

# **Veterans Benefits Administration**

## **Information Technology Design Guide**

### **VBA Regional Office Computer Room Design Guidelines**



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## VBA Regional Office Computer Room Design Guidelines

### 1. Purpose

These guidelines are intended for **NEW CONSTRUCTION** but are to serve as a general guide for existing facilities as well. Each station is encouraged to utilize existing Computer Room space to the maximum extent possible. If unclear about guideline interpretation, the station should request technical assistance from Hines Information Technology Center (ITC) Engineering Division (282/32) or the VBA Office of Facilities, Access and Administration (VBA OFAA).

The guide is divided into component sections covering all aspects of the Computer Room design. These range from doors, windows, flooring, power, fire protection, security and room construction to access control, grounding and HVAC requirements.

### 2. General Building Requirements

#### **2.1. Protection: Utility & Rooftop Equipment**

For new construction and when otherwise possible it is highly recommended that the building utilities have service entrance protection as well as lightning protection for HVAC and other rooftop equipment in addition to a general rooftop protection grid which is properly grounded. Without this basic protection, a great deal of damage can be caused to not only Computer Room equipment but also all PC's and other electronic equipment in general office spaces.

#### **2.2. Prohibition: Computer Room Overhead Piping**

No plumbing lines, chilled water lines, etc., other than pre-action sprinklers shall be located above the ceiling or pass through the Computer Room ceiling. Only utilities required for operation of the Computer Room and its equipment shall pass into the room.

### 3. Applicable Codes & Standards

The following codes and standards, as applicable, shall be adhered to by the design team and installation contractors. If a version of one of the following standards or codes is published that supersedes the following, that new version of the standard shall be used.

### **3.1. National Fire Codes**

- 3.1.1. *National Electric Code – NFPA 70 (2005)*
- 3.1.2. *Protection of Information Technology Equipment - NFPA 75 (2003)*
- 3.1.3. *National Fire Alarm Code - NFPA 72 (2002)*
- 3.1.4. *Life Safety Code - NFPA 101 (2006)*

### **3.2. The International Code Council (ICC) (2006)**

- 3.2.1. *International Building Code*
- 3.2.2. *International Fire Protection Code*

### **3.3. Federal Information Processing Standards Publications**

- 3.3.1. *FIPS PUB 199 - Standards for Security Categorization of Federal Information Processing Systems (February 2004)*
- 3.3.2. *FIPS PUB 200 - Minimum Security Requirements for Federal Information and Information Systems (July 2005)*

### **3.4. VA Standard specifications**

Available at [http://www.va.gov/facmgt/standard/spec\\_idx.asp](http://www.va.gov/facmgt/standard/spec_idx.asp)

### **3.5. ADA**

Uniform Federal Accessibility Standards (UFAS) or Americans with Disabilities Act (ADA)

### **3.6. National Institute of Standards and Technology (NIST)**

- 3.6.1. *NIST SP 800-53 – Recommended Security Controls for Federal Information Systems (Minimum Security Controls - Moderate Baseline)*
- 3.6.2. *NIST SP 800-12 – An Introduction to Computer Security: The NIST Handbook*

### **3.7. VA Information Security Directives**

- 3.7.1. *No. 5.00.01, “Information Security Program”, MP20-4, Part II (December 31, 1996)*
- 3.7.2. *VBA IT Handbook No. 5.00.02.HB1, (April 4, 2002)*
- 3.7.3. *VBA IRM Handbook No. 5.02.01.HB1, “Computer Room Access Controls” (Draft 10/5/98)*
- 3.7.4. *VA Handbook 730/1 (August 20, 2004)*

### **3.8. VA HVAC Design Guide**

### **3.9. United States General Accounting Office**

- 3.9.1. *GAO - Federal Information System Controls Audit Manual (FISCAM) (Jan 1999)*

## **4. Computer Room - Construction**

### **4.1. Location**

The preferred location for a VARO Computer Room is on the first floor, interior of the building, away from any windows on the exterior of the building. The least preferred location is below grade where water from heavy rains or fire fighting on upper floors may accumulate and damage the systems contained in the Computer Room. The location chosen shall provide for several objectives of the VBA:

- Provide physical security of equipment and media.

- Reduce the floor load requirement for the building if the Computer Room was located above the ground floor.
- Reduce possible adverse effects from sunlight, radiant heat and lightening strikes.
- Minimize cable runs to client PC's, printers and terminals in office areas as well as telecommunications lines.
- Minimize wiring run from power source.

#### **4.2. Computer Room Size & Equipment**

Final square footage requirements for the RO computer room shall be determined on a case by case basis and based on the actual equipment to be placed into the computer room. When possible, a survey of the existing Computer Room is highly recommended before sizing the new space and integrated rack system. There should be a small amount of space provided for future rack mounted equipment. See the diagram labeled "Detail A" at the end of the section for an example of a RO computer room layout.

##### *4.2.1. Integrated Computer Room Rack System*

OFAA will provide the RO with an integrated computer room rack system. This system will include an integrated UPS, PDU, telecommunications racks, racks for RO servers, rack mounted PDUs and necessary equipment and labor to rack mount existing equipment. HVAC equipment may be included in the rack system or purchased separately by OFAA as required. The existing RO servers will be rack mounted (if possible) and integrated into the new rack system. Details on the integrated rack system are in the following sections.

##### 4.2.1.1. Typical Rack Properties for a Rack in an Integrated Rack System

All racks shall have the following properties within the rack system. Only the telephone switch rack may differ:

- Adjustable mounting depths
- Door ventilation that exceeds 800 in<sup>2</sup>
- Lockable doors and side panels
- Removable side panels for easy MDF, IDF and LAN equipment integration, allowing the racks to become a large rack with multiple access doors
- Multi-vendor compatibility
- Numbered U positions
- Roof and base cable access
- Roll through a 7 foot door
- Rollers on the bottom with integrated leveling stands with at least 1.75" of adjustment
- Separate power and data distribution channels
- Ability to integrate power strips into the sides of the rack vertically
- Split rear doors for easier access in small spaces
- Ability to integrate power, voice and data cables into overhead cable trays for use on top of the rack system

##### *4.2.2. Data, Voice and Server Equipment Racks*

The Voice & Data MDF will also be housed in the rack system. All racks should be provided with individual "Rack PDUs" as specified in section 6.2.3.3.

