1994.

1.2.5.2.2 Spent Nuclear Fuel Assembly Transfer Subsystem

1.2.5.2.2.1 Subsystem Description

SNF assembly transfer occurs in the pool by using the spent fuel transfer machine to transfer SNF assemblies from the transportation cask or the DPC to either a TAD canister or the SNF staging rack.

1.2.5.2.2.1.1 Subsystem Functions

The functions of SNF assembly transfer subsystem are to:

- Receive SNF assemblies from a DPC or transportation cask
- Using the spent fuel transfer machine, place SNF assemblies in SNF staging racks or transfer the SNF assemblies into a TAD canister.

1.2.5.2.2.1.2 Subsystem Location and Functional Arrangement

The functional arrangement of components in the SNF assembly transfer subsystem is shown in Figures 1.2.5-2, 1.2.5-3, and 1.2.5-16. Components of the SNF assembly transfer subsystem are located in the pool (SNF staging racks, PWR lifting grapple, BWR lifting grapple, pool lid-lifting grapple, and long-reach grapple adapter) and above the pool (spent fuel transfer machine and auxiliary pool crane) in the cask preparation area (Room 1016).

1.2.5.2.2.1.3 Subsystem and Components

ITS SSCs in the SNF assembly transfer subsystem that are unique to the WHF are described below.

Auxiliary Pool Crane—The auxiliary pool crane is used for the removal and replacement of the transportation cask lid, shielded transfer cask lid, TAD canister lid, and removal of the DPC shield plug. It can also be used to support cask preparation, DPC cutting, and TAD canister closure operations in the cask preparation area if required. The auxiliary pool crane is a double-girder, top-running-type crane with a top-running trolley. The crane is rated at 10 tons.

The auxiliary pool crane is a NOG-1, Type I (ASME NOG-1-2004) crane and is equipped with seismic restraint rail clamps to prevent both sideways and uplift motion and to prevent derailment and dropping during a DBGM-2 event. For details of this equipment, refer to Figures 1.2.5-39 and 1.2.5-40. Zone controls are provided to avoid collisions with other equipment. Figure 1.2.5-41 shows the logic diagram for the auxiliary pool crane hoist.

BWR Lifting Grapple—The BWR lifting grapple is used to transfer BWR SNF assemblies from a DPC or transportation cask into an SNF staging rack or a TAD canister. The BWR lifting grapple is remotely connected to the spent fuel transfer machine in the pool. A local control interface provides indication to the operator that the grapple is connected to the spent fuel transfer machine and indicates when the grapple is connected to an SNF assembly. Interlocks prevent the spent fuel transfer machine from raising the grapple unless a fully engaged or disengaged signal is provided. The BWR lifting grapple is stored on the spent fuel transfer machine grapple staging rack when not in use. For details of this equipment, refer to Figure 1.2.5-42.

Pool Lid-Lifting Grapple—The pool lid-lifting grapple is used in the pool for the removal and replacement of the rail cask lid, shielded transfer cask lid, and TAD canister lid and removal of the DPC shield plug. The pool lid-lifting grapple is designed to interface with the long-reach grapple adapter. This equipment is shown in Figures 1.2.5-43 and 1.2.5-44. The WHF logic diagram for the auxiliary pool crane pool lid-lifting grapple is shown in Figure 1.2.5-45.

Long-Reach Grapple Adapters—Two long-reach grapple adapters are used in the pool as extension tools for the auxiliary pool crane to aid in the removal and replacement of the transportation cask, shielded transfer cask, and TAD canister lids and DPC shield plugs. The long-reach grapple adapters allow the auxiliary pool crane hook to remain above the pool water level. The long-reach grapple adapters interface with the auxiliary pool crane, pool lid-lifting grapple, and truck cask lid-lifting grapple, and each has a 12-ton lifting capacity. When not in use, the long-reach grapple adapters are stored on the long-reach grapple adapter stand in the southeast corner of the pool. For details of this equipment, refer to Figure 1.2.5-46.

PWR Lifting Grapple—The PWR lifting grapple is used to transfer PWR SNF assemblies from a DPC or transportation cask into the SNF staging rack or a TAD canister. The PWR lifting grapple is remotely connected to the spent fuel transfer machine in the pool. A local control interface provides indication to the operator that the grapple is connected to the spent fuel transfer machine and indicates when the grapple is connected to an SNF assembly. Interlocks prevent the spent fuel transfer machine from raising the grapple unless a fully engaged or disengaged signal is provided. The PWR lifting grapple is stored on the spent fuel transfer machine grapple staging rack when not in use. For details of this equipment, refer to Figure 1.2.5-42.

Spent Fuel Transfer Machine—The spent fuel transfer machine is used to transfer SNF assemblies from a DPC or transportation cask to either a TAD canister or the SNF staging rack. The bridge of the spent fuel transfer machine includes a viewing platform allowing personnel to observe pool operations. The spent fuel transfer machine interfaces with the PWR lifting grapple and BWR lifting grapple. The spent fuel transfer machine operates only in the pool and the bridge traverses in the east–west direction. Operators control the spent fuel transfer machine by pendant control, located on the viewing platform, to provide the operator with an unobstructed view of handling operations.

The spent fuel transfer machine design ensures that a seismic event does not cause the device to overturn, derail, lose any main structural components, or drop an SNF assembly or a load that could have an adverse impact on a staging rack, transportation cask, or shielded transfer cask that contains SNF assemblies. The spent fuel transfer machine is designed to DBGM-2.

Interlocks prevent operation of the spent fuel transfer machine grapple unless it is properly connected to the hoisting system and prevent operation of the hoist unless the SNF assembly is fully engaged or fully disengaged. Interlocks prevent spent fuel transfer machine bridge and trolley travel until the SNF assembly is raised to a safe travel height to ensure that the SNF assembly has cleared the transportation cask, shielded transfer cask, or the SNF rack before traversing. An interlock also prevents the spent fuel transfer machine from lifting loads weighing more than the load cell setpoint. Two upper limit switches and a mechanical stop are provided to protect the hoisting system and ensure that an SNF assembly is not raised above prescribed limits to ensure that minimum acceptable cover (water depth) is maintained at all times. Interlocks prevent bridge and trolley overtravel. For details of the spent fuel transfer machine, refer to Figures 1.2.5-47 and 1.2.5-48. Figure 1.2.5-49 shows the logic diagram for the spent fuel transfer machine mast hoist. Figure 1.2.5-50 shows the logic diagram for the spent fuel transfer machine grapple.

SNF Staging Rack—The SNF staging rack is located in the WHF pool and is used to stage SNF assemblies. The SNF staging racks contain fixed neutron absorber for criticality control in accordance with ANSI/ANS-8.21-1995 and ANSI/ANS 8.14-2004. The purpose of the SNF staging rack is to enable the blending of fuel assemblies for thermal management and to allow for loading and unloading flexibility. Separate staging racks and cells are provided to accommodate 81 PWR assemblies, 128 BWR assemblies, and 4 damaged-fuel cans or baskets. The design of the SNF staging rack ensures that there is adequate fuel assembly spacing to prevent criticality. A protective wall is adjacent to the SNF staging rack to ensure that large objects cannot collide with it, damaging either the rack or SNF assemblies or both. The staging racks are fixed to each other but not to the facility. For details of this equipment, refer to Figure 1.2.5-51.

Truck Cask Lid-Lifting Grapple—The truck cask lid-lifting grapple is used in the pool for the removal and replacement of truck cask lids. The truck cask lid-lifting grapple is designed to interface with the long-reach grapple adapter. This equipment is described in Section 1.2.5.2.1 and shown in Figure 1.2.5-31.

Truck Cask Handling Frame—The truck cask handling frame is a structural steel frame used to support the truck cask and provide stability during cask preparation activities at preparation station 1 or 2 and fuel transfer operations in the bottom of the pool. The truck cask handling frame design includes trunnions that are positioned and sized to interface with the cask handling yoke and pool cask handling yoke. For details of this equipment, refer to Figure 1.2.5-52.

Pool Cask Handling Yoke—This equipment is described in Section 1.2.5.2.1.1.3.

1.2.5.2.2.2 Operational Processes

SNF Assembly Transfer—SNF assembly transfer is conducted in the WHF pool. After a transportation cask containing uncanistered SNF or a shielded transfer cask containing a DPC is placed in the pool, the auxiliary pool crane is used to remove the transportation cask or shielded transfer cask lid. In the case of the DPC, the DPC shield plug is removed from the DPC using the auxiliary pool crane and placed in a staging area in the pool. If the shield plug is a type that has a siphon tube attached, the siphon tube is cut and detached from the shield plug during shield plug removal. The spent fuel transfer machine is then used to remove the SNF assemblies from the transportation cask or DPC and transfers the assemblies to a TAD canister or to the SNF staging rack. After SNF assembly transfer is complete, the auxiliary pool crane is used to place the lid back onto the transportation cask or the shielded transfer cask containing a DPC. If a TAD canister has been filled with SNF assemblies, the auxiliary pool crane is used to replace the TAD canister shield lid and then replaces the shielded transfer cask lid.

1.2.5.2.2.3 Safety Category Classification

The spent fuel transfer machine, SNF staging racks, pool cask handling yoke, auxiliary pool crane, BWR and PWR lifting grapples, truck cask lid-lifting grapple, pool lid-lifting grapple, truck cask handling frame, and long-reach grapple adapter are classified as ITS.

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

There are no procedural safety controls for the SNF assembly transfer subsystem.

1.2.5.2.2.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the SNF assembly transfer subsystem in the WHF are addressed in Table 1.2.5-3.

1.2.5.2.2.6 Design Methodologies

The design methodologies for ITS SSCs, including the pool cask handling yoke, auxiliary pool crane, BWR and PWR lifting grapples, truck cask lid-lifting grapple, pool lid-lifting grapple, and long-reach grapple adapter, in the SNF assembly transfer subsystem in the WHF are in accordance with codes and standards provided in Section 1.2.2.2.

The design methodologies used in the design of the SNF staging rack and the truck cask handling frame are is in accordance with Section Q1.2 of ANSI/AISC N690-1994. The design methodology used in the design of the spent fuel transfer machine is in accordance with ASME NOG-1-2004.

1.2.5.2.2.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of ITS SSCs in the SNF assembly transfer subsystem in the WHF including the pool cask handling yoke, auxiliary pool crane, BWR and PWR lifting grapples, truck cask lid-lifting grapple, pool lid-lifting grapple, and long-reach grapple adapter, are in accordance with codes and standards provided in Section 1.2.2.2.

The materials of construction used in the design of the SNF staging rack and truck cask handling frame are in accordance with Section Q1.4 of ANSI/AISC N690-1994. The materials of construction used in the design of structural and mechanical components of the spent fuel transfer machine are in accordance with NOG-4200 and -5200 of ASME NOG-1-2004.

1.2.5.2.2.8 Design Codes and Standards

The principal codes and standards applicable to the SNF assembly transfer subsystem are identified in Table 1.2.2-12.

1.2.5.2.2.9 Design Load Combinations

The load combinations used in the analysis of ITS SSCs for the SNF assembly transfer subsystem, including pool cask handling yoke, auxiliary pool crane, BWR and PWR lifting grapples, truck cask lid-lifting grapple, pool lid-lifting grapple, and long-reach grapple adapter 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 analysis of the SNF staging rack, truck cask handling frame, and the spent fuel transfer machine are in accordance with Table Q1.5.7.1 of ANSI/AISC N690-1994 and ASME NOG-1-2004.

1.2.5.2.3 Dual-Purpose Canister Cutting Subsystem

1.2.5.2.3.1 Subsystem Description

DPC cutting is the process that cuts open the DPC to provide access to the SNF assemblies inside to allow for unloading into a staging rack or a TAD canister. The cutting process has the functionality to open the various types and sizes of DPCs that are received in the WHF. DPC cutting is performed outside the pool at the DPC cutting station in the cask preparation area. The DPC cutting subsystem has been classified as non-ITS. The DPC cutting machine is classified as non-ITS and is described in summary in Table 1.2.5-2. The DPC cutting jib crane, DPC cutting station, and the lid-lifting grapple are classified as ITS.

1.2.5.2.3.1.1 Subsystem Functions

The WHF receives various types of DPCs for the purpose of opening them to access and transfer the SNF assemblies to a staging rack or a TAD canister.

1.2.5.2.3.1.2 Subsystem Location and Functional Arrangement

The DPC cutting machine is located in the DPC cutting station in the north end (Figure 1.2.5-2) of the cask preparation area (Room 1016).

DPC cutting is performed in the cask preparation area.

1.2.5.2.3.1.3 Subsystem and Components

1.2.5.2.3.1.3.1 Dual-Purpose Canister Cutting Subsystem

ITS SSCs in the DPC cutting subsystem in the WHF are described below.

DPC Cutting Jib Crane—The DPC cutting jib crane is located at the DPC cutting station and is used to handle the shielded transfer cask lid, DPC cutting machine, shield plug lift adapter, and the cask shield ring for the DPC shielded transfer cask. The jib crane is mounted to a separate column than the DPC cutting station, making the jib crane support structure independent of the DPC cutting station structure. The jib crane boom can swing in an arc to cover the operating area and has a movable hoist to allow the hoist to be positioned over the item to be lifted. The hoist is rated at 10 tons. The DPC cutting jib crane is equipped with interlocks and design features in accordance with ASME NUM-1-2004 to prevent dropping a load during a DBGM-2 event. For details of this equipment, refer to Figures 1.2.5-53 and 1.2.5-54. Figure 1.2.5-55 shows the logic diagram for the jib crane hoist.

DPC Cutting Station—The DPC cutting station is a steel structure in which DPCs are cut open prior to placement in the pool for fuel transfer. The DPC cutting station allows personnel to access the top of the shielded transfer cask and DPC for the operations associated with DPC cutting and preparation for placement in the pool. The station is enclosed on four sides with shielding to minimize dose to nearby workers and has an open roof to allow crane access. The station has a door and a hinged platform to allow the cask handling crane to load and unload a shielded transfer cask containing a DPC. For details of this equipment, refer to Figures 1.2.5-34 and 1.2.5-35.

Lid-Lifting Grapple—The lid-lifting grapple is used for the removal and replacement of the shielded transfer cask lid and for handling the shield plug lift adapter. The lid-lifting grapple is designed to interface with the DPC cutting jib crane. This equipment is described in Section 1.2.5.2.1. Figure 1.2.5-26 shows the logic diagram for the jib crane lid-lifting grapples.

1.2.5.2.3.2 Operational Processes

DPC Cutting—DPC cutting is done outside the pool at the DPC cutting station in the cask preparation area. The shielded transfer cask containing a DPC is transferred to the DPC cutting station using the cask handling crane. An inflatable seal between the DPC and the shielded transfer cask is put in place and inflated. The fill and drain ports on the shielded transfer cask are opened and the annulus between the DPC and shielded transfer cask is filled with treated borated water. The shielded transfer cask lid is unbolted and then removed using the DPC cutting jib crane. The DPC cutting machine is then moved to the DPC adapter plate stand using the DPC cutting jib crane and attached to one of three adapter plates that are used to adapt the DPC cutting machine to fit the various DPC lid configurations.

The DPC cutting machine and DPC adapter plate assembly are positioned onto the DPC outer lid using the DPC cutting jib crane and attached to the DPC outer lid. The DPC outer lid is then cut using the DPC cutting machine. The DPC cutting machine, DPC adapter plate, and DPC outer lid are then removed from the DPC as one assembly using the DPC jib crane. Depending on the type of DPC being cut, the DPC cutting machine and DPC adapter plate assembly are then moved onto the DPC and attached to either the DPC inner lid or the DPC shield plug.

The siphon and vent port covers are then cut using the DPC cutting machine. The siphon and vent port covers are removed, and hoses are attached to the siphon and vent ports.

If cooling of the DPC contents is required, this is achieved by filling the DPC with treated borated water or by recirculating inert cooling gas (helium gas) through the canister interior by way of the vent and drain ports. The DPC is then vented out through a water/vapor separator vessel that is connected to the WHF HVAC exhaust system. Cooling continues until the DPC interior is filled with treated borated water and the temperature of the treated borated water is low enough to mitigate boiling while the DPC is being cut. Cavity cover gases that are displaced or steam produced during water filling are routed to the WHF HVAC exhaust system. The hoses are disconnected from the siphon and vent ports, and the DPC cutting machine is used to cut the DPC inner lid or shield plug weld.

If the DPC is the type that has an inner lid, the DPC cutting machine, DPC adapter plate, and DPC inner lid are removed from the DPC as one assembly using the DPC cutting jib crane. If the DPC does not have an inner lid, the DPC cutting machine and DPC adapter plate assembly are detached from the shield plug. For all types of DPCs, a shield plug lift adapter is placed onto the shield plug using the DPC cutting jib crane and then attached to the shield plug. The shielded transfer cask lid is placed onto the shielded transfer cask using the DPC cutting jib crane and installed. The remainder of the shielded transfer cask is then filled with treated borated water via the shielded transfer cask fill and drain ports. The shielded transfer cask containing the DPC is then transferred to the DPC transfer station in the pool, with its lid reinstalled and a minimum number of bolts in place.

1.2.5.2.3.3 Safety Category Classification

The DPC cutting jib crane, the DPC cutting station, and the lid-lifting grapple are classified as ITS.

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

The preclosure safety analysis identifies one procedural safety control related to the operations of the DPC cutting subsystem of the WHF. 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-5—To limit the probability of personnel receiving direct radiation exposure, the DPC cutting subsystem procedures will include a warning that failure to install the shield ring on a DPC could result in inadvertent personnel exposures. The WHF DPC cutting subsystem procedure will include a prerequisite for each operating crew to verify that the shield ring is installed prior to commencing operations that rely upon the shield ring.

1.2.5.2.3.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the DPC cutting subsystem in the WHF are addressed in Table 1.2.5-3.

1.2.5.2.3.6 Design Methodologies

Design methodologies used for the design of the DPC cutting jib crane and the lid-lifting grapple are in accordance with codes and standards provided in Section 1.2.2.2. The methodologies used in the design of the DPC cutting station are in accordance with Section Q1.2 of ANSI/AISC N690-1994.

1.2.5.2.3.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of the DPC cutting jib crane and the lid-lifting grapple are in accordance with codes and standards provided in Section 1.2.2.2. Materials of construction used in the design of the DPC cutting station are in accordance with Section Q1.4 of ANSI/AISC N690-1994.

1.2.5.2.3.8 Design Codes and Standards

The principal codes and standards applicable to the DPC cutting jib crane, the DPC cutting station, and the lid-lifting grapple are identified in Table 1.2.2-12.

1.2.5.2.3.9 Design Load Combinations

The load combinations used in the analysis of the DPC cutting jib crane and lid-lifting grapple 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 DPC cutting station are in accordance with Table Q1.5.7.1 of ANSI/AISC N690-1994.

1.2.5.2.4 Transportation, Aging, and Disposal Canister Closure Subsystem

1.2.5.2.4.1 Subsystem Description

TAD canister closure is the process that closes the loaded TAD canister by welding the shield plug and fully draining and drying the TAD canister interior, followed by backfilling the TAD canister with helium and fully welding the TAD canister lid around its circumference onto the body of the TAD canister. The TAD canister closure subsystem has been classified as non-ITS. The TAD canister closure jib crane, the lid-lifting grapple and the TAD canister closure station in the TAD canister closure subsystem are classified as ITS. The TAD canister welding machine is classified as non-ITS and is described in summary in Table 1.2.5-2.

1.2.5.2.4.1.1 Subsystem Functions

The TAD canister closure subsystem is used to weld the TAD canisters closed. TAD canister closure is performed at the TAD canister closure station in the cask preparation area.

The process control program for the closure welds produced by the TAD canister closure system is controlled as a special process by the Quality Assurance Program.

1.2.5.2.4.1.2 Subsystem Location and Functional Arrangement

The TAD canister closure system, including the TAD canister welding machine, is located in the TAD canister closure station shielded area on the south side of the cask preparation area (Room 1016) as shown in Figures 1.2.5-2 and 1.2.5-3.

1.2.5.2.4.1.3 Subsystem and Components

1.2.5.2.4.1.3.1 TAD Canister Closure Subsystem

ITS SSCs in the TAD canister closure subsystem in the WHF are described below.

TAD Canister Closure Jib Crane—The TAD canister closure jib crane is located at the TAD canister closure station and is used to handle the shielded transfer cask lid, the TAD canister welding machine, and the cask shield ring for the shielded transfer cask. The jib crane is mounted to a separate column than the TAD canister closure station, making the jib crane support structure independent of the TAD canister closure station structure. The jib crane boom can swing in an arc to cover the operating area and has a movable hoist to allow the hoist to be positioned over the item to be lifted. The hoist is rated at 10 tons. The TAD canister closure jib crane is equipped with interlocks and ASME NUM-1-2004 design features to prevent dropping a load during a DBGM-2 event. For details of this equipment, refer to Figures 1.2.5-53 to 1.2.5-54. Figure 1.2.5-55 shows the logic diagram for the jib crane hoist.

Lid-Lifting Grapple—The lid-lifting grapple is used for the removal and replacement of the shielded transfer cask lid and installation of the TAD canister lid. The lid-lifting grapple is designed to interface with the TAD canister closure jib crane. This equipment is described in Section 1.2.5.2.1. Figure 1.2.5-26 shows the logic diagram for the jib crane lid-lifting grapples.

TAD Canister Closure Station—The TAD canister closure station is a steel structure used for TAD canister closure operations prior to export from the WHF. The TAD canister closure station allows personnel to access the top of the shielded transfer cask and TAD canister for all the operations associated with TAD canister closure, including welding, draining, and drying. The station is enclosed on four sides with shielding to minimize dose to nearby workers and has an open roof to allow crane access. The station has a door and a hinged platform to allow the cask handling crane to load and unload a shielded transfer cask containing a TAD canister. For details of this equipment, refer to Figures 1.2.5-36 and 1.2.5-37.

1.2.5.2.4.2 Operational Processes

TAD Canister Closure—TAD canister closure is done at the TAD canister closure station in the cask preparation area. The shielded transfer cask containing a loaded TAD canister is transferred from the pool to the TAD canister closure station using the cask handling crane. The shielded transfer cask lid is unbolted and then removed using the TAD canister closure jib crane. The TAD canister is then partially drained via the siphon port in order to lower the water level below the shield plug in preparation for welding. The TAD canister welding machine is positioned onto the TAD canister shield plug using the TAD canister closure jib crane, and the shield plug is welded in place. After a weld is completed, visual examination of the weld is performed in addition to the eddy current testing and ultrasonic testing that are performed by the TAD canister welding machine.

A draining, drying, and inerting system is connected to the siphon and vent ports in the shield plug and used to dry the interior of the TAD canister, followed by backfilling it with helium gas. The TAD canister drying and inerting subsystem is described in Section 1.2.5.3.5. Port covers are then placed over the siphon and vent ports and welded in place using the TAD canister welding machine. The TAD canister welding machine is removed, and the outer lid is placed onto the TAD canister using the TAD canister closure jib crane. The TAD canister welding machine is positioned onto the TAD canister outer lid, and the lid is welded in place. The TAD canister welding machine is removed, and the shielded transfer cask lid is placed onto the shielded transfer cask using the TAD canister closure jib crane and installed. Hoses are connected to the fill and drain ports on the shielded transfer cask, and the water is sampled for contamination. If the water is clean, the ports are opened to drain the annulus between the TAD canister and the shielded transfer cask. If the water is contaminated, then the annulus is flushed with treated borated water as needed. A drying system is then used to dry the annulus. The potential for contamination is kept to a minimum by the use of the inflatable seal.

1.2.5.2.4.3 Safety Category Classification

The TAD canister closure jib crane, the lid-lifting grapple, and the TAD canister closure station are classified as ITS.

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

The preclosure safety analysis identifies one procedural safety control related to the operations of the TAD canister closure subsystem of the WHF. 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-5—To limit the probability of personnel receiving direct radiation exposure, the TAD canister closure subsystem procedures will include a warning that failure to install the shield ring on a TAD canister could result in inadvertent personnel exposures. The WHF TAD canister closure subsystem procedure will include a prerequisite for each operating crew to verify that the shield ring is installed prior to commencing operations that rely upon the shield ring.

1.2.5.2.4.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the TAD canister closure subsystem in the WHF are addressed in Table 1.2.5-3.

1.2.5.2.4.6 Design Methodologies

Design methodologies used in the design of the TAD canister closure jib crane and the lid-lifting grapple are in accordance with codes and standards provided in Section 1.2.2.2. The design methodologies used in the design of the TAD canister closure station are in accordance with Section Q1.2 of ANSI/AISC N690-1994.

1.2.5.2.4.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of the TAD canister closure jib crane and the lid-lifting grapple are in accordance with codes and standards provided in Section 1.2.2.2. Materials of construction used in the design of the TAD canister closure station are in accordance with Section Q1.4 of ANSI/AISC N690-1994.

1.2.5.2.4.8 Design Codes and Standards

The principal codes and standards applicable to the design of the TAD canister closure jib crane, lid-lifting grapple, and TAD canister closure station are identified in Table 1.2.2-12. The qualification of the TAD canister final closure welds is in accordance with ISG-18 (NRC 2003).

1.2.5.2.4.9 Design Load Combinations

The load combinations used in the analysis of the TAD canister closure jib crane and lid-lifting grapple 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 TAD canister closure station are in accordance with Table Q1.5.7.1 of ANSI/AISC N690-1994.

1.2.5.2.5 Canister Transfer Subsystem

1.2.5.2.5.1 Subsystem Description

The canister transfer subsystem consists of SSCs that transfer DPCs and TAD canisters between transportation casks, shielded transfer casks, and aging overpacks.

1.2.5.2.5.1.1 Subsystem Functions

The functions of the canister transfer subsystem are to:

- Transfer loaded TAD canisters from shielded transfer casks to aging overpacks
- Transfer loaded DPCs from transportation casks to shielded transfer casks
- Transfer loaded DPCs from aging overpacks to shielded transfer casks.

1.2.5.2.5.1.2 Subsystem Location and Functional Arrangement

The canister transfer subsystem is located in the canister transfer room (Room 2004), cask unloading room (Room 1008), and the loading room (Room 1007). Additionally, this area interfaces with the canister transfer machine maintenance room (Room 1009). These rooms are shown in Figures 1.2.5-2 and 1.2.5-3.

1.2.5.2.5.1.3 Subsystem and Components

ITS SSCs in the WHF canister transfer subsystem that are similar to those used in other handling facilities are listed below and described 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 between a transportation cask, shielded transfer cask, or 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 cavity floor of the transportation cask, aging overpack, or waste package. This equipment is described in Section 1.2.4.2 and shown in Figures 1.2.4-50 to 1.2.4-56.

Cask Port Slide Gate—The cask port slide gate is located in the operating deck between the canister transfer room and the cask unloading room. This equipment is described in Section 1.2.4.2 and shown in Figures 1.2.4-57 to 1.2.4-59.

Canister Transfer Machine Canister Grapple—The canister transfer machine canister grapple is used with the canister transfer machine to transfer a TAD canister or a DPC between a transportation cask, shielded transfer cask, or aging overpack. This equipment is described in Section 1.2.4.2 and shown in Figures 1.2.4-47 to 1.2.4-49.

DPC Lid Adapter—The DPC lid adapter, described in the cask handling subsystem (Section 1.2.5.2.1.1.3), is also used in the canister transfer subsystem.

ITS SSCs that are unique to the WHF canister transfer subsystem are described below.

Overpack Port Slide Gate—The overpack port slide gate is located in the operating deck between the canister transfer room and the loading room. The overpack port slide gate is designed similarly to the cask port slide gate. For details of this equipment, see Section 1.2.4.2 and refer to Figures 1.2.4-57 to 1.2.4-59.

1.2.5.2.5.2 Operational Processes

The canister transfer subsystem transfers DPCs and TAD canisters between transportation casks, shielded transfer casks, and aging overpacks.

DPC Transfer from Transportation Cask to Shielded Transfer Cask—After the rail cask containing a DPC is brought into the cask unloading room, the rail cask lid is removed using the canister transfer machine and placed in a laydown area. The canister transfer machine is moved to the cask port. The canister transfer machine shield skirt is lowered, and the canister transfer machine slide gate and the cask port slide gate are opened. The canister guide sleeve is lowered, the DPC is lifted into the canister transfer machine, the canister guide sleeve is raised, the cask port slide gate and canister transfer machine slide gate are closed, and the canister transfer machine shield skirt is raised.

The canister transfer machine maintenance crane is used to place the rail cask lid onto the unloaded rail cask. The mechanical equipment envelope for the canister transfer machine maintenance crane is shown in Figure 1.2.5-56. The unloaded rail cask on the cask transfer trolley is then moved to preparation station 1 and subsequently exported from the facility. After an unloaded shielded transfer cask has been brought into the cask unloading room, the shielded transfer cask lid is removed using the canister transfer machine maintenance crane. The canister transfer machine is moved to the cask port, the canister transfer machine 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 DPC is transferred into the shielded transfer cask, the canister guide sleeve is raised, the cask port slide gate and canister transfer machine slide gate are closed, and the canister transfer machine shield skirt is raised. The shielded transfer cask lid is replaced using the canister transfer machine and the shielded transfer cask containing a DPC is moved to preparation station 1 on the cask transfer trolley.

DPC Transfer from Aging Overpack to Shielded Transfer Cask—After the aging overpack containing a DPC has been received in the loading room and an unloaded shielded transfer cask has been received in the cask unloading room, the shielded transfer cask lid and the aging overpack lid are removed by the canister transfer machine and placed in a laydown area. The canister transfer machine is moved to the overpack port. The canister transfer machine shield skirt is lowered, and the canister transfer machine slide gate and the overpack port slide gate are opened. The canister guide sleeve is lowered, the DPC is lifted into the canister transfer machine, the canister guide sleeve is raised, and the overpack port slide gate and canister transfer machine slide gate are closed. The canister transfer machine shield skirt is raised and the canister transfer machine then moves to the cask port. The canister transfer machine shield skirt is lowered, and the canister transfer machine slide gate and the cask port slide gate are opened. The canister guide sleeve is lowered, the DPC is transferred into the shielded transfer cask, the canister guide sleeve is raised, the cask port slide gate and canister transfer machine slide gate are closed, and the canister transfer machine shield skirt is raised. The shielded transfer cask lid is then replaced using the canister transfer machine, and the shielded transfer cask containing a DPC is moved to preparation station 1 on the cask transfer trolley.

TAD Canister Transfer from Shielded Transfer Cask to Aging Overpack—After an aging overpack has been received in the loading room and the shielded transfer cask containing a TAD canister has been received in the cask unloading room, the aging overpack lid and shielded transfer cask lids are removed by the canister transfer machine and placed in a laydown area. The canister transfer machine is moved to the cask port. The canister transfer machine shield skirt is lowered, the canister transfer machine slide gate and the cask port slide gate are opened, the canister guide sleeve is lowered, the TAD canister is then lifted into the canister transfer machine, the canister guide sleeve is raised, the cask port slide gate and canister transfer machine slide gate are closed, and the canister transfer machine shield skirt is raised. The canister transfer machine moves to the overpack port, the canister transfer machine shield skirt is lowered, and the canister transfer machine slide gate and the overpack port slide gate are opened. The canister guide sleeve is lowered, the TAD canister is transferred into the aging overpack, the canister guide sleeve is raised, the overpack port slide gate and canister transfer machine slide gate are closed, and the canister transfer machine shield skirt is raised. The aging overpack lid is then replaced using the canister transfer machine, and the aging overpack containing a TAD canister is moved to the aging overpack access platform by the site transporter.

1.2.5.2.5.3 Safety Category Classification

The canister transfer machine, canister transfer machine canister grapple, cask port and overpack port slide gates, and DPC lid adapter in the canister transfer subsystem are categorized as ITS.

1.2.5.2.5.4 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 WHF. 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-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 WHF canister transfer room (Room 2004) 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 WHF 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.

1.2.5.2.5.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the canister transfer subsystem in the WHF are addressed in Table 1.2.5-3.

1.2.5.2.5.6 Design Methodologies

The design methodologies used in the design of ITS components in the canister transfer subsystem, including the canister transfer machine, canister transfer machine canister grapple, and DPC lid adapter that are similar to those used in other handling facilities, are in accordance with codes and standards provided in Section 1.2.2.2. The methodologies used in the design of the cask port and overpack port slide gates are in accordance with Section Q1.2 of ANSI/AISC N690-1994.

1.2.5.2.5.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of the ITS SSCs in the canister transfer subsystem that are similar to those used in other handling facilities, including the canister transfer machine, canister transfer machine canister grapple, and DPC lid adapter are in accordance with codes and standards provided in Section 1.2.2.2.

Materials of construction used in the design of cask port and overpack port slide gates are in accordance with Section Q1.4 of ANSI/AISC N690-1994.

1.2.5.2.5.8 Design Codes and Standards

The principal codes and standards applicable to the canister transfer subsystem are identified in Table 1.2.2-12.

1.2.5.2.5.9 Design Load Combinations

The load combinations used in the design of ITS SSCs for the canister transfer subsystem, including the canister transfer machine, canister transfer machine canister grapple, and DPC lid adapter 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 cask port and overpack port slide gates are in accordance with Table Q1.5.7.1 of ANSI/AISC N690-1994.

1.2.5.3 Process Systems

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

1.2.5.3.1 Cask Cavity Gas Sampling Subsystem

The cask cavity gas sampling system samples the gas inside a loaded transportation cask or DPC 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 or DPC 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 WHF is functionally the same as 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 WHF. The WHF cavity gas sampling system is located in the gas sampling room (Room 1010). The WHF transportation cask/DPC/shielded transfer cask cavity gas sampling piping and instrumentation diagram is shown in Figure 1.2.5-57. The cask cavity gas sampling subsystem is classified as non-ITS.

1.2.5.3.2 Pool Water Treatment and Cooling System

1.2.5.3.2.1 System Description

The pool water treatment and cooling system is divided into five subsystems: the pool water treatment subsystem, the pool water cooling subsystem, the pool water makeup subsystem, the boric acid makeup subsystem, and the leak detection subsystem. The WHF pool is initially filled with deionized water and enriched boron with a minimum concentration of 2,500 mg/L (enriched to 90 wt % ^{10}B). The function of the soluble neutron absorber in the form of boric acid is to prevent criticality in the pool. The pool water treatment and cooling system maintains the water level of the WHF pool to provide sufficient shielding from the SNF assemblies in the pool. The concentration of boron in the WHF pool is maintained above 2500 mg/L through manual operation of the boric acid makeup subsystem. The system also monitors the leak detection sumps located in Rooms B001 and B009 to identify any leakage in the WHF pool liner.

The pool water treatment and cooling system and its subsystems have been classified as non-ITS. The pool water treatment and cooling system maintains the quality of the water in the WHF pool. This includes clarity, such that SNF assembly identification can be established by direct viewing through standard underwater viewing devices; conductivity, such that the annual average pool water conductivity is less than 3 micro-mho/cm; and water chemistry, to ensure that the water chloride concentration is less than 0.5 ppm and the average pool water pH is between 5.3 and 7.5. The system also maintains the temperature of the pool water to meet the temperature limits shown in Section 1.2.5.3.2.2.

1.2.5.3.2.1.1 System Functions

The following sections provide overviews of the functions performed by these subsystems.

Pool Water Treatment Subsystem—This subsystem functions to:

- Remove crud and particulates using filters
- Remove radionuclides to maintain low radioactivity levels in the pool
- Remove other ionic species
- Skim the surface of the pool water to remove crud and particulates
- Vacuum the pool walls and floors to remove crud and particulates
- Maintain optical clarity of the pool water to allow identification of SNF assembly identifiers and facilitate SNF handling
- Minimize worker occupational radiation exposure.

Pool Water Cooling Subsystem—This subsystem functions to remove decay heat from the pool water caused by the heat load of the SNF in the pool.

Pool Water Makeup Subsystem—This subsystem functions to control the level of the water in the pool and provide deionized water to replace water evaporated from the pool.

Boric Acid Makeup Subsystem—This subsystem functions to maintain the required concentration of boron in the WHF pool to prevent criticality as discussed in Section 1.14.

Leak Detection Subsystem—This subsystem functions to provide monitoring of the leak detection piping embedded between the pool liner and the concrete of the pool.

1.2.5.3.2.1.2 System Location and Functional Arrangement

Pool Water Treatment Subsystem—The three pool water treatment trains are located in Rooms 1042A, B, and C; 1043A, B, and C; and 1044A, B, and C. The underwater filters, underwater vacuums, and pool skimmer are located in the WHF pool (Room P001).

Pool Water Cooling Subsystem—The pool water cooling heat exchangers are located in Room M001, 20 ft above the ground floor. The chillers, which provide the cooling water for the heat exchangers, are located outside of the WHF in the chiller area.

Pool Water Makeup Subsystem—Level detectors are provided to monitor the level of WHF pool water. Deionized water is supplied to the WHF pool from the plant services system.

Boric Acid Makeup Subsystem—The boric acid makeup tank is located in the low-level radioactive waste staging area (Room 1013). Boric acid solution is prepared in the makeup tank and is mixed with the treated water from the pool water treatment subsystem, as needed.

Leak Detection Subsystem—The leak detection sumps are located in the basement below the WHF pool in Rooms B001 and B009. The leak detection pumps are located in the sumps. In the event of a leak in the WHF pool liner, the leak detection pumps return the water to the WHF pool.

The pool water treatment and cooling system piping and instrumentation diagrams are shown in Figures 1.2.5-58 to 1.2.5-62. The boric acid makeup subsystem process and instrumentation diagram is shown in Figure 1.2.5-63.

1.2.5.3.2.1.3 Components

1.2.5.3.2.1.3.1 Pool Water Treatment Subsystem

Pool Water Treatment Pump Strainers—Inline strainers (Rooms 1042A, B, and C) protect the pool water treatment pumps by removing debris from the pool water prior to the pump intakes. The strainers are basket-type strainers and are sized to remove debris that might damage the pumps.

Pool Water Treatment Pumps—There are three pool water treatment pumps (Rooms 1042A, B, and C), which correspond to the three pool water treatment trains for cleaning the water in the WHF pool. Each pump can transfer pool water through a treatment train and return the water back to the pool. For normal operations, one pump transfers water from the east end of the fuel transfer and storage area of the WHF pool. A second pump takes water from the east end of the DPC unloading bay. The third pump is for standby and can transfer water from either part of the pool. When a pool water treatment train is shut down for maintenance, the third train is used in its stead.

Pool Water Treatment Roughing Filters—Each pool water treatment train has two roughing filters (Rooms 1043A, B, and C) in parallel. The roughing filter is a double filter that filters at 20 microns and 2 microns. The roughing filters remove crud that is released from the SNF assemblies during fuel transfer and staging. Dust and dirt in the pool from in-leakage of air from outside or from the surface of transportation casks is removed as well. Water flows through the filter from the inside to the outside, trapping the particulates inside the filter.

Pool Water Treatment Polishing Filters—Following each of the roughing filters, each pool water treatment train has a polishing filter (Rooms 1043A, B, and C). The polishing filter is a 0.1-micron filter. The polishing filters remove the smaller crud particles. Water flows through the filter from the inside to the outside, trapping the particulates inside the filter.

Pool Water Treatment Ion Exchangers—The three pool water treatment ion exchangers are located in a pool ion-exchanger room (Rooms 1044A, B, and C). A nuclear grade ion-exchange resin is used, which reduces the loss of boron from the pool water. The ion-exchange system has a twofold purpose: to remove radionuclides to reduce the radiation level of the pool water and to remove ions from the pool water to decrease the conductivity of the pool water. Reducing the conductivity provides corrosion protection for spent fuel cladding. The pool water treatment ion exchangers are designed to maintain pool water quality within the limits provided in Section 1.2.5.3.2.1.

Ion-Exchange Strainer—For nuclear grade ion-exchange resin, about 95% of the beads are 0.3 to 1.2 mm. However, smaller, broken, or misshapen ion-exchange beads can slip through the screening at the bottom of the ion-exchange vessel. Inline basket-type strainers (Rooms 1044A, B, and C) are used to ensure that ion-exchange resin that passed through the ion-exchange screens is not released to the WHF pool.

Pool Underwater Filters—Four underwater filter units are located on the floor of the WHF pool (Room P001): two in the DPC unloading bay and two for the rest of the pool. One filter unit on each side is standby. The underwater filters are placed on the bottom of the pool, outside of the boundary for the spent fuel transfer machine. The underwater filter units have self-contained pumps. Water is drawn through the top of the filter housings and is discharged via hoses at the top of the unit to remote areas of the pool.

Pool Underwater Vacuum—Underwater vacuum systems are used to clean the floor and sides of the pool (Room P001). The vacuums have hoses and special tools for cleaning floors, walls, corners, and crevices. Five vacuum stations on the floor of the WHF pool are located to easily reach the areas of the WHF pool.

WHF Pool Skimmer—A pool skimmer is connected by flexible hose to one of the five underwater vacuum units to filter the surface of the WHF pool (Room P001). The floating pool skimmer can be tethered anywhere in the pool. The skimmer does not accumulate radioactive material since the filtering is performed by the underwater vacuum system.

Filter Transfer Machines—There are three filter transfer machines (Rooms 1043A, B, and C), which correspond to the three pool water treatment trains for cleaning the water in the WHF pool. The filter transfer machines are used to remotely transfer spent roughing and polishing filters from their filter housings to a spent filter transfer pig. The filter transfer machine is designed similar to an overhead crane except that two trolleys are mounted on the bridge; a hoist trolley and a shield bell trolley. The shield bell trolley supports a shield bell that is moved along the span of the bridge to position the shield bell over the filter housing compartment or the spent filter transfer pig. The hoist trolley can be moved independently of the shield bell trolley but is mechanically coupled with the shield bell trolley during filter transfer operations. A motorized slide gate is provided at the bottom of the shield bell to provide bottom shielding for the filter once it is inside the shield bell. A motorized shield skirt is also provided to close the gap between the bottom of the shield bell and the top of the filter housing compartment or spent filter transfer pig during a filter transfer operation. The filter transfer machine mechanical equipment envelope is shown in Figure 1.2.5-64 and the filter transfer machine process and instrumentation diagram is shown in Figure 1.2.5-65.

1.2.5.3.2.1.3.2 Pool Water Cooling Subsystem

Pool Water Heat Exchangers—The shell-and-tube heat exchangers (Room M001) are used to remove decay heat from the pool water. The cooling water, which is a closed loop of deionized water, is on the shell side with the pool water in the tubes. The pressure on the shell side is slightly higher than that for the tube side. In the event of a leak, clean cooling water leaks into the contaminated tube side, preventing contamination of the cooling water system.

Pool Water Chiller Units—The chiller units (Room 1040) are air-cooled using a refrigerant. The deionized water in the cooling loop is cooled to 50°F.

Cooling Water Pumps—There are two cooling water pumps located outside of WHF in the chiller area (Room 1040) near the air-cooled chiller units. The pumps move cooling water from the pool water chiller units to the pool water heat exchangers.

1.2.5.3.2.1.3.3 Boric Acid Makeup Subsystem

Boric Acid Makeup Tank—The makeup tank (Room 1013) is a flat-bottomed, atmospheric pressure tank that is used to mix dry boric acid with deionized water prior to adding it to the WHF pool.

Boric Acid Makeup Tank Agitator—The agitator is located in the boric acid makeup tank and is utilized to facilitate mass transfer during the dissolution of the dry boric acid. The agitator is a top-entering, pitched four-blade turbine and is configured to be angular and off-center.

Boric Acid Makeup Tank Immersion Heater—The immersion heater is located in the boric acid makeup tank and is utilized to facilitate the dissolution of the boric acid and to maintain the temperature of the boric acid solution in the tank. The dissolution of boric acid is an endothermic reaction. The immersion heater is used to raise the temperature of the deionized water above ambient prior to adding the dry boric acid. After addition, the immersion heater is used to maintain the solution temperature at or above 68°F.

Boric Acid Transfer Pumps—There are two boric acid transfer pumps located in the same area as the boric acid makeup tank (Room 1013). The centrifugal pumps transfer the boric acid solution in batches from the makeup tank to the return piping of the pool water treatment subsystem where it enters the WHF pool. The discharge pressure of the transfer pumps is higher than the pressure in the return line to prevent backflow during transfers. When transfers are not occurring, backflow into the boric acid makeup piping is prevented by the use of a check valve in the transfer line. Heat tracing is not required for the transfer piping since the boric acid makeup concentration is soluble at ambient temperatures. However, the transfer piping, components, and instruments are heat traced to accommodate higher concentrations and temperatures if warranted.

1.2.5.3.2.1.3.4 Pool Water Makeup Subsystem

Pool Level Controls—Redundant level transmitters monitor the pool level and send the signal to the DCMIS to be indicated in the facility operations room. If the pool level drops to the low operating level, automatic controls open the pool makeup valve to allow deionized water to refill the pool. The valve is automatically closed to stop the flow of makeup water when the pool level has risen to the high-level set point. An alarm is provided in the Central Control Center and facility operations room if the pool level continues to increase to the high-high level or if the level decreases to the low-low level. The pool makeup valve may also be opened and closed from the facility operations room. Upon loss of power, the valve closes, and a bypass valve is available for manual local operation.

1.2.5.3.2.1.3.5 Leak Detection Subsystem

Sump Pumps—The sump pumps are located in the leak detection sumps in Rooms B001 and B009. The sump pumps are used to transfer the sump contents to the WHF pool.

Sump Cameras—The leak detection sumps are monitored in the facility operations room by cameras located in Rooms B001 and B009.

Sumps—The sumps are located in Rooms B001 and B009. The leak detection piping from under the pool liner terminates at the sumps. The sumps are monitored by cameras and by level detection equipment. Flow in the leak detection piping is used as an input to determine the location of any leaks in the pool liner.

1.2.5.3.2.1.4 Maintenance Considerations

Underwater Vacuums and Filters—The filters in the underwater filter and vacuum units are replaced when the flow rates drop to unacceptable levels (monitored flow) or when the radiation level of the filters rises to an established limit such that replacement can be achieved with occupational doses that are as low as is reasonably achievable. The filters for the underwater vacuum units and underwater filter unit are replaced underwater, providing shielding and contamination control during replacement. A shielded container for used filters is placed in the pool.

The filters are placed in a submerged shielded filter container at the bottom of the pool. The shielded filter container is removed from the pool, drained, and transported for disposal as wet solid low-level radioactive waste.

Roughing and Polishing Filters—The roughing and polishing filters are replaced when the pressure drop reaches unacceptable levels (monitored) or when the radiation level of the filters rises to an established limit such that replacement can be achieved with occupational doses that are as low as is reasonably achievable. The roughing and polishing filters are replaced remotely using the filter transfer machines.

1.2.5.3.2.2 Operational Processes

For the three pool water treatment trains (two operating, one in standby) pool water is transferred from the WHF pool by each train. Each train is capable of meeting the requirement for a 72-hour turnover rate. The pool water passes through a strainer in front of the pump to protect the pump from debris. The pump forces the water through two roughing filters and two polishing filters to remove crud and other particulates. Then, the water is passed through an ion-exchange vessel to remove radionuclides and other ions and a strainer that prevents any resin beads from entering the WHF pool. The water from the pool water treatment trains is combined and returned to the WHF pool.

In the WHF, the pool water is maintained at 75°F, not to exceed 110°F more than 5% of the time. If the temperature exceeds 75°F, the treated pool water is diverted to the pool water cooling subsystem before being returned to the pool. The treated pool water bypasses the cooling subsystem if the pool water is within the acceptable temperature range. The pool water cooling system is sized to remove the maximum possible heat load from SNF in the WHF pool (760,000 Btu/hr), and no credit is taken for heat loss due to evaporation of water from the pool. The pool water cooling system consists of two 100% heat exchangers. The pool water is cooled in a shell and tube heat exchanger with the pool water on the tube side and the cooling water on the shell side. The cooling water is provided by a commercial chiller unit. The cooled pool water is returned to the WHF pool in the DPC unloading bay and the rest of the pool. Because the pool treatment trains may not run continuously, the pool water temperature is monitored from the pool as well as in the treatment trains. The pool water temperature is monitored in the pool by two instruments, one instrument located in each of the two pool sections: the DPC unloading bay and the fuel transfer area. The instruments are linked to indicators in the Central Control Center and the facility operations room. If the pool water cooling subsystem was lost for a period of time, the pool temperature would stabilize at 100°F to 105°F assuming the maximum possible pool heat load (760,000 Btu/hr) and an average evaporation rate. Cooling would need to be lost for 25 to 30 days in order to achieve this temperature, assuming a starting temperature of 75°F.

Underwater filter units are used to remove crud and debris from the vicinity of the transportation casks or DPCs in the WHF pool before they spread throughout the pool. The underwater filters also supplement the filtering capacity of the pool water treatment subsystem to reduce the turnover time for water treatment. Two 600 gpm underwater filter units in conjunction with a single train at 350 gpm are sufficient to meet a 24-hour filtration turnover rate for the pool. Two underwater filter units are placed in both the DPC unloading bay and in the fuel transfer area. The second filter unit in each area is available during filter change-out of the first. These underwater filter units are placed in close proximity to where the DPCs are opened and where crud bursts are most likely to occur. In doing so, much of the crud released by opening the casks and moving the spent fuel is captured before it spreads throughout the entire pool.

Five underwater vacuum units are located throughout the WHF pool. These units are used with a pool skimmer to remove debris floating on the water. Depending on the operations being performed in the pool, the pool skimmer can be moved to a location away from the activities. The underwater vacuum units are also used to manually vacuum the bottom and sides of the WHF pool where crud can accumulate. Special tools are used to vacuum flat surfaces and corners of the pool.

The pool (Room P001) is 52 ft deep. The normal water level in the pool is 48 ft, or 4 ft below the top of the pool. The water level will fluctuate due to content, evaporation, and maintenance operations. The only piping that penetrates the surface of the pool is the suction and return lines to and from the pool water treatment and cooling system. The pool water treatment and cooling system piping is designed and arranged such that a failure of the suction and discharge piping will not inadvertently drain the pool level below a point to uncover the top of the spent fuel. The inlet to the suction pipe of the pool water treatment and cooling system begins at 8 ft below the top of the pool at a water level of 44 ft. The suction piping runs up to an elevation of 4 ft above the top of the pool where the pump transfers pool water to the treatment equipment. The lowest points in the pool water treatment and cooling system are 4 ft below the top of the pool. A siphon breaker in the suction piping is unnecessary because the inlet of the suction is at a lower elevation than the transfer pump and equipment. Figure 1.2.5-13 shows the various pool water levels during transfer operations.

A conservative minimum water level for shielding purposes, when fuel assemblies are not being transferred, is 35 ft. Since the suction inlet is 9 ft above this level, water cannot be drawn down below 35 ft. The pool water treatment and cooling system return outlet is 3 ft above the bottom of the pool and is designed to promote heat transfer and cooling. Because the pool equipment is stationed at elevations above the pool and all the piping of the pool water return piping is routed at elevations higher than both its penetration point and termination point in the pool, there is no risk of siphoning due to a break in the return piping.

The pool water makeup subsystem has a level control system to measure the height of the pool water. When the pool level drops below the predetermined low operating level, automatic controls open the pool water makeup valve to allow deionized water to refill the pool. The level control system cuts off the makeup water when the pool water has reached the desired height. If the pool water makeup subsystem was lost for an extended period of time, it would take over 180 days to evaporate enough water to lower the pool level down from 48 ft to 35 ft assuming the maximum possible pool heat load (760,000 Btu/hr) and an average pool temperature between 100°F and 105°F. At the control temperature of 75°F, this evaporation would take over 600 days.

The leak detection subsystem monitors the leak detection sumps for water that would indicate a leak in the WHF pool liner. Cameras are located such that the leak detection sumps are visible in the control room. There are also level indicators to monitor the level of water in the sumps, which activate an alarm in the event water starts to accumulate. Sump pumps are located in the leak detection sumps to return water from the sumps to the WHF pool.

Pool water is sampled and analyzed on a regular basis to determine water chemistry parameters including boron concentration. The ion-exchanger influent and effluent activity are measured routinely to determine the decontamination factor for the ion-exchanger system. The concentration of boron in the WHF pool water is measured in the chemical laboratory (Room 1014).

A loss of boron is not anticipated to occur in the pool water. However, the boron makeup system tank is used to provide a volume of a boric acid solution capable of raising the boron concentration to the required level. The solution is routinely added to the treated water from the pool water treatment subsystem to replenish any losses. The losses and additions are trended and the frequency of addition is modified to appropriately maintain the required minimum boron concentration of 2,500 mg/L (enriched to 90 wt % ^{10}B) in the pool. An immersion heater and agitator are available to aid in the dissolution of boric acid and the immersion heater is also used to sustain the solution temperature to ensure that the boric acid does not precipitate. The average temperature in the room where the tank is located (Room 1013) is 72°F and the concentration of boric acid within the tank is soluble at 68°F.

Ion exchange resin is changed out based upon high radiation levels, high pressure drop, and/or unacceptable decontamination levels. Only one ion exchanger is sluiced at a time, allowing for use of the treatment system during maintenance. A recirculation path is available in case of an interruption in the resin sluicing process. The recirculation path is necessary to keep the slurry moving to prevent the resin from settling out and clogging the sluicing pipes. Section 1.4.5 provides a description of the spent resin disposal system.

1.2.5.3.2.3 Design Codes and Standards

The SSCs in the pool water treatment and cooling systems are designed using the methods and practices in the following codes and standards:

- ANSI/ANS-57.7-1988, *American National Standard, Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)*
- Regulatory Guide 1.143, *Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants*, Table 1 (excluding footnotes).

1.2.5.3.3 Cask Decontamination Subsystem

1.2.5.3.3.1 Subsystem Description

The cask decontamination system is used to rinse the unloaded transportation casks and unloaded shielded transfer casks and to rinse the shielded transfer casks containing TAD canisters when they are removed from the WHF pool. The wash lance is used with deionized water to rinse off the contaminated pool water while casks are suspended over the WHF pool. The rinse water drips directly into the pool. If a radiological survey of the exterior surface of the cask indicates that further decontamination is required, the transportation cask or shielded transfer cask containing a DPC or TAD canister is transferred into the decontamination pit. The cask decontamination subsystem is classified as non-ITS, but the decontamination pit and seismic restraints are ITS. The wash lance is classified as non-ITS. Table 1.2.5-3 provides the design bases and their relationship to the design criteria for the decontamination pit and seismic restraints.

1.2.5.3.3.1.1 Subsystem Functions

The function of the cask decontamination system is to remove contamination from the exterior of the transportation casks and shielded transfer casks in order to prepare these components for export or removal from the WHF.

1.2.5.3.3.1.2 Subsystem Location and Functional Arrangement

The decontamination pit (Room P002) is located in the cask preparation area (Room 1016) near the WHF pool (Room P001). The decontamination pit includes a closed loop system for decontamination water cleanup. A system of adjustable spray units are used to remove the contamination from the exterior of the shielded transfer casks and the transportation casks. The wash lance is connected to the deionized water subsystem at a location adjacent to the pool. The wash lance can be used to decontaminate various handling and lifting equipment components over the WHF pool.

The decontamination pit mechanical equipment envelope is shown in Figure 1.2.5-66, and the process and instrumentation diagram is shown in Figure 1.2.5-67. The wash lance mechanical equipment envelope is shown in Figure 1.2.5-68.

1.2.5.3.3.1.3 Components

ITS SSCs that are unique to the cask decontamination system are described below.

Decontamination Pit—The decontamination pit is used for the decontamination of transportation casks or shielded transfer casks. The decontamination pit can accommodate different sizes of commercial transportation casks and shielded transfer casks. Smooth stainless steel is provided on the surfaces of the walls. A system of retractile spray headers with high pressure spray nozzles can accommodate different cask diameters. A pump module provides deionized water for the decontamination washdown and to the spray nozzles. The pump module can adjust the water temperature and pressure, and the chemical solutions (i.e., add or change decontamination agent chemicals, or mild detergents, or other chemicals) as required for specific decontamination of transportation casks or shielded transfer casks. For details of the decontamination pit, refer to Figures 1.2.5-66 and 1.2.5-67.

Seismic Restraints—The decontamination pit includes seismic restraints to ensure that the transportation cask or shielded transfer cask inside the decontamination pit is restrained to prevent tipover. The seismic restraints are fabricated with structural steel and are tied into the decontamination pit structure. The seismic restraints are adjustable in order to accommodate the various sizes of casks that could be transferred to the decontamination pit.

1.2.5.3.3.2 Operational Processes

When the transportation cask or shielded transfer cask is removed from the WHF pool, the wash lance is used to rinse the contaminated pool water from the exterior. The process is a manual operation. If the radiological survey shows that this process is unsuccessful at removing external contamination, the transportation cask or shielded transfer cask can be moved (using the cask handling crane) to the decontamination pit where more extensive decontamination of the external surfaces can be performed. The decontamination pit cover is removed from the decontamination pit and the transportation cask or shielded transfer cask is transferred into the decontamination pit. The seismic restraints are then adjusted to the diameter of the transportation cask or shielded transfer cask and the decontamination pit cover is placed back onto the decontamination pit. The transportation cask or shielded transfer cask is then accessed via the platform to perform spot decontamination, or decontamination is done remotely by operating the pump module and spray nozzles from the shielded area at the south end of the pit.

1.2.5.3.3.3 Design Codes and Standards

ITS SSCs in the cask decontamination subsystem are designed in accordance with ANSI/AISC N690-1994. The design of the decontamination pit and seismic restraints is in accordance with Section Q1.2 (design methodologies), Section Q1.4 (selection of appropriate material), and Table Q1.5.7.1 (meeting load combinations) in ANSI/AISC N690-1994.

1.2.5.3.4 Cask Cooling and Filling Subsystem

1.2.5.3.4.1 Subsystem Description

The primary function of the cask cooling and filling subsystem is to cool the inside of DPCs and casks, such as shielded transfer casks, legal-weight truck casks, and rail casks, prior to opening or placement in the pool. The equipment in this system is also used to fill TAD canisters and annulus spaces. In this system, the DPCs, casks, and TAD canisters are slowly filled from the bottom with treated borated pool water prior to placement in the pool. The casks and DPCs are cooled through evaporative cooling. A secondary option is to cool the casks with a forced helium dehydrator. The forced helium dehydrator is discussed in Section 1.2.5.3.5.

The cask cooling subsystem is classified as non-ITS, except the cask or canister overpressure protection function, as shown on Figures 1.2.5-69 through 1.2.5-72, is classified as ITS.

1.2.5.3.4.1.1 Subsystem Functions

The cask cooling subsystem is used to cool the inside of a cask or DPC and fill it with treated borated pool water prior to placement in the pool. The casks and DPCs are cooled to prevent a steam or rapid gas release when placed in the pool. The DPCs must also be cooled to prevent boiling during the DPC cutting process. Empty TAD canisters do not need to be cooled, but they are filled by the cask cooling subsystem prior to being placed in the pool and drained after they are removed from the pool.

The function of overprotection during cask cooling is ITS. Details of the design of the ITS pressure relief valves are presented below. Details of the non-ITS portions of the cask cooling and filling subsystem are provided in Sections 1.2.5.3.4.1.2 to 1.2.5.3.4.3.

ITS Component Description—Pressure relief valves are used to reduce the probability of cask failure due to overpressure. ITS pressure relief valves are added to mitigate overpressurization of the casks and the DPC. Equipment selection and associated controls are selected to prevent the overpressurization of the cask or DPC.

Operational Processes—Protection against inadvertent overpressurization of the cask cooling and filling subsystem that could potentially damage the casks or DPCs is accomplished by providing a pressure relief valve at the inlet of the cask or DPC at each station. The selection of the pressure relief valves ensures that they have sufficient relieving capacity so that the cask cooling and filling subsystem does not exceed the specified pressure.

Safety Category Classification—The pressure relief valves are classified as ITS.

Procedural Safety Controls to Prevent Event Sequences—There are no procedural safety controls associated with the cask cooling and filling subsystem.

Design Bases and Design Criteria—The nuclear safety design bases and design criteria for the overpressure protection function of the cask cooling and filling subsystem in the WHF are addressed in Table 1.2.5-3.

Design Methodologies—The design methodologies used for the design of the pressure relief valves are in accordance with ASME Section III, Division I, Subsection ND, Class 3 Components (ASME 2001).

Consistency of Materials with Design Methodologies—The materials of construction used in the design of the pressure relief valves are in accordance with ASME Section III, Division I, Subsection ND, Class 3 Components (ASME 2001).

Design Codes and Standards—The design of the pressure relief valves is in accordance with ASME Section III, Division I, Subsection ND, Class 3 Components (ASME 2001).

Design Load Combinations—The design load combinations used in the design of the pressure relief valves are in accordance with ASME Section III, Division I, Subsection ND, Class 3 Components (ASME 2001).

1.2.5.3.4.1.2 Subsystem Location and Functional Arrangement

The treated borated pool water used for cooling and filling comes from the pool water treatment and cooling system return line. Connections to this line and provisions for cooling are located at preparation station 1, preparation station 2, the DPC cutting station, and the TAD canister closure station (Room 1016). The piping and instrumentation diagrams for these systems are shown in Figures 1.2.5-69 to 1.2.5-72. The borated pool water is pumped from the pool water treatment and cooling system to the DPC, cask, or TAD canister for filling. Controls and equipment are chosen to prevent overpressurizing the container. The steam created by evaporative cooling leaves the DPC or cask through vent piping into a liquid/gas separator vessel. The collected liquid is pumped back to the pool water treatment system before returning to the pool and the gas vents to the HVAC system. The forced helium dehydrator is located in the canister transfer machine maintenance room (Room 1009) and is shown in Figure 1.2.5-73.

1.2.5.3.4.1.3 Components

Provisions for cask or DPC cooling, by slowly introducing borated pool water, consist of a metering pump, quick disconnects on the containers, a liquid/gas separator, and centrifugal pump. The metering pump is a positive displacement pump that regulates the flow of water into the cask or DPC. The treated borated water for cask or DPC cooling is provided via permanent connections to and from the WHF pool water treatment and cooling system. Flexible hoses are used to transfer the borated pool water between the permanent connections and the quick disconnects of the cask, DPC, or TAD canister. Drainage is provided via the return path to the WHF pool water treatment and cooling system.

The forced helium dehydrator consists of a refrigeration unit and four modules: the condensing module, the demoisturizer module, the helium circulation module, and the preheater module. For cask and canister cooling the preheater module is not used because the objective is to provide cooling.

1.2.5.3.4.2 Operational Processes

The primary method for cask or DPC cooling is by the addition of treated borated water. Treated borated water is slowly pumped by the metering pump to the cask or DPC. The water enters the drain pipe of the cask or DPC, which allows filling at the bottom of the container. The steam exits the cask or DPC through the vent piping and enters the liquid/gas separator where any condensation is separated from the steam. The temperature and pressure of the off-gas are measured to evaluate the cooling. When the off-gas has reached the desired temperature, the cask or DPC is filled and flushed with treated borated water prior to placement in the pool. Water condenses at the bottom of the separator. When the liquid level reaches the high set point, water is pumped back to the pool water treatment and cooling system supply piping to be treated before returning to the pool.

Another method used to cool DPCs is to use the forced helium dehydrator to circulate helium through the DPCs. The helium from DPCs is cooled using the condensing module. The cooled helium is recirculated using the helium circulation module. The temperature of the helium from certain DPCs is monitored until the given temperature is reached. Then those DPCs are filled with treated borated water through the cask cooling piping.

1.2.5.3.4.3 Design Codes and Standards

The SSCs in the cask cooling and filling subsystem are designed using the methods and practices in the following codes and standards:

- ASME B31.3-2004, *Process Piping*
- *2004 ASME Boiler and Pressure Vessel Code*, Section VIII, Division I (ASME 2004)

1.2.5.3.5 Transportation, Aging, and Disposal Canister Drying and Inerting Subsystem

1.2.5.3.5.1 Subsystem Description

The TAD canister drying and inerting subsystem consists of a generic forced helium dehydrator system package and a traditional vacuum drying system. The forced helium dehydrator system package or the vacuum drying system is used to dry TAD canisters filled in the WHF pool. For the forced helium dehydrator system package, heated helium is circulated through the TAD canister to evaporate water. The forced helium dehydrator system package is used to inert the TAD canisters filled in the WHF pool.

The TAD canister drying and inerting system is designed to the following performance requirements:

- Draining and drying of the TAD canister is in accordance with NUREG-1536 (NRC 1997).
- Helium is the only gas used for backfilling operations.
- The TAD canister is helium leak tested in accordance with ANSI N14.5-1997.

The TAD canister drying and inerting subsystem is classified as non-ITS.

1.2.5.3.5.1.1 Subsystem Functions

The TAD canister drying and inerting subsystem in the WHF performs the following functions:

- Drain the TAD canister through the drain port using helium pressure admitted to the vent port
- Dry the TAD canister with a closed-loop dehydration system using helium as the heat transfer medium or by a vacuum drying system.
- Inert the TAD canister interior with helium.

The subsystem can also be used for drying shielded transfer casks. The forced helium dehydrator system package can also be used for cooling loaded transportation casks and DPCs.

1.2.5.3.5.1.2 Subsystem Location and Functional Arrangement

The forced helium dehydrator system package is located in Room 1009, and the vacuum drying subsystem is located near the TAD canister closure station. The TAD canister drying and inerting system piping and instrumentation diagram is shown in Figure 1.2.5-73.

1.2.5.3.5.1.3 Components

Forced Helium Dehydrator System—The forced helium dehydration system package consists of the main unit and the refrigeration unit. The main unit consists of the condensing, demoisturizer, helium circulation, and preheater modules. The refrigeration unit is air-cooled. The system package can also be used for drying shielded transfer casks and cooling transportation casks and DPCs by circulating helium through the internal refrigeration unit.

Refrigeration equipment provides cooling to the condensing and demoisturizer modules. The forced helium dehydrator system package circulates helium through the TAD canister for drying.

The moist helium from the TAD canister is sent to the condensing module, and additional water is removed in the demoisturizer module.

Vacuum Drying Subsystem—The vacuum drying subsystem consists of a vacuum pump, filter, and condenser. The vacuum pump is sized to produce a vacuum of 3.0 mm Hg or less in the TAD canister. The filter is located upstream of the vacuum pump and condenser and is used to protect the condenser and vacuum pump from particulates. The condenser is located upstream of the vacuum pump and removes moisture.

1.2.5.3.5.2 Operational Processes

When the loaded TAD canister is removed from the WHF pool, the TAD canister is full of pool water. The TAD canister drying and inerting system uses helium to blow out the water to the extent possible using the vent and drain connections on the TAD canister. The water from the TAD canister is returned to the WHF pool.

To dry the inside of the TAD canister using the forced helium dehydrator system package, warm helium is circulated through the canister. The moist helium from the TAD canister is sent to the condenser module of the forced helium dehydrator to cool the helium. This ensures that dry helium is used for inerting the TAD canister. The water condensed in this module is returned to the WHF pool. Additional water is removed in the demoisturizer module and returned to the WHF pool. The helium circulation module provides the motive force for circulating the helium gas. The preheater module reheats the helium gas to be recirculated through the TAD canister. Warm helium is recirculated through the TAD canister until the inside is dry. The demoisturizer module uses a liquid coolant circulating at a temperature of approximately 5°F. At this temperature, the partial pressure of water is less than 3 mm Hg. The flow of water from the demoisturizer is monitored to determine when drying is completed.

To dry the inside of the TAD canister using the vacuum drying system, the vacuum pump is used to pull a vacuum on the TAD and vaporize the remaining water. The vacuum pressure is monitored and controlled in order to avoid freezing the water in the TAD. The vacuum pressure is controlled by a manual throttling valve. Adequate moisture removal is verified by maintaining a constant pressure over a period of 30 minutes without vacuum pump operation.

After drying, the TAD is leak tested in accordance with ANSI N14.5-1997. Once the TAD canister is confirmed to be dry and the system is leak tight, the TAD canister is filled with helium as the inerting gas. The demoisturizer module uses a liquid coolant circulating at a temperature of approximately 5°F. At this temperature, the partial pressure of water is less than 3 mm Hg. The flow of water from the demoisturizer is monitored to determine when drying is completed.

1.2.5.3.5.3 Design Codes and Standards

The SSCs in the TAD canister drying and inerting system are designed using the methods and practices in the following codes and standards:

- ANSI/ANS-57.7-1988, *American National Standard, Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)*

- ANSI/ANS-57.9-1992, *American National Standard, Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)*
- NUREG-1536, *Standard Review Plan for Dry Cask Storage Systems* (NRC 1997)
- ANSI N14.5-1997, *American National Standard for Radioactive Materials—Leakage Tests on Packages for Shipment*.

1.2.5.3.6 Water Collection Subsystem

The water collection subsystem provides floor drains to collect small amounts of water that are discharged or leaked from process SSCs, decontamination and wash water, and fire suppression water. Figure 1.2.5-74 shows the WHF C2 liquid low-level radioactive waste collection system piping and instrumentation diagram. Figure 1.2.5-75 shows the WHF C3 liquid low-level radioactive waste collection system piping and instrumentation diagram. The system is classified as non-ITS. The system description and operational processes for the water collection subsystem are provided in Section 1.2.4.3.

In the WHF, C2 (normally not contaminated) and C3 (potential for being contaminated) drains collect fire water and liquid low-level radioactive waste. The C2 drains are segregated from the C3 drains and collect into two tanks. There is one C2 tank located on the north side of the facility and one C2 tank located on the south side of the facility in the WHF basement. There is one C3 tank, located on the north side of the WHF basement, for collecting potentially contaminated low-level radioactive liquid wastes from the C3 area drains. The tanks are configured to allow the liquid to be sampled. Pumps take suction on the C2 tanks and transfer the liquid either to a tanker truck or to the C3 tank. The liquid is transferred to the tanker truck only if it is not contaminated. If the liquid is contaminated, the transfer is made to the C3 tank. The C3 transfer system has the capability to transfer the liquid to a tanker truck if there is no contamination. Contaminated liquid from the C3 tank is hard piped to the Low-Level Waste Facility.

1.2.5.4 Shielded Transfer Cask

[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)]

1.2.5.4.1 System Description

There are three different types of shielded transfer casks used at the repository:

- A vertical TAD shielded transfer cask is used within the WHF for handling TAD canisters during loading and closure operations.

- A vertical DPC shielded transfer cask is used within the WHF for handling DPC canisters during opening and unloading operations. A vertical DPC shielded transfer cask can also be used to transport unloaded DPCs from the WHF to the Low-Level Waste Facility.

- A horizontal shielded transfer cask is used to move the horizontal DPCs from the Aging Facility to the WHF. The horizontal shielded transfer cask is also used within the WHF for handling these DPCs during opening and unloading operations.

The performance envelope for the design of each of the shielded transfer casks is similar. The features are discussed in Section 1.2.5.4.1.3.

1.2.5.4.1.1 System Functions

The functions of the shielded transfer cask are to provide a safe means of: (1) processing TAD canisters and DPCs within the WHF for canister opening, SNF transfer, and the canister closing operations; and (2) transporting horizontal DPCs from the Aging Facility to the WHF.

1.2.5.4.1.2 System Location and Functional Arrangement

The three types of shielded transfer casks are used in multiple locations within the WHF. The horizontal shielded transfer cask is also used to move the horizontal DPC to the WHF from the Aging Facility.

1.2.5.4.1.3 System and Components

Vertical DPC—A vertical DPC is a right-circular cylinder designed to hold commercial SNF, consisting of either PWR or BWR SNF assemblies. The key functions are to contain the fuel, limit radiation exposure from the top of the canister during cask loading and unloading operations (through the use of a shield plug or shielded lid), and prevent criticality. The DPC functions with the shielded transfer cask to protect the fuel and to provide adequate heat transfer to prevent fuel cladding overheating and subsequent cladding degradation. U.S. Nuclear Regulatory Commission–licensed, vertical DPCs of varying lengths, diameters, and weights are received at the repository. Section 1.5.1 provides additional details.

Vertical DPC Shielded Transfer Cask—A vertical DPC shielded transfer cask is designed to accommodate a single vertical DPC, be moved into the WHF by a bottom-lift site transporter, be moved within the WHF by an overhead crane and cask transfer trolley, provide integral shielding to protect repository workers, and provide structural strength and passive cooling to maintain the functional integrity of the DPC. Vertical DPC shielded transfer casks are designed to be lifted by their trunnions in a vertical orientation by an overhead crane, and to stand upright when set down upon a flat horizontal surface. The vertical DPC shielded transfer cask is shown in Figure 1.2.5-76.

TAD Canister—A TAD canister is a right-circular cylinder designed to hold commercial reactor fuel: either 21-PWR or 44-PWR spent fuel assemblies. Its key functions are to contain the fuel and limit radiation exposure from the top of the canister during cask loading and unloading operations. The TAD canister functions with the TAD shielded transfer cask to protect the fuel and provides adequate heat transfer to prevent fuel cladding overheating and subsequent cladding degradation. U.S. Nuclear Regulatory Commission–licensed TAD canisters of varying weights are received at the repository. Section 1.5.1 provides details on the TAD canister.

TAD Shielded Transfer Cask—A TAD shielded transfer cask is designed to accommodate a single TAD canister, be moved into and out of the WHF by a bottom-lift site transporter, be moved within the WHF by an overhead crane or cask transfer trolley, provide integral shielding to protect repository workers, and provide structural strength and passive cooling to maintain the functional integrity of the TAD canister. TAD shielded transfer casks are designed to be lifted by their trunnions in a vertical orientation by an overhead crane and to stand upright when set down upon a flat horizontal surface. The TAD shielded transfer cask is shown in Figure 1.2.5-77.

Horizontal DPC—A horizontal DPC is a right-circular cylinder designed to hold commercial SNF: either PWR or BWR spent fuel assemblies. Its key functions are to contain the fuel, limit radiation exposure from the canister during cask loading and unloading operations, and prevent criticality. It functions with the shielded transfer cask to protect the fuel, and to provide adequate heat transfer to prevent fuel cladding overheating and subsequent cladding degradation. U.S. Nuclear Regulatory Commission–licensed, horizontal DPCs of varying lengths, diameters, and weights are received at the repository. Section 1.5.1 provides additional details.

Horizontal Shielded Transfer Cask—A horizontal shielded transfer cask is designed to accommodate a single horizontal DPC, to be upended and lifted by its trunnions in a vertical orientation by an overhead crane, to stand upright when set down upon a flat horizontal surface, and to be moved between the WHF and Aging Facility on a cask transfer trailer. A horizontal shielded transfer cask is designed to provide integral shielding to protect repository workers, and structural strength and passive cooling to maintain the functional integrity of the DPC. The horizontal shielded transfer cask is designed for the largest DPC. The horizontal shielded transfer cask is shown in Figure 1.2.5-78.

Each of the shielded transfer casks perform different functions in the handling of TAD canisters and DPCs, but they have common design features in order to standardize operations and maintenance.

The following design requirements envelope the performance of each of the shielded transfer casks:

- Shielded transfer casks are designed to maintain their structural integrity, retain the canister, and continue to provide shielding when subjected to drops, tipovers, collisions, fires, seismic events, ground motions shown in Figures 1.2.2-10 and 1.2.2-11, and the natural phenomena listed in Table 1.2.2-1.

- The TAD shielded transfer cask is designed to the commercial SNF assembly source terms provided in Section 1.5.1. The DPC shielded transfer cask is designed based on commercial SNF assembly source term representative of the DPCs to be handled or the bounding TAD canister SNF assembly source term in Section 1.5.1.

- Shielded transfer casks are designed to be compatible with the pool water.

- Shielded transfer casks are designed to provide passive cooling for a heat load of 22 kW.
- The maximum weight of the shielded transfer casks containing a loaded canister and filled with water does not exceed 200 tons including the weight of the lifting yoke.

1.2.5.4.2 Operational Processes

Vertical DPC and TAD shielded transfer casks are used to handle DPCs and TAD canisters within the WHF. Horizontal shielded transfer casks are used to transfer DPCs containing SNF from horizontal aging modules at repository aging pads to the WHF and to handle the DPCs within the WHF. Operations involving shielded transfer casks are summarized in the following sections.

1.2.5.4.2.1 Aging Facility Operations

Horizontal Shielded Transfer Cask—A cask tractor moves an empty horizontal shielded transfer cask on a cask transfer trailer to a horizontal aging module at the Aging Facility. A mobile crane repositions or installs a hydraulic ram on the cask transfer trailer, removes the closure lid of the horizontal shielded transfer cask, and removes the access door on the horizontal aging module. The cask tractor and cask transfer trailer position the horizontal shielded transfer cask in alignment with the DPC on the cradle inside the horizontal aging module. The cask transfer trailer is docked and restrained to the horizontal aging module access port. The hydraulic ram engages the DPC and moves the DPC from the horizontal aging module into the horizontal shielded transfer cask. The cask transfer trailer is undocked from the horizontal aging module. The mobile crane repositions or removes the hydraulic ram from the cask transfer trailer, installs the closure lids on the loaded horizontal shielded transfer cask, and installs the access door on the horizontal aging module. The cask tractor moves the loaded horizontal shielded transfer cask to the WHF.

1.2.5.4.2.2 Wet Handling Facility Operations

Vertical DPC Shielded Transfer Cask—A site transporter moves a vertically oriented, unloaded shielded transfer cask to the receipt portion of the cask preparation area. The cask handling crane lifts the shielded transfer cask onto the cask transfer trolley. The cask transfer trolley moves the unloaded shielded transfer cask into the cask unloading room where the shielded transfer cask lid is removed. The canister transfer machine places the DPC (previously removed from a transportation cask) with commercial SNF into the shielded transfer cask and reinstalls the shielded transfer cask lid.

The cask transfer trolley moves the shielded transfer cask to preparation station 1, where the shielded transfer cask lid is removed, the DPC lid adapter is removed (installed previously to accommodate DPC lifting by the canister transfer machine), and the shielded transfer cask lid is reinstalled with bolts. The cask handling crane lifts the shielded transfer cask from the cask transfer trolley and moves the shielded transfer cask to the DPC cutting station where the shielded transfer cask lid is removed, and the DPC lid is cut, removed, and placed into a low-level radioactive waste box. A lid adapter is attached to the removable DPC shield plug (the shield plug remains in the DPC), and the shielded transfer cask lid is reinstalled.

The cask handling crane moves the shielded transfer cask to the staging-shelf of the pool where the shielded transfer cask lid bolts are removed. The cask handling crane moves the shielded transfer cask to the DPC station at the bottom of the pool where the shielded transfer cask lid and DPC shield plug are removed. The spent fuel transfer machine transfers the commercial SNF assemblies to an empty TAD canister within a shielded transfer cask previously staged in the pool or, alternatively, to staging racks in the pool. The shielded transfer cask with the unloaded DPC is removed from the pool. The unloaded DPC, cleared of debris (if any) and loose surface contamination, is removed from the WHF for disposal as low-level radioactive waste. The vertical DPC shielded transfer cask is reused within the WHF.

TAD Shielded Transfer Cask—A site transporter moves a shielded transfer cask containing an empty TAD canister with inner lid (the outer lid is prestaged at the TAD canister closure station) to the receipt portion of the cask preparation area. The cask handling crane moves the shielded transfer cask to preparation station 2, where the shielded transfer cask lid and TAD canister inner lid are removed, the TAD canister and shielded transfer cask are filled with borated water, the TAD canister inner lid is placed on the TAD canister, and the shielded transfer cask lid is placed on the shielded transfer cask. The cask handling crane moves the shielded transfer cask to the bottom of the pool where the shielded transfer cask lid and the TAD canister inner lid are removed. The spent fuel transfer machine loads the TAD canister with commercial SNF assemblies directly from a loaded transportation cask or shielded transfer cask with an open DPC previously positioned in the pool, or from staging racks in the pool.

