DISCLAIMER

(2.)

This contractor document was prepared for the U.S. Department of Energy (DOE), but has not undergone programmatic, policy, or publication review, and is provided for information only. The document provides preliminary information that may change based on new information or analysis, and represents a conservative treatment of parameters and assumptions to be used specifically for Total System Performance Assessment analyses. The document is a preliminary lower level contractor document and is not intended for publication or wide distribution.

Although this document has undergone technical reviews at the contractor organization, it has not undergone a DOE policy review. Therefore, the views and opinions of authors expressed may not state or reflect those of the DOE. However, in the interest of the rapid transfer of information, we are providing this document for your information per your request.

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
INPUT TRANSMITTAL

1. QA: QA
Page: 1 Of: 1

MOL.20000207.0125

TO:

2. INPUT TRACKING NO.
RSO-SUF-00003.T

3. REQUESTER/RECIPIENT NAME
Dealis Gwyn

4. REQUESTER/RECIPIENT ORGANIZATION
RSO/Safety Analysis

5. REQUESTER/RECIPIENT ADDRESS
1180 Town Center Drive, MS 423

6. TITLE
TN 2-7-00
~~Department Manager~~ Surface Design Description for Site Recommendation

ATTACHED ARE THE INPUT DESCRIBED BELOW: | **INPUT STATUS**

7. ITEM NO.	8. DESCRIPTION (Including document number/identifier, if applicable)	9. REVISION	10. DATE	11. NEEDS FURTHER CONFIRMATION Y/N
1	Attachment II, Engineering Files for Site Recommendation, Pages II-1 to -29	00A	1-25-00	Y
2	Attachment II, Engineering Files for Site Recommendation, Fig EF-13 to -19	00A	1-31-00	Y
3	Surface Nuc. Fac. Space Program Analysis for SR, Figures SPA-ME-1 to -28	00A	1-31-00	Y
4	Attachment II, Engineering Files for SR, Pg II-120 to -123 & Fig EF-7 to -12	00A	1-31-00	Y
5	Surface Nuc. Fac. Space Program Analysis for SR, Figures 1 to 9 & C/S 1-3	00A	1-24-00	Y

12. SPECIAL INSTRUCTIONS/COMMENTS:

Yes No
- [x] [ ] Identified input is latest version
- [x] [ ] Identified input will be placed in a controlled source

The controlled source documents will be:

PRELIMINARY DRAFT
INFORMATION ONLY

1) Engineering Files for the Site Recommendation. TDR-WHS-MD-000001, Rev 00 and

2) Surface Nuclear Facilities Space Program Analysis for Site Recommendation, ANL-WHS-AR-000001, Rev 00
(Note: the title will be changed prior to issuance as a Rev 00 document) NEW TITLE IS:
WHB/WTB SPACE PROGRAM ANALYSIS FOR SITE RECOMMENDATION 2-2-00 lg

by Keith Schwartztrauber, 2-1-00

13. APPROVED BY:
(Including authorization to release information that needs further confirmation)

RESPONSIBLE MANAGER NAME	RESPONSIBLE MANAGER SIGNATURE	DATE
Gus Mattsson	GMattsson	2-1-00

14. TRANSMITTING ORGANIZATION	15. ADDRESS
Repository Surface Design Department	1261 Town Center Drive, Room 924B

16. RETURN TRANSMITTAL BY (DATE) 2/9/00 2-2-00 lg

REQUESTER/RECIPIENT ACKNOWLEDGMENT

17. TRANSMITTED DATA:
- [x] Correct Input
- [ ] Incorrect Input (Include explanation)
- [ ] Unsolicited Input, Receipt Acknowledged

18. REQUESTER/RECIPIENT NAME	REQUESTER/RECIPIENT SIGNATURE	DATE
Dealis Gwyn	Dealis W Gwyn	2/4/00

19. REQUESTER/RECIPIENT NON-ACKNOWLEDGMENT | DATE

RESPONSIBLE MANAGER SIGNATURE

1. RADIOLOGICALLY CONTROLLED AREA

1.1 WASTE HANDLING BUILDING

1.1.1 Assembly Transfer System

1.1.1.1 Functional Description

The two nearly identical Assembly Transfer System (ATS) lines are provided in the Waste Handling Building (WHB). The ATS lines include the fuel storage pool area and the non-standard fuel pool room (Reference KRA-9 CRWMS M&O 2000, Section TBD). Each line operates independently to handle the waste transfer throughput and to support maintenance operations. (Reference KRA-5 CRWMS M&O 1998, Summary)

The ATS receives, cools, and opens rail and truck transportation casks from the CCHS. The system unloads commercial spent nuclear fuel (SNF) consisting of bare assemblies and single element canisters, and dual-purpose canisters (DPCs) from the transportation casks. For casks containing a DPC, the system opens the DPC and then unloads the SNF. The system stages or stores the assemblies, loads them into a Disposal Container (DC), temporarily fills the DC with inert gas and seals the DC, decontaminates the DC, and transfers the DC to the Disposal Container Handling System (DCHS). The system repackages non-standard fuel assemblies to acceptable packages (Reference KRA-9 CRWMS M&O 2000, Section TBD). The system also prepares empty casks and DPC over-packs for off-site shipment.

Each ATS line consists of a cask unloading area and a hot cell area. The cask unloading area includes a cask preparation and decontamination area, and a pool area. The pool area contains a cask unloading pool and an assembly staging pool. A single transfer canal connects the two pools. The hot cell area consists of an assembly-handling cell, a DC loading cell, and a DC decontamination cell An incline transfer canal is used to move the SNF from the staging pool to the assembly-handling cell (Reference KRA-5 CRWMS M&O 1998, Summary). The assembly-handling cell is equipped with two drying stations, a DC loading port, an assembly transfer machine, a DC loading manipulator, an in-cell service crane, and a maintenance bay.

One of the ATS lines is specifically designed and equipped to handle shipments of non-standard commercial SNF The ATS line is connected to the non-standard fuel handling room by an underwater transfer canal equipped with isolation gates and a SNF transfer cart. All the ATS pools and fuel storage pools have isolation gates to allow each pool to be segregated from the other pools, if necessary. (Reference KRA-9 CRWMS M&O 2000, Section TBD)

The ATS operating sequence begins with moving transportation casks to the cask preparation area. The cask preparation operations consist of remote cask cavity gas sampling, cask venting, cask cool-down, cask lid unbolting and removal, shield plug unbolting, and shield plug lifting fixture attachment. Casks containing bare SNF (no DPC) are filled with water in the cask preparation area and placed in the cask unloading pool. The shield plugs are removed underwater. For casks containing a DPC, the cask lid(s) is remotely removed, the DPC vent valves are opened, and the DPC cavity is sampled, vented, and cooled. A DPC lifting fixture is remotely attached and the cask is placed into the cask unloading pool. In the cask unloading pool, the DPC is removed from the cask and placed in a canister over-pack where the DPC lid is severed and removed. (Reference KRA-5 CRWMS M&O 1998, Summary)

Assemblies are individually removed from either an open cask or DPC and loaded into assembly baskets positioned in the assembly staging pool or in the assembly basket transfer cart. The assembly baskets are then transferred to the fuel storage pool area. Two fuel basket transfer canals, each equipped with an assembly basket transfer cart, interconnect the ATS staging pools of both ATS lines with the fuel storage pool area. The fuel storage pool area consists of four storage pools (Reference KRA-9 CRWMS M&O 2000, Section TBD).

The assembly baskets are transferred to the storage pools only when (CSNF) loaded in the DC are generating heat at a rate more than 11.8 kW. The assembly baskets are transferred from the storage pools only when CSNF loaded in the DC are generating heat at a rate less than 11.8 kW (Reference KRA-9 CRWMS M&O 2000, Section TBD). It has been determined (reference KRA-9, Section XXX) that approximately 12,000 SNF assemblies and 2800 assembly baskets will accumulate in the storage pools during the emplacement period to satisfy the blending requirement (see Parameter 1.1.1.2.1.8). This amount of SNF can be held in four storage pools each sized to stage 1250 metric tons uranium (MTU) or 750 fuel baskets (Parameter 1.1.1.2.1.3).

From the storage pools, assembly baskets are moved to a dry assembly-handling cell and loaded into one of two SNF drying vessels. After drying, the assemblies are individually removed from the drying vessels and loaded into a DC positioned below the DC load port. After installation of a DC inner lid sealing device, the DC is transferred to the DC decontamination cell where the top area of the DC and the DC inner lid sealing device are decontaminated, and the DC is evacuated and filled with nitrogen gas. The DC is then transferred to the Disposal Container Handling System for lid welding and inspection. (Reference KRA-5 CRWMS M&O 1998, Summary)

In the second cask preparation and decontamination area, lids are replaced on the empty transportation cask and DPC over-pack, the cask and DPC over-pack are decontaminated, inspected, and transferred to the CCHS for shipment off-site. Cask preparation equipment is designed to facilitate remote or manual operation, decontamination, and contact maintenance. (Reference KRA-5 CRWMS M&O 1998, Summary)

The ATS interfaces with the CCHS for incoming transportation casks and outgoing casks and DPC over-packs. The system also interfaces with the DCHS, which prepares the empty DC for loading and subsequently closes and seals the DC. The ATS also interfaces with the WHB system, the WHB electrical system, and other WHB utility systems for operational support (Reference KRA-5 CRWMS M&O 1998, Summary)

1.1.1.2 Design Parameters and Assumptions

1.1.1.2.1 Parameters

1.1.1.2.1.1 Two ATS lines are required to handle the waste throughput and support maintenance operations. (Reference KRA-9 CRMWS M&O 2000, Section TBD)

1.1.1.2.1.2 Two cask preparation and decontamination rooms are required in each ATS line to meet throughput needs. (Reference KRA-9 CRMWS M&O 2000, Section TBD)

1.1.1.2.1.3 Four fuel pools, each sized to stage 1,250 MTU, or 750 fuel baskets, are needed to provide lag storage for blending. (Reference KRA-9 CRMWS M&O 2000, Section TBD)

1.1.1.2.1.4 Two fuel basket transfer canals are needed to convey fuel baskets from the staging pools and to return fuel baskets to the ATS lines. (Reference KRA-9 CRMWS M&O 2000, Section TBD)

1.1.1.2.1.5 Two fuel drying vessels are needed in each ATS line to provide the staging capacity for fuel drying. (Reference KRA-9 CRWMS M&O 2000, Section TBD)

1.1.1.2.1.6 The pressurized water reactor (PWR) assembly baskets will each accommodate 4 PWR fuel assemblies. (Reference KRA-8 CRWMS M&O 1998, Section TBD)

1.1.1.2.1.7 The boiling water reactor (BWR) assembly baskets will each accommodate 8 BWR fuel assemblies. (Reference: KRA-8 CRWMS M&O 1998, Section TBD)

1.1.1.2.1.8 Loaded DC maximum thermal output shall not exceed 11.8 kW. (see Section 4.1.2.X)

1.1.1.2.2 Assumptions

1.1.1.2.2.1 Approximately 11' of water will provide safe and adequate gamma and neutron shielding of spent fuel elements. The water will also shield and contain alpha and beta radiation contamination sources and prevent nearly all radioactive particulate matter from becoming airborne. This is based on the proven nuclear power plant practice of using a pool for both a shield and a confinement for radionuclides.

Basis: Reference KRA-3 CRWMS M&O 1997, Section 4.3.6.
Usage: Section 1.1.1.3

1.1.1.2.2.2 ATS waste handling operations are based on the Repository Surface Design Mechanical Flow Diagrams.

Basis: Reference KRA-2 CRWMS M&O 1997, BCBD00000-01717-2700-67004 thru -67008.
Usage: Section 1.1.1.4

1.1.1.2.2.3 The DC is equipped with standardized lifting and base collars for handling purposes.

Basis: Reference KRA-11 CRWMS M&O 1999, Section TBD.
Usage: Section 1.1.1.4

1.1.1.2.2.4 An empty DC is fitted with a device to temporarily seal the inner lid of the DC before and after fuel assembly loading to prevent spread of contamination from the ATS to other systems.

Basis: Reference KRA-11 CRWMS M&O 1999, Section TBD.
Usage: Section 1.1.1.4

1.1.1.2.2.5 Adequate tools, spares, maintenance personnel, storage area, and equipment will be readily available to immediately repair failed system equipment. Since the ATS is used continuously, the system is continuously maintained over its operating life.

Basis: KRA-8 CRWMS M&O 1998, Section 4.3.6.5
Usage: Section 1.1.1.3

1.1.1.2.2.6 The assembly basket staging racks in each ATS assembly staging pool provide capacity to stage 16 assembly baskets.

Basis: KRA-9 CRWMS M&O 2000, Section TBD [4.3.1.17]
Usage: Section 1.1.1.3

1.1.1.2.2.7 The operating schedule for the ATS is 24 hours per day, 120 hours per week, and 50 weeks per year (6,000 hours per year).

Basis KRA-8 CRWMS M&O 1998, Section 4.3.6.4
Usage Section 1.1.1.4

1.1.1.2.2.8 The ATS will provide the capability to safely and efficiently recover from a wide variety of equipment malfunctions and off-normal conditions.

Basis: KRA-4 CRWMS M&O 1997, Section 7.3.2.2
Usage: Section 1.1.1.3

1.1.1.2.2.9 A segregated storage pool facility equipped for remote underwater handling will be provided to process non-standard fuel into disposable forms.

Basis: KRA-9 CRWMS M&O 2000, Section TBD.

Usage: Section 1.1.1.4

1.1.1.2.2.10 Commercial CSNF assembly baskets will be staged and stored for fuel assembly heat output blending purposes.

Basis: KRA-9 CRWMS M&O 2000, Section TBD.
Usage: Section 1.1.1.4

1.1.1.3 System Description

Two nearly identical ATS lines are provided in the WHB (Parameter 1.1.1.2.1.1). Each line is operated concurrently to handle the waste throughput and to support maintenance operations. Each line consists of an airlock, a cask preparation and decontamination area, a cask unloading and staging pool area, and a hot cell area.

An airlock provides air confinement between the pool and hot cell area and the WHB Carrier Bay. The cask preparation and decontamination area consists of two cask preparation and decontamination rooms (Parameter 1.1.1.2.1.2). Each room contains a station for unloading and loading transportation casks from a cask transfer cart to and from a cask preparation pit for preparation of loaded casks or decontamination of empty casks and DPC overpacks. Each cask preparation pit is equipped with access platforms that are adjustable for the various cask diameters and a remotely operated gantry-mounted cask preparation manipulator and hoist that straddles the pit and access platforms. A variety of tools and accessories are available for the performance of remote preparation and decontamination activities using the cask preparation manipulator and hoist. Each ATS line is equipped with a large overhead bridge crane. The cask preparation area includes a crane maintenance bay for contact maintenance of the bridge crane.

The pool area contains a cask unloading pool and an assembly staging pool. The two pools are interconnected by a transfer canal. The assembly staging pool is connected to the dry assembly-handling cell by an incline transfer canal. Two fuel basket transfer canals (Parameter 1.1.1.2.1.4), each equipped with a basket transfer cart, interconnect the staging pools of both ATS lines with the fuel basket storage pools. A third transfer canal connects the cask unloading pool and the non-standard fuel pool.

The cask preparation and pool area equipment consists of the cask transfer carts, the cask unloading area bridge crane, and two gantry-mounted cask preparation manipulators with hoists. Cask and DPC lifting yokes, fixtures, remote tools, and accessories are also provided. The cask unloading and staging pools are equipped with pool-deck-mounted assembly transfer machines, wet assembly lifting grapples, DPC lid severing tools, DPC over-packs, assembly baskets, basket staging racks, two fuel storage pool transfer canal carts, and incline transfer canal carts.

The fuel storage pool area consists of four large water basins. Each basin is capable of storing 750 baskets of CSNF (Parameter 1.1.1.2.1.3). All four pools are interconnected using the two fuel basket transfer canals. A separate non-standard fuel pool is provided for handling off-normal and damaged fuel assemblies in single-element canisters. The five pools are housed in an annex to the WHB. At all times spent fuel and basket handing operations are conducted underwater, with 11 feet of water coverage over the fuel elements (Assumption 1.1.1.2.2.1). _

From the time that the fuel is unloaded from the cask until the fuel is dried for loading into the DC, fuel is handled in standard size spent fuel baskets containing 4 PWR or 8 BWR assemblies (Parameter 1.1.1.2.1.6 and 1.1.1.2.1.7). A maximum of 16 fuel baskets may be staged in the ATS staging pool at any time (Assumption 1.1.1.2.2.6).

The hot cell area consists of an assembly handling cell, a DC load cell, and a DC decontamination cell. The assembly-handling cell is interconnected to the pool area assembly staging pool by the incline transfer canal. The assembly-handling cell contains two assembly drying vessels (Parameter 1.1.1.2.1.5), a DC load port, a dry assembly transfer machine, dry assembly lifting grapples, an assembly handling cell bridge crane, an assembly handling cell manipulator, a DC load port shield plug, an assembly drying vessel shield plug, an equipment maintenance bay, and recessed lid and shield plug storage areas. The DC load cell is located below the assembly handling cell and the DC decontamination cell is located below the assembly handling cell equipment maintenance bay.

The equipment maintenance bay, which is used to perform contact maintenance on the dry assembly transfer machine, the bridge crane, and the assembly handling cell manipulator, is separated from the assembly handling cell by a multi-segment isolation door. The maintenance bay is also interconnected to an overhead equipment transfer corridor by means of a shielded access hatch.

The DC load cell and the DC decontamination cell are serviced by a DC transfer cart which is used to transfer a DC between the DC handling cell, the DC decontamination cell, and the DC load cell. An isolation door is provided between the DC load cell and the DC decontamination cell and a shield door is provided between the DC decontamination cell and the DC handling cell. A DC load port mating device in the DC load cell provides a contamination barrier between the assembly handling cell, the DC load port, and the DC during SNF transfer operations. The DC decontamination cell is equipped with a bridge-mounted DC inerting manipulator, a bridge-mounted decontamination manipulator, a DC decontamination tool, and a DC contamination sample pass-through glove-box. The pass-through glove-box is used to transfer contamination survey samples into an adjacent operating gallery for counting.

All ATS remote operations are controlled from operating galleries adjacent to each hot cell. Strategically located closed-circuit television (CCTV) systems and shield windows support the remote operations. All hot cell area equipment is designed to facilitate remote operation and remote removal for contact decontamination and maintenance. Interchangeable components are provided where appropriate. The equipment is also designed to provide safe and efficient recovery from failures and malfunctions (Assumption 1.1.1.2.2.8).

1.1.1.4 Operational Description

Figure 4.1-X provides a mechanical flow diagram for the operations of the ATS. The following subsections describe the operational steps (see Assumption 1.1.1.2.2.2) in the diagram for each ATS area in the WHB.

Airlock

A commercial SNF transportation cask (see Section 4.1.1.2.5) is unloaded from its truck or rail carrier and is transferred into the ATS line from the CCHS using the carrier bay crane. The cask is upended on the carrier, lifted vertically, transferred to the ATS line cask transfer cart, and secured against overturning. The cask transfer cart is moved into the ATS line airlock. The airlock is provided with isolation doors at both ends to maintain a slightly negative air pressure in the ATS work areas compared to the carrier bay. The cask transfer cart is then used to move the cask to the cask preparation area.

Cask Preparation Area

The casks are removed from the cask transfer cart using the dry cask lifting yoke and the cask unloading area bridge crane and placed into a cask preparation pit in one of the cask preparation and decontamination rooms. The access platforms are adjusted to accommodate the cask diameters. The cask preparation activities are performed by a combination of remote and contact operations, using the crane, manipulator, and associated tools. The cask preparation operations consist of remote cask cavity gas sampling, cask venting, gas and water cool-down, shield plug unbolting, and attachment of the shield plug lifting fixture. For casks containing fuel assemblies within a DPC, the cask outer lid is remotely or manually removed in the preparation pit, the DPC is remotely or manually sampled, vented and cooled, and a DPC lifting fixture is remotely or manually attached. Following cask preparation operations, the bridge crane and lifting yoke are used to transfer the cask to the cask unloading pool for fuel and DPC unloading.

Cask Unloading and Staging Pools

For casks containing bare fuel assemblies, the cask is placed in the cask unloading pool and the shield plug is removed underwater in the cask unloading pool. For cask containing a DPC, the DPC is removed from the cask and placed in the canister over-pack using the bridge crane. The DPC lid is then severed and removed using the DPC lid severing tools and bridge crane.

Fuel assemblies are individually removed from either an open shipping cask or an open DPC by the wet assembly transfer machine and loaded into assembly baskets in the staging pool or the assembly basket transfer cart. The empty cask and the canister over-pack, containing the empty DPC and the severed lid, are returned to the cask preparation and decontamination area where they are prepared for off-site shipment. Prior to shipment, lid installation, bolting, drying, contamination survey testing, and decontamination is performed, as required.

Fuel Storage Pools

When the assembly baskets in the staging pool are full, they are removed from the assembly basket staging rack by the wet assembly transfer machine and placed in one of the fuel basket transfer canal carts. The fuel basket transfer canal cart is then used to transfer the loaded fuel baskets to one of the storage pools for fuel blending and DC loading. CSNF blending (Assumption 1.1.1.2.2.10) requires that any loaded DC generate heat at a rate not exceeding 11.8

kW (Parameter 1.1.1.2.1.8). Loading of the DC is allowed only when the inventory of spent fuel in surface storage is sufficient to provide a mixture of fuel assemblies that average 562 watts for PWR fuel and 268 watts for BWR fuel. Unless sufficient quantities of fuel generating heat below these average values is available, a DC cannot be loaded until the heat generation is reduced by radioactive decay or cooler fuel arrives. (Reference KRA-9 CRWMS M&O 2000, Section TBD)

When a loaded fuel basket is selected from the storage pools for DC loading, the fuel basket is once again placed in one of the assembly basket transfer canal carts and transferred back to the ATS assembly staging pool. The loaded assembly basket is then removed from the cart by the wet assembly transfer machine and placed in an incline transfer canal cart. The incline transfer cart is used to transfer loaded assembly baskets up the incline transfer canal, out of the pool, and into the dry assembly handling cell.

Non-Standard Fuel Handling Room

The non-standard fuel handling room processes failed and non-standard size SNF that does not meet the criteria for DC loading. To meet the DC loading criteria, non-standard single-element canisters, consolidated SNF canisters, and over-size canisters are subjected to cutting, unloading, and repackaging operations (Assumption 1.1.1.2.2.9). All of these operations take place under water in the non-standard fuel pool. The non-standard fuel handling room is located in the storage pool area annex of the WHB. A transfer canal, with normally closed isolation gates at each end, connects one ATS cask unloading pool with the non-standard fuel pool.

A cask containing non-standard SNF is directed to the appropriate ATS line. After completion of the cask preparation operations, the cask is placed in the ATS cask unloading pool. The cask is opened and the isolation gates between the ATS cask unloading pool and the non-standard fuel pool are opened. The ATS wet assembly transfer machine unloads the assemblies from the cask and places them in assembly baskets located into the non-standard assembly basket transfer cart. The transfer cart is moved to the non-standard fuel pool. Once the fuel unloading and transfer operation is completed, the isolation gates between the two pools are closed. Using an overhead bridge crane, the assembly baskets are removed from the non-standard fuel transfer cart and placed into the non-standard fuel pool basket-staging rack. After the fuel has been repackaged, it is loaded into the assembly basket again and sent back to the ATS cask unloading pool by reversing the above operational sequences. Once in the ATS cask unloading pool, the loaded fuel baskets are directed either to the storage pools or to the assembly handling hot cell.

Assembly Handling Cell and DC Load Cell

In the assembly handling cell, the assembly basket is removed from the incline transfer canal cart by the dry assembly transfer machine and loaded into one of two assembly drying vessels. SNF assembly drying operations are performed to meet performance criteria (see Section 4.1.1.2.11). An empty DC, equipped with a lifting collar, a base collar (Assumption 1.1.1.2.2.3), and an inner lid sealing device (Assumption 1.1.1.2.2.4), is transferred into the DC load cell and mated with the DC load port. The dry assembly transfer machine is then used to remove the DC load port lid and the inner lid-sealing device from the DC. After the fuel assemblies are dry, the dry assembly transfer machine is used to remove fuel assemblies, one at a time, from the baskets in the drying vessel and load the assemblies into the DC positioned below the DC load port. The empty assembly baskets are returned to the storage pools, using the incline transfer canal and fuel basket transfer canal carts.

When the DC is filled with fuel assemblies, the DC inner lid sealing device and load port lid are re-installed by the transfer machine. The DC is disengaged from the DC load port and transferred to the DC decontamination cell using the DC transfer cart. In the DC decontamination cell, the lid area of the DC and the DC inner lid sealing device are decontaminated. The DC is evacuated and filled with nitrogen gas to exclude oxygen using the DC inerting manipulator. The DC is then transferred using the DC transfer cart to the DC Handling System for lid welding, inspection, and subsequent emplacement in the repository subsurface.

Summary of Operations

To ensure that the ATS is capable of handling the throughput quantities specified in Section 4.1.1.2.6 of the Engineering Files for Site Recommendation (EFSR), a waste handling simulation has been performed using the WITNESS computer program (Ref KRA-8 CRWMS M&O 1998). The results of the simulation (see reference KRA-9, Section XXX) indicate that two ATS lines can receive, unload, handle, store, blend, and load fuel into the DCs by operating 6000 hours annually (Assumption 1.1.1.2.2.7). This assumption is based on timely response to ATS maintenance needs, equipment repair, and replacement (Assumption 1.1.1.2.2.5).

1.1.2 Canister Transfer System

1.1.2.1 Functional Description

The Canister Transfer System (CTS) receives rail transportation casks from the CCHS as well as empty DCs from the DCHS. The system is located in the WHB. The system unloads the canisters from a cask, stages canisters (as required), loads canisters into the DC, and prepares the empty cask for off-site shipment. Cask unloading begins with cask inspection, gas sampling, and lid bolt removal operations. One or more cask lids are removed and the canisters are unloaded inside shielded hot cells. Small defense high-level waste (DHLW) or U.S. Department of Energy (DOE) spent nuclear fuel (DSNF) canisters are either loaded directly into a DC or are staged in the hot cell until enough canisters are available to fill a DC. Large DSNF canisters are loaded directly into a DC. Canisters that are damaged, contaminated, or received that do not meet acceptance specifications are considered off-normal. Off-normal canisters are transferred to the off-normal canister-handling cell for remedial processing. The system delivers a loaded DC to the DCHS. Empty transportation casks and associated components are decontaminated as required, closed, and delivered to the CCHS.

One CTS line is provided in the WHB (see reference FFH-6). The line is configured to handle disposable DHLW and DSNF canisters (see reference FFH-8) and load them into a DC. _The CTS line contains an airlock, cask preparation and decontamination area, canister transfer cell, and an off-normal canister-handling cell. The cask preparation and decontamination area includes a cask preparation station and a cask decontamination station. The canister transfer cell consists of canister transfer upper and lower rooms, a cask unloading port, a DC loading port, an off-normal canister transfer port, a small canister staging area, and a crane maintenance area. Canister staging is provided for the accumulation of small canisters in a shielded area.

All radioactive canister transfer operations are performed remotely in the shielded canister transfer or off-normal canister handling cells. The canisters are removed from a cask one at a time using in-cell remote equipment and placed in the DC, the canister staging area, or the off-normal canister port to be transported to the off-normal canister handling cell. The equipment in the off-normal canister-handling cell is provided to receive, handle and, if necessary, repackage off-normal canisters prior to final disposal in the repository. Once a DC is loaded, it is transported to the DCHS. The empty cask is returned to the cask preparation and decontamination area and the CCHS for off-site shipment.

The CTS interfaces with the CCHS for incoming and outgoing transportation casks (see reference FFH-7). The CTS also interfaces with the DCHS by receiving an empty DC prepared for loading and returning a loaded DC for sealing and eventual emplacement. The CTS also interfaces with the WHB system, the WHB Electrical System, and other WHB utility systems for operational support.

1.1.2.2 Parameters and Assumptions

1.1.2.2.1 Parameters

1.1.2.2.1.1 One CTS line is required to handle all expected DHLW and DSNF canister waste througput and maintenance support operations. (Reference FFH-2, FFH-4, and FFH-6)

1.1.2.2.1.2 One CTS cask preparation station and decontamination station is required to meet expected DHLW and DSNF cask throughput and maintenance support operations. (Reference FFH-2, FFH-4 and FFH-6)

1.1.2.2.1.3 During the life of the repository, several canisters will be classified as off-normal and will require remedial processing before they are accepted for loading into a DC. (Reference FFH-2)

1.1.2.2.1.4 Forty DHLW and DSNF canister staging area positions are required to provide lag storage capacity for small canisters. Twenty positions are required for normal operations and twenty are required for off-normal waste handling operations. (Reference FFH-2, FFH-4 and FFH-6)

1.1.2.2.2 Assumptions

1.1.2.2.2.1 The canister transfer cell is divided into an upper and lower room to reduce the canister lift height above the cell floor when moving a canister from a cask to a DC or lag storage position.

Basis: Reference FFH-2, Section XXX.
Usage: Section XXX

1.1.2.2.2.2 One off-normal canister-handling cell with a canister transfer cell tunnel is required to perform remedial processing for damaged, contaminated, or abnormal canisters and maintenance support operations.

Basis: Reference FFH-2, Section XXX.
Usage: Section XXX

1.1.2.2.2.3 All abnormal canister remedial processing will be performed in a separate off-line hot cell to prevent off-normal canister operations from interfering with canister waste handling operations and slowing CTS throughput.

Basis: Reference FFH-2, Section XXX.
Usage: Section XXX.

1.1.2.2.2.4 Abnormal canisters that cannot be repaired (weld repair, crack repair, etc.) in the CTS off-normal canister handling cell will be placed in an over-pack in the off-normal canister handling cell, welded closed, and returned to the canister transfer cell for loading into a DC. A DC will be configured with a special basket that will accept the overpack and a small canister. Due to the classified nature of some DSNF (see reference FFH-9), the transfer and repackaging of large naval canisters is infeasible at the Monitored Geologic Repository (MGR). This approach is based on the assumption that solidified DHLW cannot be effectively removed from its canister and repackaged in a replacement canister. In addition, it is assumed that DSNF cannot be repackaged due to criticality concerns and the potential for extensive cell contamination during repackaging.

Basis: Reference FFH-2, Section XXX and reference FFH-9.
Usage: Section XXX

1.1.2.3 System Description

The design of the CTS is based on the best available design information developed for the Viability Assessment Report and its supporting documents (see reference FFH-3). One CTS line is provided in the WHB to handle canister waste transfer throughputs and to support canister transfer system maintenance (Parameter 1.1.2.2.1.1). The CTS includes an airlock, a cask preparation and decontamination area, canister transfer cell, and an off-normal canister handling cell with a transfer tunnel connecting the two cells (Assumption 1.1.2.2.2.2).

Remote handling equipment in the cask preparation and decontamination area consists of a cask transfer cart, cask preparation manipulator, and tools required to perform cask unbolting, venting, lid removal, and decontamination.

The canister transfer cell is divided into a lower and an upper room (Assumption 1.1.2.2.2.1) with canister transfer ports employed to allow vertical canister lifts from the cask to the DC, staging area, or off-normal transfer tunnel. The upper room of the canister transfer cell includes a cask unloading port, a DC loading port, an off-normal canister transfer port, off-normal canister transfer tunnel, the staging area canister ports, and an in-cell maintenance bay. The canister transfer cell lower room includes a canister transfer station and a DC loading station. The lower room of the canister transfer cell also includes the canister staging area and the off-normal canister transfer tunnel. A canister staging rack is provided for the accumulation of 20 small canisters (Parameter 1.1.2.2.1.4). This arrangement reduces the potential canister drop height during the canister transfer operation (Assumption 1.1.2.2.2.1).

Remote handling equipment in the canister transfer cell includes a 65-ton overhead bridge crane (sized to handle the large naval canisters), an in-cell electro-mechanical manipulator, and a suite of small canister lifting fixtures. The remote equipment is designed to facilitate in-cell operations, maintenance, and recovery from off-normal events. A maintenance bay inside the canister transfer cell is used to perform contact maintenance operations. Interchangeable components are provided to support maintenance, repair, and replacement of equipment. Lay-down areas are included, as required, for fixtures, tooling, and canister grapples. In the event of in-cell equipment failures, the crane and manipulator can be remotely withdrawn to the maintenance bay using off-normal and recovery operations.

A separate off-normal canister handling cell is located adjacent to the canister transfer cell and is interconnected to the transfer cell by means of the off-normal canister transfer tunnel (Assumption 1.1.2.2.2.3). The cell is equipped with a small overhead crane, a bridge-mounted electro-mechanical manipulator, and two over-pack loading and welding stations (for canisters with different diameters and heights). The loading and welding stations are located in a pit to reduce the canister lift height above the cell floor when placing a canister into the overpack. Fixtures are used at the loading and welding stations to properly position, load, and weld the various-height over-packs. A robotic welding machine, positioned between the pits, performs remote welding of a loaded over-pack in either station. The cell is also equipped with a canister transfer tunnel cart, storage racks for 20 small canisters (Parameter 1.1.2.2.1.4), a canister repair station, canister over-packs, remote handling fixtures, a decontamination station, and strategically located CCTV systems and shield windows.

The CTS interfaces with the CCHS to receive and transfer casks. The system interfaces with the Disposal Container Handling System to receive empty DCs for loading, and to provide loaded DCs for welding. The WHB houses the equipment and provides the facility, utility, maintenance, safety, and auxiliary systems required to support operations, shield radioactive sources from workers, and confine contamination.

1.1.2.4 Operational Description

Figure 4.2-X provides a mechanical flow diagram for the operations of the CTS. The following subsections describe the operational steps in the diagram for each CTS area in the WHB.

Airlock

A DHLW or DSNF transportation cask (see reference FFH-7) is unloaded from its rail carrier and is transferred into the CTS line from the CCHS using the carrier bay crane. The cask is upended on the rail carrier, lifted vertically, transferred to the CTS line cask transfer cart, and secured against overturning. The cask transfer cart is moved through a cask transfer corridor into the CTS line airlock. The airlock is provided with isolation doors at both ends to maintain a slightly negative air pressure in the CTS work areas compared to the carrier bay. The cask transfer cart is then used to move the cask to the cask preparation area.

Cask Preparation and Decontamination Area

One cask preparation and one cask decontamination work station, per CTS line, is required to meet all DHLW or DSNF transportation cask throughput and maintenance support operations (Parameter 1.1.2.2.1.2). The cask preparation operations consist of cask seal test port gas sampling, venting and purging, cask outer lid bolt de-tensioning and removal, and positioning the cask outer lid lifting fixture over the cask. The cask outer lid is removed and staged in the cask preparation area using a manipulator and hoist.

The cask preparation operations also include cask internal cavity gas sampling, cask venting and purging, cask inner lid bolt de-tensioning, positioning the cask inner lid lifting fixture over the cask, and securing the lifting fixture to the cask inner lid. For naval fuel casks, a naval fuel canister-lifting fixture is installed on the canister using the manipulator and hoist to secure the lifting fixture to the canister. The cask then is moved to the canister transfer cell using the cask transfer cart.

Once the DHLW and DSNF canisters are removed from the cask, empty cask preparation operations consist of moving the cask transfer cart to the cask decontamination area, removing the cask inner lid lifting fixture, and installing and tensioning the cask inner lid bolts.
For the naval fuel cask, the operations only include installing the cask outer lid, installing and tensioning the lid bolts, removing the cask outer lid lifting fixture, and performing decontamination operations on the empty cask.

The cask preparation area involves contact or remote operations using the cask preparation manipulator, hoist, and tooling. Remote operations will be performed when radiation exposure rates exceed as low as reasonably achievable (ALARA) guidelines. Upon completion of cask preparation, decontamination, and radiation protection operations, the cask is move to the carrier bay for loading onto its rail carrier.

Canister Transfer and DC Loading

The canister transfer cell consists of an upper and lower shielded hot cell area. Casks are moved into the canister transfer cell lower level, one at a time, on the cask transfer cart. For casks containing small DHLW and DSNF canisters, the cask inner lid is removed and stored in the cask lid staging area in the canister transfer cell using an overhead bridge crane. Canisters are lifted vertically using the bridge crane, a grapple, and loading ports for unloading the cask and loading the DC. The bridge crane auxiliary hoist, canister grapple, and in-cell manipulator is used to grapple and lift the canister out of the cask, transfer the canister to a DC loading port position, and lower the canister directly into the DC. If canister staging is required prior to DC loading, the canisters are unloaded and transferred to staging rack positions located under ports in the floor over the canister lag storage area. The canisters staged are loaded into the next available DC to ensure lag storage empty locations.

An empty DC is moved into the canister transfer cell, one at a time, on a DC transfer cart. The empty DC is brought to the lower level of the canister transfer cell from the Disposal Canister Handling System. The canister is loaded into the DC either directly from the cask or from the canister lag storage area. If the DC is loaded with a large naval canister, the in-cell crane and manipulator are used to unbolt, remove, and stage the canister-lifting fixture. If the cask is loaded with small DHLW or DSNF canisters, the cask inner lid and lifting fixture are reinstalled. The loaded DC is then moved to the DC handling cell for DC closure welding, inspection, and testing. The lifting fixture, cask, and cask cart are returned to the cask preparation area.
In the cask preparation area, the cask, fixtures, and cask cart are checked for contamination. Any decontamination operations required are performed before the cask is transferred to the CCHS for off-site shipment.