##### 4.2.2.1. Data MDF Rack

The Data MDF rack will house the LAN/WAN router(s) and LAN work group switch(s). If the RO has multiple IDFs rather than just the computer room then this rack will also

house fiber optic patch panels that receive the fiber optic data backbones from each closet data switch. This rack should be a standard 19" rack at least 42" deep (approx 42" D X 20" W X 84"H each). One (1) rack from the integrated system shall be provided to house this equipment.

#### 4.2.2.2. Voice MDF Rack

The voice MDF Rack will receive phone switch tails and terminate them on the Cat 3 or better patch panels. This rack should be a standard 19" rack at least 42" deep (approx 42" D X 20" W X 84"H each). The number of racks to be provided from the integrated rack system shall be determined from an engineering survey done prior to the move and finalization of the RO LAN architecture. Overhead cable tray should be provided to neatly route overhead the phone tails to this rack from the phone switch.

#### 4.2.2.3. MDF to IDF Cross Connect Rack or IDF Rack

This rack will serve one of two possible functions depending on the RO and it's specific LAN setup. With either setup this rack should be a standard 19" rack at least 42" deep (approx 42" D X 20" W X 84"H each). The number of racks to be provided from the integrated rack system shall be determined from an engineering survey done prior to the move and finalization of the RO LAN architecture. Overhead cable tray should be provided to cleanly route overhead fiber and or phone tails and horizontal cables to this rack.

##### 1. *Computer Room Serves as ONLY an MDF*

When the computer room for the RO serves as a distribution point for the entire facility and there are other IDFs throughout the building then this rack or racks shall serve as a "Voice Backbone Cross Connect Rack". The phone tails terminate in the rack(s) next to this one and voice backbones can be patched to any closet in the building using this rack(s). Voice backbones connected to the building IDFs shall be terminated on patch panels in this rack(s).

##### 2. *Computer Room Serves as BOTH MDF and IDF*

When the computer room is the distribution facility for the entire facilities phone and data horizontals then this rack(s) shall be where the horizontals for the facility terminate. This rack(s) shall serve as the "IDF Rack" for the facility. The voice numbers and LAN connections can then be made to this rack(s).

#### 4.2.2.4. LAN/WAN Servers

This rack shall house the local RO servers (i.e. Outlook Exchange Server, File/Print Servers, Migration Gateway Servers (MGWs)) and any other required servers for the network equipment. This rack(s) should be a standard 19" rack at least 42" deep (approx 42" D X 20" W X 84"H each). The number of racks required shall be determined from an engineering survey done during the relocation process.

#### 4.2.2.5. UPS / PDU

Uninterruptible Power Supply (UPS), UPS batteries and associated Power Distribution Units (PDU) should be contained in rack type systems that match the previous racks to house all the other equipment in the computer room. For a 40KVA UPS and PDU the units should fit into approximately three standard 19" rack spaces. Larger UPS/PDU combinations will require an additional rack unit. See Section 6.2 – "Electrical Power" for a detailed description of the electrical and connection requirements for these units.

#### 4.2.2.6. Extra Racks

At least one (1) extra rack for every five (5) racks in the computer room shall be provided with the rack system. The extra racks shall be a standard 19" rack at least 42" deep (approx 42" D X 20" W X 84"H each). They shall be provided so that additional equipment can be easily integrated into the computer room in the future and the space and power will be available.

#### 4.2.2.7. Phone Switch

The following requirements are nominal space and power requirements for a phone switch but each RO will have different requirements for the telephone switch cabinet(s) and power. The space requirements should be verified before finalizing the rack layout of the computer room. The phone switch should have a footprint of approximately 60" x 36" x 21" (HxWxD). The phone switch shall be provided with a dedicated 20A/110V dedicated power whip from the main PDU. Earth grounding shall be provided for this equipment per the manufacturer's recommendations. A minimum of three foot clearance in front and back shall be provided for this piece of equipment.

#### 4.2.2.8. Phone Equipment Rack

This rack shall house the Voice Mail Server and Switch Administration/Call Master Server. This rack should be a standard 19" rack at least 42" deep (approx 42" D X 20" W X 84"H each). One (1) rack from the integrated system shall be provided to house this equipment.

#### 4.2.2.9. Specific Equipment for Individual Racks

- *Data MDF Rack* shall be provided with cable management and other features as noted in the VBA Regional Office Cabling Design Guide. Cabling contractor shall provide cable management in this rack as specified in the VBA Regional Office Cabling Design Guide.
- *Voice MDF Rack* shall be provided with cable management and other features as noted in the VBA Regional Office Cabling Design Guide. Cabling contractor shall provide cable management in this rack as specified in the VBA Regional Office Cabling Design Guide.
- *MDF to IDF Cross Connect Rack or IDF Rack* shall be provided with cable management and other features as noted in the VBA Regional Office Cabling Design Guide. Cabling contractor shall provide cable management in this rack as specified in the VBA Regional Office Cabling Design Guide.
- *LAN/WAN Server Racks* shall be provided with rack mounting kits or shelving if a kit is not available to accommodate the number of servers the RO will need. An RO typically has 2-4 file and print servers depending on the size of the RO. A KVM switch for the number of servers and rack mountable monitor, keyboard and mouse combination should also be provided. Cable management devices shall be provided by the rack vendor.
- *Migration Gateway Server Rack* shall be provided with rack mounting kits or shelving if a kit is not available to accommodate the number of servers the RO will need. A KVM switch for the number of servers and rack mountable monitor and keyboard combination should also be provided. Cable management devices shall be provided by the rack vendor.



- *Phone Equipment rack* shall be provided with rack mounting kits or shelving if a kit is not available to accommodate the number of servers the RO will need. A KVM switch for the number of servers and rack mountable monitor and keyboard/mouse combination should also be provided. Cable management devices shall also be provided by the rack vendor.
- *One (1) Extra Rack* shall be provided with the minimum of the two (2) Metered side mountable PDUs specified in section 6.2.3.3. Other equipment can be provided as necessary by the RO IRM staff to accommodate the needs of the equipment going in the racks. Cable management devices shall also be provided by the rack vendor.

