Houston Information Technology Systems (HITS)

Facility Information Technology Standards

Version 5.0
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PART 1 - GENERAL INFORMATION

1.1 PURPOSES

A. The purpose of the Facility IT Standards is to define a set of guidelines for deploying and managing the growing communications infrastructure in the City of Houston. The goal is to establish an efficient, logical, cost-effective, and strategic foundation for the support of the physical communications layer installed for the City's IT systems. Following this standard will ensure that citywide installation of all physical infrastructure - both inside and outside - will meet end-user needs, current industry safety standards, technical and performance specifications, and warranty requirements for all systems and equipment. This document is to be used as a minimum requirement guideline.

B. This document assumes that the user is familiar with distribution systems, with the cable and hardware used within, and with the installation of cabling in many different environments; including, but not limited to, local area networks (LANs), metropolitan area networks (MANs), wide area networks (WANs), and campus distribution systems. It is not intended to be a training manual in communications distribution systems or to replace existing industry standards.

1.2 APPLICABILITY

A. This communications infrastructure is intended to serve a wide range of usage, such as to provide telephone/data service, computer networks, Cable TV services, network infrastructure to support other building systems (building automation system, electronic security system, audio-video system, digital signage, room scheduling system, etc.). The communication system should follow the same standard citywide.

B. This Standard shall be followed for all projects involving the provision of communications cabling and services in facilities owned or leased by City of Houston. The Standard and design guideline specifications provide a minimum configuration that must be followed when planning new construction, remodeling and or any additions, moves, or changes of an existing facility. HITS must be consulted during the early planning, design and construction phases of the project for project specific requirements.

C. This standard document will be reviewed and updated if deemed necessary when new products or technologies are available, or City's Communications program requirements change. All projects still in planning or design phase on the day of release shall follow the newly released Standard. For projects already under construction, the project team shall make the best effort to implement the newly release Standard, and consult with HITS representative on what can be done for items which do not meet the new Standard.

1.3 ROLES AND RESPONSIBILITIES OF HITS

A. HITS (Houston IT Service) department is responsible for the City's network connectivity and communications infrastructure. HITS will always assist end users in evaluating both standard practices and alternatives, recommending design solutions that are technically appropriate to meet the department's present operational and business needs, and those of the foreseeable future. The responsibilities of HITS in a communications project include:

1. Develop and update the Facility IT Standard.
2. Review and approve Request for Variance to the Standard.
3. Review and sign off IT engineering design documents (drawings and specifications) produced by architect/engineer team.
4. Review and sign off IT Product Submittals and Shop Drawings from the contractors
5. Inspect the installation of IT systems and provide a list of items in need of correction

B. Please note that HITS sets the IT standards, and will provide any guidance or interpretation if needed to help the project team implement the Standard , but HITS is NOT responsible for the engineering design or installation of the IT system, unless otherwise noted. The Architects/Engineers and/or construction team shall be responsible for the IT system's engineering design, and shall hire qualified

engineer/consultant (RCDD certificate holder) to perform the design tasks, and get approval from user group (each department) on locations and quantity of all IT field devices and outlets required for the project.

C. In addition, HITS will review the design documents and inspect the installations to help the project Architects/Engineers team and construction team to follow/implement the Standard. But that does not relieve their responsibility to provide an IT system in full compliance with this Standard.

1.4 ROLES AND RESPONSIBILITY OF ARCHITECT/ENGINEERS

A. For all projects designed by the architect/engineer team, the responsibilities of architect/engineer team include the following, but not limited to:

1. Include qualified IT system designers/engineers (RCDD) in their team, and provide a complete engineering design of the IT system.
2. Coordinate with Mechanical, Electrical, Plumbing, Structural, Civil, etc., on building systems supporting the IT systems, such as cooling, power, fire protection, lighting, etc.
3. Verify with user group (department) on program requirements (IT device type, mounting height and locations) throughout the project scope of work area.
4. Schedule review meeting at each milestone deliverable (SD, DD, CD) and present the IT system design to HITS representatives to demonstrate that the IT system planned meets City's standard and project program requirements.
5. Review and obtain signoff from HITS team on the IT system design at each milestone deliverable (SD, DD, CD), especially the IT Room size, location and layouts. Please note that signoff by HITS only indicates that specific items brought up for review have been approved, and this signoff does not relive them from the responsibility of providing a IT system design that is fully compliant with this Standard and other applicable codes and regulations. The Architects and Engineer shall be liable for any cost associated with the correction to the design and installation, if found NOT in compliance with this Standard.
6. Ensure that the permanent link distance (from outlet faceplate to patch panel, including up and down, and cable service loops at each end) of all horizontal data cable runs are within the 295-ft distance limit, if installed following the scheduled horizontal cabling pathway (not in a bird fly fashion).

1.5 ROLES AND RESPONSIBILITIES OF COMMUNICATIONS CONTRACTOR

A. Communications contractor is tasked with providing materials and labor required for the installation of a complete functioning IT Communications system. The Communications contractor's responsibilities include, but not limited to:

1. Provide product submittals for review and approval before placing an order.
2. Provide shop drawings for review and approval before installation starts.
3. Coordinate with other trades on the installation schedule and clearance required.
4. Furnish and install the Communications system that meets all the codes and standards applicable, and the project specifications. Refer to Appendix A – IT Construction Project Responsibility Matrix for more information.
5. Notify project architects/engineers and HITS before installation to start if any of the horizontal data cable runs might be over the distance limit (295-ft including the ups/downs, cable service loops) per TIA standards. Contractor shall take the responsibility to make any correction needed to bring the cable runs under the distance limit if the cables are installed without prior notice and approval from HITS. The A&E team shall share the responsibility if the engineering design does not allow the installation to meet the distance limit requirement, if installed following the industry standard and best practices.
6. Test and label the IT systems installed.
7. Provide Closeout documents including test reports, warranty, as-built drawings, etc. to HITS.