When the TAD canister is loaded, the TAD canister inner lid, which also functions as a shield plug, is returned to the TAD canister, and the lid of the shielded transfer cask is returned to the shielded transfer cask. The cask handling crane moves the shielded transfer cask with the TAD canister to the staging-shelf of the pool where the shielded transfer cask lid bolts are installed. The cask handling crane lifts the shielded transfer cask above the pool where the exterior of the shielded transfer cask is washed. The cask handling crane moves the shielded transfer cask to the TAD canister closure station where the shielded transfer cask is partially drained, the shielded transfer cask lid is removed, the TAD canister inner and outer lids are welded and acceptance tested, the shielded transfer cask lid is reinstalled, the TAD canister interior is dewatered and dried, and then the annulus between the shielded transfer cask and TAD canister is drained and dried.

With proper controls, minimizing TAD canister residence time in the pool and control of the annular water volume, and draining treated borated water out of the annulus results in minimal residual contamination of the TAD canisters.

The exterior surfaces of the TAD canisters are surveyed for loose contamination and are locally decontaminated if excessive contamination is found. TAD canisters loaded into aging overpacks to be moved to the aging pads comply with established surface contamination limits.

The cask handling crane lifts the shielded transfer cask onto the cask transfer trolley at preparation station 1. The cask transfer trolley moves the shielded transfer cask into the cask unloading room. The TAD canister is removed from the shielded transfer cask and placed into an aging overpack previously positioned by a site transporter in the loading room located adjacent to the canister transfer station. The aging overpack transports the TAD canister to a CRCF for processing (for placement into a waste package for disposal within Yucca Mountain) or to the Aging Facility for aging, if required. The TAD shielded transfer cask is reused within the WHF.

Horizontal Shielded Transfer Cask with Loaded DPC from Aging—Horizontal shielded transfer casks with loaded DPCs from the Aging Facility are moved on a cask transfer trailer to the receipt portion of the cask preparation area. Tie-downs are removed, and the cask handling crane upends and moves the shielded transfer cask to the DPC cutting station. From this point, the DPC is cut open, the horizontal shielded transfer cask with DPC is placed into the pool, and the fuel assemblies are transferred either to an empty TAD canister or to staging racks in the pool.

1.2.5.4.3 Safety Category Classification

The shielded transfer casks are classified as ITS.

1.2.5.4.4 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 shielded transfer cask in the WHF. 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-6 is addressed in Section 1.2.5.1.4.

1.2.5.4.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the shielded transfer cask are addressed in Table 1.2.5-3.

1.2.5.4.6 Design Methodologies

The design methodologies used in the design of the shielded transfer cask are in accordance with *2004 ASME Boiler and Pressure Vessel Code*, Section III, Subsection NC (ASME 2004).

1.2.5.4.7 Consistency of Materials with Design Methodologies

Materials of construction used in the design of the shielded transfer cask are in accordance with *2004 ASME Boiler and Pressure Vessel Code*, Section III, Subsection NC (ASME 2004).

1.2.5.4.8 Design Codes and Standards

The principal codes and standards applicable to the shielded transfer cask are identified in Table 1.2.2-12.

1.2.5.4.9 Design Load Combinations

The load combinations used in the analysis of the shielded transfer cask are in accordance with *2004 ASME Boiler and Pressure Vessel Code*, Section III, Subsection NC (ASME 2004).

1.2.5.5 Wet Handling Facility Heating, Ventilation, and Air-Conditioning 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)(a), (2)(d), (2)(h), (2)(j) (2)(l), 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 WHF HVAC system is designed to limit the release of radioactive airborne contaminants for the protection of workers and the public, condition air to support the operation of ITS SSCs, 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 WHF is based upon normal operations. The WHF contains areas that are expected to remain clean during normal operations, areas where airborne contamination is not expected (tertiary confinement), and areas where there is potential for airborne contamination (secondary confinement). The confinement zoning is defined in Table 1.2.2-13. The remaining portions of the facility where there is no potential for contamination are classified as nonconfinement zones.

All areas within the secondary confinement zones and some areas within the tertiary confinement zones have a potential for contamination release from a dropped waste form. The confinement in these areas is ITS. The ITS confinement areas are the cask preparation area (pool room), pool equipment rooms, pool basement, decontamination pit, loading room, and cask unloading room. The exhaust subsystem SSCs serving the ITS confinement areas are ITS.

The removal of heat from the ITS electrical and battery rooms is an ITS function. The supply and exhaust to these rooms are classified as ITS in order to ensure the ITS electrical systems continue to perform their safety function. Figure 1.2.5-79 to 1.2.5-82 illustrate the confinement zoning for the WHF.

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 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 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 WHF 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 WHF where canisters are transferred from one waste container to another was evaluated. This evaluation bounds other locations in the facility as well as the handling of casks containing uncanistered waste. 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.

1.2.5.5.1 System Description

The WHF HVAC system includes the following subsystems:

- ITS exhaust subsystem serving ITS secondary confinement areas
- ITS HVAC subsystems serving ITS electrical equipment and battery rooms
- Non-ITS HVAC supply subsystems serving ITS secondary confinement areas
- Non-ITS HVAC supply and exhaust subsystems serving non-ITS tertiary confinement areas
- Non-ITS HVAC subsystem serving non-ITS 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.

ITS Exhaust Subsystem Serving ITS Secondary Confinement Areas—The ITS exhaust subsystem is provided for areas that have a potential for a drop and breach of a waste form, resulting in potential airborne contamination that requires mitigation during an event sequence, including the secondary confinement areas that have high potential for contamination from the pool water treatment and cooling system equipment. Air is exhausted from these areas through two stages of ITS exhaust high efficiency particulate air (HEPA) filters. The ITS exhaust subsystem flow rate is greater than the make-up air flow rate ensuring that the air flow is into the confinement areas.

Each ITS 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 an adjustable speed drive. The exhaust subsystem includes redundant ITS components, including ductwork. ITS diesel generators provide ITS electric power to the exhaust fans. The HVAC supply subsystem components achieve a fail-safe condition on loss of power; for example, supply dampers close and supply fans stop running. Should the running fan fail, the ITS exhaust subsystem is provided with ITS instrumentation and controls to automatically start the stand-by fan. Physical separation is provided so that damage to one train of exhaust equipment does not cause damage to the redundant train.

The WHF 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, at the Central Control Center and the facility operations room.

Figure 1.2.5-83 shows the composite ventilation flow diagrams for the ITS exhaust subsystem serving ITS secondary confinement areas. Figures 1.2.5-84 to 1.2.5-86 show the ventilation and instrumentation diagrams for the ITS confinement areas HEPA exhaust subsystem for Trains A and B. Figure 1.2.4-103 shows the ITS confinement areas exhaust subsystem HEPA exhaust fan (Trains A and B) logic diagram.

ITS HVAC Subsystems Serving ITS Electrical Equipment and Battery Rooms—Each group of ITS electrical rooms and battery rooms (Train A and Train B) are served by redundant 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 ITS 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 1.2.5-87 shows the composite ventilation flow diagram and Figures 1.2.5-88 to 1.2.5-91 show the ventilation and instrumentation diagrams for the ITS HVAC subsystems serving ITS electrical equipment and battery rooms. Figures 1.2.4-109 and 1.2.4-110 show the CRCF and WHF confinement ITS electrical room fan coil unit (Trains A and B) logic diagram. Figure 1.2.4-111 shows the CRCF and WHF confinement ITS battery room exhaust fan (Trains A and B) logic diagram.

Non-ITS HVAC Supply Subsystems Serving ITS Secondary and Tertiary Confinement Areas—The ITS confinement areas are cooled by direct supply from non-ITS 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 HEPA filters, heating and cooling coils, and a supply fan.

Figure 1.2.5-83 shows the composite ventilation flow diagram, and Figures 1.2.5-86 and 1.2.5-92 show the ventilation and instrumentation diagrams for the non-ITS HVAC supply subsystems serving the ITS secondary and tertiary confinement areas.

Non-ITS HVAC Supply and Exhaust Subsystems Serving Non-ITS Tertiary Confinement Areas—The non-ITS confinement areas are served by recirculating supply air units and exhaust HEPA filter assemblies. The supply subsystem has one standby and two operating air handling units serving non-ITS confinement areas and corridors for the ground level and for the north second level. In addition, dedicated recirculating air supply units are provided for the maintenance room (one operating and one standby) and for the transportation cask vestibule (three operating and one standby).

A portion of the air supplied to the non-ITS confinement areas is exhausted by the non-ITS exhaust HEPA assembly or cascaded to the ITS confinement areas in order to maintain the appropriate confinement, and the remaining air is returned to the air handling unit. The exhaust air for the non-ITS confinement areas is passed through a single stage of HEPA filters prior to discharging to the atmosphere. The exhaust system effluent is continuously monitored for radioactivity downstream of the exhaust fans. Upon detection of high exhaust air radiation, a high radiation alarm is annunciated locally, at the Central Control Center and the facility operations room.

The normal power battery room is also provided with a separate exhaust that operates continuously with sufficient volume changes per hour to preclude accumulation of hydrogen generated by the batteries during charging such that it is below the lower level explosive limit. Air that is cascaded or supplied into the battery room is exhausted by means of a redundant one-stage exhaust HEPA filter unit and exhaust fan with spark-resistant construction and explosion-proof motors. This exhaust is also provided with a radioactivity monitor.

Figures 1.2.5-93 and 1.2.5-94 show the composite ventilation flow diagrams, and Figures 1.2.5-95 to 1.2.5-103 show the ventilation and instrumentation diagrams, for the non-ITS HVAC supply and exhaust subsystems serving non-ITS tertiary confinement areas.

Non-ITS HVAC Subsystem Serving Non-ITS Nonconfinement Areas—The non-ITS nonconfinement HVAC subsystem provides conditioned air for cooling, heating, and ventilation 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 WHF.

The non-ITS nonconfinement HVAC subsystem is provided for areas such as offices, vestibules, and facility operations rooms that have no potential for contamination. The system provides pressure differentials that are slightly positive in the clean areas of the facilities relative to the ambient air pressure to minimize infiltration of unconditioned air and dust during the system operation. It is a recirculating HVAC system with no HEPA filter. The non-ITS 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 non-ITS recirculating fan coil units are provided for the site transporter vestibule. The vestibule is classified as a nonconfinement area. Each supply unit consists of a recirculating air handling unit, which is provided with prefilters and HEPA filters, heating and cooling coils, and a supply fan. Figure 1.2.5-104 shows the composite ventilation flow diagram for the non-ITS HVAC subsystem serving non-ITS nonconfinement areas. Figure 1.2.5-105 shows the wet handling facility composite ventilation flow diagram for nonconfinement HVAC utility and electrical rooms.

1.2.5.5.1.1 System Functions

The functions of the WHF 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.

1.2.5.5.1.2 System Location and Functional Arrangement

The location and arrangement of the HVAC supply and exhaust equipment are shown on the WHF floor plan general arrangement (Figures 1.2.5-2 and 1.2.5-3).

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

Table 1.2.5-3 provides the HVAC design bases and their relationship to design criteria.

Table 1.2.5-4 provides the ITS HVAC exhaust components and system design data.

Table 1.2.5-5 provides the indoor design temperatures.

Table 1.2.5-6 provides the non-ITS HVAC supply components and system design data.

Table 1.2.5-7 provides the non-ITS HVAC exhaust components and system design data.

Table 1.2.5-8 provides the ITS HVAC supply components and system design data.

The redundant ITS exhaust system components are located in separate rooms on the first level of the facility. The ITS fan coil units serving the ITS electrical rooms are located inside the rooms they serve while the condensing units are located in a missile protected area outdoors. The ITS battery room exhaust trains are located in separate rooms on the first level above the respective battery rooms. The non-ITS air handling units serving the ITS confinement areas and the secondary confinement areas are located in the HVAC equipment room on the mezzanine above the pool equipment rooms. The non-ITS HEPA exhaust units serving the non-ITS confinement areas, including corridors, are located in HVAC equipment rooms on the first level. The non-ITS air handling units serving the non-ITS confinement areas, including corridors, are located in HVAC equipment rooms on the second level. The nonconfinement air handling unit is located in the second level south side HVAC equipment room.

1.2.5.5.1.3 System and Components

The major components in the WHF confinement and nonconfinement HVAC system are also used in the CRCF confinement and nonconfinement HVAC system, which is described in Section 1.2.4.4.1.3, including logic diagrams.

Additionally, the WHF contains non-ITS once-through air handling units serving confinement areas. Each air handling unit consists of prefilters, high-efficiency 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.

1.2.5.5.2 Operational Processes

The operational processes for the WHF HVAC system are similar to the processes for the CRCF with respect to ITS confinement, non-ITS confinement, and non-ITS nonconfinement functions. These operational processes are described in Section 1.2.4.4.2.

1.2.5.5.3 Safety Category Classification

Safety classification of HVAC systems is based upon whether credit is taken in the preclosure safety analysis for SSCs to mitigate the consequences of an event sequence. Portions of the HVAC system that support the cooling of ITS electrical and controls equipment are classified as ITS. Portions of the confinement HVAC system that exhaust from areas with a potential for a breach are classified as ITS.

1.2.5.5.4 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 components in the HVAC system of the WHF. 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-7—To limit the probability that the WHF HVAC system fails to start upon demand, the WHF operating procedures will identify the required status of the ITS confinement HVAC exhaust fans and the ITS supply and exhaust fans for the ITS electrical and battery rooms in the WHF as a condition for commencing waste handling operations in the WHF.

1.2.5.5.5 Design Bases and Design Criteria

The nuclear safety design bases and design criteria for the HVAC system in the WHF are addressed in Table 1.2.5-3.

1.2.5.5.6 Design Methodologies

The design methodologies used in the design of ITS SSCs in the WHF HVAC systems are in accordance with the codes and standards provided in Section 1.2.2.3.

1.2.5.5.7 Consistency of Materials with Design Methodologies

The materials of construction used in the design of the ITS SSCs of the WHF HVAC systems are in accordance with the codes and standards provided in Section 1.2.2.3.

1.2.5.5.8 Design Codes and Standards

The principal codes and standards applicable to the ITS SSCs in the WHF HVAC system are provided in Section 1.2.2.3.

Non-ITS SSCs in the WHF HVAC system are designed using the methods and practices in the codes and standards identified in Section 1.2.4.4.8.

1.2.5.5.9 Design Load Combinations

The design load combinations used in the analysis of SSCs classified as ITS for the WHF HVAC system are in accordance with codes and standards provided in Section 1.2.2.3.

1.2.5.6 General References

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Table 1.2.5-1. List of Non-ITS Mechanical Handling Structures, Systems, and Components in the Wet Handling Facility That are Also Used in Other Handling Facilities

WHF Mechanical Handling Non-ITS SSCs Which are Also Used in Other Handling Facilities	Summary Description
Canister Transfer Machine Maintenance Crane	This equipment is described in Table 1.2.4-1. Figure 1.2.5-56 is the mechanical equipment envelope drawing for this equipment.
Cask Tilting Frame	This equipment is described in Table 1.2.4-1.
Grapple Stand	This equipment is described in Table 1.2.4-1.
Horizontal Cask Stand	This equipment is described in Table 1.2.4-1.
Horizontal Lifting Beam Stand	This equipment is described in Table 1.2.4-1.
Impact Limiter Lifting Device	This equipment is described in Table 1.2.4-1.
Mobile Access Platforms	This equipment is described in Table 1.2.4-1.
Mobile Lift	This equipment is described in Table 1.2.4-1.
Equipment Stands	This equipment is described in Table 1.2.4-1.
WHF Lid Adapter Stands	The lid adapter stands are located in the pool room and canister transfer room, and provide storage of lid adapters when not in use. For details of this equipment, see Figure 1.2.4-126 and Table 1.2.4-5.
Personnel Confinement Single Door	This equipment is described in Table 1.2.4-2. For details of this equipment, refer to Figure 1.2.4-146.

Table 1.2.5-2. Description of WHF-Specific Non-ITS Mechanical Handling Structures, Systems, and Components

WHF Specific Mechanical Handling Non-ITS SSCs	Summary Description
Cask Handling Yoke Stand	The cask handling yoke stand is a structural frame used to hold and store the cask handling yoke when not in use. The stand has integral platforms to allow personnel access to the cask handling yoke for maintenance and inspection while it is on the stand. The stand is located adjacent to the pool at the north side of the cask preparation area. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-106.
DPC Lid Rack	The DPC lid rack is a floor-mounted structural steel frame used for staging the DPC shield plug during fuel transfer operations in the pool. The DPC lid rack is located in the DPC unloading bay in the pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-107.
Shielded Transfer Cask Lid Rack	Four shielded transfer cask lid racks are provided for shielded transfer cask lid staging during DPC cutting, TAD canister closure, and SNF transfer in the pool. The shielded transfer cask lid rack is a floor-mounted structural steel frame. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-107.
TAD Canister Lid Rack	Two TAD canister lid racks are provided to stage the TAD canister lids at the TAD canister closure station and in the pool. The TAD canister lid rack is a floor-mounted structural steel frame. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-107.
Transportation Cask Lid Rack	The transportation cask lid rack is used in the pool for truck cask lid staging during SNF transfer operations. The transportation cask lid rack is a floor-mounted structural steel frame. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-107.
Pool Crush Pads	Crush pads are energy absorbing pads located on the pool floor, the pool staging-shelf, and the decontamination pit. The crush pads are designed to prevent loss of pool integrity given a drop of a transportation cask or shielded transfer cask. Each crush pad is nominally 2 ft thick and consists of energy absorbing material contained by upper and lower distribution plates. Edges of each crush pad and the seams between the pads are sealed to minimize displacement and to prevent trapping fissile material or contamination. This equipment is designed using the methods and practices of *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-108.
Lid Adapter Stand	Two lid adapter stands are used to stage adapters for transportation casks and DPCs that are handled in the cask preparation area. The lid adapter stands are floor-mounted structural steel frames that are prestaged as required. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.4-126 and Table 1.2.4-5.

Table 1.2.5-2. Description of WHF-Specific Non-ITS Mechanical Handling Structures, Systems, and Components (Continued)

WHF Specific Mechanical Handling Non-ITS SSCs	Summary Description
Decontamination Pit Cover	The decontamination pit cover is used to cover the decontamination pit. The cover provides shielding and water retention when a transportation cask or shielded transfer cask is being decontaminated in the decontamination pit. The cover is robust enough to prevent a transportation cask or shielded transfer cask from penetrating the cover and falling into the pit. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). The decontamination pit cover is shown in Figure 1.2.5-109.
Pool Equipment Crane	The pool equipment crane is a 5-ton, double-girder, top-running-type crane located in the mezzanine. The pool equipment crane is used for maintenance purposes for HVAC equipment and pool equipment in room M001. The pool equipment crane traverses in the north–south direction. The pool equipment crane is classified as non-ITS. However, the crane design ensures that a seismic event does not cause the crane to overturn, derail, or lose any main structural components. The rated capacity of the pool equipment crane exceeds the weight of the heaviest anticipated load. Engineered features prevent the pool equipment crane or the crane loads from colliding with structures or major SSCs. These engineered features include mechanical stops and bumpers as well as limit switches and interlocks in the crane control circuitry. This equipment is designed following the methods and practices provided in ASME NOG-1-2004, Type III. For details of this equipment, refer to Figures 1.2.5-110 and 1.2.5-111.
TAD Canister Welding Machine	The TAD canister welding machine is a remotely operated system used to weld the TAD canister lids in order to permanently seal the TAD canister. The TAD canister welding machine includes the following subcomponents: a rotating platform is attached to the base plate of the TAD canister welding machine to rotate the machine 360° around the vertical center axis of the lid; a radial drive assembly that is attached to the rotating platform that can be adjusted horizontally to various radii; an axial drive assembly that is attached to the end of the radial drive assembly that can be adjusted vertically at various heights relative to the lid; a tilting drive assembly that is attached to the end of the axial drive assembly; and a welding electrode with a wire feeder. The various drives used on the TAD canister welding machine allow the welder to be positioned across a range of horizontal, vertical, and angular positions in order to weld the TAD canister lids. The TAD canister welding machine is moved into position using the TAD canister closure jib crane and is staged on the TAD canister welding machine stand when not in use. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997) and NFPA 70, *National Electrical Code*. The qualification of the TAD canister final closure welds meets the requirements in ISG-18 (NRC 2003) to ensure no credible leakage for containment and confinement. For details of this equipment, refer to Figures 1.2.5-112 and 1.2.5-113.
Staging-Shelf Transfer Station	The staging-shelf transfer station is used as an intermediate staging position to secure a shielded transfer cask containing a DPC during transfer into or out of the pool. The staging-shelf transfer station is a structural steel frame mounted to the pool staging-shelf in the DPC unloading bay in the pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-114.

Table 1.2.5-2. Description of WHF-Specific Non-ITS Mechanical Handling Structures, Systems, and Components (Continued)

WHF Specific Mechanical Handling Non-ITS SSCs	**Summary Description**
TAD Canister Welding Machine Stand	The TAD canister welding machine stand is used for staging the TAD canister welding machine when it is not in use. The TAD canister welding machine stand is a structural steel frame that is located at the TAD canister closure station. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.4-126 and Table 1.2.4-5.
Staging-Shelf Dual-Transfer Station	The staging-shelf dual-transfer station is used as an intermediate staging position to secure up to two casks, such as a transportation cask and a shielded transfer cask containing a TAD canister, during transfer into or out of the pool. The staging-shelf dual-transfer station is a structural steel frame mounted to the pool staging-shelf in the main part of the pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-115.
Pool Yoke Lift Adapter Stand	The pool yoke lift adapter stand is used to stage the pool yoke lift adapter in a vertical orientation in the pool when it is not in use. The stand allows part of the adapter to remain above the pool water level to allow personnel to connect the adapter to the cask handling crane hook. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-116.
DPC Transfer Station	The DPC transfer station is used to stage and secure a shielded transfer cask containing a DPC prior to transfer of SNF assemblies from the DPC. The DPC transfer station is a floor-mounted structural steel frame located in the DPC unloading bay in the pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figures 1.2.5-117 and 1.2.5-118.
Deep Remediation Station	The deep remediation station is used to stage and secure a cask that requires to be set aside in the WHF pool for remediation. The deep remediation station is a floor-mounted structural frame located in the WHF pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figures 1.2.5-117 and 1.2.5-118.
Shielded Transfer Cask/TAD Canister Transfer Station	The shielded transfer cask/TAD canister transfer station is used to stage and secure the shielded transfer cask and TAD canister prior to transfer of SNF assemblies into the TAD canister. The shielded transfer cask/TAD canister transfer station is a floor-mounted structural frame located in the WHF pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figures 1.2.5-119 and 1.2.5-120.
Truck Cask Transfer Station	The truck cask transfer station is used to stage and secure the truck cask handling frame containing a truck cask prior to transfer of SNF assemblies from the cask. The truck cask transfer station is a floor-mounted structural steel frame located in the WHF pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figures 1.2.5-119 and 1.2.5-120.

Table 1.2.5-2. Description of WHF-Specific Non-ITS Mechanical Handling Structures, Systems, and Components (Continued)

WHF Specific Mechanical Handling Non-ITS SSCs	Summary Description
Rail Cask Transfer Station	The rail cask transfer station is used to stage and secure the rail cask prior to transfer of SNF assemblies from the cask. The rail cask transfer station is a floor-mounted structural steel frame located in the WHF pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figures 1.2.5-119 and 1.2.5-120.
Spent Fuel Transfer Machine Grapple Staging Rack	The spent fuel transfer machine grapple staging rack is a wall-mounted structural steel frame used for staging the PWR lifting grapple and BWR lifting grapple. The spent fuel transfer machine grapple staging rack is located in the WHF pool. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-121.
Wash Lance	The wash lance is a hose connected to a demineralized water supply that is used to wash down the various yokes, long-reach adapters, transportation casks, shielded transfer casks, and any other item as it is removed from the pool. The wash lance is located adjacent to the pool in the cask preparation area. For details of this equipment, refer to Figure 1.2.5-68.
DPC Unloading Bay Gate	The WHF pool is subdivided into two distinct areas—the north end of the pool, which receives and unloads DPCs in shielded transfer casks, and the south end of the pool, which receives uncanistered SNF assemblies in transportation casks. These two areas are divided by a wall and a DPC unloading bay gate. The wall and gate, together with features of the pool water treatment and cooling systems, are provided to ensure pool cleanliness when both casks and DPCs are received. The DPC unloading bay gate is located in the pool between the DPC unloading bay and the rest of the pool. The gate allows the unloading bay to be isolated from the rest of the pool if there are significant debris and contaminants in the water after the DPC has been opened. The gate is moved using the cask handling crane. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-122.
Personnel Confinement Double Door	The personnel confinement double doors provide equipment and personnel access to various confinement areas. The personnel confinement double door is two door panels hinged on one side for a swing-open operation. The door is manually opened with an auto-close mechanism. For details of this equipment, refer to Figure 1.2.5-123.

Table 1.2.5-2. Description of WHF-Specific Non-ITS Mechanical Handling Structures, Systems, and Components (Continued)

WHF Specific Mechanical Handling Non-ITS SSCs	Summary Description
DPC Cutting Machine	The DPC cutting machine cuts the lids off the DPC in order to gain access to the SNF assemblies. The DPC cutting machine includes the following subcomponents: the DPC cutting machine base plate is bolted to the top of DPC adapter plate (Type 1, 2, or 3) which in turn is bolted to the top of the DPC lid or shield plug being cut (there are three types of adapter plates to allow the DPC cutting machine to be attached to the various types of DPCs); a rotating platform is attached to the top of the DPC cutting machine base plate to rotate the machine 360° around the vertical center axis of the lid or shield plug; a radial drive assembly that is attached to the rotating platform that can be adjusted horizontally to various radii; an axial drive assembly that is attached to the end of the radial drive assembly that can be adjusted vertically at various heights relative to the lid or shield plug; a tilting drive assembly that is attached to the end of the axial drive assembly; and a spindle holding an end mill cutter that is attached to the tilting drive assembly. The various adapter plates and drives used on the DPC cutting machine allow the end mill cutter to be positioned across a range of horizontal, vertical, and angular positions in order to cut open all of the types of DPCs expected to be received in the WHF. An integral vacuum system collects metal cuttings as they are generated. The DPC cutting machine is classed as non-ITS but has a limited range of motion to ensure that the end mill cutter cannot over extend its cutting depth and damage any SNF assemblies. The DPC cutting machine is moved into position using the DPC cutting jib crane and is staged on the DPC cutting machine stand when not in use. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997) and NFPA 70, *National Electrical Code*. For details of this equipment, refer to Figure 1.2.5-124 and 1.2.5-125.
DPC Cutting Machine Stand	The DPC cutting machine stand is used for staging the DPC cutting machine when it is not in use. The DPC cutting machine stand is a structural steel frame that is located at the DPC cutting station. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.4-126 and Table 1.2.4-5.
Long-Reach Tool Adapter	The long-reach tool adapter is used to aid in the removal of lid bolts on transportation casks and shielded transfer casks in the pool. The long-reach tool adapter resides on the long-reach tool adapter stand adjacent to the pool when not in use. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997).
Lid-Lifting Grapple Stand	Five lid-lifting grapple stands are used in the WHF to stage the various lid-lifting grapples when they are not in use. The stands are located at the DPC cutting station, preparation station 1, preparation station 2, the TAD canister closure station, and the canister transfer room. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.4-125.
Long-Reach Grapple Adapter Stand	Two long-reach grapple adapter stands are used to stage the long-reach grapple adapters in a vertical orientation in the pool when they are not in use. The stand allows part of the adapter to remain above the pool water level to allow personnel to connect the adapter to the auxiliary pool crane hook. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-126.

Table 1.2.5-2. Description of WHF-Specific Non-ITS Mechanical Handling Structures, Systems, and Components (Continued)

WHF Specific Mechanical Handling Non-ITS SSCs	Summary Description
DPC Cutting Shield Ring Stand	The DPC cutting shield ring stand is used for staging the cask shield ring for the DPC shielded transfer cask when it is not in use. The DPC cutting shield ring stand is a structural steel frame that is prestaged at the DPC cutting station as required. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.4-126 and Table 1.2.4-5.
DPC Adapter Plate	Three DPC adapter plates of various dimensions are used with the DPC cutting machine to cut the various types of DPCs that are received in the WHF. The DPC adapter plates are steel plates that are individually attached to the base of the DPC cutting machine and the combined plate and machine are then attached to the DPC being cut. The plate is sized to fit the type of DPC being cut and has a bolt hole pattern to match the bolt holes on the DPC lid. The plate is prestaged on the DPC adapter plate stand prior to use. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figures 1.2.5-124 and 1.2.5-125.
Shield Plug Lift Adapter	The shield plug lift adapter is used to aid in the removal of the DPC shield plugs in the WHF pool. The shield plug lift adapter is bolted to existing bolt holes in the DPC shield plug and provides an interface that allows the lid-lifting grapple to engage and raise the shield plug in the pool. The shield plug lift adapter is installed at the DPC cutting station prior to placing the shielded transfer cask containing the DPC in the pool. The shield plug lift adapter is staged on the shield plug lift adapter stand when not in use. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-127.
Shield Plug Lift Adapter Stand	The shield plug lift adapter stand is used for prestaging the shield plug lift adapter prior to use. The shield plug lift adapter stand is a structural steel frame that is located at the DPC cutting station. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.4-126 and Table 1.2.4-5.
TAD Canister Closure Shield Ring Stand	The TAD canister closure shield ring stand is used for staging the cask shield ring for the TAD shielded transfer cask when it is not in use. The TAD canister closure shield ring stand is a structural steel frame that is prestaged at the TAD canister closure station as required. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.4-126 and Table 1.2.4-5.
Siphon Tube Shear Tool	The siphon tube shear tool is a remotely operated shear tool that is located in the WHF pool. The siphon tube shear tool is used to cut the siphon tube on DPCs that have a siphon tube connected to the shield plug. When the shield plug is raised by the auxiliary pool crane, the siphon tube shear tool is moved to the location of the tube, near to where it connects to the shield plug, and then cuts the tube, allowing the cut-off section to remain with the DPC. All of the motions of the siphon tube shear tool are pneumatically driven. The siphon tube shear tool is mounted on the pool wall but can be fully removed from the pool to perform maintenance. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-128.

Table 1.2.5-2. Description of WHF-Specific Non-ITS Mechanical Handling Structures, Systems, and Components (Continued)

WHF Specific Mechanical Handling Non-ITS SSCs	Summary Description
Cask Shield Ring Type 1 and Type 2	The cask shield rings (Types 1 and 2) are used with transportation casks and shielded transfer casks to protect personnel from gap shine. This equipment is designed using the methods and practices of *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). The shield rings provide approximately 6 in. of shielding material at the gap. For details of this equipment, refer to Figure 1.2.5-129.
Cask Shield Ring Type 3	The cask shield ring (Type 3) is used around the TAD shielded transfer cask top to protect personnel from gap shine. The shield ring provides approximately 6 in. of shielding material at the gap. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-129.
Cask Shield Ring Type 4	The cask shield ring (Type 4) is used around the horizontal shielded transfer cask to protect personnel from gap shine. The shield ring provides approximately 6 in. of shielding material at the gap. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-129.
Cask Shield Ring Type 5	The cask shield ring (Type 5) is used around the vertical DPC shielded transfer cask top to protect personnel from gap shine. The shield ring provides approximately 6 in. of shielding material at the gap. This equipment is designed following the methods and practices provided in *Manual of Steel Construction, Allowable Stress Design* (AISC 1997). For details of this equipment, refer to Figure 1.2.5-129.
WHF Lid Rack	The WHF lid rack serves as a temporary laydown area for lids during transfer operations. The racks are located in the pool room. For details of this equipment, refer to Figure 1.2.5-107. This equipment is designed using the methods and practices of *Manual of Steel Construction, Allowable Stress Design* (AISC 1997).
DPC Lid Receptacle	The DPC lid receptacle is used to receive DPC lids and shield plugs in the cask preparation area. The receptacle is kept at the DPC cutting station in the cask preparation area. The receptacle is designed to interface with the lid-lifting grapple as well as a forklift. For details of this equipment, see Figure 1.2.5-130.
Lid-Lifting Grapple (Transfer Room)	This lid-lifting grapple is used with the canister transfer machine maintenance crane to remove the shielded transfer cask lid and install the transportation cask lid during transfer of a DPC from a transportation cask to a shielded transfer cask. The lid-lifting grapple for the transfer room is the only non-ITS lid-lifting grapple used in the WHF. This equipment is described in Section 1.2.5.2.1.
W74 Upper Basket Lifting Device	The W74 upper basket lifting device is used to remove the upper basket from the W74 canister in order to gain access to the SNF in the lower basket. The device connects to the engagement spacer plate at the bottom of the upper basket. The W74 upper basket lifting device interfaces with the long reach grapple adapter and has a lifting capacity of 6 tons. The W74 upper basket lifting device is prestaged in the WHF as required prior to use. The W74 upper basket lifting device is designed using the methods and practices of ANSI N14.6-1993. Figure 1.2.5-131 provides details of the equipment.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling Facility

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases		Design Criteria
			Safety Function	Controlling Parameters and Values	
Cask/Canister/ Waste Package Process System (MR)	Cask Cooling	Cask/DPC Overpressure Protection Features	Protect against cask failure due to overpressure	MR.WH.01. The mean probability of an overpressure of a cask or cooling system line during the cask cooling operation shall be less than or equal to 8 × 10^{-6} per cask.	Pressure relief valve(s) are required to be provided in accordance with ASME Section III, Division I, Subsection ND, Class 3 Components (ASME 2001).
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)	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: preclosure safety analysis depends on the combination of the reliabilities of each component.)
				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: preclosure safety analysis depends on the combination of the reliabilities of each component.)
				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: preclosure safety analysis depends on the combination of the reliabilities of each component.)
			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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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)	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 (Continued)	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.
		Cask Handling Yoke (050-HM00-BEAM-00001)	Protect against drop	H.WH.HM.01. The cask handling yoke is an integral part of the load-bearing path. See cask handling crane requirements.	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). 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. Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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)	Cask Handling (Continued)	Pool Cask Handling Yoke (050-HM00-BEAM-00002)	Protect against drop	H.WH.HM.02. The pool cask handling yoke is an integral part of the load-bearing path. See cask handling crane requirements.	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). 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. Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.
		Cask Handling Crane; 200-ton (050-HM00-CRN-00001)	Protect against drop	H.WH.HM.03. 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 path supporting the cask shall be less than or equal to 3×10^{-5} per transfer with the cask yoke or 1×10^{-4} per 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.WH.HM.04. 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.WH.HM.05. 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 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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 (050-HM00-CRN-00001) (Continued)	Protect against drop of a load onto a cask	H.WH.HM.06. The mean probability of dropping a load onto a loaded cask or its contents shall be less than or equal to 3 × 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.
			Maintain moderator control	H.WH.HM.07. The mean probability of inadvertent introduction of an oil moderator into a canister shall be less than or equal to 9 × 10^{-5} over a 720-hour period following the radionuclide release	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes. The crane is required to have double retention capability on the areas of the crane where leaked lubricating oil could enter a breached canister.
			Limit speed	H.WH.HM.08. 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.WH.HM.09. 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.WH.HM.10. 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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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)	Pool Yoke Lift Adapter (050-HM00-TOOL-00002)	Protect against drop of a cask	H.WH.HM.11. The pool yoke lift adapter is an integral part of the load-bearing path. See cask handling crane requirements.	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). Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.
		Cask Transfer Trolley and Pedestals (Trolley: 050-HM00-TRLY-00001) (Pedestals: 050-HM00-PED-00001/00002/00003/00004/00005)	Limit speed	H.WH.HM.12. The cask transfer trolley shall be limited to 2.5 mph.	The cask transfer trolley is required to be designed to preclude speed greater than 2.5 mph.
			Protect against spurious movement	H.WH.HM.13. 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.
			Protect against impact and inducing stresses on the waste container	H.WH.HM.14. 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.
				H.WH.HM.15. 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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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	Entrance Vestibule Crane (050-HMC0-CRN-00001)	Protect against collapse	H.WH.HMC.01. The mean frequency of collapse of the entrance vestibule 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.WH.HMC.02 The horizontal lifting beam is an integral part of the load-bearing path. See cask handling crane requirements.	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). Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.
	Cask Handling/Cask Preparation	Truck Cask Lid Adapters (050-HMH0-HEQ-00010-11) Rail Cask Lid Adapters (050-HMH0-HEQ-00012-13)	Protect against drop	H.WH.HMH.01. The truck and rail cask lid adapters are an integral part of the load-bearing path. See cask handling crane requirements.	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). Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.
		Auxiliary Pool Crane; 10-ton (050-HMH0-CRN-00001)	Protect against a drop of a load onto canister	H.WH.HMH.02. The mean probability of drop of a load onto a canister shall be less than or equal to 3×10^{-5} per lift.	The crane is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes.
			Protect against collapse of the auxiliary pool crane	H.WH.HMH.03. The mean frequency of collapse of the auxiliary pool 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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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 Preparation (Continued)	Auxiliary Pool Crane; 10-ton (050-HMH0-CRN-00001) (Continued)	Protect against a heavy object drop from the auxiliary pool crane	H.WH.HMH.04. The mean frequency of a hoist system failure of the auxiliary pool 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.
		Preparation Station Jib Cranes (1 and 2) (050-HMH0-CRN-00002/00003)	Protect against a drop of a load onto canister	H.WH.HMH.05. The mean probability of drop of a load onto a canister shall be less than or equal to 3×10^{-5} per lift.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane.
		Preparation Station Jib Cranes (1 and 2) (050-HMH0-CRN-00002/00003) (Continued)	Protect against collapse of the jib crane	H.WH.HMH.06. The mean frequency of collapse of the jib crane due to the spectrum of seismic events shall be less than or equal to 8×10^{-6} per year.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane, for loads and accelerations associated with a DBGM-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.
			Protect against a heavy object drop from the jib crane	H.WH.HMH.07. The mean frequency of a hoist system failure of the jib crane due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane, for loads and accelerations associated with a DBGM-2 seismic event.
		Cask Support Frame (Preparation Station #2) (WHF: 050-HMH0-FRM-00001)	Protect against tipover of a cask	H.WH.HMH.08. The mean frequency of failure of the cask support frame and anchorage due to the spectrum of seismic events shall be less than or equal to 1×10^{-5} per year.	The frame 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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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 Preparation (Continued)	Lid-Lifting Grapples (050-HMH0-HEQ-00001/00002/00003/ 00004, 00006) Truck Cask Lid-Lifting Grapples (050-HMH0-HEQ-00007/00008/00009)	Protect against drop of a load onto a canister	H.WH.HMH.09. The lid lift grapple is an integral part of the load-bearing path. See preparation station jib crane and auxiliary pool crane requirements.	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). 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. Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.
		DPC Lid Adapter (050-HMH0-HEQ-00014)	Protect against drop of a DPC	H.WH.HMH.10. The DPC lid adapter is an integral part of the load-bearing path. See canister transfer machine requirements.	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). Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.
		Long Reach Grapple Adapter (050-HMH0-TOOL-00001/00002)	Protect against drop of a load	H.WH.HMH.11. The long reach grapple adapter is an integral part of the load-bearing path. See Auxiliary Pool Crane requirements.	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). Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases: Safety Function	Nuclear Safety Design Bases: Controlling Parameters and Values	Design Criteria
Mechanical Handling System (H) (Continued)	Waste Transfer/Fuel Assembly Transfer	Spent Fuel Transfer Machine (050-HTF0-FHM-00001)	Protect against drop of an SNF assembly	H.WH.HTF.01. The mean probability of dropping an SNF assembly due to a failure of a piece of equipment within the load path shall be less than or equal to 5×10^{-6} per assembly transfer.	The spent fuel transfer machine is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes. The spent fuel transfer machine 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.
			Protect against lifting an SNF assembly above the safe limit for workers	H.WH.HTF.02. The mean probability of lifting an SNF assembly such that 10 CFR 63.111(a) limits are exceeded shall be less than or equal to 7×10^{-7} per assembly transfer.	The spent fuel transfer machine is required to be designed in accordance with the requirements of ASME NOG-1-2004 for Type I cranes. The spent fuel transfer machine is required to be designed with a mechanical stop to limit the maximum lift height for lifting a spent nuclear fuel assembly.
			Protect against collapse of the spent fuel transfer machine	H.WH.HTF.03. The mean frequency of collapse of the spent fuel transfer machine due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The spent fuel 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.
			Protect against an SNF assembly or heavy object drop from the spent fuel transfer machine	H.WH.HTF.04. The mean frequency of a hoist system failure of the spent fuel transfer machine due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The spent fuel 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 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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/Fuel Assembly Transfer (Continued)	PWR Lifting Grapples (050-HTF0-HEQ-00001) BWR Lifting Grapples (050-HTF0-HEQ-00002)	Protect against drop of an SNF assembly	H.WH.HTF.05. The PWR/BWR grapples are an integral part of the load-bearing path. See spent fuel transfer machine requirements.	The special lifting device/adapter is required to be designed in accordance with the requirements of ANSI N14.6-1993. Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.
		SNF Staging Rack (PWR SNF: 050-HTF0-RK-00001) (BWR SNF: 050-HTF0-RK-00010) (DFCA SNF: 050-HTF0-RK-00011)	Protect against tipover of SNF	H.WH.HTF.06. The mean frequency of collapse of the SNF staging racks (sufficient to cause loss of confinement of the fuel assemblies within the staging rack fuel compartments) due to the spectrum of seismic events shall be less than or equal to 2×10^{-6} per year.	The SNF staging racks are 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.
		Truck Cask Handling Frame (050-HTF0-RK-00007)	Protect against cask drop from a crane	H.WH.HTF.07. The mean frequency of a cask drop due to a failure of the truck cask handling frame due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The frame is required to be designed in accordance with the applicable provisions of ANSI/AISC N690-1994 for loads and accelerations associated with DBGM-2 seismic event.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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	Canister Transfer Machine (050-HTC0-FHM-00001)	Protect against drop	H.WH.HTC.01. 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.	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: • 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.WH.HTC.02. 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.	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: • 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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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 (050-HTC0-FHM-00001) (Continued)	Limit drop height	H.WH.HTC.03. 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.
			Protect against drop of a load onto a canister	H.WH.HTC.04. 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: • 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.WH.HTC.05. 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 7×10^{-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.WH.HTC.06. The speed of the canister transfer machine trolley and bridge shall be limited to 20 ft/min.	The canister transfer machine trolley and bridge are required to be designed to preclude speed greater than 20 ft/min.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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 (050-HTC0-FHM-00001) (Continued)	Preclude non-flat bottom drop of a DPC or TAD	H.WH.HTC.07. 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.
			Protect against direct exposure to personnel	H.WH.HTC.08. 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 9×10^{-6} per transfer.	The canister transfer machine is required to be designed with the following features: • 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 slide gate interlock (skirt must be down before port slide gate can be opened). • PSC-13 (Section 1.2.5.2.5.4) addresses closure of the port slide gates at the completion of a canister transfer operation.
			Maintain moderator control	H.WH.HTC.09. The mean probability of inadvertent introduction of an oil moderator into a canister shall be less than or equal to 9×10^{-5} over a 720-hour period following the breach of a canister.	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 have double retention capability on areas of the crane where leaked lubricating oil could enter a breached waste canister.
			Preclude canister breach	H.WH.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.WH.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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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 (050-HTC0-FHM-00001) (Continued)	Protect against a canister or heavy object drop from the canister transfer machine	H.WH.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.
		Canister Transfer Machine Grapples (050-HTC0-HEQ-00001)	Protect against drop	H.WH.HTC.13. The canister transfer machine grapple is an integral part of the load-bearing path. See canister transfer machine requirements.	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). 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. 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. Special lifting devices/adapters are required to be designed for loads and accelerations associated with a DBGM-2 seismic event.
Mechanical Handling System (H) (Continued)	TAD Closure	TAD Closure Jib Crane (050-HC00-CRN-00001)	Protect against drop of a load	H.WH.HC.01. The mean probability of a drop of a load onto a cask containing a TAD canister shall be less than or equal to 3×10^{-5} per lift.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane.
			Protect against collapse of the TAD closure jib crane	H.WH.HC.02. The mean frequency of collapse of the TAD closure jib crane due to the spectrum of seismic events shall be less than or equal to 8×10^{-6} per year.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane, for loads and accelerations associated with a DBGM-2 seismic event.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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)	TAD Closure (Continued)	TAD Closure Jib Crane (050-HC00-CRN-00001) (Continued)	Protect against a heavy object drop from the TAD closure jib crane	H.WH.HC.03. The mean frequency of a hoist system failure of the TAD closure jib crane due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane, for loads and accelerations associated with a DBGM-2 seismic event.
		Cask Support Frame (TAD Closure Station) (050-HC00-FRM-00001)	Protect against tipover of a cask	H.WH.HC.04. The mean frequency of failure of the cask support frame and anchorage due to the spectrum of seismic events shall be less than or equal to 6×10^{-5} per year.	The frame 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.
	Dual-Purpose Canister Cutting	DPC Cutting Jib Crane (050-HD00-CRN-00001)	Protect against drop of a load	H.WH.HD.01. The mean probability of a drop of a load onto a cask containing a DPC shall be less than or equal to 3×10^{-5} per lift.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane.
			Protect against collapse of the DPC cutting jib crane	H.WH.HD.02. The mean frequency of collapse of the DPC cutting jib crane due to the spectrum of seismic events shall be less than or equal to 8×10^{-6} per year.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane, for loads and accelerations associated with a DBGM-2 seismic event.
			Protect against a heavy object drop from the DPC cutting jib crane	H.WH.HD.03. The mean frequency of a hoist system failure of the DPC cutting jib crane due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	The jib crane is required to be designed in accordance with the applicable provisions of ASME NUM-1-2004 for a Type IA crane, for loads and accelerations associated with a DBGM-2 seismic event.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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)	Dual-Purpose Canister Cutting (Continued)	Cask Support Frame (DPC Cutting Station) (050-HD00-FRM-00001)	Protect against tipover of a cask	H.WH.HD.04. The mean frequency of failure of the cask support frame and anchorage due to the spectrum of seismic events shall be less than or equal to 6×10^{-5} per year.	The frame 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.
Surface Nuclear Confinement HVAC System (VC)	Surface Nuclear Confinement HVAC	Portions of the surface nuclear confinement HVAC system that exhaust from areas with a potential for a breach	Mitigate the consequences of radionuclide release	VC.WH.01. The mean probability that the HVAC system (including HEPA filtration of exhaust air from the WHF confinement areas) becomes unavailable during a 30-day mission time following a radionuclide release shall be less than or equal to 4×10^{-2}. This parameter does not apply in the case of large fires, which may disable the HVAC system.	The HVAC subsystem that exhausts from areas where there is a potential for canister breach is required to be designed to have two full capacity independent trains with automatic start upon failure of the operating train.
				VC.WH.02. The mean probability that the HVAC system (including HEPA filtration of exhaust air from the WHF confinement areas) becomes unavailable during a 1-day mission time following a radionuclide release from the cask sampling and cooling process shall be less than or equal to 1×10^{-3}.	The HVAC subsystem that exhausts from areas where there is a potential for canister breach is required to be designed to have two full capacity independent trains with automatic start upon failure of the operating train.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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	
Surface Nuclear Confinement HVAC System (VC) (Continued)	Surface Nuclear Confinement HVAC (Continued)	Portions of the surface nuclear confinement HVAC system that support the cooling of ITS electrical equipment and battery rooms	Support ITS electrical function	VC.WH.03. The mean conditional probability of failure of the portions of the surface nuclear confinement HVAC system that support the cooling of ITS electrical equipment and battery rooms in the WHF shall be less than or equal to 2×10^{-2} per ITS electrical train over a period of 720 hours following a radionuclide release.	The HVAC subsystem that provides cooling for the ITS electrical equipment and battery rooms is required to be designed to have an independent train for the rooms associated with each of the two ITS electrical trains.
				VC.WH.04. The mean conditional probability of failure of the portions of the surface nuclear confinement HVAC system that support the cooling of ITS electrical equipment and battery rooms in the WHF shall be less than or equal to 5×10^{-4} per ITS electrical train over a period of 24 hours following a cask overpressure or a cooling system line break.	The HVAC subsystem that provides cooling for the ITS electrical equipment and battery rooms is required to be designed to have an independent train for the rooms associated with each of the two ITS electrical trains.
Wet Handling Facility (WH)	Wet Handling Facility (WHF)	Structure	Maintain building structural integrity to protect ITS SSCs inside the building from external events	WH.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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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	
Wet Handling Facility (WH) (Continued)	Wet Handling Facility (WHF) (Continued)	Structure (Continued)	Maintain building structural integrity to protect ITS SSCs inside the building from external events (Continued)	WH.02. The mean frequency of building collapse due to volcanic ashfall less than or equal to a roof live 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.
				WH.03. The WHF shall be located such that there is a distance of at least one-half mile between the WHF and the repository heliport.	The heliport is located at least one-half mile from any ITS structure.
			Protect against building collapse onto waste containers	WH.04. The mean frequency of collapse of the WHF 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.
		Shield Doors (Including Anchorages)	Protect against direct exposure of personnel	WH.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 are not closed.
			Preclude collapse onto waste containers	WH.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	WH.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 DBGM-2 seismic event. Additional structural capacity is provided as required to demonstrate compliance.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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	
Wet Handling Facility (WH) (Continued)	Wet Handling Facility (WHF) (Continued)	Pool Structure	Maintain pool integrity to protect against collapse onto waste containers and to maintain pool water retention capability	WH.08. The mean frequency of collapse of, or water loss from, the WHF pool due to the spectrum of seismic events shall be less than or equal to 2×10^{-6} per year.	Fragility assessment of pool structure integrity is performed to develop the fragility curve. Convolution of the pool structure fragility curve and seismic hazard curve (as described in Section 1.7) is performed to demonstrate compliance.
		Cask Port Slide Gate (050-HTC0-HTCH-00002)	Protect against dropping a canister due to a spurious closure of the slide gate	WH.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 2×10^{-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	WH.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.	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	WH.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 a canister.
		Overpack Port Slide Gate (050-HTC0-HTCH-00001)	Protect against dropping a canister	WH.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 2×10^{-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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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	
Wet Handling Facility (WH) (Continued)	Wet Handling Facility (WHF) (Continued)	Overpack Port Slide Gate (050-HTC0-HTCH-00001) (Continued)	Protect against direct exposure to personnel	WH.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.	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	WH.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.
		Aging Overpack Access Platform (050-HAC0-PLAT-00001)	Protect against platform collapse	WH.HAC.01. The mean frequency of collapse of the aging overpack access 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 site transporter	WH.HAC.02. The mean frequency of platform collapse or waste container breach from the impact of the site transporter onto 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.
		TAD Closure Station (050-HC00-PLAT-00001)	Protect against platform collapse	WH.HC.01. The mean frequency of collapse of the TAD closure station 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 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling Facility (Continued)

System or Facility (System Code)	Subsystem or Function (as Applicable)	Component	Nuclear Safety Design Bases: Safety Function	Nuclear Safety Design Bases: Controlling Parameters and Values	Design Criteria
Wet Handling Facility (WH) (Continued)	Wet Handling Facility (WHF) (Continued)	DPC Cutting Station (050-HD00-PLAT-00001)	Protect against platform collapse	WH.HD.01. The mean frequency of collapse of the DPC cutting station 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.
		Preparation Station #1 (050-HMH0-PLAT-00001)	Protect against platform collapse	WH.HMH.01. The mean frequency of collapse of the preparation station 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 of the cask transfer trolley	WH.HMH.02. The mean frequency of platform collapse or waste container breach from the impact of the cask transfer trolley onto 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 due to seismic and impact loads. Energy absorbing features are required as necessary to limit the impact forces on the waste container.
		Preparation Station #2 Platform (050-HMH0-PLAT-00002)	Protect against platform collapse	WH.HMH.03. The mean frequency of collapse of the preparation station 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.
		Decontamination Pit; Decontamination Pit Seismic Restraints (050-HM00-BRAC-00001)	Provide lateral stability to the cask in the decontamination pit	WH.HM.01. The mean frequency of the failure of the seismic restraints in the decontamination pit due to the spectrum of seismic events shall be less than or equal to 2×10^{-5} per year.	Seismic restraints in the decontamination pit are 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.

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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 Overpack	Horizontal Shielded Transfer Cask (170-HAC0-HEQ-00001)	Provide containment	AP.SB.HAC.03. The mean conditional probability of breach of a canister in a sealed horizontal shielded transfer cask on a 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: preclosure safety analysis depends on the combination of the reliabilities of each component.)
				AP.SB.HAC.04. The mean probability of breach of a canister in an horizontal shielded transfer cask on a cask transfer trailer resulting from a drop of a load onto the horizontal shielded transfer 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: preclosure safety analysis depends on the combination of the reliabilities of each component.)
				AP.SB.HAC.05. The mean conditional probability of breach of a canister in a sealed horizontal shielded transfer cask on a 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 low speed impact or collisions meets the required reliability when evaluated against the canister capacity curves. (Note: preclosure safety analysis depends on the combination of the reliabilities of each component.)

Table 1.2.5-3. Preclosure Nuclear Safety Design Bases and their Relationship to Design Criteria for the Wet Handling 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	
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: AP: Aging Facility; WH: Wet Handling Facility; SB: Balance of Plant.
System Codes: H: Mechanical Handling; MR: Cask/Canister/Waste Package Process System.
Infrastructure System Codes:VC: Surface Nuclear Confinement HVAC; VN: Surface Nonconfinement HVAC.
Subsystem Codes: HAC: Aging Overpack; HC: Transport, Aging, and Disposal Canister Closure; HD: Dual Purpose Canister Cutting; HM: Cask Handling; HMC: Cask Receipt; HMH: Cask Preparation; HTC: Canister Transfer; HTF: Fuel Assembly Transfer.

Table 1.2.5-4. WHF ITS HVAC Exhaust Components and System Design Data

Subsystem/Components	Number of Units		Nominal Airflow Capacity cfm/unit	HEPA Filter Plenum Components (Number of Banks)		
	Operating	Standby		Demister	Prefilter	HEPA Filter
ITS Confinement Areas Exhaust HEPA Filter Plenum—Train A (Equipment Number 050-VCS0-FLT-00001/00002/00003)	3	0	13,500	1	1	2
ITS Confinement Areas Exhaust Fan—Train A (Equipment Number 050-VCS0-EXH-00001)	1	0	40,500	NA	NA	NA
ITS Confinement Areas Exhaust HEPA Filter Plenum—Train B (Equipment Number 050-VCS0-FLT-00005/00006/00007)	0	3	13,500	1	1	2
ITS Confinement Areas Exhaust Fan—Train B (Equipment Number 050-VCS0-EXH-000002)	0	1	40,500	NA	NA	NA
ITS Battery Room Train A Exhaust HEPA Filter Plenum (Equipment Number 050-VCT0-FLT-00010/00011)	1	1	1,000	NA	1	1
ITS Battery Room Train A Exhaust Fan (Equipment Number 050-VCT0-EXH-00004/00005)	1	1	1,000	NA	NA	NA
ITS Battery Room Train B Exhaust HEPA Filter Plenum (Equipment Number 050-VCT0-FLT-00012/00013)	1	1	1,000	NA	1	1
ITS Battery Room Train B Exhaust Fan (Equipment Number 050-VCT0-EXH-00006/00007)	1	1	1,000	NA	NA	NA

NOTE: Equipment and equipment numbers are shown in Figures 1.2.5-83 and 1.2.5-87.
NA = not applicable.

Table 1.2.5-5. WHF Indoor Design Temperatures

Area or Room	Maximum Summer Temperature (°F Dry Bulb)	Minimum Winter Temperature (°F Dry Bulb)
Cask Preparation Area	85[a]	65
Cask Loading and Unloading Rooms	85[a]	65
Pool Equipment Rooms	90[b]	65
HVAC Rooms (Mezzanine)	90[b]	65
HVAC Room (ITS HEPA Exhaust)	90[b]	65
Canister Transfer Machine Maintenance Room	85[a]	65
Pool Basement Rooms	90[b]	65
Corridors	90[b]	65
Gas Sampling Room	85[a]	65
Electrical Rooms	90[b]	65
Battery Rooms	77	72
Corridors and Elevator Lobby	85	65
Low-Level Radioactive Waste Staging Area	85[a]	65
Transportation Cask Vestibule	90[b]	65
Site Transporter Vestibule	85[a]	65
HVAC Rooms	90[b]	65
Canister Transfer Room	85[a]	65
Maintenance Room	85[a]	65
Support Areas	75	70
Operations Room	75	70
Backup Central Communications Rooms	75	70
Utility Room	90[b]	65
Corridors	85	65

NOTE: [a]These areas are normally not occupied. However, these areas are designed to be at maximum of 85°F since there is expected extended occupancy during operation.
[b]These areas are normally not occupied and the temperature limits are based on the electrical equipment located in the space.

Table 1.2.5-6. WHF Non-ITS HVAC Supply Components and System Design Data

Subsystem/Components	Number of Units		Nominal Airflow Capacity cfm/unit
	Operating	Standby	
ITS Confinement Areas Supply Air Handling Units (Equipment Number 050-VC00-AHU-00001/00002/00003)	2	1	20,000
Non-ITS Confinement Areas Supply Air Handling Units (Equipment Number 050-VCT0-AHU-00001/00002/00003)	2	1	30,000
Transportation Cask Vestibule (Tertiary Confinement)—Fan Coil Units (Equipment Number 050-VCT0-FCU-00009/00010/00011/00012)	3	1	10,000
Maintenance Room (Tertiary Confinement)—Fan Coil Units (Equipment Number 050-VCT0-FCU-00007/00008)	1	1	10,000
Nonconfinement Areas Supply Air Handling Units (Equipment Number 050-VNI0-AHU-00001/00002)	1	1	30,000
Nonconfinement Areas Return Fans (Integral to 050-VNI0-AHU-00001/00002)	1	1	30,000
Site Transporter Vestibule (Nonconfinement)—Fan Coil Units (Equipment Number 050-VNI0-FCU-00001/00002/00003)	2	1	6,000
Nonconfinement Utility Room—Fan Coil Units (Equipment Number 050-VNI0-FCU-00004/00005)	1	1	10,000
Nonconfinement Electrical Equipment Room—Fan Coil Units (Equipment Number 050-VNI0-FCU-00006/00007)	1	1	6,000

NOTE: Equipment and equipment numbers are shown in Figures 1.2.5-83, 1.2.5-93, 1.2.5-94, 1.2.5-104, and 1.2.5-105.

Table 1.2.5-7. WHF Non-ITS 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
Non-ITS HEPA Exhaust Filter Plenums (Equipment Number 050-VCT0-FLT-00016/00017/00018)	2	1	18,000	NA	1	1
Non-ITS HEPA Exhaust Fans (Equipment Number 050-VCT0-EXH-00001/00002/00003)	2	1	18,000	NA	NA	NA
Non-ITS Battery Room HEPA Exhaust Filter Plenums (Equipment Number: 050-VCT0-FLT-00014/00015)	1	1	1,500	NA	1	1
Non-ITS Battery Room HEPA Exhaust Fans (Equipment Number: 050-VCT0-EXH-00008/00009)	1	1	1,500	NA	NA	NA
Nonconfinement Second Level Men's and Women's Restrooms Exhaust Fan (Equipment Number: 050-VNI0-EXH-00001)	1	NA	800	NA	NA	NA
Nonconfinement HVAC Room Exhaust Fan (Equipment Number: 050-VNI0-EXH-00002)	1	NA	1,600	NA	NA	NA
Nonconfinement First Level Men's and Women's Restrooms Exhaust Fan (Equipment Number: 050-VNI0-EXH-00003)	1	NA	1,560	NA	NA	NA
Nonconfinement Elevator Machine Room Exhaust Fan (Equipment Number: 050-VNI0-EXH-00004)	1	NA	200	NA	NA	NA

NOTE: Equipment and equipment numbers are shown in Figures 1.2.5-93, 1.2.5-94, and 1.2.5-104.
NA = not applicable.

Table 1.2.5-8. WHF ITS HVAC Supply Components and System Design Data

Subsystem/Components	Number of Units		Nominal Unit Capacity
	Operating	Standby	
ITS Electrical Room Train A—Direct Expansion Fan Coil Units (Equipment Number 050-VCT0-FCU-00001/00002)	1	1	6,000 cfm
ITS Electrical Room Train A—Condensing Units (Equipment Number 050-VCT0-CDU-00001/00002)	1	1	20 tons
ITS Electrical Room Train B—Direct Expansion Fan Coil Units (Equipment Number 050-VCT0-FCU-00003/00004)	1	1	6,000 cfm
ITS Electrical Room Train B—Condensing Units (Equipment Number 050-VCT0-CDU-00003/00004)	1	1	20 tons

NOTE: Equipment and equipment numbers are shown in Figure 1.2.5-87.

ROOM LEGEND

WET HANDLING FACILITY

GROUND FLOOR

1001 TRANSPORTATION CASK VESTIBULE
1002 ELECTRICAL ROOM (ITS TRAIN A)
1003 BATTERY ROOM (ITS TRAIN A)
1004 HVAC ROOM (ITS HEPA EXHAUST TRAIN A)
1005 SPENT RESIN TRANSFER PUMP ROOM
1006 HVAC ROOM (HEPA EXHAUST)
1007 LOADING ROOM
1008 CASK UNLOADING ROOM
1009 CANISTER TRANSFER MACHINE MAINTENANCE ROOM
1010 GAS SAMPLING ROOM
1011A CORRIDOR
1011B CORRIDOR
1012A CORRIDOR
1012B CORRIDOR
1013 LOW-LEVEL (RADIOACTIVE) WASTE STAGING AREA
1014 CHEMICAL LAB
1015 ELEVATOR MACHINE ROOM
1016 CASK PREPARATION AREA
1017 UTILITY ROOM
1018 MAINTENANCE ROOM
1018A VESTIBULE
1018B VESTIBULE
1019 ELECTRICAL ROOM (ITS TRAIN B)
1020 BATTERY ROOM (ITS TRAIN B)
1021 HVAC ROOM (ITS HEPA EXHAUST TRAIN B)
1022 VESTIBULE
1023 SITE TRANSPORTER VESTIBULE
1024 STAIR #1
1025 STAIR #2
1026 STAIR #3
1027 STAIR #4
1028 FREIGHT ELEVATOR
1029 ELEVATOR LOBBY (WEST)
1030 ELEVATOR EQUIPMENT ROOM
1031 CORRIDOR
1032 CORRIDOR
1032A STORAGE ROOM
1033 CORRIDOR
1034 FIRE WATER RISER VALVE ROOM #1
1035 FIRE WATER RISER VALVE ROOM #2
1036 ELEVATOR
1037 ELEVATOR MACHINE ROOM
1038 CONDENSER AREA (NORTH)
1039 CONDENSER AREA (SOUTH)
1040 CHILLER AREA
1041 TRANSFORMER AREA
1042A POOL PUMP ROOM (TRAIN A)
1042B POOL PUMP ROOM (TRAIN B)
1042C POOL PUMP ROOM (TRAIN C)
1043A POOL FILTER ROOM (TRAIN A)
1043B POOL FILTER ROOM (TRAIN B)
1043C POOL FILTER ROOM (TRAIN C)
1044A POOL ION EXCHANGER ROOM (TRAIN A)
1044B POOL ION EXCHANGER ROOM (TRAIN B)
1044C POOL ION EXCHANGER ROOM (TRAIN C)
1045A CORRIDOR
1045B CORRIDOR
1045C CORRIDOR
1045D CORRIDOR
1046 ELECTRICAL ROOM
1047 GAS STORAGE AREA

GROUND FLOOR SUPPORT AREA

1201 ENTRY/EXIT VESTIBULE
1202 BRIEFING ROOM
1203 MENS LOCKER/SHOWER RESTROOM
1204 WOMENS LOCKER/SHOWER RESTROOM
1205 RADIATION PROTECTION CONTROL POINT
1206 CONTROLLED EXIT
1207 VESTIBULE OUT
1208 VESTIBULE IN
1209 RADIATION PROTECTION GEAR SUPPLY ROOM
1210 DECONTAMINATION
1211 RESPIRATOR ROOM
1212 RADIATION PROTECTION EQUIPMENT ROOM
1213 CHANGE ROOM 2
1214 CHANGE ROOM 1
1215 RADIATION PROTECTION INSTRUMENT ROOM
1216 RADIATION PROTECTION LAB/SAMPLE PREPARATION ROOM
1217 RADIATION PROTECTION LAB/COUNT ROOM
1218A CORRIDOR
1218B CORRIDOR
1218C CORRIDOR

SECOND FLOOR

2001 ELECTRICAL ROOM (NORMAL POWER)
2001A BATTERY ROOM (NORMAL POWER)
2002 HVAC ROOM (CONFINEMENT AREA SUPPLY)
2003 HVAC ROOM (CONFINEMENT AREA SUPPLY)
2004 CANISTER TRANSFER ROOM
2005A CORRIDOR
2005B CORRIDOR
2006 CORRIDOR
2007A CORRIDOR
2007B CORRIDOR
2008 CRANE MAINTENANCE AREA
2009 NOT USED
2010 HVAC ROOM SOUTH (PROCESS AREA SUPPLY)
2011A BACK-UP CENTRAL COMMUNICATIONS ROOM A
2011B BACK-UP CENTRAL COMMUNICATIONS ROOM B
2012 OPERATIONS ROOM
2013 OPERATIONS SUPERVISOR ROOM
2014 THRU 2023 NOT USED
2024 STAIR #1
2025 STAIR #2
2026 STAIR #3
2027 STAIR #4
2028 NOT USED
2029 ELEVATOR LOBBY (EL +40'-0")
2030 ELEVATOR LOBBY (EL +32'-0")
2031 ELEVATOR MACHINE ROOM
2032 CORRIDOR (EL +32'-0")
2033 ELEVATOR LOBBY (EL +40'-0")
2034 CORRIDOR (EL +40'-0")

MEZZANINE

M001 HVAC (ITS CONFINEMENT AREA)/ POOL EQUIPMENT ROOM

PIT

P001 POOL
P002 DECONTAMINATION PIT

POOL BASEMENT

B001 ACCESS STAIR/ LEAK DETECTION SUMP AREA (NORTH)
B002 STORAGE TANK AREA (LLW/ POOL OVERFLOW) (NORTH)
B003 UNASSIGNED
B004 UNASSIGNED
B005 DECONTAMINATION COLLECTION TANK AREA
B006 ELEVATOR LOBBY
B007 ELEVATOR
B008 STORAGE TANK AREA (LOW-LEVEL RADIOACTIVE WASTE/ POOL OVERFLOW) (SOUTH)
B009 ACCESS STAIR/ LEAK DETECTION SUMP AREA (SOUTH)

SECOND FLOOR SUPPORT AREA

2201 BRIEFING ROOM
2202 RADIATION PROTECTION STAFF WORK ROOM
2203 BREAK/VENDING ROOM
2204 WOMENS RESTROOM
2205 MENS RESTROOM
2206 JANITOR ROOM

DRAWING LEGEND

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

ABBREVIATIONS AND ACRONYMS

AO = AGING OVERPACK
AUX = AUXILIARY
COL = COLUMN
CHW = CHILLED HOT WATER
CTM = CANISTER TRANSFER MACHINE
DN = DOWN
DOE = U.S. DEPARTMENT OF ENERGY
DPC = DUAL PURPOSE CANISTER
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
RC = RAIL CASK
RP = RADIOLOGICAL PROTECTION
SFTM = SPENT FUEL TRANSFER MACHINE
SNF = SPENT NUCLEAR FUEL
SSC = STRUCTURE, SYSTEM OR COMPONENT
STC = SHIELDED TRANSFER CASK
TAD = TRANSPORTATION, AGING AND DISPOSAL
TC = TRUCK CASK
TOC = TOP OF CONCRETE
TOR = TOP OF RAIL
TOS = TOP OF STEEL
TYP = TYPICAL
UNO = UNLESS NOTED OTHERWISE
WHF = WET HANDLING FACILITY
# = NUMBER
℄ = CENTER LINE

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Figure 1.2.5-1. WHF 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: Information Designated as Official Use Only, as Figure A-39.

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

Figure 1.2.5-2. WHF General Arrangement Ground Floor Plan

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-40.

NOTE: STC = shielded transfer cask.

Figure 1.2.5-3. WHF General Arrangement Plan Below +40′–0″

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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-41.

NOTE: CTM = canister transfer machine; HR = handrail; LC = load center; MCC = motor control center.

Figure 1.2.5-4. WHF General Arrangement Second Floor Plan

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-42.

NOTE: CTM = canister transfer machine.

Figure 1.2.5-5. WHF General Arrangement Plan Below Elevation +93′–0″

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-43.

NOTE: HR = handrail; LLW = low-level radioactive waste.

Figure 1.2.5-6. WHF General Arrangement Section A

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-44.

NOTE: HR = handrail; LLW = low-level radioactive waste.

Figure 1.2.5-7. WHF General Arrangement Section B

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-45.

NOTE: HR = handrail.

Figure 1.2.5-8. WHF General Arrangement Section C

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-46.

Figure 1.2.5-9. WHF General Arrangement Section D

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-47.

NOTE: HR = handrail; MCC = motor control center.

Figure 1.2.5-10. WHF General Arrangement Section E

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-48.

NOTE: HR = handrail.

Figure 1.2.5-11. WHF General Arrangement Section F

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-49.

NOTE: CTM = canister transfer machine; HR = handrail.

Figure 1.2.5-12. WHF General Arrangement Section G

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-50.

NOTE: HR = handrail; SFTM = spent fuel transfer machine; STC = shielded transfer cask.

Figure 1.2.5-13. WHF General Arrangement Section H

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-51.

NOTE: HR = handrail; LLW = low-level radioactive waste; RC = rail cask; STC = shielded transfer cask.

Figure 1.2.5-14. WHF General Arrangement Section J

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-52.

Figure 1.2.5-15. WHF General Arrangement Roof Plan

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-53.

NOTE: LLW = low-level radioactive waste; RC = rail cask; SFTM = spent fuel transfer machine; STC = shielded transfer cask; TC = truck cask.

Figure 1.2.5-16. WHF General Arrangement Pool Plan

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-54.

Figure 1.2.5-17. WHF Operational Sequences and Material Flow Paths (Sheet 1 of 3)

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-54.

Figure 1.2.5-17. WHF Operational Sequences and Material Flow Paths (Sheet 2 of 3)

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This figure is included in Appendix A: Information Designated as Official Use Only, as Figure A-54.

Figure 1.2.5-17. WHF Operational Sequences and Material Flow Paths (Sheet 3 of 3)

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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-55.

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 the number of waste forms that may be present in specific areas of the facility. STC = shielded transfer cask.

Figure 1.2.5-18. Inventory of Waste Forms in Wet Handling Facility at Any One Time

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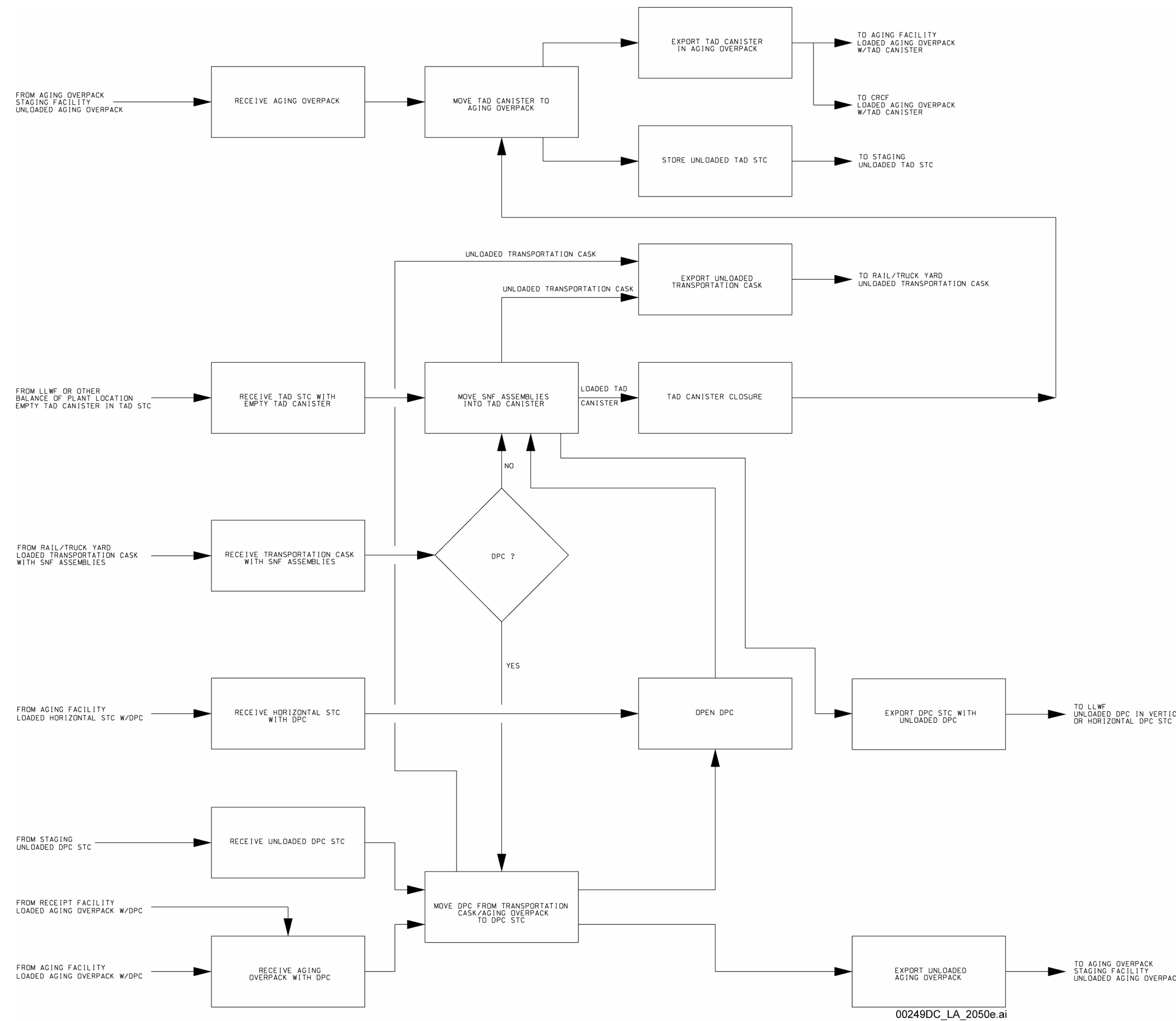

Figure 1.2.5-19. Major Waste Processing Functions in the WHF

NOTE: LLWF = Low-Level Waste Facility; STC = shielded transfer cask.

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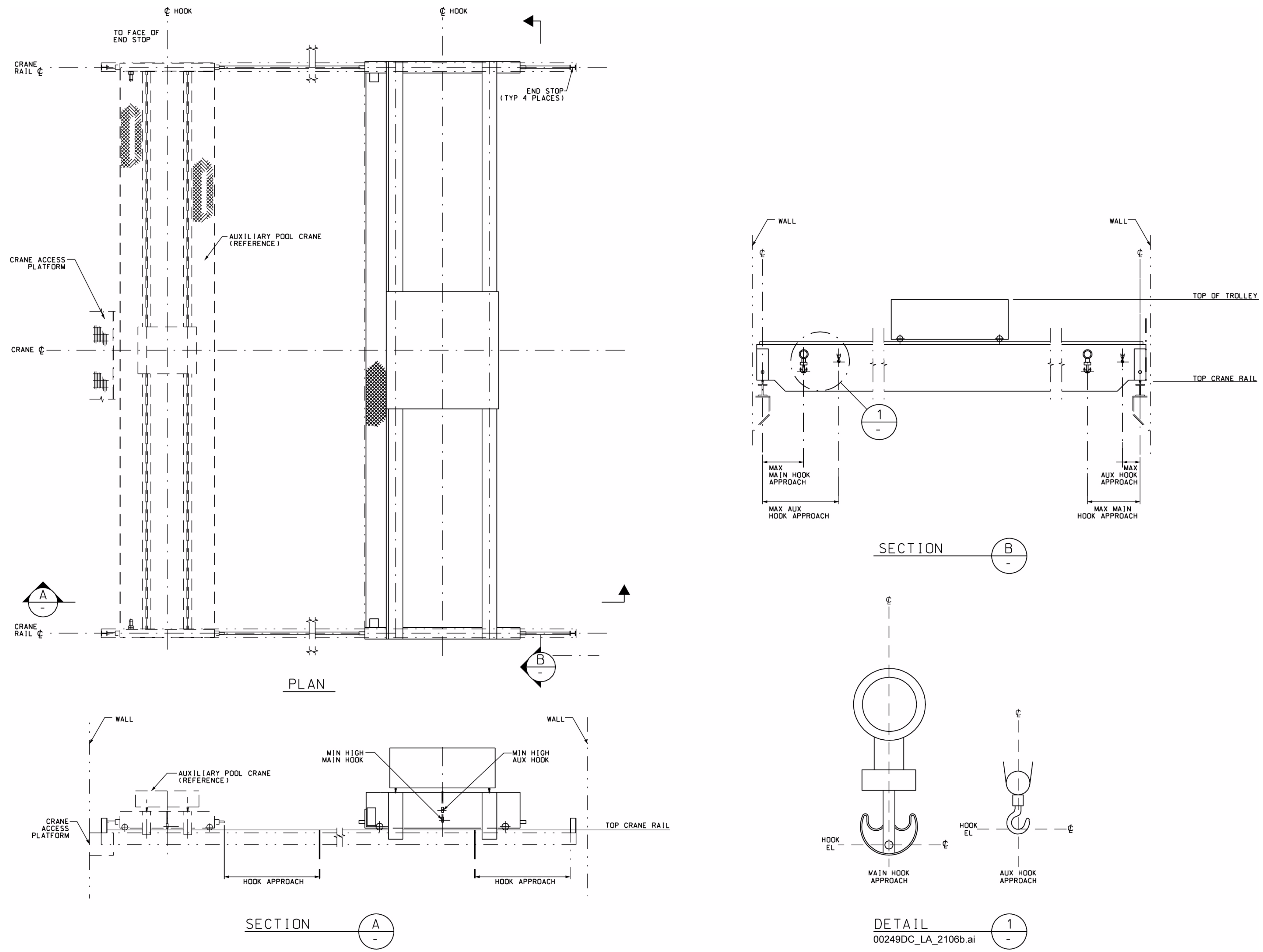

Figure 1.2.5-20. Cask Handling Crane Mechanical Equipment Envelope

Equipment Number: 050-HM00-CRN-00001, cask handling crane.