#### *4.2.3. Other Clear Areas*

Space will also be required to configure and test new systems, accommodate doors and aisle ways, and provide maintenance access to the equipment and ceiling. No office space or permanent seating will be allowed in the computer room. Only space to configure and maintain the servers should be allowed in the computer room.

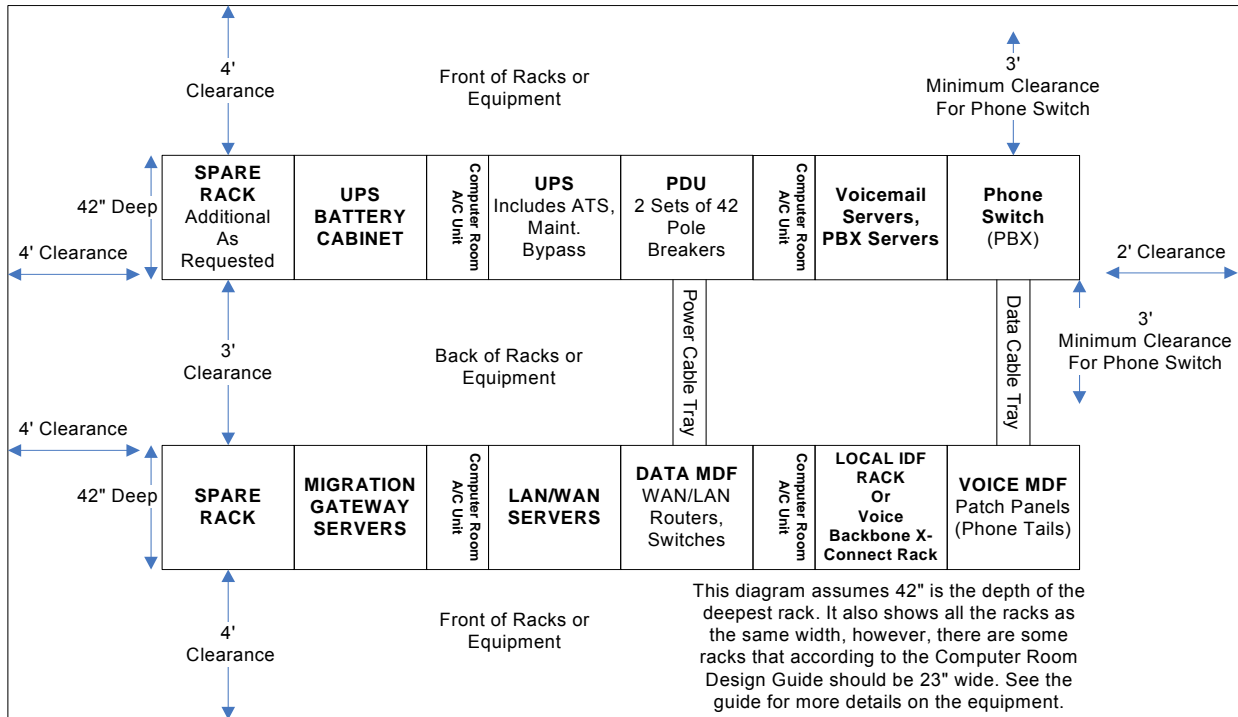
#### *4.2.4. Existing Computer Rooms*

Any modifications to the existing computer room should be in an effort to best use the existing space and if possible modify the computer room to meet the requirements in this guide. Code violations and security deficiencies should take the priority during the remodeling or re-alignment process of existing construction.

#### *4.2.5. Future Computer Room Equipment*

A rack system with integral rack mounted UPS/PDU provides one of the most efficient ways for computers and equipment to be housed in the computer room. In order to maintain this efficiency the ROs should be provided with rack mountable equipment in the future. Currently (2006) the servers and file storage in a RO take up approximately three (3) racks. In the future the rack space that the ROs servers and file systems take up could be reduced to one or two racks if blade type servers and compact file systems are provided and used.

**Detail A**  
 Example of the minimum RO computer room layout with an integrated rack system. NOT TO SCALE



**4.3. Partitions & Penetrations**

Partitions shall be in accordance with NFPA 75 and the codes in Section 3. Walls shall be painted or otherwise covered to provide a vapor barrier in order to maintain a stable humidity level within the room. All cable penetrations (minimum 2 per wall - 12" x 6" above ceiling) shall be fitted with sleeves or conduit and fire-stopped with removable & reusable fire stopping material. See section 5.2.2. "Security – Interior Walls" for additional requirements.

**4.4. Windows**

Windows are not recommended because they pose fire spread and security risks for VARO computer rooms. See section 5.2.1. "Security – Windows" for additional requirements.

**4.5. Doors**

**4.5.1. Door Width**

The Computer Room doors shall be at least 36 inches wide in order to accommodate the largest equipment will be brought into the room. If larger equipment is known to exist, then at least one door shall be large enough to accommodate that piece of equipment.

**4.5.2. Door Access To/From IRM Offices**

A second door may be provided to allow direct access from IRM offices if they are directly adjacent to the Computer Room. If a door from the IRM Offices into the Computer Room is provided the security level of the IRM Office door shall be equal to that of the Computer Room. The IRM Offices shall have to then meet the security requirements in Section 5.

#### 4.5.3. Security Requirements

See section 5.2.1. "Security – Door Security" for security requirements and restrictions.

### 4.6. Flooring

#### 4.6.1. Flooring Type

A Vinyl Composition Tile (VCT) floor coated with an ESD wax shall be installed in the computer room to help prevent the static buildup of electrical charge and protect sensitive electronic equipment.

The floor should have the following properties:

- Be available in 12"x12" tiles for easy replacement.
- Have a thickness of at least 0.124 " (3.00 mm).
- Homogeneous solid vinyl tile.
- Conform to the following:
  - ASTM F-1700: Solid Vinyl Floor Covering Materials.
  - NFPA 101: Life Safety Code.
  - ASTM E-648: Critical Radiant Flux CRF (W/cm<sup>2</sup>) > 1.0 W/cm<sup>2</sup>.
  - ASTM E-662: Smoke Density ≤ 450.
  - ASTM E-84: Fire Resistance (Steiner Tunnel) < 75 (Class 1).
  - ASTM F-970: Static Load <0.001" RI @ 250 psi (1.125" diameter foot).  
2,500 psi @ 0.005" RI (0.5" diameter foot).
  - ASTM F-925: Chemical Resistance Excellent (Acids, Alkalis, Household Chemicals).