8. Obtain written acceptance letter from HITS.

1.6 QUALITY ASSURANCE

A. Communications System Designer/Engineer

1. The lead designer for the IT system shall have a valid RCDD certificate and a minimum of 10 years of Communications design project experience.
2. The Architect/Engineer team shall include the resumes and certificates of the Communications design team in the RFQ submittals.
3. HITS reserves the right to review and approve any personnel assigned to do the Communications system design and engineering work.

B. Communications Contractors

1. The contractor shall be certified by the manufacturer of the products, adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this Project, and be able to provide 25-year Extended Product Warranty for all fiber and copper cable system installed.
2. All members of the installation team shall be certified by the manufacturer as having completed the necessary training to complete their part of the installation. Resumes of the entire team shall be provided along with documentation of completed training courses.
3. Must be supervised on-site by a BICSI RCDD who has a minimum of five (5) years of Communications design experience and can demonstrate knowledge and compliance with all BICSI, TIA, UL, and NEC methods, standards and codes.
4. The contractor shall provide five (5) references for projects of equivalent scope, type and complexity of work completed within the last five years.
5. Cable splicing personnel shall have a minimum of five (5) years of splicing experience and shall have completed a minimum of five major splicing projects.
6. HITS reserves the right to review and approve any personnel assigned to this project. Contractors shall submit certificates of their personnel assigned to this project for review and approval, typically during the project proposal/bidding and product submittal process.

C. Communications System Design Drawings

1. All Communication drawings shall be prepared and stamped by a registered RCDD following standards and guidelines set forth in the most recent City of Houston Facility IT Standard.
2. All Communication drawings shall be in "T" series and separate from the architectural and electrical drawings. Showing IT system's scope of work on Architectural or other building system's drawings is NOT acceptable.
3. Communications system drawings shall include, as a minimum, the following:
    a. Communications Legends and Notes sheet.
    b. Communications Site Plan sheet to show raceway for incoming services, customer owned OSP raceway, devices and cabling, if any.
    c. Communications Overall Floor Plan sheets to show the boundary of the areas served by each Communications Room, the maximum horizontal Data cable run distance and route, callout for each Communications Room.
    d. Communications Floor Plan sheets (minimum 1/8" =1' scale) to show floor and wall mounted communications devices and outlets with exact port count per outlet.
    e. Communications RCP Plan sheets (minimum 1/8" =1' scale) to show ceiling mounted communications devices and outlets with exact port count per outlet, overhead cable tray and conduit pathway.

f. Communications Room Enlarged Plan and Rack Elevations (minimum ½" =1' scale) sheets

g. Communications Riser Diagrams sheet to show backbone and riser cabling and pathway, communications grounding and bonding.

h. Communications Detail Sheets.

4. Minimum level of Communications system design details shall be included in the milestone design deliverables:

a. 100% Schematic Design (SD)

1) Site Plans showing the incoming service raceway, manholes/handhole and OSP raceway between customer owned buildings on campus, if applicable

2) Communications Overall Floor Plans with callout of MDF/IDF rooms and serving boundary of and projected maximum cable run distance from each Communication Room.

3) Enlarged MDF/IDF Room Plans showing the room dimensions and layout of equipment racks.

4) Communications Pathway Riser Diagrams

b. 100% Design Development (DD)

1) All from 100%SD Plus

2) Communications Legend and Note Sheet

3) Site Plan, Floor Plans and Ceiling Plans with all Communication system devices and Voice/Data/WiFi outlet

4) Cable trays and/or conduits as the trunk pathway from MDF/IDF rooms to work areas

5) Enlarged MDF/IDF Room Plans with layout of plywood wall field, overhead cable tray, equipment room racks and wall mounted equipment

6) Communications Cabling and Grounding Riser Diagrams

c. 100% Construction Documents (CD)

1) All from 100%DD Plus

2) All Communications devices, outlets, cable trays/conduits are coordinated with other building systems and free of collision.

3) All Communications devices and outlets' mounting height and locations have been coordinated and clearly indicated

4) Enlarged MDF/IDF Room Plans with Rack Elevations, horizontal and vertical runways, sleeves penetrating walls, floor and ceiling of Communications Rooms.

5) Power, Cooling, Light Fixtures, Floor Finish, Ceiling Finish, Fire Protection, Access Control and Video Surveillance, Conduit/Sleeve Penetrations and etc. related to all Communications Rooms have been coordinated with Architects, MEP, and Structural engineers and incorporated into other building system's architectural/engineering drawings.

6) Communications Detail Sheets

D. Communications System Specifications

1. The specifications for Communications system shall follow the most recent CSI MasterFormat standard (in Division 27).

2. The Communications specifications shall include the following sections as a minimum, if applicable:

a. Section 270000: Communications
b. Section 270526: Grounding and Bonding for Communications Systems
c. Section 270528: Interior Pathways for Communications Systems
d. Section 270543: Exterior Pathways for Communications Systems
e. Section 270553: Identification for Communications Systems
f. Section 271100: Communications Equipment Room Fittings
g. Section 271300: Communications Backbone Cabling
h. Section 271500: Communications Horizontal Cabling
i. Section 272100: Data Communication Network Equipment

E. Communications System Product Submittals

1. Contractor shall submit product cut-sheets that include manufacturer, trade name, and complete model number for each product specified. Model number shall be highlighted to indicate exact selection.
2. Contractor shall submit the proposed system test equipment with certification of test equipment calibration. All test equipment shall have a calibration date within one year of projected test date. Installer is to recalibrate and resubmit if necessary.
3. Contractor shall submit a list of previous ten (10) other projects completed in the last five (5) years
4. Contractor shall submit manufacturer certifications of all installers assigned to this project for review and approval.
5. All product data sheets shall be organized by specification sections and provided with index sheet and table of contents. All products required shall be included in one submittal.
6. All product substitutions shall be submitted in advance for review and approval before being included in product submittal package.

