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# SPECIFICATION 271100
# COMMUNICATIONS CABINETS AND EQUIPMENT ROOMS
# Rev 06-26-2013

## PART 1 – GENERAL

### 1.01 SUMMARY

A. This section includes the specifications for constructing and building out of Telecommunications Equipment Rooms (MDF/IDFs) to be used for supporting telecommunications and other special systems.

B. Upon completion of the installation, a third party field verification firm will independently verify the installation for compliance to the TIA/EIA-568-B standard and/or additional requirements as stated in this specification. Contractor shall be responsible for fully rectifying all indicated faults by the third party field verification firm in accordance with the approved project schedule

### 1.02 RELATED SECTIONS:

A. Specification 270553: Identification and Labeling of Communication Infrastructure
B. Specification 271300: Backbone/Riser Media Infrastructure
C. Specification 271500: Horizontal Media Infrastructure
D. Specification 270528: Interior Communications Pathways
E. Specification 270543: External Communication Pathways
F. Specification 270526: Telecommunications Grounding and Bonding

### 1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts:

1. Between referenced requirements: Comply with the one establishing the more stringent requirements.
2. Between referenced requirements and contract documents: Comply with the one establishing the more stringent requirements.

D. Telecommunications Industry Association /Electronic Industries Association (TIA/EIA) 568B-Commercial Building Telecommunications Wiring Standards.

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E. TIA/EIA-569A-Commercial Building Standard for Telecommunications Pathways and Spaces.

F. ANSI/TIA/EIA 607-Commercial Building Grounding and Bonding Requirements.

G. Underwriters Laboratories (UL®) Cable Certification and Follow Up Program.

H. National Electrical Manufacturers Association (NEMA).

I. National Electric Code (NEC®).

J. UL Testing Bulletin.

K. Houston Airport System Standards and Specifications

1.04 DEFINITIONS AND ABBREVIATIONS

A. Asynchronous Transfer Mode - ATM

B. American Wire Gauge – AWG

C. Computer Aided Drafting - CAD

D. Polyvinyl Chloride – PVC

E. Megabits per second - Mbps

F. Main Distribution Frame – MDF

G. Intermediate Distribution Frame - IDF

1.05 SUBMITTALS

A. Contractor shall submit the proposed layout for each communications room in the airport. This should be in accordance with the drawings in for a “typical” room layout and is required for every room.

B. The contractor will need to submit proposed layout and as-build drawings that depict the complete layout of each communications room prior to implementation. Drawings must be entered into the ECN process

C. Shop Drawings and Systems cutover schedules for all services to be submitted and approved before implementation is started. Shop Drawings to be submitted in accordance with

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Specification 01340.

D. Record Drawings: Furnish CAD drawings of all installed equipment within each communications room. All CAD work performed as part of the design effort shall be in compliance with the current City of Houston CAD standards as well as the U.S. National CAD Standard. This should apply to all CAD layering, symbols, etc.

1.06 QUALITY ASSURANCE

A. Furnish, erect, install, connect, clean, adjust, test and condition all manufactured articles, materials, and equipment, and place in service in accordance with the manufacturer's directions and recommendations except as otherwise indicated in the contract documents.

B. See Appendix A – MDF/IDF Readiness Checklist

C. See Appendix B – Typical Inspector Checklist

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. MDF space allocation shall be a minimum of 1000 sqft.

B. IDF space allocation shall be a minimum of 250 sqft.

C. The manufacturers and specific part numbers listed in this section are provided as an aid in the RFP process and are not meant to preclude other manufacturers that may be qualified to provide communications components. Other manufacturers with comparable qualifications may be proposed but shall be subject to review as an approved equivalent.

2.02 RELAY RACKS

A. Manufacturer: APC or submitted and owner-approved equivalent.

B. Seven-foot double-sided, high cable density style relay rack shall comply with following specifications:
   1. 19" rack width
   2. Double-sided universal mounting spacing
   3. #12-24 panel mounting holes
   4. Conformance to EIA-310-D
   5. Twin 2" x 2" top angles