#### 4.6.2. Installation of VCT Floors

Adhesive and tiles shall always be installed as recommended by the manufacturer. Proper moisture release rate tests shall be conducted using the proper manufacturer recommended test(s) for newly poured concrete floors.

#### 4.6.3. Sub Floor Cleaning & Sealing

Prior to installation of the VCT floor material, contractor shall thoroughly clean the floor with a manufacturer approved cleaner and using the correct manufacturers recommended procedure to reduce dust.

#### 4.6.4. Spare Tiles

At minimum 10% (rounded up to the box) of spare tiles shall be provided at the end of installation to replace damaged tiles in the future.

#### 4.6.5. Maintenance

The VCT floor should be maintained with the manufacturer's recommended cleaners and should be regularly waxed with an ESD (Electrostatic Discharge Wax). The ESD wax coating will help prevent the build up of static in the computer room environment. Regular cleaning and dusting will prolong the life of the wax.

#### 4.6.6. Floor Sloping and Drains

The floor shall be sloped towards all floor drains. There shall be no more than a 3% grade to any drain in the computer room. This will allow the rack system to be leveled over a large area without difficulty. See section 6.3.8. "A/C Drainage" for floor drain requirements.

#### **4.7. Suspended Ceiling and Space**

Ceiling height shall be at least 9' above finished floor (10' is preferred).

##### *4.7.1. Acoustical Properties*

Ceiling shall be a suspended, acoustical ceiling. The ceiling shall provide a minimum noise reduction coefficient of (NRC 55).

##### *4.7.2. Fire Protection Properties*

Ceiling tiles shall have a flame spread of less than 25 and a smoke development ratio of 50 or less (ASTM E-84).

##### *4.7.3. Humidity Properties*

Ceiling tiles shall provide a vapor barrier and shall not be affected by room relative humidity of 60% RH (an example is Armstrong's "Fine fissured RH90" ceiling tiles).

##### *4.7.4. Cable Sleeves & Conduit*

Cable sleeves and conduit shall be installed above the suspended ceiling and coordinated with cable tray paths to allow for current and anticipated cable, monitoring, alarm systems and power access to the Computer Room. Additional sleeves should be installed during initial construction to allow for future growth and expansion of capabilities. All sleeves shall be fire-stopped with reusable, pliable material.

### **5. Computer Room - Protection**

#### **5.1. Fire Protection**

##### *5.1.1. Computer Room*

The Computer Room shall be constructed to comply with NFPA 75 and local code if applicable and more stringent. Detection, alarm and suppression systems including smoke detection, Pre-Action sprinkler system and associated electrical power off (EPO) controls shall be installed in accordance with NFPA code. The installation shall also comply with the VA Fire Protection Design Manual except that VBA requires a pre-action sprinkler system instead of wet pipe. Smoke detectors and sprinklers are required below the drop ceiling. The detectors shall be configured in either a "cross - zone" or "verified" detection scheme to reduce the probability of false alarms. Systems shall be UL approved or equal. A water flow switch shall be connected to the EPO system to enable power down of all computer room equipment just prior to water being released into the computer room through the sprinkler system.

##### *5.1.2. Zones*

The computer room sprinkler and alarm system shall be on a separate zone from the rest of the building sprinkler and alarm system.

##### *5.1.3. Fire Extinguishers*

The computer room shall have the proper number of clean agent type fire extinguishers specified by NFPA 75. Clean agent shall be used so that no residue will be left in the computer room should the extinguishers be used.

##### *5.1.4. Directly Connected Spaces*

Directly connected spaces without doors to the computer room shall comply with NFPA 75 and the rest of this guide.

#### **5.2. Security**

##### *5.2.1. Windows*

Windows are not recommended: they pose security and fire-spread risks for VARO computer rooms. When windows in the computer room area are unavoidable, the windows shall comply with NFPA 75 and VA Handbook 0730/1 requirement A.

#### 5.2.1.1. Interior

No windows shall be installed to the building corridors - windows are allowed in walls shared with controlled access, i.e. the IRM office space. Small windows or light kits of less than 100 square inches in area are also allowed in doors if they meet the requirements of section 5.2.3 and NFPA fire codes.

#### 5.2.1.2. Exterior

Exterior windows are highly discouraged. At minimum, exterior windows on ground level shall have security bars installed. All exterior windows shall at least be fitted with blackout curtains for security and to minimize solar heating in the Computer Room. See the VA Handbook 0730/1 requirement A for more details.

### 5.2.2. *Interior Walls*

All interior walls shall be full height extending from the true floor to true ceiling. Depending on how the building ventilation system is designed, motor operated fire dampers may be needed to allow for proper plenum airflow. These dampers should be interfaced to the smoke detection systems to close in the event of smoke (see Article 5.3.3). Fire dampers, fresh air supplies and any access points into the computer room that exceed 0.06 m<sup>2</sup> (100 square inches) in cross sectional area, shall have a wire mesh barrier affixed to prevent unauthorized access. Compliance with this Article will satisfy security requirements and the requirements of NFPA-75.

### 5.2.3. *Door Security*

Doors and frames shall be in accordance with NFPA and VBA Information Security requirements with wire mesh inside the glass or alternatively use a burglar rated security laminate on the secure side of the window glass. Windows shall be less than 5 inches in one direction to prevent entry by any person through the window. Tamper resistant hinge pins shall be used. If removable pins are used on the door exteriors, the hinge pins shall be retained with set pins or spot welded to prevent their removal. Hollow metal doors are required for security, durability and fire ratings.

### 5.2.4. *Minimum Access Control Requirements*

These security systems and devices along with alarm systems, smoke detection and the like should be powered from the Computer Room UPS system. Refer to VA Handbook 0730/1 requirement C & Q and "VBA IRM Handbook, No. 5.02.01, HB1" Appendix A for details.