F. Communications System Shop Drawings

1. Contractor shall submit, for approval, floor plans that identify all device and outlet locations, device and outlet ID, cable routes and quantities, cable types, riser locations, and references to installation details and diagrams.
2. Contractor shall notify A&E team of any cable routes that will exceed the permanent link distance limit and get approval before work to start. Without advance notice and approval from A&E team, the contractor shall be fully responsible for make corrections as needed to bring all installed cables within the distance limit.
3. Contractor shall submit, for approval, enlarged communications room layouts, rack layouts and elevations of walls and equipment racks, cabling riser and interconnection diagrams, etc.
4. Contractor shall submit, for approval, the labeling scheme for all communications devices, cabling components (faceplates, horizontal cables, riser cables, inter-building cables, patch panels, etc.), equipment racks and equipment installed.
5. Shop Drawings shall show the proposed firestop systems and locations, (stamped/embossed by the PE) to restore/maintain the designed fire rating of the building structure (walls, ceilings, floors, etc.), and waterproofing details for all penetrations to exterior walls and roof.
6. Shop drawings shall be developed in coordination with other trades (MEP, Architecture, Structural, etc.) to avoid any collision or conflict and to meet all industry standards best practices, codes and regulation requirements. By submitting shop drawings on the project, this Contractor is indicating that all necessary coordination has been completed and that the systems, products and equipment submitted can be installed in the building and will operate as specified.

7. **Shop drawings shall be developed in AutoCAD or Revit and properly scaled. Submitting redline drawings (PDF markup) or a clone copy of the engineering design drawings as shop drawing is not acceptable.**

G. Communications System Closeout Documents

1. Closeout documents shall include but not limited to:
   a. Cable Test Report
   b. Manufacturer's Extended Product Warranty (25-year)
   c. Contractor's Warranty (minimum 1-year from the date of final acceptance by Owner)
   d. Approved Product Data Submittals
   e. **Communications as-built drawings in both AutoCAD and PDF.**

H. Communications System Design and Installation Process

1. Planning Phase: HITS shall be provided with advanced notice of all approved construction projects. This notice should be provided as soon as the funding for the project has been approved or as early as possible in the architectural and engineering design process.
2. Design Phase: When a new project, building, or building renovation is planned, architectural/engineering drawings are typically released for review to HITS in the following order:
   a. Schematic Design (SD) - These are the initial planning documents and design drawings that assist departments in the early stage of the project. HITS shall be provided Schematic Design (SD) documents for review and be provided a minimum of five (5) working days from the date documents are received by HITS for review and return of comments.
   b. Design Development (DD) - As the architectural design process progresses, overlays are developed to show the various structures and systems planned for the building. HITS shall be provided Design Development (DD) documents for review at each stage (50%DD, 100%DD, etc.) of the design development process and be provided a minimum of ten (10) workdays from the date documents are received by HITS for review and return of comments.
   c. Construction Documents (CD) - These documents depict the final design before bid submittal is undertaken. HITS shall be provided Construction Documents (CD) for review at each stage (50%CD, 95%CD, 100%CD) of the construction document process and be provided a minimum of ten (10) workdays from the date documents are received by HITS for review and return of comments.
3. Bidding/Proposal Phase: All contractors bidding on City's communications procurement and installation projects shall include in their proposal, as a minimum the following for HITS's review and approval. City's project manager shall arrange for HITS representative's review and approval before awarding project to the contractors. HITS reserve the right to deny contractors not meeting City's Standard to work on the communications project:
   a. Contractor's qualifications (certifications, project portfolio, etc.) per para 1.6.2
   b. Itemized pricing of communication system proposed (e.g quantity and type of equipment racks, vertical managers, cable trays, fiber cables, copper cables, patch panels, etc.)
4. Construction Phase: During construction City's project manager shall arrange with HITS representative to perform the following:
   a. Construction kick-off meeting with communications contractors
   b. Communications system Product Data submittal review and approval
   c. Communications system Shop Drawing submittal review and approval

d. Inspection walk on the outside plan and inside plan pathway installation before they are covered up

e. Inspection walk on communications cables and support installed above the finish ceiling before the ceiling is covered

f. Inspection walk to check the readiness of Communications rooms (MDF/IDF) before network equipment is allowed to be installed.

g. Final punch walk after all communications components have been installed and labeled.

5. Post-Installation Acceptance: Once all work including punchlist items has been completed, contractors shall schedule a final acceptance walk with HITS to demonstrate that all work has been completed per the contract documents and City's Standard . Contractors shall also submit close-out documents including test report, warranty, as-built drawings, and Operation and Maintenance Manuals for review and approval. HITS will notify the project manager and Contractors in writing of formal acceptance of the system after all work and documents required have been reviewed and approved.

6. Documents Turnover to HITS: City's Project Manager shall ensure that a copy of all the communications system closeout documents is turned over to HITS representative before the project closes. **Refer to 1.6G above for more info about closeout document requirements.**

1.7 CODES AND STANDARDS

A. These codes and standards are to be used as references when designing communications systems. Latest version of each standard and currently adopted codes shall be applicable.

1. ANSI/TIA-568 Commercial Building Telecommunications Cabling Standard
2. ANSI/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces
3. ANSI/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
4. ANSI-J-STD-607 Commercial Building Grounding and Bonding Requirements for Telecommunications
5. ANSI/TIA-526 Standard Test Procedures for Fiber Optic Systems
6. ANSI/TIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard
7. ANSI/TIA-1152: "Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling"
8. BICSI'S Telecommunications Distribution Methods Manual.
9. National Electrical Code (NEC)
10. National Electrical Manufacturers Association (NEMA)
11. Underwriters' Laboratories (UL)
12. American Society for Testing Materials (ASTM)
13. American National Standards Institute (ANSI)
14. Local, county, state and federal regulations and codes in effect as of date of installation

PART 2 - COMMUNICATIONS SYSTEM

2.1 SYSTEM OVERVIEW

A. The Horizontal Segment consists of the workstation outlets, cabling to the IDF and all associated pathways.

B. The Riser Segment refers to the riser cable, and the sleeves, slots, and conduits that enable the cable to pass from floor to floor: Main IDF(MDF) to the IDF's.

C. The Campus Segment or Metropolitan Area Network (MAN) refers to the cabling and infrastructure that interconnect buildings and or systems on campus or within a metro area.