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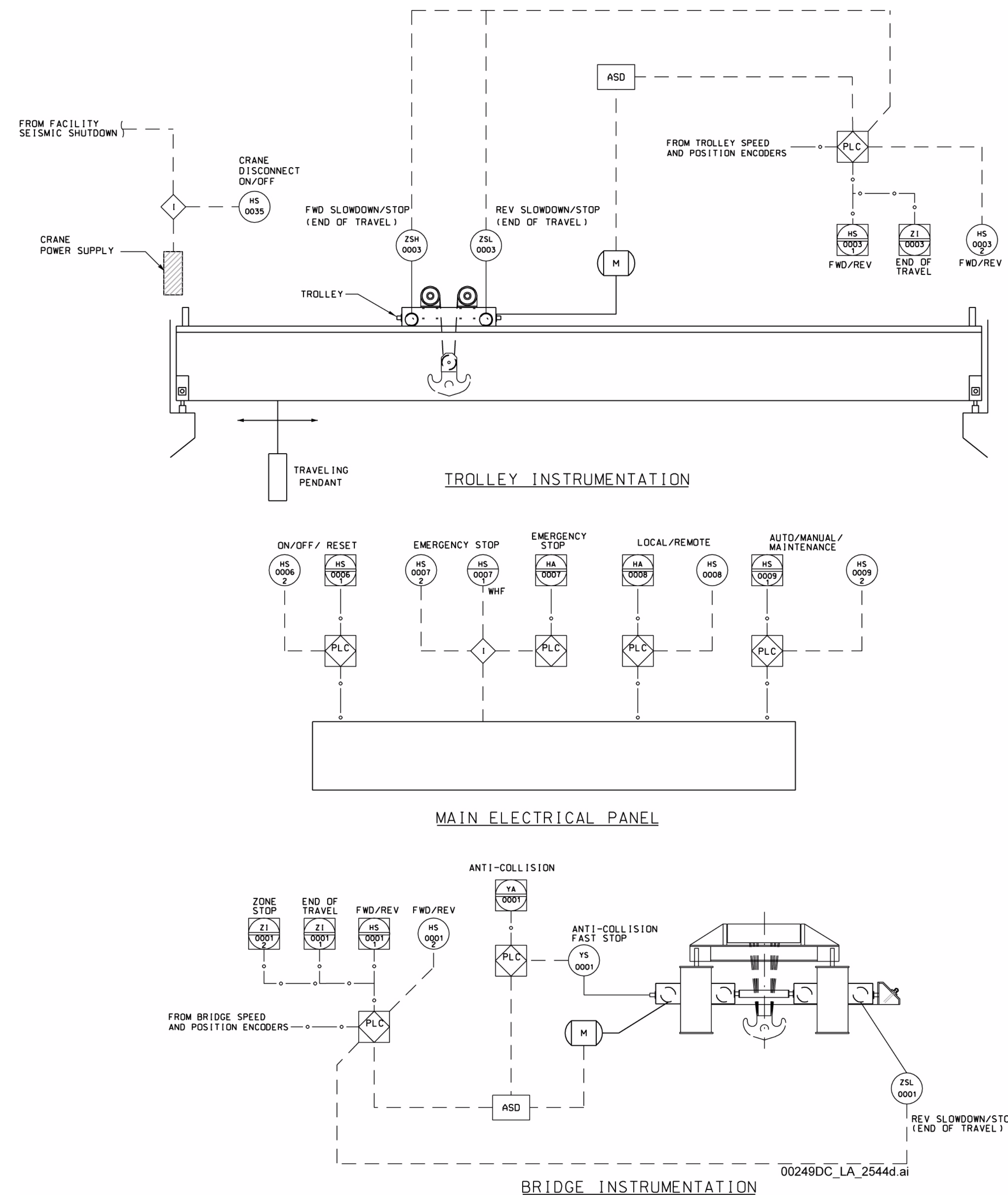

NOTE: Automation controls for the cask handling crane cause the bridge to ramp down to zero speed at a designated zone point.

Equipment Number: 050-HM00-CRN-00001, cask handling crane.

Figure 1.2.5-21. WHF Cask Handling Crane Process and Instrumentation Diagram (Sheet 1 of 3)

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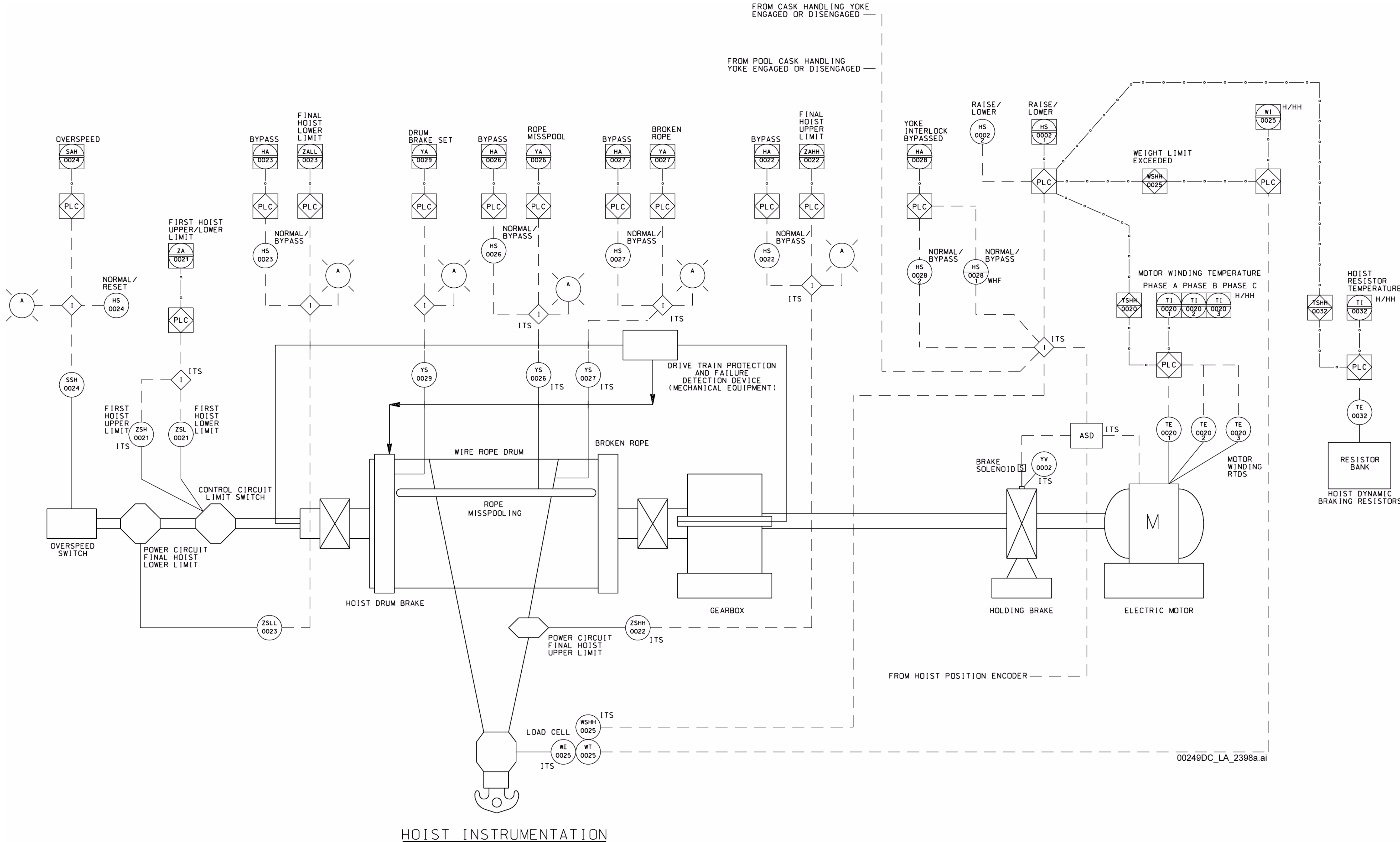

Figure 1.2.5-21. WHF Cask Handling Crane Process and Instrumentation Diagram (Sheet 2 of 3)

Equipment Number: 050-HM00-CRN-00001, cask handling crane.

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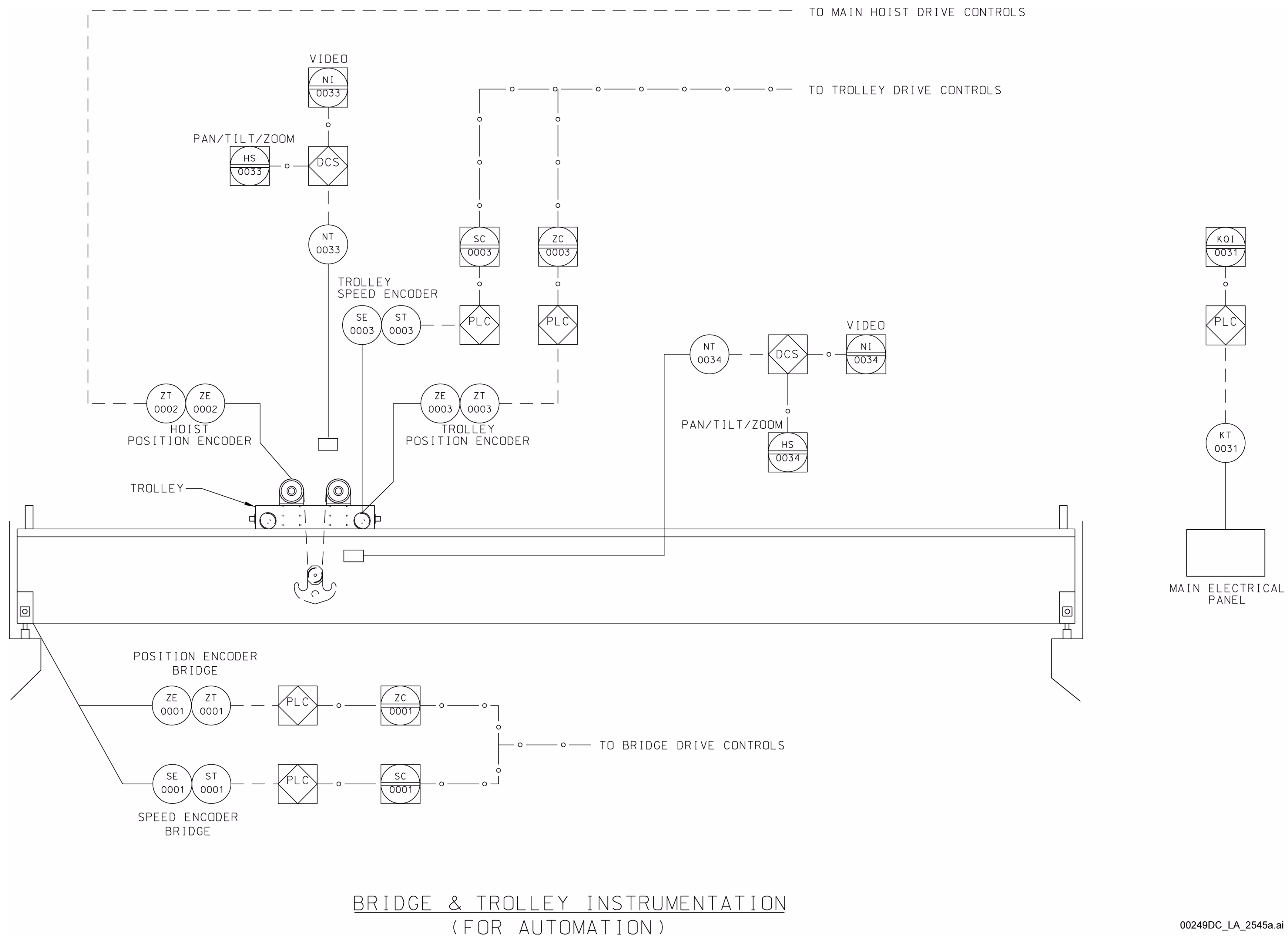

Figure 1.2.5-21. WHF Cask Handling Crane Process and Instrumentation Diagram (Sheet 3 of 3)

Equipment Number: 050-HM00-CRN-00001, cask handling crane.

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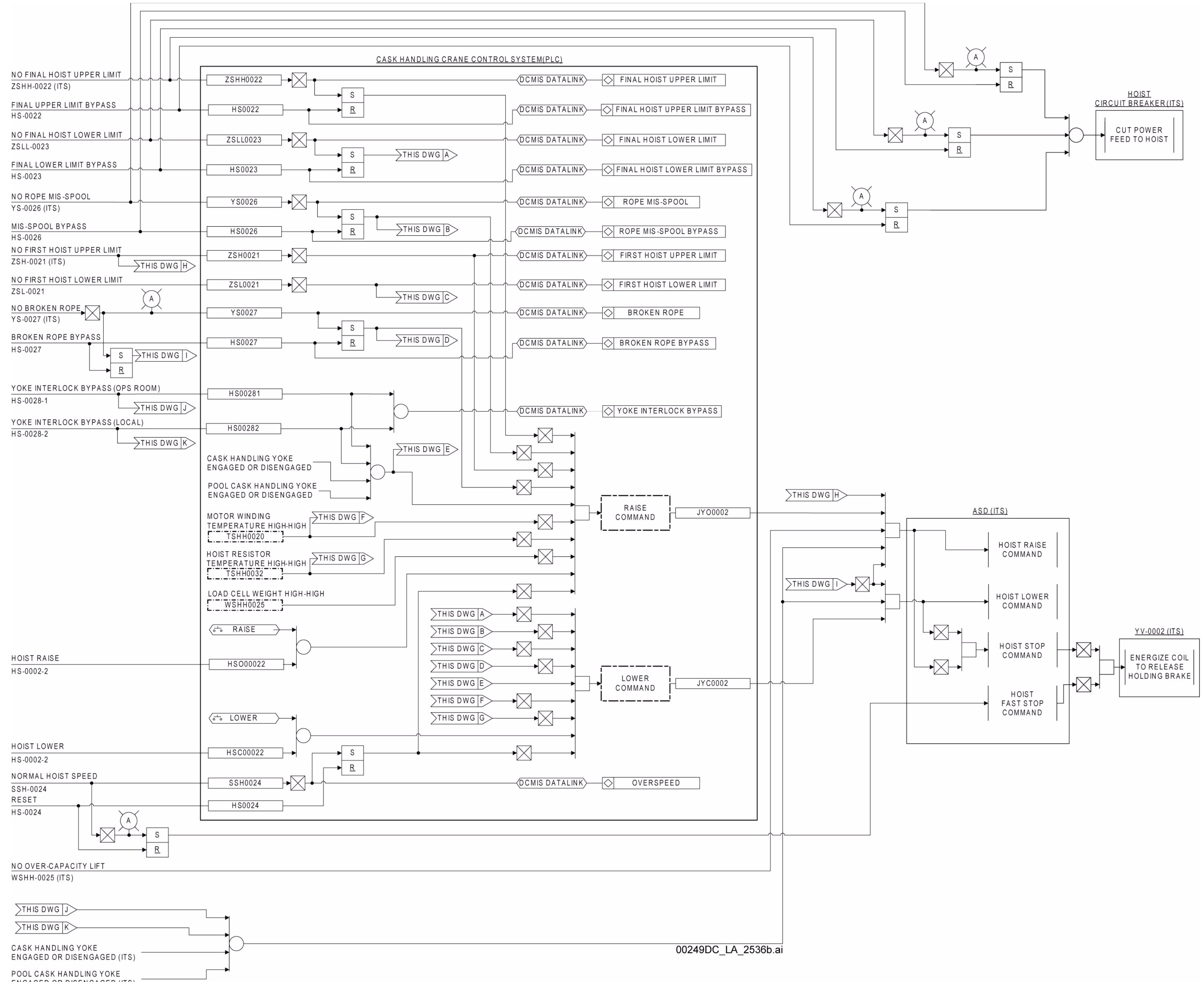

NOTE: ITS controls are identified by the letters "ITS" after the instrumentation tag number or the control device identifier. The cask handling crane control system, which controls the hoist, is non-ITS and non-ITWI. Simultaneous DCMIS and local control is prevented by means of a "local/remote" selector switch associated with the cask handling crane controls. Instrumentation tag numbers are prefixed by "050-HM00-," and software tag numbers are prefixed by "050HM00." ASD = adjustable speed drive; PLC = programmable logic controller.

Equipment Number: 050-HM00-CRN-00001, cask handling crane.

Figure 1.2.5-22. Logic Diagram for the WHF Cask Handling Crane Hoist

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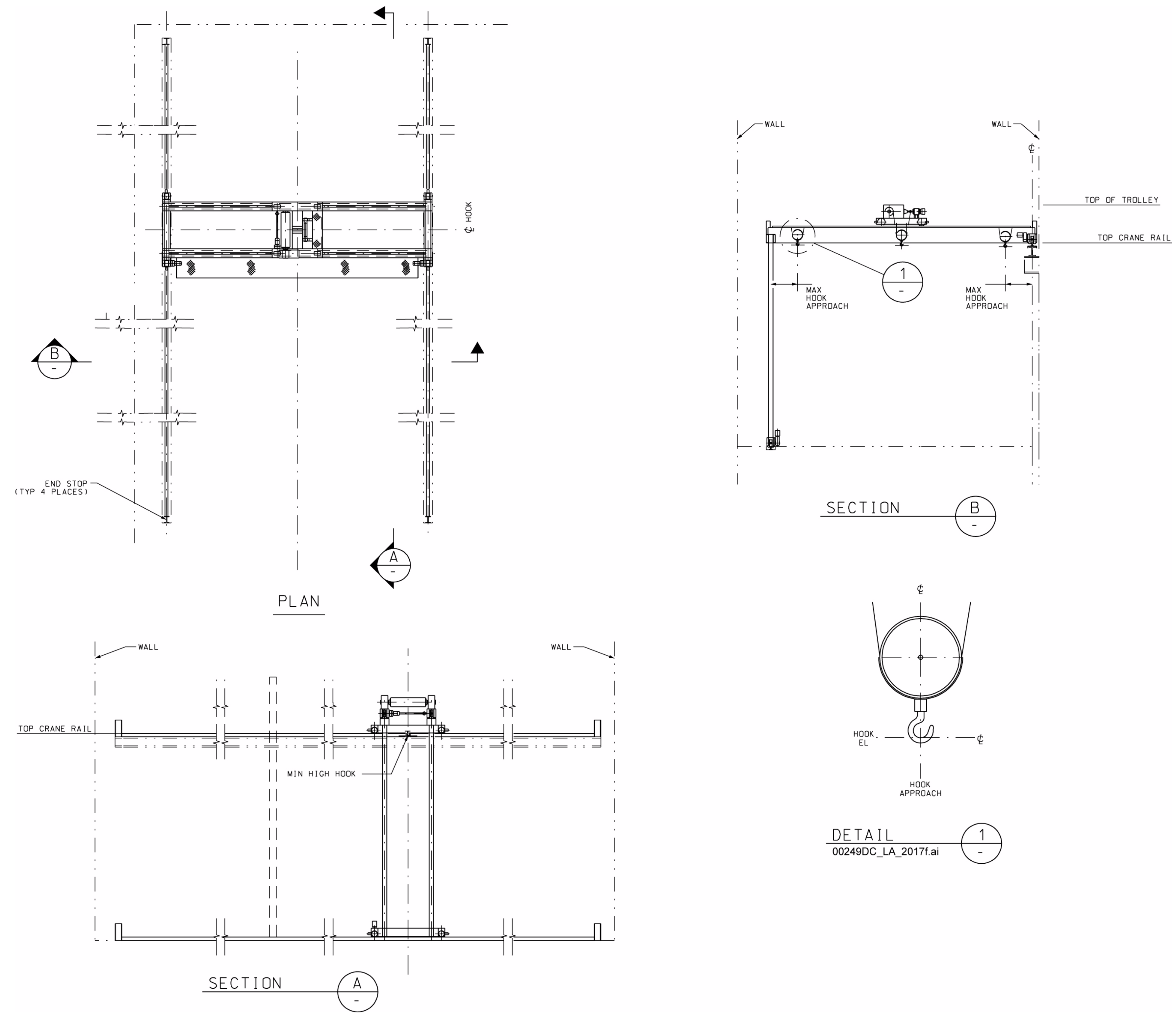

Equipment Number: 050-HMC0-CRN-00001, entrance vestibule crane.

Figure 1.2.5-23. WHF Entrance Vestibule Crane Mechanical Equipment Envelope

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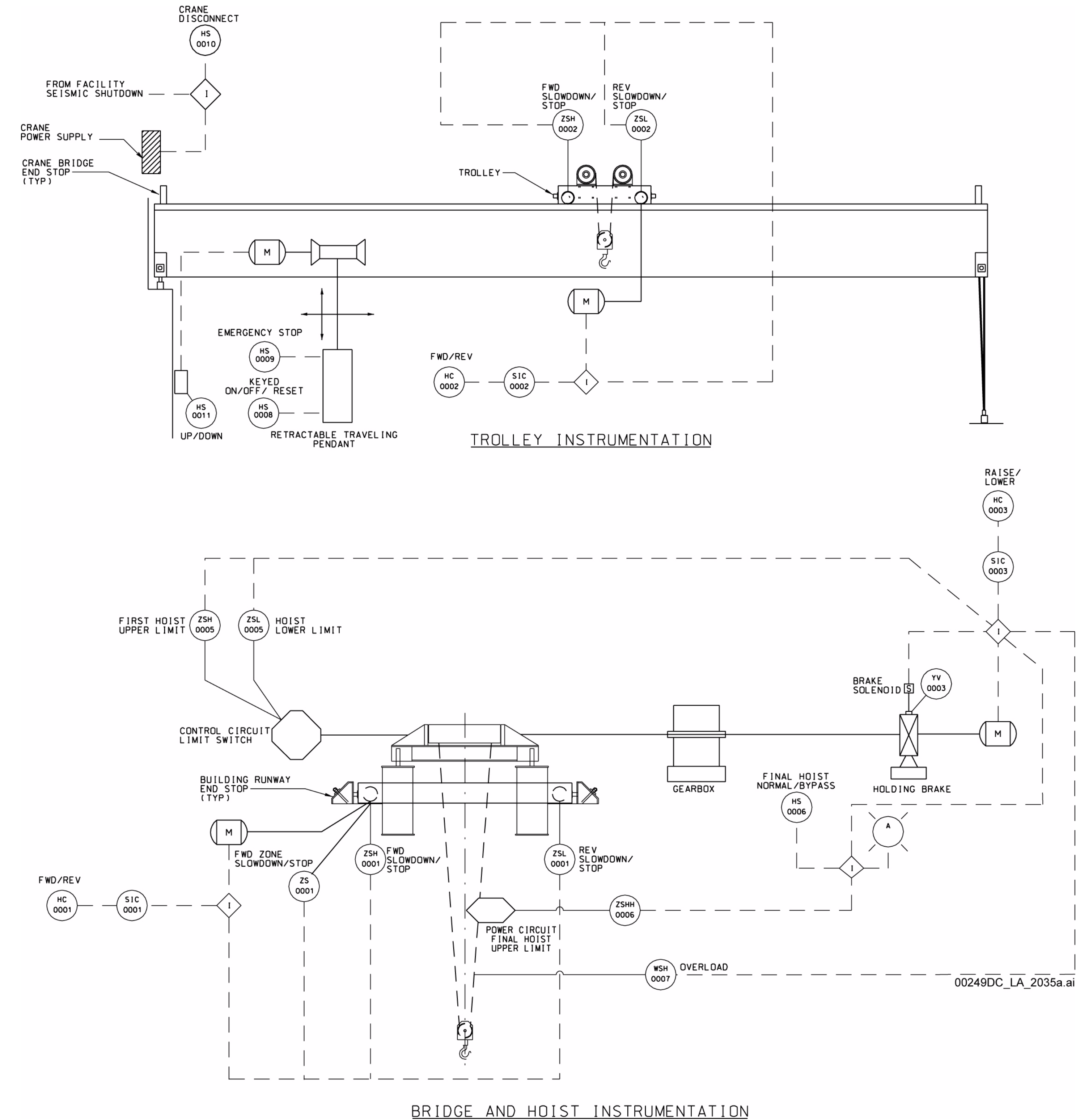

NOTE: This drawing includes the WHF entrance vestibule crane that has been classified as ITS. While the WHF entrance vestibule crane is ITS, the instrumentation, electrical, and control devices shown herein are non-ITS and non-ITWI.

Equipment Number: 050-HMC0-CRN-00001, entrance vestibule crane.

Figure 1.2.5-24. Entrance Vestibule Crane Process and Instrumentation Diagram

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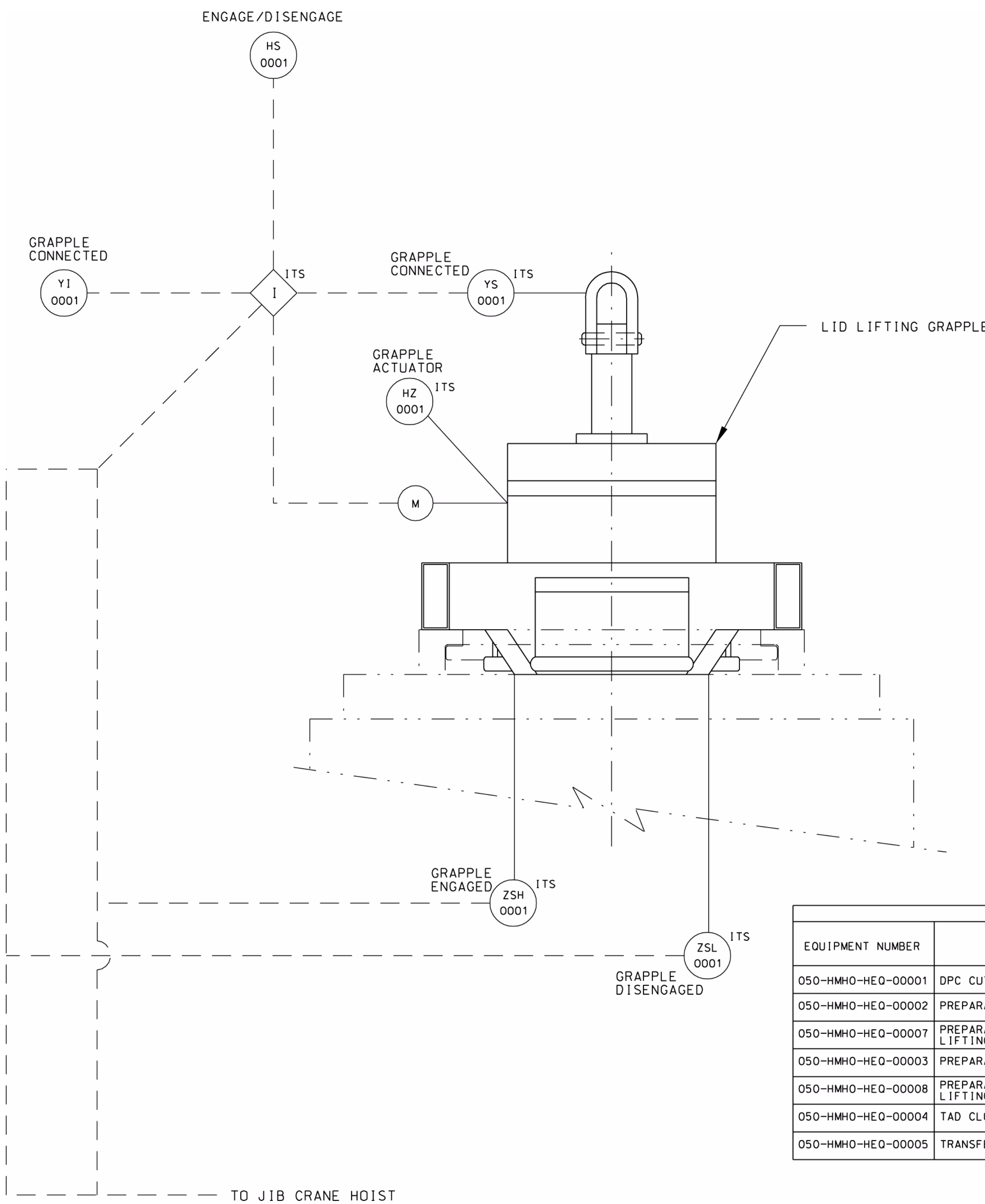

EQUIPMENT AND INSTRUMENTATION TABLE									
EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	ASSOCIATED CRANE		LOCAL HANDSWITCH	LOCAL CONNECTED INDICATOR	ACTUATOR	STATUS SWITCHES		
		EQUIPMENT NUMBER	DESCRIPTION				CONNECTED	ENGAGED	DISENGAGED
050-HMHO-HEQ-00001	DPC CUTTING STATION LID LIFTING GRAPPLE	050-HD00-CRN-00001	DPC CUTTING STATION JIB CRANE	HS-0001	YI-0001	HZ-0001 (ITS)	YS-0001 (ITS)	ZSH-0001 (ITS)	ZSL-0001 (ITS)
050-HMHO-HEQ-00002	PREPARATION STATION 1 LID LIFTING GRAPPLE	050-HMHO-CRN-00003	PREPARATION STATION 1 JIB CRANE	HS-0002	YI-0002	HZ-0002-1 (ITS)	YS-0002-1 (ITS)	ZSH-0002-1 (ITS)	ZSL-0002-1 (ITS)
050-HMHO-HEQ-00007	PREPARATION STATION 1 TRUCK CASK LID LIFTING GRAPPLE					HZ-0002-2 (ITS)	YS-0002-2 (ITS)	ZSH-0002-2 (ITS)	ZSL-0002-2 (ITS)
050-HMHO-HEQ-00003	PREPARATION STATION 2 LID LIFTING GRAPPLE	050-HMHO-CRN-00002	PREPARATION STATION 2 JIB CRANE	HS-0003	YI-0003	HZ-0003-1 (ITS)	YS-0003-1 (ITS)	ZSH-0003-1 (ITS)	ZSL-0003-1 (ITS)
050-HMHO-HEQ-00008	PREPARATION STATION 2 TRUCK CASK LID LIFTING GRAPPLE					HZ-0003-2 (ITS)	YS-0003-2 (ITS)	ZSH-0003-2 (ITS)	ZSL-0003-2 (ITS)
050-HMHO-HEQ-00004	TAD CLOSURE STATION LID LIFTING GRAPPLE	050-HC00-CRN-00001	TAD CLOSURE STATION JIB CRANE	HS-0004	YI-0004	HZ-0004 (ITS)	YS-0004 (ITS)	ZSH-0004 (ITS)	ZSL-0004 (ITS)
050-HMHO-HEQ-00005	TRANSFER ROOM LID LIFTING GRAPPLE	050-HTC0-CRN-00001	CTM MAINTENANCE CRANE	HS-0005	YI-0005	HZ-0005	YS-0005	ZSH-0005	ZSL-0005

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NOTE: The grapple local control hand switch and local grapple connected indicator are located on the associated crane pendants.

Figure 1.2.5-25. WHF Lid-Lifting Grapple Process and Instrumentation Diagram

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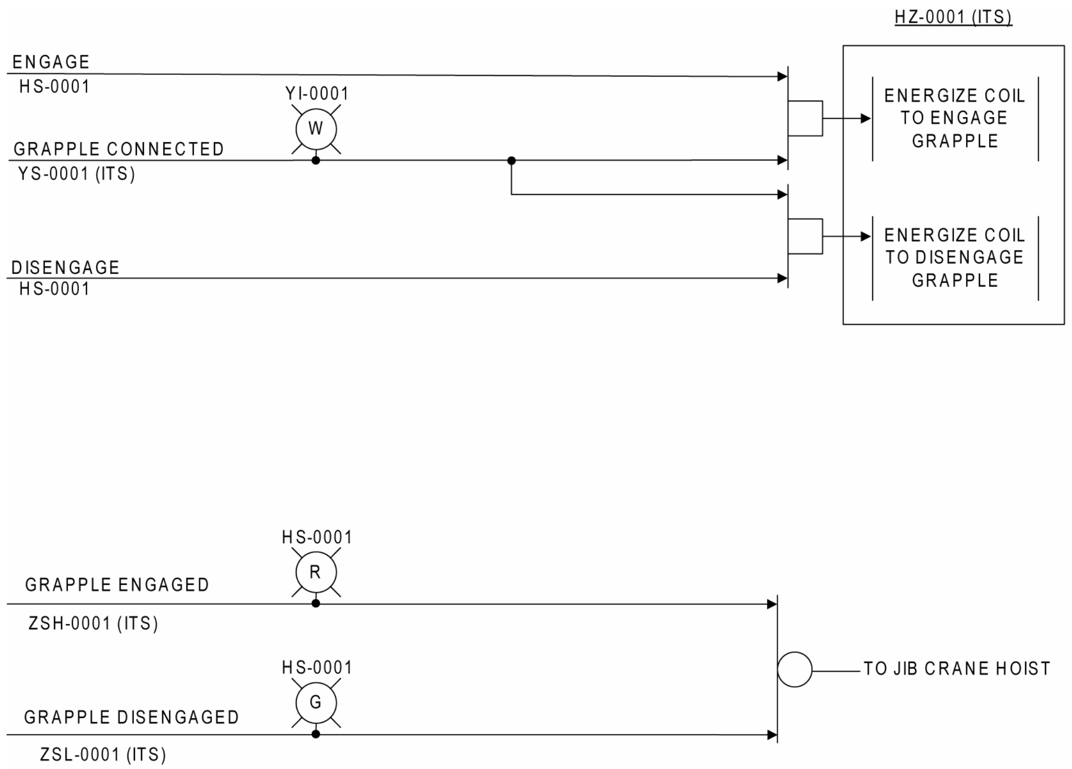

DESCRIPTION	GRAPPLE EQUIPMENT NUMBER	ASSOCIATED CRANE		LOCAL HANDSWITCH	LOCAL CONNECTED INDICATOR	MOTOR ACTUATOR	GRAPPLE STATUS SWITCHES		
		EQUIPMENT NUMBER	DESCRIPTION				ENGAGED	DISENGAGED	CONNECTED
DPC CUTTING STATION LID LIFTING GRAPPLE	050-HMH0-HEQ-00001	050-HD00-CRN-00001	DPC CUTTING STATION JIB CRANE	HS-0001	YI-0001	HZ-0001 (ITS)	ZSH-0001 (ITS)	ZSL-0001(ITS)	YS-0001 (ITS)
PREPARATION STATION 1 LID LIFTING GRAPPLE	050-HMH0-HEQ-00002	050-HMH0-CRN-00003	PREPARATION STATION 1 JIB CRANE	HS-0002	YI-0002	HZ-0002-1 (ITS)	ZSH-0002-1 (ITS)	ZSL-0002-1 (ITS)	YS-0002-1 (ITS)
PREPARATION STATION 1 TRUCK CASK LID LIFTING GRAPPLE	050-HMH0-HEQ-00007					HZ-0002-2 (ITS)	ZSH-0002-2 (ITS)	ZSL-0002-2 (ITS)	YS-0002-2 (ITS)
PREPARATION STATION 2 LID LIFTING GRAPPLE	050-HMH0-HEQ-00003	050-HMH0-CRN-00002	PREPARATION STATION 2 JIB CRANE	HS-0003	YI-0003	HZ-0003-1 (ITS)	ZSH-0003-1 (ITS)	ZSL-0003-1 (ITS)	YS-0003-1 (ITS)
PREPARATION STATION 2 TRUCK CASK LID LIFTING GRAPPLE	050-HMH0-HEQ-00008					HZ-0003-2 (ITS)	ZSH-0003-2 (ITS)	ZSL-0003-2 (ITS)	YS-0003-2 (ITS)
TAD CANISTER CLOSURE STATION LID LIFTING GRAPPLE	050-HMH0-HEQ-00004	050-HC00-CRN-00001	TAD CANISTER CLOSURE STATION JIB CRANE	HS-0004	YI-0004	HZ-0004 (ITS)	ZSH-0004 (ITS)	ZSL-0004 (ITS)	YS-0004 (ITS)

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NOTE: ITS controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. Instrumentation tag numbers are prefixed by "050-HMH0-," and software tag numbers are prefixed by "050HMH0."

Figure 1.2.5-26. Logic Diagram for the Jib Crane Lid-Lifting Grapples

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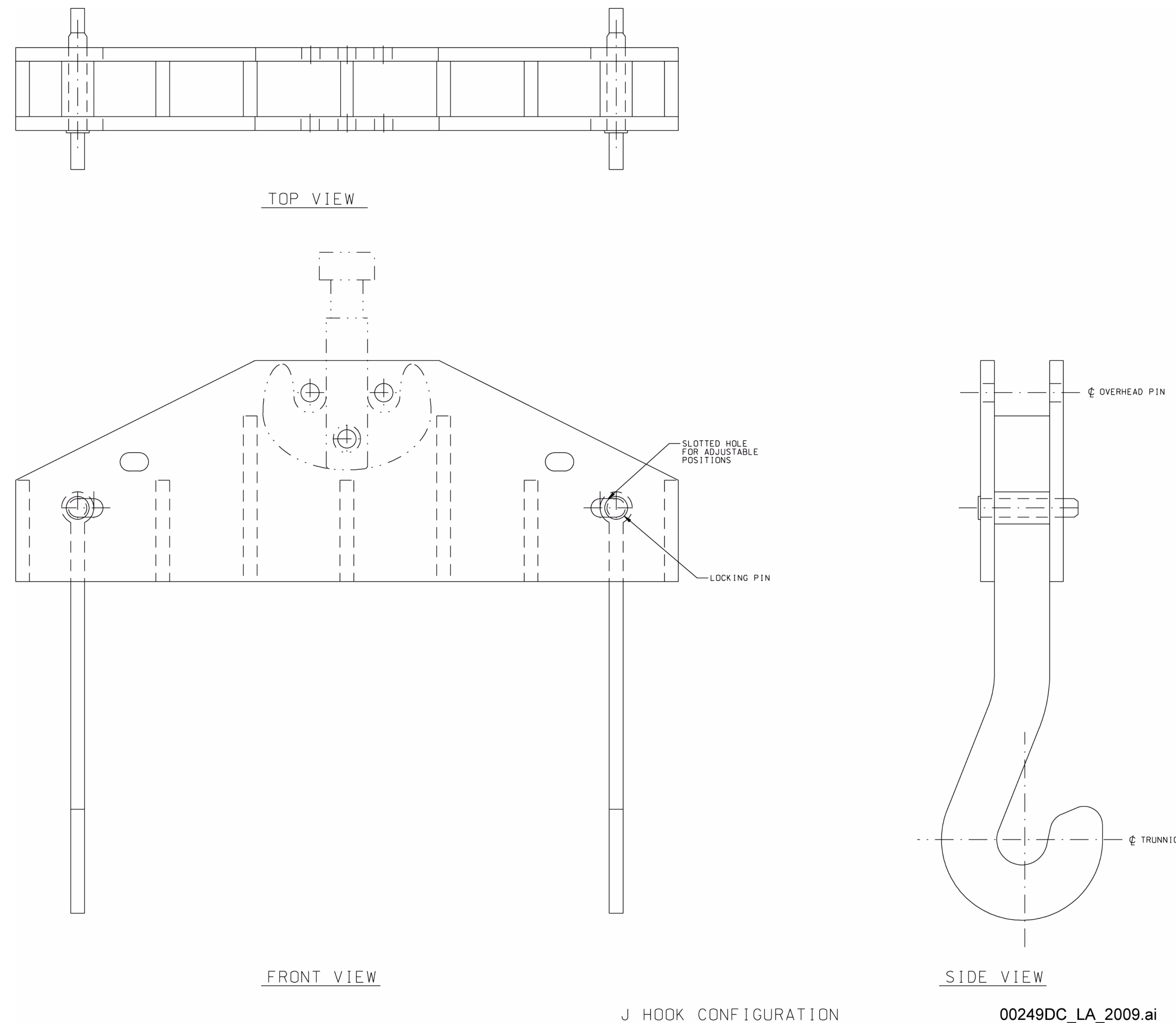

Figure 1.2.5-27. Pool Cask Handling Yoke Mechanical Equipment Envelope (Sheet 1 of 2)

Equipment Number: 050-HM00-BEAM-00002, pool cask handling yoke.

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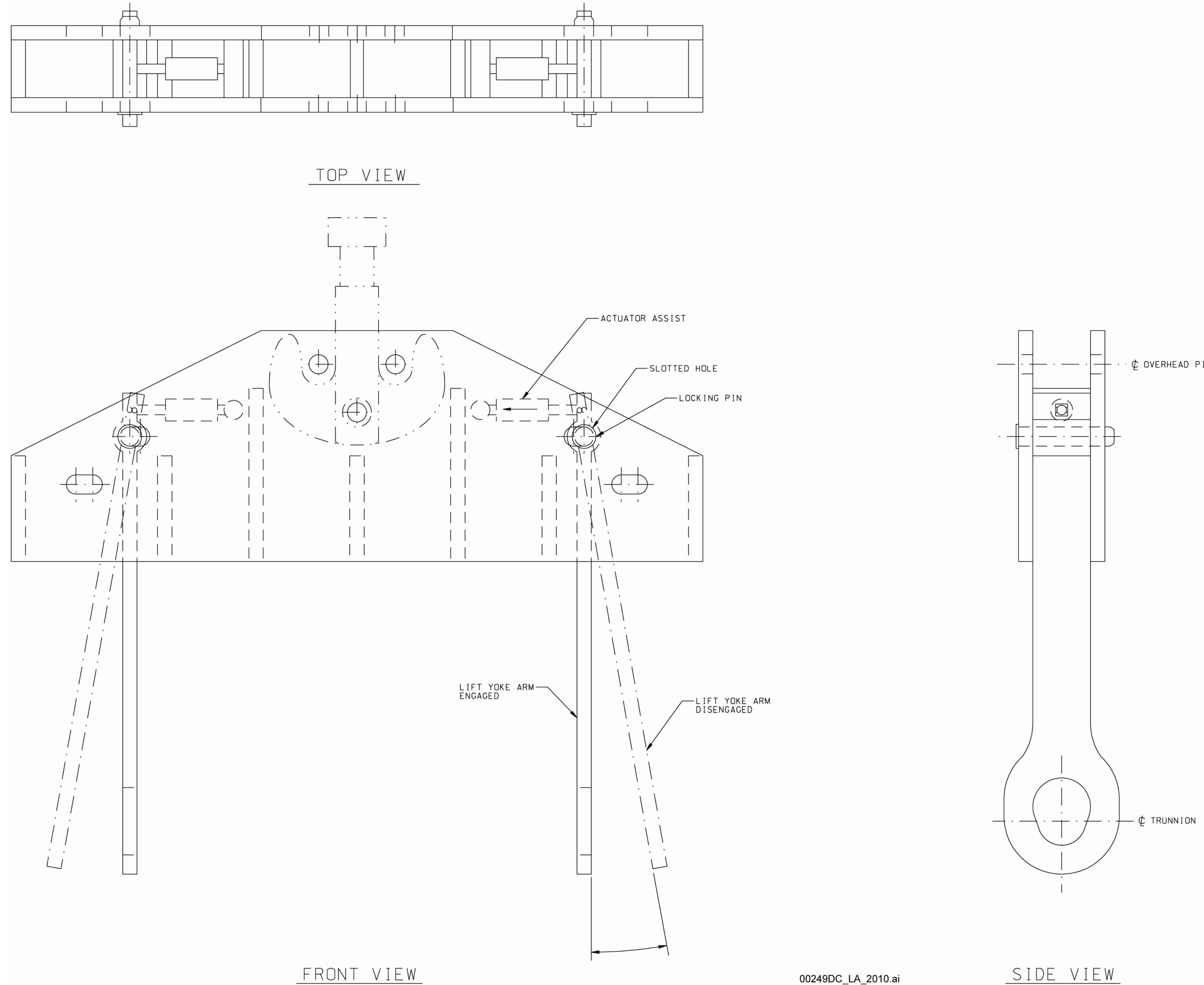

Equipment Number: 050-HM00-BEAM-00002, pool cask handling yoke.

Figure 1.2.5-27. Pool Cask Handling Yoke Mechanical Equipment Envelope (Sheet 2 of 2)

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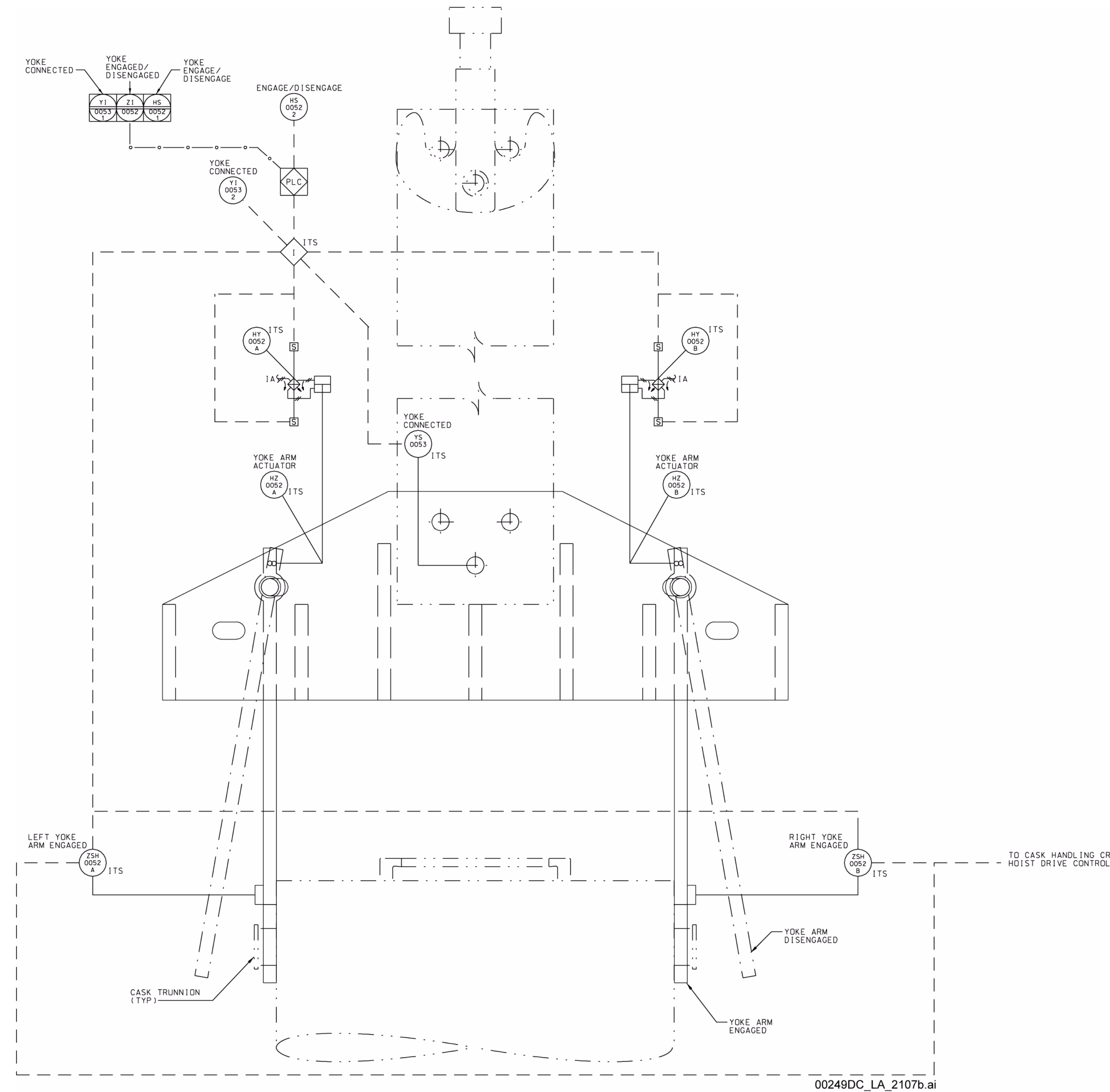

Equipment Number: 050-HM00-BEAM-00002, pool cask handling yoke.

Figure 1.2.5-28. Pool Cask Handling Yoke Process and Instrumentation Diagram

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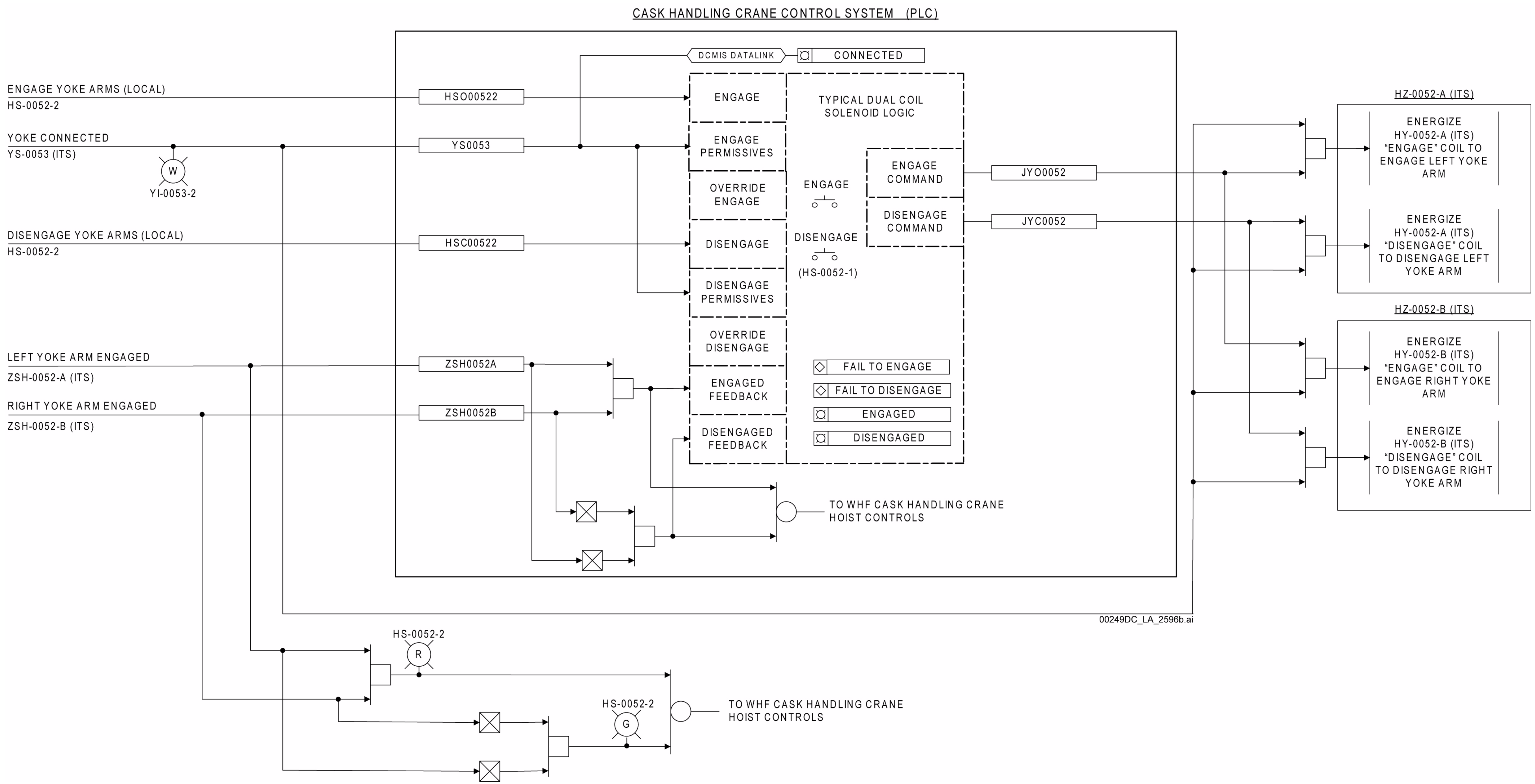

NOTE: ITS controls are identified by the letters “ITS” after the instrumentation tag number or control device identifier. The cask handling crane control system, which controls the pool cask handling yoke, is non-ITS and non-ITWI. Simultaneous DCMIS and local control is prevented by means of a “local/remote” selector switch associated with the cask handling crane. Instrumentation tag numbers are prefixed by “050-HM00-,” and software tag numbers are prefixed by “050HM00.” PLC = programmable logic controller.

Equipment Number: 050-HM00-BEAM-00002, pool cask handling yoke.

Figure 1.2.5-29. Logic Diagram for the Cask Handling Crane Pool Cask Handling Yoke

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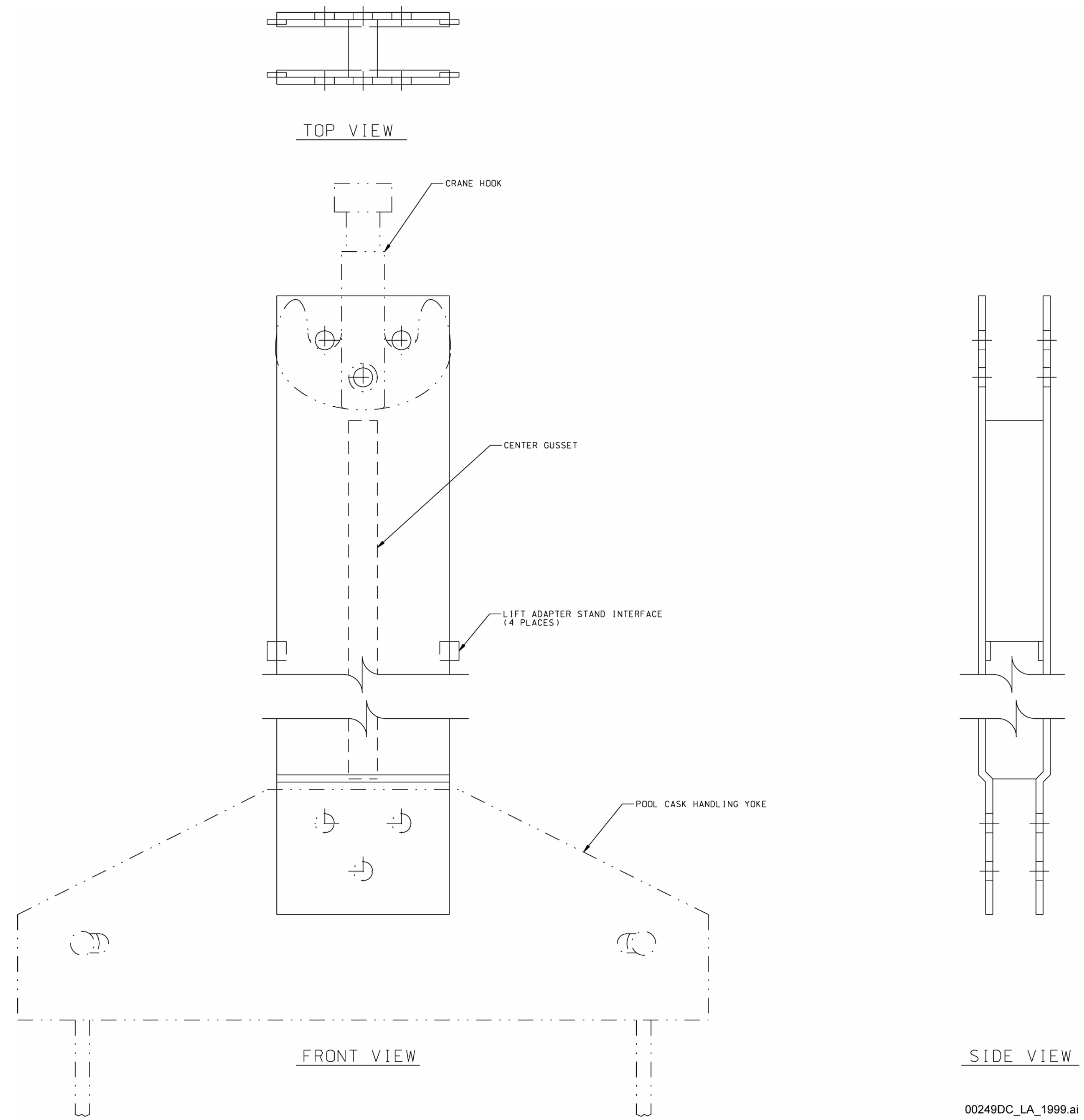

Equipment Number: 050-HM00-TOOL-00002, pool yoke lift adapter.

Figure 1.2.5-30. Pool Yoke Lift Adapter Mechanical Equipment Envelope

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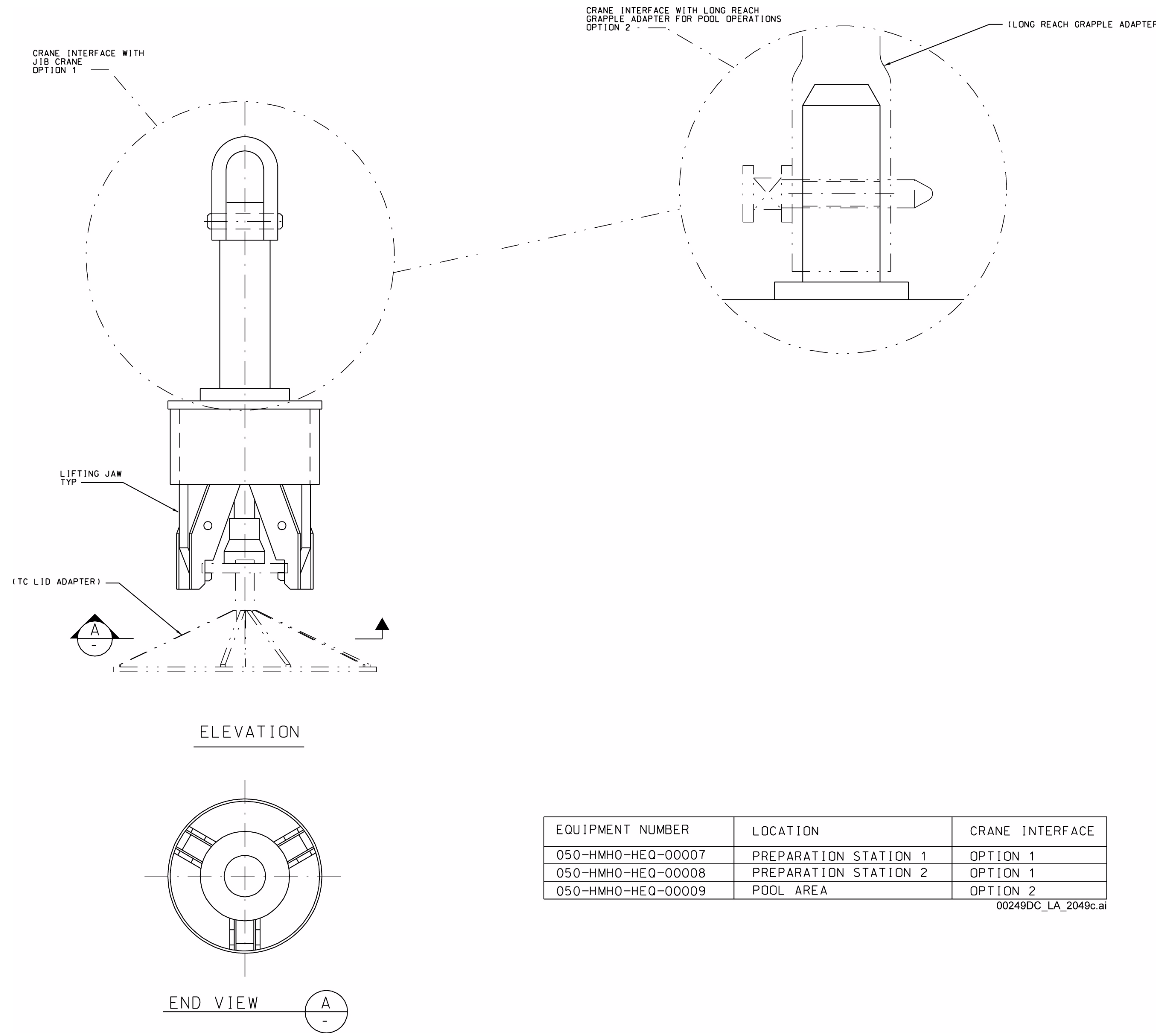

EQUIPMENT NUMBER	LOCATION	CRANE INTERFACE
050-HMH0-HEQ-00007	PREPARATION STATION 1	OPTION 1
050-HMH0-HEQ-00008	PREPARATION STATION 2	OPTION 1
050-HMH0-HEQ-00009	POOL AREA	OPTION 2

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NOTE: TC = truck cask.

Figure 1.2.5-31. Truck Cask Lid-Lifting Grapple Mechanical Equipment Envelope

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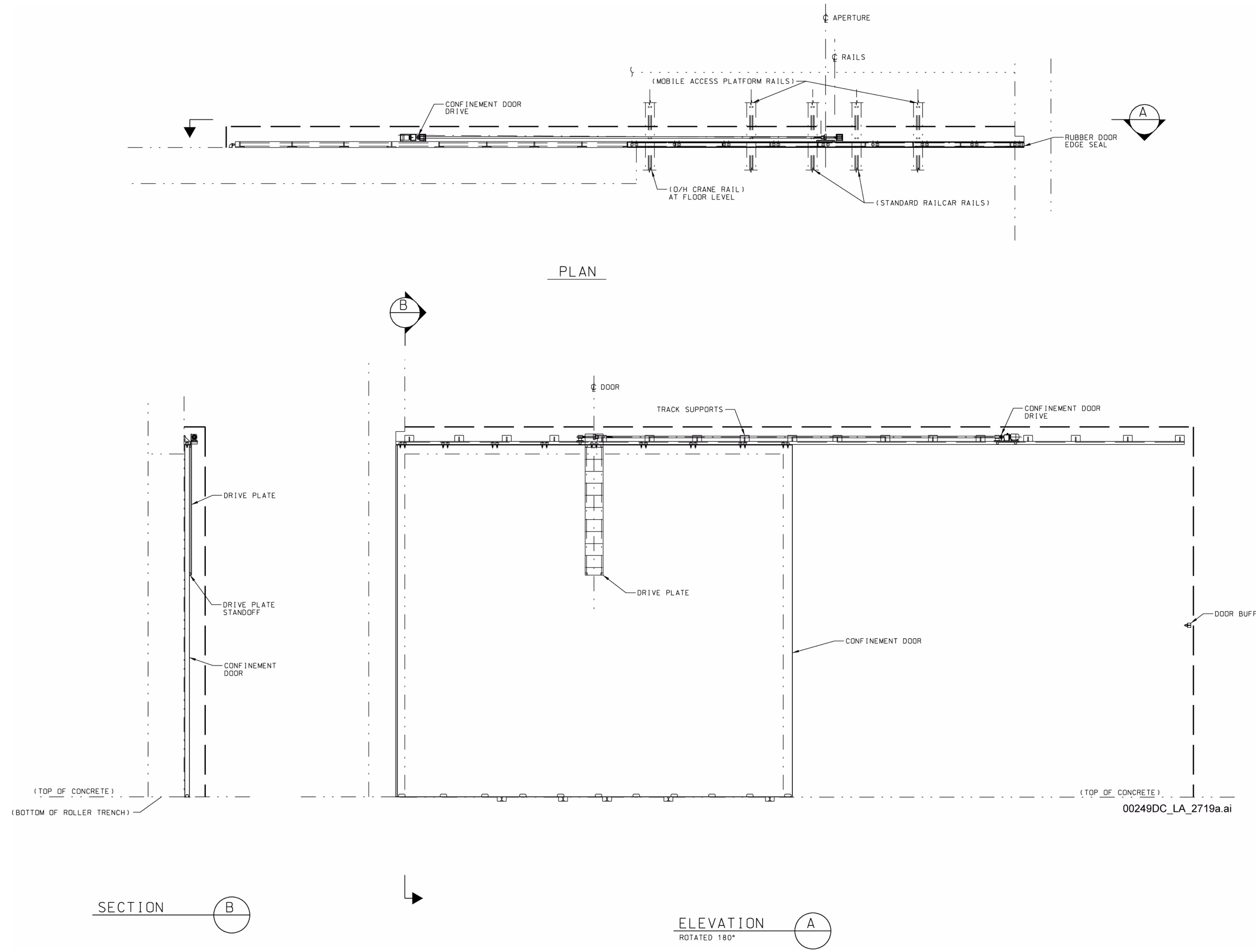

Figure 1.2.5-32. WHF Cask Preparation Area Equipment Confinement Door Mechanical Equipment Envelope

Equipment Number: 050-WH00-DR-00001, cask preparation area equipment confinement door.

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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-56.

Equipment Number: 050-HAC0-PLAT-00001, aging overpack access platform.

Figure 1.2.5-33. Aging Overpack Access 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-57.

Figure 1.2.5-34. Preparation Station 1 and Dual-Purpose Canister Cutting Station Mechanical Equipment Envelope (Sheet 1 of 2)

NOTE: STC = shielded transfer cask; TC = truck cask.

Equipment Number: 050-HD00-PLAT-00001, DPC cutting station; 050-HMH0-PLAT-00001, preparation station 1.

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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-57.

NOTE: STC = shielded transfer cask; TC = truck cask.

Equipment Number: 050-HD00-PLAT-00001, DPC cutting station; 050-HMH0-PLAT-00001, preparation station 1.

Figure 1.2.5-34. Preparation Station 1 and Dual-Purpose Canister Cutting Station Mechanical Equipment Envelope (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-58.

NOTE: This drawing includes the WHF preparation station 1 and the DPC cutting station that have been classified as ITS. While the WHF preparation station 1 and the DPC cutting station are ITS, the electrical and control devices shown herein are non-ITS and non-ITWI.

Equipment Number: 050-HD00-PLAT-00001, DPC cutting station; 050-HMH0-PLAT-00001, preparation station 1.

Figure 1.2.5-35. Preparation Station 1 and Dual-Purpose Canister Cutting Station Process and Instrumentation Diagram (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-58.

Equipment Number: 050-HD00-PLAT-00001, DPC cutting station; 050-HMH0-PLAT-00001, preparation station 1.

Figure 1.2.5-35. Preparation Station 1 and Dual-Purpose Canister Cutting Station Process and Instrumentation Diagram (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-59.

NOTE: STC = shielded transfer cask; TC = truck cask.

Equipment Number: 050-HC00-PLAT-00001, TAD canister closure station; 050-HMH0-PLAT-00002, preparation station 2.

Figure 1.2.5-36. Preparation Station 2 and TAD Canister Closure Station Mechanical Equipment Envelope (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-59.

NOTE: STC = shielded transfer cask.

Equipment Number: 050-HC00-PLAT-00001, TAD canister closure station; 050-HMH0-PLAT-00002, preparation station 2.

Figure 1.2.5-36. Preparation Station 2 and TAD Canister Closure Station Mechanical Equipment Envelope (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-60.

NOTE: While the WHF preparation station 2 and the TAD canister closure station are ITS, the instrumentation, electrical, and control devices shown herein are non-ITS and non-ITWI.

Equipment Number: 050-HC00-PLAT-00001, TAD canister closure station; 050-HMH0-PLAT-00002, preparation station 2.

Figure 1.2.5-37. Preparation Station 2 and TAD Canister Closure Station Process and Instrumentation Diagram (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-60.

NOTE: STC = shielded transfer cask.

Equipment Number: 050-HC00-PLAT-00001, TAD canister closure station; 050-HMH0-PLAT-00002, preparation station 2.

Figure 1.2.5-37. Preparation Station 2 and TAD Canister Closure Station Process and Instrumentation Diagram (Sheet 2 of 2)

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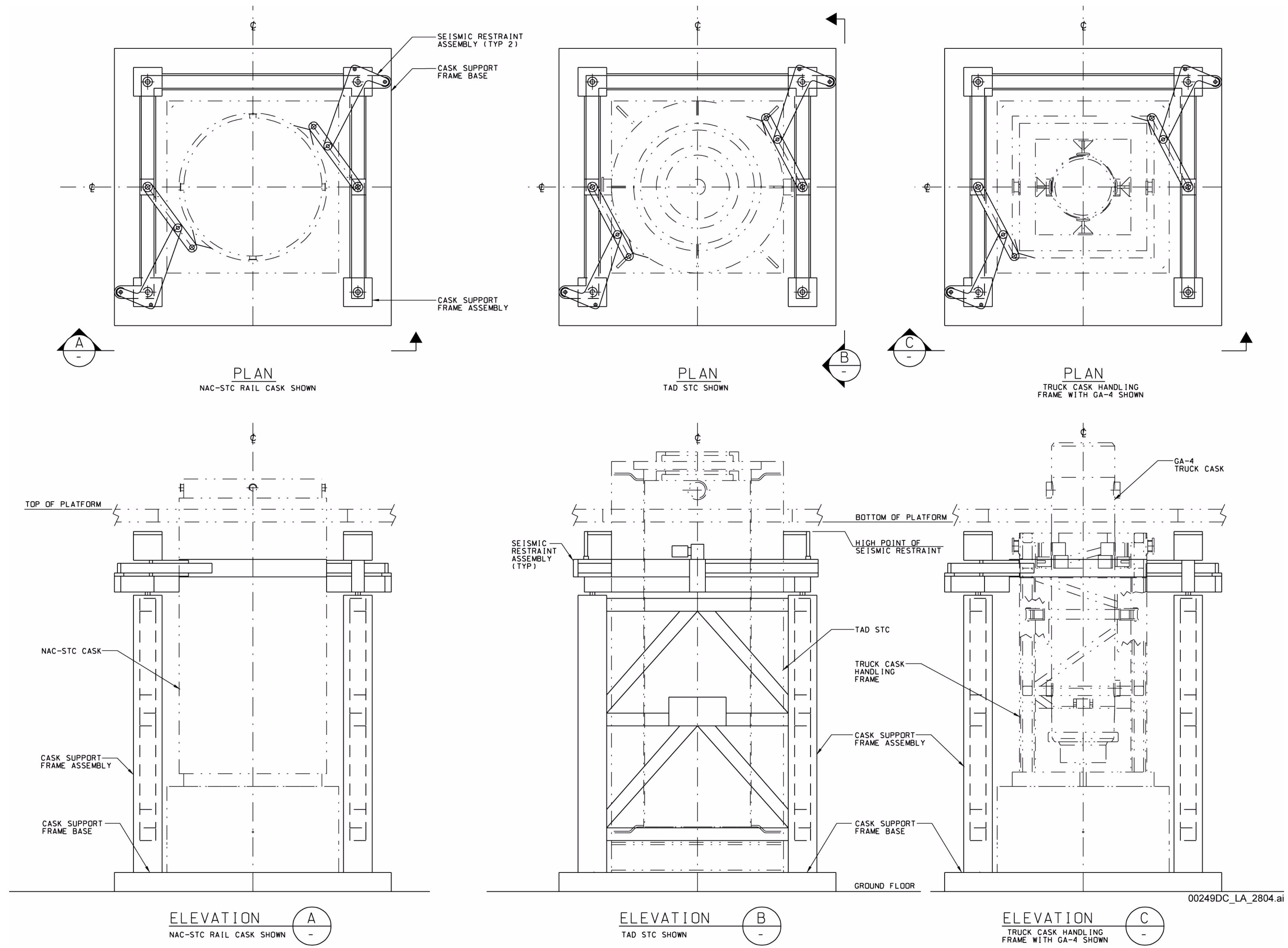

Equipment Number: 050-HC00-FRM-00001, cask support frame, TAD canister closure station; 050-HD00-FRM-00001, cask support frame, DPC cutting station; 050-HMH0-FRM-00001, cask support frame, preparation station 2.

Figure 1.2.5-38. Cask Support Frame Mechanical Equipment Envelope

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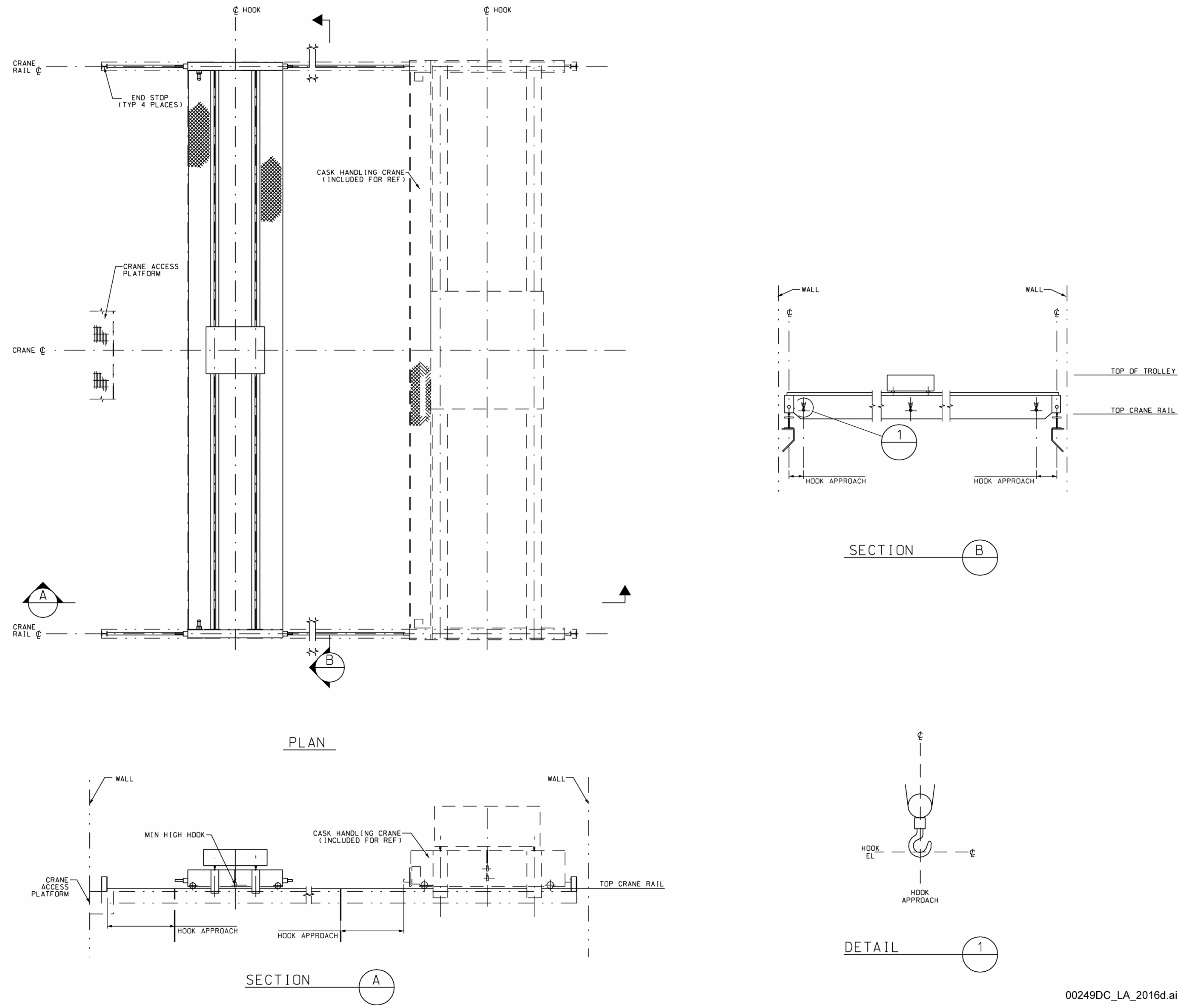

Equipment Number: 050-HMH0-CRN-00001, auxiliary pool crane.

Figure 1.2.5-39. Auxiliary Pool Crane Mechanical Equipment Envelope

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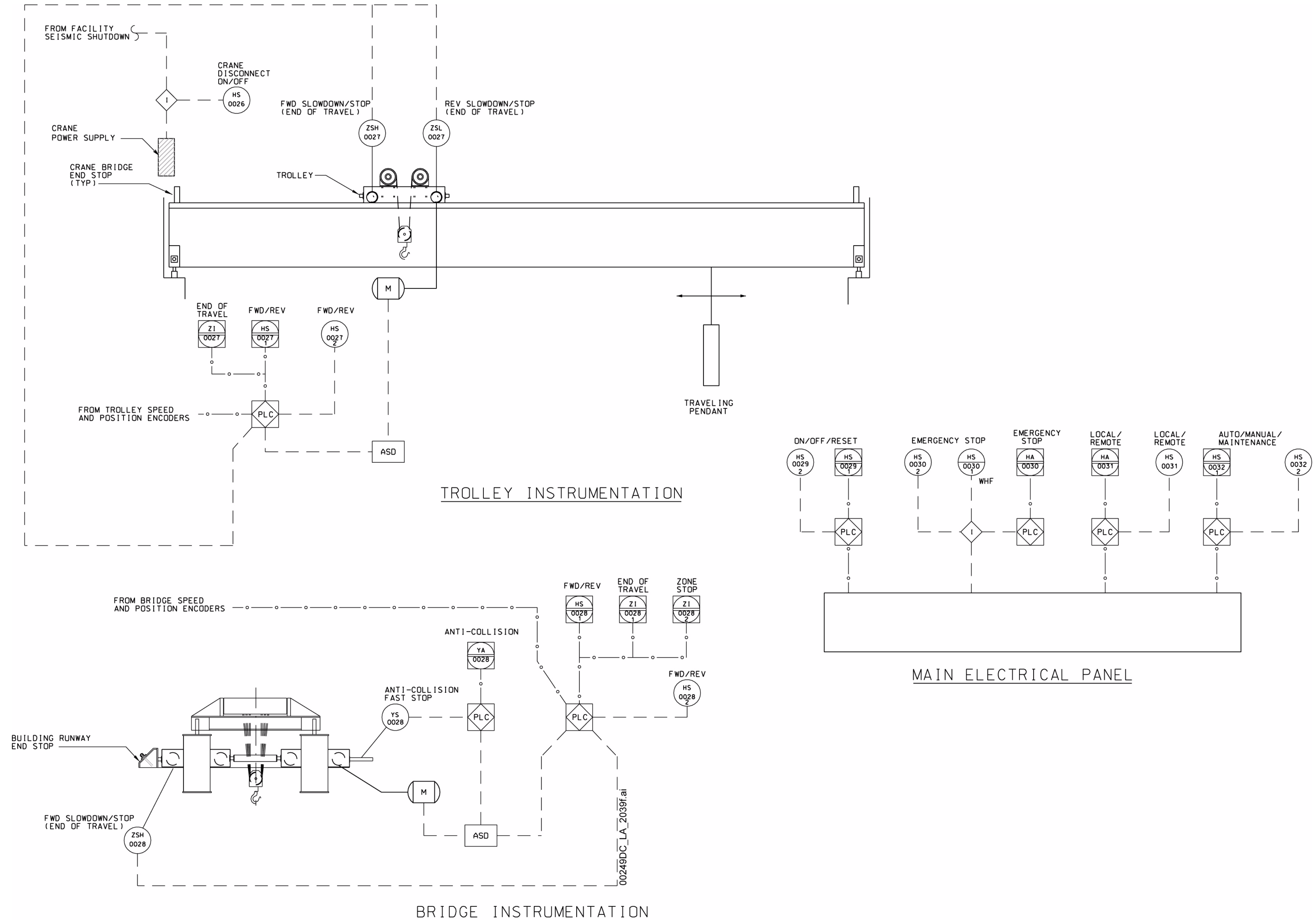

NOTE: Automation controls for the auxiliary pool crane cause the bridge to ramp down to zero speed at a designated zone point.

Equipment Number: 050-HMH0-CRN-00001, auxiliary pool crane.

Figure 1.2.5-40. Auxiliary Pool Crane Process and Instrumentation Diagram (Sheet 1 of 3)

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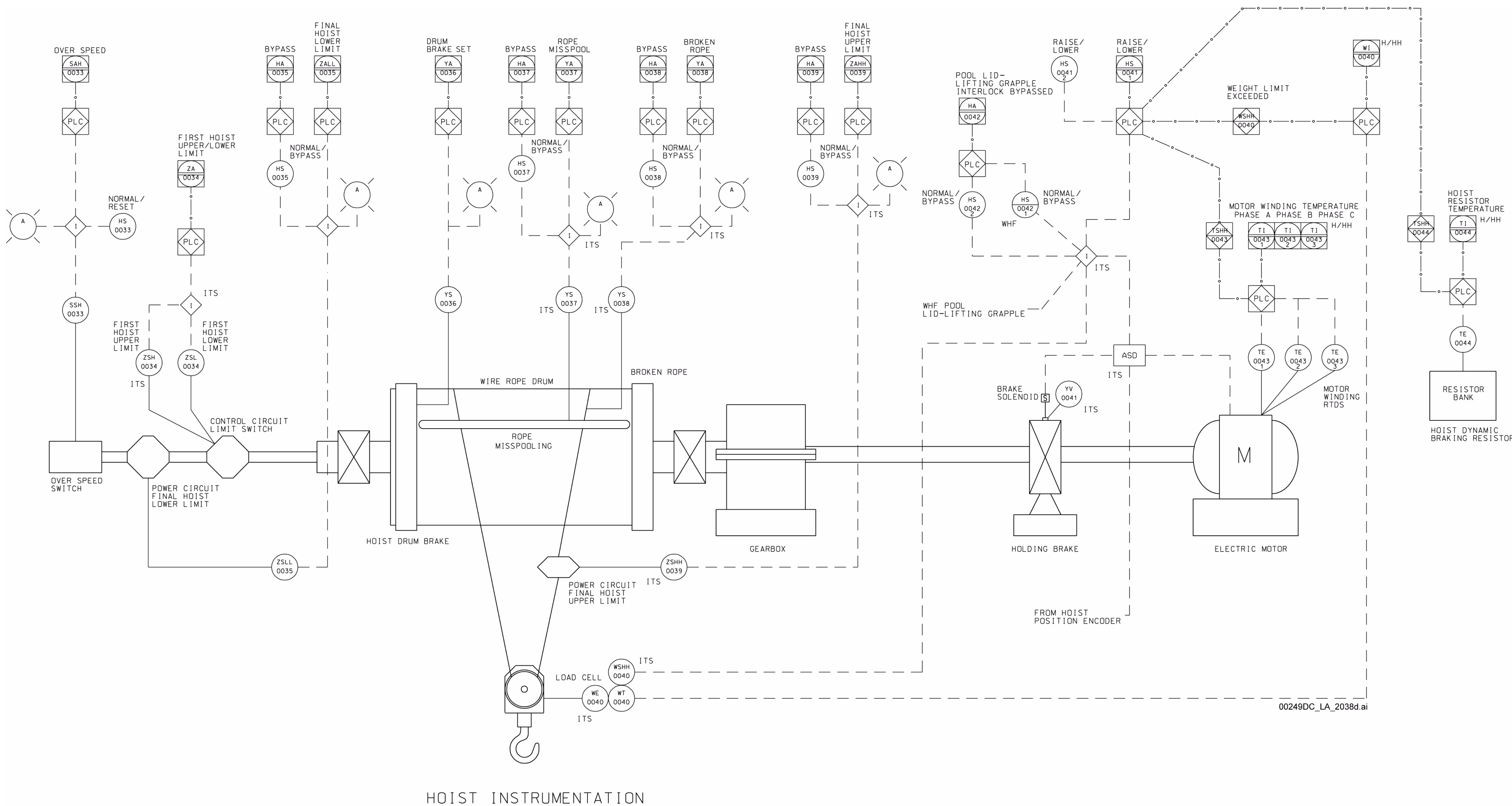

Equipment Number: 050-HMH0-CRN-00001, auxiliary pool crane.