#### 5.2.4.1. Access Control Devices

Minimum access control for computer room requires using a proximity card system and electric strike for each door. Each door shall have a key activated lock in case the electric strike fails. There shall be a proximity reader with keypad on the outside and only a proximity reader on the inside of the each of the computer room doors. A badge reader on both the inside and outside will allow the employees to leave a record of how long they were in the computer room and when they left. Computer room doors shall fail secure in the event of an emergency, power failure and or device failure.

#### 5.2.4.2. Access Control System

The card reader system shall be programmed to prevent unauthorized persons from entering or leaving. Doors shall be equipped with a door status sensor so that forced exits/entries can be recorded. The card reader system shall have the capability to keep electronic access logs of reader and sensor events for at least two years in order to allow for yearly audits.

#### 5.2.4.3. Access Signs

Signs stating "Restricted Access – No Tailgating" shall be posted on permanent signs outside of each entrance.

#### 5.2.5. *Intrusion Detection System*

##### 5.2.5.1. System Requirements

Intrusion detection after hours can be accomplished by using a locally installed alarm panel. The intrusion detection system shall be installed so that entry into the room by any means is detected. The system shall have an internal automatically charging standby DC power supply and a primary AC power supply. The system shall be equipped with a local alarm of at least 80 dB and not greater than 90dB within the computer room. The system shall have an external keypad/key operated switch outside the door to the room to allow activation/deactivation of the detection system. The system shall have an automatic reset capability following intrusion detection and a low nuisance susceptibility. The system shall be capable of integration into the Access Control System required in section 5.2.4.2.

##### 5.2.5.2. Detection Sensors

The sensors shall use Passive Infrared (PIR) technology. The sensors shall be installed in such a way to cover motion throughout the computer room. A glass break sensor shall be installed where a window is part of the perimeter surface of the computer room, including mesh or other windows in doors.

#### 5.2.6. *Optional CCTV System Requirements*

If the regional office decides to implement a new CCTV system, the following requirements should be used as a baseline for implementation. CCTV is not required as part of the current VA Security Standards.

##### 5.2.6.1. System Hardware and Equipment

The CCTV system shall use an IP based communication system and have Power Over Ethernet (POE) capability. The system shall use IP server based recording software to manage the video that is recorded and have a minimum capacity of at least three (3) weeks of recorded video for all the cameras connected to the system. The server and the associated security equipment shall be connected to a UPS power supply.

##### 5.2.6.2. CCTV Camera Requirements

The cameras shall be set to record at a rate of at least 5 images per second (IPS) at a resolution of at least VGA 640x480. The cameras shall use MPEG 4 compression to best use the network bandwidth and be full color cameras. There shall be at least two (2) cameras per entrance to the computer room. One (1) shall be focused on the inside of the entrance and one (1) on the outside of the entrance. The cameras shall be dome type and have day/night capability with POE integrated into the units. Cameras shall be able to be motion activated and have security built into the network interface so that unauthorized viewing is prevented. Each camera location shall have a single drop installed to provide communications and the corresponding IDF closet shall have a dedicated POE switch to provide power to the cameras over the single drop. The switch shall be sized according to the number of cameras planned in the area of the IDF.

### **5.3. Safety**

#### 5.3.1. *Door Safety Features*

NFPA 101 required panic exit hardware & automatic closures shall be provided on all doors.

### 5.3.2. *Emergency Lighting*

Emergency, battery powered lighting shall be installed in accordance with NFPA 75.

### 5.3.3. *Emergency Power Off Controls*

Emergency Power Off controls shall be provided to disconnect power to all electronic equipment in the computer room. The EPO controls shall also disconnect the power to all dedicated HVAC systems serving the computer room. Emergency power off (EPO) push buttons with a local alarmed clear plastic cover shall be installed and located in accordance with NFPA 75 at the interior near all Computer Room exits.

## 6. Computer Room - Utilities

### 6.1. *Overhead Lighting*

Lighting level provided shall be 70 foot candles at work surface height during working hours, and measured at 30" above finished floor (AFF). Zoned lighting switches shall be provided to allow full lighting level when personnel occupy the Computer Room and a reduced lighting level, to conserve energy, when the room is not occupied. One (1) non-switched fixture shall be provided for every 500 square feet available.

### 6.2. *Electrical Power*

#### 6.2.1. *Uninterruptible Power System (UPS) and Power Distribution Unit (PDU)*

The UPS and its associated PDU are essential equipment in a VARO Computer Room. The majority of Utility power outages last less than a few minutes. A properly sized UPS enables Computer room equipment to "ride through" such outages without service interruptions. Should the Utility outage persist, a properly sized UPS will provide sufficient time for VARO personnel or server shutdown software to "gracefully" shut down the Computer Room equipment.

#### 6.2.2. *UPS Desirable Attributes*

Should new or replacement units be required, the following list of desirable attributes or better should be specified to provide the protection and versatility that VARO Computer Room systems require.

##### 6.2.2.1. Sizing

The UPS shall be sized based on the equipment requirements of the Regional Office and future anticipated growth. The attached load should not be less than 30% of the UPS capacity and not more than 70% capacity for the initial sizing. In general, 50% - 70% load should be the goal on sizing the UPS.

##### 6.2.2.2. Physical Size

The UPS and associated batteries shall fit into standard 19" racks at approximately 42" D X 20" W X 84"H each. Depending on the UPS size required for the specific RO, the UPS and associated batteries should require no more than approximately three (3) rack spaces.

##### 6.2.2.3. Connection To Utility Power

The preferred input configuration is 3 phase 120/208V.

##### 6.2.2.4. Input / Output Voltage Configuration

A 3 phase, 4 wire 120/208V input and 3 phase 120/208V 4 wire output is preferred. A 277/480V input may be acceptable dependent on pricing. Using a 277/480V input would require an input filter and step down transformer.

#### 6.2.2.5. Hold-Up Time

Batteries shall be sized to supply full rated power for 20 minutes minimum.

#### 6.2.2.6. Rectifier/Inverter Features

- Full, “on-line” solid state conversion
- IGBT technology preferred. SCR technology is acceptable
- Static bypass and automatic transfer to bypass on failure, overload or battery end of life and low voltage.
- Maintenance Bypass Switch circuit shall be internal (by UPS manufacturer). This feature allows continued operation on utility power when unit is down for service.