D. Telecom Rooms including MDF and IDFs which contain the hardware i.e., patch panels, and punch down blocks and equipment racks for terminating the cabling from the workstation outlets, electronic equipment, and riser cables, while MDF also houses common system equipment and hardware for terminating the campus and riser cables.

E. Special Systems refers to any system beyond typical network communication systems.

PART 3 - HORIZONTAL SEGMENT

3.1 OVERVIEW

A. The horizontal cable and connecting hardware that provides the means for transporting the telecommunications signals between the workstation outlet and the horizontal cross-connect in the IDF.

B. The horizontal cabling pathways and spaces that distribute and support the horizontal cable and connecting hardware between the workstation outlet and the IDF and from IDF to IDF.

C. All copper or coax cables shall be run using a star topology from the MDF/IDF on each floor to every individual workstation and information outlet. All cable routes shall be approved by HITS before the installation of the cabling.

D. All horizontal cables, serving the floor areas, shall originate from the MDF/IDF and shall travel above the hallway ceiling to individual work areas. Routing cables through adjacent Below ceiling exposed cable will not be acceptable.

3.2 HORIZONTAL CABLES

A. Data Cables: Horizontal Data cables shall be Cat6A UTP home run to IDF room for all new construction and major renovation projects. In existing buildings where only a few (6 or less) data cable runs are added or replaced and the existing Data cable system is not Cat6A, Cat6 cables and jacks shall be used for the installation.

B. Data Cable Terminations: Horizontal Data UTP cables shall be terminated into RJ45 jacks at station side with TIA T568B wiring configuration and patch panels on the IDF room side. The jacks shall be flush mounted to a Data faceplate, or terminated onto a surface mounted box placed inside the backbox or equipment cabinet (Fire Alarm, BAS, wall-mounted or gyp ceiling mounted WiFi AP, etc.).

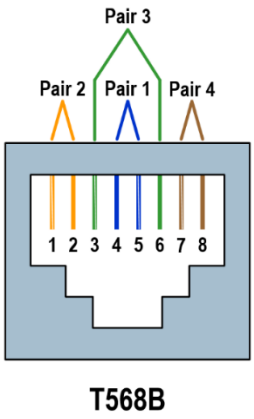


Figure 1: T568B RJ-45 Jack and Pin Assignment

C. Data Cable Distance Limit: The maximum permanent link length of the horizontal data cable from the workstation to the IDF shall not exceed 295 feet. It's the A&E team and the construction team contractor's responsibility to ensure that the IT design and installation meet the distance limit. No exception. Any variance request shall be submitted to HITS for review and approval.

D. Horizontal Fiber Cables: Provide 2-strand singlemode fiber cable and media converters for each cable run to outdoor IT devices or Data outlets that is over the 295-ft distance limit.

E. Service Loops: Cable service loops must be provided at both ends of cable runs to accommodate future cabling system changes. Provide minimum of 10-ft service loop on the IDF room side and minimum of 3-ft service loop on the workstation side.

F. Patch Cords: Provide two (2) data patch cords per data cable run installed. All data patch cords shall be Cat6A rated and pre-assembled. Field terminated patch cord is not acceptable.

G. Special Environments: All horizontal cables and patch cords utilized in areas of high electromagnetic interference should be of type Shielded Twisted Pair (STP). All cables in outdoor space or underground shall be OSP rated.

H. Approved Cable Manufacturers: All horizontal UTP data cabling and Coax cabling products shall be by CommScope. All optical fiber cabling products shall be by Corning.

I. Surge Protection and Grounding: Surge protection shall be provided to all outdoor UTP and coax cable runs. All armored or shield cables shall be properly grounded/bonded per TIA-607 standard.

J. Cable Deformation/Damage: Any cables found deformed (kinks, flattening, jacket skinning) or cable jacket being painted during the construction process shall be replaced by the contractors at no additional cost to Owner.

K. Cable Management: all cables not in conduits shall be neatly bundled with hook and loop ties in groups no larger than 24 cables per group. Plastic cable tie is NOT allowed for use on Communications data cables.

L. Cable Testing: All communications cables shall be 100% tested per TIA/BICSI standards and manufacturer's instructions with an approved tester after installation.

3.3 DATA OUTLET CONFIGURATIONS

A. Work area outlets at the City of Houston include but not limited to the following configurations:

1. **Standard workstation outlet: (1) Cat6A RJ45 jack**
2. **Printer/Fax outlet: (2) Cat6A RJ45 jacks**
3. **TV Outlet: (1) Cat6A RJ45 jack. Coordinate with end user department for coax cable requirements. If required, coax cable shall be pulled to the CATV demarc location (typically mech or elec room, NOT MDF or IDF room).**
4. **Wireless Access Point (WAP) data outlet: (2) Cat6A RJ45 jacks**
5. **Digital signage data outlet: (1) Cat6A RJ45 jack**
6. Room Scheduler data outlet: (1) Cat6A RJ45 jack
7. AV Device Data Outlet: Coordinate with AV Consultant on location and quantity of Data jacks required.

B. Please note that locations and quantity of all data outlets and IT devices (phones, printers, workstations, digital signages, room schedulers, TVs, etc.) are dependent on project program requirements. A&E team shall coordinate with user group for review and approval before issuing for bid or proposal.

C. Layout of WAPs shall take into consideration of WAP heat map and occupancy of the spaces. A&E team shall consult with HITS and obtain WAP heat map before finalizing the WAP layout. Minimum one (1) WAP shall be allocated for every 25 occupants.

D. Each project is different. Addition or change to the above outlet configurations might be necessary to meet each project's specific program requirements.

3.4 THE COLOR CODE OF DATA CABLES AND JACKS

Application	Horizontal Cable Color	RJ45 Jack Color	Patch Cord Color
Data	Blue	Blue	Blue
WAP	Green	Green	Green
Security	Purple	Purple	Purple
Fire Alarm	Red	Red	Red
POTS Voice	Orange	Orange	Orange
BAS	White	White	White
AV	Gray	Gray	Gray

3.5 HORIZONTAL CABLING PATHWAY

A. Cable Tray: Basket type cable tray (minimum 12" wide x4" deep) shall be provided in hallway ceiling as trunk pathway for communications cabling from each MDF/IDF room to work areas. Substitute cable tray with 4" conduits of equivalent capacity in areas with in-accessible finish ceiling or exposed ceiling deck.