Small Canister Storage

If space in the DC will not accommodate all of the DHLW or DSNF canisters from the incoming cask, canisters are stored in the canister staging area for subsequent loading in the next available DC. It has been determined by simulation analyses, that 20 canister storage positions are adequate to accommodate the canisters that require staging (reference FFH-2, Section XXX).

Off-Normal Canister Handling

During the operating life of the repository, it is anticipated that several canisters will be classified as off-normal and handled in a manner described in this section (Parameter 1.1.2.2.1.3). Only small DHLW and DSNF canisters are handled and remedial processing is limited to minor weld repairs, simple cutting operations, loading the canisters into disposable over-packs, and welding the over-pack lid for subsurface disposal (Assumption 1.1.2.2.2.4).

When required, an off-normal canister is removed using the canister transfer cell overhead crane and transferred to the off-normal canister transfer tunnel port and transfer cart. The off-normal canister is then moved to the off-normal canister cell for repair or placement into overpack. If the canister requires only weld repair or surface repair, the canister is placed in the cell weld station and the weld repair is performed using the electro-mechanical manipulator and a remote welding tool. If it is determined that the canister must be placed into an overpack, the canister is loaded into an over-pack positioned in one of the welding pits (the appropriately sized empty over-pack is placed in one of the welding pits prior to loading).

An over-pack lid is installed and seal-welded using the remote manipulator and welder. After weld repairs to the canister or seal welding the over-pack, the weld is inspected using the appropriate non-destructive examination method. The canister or over-pack is then placed in the decontamination station and decontamination operations are performed using the manipulator and the appropriate tooling. Off-normal canisters with a contamination level higher than is acceptable for DC loading are also decontaminated at the decontamination station. The repaired canisters or canister over-pack is then returned to the CTS canister transfer cell using the off-normal canister transfer tunnel and cart and processed in the same manner as a standard canister.

1.1.3 Carrier/Cask Handling System

1.1.3.1 Functional Description

The Carrier/Cask Handling System (CCHS) receives rail and truck transportation cask carriers from the Carrier/Cask Transport System, unloads casks from carriers, and loads empty casks onto carriers for off-site shipment. Loaded casks are transferred to the Assembly Transfer System (ATS) or the Canister Transfer System (CTS). Empty casks are received from the ATS and the CTS for off-site shipment. The CCHS operates to handle the waste transfer throughput and to support maintenance operations. (see Section 4.3.2.1.7)

The CCHS also receives empty dual-purpose canister (DPC) over-packs from the Carrier/Cask Transport System, unloads over-packs from carriers, transfers over-packs to the ATS, receives over-packs with empty DPCs from the ATS, and loads them onto carriers for off-site shipment.

CCHS operations begin when loaded truck or rail transportation casks are delivered to the Waste Handling Building (WHB) by the Carrier/Cask Transport System. The casks are unloaded from the carriers and placed on cask transfer carts that transport the casks to either an ATS or CTS line. After the cask waste contents are unloaded, the ATS and CTS return the empty casks to the CCHS. The CCHS receives the empty casks from the ATS and CTS and loads the casks onto cask carriers for off-site shipment. The CCHS also unloads empty DPC over-packs from truck carriers and transfers the over-packs to the ATS using a transfer cart. After the empty DPCs are loaded into the over-packs, the ATS returns the over-packs to the CCHS. The CCHS then loads the over-packs onto truck carriers for off-site shipment.

The CCHS interfaces with the Carrier/Cask Transport System that provides the rail and road system for the site prime movers (transport vehicles) to tow and haul rail and truck carrier systems to the CCHS (see Section 1.4). The CCHS also interfaces with the ATS and the CTS for delivering loaded casks, shipping empty casks, receiving empty DPC over-packs, and shipping DPC over-packs off-site. The WHB System houses the CCHS, and provides the utility and safety systems required to support maintenance and operations.

1.1.3.2 Parameters and Assumptions

1.1.3.2.1 Parameters

1.1.3.2.1.1 Two carrier transport lines are required to accommodate either truck or rail carriers in the WHB (Reference FFH-CCHS-10, Section 6.2.1.1).

1.1.3.2.1.2 The transportation cask characteristics and parameters are defined in the *Interface Control Document for the Transportation System and the Mined Geological Disposal System Surface Repository Facilities and Systems for Mechanical and Envelope Interfaces* (Reference FFH-CCHS-2, Tables 7-7 through 7-10).

1.1.3.2.1.3 The size and configuration of the Carrier/Cask Handling System is defined in *Surface Nuclear Facilities Space Program Analysis* (Reference FFH-CCHS-10).

1.1.3.2.2 Assumptions

1.1.3.2.2.1 Rail and truck carriers will be used to haul waste transportation casks. The carrier dimensional envelopes are based on existing and planned designs for NRC-docketed cask transportation systems (Reference FFH-CCHS-3). The following specific design assumptions are used:

- Rail carrier dimensions and overall dimensions are based on data provided in Parameter 1.1.3.2.1.2 for the largest transportation cask. Other dimensions are based on the cask characteristics in Reference FFH-CCHS-4.

- The legal-weight truck carrier dimensions are based on data provided in Parameter 1.1.3.2.1.2 for the largest legal-weight transportation cask. Other dimensions are based on the cask characteristics in Reference FFH-CCHS-4.

1.1.3.2.2.2 Adequate tools, spares, maintenance personnel, storage area, and equipment must be readily available to immediately repair failed system equipment. Since the Carrier/Cask Handling System is used continuously, the system must be regularly maintained over its operating life. (Reference FFH-CCHS-11, Section 4.3.6.5).

1.1.3.2.2.3 Cask unloading/loading in the Carrier/Cask Handling System will occur in a contact operation area using manual and remote handling equipment. Readily available remote/robotic technology in the nuclear industry (Reference FFH-CCHS-7) will be used to support cask unloading/loading operations and ensure that radiation exposure rates for manual operation are as low as reasonably achievable.

1.1.3.3 System Description

The Carrier/Cask Handling System (CCHS) receives rail and truck transportation cask carriers from the Carrier/Cask Transport System, unloads casks from carriers, and loads empty casks onto carriers for off-site shipment. Loaded casks are transferred to the Assembly Transfer

System (ATS) or the Canister Transfer System (CTS). Empty casks are received from the ATS and the CTS for off-site shipment. Carrier/Cask Transport System operations are described in Section 1.4.

The CCHS also receives empty dual-purpose canister (DPC) over-packs from the Carrier/Cask Transport System, unloads over-packs from carriers, transfers over-packs to the ATS, receives over-packs with empty DPCs from the ATS, and loads them onto carriers for off-site shipment.

CCHS operations begin when loaded truck or rail transportation casks are delivered to the Waste Handling Building (WHB) by the Carrier/Cask Transport System. The truck and rail carrier configurations/dimensions are shown in Figures 1.1.3-1 and 1.1.3-2 (Assumption 1.1.3.2.2.1). The CCHS operates 120-hour per week and 50 weeks per year to handle the waste transfer throughput and to support maintenance operations (Reference FFH-CCHS-10). Since the Carrier/Cask Handling System is used continuously, the system must be regularly maintained over its operating life. Adequate tools, spares, maintenance personnel, storage area, and equipment are assumed to be available to repair failed system equipment in a timely manner (Assumption 1.1.3.2.2.2).

Two carrier transport lanes (Parameter 1.1.3.2.1.1) enter and leave the WHB providing unloading-loading stations in the carrier bay, each of which can accommodate either truck or rail carriers (Reference FFH-CCHS-3). Truck carriers can enter and leave the carrier bay in one direction (one-way drive through) to minimize handling time in the carrier bay. Rail carriers enter and leave from the same end of the carrier bay. The truck or rail carrier is towed into the carrier bay unloading-loading area of the Carrier/Cask Handling System using a site prime mover as shown in Figures 1.1.3-3 and 1.1.3-4.

The WHB carrier bay is configured and sized to accommodate two lanes, a carrier unloading area, a carrier loading area, three cask transfer carts, an overhead bridge crane, gantry-mounted manipulators, and other support equipment (Parameter 1.1.3.2.1.3). In the carrier bay unloading area, the overhead bridge crane is used to upright and transfer the cask to a cask transfer cart. The reverse operation is used to load an empty cask to the carrier. The carrier unloading/loading area is also equipped with support equipment such as cask lifting yokes, tooling, and maintenance equipment required to support normal and recovery activities.

The bridge crane is mounted on overhead rails in the carrier bay. The bridge crane consists of a double bridge-girder, trolley, main hoist, and auxiliary hoist. The crane main hoist/hook, rated for lifting a 160-ton load, is equipped with an electrically powered rotating hook to rotate the cask, if required The crane main hoist is used in conjunction with the cask lifting yoke. The auxiliary hoist hook is used for lighter lifting operations. The cask lifting yoke is suspended from the crane hook and is equipped with two lifting arms designed to engage the cask trunnions. The cask lifting yoke facilitates tilting the cask to a vertical orientation and transfer of the cask to the transfer cart. The distance between the lifting arms is adjustable to accommodate the various diameters of the transportation casks. The lifting arm adjustment is accomplished by means of an electro-mechanical device incorporated into the lifting yoke. Multiple lifting yokes may be required to support the different cask designs (see Section 4.3.2.1.6).

The crane bridge and trolley move in a rectangular (X-Y coordinate) pattern inside the carrier bay loading/unloading area, the main hook rotates 360 degrees, and both the main and auxiliary hooks move in a vertical (Z coordinate) lifting motion. The crane is equipped with platforms for contact maintenance in the carrier bay.

A gantry-mounted manipulator is provided for each carrier transport lane to assist cask unloading/loading operations and allow partial remote handling to reduce radiation exposure. Each gantry-mounted manipulator consists of an electro-mechanical manipulator and a telescoping mast installed on a rail-mounted gantry and trolley system. The manipulator can be equipped with a variety of tools and accessories such as a robotic arm and hand assembly to assist in cask unloading and inspection operations.

1.1.3.4 Operational Description

The Carrier/Cask Handling System (CCHS) is housed in the carrier bay of the WHB. Figure 1.1.3-5 provides a mechanical flow diagram for the system operations. The operational steps in the diagram are described below.

The truck or rail carrier is towed into the carrier bay unloading-loading area of the Carrier/Cask Handling System using a site prime mover. The cask is lifted off of the carrier using the large carrier bay bridge crane and a lifting yoke. The overhead bridge crane is used to engage the cask trunnions with the cask lifting yolk and rotate the cask to an upright position (Reference FFH-CCHS-3). After the cask is in the upright position, the crane lifts the cask high enough to clear the carrier trunnion cradle and move the cask to a position for placement onto either an Assembly or Canister Transfer System cask transfer cart. The potential to drop a loaded cask during lifting exists. To minimize the lift height and the potential damage to the cask if a cask is accidentally dropped, the transport lanes are recessed below the carrier bay floor (Reference FFH-CCHS-R10). If necessary, the cask will be rotated about its vertical axis and then placed onto the rail-mounted transfer carts. The transfer cart will be used to transfer the cask into the Assembly or Canister Transfer System lines. The system is configured and sized to accommodate the waste transportation and receiving schedules established for the repository (References FFH-CCHS-6 and FFH-CCHS-11).

The cask unloading/loading procedure for the CCHS is a contact or remote operation using manual and remote equipment. To reduce radiation exposure rates for manual operation, operators will remotely operate the overhead bridge crane or the gantry-mounted manipulators (with the assistance of remote tools) from a safe distance by a radio control, a portable control console, or a crane overhead cab (Assumption 1.1.3.2.2.3).

1.1.4 Waste Package Remediation System

1.1.4.1 Functional Description

The Waste Package Remediation System (WPRS) performs remedial action on abnormal Waste Packages (WPs) and Disposal Containers (DCs). The system receives DCs and WPs from, and delivers them to, the Disposal Container Handling System (DCHS). The system receives DCs and WPs that have failed the weld inspection processes of DCHS, that have been selected for retrieval from the subsurface repository for performance confirmation examinations, and that are defective or abnormal. The system also delivers DCs and WPs to the DCHS that have been examined, repaired, and unsealed.

If inspections of the closure weld in the DCHS indicates an unacceptable, but repairable, welding defect, the DC is transferred to the WPRS for examination, preparation for re-welding, and unsealing, if required. Correction of rejected closure welds will require removal of the weld material in such a way that the DCHS may resume and complete the closure welding process. If examinations indicate that the DC closure weld defect cannot be repaired, the DC is opened in the WPRS. If a WP is retrieved from the subsurface repository due to suspected damage, WP failure, or planned performance confirmation examinations, the WP is also opened in the WPRS.

WP and DC opening will require closure weld remote cutting for each of the lids, removal and staging of the lids, collection and processing of cutting fines, cutting-waste removal and disposal, and installation of a temporary seal to confine contamination inside the DC/WP. Spent nuclear fuel and high-level waste removal from an opened WP and DC is facilitated by transferring the opened DC/WP to either the Assembly or Canister Transfer System (see Sections 1.1.1 and 1.1.2).

All radioactive waste package container remedial operations are performed remotely in a shielded WPRS hot cell located in the Waste Handling Building (WHB). The cell is accessed directly from the DC handling system/cell. One package at a time can be handled in the WPRS cell. The DC/WP arrives on a DC transfer cart, is positioned at one of two work stations within the cell for remedial operations, and exits the cell without being removed from the cart. The system includes a wide variety of remotely operated equipment including an overhead bridge crane, an in-cell multi-purpose electro-mechanical manipulator, a lid cutting machine, and closed-circuit television viewing systems. Specialized tools and remote controlled equipment are used to perform lid removal, temporary DC lid sealing, drilling, ultrasonic non-destructive examinations, visual inspections, waste collection, decontamination, pressure measurement, gas sampling, and testing. All remotely operated equipment is designed to facilitate decontamination hot cell equipment maintenance, and replacement of interchangeable components, as required.

The WPRS interfaces with the Disposal Container Handling System for the receipt and delivery of waste packages and disposal containers. The Waste Handling Building System houses the system, and provides the facility, safety, and auxiliary systems required to support operations. The WPRS receives power from the Waste Handling Building Electrical System. The WPRS also interfaces with the Performance Confirmation Data Acquisition/Monitoring System for the types of data needed to support the performance confirmation program.

1.1.4.2 Design Parameters and Assumptions

1.1.4.2.1 Parameters

1.1.4.2.1.1 The DCHS facilitates transport and transfer of retrieved WPs from the Waste Emplacement System to the WPRS (see Section 1.1.5).

1.1.4.2.1.2 The WPRS shall be capable of handling 9 DCs or WPs per year during the 40-year operational life of the system and 1 WP per year during the systems 70-year extended operational life (reference KRA-1, Section 4.4.2.1.7)

1.1.4.2.2 Assumptions

1.1.4.2.2.1 The DC/WP preparation, staging, examination, repair, opening and decontamination operations will be performed in a shielded hot cell using remote handling equipment. Remote/robotic technology readily available in the nuclear industry will be used to perform or support these operations to ensure that personnel radiation exposure rates are consistent with as low as reasonably achievable principles. (Reference KRA-3 CWRMS M&O 1997).

Basis: Reference KRA-2 CRWMS M&O 1999, Section 5.1
Usage: 1.1.4.2.4

1.1.4.2.2.2 The WPRS shall install temporary seals, evacuate gases, and backfill open DCs with inert gas to prevent spread of contamination and exclude oxygen from spent nuclear fuel assemblies.

Basis: Reference KRA-2 CRWMS M&O 1999, Section 5.3
Usage: 1.1.4.2.4

1.1.4.2.2.3 The WPRS is one of the surface waste handling systems housed in the WHB (Reference KRA-4 CRWMS M&O 2000, Section 6.2.1.5). The WHB systems are designed for operation only during the MGR emplacement period with a design life of 40 years. Therefore, the maximum operational life of the WPRS is 40 years. If it is required that the operational capability of the WPRS extends beyond the MGR emplacement period (i.e., through the MGR caretaker period for a total of 110 years), the WHB would have to be modified and re-qualified (see Section 4.4.2.1.8). An alternative to an extended WHB design life could include construction of a new facility (prior to the end of the WHB 40-year life) with WPRS capabilities.

Basis Reference KRA-2 CRWMS M&O 1999, Section 5.3
Usage 1.1.4.2.4

1.1.4.2.3 System Description

The Disposal Container Handling System (DCHS) transports and transfers retrieved Waste Packages (WPs) from the Waste Emplacement System for delivery to the WPRS (Parameter 1.1.4.2.1.1). The WPRS is located inside a hot cell in the WHB and is directly connected to the Disposal Container Handling System (Reference KRA-4). The WPRS performs remedial action on abnormal WPs and Disposal Containers (DCs). The system receives DCs and WPs from, and delivers them to, the DCHS. The system receives DCs and WPs that have failed the weld inspection processes of DCHS, that have been selected for retrieval from the subsurface repository for performance confirmation examinations, and that are defective or abnormal. The system also delivers DCs and WPs to the DCHS that have been examined, repaired, and unsealed. The WHB provides the facility, utility, maintenance, safety, and auxiliary systems to support the operations.

The DCs/WPs are delivered to the WPRS from the DCHS for remedial action only if failure or damage has been detected. The DC/WP arrives on a DC transfer cart that is remotely positioned within the cell for WPRS operations. The DC/WP enters and exits the cell without being removed from the cart.

The DC/WP remediation of rejected closure welds requires minor repair or removal of the weld in such a way that the DC closure re-welding can be performed in the DC handling cell weld station of the DCHS. If the examination of the DC closure weld indicates an irreparable welding defect, or suspected failure or damage to a retrieved WP, DC/WP opening operations will be required. The DC/WP opening is expected to be infrequent (Parameter 1.1.4.2.1.2), but requires the capability to unseal, vent, measure the temperature and pressure, and sample the gas composition of the DC/WP internals. WP and DC opening will require closure weld remote cutting at each of the lids, removal and staging of the lids, collection and processing of cutting fines, cutting-waste removal and disposal, and installation of a temporary seal to confine contamination inside the DC/WP. Once open, the DC/WP is surveyed for contamination, decontaminated as required, and transferred to the Assembly or Canister Transfer System for fuel assembly or canister unloading operations.

Non-destructive examination capabilities include visual, ultrasonic, and physical inspections of the DC/WP. Metallurgical and radiological sampling and data collection may also be required for Performance Confirmation measurements. The system includes a wide variety of remotely operated equipment including an overhead bridge crane, an in-cell multi-purpose electro-mechanical manipulator, a lid cutting machine, and closed-circuit television viewing systems. Specialized tools and remotely controlled equipment are used to perform lid removal, temporary DC lid sealing, drilling, ultrasonic non-destructive examinations, visual inspections, waste collection, decontamination, pressure measurement, gas sampling, and testing.

1.1.4.2.4 Operational Description

Figure 1.1-X provides a mechanical flow diagram for the operations of the Waste Package Remediation System (WPRS). The operational steps in the diagram for the WPRS are described below.

One package at a time can be handled in the WPRS cell. The system operations are all performed remotely in a hot cell (Assumption 1.1.4.2.2.1). All remotely operated equipment is designed to facilitate decontamination, hot cell equipment maintenance, and replacement of interchangeable components, as required.

The DC/WP arrives on a transfer cart and enters the cell on rails for WPRS operations. A large shield door is opened to allow the transfer cart to enter. The DC/WP exits the cell after remedial operations without being removed from the cart. Two remote work stations are provided in the

WPRS cell: one for DC/WP lid cutting, lid removal, and repairs; and one for DC inspection, examination, purging and backfill of the DC interior with inert gas, temporary sealing, and decontamination (Assumption 1.1.4.2.2.2).

Following WPRS operations, the DC/WP is externally inspected for contamination and remotely decontaminated, as required. The DC/WP is then returned to the DCHS for re-welding or is transferred to the Assembly Transfer System for fuel assembly unloading or to the Canister Transfer System (CTS) for canister unloading (see Section 1.1.5). In either case, the empty DC is removed from the DC handling cell using the CTS line or the DCHS waste package transporter loading line.

The system is designed for operation only during the MGR emplacement period with a design life of 40 years similar to other systems in the WHB. If the WPRS operational capability should be extended beyond the emplacement period, the WHB would have to be modified and re-qualified or all of the WPRS capabilities would have to be provided in a separate facility constructed prior to the end of the WHB 40-year life (Assumption 1.1.4.2.2.3).

[Figure 1.1-x]

1.1.5 Disposal Container Handling System

1.1.5.1 Functional Description

The empty DC is fabricated at a commercial supplier's facility and shipped with the inner and outer top lids to the repository WHB for loading. The DCHS receives and prepares the empty DC for loading, and delivers the empty DC to the ATS or CTS for loading. Once loaded, the DCHS receives the DC from the ATS or CTS and performs inner and outer lid closure welding, examination, and heat-treating. A DC that does not meet the weld examination criteria is transferred to the Waste Package Remediation System (WPRS) for repair or corrective action. The DCHS also stages the loaded DC, loads the waste package (WP) onto the WP transporter, and transfers any DC/WP requiring remedial processing to the WPRS.

DCHS functions begin with empty DC preparation, which includes staging the DC, installing collars to lift and handle the DC, tilting the DC upright, configuring the DC for loading, and transferring it to the DC handling cell. DC handling cell operations include staging the DC lids at the weld stations, and transferring the DC to the ATS or CTS for loading. Once loaded, the DC is returned to the DC handling cell for welding. A number of DC welding stations are provided to receive loaded DCs from the ATS or CTS lines. The welding operations include mounting the DC on a turntable, removing lid seals, installing and welding the lids. The weld process for each lid includes non-destructive examination (NDE). Following NDE and weld acceptance, the WP is either staged or transferred to a tilting station for transfer to the repository subsurface. At the tilting station, the WP is tilted to a horizontal orientation and transferred to the WP transporter-loading cell. The WP transporter loading operations include a contamination survey, WP decontamination, loading the WP onto a pallet, and transfer of the WP into the WP transporter.

The DCHS is contained within the WHB which includes areas for empty DC preparation, welding, loaded DC staging, WP transporter docking and loading, associated welder operating rooms, and required equipment maintenance areas. The areas operate concurrently to accommodate the DC/WP throughput rates and support DCHS maintenance.

The empty DC preparation area is located in an unshielded structure. The handling equipment includes a bridge crane, tilting station, and transfer carts. The DC handling cell includes several DC weld and NDE stations, a loaded DC staging area, and a DC tilting station. A robotic welding gantry and turntable supports each weld and NDE station. The WP transporter loading cell includes equipment for WP transfer, lifting, inspection, and decontamination. The operations are supported by a remotely operated horizontal transfer cart, a horizontal lifting system, decontamination and inspection manipulators, and a decontamination system. All handling operations are supported by a suite of fixtures including yokes, lift beams, collars, and attachments. The remote equipment is designed to facilitate decontamination and maintenance, and interchangeable components are provided where appropriate. Set-aside areas are included as required for fixtures and tooling to support off-normal and recovery operations. Semi-automatic, manual, and backup control methods support normal, maintenance, and recovery operations.

The DCHS interfaces with the ATS and CTS to deliver empty DCs and receive loaded DCs, the Waste Emplacement and Waste Retrieval System for loading/unloading the WP transporter, and the WPRS for DC/WP repair and corrective action. The DCHS interfaces with the WHB system, the WHB Electrical System, and other WHB systems for operational support and radiation protection. The system also interfaces with each of the WP designs.

1.1.5.2 Parameters and Assumptions

1.1.5.2.1 Parameters

1.1.5.2.1.1 Eight welding stations are required to support the planned facility throughput. (Reference RER-DCHS-R1)

1.1.5.2.1.2 The DCHS must support the operation of two ATS lines and one CTS line. (Reference RER-DCHS-R2)

1.1.5.2.1.3 The DCHS supports transport and transfer of retrieved WPs from the Waste Emplacement System to the WPRS. (Reference RER-DCHS-R3)

1.1.5.2.1.4 The empty DC preparation area provides space for staging 20 DCs and associated hardware including lids, base collars, lifting collars, and temporary seal devices (Reference RER-DCHS-R4)

1.1.5.2.1.5 The loaded DC staging area provides staging capacity for 20 DCs. (Reference RER-DCHS-R1, Section 7.2.3.4)

1.1.5.2.1.6 The DCHS shall remove temporary seals, evacuate gases, and backfill the DC with inert gas to a combined concentration of less than or equal to 0.25 volume percent for O_2, CO_2, and CO. (Reference RER-DCHS-R3)

1.1.5.2.1.7 DCHS operations are based on a 120-hour workweek with three shifts per day and a 50-week annual work schedule. Equipment maintenance will be performed on a rotating outage basis. The DCHS is available for operations 6,000 hours per year. (Reference RER-DCHS-R1, Section 4.3.6.4)

1.1.5.2.2 Assumptions

1.1.5.2.2.1 DCHS operations are based on the Repository Surface Design Mechanical Flow Diagrams. (Reference RER-DCHS-R6)

1.1.5.2.2.2 The DC is equipped with standardized lifting and base collars for handling purposes. (Reference RER-DCHS-R7, Figures 7.1-11 and 7.1.12)

1.1.5.2.2.3 An empty DC is fitted with a device to temporarily seal the inner lid of the DC, before and after fuel assembly loading, to prevent spread of contamination from the ATS to other systems. (Reference RER-DCHS-R4, Figure 7.1-11)

1.1.5.2.2.4 Individual WPs will not provide any additional shielding for personnel protection. (Reference RER-DCHS-R5, Controlled Project Assumption CPA 019 – Waste Package Shielding)

1.1.5.2.2.5 The DCHS provides a two-week in-process loaded DC storage capacity to account for unavailability of the subsurface repository. The two-week period is based on a preliminary estimate of anticipated outages for the subsurface repository. (Reference RER-DCHS-R1, Section 4.3.1)

1.1.5.2.2.6 The DC handling cell is equipped with redundant cranes to support continuous DCHS operating schedules during waste emplacement. Redundant cranes are considered prudent design contingencies against unplanned crane outages and extensive crane maintenance activities. (Reference RER-DCHS-R2, Section 6.2.1.4)

1.1.5.2.2.7 Adequate tools, spares, maintenance personnel, and equipment are readily available to immediately repair failed equipment. Since the DCHS is used continuously 50 weeks per year, the facility must also be continuously maintained over its operating life. (Reference RER-DCHS-R1, Section 4.3.6.5)

1.1.5.2.2.8 The design characteristics of the DC and WP, including the different waste forms, waste content, maximum diameter, maximum height, and the loaded and unloaded weights used in this analysis are provided in Reference RER-DCHS-R8 based on the current WP development organization designs.

1.1.5.3 System Description

The DC design consists of two metal cylinders; an inner cylinder made from stainless steel with nominal thickness of 5 cm (2 inches), and an outer cylinder made of high-nickel alloy with nominal thickness of 2 cm (0.79 inch). The inner cylinder is a structural component and outer cylinder is a corrosion-resistant component. The internals of the DC consist of carbon steel baskets used to provide structural support for the various waste forms. The DC cylinder bottom end is closed with inner and outer lids made of the same materials. The inner lid thickness is at least 9.5 cm (3.7 inches). The outer lid thickness is at least 2.5 cm (1 inch). A third lid is provided for the top of the DC with a thickness of 1-cm (0.4 inch). This third lid provides additional protection against stress corrosion cracking in the closure weld. The DC does not include the waste forms or any personnel shielding (Assumption 1.1.5.2.2.4). The lids for the top of the DC are fabricated but not welded and inspected until after waste is loaded into the DC. The three top lids are installed and welded inside the repository surface facility WHB. Once the DC is loaded and the inner and outer top lids are welded, inspected, and accepted in the WHB, the DC is called a WP.

DC handling fixtures have been developed to reduce the number of operations during DC handling. A standard set of DC lifting collars and base collars for the different DC sizes are installed on each DC in the empty DC preparation area (Assumption 1.1.5.2.2.2). The collars facilitate remote handling operations in the hot cells with the DC handling cell cranes. The collars are attached and secured to the DC. The collars are equipped with trunnions for lifting, positioning, aligning, tilting, and securing the DC during handling operations. The benefits of using the collars include a standard lifting trunnion interface for all DCs, a quick and visually verifiable lift attachment, and a safe and proven concept for lifting, tilting, aligning, and securing heavy loads. The base collar is used to secure and protect the DC against tip-over when it is placed on carts, staging fixtures, welding station turntables, and when the DC is rotated during DC lid welding. The collars are also used to support and lift the DC when it is in a horizontal position.

The DCHS is located in the WHB and includes an unshielded empty DC preparation area and shielded hot cells for DC handling, welding, and transfer to the subsurface. Separate areas are provided for crane, welder, and manipulator maintenance bays. The areas operate concurrently 6000 hours per year to meet DCHS throughputs and to support maintenance (Parameter 1.1.5.2.1.7). The DCHS prepares empty DCs for loading, welds and stages DCs received from the ATS and CTS, and transfers them to the repository subsurface transporter for emplacement. The system also transports retrieved waste packages and defective DCs to the WPRS.

Empty DC preparation includes unloading DCs from a carrier, staging empty DCs, tilting DCs for vertical handling, outfitting the empty DC with lids and fixtures, transferring the empty DC to a DC cart, and transferring it through an airlock to the DC handling cell. The DC handling cell provides DC staging capabilities, DC transfer carts connecting to the ATS and CTS, and a DC tilting station. DC handling cell operations include staging DC lids at the weld stations and transferring the empty DCs to the Assembly or Canister Transfer Systems for loading (Parameter 1.1.5.2.1.2).

The DCHS receives loaded and partially sealed DCs, then transfers them to a staging area or the DC welding stations. DC handling operations are supported by two remotely operated bridge cranes and hoists, as well as other peripheral equipment (Assumption 1.1.5.2.2.6). The operations include positioning the DCs, removing temporary sealing devices, purging the DC lid area with inert gases for welding, evacuating DC internal gases, back-filling the DC with helium prior to closure (Parameter 1.1.5.2.1.6), turning and welding the inner lid, installing the outer lid, and welding the outer lid. Each weld operation includes NDE. Following examination and weld certification, the DC is either staged or prepared for transfer to the subsurface. A loaded, closed, welded, and inspected DC is called a WP.

The final DC handling sequence involves repositioning the WP to a horizontal orientation, transferring the welded WP to a decontamination and subsurface transporter loading cell, remotely conducting final decontamination, final inspection, tagging and recording WP data, and loading the WP on the subsurface transporter. These operations are performed using one of two DC handling cell overhead cranes, a WP tilting station for changing the WP orientation, a transfer cart, a WP horizontal lifting machine, a remotely operated WP decontamination system, and the subsurface WP transporter. Once the WP is loaded onto the WP transporter pallet and rail car, the transporter operator will retract the rail car into the shielded transporter, undock the WP transporter from the transporter loading cell, and close the WP transporter shield doors prior to hauling the WP into the subsurface repository.

DCHS equipment is designed to facilitate manual decontamination, maintenance, and component replacement, when feasible. All handling operations are supported by a variety of remote handling fixtures including DC lifting and base collars, lifting trunnions, lifting yokes, lifting beams, tilting fixtures, staging fixtures, and DC lid sealing devices. A crane maintenance bay is provided at the far end of the DC handling cell to allow for contact maintenance and inspection of the DC handling cell cranes.

A remotely controlled robotic gantry is used to setup, prepare, weld, inert, and inspect the DC closure operations. The robotic gantry and its associated equipment are remotely removed from the DC handling cell into a welder maintenance bay for service, maintenance, and retooling. Lay-down areas are included as required for lids, fixtures, welder, NDE, tooling, and robotic end-effectors to support normal, off-normal, and recovery operations.

The system interfaces with the ATS and CTS to deliver empty DCs and receive loaded DCs. The system interfaces with the Waste Emplacement System during DC loading of the subsurface WP transporter. The system also interfaces with the WPRS for DC repair, inspection, and performance confirmation of retrieved WPs (Parameter 1.1.5.2.1.3). The WHB interface provides the facility, utility, maintenance, safety, and auxiliary systems required supporting operations and radiation protection activities.

1.1.5.4 Operational Description

Figure 1.1-X provides a mechanical flow diagram for the operations of the DCHS. The following subsections describe the operational steps (see Assumption 1.1.5.2.2.1) in the diagram for each DCHS area in the WHB.

The design configuration for the DCHS is based on the *Surface Nuclear Facilities Space Program Analysis* (see reference RER-DCHS-R2) and the *Viability Assessment* (VA) design report, Reference XXXXX. The design has been modified to accommodate design changes to the WP and the WHB. However, the DC handling operations, system configuration, and design for the DCHS has been modified only slightly since the VA design. The operations performed in these areas are as follows:

Emptv DC Preparation Area

In this area, an empty DC will be received, inspected, fitted with handling collars, oriented in a vertical position, and prepared for loading by installing fuel assembly spacers, inner and outer lids, and the inner lid seal ring. The empty DC preparation area provides adequate space for staging 20 empty DCs and their lids, handling collars, and inner lid seal rings (Parameter 1.1.5.2.1.4). The DC is then placed on the empty DC transfer cart in preparation for transfer into the DC handling cell.

The DCHS is configured so that empty DCs can be brought into the DC handling cell ready for handling and loading. This permits manual preparation of each DC prior to transfer into the DC handling cell. The empty DC preparation area is designed to implement this handling strategy as follows:

- The empty DC carrier will be received at the empty DC preparation area. The empty DC will be lifted in the horizontal orientation, using a lifting beam and a service crane, onto a support cradle area and the DC handling collars installed.

- The DC will be lifted again in the horizontal orientation, using a lifting beam and a service crane, onto a tilting stand that engages the DC base collar trunnions.

- The DC will be upended to the vertical orientation using the collars, trunnions, a yoke, and the service crane. The DC will then be lifted in the vertical orientation and placed on a DC transfer cart where it is prepared for loading by installing fuel assembly spacers, the inner lid, the inner lid seal ring, and the outer lid (Assumption 1.1.5.2.2.3).

- During empty DC preparation, the DC will be secured to the transfer cart using the trunnions on the base collar. The empty DC and cart will then be remotely transferred through the empty DC cell airlock into the DC handling cell.

Emptv DC Preparation Airlock

The airlock consists of a shielded room through which the empty DC is transferred into the DC handling cell. The purpose of the airlock is to prevent transfer of any contamination that may be present in the DC handling cell into the empty DC preparation area. The shield walls and doors at the airlock also provide radiation protection from radioactive sources inside the DC handling cell.

DC Handling Cell

The DC handling cell is a large shielded structure containing areas for welding stations, loaded DC staging, transfer cart operations, tilting the DC to a horizontal position, and maintenance of the overhead cranes. DC handling operations are supported by two remotely operated bridge cranes and hoists, as well as other peripheral equipment (Assumption 1.1.5.2.2.6). An empty DC is lifted using one of the DC handling cell cranes and is either staged or directly transferred to a DC transfer cart servicing one the three ATS or CTS lines. The inner and outer lids are staged near the weld stations for later installation in a similar manner. The empty DC is taken into the ATS or the CTS for loading. When loaded, the DC is returned from either the ATS or the CTS and is taken to the staging area or one of eight welding stations. The DC is placed on a turntable, the inner and outer DC lids are installed, and the turntable is used to rotate the DC while the DC lids are welded, inspected, and heat-treated.

The DC handling cell crane will be used to lift and transfer a loaded DC to one of eight independent DC lid weld stations (Parameter 1.1.5.2.1.1). The weld station operations include securing the DC to the weld station turntable, removing temporary sealing devices, purging the DC lid area with inert gases for welding, back-filling the DC with helium prior to closure, turning the DC, welding the inner lid, installing the outer lids, and welding the outer lids. Welding of the DC lids will be performed using automatic welders deployed from a robotic gantry system that can be remotely removed from the cell for retooling, testing, and adjustments. This feature eliminates the need for personnel to enter the DC handling cell. The robotic gantry is withdrawn into a welder service bay where a number of contact change-out and service operations can be performed. The welder service bay is directly adjacent to the DC handling cell.

Each weld operation includes NDE. If a weld failure is detected, the DC is taken to another DC cart for transfer to the WPRS. Following examination and weld certification, the DC is either staged or prepared for transfer to the subsurface. A completed WP is moved to either the loaded DC staging area or the WP tilting area where the WP is rotated to a horizontal position onto the WP transfer cart. This cart transfers the WP to the transporter-loading cell.

Loaded DC Staging Area

The loaded DC staging area is used to stage loaded DCs or WPs waiting transfer to the WP transporter loading cell (Assumption 1.1.5.2.2.5). Waste handling simulations have shown that a two-week interruption in subsurface emplacement operations can be accommodated by staging 20 loaded DCs in the DC handling cell (Parameter 1.1.5.2.1.5).

To reduce crane maintenance bay radiation levels, loaded DCs will be staged in a separate area inside the DC handling cell with partial walls and an access door to facilitate DC transfers to and from staging locations. The partial walls will provide shadow shielding for the main portion of the cell and the maintenance bay. The design configuration incorporates both distance and shielding by isolating radiation sources to one area of the hot cell and by adding a wall separating the staged DCs from the welding, handling, and crane maintenance areas. This will significantly reduce radiation doses to equipment during normal operation, and radiation levels during manned entry into the cell for periodic maintenance and test operations.