#### 6.2.2.7. Hot-swappable Features

Batteries and power modules should optimally be hot-swappable so that the UPS will not need to be put on maintenance bypass nor have to trip a breaker to change a power module or battery.

#### 6.2.2.8. Monitor, Alarm, and Emergency Features

- Monitor / alarm panel with power parameters, alarms, alarm history (discharge record and battery monitor desirable)
- Remote summary alarm capability (for 24 hour guard station or equal)
- “Outcall pager” function to page IRM or Engineering personnel on a UPS alarm or trouble condition. May be separate device from UPS.
- The UPS shall have dry contacts available for external alarm and control and specifically have at least one form “c” contact to signal computer equipment that the UPS is on battery for automatic server shutdown capability.
- Emergency Power Off (EPO) capability to interface with EPO push-buttons at exit doors and smoke detection system / pre-action sprinkler system.
- Server shutdown software and hardware/cable connectivity should be provided and compliant with current and planned servers.

#### 6.2.2.9. Certification & Warranty

- The UPS shall be UL listed and labeled (or equal) for use in a Computer Room in accordance with the National Electrical Code.
- Minimum one (1) year parts and labor on complete system plus battery manufacturers warranty to be provided to VA IRM.

#### 6.2.2.10. Turn-Key Quote

- Include shipping, installation, startup and training in request for quote from UPS vendor.

#### 6.2.2.11. Electrical Wiring

- Connecting utility power to the UPS should be by a qualified electrician.
- Connecting UPS power to the PDU and from the PDU to Computer Room receptacles should be by a qualified electrician.

Hines VA ITC Engineering (282/32) can review any proposals or quotations received by the Regional Offices for technical adequacy.

### 6.2.3. *PDU & Branch PDU Units*

The PDU outputs shall feed to rack mounted PDUs that are integrated into the rack system. The PDU shall have full capacity isolated neutral bus and isolated ground bus, self monitoring capabilities including trend/alarm history functions for troubleshooting and analysis which include: kW, voltage, current and power factor. The PDU shall fit into a standard 19” rack or similar space (24” W x 36” D). The rack mounted PDUs shall be connected to the main PDU using flexible corded whips of the appropriate size and rating routed in overhead cable tray. The



rack PDU whips shall be sized for length and then connected to the main PDU by a qualified electrician.

#### 6.2.3.1. Main Input Disconnect

A main input disconnect circuit breaker is required with shunt trip capability. The shunt trip shall be tied to the Emergency Power Off (EPO) circuit for manual or automatic disconnect in the event of a fire per NFPA 75 and the NEC. This breaker may be integral to the UPS unit.

#### 6.2.3.2. PDU Sizing

If the PDU contains an isolation transformer, the PDU shall be sized 20% below the UPS output rating in order to prevent UPS overload due to inrush current at startup. At least 10% spare circuits from the PDU, 20% spare spaces and 20% spare service current shall be provided. Ex. If a 42 pole PDU has only 7 breaker spaces/breakers left after providing all the current equipment power then a second PDU panel shall be added to provide the spare breaker and space capacity. The UPS and PDU shall be resized accordingly if a second PDU panel is added to make sure an overload condition is not possible.

#### 6.2.3.3. Rack PDUs

Two (2) separate side mounted metered rack PDUs shall be provided for each rack. Each rack PDU shall be fed power from separate circuits on the main PDU. The rack mounted PDUs shall use a locking plug and receptacle setup with flexible whips supply the power from the main PDU. The rack PDUs shall have the capability of metering the load on the PDU and displaying it in real time on the PDU. This will prevent overloading of circuits and possible code violations. Each rack PDU shall have a minimum of 24 outlets fed from a 3-phase circuit so that phase balancing can occur when adding loads to the rack mounted PDUs. The socket/plug type for the PDUs shall be determined by the RO server's needs.

#### 6.2.3.4. Required Branch Circuits

Branch circuits to racks shall be dual redundant feeds to equipment (two rack mounted PDUs fed from two separate circuits off the main PDU). An example of a properly redundant branch circuit would be where application loads such as "Local APPS Server, tape backup, associated CDROM drives, and monitors are grouped on the same branch circuit(s) and this branch circuit(s) does not power other application loads such as Exchange, or C & P. Two applications should not be grouped on the same breaker. Some equipment such as the Cisco 4000 Ethernet Switches and most servers have dual power supplies, this equipment shall be powered from two separate rack mounted PDUs that are powered from two separate branch circuits to avoid a common mode failure source. Additional circuit breakers, of similar size, shall be installed to provide 10% spare branch circuits and breakers as noted in 6.2.3.2. This will allow additional PDU whips to be fed from the PDU to the individual racks in the future with very little wiring required. The Contractor setting up the UPS and PDU shall work with IRM staff to determine branch circuit load grouping based on this scheme.

#### 6.2.3.5. Branch Circuit - Breaker Sizing

Branch circuits shall be sized per NEC and equipment nameplate or nominal rating for all UPS loads. Nominal ratings can be determined on some UPS manufacturers' websites.

#### 6.2.3.6. Branch Circuit - Receptacles, & Grounding

Individual branch circuits for loads outside the racking system shall be installed in solid metal conduit to associated "isolated ground" type (IG) receptacles and in accordance with NEC. A ground wire should be pulled for each circuit along with a dedicated

neutral. Neutrals feeding three phase loads shall have current ratings of at least 1.7 X phase rating to reduce neutral heating.

#### 6.2.3.7. Branch Circuit – Cable Labeling

Individual branch circuit outlets shall be labeled with the PDU number and circuit breaker number from which they originate. Rack PDUs shall be labeled with the PDU number and circuit breaker number from which they originate.

#### 6.2.4. Zero Reference Signal Ground (ZRSSG)

The ZRSSG serves to ensure that all equipment in the Computer Room including the UPS and PDU are at the same equipotential ground level. Rack grounding ties shall be installed and connected to each rack and tied back to the UPS and PDU. The UPS and PDU shall be tied into the building electrical ground per NEC.