Figure 1.2.5-40. Auxiliary Pool Crane Process and Instrumentation Diagram (Sheet 2 of 3)

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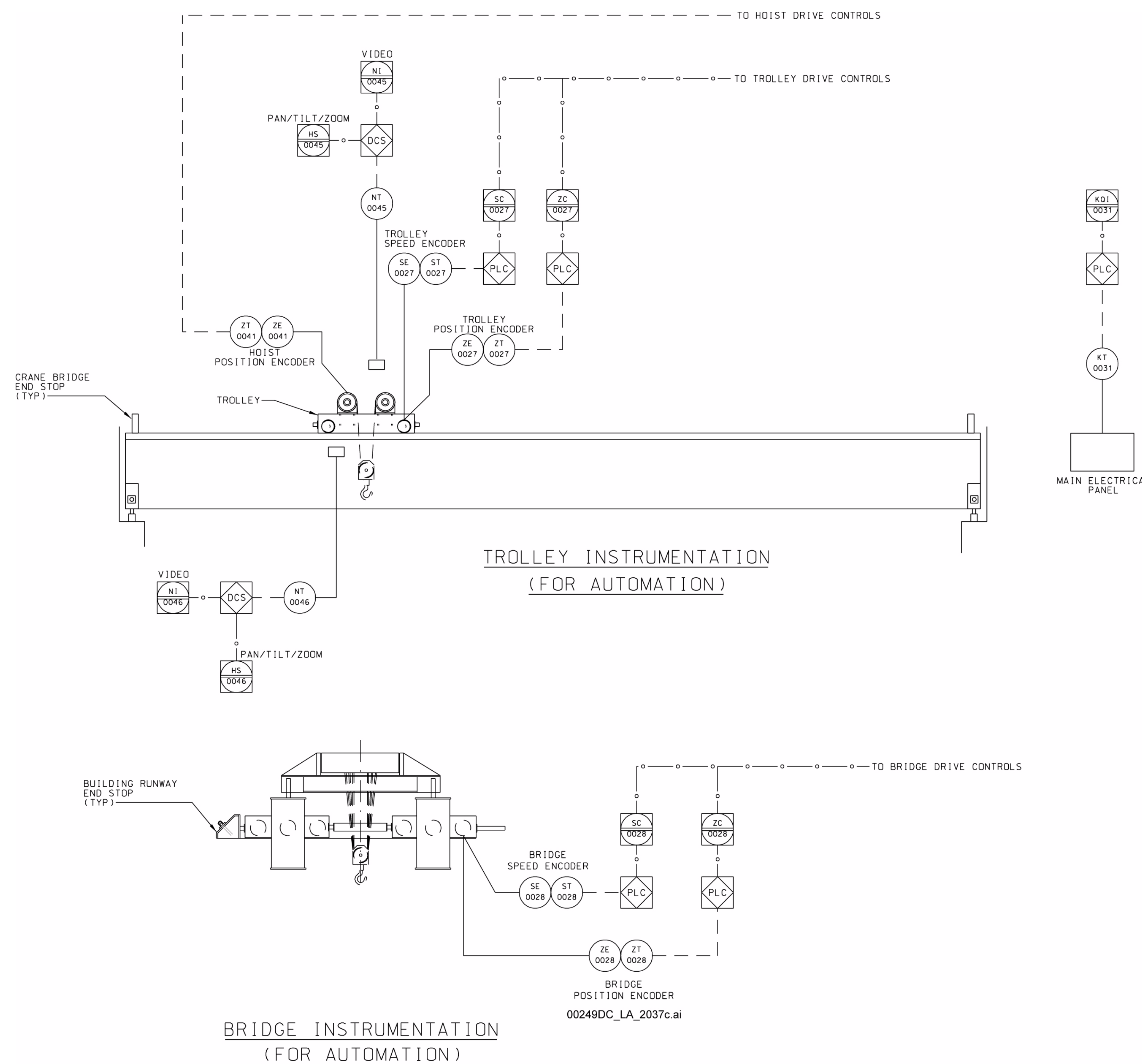

Equipment Number: 050-HMH0-CRN-00001, auxiliary pool crane.

Figure 1.2.5-40. Auxiliary Pool Crane Process and Instrumentation Diagram (Sheet 3 of 3)

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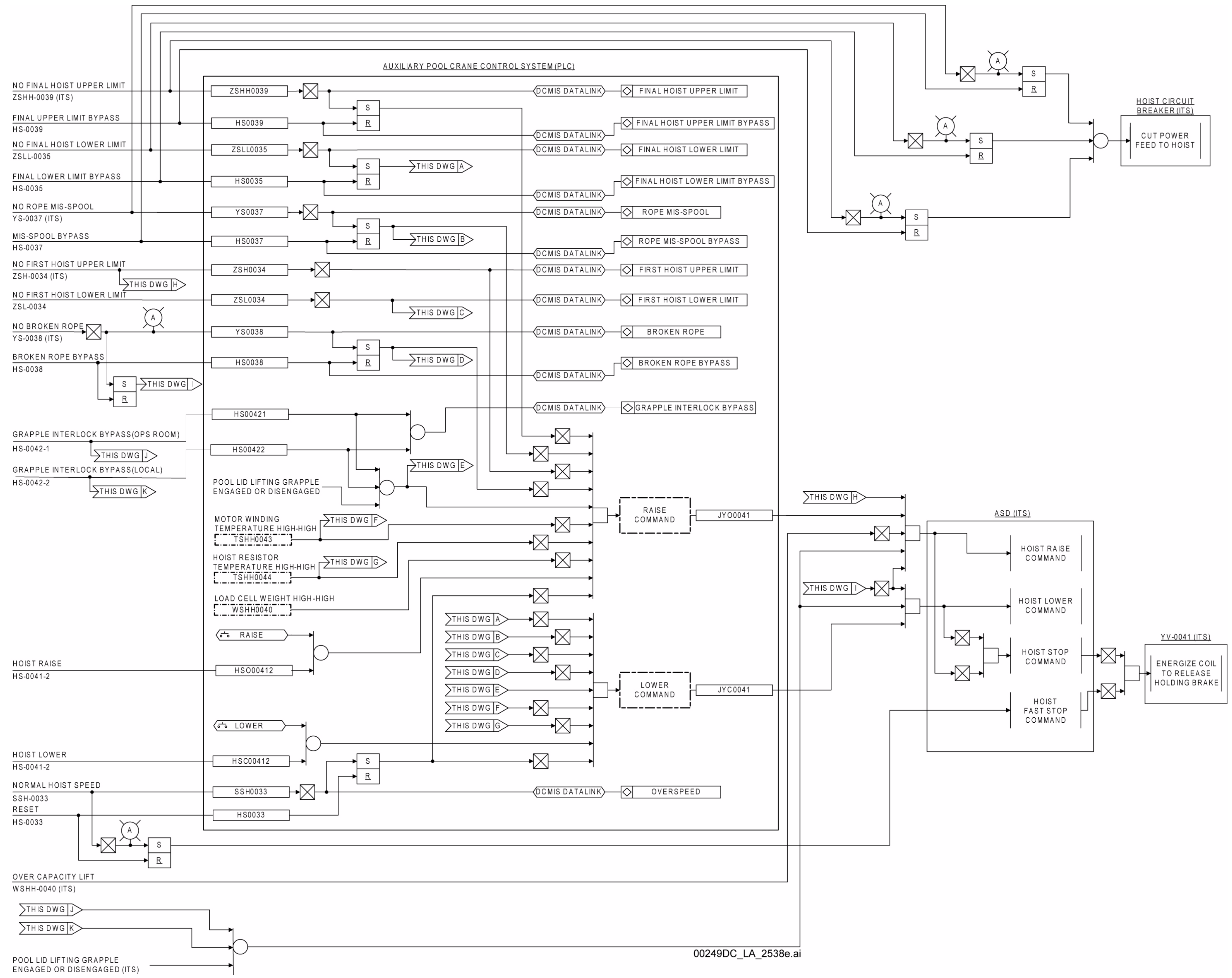

NOTE: ITS controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The auxiliary pool crane control system, which controls the hoist, is non-ITS and non-ITWI. Simultaneous DCMIS and local control is prevented by means of a "local/remote" selector switch associated with the auxiliary pool crane controls. Instrumentation tag numbers are prefixed by "050-HMH0-," and software tag numbers are prefixed by "050HMH0." ASD = adjustable speed drive; PLC = programmable logic controller.

Equipment Number: 50-HMH0-CRN-00001, auxiliary pool crane.

Figure 1.2.5-41. Logic Diagram for the Auxiliary Pool Crane Hoist

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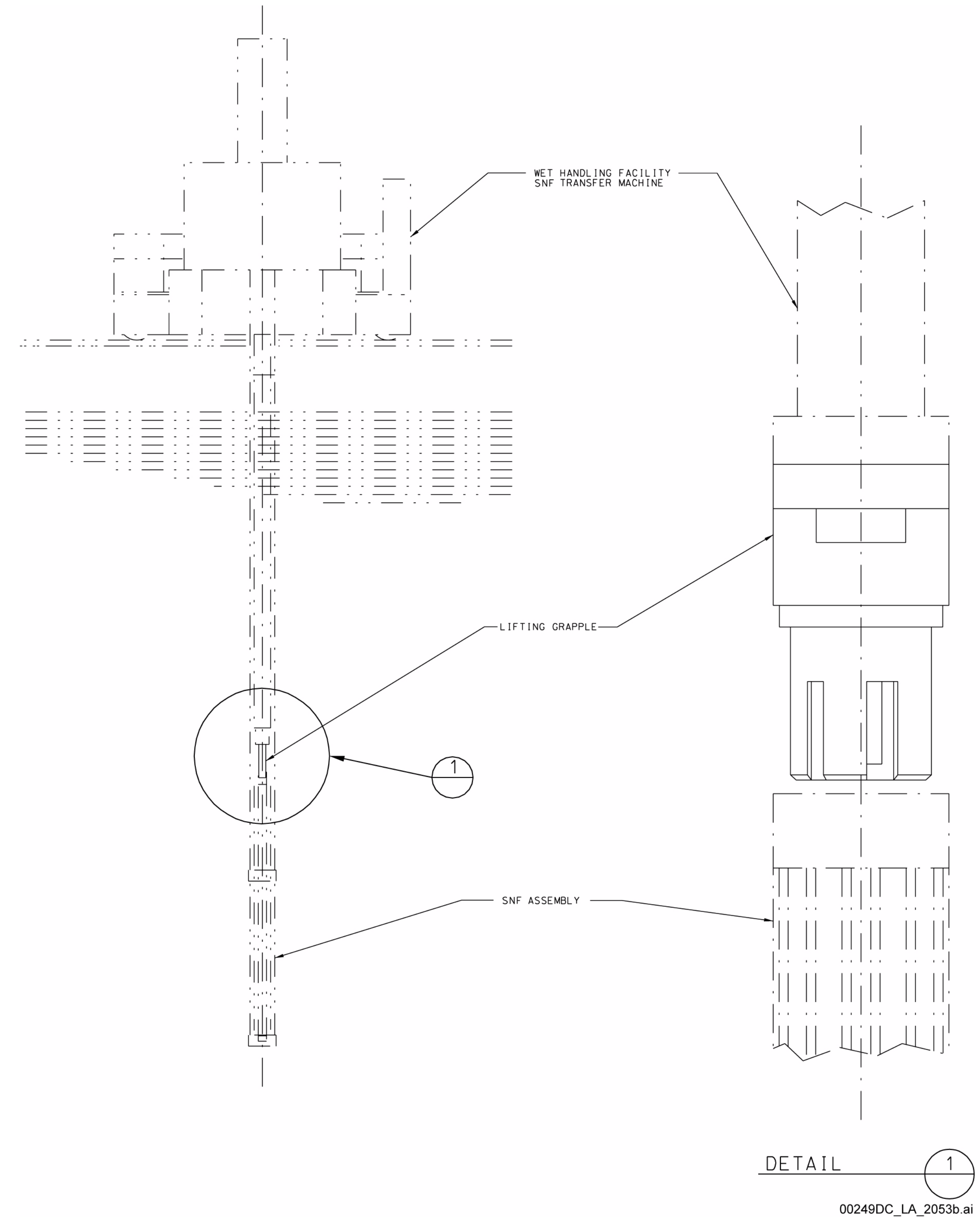

Figure 1.2.5-42. Pressurized Water Reactor and Boiling Water Reactor Lifting Grapple Mechanical Equipment Envelope

Equipment Number: 050-HTF0-HEQ-00001, PWR lifting grapple 1; 050-HTF0-HEQ-00002, BWR lifting grapple 2.

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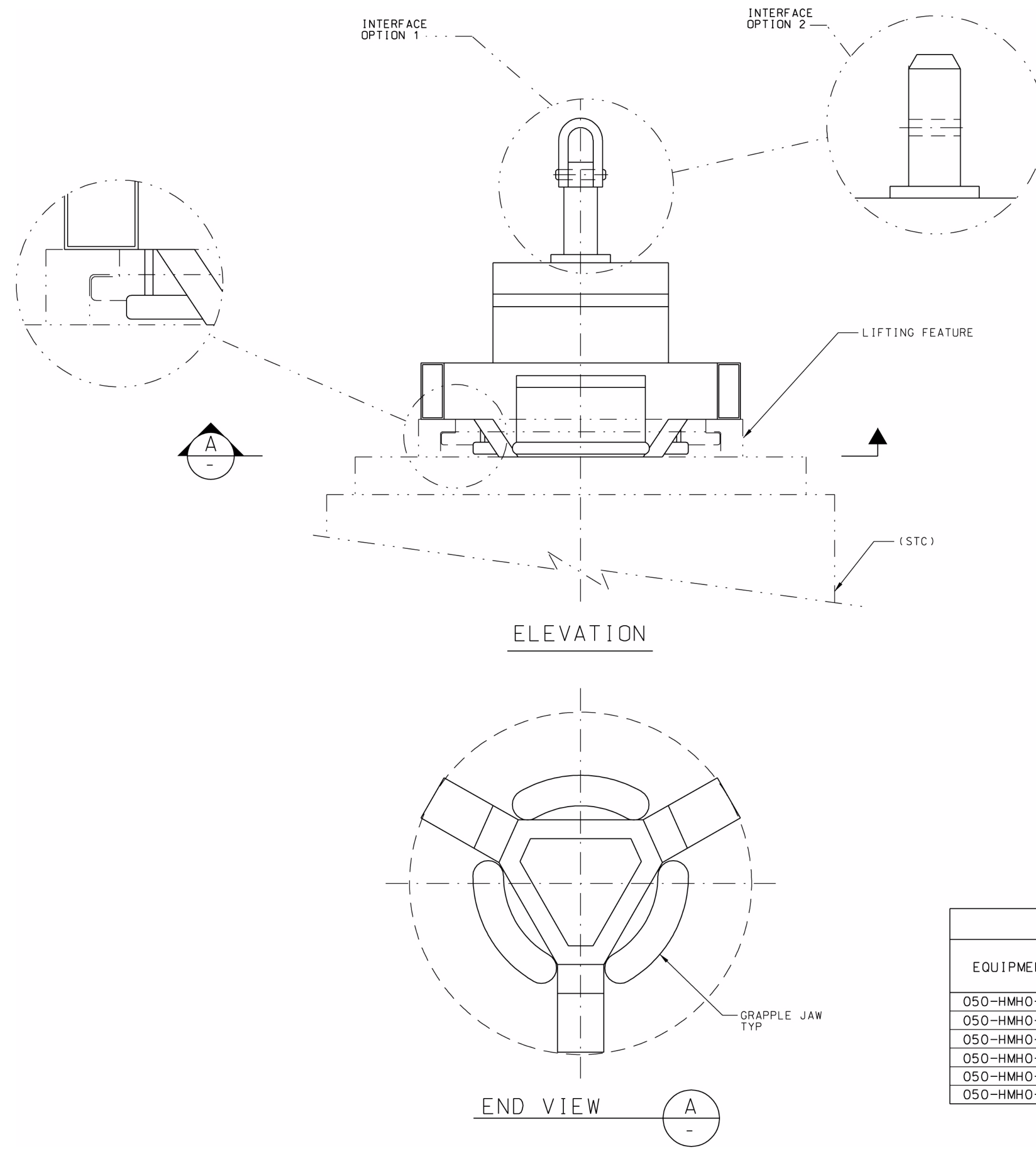

EQUIPMENT LOCATION AND CRANE INTERFACE TABLE			
EQUIPMENT NUMBER	LOCATION	INTERFACE	SAFETY CLASSIFICATION
050-HMH0-HEQ-00001	DPC CUTTING STATION	DIRECT	ITS
050-HMH0-HEQ-00002	PREPARATION STATION 1	DIRECT	ITS
050-HMH0-HEQ-00003	PREPARATION STATION 2	DIRECT	ITS
050-HMH0-HEQ-00004	TAD CLOSURE STATION	DIRECT	ITS
050-HMH0-HEQ-00005	TRANSFER ROOM	DIRECT	NON-ITS
050-HMH0-HEQ-00006	POOL AREA	LONG REACH	ITS

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NOTE: STC = shielded transfer cask.

Figure 1.2.5-43. Pool Lid-Lifting Grapple Mechanical Equipment Envelope

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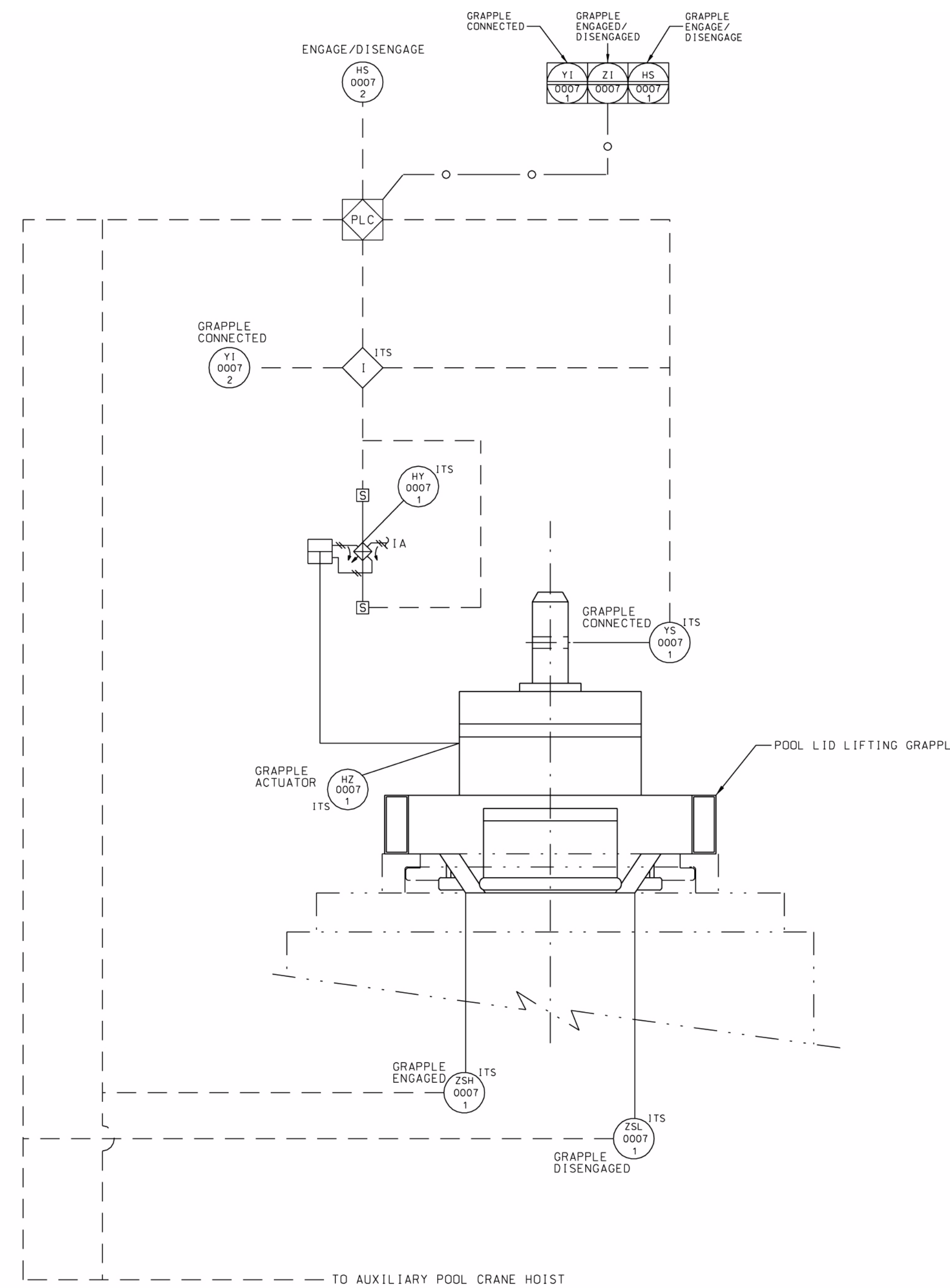

EQUIPMENT AND INSTRUMENTATION TABLE

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	ASSOCIATED CRANE		DCMIS HANDSWITCH	DCMIS INDICATORS		LOCAL HANDSWITCH	LOCAL CONNECTED INDICATOR	ACTUATOR	ACTUATOR SOLENOID	STATUS SWITCHES		
		EQUIPMENT NUMBER	DESCRIPTION		GRAPPLE CONNECTED	ENGAGED/DISENGAGED					CONNECTED	ENGAGED	DISENGAGED
050-HMHO-HEQ-00006	POOL LID LIFTING GRAPPLE	050-HMHO-CRN-00001	AUXIIARY POOL CRANE	HS-0007-1	YI-0007-1	ZI-0007	HS-0007-2	YI-0007-2	HZ-0007-1 (ITS)	HY-0007-1 (ITS)	YS-0007-1 (ITS)	ZSH-0007-1 (ITS)	ZSL-0007-1 (ITS)
050-HMHO-HEQ-00009	POOL TRUCK CASK LID LIFTING GRAPPLE								HZ-0007-2 (ITS)	HY-0007-2 (ITS)	YS-0007-2 (ITS)	ZSH-0007-2 (ITS)	ZSL-0007-2 (ITS)

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Figure 1.2.5-44. Pool Lid-Lifting Grapple Process and Instrumentation Diagram

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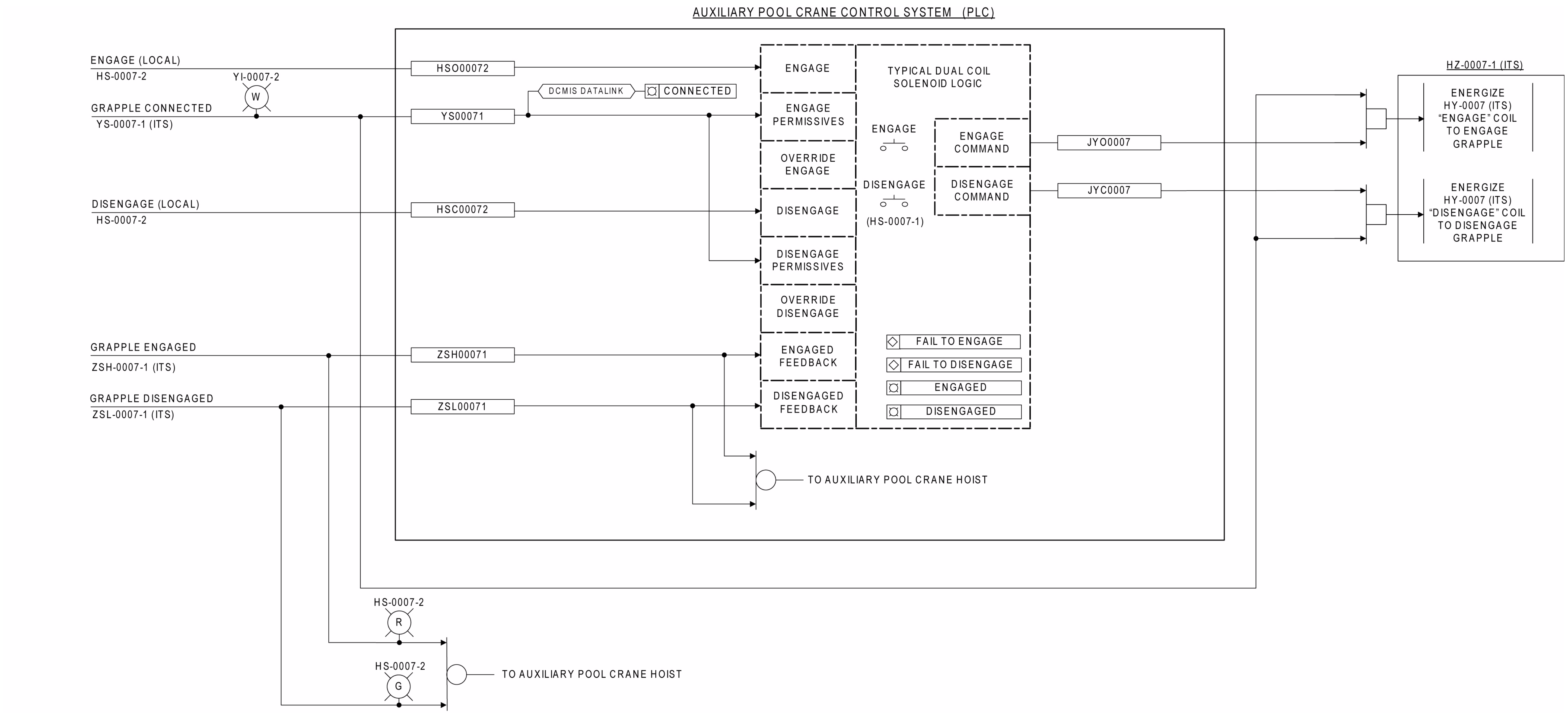

DESCRIPTION	GRAPPLE EQUIPMENT NUMBER	ASSOCIATED CRANE		REMOTE HANDSWITCH	LOCAL HANDSWITCH	LOCAL CONNECTED INDICATOR	MOTOR ACTUATOR	ACTUATOR SOLENOID	GRAPPLE STATUS SWITCHES			LOGIC INPUT ENGAGE	LOGIC INPUT DISENGAGE	LOGIC OUTPUT ENGAGE	LOGIC OUTPUT DISENGAGE
		EQUIPMENT NUMBER	DESCRIPTION						ENGAGED	DISENGAGED	CONNECTED				
POOL LID LIFTING GRAPPLE	050-HMH0-HEQ-00006	050-HMH0-CRN-00001	AUXILIARY POOL CRANE	HS-0007-1	HS-0007-2	YI-0007-2	HZ-0007-1 (ITS)	HY-0007-1 (ITS)	ZSH-0007-1 (ITS)	ZSL-0007-1(ITS)	YS-0007-1 (ITS)	HSO00072	HSC00072	JYO0007	JYC0007
POOL TRUCK CASK LID LIFTING GRAPPLE	050-HMH0-HEQ-00009						HZ-0007-2 (ITS)	HY-0007-2 (ITS)	ZSH-0007-2 (ITS)	ZSL-0007-2 (ITS)	YS-0007-2 (ITS)				

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NOTE: ITS controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The auxiliary pool crane control system, which controls the pool lid lifting grapple, is non-ITS and non-ITWI. Simultaneous DCMIS and local control is prevented by means of a "local/remote" selector switch associated with the auxiliary pool crane. Instrumentation tag numbers are prefixed by "050-HMH0-" and software tag numbers are prefixed by "050HMH0."
PLC = programmable logic controller.

Figure 1.2.5-45. Auxiliary Pool Crane Pool Lid-Lifting Grapple Logic Diagram

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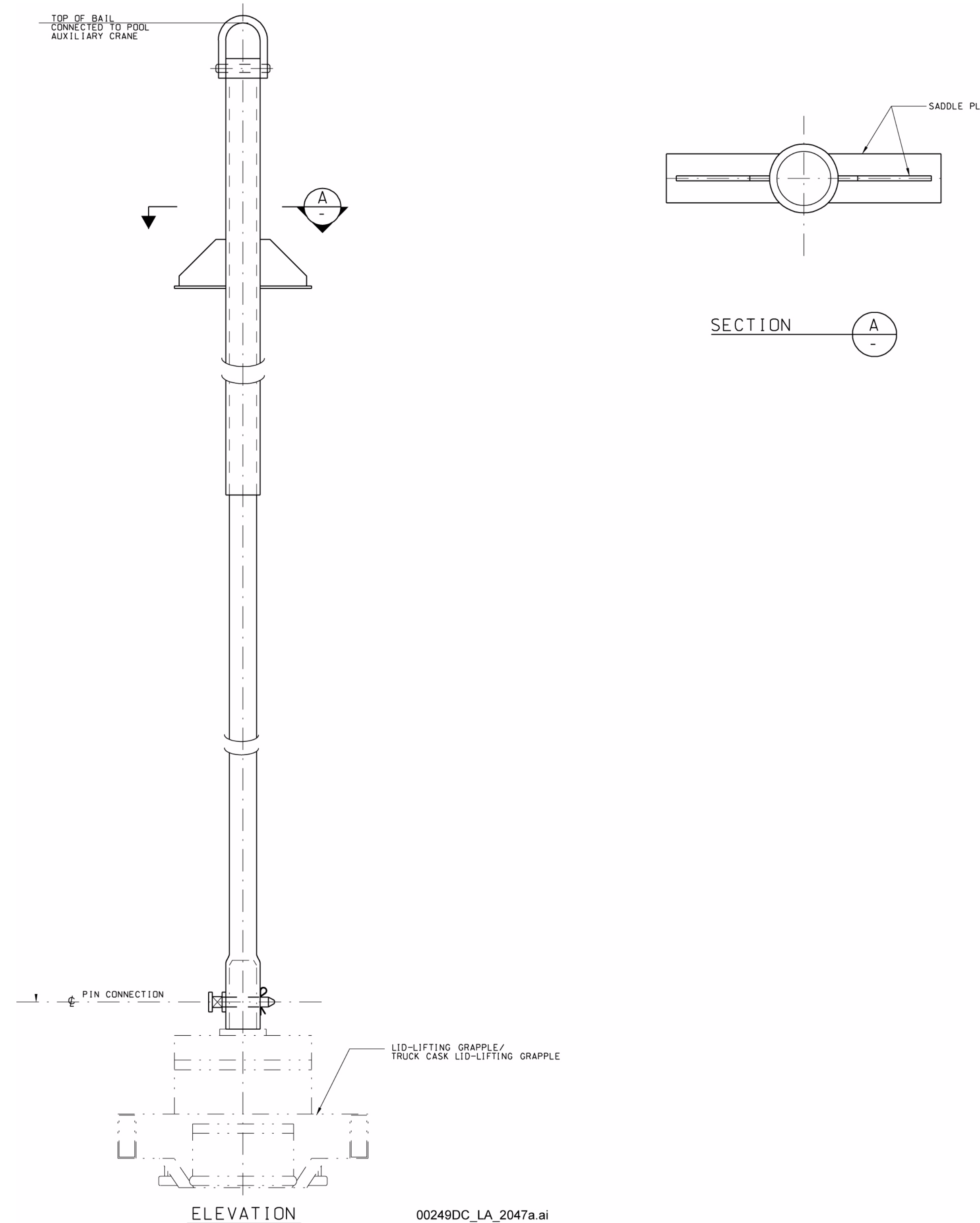

NOTE: The WHF pool will incorporate long-reach grapple adapters, one dedicated to the lid-lifting grapple and the other to the truck cask lid-lifting grapple.

Equipment Number: 050-HMH0-TOOL-00001/00002, long-reach grapple adapter.

Figure 1.2.5-46. Long-Reach Grapple Adapter Mechanical Equipment Envelope

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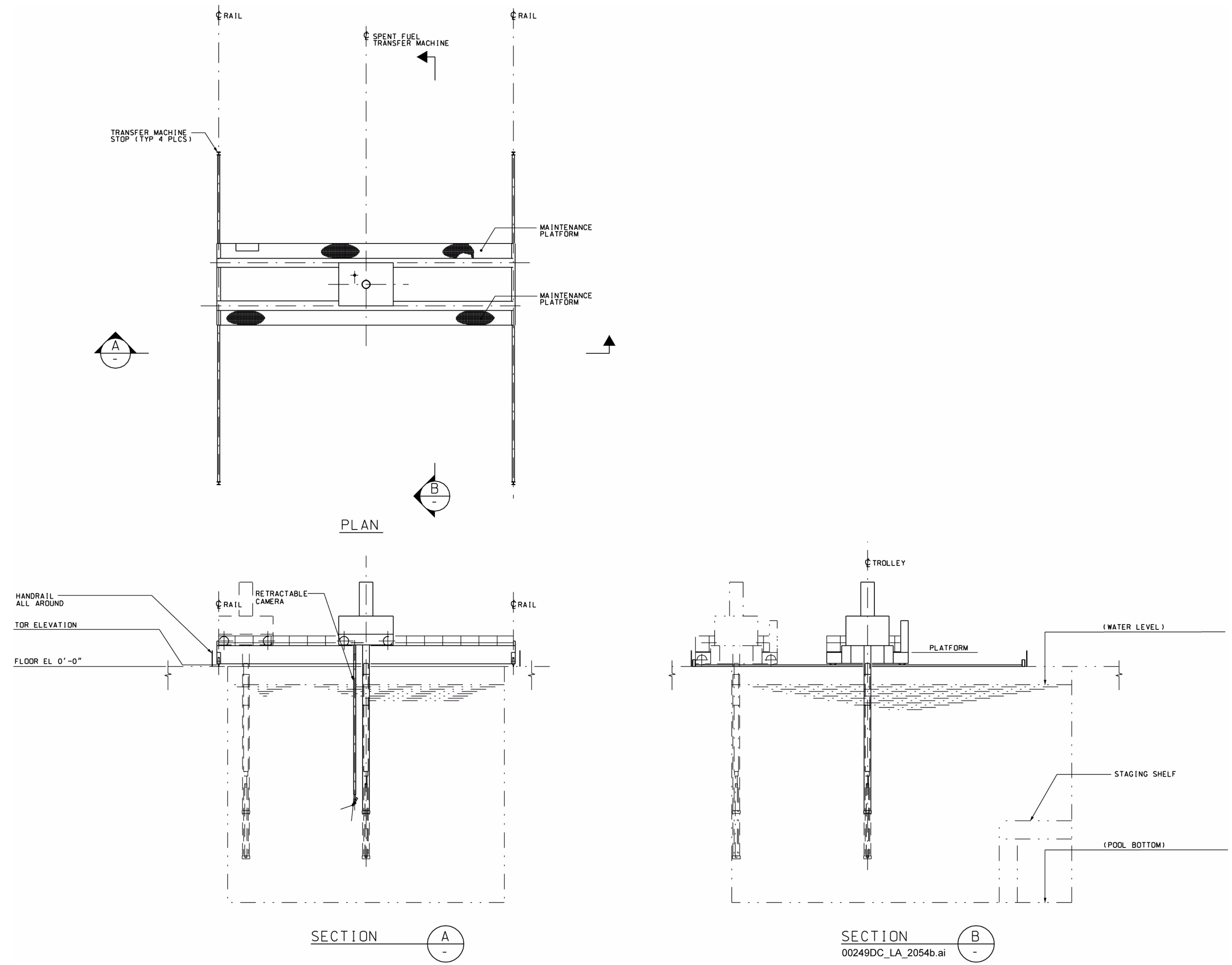

Equipment Number: 050-HTF0-FHM-00001, spent fuel transfer machine.

Figure 1.2.5-47. Spent Fuel Transfer Machine Mechanical Equipment Envelope

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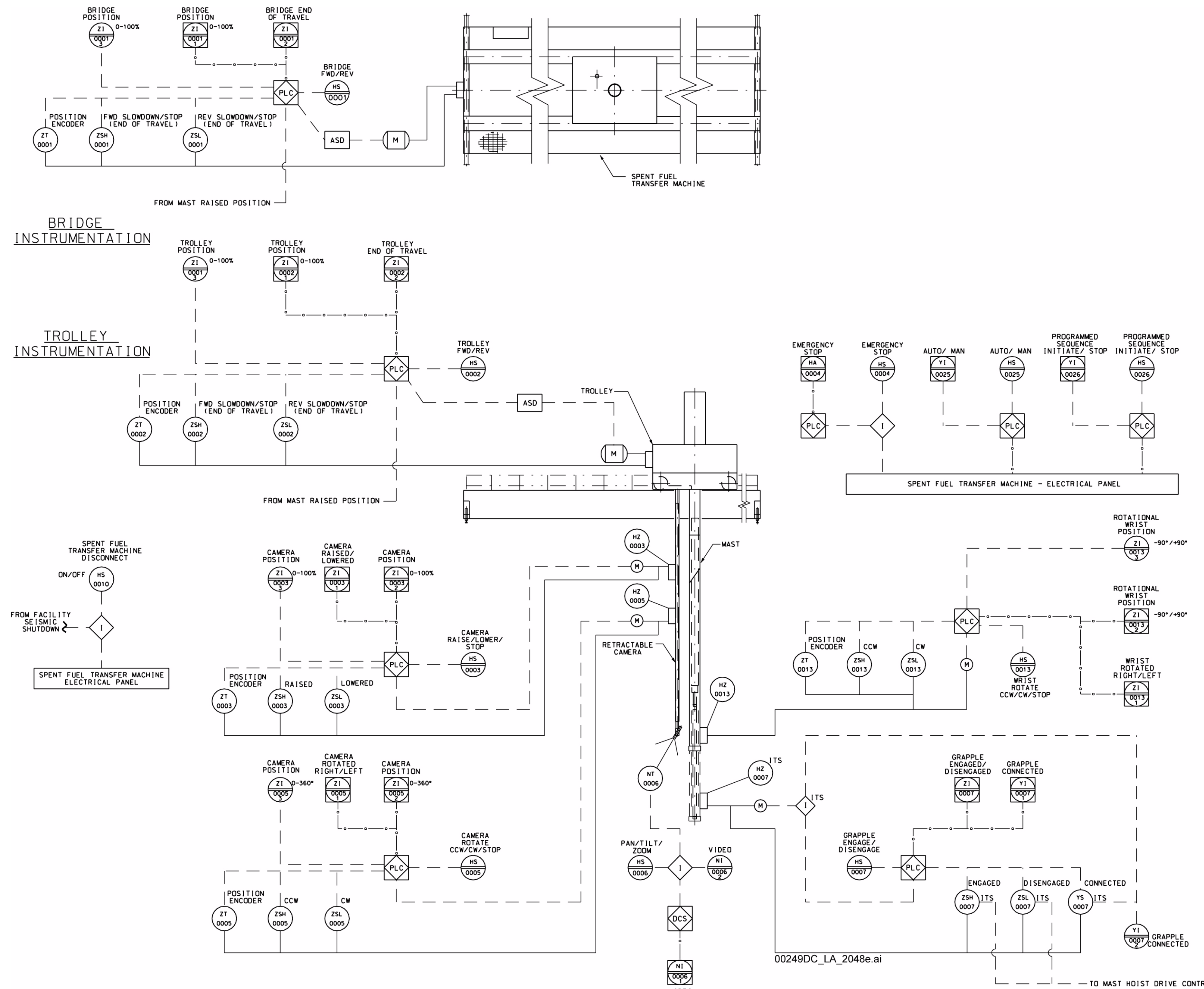

NOTE: CCW = counterclockwise; CW = clockwise.

Equipment Number: 050-HTF0-FHM-00001, spent fuel transfer machine.

Figure 1.2.5-48. Spent Fuel Transfer Machine Process and Instrumentation Diagram (Sheet 1 of 2)

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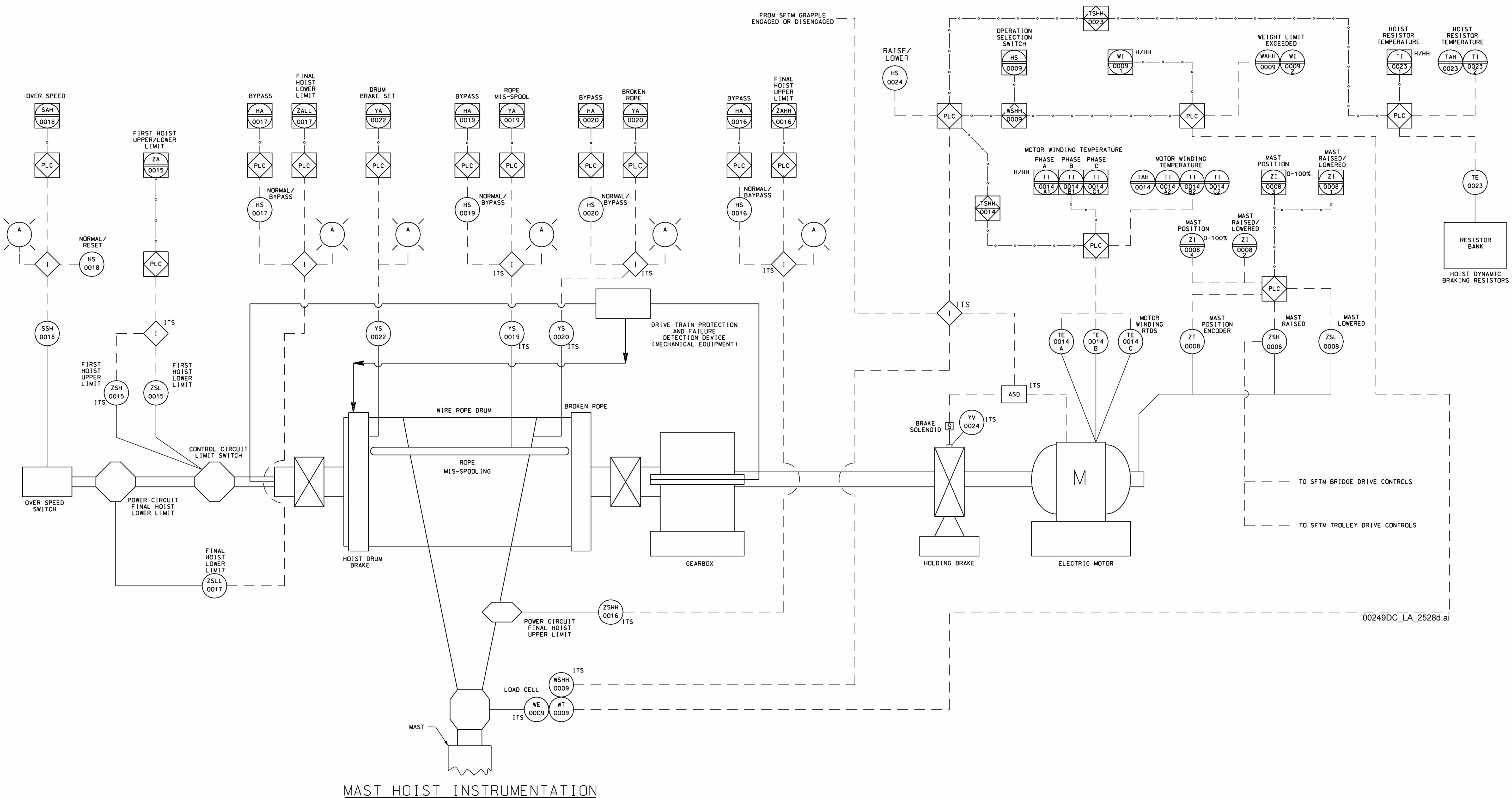

Figure 1.2.5-48. Spent Fuel Transfer Machine Process and Instrumentation Diagram (Sheet 2 of 2)

NOTE: RTDS = resistance temperature detectors; SFTM = spent fuel transfer machine.

Equipment Number: 050-HTF0-FHM-00001, spent fuel transfer machine.

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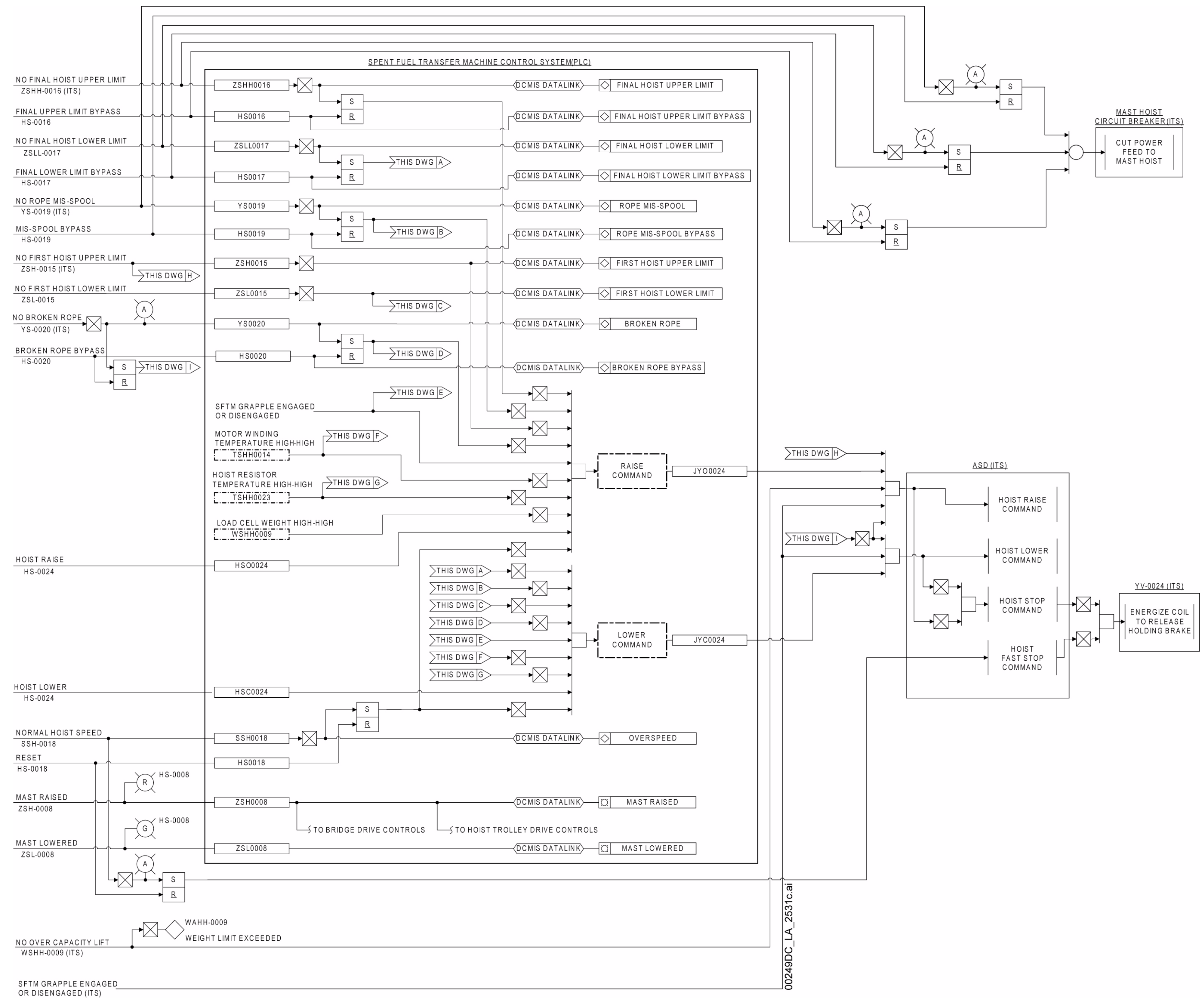

NOTE: ITS controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The spent fuel transfer machine control system, which controls the mast hoist, is non-ITS and non-ITWI. Instrumentation tag numbers are prefixed by "050-HTF0-" and software tag numbers are prefixed by "050HTF0." ASD = adjustable speed drive; ASD = adjustable speed drive; PLC = programmable logic controller; SFTM = spent fuel transfer machine.

Equipment Number: 050-HTF0-FHM-00001, spent fuel transfer machine.

Figure 1.2.5-49. Spent Fuel Transfer Machine Mast Hoist Logic Diagram

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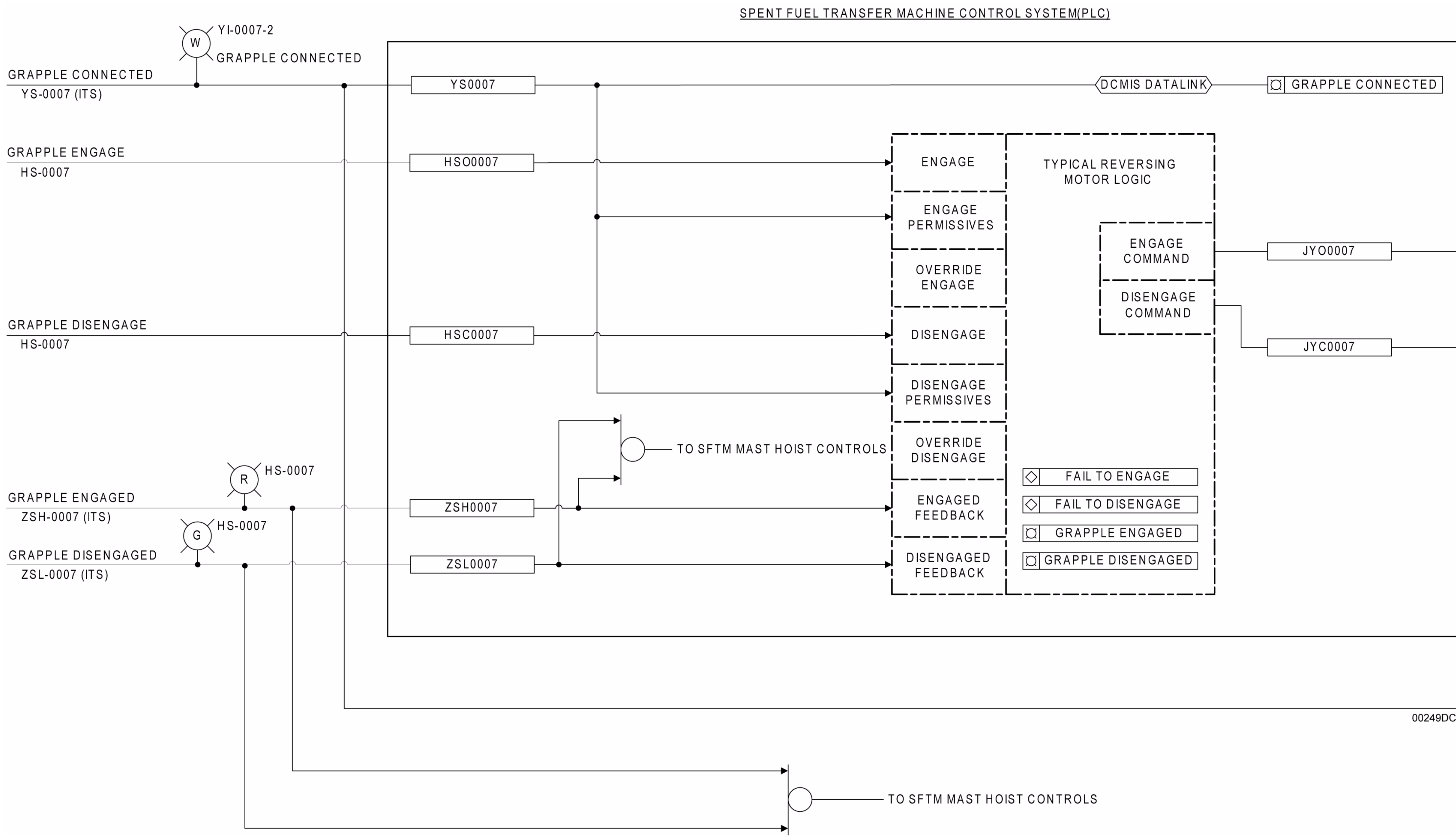

NOTE: ITS controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. The spent fuel transfer machine control system, which controls the grapple, is non-ITS and non-ITWI. Instrumentation tag numbers are prefixed by "050-HTF0-," and software tag numbers are prefixed by "050HTF0." PLC = programmable logic controller; SFTM = spent fuel transfer machine.

Equipment Number: 050-HTF0-FHM-00001, spent fuel transfer machine.

Figure 1.2.5-50. Logic Diagram for the Spent Fuel Transfer Machine Grapple

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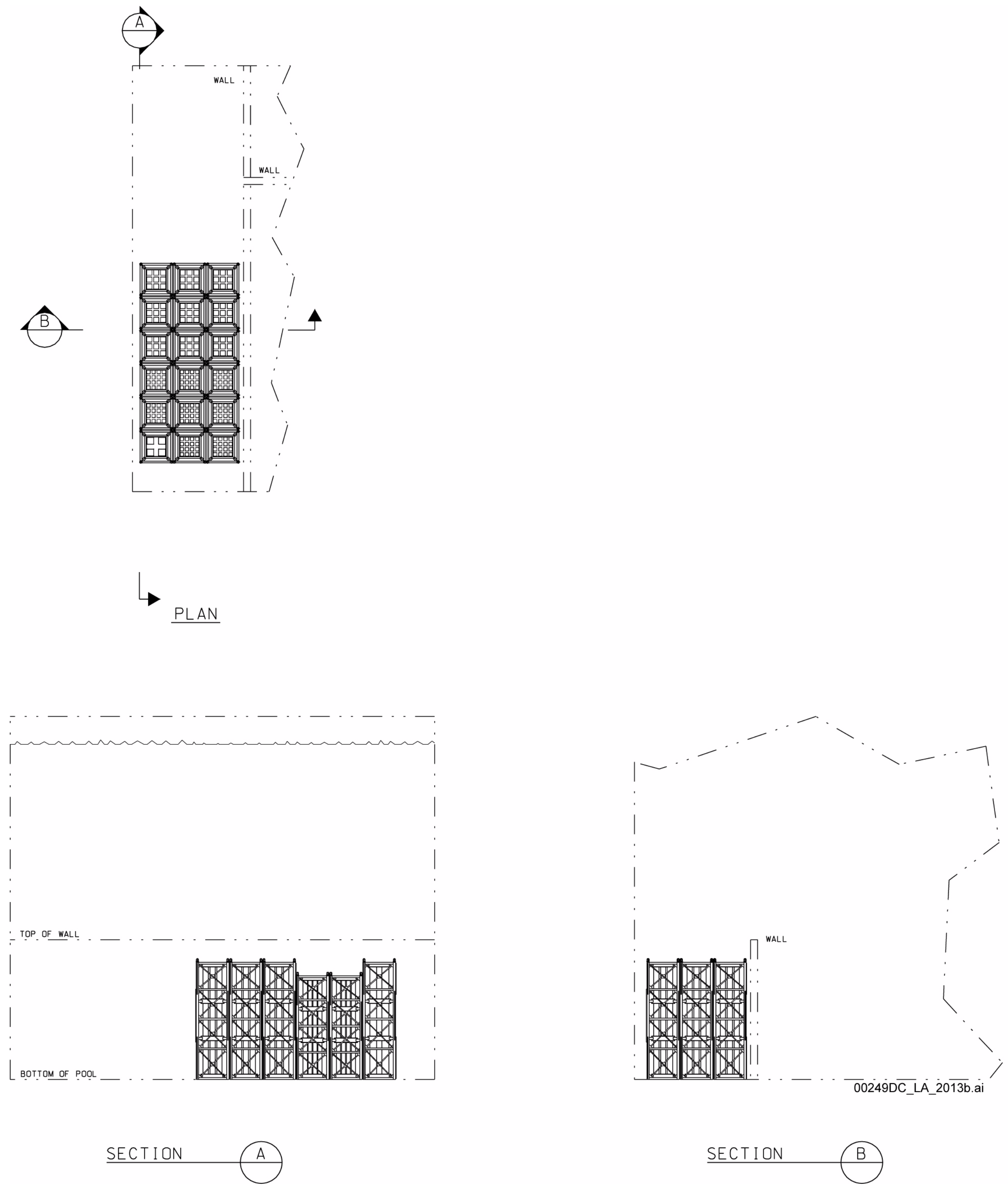

Equipment Number: 050-HTF0-RK-00001/00010/00011, SNF staging racks PWR/BWR/damaged-fuel canister assembly.

Figure 1.2.5-51. SNF Staging Racks Mechanical Equipment Envelope (Sheet 1 of 3)

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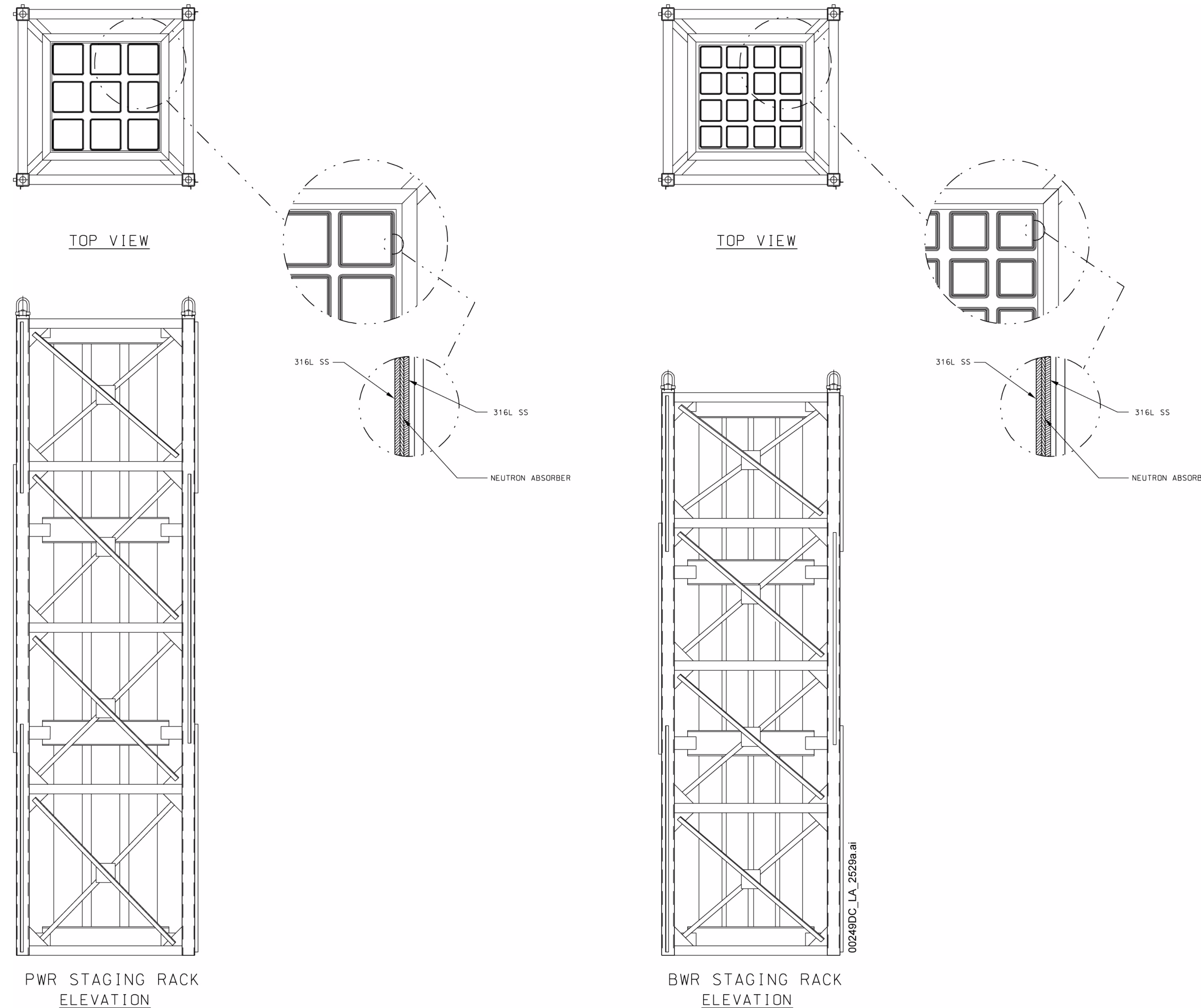

Equipment Number: 050-HTF0-RK-00001/00010, SNF staging racks PWR/BWR.

Figure 1.2.5-51. SNF Staging Racks Mechanical Equipment Envelope (Sheet 2 of 3)

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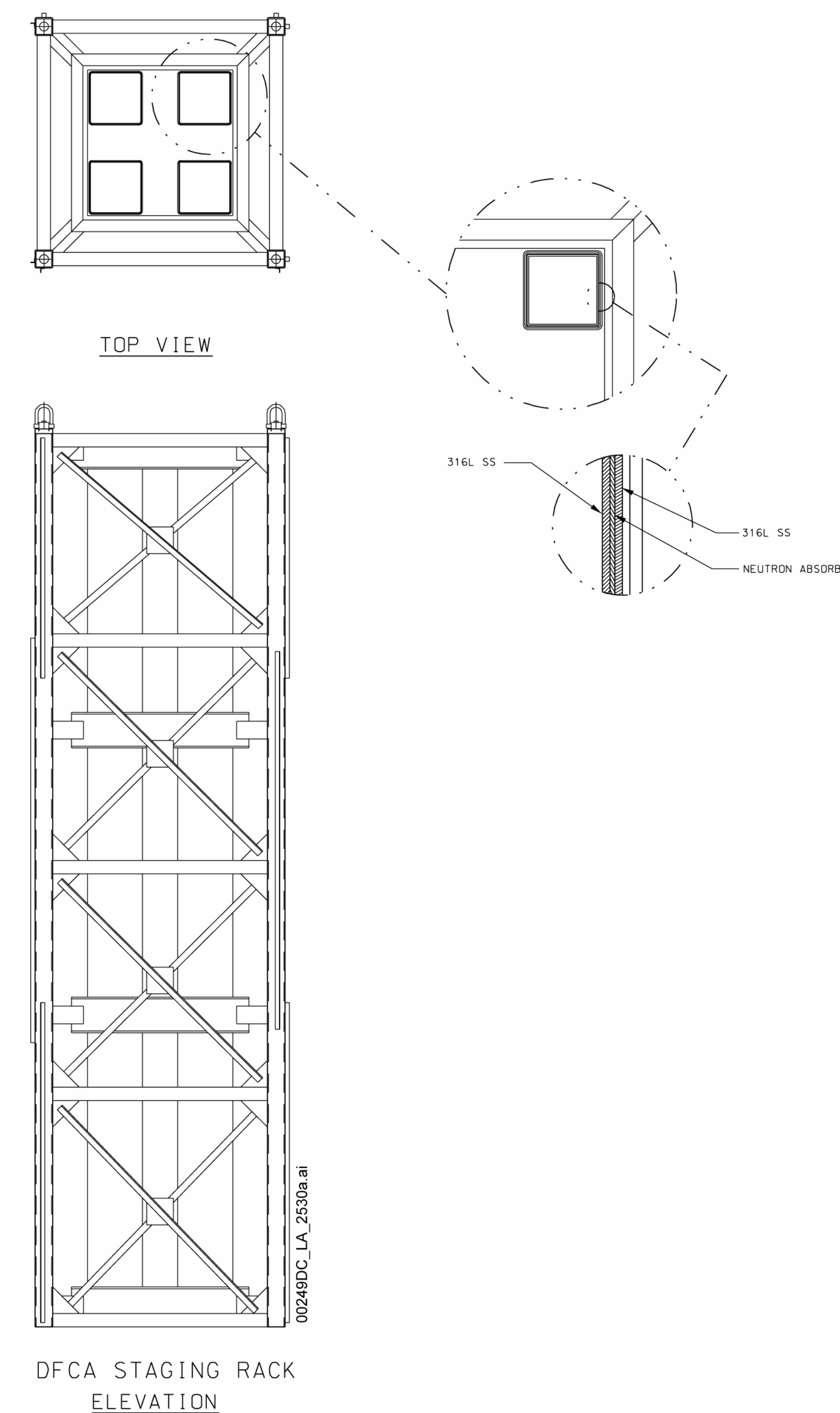

NOTE: DFCA = damaged-fuel canister assembly.

Equipment Number: 050-HTF0-RK-00011, SNF staging rack, damaged-fuel canister assembly.

Figure 1.2.5-51. SNF Staging Racks Mechanical Equipment Envelope (Sheet 3 of 3)

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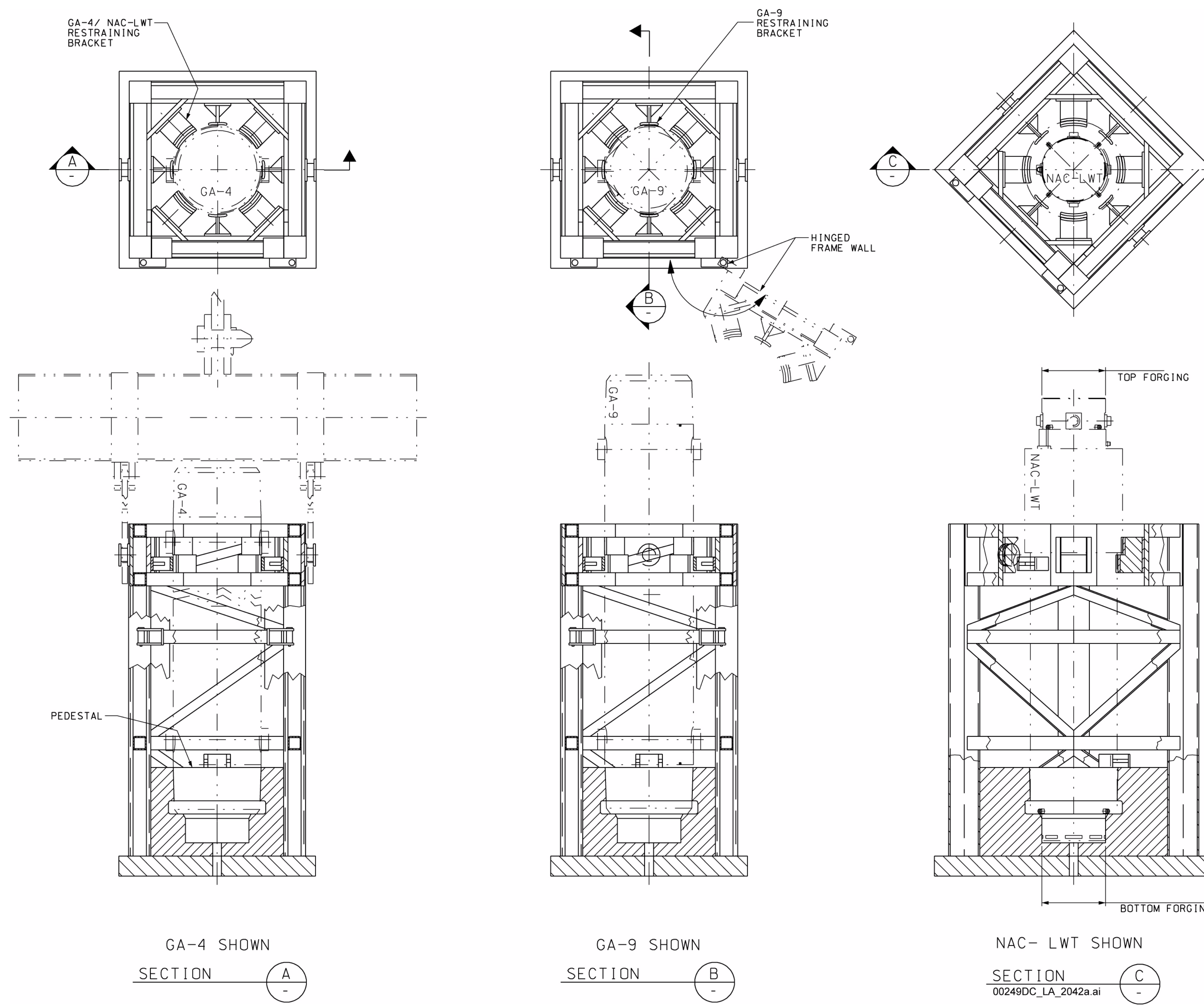

Equipment Number: 050-HTF0-RK-00006, truck cask handling frame.

Figure 1.2.5-52. Truck Cask Handling Frame Mechanical Equipment Envelope

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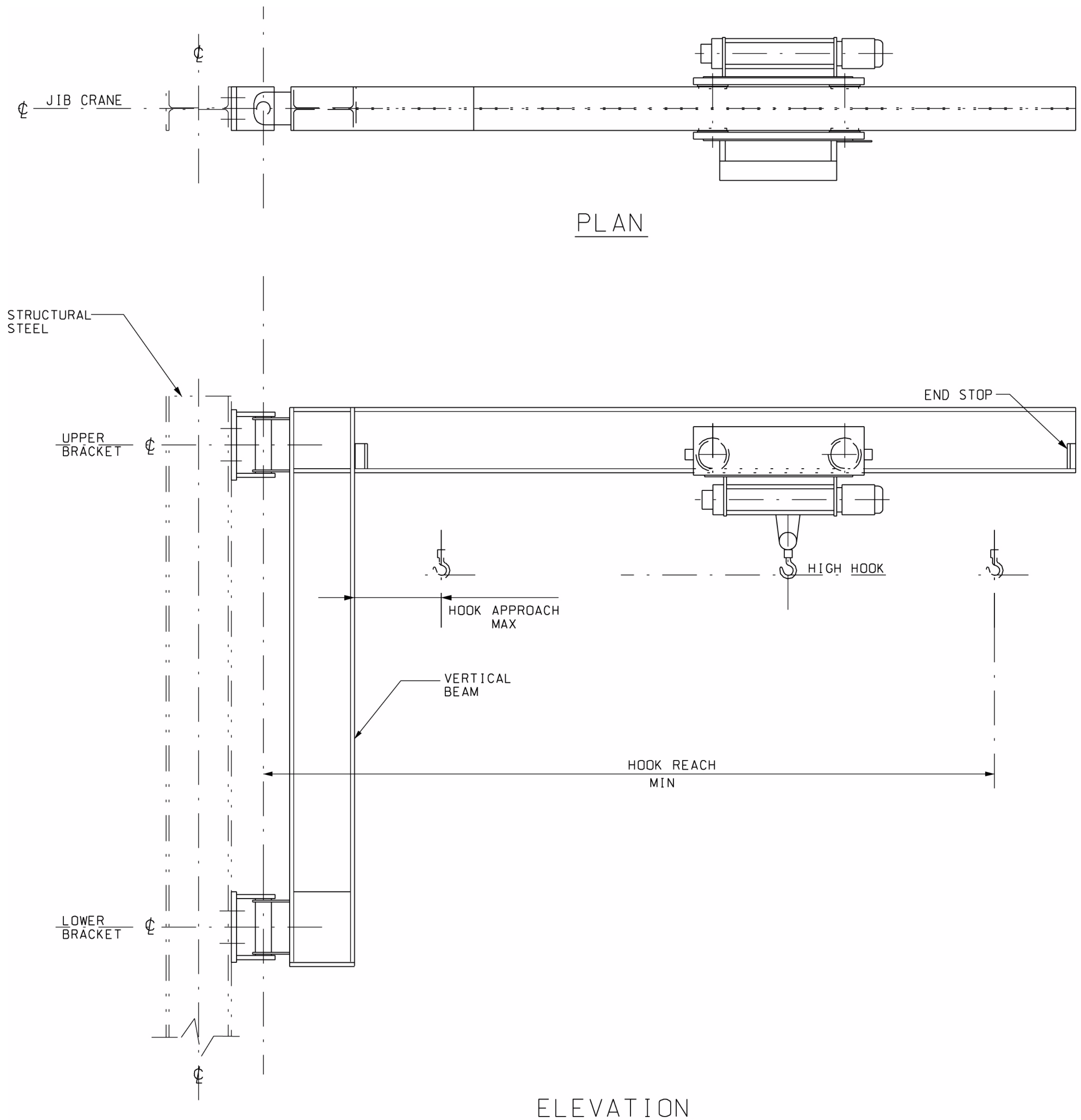

JIB CRANE TABLE	
EQUIPMENT NUMBER	EQUIPMENT NAME
050-HD00-CRN-00001	DPC CUTTING JIB CRANE
050-HMH0-CRN-00002	PREPARATION STATION #1 JIB CRANE
050-HMH0-CRN-00003	PREPARATION STATION #2 JIB CRANE
050-HC00-CRN-00001	TAD CLOSURE JIB CRANE

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Figure 1.2.5-53. Jib Cranes Mechanical Equipment Envelope

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EQUIPMENT AND INSTRUMENTATION TABLE

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	POWER DISCONNECT SWITCH	SLEWING DRIVE				TROLLEY				
			LOCAL HAND SWITCH	COUNTER CLOCKWISE STOP	CLOCKWISE STOP	BRAKE SOLENOID	LOCAL HAND SWITCH	FWD STOP	REV STOP	SPEED ENCODER SENSOR	SPEED ENCODER TRANSMITTER
050-HC00-CRN-00001	TAD CLOSURE JIB CRANE	HS-0010	HS-0011	ZSH-0011	ZSL-0011	HV-0011	HS-0012	ZSH-0012	ZSL-0012	SE-0013	ST-0013
050-HD00-CRN-00001	DPC CUTTING JIB CRANE	HS-0010	HS-0011	ZSH-0011	ZSL-0011	HV-0011	HS-0012	ZSH-0012	ZSL-0012	SE-0013	ST-0013
050-HMH0-CRN-00002	PREPARATION STATION #1 JIB CRANE	HS-0010	HS-0011	ZSH-0011	ZSL-0011	HV-0011	HS-0012	ZSH-0012	ZSL-0012	SE-0013	ST-0013
050-HMH0-CRN-00003	PREPARATION STATION #2 JIB CRANE	HS-0047	HS-0048	ZSH-0048	ZSL-0048	HV-0048	HS-0049	ZSH-0049	ZSL-0049	SE-0050	ST-0050

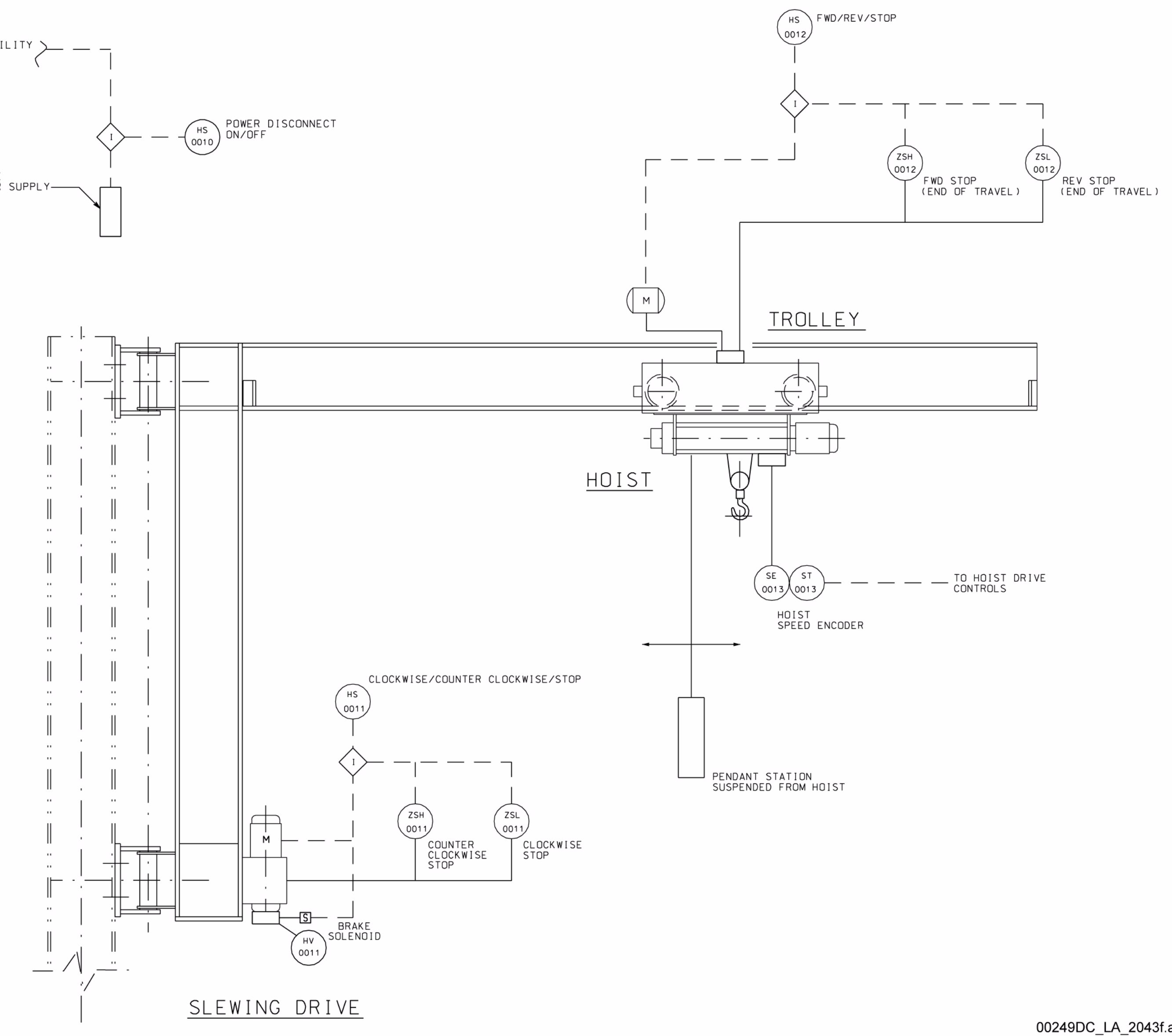

Figure 1.2.5-54. Jib Cranes Process and Instrumentation Diagram (Sheet 1 of 2)

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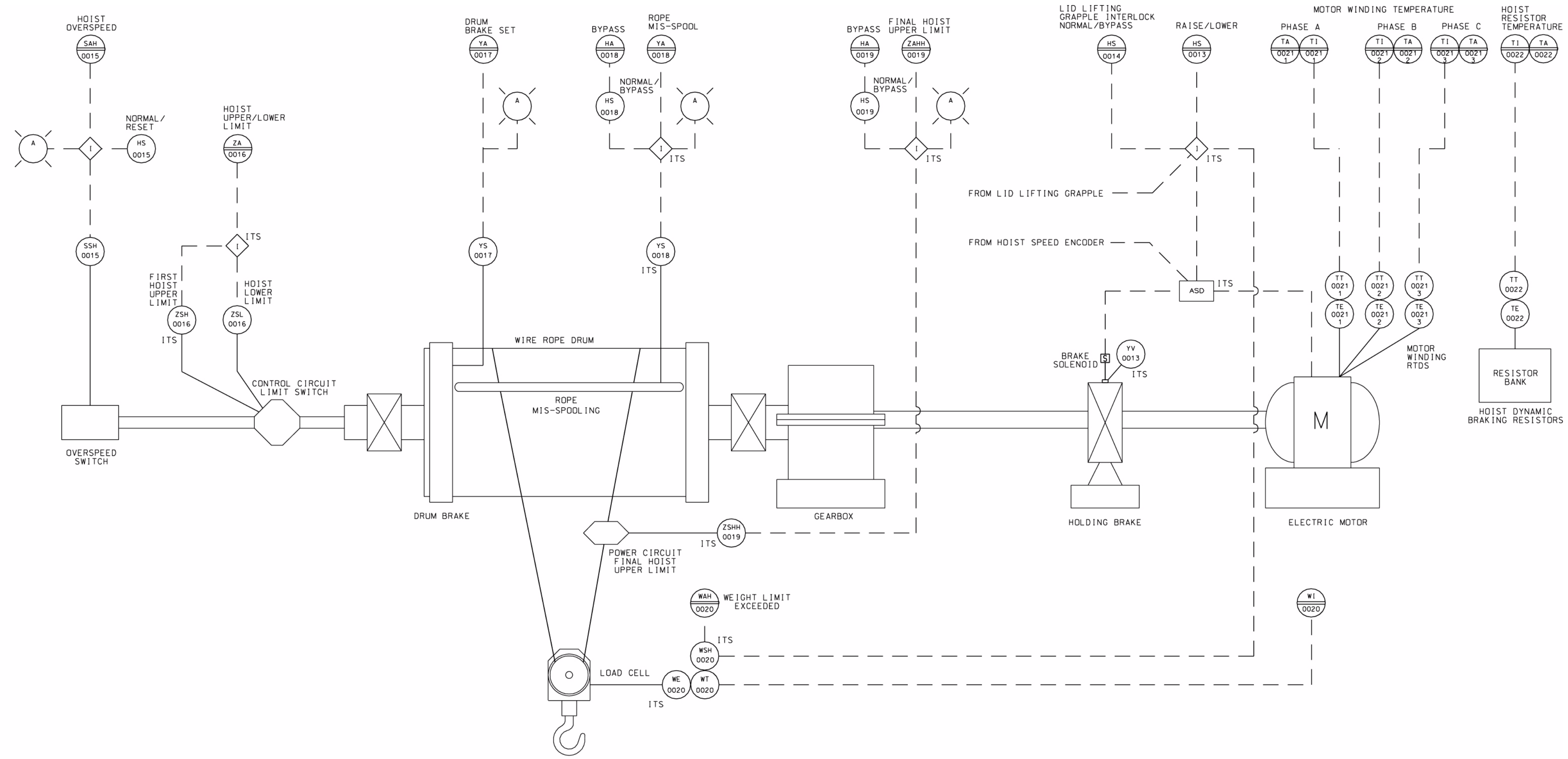

HOIST INSTRUMENTATION

EQUIPMENT AND INSTRUMENTATION TABLE

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	OVERSPEED	FIRST HOIST LIMIT	DRUM BRAKE SET	ROPE MIS-SPOOL		FINAL HOIST UPPER LIMIT		LOAD CELL		MOTOR WINDING RTDS PHASE A, B & C			CRANE HOIST		
														RESISTOR TEMPERATURE	LOCAL HAND SWITCH/ HOLDING BRAKE SOLENOID	LID LIFTING GRAPPLE INTERLOCK HAND SWITCH
		SWITCH/ HANDSWITCH/ ALARM	UPPER LIMIT SWITCH/ LOWER LIMIT SWITCH/ ALARM	SWITCH/ ALARM	SWITCH/ ALARM	HAND SWITCH/ ALARM	SWITCH/ ALARM	HAND SWITCH/ ALARM	ELEMENT/ TRANSMITTER/ SWITCH	ALARM/ INDICATOR	ELEMENT/ TRANSMITTER/ INDICATOR/ ALARM	ELEMENT/ TRANSMITTER/ INDICATOR/ ALARM	ELEMENT/ TRANSMITTER/ INDICATOR/ ALARM	ELEMENT/ TRANSMITTER/ INDICATOR/ ALARM		
050-HC00-CRN-00001	TAD CLOSURE JIB CRANE	SSH-0015 HS-0015 SAH-0015	ZSH-0016 (ITS) ZSL-0016 ZA-0016	YS-0017 YA-0017	YS-0018 (ITS) YA-0018	HS-0018 HA-0018	ZSHH-0019 (ITS) ZAHH-0019	HS-0019 HA-0019	WE-0020 (ITS) WT-0020 WSH-0020 (ITS)	WAH-0020 WI-0020	TE-0021-1 TT-0021-1 TI-0021-1 TA-0021-1	TE-0021-2 TT-0021-2 TI-0021-2 TA-0021-2	TE-0021-3 TT-0021-3 TI-0021-3 TA-0021-3	TE-0022 TT-0022 TI-0022 TA-0022	HS-0013 YV-0013 (ITS)	HS-0014
050-HD00-CRN-00001	DPC CUTTING JIB CRANE	SSH-0015 HS-0015 SAH-0015	ZSH-0016 (ITS) ZSL-0016 ZA-0016	YS-0017 YA-0017	YS-0018 (ITS) YA-0018	HS-0018 HA-0018	ZSHH-0019 (ITS) ZAHH-0019	HS-0019 HA-0019	WE-0020 (ITS) WT-0020 WSH-0020 (ITS)	WAH-0020 WI-0020	TE-0021-1 TT-0021-1 TI-0021-1 TA-0021-1	TE-0021-2 TT-0021-2 TI-0021-2 TA-0021-2	TE-0021-3 TT-0021-3 TI-0021-3 TA-0021-3	TE-0022 TT-0022 TI-0022 TA-0022	HS-0013 YV-0013 (ITS)	HS-0014
050-HMH0-CRN-00002	PREPARATION STATION #1 JIB CRANE	SSH-0015 HS-0015 SAH-0015	ZSH-0016 (ITS) ZSL-0016 ZA-0016	YS-0017 YA-0017	YS-0018 (ITS) YA-0018	HS-0018 HA-0018	ZSHH-0019 (ITS) ZAHH-0019	HS-0019 HA-0019	WE-0020 (ITS) WT-0020 WSH-0020 (ITS)	WAH-0020 WI-0020	TE-0021-1 TT-0021-1 TI-0021-1 TA-0021-1	TE-0021-2 TT-0021-2 TI-0021-2 TA-0021-2	TE-0021-3 TT-0021-3 TI-0021-3 TA-0021-3	TE-0022 TT-0022 TI-0022 TA-0022	HS-0013 YV-0013 (ITS)	HS-0014
050-HMH0-CRN-00003	PREPARATION STATION #2 JIB CRANE	SSH-0052 HS-0052 SAH-0052	ZSH-0053 (ITS) ZSL-0053 ZA-0053	YS-0054 YA-0054	YS-0055 (ITS) YA-0055	HS-0055 HA-0055	ZSHH-0056 (ITS) ZAHH-0056	HS-0056 HA-0056	WE-0057 (ITS) WT-0057 WSH-0057 (ITS)	WAH-0057 WI-0057	TE-0058-1 TT-0058-1 TI-0058-1 TA-0058-1	TE-0058-2 TT-0058-2 TI-0058-2 TA-0058-2	TE-0058-3 TT-0058-3 TI-0058-3 TA-0058-3	TE-0059 TT-0059 TI-0059 TA-0059	HS-0050 YV-0050 (ITS)	HS-0051

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NOTE: RTDS = resistance temperature detectors.