B. J-hooks: J-hooks shall be provided to support above ceiling communication cables, if not routed in conduit, from Data outlets to the cable tray in hallway. No cables shall be laid on finish ceiling or attached to ducts, pipes, or conduits. J-hooks shall not be used as the trunk pathway for Data Cabling. Locate J-hooks 4' to 5' on center. Cable sag between vertical support shall be minimum of 3" and maximum of 6".

C. Data Outlet Boxes: All communications outlet boxes shall be minimum 4" square 2.5" deep with 1-gang plaster ring that will support standard 1-gang faceplate. Provide 1" conduit from each wall data outlet stud-up to accessible ceiling area.

D. Communications Conduits: All communications cables in new or rebuilt walls, above inaccessible finish ceiling or be routed through areas with exposed ceiling deck, shall be installed in EMT conduit. EMT may not be used outside, in concrete or underground, where it is exposed and subject to mechanical damage (below 6ft AFF). Conduits for communications shall be minimum of 1". Provide pull string with minimum 1200 lb tensile strength in each conduit run and bushings at each end. Conduit pathway shall properly sized and not to exceed the 40% fill ratio.

E. Conduit Routing and Distance Limit: All conduits must be installed parallel to building structure with as few turns as possible toward the IDF room serving this area. Contractors installing conduits shall coordinate with cabling contractor to verify the conduit pathway is the most direct route to the IDF room. It's the conduit contractor's responsibility to identify any locations where it is not physically possible to meet these requirements prior to installation. If installed pathway system results in communications cable length to exceed 295-ft distance limit, the conduit installer shall be liable for all additional costs (including premium time) associated with re-working of a conduit system to make the communication cabling system length compliant.

F. Modular Furniture: Cables installed in modular furniture raceways do not require conduit; however, conduit or equivalent protection is required between the wall plate or junction box and the raceway. **Horizontal data cables shall be routed through modular furniture and terminated at each cubicle in an open office setup**.

G. Flex Conduit: flex conduit is not recommended for communications cabling. Increase conduit one size if flex conduit has to be used in place of EMT, and the use of flex conduit need written approval from HITS.

H. Surface Mounting: Surface mounting of cables and outlet boxes should be avoided if at all possible.

I. Ring and String: this installation method is not acceptable for new constructions or major renovations where new walls will be constructed. It may be used only when data outlets are added to existing-to-remain walls .

J. Unacceptable Communications Pathway: No LB type fittings of any size are to be used for communication conduit. No PVC conduit or PVC sleeves are to be used for communication conduit within the confines of a building. No daisy-chain is allowed with conduits from one data outlet to another. Conduit must not be run through areas in which flammable materials may be stored, adjacent to, or over boilers, incinerators, hot water lines, or steam lines.

K. Conduit Bend Radius: Minimum bend radius for communications conduits with less than 2" internal diameter (I.D.) is 6 times of the I.D., and10 times of the I.D. for conduits 2" or larger.

L. Pull Boxes: Properly sized pull boxes shall be provided for every 100-ft of straight run of communications conduit, and for every two 90-degree bends.

M. Grounding and Firestopping: all communications pathway shall be properly grounded and bonded per TIA-607 standard. Apply fire-stopping to all pathway penetrating fire-rated partitions to meet the fire codes.

N. Pathway Identification: all communications pathway (conduits, boxes, pull boxes) shall be labeled "DATA" with nonerasable paint.

O. Cable Tray Clearance Requirements:

1. Above the tray: 12"
2. One side of the tray: 12"
3. Between cable tray and fluorescent light fixtures: 6"
4. Between cable tray and motor or transformer: 48"
5. Between cable tray and any flue, hot water, steam line or other non-insulated heat sources: 12"

3.6 CABLE TESTING AND PROCEDURES

A. This section describes the performance tests required for the Acceptance of newly installed cables. Tests shall be conducted per TIA Standards. All installed cables are to be tested.

B. These tests are designed to detect damage or errors that may have occurred in the manufacturing, placing, or splicing of cable.

C. Cables with bad pairs must be properly labeled and documented in a manner, which identifies the cable pairs tested and test(s) failed. Materials and installation should be of a high quality, which minimizes the number of bad pairs in any cable.

D. Before acceptance, the installed cable must be thoroughly tested to demonstrate that all materials and installation will meet performance specifications.

E. No cables with bad fibers will be accepted. Cables not meeting the manufacturer's performance specifications and those, and maybe additionally described herein, must be replaced. No bad pairs will be accepted in any cable and damaged cable must be replaced.

F. All cables shall be tested with approved test equipment. All test reports shall be provided in an approved format (test results data in original non-editable format and PDF print of the report) to HITS for review and approval before final acceptance.

PART 4 - RISER SEGMENT

4.1 OVERVIEW

A. The building riser system provides copper and optical fiber connectivity between MDF and the MPOE as well as from the MDF to the IDF.

4.2 RISER CABLING

A. **All riser cables from MDF to each IDF room shall include a minimum of one (1) 12-strand singlemode fiber cable in orange innerduct.**

B. **If MPOE is located in a separate room, the riser cable from MPOE to the MDF room shall include a minimum of one (1) 24-strand singlemode fiber cable in orange innerduct.**

C. Project specific requirements might be different. Consult with HITS representative during the early design and planning phase on exact cable type and quantity required.

D. All fiber cables shall be terminated to rack-mounted enclosures. All fiber strands shall be terminated, tested, and labelled.

E. **No multi-pair voice riser cable is required from MDF to each IDF or between building MDF rooms, unless noted otherwise.**

4.3 RISER PATHWAY

A. IDFs and MDF that are stacked (vertically aligned) shall be connected with sleeves. If not stacked, conduits and/or cable trays shall be provided instead to connect MDF to each IDF room.