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6. Self squaring with tapped assembly holes
7. Material: 6061-T6 aluminum alloy
8. Provide Horizontal and Vertical wire management
9. Finish: Black Finish
10. Part number: NetShelter AR201
11. Isolation kit for mounting
12. Power Strip – APC or owner approved equivalent QTY (2) The switched RACK Metered PDUs NEMA 5-20P input and Nema 5-20R AP7930, Rack PDU, Switched, Zero U, 20A, 120V, (24)5-20, input L5-20P AP7901, Rack PDU, Switched, 1U, 20A, 120V, (8)5-20, input L5-20P *(Designer to ensure all equipment power requirements are met with power strip installation)*
13. All Cabinets/Rack are to have a 24 port standard RJ45 patch panel installed with 12 ports cabled back to the Horizontal cable cabinet on a iPatch panel *(Designer to ensure enough ports are terminated to cover the equipment in each cabinet)*

## 2.03 FREESTANDING VERTICAL EQUIPMENT CABINETS

A. Manufacturer: APC Rack Systems or submitted and owner-approved equivalent.

B. General
1. The work covered here consists of the furnishing of all necessary labor, supervision, materials, accessories, parts, equipment, and services to provide and install a complete freestanding equipment cabinet.
2. The standard freestanding equipment cabinets are defined to include, but not limited to, cabinet frames, cabinet front and rear doors, top and side panels.
3. All internal cabinetry hardware shall be 19-inch rack mountable.
4. Provide and install freestanding vertical cabinets, with hinge placement as indicated in the Drawings.
5. Provide vertical and horizontal wire management for all cabinets
6. All cabinets once installed must have padlock eyes installed. Part# 60R.
7. All Cabinets/Rack are to have a 24 port standard RJ45 patch panel installed with 12 ports cabled back to the Horizontal cable cabinet on a iPatch panel *(Designer to ensure enough ports are terminated to cover the equipment in each cabinet)*

C. Standard Network cabinet:
1. Cabinets shall be fully assembled by the manufacturer with the components listed below. Individual component part numbers provided for information only.
   a. APC AR3150 42U/750mm Wide Cabinet screw/round hole

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b. AR8442 QTY (6) Kits Vertical Cable Organizer
c. AR8425A QTY (1)Horizontal Cable Organizer 1RU
d. AR8426A QTY (1) Horizontal Cable Organizer 2RU
e. AR8428 QTY (1) Horizontal Cable Organizer 2RU w/pass through
f. AR7706 QTY (1) Rail Brush Strips
g. All Network cabinets to have 24 patch panel installed. See Specification 271500
h. PDU Power Strips:
   1) Core Switch Cabinet QTY (2) The switched RACK Metered PDUs L6-20P input with at least two L6-20R for connecting Cisco 65xx switches rest Nema 5-20R/outlets AP7940, Rack PDU, Switched, Zero U, 20A, 200/208V, (21)C13 & (3)C19, input L6-20P AP7863, Rack PDU, Metered, Zero U, 5.7kW,120&208V,(21)5-20&(6)L6-20 (Metered Not Switched), input L21-20P *(Designer to ensure all equipment power requirements are met with PDU power strip installation).*
   2) All other Cabinets QTY (2) The switched RACK Metered PDUs NEMA 5-20P input and Nema 5-20R output AP7930, Rack PDU, Switched, Zero U, 20A, 120V, (24)5-20, input L5-20P AP7901, Rack PDU, Switched, 1U, 20A, 120V, (8)5-20, input L5-20P *(Designer to ensure all equipment power requirements are met with PDU power strip installation)*

D. Standard Server Cabinet:
1. Cabinets shall be fully assembled by the manufacturer with the components listed below. Individual component part numbers provided for information only.
   a. AR3150 QTY (1) 42U/750mm Wide cabinet square hole.
   b. AP7541 QTY (2) Zero U Basic PDU not managed Input 10' cord L6-30P 200/208V Output (20) C13 & (4) C19. *(Designer to ensure all equipment power requirements are met with PDU power strip installation).*
   c. AR8136 or AR8136BLK200 QTY (10/200) 1U toolless blanking panels
   d. AR8442 Kits QTY (6) Vertical Cable Organizers Zero U
   e. AR7202 QTY (1) Roof Match Kit Optional (to match height of taller US standard cabinets)
   f. All Server cabinets to have 24 patch panel installed. See Specification 271500
2. Grounding Bus Bar:
   a. Provide Rack-Mounted Ground Bar. See Specification 270526

E. Standard Wall Mount Cabinet:
   a. AR100HD QTY (1)WX Wall mount 13U screw/round hole or approve
   b. PDU Power strip: *Designer to ensure all equipment power requirements are met with PDU power strip installation.*
   c. Provided Vertical wire management