DC cell crane, a large mechanism for turning the WP from a vertical to horizontal orientation,

WP Transporter Loading Cell

The last set of operations involve transferring the welded WP to a decontamination and WP loading hot cell where final decontamination, final inspection, certification, tagging, and WP loading on the WP transporter occurs. These operations are performed using a horizontal transfer cart, a WP horizontal lifting machine, a decontamination system, and the underground WP transporter. Only one line is available for the final decontamination, inspection, WP transfer and loading onto the WP transporter. Once the WP is loaded onto the WP transporter pallet, the transporter operator will retract the pallet into the shielded transporter, close the transporter shield doors, and undock the WP transporter from the airlock dock prior to hauling the WP into the subsurface repository.

The WP is lifted off the horizontal transfer cart using the collars and the horizontal-lifting machine. While suspended, the WP is decontaminated, inspected, certified, and tagged. The WP transporter pallet is transferred into the cell and the WP is lowered onto the pallet. The collars will be remotely removed and taken out of the DC cell for reuse. Any contamination picked up during DC loading will be manually removed prior to reuse of the collars in the empty DC preparation area. The final operation occurs when the WP is pulled into the WP transporter to be taken into the repository subsurface.

WP Transporter Airlock

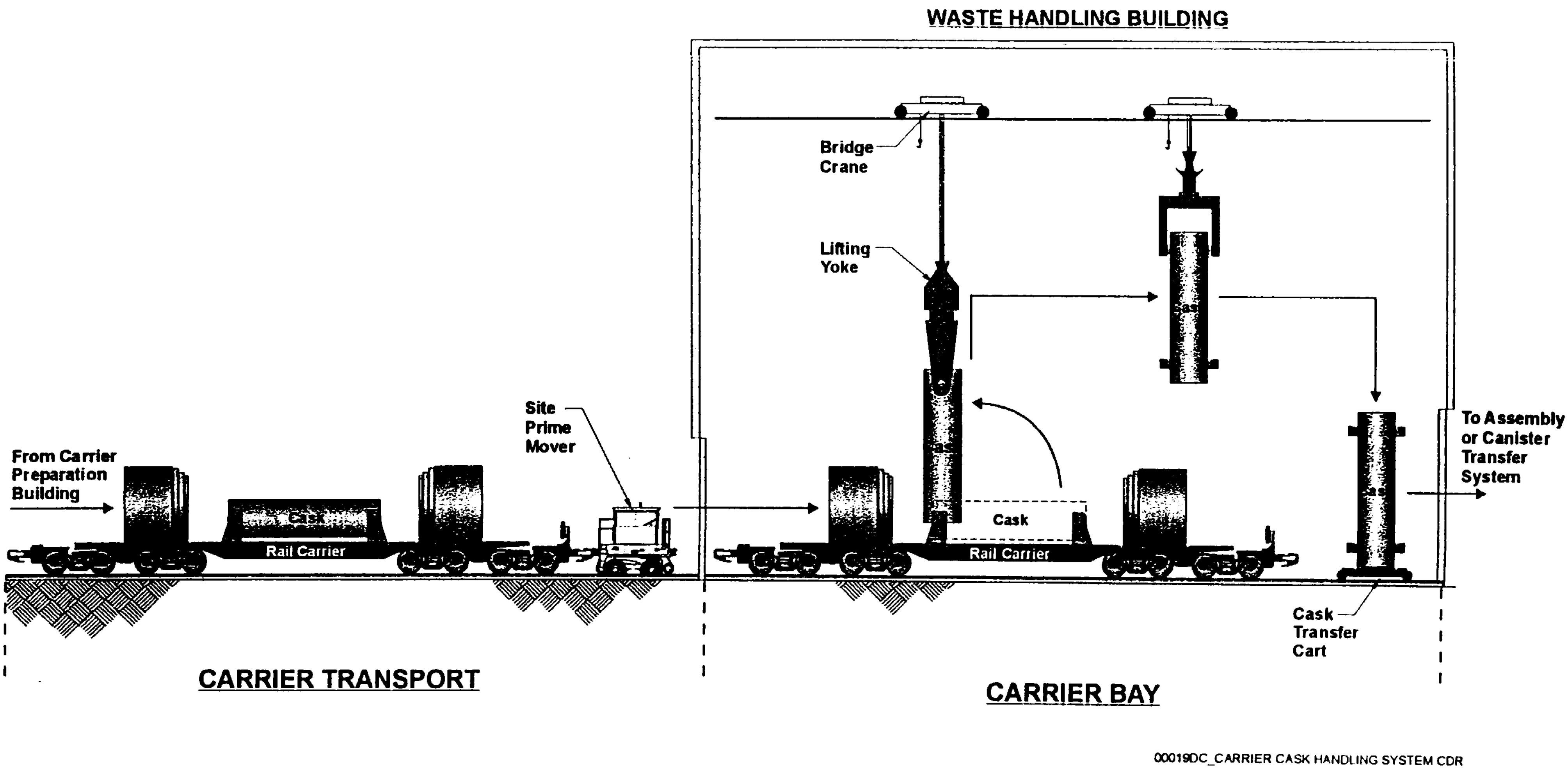
The function of this cell is to provide an airlock where the WP transporter vehicle may be docked for loading The airlock prevents movement of air between the WP transporter loading cell and the outside atmosphere.

Welder Airlocks

The function of these airlocks (one room for each of the eight welders) is to provide access to the robotic welding gantry, welder, NDE equipment, and post-weld heat treating equipment. Access and service work on the equipment is possible in these rooms without exposing the workers to the atmosphere and radiation in the DC handling cell.

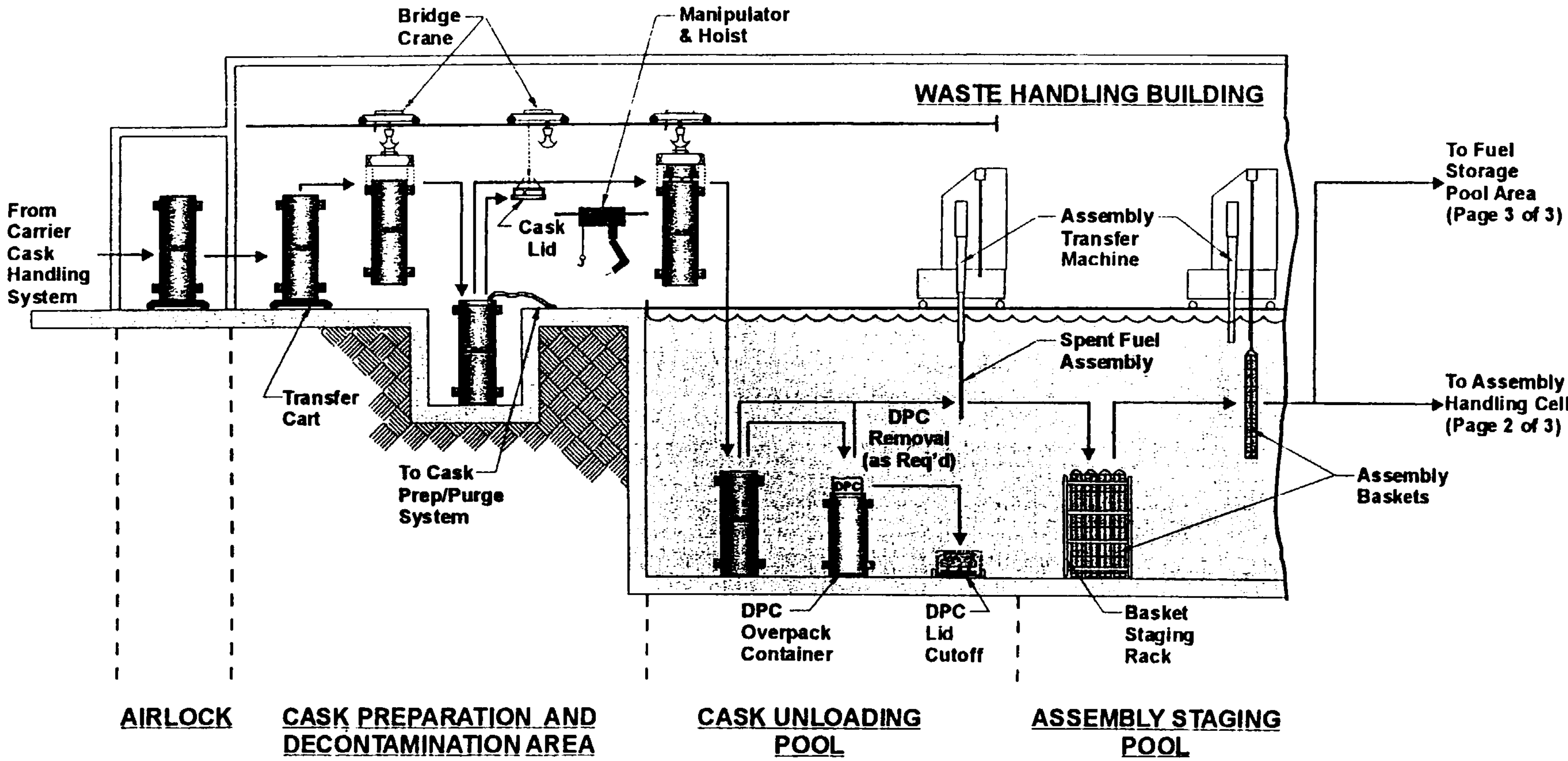
Welder Maintenance Bay

The welder maintenance bay is provided as an area where equipment change-out, repair, replacements, and testing may be performed on any robotic welding gantry, welder, NDE equipment, and post-weld heat treating equipment that has been removed from the DC handling cell (Assumption 1.1.5.2.2.7). Prompt maintenance and repair of failed or malfunctioning equipment is required to support a 24-hour per day operation 50-weeks per year.



CARRIER/CASK HANDLING SYSTEM

Figure: EF-13 Carrier/Cask Handling System

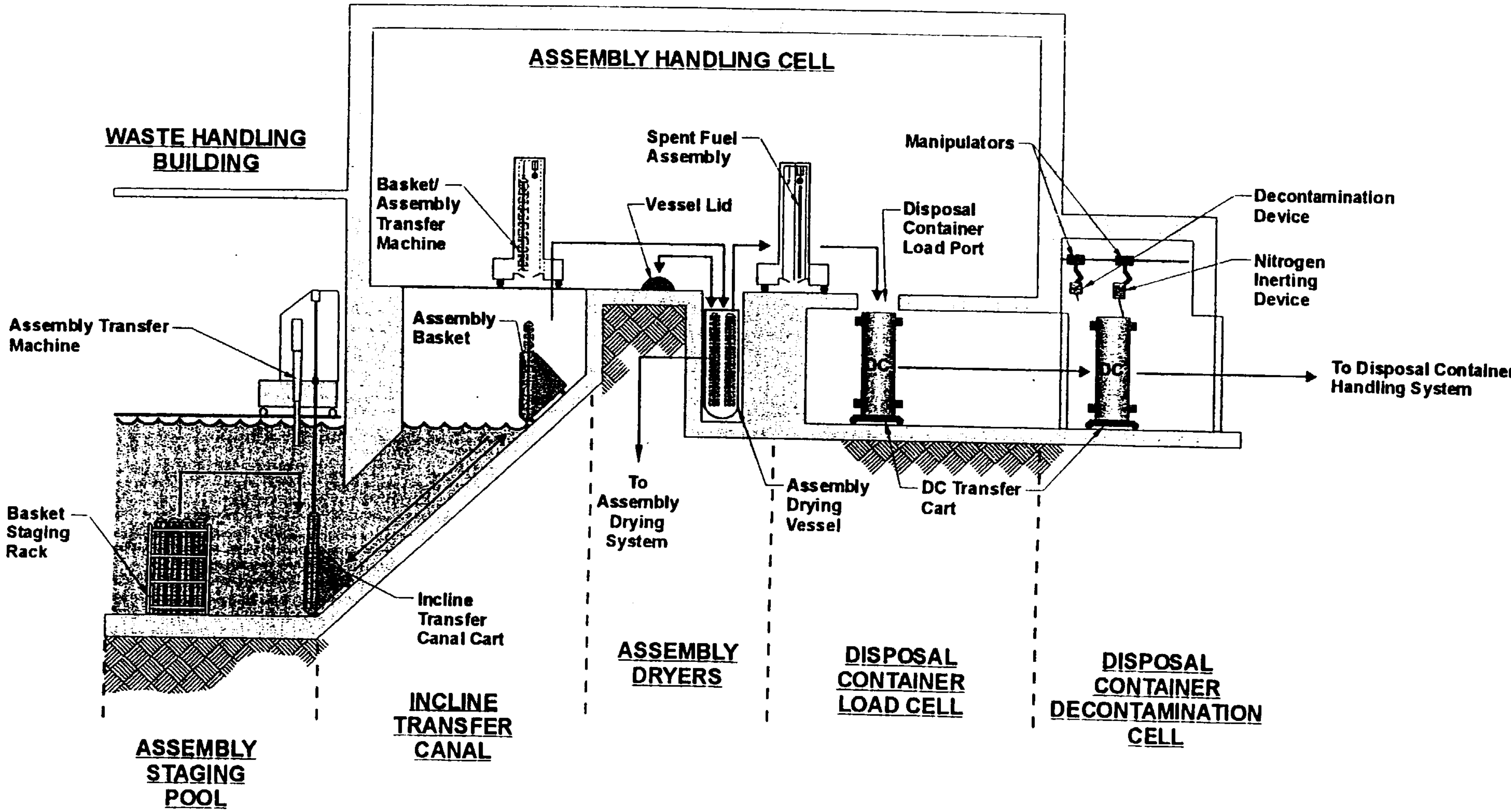


DPC - Dual Purpose Canister

ASSEMBLY TRANSFER SYSTEM 1 OF 3 CDR

ASSEMBLY TRANSFER SYSTEM (PAGE 1 OF 3)

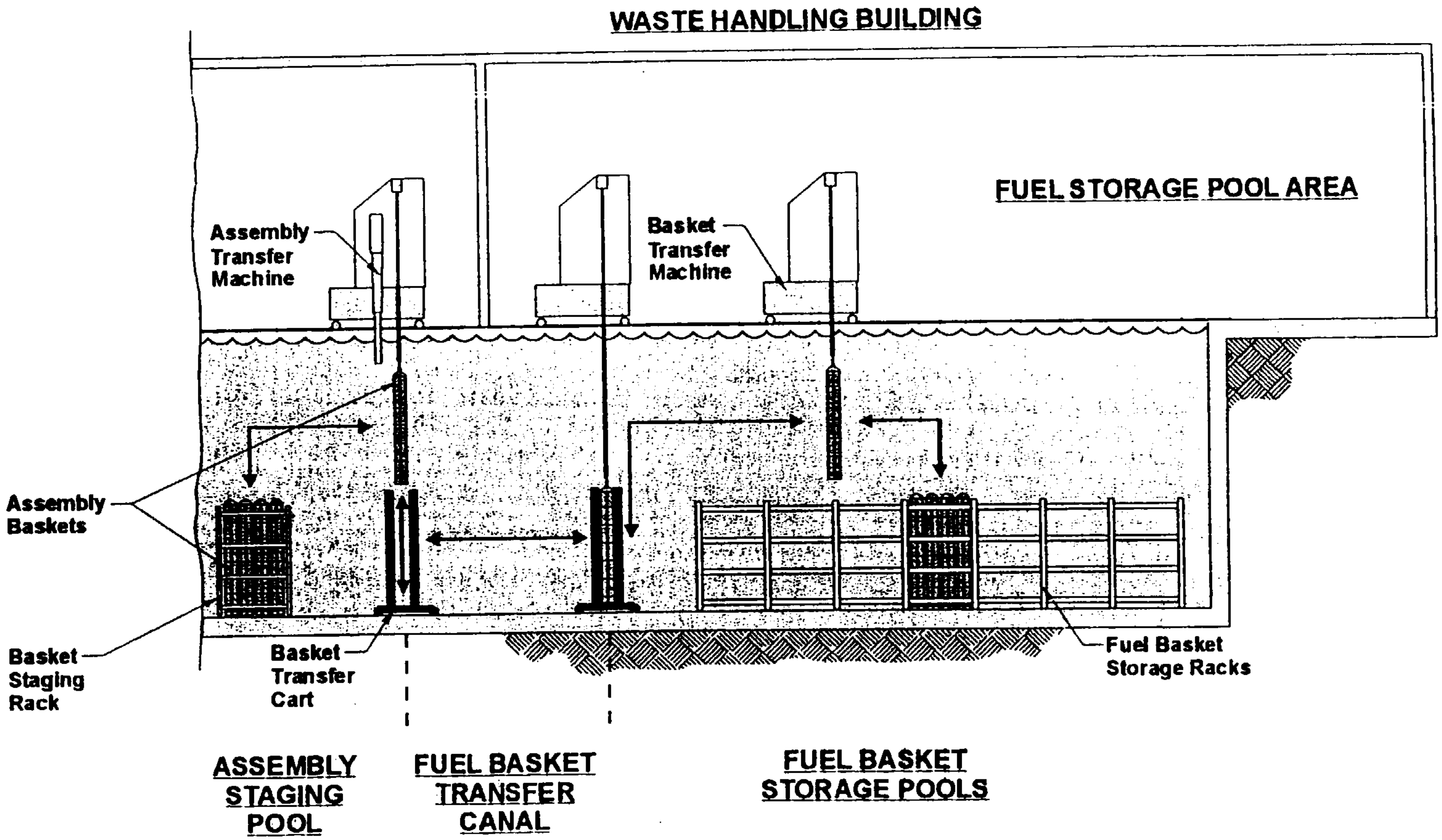
Figure: EF-14 Assembly Transfer System (page 1)



DC - Disposal Container

ASSEMBLY TRANSFER SYSTEM (PAGE 2 OF 3)

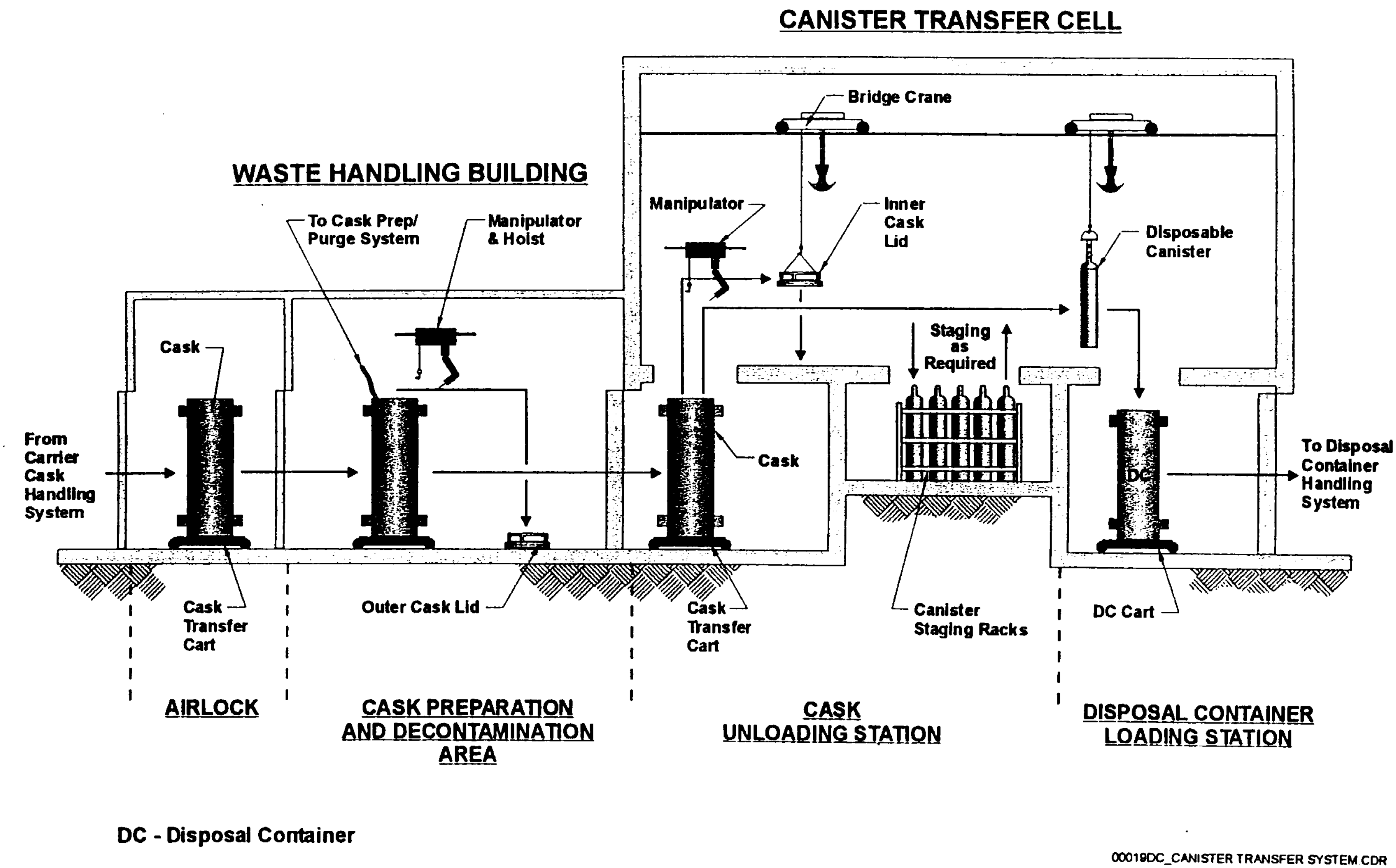
Figure: EF-15 Assembly Transfer System (page 2)



ASSEMBLY TRANSFER SYSTEM
(PAGE 3 OF 3)

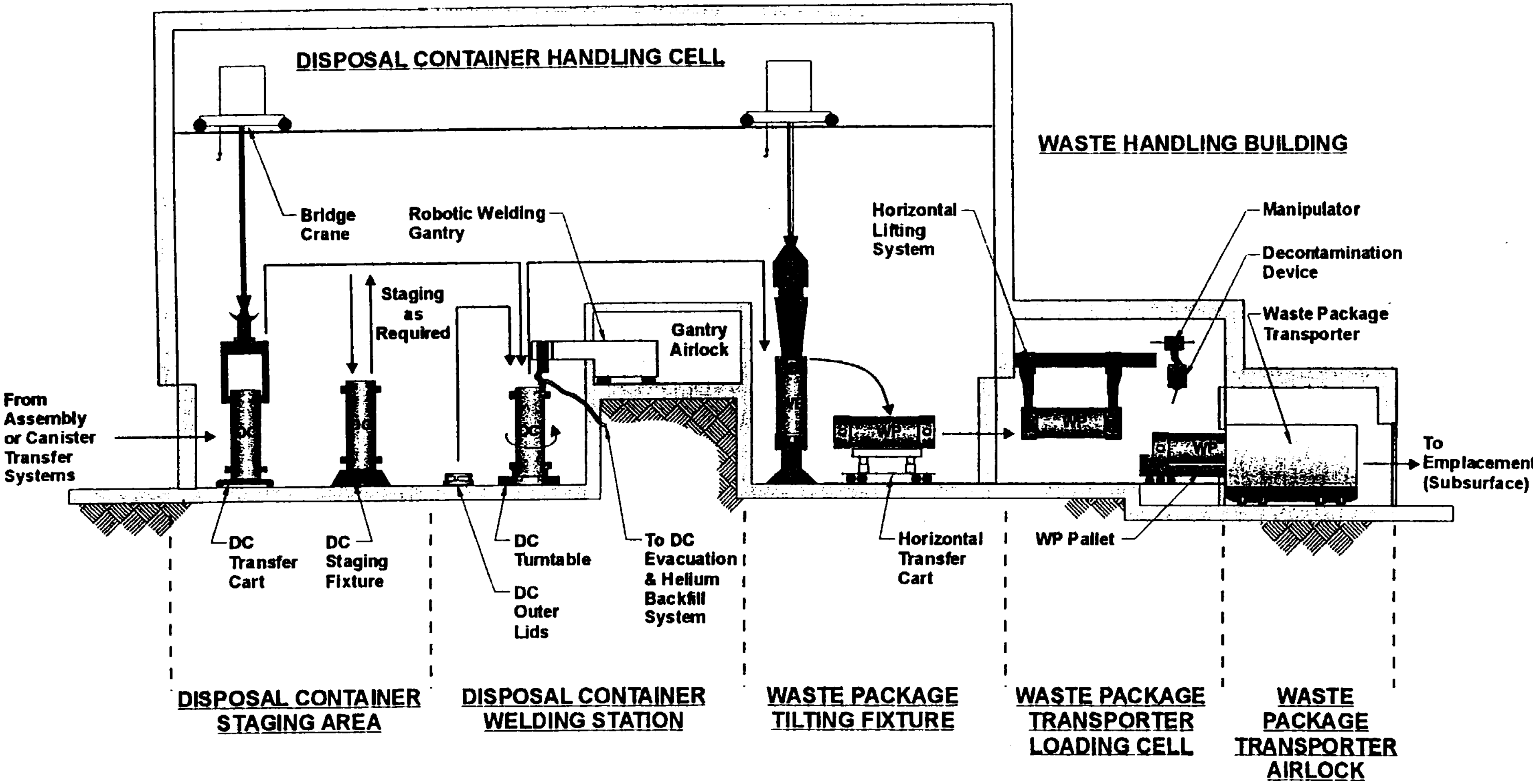
00019DC_ASSEMBLY TRANSFER SYSTEM 3 OF 3 CDR

Figure: EF-16 Assembly Transfer System (page 3)



CANISTER TRANSFER SYSTEM

Figure: EF-17 Canister Transfer System

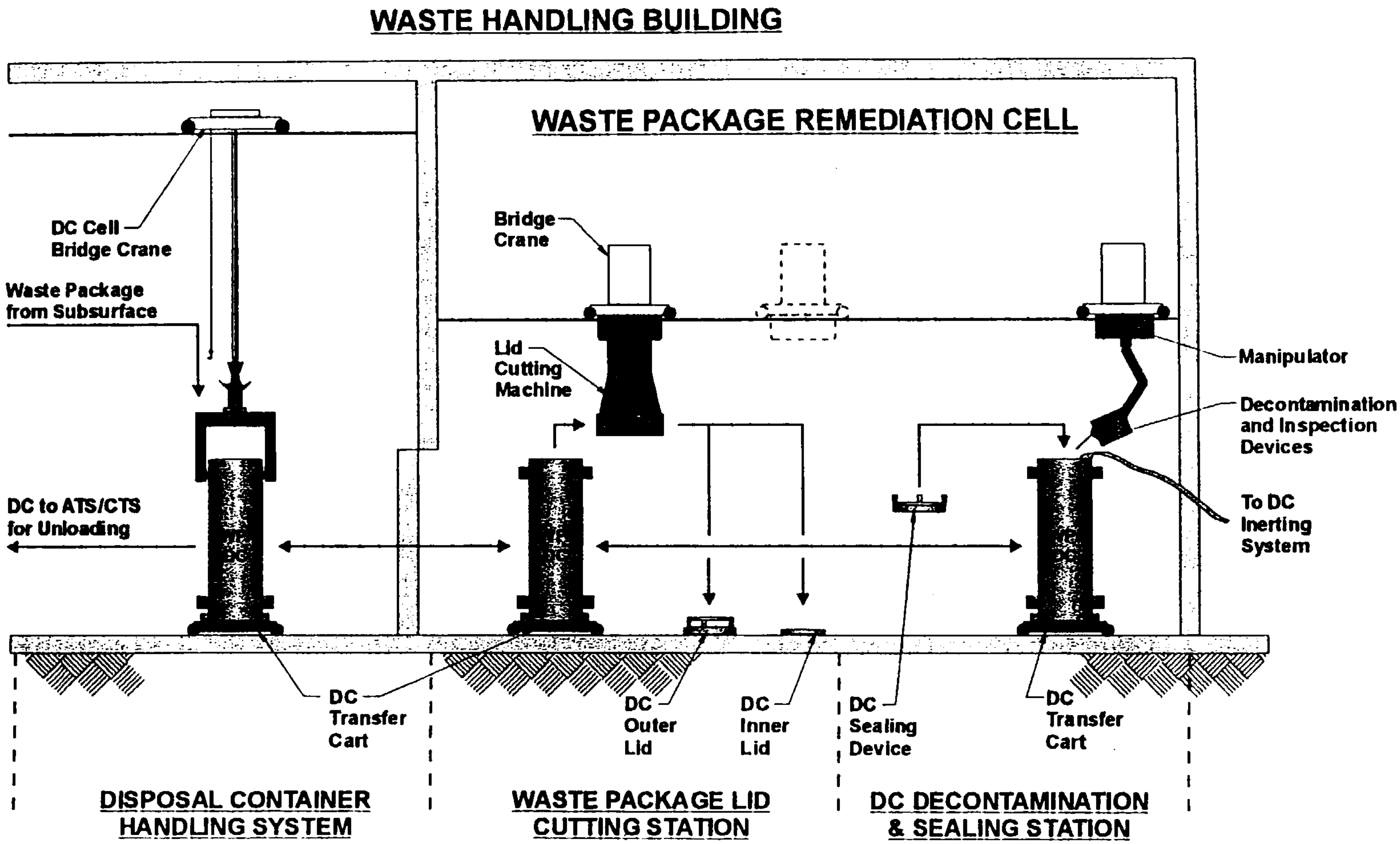


DC - Disposal Container
WP - Waste Package

00019DC_DISPOSAL CONTAINER HANDLING SYSTEM CDR

DISPOSAL CONTAINER HANDLING SYSTEM

Figure: EF-18 Disposal Container Handling System



DC - Disposal Container
WP - Waste Package
ATS - Assembly Transfer System
CTS - Canister Transfer System

00019DC_WASTE PACKAGE REMEDIATION SYSTEM CDR

WASTE PACKAGE REMEDIATION SYSTEM

Figure: EF-19 Waste Package Remediation System

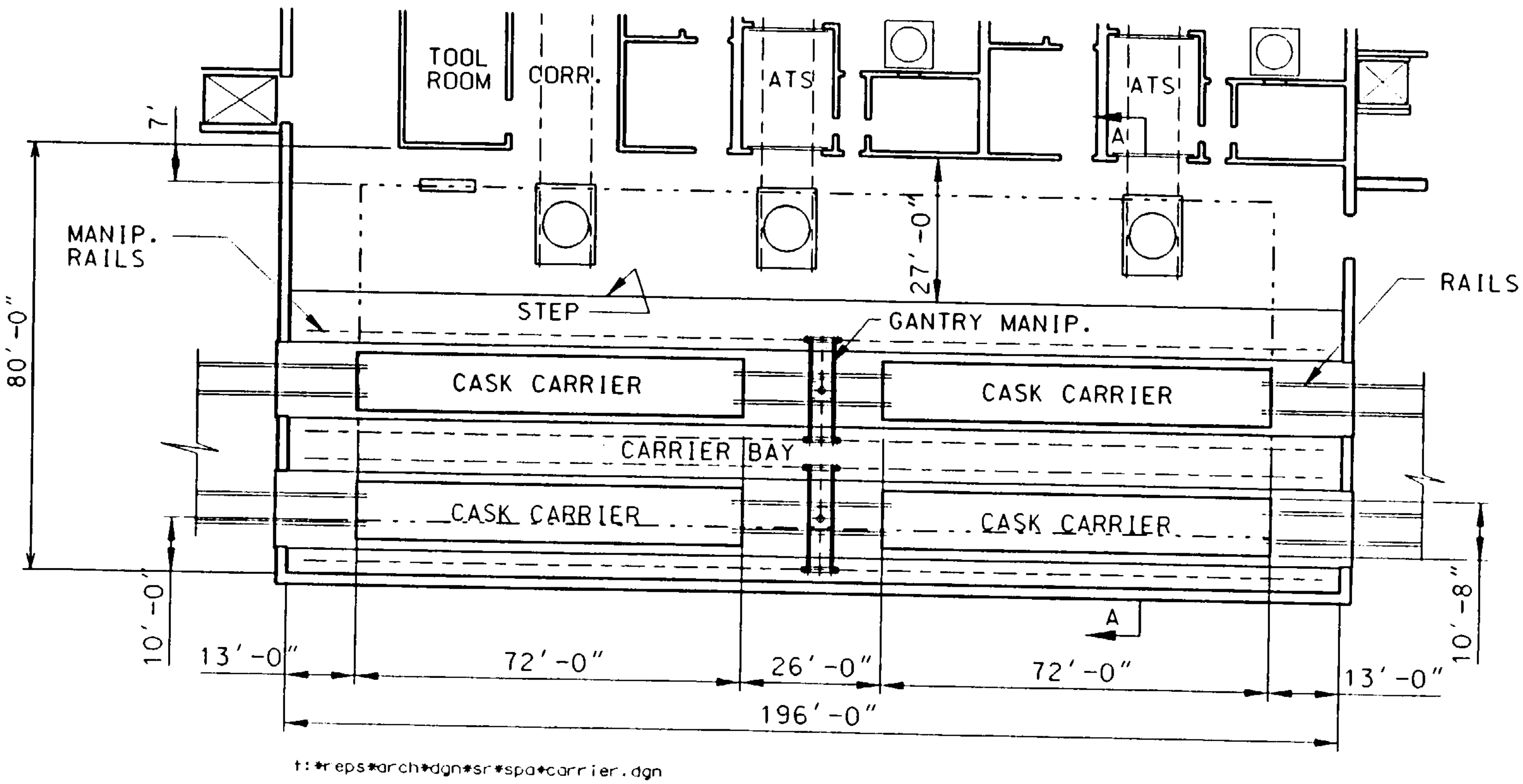


Figure SPA-ME 1 Carrier Bay Plan

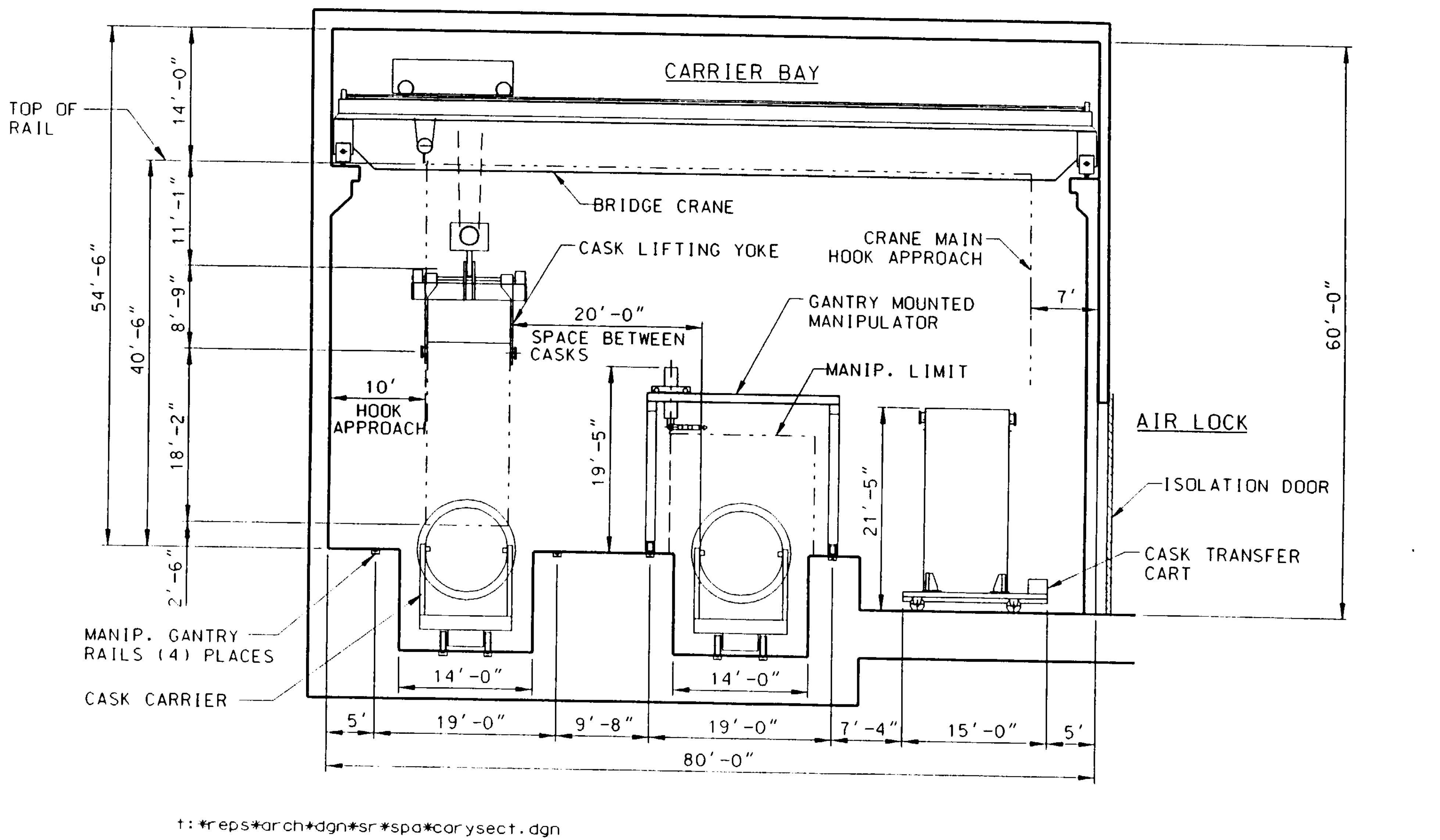
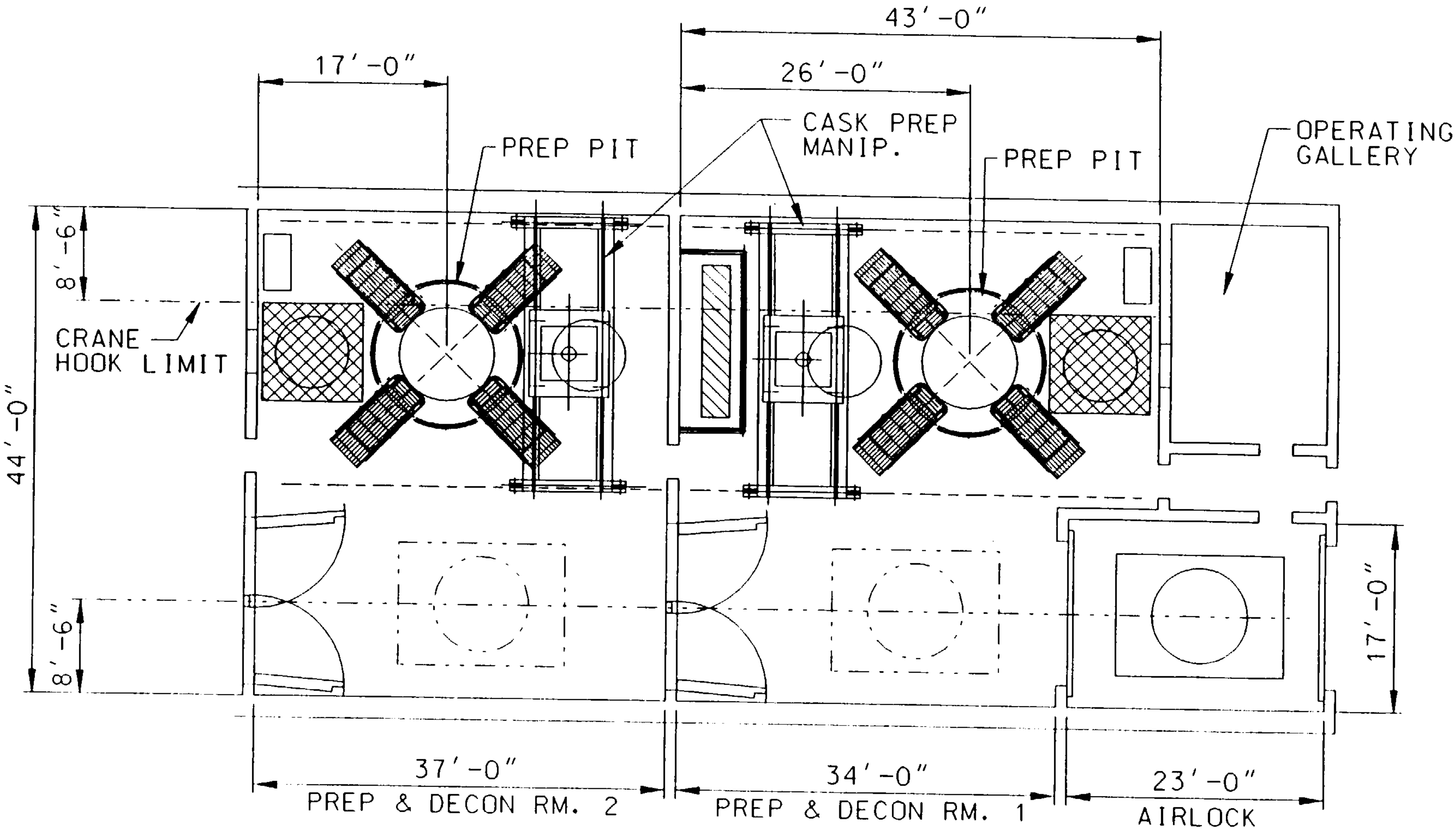