Figure 1.2.5-54. Jib Cranes Process and Instrumentation Diagram (Sheet 2 of 2)

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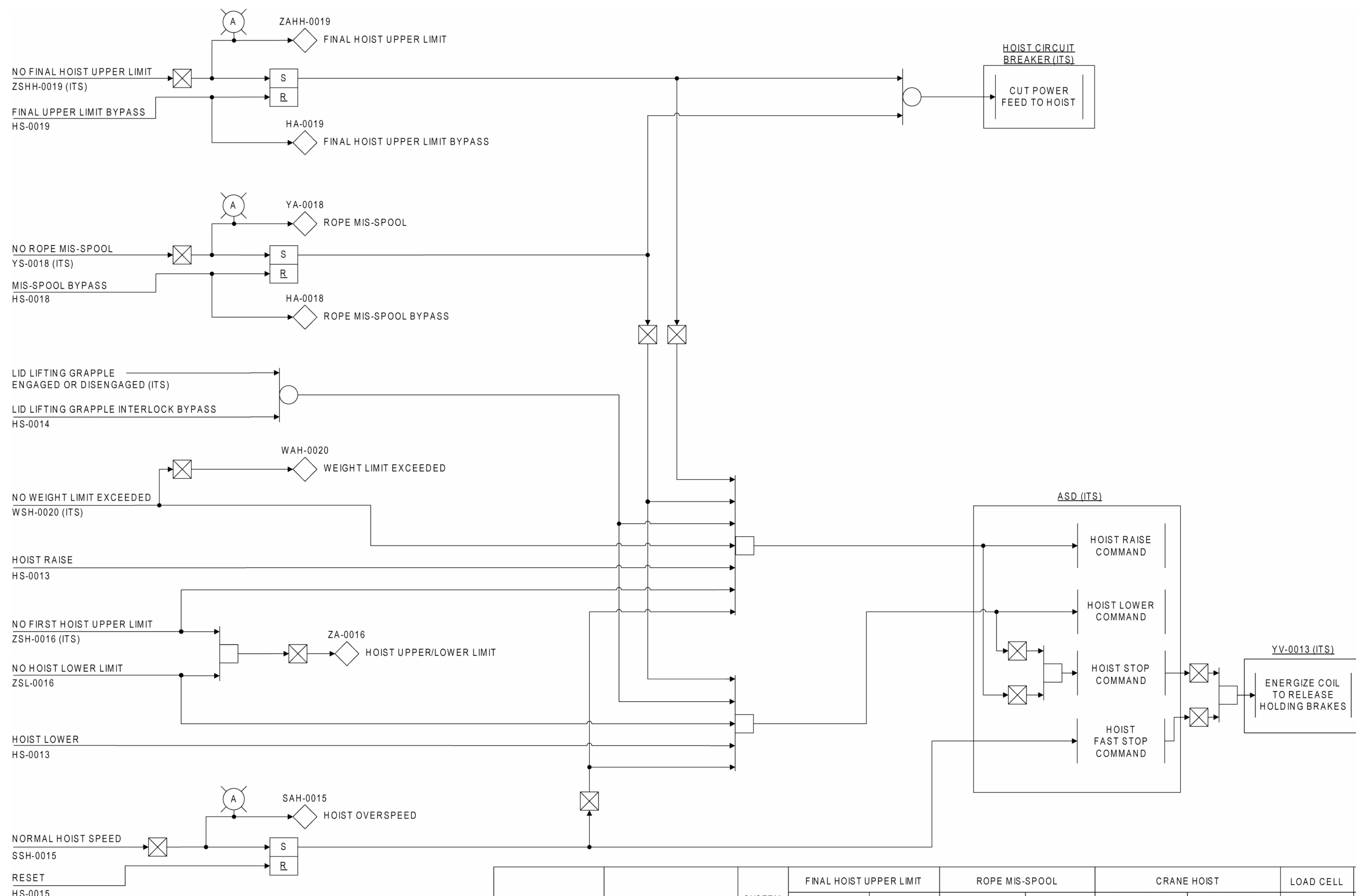

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	SYSTEM CODE	FINAL HOIST UPPER LIMIT		ROPE MIS-SPOOL		CRANE HOIST		LOAD CELL	FIRST HOIST LIMIT	OVERSPEED
			SWITCH/ ALARM	BYPASS SWITCH/ ALARM	SWITCH/ ALARM	BYPASS SWITCH/ ALARM	LOCAL HAND SWITCH/ HOLDING BRAKE SOLENOID	LID LIFTING GRAPPLE INTERLOCK BYPASS SWITCH	SWITCH/ ALARM	UPPER LIMIT SWITCH/ LOWER LIMIT SWITCH/ ALARM	LIMIT SWITCH/ RESET SWITCH/ ALARM
050-HC00-CRN-00001	TAD CANISTER CLOSURE JIB CRANE	HC00	ZSHH-0019 (ITS) ZAHH-0019	HS-0019 HA-0019	YS-0018 (ITS) YA-0018	HS-0018 HA-0018	HS-0013 YV-0013 (ITS)	HS-0014	WSH-0020 (ITS) WAH-0020	ZSH-0016 (ITS) ZSL-0016 ZA-0016	SSH-0015 HS-0015 SAH-0015
050-HD00-CRN-00001	DPC CUTTING JIB CRANE	HD00									
050-HMH0-CRN-00002	PREPARATION STATION #1 JIB CRANE	HMH0									
050-HMH0-CRN-00003	PREPARATION STATION #2 JIB CRANE	HMH0	ZSHH-0056 (ITS) ZAHH-0056	HS-0056 HA-0056	YS-0055 (ITS) YA-0055	HS-0055 HA-0055	HS-0050 YV-0050 (ITS)	HS-0051	WSH-0057 (ITS) WAH-0057	ZSH-0053 (ITS) ZSL-0053 ZA-0053	SSH-0052 HS-0052 SAH-0052

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NOTE: ITS controls are identified by the letters "ITS" after the instrumentation tag number or control device identifier. Instrumentation tag numbers are prefixed by "050-YYYY-," where "YYYY" is the system code. ASD = adjustable speed drive.

Figure 1.2.5-55. Logic Diagram for the Jib Crane Hoist

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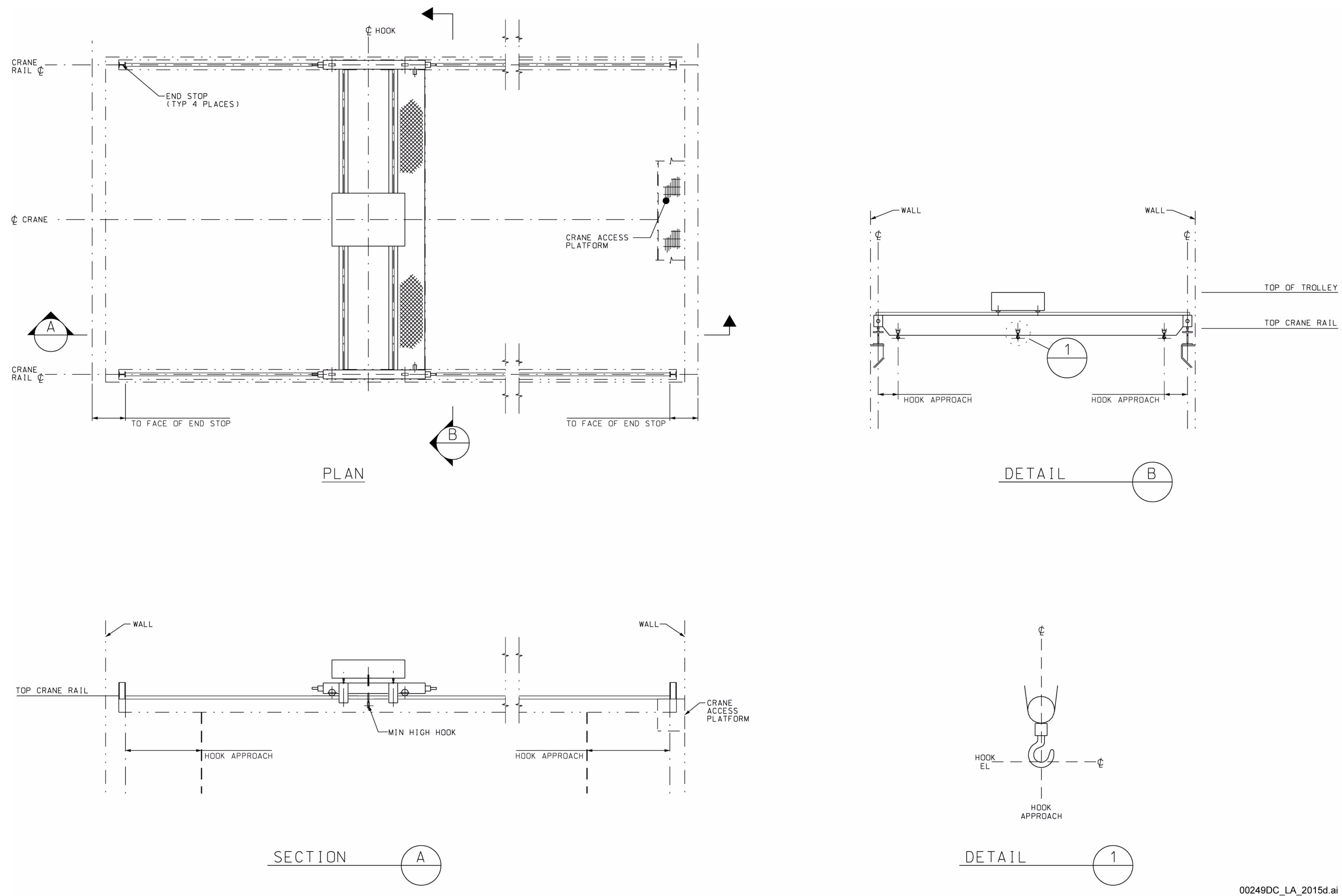

Figure 1.2.5-56. Canister Transfer Machine Maintenance Crane Mechanical Equipment Envelope

Equipment Number: 050-HTC0-CRN-00001, canister transfer machine maintenance crane.

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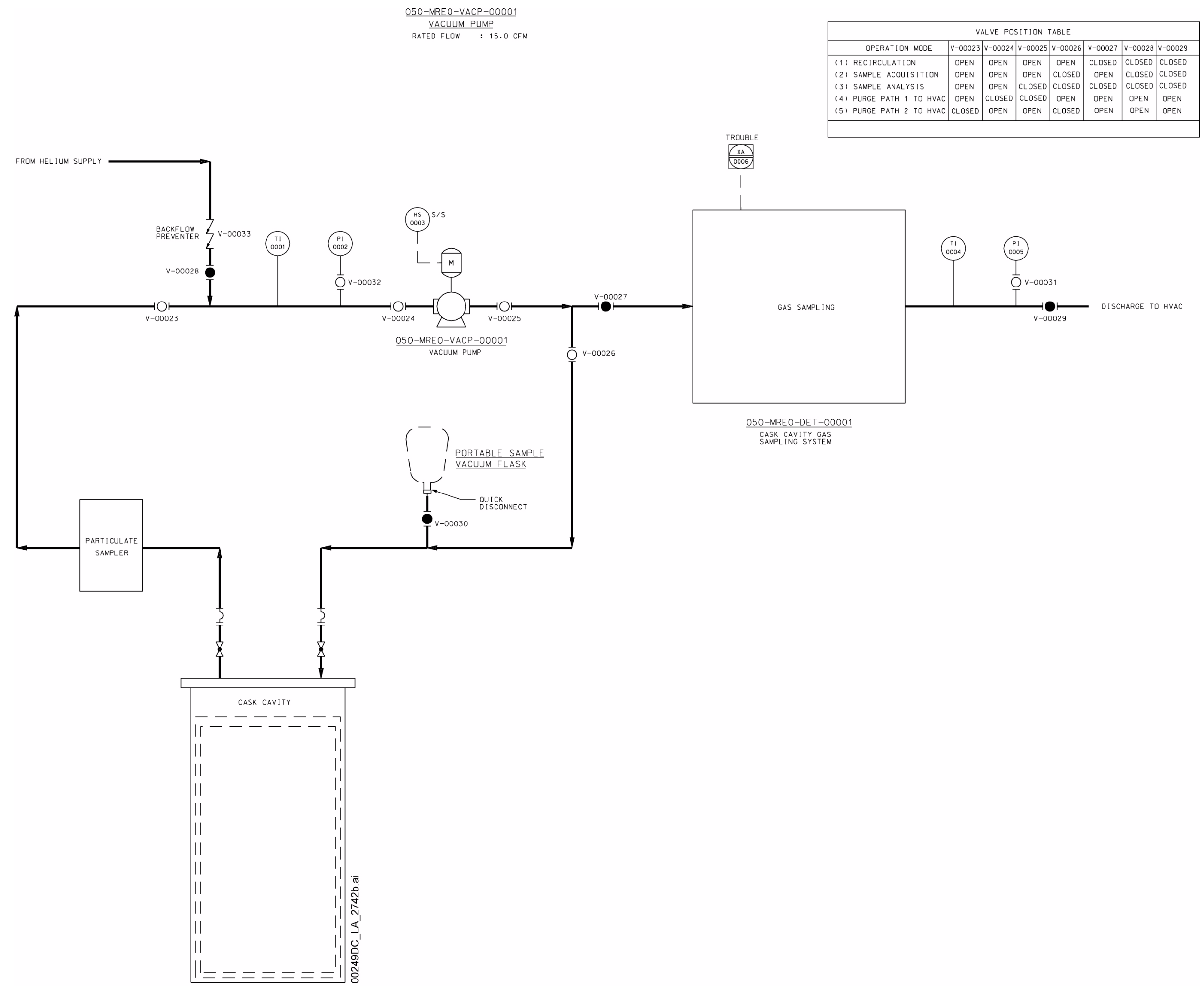

VALVE POSITION TABLE

OPERATION MODE	V-00023	V-00024	V-00025	V-00026	V-00027	V-00028	V-00029
(1) RECIRCULATION	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED
(2) SAMPLE ACQUISITION	OPEN	OPEN	OPEN	CLOSED	OPEN	CLOSED	CLOSED
(3) SAMPLE ANALYSIS	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
(4) PURGE PATH 1 TO HVAC	OPEN	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN
(5) PURGE PATH 2 TO HVAC	CLOSED	OPEN	OPEN	CLOSED	OPEN	OPEN	OPEN

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 1.2.5-57. WHF Transportation Cask/Dual-Purpose Canister/Shielded Transfer Cask Cavity Gas Sampling System Piping and Instrumentation Diagram

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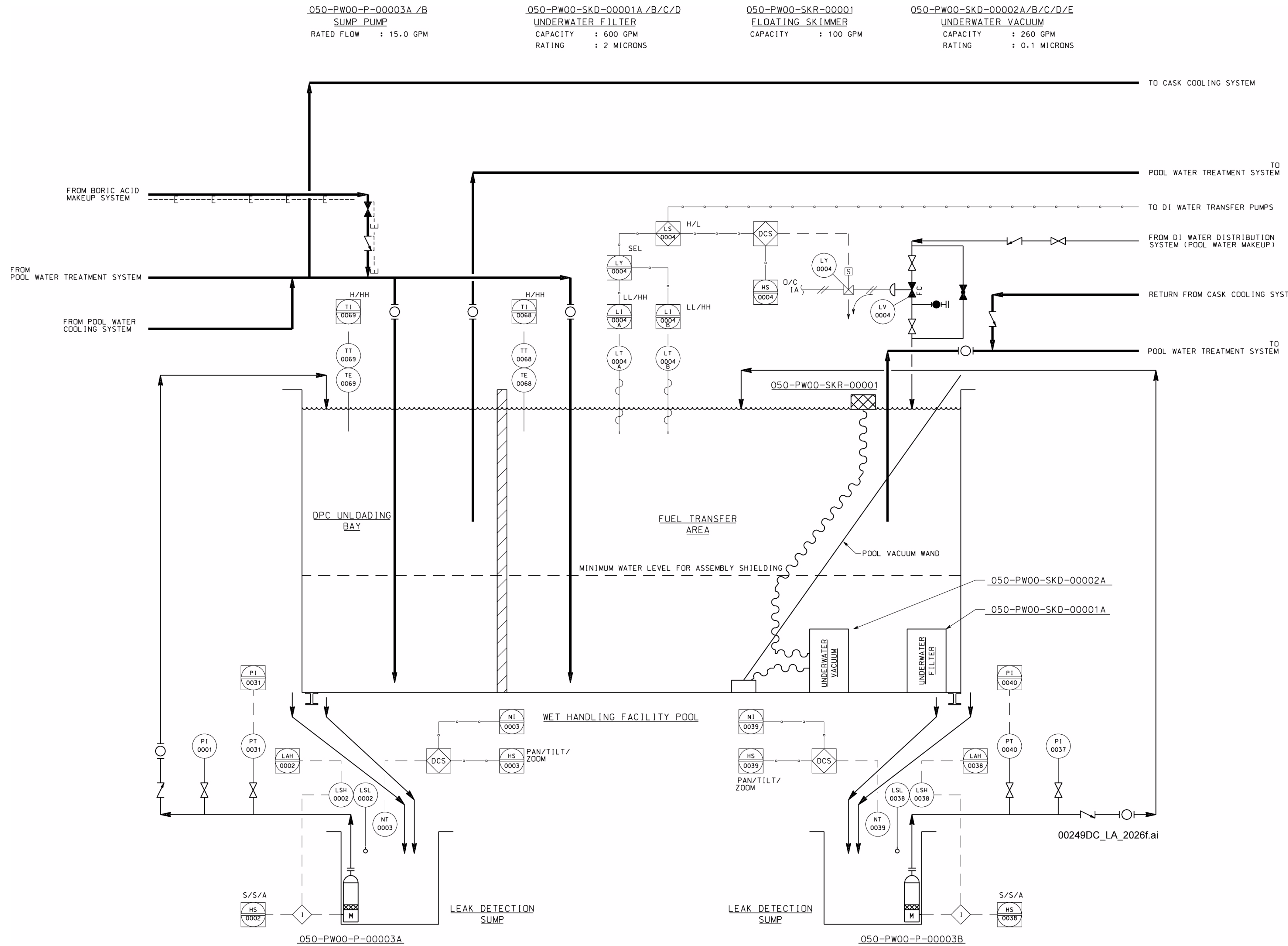

Figure 1.2.5-58. WHF Pool Water Treatment and Cooling System Piping and Instrumentation Diagram

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

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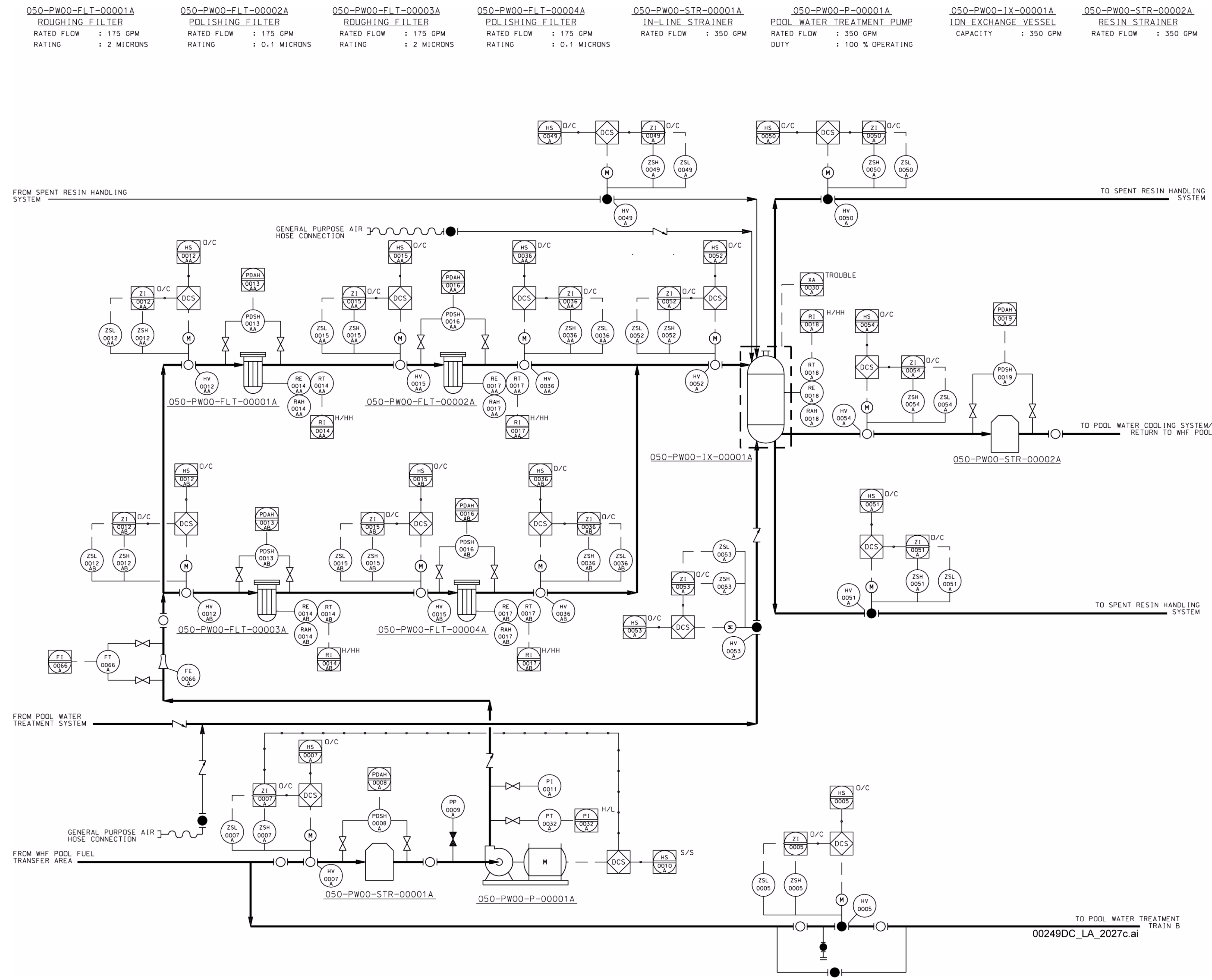

Figure 1.2.5-59. WHF Pool Water Treatment System Train A Piping and Instrumentation Diagram

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

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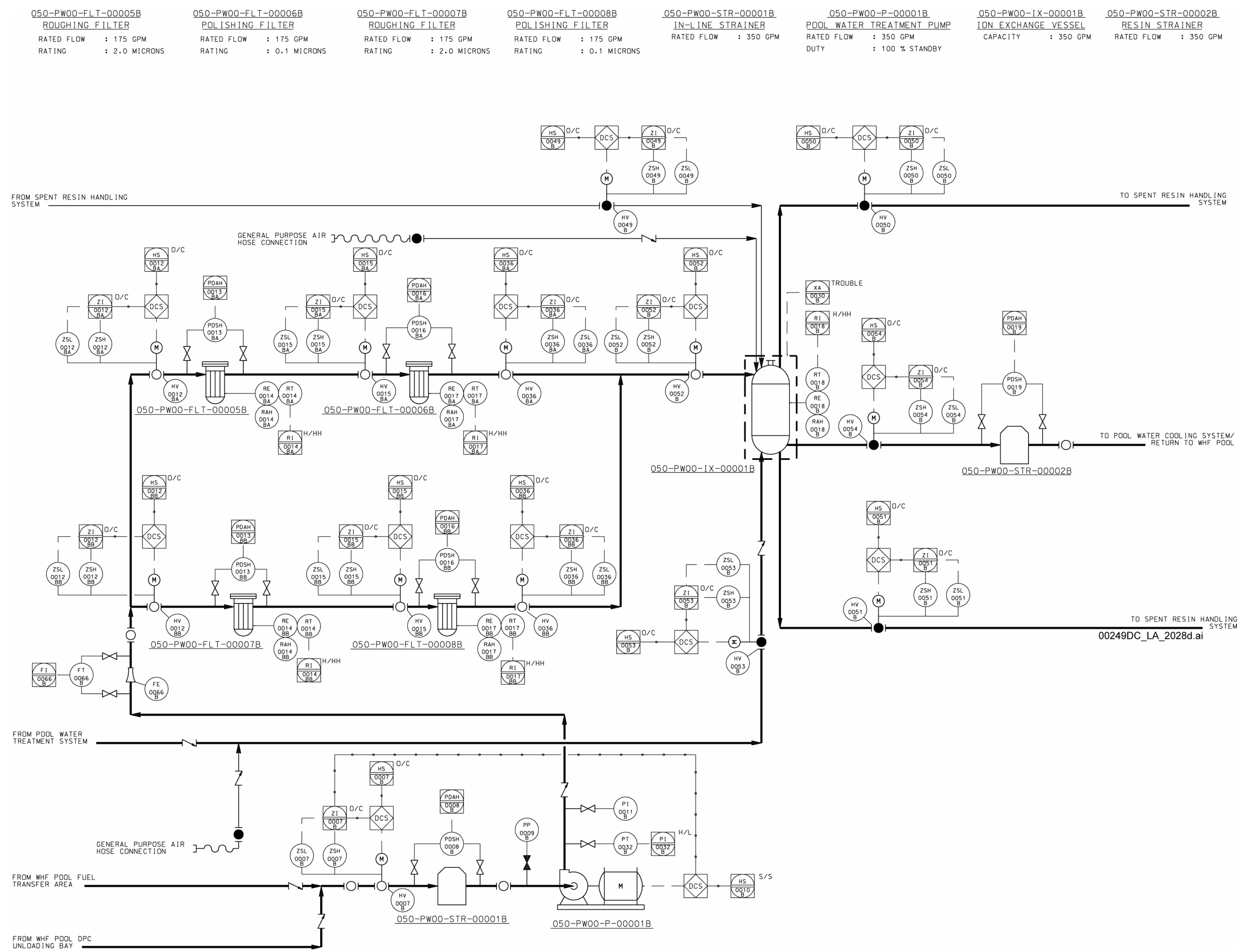

Figure 1.2.5-60. WHF Pool Water Treatment System Train B Piping and Instrumentation Diagram

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

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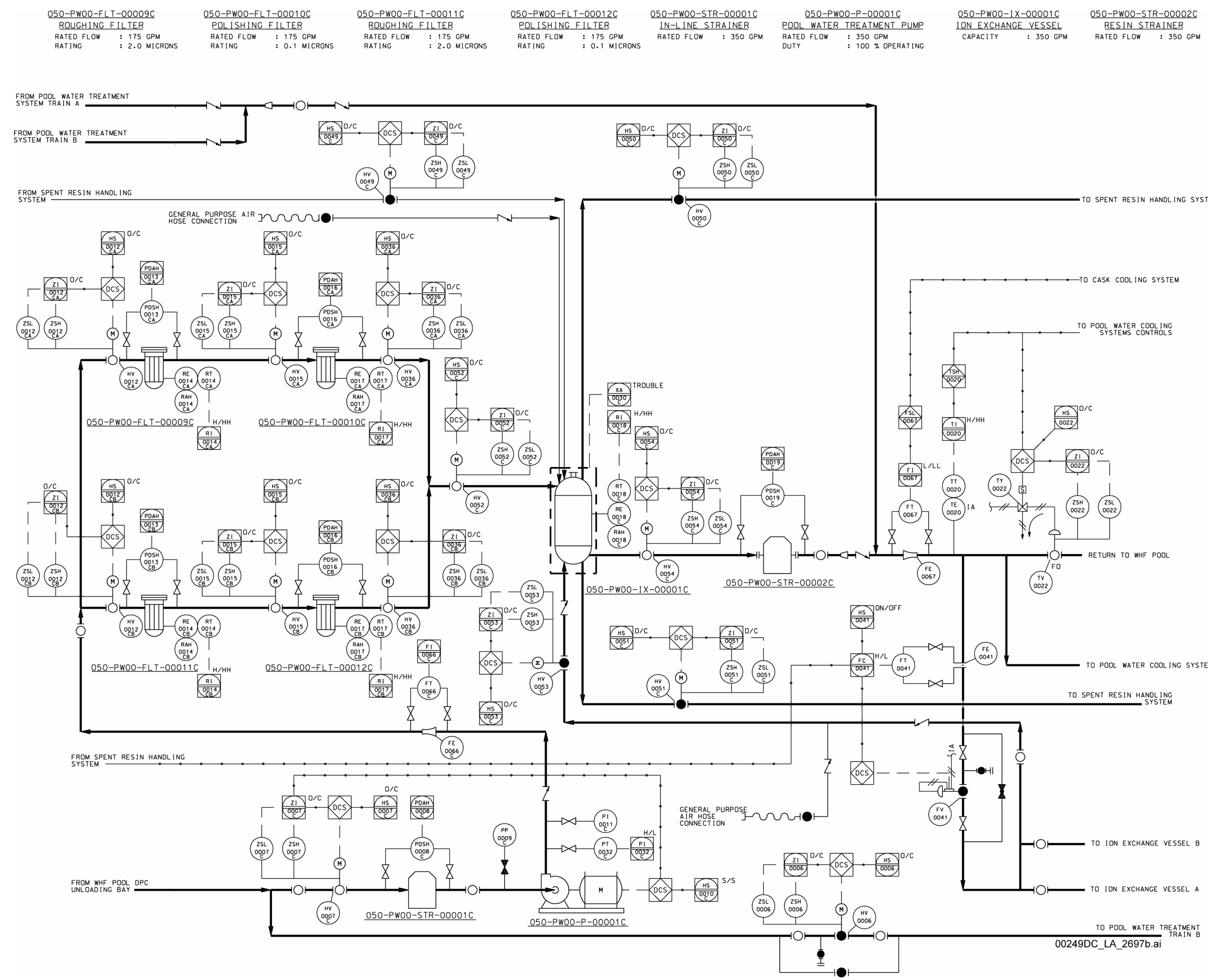

Figure 1.2.5-61. WHF Pool Water Treatment System Train C Piping and Instrumentation Diagram

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

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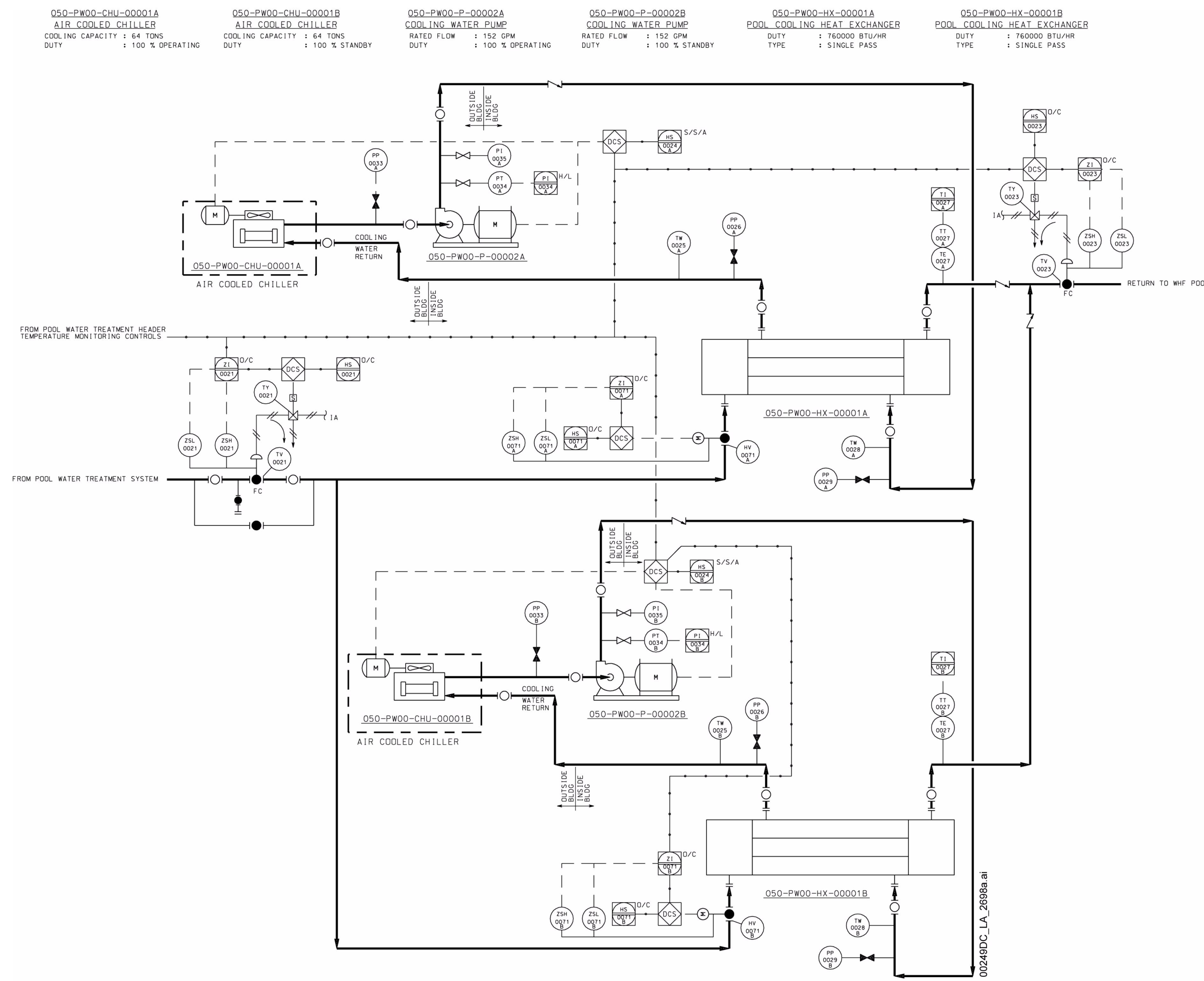

Figure 1.2.5-62. WHF Pool Water Cooling System Piping and Instrumentation Diagram

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

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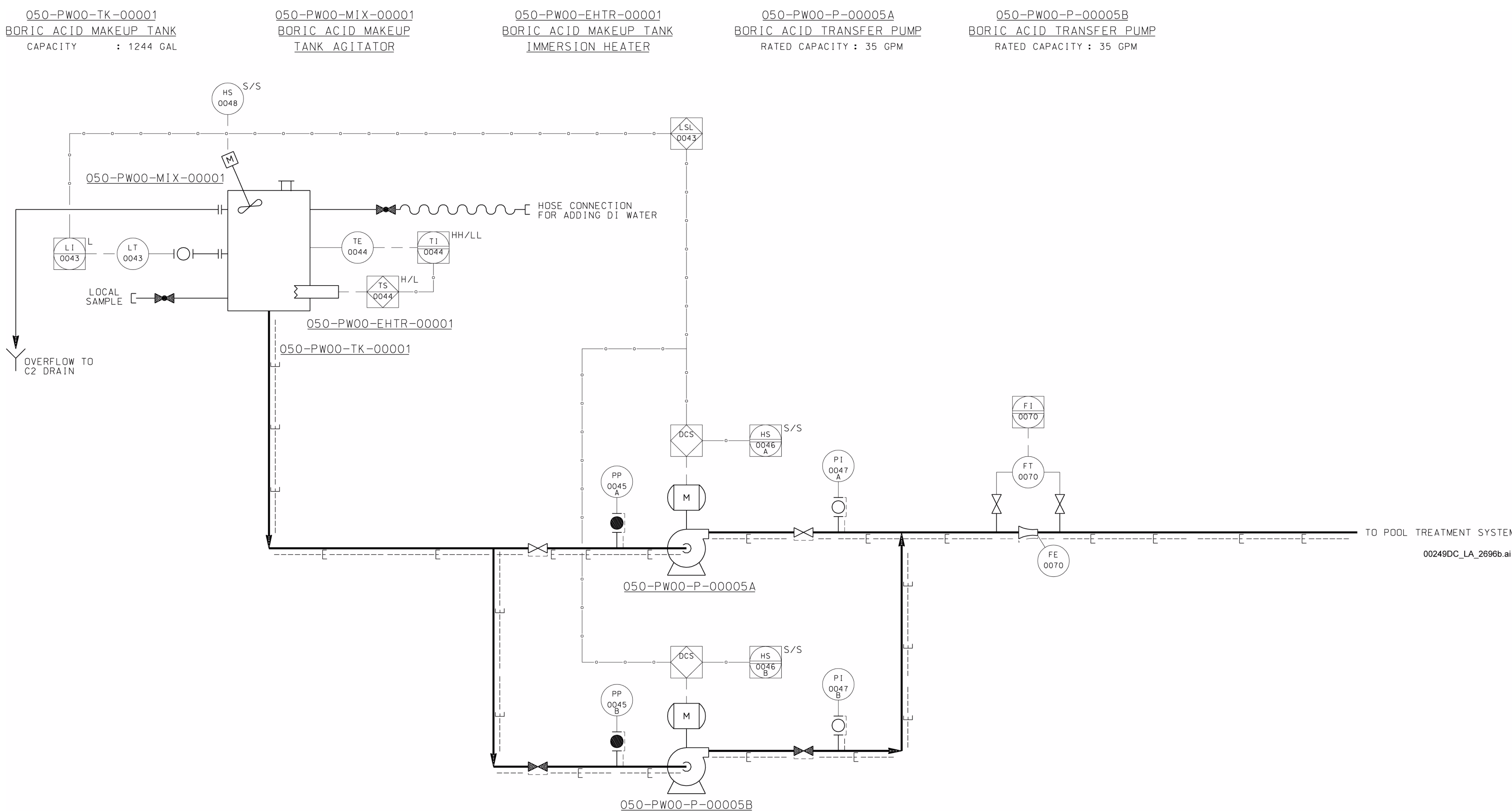

NOTE: This figure includes no SSCs that are either ITS or ITWI.
DI = deionized.

Figure 1.2.5-63. WHF Boric Acid Makeup System Piping and Instrumentation Diagram

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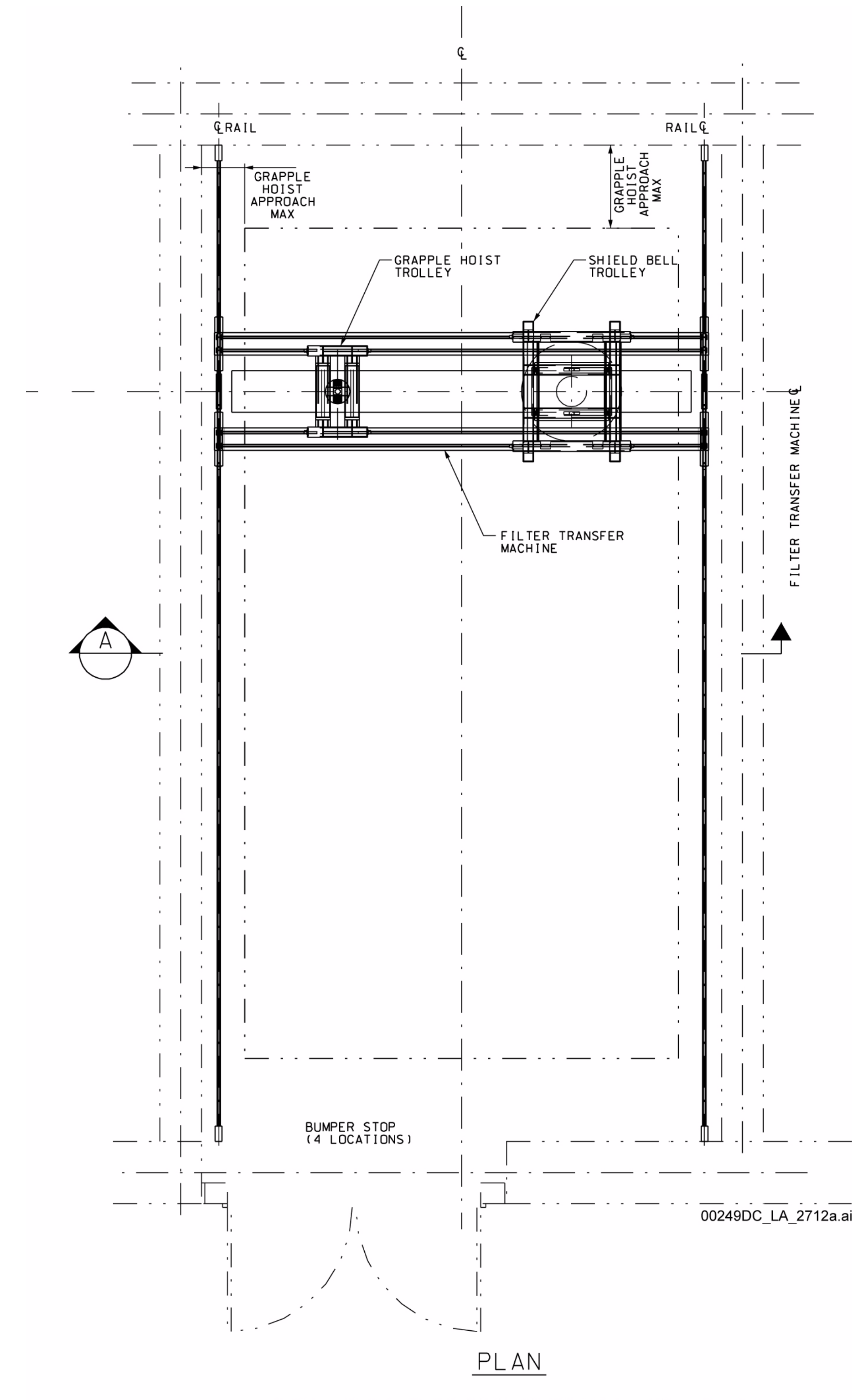

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HT00-HEQ-00003/00004/00005, filter transfer machine
Room 1043A/Room 1043B/Room 1043C.

Figure 1.2.5-64. Filter Transfer Machine Mechanical Equipment Envelope (Sheet 1 of 2)

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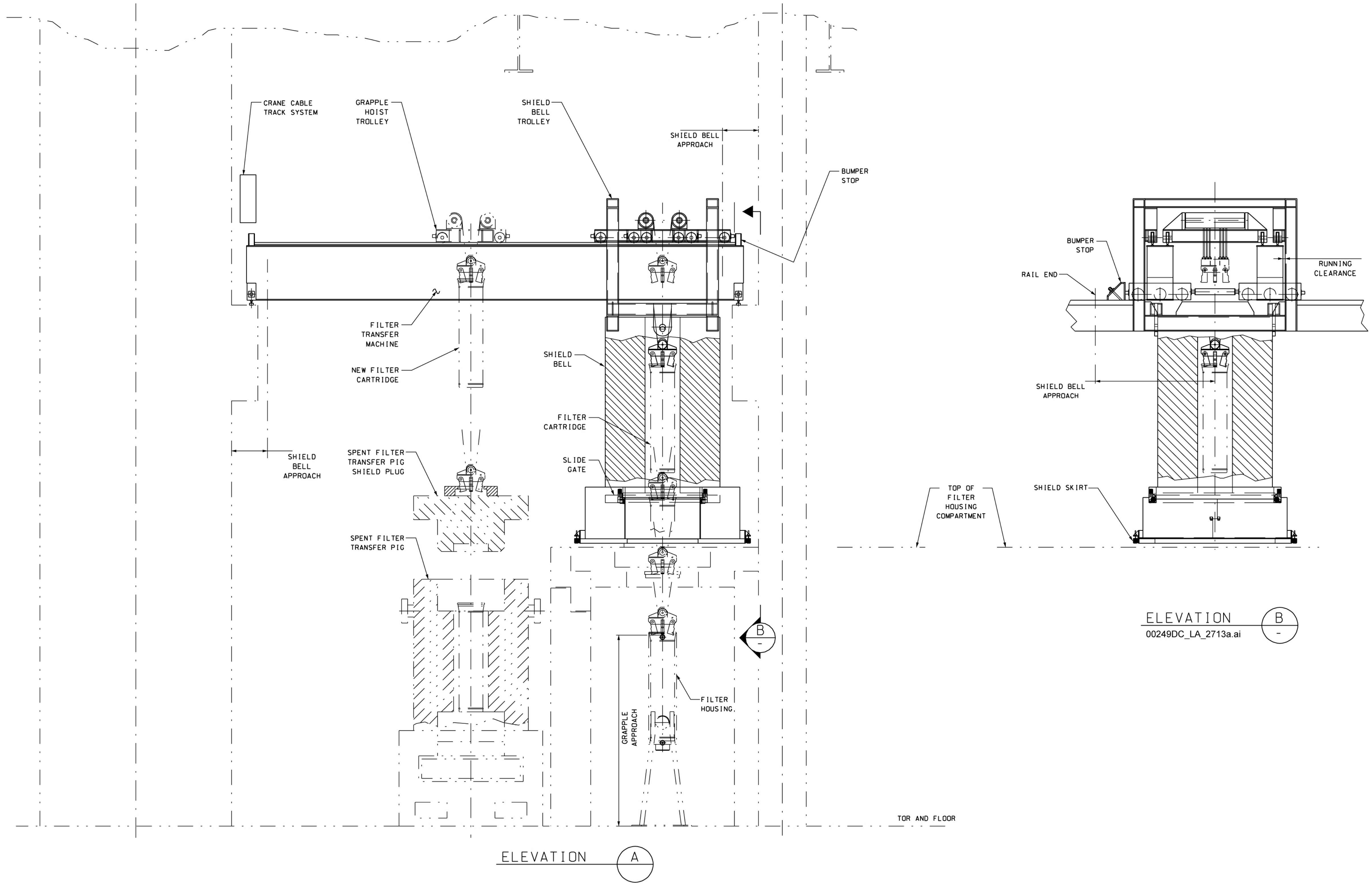

Figure 1.2.5-64. Filter Transfer Machine Mechanical Equipment Envelope (Sheet 2 of 2)

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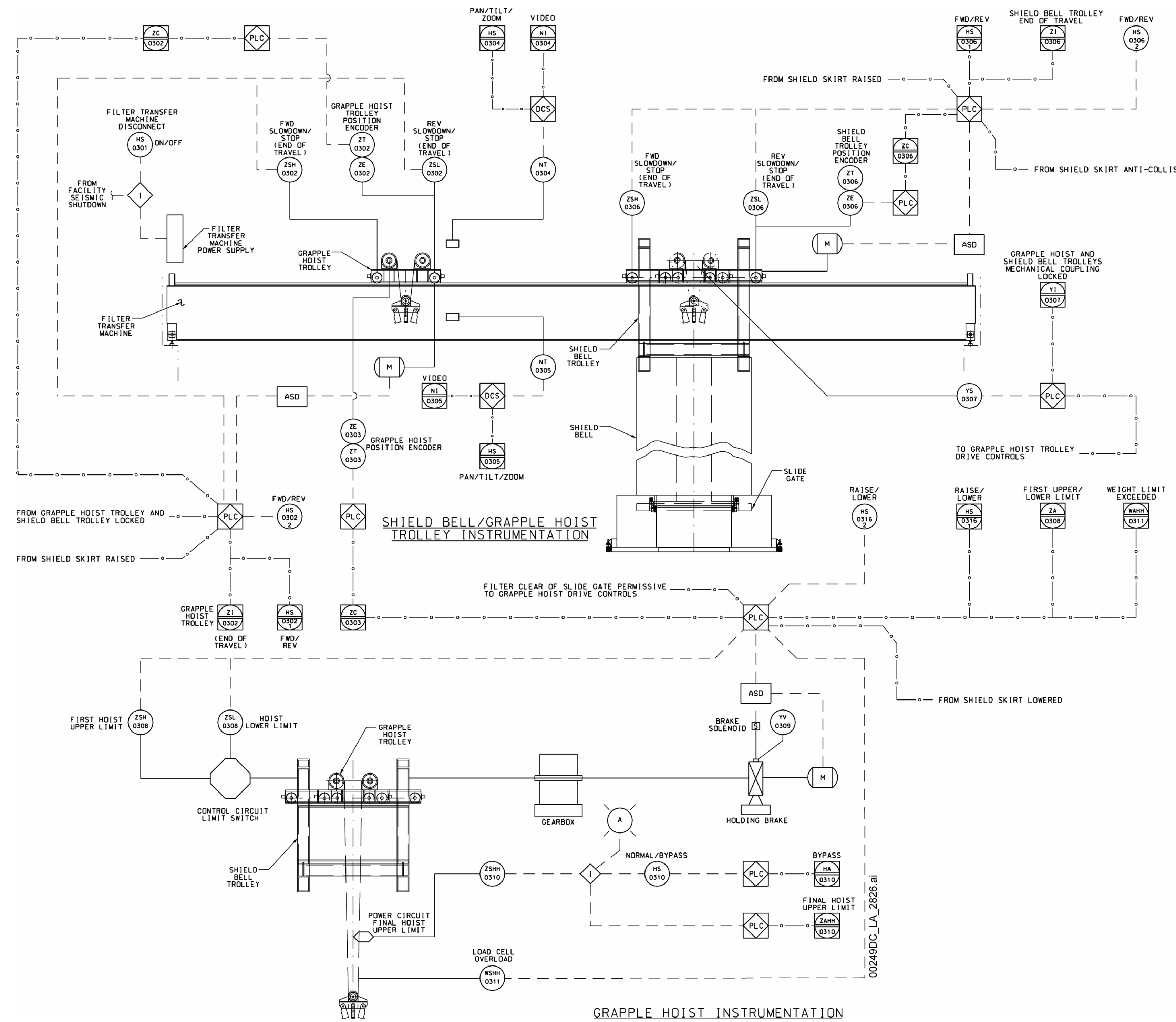

NOTE: This figure includes no SSCs that are either ITS or ITWI. Instrumentation tag numbers are prefixed by "050-HT00." Filter transfer machine 4-loop sequences are "0400" series; filter transfer machine 5-loop sequences are "0500" series. The grapple hoist trolley and shield bell trolley are mechanically coupled during filter transfer, with the shield bell trolley driving the grapple hoist trolley. All switches on the main electrical panel are keyed, except for emergency stop. The shield skirt anticollision device stops the bridge and shield bell trolley due to internal or external shield skirt obstructions. Torque is limited to prevent shearing an object if the slide gate were to inadvertently strike an object. A sensor detects when an object has cleared the shield bell slide gate during a lifting operation and stops the grapple hoist drive. The grapple hoist drive will be allowed to lower the load.

Figure 1.2.5-65. WHF Filter Transfer Machine Process and Instrumentation Diagram (Sheet 1 of 2)

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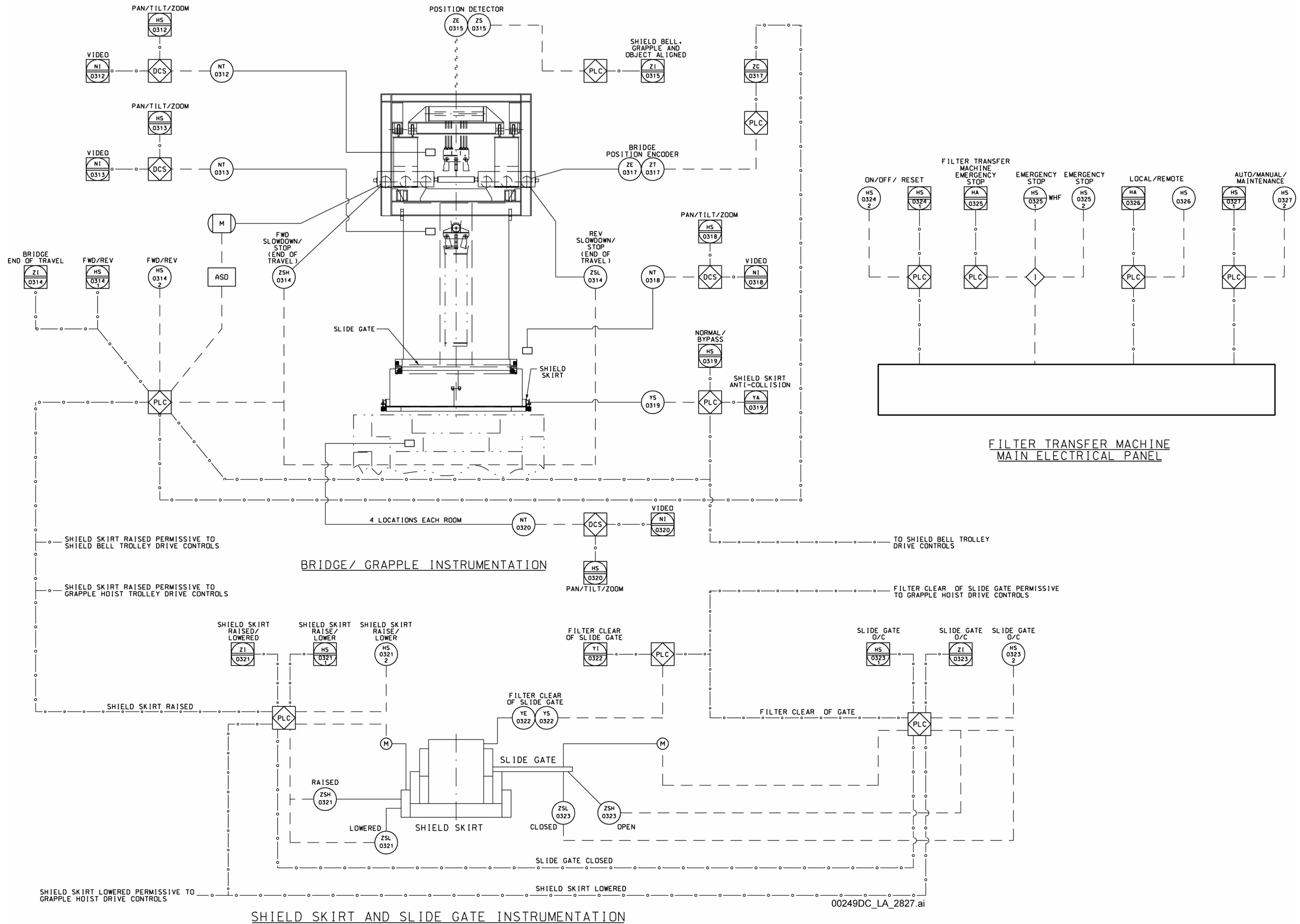

Figure 1.2.5-65. WHF Filter Transfer Machine Process and Instrumentation Diagram (Sheet 2 of 2

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-61.

Equipment Number: 050-HM00-NZL-00001, spray nozzle; 050-HM00-P-00001, pump module; 050-HM00-PLAT-00002, platform; 050-HM00-BRAC-00001, decontamination pit seismic restraints.

Figure 1.2.5-66. Decontamination Pit 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-62.

Equipment Number: 050-HM00-NZL-00001, spray nozzle; 050-HM00-P-00001, pump module; 050-HM00-PLAT-00002, platform; 050-HM00-BRAC-00001, decontamination pit equipment seismic restraints.

Figure 1.2.5-67. Decontamination Pit Process and Instrumentation Diagram

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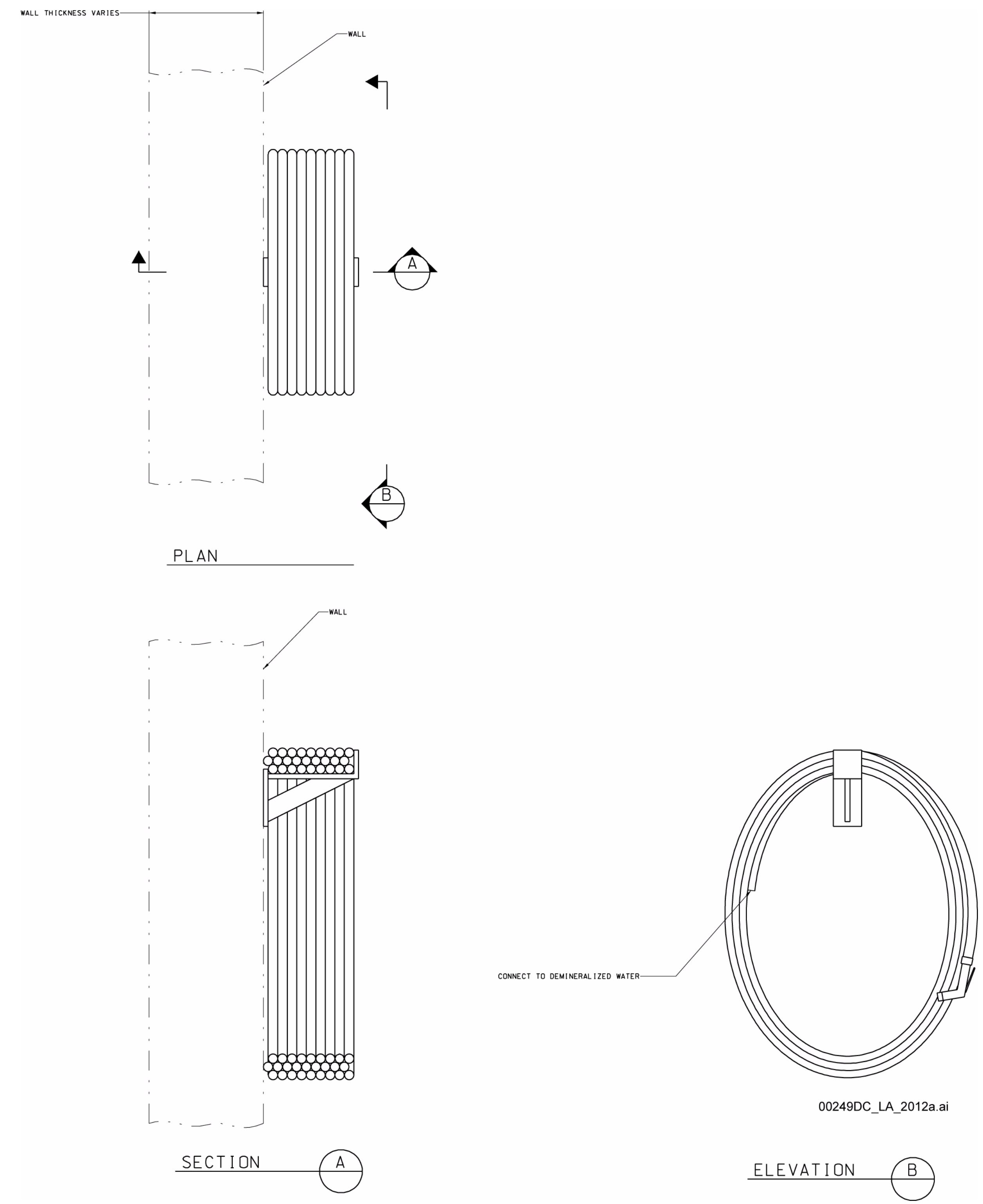

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-WH00-HOSE-00001, wash lance.

Figure 1.2.5-68. Wash Lance Mechanical Equipment Envelope

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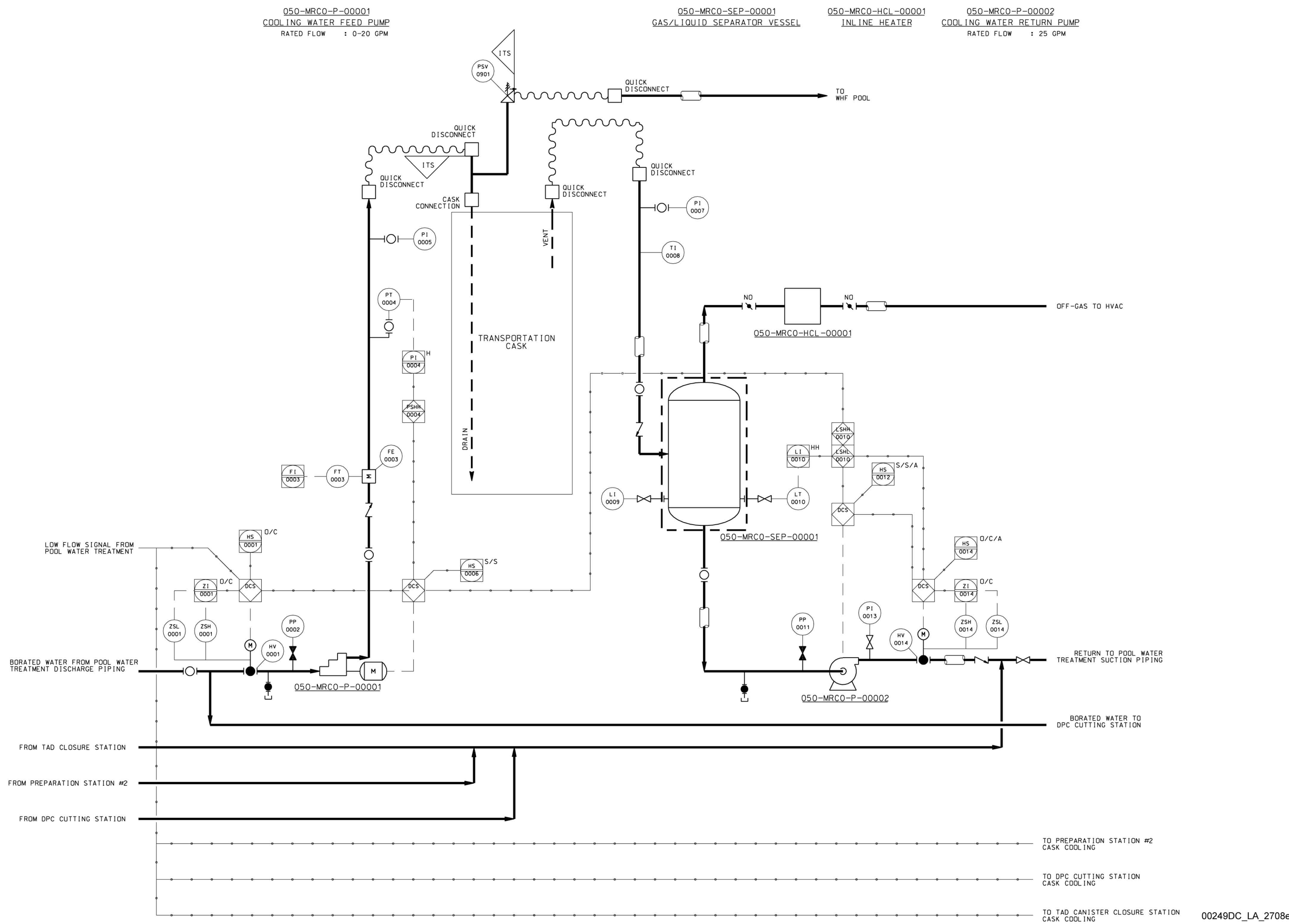

NOTE: An ITS pressure relief valve will be provided on an ITS pipe assembly that connects directly to the cask connection. This ITS pressure relief valve is provided to protect against the potential for cask failure due to overpressure. Discharge from the pressure relief valve as a result of an overpressurization event will be routed to the WHF pool. All other SSCs shown on this figure are non-ITS and non-ITWI.

Figure 1.2.5-69. WHF Preparation Station 1 Cask Cooling System Piping and Instrumentation Diagram

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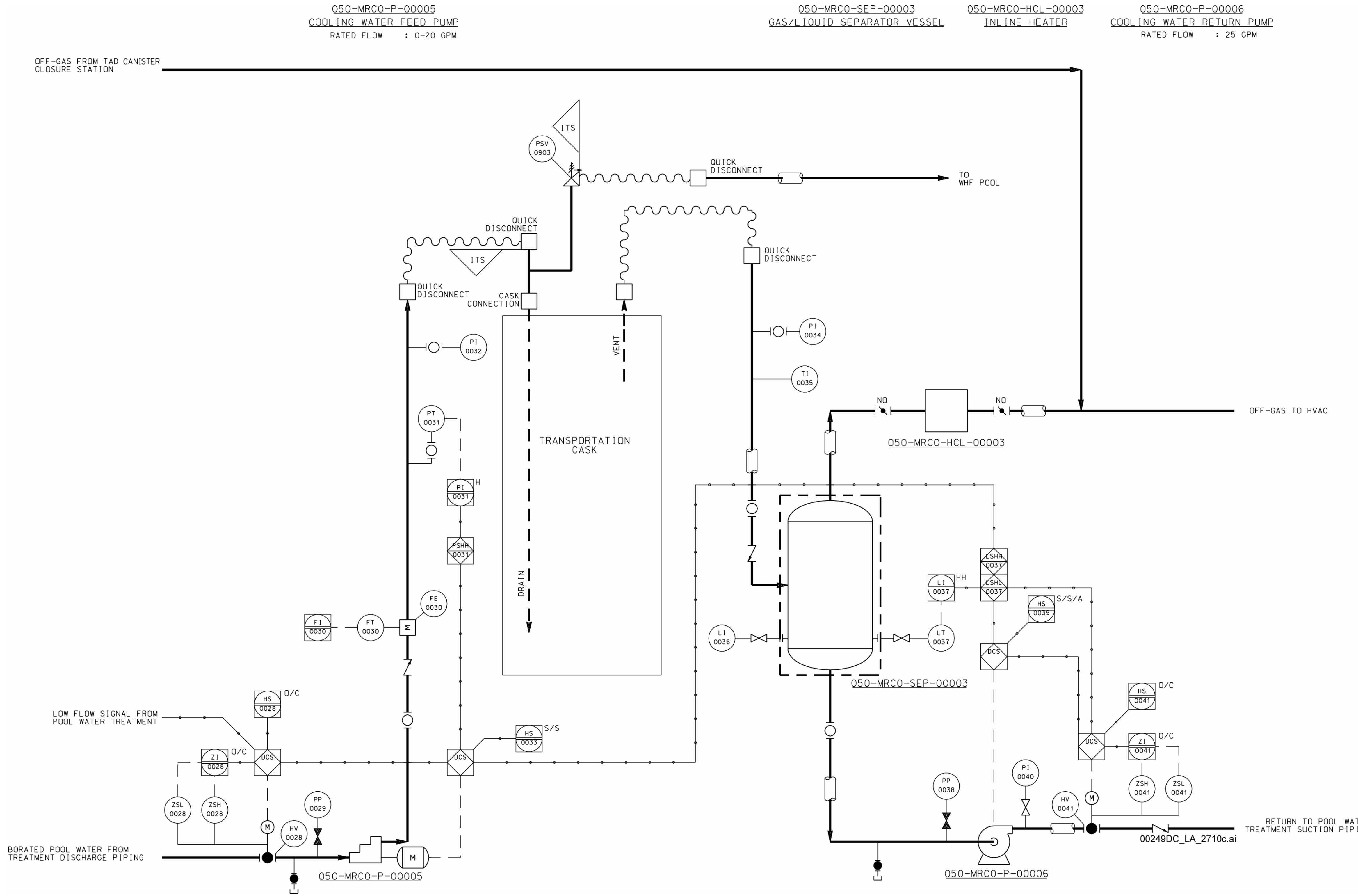

NOTE: An ITS pressure relief valve will be provided on an ITS pipe assembly that connects directly to the cask connection. This ITS pressure relief valve is provided to protect against the potential for cask failure due to overpressure. Discharge from the pressure relief valve as a result of an overpressurization event will be routed to the WHF pool. All other SSCs shown on this figure are non-ITS and non-ITWI.

Figure 1.2.5-70. WHF Preparation Station 2 Cask Cooling System Piping and Instrumentation Diagram

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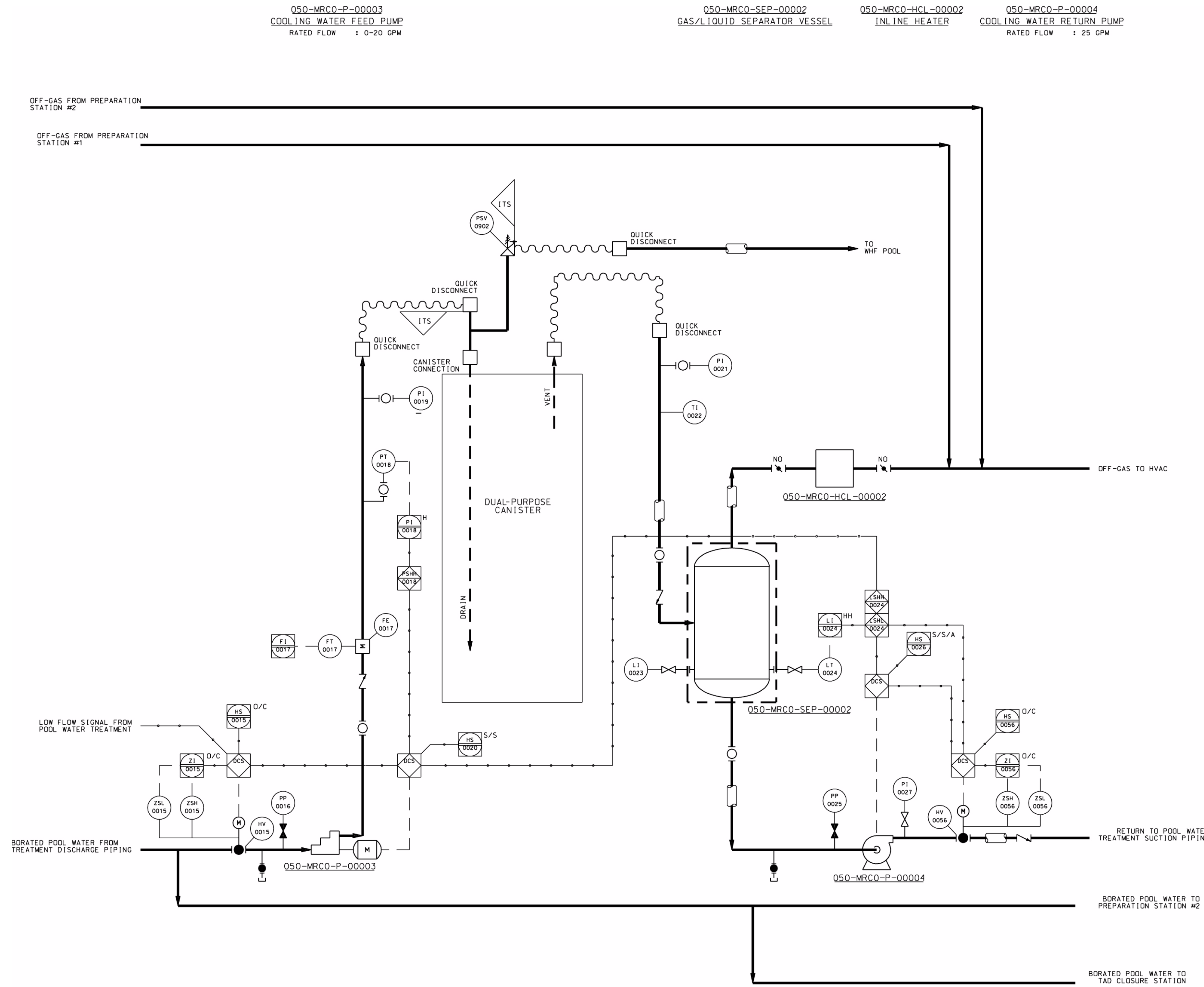

NOTE: An ITS pressure relief valve will be provided on an ITS pipe assembly that connects directly to the cask connection. This ITS pressure relief valve is provided to protect against the potential for cask failure due to overpressure. Discharge from the pressure relief valve as a result of an overpressurization event will be routed to the WHF pool. All other SSCs shown on this figure are non-ITS and non-ITWI.