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2. Grounding Bus Bar:
   a. Provide Rack-Mounted Ground Bar. See Specification 270526

F. Co-location Cabinet – three compartment: DAMAC part number CC-RB-3-842430-XX. Shall comply with the following specifications.
1. Dimensions: 84"H x 24"W x 30"D
2. Each frame shall include six 19” EIA mounting rails untapped.
3. Cabinet shall have three compartments with two divider shelves.
4. Frame construction shall be of fully welded 16 gauge tubular steel.
5. Frame shall have four adjustable levelers.
6. Frame bottom shall have four weld-in floor-mount gussets.
7. Frame shall be capable of supporting 1000 pounds of equipment.
8. Cable routing to top of cabinet shall be in a 2” x 2” rear duct and shall be secure in each cabinet.
9. Cabinet shall have a ventilated base frame.
10. Front doors: Custom 1/3 door, Plexi-glass, right hinge placement
11. Rear doors: Custom 1/3 door, louvered, right hinge placement
12. Side panels shall be fully perforated.
13. Mounting hardware shall be included.
14. Each compartment shall be supplied with Master lock combination change-list (five combinations).
15. Provide and install one power strip in each compartment. Mounting rails shall have rack unit labels reference 270553.
16. Isolation kit for floor isolation
17. Provide Rack-Mounted Ground Bar. See Specification 270526

G. Co-location Cabinet – two compartment: DAMAC part number CC-RB-3-843030-XX. Shall comply with the following specifications.
1. Dimensions: 84"H x 30"W x 30"D
2. Each frame shall include six 19” EIA mounting rails untapped.
3. Cabinet shall have three compartments with two divider shelves.
4. Frame construction shall be of fully welded 16 gauge tubular steel.
5. Frame shall have four adjustable levelers.
6. Frame bottom shall have four weld-in floor-mount gussets.
7. Frame shall be capable of supporting 1000 pounds of equipment.
8. Cable routing to top of cabinet shall be in a 2” x 2” rear duct and shall be secure in each cabinet.
9. Cabinet shall have a ventilated base frame.
10. Front doors: Custom 1/3 door, Plexi-glass, right hinge placement

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11. Rear doors: Custom 1/3 door, louvered, right hinge placement
12. Side panels shall be fully perforated.
13. Mounting hardware shall be included.
14. Each compartment shall be supplied with Master lock combination change-list (five combinations).
15. Provide and install one power strip in each compartment.
16. Mounting rails shall have rack unit labels reference 270553.
17. Provide Rack-Mounted Ground Bar. See Specification 270526

2.04 WALL BACKBOARDS

A. All walls in telecommunication rooms (MDF/IDF's, Tenant etc.) will be covered with ¾ inch plywood installed in 4 x 8 sheets.

B. Plywood shall be A/C grade or better void-free with A grade side facing out.

C. Plywood shall be and either fire-rated or treated on all sides with at least 2 coats of fire-resistant light-colored paint. Fire-retardant plywood is also generally acceptable.

D. Plywood to be installed 6 inches above finished floor or raised deck.

2.05 IDENTIFIERS, LABELS AND LABELING SYSTEM

A. All Identification and Labeling shall follow Specification: 270553–Identification and Labeling of Communication Infrastructure. **Any deviation from the specification must be approved by HAS IT prior to installation.**

2.06 Energy Efficient Lighting for IDFs

A. General
1. The work covered here consists of the furnishing of all necessary labor, supervision, materials, accessories, parts, equipment, and services to provide and install a complete lighting system.
2. Lights shall be LED and controlled by an occupancy sensor so lights are turned off when the room is not occupied.

2.07 Energy Efficient Lighting for MDFs Computer rooms

A. Manufacturer: Redwood Systems or submitted and owner-approved equivalent.

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B. General

1. The work covered here consists of the furnishing of all necessary labor, supervision, materials, accessories, parts, equipment, and services to provide and install a complete lighting system.
2. System must be cabled to the HAS network so it can be remotely managed.
3. System must be configured with installed occupancy sensors, to facilitate the lights being turned off when the room is not occupied.

C. Lighting System

1. RE64-2G-120-250-ROS – Redwood Engine – 2U rack or wall mountable LED power and control core component with 64 20W channels. Unit is capable of 1280W output per engine.