B. The number of riser sleeves/conduits required depends on the number of IDFs to support. Provide minimum two (2) 4" sleeves/conduits if the pathway is to support one (1) IDF room, three (3) 4" for 2 to 4 IDF rooms, (4) 4" for 5 to 7 IDF rooms, (5) 4" for 8 to 10 IDF rooms, etc.

C. All sleeves and/or conduits penetrating the floor/ceiling shall be positioned within 6 inches of the wall, and not directly above or below the termination fields or any other wall-mounted equipment.

D. Sleeves shall have connectors and plastic bushings on both ends and be properly anchored to walls/floors/ceiling (e.g., anchored Unistrut with strut clamps).

E. Sleeves must not be left open after cable installation, and they shall be properly fire-stopped per all applicable building codes. Unused sleeves/conduits shall be capped and

F. Sleeves must extend a minimum of 4 inches above the floor level, and 1 to 2 inches below the ceiling.

PART 5 - CAMPUS AND MAN SEGMENTS

5.1 OVERVIEW

A. The campus and Metropolitan Area Network (MAN) segments consist of the cables and structures needed to the inter-connect building to building and building to metro area distribution frames (MADFs). It includes underground conduits, underground cables, splice boxes, manholes, pull boxes, aerial cables, pole lines, outside terminals, and support structures.

B. HITS must be consulted during the early planning phase of a project to provide technical guidance on cabling and pathway requirements.

C. All campus and MAN segments must be designed and installed to BICSI, Customer-Owned Outside plant manual, and ANSI/TIA-758 Specifications for Outside Plant Construction.

D. The following steps must be taken to identify the routes between new buildings and major building renovations.

1. Obtain a MAN and or campus layout drawing.
2. Determine where the cable entrance points are for each building.
3. Sketch the cable route from the starting point to the terminating point in the buildings to be served.
4. Note any obstacles, existing cable facilities, or other underground utilities on the campus layout map.
5. Note and document all of the right-of-way and easements, to determine if permit is required.
6. Review proposed cable route to determine if conditions exist that would require an environmental impact study. Identify all possible sources of future cable maintenance problems.

5.2 CAMPUS AND MAN CABLING

A. The type and quantity of communications backbone cabling required for campus and MAN depend on the specific configurations and project requirements. HITS and City of Houston engineers must be contacted to determine the backbone cabling required. Below are the acceptable cable types:

1. **Campus Backbone Fiber Cables: provide a minimum of one (1) 24-strand OS2 singlemode fiber cable from each building MDF** to the campus fiber distribution hub using the star topology.. Request for variance should be submitted and approved by HITS if different topology has to be used for specific projects. Final strand count and routing are subject to HITS review and approval.
2. **Campus Backbone Voice Cables: Voice backbone cable is not required for new construction projects, unless otherwise noted.**
3. MAN Cables: typically only fiber cables are required for metropolitan area network, and it can be customer-owned or leased from 3rd party. Consult with HITS representative for specific project requirements.

B. All cables placed in or through space not air-conditioned shall be outdoor rated. All fiber cables shall be armored and grounded.

C. All cables (pairs or strands) installed shall be terminated, tested and labeled per City's labeling standard.

5.3 CAMPUS AND MAN PATHWAY

A. Underground pathway system consists of buried conduits, using manholes and/or pull boxes for splices in large runs. The conduit runs from the building entrance location to a pole, pedestal, or manhole. This is the preferred pathway method for MAN. All pathway inside the property line of the campus shall be underground. No exception.

B. Direct buried cable systems consist of cables and associated splices directly placed in the earth. The trench runs from the building entrance location to a pole, pedestal, or manhole. This is not an acceptable distribution method for City of Houston.

C. Aerial cable systems are installed on aerial supporting structures with messenger cables such as poles, sides of buildings, and other above-ground structures. This is typically acceptable for MAN, but not acceptable for use on Campus.

D. Conduit pathway system minimum design requirements:

E. Telecom entrance conduits from each building's MDF shall have minimum of three (3) 4" to the nearest telecom manhole/handhole (MH/HH). For buildings with voice/data service from carriers, there shall be a MH located inside the property line and near the telecom utility pole.

F. The City of Houston requires that all sites designated as "High Priority" also referred to as "Priority 1" or "Tier 1" must be designed with dual, diverse telecommunications conduit entrances. These entrance facilities should be extended to the building from separate points of entry and maintain a minimum separation of at least 50 feet from each other. The entrances should be extended to separate communications manholes/vaults in a way that is conducive to providing telecommunications diversity.

G. Conduit ductbanks serving two (2) or more buildings shall have a minimum of four (4) 4" conduits.

H. Provide minimum (1) 4" 3-cell Maxcell innerduct and (1) pull string in each 4" conduit installed.

I. Each conduit section shall have no more than the equivalent of two 90-degree sweeps (a total of 180 degrees) between pull points. The 180-degree maximum shall include kicks and offsets. Where it is not possible to construct a section of conduit within the 180-degree sweep maximum, an intermediate MH/HH shall be installed.

J. All MH/HH shall be minimum of 3'W x3'L x 3'D pre-cast with lockable cover of minimum HS20 rating and labeled "TELECOM MH#**".

K. Orange color warning tape containing metallic tracings for the telecommunications cables must be placed a minimum of 18 inches above the buried conduits and or cables to minimize any chance of an accidental dig-up.

L. The minimum depth of a trench must allow 36 inches of cover from the top of the duct bank to the final grade point.

M. The following minimum vertical or horizontal separations must be maintained between telecommunications facilities and other facilities sharing a common trench.

1. Power or other foreign conduits: 3 inches of concrete, 4 inches of masonry, or 12 inches of well-tamped earth.
2. Pipes such as gas, oil, water: 6 inches when crossing, 12 inches when parallel.
3. Railways: 3 feet below top of rails.

N. Conduit must be encased in concrete when the following conditions exist. Reinforcing bars and or crutches within the concrete must be used at any location subject to potentially extreme stress.