Figure SPA-ME 2 Carrier Bay Section



t:/reps/arch/dgn/sr/spa/atscaskp.dgn

Figure SPA-ME 3 Cask Preparation and Decontamination Rooms Plan

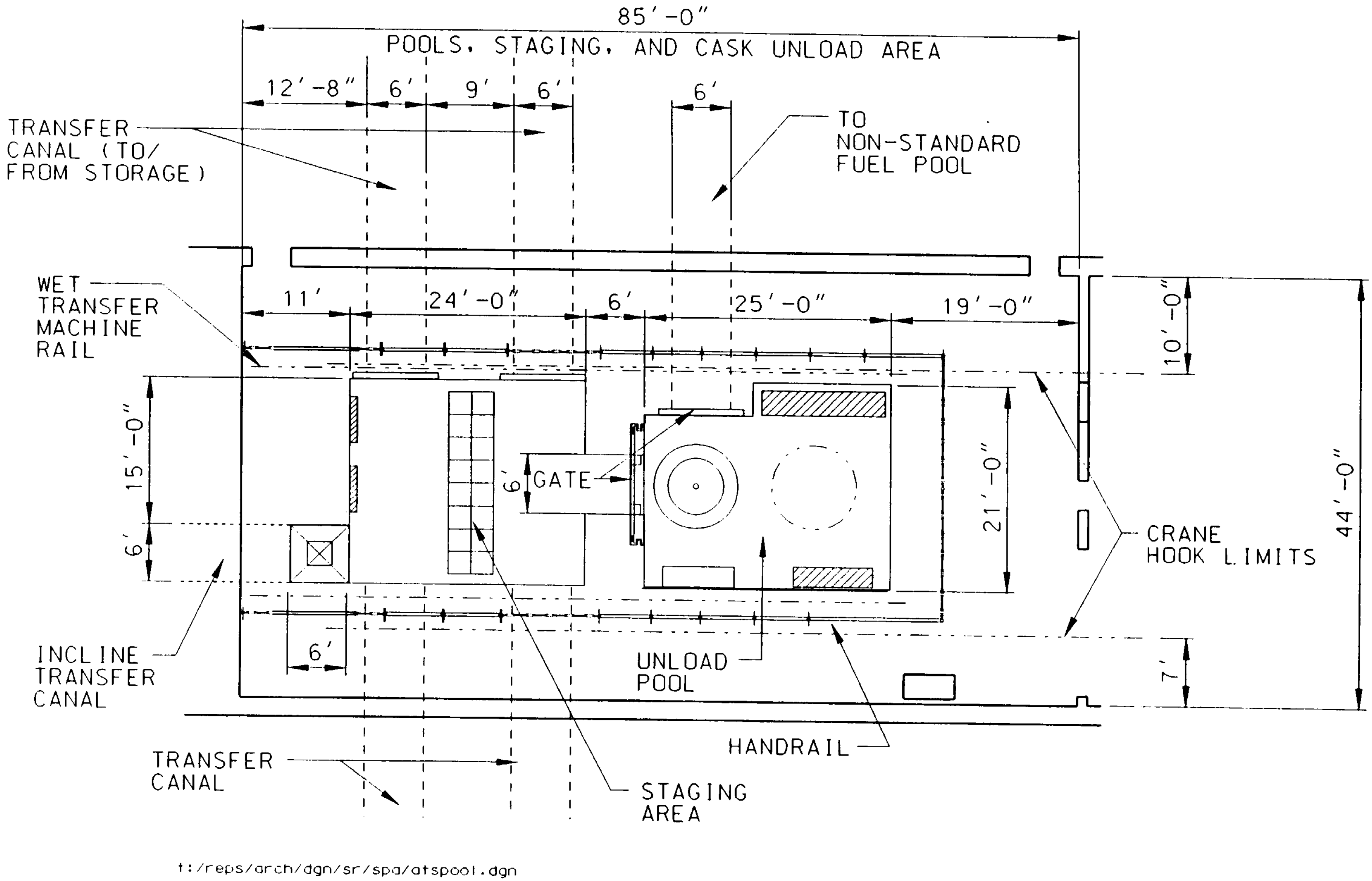
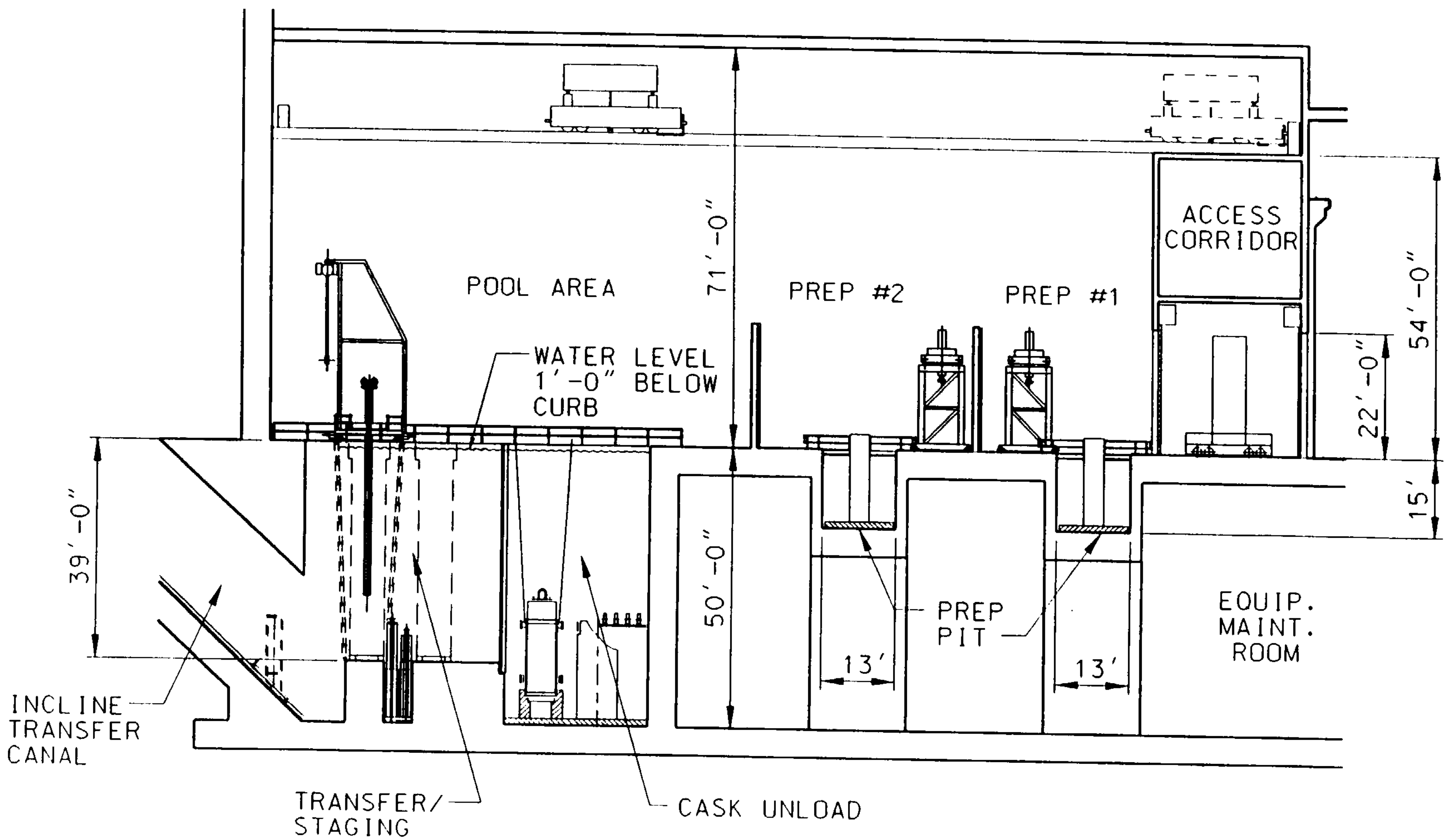


Figure SPA-ME 4 Cask Unloading Area Plan



f:/reps/arch/dgn/sr/spa/atsunldst.dgn

Figure SPA-ME 5 Cask Preparation and Unloading Area Section

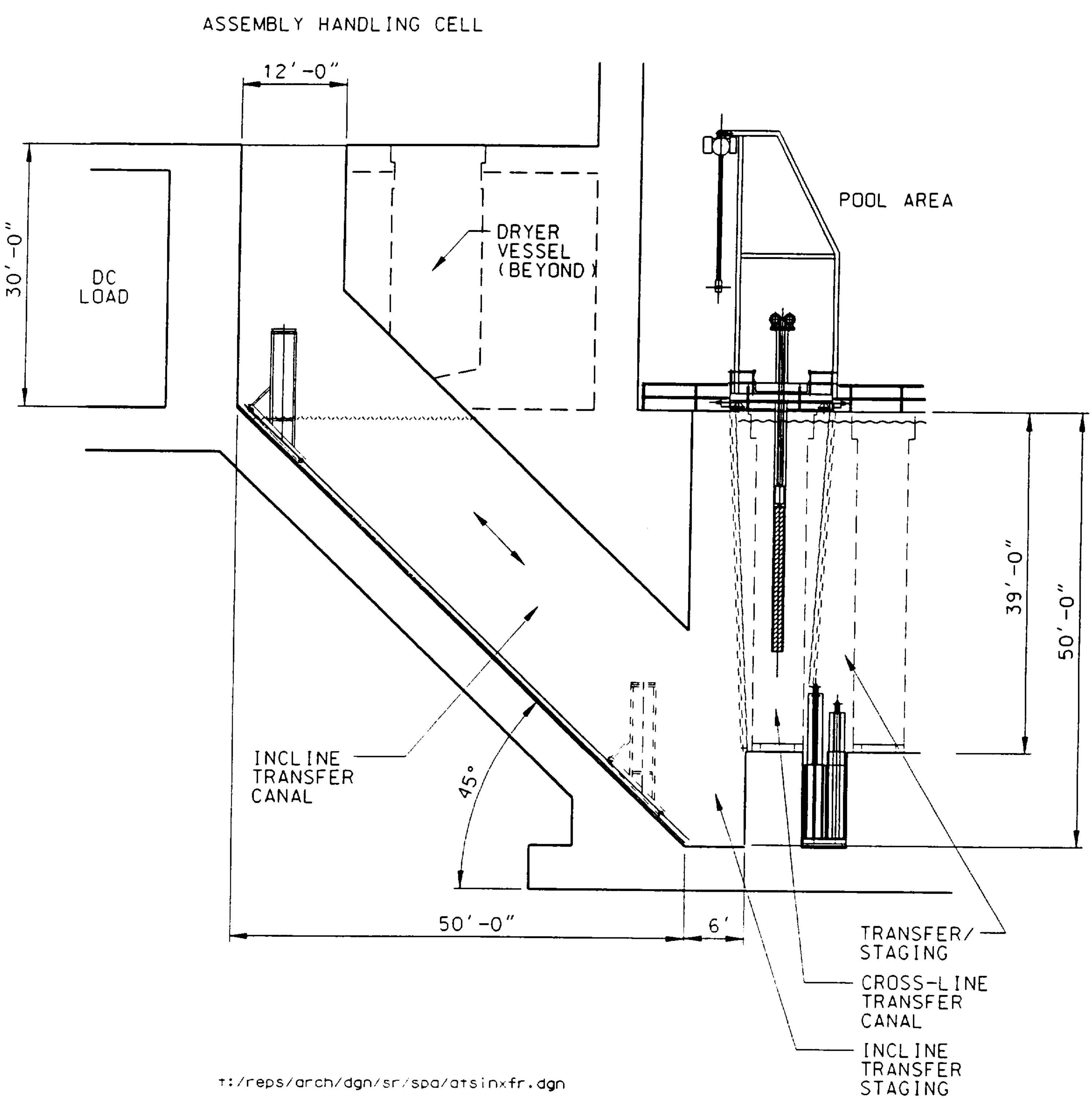


Figure SPA-ME 6 Incline Transfer Canal Section

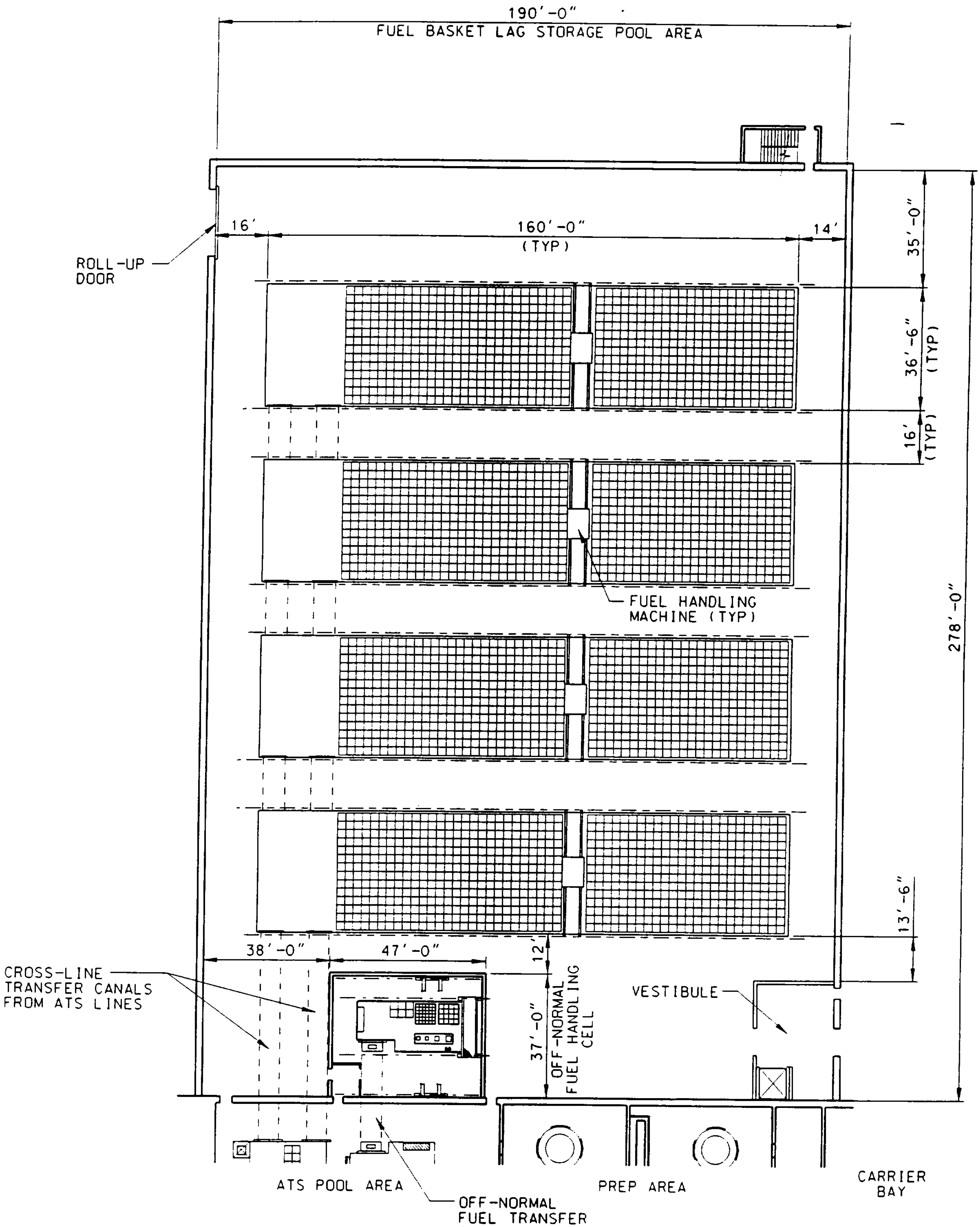
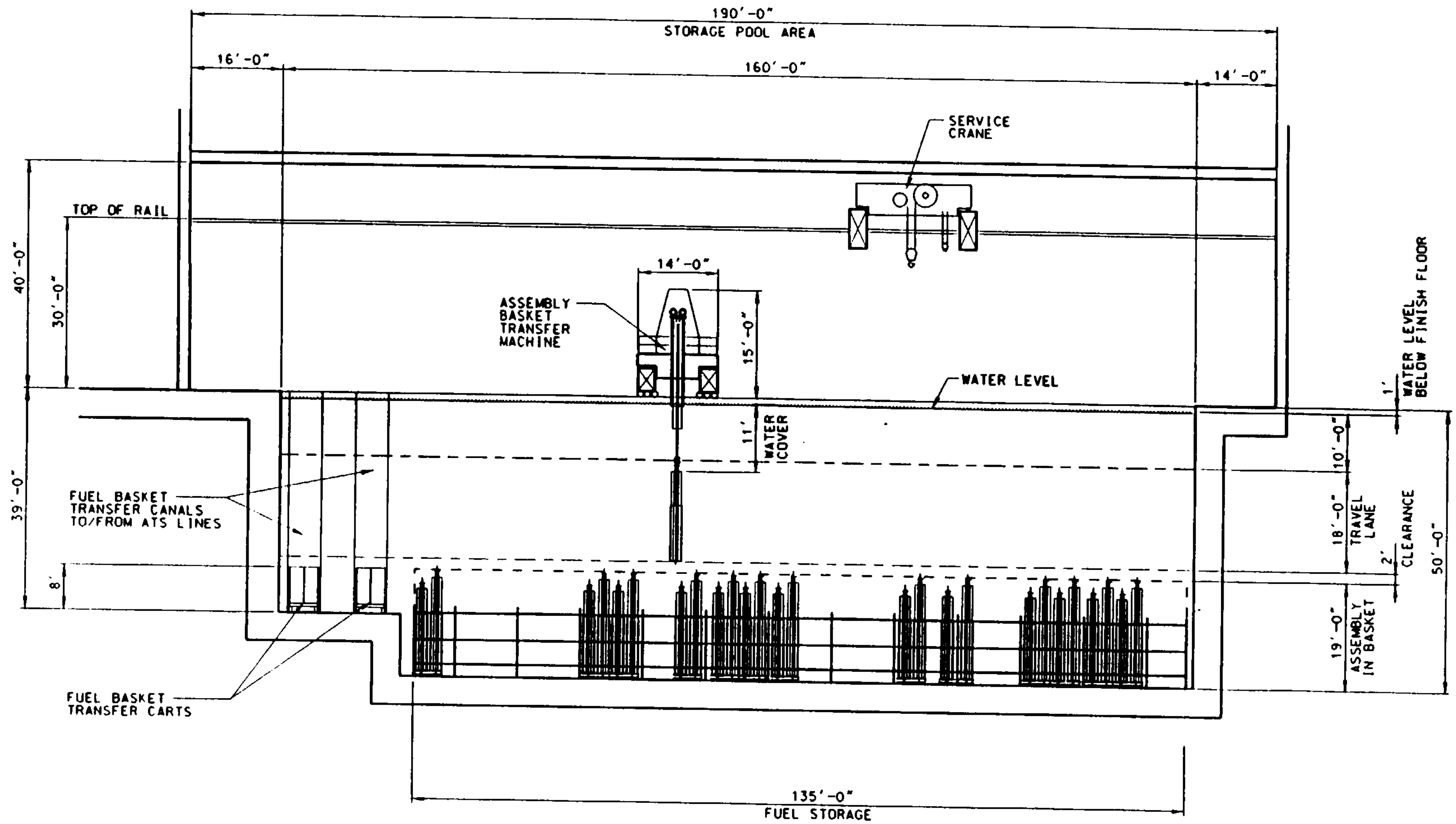


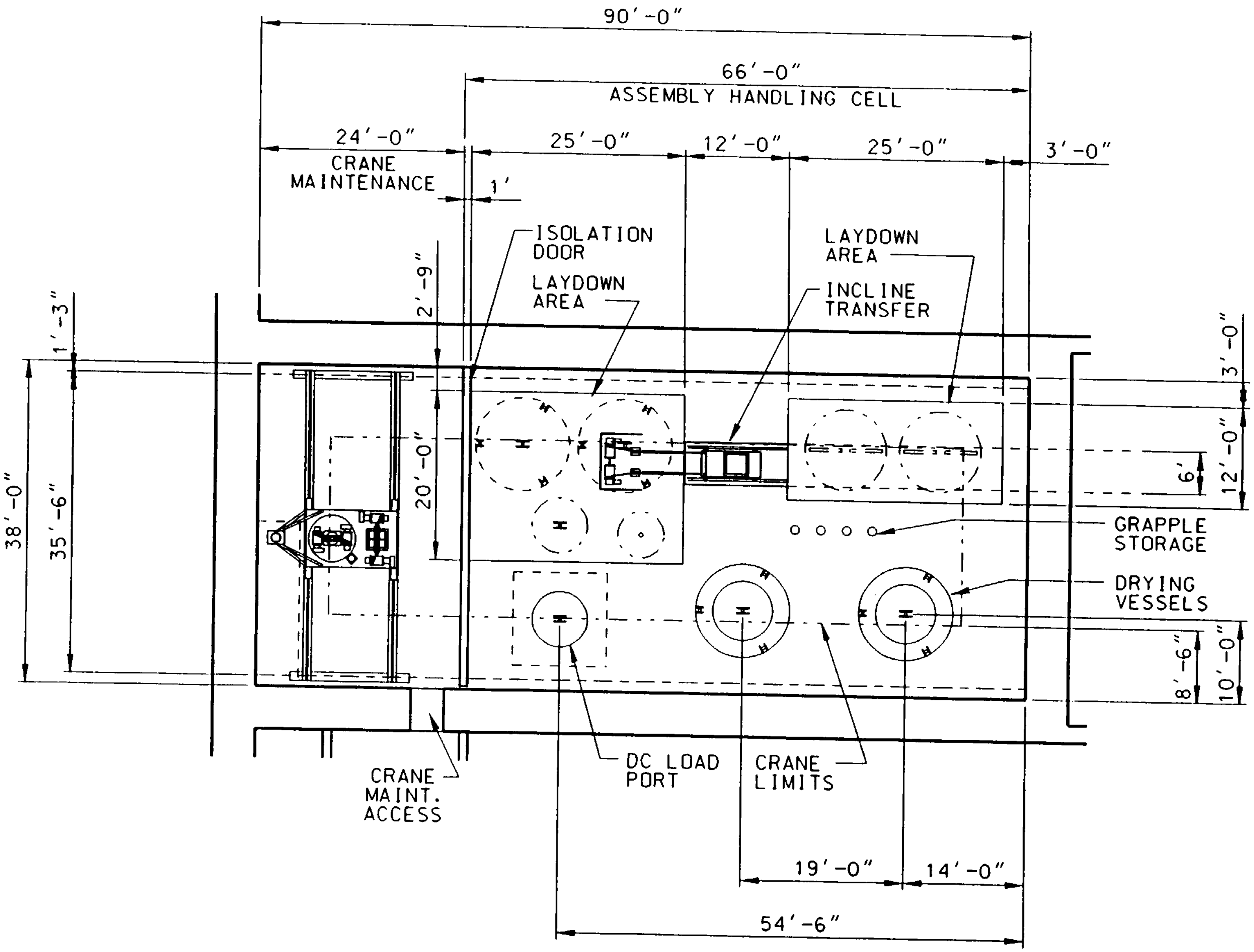
Figure SPA-ME 7 Fuel Basket Lag Storage Pool Area

