

## 1. SCOPE

This interface control document (ICD) defines the interface between the High-altitude Electro-Magnetic Pulse (HEMP) protection hardware of the Tenant system and the HEMP vault of the Terminal Equipment Building (TEB). The Tenant system consists of the Fixed Distributed System (FDS). The FDS HEMP Protection System (FDS HPS) provides HEMP protection to the TEB from transients on the FDS cables.

### 1.1. Item Description

The following items are illustrated in Figures 1 and 2a. The HPS development and installation contractor items will be installed after facility construction is complete.

#### 1.1.1. Host Items

The items specified herein are provided by the Host. These items will be installed prior to FDS HPS installation.

##### 1.1.1.1. Trunk Cable Conduit

The trunk cable conduit provides physical protection for the trunk cables of the Tenant systems.

##### 1.1.1.2. Pull Pit

The pull pit adjacent to the TEB provides an area for pulling the trunk cables through the trunk cable conduit.

##### 1.1.1.3. Cable Tunnel

The cable tunnel provides cable access from the pull pit to the TEB and provides room for cable slack.

##### 1.1.1.4. Cable Entrance Facility (CEF) Hardware

The CEF hardware provides an environmental seal for the trunk cable entry into the TEB. Figure 2b shows the CEF cable stack-up.

##### 1.1.1.5. HEMP Vault

The HEMP vault consists of TEB rooms B2.25 and B1.32 (see Figure 1). (The HEMP Vault is also known as Vault C). The electromagnetic barrier (EMB) wall divides the HEMP vault into a dirty area and a clean area. Each area of the HEMP vault has its own shielded HEMP door for access. The HEMP vault dirty area is divided vertically into three levels by floor grating. A ladder is provided for access between levels. A section of the floor grating will be removable for hoisting equipment between levels. The passage area will not be obstructed by any cables or equipment. The HEMP vault dirty area is topologically outside the HEMP shield of the TEB. The HEMP vault walls are steel plate.

##### 1.1.1.6. EMB Wall

The EMB wall provides an electromagnetic barrier between the dirty and the clean areas of the HEMP vault. The EMB wall is steel plate.

#### *1.1.1.7. Ground Bar Ground Connections*

The ground bar provides a single-point ground for the G2 grounds of the Tenant systems via the satellite plates. Each satellite plate is connected to a dedicated cable which is routed in a conduit and terminated at the ground bar. The G2 ground path connects to the test link, the down conductor, and the building ground mat. The ground bar is located on the clean side of the EMB wall. The satellite plates are located in the equipment room.

#### *1.1.1.8. Test Link*

The test link provides a test point for checking the integrity of the building ground mat. The test link may be disconnected from all building grounds during the integrity test. The test link is located on the EMB wall of the HEMP vault dirty area.

#### *1.1.1.9. Down Conductor*

The down conductor provides the conducting path for ground currents between the test link and the building ground mat.

#### *1.1.1.10. Building Ground Mat (G2)*

The building ground mat provides the G2 ground for the Tenant systems.

#### *1.1.1.11. Equipment Room Raceway*

The equipment room raceway provides mechanical protection for the power/ground cable, fiber cable and control cable for the Tenant systems. This raceway transits between the HEMP vault clean area to the equipment room.

##### *1.1.1.11.1. Transit Between the HEMP Vault and the Equipment Room*

System cable access from the HEMP vault to the equipment room will be through the telephone frame room (B1.33) ceiling area and into the equipment room at the 8 foot level. This puts the power, signal, ground, and control cables below the suspended ceiling in a cable tray that can be divided into 4 or more raceways. The Host will provide halfen which can be used to install cable tray hangers every 2 feet, 4 foot wide, along the cable route. Above the telephone frame room, the cables will be installed in a large steel tray suspended from the ceiling (4 feet deep).

#### *1.1.1.12. Equipment Room*

The equipment room provides space for the operational equipment of the Tenant systems. The equipment room consists of TEB room B1.34.