#### 6.2.5. Emergency Backup Power

Generators may be justified on a case by case basis depending upon the reliability of local utilities and potential for natural disasters to remove electric service from the facility. This decision must be justified by the local office and approved by the Under Secretary for Benefits, The Director of VBA Office of Facilities, Access and Administration and The VBA Chief Information Officer. Emergency backup gives the Regional Office the ability to continue operations during a prolonged power outage. Another advantage is that the size of backup battery systems on the UPS, telephone switch and other systems can be reduced when generators provide backup to these systems.

##### 6.2.5.1. Generator Sizing

When generators are determined essential, they should be sized based on UPS and Generator Manufacturers' recommendations by professional engineers. Proper recommendations should minimize adverse harmonic feedback from the UPS system and allow for reasonable expansion for future requirements.

##### 6.2.5.2. Emergency Power Loads

Emergency power shall be provided for the following loads:

- Life safety, Computer Room UPS, Telephone Equipment Room, Facility IDF closets, Generator Room and essential lighting as determined by the design team,
- Security, Fire, smoke and water detection systems; Telephone Equipment Room A/C systems and EAPBX UPS system,
- All automatic temperature control systems, building chiller system, pneumatic air compressors, air dryers, local and central engineering controls; critical ventilation equipment.

##### 6.2.5.3. UPS System Automatic Transfer Switch (ATS)

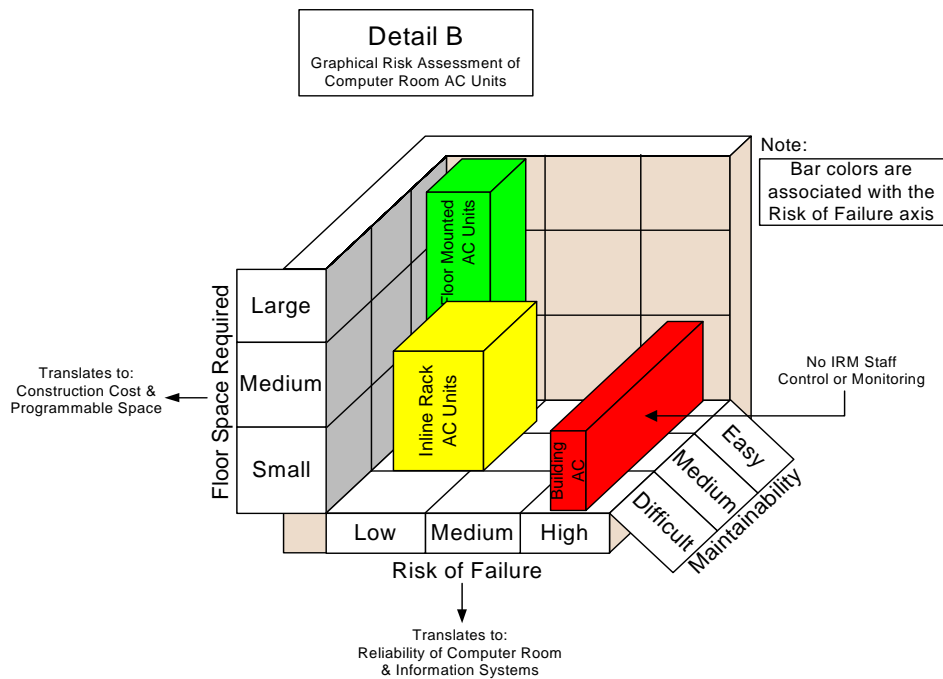
The UPS system ATS shall be of the "delayed transition type", precluding an engine start and transfer to emergency during short power interruptions that can be accommodated by the UPS battery (generally set for 50 - 60 seconds). Transfer switches shall be adjustable and set to require a nominal 10 second outage prior to generator start. Standard "break before make transfer switches" with "in-phase" monitors should be used for other than UPS loads. Upon loss of phase voltage to the ATS and a nominal 10 second delay, a start signal shall be sent to the emergency generator(s) and a transfer to emergency power shall occur when conditions are met.

**6.3. Air Conditioning / Humidification**

**6.3.1. AC Units (Quantity, Type and Risk)**

For redundancy, using two air conditioner (AC) units in the RO Computer Room are recommended. Both AC units should be operating at all times and sharing the load but able to handle 100% of the load if one unit fails or is undergoing maintenance. Sections 6.3.1.1 – 6.3.1.2 contain two possible AC unit configurations listed in order of reliability. The third section 6.3.1.3 is not an acceptable configuration for RO Computer Rooms. All units and configurations should meet the applicable requirements in the rest of section 6.3. Combinations of these configurations are also possible but not listed and may mitigate or increase the overall risk of a certain combination of AC units.

The Director of VBA Office of Facilities, Access and Administration and The VBA Chief Information Officer have approved the use of 6.3.1.1 and 6.3.1.2 for RO computer rooms. The Inline Rack AC Units should be the first choice with Floor Mounted units being the second option. If it is suggested that an alternative is better suited for the facility, then the The Director of VBA Office of Facilities, Access and Administration and The VBA Chief Information Officer must sign a waiver accepting the increased risk of the alternate AC configuration. See Detail “B” below for a graphical risk assessment of the AC unit configurations listed in this guide.



**6.3.1.1. Inline Rack AC Units**

Inline rack AC units provide an alternative to the normal space concerns that are presented with the separate floor mounted AC units. These units still allow access without the need for ladders and monitoring of the units by staff while eliminating some of the floor space taken up by conventional floor mounted AC units. The availability of the rack mounted AC units may depend on the rack system manufacturer. There are significantly fewer

manufacturers of this type of unit and this in itself presents the greatest risk for this type of unit but the space advantages outweigh any other concerns.

#### 6.3.1.2. Floor mounted AC Units

This option takes up floor space but provides the easiest way to access, maintain and monitor the AC units. This is the most reliable AC unit configuration and has been the configuration of VBA RO Computer Rooms for many years. The cooling ducts should be routed through the ceiling space in order to provide adequate distribution of the cool air in the cold isles of the computer room. When two floor mounted AC units are used, they should be positioned at opposite ends of the Computer Room.

#### 6.3.1.3. Building AC

The use of Building AC as the primary or secondary cooling method in the RO computer room is **NOT** acceptable.