t:+reps+arch+dgn+sr+spa+lagpool.dgn



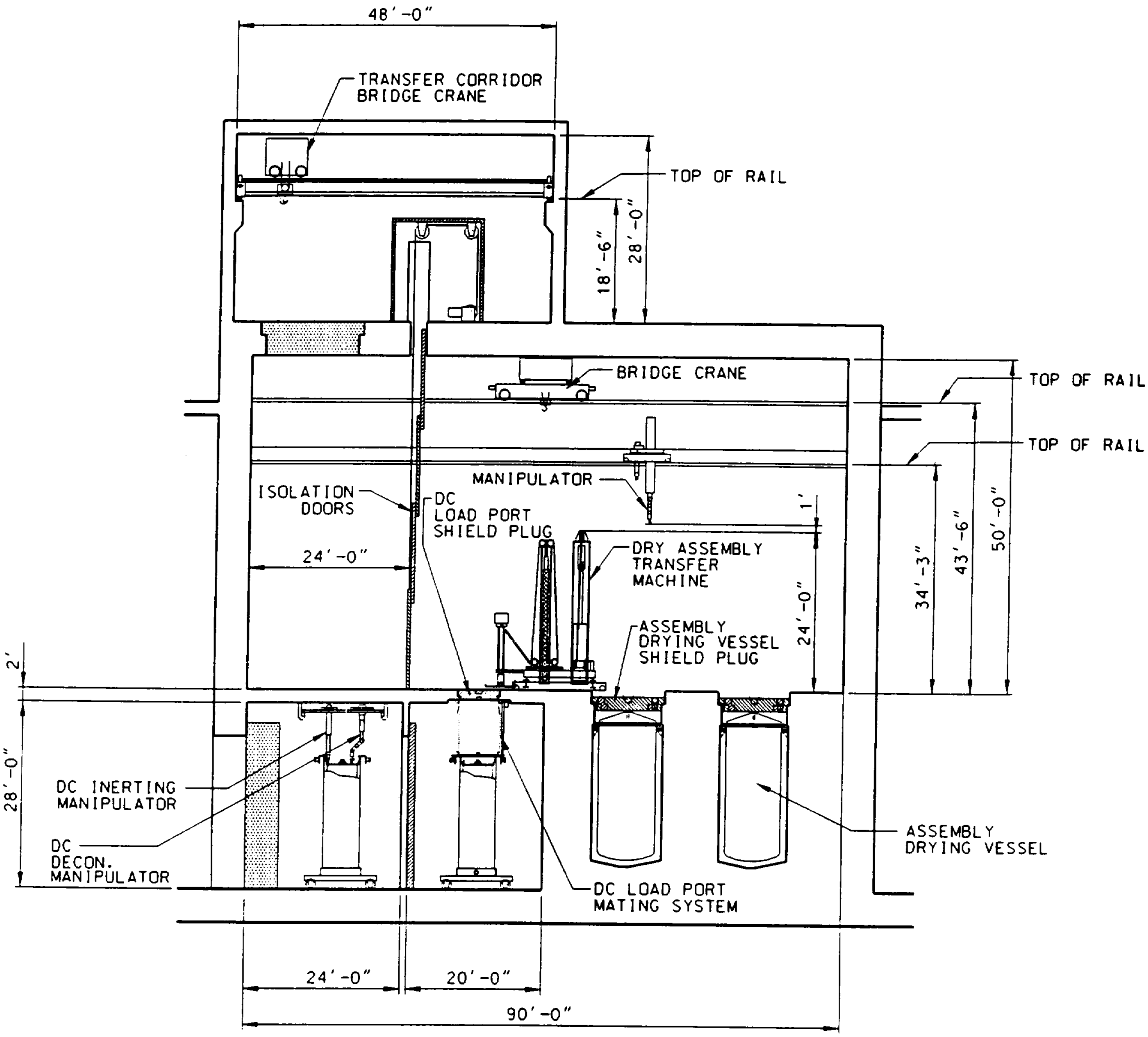
t:/reps/arch/dgn/sr/spa/lagpoolst.dgn

Figure SPA-ME 8 Fuel Basket Lag Storage Pool Section



t:/reps/arch/dgn/sr/spa/atsxfr.dgn

Figure SPA-ME 9 Assembly Handling Cell Plan



t:/reps/arch/dgn/sr/spa/ats*frst.dgn

Figure SPA-ME 10 Assembly Handling Cell Section

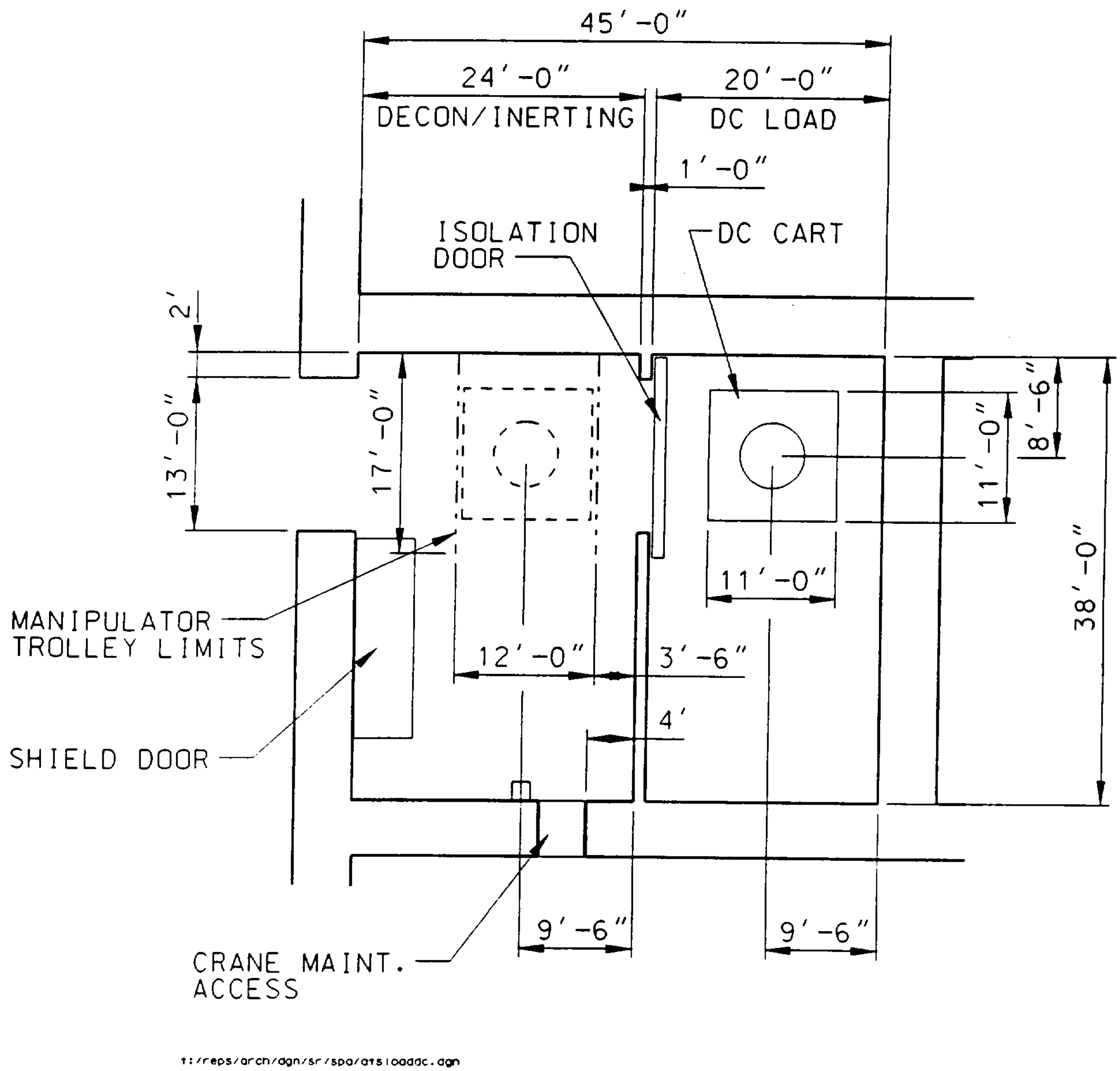


Figure SPA-ME 11 Disposal Container Load and Decontamination Cells Plan

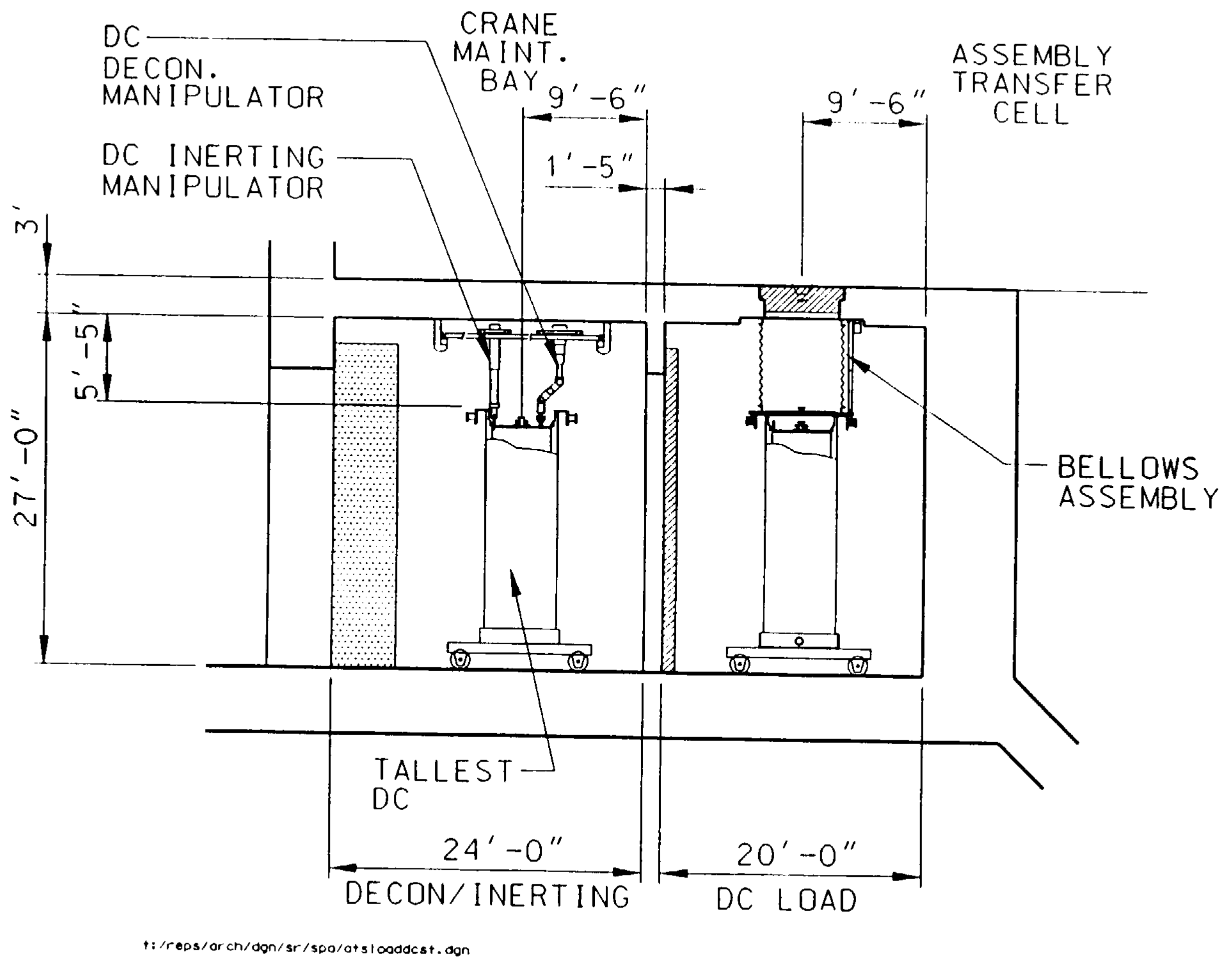


Figure SPA-ME 12 Disposal Container Load and Decontamination Cells Section

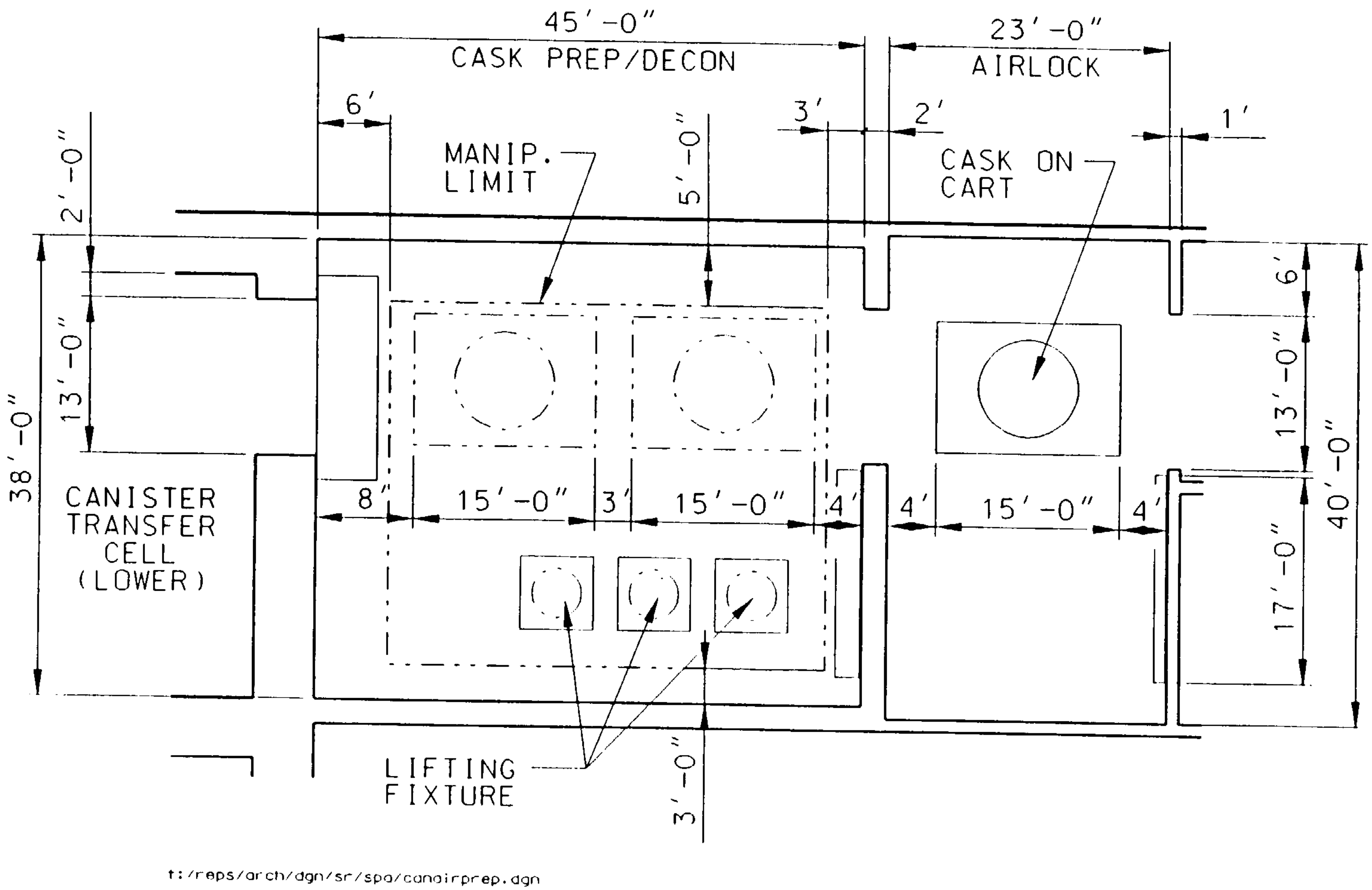


Figure SPA-ME 13 Airlock and Cask Preparation Area Plan

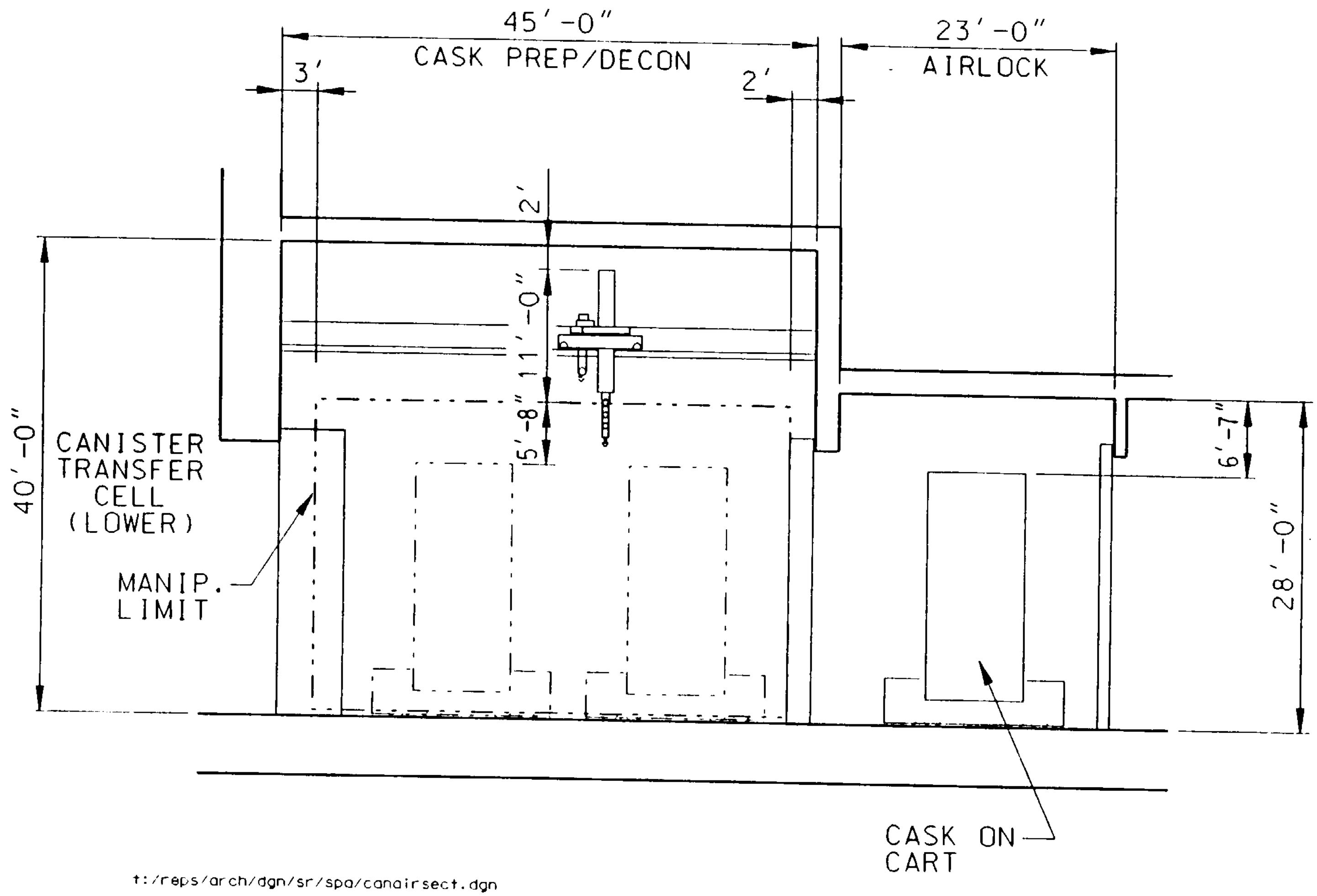
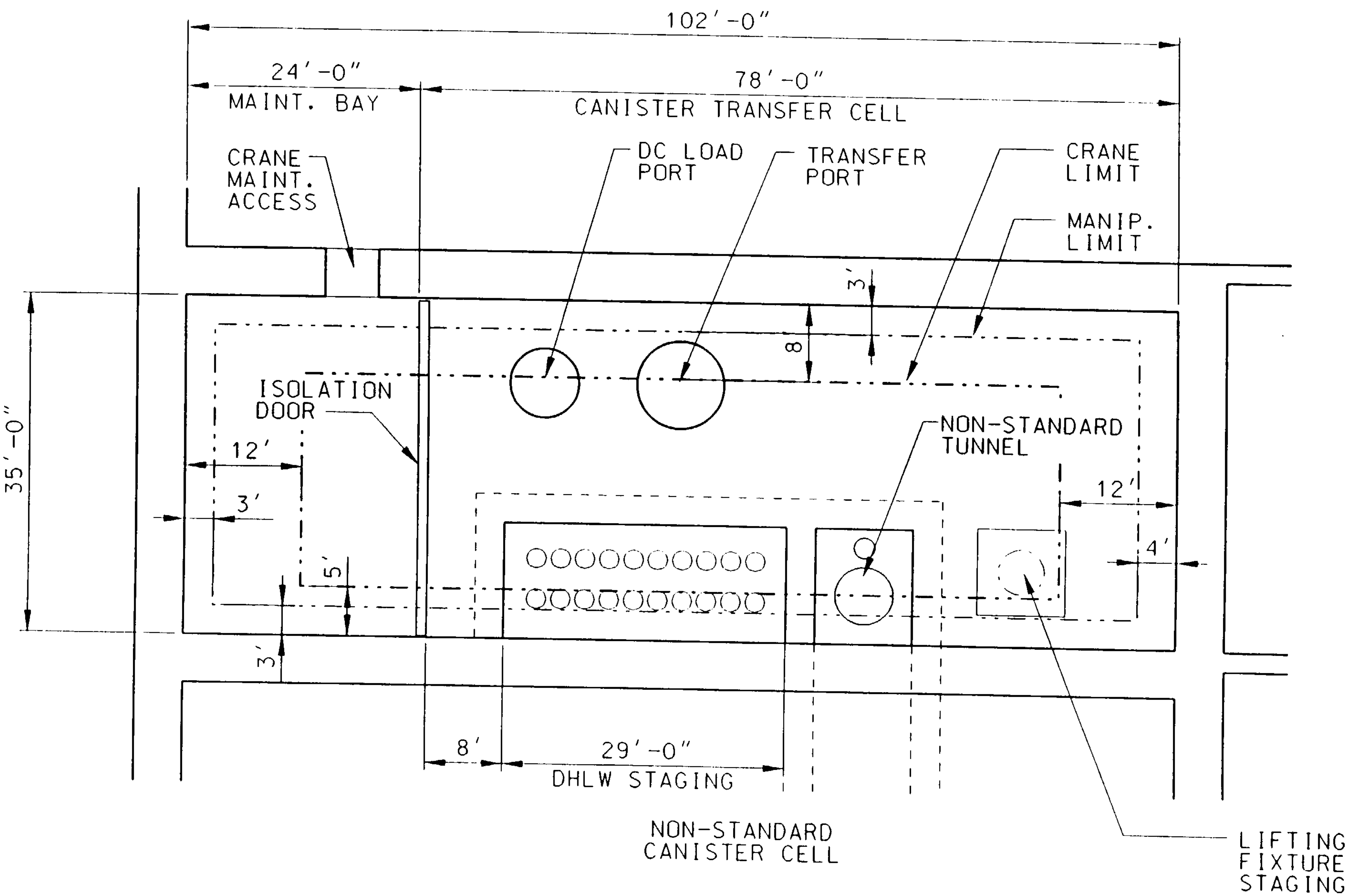
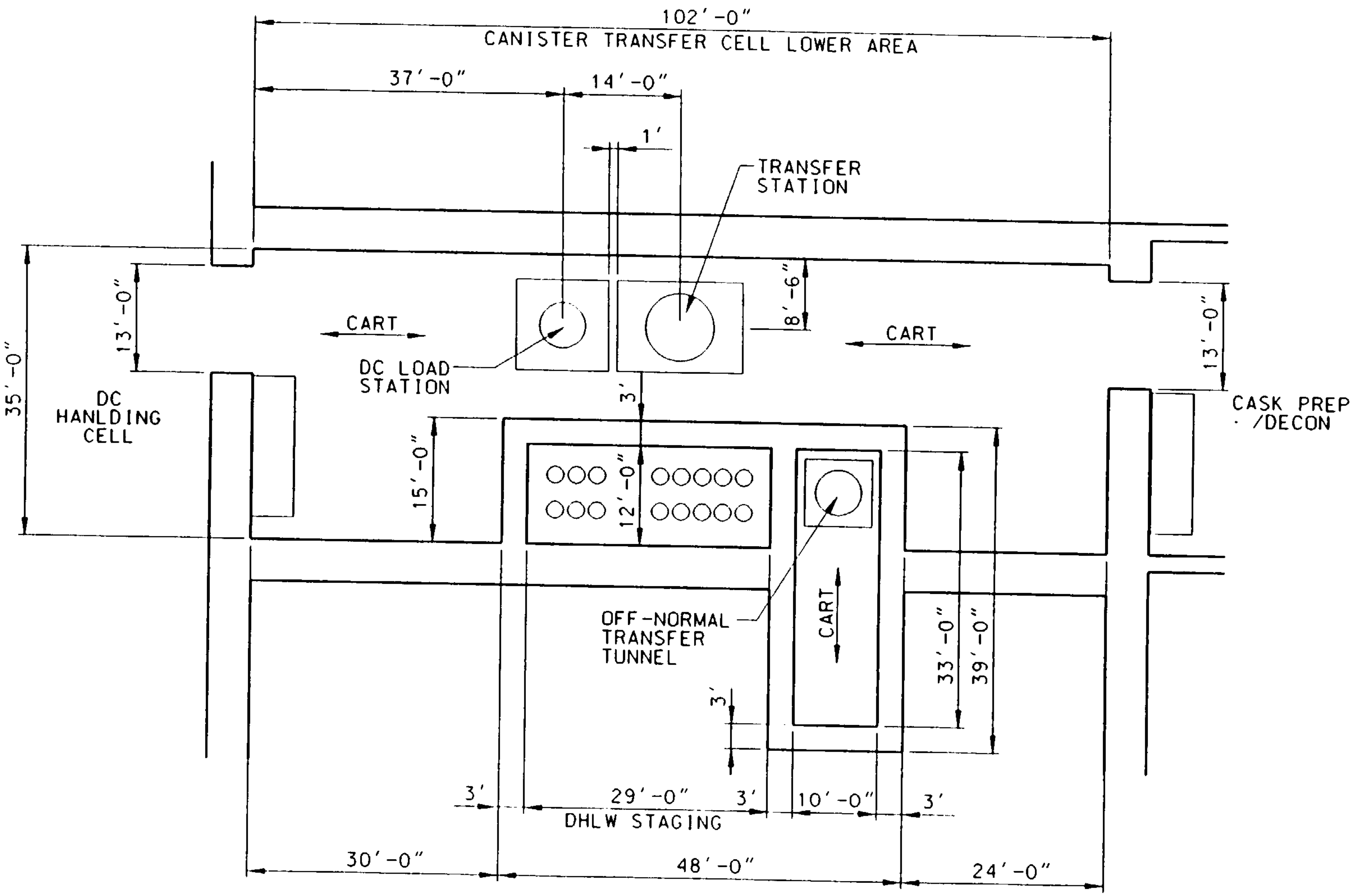


Figure SPA-ME 14 Airlock and Cask Preparation Area Section



t:/reps/arch/dgn/sr/spa/canxfr.dgn

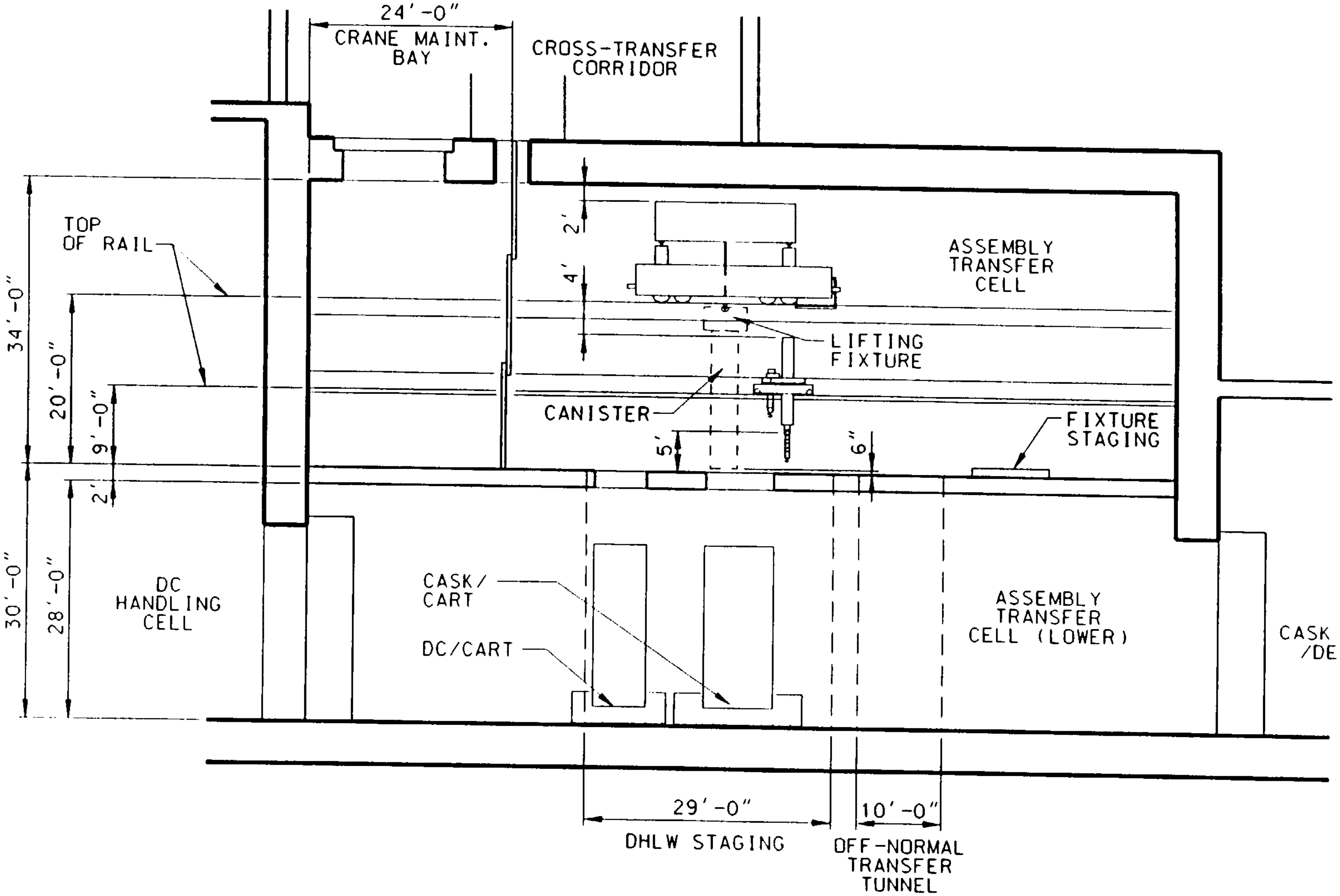
Figure SPA-ME 15 Canister Transfer Cell Plan



f:/reps/arch/dgn/sr/spa/canlower.dgn

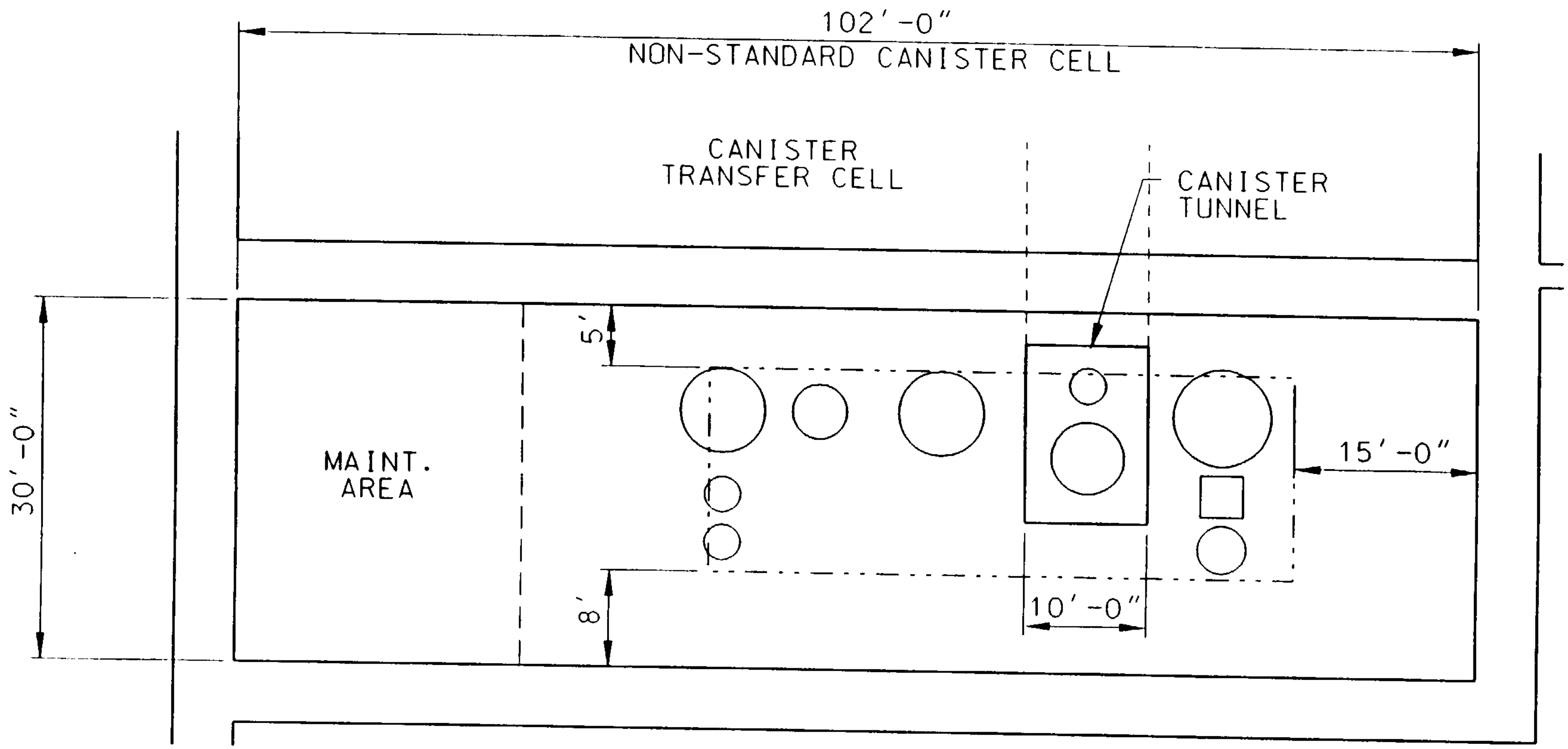
Figure SPA-ME 16 Canister Transfer Cell Lower Room Plan

Surface Nuclear Facilities Space Program Analysis for Site Recommendation
ANL-WHS-AR-000001 Rev 00A (Preliminary Draft) January 31, 2000



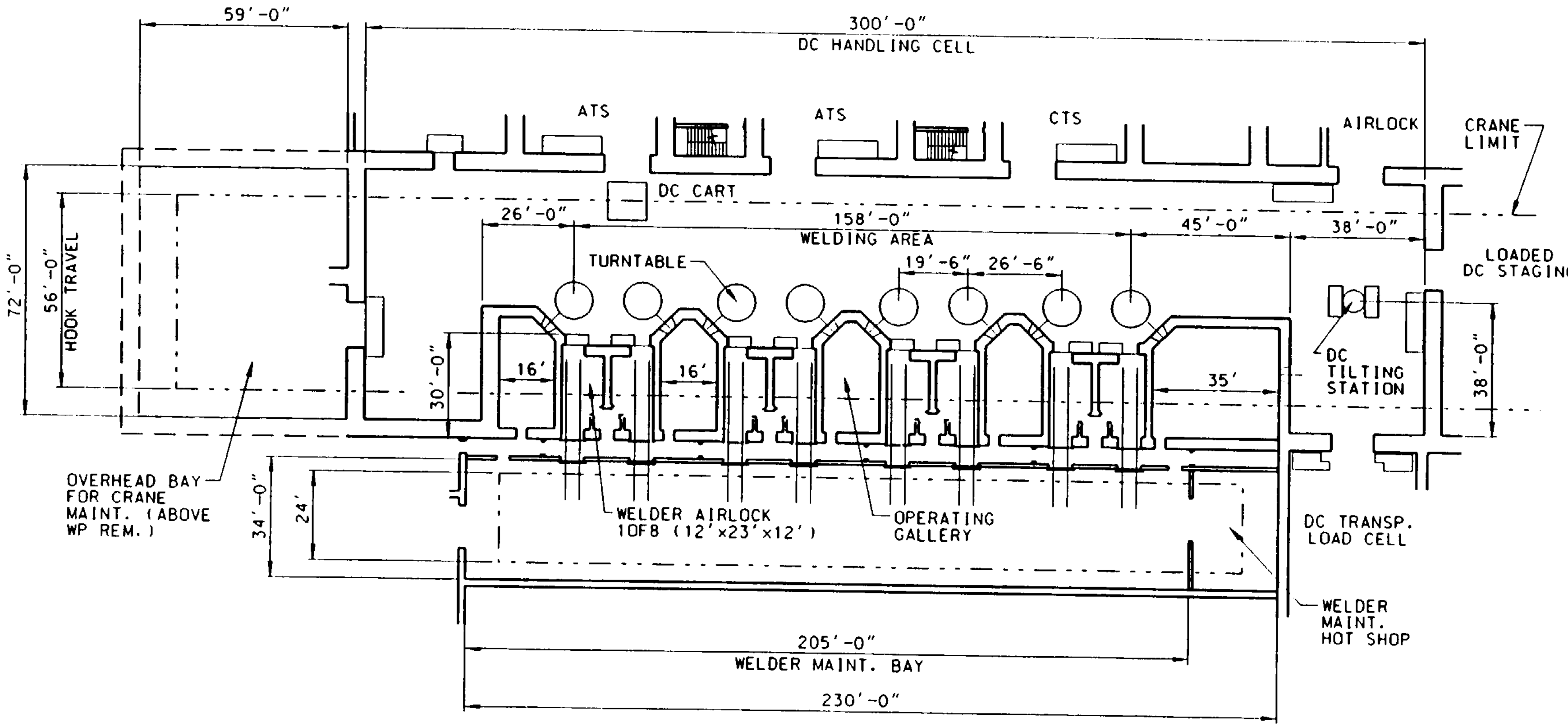
ti/reps/arch/dgn/sr/spa/canxfrsect.dgn

Figure SPA-ME 17 Canister Transfer Cell Section



t:/reps/arch/dgn/sr/spa/canoffnorml.dgn

Figure SPA-ME 18 Off-Normal Canister Handling Cell Plan



t:/reps/arch/dgn/sr/spa/dccell.dgn

Figure SPA-ME 19 Disposal Container Handling Cell Plan

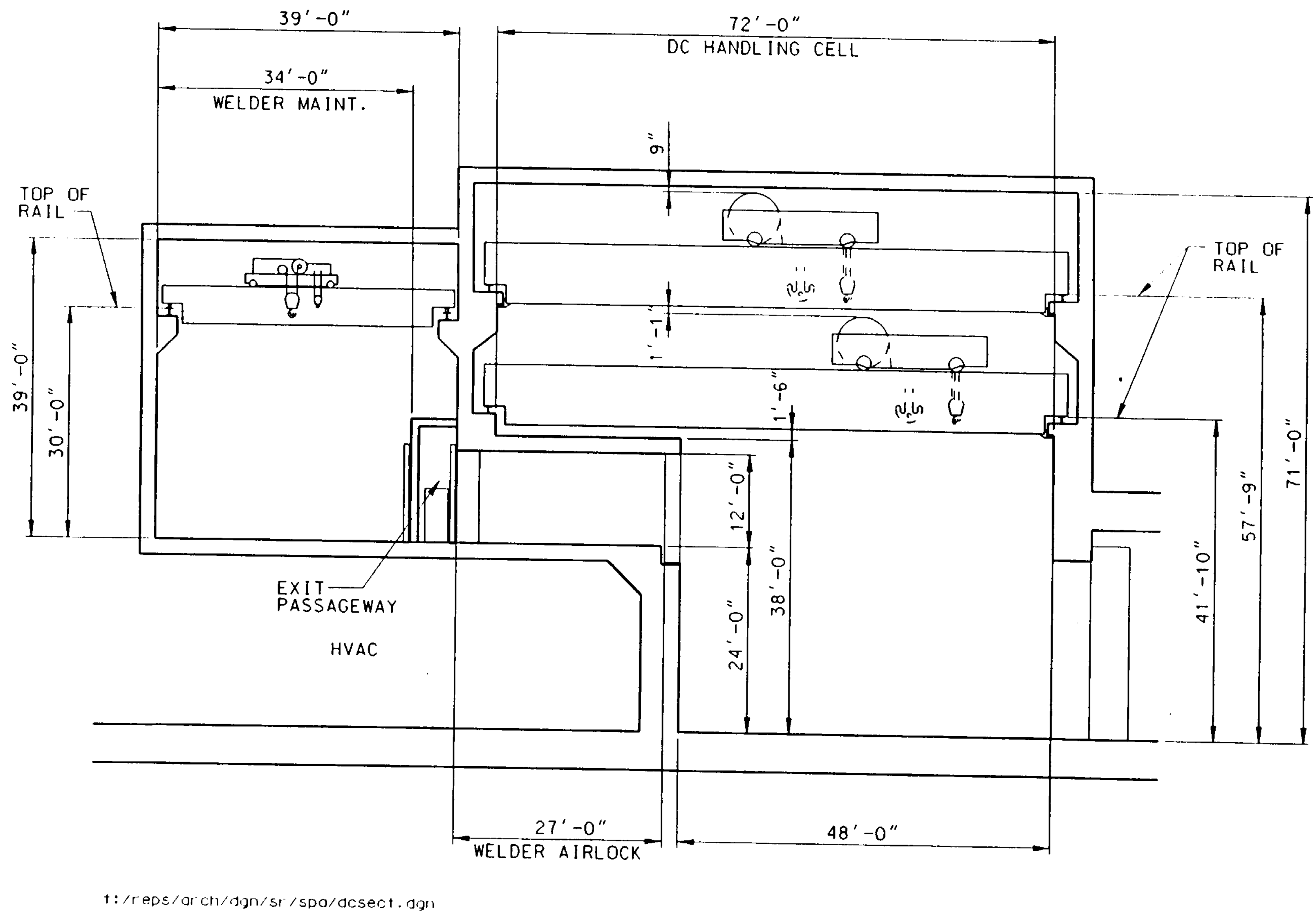
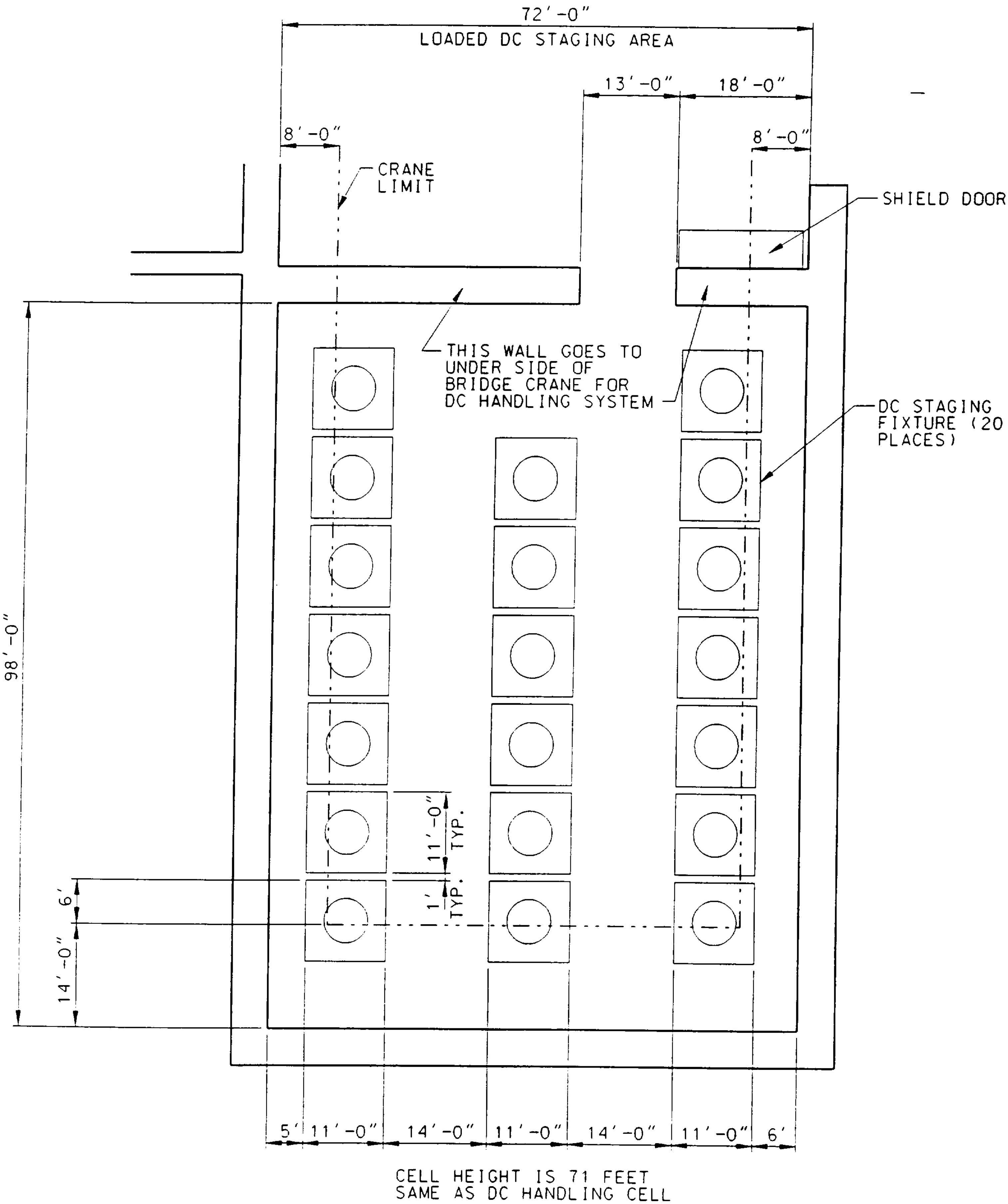
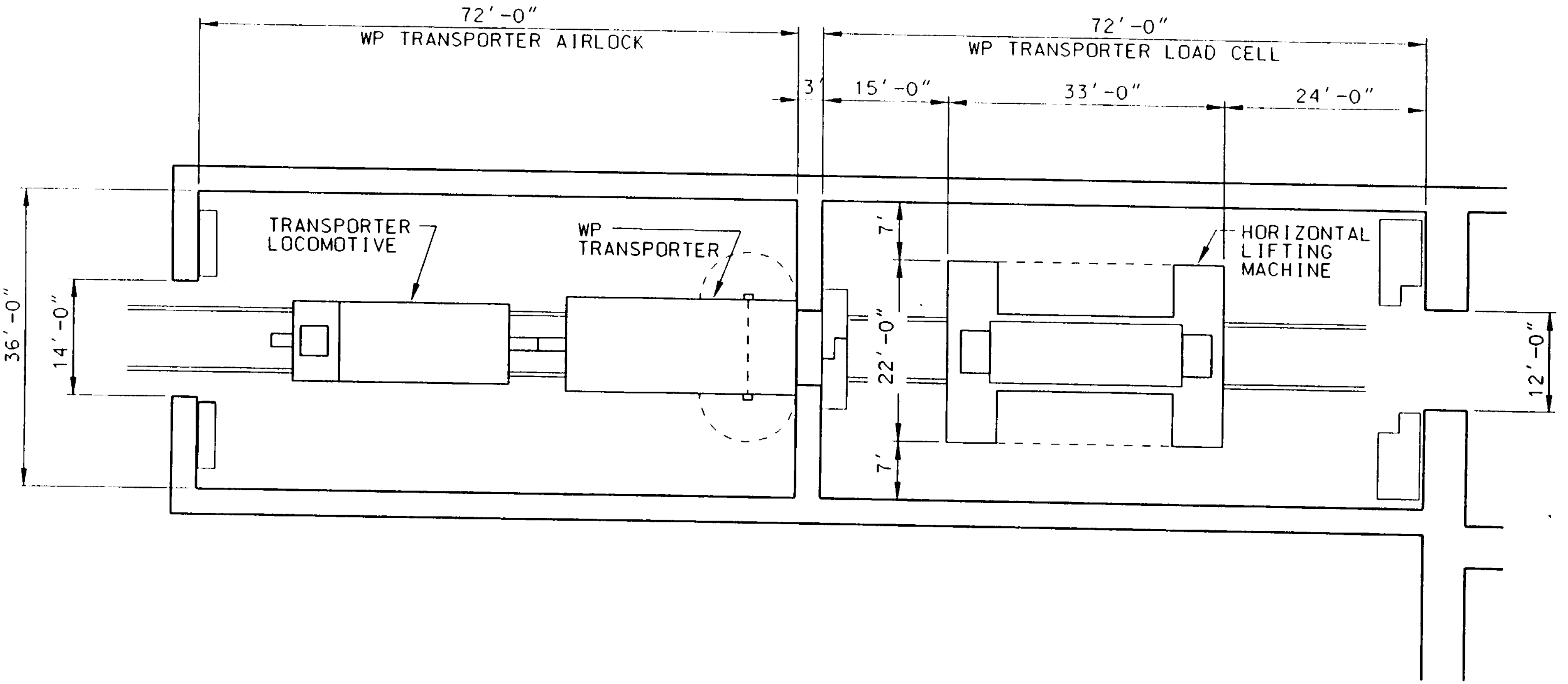