Figure 1.2.5-71. WHF Dual-Purpose Canister Cutting Station Cask Cooling System Piping and Instrumentation Diagram

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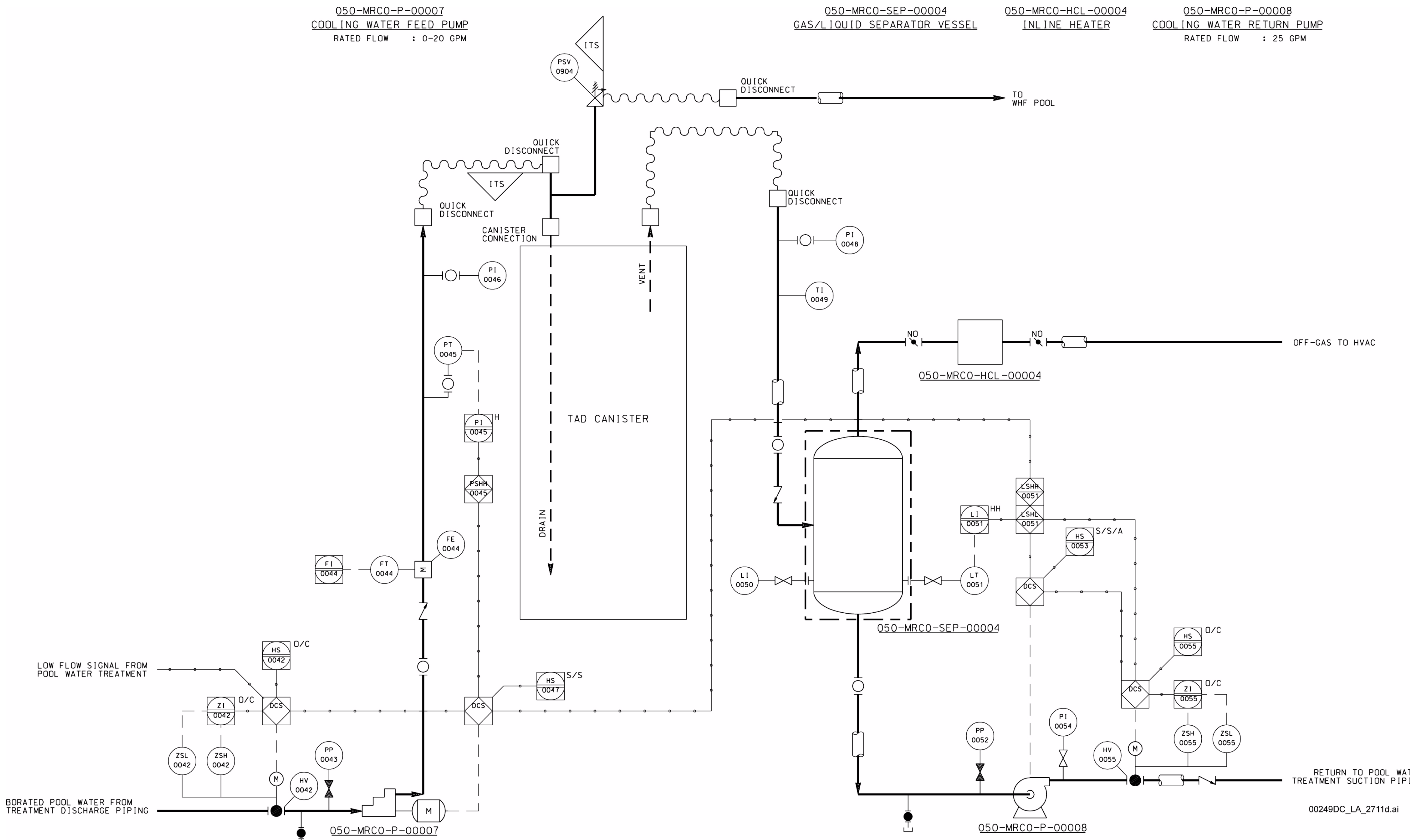

NOTE: An ITS pressure relief valve will be provided on an ITS pipe assembly that connects directly to the cask connection. This ITS pressure relief valve is provided to protect against the potential for cask failure due to overpressure. Discharge from the pressure relief valve as a result of an overpressurization event will be routed to the WHF pool. All other SSCs shown on this figure are non-ITS and non-ITWI.

Figure 1.2.5-72. WHF TAD Canister Closure Station Cask Cooling System Piping and Instrumentation Diagram

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VALVE POSITION TABLE

OPERATION MODE	VALVE POSITIONS									
	MRGO-HE (VENT)				MRGO-XFD (DRAIN)					
	V-00001	V-00002	V-00003	V-00004	V-00001	V-00002	V-00003	V-00004	V-00005	V-00006
DRAINING	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	CLOSED	OPEN
DRYING	CLOSED	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
VENT	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
EVACUATION	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
BACKFILL	OPEN	CLOSED	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
STANDBY	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED

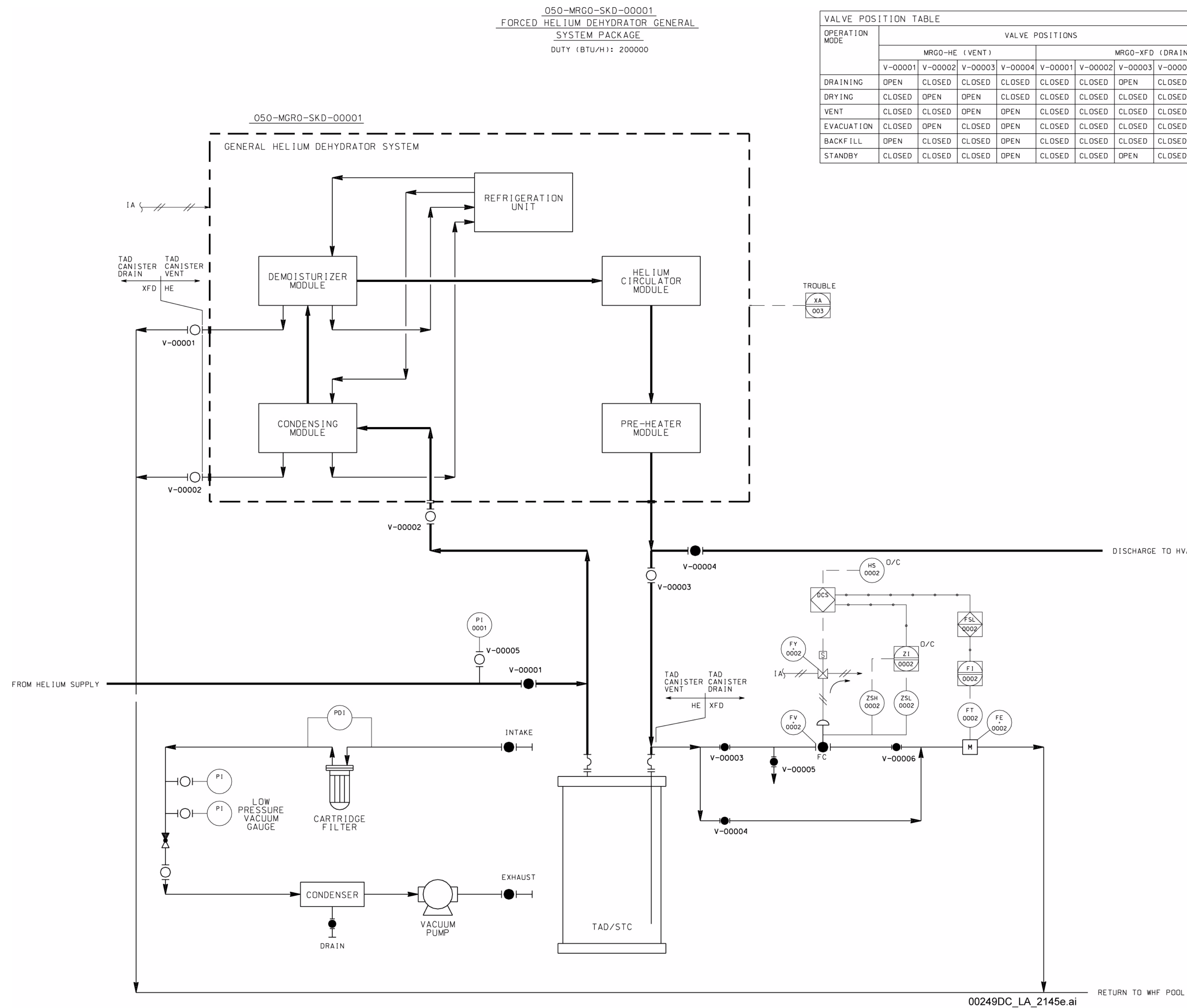

Figure 1.2.5-73. WHF TAD Canister and Shielded Transfer Cask Drying and TAD Canister Inerting Piping and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.
STC = shielded transfer cask.

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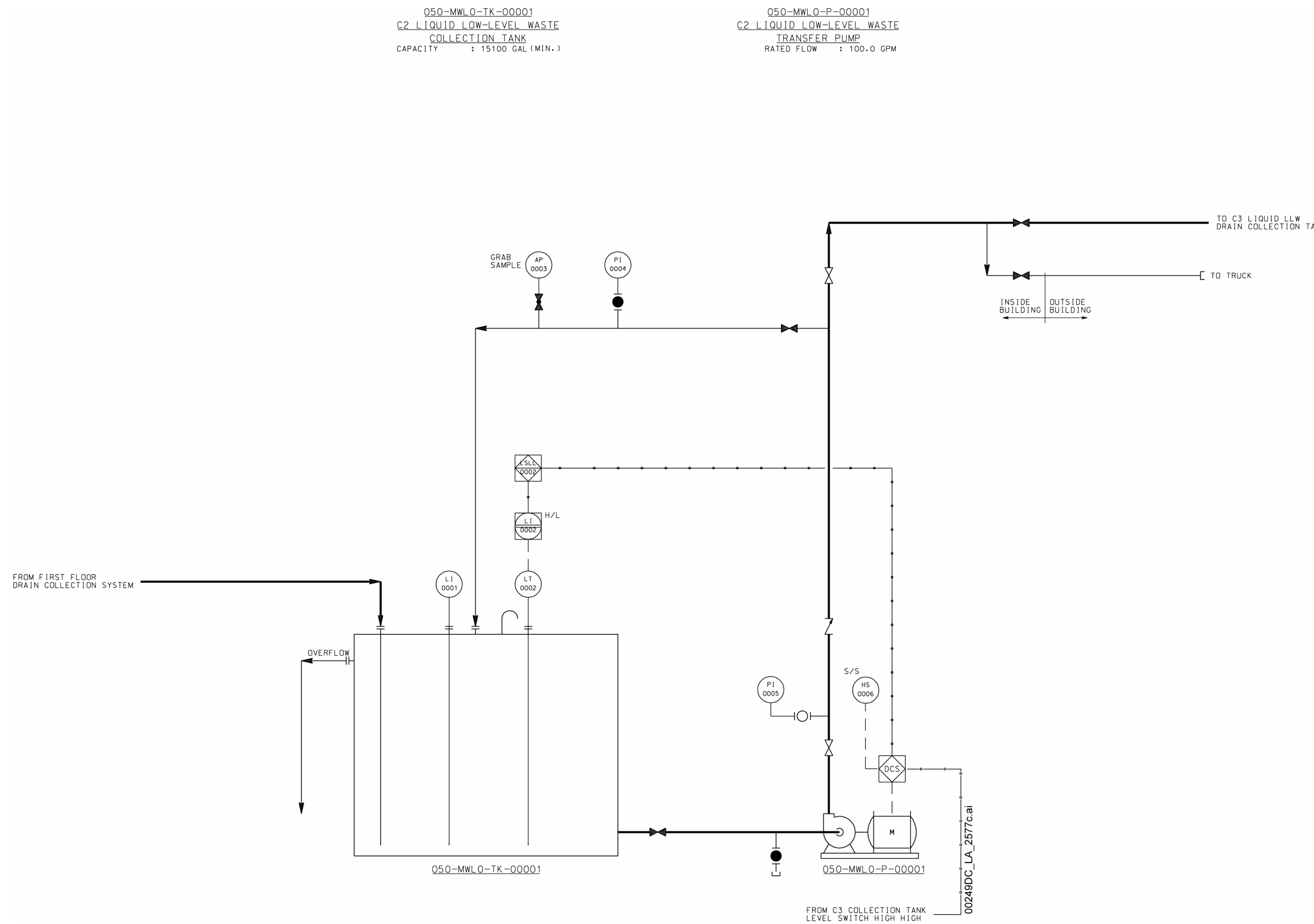

NOTE: This figure includes no SSCs that are either ITS or ITWI.
LLW = low-level radioactive waste.

Figure 1.2.5-74. WHF C2 Liquid Low-Level Radioactive Waste Collection System Piping and Instrumentation Diagram (Sheet 1 of 2)

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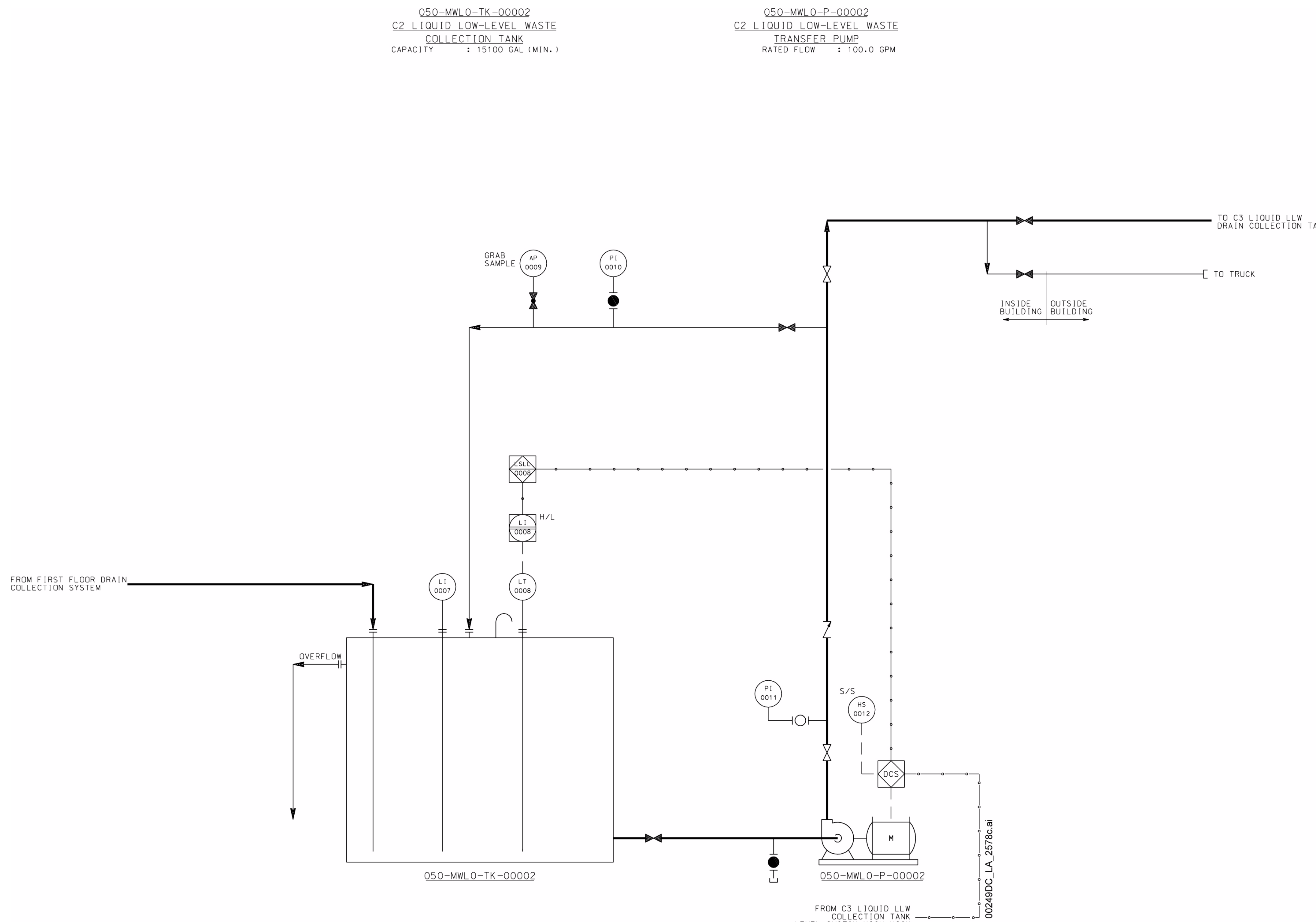

NOTE: This figure includes no SSCs that are either ITS or ITWI.
LLW = low-level radioactive waste.

Figure 1.2.5-74. WHF C2 Liquid Low-Level Radioactive Waste Collection System Piping and Instrumentation Diagram (Sheet 2 of 2)

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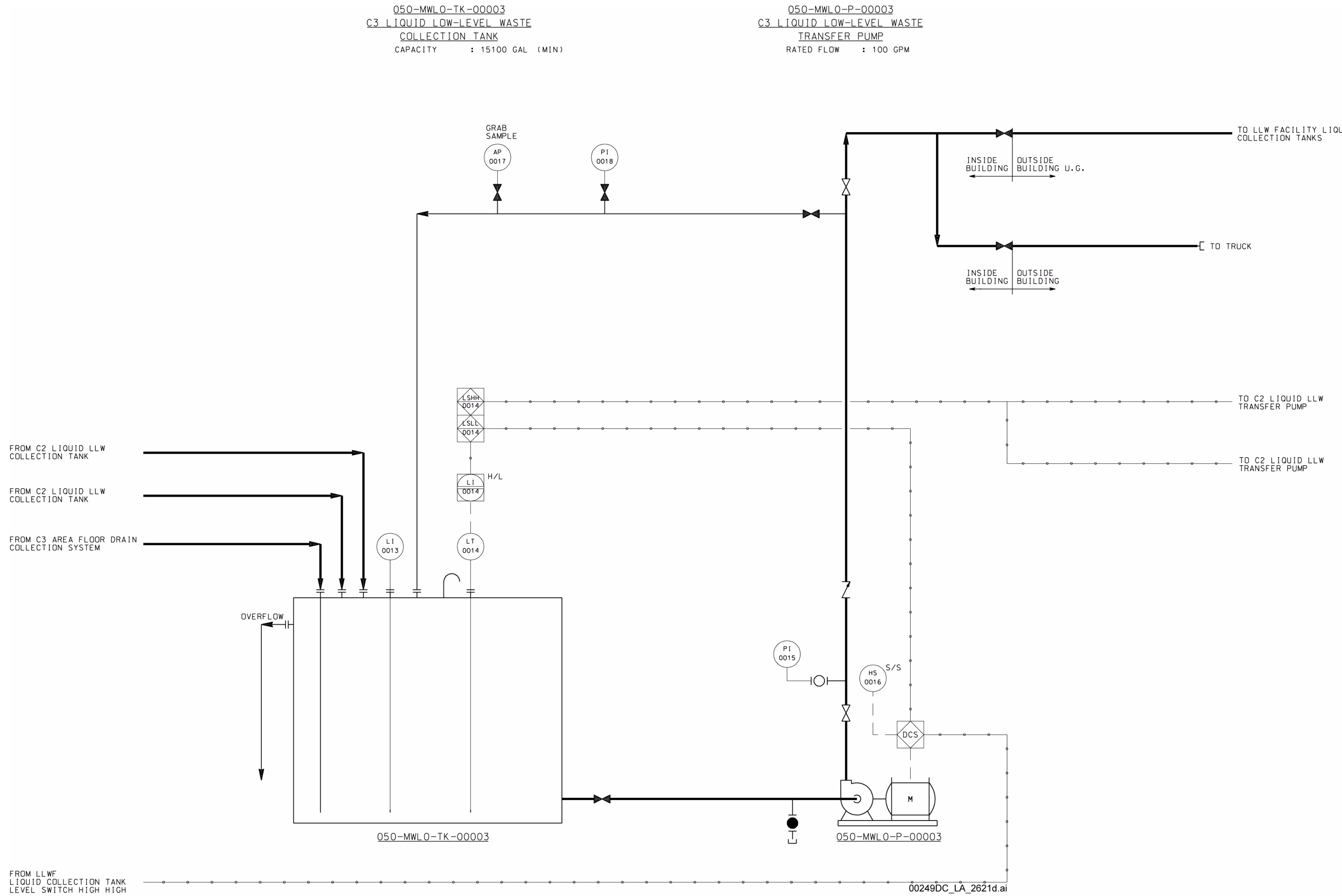

Figure 1.2.5-75. WHF C3 Liquid Low-Level Radioactive Waste Collection System Piping and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.
LLW = low-level radioactive waste; LLWF = Low-Level Waste Facility.

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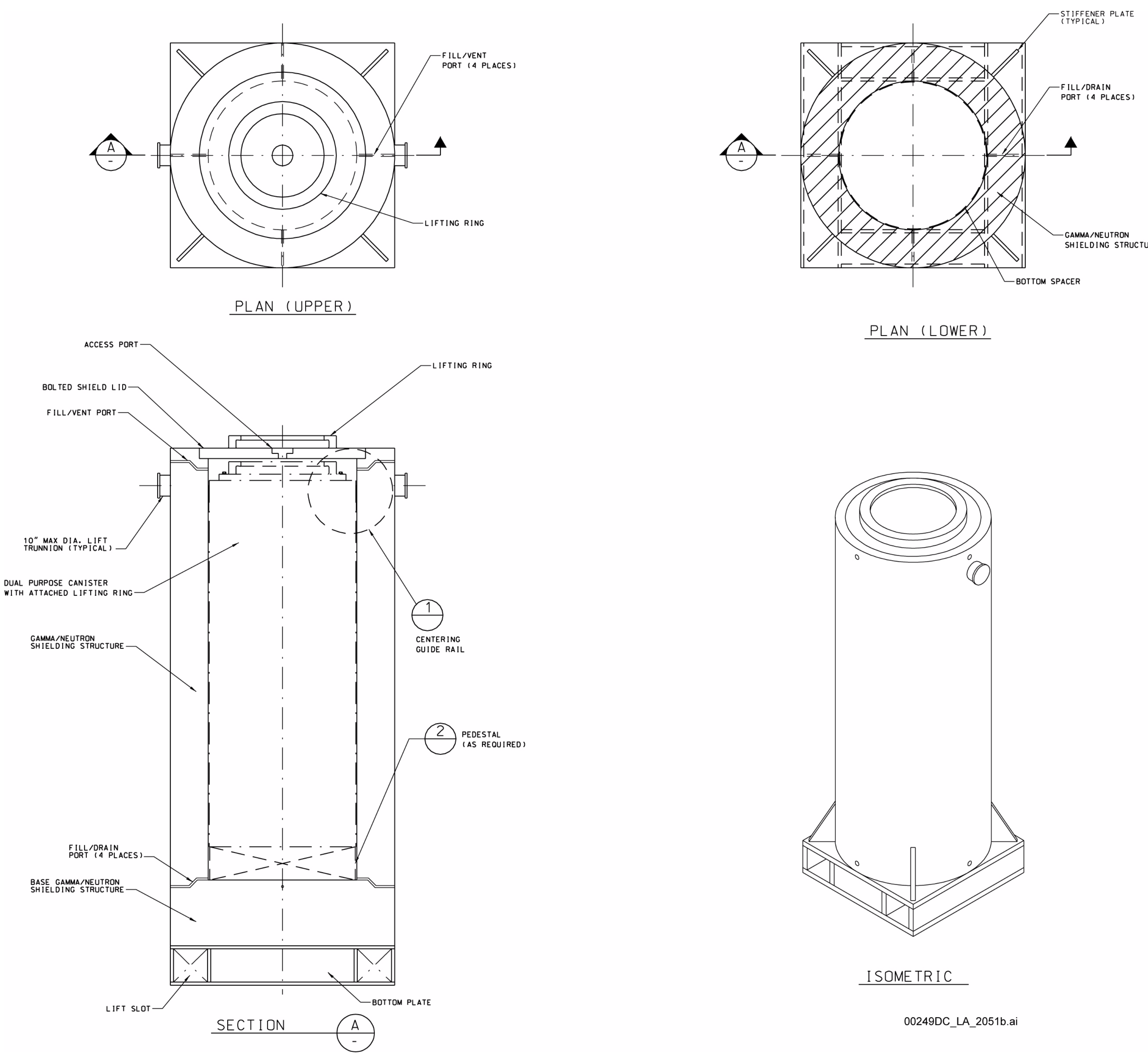

Figure 1.2.5-76. Vertical Dual-Purpose Canister Shielded Transfer Cask Mechanical Equipment Envelope (Sheet 1 of 2)

Equipment Number: 050-HT00-HEQ-00002, vertical DPC shielded transfer cask;
050-HM00-PED-00001/00002/00003/00004/000005, cask pedestal 1/2/3/4/5.

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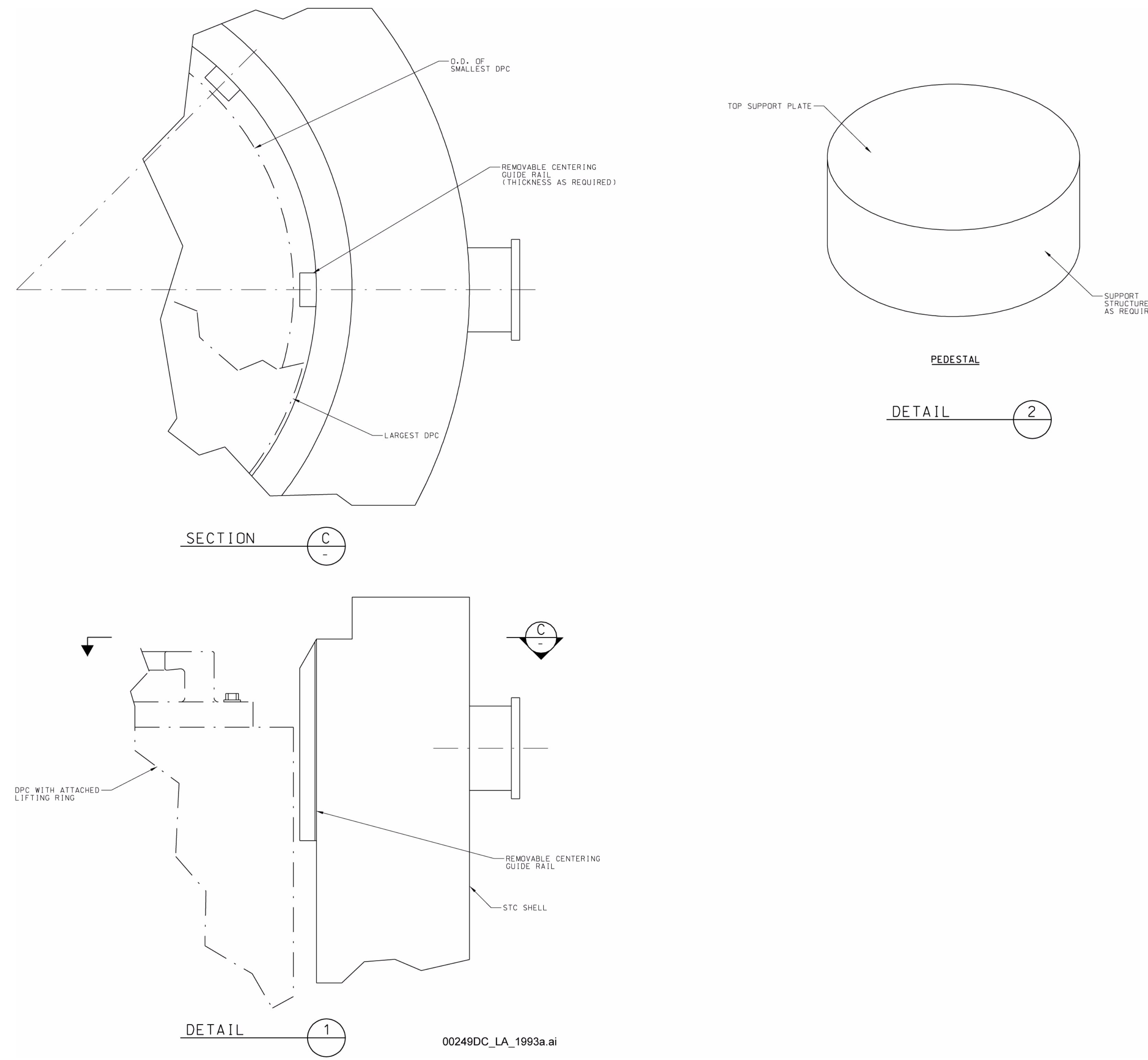

NOTE: STC = shielded transfer cask.

Equipment Number: 050-HT00-HEQ-00002, vertical DPC shielded transfer cask.

Figure 1.2.5-76. Vertical Dual-Purpose Canister Shielded Transfer Cask Mechanical Equipment Envelope (Sheet 2 of 2)

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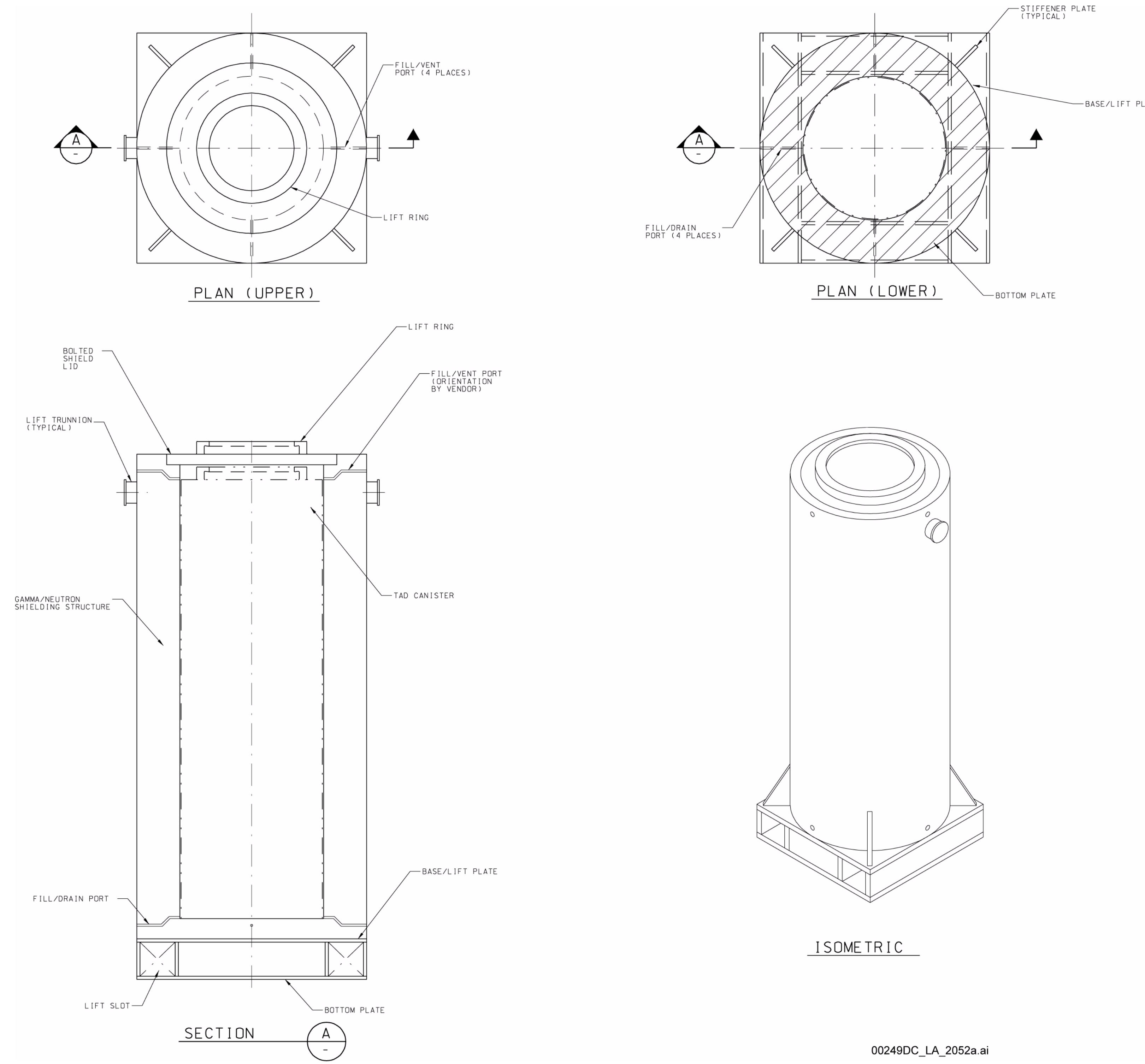

Equipment Number: 050-HT00-HEQ-00001, TAD shielded transfer cask.

Figure 1.2.5-77. TAD Shielded Transfer Cask Mechanical Equipment Envelope

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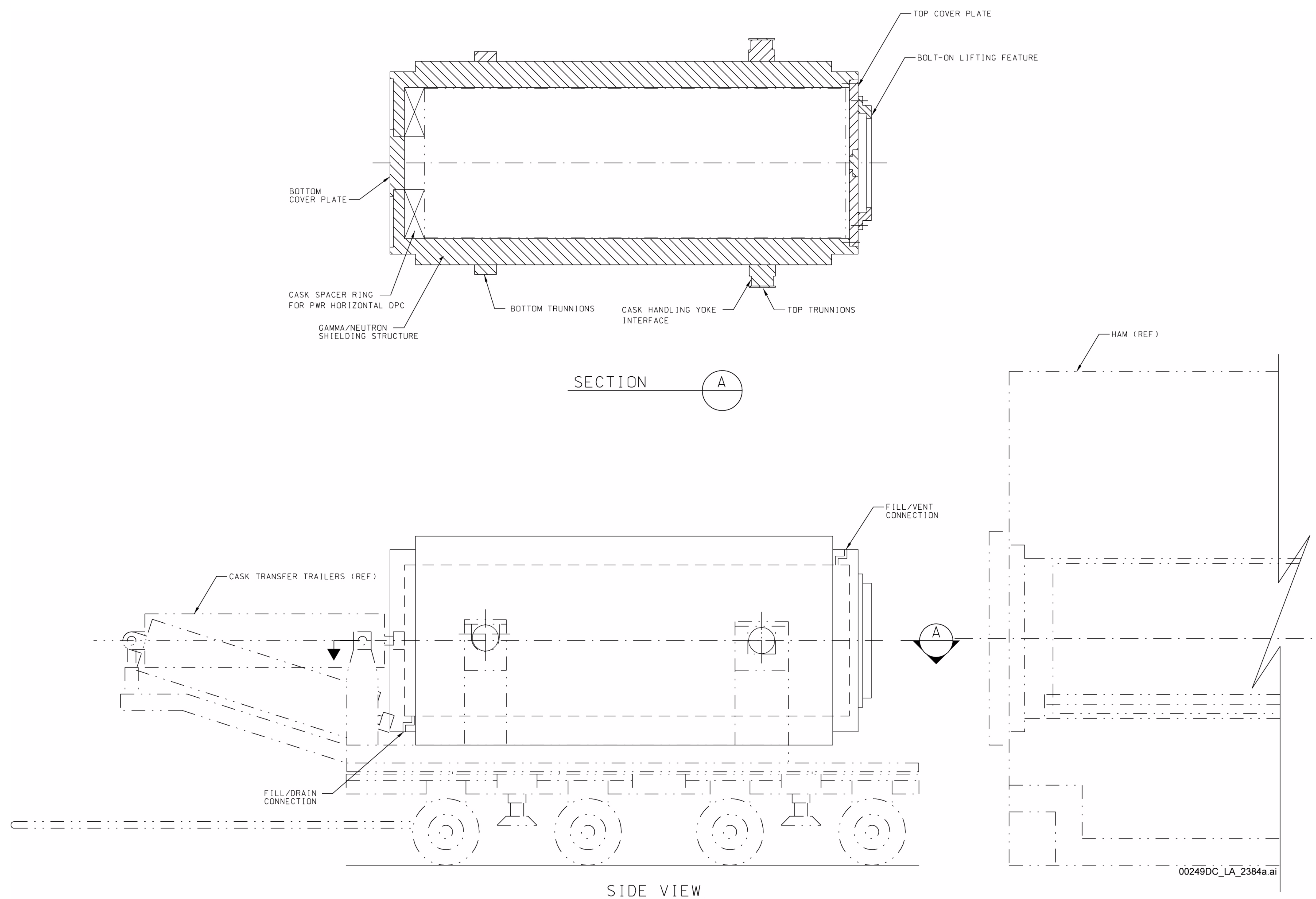

NOTE: HAM = horizontal aging module.

Equipment Number: 170-HAC0-HEQ-00001, horizontal shielded transfer cask.

Figure 1.2.5-78. Horizontal Shielded Transfer Cask 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-63.

Figure 1.2.5-79. WHF 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-64.

Figure 1.2.5-80. WHF Confinement Zoning Below 40′

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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-65.

Figure 1.2.5-81. WHF 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-66.

Figure 1.2.5-82. WHF Confinement Zoning Pool Plan at Elevation –52′–0″

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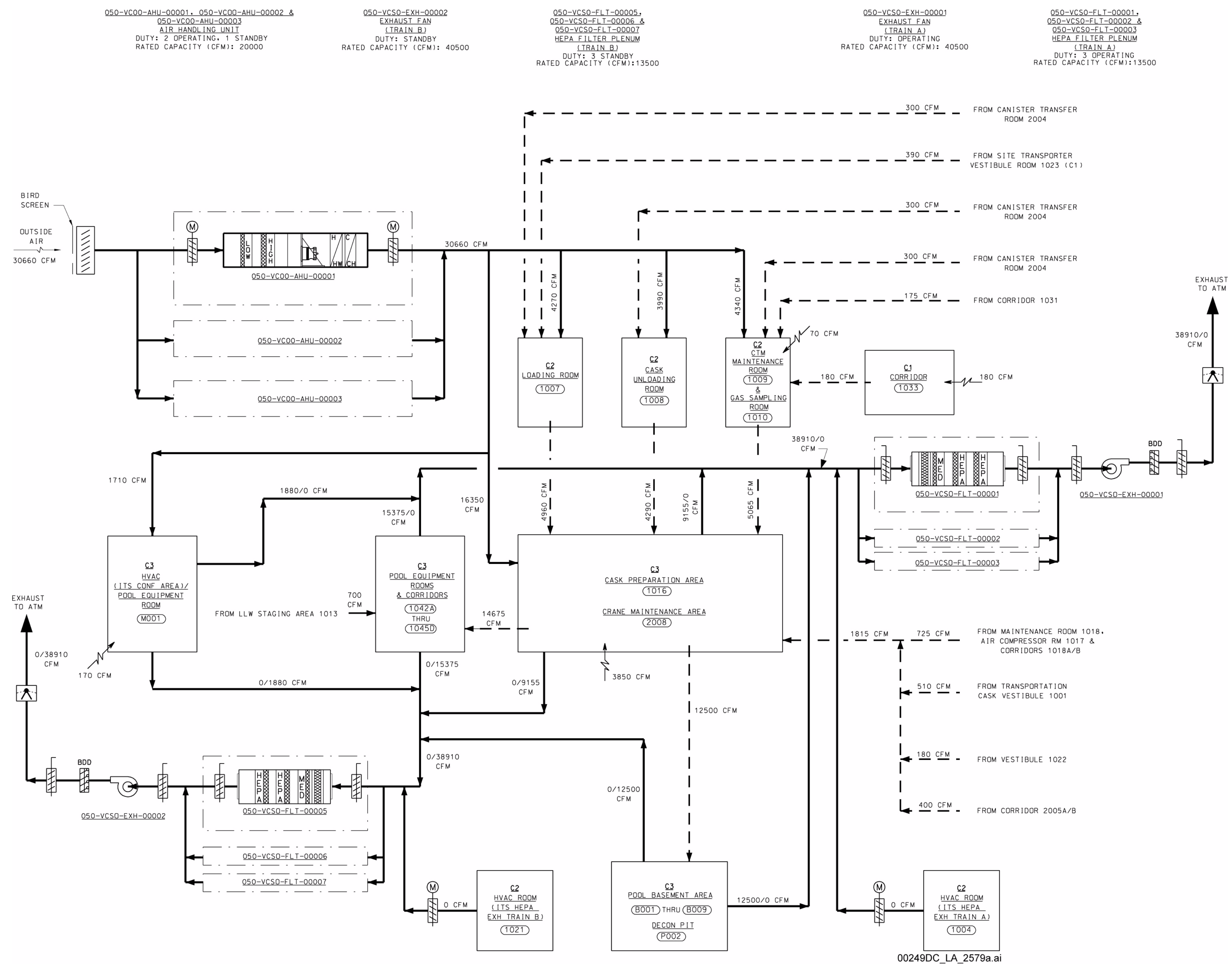

NOTE: The Train A and Train B exhaust equipment and ductwork are ITS. The supply side equipment and ductwork are non-ITS.
CTM = canister transfer machine; LLW = low-level radioactive waste.

Figure 1.2.5-83. WHF Composite Ventilation Flow Diagram HVAC Supply and ITS Exhaust

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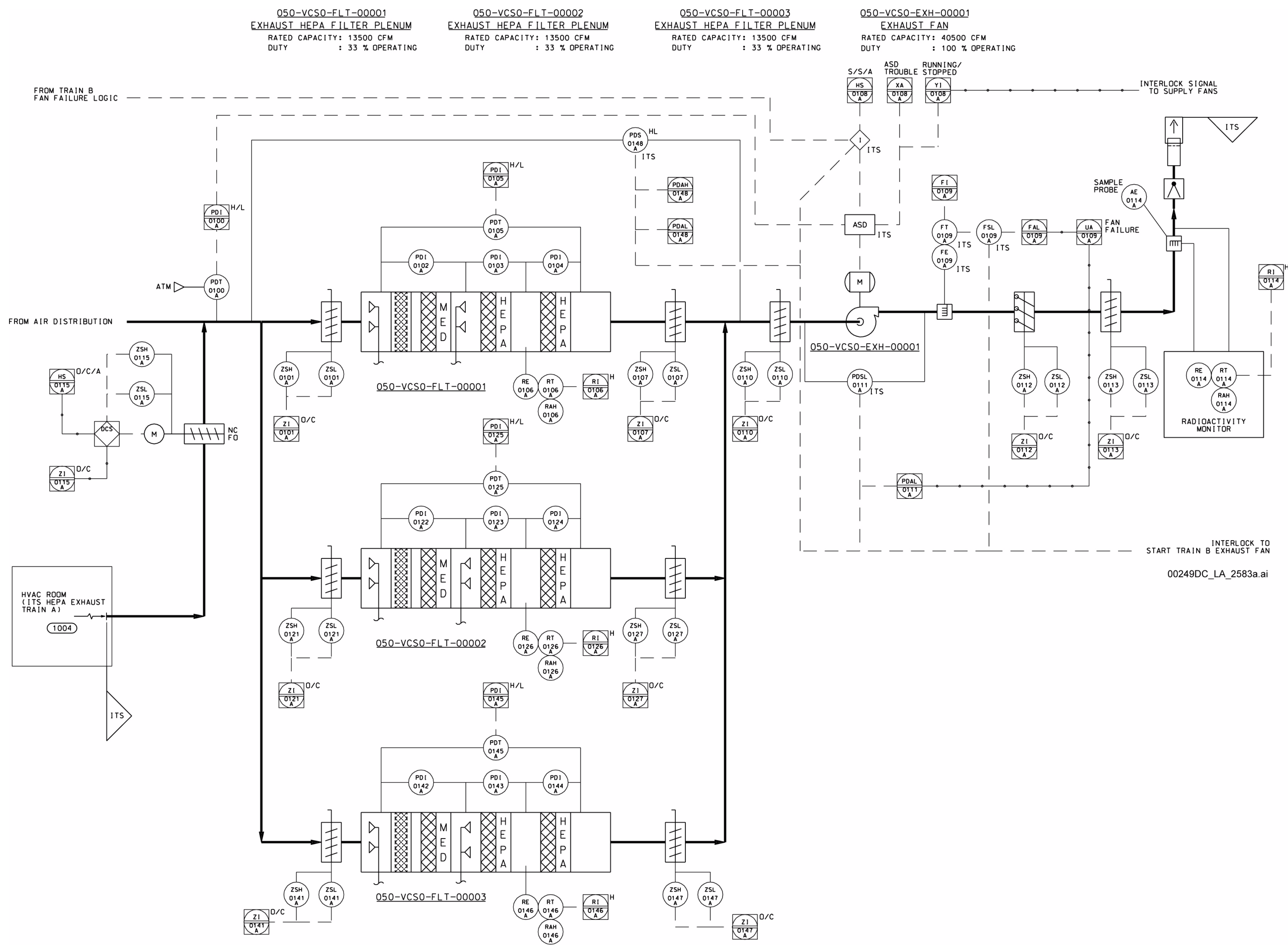

NOTE: An interlock is provided to shut down the operating fan and start the standby unit upon detection of high or low differential pressure across the HEPA filter train or upon detection of low differential pressure across the operating fan coincident with low flow. All HVAC equipment ductwork and duct-mounted accessories shown are ITS. The ITS controls are identified by the letters "ITS." ASD = adjustable speed drive.

Figure 1.2.5-84. WHF ITS Confinement Areas HEPA Exhaust System—Train A Ventilation and Instrumentation Diagram

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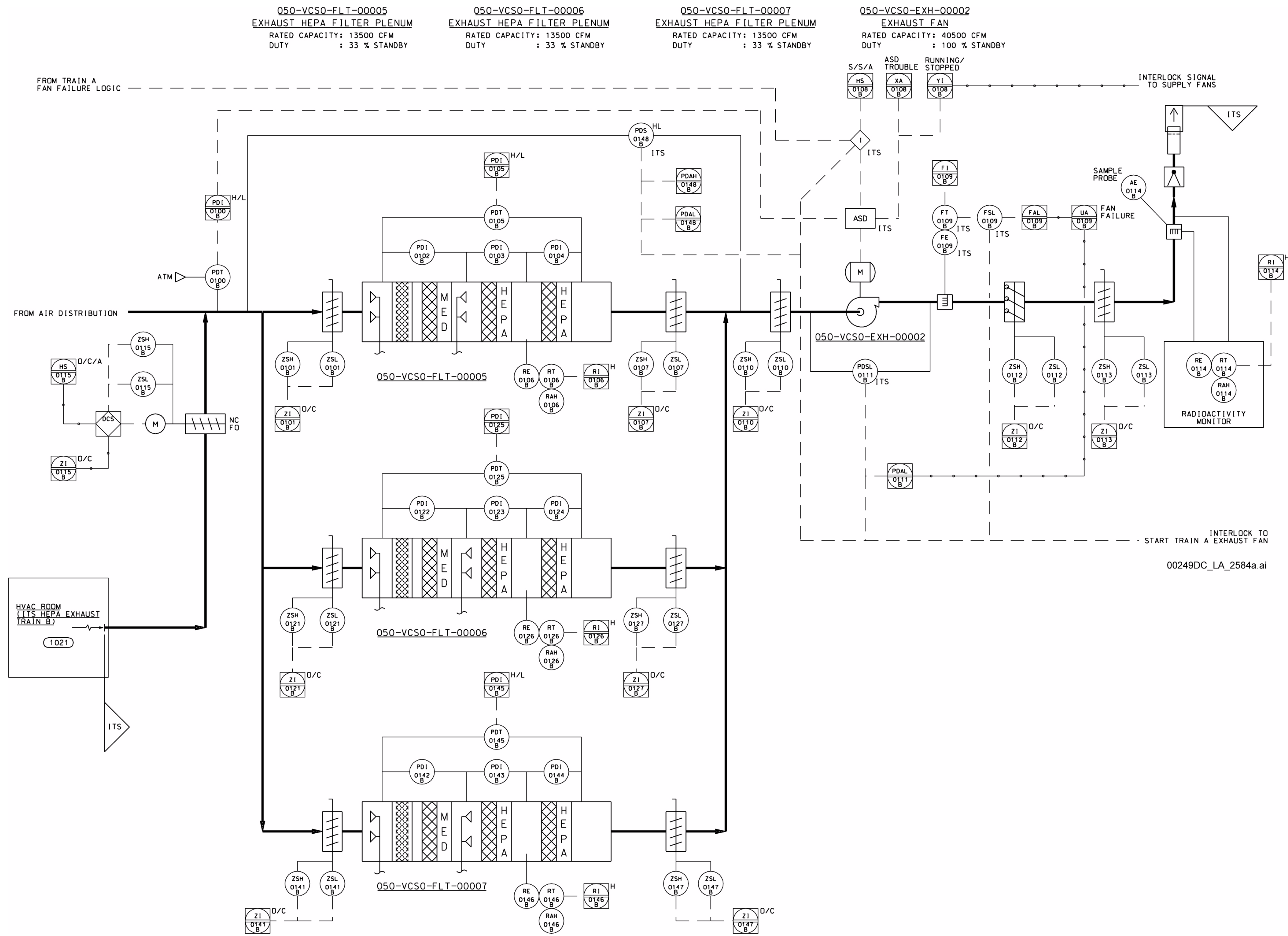

NOTE: An interlock is provided to shut down the operating fan and start the standby unit upon detection of high or low differential pressure across the HEPA filter train or upon detection of low differential pressure across the operating fan coincident with low flow. All HVAC equipment ductwork and duct-mounted accessories shown are ITS. The ITS controls are identified by the letters "ITS." ASD = adjustable speed drive.

Figure 1.2.5-85. WHF ITS Confinement Areas HEPA Exhaust System—Train B Ventilation and Instrumentation Diagram

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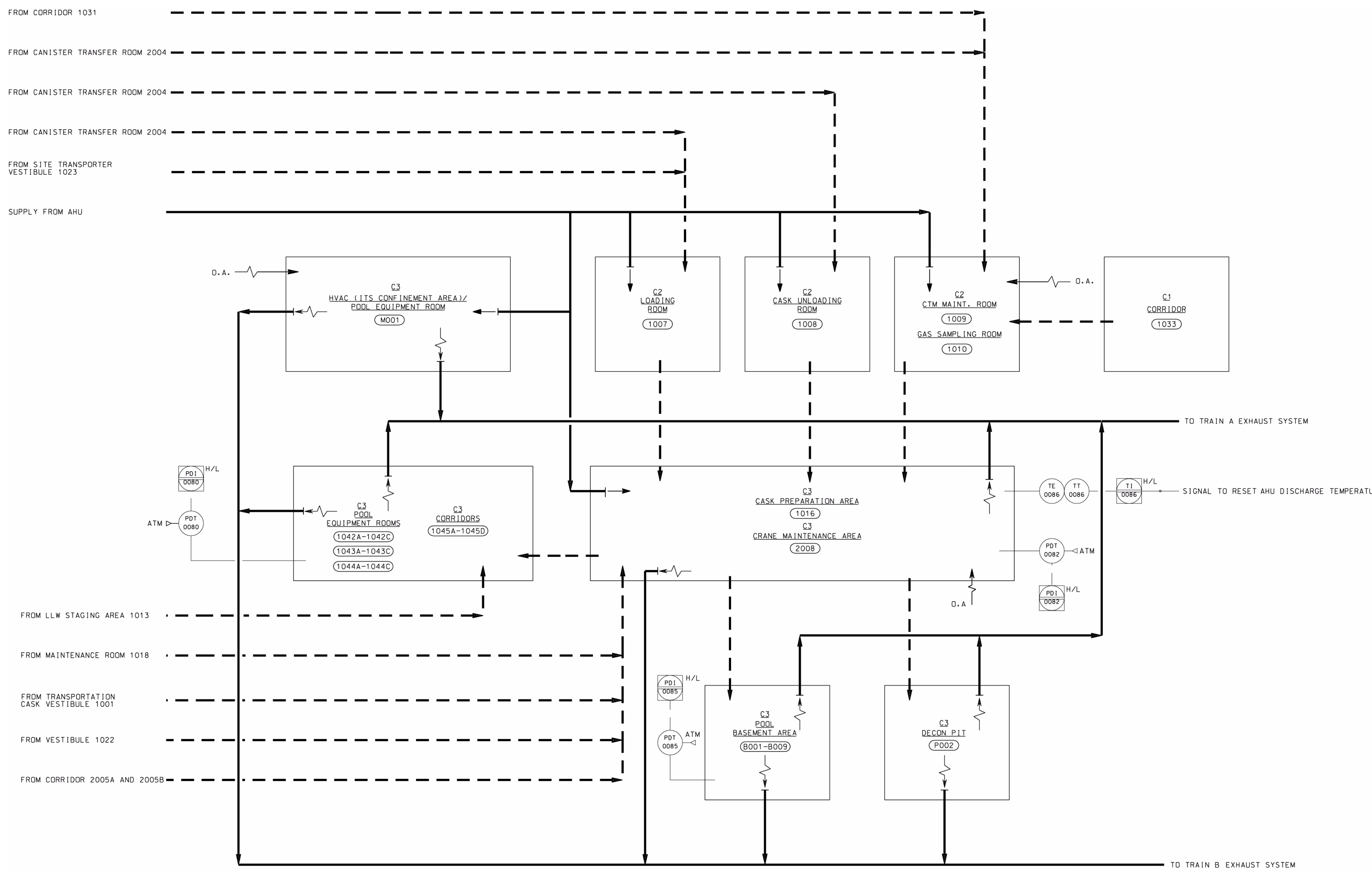

NOTE: AHU = air handling unit; CTM = canister transfer machine; LLW = low-level radioactive waste.

Figure 1.2.5-86. WHF ITS Confinement Areas Air Distribution System Ventilation and Instrumentation Diagram

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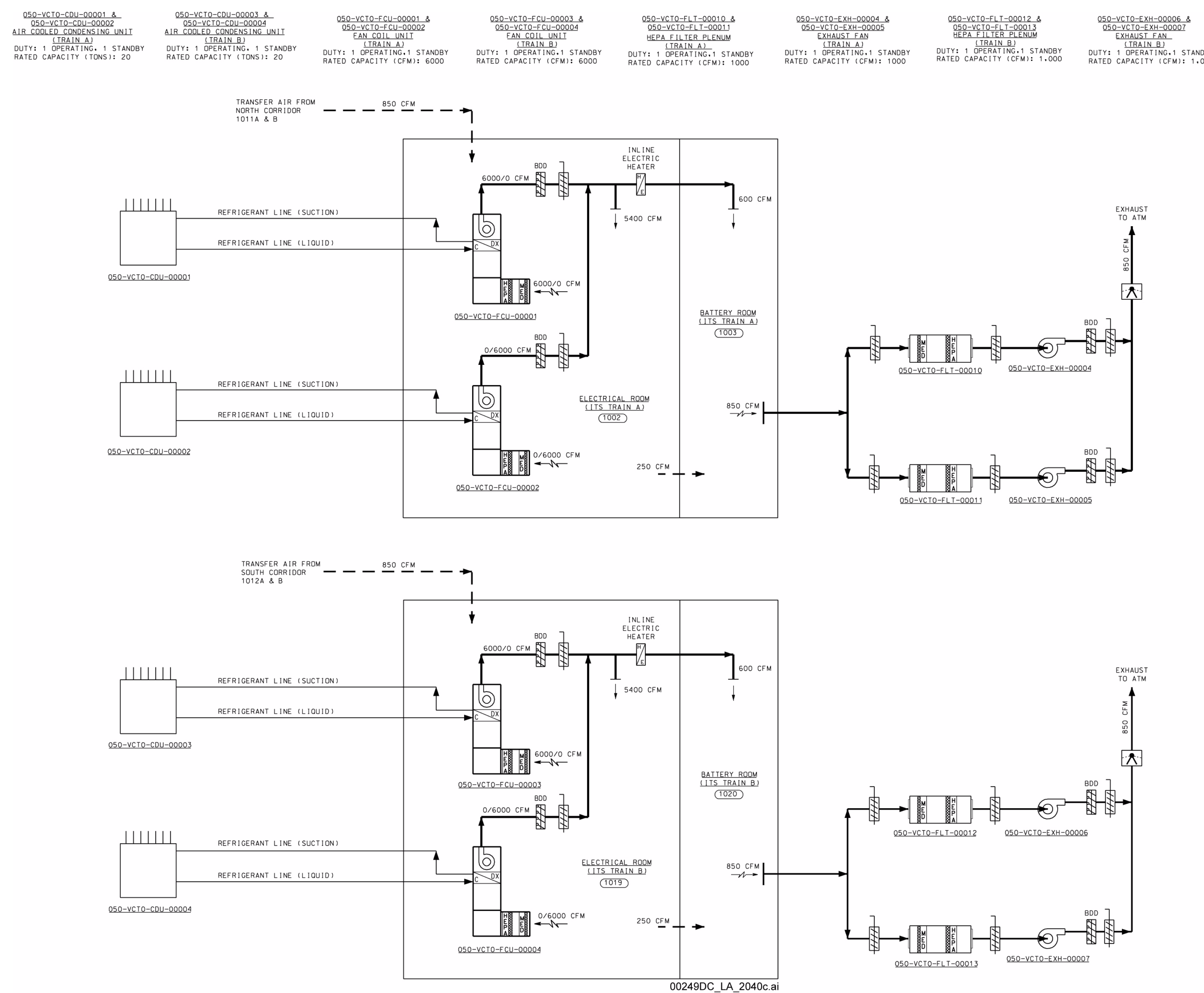

Figure 1.2.5-87. WHF Composite Ventilation Flow Diagram ITS HVAC Electrical and Battery Rooms

NOTE: All HVAC equipment, ductwork, and duct-mounted accessories shown are ITS.

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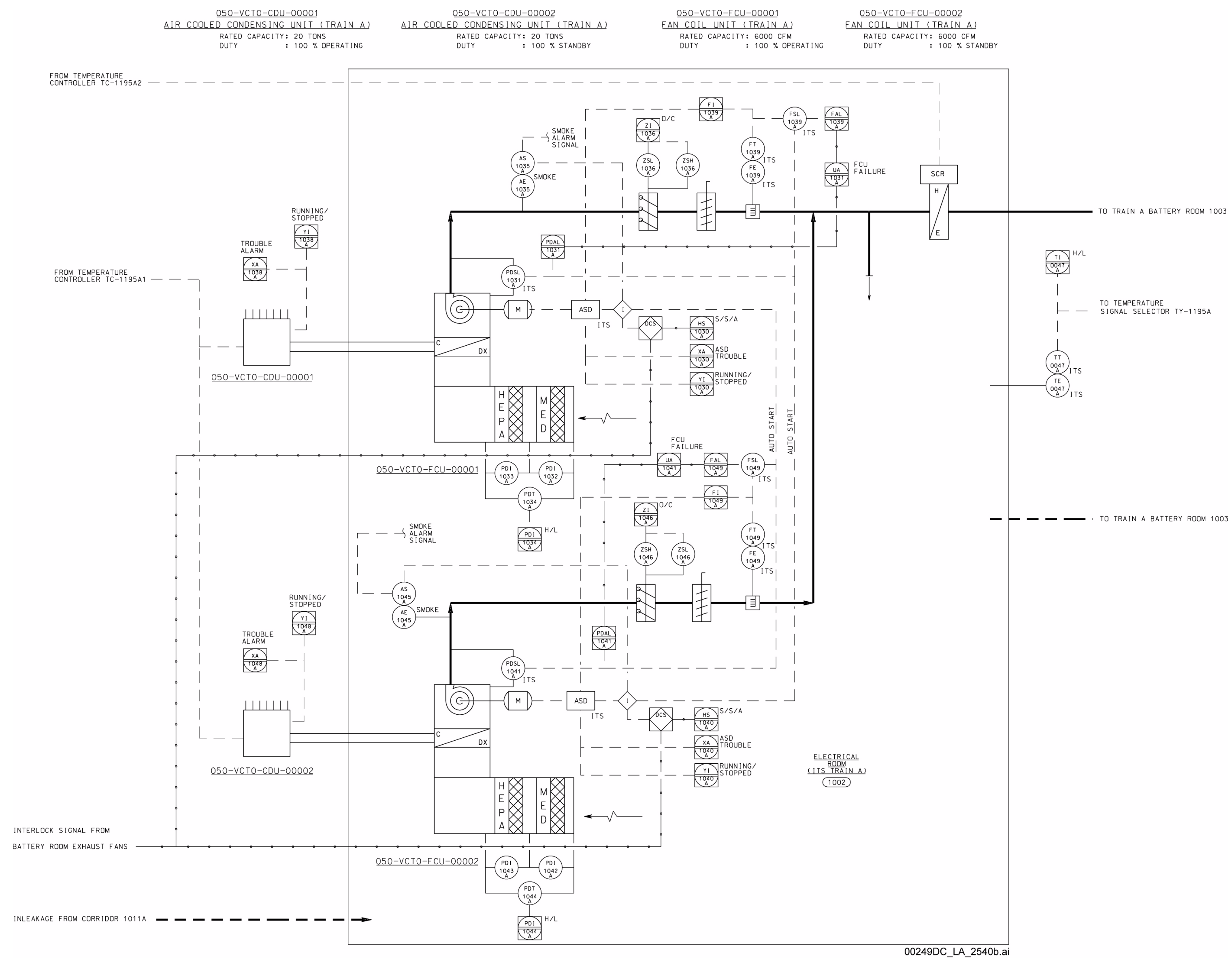

NOTE: All HVAC equipment ductwork and duct-mounted accessories shown are ITS. The ITS instrumentation and control devices are identified by the letters “ITS” outside the instrument circle or device symbol.
ASD = adjustable speed drive; FCU = fan coil unit.

Figure 1.2.5-88. WHF Confinement ITS Electrical Room HVAC System—Train A Ventilation and Instrumentation Diagram

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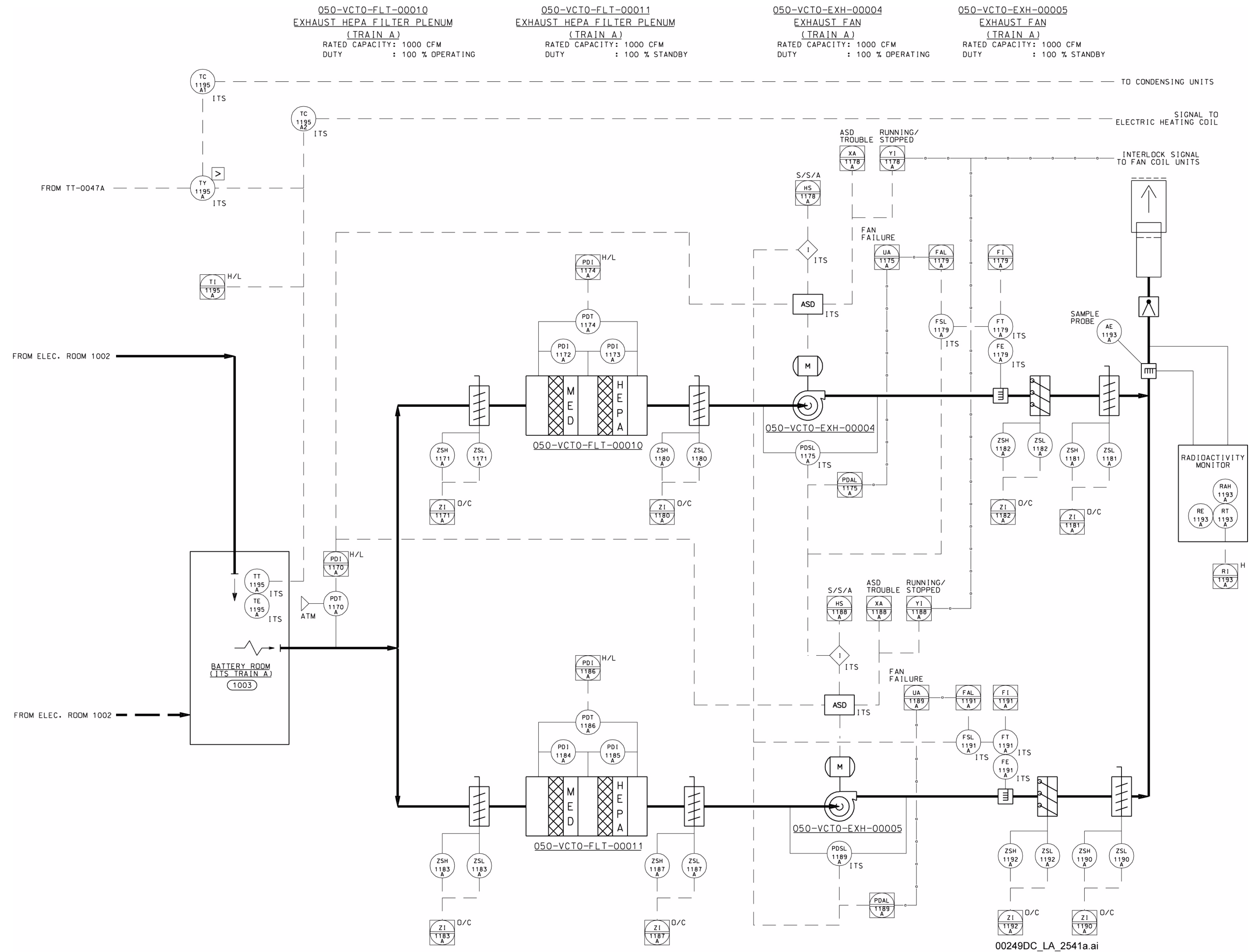

NOTE: All HVAC equipment ductwork and duct-mounted accessories shown are ITS. The ITS instrumentation and control devices are identified by the letters "ITS" outside the instrument circle or device symbol.
ASD = adjustable speed drive.

Figure 1.2.5-89. WHF Confinement ITS Battery Room Exhaust System—Train A Ventilation and Instrumentation Diagram

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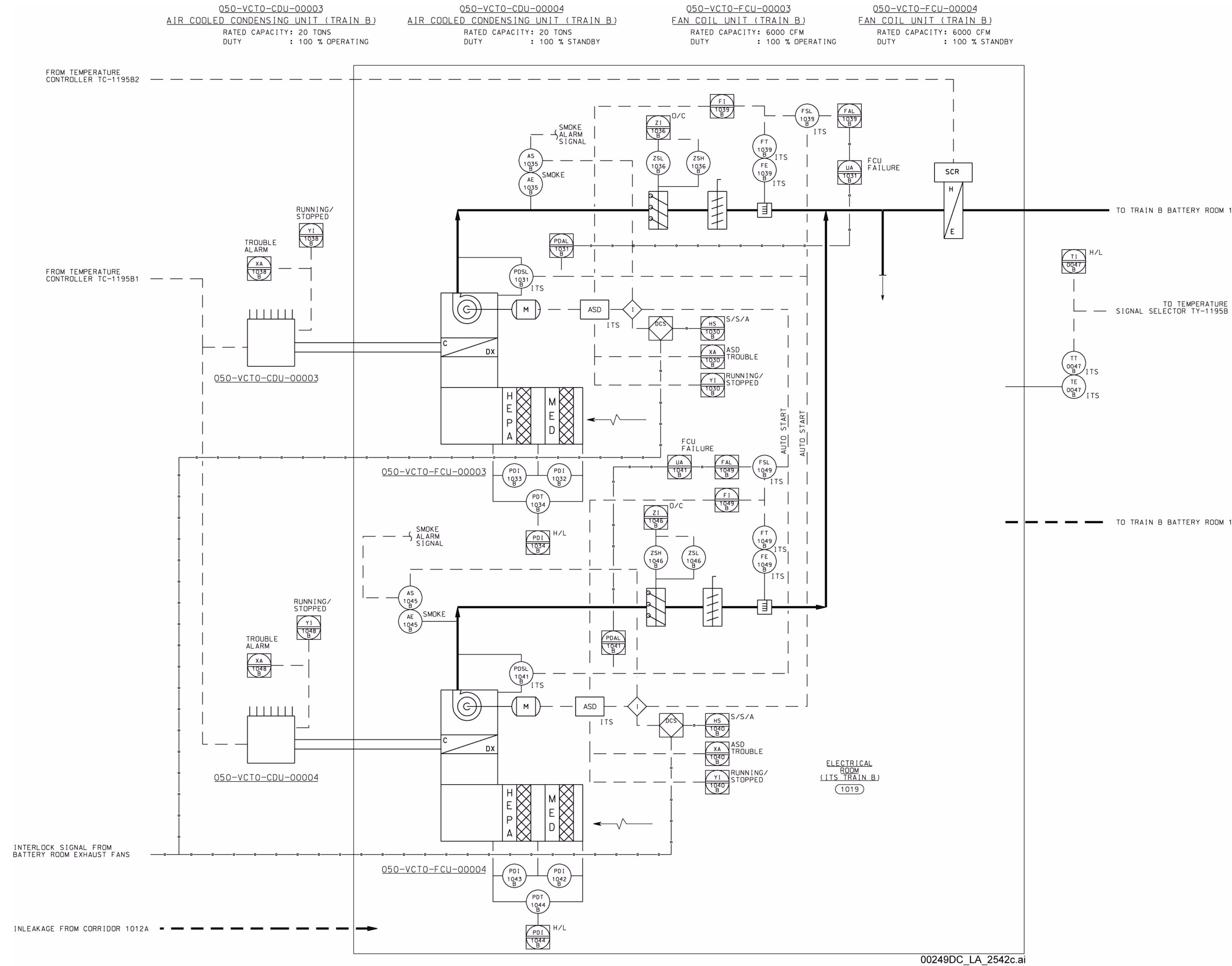

NOTE: All HVAC equipment ductwork and duct-mounted accessories shown are ITS. The ITS instrumentation and control devices are identified by the letters “ITS” outside the instrument circle or device symbol.
ASD = adjustable speed drive; FCU = fan coil unit.

Figure 1.2.5-90. WHF Confinement ITS Electrical Room HVAC System—Train B Ventilation and Instrumentation Diagram

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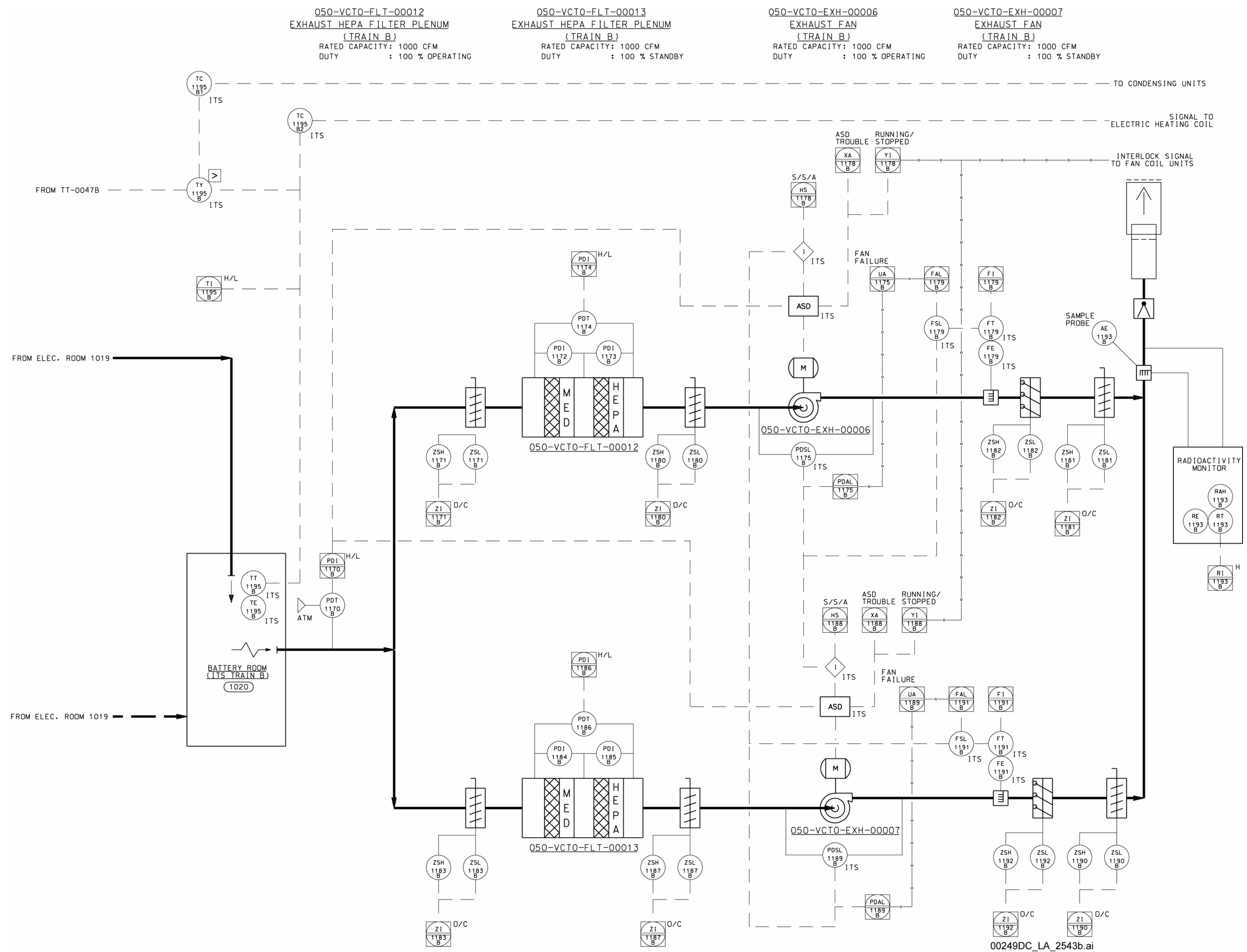

NOTE: All HVAC equipment ductwork and duct-mounted accessories shown are ITS. The ITS instrumentation and control devices are identified by the letters "ITS" outside the instrument circle or device symbol.
ASD = adjustable speed drive.

Figure 1.2.5-91. WHF Confinement ITS Battery Room Exhaust System—Train B Ventilation and Instrumentation Diagram

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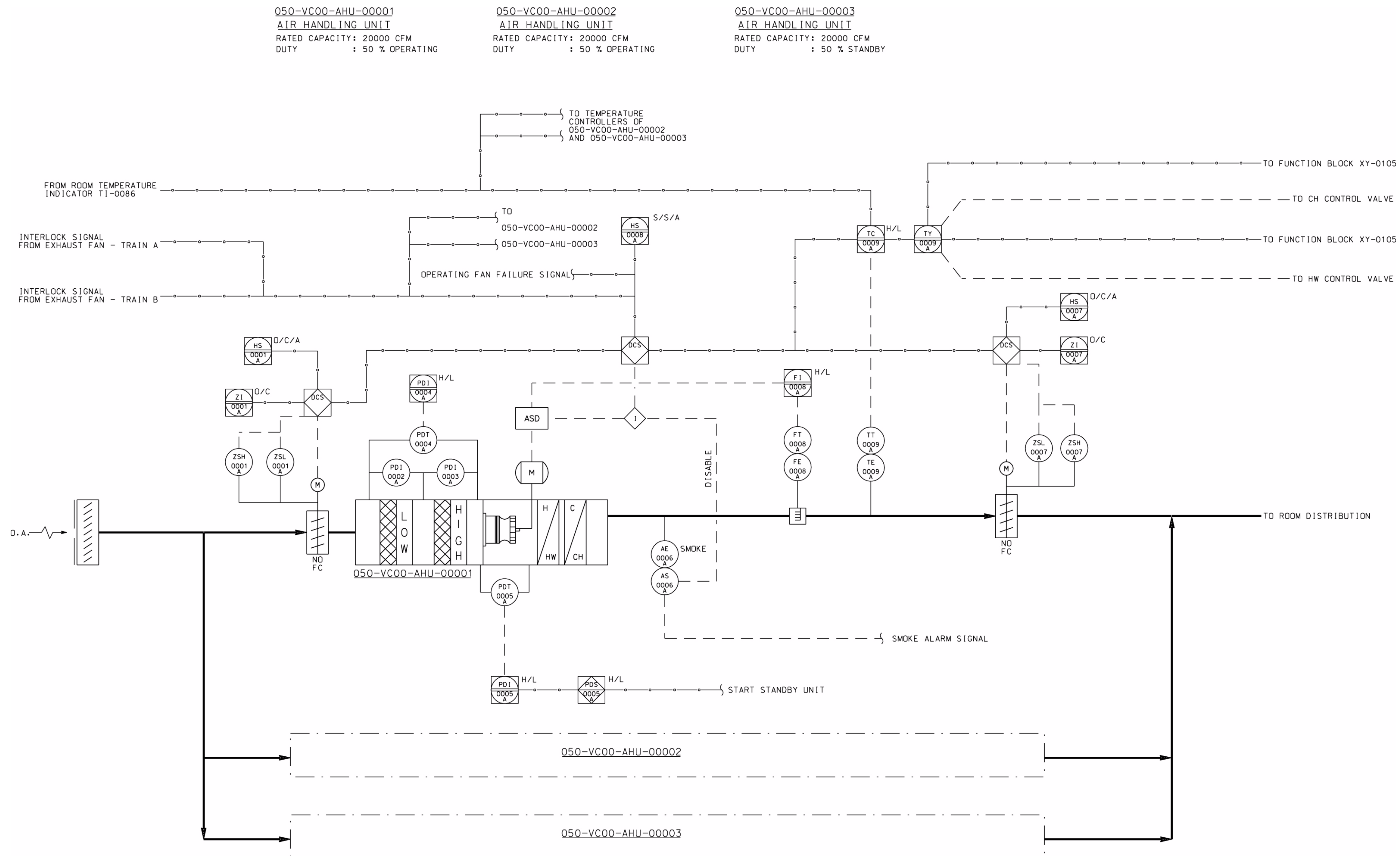

TABLE 1:

MECHANICAL COMPONENT	AIR HANDLING UNIT					INLET DAMPER				OUTLET DAMPER				SMOKE		FLOW			TEMPERATURE				FAN DP		
AIR HANDLING UNIT	HS	PDI	PDI	PDT	PDI	HS	ZI	ZSL	ZSH	HS	ZI	ZSL	ZSH	AE	AS	FE	FT	FI	TE	TT	TC	TY	PDT	PDI	PDS
050-VC00-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
050-VC00-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
050-VC00-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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Figure 1.2.5-92. WHF Non-ITS Confinement Areas HVAC Supply System Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.
CH = chilled water; HW = hot water.