### 6.3.2. *Unit Specifications*

#### 6.3.2.1. Cooling Capacity

Cooling capacity of each AC unit shall be adequate to remove all the sensible heat from the Computer Room. This heat is attributable only to the UPS loads and the heat loss due to the AC units and the UPS itself (typically 7 - 10 % for modern in-line systems). The heat load from the AC unit's compressors and fan should be integrated into the room heat load calculations. Redundancy shall be built into the system which may be chilled water, glycol or DX cooling such that failure of any one pump, compressor or blower or the like shall not result in Computer Room over-temperature. Sufficient capacity should be provided to remove 110% of the UPS rated KW loads with both compressors operating.

#### 6.3.2.2. Programmable Temperature Range

Temperature shall be adjustable and maintained between 68 and 78 degrees Fahrenheit dry bulb with no more than 1 degree / hour change allowable. The units shall have programmable microprocessor controls with local monitoring and alarm indicators / enunciators.

#### 6.3.2.3. Humidification

Humidity shall be maintained in the range of 40 - 60 % RH, non-condensing. The computer room A/C unit should be specified with an internal humidifier to maintain this humidity. Note that if low-pressure steam is available or planned, it may be cost effective to use steam humidification. Provide water or steam hookup for use by the A/C humidifiers with a valve at each unit to provide easy access for emergencies or maintenance.

### 6.3.3. *Fresh Air Supply*

A fresh air supply from the building HVAC system should be provided to the Computer Room with a fire damper where the ductwork passes through the Computer Room firewalls. This should keep the room at a positive pressure and provide cooling for radiant heat gain, conduction, convection, lighting and personnel load for the room. Design for 200 - 300 CFM building air (minimum). The incoming air should be at a maximum of 80% Relative Humidity before entering the computer room. Reference the VA HVAC Design Guide for additional information on Building HVAC systems. The fresh air duct shall comply with Section 5.2.2 "Security – Interior Walls".

### 6.3.4. *Air Filters*

Air filters shall be computer room grade, high efficiency filters as recommended by the equipment manufacturer.

#### 6.3.5. *Water detection system*

Under each AC unit and in a minimum of two additional locations in the Computer Room, (near piping unions, nominally 4 feet from floor drains, etc. to identify problems) there shall be water detectors. These detectors should report to a local annunciator panel that sounds an alarm and indicates which detector is in alarm. This panel should be co-located with the fire and smoke alarm panels and should alarm at a central security station or use a dial-out modem / out-call paging to alert support personnel.

#### 6.3.6. *Outcall Capability*

The AC system in the RO computer room shall include an outcall capability if a failure occurs in any of the AC equipment. This service or similar should be provided. If the AC equipment cannot provide the service than the below device or similar shall be provided.

#### 6.3.7. *Separate Temperature/Humidity Monitoring Devices*

In situations where the RO computer room is not staffed 24/7 and it is possible for the computer room to over heat if A/C fails, Hines ITC Engineering recommends that the RO include an auto dialing, temperature-monitoring device in the RO computer room. The unit should be easily programmed to send an alarm so that damage to critical systems such as servers, phone switch and UPS may be prevented. Hines ITC Eng. has tested a number of commercially available devices. Most are available for approximately \$400 as of January 2006. The devices we tested provided the following features:

1. Auto dial out to pagers and telephones when temperature or humidity goes out of preset limits and/or power fails in the computer room.
2. Device is complete and standalone, supported by a dedicated analog telephone line, and supported password security.
3. The device is not connected to the VBA network and is easily programmable by use of a touch-tone phone.
4. The device required acknowledgement of the alarm before ceasing to call / page employees on the preprogrammed list.
5. The device kept a record of the min/max of temperature and humidity values it measured.

We found other devices that can provide an additional feature that monitors the state of external Form C contacts (as in water detection circuits), however these units require on-site wiring and cost a few hundred dollars more. Contact Hines ITC Engineering for more information.

#### 6.3.8. *A/C Drainage*

At least one (1) floor drain shall be provided to allow drainage for A/C condensate and any water from the sprinkler system should it be activated. An automatic flushing system should be installed to keep the drain(s) free and clear and to provide a water seal to prevent odors in the associated trap from escaping. Condensate pump lines should be valved at each A/C unit to allow easy maintenance in case of an emergency.


## 7. Document Versions

<i>Version</i>	<i>Date</i>	<i>Changes</i>
1.00	9/17/04	Original Document
2.00	5/8/06	This version has major and minor changes to many sections of the document. Eliminated outdated requirements, changed sections, added and deleted sections, included VA security requirements, FIPS and NIST documents as requirements.
2.01	5/8/06	Included comments from 20S Internal Review. Changes include: Added sloped floor for drainage, adjustability height requirement for rack levelers, color camera for CCTV device, labeling section for branch circuits, fire extinguisher requirement, changed ceiling height requirements back to 9' required and 10' recommended due to the rack system having cabling on top. Minor spelling and grammar edits included.
2.02	7/10/06	Included comments from 20M31 Review. Changes include: Changing the name of the guide to "VBA Regional Office Computer Room Design Guide", adding OFAA as a list of contacts for the guide, adding HVAC as part of what OFAA will provide, took out the "or greater" in section 4.5.2. Took out "curing" description for section 4.6.2 and references to specific types of equipment in sections 5.3.2 and 6.1. Took out comments in 6.2.2.1 and 6.2.4. Took out reference to "small", "medium" and Large ROs in section 4.2.2.3. Added agreed upon DAAs to the guide in 6.2.5. and 6.3.1. Added the Section 8 (Approval Signatures) to the document. Changed the approved HVAC options to reflect agreed upon options. Revised the Risk graph to reflect the new decisions. Revised the typical RO Computer Room Layout Drawing. Minor spelling and grammar edits included.

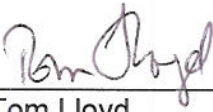
8. Approval Signatures for Use with VBA RO Computer Rooms

  
\_\_\_\_\_  
William L. Miller, Director  
Hines Information Technology Center

*August 10, 2006*  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Leo A. Phelan, Director  
VBA Office of Facilities, Access and Administration

*8/17/06*  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Tom Lloyd  
Assistant Deputy Chief Information Officer for Benefits

*August 15, 2006*  
\_\_\_\_\_  
Date

Prepared by Hines Engineering (282/32)  
Hines Information Technology Center (20S4)