#### *1.1.2. Tenant Items*

The items specified herein are provided by the Tenant.

*1.1.2.1. G2 Ground Cables*

The G2 ground cables provides the ground path for all signal and safety grounds between the Tenant systems and the ground bar via the satellite plates.

*1.1.2.2. FDS Cable*

The HEMP vault is configured for six FDS trunk cables and six FDS ground cables. These cables are Deep Water Trunk (DWT) cables.

*1.1.2.3. FDS Trunk Cable Termination Box (FDS TCTB)*

The HEMP vault is configured for six TCTBs. Initially, two of these will be of Type A and four will be of Type B. The Type A TCTB will contain operational HEMP protection devices. The Type B TCTB will not contain operational HEMP protection devices. The Type B TCTB can be re-configured to a Type A TCTB.

Each Type A TCTB provides the primary HEMP protection on the associated FDS system. The Type A TCTB also provides Current Protection Panel (CPP) & Power Signal Junction Box (PSJB) functions. The Type B TCTB is capable of shunting cables to ground. Each FDS TCTB is configured for one power/signal trunk cable and one sea return ground cable.

*1.1.2.4. HEMP Vault Conduit*

The HEMP vault conduit provides electrical shielding and mechanical protection for the power/ground cables, system signal fiber, status/control fibers, and low voltage dc cables between TCTB and the EMB wall. The HEMP vault is configured for six FDS HEMP vault conduits. The Vault Conduit connected to a Type A TCTB contains the following cables:

*1.1.2.4.1. Power/Ground Cable*

The power and ground cables provide the power and ground paths between the TCTB and the FDS hardware in the equipment room.

*1.1.2.4.2. System Fiber Cable*

The system fiber cable provides the system signal path between the Type A TCTB and the FDS hardware in the equipment room.

*1.1.2.4.3. Status/Control Cable*

The status/control cable provides the status/control paths between the Type A TCTB and the FDS HPS hardware in the equipment room. The control cable consists of a set of optical fibers.

*1.1.2.4.4. Low Voltage DC Power Cable*

The low voltage cable provides DC power for the operation of the electronic circuitry in the Type A TCTB. The power and return paths are routed between the Type A TCTB and the FDS HPS hardware in the equipment room.

## 2. *APPLICABLE DOCUMENTS*

### 2.1. *Government Documents*

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between documents referenced and the contents of this specification, the contents of this specification shall be considered the superseding requirement.

MIL-STD-188-124A 12 February 1984	Military Standard Grounding, Bonding and Shielding
MIL-STD-188-125 26 June 1990	High-Altitude Electromagnetic Pulse (HEMP) Protection for Ground-Based C4I Facilities Performing Critical, Time-Urgent Missions
MIL-HDBK-419A 29 December 1982	Grounding, Bonding, and Shielding for Electronic Equipment and Facilities, Volume II
DOD-STD-100C Notice 6 15 March 1987	Engineering Drawing Practices

### 2.2. *Non-Government Documents*

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between documents referenced and the contents of this specification, the contents of this specification shall be considered the superseding requirement.

G853000	Prime Item Development Specification (PIDS) Addendum for the Fixed Distributed System (FDS) Underwater Segment (UWS) for FDS-1
ARG853560	FDS HEMP Protection System (FDS HPS) Assembly Requirements
ARG846000	SD-C HEMP Protection System (SD-C HPS) Assembly Requirements
AT&T Federal Systems	HPS Acceptance & Verification Test Plan

AT&T Federal  
Systems

HPS Hardness Maintenance / Hardness  
Surveillance (HM/HS) Plan

### 3. INTERFACE REQUIREMENTS

#### 3.1. Physical

##### 3.1.1. Mounting

###### 3.1.1.1. FDS TCTB Mounting

The TCTB hardware shall be mounted on the HEMP vault wall in the dirty area as shown in the Vault C layout included in Appendix A.. The TCTB mounting requirements shall be specified in ARG853560. The FDS TCTBs shall be capable of being welded to the HEMP vault walls.