1. Minimum conduit depth cannot be attained.
2. Conduit must pass under roads, driveways, railroad tracks, or when bend points are subject to movement.

O. The inside-the-building end of the conduit must be sealed to prevent rodents, water, or gases from entering the building.

P. All bends must be long, sweeping bends with a radius not less than 24” for a conduit 2 inches or smaller, or 48” for conduits with internal diameter larger than 2 inches.

PART 6 - COMMUNICATION ROOMS

6.1 OVERVIEW

A. The Communications infrastructure in a campus environment centers upon communications rooms located throughout the facility. These rooms house wiring cross-connect panels as well as network electronics needed for voice, data, video, etc. Each building has one Main Distribution Frame (MDF) room, and possibly one or more Intermediate Distribution Frame (IDF) rooms located elsewhere in the building. The MDF serves as the connection point between the entrance and riser cabling systems. IDF’S serve as the connection point between the riser and horizontal cabling systems. Each IDF serves as the hub for a particular geographic zone of the building (i.e. floor or wing). In most cases the MDF also serves as an IDF and the MPOE (Minimum Point of Entry).

6.2 LOCATION OF THE MDF/IDF ROOMS

B. MDF and IDF rooms must be located as close as possible to the center of, and on the same floor as, the workstation areas it serves; this will minimize the horizontal cable lengths and provide ease of maintenance and troubleshooting.

C. Each building must have one (1) MDF room, and there must be at minimum of one IDF or MDF per floor. Multiple IDF’s are required if the usable floor space to be served exceeds 10,000 square feet or the cable length between the work area outlet and the patch panels in the IDF exceeds 295 feet or 90 meters.

D. Access to the MDF/IDF room must be located directly from hallways, not within classrooms, offices, and electrical or mechanical spaces.

E. MDF/IDF room must not be located in any place that may be subject to water or steam infiltration, humidity from nearby water or steam, heat, and any other corrosive atmospheric or environmental conditions. MDF/IDF shall not be located below water level or flood plain unless preventative measures against water infiltration are implemented. The MDF/IDF shall be free of water or drain pipes not directly required in support of the equipment in the room. Piping containing liquids of any kind shall not pass over the top of the MDF/IDF. This includes septic, drain, water, mechanical

chilled loops, etc. A water sensor and floor drain with back flow preventer shall be provided within the room if risk of water ingress exists.

F. At no time is an MDF/IDF to be located near electrical power supply transformers, motors, generators, transmitters, radar transmitters, induction heating devices, and other potential sources of electromagnetic interference.

G. MDF/IDF's must not share space with mechanical, electrical, janitorial, office, or storage facilities. No exception.

H. MDF and IDF's must be stacked vertically in a multi-story building. If special conditions exist that make it not feasible for stacking the Telecom rooms, 4" riser conduits shall be provided for riser cabling.

I. At all times the locations of the MDF/IDF must be submitted for inclusion in the construction drawings, and they must be annotated as MDF or IDF (or MPOE if it's in a separate room) on all floor plans.

6.3 MDF/IDF ROOM SIZING

A. The size of the MDF/IDF room depends on its function and the size of the usable floor space it will serve. Usable floor space refers to the occupied areas used for normal daily work functions. Minimum 3-ft clearance is required around floor-mounted equipment racks (minimum 3 sides) and in front of wall-mounted equipment.

B. Equipment allowed in MDF/IDF Rooms: voice/data/TV carrier equipment, voice/data/TV cabling terminations devices, voice equipment, network switches and routers, UPS, cooling equipment dedicated for MDF/IDF rooms, paging equipment, Security access control and video surveillance headend.

C. Equipment Not Allowed in MDF/IDF Rooms: electrical transformers, motors, generators, transmitters, radar transmitters, induction heating devices, electrical panels not dedicated for MDF/IDF room, Fire Alarm Panels, BAS equipment, water pumps, water/gas pipes, ductworks.

D. Dedicated Telecom Room (MDF/IDF) or access-restricted space within a room shall be provided for HITS use only. This is City's standard. Any MDF/IDF that will be shared will require prior written approval from HITS by submitting a Variance Request form.

E. The minimum IDF sizes shown are based on providing communications service to one individual work area and represent the minimum amount of space to be dedicated for HITS use only. Additional approved uses require additional square footage.

1. 5,000 square feet. or less = 10 feet × 8 feet finished room size
2. 5,000 to 8,000 square feet = 10 feet × 10 feet finished room size
3. 8,000 to 10,000 square feet = 10 feet × 12 feet finished room size

F. The MDF room typically serves as both an IDF, and also MPOE and fiber/copper distribution hub. minimum size of the MDF can be determined as follows:

1. 5,000 square feet. or less = 10 feet × 10 feet finished room size
2. 5,000 to 8,000 square feet = 10 feet × 12 feet finished room size
3. 8,000 to 10,000 square feet = 10 feet × 15 feet finished room size

G. The above sizing guidelines are for planning using only. Exact sizing of the rooms depend on the size of the spaces being served and the amount of equipment to house in the room. A&E team shall allocate space based on current needs and future growth (30%) with minimum of 3-ft clearance around floor mounted equipment racks and in front of wall mounted equipment.

6.4 CONSTRUCTION AND BUILDOUT OF MDF/IDF ROOMS

A. Ceiling: Minimum ceiling height is 9-feet. Consideration should be given to having a 10-ft-high ceiling. The City's standard is not to have any drop ceiling (tile or gypsum). Exceptions to this rule must be pre-approved by HITS.

B. Doors: The MDF/IDF doors must be a minimum of 3 feet wide and 6 feet, 8 inches tall and swing out if allowed by code. The doors must be lockable.

C. Security: MDF and IDF rooms must be secured and controlled with a proximity card reader, and access must be restricted on a least privilege basis. Video surveillance camera shall also be provided inside each MDF/IDF room. Consult with HITS for exact placement and orientation of the camera. Exceptions to this rule must be approved by HITS. A placard should be placed at all entrances to MDF/IDF rooms that reads as follows: "RESTRICTED AREA: Escort Required. Contact HITS at (832) 393-0383".