Figure SPA-ME 20 Disposal Container Handling Cell Section



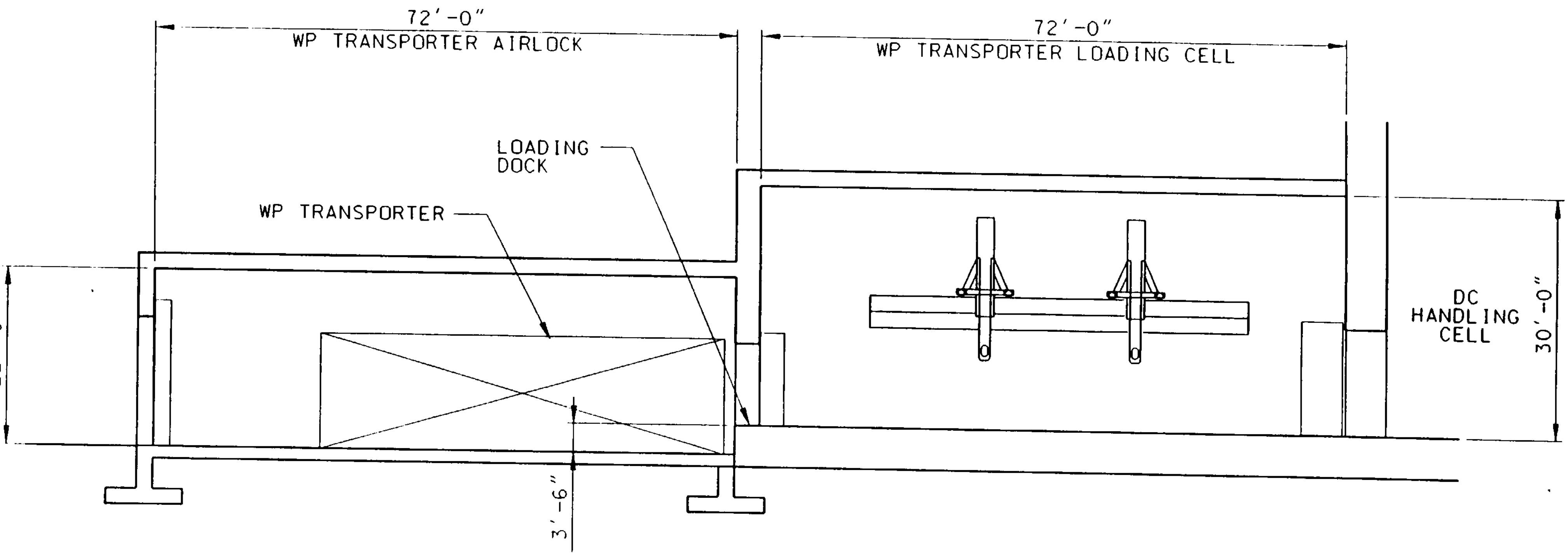
t:/reps/arch/dgn/sr/spa/dcstg.dgn

Figure SPA-ME 21 Loaded Disposal Container Staging Area Plan



t:/reps/arch/dgn/sr/spa/wptranld.dgn

Figure SPA-ME 22 Waste Package Transporter Loading Cell and Airlock Plan



t:/reps/arch/dgn/sr/spa/wptransect.dgn

Figure SPA-ME 23 Waste Package Transporter Loading Cell and Airlock Section

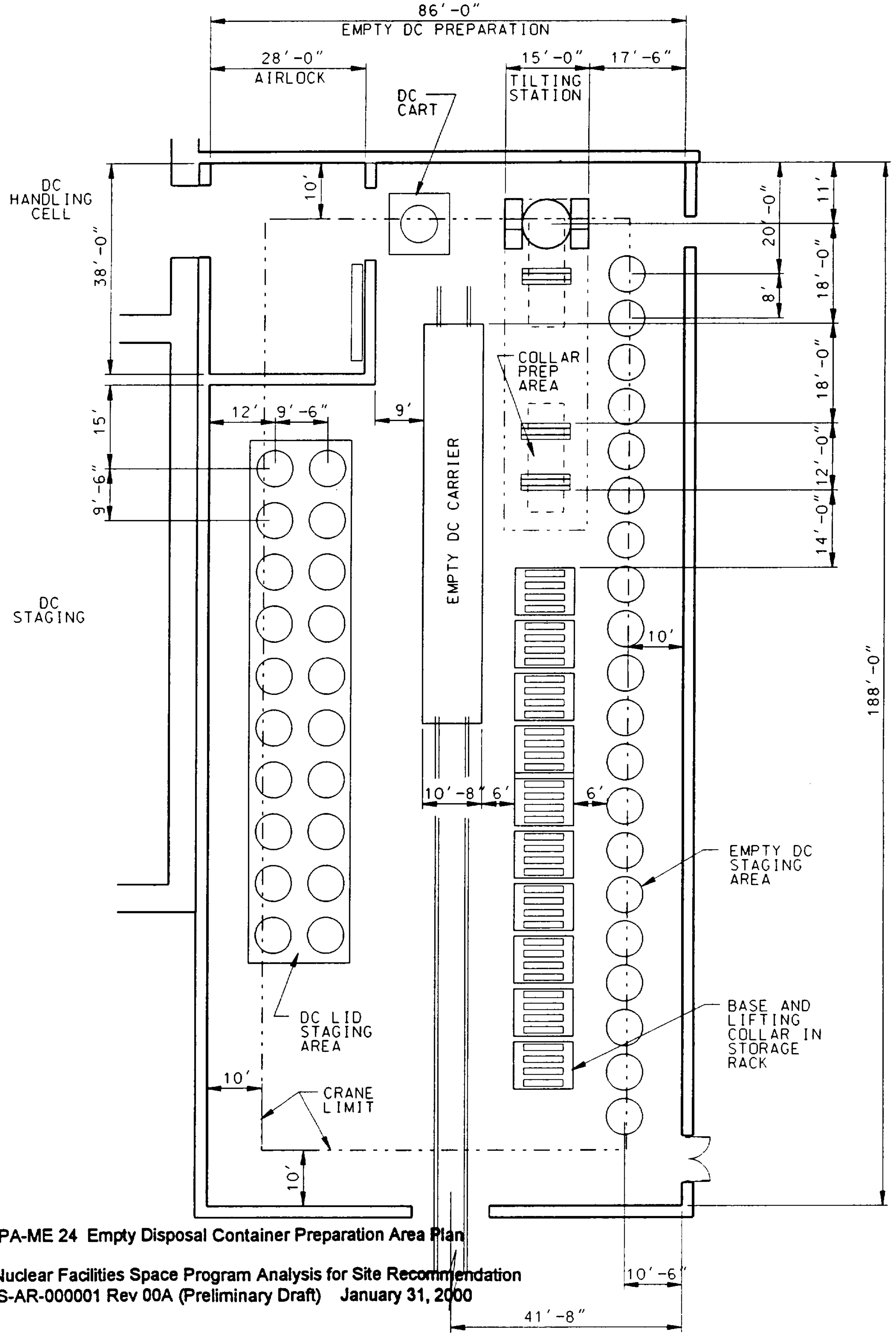
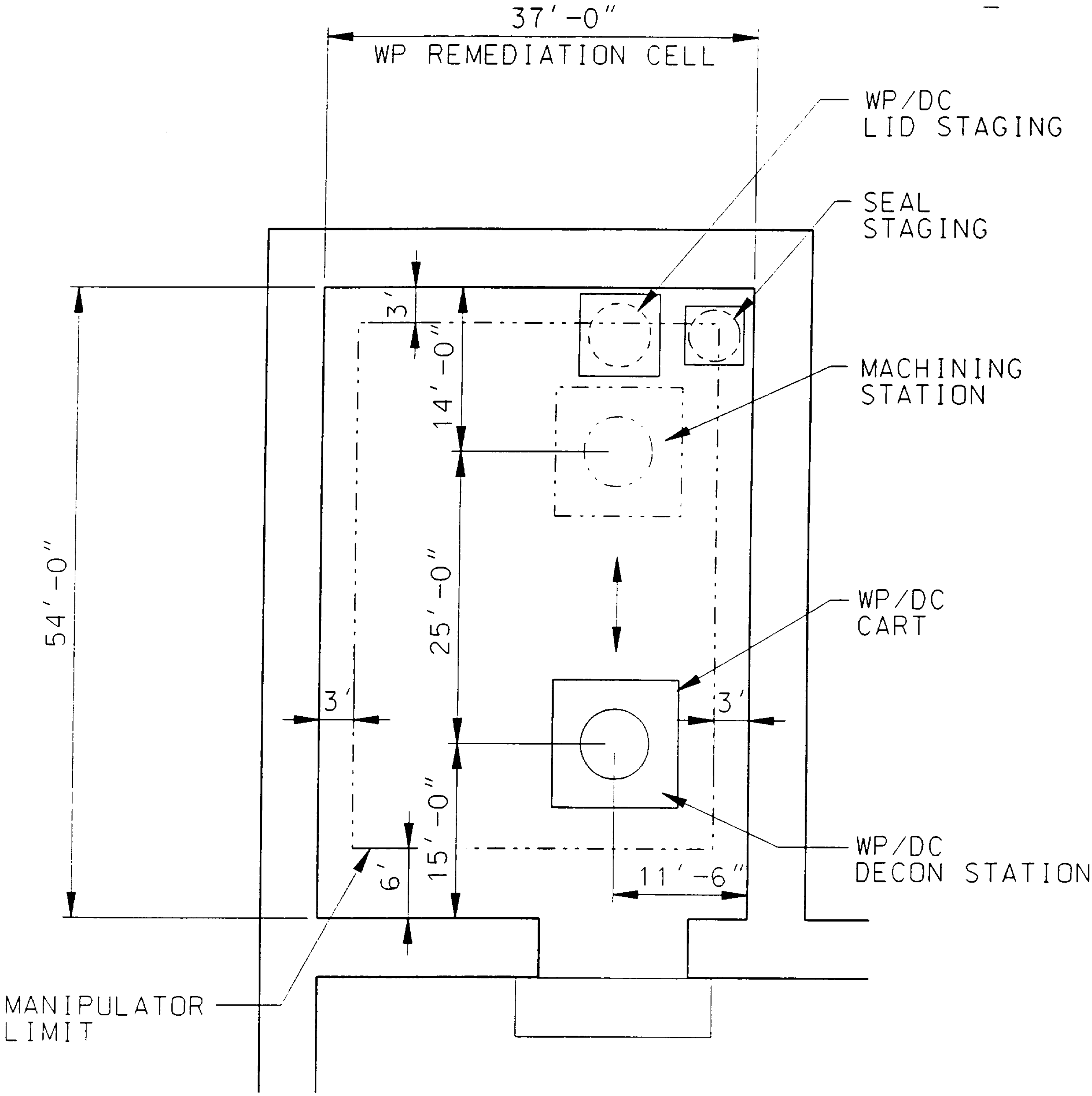


Figure SPA-ME 24 Empty Disposal Container Preparation Area Plan

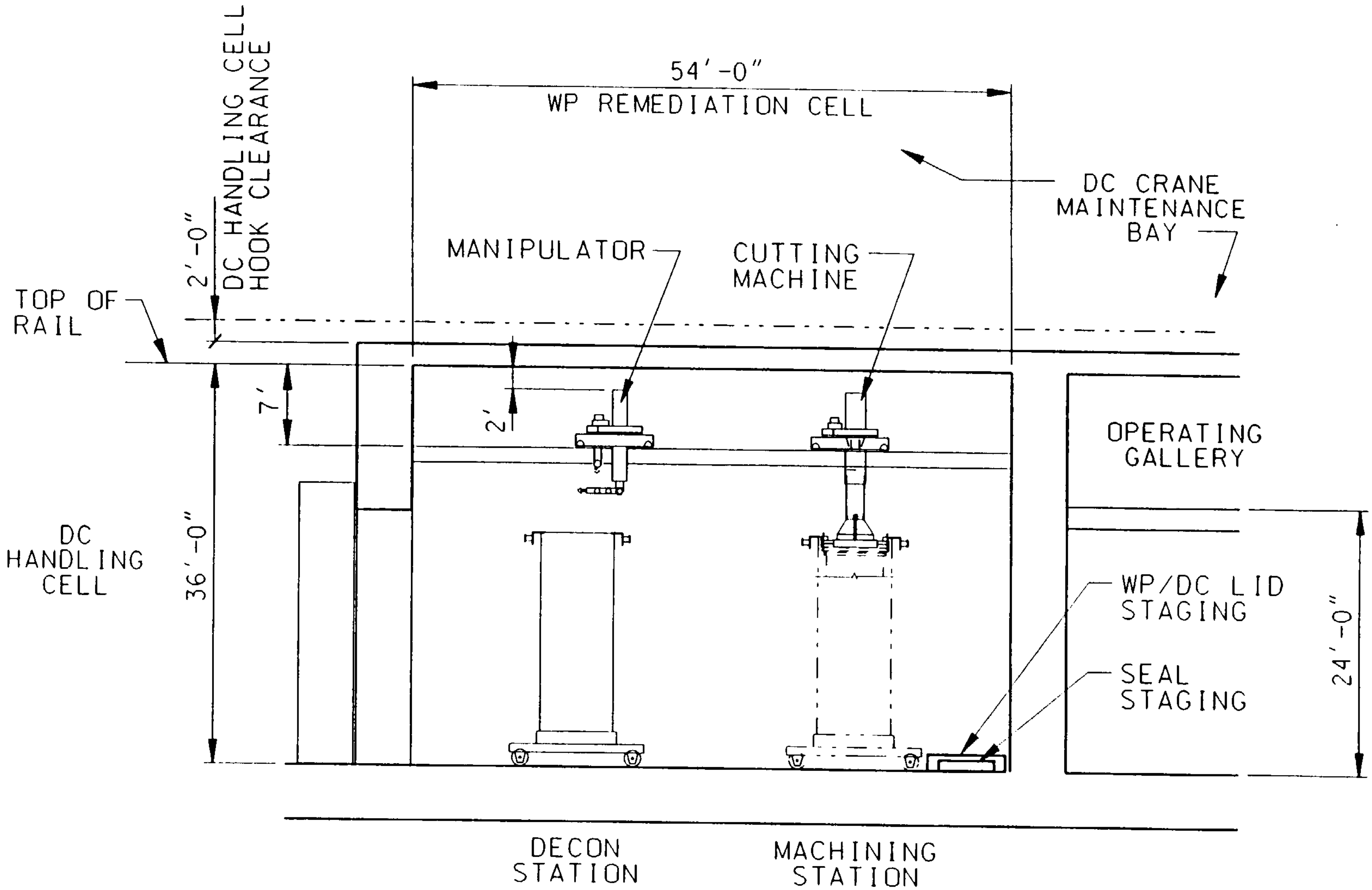
Surface Nuclear Facilities Space Program Analysis for Site Recommendation
ANL-WHS-AR-000001 Rev 00A (Preliminary Draft) January 31, 2000

t:/reps/arch/dgn/sr/spa/emptydc.dgn



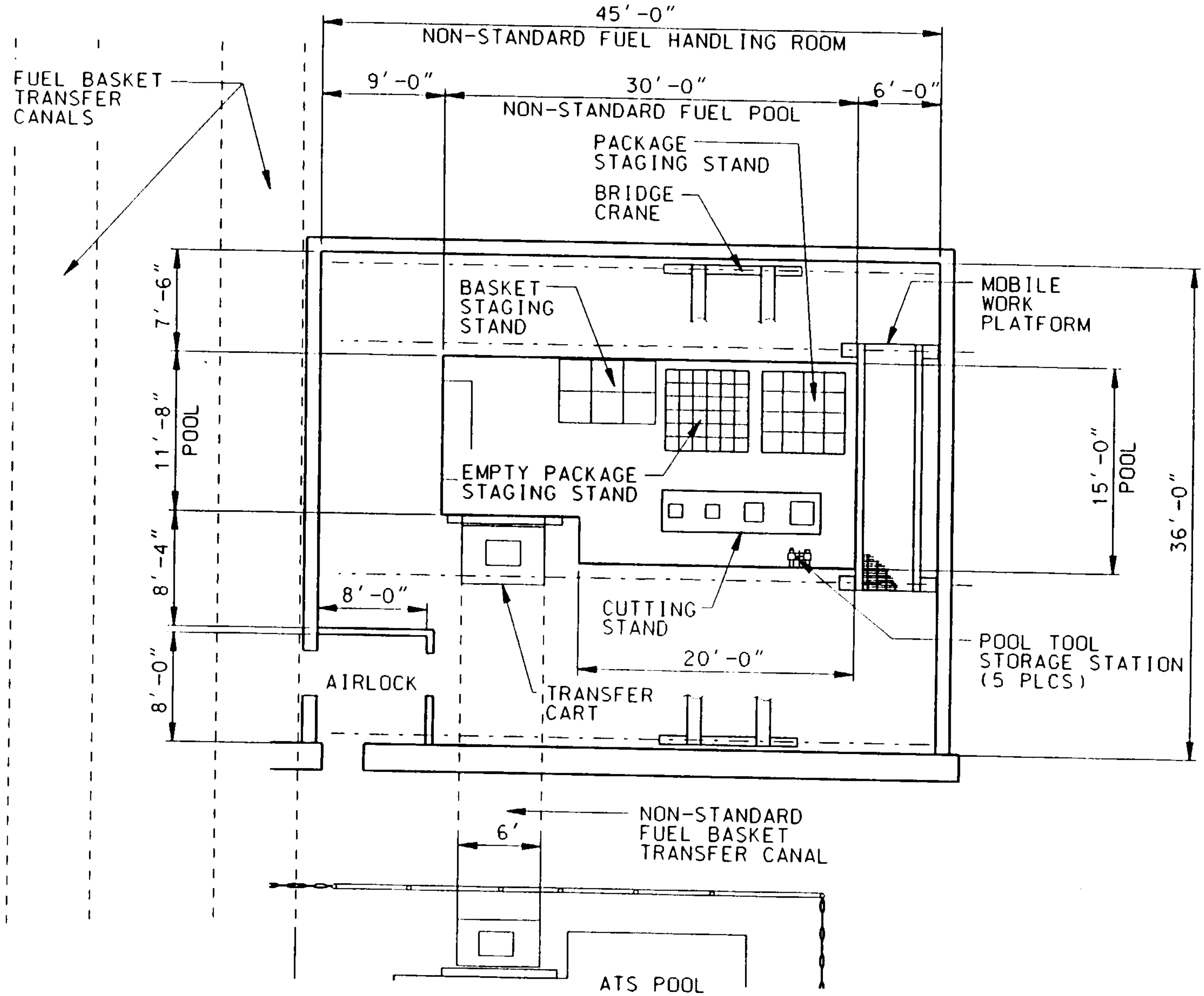
t:/reps/arch/dgn/sr/spa/wpremp1.dgn

Figure SPA-ME 25 Waste Package Remediation Cell Plan



t:/reps/arch/dgn/sr/spa/wpremsect.dgn

Figure SPA-ME 26 Waste Package Remediation Cell Section



t:/reps/arch/dgn/sr/spa/nonstdpl.dgn

Figure SPA-ME 27 Non-Standard Fuel Handling Room Plan

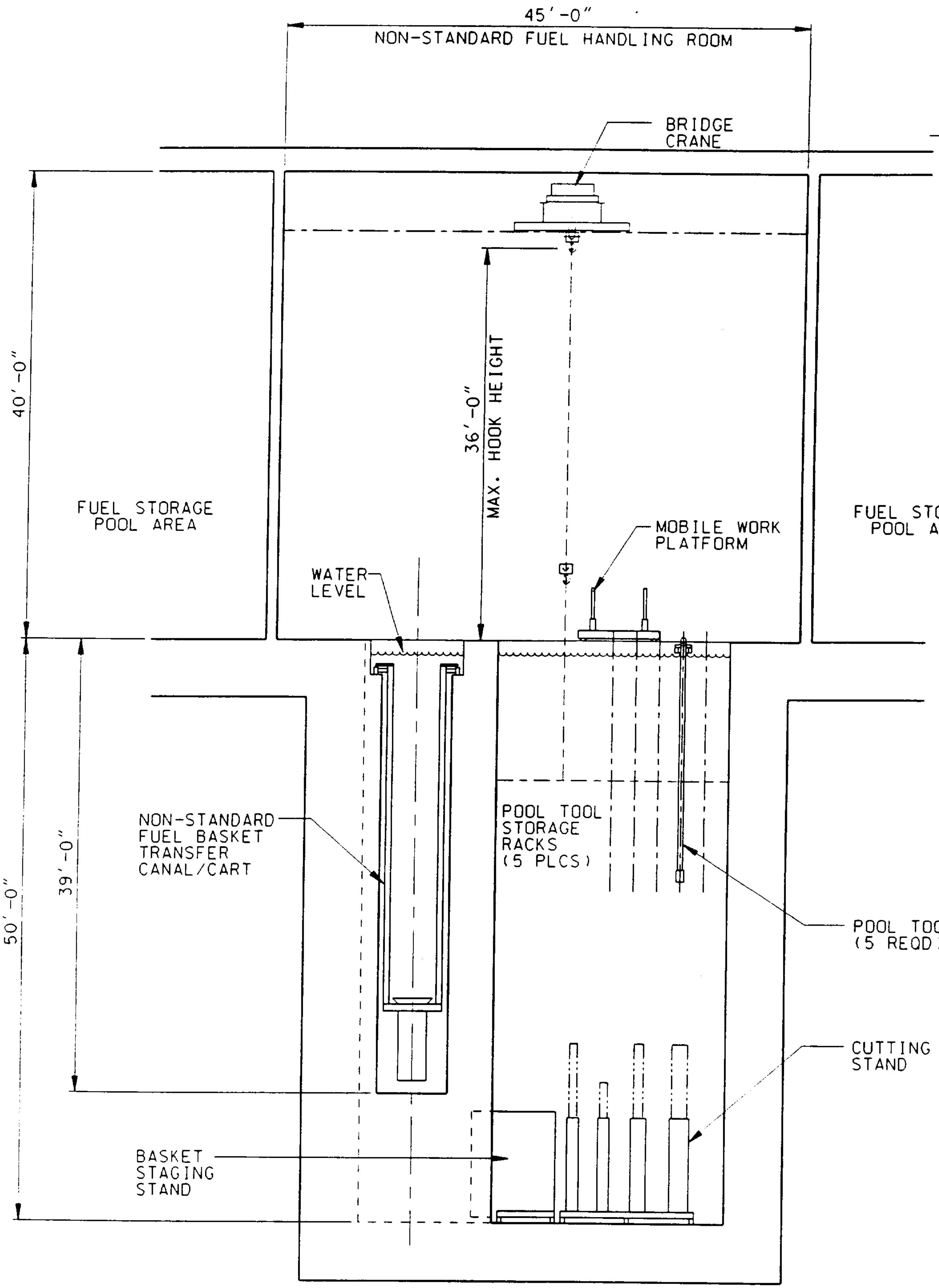


Figure SPA-ME 28 Non-Standard Fuel Handling Room Section

t:\reps\arch\dgn\sr\spa\nonstdsect.dgn

1.3.2 Carrier Preparation Building Material Handling System

1.3.2.1 Functional Description

The CPB Materials Handling System (MHS) receives rail and truck shipping casks from the Carrier/Cask Transport System, and inspects and prepares the shipping casks for return to the Carrier/Cask Transport System. Carrier preparation operations for carriers/casks received at the surface repository include performing a radiation survey of the carrier and cask, removing/retracting the personnel barrier, sampling for contamination, measuring the cask temperature, removing/retracting the impact limiters, removing the cask tie-downs (if any), and installing the casks trunnions (if any). The shipping operations for carriers/casks leaving the surface repository include removing the cask trunnions (if any), installing the cask tie-downs (if any), installing the impact limiters, performing a radiation survey of the cask, and installing the personnel barriers.

There are four parallel carrier/cask preparation lines installed in the CPB with two preparation bays in each line, each of which can accommodate carrier/cask shipping and receiving. The lines are operated concurrently to handle the waste shipping throughputs and to allow system maintenance operations. One remotely operated overhead bridge crane and one remotely operated manipulator is provided for each pair of carrier/cask preparation lines, servicing four preparation bays. Remotely operated support equipment includes a manipulator, and tooling and fixtures fore removing and installing personnel barriers, impact limiters, cask trunnions, and cask tie-downs. Remote handling equipment is designed to facilitate maintenance, dose reduction, and replacement of interchangeable components where appropriate. Semi-automatic, manual, and backup control methods support normal, abnormal and recovery operations. Laydown areas and equipment are included as required for transportation system components (e.g. personnel barriers and impact limiters), fixtures, and tooling to support abnormal and recovery operations.

The CPB MHS interfaces with the Cask/Carrier Transportation System to move the carriers to and from the system The CPB System houses the equipment, and provides the facility, utility, safety, communications, and auxiliary systems supporting operations and protect personnel. (Reference KRA-1 CRWMS-M&O 1999, Summary)

1.3.2.2 Parameters and Assumptions

1.3.2.2.1 Parameters

Not addressed for Site Recommendation. See KRA-1 CRWMS M&O 1999.

1.3.2.2.2 Assumptions

1.3.2.2.2.1 Carrier/cask preparation operations will be performed in a contact operation area using manual and remote handling equipment. Readily available remote/robotic technology in the nuclear industry will be used to assist carrier/cask preparation operations and ensure that radiation exposure rates for manual operation are ALARA.

Basis: Reference KRA-2 CRWMS M&O 1999, Section 5.1
Usage: Section 1.3.2.4

1.3.2.2.2.2 The rail cask personnel barrier is retractable and stored on the railcar. The truck cask personnel barrier is tarpaulin-type and is removed manually by personnel. The truck cask personnel barriers are staged in the CPB (*Mined Geological Disposal System (MGDS), Advanced Conceptual Design Report,* Reference KRA-3 CRWMS M&O 1996).

Basis: Reference KRA-2 CRWMS M&O 1999, Section 5.3
Usage: Section 1.3.2.4

1.3.2.2.2.3 Rail and truck cask impact limiters are removed/retracted with their bolts retained and are stored on the cask rail car or cask truck trailer (Reference KRA-3 CRWMS M&O 1996). The heaviest cask impact limiter weighs 15,800 lbs. (7.9 tons) (Reference KRA-4 CRWMS M&O 1996, Attachment III, Page III-2).

Basis: Reference KRA-2 CRWMS M&O 1999, Section 5.4
Usage: Section 1.3.2.4

1.3.2.2.2.4 The annual operating time for the Carrier Preparation Building Materials Handling System (CPBMH) is 16 hours per day, 5 days per week, and 50 weeks per year (4,000 hours per year).

Basis: Reference KRA-5 CRWMS M&O 1999, Section 3.11)
Usage: Section 1.3.2.4

1.3.2.3 System Description

The CPBMH receives rail and truck transportation cask carriers from the Carrier/Cask Transport System, inspects and prepares the carriers for transportation to the WHB or parking area. Carrier preparation operations for carriers/casks arriving at the MGR include performing a radiation survey, removing or retracting the cask personnel barriers, sampling for contamination, measuring the cask external temperature, removing the cask impact limiters, removing the cask tie downs, and installing the cask trunnions (if required). The operations for carriers/casks leaving the MGR include removing the cask trunnions (if required), installing the tie downs, installing the impact limiters, performing a radiological survey of the cask, and installing the personnel barriers.

The CPBMH interfaces with the Cask/Carrier Transport System to move the carrier to and from the CPB. The CPB houses the equipment, and provides the facility and supporting subsystems required for carrier preparation operations. (Reference KRA-1 CRWMS-M&O 1999, Section 6.1.2)

1.3.2.4 Operational Description

Operations in the CPB sequentially utilize four equipment items, two bridge cranes and two gantry-mounted manipulators. Four parallel tracks/roadways, for the passage of both truck and rail carrier, are provided. The two exterior lines are dedicated to incoming carriers and the two interior lines are dedicated to outgoing carriers. Each pair of rail/truck lines is serviced by a bridge crane and gantry-mounted manipulator. (Reference KRA-6 CRWMS M&O 1998, Section 7.3.2)

Carriers with disposable canister waste forms [(DHLW, DSNF, and multi-purpose canisters (MPCs)] are routed only to one of the incoming lines in the CPB. Commercial fuel carriers can be routed to either incoming line in the building. (Reference KRA-6 CRWMS M&O 1998, Section 7.3.2)

The CPB receives cask carriers, either from the radiologically controlled area (RCA) parking area or the WHB, for carrier preparation operations. The carrier/cask preparation in the CPB is a contact or remote operation using manual and remote equipment (Assumption 1.3.2.2.2.1). When radiation exposure rates exceed the administrative limits for manual operation (based on ALARA analysis), operators will remotely operate the overhead bridge crane or the bridge-mounted manipulator (provided with remote tools) from a safe distance by radio control, a portable control console, or the crane overhead cab. No operating galleries or viewing windows are provided in the CPB for the carrier/cask preparation operations. (Reference KRA-1 CRWMS M&O 1999, Section 6.2.5)

A carrier containing a loaded cask is hauled from the RCA parking area by a site prime mover (SPM) to the CPB. The radiation level of the external cask is measured to assess conformance to applicable regulatory requirements. The cask personnel barrier is removed/retracted by the bridge crane. The truck cask carrier personnel barrier is removed and stored on the laydown area and the rail carrier personnel barrier is retracted and stored on the railcar (Assumption 1.3.2.2.2.2). After removal or retraction of the personnel barrier, the radiation level on the exposed external surfaces of the transportation cask is measured. In order to limit occupational radiation exposure, the radiation measurement may be performed remotely by using a bridge-mounted manipulator holding the radiation monitoring instruments. Temperature measurements of the cask external surface are taken at this time. (Reference KRA-1 CRWMS M&O 1999, Section 6.2.5)

After temperature measurements, the impact limiters are removed. The bridge-mounted manipulator is used to loosen the impact limiter bolts. Before removing the impact limiter bolts, a sling is set in place around the impact limiter and attached to the overhead bridge crane. The sling is raised vertically, being careful to only lift the impact limiter load and not the cask itself. Once the impact limiter load is fully lifted, the bolts are removed and the bridge crane pulls the impact limiter away from the cask and sets it down on the carrier (Assumption 1.3.2.2.2.3). The cask tie downs are then removed, using the bridge-mounted manipulators. The final operation, before transfer to the WHB, is the installation of the transportation cask trunnions (if required). The loaded transportation cask is now ready for transfer to the WHB for unloading. If the WHB is not ready to receive a loaded transportation cask, the carrier may remain in the CPB until the WHB is available. (Reference KRA-1 CRWMS M&O 1999, Section 6.2.5)

Unloaded transportation casks undergo the reverse of the loaded cask operations. When a space is available in the CPB preparation bay, an unloaded cask is transferred from the WHB to the CPB by a SPM. The cask trunnions are removed (if required), the tie downs and impact limiters are reinstalled, the final radiation contamination inspection is performed, the personnel barrier is reinstalled, and the transportation cask carrier is hauled to the RCA parking area to await for off-site transfer. (Reference KRA-1 CRWMS M&O 1999, Section 6.2.5)

To ensure that the CPBMH is capable of handling the throughput quantities specified in Section 4.22.2.1 of the EFSR, a waste handling simulation has been performed using the WITNESS computer program (Ref KRA-5 CRWMS M&O 1998). The results of the simulation indicate that the CPBMH can receive, handle, and prepare waste transportation casks by operating 4,000 hours annually (Assumption 1.3.2.2.2.4).