###### 3.1.1.2. HEMP Vault Conduit Mounting

The FDS HEMP vault conduit mounting requirements shall be specified in ARG853560 and ARG846000 respectively. The HEMP vault conduits shall be capable of being welded to the EMB wall. The HEMP vault conduit shall be rigid steel.

##### 3.1.2. Size

###### 3.1.2.1. FDS TCTB Volume

The TCTB shall fit within a volume of 3W x 3D x 6H feet, excluding the mounting flanges, DWT cable terminations or conduit terminations.

###### 3.1.2.2. Maximum Dimension

All FDS hardware shall be capable of passage through a doorway 55 inches wide and 78 inches high.

###### 3.1.2.3. Cable Dimensions

The DWT cable diameter is 0.525 inches. The cable shall be installed within the minimum bending radius constraints.

###### 3.1.2.4. HEMP Vault Conduit Dimensions

The length of the HEMP vault conduit shall be no greater than 30 feet each and the inner diameter shall at least 2.5 inches trade size.

##### 3.1.3. Weight

###### 3.1.3.1. FDS TCTB Weight

The FDS TCTB shall weigh no more than 1300 pounds.

###### 3.1.3.2. HEMP Vault Conduit Weight

The HEMP vault conduit, including enclosed cables, shall each weigh no more than 300 lbs.

#### *3.1.4. Cable*

##### *3.1.4.1. Cable Slack*

Each FDS cable entering the HEMP vault from outside the TEB shall have at least one meter slack in the cable tunnel to allow for re-termination of the cable. The bent cable radius shall be no less than the minimum bending radius of the cable. The slack shall be capable of being pulled out of the cable tunnel during re-termination without entering the cable tunnel.

##### *3.1.4.2. Cable Mounting*

The FDS cable shall be securely mounted on the HEMP vault wall. The bent cable radius shall be no less than the minimum bending radius of the cable. The cable shall be mounted such that there is minimal stress on the FDS TCTB or the CEF hardware. Minimal stress can be achieved by using cable hangers to guide the cable directly into and perpendicular to the FDS TCTB or CEF hardware.

##### *3.1.4.3. Cable Separation*

There is no minimum separation distance between the FDS cables within the last hundred feet of the cable run before reaching the TCTB hardware. There is no minimum separation distance between the power/ground cables and fiber/control cables.

##### *3.1.4.4. Minimum Bending Radius*

The DWT cable minimum bending radius is 20 inches. The cable shall be installed within the minimum bending radius constraints.

##### *3.1.5. HEMP Vault Capacity*

The HEMP vault shall accommodate HEMP protection hardware for up to six FDS underwater cable systems.

#### *3.2. Electrical*

##### *3.2.1. Functional*

Figure 3 shows the grounding schematic for the FDS HPS. HPS interfaces to the facilities ground and EMB shall be in accordance with MIL-STD-188-124A and MIL-HDBK-419A.

##### *3.2.1.1. EMB Wall*



The EMB wall provides HEMP protection between the HEMP vault dirty and clean areas in accordance with MIL-STD-188-125. Addition of the HPS hardware shall not degrade the EMB shielding effectiveness below that required in MIL-STD-188-125.

#### *3.2.1.2. HPS Hardware to HEMP Vault and EMB Wall Bonding*

The dc resistance of the bonding between each HPS equipment and the HEMP vault wall or EMB wall shall be no greater than 1 milliohm.

#### *3.2.1.3. Test Link Ground Connections*

All test link ground connections shall each have a dc resistance no greater than 10 milliohms.

#### *3.2.1.4. Ground Bar Ground Connections*

The HPS hardware in the equipment room to ground bar ground connections via the satellite plates, shall be copper stranded cable and each have a dc resistance no greater than 10 milliohms.