2. RPC-RJ45-1G – 84" stranded core cable that connects a single bank on the Redwood engine and extends a cluster of 8 cables to a standard patch panel with RJ45s.

3. POWERCORD-TBD-120-250 - Power cord for Redwood Engine.

4. RG-2G-TBD2CHAN (MAXLITE 2X2) – Redwood LED Gateways work with Redwood certified fixtures to turn fixtures on. Off or dim them. They receive low-voltage power from and communicate with the Redwood Engine via low-voltage or category cable. The Gateway stores fixture-specific information that assists in installation and commissioning and measures current and voltage for a fixture for accurate power metering. The Gateway connects with and is used in conjunction with a Redwood Sensor that contains a set of environmental data collectors such as light level, temperature and occupancy and sends that data back to the Redwood Engine.

5. RS-2G – The Redwood Sensor collects data on light levels, occupancy and temperature. It connects ta, and communicates with the Redwood Gateway via pre-terminated RJ45 cabling to deliver data to the Redwood Engine.

6. RD-1G-W – Redwood Dimmer allowing manual override control of lighting levels for associated locations. Requires 1 channel as Redwood Engine for power and control, single gang cut-in ring or surface gang box. Removable front plate. Available in white.

7. LOT REDWOOD MATERIALS

8. RSC-1G-FSUC-51 – Factory commissioning for (5) five or less includes (1) one onsite visit by a Redwood Systems Certified Professional Commissioning agent company representative during normal business hours. Visit will include diagnosis and guidance

on correction for installation failures (<5% of total installation). Visit will also include configuration of location groups and hierarchies at the commissioning representatives' discretion, placement of fixtures within configured locations, assignment of policies for all locations at the commissioning representatives' discretion, calibration of fixtures for daylight harvesting, operational testing of system configuration including functional test, and site staff training. Requires all Engines, Adapters, and fixtures to be installed and terminated prior to arrival with line voltage circuitry and power connection to Engines completed by others.

9. Redwood 1 Year Support – (1) One year support for all Redwood componets.

10. Maxlite – MLCP-22-D-40-41 2X2 (Redwood Enabled) – Lighting fixture.

11. All UTP cabling must follow section 271500 and all other HAS standards.

PART 3 – EXAMINATION

3.01 VERIFY FOR MINIMUM CRITERIA

A. Verify the following:

1. Minimum size of MDF is 1000 sqft.

2. Minimum size for IDF is 250 sqft.

3. HAS does not share MDF/IDF space with any other tenant and must be separated by a physical barrier be it a fence or wall. All tenants communication systems cabling and equipment shall be installed in the HAS controlled tenant space, as defined in the third item in this section. This shall apply to all tenants that do not have a dedicated MDF or IDF space for their individual telecommunications systems.

4. Conduit, raceways, and boxes are properly installed in accordance with BISCI recommended practices, ANSI/TIA/EIA 569B standards, and the City of Houston Intercontinental Airport Premises Distribution System Design Standards.
5. Conduit is minimum 1 -inch diameter.

6. Main grounding system is properly installed and tested.

7. The MDF is equipped with a smoke detector connected to the building alarm fire panel.

8. Portable fire extinguishers are provided and maintained within 75 feet travel distance from any part of the occupied space within the MDF per local code requirements. The

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size of the extinguisher shall be a minimum rating of 2-A:10-B:C

9. Ceiling protrusions have been placed to assure a minimum clear height of 8 feet 6 inches to provide space over the equipment frames for cables and suspended racks.

10. The doors are a minimum of 3 feet wide by 6 feet, 7 inches tall. If it is anticipated that large equipment will be delivered to the MDF, a double door 6 feet wide by 7 feet, 5 inches tall is recommended. The doors shall be keyed separately from other facility keys. Preferred method for keying communication room is badge access, limited to only IT personnel and related vendors. Doors shall open outward and be lockable. Access shall allow for future equipment changes. Door shall be fire rated for a minimum of one hour, or more as required by local code requirements.

11. Signage is consistent with Houston Airport System

12. The floor is sealed concrete or tile to minimize dust and static electricity. Carpet is strictly prohibited.

13. Floor loading capacity in the MDF is designed for a minimum distributed load rating of 100 lbf/ft² and a minimum concentrated load rating of at least 2000 lbf.