1.3.3 Carrier Preparation Building Electrical

1.3.3.1 Functional Description

The electrical system will provide electrical power distribution to support carrier preparation material handling operations. It will support the CPB System, which facilitates the preparation of a waste transportation cask for entering the waste handling facilities or for leaving the repository. (Reh-2)

The CPB electrical system will interface with the site electrical power distribution system. (Reh-1&2)

1.3.3.2 Parameters and Assumptions

1.3.3.2.1 Parameters

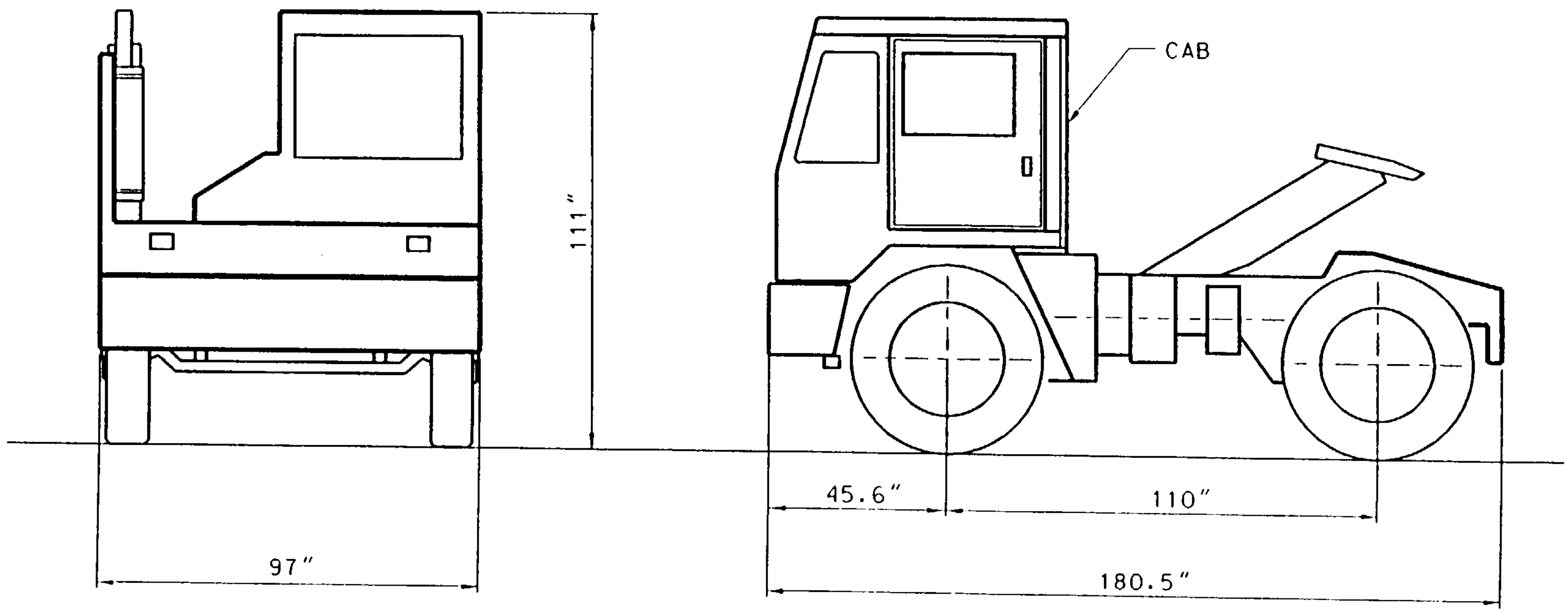
BLANK

1.3.3.2.2 Assumptions

BLANK

1.3.3.3 System Description

The CPB electrical system is classified as CQ, however, backup power will be provided to all electrical loads in the CPB identified by analysis as requiring standby power upon loss of site electrical power. Electrical power will be supplied to the CPB by a pad-mounted transformer located near the CPB. The pad mounted transformer primary winding is fed from a loop arrangement from North Portal switchgear groups A and B (located in the Switchgear Building). The electrical power distribution system will provide power to meet all the CPB electrical



TIRE MOUNTED SITE PRIME MOVER

reps/arch/dgn/truck.dgn

Figure: EF-7 Truck Carrier Prime Mover

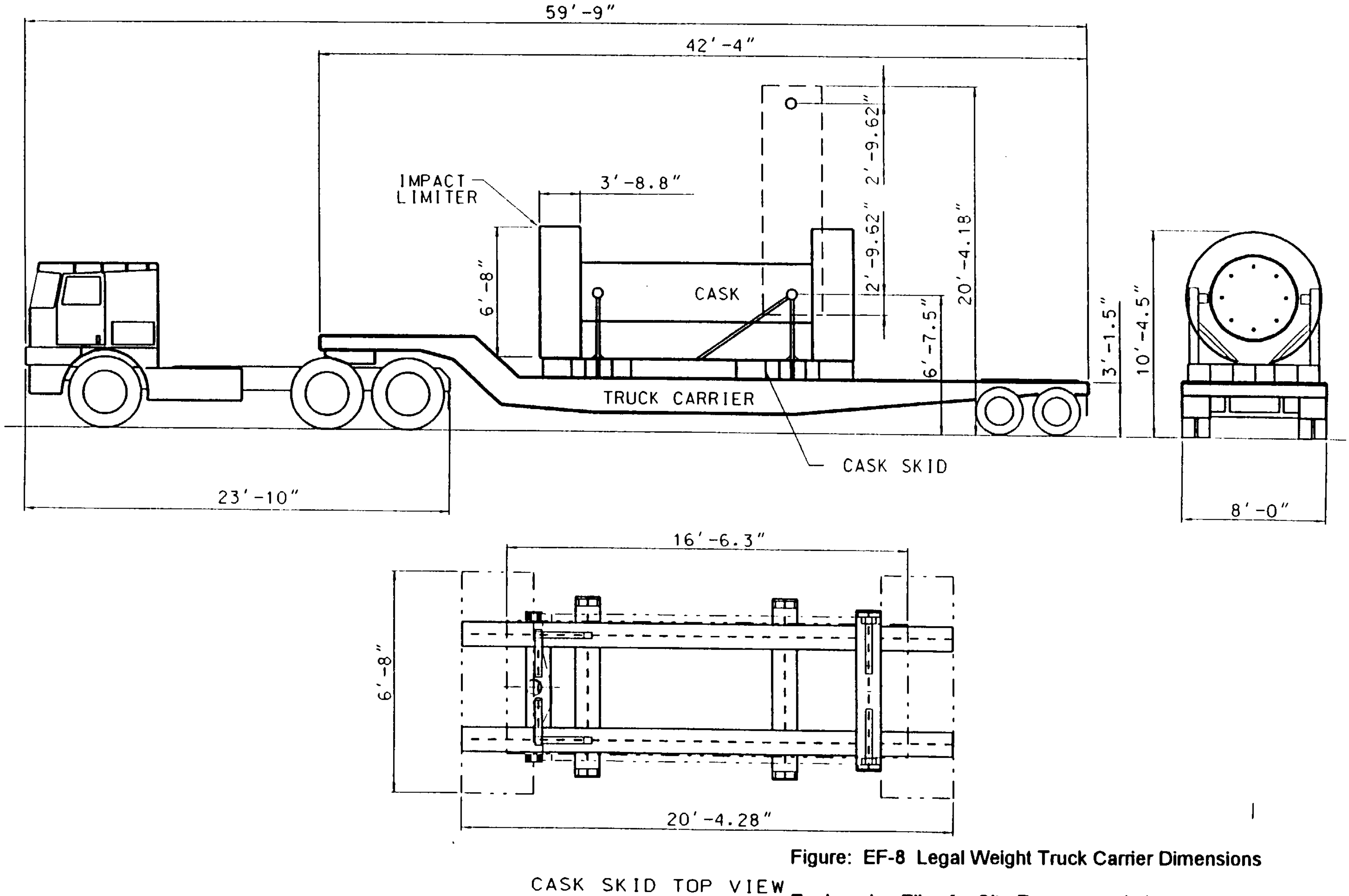
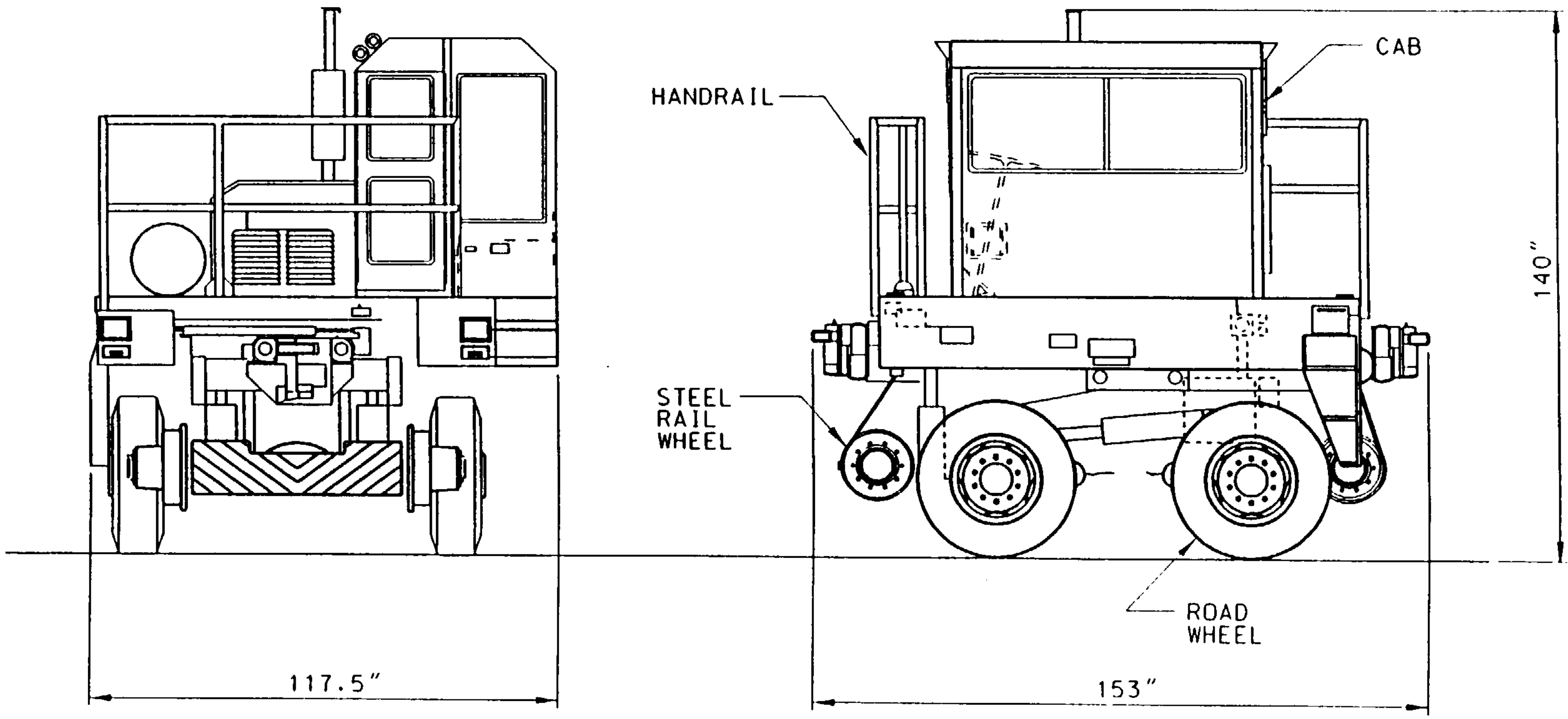


Figure: EF-8 Legal Weight Truck Carrier Dimensions



TRACK GUIDED SITE PRIME MOVER

reps/arch/dgn/truck.dgn

Figure: EF-9 Rail Carrier Prime Mover

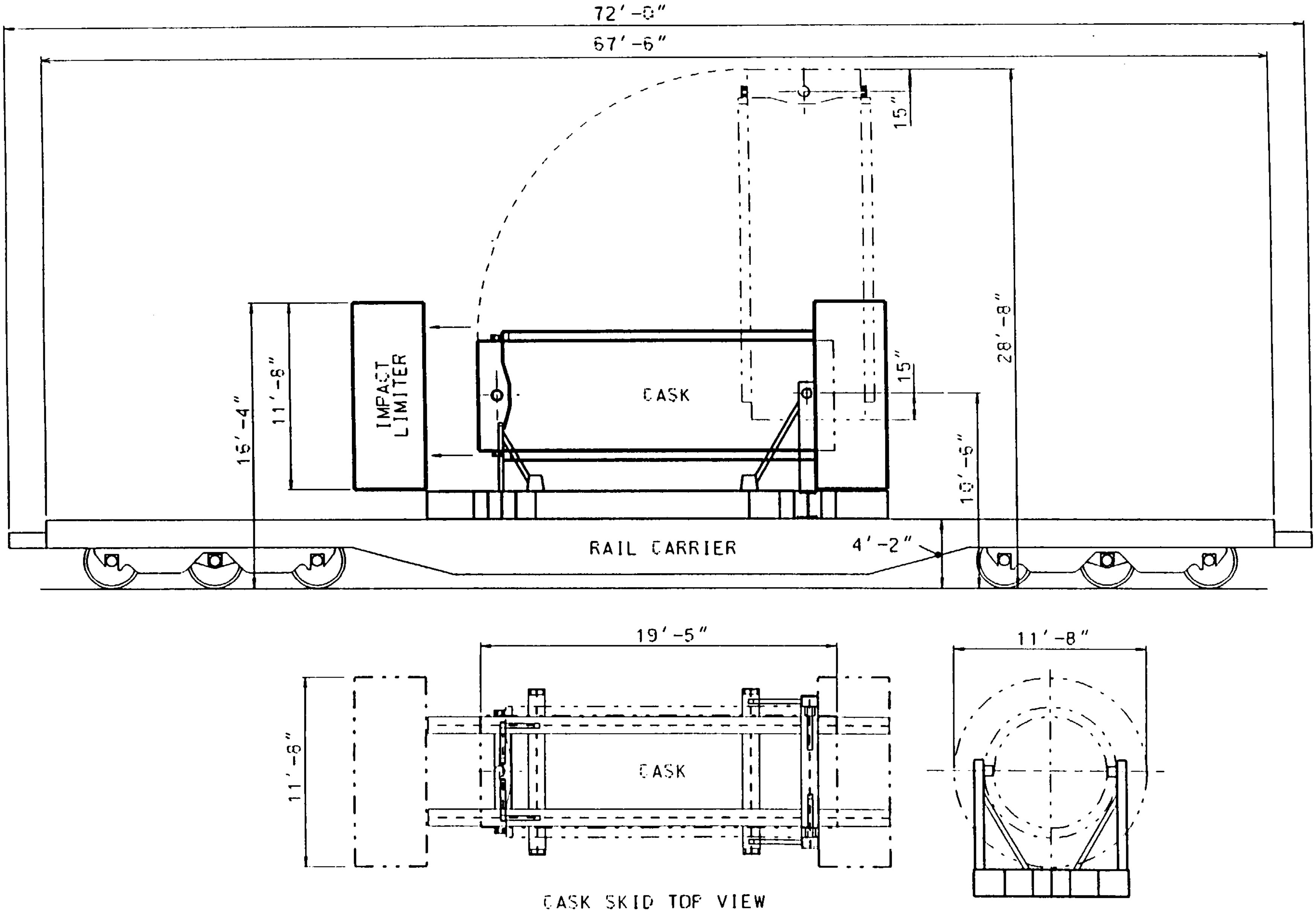
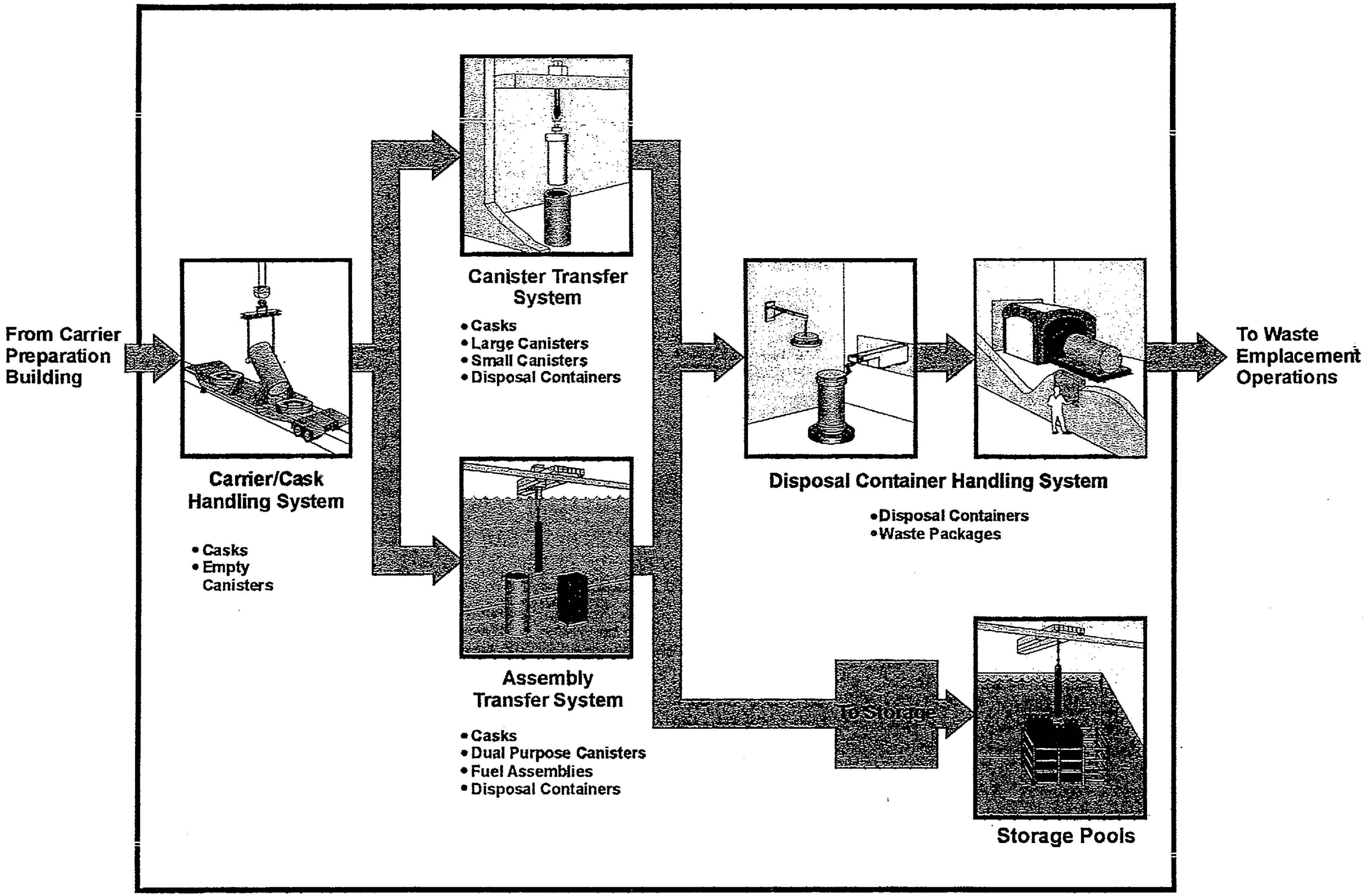
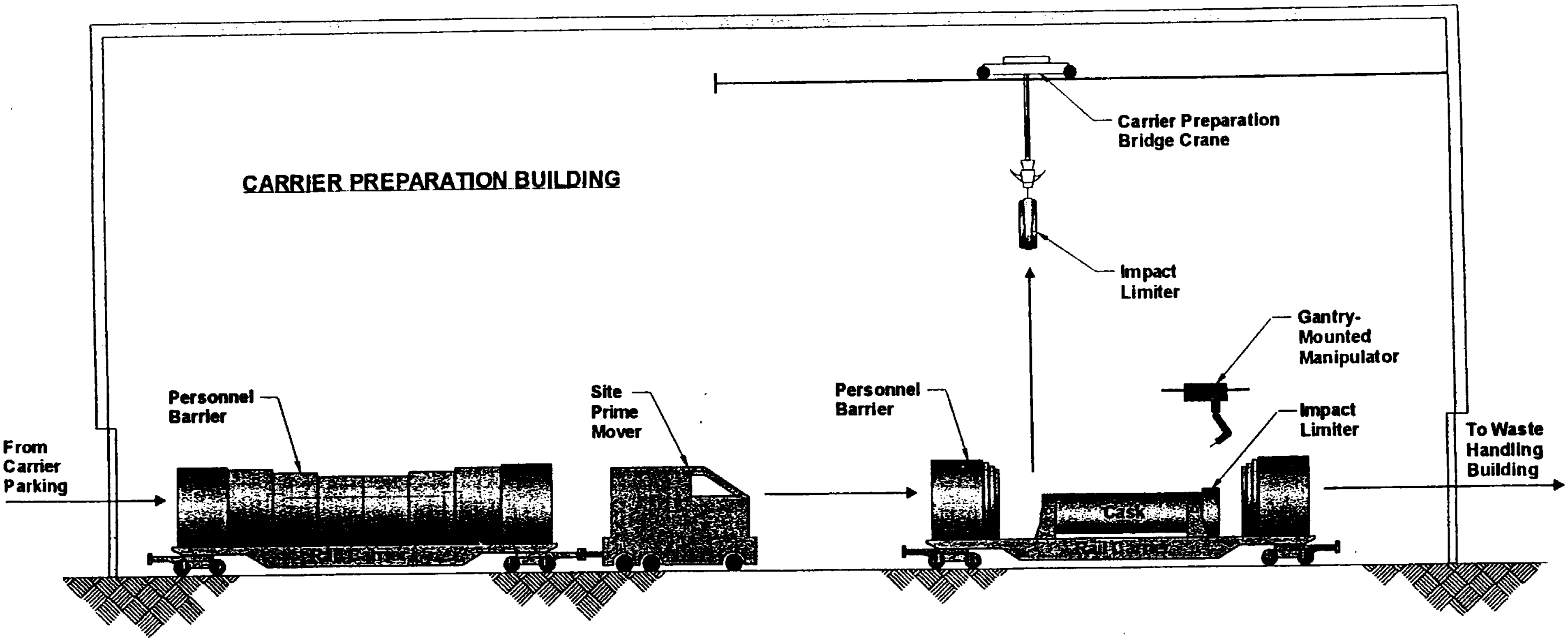


Figure: EF-10 Rail Carrier Dimensions



WASTE HANDLING BUILDING OPERATIONS

Figure: EF-11 Waste Handling Operations



CARRIER PREPARATION BUILDING MATERIALS HANDLING SYSTEM

00019DC_MATERIALS HANDLING SYSTEM CDR

Figure: EF-12 CPB Materials Handling System

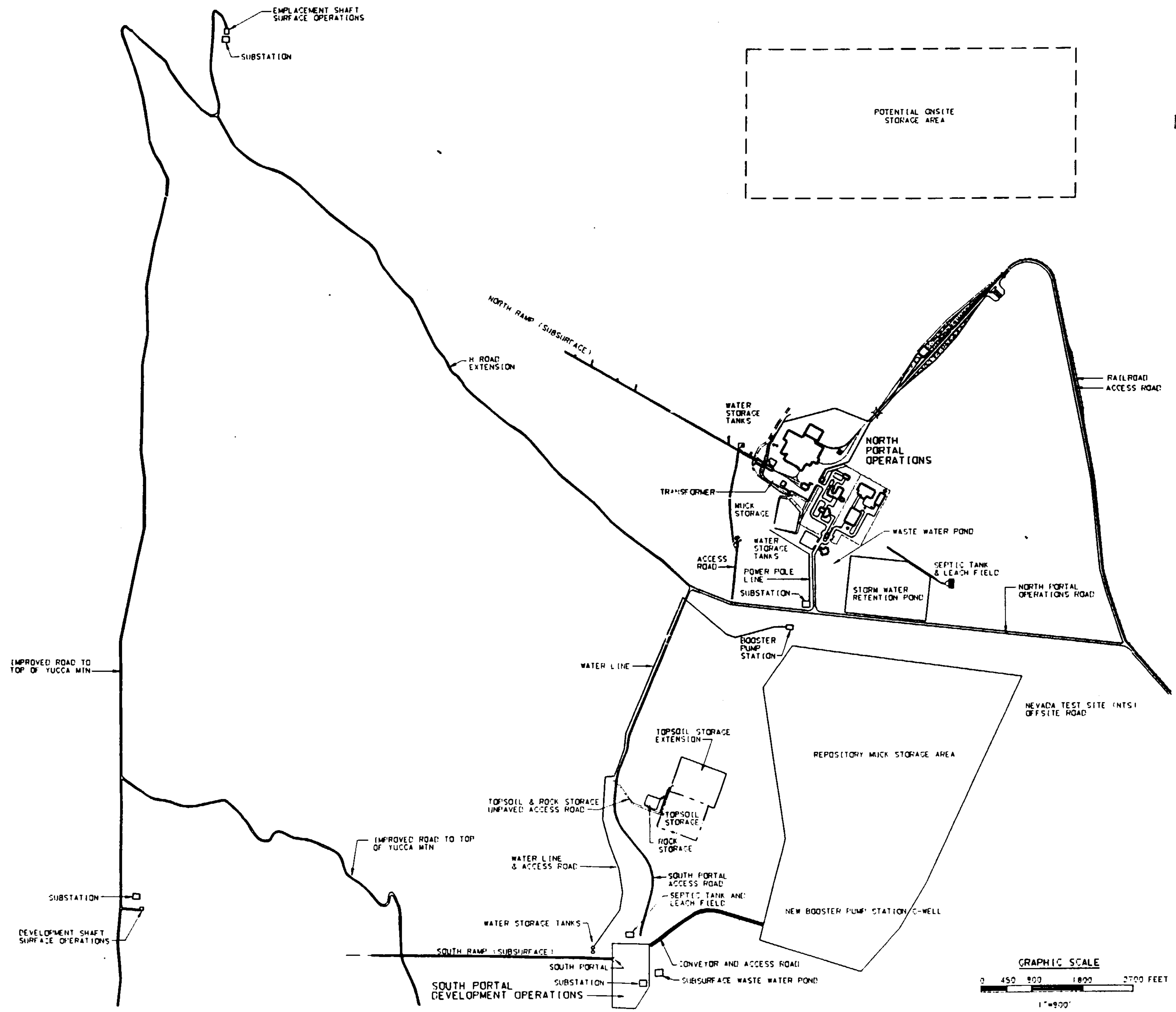


FIGURE SPA-C/S 1
REPOSITORY
OVERALL SITE PLAN

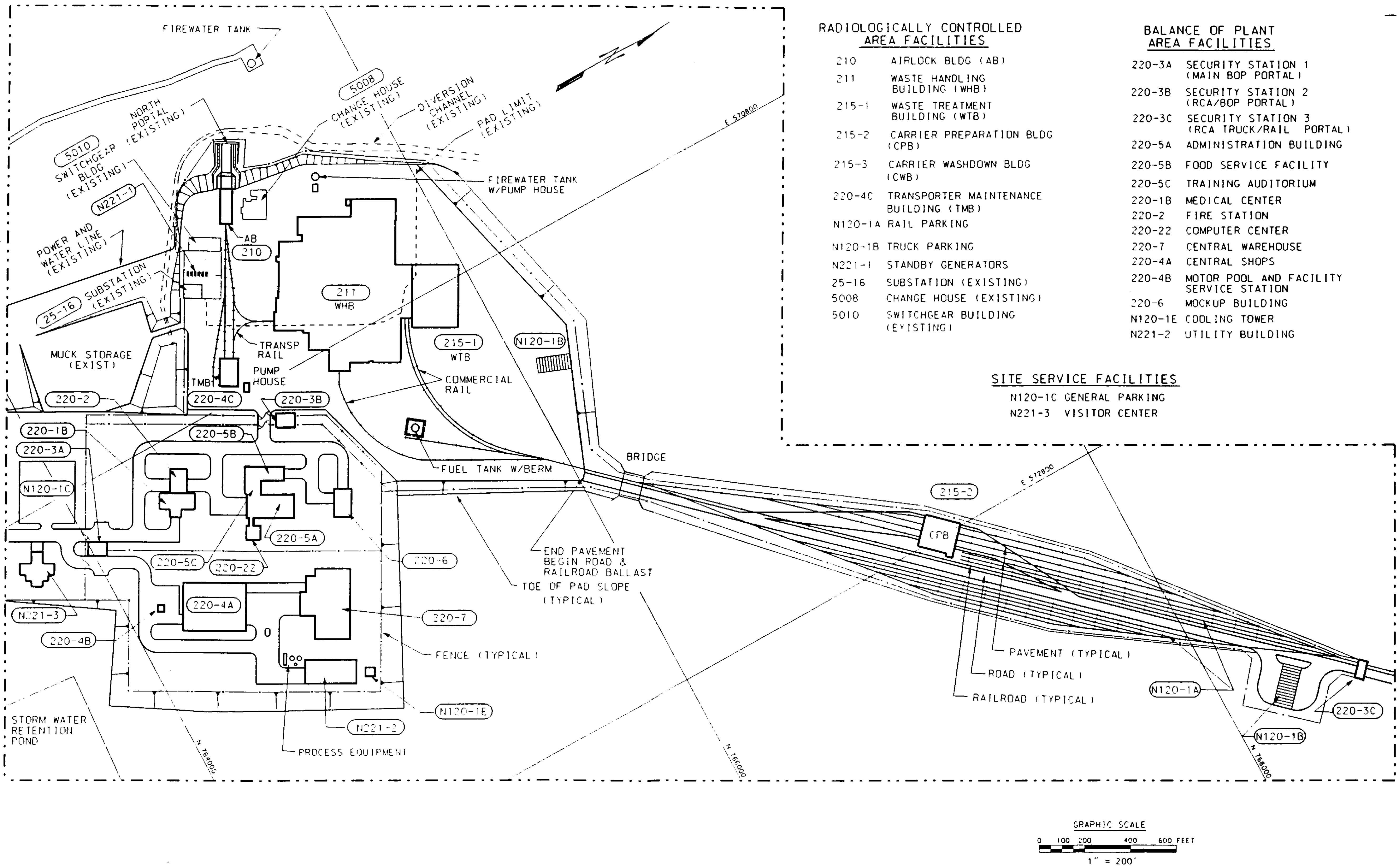


FIGURE SPA C/S 2
NORTH PORTAL REPOSITORY AREA SITE PLAN

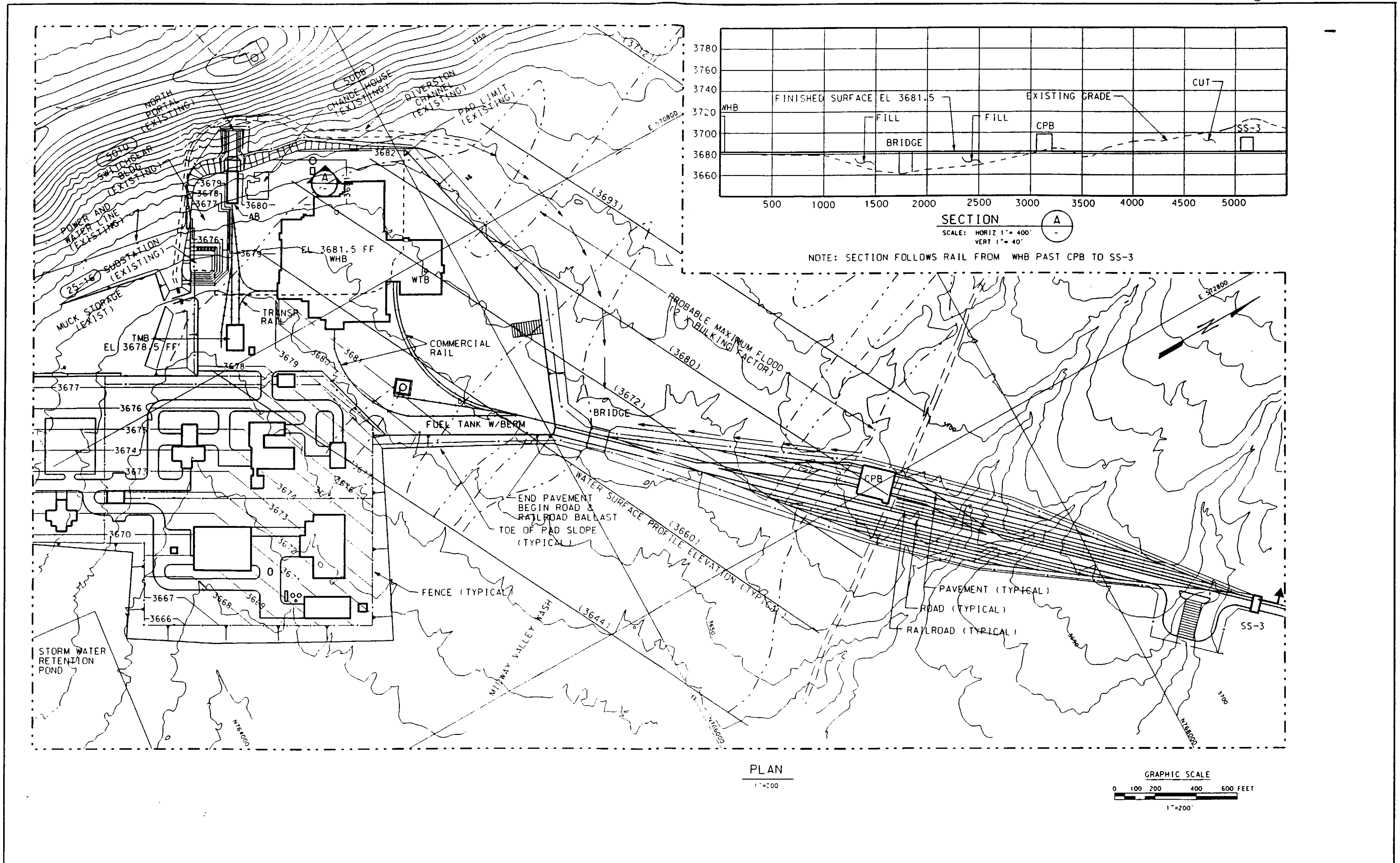


FIGURE SPA-C/S 3
NORTH PORTAL REPOSITORY
GRADING PLAN

CRWMS SURFACE NUCLEAR FACILITIES
GENERAL ARRANGEMENT FIGURES

FIGURE LIST

FIGURE	TITLE
1	TITLE SHEET
WASTE HANDLING/WASTE TREATMENT BUILDING	
2	FLOOR PLAN AT EL. 50+0
3	FLOOR PLAN AT EL. 80+0
4	FLOOR PLAN AT EL. 100+0
5	FLOOR PLAN AT EL. 130+0
6	FLOOR PLAN AT EL. 142+0
7	FLOOR PLAN AT EL. 173+0
8	ROOF PLAN
9	BUILDING SECTIONS

ROOM LEGEND

WASTE HANDLING BUILDING

PRIMARY AREAS

CARRIER/CASK HANDLING SYSTEM (CCH)

H-100A CARRIER BAY

ASSEMBLY TRANSFER SYSTEM (ATS)

H-040 VACUUM PUMP ROOM
H-101(A.B) CASK AIRLOCK
H-102(A.A2.B.B2) CASK PREP AND DECONTAMINATION
H-103(A.B) CASK UNLOAD POOL AREA
H-103(A1.B1) POOL. STAGING & CASK UNLOAD
H-104(A.B) INCLINE TRANSFER CANAL
H-105(A.B) DC LOAD CELL
H-1069A.B) DC DECONTAMINATION CELL
H-183 FUEL STORAGE POOL AREA
H-183(A.B.C.D) STORAGE POOL
H-183E NON-STANDARD FUEL POOL
H-183(F.G) FUEL BASKET TRANSFER CANAL
H-183H NON-STANDARD FUEL BASKET TRANSFER CANAL
H-183J NON-STANDARD FUEL HANDLING AREA
H-205(A.B) ASSEMBLY HANDLING CELL (AHC)
H-206(A.B) AHC CRANE MAINTENANCE BAY
H-301(A.B) POOL AREA CRANE MAINT BAY

CANISTER TRANSFER SYSTEM (CTS)

H-100B CASK TRANSFER CORRIDOR
H-103C CANISTER TRANSFER (CT) CELL. LOWER LEVEL
H-103D CANISTER STORAGE
H-104C OFF-NORMAL CANISTER TRANSFER TUNNEL
H-107A CASK AIRLOCK
H-108A CASK PREP & DECONTAMINATION
H-205C CANISTER TRANSFER CELL
H-205C1 OFF-NORMAL CANISTER HANDLING CELL. UPPER LEVEL
H-209A CT CELL CRANE MAINTENANCE BAY

DISPOSAL CONTAINER HANDLING SYSTEM (DCH)

H-110 DC HANDLING CELL
H-111 WP TRANSPORTER LOADING CELL
H-112 WP TRANSPORTER AIRLOCK
H-113 LOADED DC STAGING AREA
H-115 EMPTY DC PREPARATION AIRLOCK
H-117 EMPTY DC PREPARATION
H-208(A.B.C.D.E.F.G.H) WELDER #1-8
H-301 DC HANDLING CELL CRANE MAINTENANCE BAY

WASTE PACKAGE REMEDIATION SYSTEM

H-114 WP REMEDIATION CELL

PRIMARY SUPPORT AREAS

H-116 CONTAMINATED EQUIPMENT ROOM
H-118(A.B.C.E.F.G.H) OPERATING GALLERY
H-119 WASTE HANDLING OPERATION CNTR
H-120 CONTAMINATED EQUIPMENT & DECONTAMINATION
H-120A STAGING AREA (HOT SUPPORT)
H-122 MAINTENANCE EQUIP STORAGE
H-123 TOOL STORAGE
H-124 MAINTENANCE SHOP
H-125 LLW COLLECTION & PACKAGING
H-126 FORKLIFT STAGING & SERVICING
H-203 WELDER MAINTENANCE BAY
H-207(A.B.C.D.F.G.H.I.J) OPERATING GALLERY
H-211 WELDER MATERIALS STORAGE
H-213 WELDER MAINTENANCE HOT SHOP
H-402 ASSEMBLY & CANISTER TRANSFER CORRIDOR
H-403 DC HANDLING & WP REMEDIATION EQUIPMENT TRANSFER CORRIDOR

POOL SUPPORT AREAS

H-020 POOL TREATMENT EQUIP ROOM
H-083 POOL TREATMENT EQUIP ROOM
H-084(A.B) POOL TREATMENT EQUIP ROOM
H-085 CORRIDOR

FACILITY SUPPORT AREAS

MAINTENANCE

H-019 EQUIPMENT MAINTENANCE SHOP
H-019B INSTRUMENT MAINTENANCE SHOP
H-121 SHIPPING & RECEIVING
H-159 TOOL STORAGE
H-160 MAINTENANCE MATERIAL STORAGE
H-161(A.B) HEPA FILTER STORAGE
H-162 JANITOR CLOSET
H-163 SHIPPING & RECEIVING
H-164 WASTE STAGING
H-165 GAS BOTTLE STORAGE

OPERATIONS

H-016A CHANGE ROOM. MEN
H-016B CHANGE ROOM. WOMEN
H-017(A.B) COVERALL STORAGE
H-133(A.B) HEALTH PHYSICS LABORATORY
H-134(A.B.C.D) LABORATORY TECHNICIANS OFFICE
H-135 LABORATORY MATERIAL STORAGE
H-136 FIRST AID ROOM & OFFICE
H-137 OPERATIONS LUNCHROOM
H-138 JANITOR CLOSET

ADMINISTRATION

H-018(A.B) SUPERVISOR OFFICE
H-018B SUPERVISOR OFFICE
H-139 ENTRY LOBBY
H-140(A.B) SUPERVISOR OFFICE
H-141 PLNT OPERATIONS MANAGER OFFICE
H-142(A.B) QA/QC OPERATIONS OFFICE
H-143(A.B.C.D) OPERATIONS STAFF OFFICE
H-144 STAFF SUPPORT-OPEN OFFICE
H-145(A.B) SECRETARIAL OFFICE
H-146(A.B) DOE MANAGER OFFICE
H-147(A.B.C.D) DOE STAFF OFFICES
H-148 DOE STAFF SUPPORT-SECRETARIAL
H-149 DOE STAFF SUPPORT-CLERICAL
H-150 CONFERENCE ROOM
H-151 DOCUMENT CONTROL
H-152 COPY ROOM
H-153 STORAGE ROOM
H-154A RESTROOM. WOMEN
H-154B RESTROOM. MEN
H-155 LUNCHROOM
H-156 JANITOR CLOSET

RADIATION PROTECTION

H-010 REGULATED CHANGE ROOM
H-011 RADIATION PROTECTION PORTAL
H-012 PERSONNEL DECON ROOM
H-013 PERSONNEL RADIATION PROTECTION EQUIPMENT STORAGE
H-014 HEALTH PHYSICS OFFICE
H-015(A.B) PROTECTIVE CLOTHING & STORAGE
H-129 CALIBRATION SHOP
H-302 REGULATED CHANGE ROOM
H-305 REGULATED CHANGE ROOM
H-405 REGULATED CHANGE ROOM