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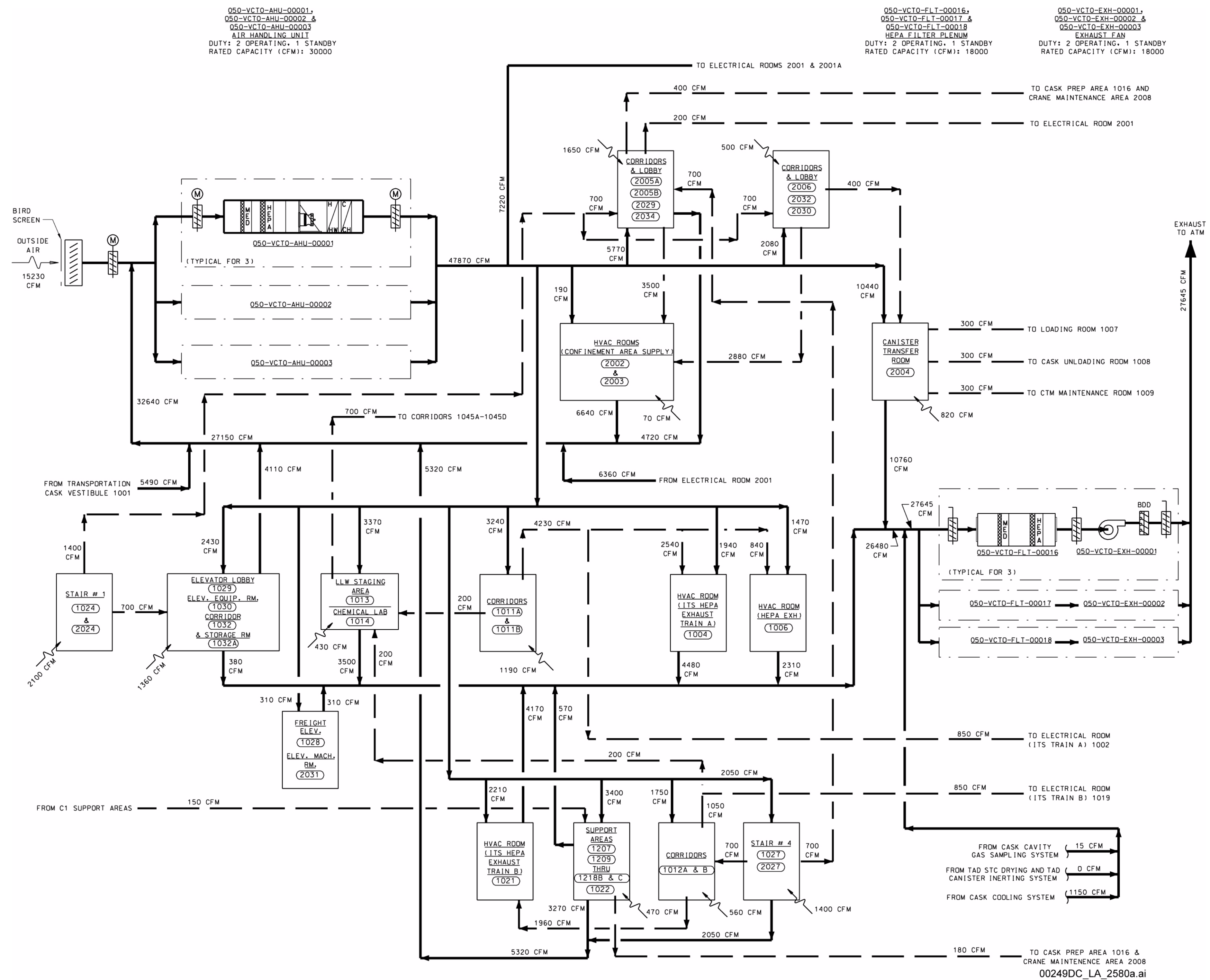

Figure 1.2.5-93. WHF Composite Ventilation Flow Diagram Tertiary Confinement Non-ITS HVAC Supply and Exhaust System

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

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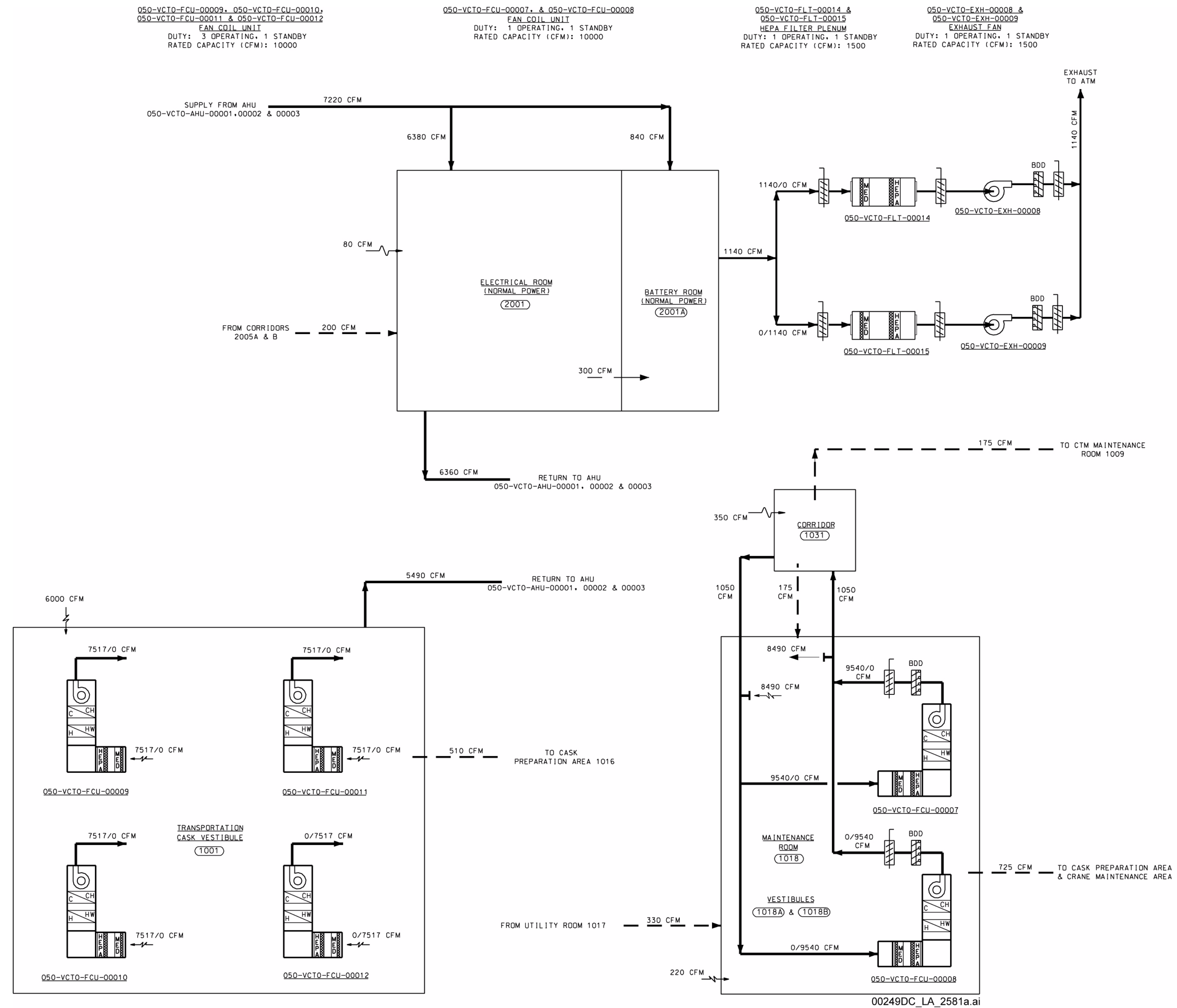

Figure 1.2.5-94. WHF Composite Ventilation Flow Diagram Non-ITS HVAC Electrical, Transportation Cask, and Maintenance Area

NOTE: This figure includes no SSCs that are either ITS or ITWI.
AHU = air handling unit; CTM = canister transfer machine.

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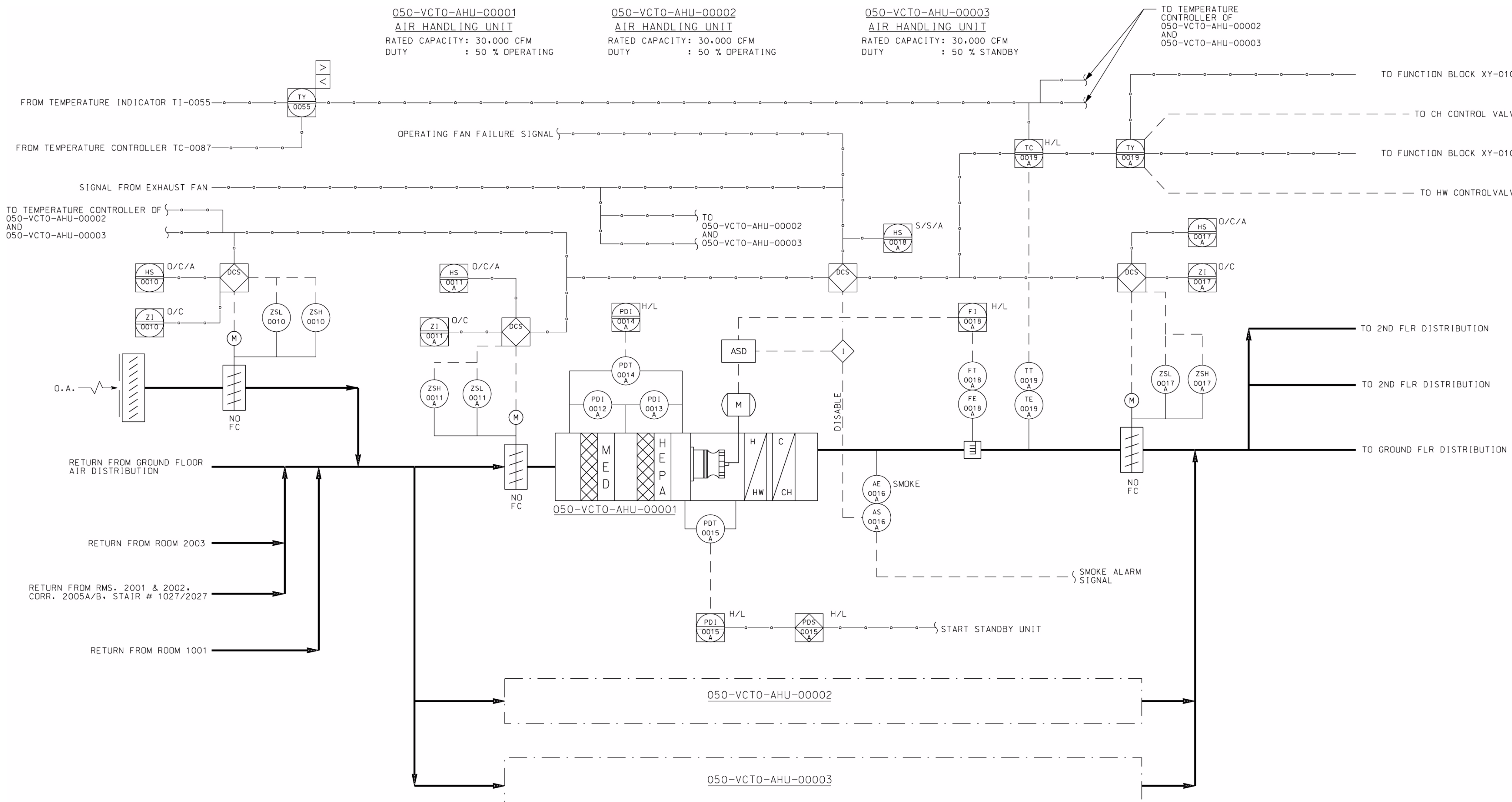

TABLE 1:

MECHANICAL COMPONENT	AIR HANDLING UNIT					INLET DAMPER				OUTLET DAMPER				SMOKE		FLOW			TEMPERATURE				FAN PD		
AIR HANDLING UNIT	HS	PDI	PDI	PDT	PDI	HS	ZI	ZSL	ZSH	HS	ZI	ZSL	ZSH	AE	AS	FE	FT	FI	TE	TT	TC	TY	PDT	PDI	PDS
050-VCTO-AHU-00001	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
050-VCTO-AHU-00002	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
050-VCTO-AHU-00003	0018C	0012C	0013C	0014C	0014C	0011C	0011C	0011C	0011C	0017C	0017C	0017C	0017C	0016C	0016C	0018C	0018C	0018C	0019C	0019C	0019C	0019C	0015C	0015C	0015C

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NOTE: This figure includes no SSCs that are either ITS or ITWI.
CH = chilled water; HW = hot water.

Figure 1.2.5-95. WHF Non-ITS Confinement Areas HVAC Supply System Ventilation and Instrumentation Diagram

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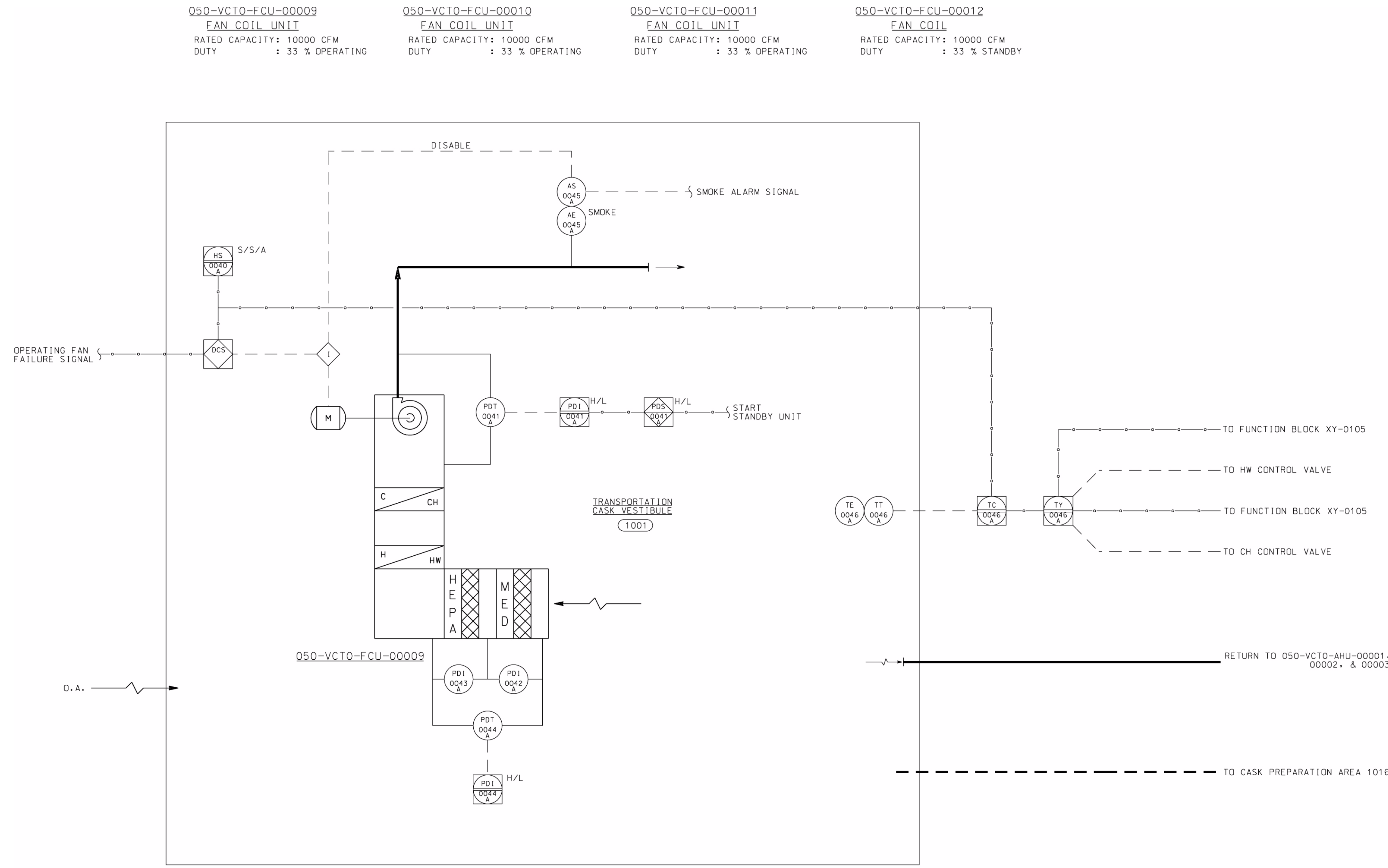

TABLE 1:

	MECHANICAL COMPONENT	FAN COIL					FAN DP			SMOKE		TEMPERATURE			
AREA/ROOM SERVED	FAN COIL UNIT	HS	PDI	PDI	PDT	PDI	PDT	PDI	PDS	AE	AS	TE	TT	TC	TY
TRANSPORTATION CASK VESTIBULE	050-VCTO-FCU-00009	0040A	0042A	0043A	0044A	0044A	0041A	0041A	0041A	0045A	0045A	0046A	0046A	0046A	0046A
TRANSPORTATION CASK VESTIBULE	050-VCTO-FCU-00010	0040B	0042B	0043B	0044B	0044B	0041B	0041B	0041B	0045B	0045B	0046B	0046B	0046B	0046B
TRANSPORTATION CASK VESTIBULE	050-VCTO-FCU-00011	0040C	0042C	0043C	0044C	0044C	0041C	0041C	0041C	0045C	0045C	0046C	0046C	0046C	0046C
TRANSPORTATION CASK VESTIBULE	050-VCTO-FCU-00012	0040D	0042D	0043D	0044D	0044D	0041D	0041D	0041D	0045D	0045D	0046D	0046D	0046D	0046D

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Figure 1.2.5-96. WHF Confinement Transportation Cask Vestibule HVAC System Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.
CH = chilled water; HW = hot water.

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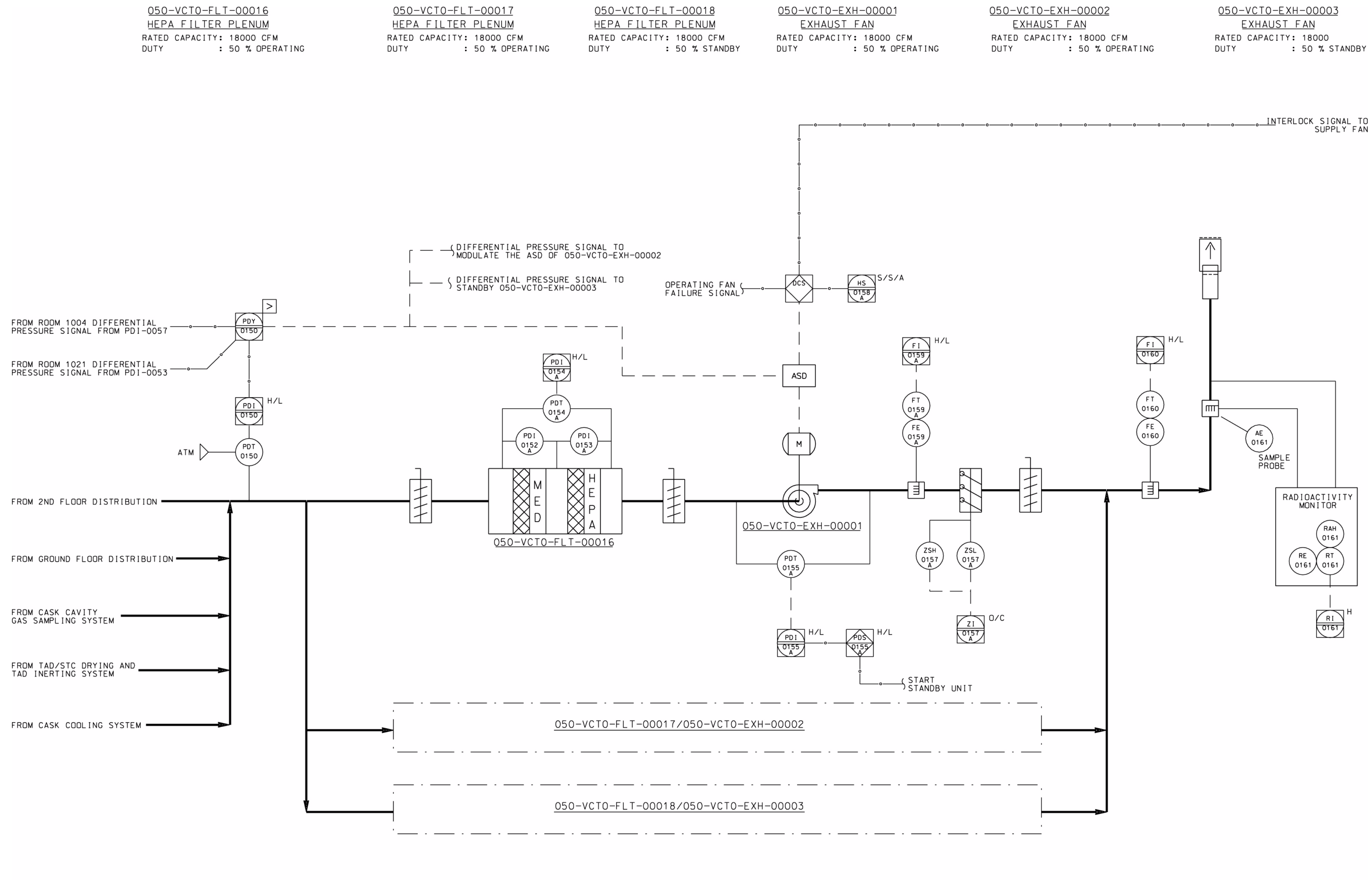

MECHANICAL COMPONENT	HEPA PLENUM				MECHANICAL COMPONENT	FAN PD				FLOW			BACKDRAFT DAMPER		
FILTER	PDI	PDI	PDT	PDI	FAN	HS	PDT	PDI	PDS	FE	FT	FI	ZSL	ZSH	ZI
050-VCTO-FLT-00016	0152A	0153A	0154A	0154A	050-VCTO-EXH-00001	0158A	0155A	0155A	0155A	0159A	0159A	0159A	0157A	0157A	0157A
050-VCTO-FLT-00017	0152B	0153B	0154B	0154B	050-VCTO-EXH-00002	0158B	0155B	0155B	0155B	0159B	0159B	0159B	0157B	0157B	0157B
050-VCTO-FLT-00018	0152C	0153C	0154C	0154C	050-VCTO-EXH-00003	0158C	0155C	0155C	0155C	0159C	0159C	0159C	0157C	0157C	0157C

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NOTE: This figure includes no SSCs that are either ITS or ITWI.
ASD = adjustable speed drive; STC = shielded transfer cask.

Figure 1.2.5-97. WHF Non-ITS Confinement Areas HEPA Exhaust System Ventilation and Instrumentation Diagram

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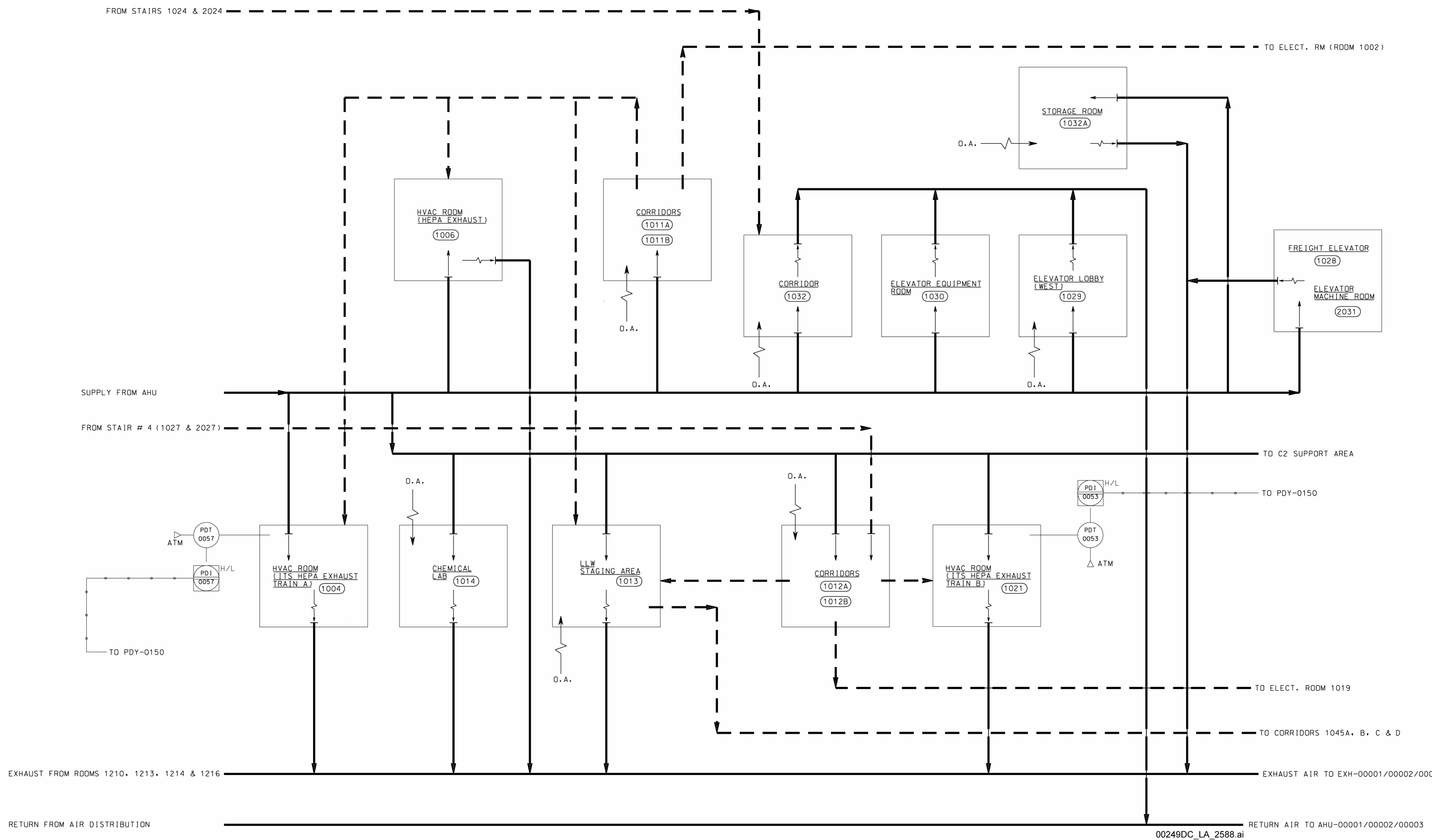

Figure 1.2.5-98. WHF Confinement First Floor West Areas Air Distribution System Ventilation and Instrumentation Diagram

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

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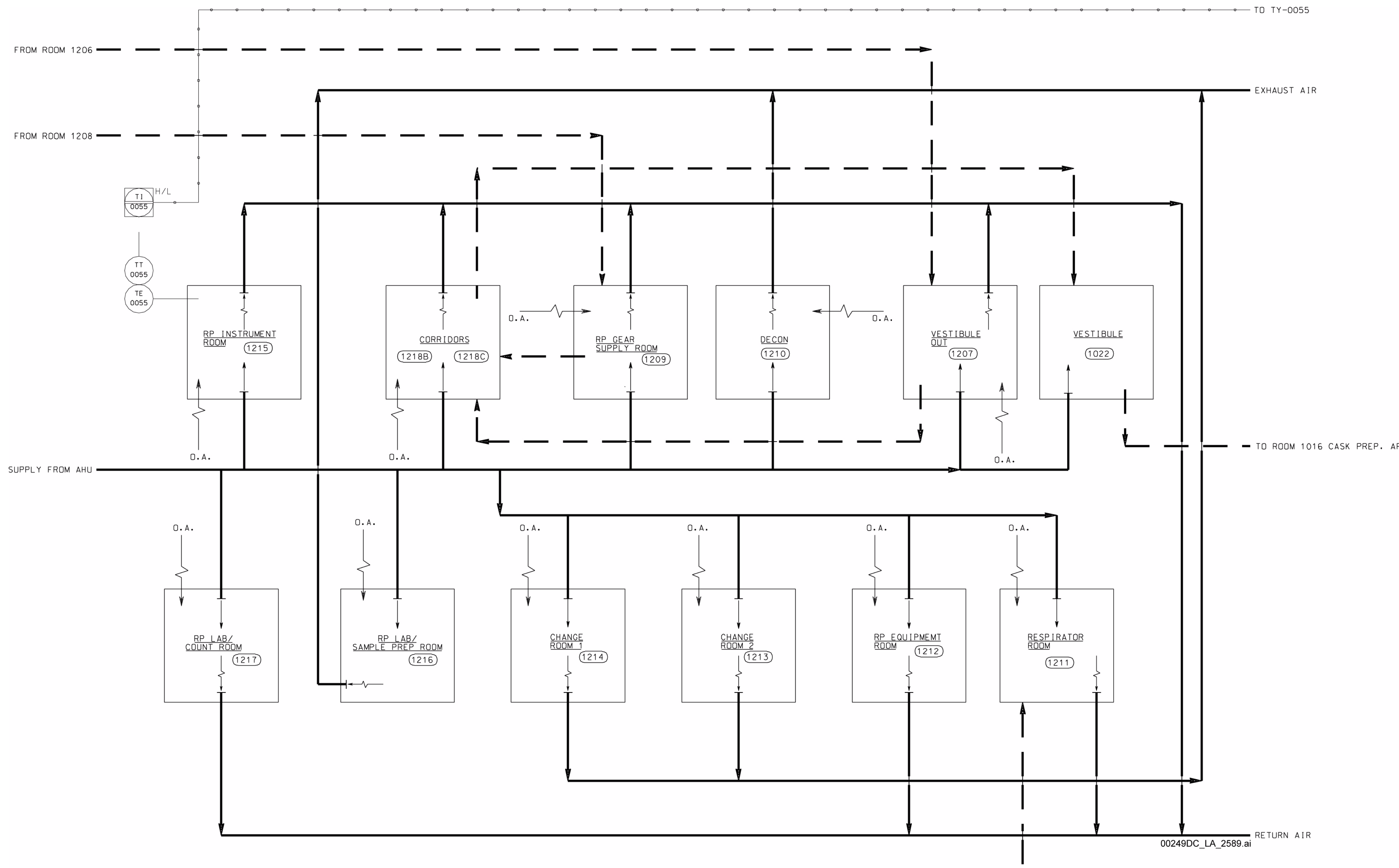

Figure 1.2.5-99. WHF Confinement Ground Floor Southeast Areas Air Distribution System Ventilation and Instrumentation Diagram

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

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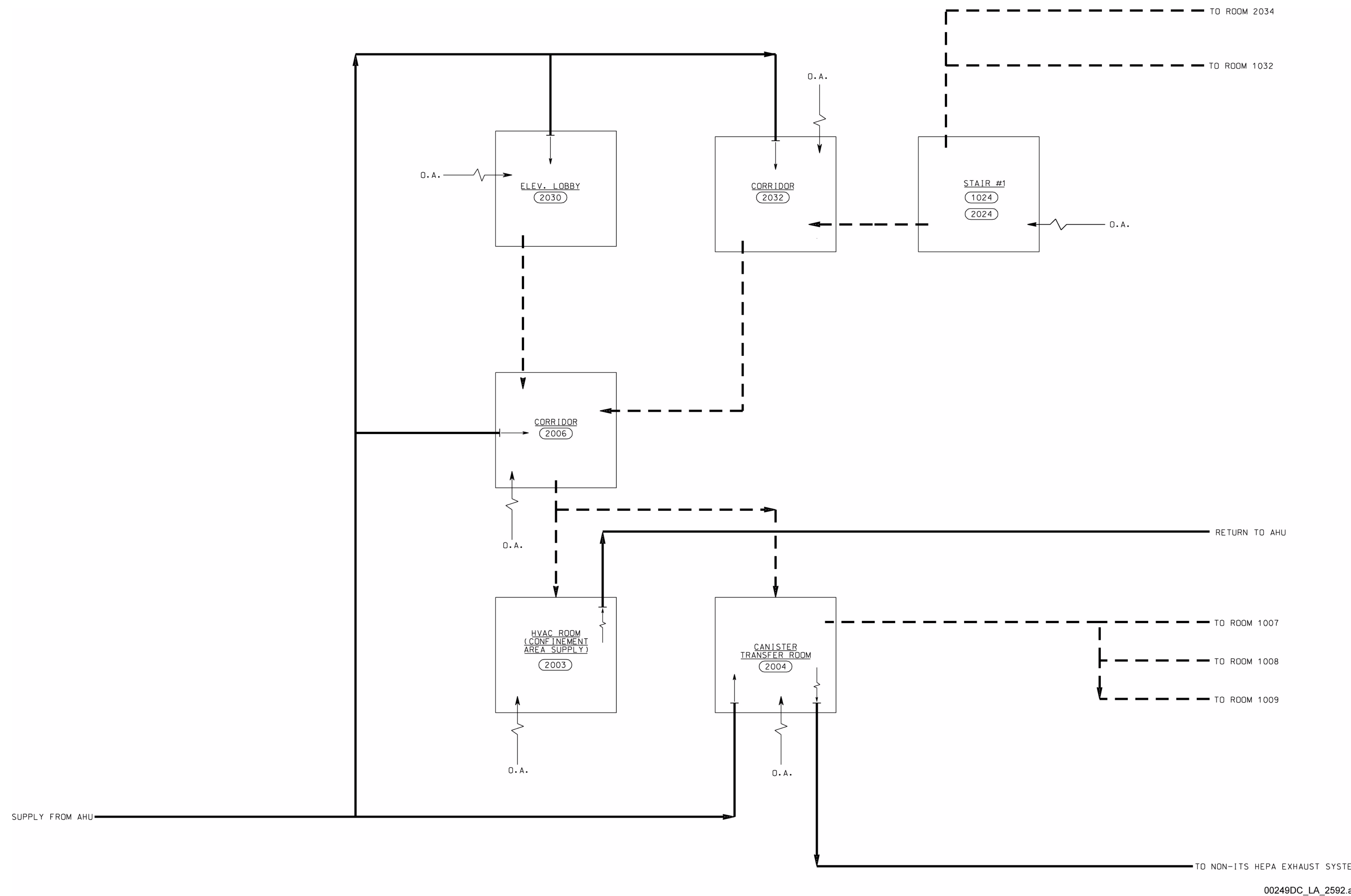

Figure 1.2.5-100. WHF Confinement Second Floor Northeast Air Distribution System Ventilation and Instrumentation Diagram

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

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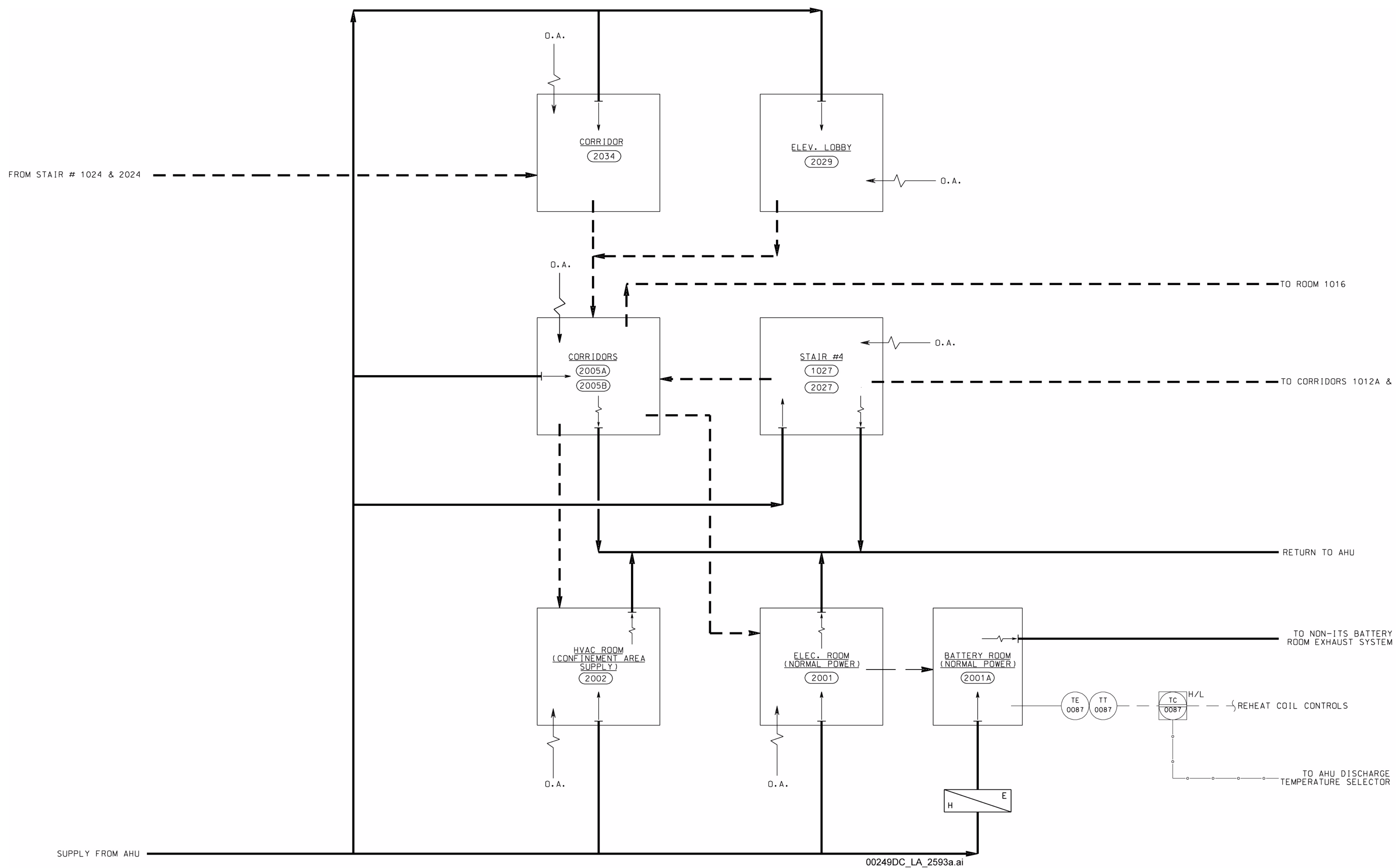

Figure 1.2.5-101. WHF Confinement Second Floor Northwest Air Distribution System Ventilation and Instrumentation Diagram

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

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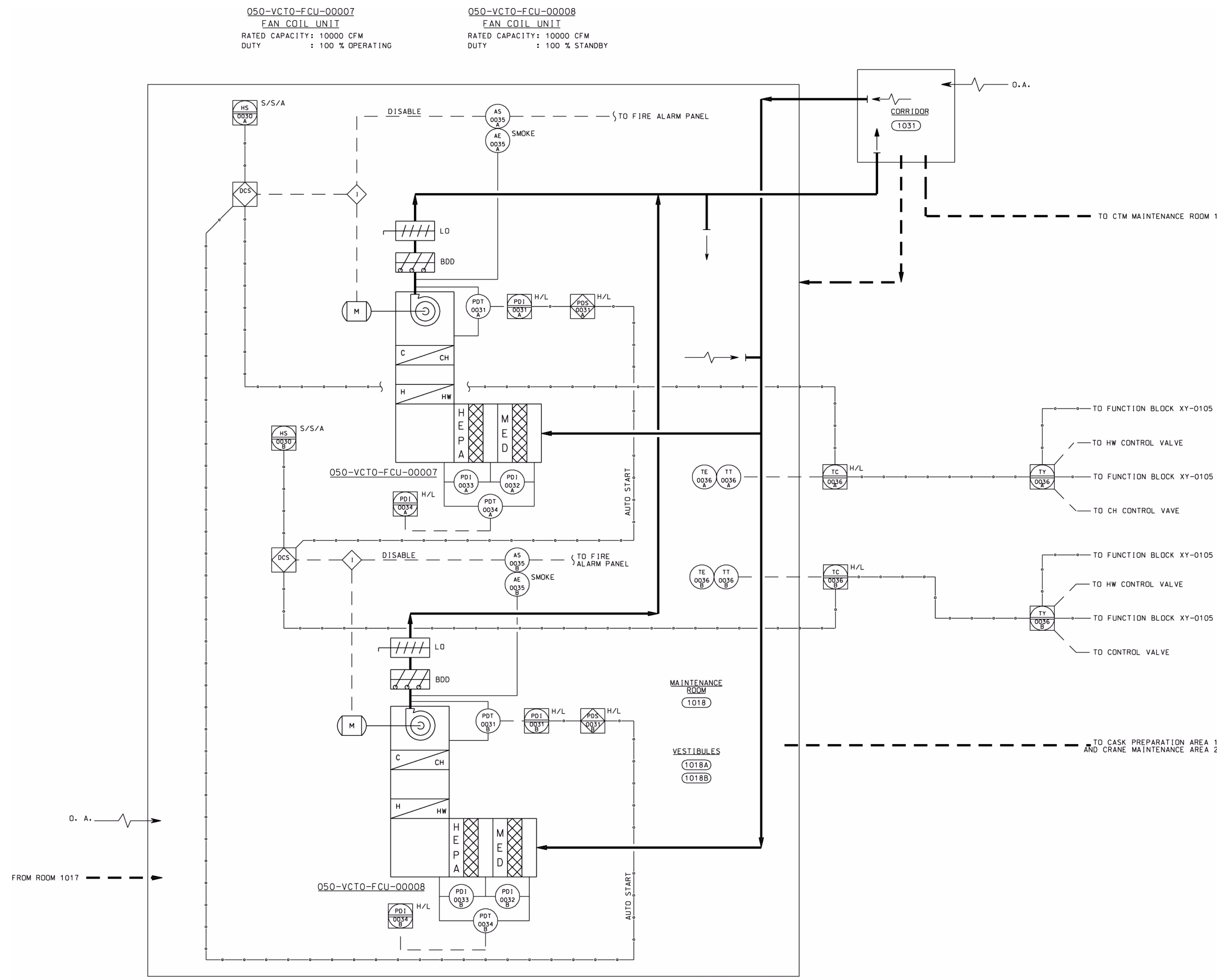

Figure 1.2.5-102. WHF Confinement Maintenance Room HVAC System Ventilation and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI.
CH = chilled water; CTM = canister transfer machine; HW = hot water.

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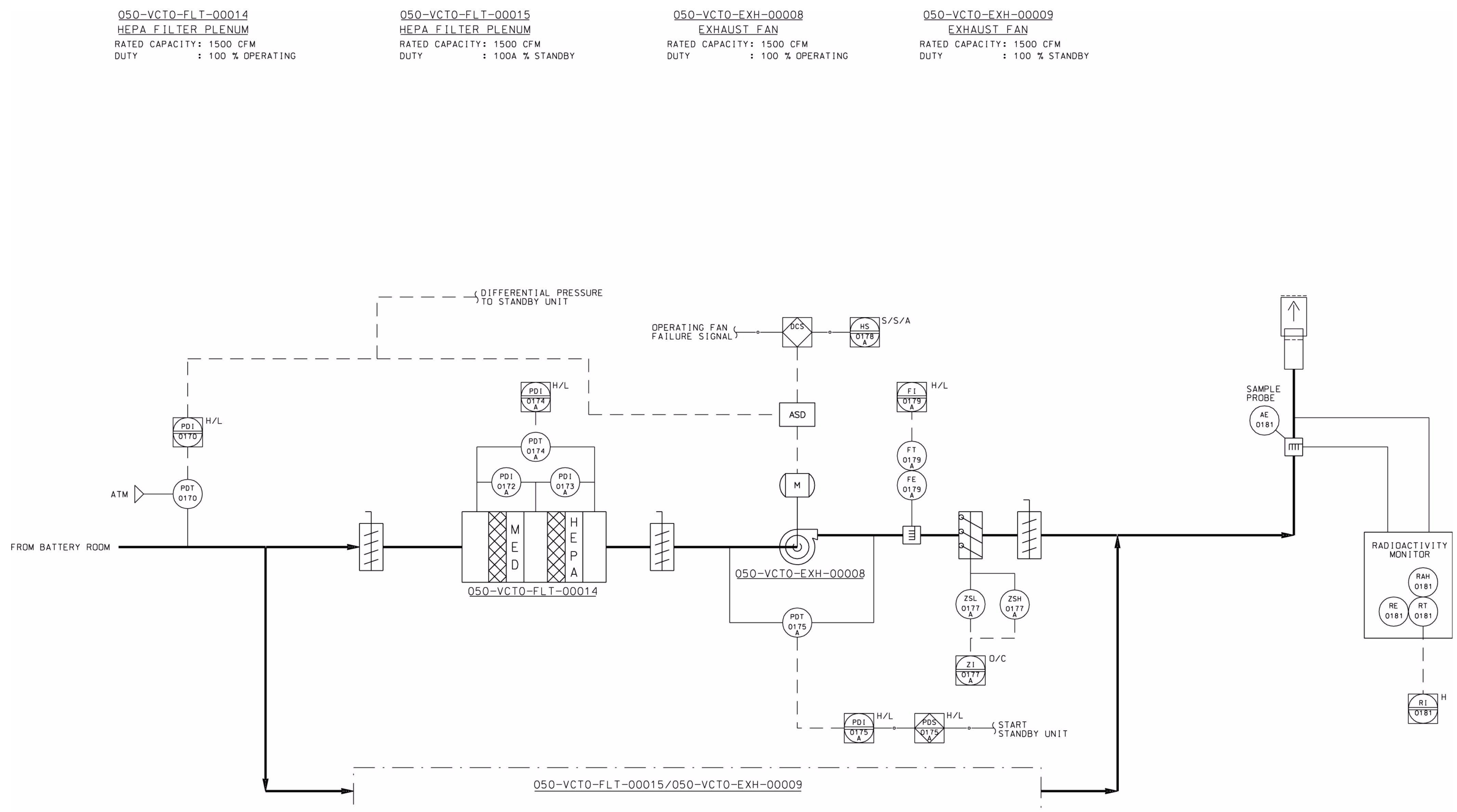

MECHANICAL COMPONENT	HEPA PLENUM				MECHANICAL COMPONENT	FAN DP				FLOW			BACKDRAFT DAMPER		
FILTER	PDI	PDI	PDT	PDI	FAN	HS	PDT	PDI	PDS	FE	FT	FI	ZSL	ZSH	ZI
050-VCTO-FLT-00014	0172A	0173A	0174A	0174A	050-VCTO-EXH-00008	0178A	0175A	0175A	0175A	0179A	0179A	0179A	0177A	0177A	0177A
050-VCTO-FLT-00015	0172B	0173B	0174B	0174B	050-VCTO-EXH-00009	0178B	0175B	0175B	0175B	0179B	0179B	0179B	0177B	0177B	0177B

00249DC_LA_2594c.ai

Figure 1.2.5-103. WHF Confinement Non-ITS Battery Room Exhaust System Ventilation and Instrumentation Diagram

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

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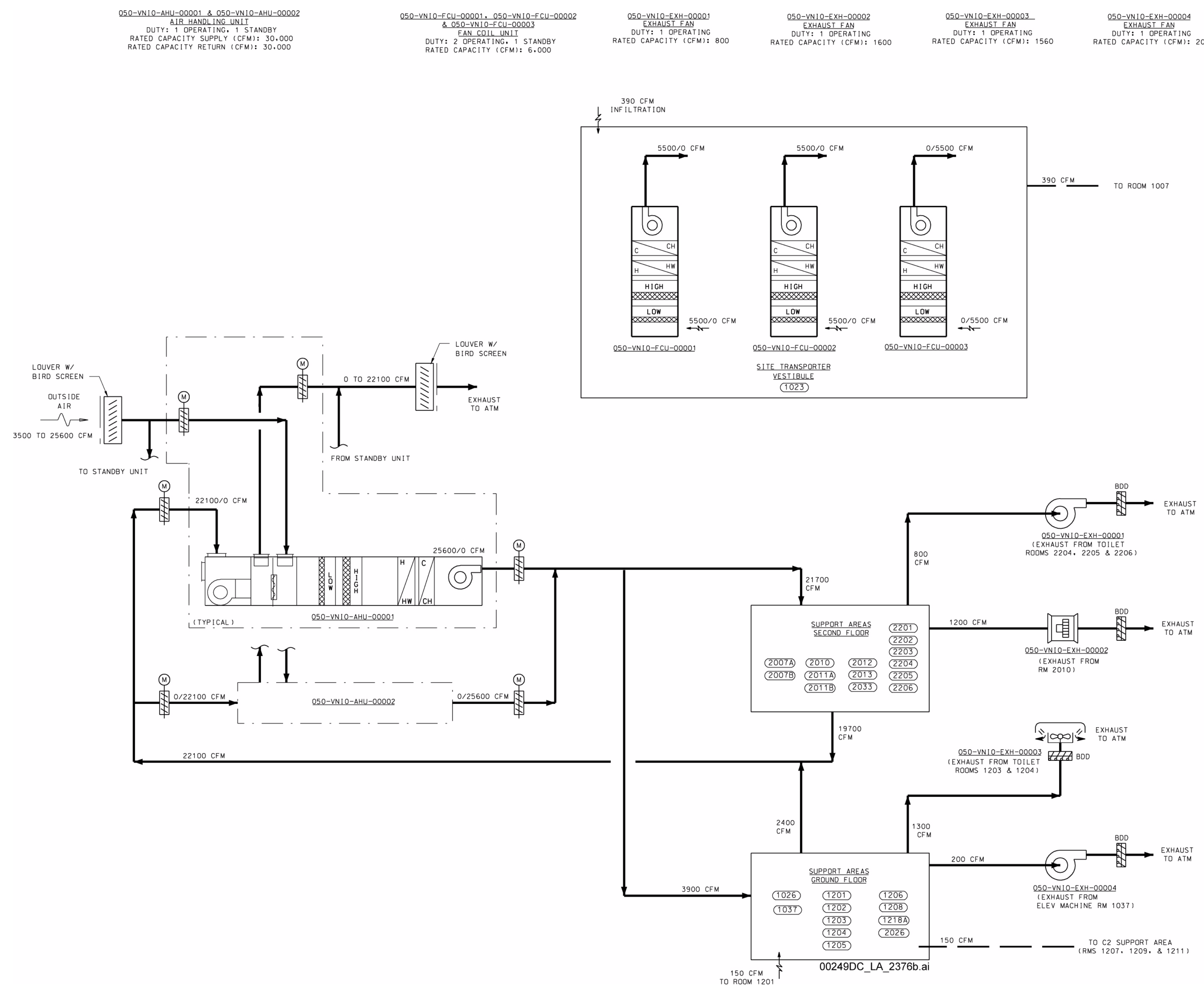

Figure 1.2.5-104. WHF Composite Ventilation Flow Diagram Nonconfinement HVAC Transportation Vestibule and Support Areas

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

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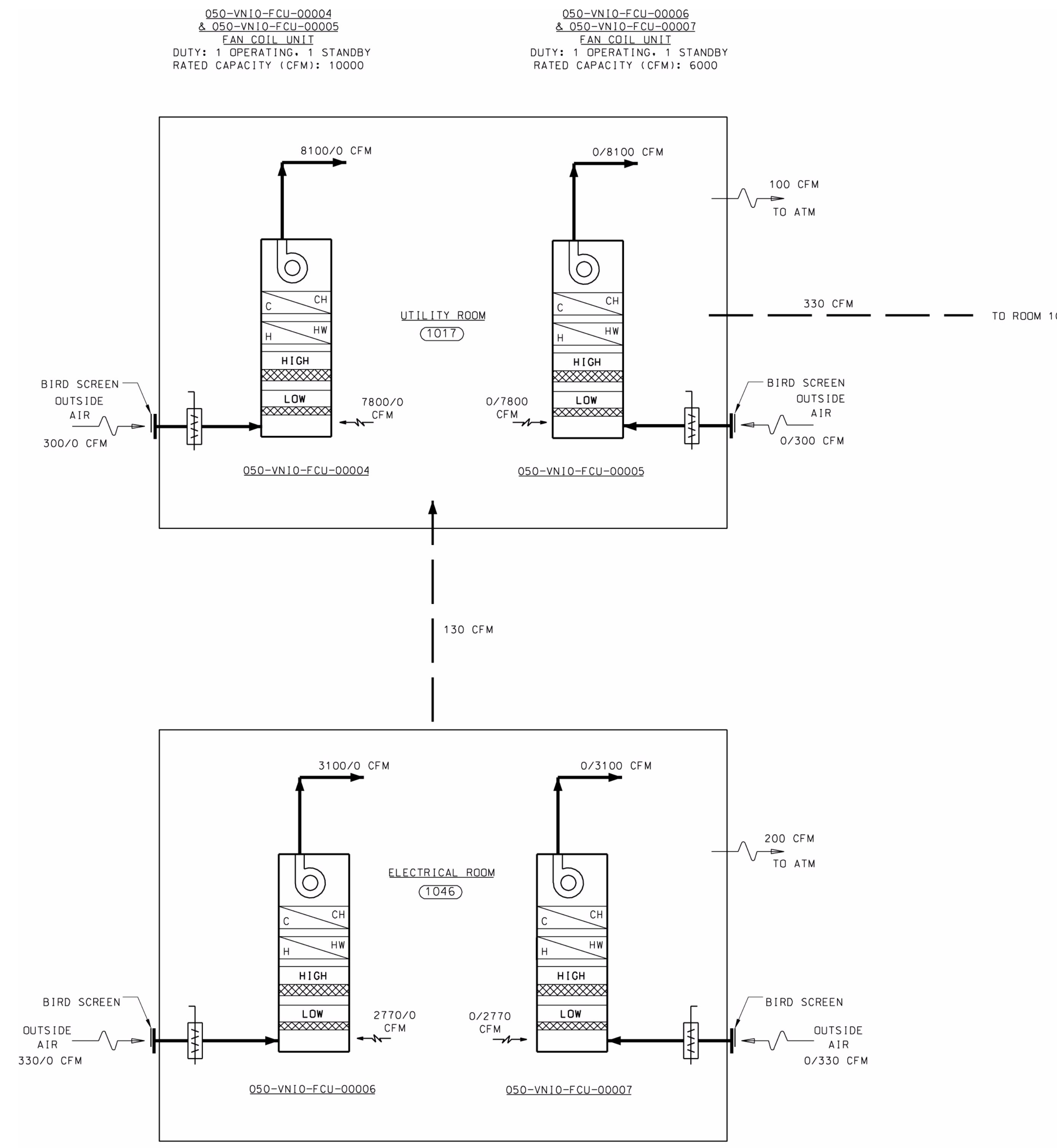

Figure 1.2.5-105. WHF Composite Ventilation Flow Diagram for Nonconfinement HVAC Utility and Electrical Rooms

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

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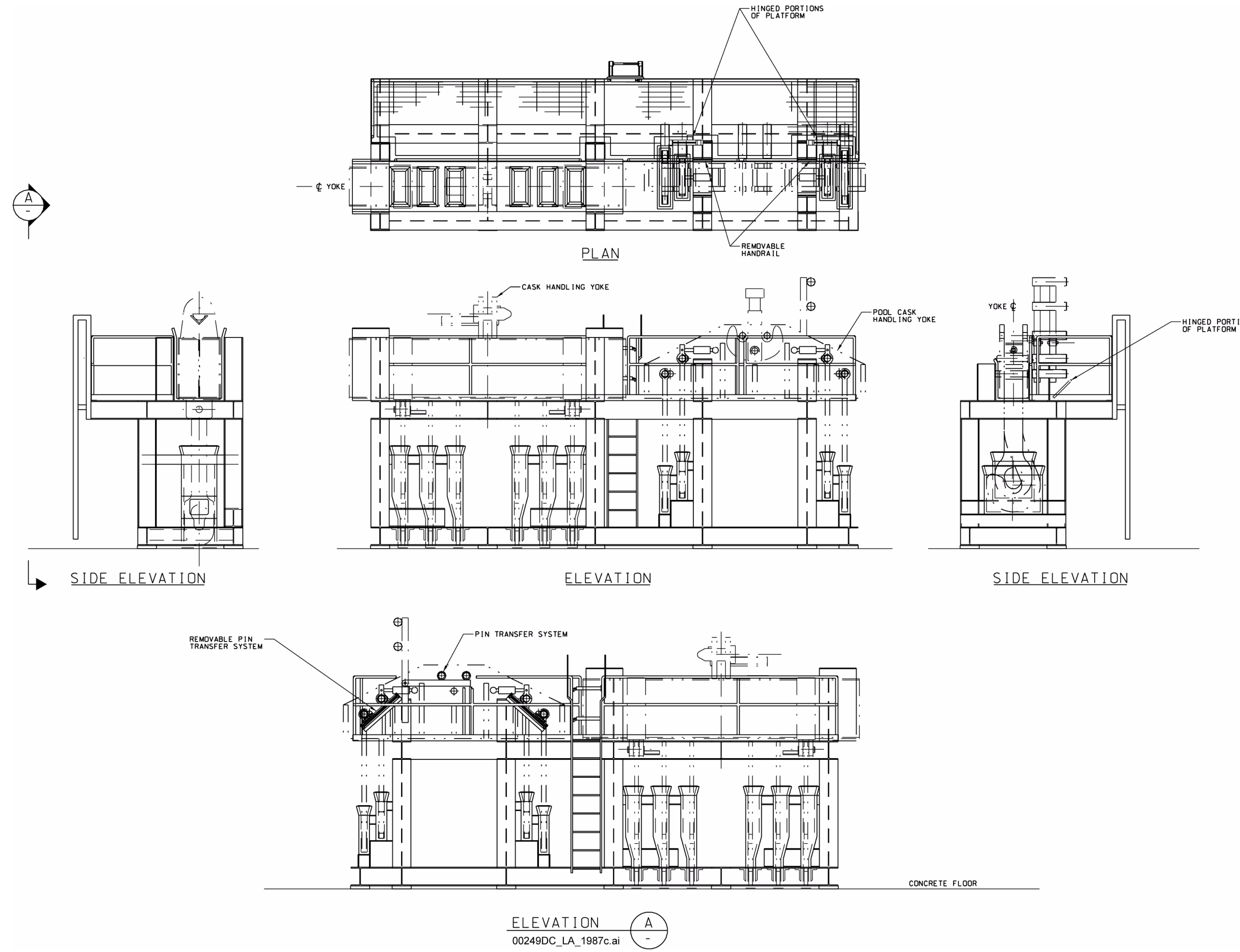

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HM00-RK-00001, Cask handling yoke stand.

Figure 1.2.5-106. Cask Handling Yoke Stand Mechanical Equipment Envelope

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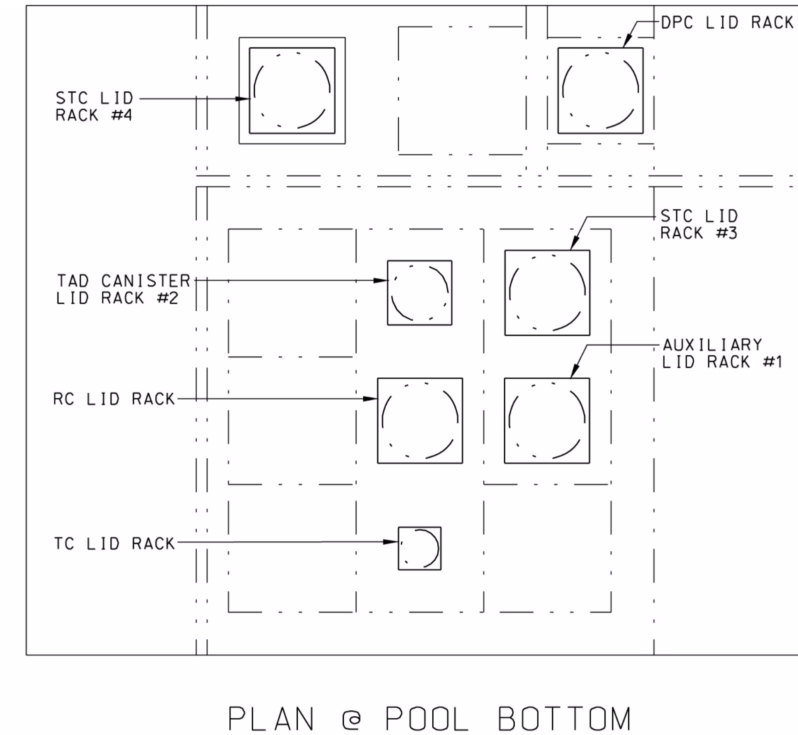
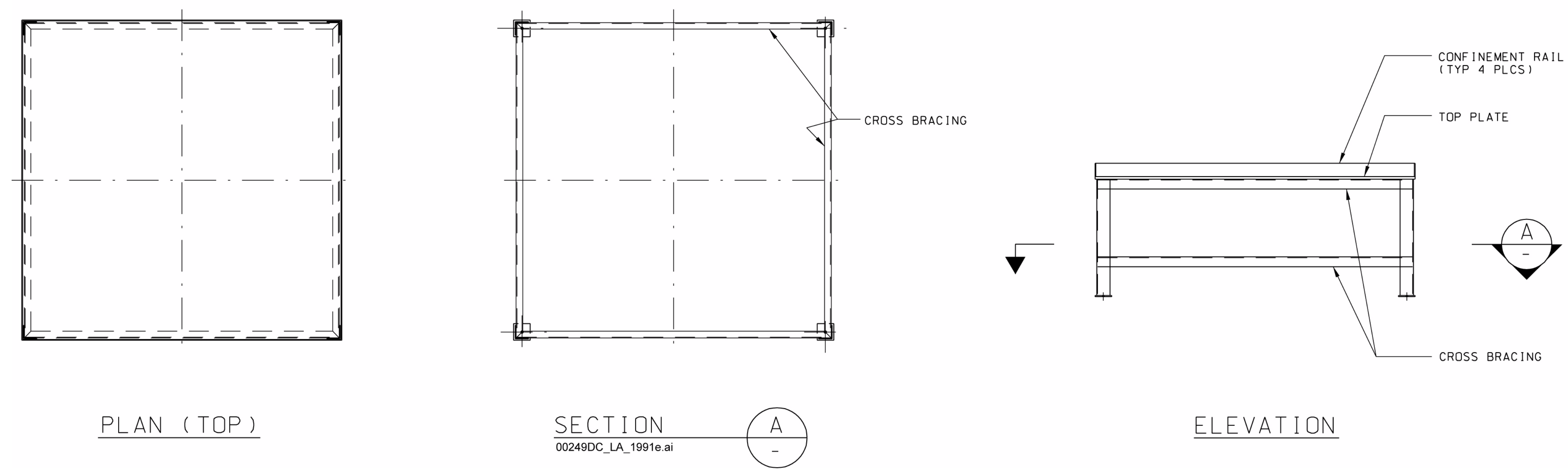
LID RACK TABLE

EQUIPMENT NUMBER	EQUIPMENT NAME	LOCATION
050-HM00-RK-00005	STC LID RACK #1	DPC CUTTING STATION
050-HM00-RK-00006	STC LID RACK #2	TAD CANISTER CLOSURE STATION
050-HM00-RK-00007	TAD CANISTER LID RACK #1	TAD CANISTER CLOSURE STATION
050-HM00-RK-00011	TAD CANISTER LID RACK #2	POOL
050-HM00-RK-00012	STC LID RACK #3	POOL
050-HM00-RK-00013	RC LID RACK	POOL
050-HM00-RK-00014	TC LID RACK	POOL
050-HM00-RK-00015	AUXILIARY LID RACK #1	POOL
050-HM00-RK-00016	DPC LID RACK	POOL
050-HM00-RK-00017	STC LID RACK #4	POOL
050-HM00-RK-00018	AUXILIARY LID RACK #2	PRE-STAGED
050-HM00-RK-00019	AUXILIARY LID RACK #3	PRE-STAGED
050-HM00-RK-00020	AUXILIARY LID RACK #4	PRE-STAGED





NOTE: This figure includes no SSCs that are either ITS or ITWI. RC = rail cask; STC = shielded transfer cask; TC = truck cask.

Equipment Number: 050-HM00-RK-00005/00006/00012/00017, shielded transfer cask lid rack 1/2/3/4;
050-HM00-RK-00007/00011, TAD canister lid rack 1/2; 050-HM00-RK-00013, rail cask lid rack;
050-HM00-RK-00014, truck cask lid rack; 050-HM00-RK-00016, DPC lid rack;
050-HM00-RK-00015/00018/00019/00020, auxiliary lid rack 1/2/3/4,

Figure 1.2.5-107. Lid Rack Mechanical Equipment Envelope

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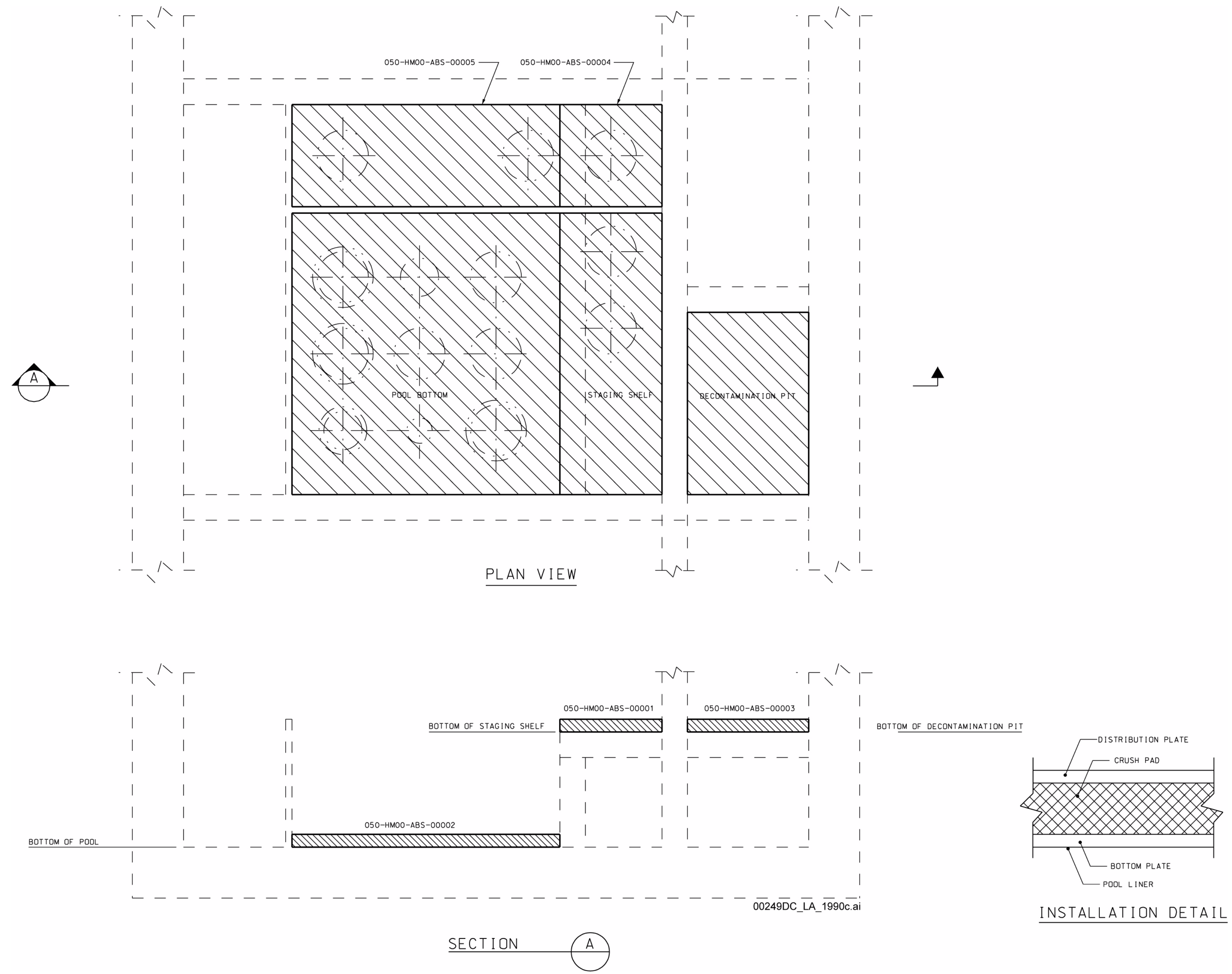

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HM00-ABS-00001/00002/00003/00004/00005, crush pads 1/2/3/4/5.

Figure 1.2.5-108. Pool Crush Pads Mechanical Equipment Envelope

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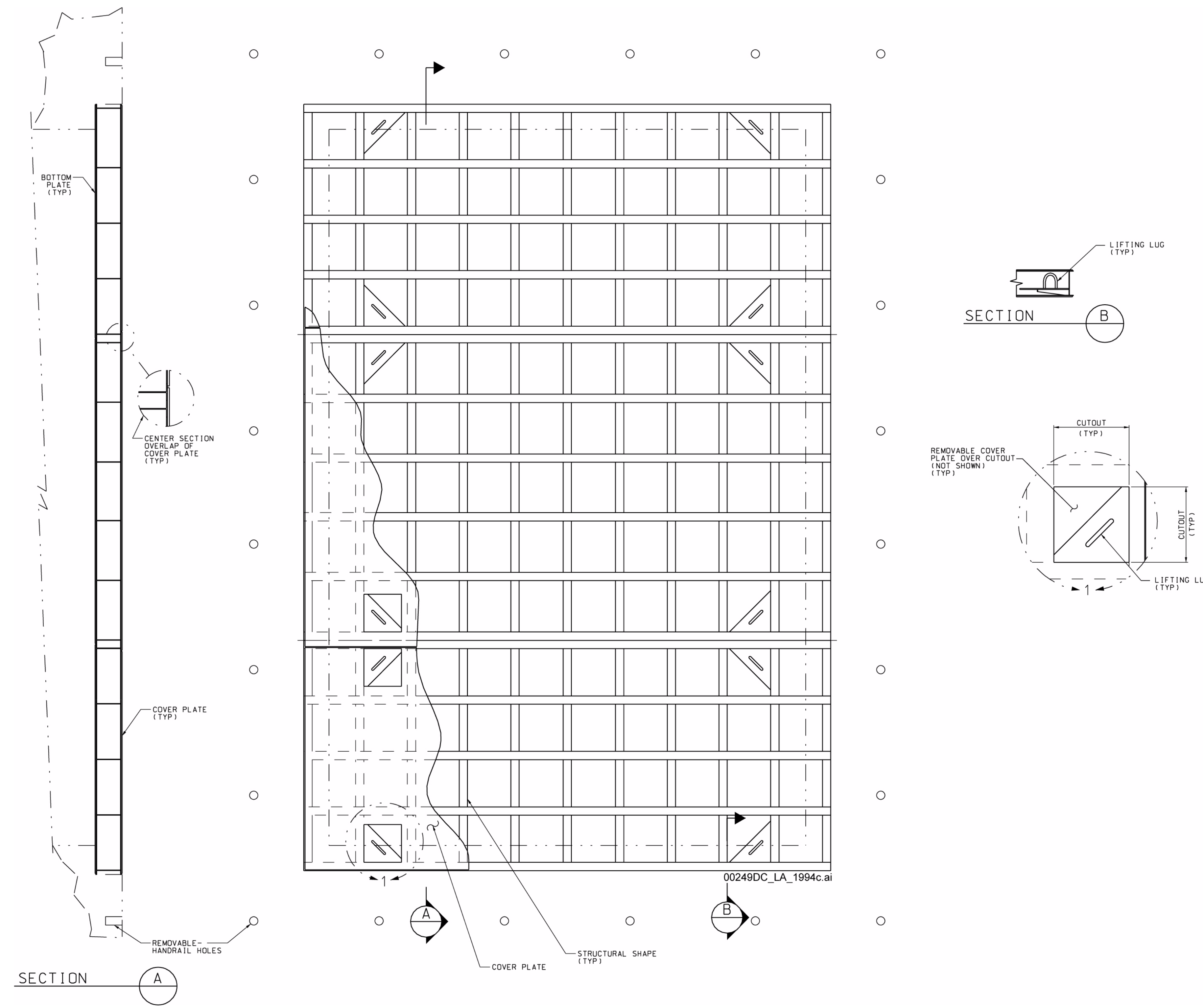

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HM00-HTCH-00001, decontamination pit cover.

Figure 1.2.5-109. Decontamination Pit Cover Mechanical Equipment Envelope

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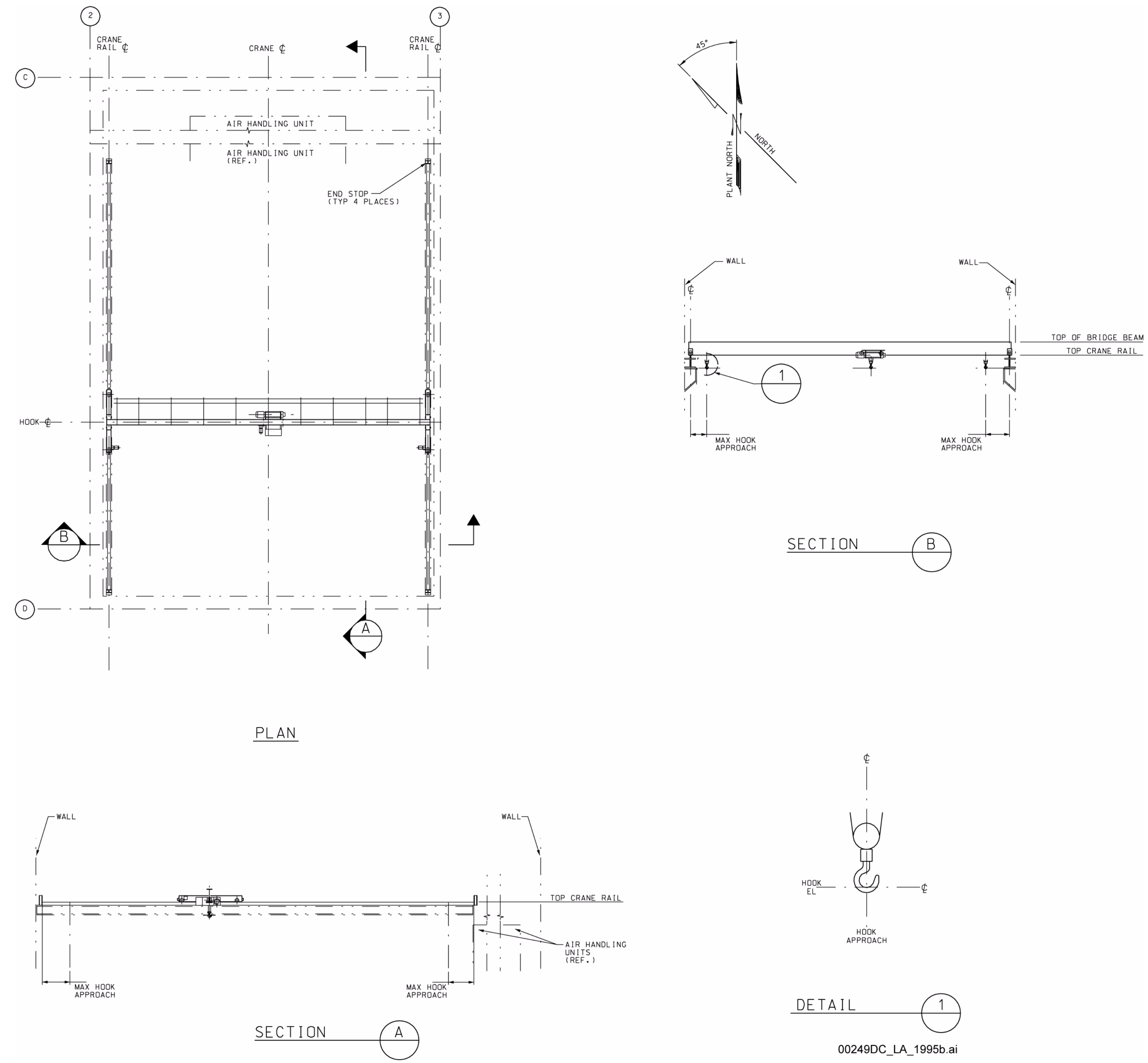

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-PW00-CRN-00001, pool equipment crane.

Figure 1.2.5-110. Pool Equipment Crane Mechanical Equipment Envelope

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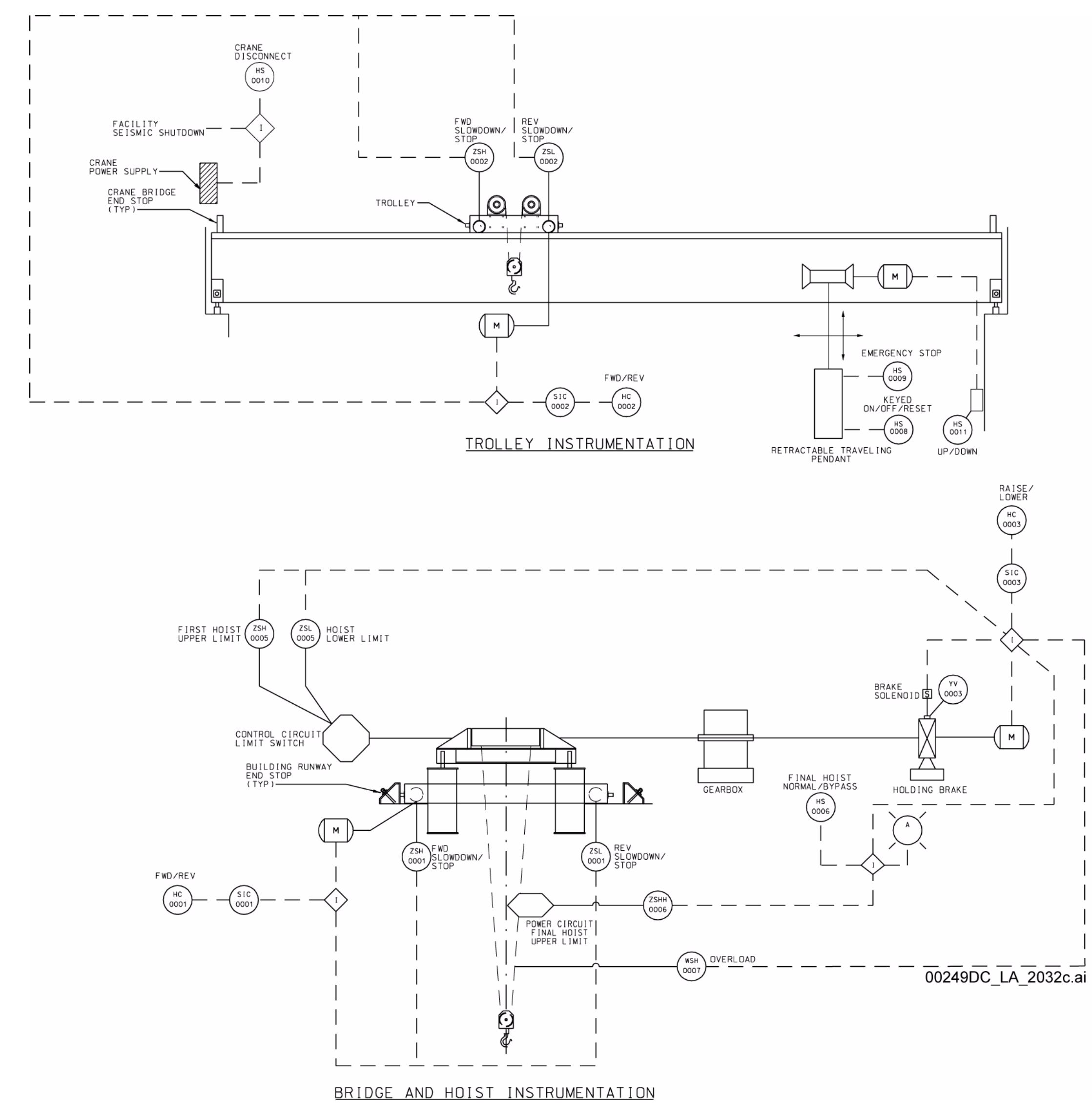

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-PW00-CRN-00001, pool equipment crane.

Figure 1.2.5-111. Pool Equipment Crane Process and Instrumentation Diagram

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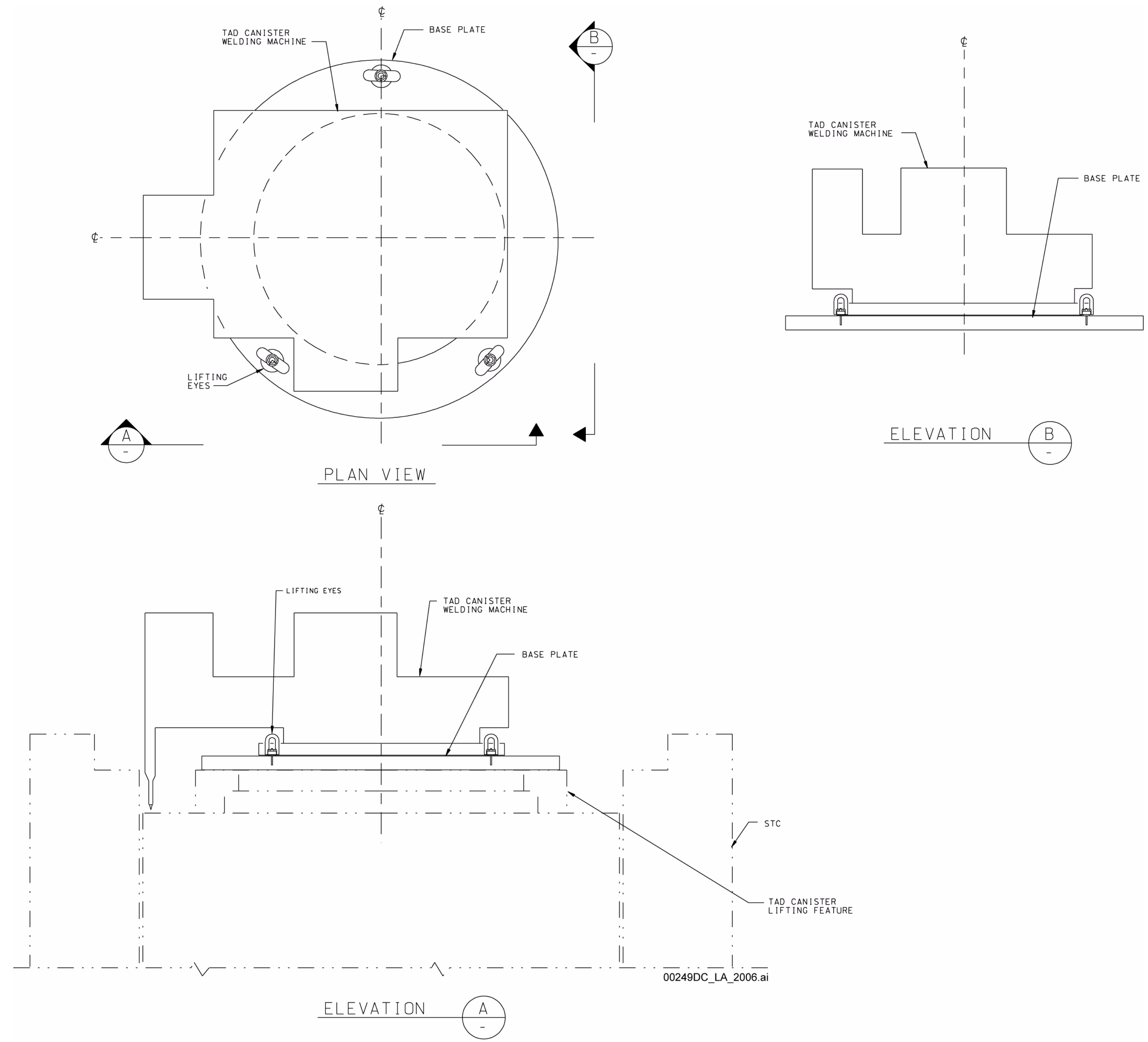

NOTE: This figure includes no SSCs that are either ITS or ITWI. STC = shielded transfer cask.