#### *3.2.1.5. Power/Ground Cables*

The power/ground cables connecting the TCTB and the HVPS shall be an RG Type coaxial cable with an operational rating of at least 4000 volts DC.

### *3.2.2. Operational*

#### *3.2.2.1. Communications*

Two way voice communications between the HEMP vault dirty area and clean area, which can operate with the shield doors open or closed, is required to support HPS installation, on site testing, and maintenance.

#### *3.2.2.2. Lighting*

Lighting in the HEMP vault dirty and clean areas is required during installation, on site testing, and maintenance.

#### *3.2.2.3. AC Power*

The Host will provide AC power outlets in the HEMP vault dirty and clean areas for use during installation, on site testing, and maintenance. At least one duplex outlet in the dirty area and one duplex outlet in the clean area will be United States Standard (120V nominal, 20A, 60Hz). This power source will be from an Uninterruptible Power Source (UPS). At least one duplex outlet in the dirty area and one duplex outlet in the clean area will be Host Standard, 240V nominal.

### *3.3. Environmental*

### 3.3.1. *Temperature*

The HPS hardware has been designed to operate within all performance limits in spaces with an ambient temperature in the range of 10 to 40 degrees C.

### 3.3.2. *Humidity*

The HPS hardware has been designed to operate within all performance limits in spaces with a relative humidity of 40 to 70 percent.

### 3.3.3. *Heat Dissipation*

The FDS HPS hardware installed in the HEMP vault shall dissipate no more than 2 kilowatt average during any 24 hour period. The FDS HPS hardware installed in the equipment room shall dissipate no more than 1 kilowatt average during any 24 hour period.

### 3.3.4. *Operational Shock*

The FDS TCTBs shall operate and not be damaged when exposed to the following blast shock environment:

	<u>Vertical</u>	<u>Horizontal</u>
a. Velocity (m/s)	0.13	.16
b. Acceleration (g)	2	3
c. Displacement (cm)	1.52	1.83

### 3.3.5. *Environmental Interface Between the HEMP Vault and the Equipment Room*

The Host will provide environmental seals to be used to seal the penetrations through the wall into the HEMP vault clean area and into the equipment room.

## 3.4. *Safety*

### 3.4.1. *Safety Interlock*

Each Type A TCTB shall have safety interlock using an interlock key from each assigned HVPS. Each Type A TCTB interlock key shall be unique for that particular TEB facility.

### 3.4.2. *Cable Termination*

Inactive FDS cable ends shall be shorted to ground and isolated within an assigned FDS Type B TCTB.

#### 4. *QUALITY ASSURANCE PROVISIONS*

##### 4.1. *Verification Responsibility*

The HPS development and installation contractor shall verify the requirements specified in this document. The Host will be requested to verify those items defined in Section 1.1.1 of this document. The Host will provide the HEMP vault and test it according to an agreed upon method prior to installation of the HPS. After installation of the HPS, the development and installation contractor shall verify that the HEMP shield integrity of the EMB wall has not been compromised.

##### 4.2. *Hardness Assurance, Maintenance, and Surveillance (HAMS)*

###### 4.2.1. *Hardness Maintenance (HM) / Hardness Surveillance (HS)*

The HAMS program shall be carried out using the HPS HM/HS plan developed by the HPS development contractor as a guide to ensure the continued level of HEMP protection provided by the equipment described in this document.

###### 4.2.2. *Hardness Critical Items (HCIs) / Hardness Critical Processes (HCPs)*

The HPS development and installation contractor shall identify on the drawings and parts list individual HCIs or HCPs in accordance with DOD-STD-100C. The HPS contractor shall also identify the location of the HCI on the drawings and a drawing note if it is a HCP. The HPS contractor shall provide proper markings for all individual HCIs.