14. All HVAC systems that provide environmental conditioning (24 hours per day, 365 days per year) and UPS shall be connected to a motor generator for those cases of extend power outages.

15. The air handling system for MDF/IDF equipment rooms is designed to provide positive air flow and cooling even during times when the main building systems are shut down. This may require separate air handlers and/or small stand-alone cooling systems that are thermostatically controlled in this space.

16. Heating, ventilation, and air conditioning sensors and control equipment are located in the MDF/IDF.

17. The room temperature is between 64°F and 75°F, with a relative humidity between 30% and 55%.

18. Designer to provide heat load analysis for all equipment cabinets..

19. The MDF/IDF is protected from contaminates and pollutants that could affect operation and material integrity of the installed equipment. When contaminates are present in concentrations greater than indicated in ANSI/TIA/EIA 569-A, Table 8.2-2, vapor barriers, positive room pressure or absolute filters shall be provided.

20. Positive air pressure differential is maintained with respect to surrounding areas.

21. Lighting to provide a minimum equivalent of 50 foot-candles when measured three feet

above finished floor. The light fixtures shall be mounted a minimum of 8 feet, 6 inches above the finished floor. The light switches are located near the entrance of the MDF/IDF. Power for the lighting is from the same circuits as power for the telecommunications equipment. Emergency lighting has properly been placed that an absence of light will not hamper emergency exit. Lights must be energy efficient LED lights control by approved room lighting system utilizing UTP cabling.

22. The MDF/IDF cabinets are equipped with a minimum of two dedicated electrical circuits appropriately sized for equipment to be installed. Separate duplex 120V AC convenience outlets (for tools, test sets, etc.) shall also be installed at 18 inches above the finished floor at 6-foot intervals around perimeter walls. The outlets shall be on non-switched circuits and they shall be identified and labeled.

23. The MDF/IDF is provided with an electrical ground on a 4-inch or larger busbar as defined by NEC Article 250-71(b). The busbar shall be mounted 6 feet, 6 inches above the finished floor if ladder racking is included in the design. If ladder racking is not part of the design, the busbar shall be located near, but not behind, the riser sleeves between floors. This grounding bar is connected to a main building ground electrode, reference ANSI/EIA/TIA-607. (Refer to Specification 270526)

24. Connection between the MDF and IDF will be connected with both unshielded twisted pair Category 6 cable, when distance is less than 90 meters and fiber optics cable if the distance is beyond 90 meters. Fiber optics cable should include single-mode and multi-mode. The type of cable, actual count and termination of the fiber will be determined at the planning stage, taking into consideration the amount of network traffic between closets, the distance between the communications rooms and the difficulty of running other cables at future dates.

25. The MDF/IDF is equipped with a single Room wide Uninterruptible Power Supply that supports all active electronics for a minimum of 30 minutes. UPS will be connected to an emergency power such as motor generator for those cases of extend power outages. Designer to size for 50% growth.

26. All walls of MDF/IDF are lined with Trade Size 3/4-inch AC-grade plywood, 8 feet high. Plywood will be mounted vertically starting 6 inches above finished floor and shall be securely fastened to the wall-framing members. Plywood to be fire treated and painted with two coats fire-retardant paint.

27. Additional equipment such as fire alarm panels and/or building monitoring devices are not be housed in the MDF/IDF. Separate space for these services can be provided as part of the electrical room or in a separate space.

28. These rooms should be on separate fire protection loops, and a “dry” fire protection system such as FM-200 or Inergen for MDF and preaction for IDF’s should be used. However, an acceptable alternative for intermediate special systems rooms is a “dry” pipe sprinkler system, or no fire protection if enclosed by fire rated walls.

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29. Access to the MDF/IDF shall be directly from hallways, not through offices, janitorial or mechanical rooms.

30. The MDF/IDF is located as close as possible to the center of the area served and preferably in the core area.

31. The MDF/IDF is located in any place that may not be subject to water or steam infiltration, humidity from nearby water or stream, heat, and any other corrosive atmospheric or environmental conditions.

32. The MDF/IDF is not located near electrical power supply transformers, motors, generators, x-ray equipment, radio transmitters, induction heating devices, and other potential sources of electromagnetic interference.

33. The MDF/IDF does not share space in or be located near or below electrical closets, boiler rooms, washrooms, janitorial closets, and storage rooms.