Equipment Number: 050-HC00-TOOL-00001, TAD canister welding machine.

Figure 1.2.5-112. TAD Canister Welding Machine Mechanical Equipment Envelope

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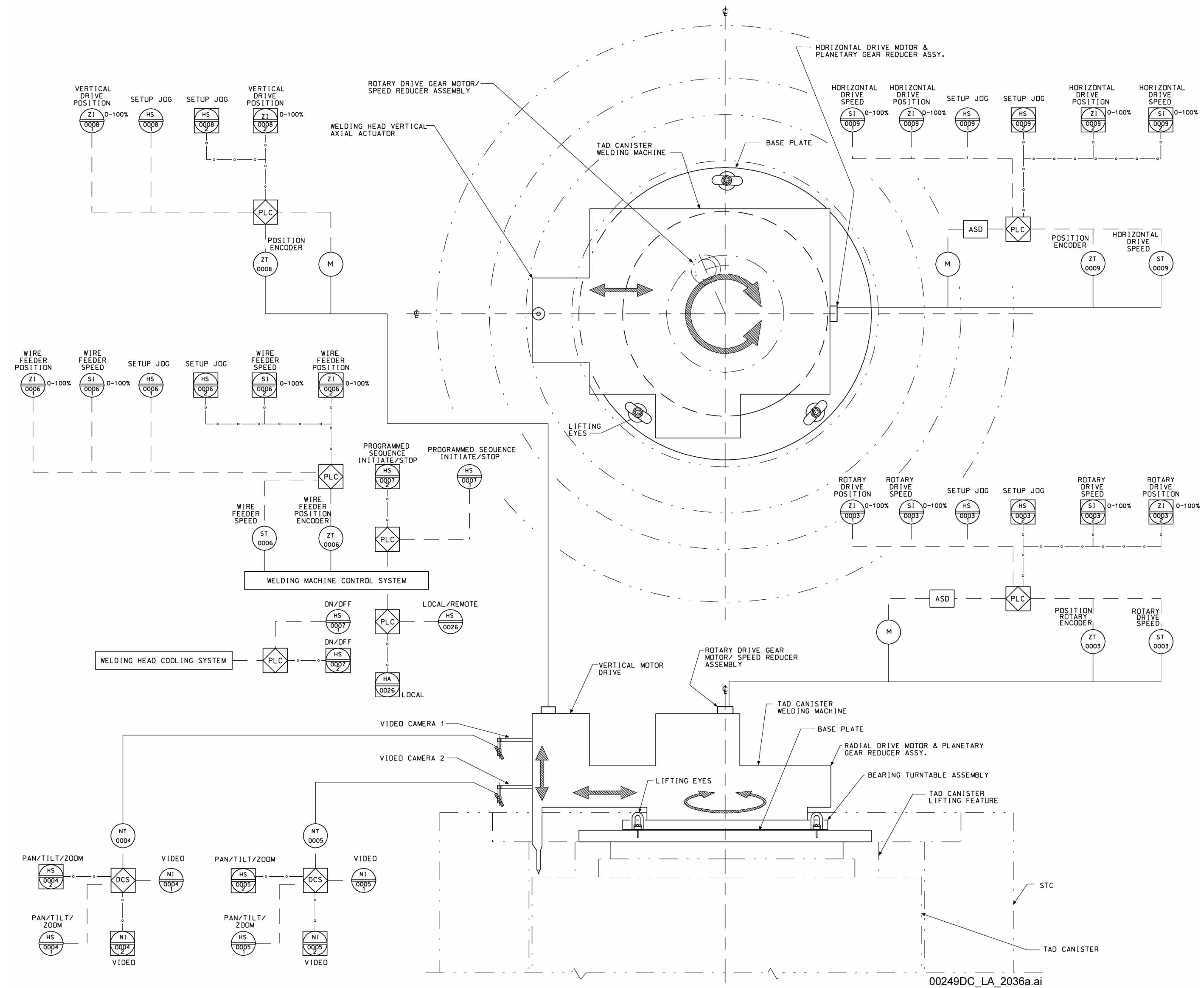

NOTE: This figure includes no SSCs that are either ITS or ITWI. STC = shielded transfer cask.

Equipment Number: 050-HC00-TOOL-00001, TAD canister welding machine.

Figure 1.2.5-113. TAD Canister Welding Machine Process and Instrumentation Diagram

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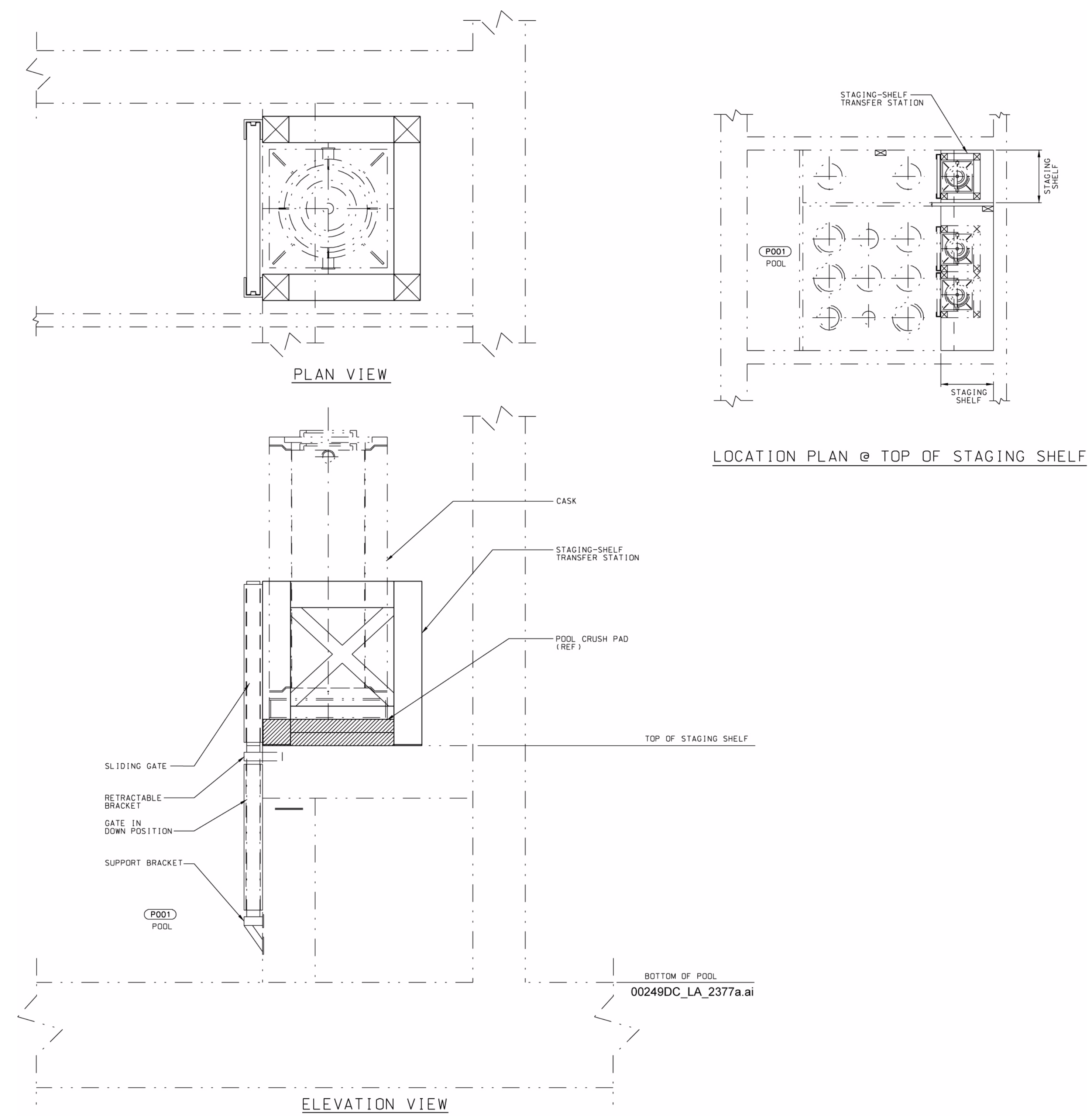

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HTF0-RK-00008, staging-shelf transfer station.

Figure 1.2.5-114. Staging-Shelf Transfer Station Mechanical Equipment Envelope

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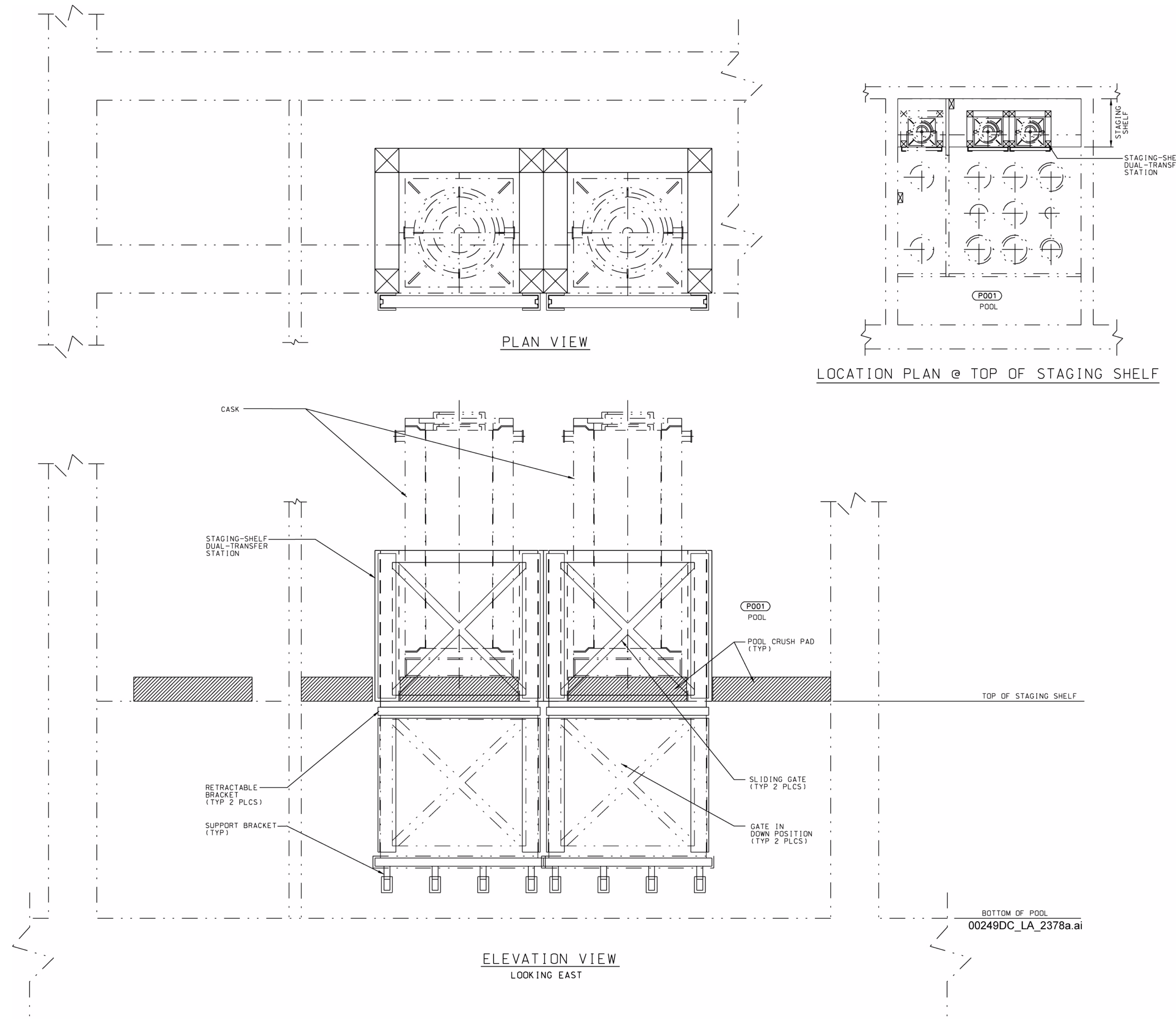

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HTF0-RK-00009, staging-shelf dual-transfer station.

Figure 1.2.5-115. Staging-Shelf Dual-Transfer Station Mechanical Equipment Envelope

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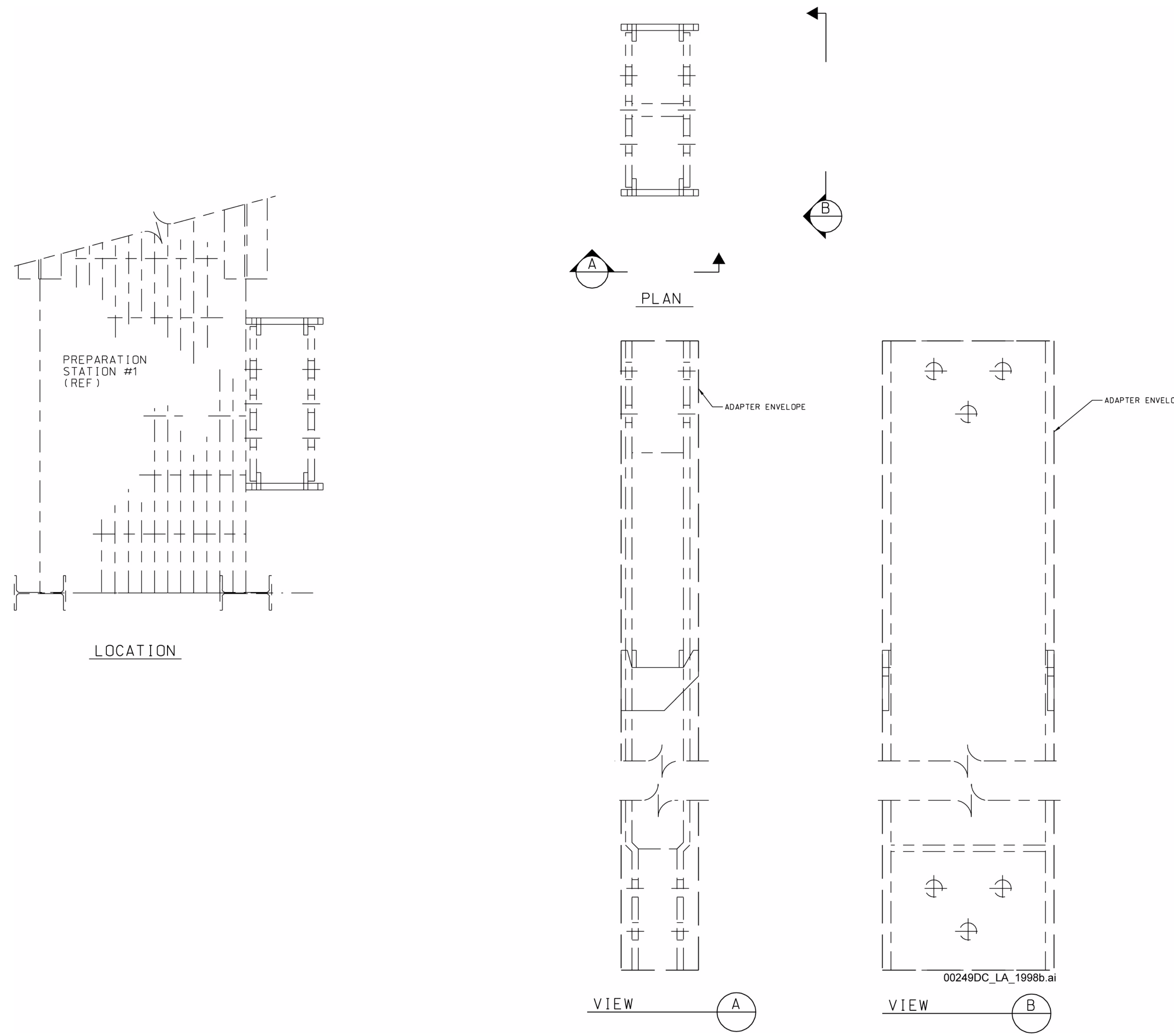

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HM00-RK-00004, pool yoke lift adapter stand.

Figure 1.2.5-116. Pool Yoke Lift Adapter Stand Mechanical Equipment Envelope

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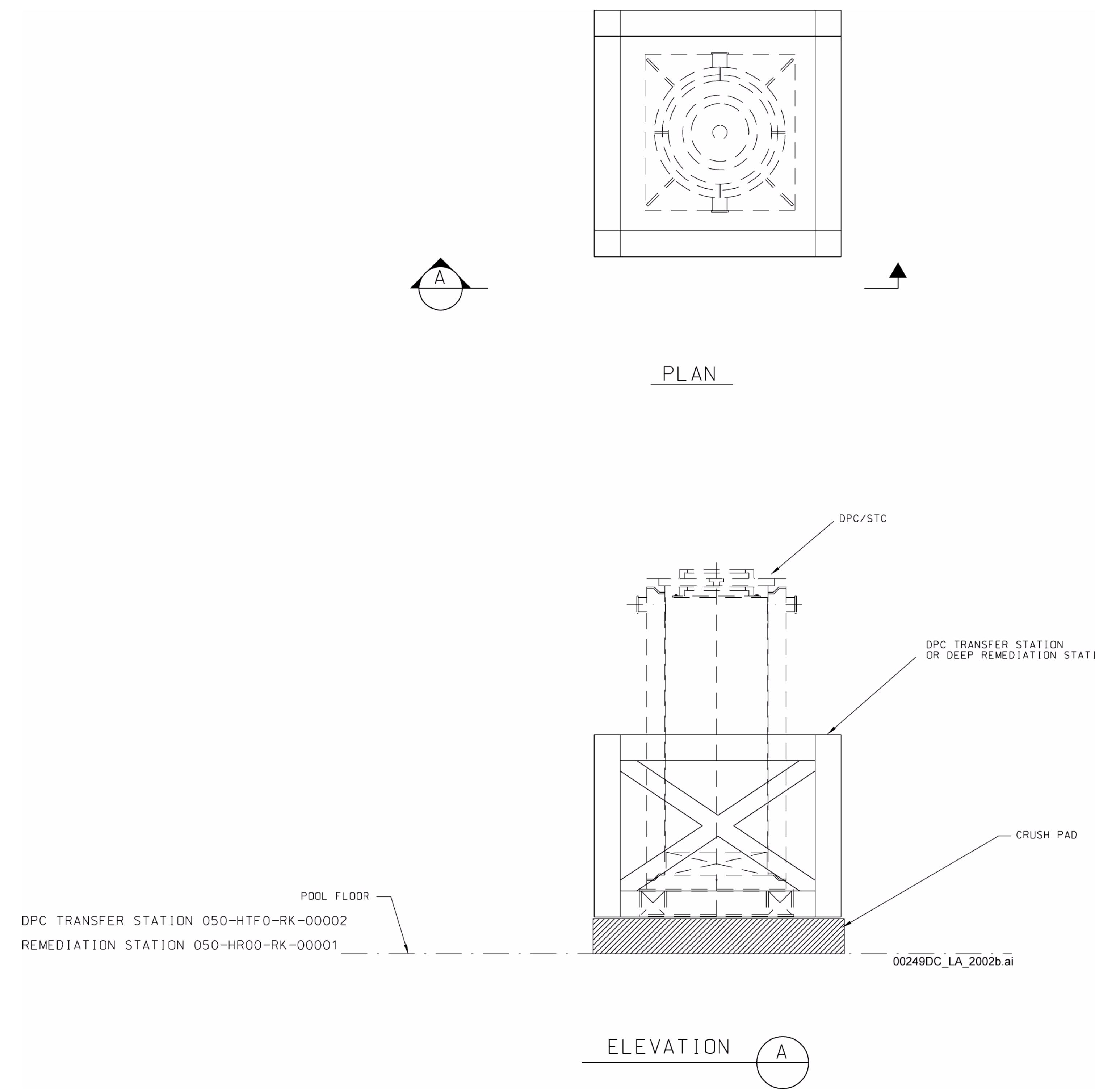

NOTE: This figure includes no SSCs that are either ITS or ITWI. STC = shielded transfer cask.

Equipment Number: 050-HTF0-RK-00002, DPC transfer station; 050-HR00-RK-00001, deep remediation station.

Figure 1.2.5-117. Dual-Purpose Canister and Remediation Stations Mechanical Equipment Envelope Plan

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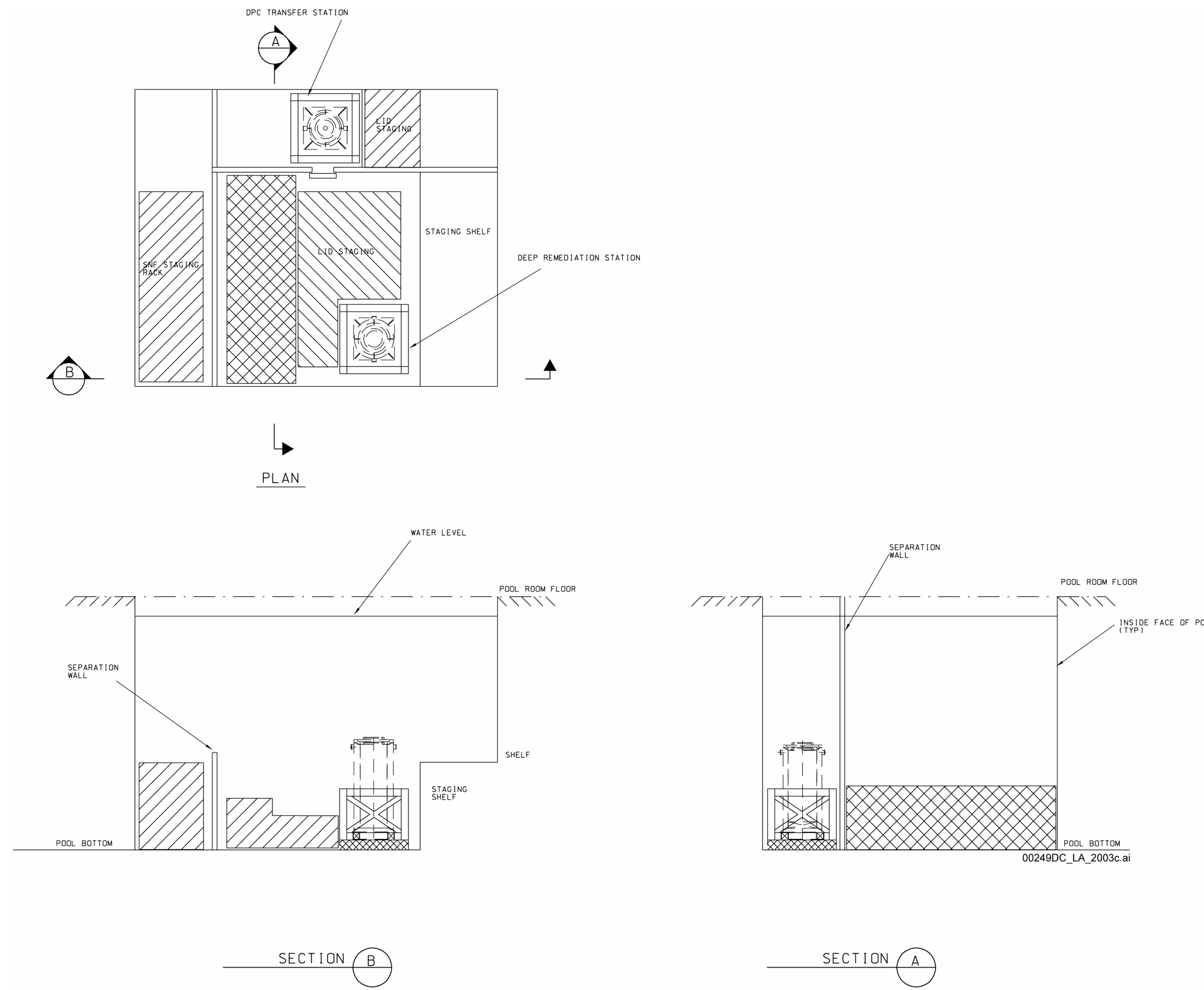

Figure 1.2.5-118. Dual-Purpose Canister and Remediation Stations Pool Layout Mechanical Equipment Envelope

Equipment Number: 050-HTF0-RK-00002, DPC transfer station; 050-HR00-RK-00001, deep remediation station.

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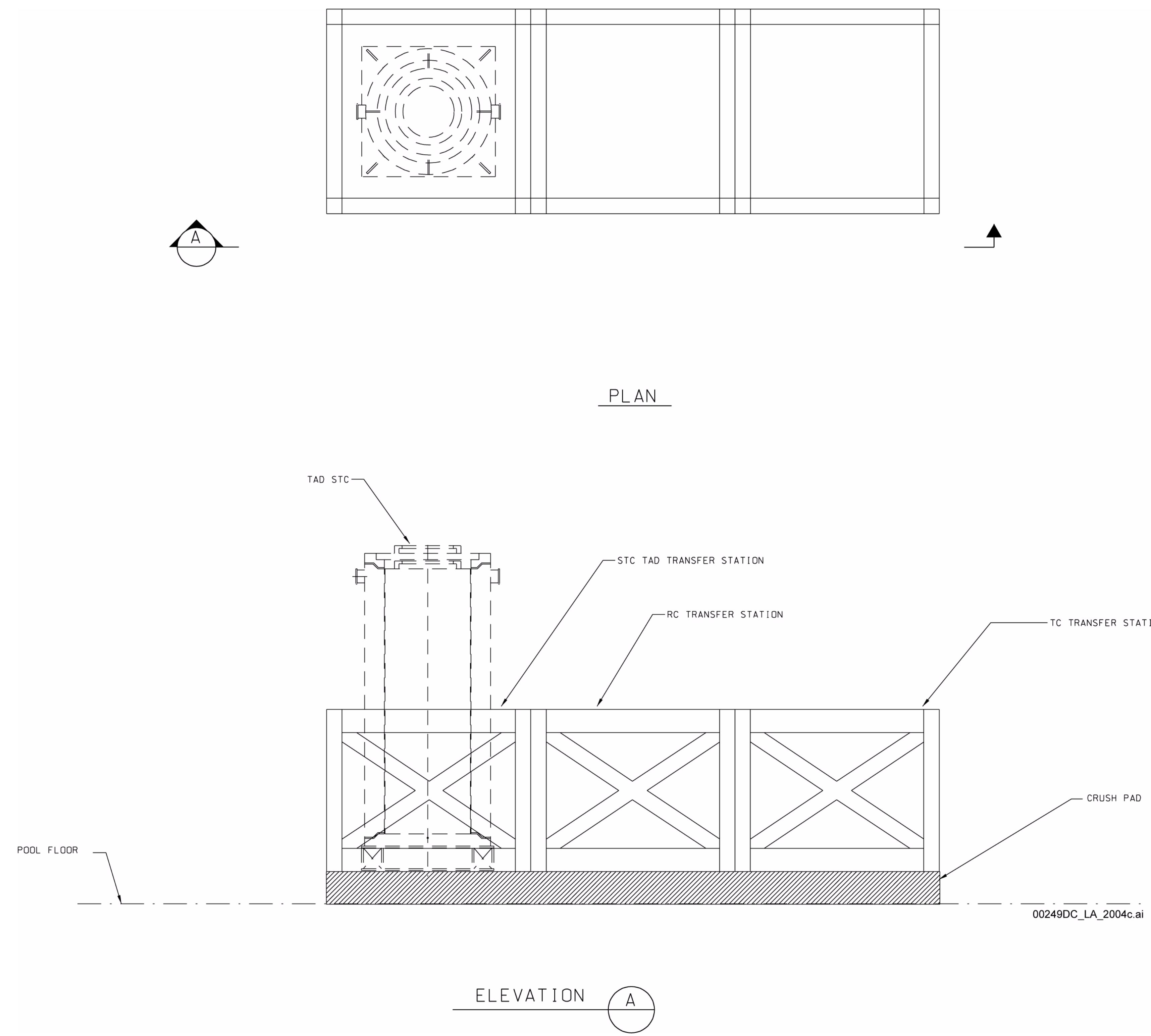

NOTE: This figure includes no SSCs that are either ITS or ITWI. RC = rail cask; STC = shielded transfer cask; TC = truck cask.

Equipment Number: 050-HTF0-RK-00003, STC/TAD transfer station; 050-HTF0-RK-00004, rail cask transfer station; 050-HTF0-RK-00005, truck cask transfer station.

Figure 1.2.5-119. TAD Canister/Rail Cask/Truck Cask Transfer Stations Plan and Elevation Mechanical Equipment Envelope

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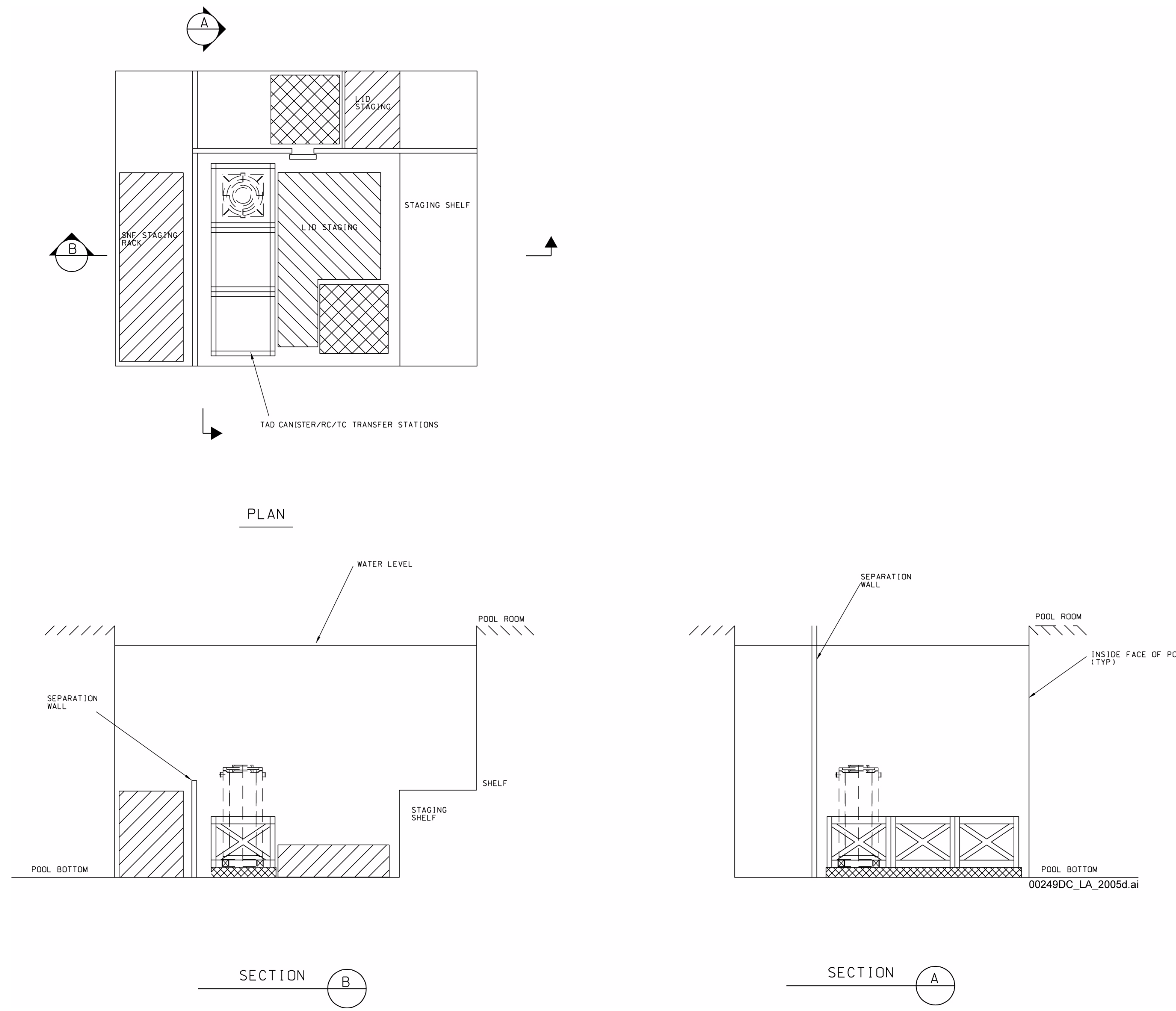

NOTE: RC = rail cask; TC = truck cask.

Figure 1.2.5-120. TAD Canister/Rail Cask/Truck Cask Transfer Stations Pool Layout Mechanical Equipment Envelope

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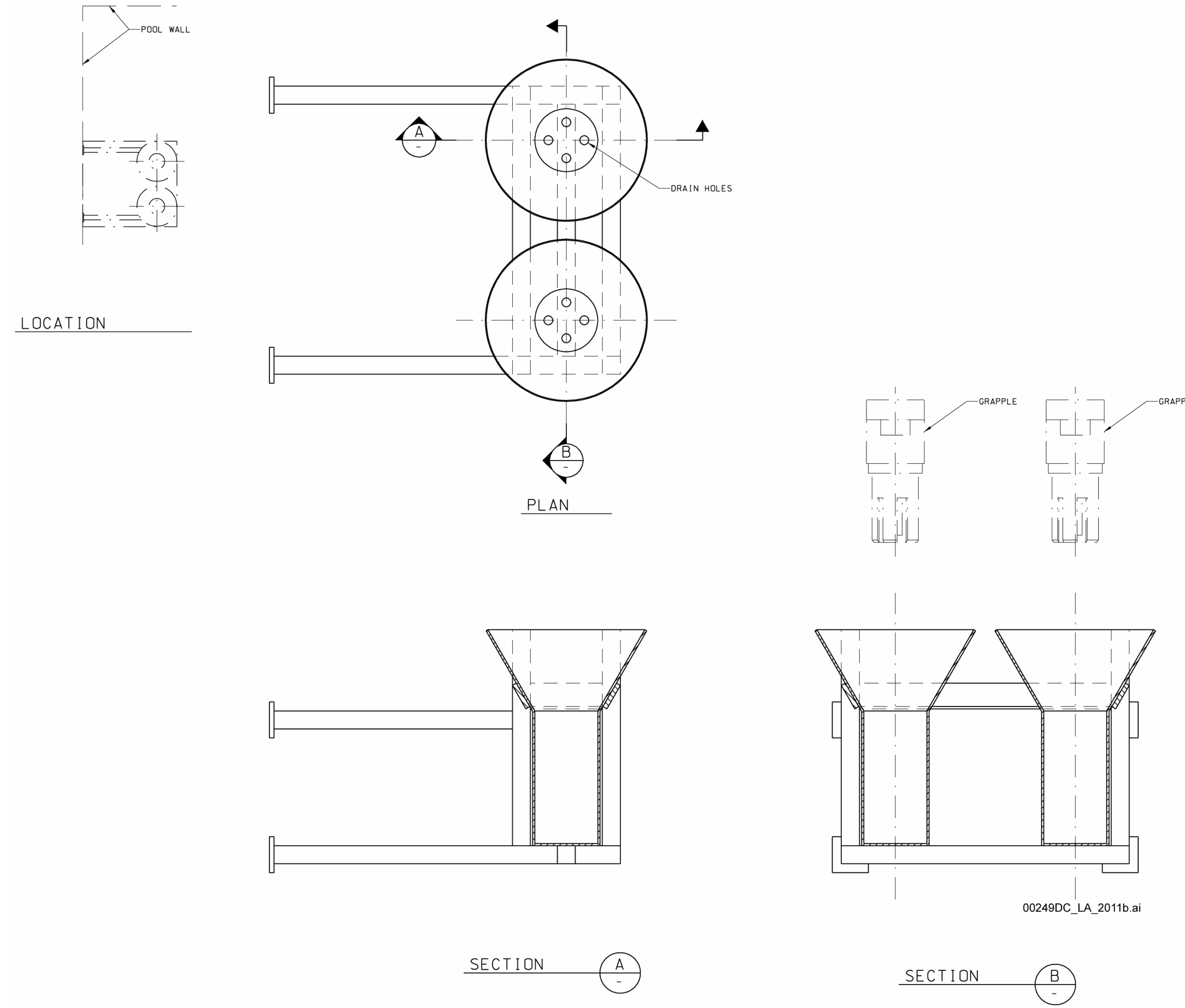

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HTF0-RK-00006, spent fuel transfer machine grapple staging rack.

Figure 1.2.5-121. Spent Fuel Transfer Machine Grapple Staging Rack Mechanical Equipment Envelope

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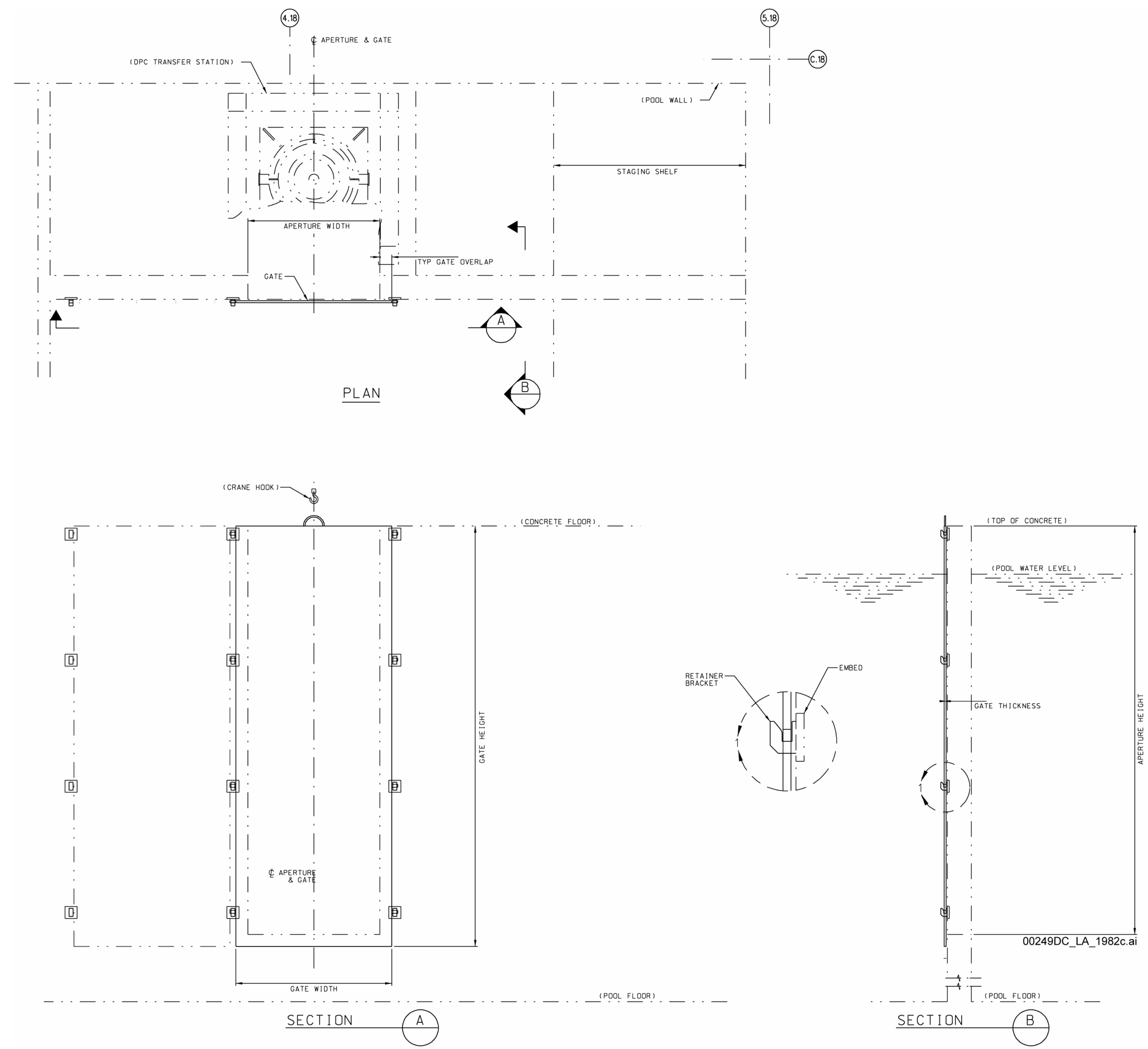

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-WH00-DR-00002, DPC unloading bay gate.

Figure 1.2.5-122. Dual-Purpose Canister Unloading Bay Gate Mechanical Equipment Envelope

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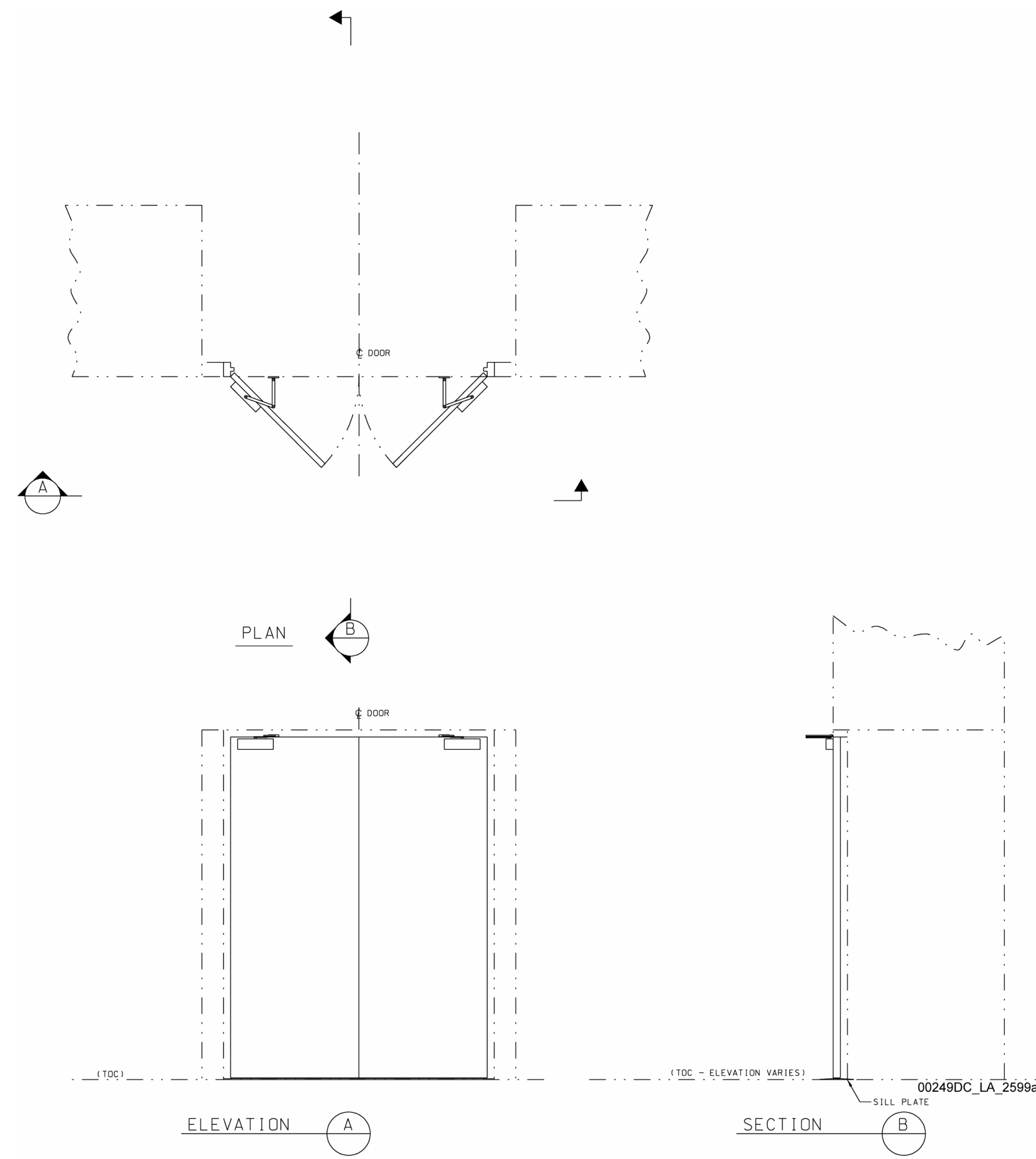

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-WH00-DR-00008/00009, personnel confinement double door east 1/east 2;
050-WH00-DR-00010, personnel confinement double door north;
050-WH00-DR-00011/00012, personnel confinement double door west 1/west 2.

Figure 1.2.5-123. Nuclear Facilities Personnel Confinement Double Door Mechanical Equipment Envelope

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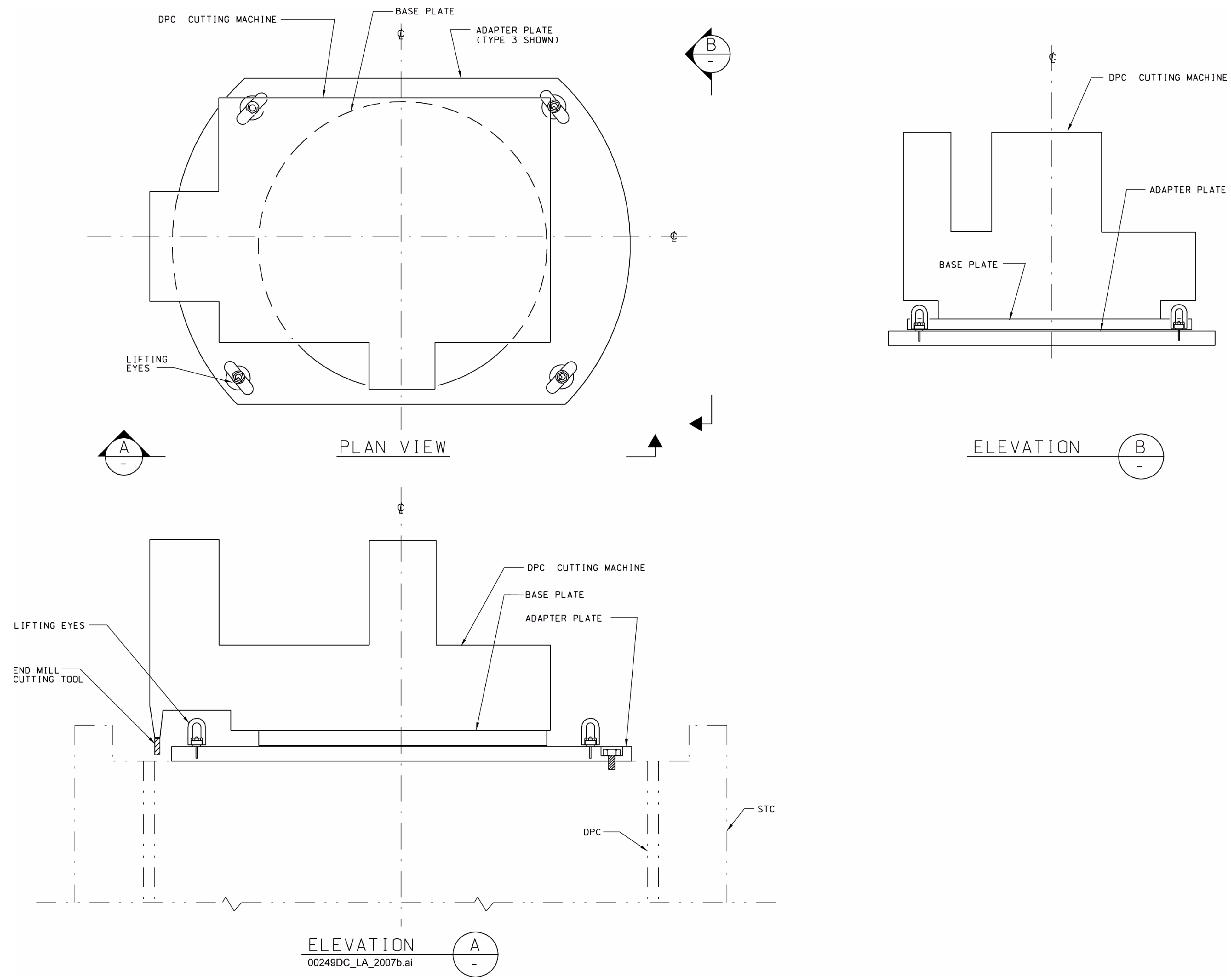

NOTE: This figure includes no SSCs that are either ITS or ITWI. STC = shielded transfer cask.

Equipment Number: 050-HD00-TOOL-00001, DPC cutting machine; 050-HD00-HEQ-00002, DPC adapter plate type 1, 050-HD00-HEQ-00003, DPC adapter plate type 2; 050-HD00-HEQ-00004, DPC adapter plate type 3.

Figure 1.2.5-124. Dual-Purpose Canister Cutting Machine Mechanical Equipment Envelope (Sheet 1 of 2)

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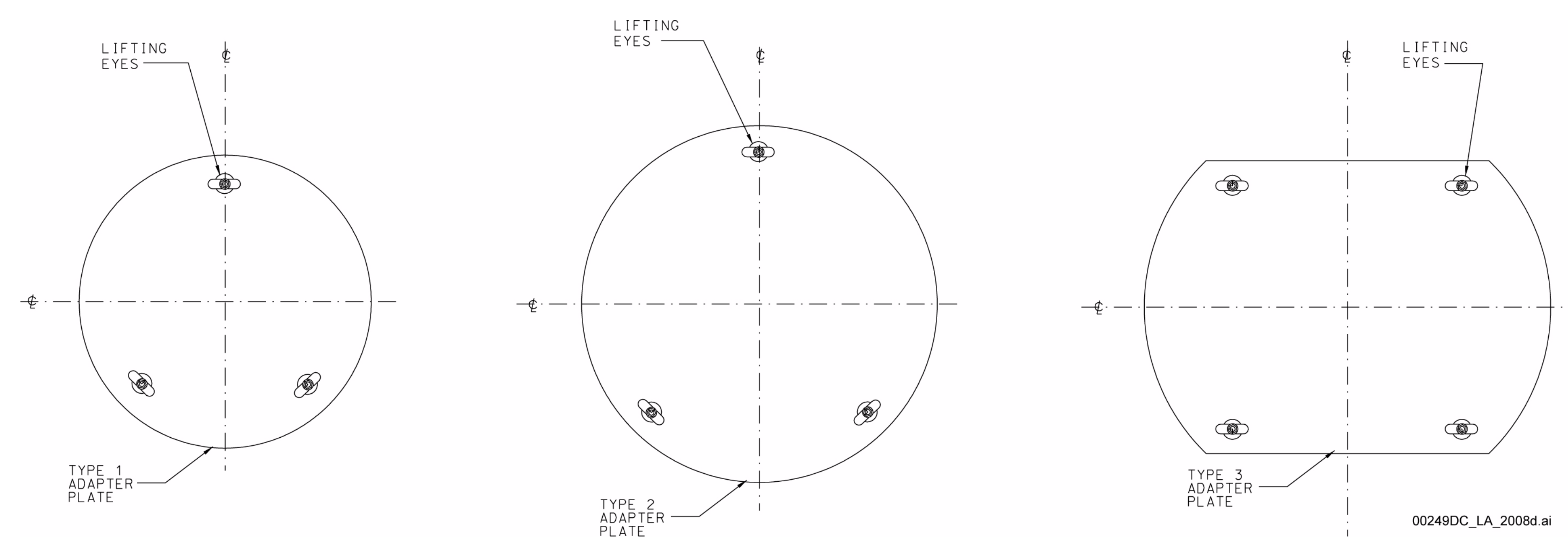

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HD00-TOOL-00001, DPC cutting machine.

Figure 1.2.5-124. Dual-Purpose Canister Cutting Machine Mechanical Equipment Envelope (Sheet 2 of 2)

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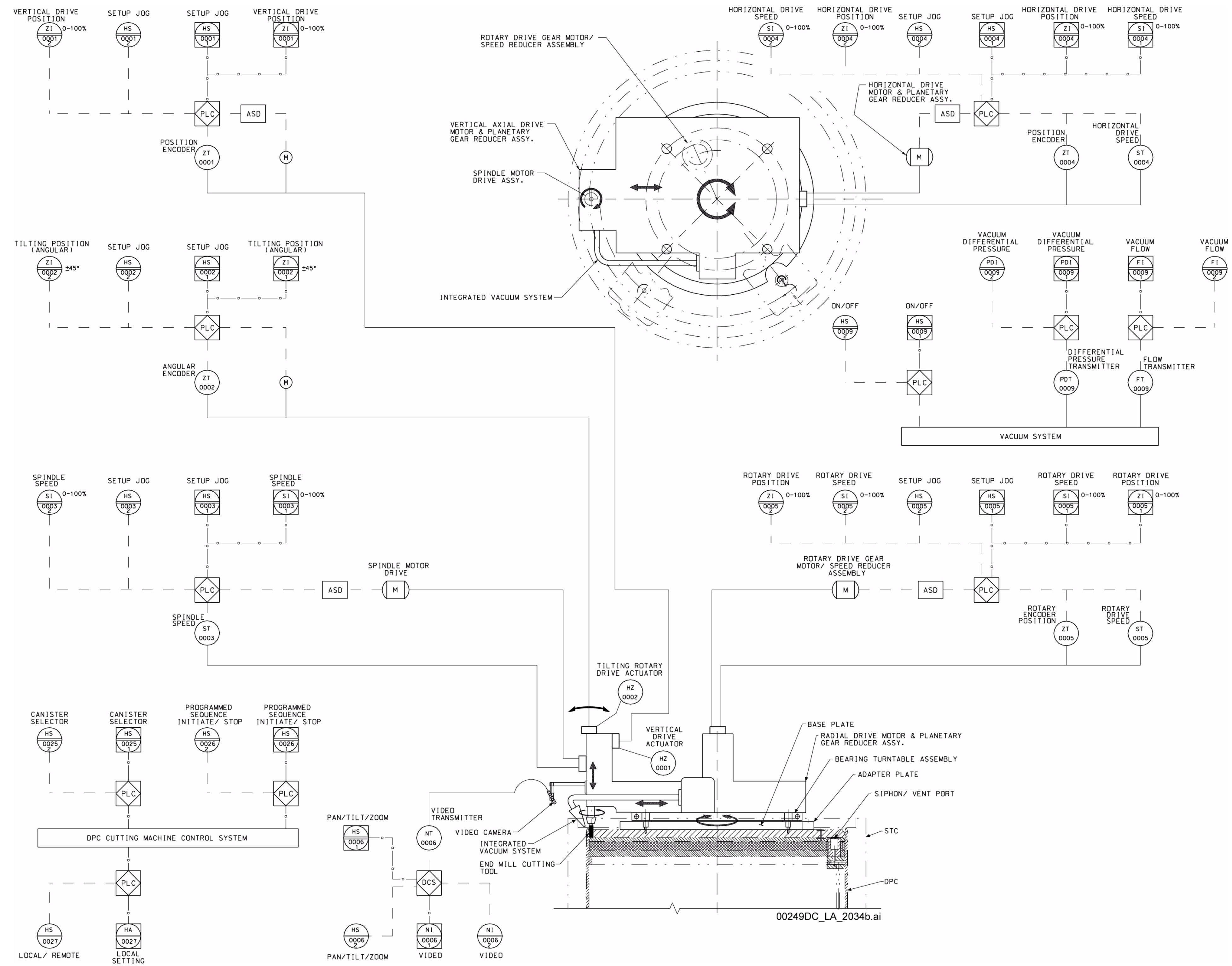

Figure 1.2.5-125. Dual-Purpose Canister Cutting Machine Process and Instrumentation Diagram

NOTE: This figure includes no SSCs that are either ITS or ITWI. STC = shielded transfer cask.

Equipment Number: 050-HD00-TOOL-00001, DPC cutting machine.

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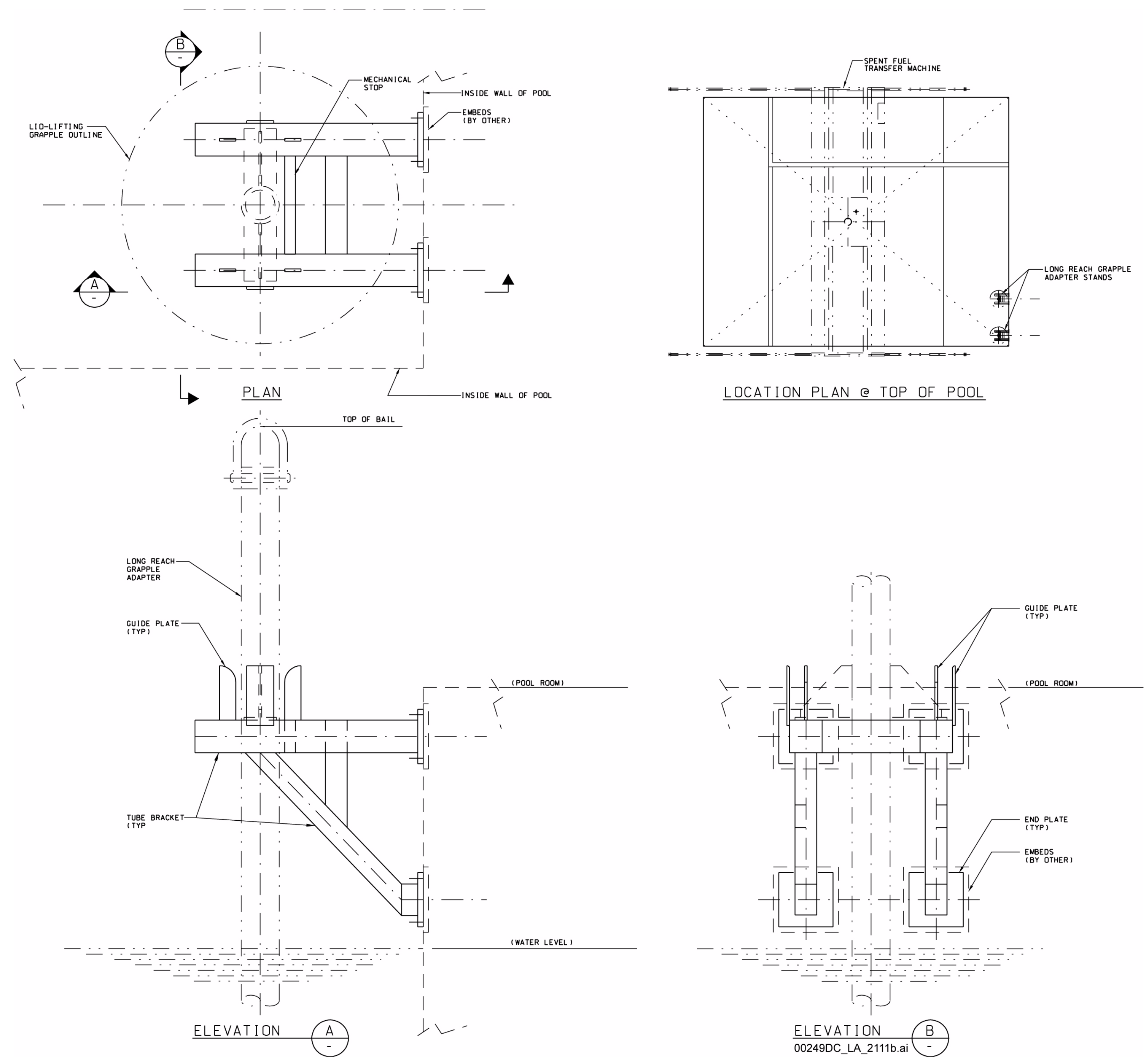

NOTE: This figure includes no SSCs that are either ITS or ITWI. The WHF pool will incorporate long-reach grapple adapters, one dedicated to the lid-lifting grapple and the other to the truck cask lid-lifting grapple.

Equipment Number: 050-HMH0-RK-00008/00011, long-reach grapple adapter stands.

Figure 1.2.5-126. Long-Reach Grapple Adapter Stand Mechanical Equipment Envelope

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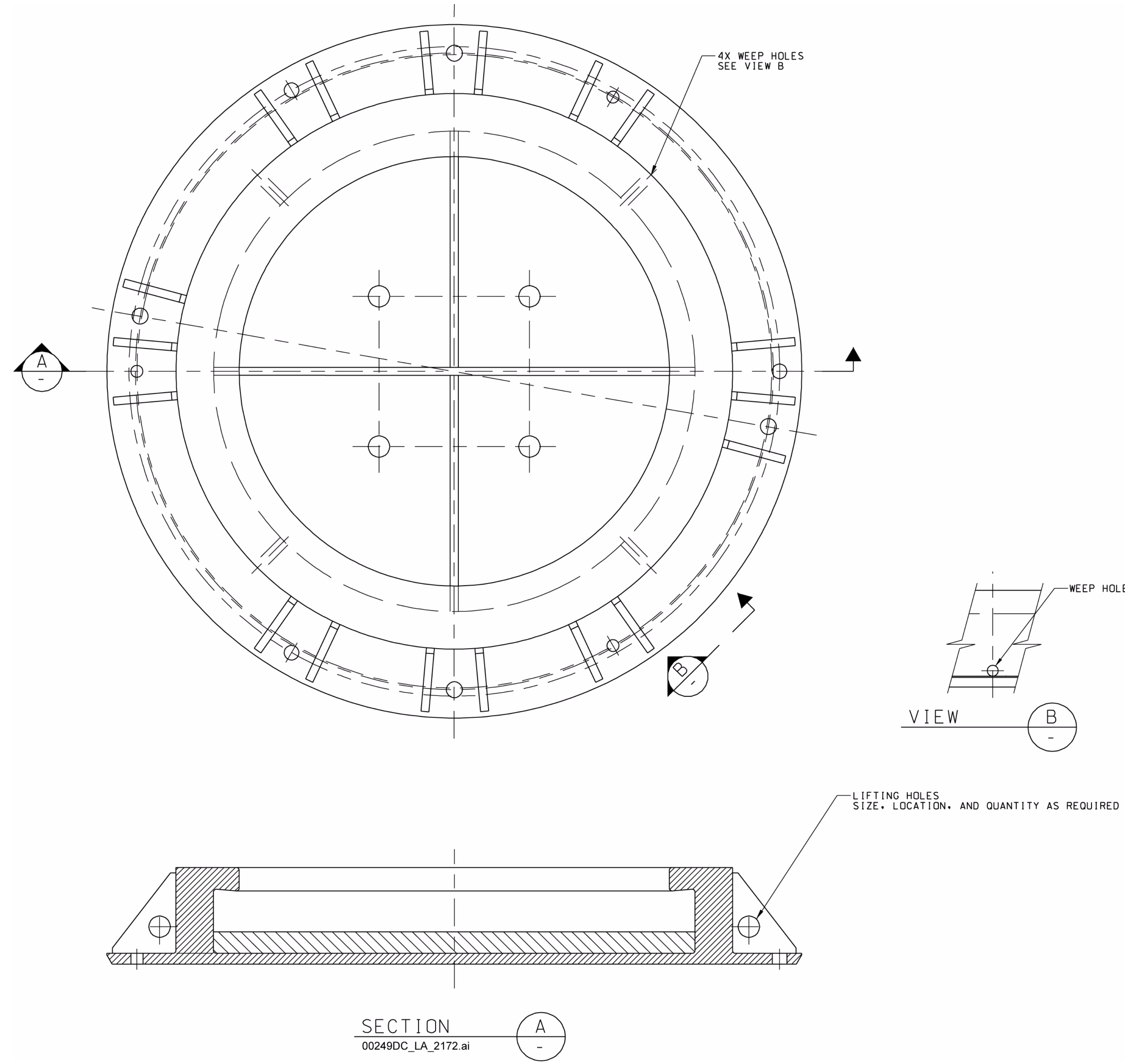

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HD00-HEQ-00005, shield plug lift adapter.

Figure 1.2.5-127. Shield Plug Lift Adapter

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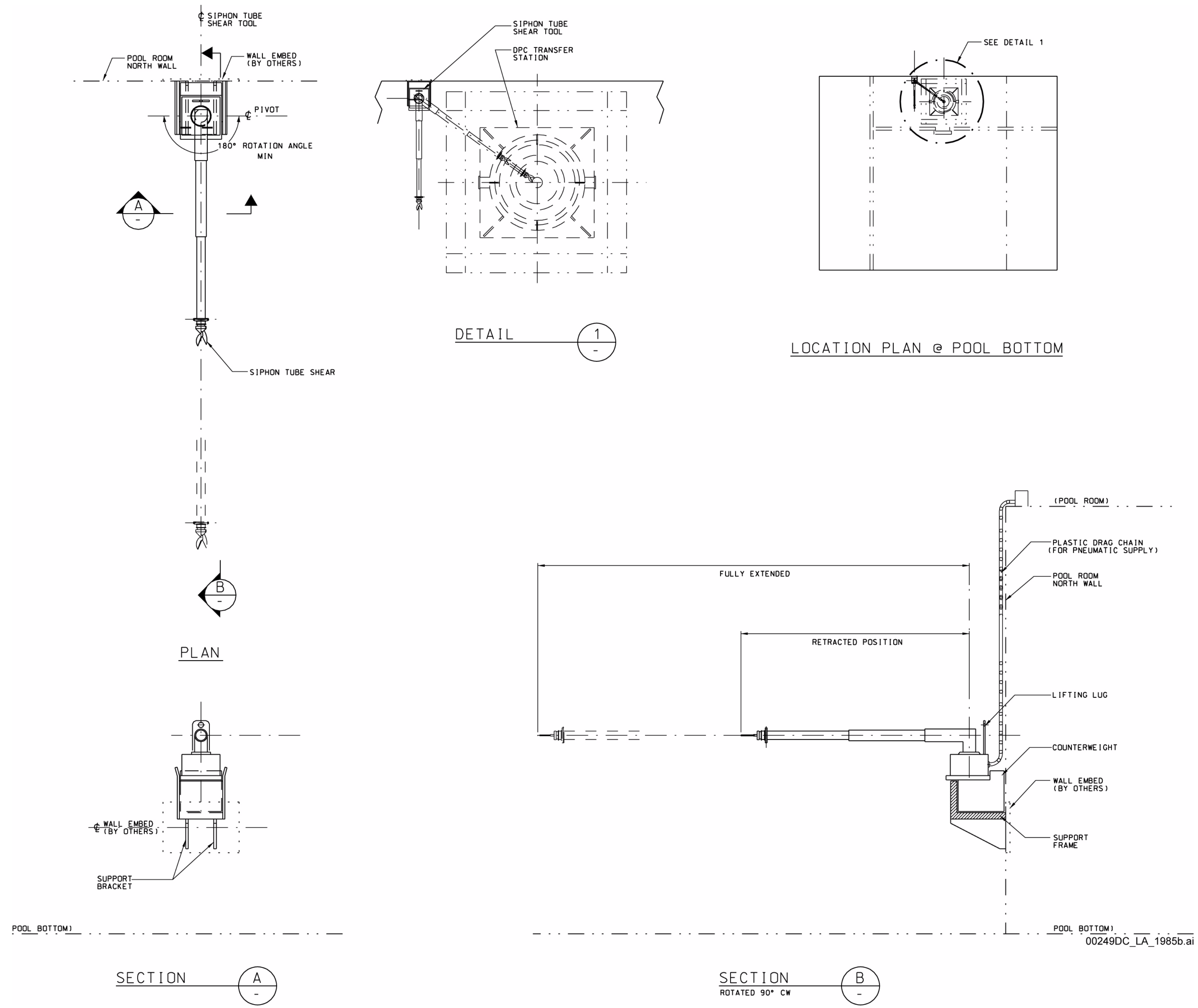

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HD00-TOOL-00002, siphon tube shear tool.

Figure 1.2.5-128. Siphon Tube Shear Tool Mechanical Equipment Envelope

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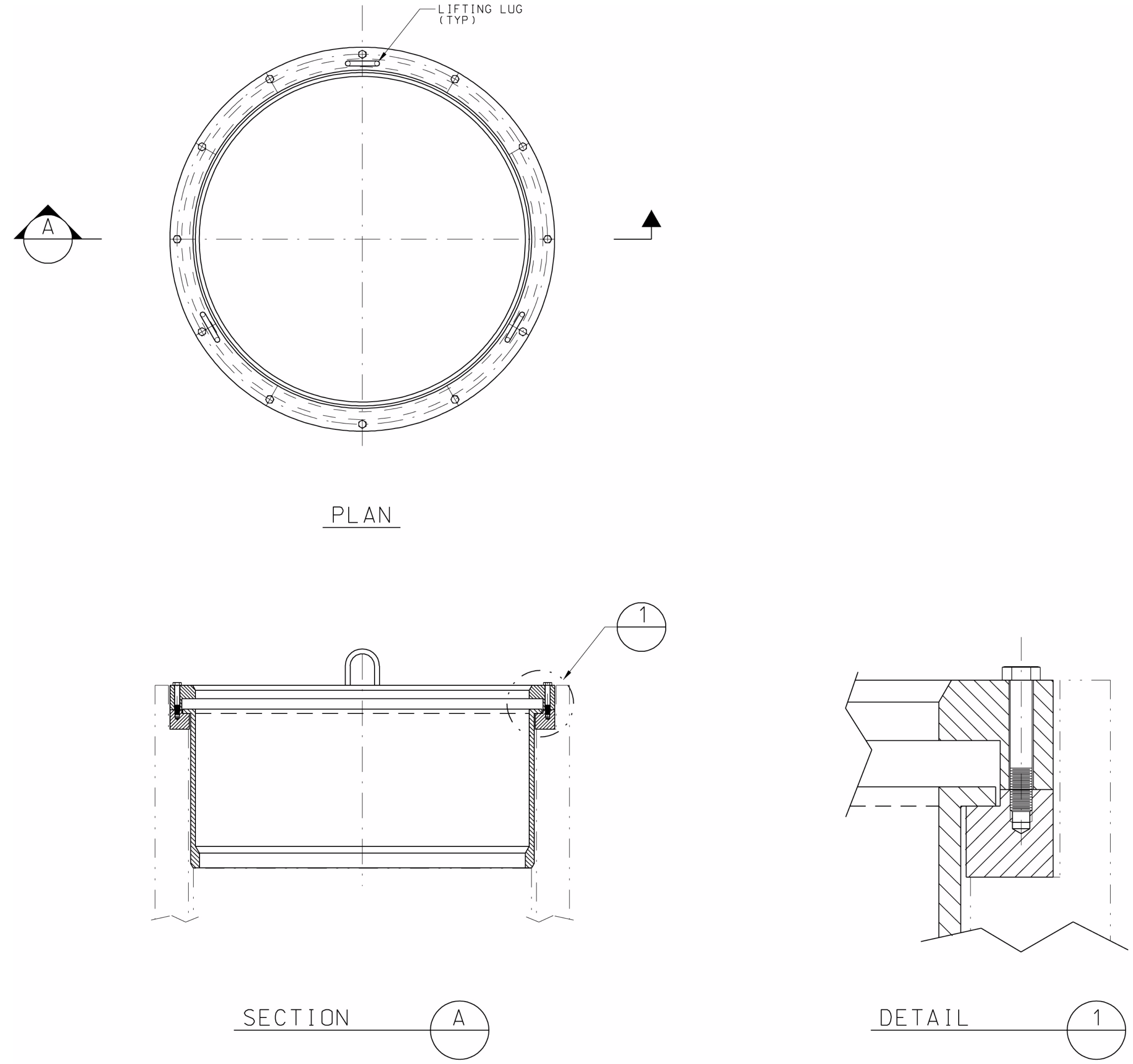

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HMH0-HEQ-00015/00016/00017/00018/00019, cask shield rings type 1/2/3/4/5.

Figure 1.2.5-129. Cask Shield Ring Mechanical Equipment Envelope

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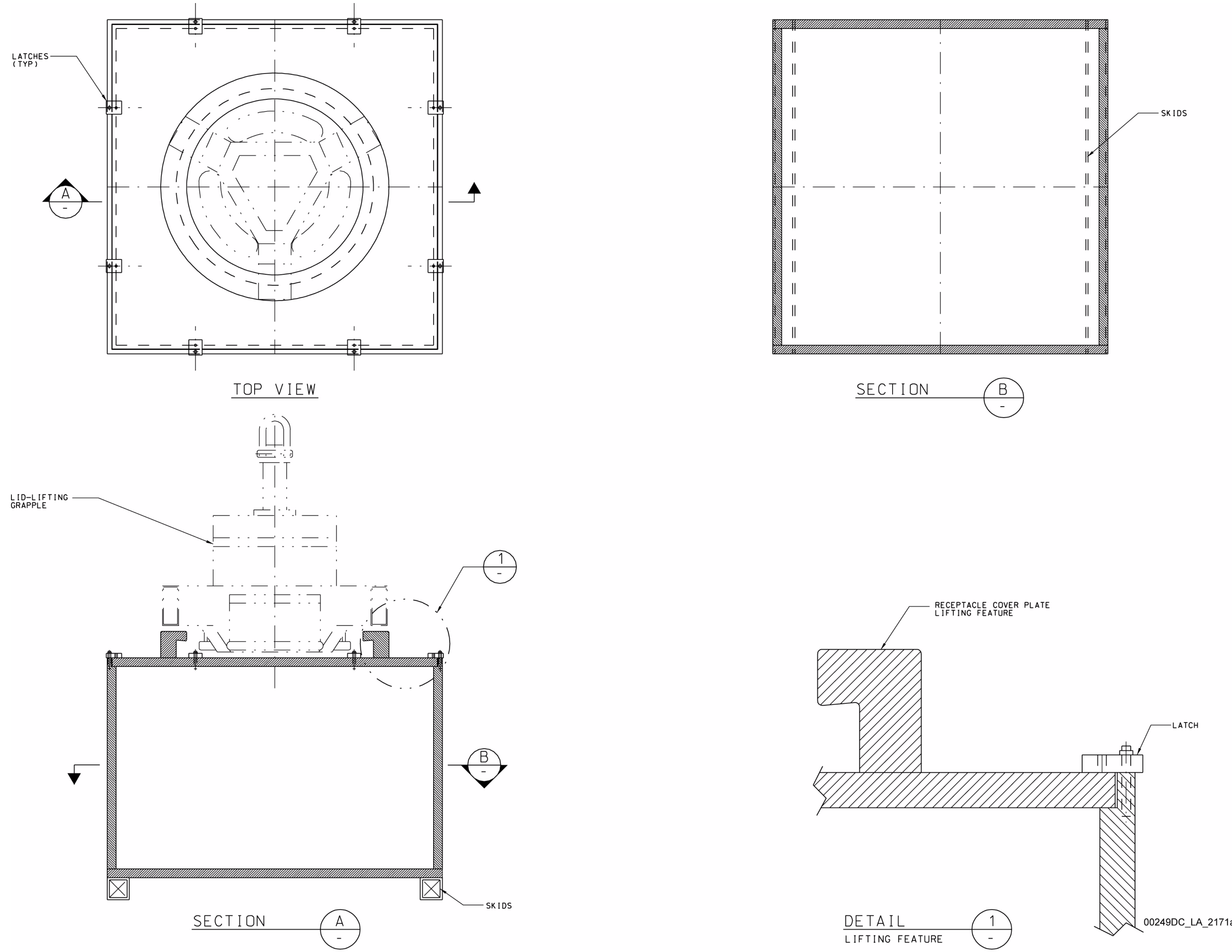

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HD00-RCP-00001, DPC lid receptacle

Figure 1.2.5-130. Dual-Purpose Canister Lid Receptacle Mechanical Equipment Envelope

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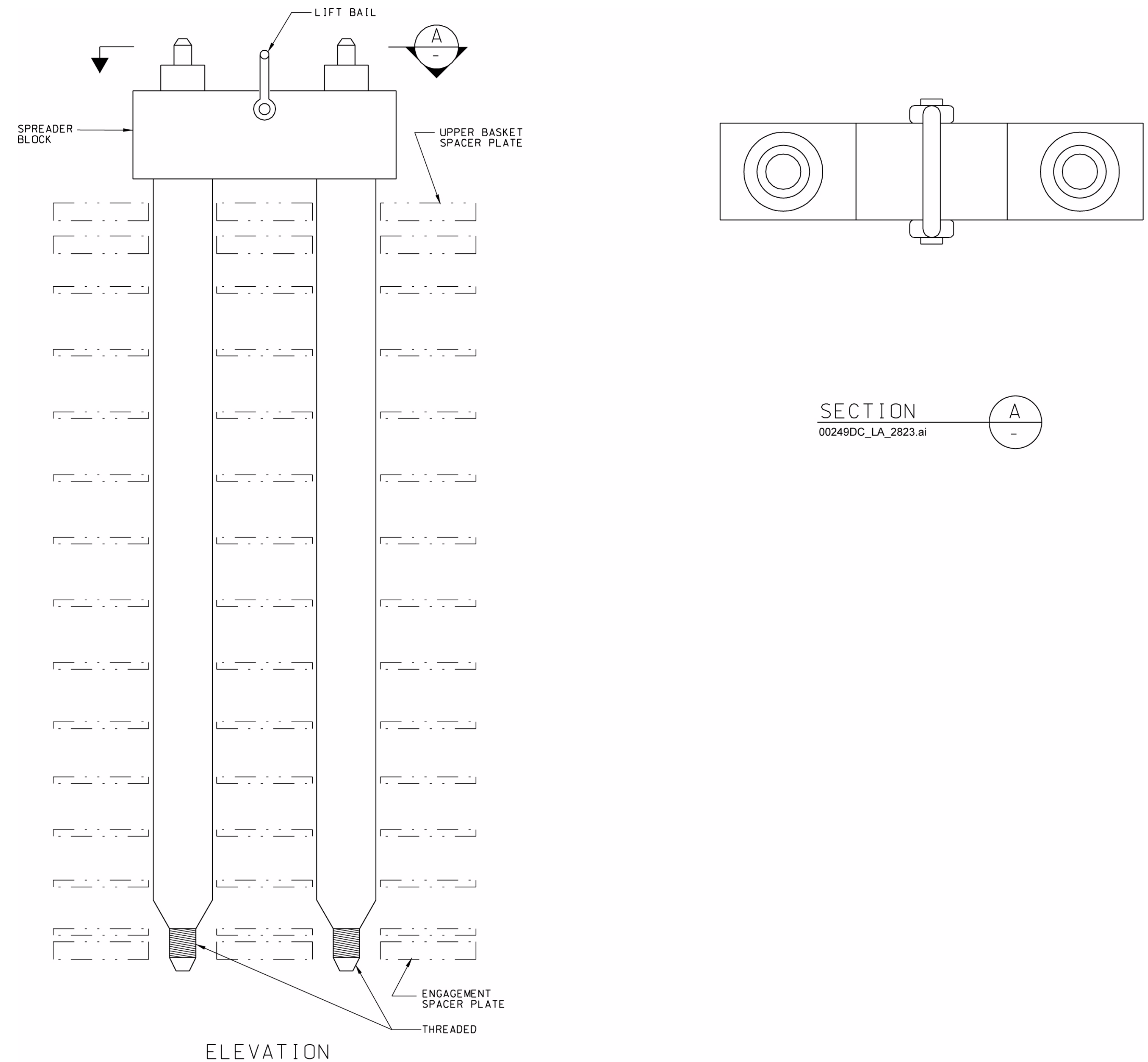

NOTE: This figure includes no SSCs that are either ITS or ITWI.

Equipment Number: 050-HTF0-HEQ-00003, W74 upper basket lifting device.

Figure 1.2.5-131. WHF W74 Upper Basket Lifting Device Mechanical Equipment Envelope

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