##### 4.3. *Acceptance and Verification Testing*

The on-site acceptance and verification testing program shall demonstrate that hardness performance requirements have been satisfied and that the required HEMP hardness has been achieved. This program shall include: (1) quality assurance testing during facility construction and acceptance testing for the completed EMB Wall by the Host and witnessed by the HPS development and installation contractor and (2) quality assurance, acceptance, and verification testing of the HPS hardware commencing after the Building Occupancy Date (BOD) using the HPS acceptance and verification test plan as a guide.

## 5. NOTES

### 5.1. Acronyms

BOD	Building Occupancy Date
C	Centigrade
CEF	Cable Entrance Facility
CPP	Current Protection Panel
D	Depth
DC	Direct Current
DWT	Deep Water Trunk
EMB	Electromagnetic Barrier
FDS	Fixed Distributed System
G2	Safety Ground or Building Ground Mat
H	Height
HAMS	Hardness Assurance, Maintenance, and Surveillance
HCI	Hardness Critical Item
HCP	Hardness Critical Process
HEMP	High-Altitude Electromagnetic Pulse
HM	Hardness Maintenance
HPS	HEMP Protection System
HS	Hardness Surveillance
HVPS	High Voltage Power Supply
ICD	Interface Control Document
PSJB	Power Signal Junction Box
SD-C	Type SD Coaxial Cable
TCTB	Trunk Cable Termination Box
TEB	Terminal Equipment Building
UPS	Uninterruptable Power Supply
UWS	Underwater Segment
W	Width