34. If any of these items are not provided, contact the HAS/IT representative.

3.02 INSTALLATION

A. Install work following drawings, manufacturer's instructions, and approved submittal data.

B. All installation shall be done in conformance with TIA/EIA 569B and BICSI installation guidelines. Failure to follow the appropriate guidelines will require the Contractor to provide, in a timely fashion, the additional material and labor necessary to properly rectify the situation.

C. The contractor shall adhere to the installation schedule of the general contractor and should attend all construction meetings scheduled by the general contractor.

D. As a general practice for rack mounted equipment, the contractor shall run power cables, control cables, and high-level cables on the left side of an equipment rack as viewed from the rear. The contractor shall run other cables on the right side of an equipment rack as viewed from the rear. For equipment mounted in drawers or on slides, provide the interconnecting cables with a service loop of not less than three feet and ensure that the cable is long enough to allow full extension of drawer or slide.

E. All racks and cabinets shall be floor mountable by design and permanently fixed to the floor with bolt-down kits. Manufacturer's procedures for floor mounting should be followed. Multiple racks and cabinets shall be connected together directly or indirectly via horizontal cable management hardware as indicated by drawings.

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F. A minimum of 2 feet shall be left at the end of the row of equipment bays. A minimum of 5 feet between walls and equipment bays will allow space for wall mounted copper cable terminations and the required 36" distance from equipment for work space.

3.04 CONTRACTOR'S FIELD QUALITY CONTROL

A. The contractor shall be responsible for performing field inspections to ensure that all communications are installed in accordance with the contract drawings, specifications, and City of Houston requirements prior to the performance of field inspections by the City.

B. Should there be any discrepancies or a question of intent, refer the matter to the City for a decision before ordering any equipment, materials or before starting any related work.

C. The City shall perform field inspections and note all discrepancies that must be corrected prior to system acceptance.

END OF SECTION

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# Appendix A

***(These Guidelines are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer/Contractor/Installation Team.)***

This list below is intended as a minimum checklist. CM should ensure that the contractor's schedule has built in these components and the necessary buffer period – and associated access restrictions to the communications equipment rooms -- for HAS IT and tenant IT to prepare.

1. All communication rooms that will service the area to be opened must be completed. That means a final walkthrough of these areas has been completed. It is not necessary that the entire project achieve substantial completion, but IT cannot install equipment and begin work until the following minimum criteria is met:
    a. Space is built out and clean – free from dust/residues.
    b. Electrical w/UPS as required.
    c. All racks/cabinets installed and mounted. Padlocks eyes have been installed.
    d. Grounding bus bar installed and properly tied to main grounding bus bar in MDF
    e. HVAC functioning properly and is adequately filtering dust. Humidity is controlled.
    f. Door access control is installed (card reader) -or- an approved temporary provision. Simple key access is not permissible.
    g. Lighting is installed and operational.
    h. Cable trays/ladder racks installed and ready to use.
    i. Permanent or temporary signage identifying permanent room number.

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2. All cabling necessary to operate the areas to be opened is completed.
    a. Backbone cabling (copper and fiber) from the applicable communication room(s) is installed, tested, labeled, and approved by the inspector and communications design consultant.
    b. Horizontal cabling for all areas to be occupied is installed, tested, labeled, and approved by the inspector and communications design consultant.
    c. Copper cross connects and/or fiber jumpers have been installed per the owner/tenant requirements.
    d. Cable records and redline drawings for installed cables are submitted and approved PRIOR to putting any active circuits on the new cables. Cable records reflect all installed cables * * and* * any cross connects or jumper assignments installed by the contractor.
    e. All iPatch Panels are programmed and operational.
    f. All jumpers and patch cords specified by the contract are transmitted to the owner for use.
    g. NOTE: cable labels and permanent room numbers need to match. CM needs to be sure to get design team, airport, IT, and CM / contractor reps together to review permanent room numbers prior to contractor installing cable labels.

3. Move-in buffer period needs to be minimum 6 weeks for HAS-IT to install/extend services within the area to be occupied prior to occupation of the facility or spaces. Additional time may be necessary if Tenant IT organization is involved, or if contractor has other systems that must be configured/tested which require HAS-IT resources (i.e. cabling or data network connections). This is frequently the case for PA System, television, radio, Fire Alarm, pay telephone, EFSO (Electronic Fuel Shutoff), access control & CCTV, etc.