SECURITY

H-130(A.B) SECURITY PORTAL
H-131 SECURITY ALARM STATION
H-132(A.B) OFFICE

HVAC EQUIPMENT AREAS

H-157 COLD SUPPORT HVAC ROOM
H-171 TERTIARY CONFINEMENT EXHAUST
H-171A ELECTRICAL DISTRIBUTION HVAC ROOM
H-171(B.C) STACK MONITOR ROOM
H-200 TERTIARY CONFINEMENT SUPPLY
H-201 TERTIARY CONFINEMENT RECIRCULATING
H-204 HYDRONIC EQUIPMENT ROOM
H-300 PRIMARY/SECONDARY CONFINEMENT SUPPLY
H-308(A.B) EMERGENCY CONFINEMENT SUPPLY ROOM
H-383A FUEL STORAGE POOL TERTIARY SUPPLY
H-383B FUEL STORAGE POOL TERTIARY EXHAUST
H-400 PRIMARY/SECONDARY CONFINEMENT EXHAUST
H-400A PRIMARY NORMAL EXHAUST ROOM
H-400(B.C) EMERGENCY CONFINEMENT EXHAUST ROOM

MISCELLANEOUS BUILDING SUPPORT AREAS

AIRLOCK AND VESTIBULE

H-100C ACCESS CORRIDOR
H-100(D.E.F) VESTIBULE
H-101(D.E.F.G.H) AIRLOCK
H-116A ACCESS CORRIDOR
H-183K VESTIBULE
H-217 AIRLOCK
H-220 AIRLOCK
H-223 VESTIBULE
H-228 VESTIBULE
H-303 AIRLOCK
H-304 VESTIBULE
H-307 AIRLOCK
H-309 ACCESS CORRIDOR
H-310 VESTIBULE
H-312 VESTIBULE
H-313 VESTIBULE
H-317 VESTIBULE
H-404 AIRLOCK
H-406 AIRLOCK
H-407 AIRLOCK

COMMUNICATIONS

H-170 COMMUNICATIONS ROOM

CORRIDORS & HALLWAYS

H-050 CORRIDOR
H-051 CORRIDOR
H-052 CORRIDOR
H-053 CORRIDOR
H-054 CORRIDOR
H-120B CORRIDOR
H-127 ACCESS CORRIDOR
H-128 ACCESS CORRIDOR
H-181 ACCESS CORRIDOR
H-182 ACCESS CORRIDOR
H-218 ACCESS CORRIDOR
H-219 ACCESS CORRIDOR
H-221 ACCESS CORRIDOR
H-224 ACCESS CORRIDOR
H-225 ACCESS CORRIDOR
H-226 ACCESS CORRIDOR
H-227 ACCESS CORRIDOR
H-306 ACCESS CORRIDOR
H-314 ACCESS CORRIDOR
H-315 ACCESS CORRIDOR
H-316 ACCESS CORRIDOR
H-401(A.B.C.D.E.F) ACCESS CORRIDOR

ELECTRICAL

H-168 ELECTRICAL DISTRIBUTION
H-169(A.B) EMERGENCY GENERATOR
H-172(A.B) SAFETY ELECTRICAL EQUIPMENT

ELEVATORS

FOUR ELEVATOR (UNASSIGNED)

FIRE PROTECTION

H-167(A.B.C.D.E.F.G) FIRE RISER
H-267(C.D.E.F.G) FIRE RISER

PIPE CHASE

H-075 PIPE CHASE

STAIRWAYS

FOURTEEN STAIRWAYS (UNASSIGNED)

UTILITIES CORRIDOR (BETWEEN OPERATING GALLERY LEVELS)

M-118(B.C) UTILITY CORRIDOR (BETWEEN OPERATING GALLERY LEVELS)

WASTE TREATMENT BUILDING

PROCESS AREA

T-101 SOLID LLW PROCESSING
T-102 CHEMICAL LIQUID LLW PROCESSING
T-103 RECYCLABLE LIQUID LLW PROCESSING
T-104 MIXED & HAZARDOUS WASTE STAGING

FACILITY SUPPORT AREA

SECURITY

T-105 SECURITY PORTAL
T-106 SECURITY PORTAL
T-107 OFFICE

OPERATIONS

T-108 PARTS STORAGE
T-109 MEN'S CHANGE ROOM
T-110 WOMEN'S CHANGE ROOM
T-111 COVERALL STORAGE
T-112 LUNCHROOM
T-113 (A.B) JANITOR CLOSET
T-114 FORKLIFT STAGING
T-115 SHIPPING/RECEIVING

ADMINISTRATION

T-116 NOT USED
T-117 SUPERVISOR OFFICE
T-118 SUPERVISOR OFFICE
T-119 PLANT MANAGER OFFICE
T-120 PLANT MANAGEMENT SUPERVISOR OFFICE
T-121 STAFF SUPPORT-OPEN OFFICE
T-122 HEALTH PHYSICS OFFICE
T-123 QA OFFICE
T-124 INVENTORY CONTROL OFFICE
T-125 COPY/STORAGE ROOM
T-126 INSTRUMENT CALIBRATION

HVAC EQUIPMENT AREAS

T-200 HVAC OFFICE
T-201 PROCESS AREA SUPPLY
T-202 PROCESS AREA EXHAUST

BUILDING SUPPORT AREAS

FIRE PROTECTION

T-127 FIRE RISER ROOM

ELECTRICAL

T-203 ELECTRICAL POWER DISTRIBUTION
T-204 ELECTRICAL SWITCHGEAR

COMMUNICATIONS

T-128 COMMUNICATION ROOM

FIGURE 1
WASTE HANDLING BUILDING
TITLE SHEET

SAUERT t:+reps+arch+dgn+sr+ga+wethc.dgn 24-JAN-2000 04:43

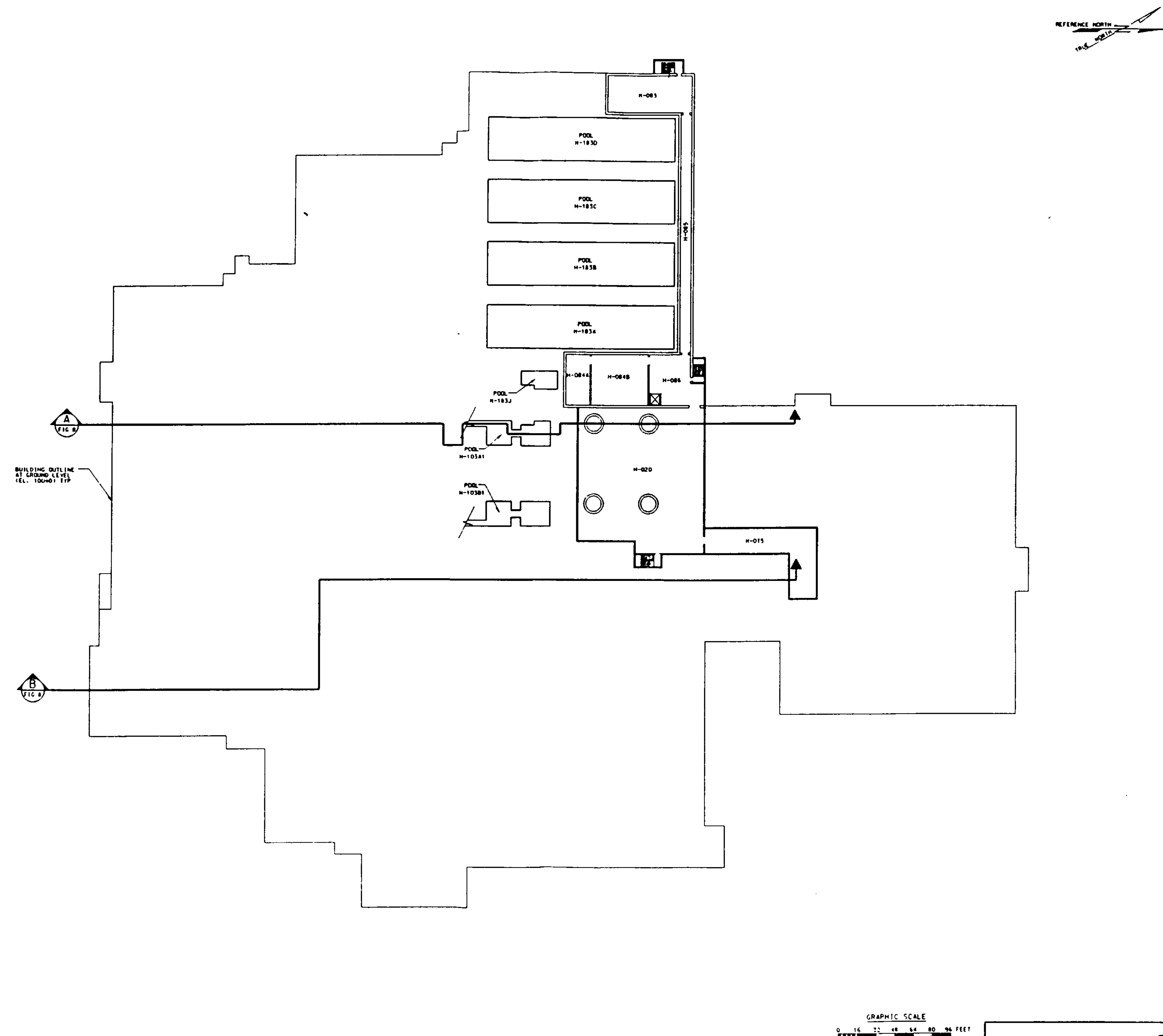


FIGURE 2
WASTE HANDLING/WASTE TREATMENT BLDG
FLOOR PLAN AT EL. 50+0

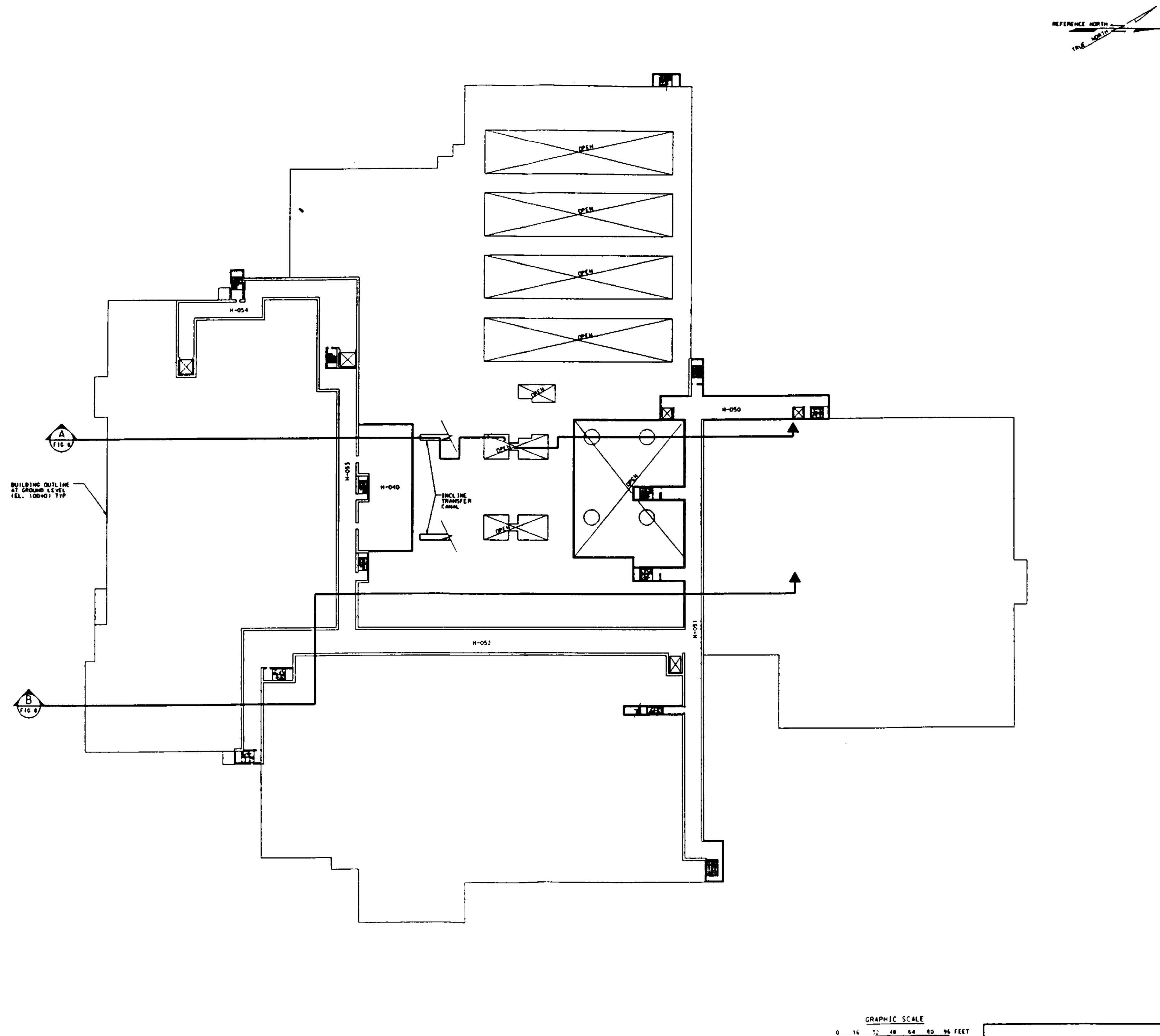


FIGURE 3
WASTE HANDLING/WASTE TREATMENT BLDG
FLOOR PLAN AT EL. 80+0

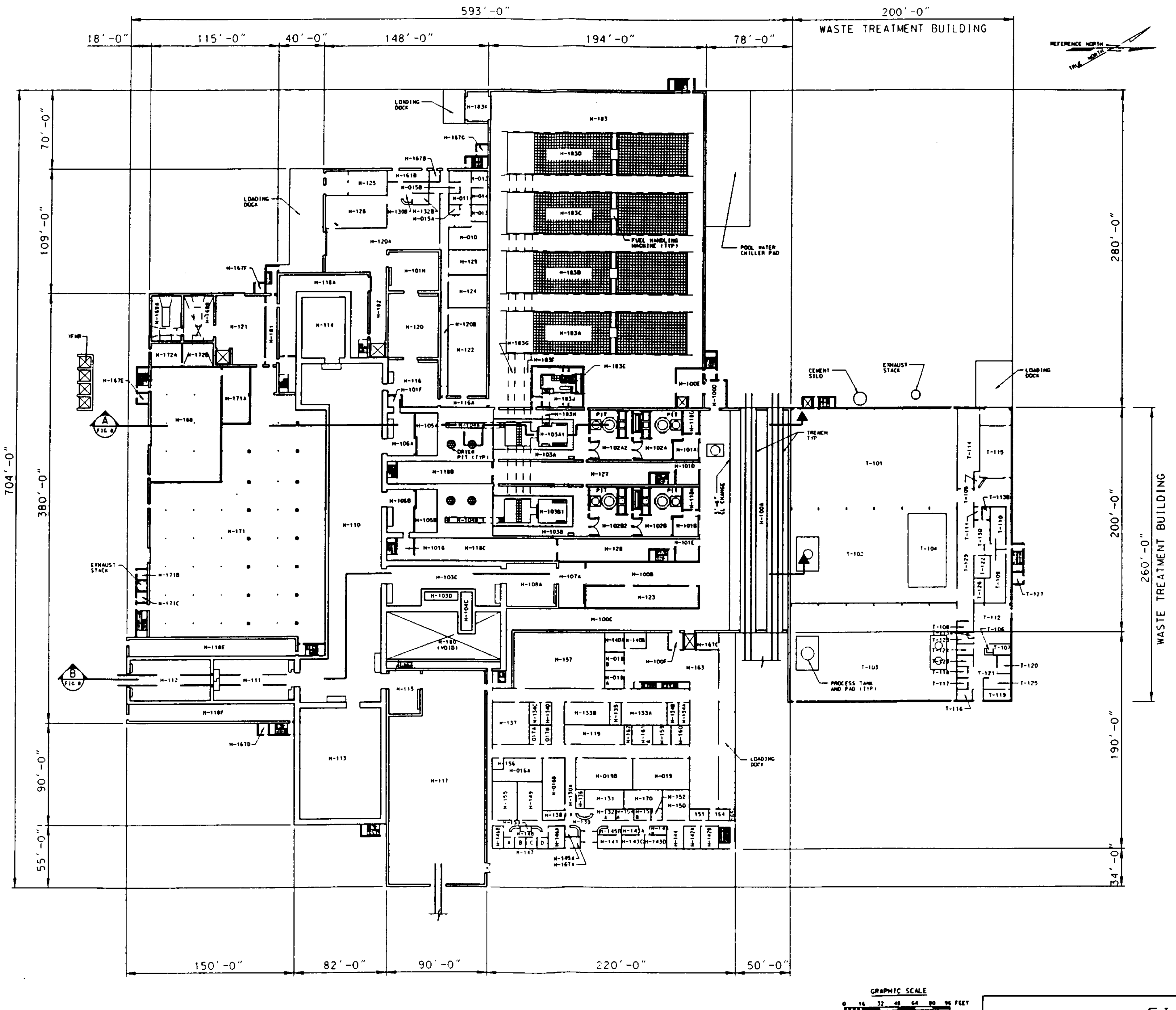


FIGURE 4
WASTE HANDLING/WASTE TREATMENT BLDG
FLOOR PLAN AT EL. 100+0

SAUERT t:*reps*arch*dgn*sr*ga*wethc.dgn 21-JAN-2000 15:05

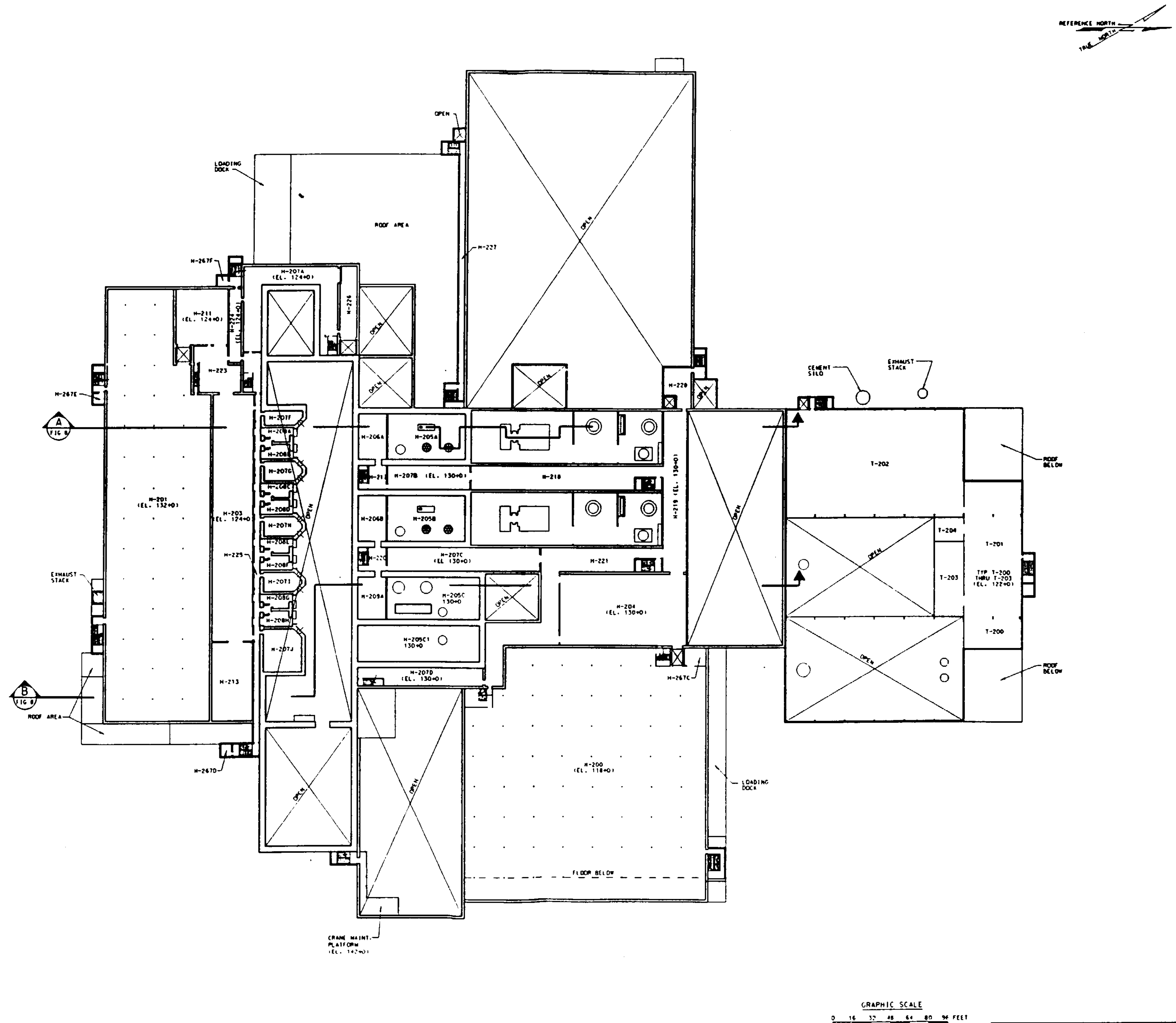


FIGURE 5
WASTE HANDLING/WASTE TREATMENT BLDG
FLOOR PLAN AT EL. 130+0

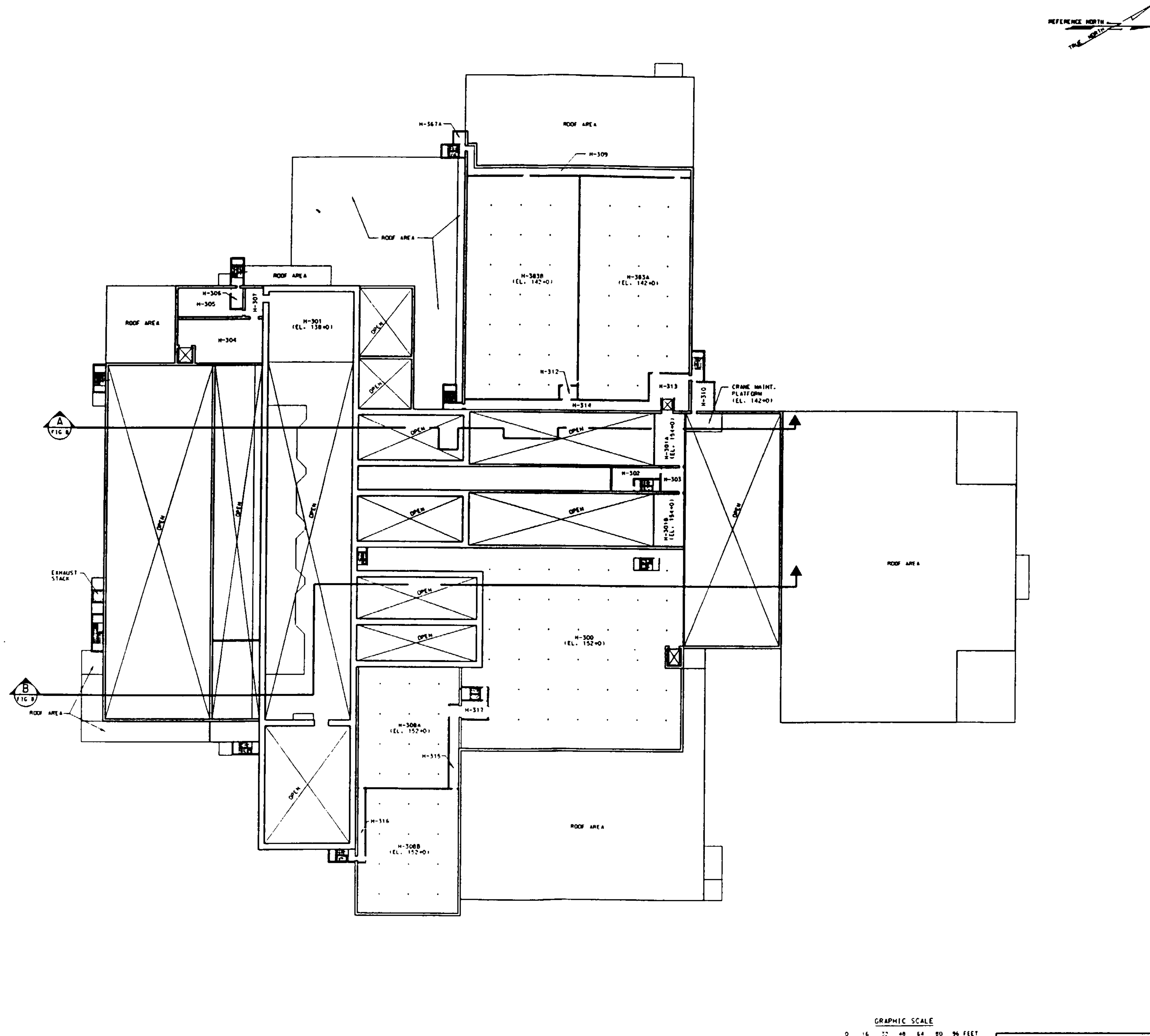


FIGURE 6
WASTE HANDLING/WASTE TREATMENT BLDG
FLOOR PLAN AT EL. 142+0

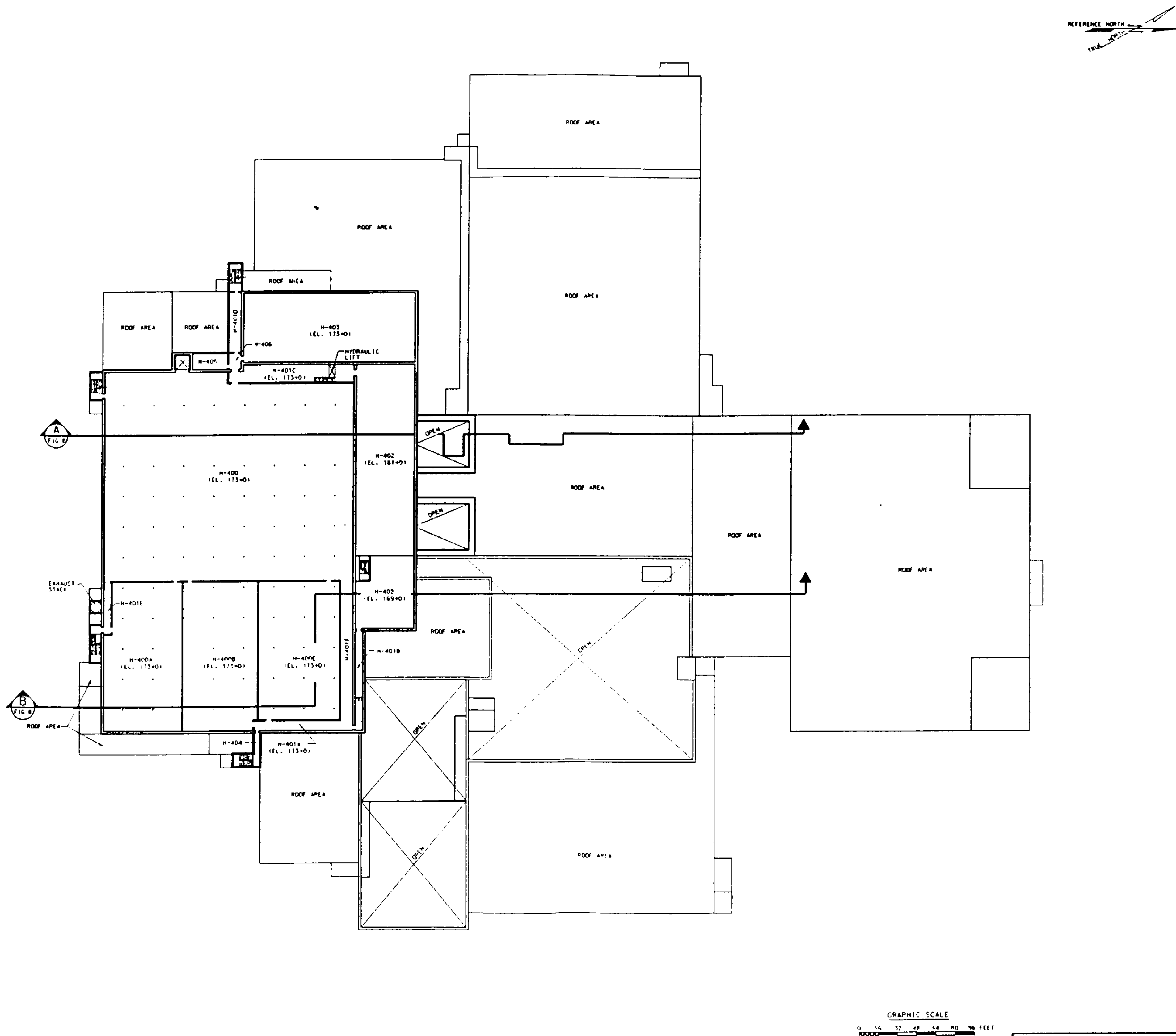


FIGURE 7
WASTE HANDLING/WASTE TREATMENT BLDG
FLOOR PLAN AT EL. 173+0

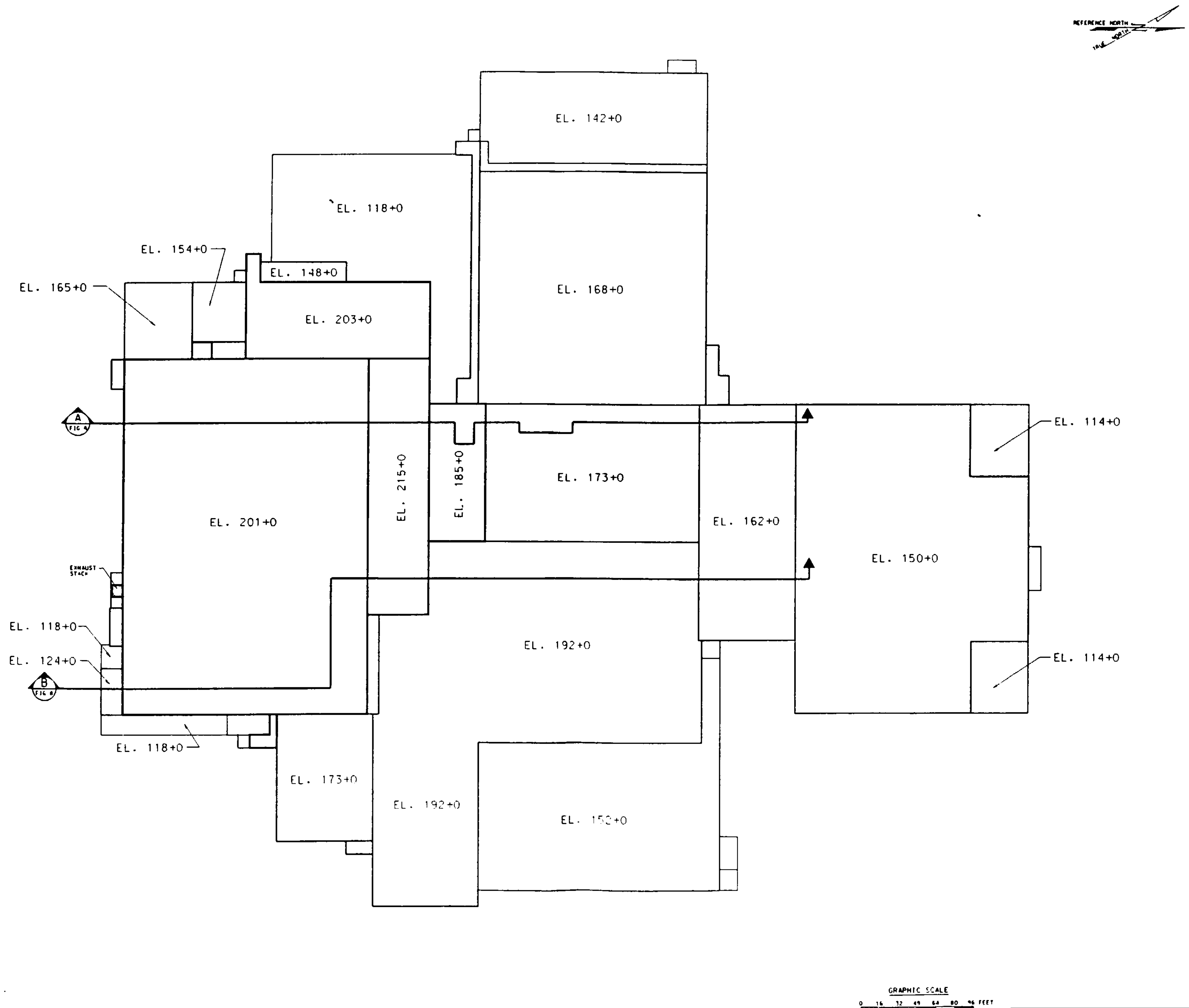
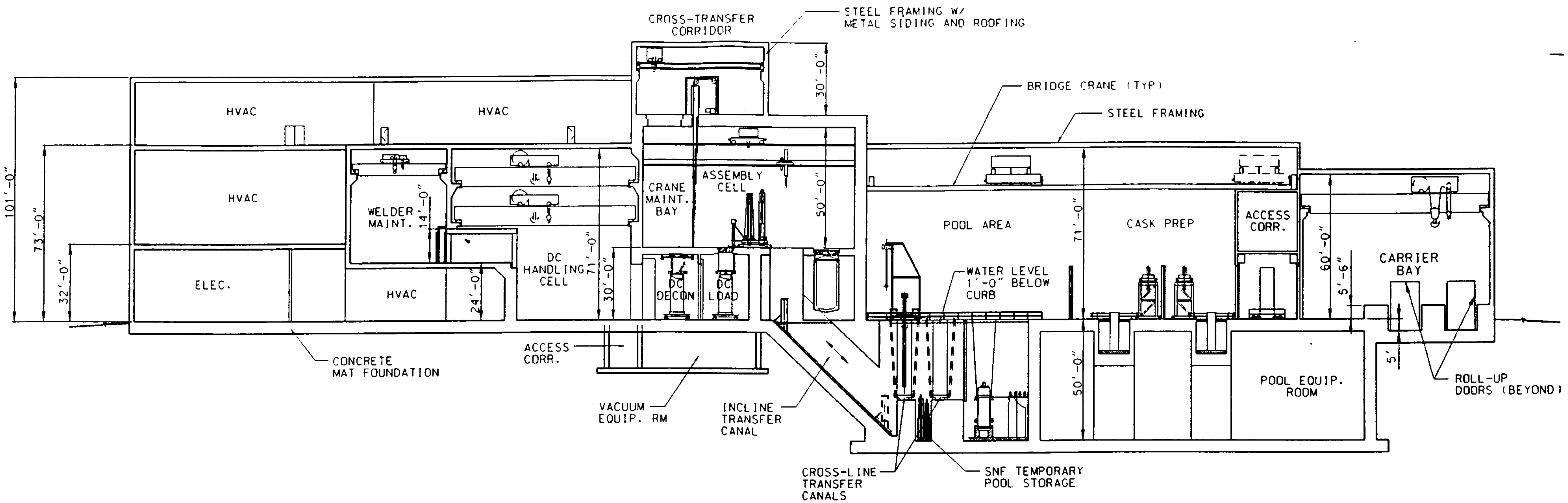
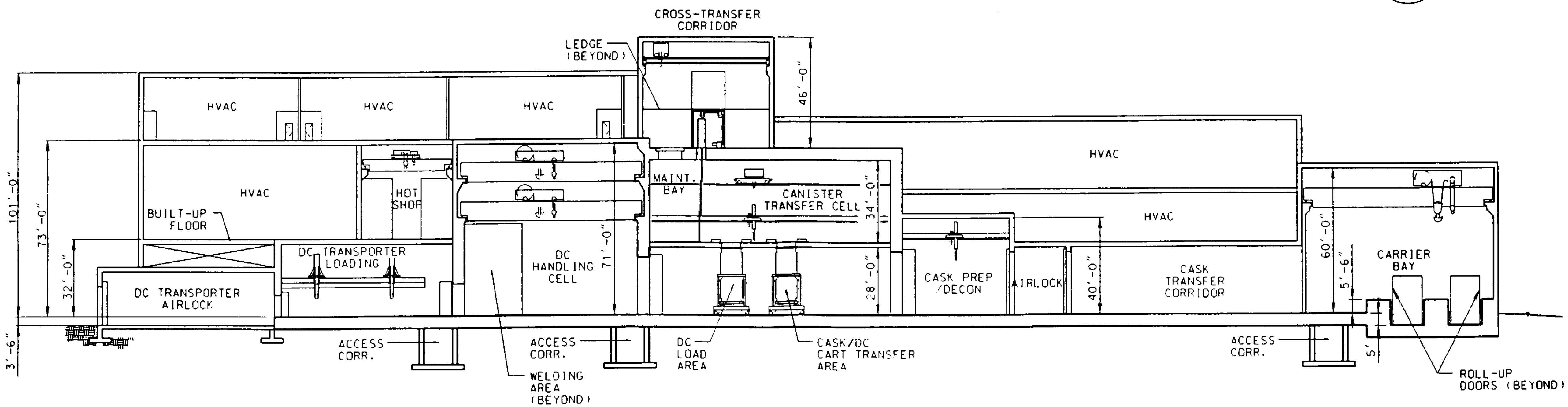


FIGURE 8
WASTE HANDLING/WASTE TREATMENT BLDG
ROOF PLAN



BUILDING SECTION – ASSEMBLY TRANSFER

A
FIG 4



BUILDING SECTION – CANISTER TRANSFER

B
FIG 4

FIGURE 9
WASTE HANDLING/WASTE TREATMENT BLDG
BUILDING SECTIONS