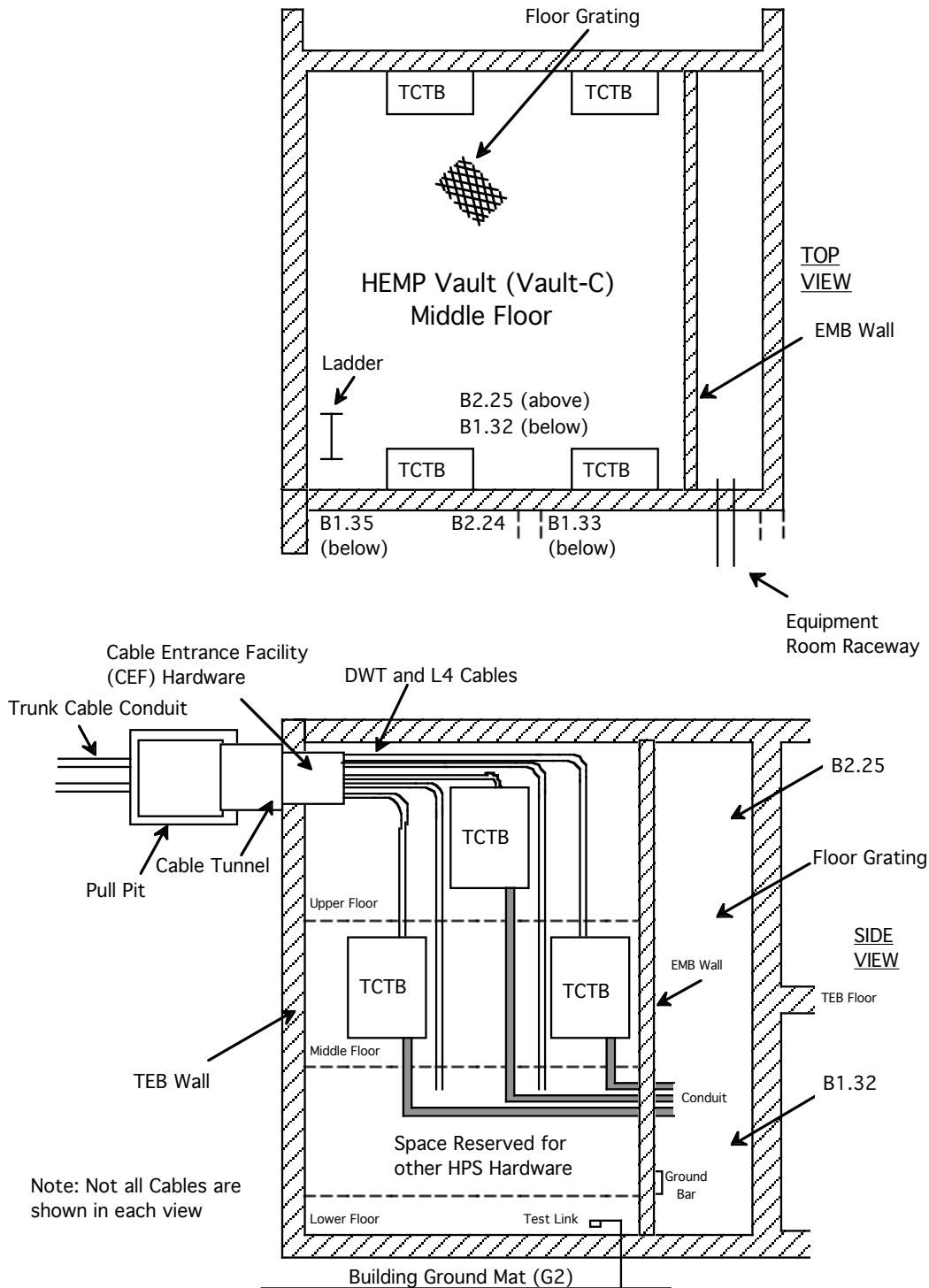


Figure 1. HEMP Vault (Vault C)

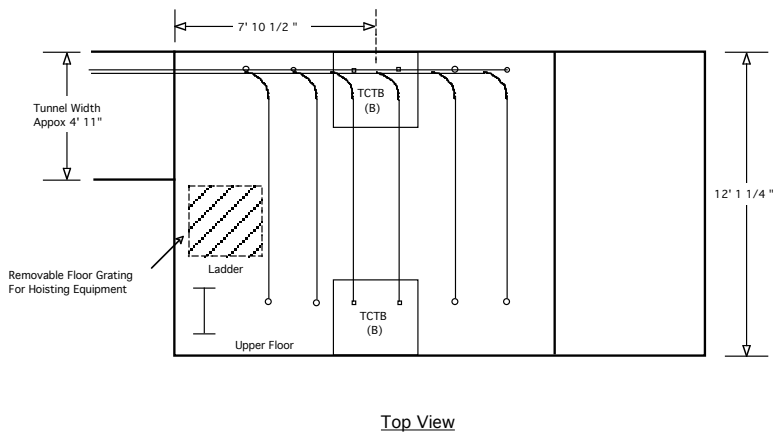
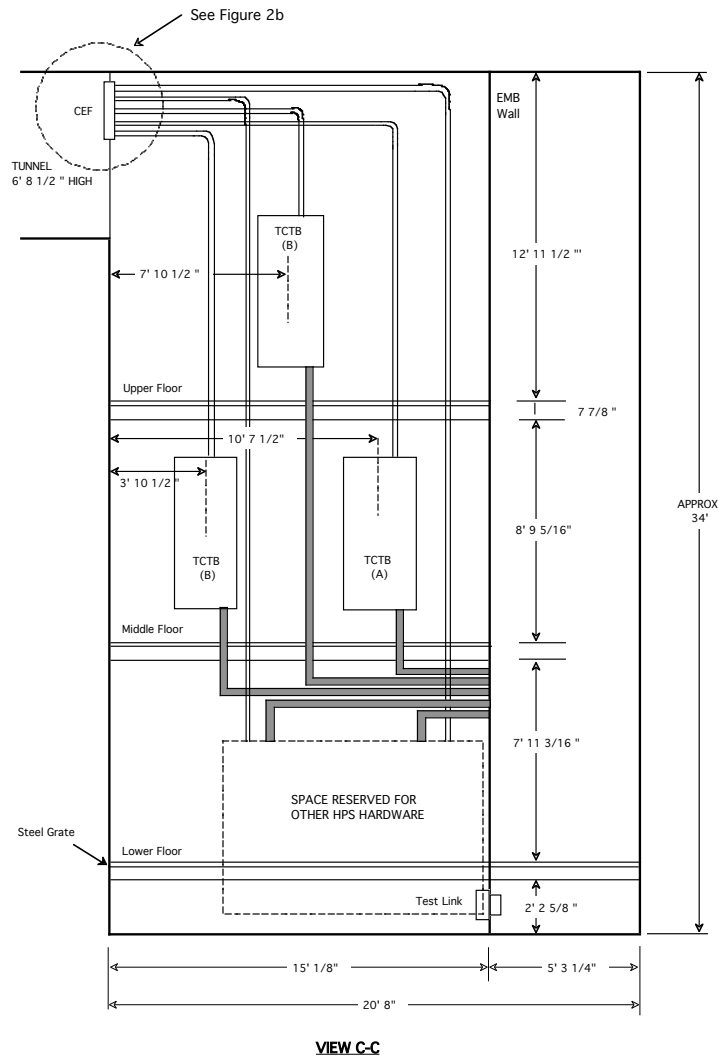