4. Once HAS-IT accepts a communications equipment room and begins to install/configure equipment in preparation for hosting live applications, this room becomes a restricted area with access to be controlled by HAS-IT. Contractors must be substantially complete with systems <u>inside</u> the communications equipment room so that access is generally not required. Minor punch list and scheduled testing with escort can be arranged, but access will be very limited.

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5. Other IT-related systems that must be operational, tested, and accepted or approved temporary provisions.
    a. PA System
    b. MATV and/or CNN TV (where applicable)
    c. Fire Alarm
    d. MUFIDS
    e. Pay Telephones (where applicable)
    f. EFSO (where applicable)
    g. Access Control & CCTV (note: must be PROGRAMMED, and approved acceptance test walk through by HAS)
    h. Crash phone (where applicable)
    i. Radio system enhancements (where applicable)
    j. Data Network switch installed and configured.

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# Appendix B

***(These Guidelines are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer/Contractor/Installation Team.)***

| **IDF Number:** | | **Date:** | | |
|---|---|---|---|---|
| | | | | |
| Grounding & Bonding: | | **YES** | **NO** | **COMMENTS** |
| | TGB properly installed | | | |
| | Proper grounding conductor installed (6AWG min.) | | | |
| | Cable trays properly bonded | | | |
| | Equipment Racks, Armored Cables & Cabinets properly bonded | | | |
| | Conduit properly bonded | | | |
| | Cabling properly bonded | | | |
| | Splice Cases properly bonded | | | |
| Horizontal Cabling: | | **YES** | **NO** | **COMMENTS** |
| | Routing | | | |
| | Cables properly supported | | | |
| | Pull tensions properly recorded | | | |
| | Sheath damage | | | |
| | Bend radius observed | | | |
| | Pair twist meets spec | | | |
| | Proper termination scheme | | | |
| | Cable/jack part number meets spec | | | |
| | Plenum vs. PVC | | | |

***(These Guidelines are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer/Contractor/Installation Team.)***

| | | | | |
|---|---|---|---|---|
| | Properly dressed in tray | | | |
| | Properly dressed in cable management | | | |
| | Cables bundled properly | | | |
| | Appropriate clearances observed (power) | | | |
| | Minimum about of cable exposed at termination | | | |
| Backbone Cabling: | | **YES** | **NO** | **COMMENTS** |
| | Fiber strain relief properly applied | | | |
| | Routing | | | |
| | Cables properly supported | | | |
| | Pull tensions properly recorded | | | |
| | Sheath damage | | | |
| | Bend radius observed | | | |
| | Properly dressed in tray | | | |
| | Fiber installed in inner duct | | | |
| | Properly dressed in termination shelf | | | |
| | Any splice cases properly supported | | | |
| Room Layout: | | **YES** | **NO** | **COMMENTS** |
| | Room laid out according to project drawings | | | |
| | Proper clearances maintained | | | |
| | Is the room clean & neat in appearance | | | |
| | Liquid carrying pipes within the room | | | |
| Pathways: | | **YES** | **NO** | **COMMENTS** |

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| | | | | |
|---|---|---|---|---|
| | Conduit properly routed & supported | | | |
| | Cable Tray properly routed & supported | | | |
| | Inner Duct used to route fiber and properly supported | | | |
| | | | | |
| Labeling: | | **YES** | **NO** | **COMMENTS** |
| | Grounding conductor | | | |
| | End-to-End labeling | | | |
| | Pair Count on Splice Case | | | |
| | Horizontal Cabling | | | |
| | Fiber Optic Cabling | | | |
| **Other:** | | **YES** | **NO** | **COMMENTS** |
| | Appropriate fire stop material in place | | | |
| | Cabling test results submitted with proper information | | | |
| | Climate controlled environment (Temp. & Humidity) | | | |
| | Is the room access controlled | | | |
| **Copper Cabling:** | | | | |
| | Total Pairs (Riser) | | | |
| | Pair Counts | | | |
| | Termination Type (66, 110, Protectors..) | | | |
| | Termination Location | | | |
| | | | | |

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| | | |
|---|---|---|
| | | |
| **Fiber Optic Cabling:** | | |
| **Multimode:** | | |
| | **Total Strands** | |
| | Termination Type (LC, SC) | |
| | Termination Location | |
| | | |
| **Single Mode** | | |
| | **Total Strands** | |
| | Termination Type (LC, SC) | |
| | Termination Location | |

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End of Appendix