Figure 2a. HPS Hardware Location

TOP

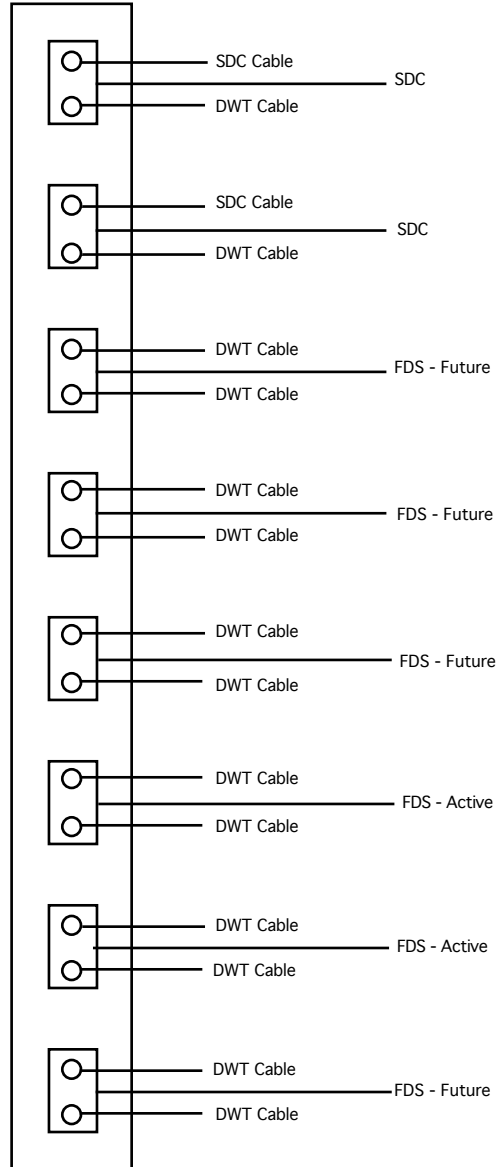


Figure 2b. CEF Cable Stack-up

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*Figure 3. FDS HPS Grounding Schematic*

**APPENDIX A**  
**HEMP Vault (Vault C) Layout**

**Note: Individual HCIs and HCPs will be identified seperately on the HPS drawings and Parts Lists.**

**High-Altitude Electromagnetic Pulse (HEMP) Vault  
Interface Control Document**

Data Item Number A04T

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APPROVALS

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Date

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Date

**WARNING NOTICES: FDS Information - Further dissemination only as directed  
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requires prior specific approval of CNO (N874) and SPAWAR (PMW 184).**

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