D. Flooring: The floor must be sealed concrete or antistatic floor tile bonded to the ground using manufacturer-recommended hardware. Carpet flooring is not allowed.

E. Environment Control: There must be continuous and dedicated environmental control (24 hours per day, 365 days per year) to ensure that temperature and humidity values are within acceptable limits. If the facility is powered by a generator or other emergency power source then the dedicated HVAC system(s) within the MDF/IDF must also be powered by the generator. Maintain the room temperature between 64° F and 81° F. Humidity range, noncondensing: 16 ºF DP to 59 ºF DP and 50% RH to 70% RH. Provide network monitored sensor (Meraki MT10 or approved equal) in each MDF/IDF room. The cooling load shall be based on equipment to be installed initially and future growth (assuming that the equipment racks will be fully occupied eventually). For planning purpose plan for 12,000 BTU per full height (7-ft) equipment rack.

1. Fan Coil Units are more desirable than split units. Fan coil units, condensation pipes/tubing, refrigerant pipes/tubing, and plumbing shall not be located in the MDF/IDF room. The MDF/IDF room shall have only supply and return ducts to maintain cooling efficiency.

2. Split units are not desirable, but if used shall meet the following criteria: NO more than 6 in. of any plumbing pipes/tubing, including condensation and refrigerant, shall be visible in communications rooms; All 6 in. of visible pipes/tubing shall be insulated; Split units shall have a drain pan placed below the units to catch and divert any and all condensation/water to protect the electronic and cable warranties.

F. **Plywood Wall Field: Minimum of 3 walls must be lined with 3/4 inch 8-ft-high fire rated plywood, installed with the bottom at 12"AFF. The plywood shall be painted with two coats of fire-retardant paint. The paint color shall match the wall finish color, and the fire rating stamps shall be visible (exposed) after painting. The plywood must be securely fastened to the wall-framing members with offset flush or flat-mounted fasteners.**

G. Lighting: Lighting in MDF / IDF, must have a uniform intensity of 70 Foot Candles when measured 30 inches from the finished floor on all sides of equipment racks. **Do not place light fixtures above equipment racks or cable trays, to avoid blocking of light. Plan to place one set of light fixtures in the front and one set in the back of the equipment racks.** All lighting fixtures must have cage protection if standalone chain types are used.. All controls and light switches must be located inside the room. The light switch should be motion-activated. Minimum one set of the light fixtures shall be emergency lights. If generator power is available, all lights within the MDF/IDF must also be powered by the generator.

H. Electrical requirements: A minimum of two (2) dedicated 120V/AC power outlets on separate branch circuits shall be provided per equipment rack installed, (1) NEMA L5-30R twist lock receptacle and (1) NEMA 5-20R quad receptacle for each full height equipment rack, (1) NEMA L5-20R twist lock receptacle and (1) NEMA 5-20R quad receptacle for each half-height equipment rack,. Some equipment racks might require more power. It's A&E team's responsibility to review the program requirements and make any adjustment to the power outlet configurations as necessary to meet the project requirements. If a building generator/emergency power is present, then these outlets must be powered by the emergency power source. Power outlets shall be mounted at 7'6" AFF directly above the floor-mounted equipment racks (at the back of the racks). For wall mounted equipment rack, it shall be mounted on wall above the rack. Separate duplex 120V AC convenience outlets with NEMA 5-20R (for tools, test sets, vacuums, etc.) installed at least 18 inches above the finished floor at 6-foot intervals around perimeter walls. Power outlets shall also be provided for any other wall-mounted equipment scheduled.

I. Fire Protection: Fire protection shall be provided as per the applicable code. Consideration should be given to the installation of pre-action sprinkler or other dry fire suppression system, or no fire protection if enclosed by fire rated walls. If wet pipe sprinklers are installed, the sprinkler heads shall be provided with wire cages to prevent accidental operation, and drainage troughs shall be placed under the sprinkler pipes to prevent leakage onto the equipment or cabling within the room.

J. Room Layout: The Standard MDF/IDF room layout is to have multiple floor standing standard height (7-ft) equipment racks (2-post) in a row centered on the wall (minimum 10-ft wide) opposite or perpendicular to the entrance wall . Provide overhead ladder tray along the perimeter of room and over the equipment rack row, and vertical cable managers (minimum 6" wide and 7-ft high) between equipment racks and each end of the equipment rack row. Vertical cable runway shall also be provided from end of conduits/sleeves to horizontal ladder tray. Refer to Appendix C for example room layout drawing of MDF room and IDF rooms. Please note that exact number of racks might be different for specific projects depending on quantity of Data cables and amount of equipment required.

K. Rack Elevations: in MDF/IDF room, backbone and riser cables, voice gateway and core switches shall be located in Rack #1. Rack#2 (and #3 if needed) shall be reserved for terminations of horizontal cables and edge switches. The top half of each rack shall be reserved for cable terminations (patch panels, fiber enclosures, etc.), and bottom half of each rack shall be reserved for active network equipment (switches, UPS, etc.). Refer to Appendix D and E for example drawings of room and equipment rack elevations in MDF room and IDF rooms.

6.5 GROUNDING AND BONDING

A. Grounding and bonding for Communications system shall conform to ANSI-J-STD-607, NEC code and manufacturer's grounding requirements as a minimum.

B. The grounding and bonding system typically includes a Telecom Bonding Backbone (TBB) extended from the Primary Bonding Busbar (PBB) to each Secondary Bonding Busbar (SBB), and Telecom Bonding Conductor (TBC) from PBB to the building main electrical service ground.

C. All building entrance protection devices, armored cables, all metallic elements in the Communications systems such as equipment racks, cabinets, conduits, cable trays, etc.) and all active equipment shall be bonded to the PBB/SBB.

PART 7 - TESTING

7.1 OVERVIEW

A. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions per the requirements of ANSI/TIA and BICSI standards. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced to ensure 100% useable conductors in all cables installed.

B. All fiber and UTP cabling shall be tested in accordance with this document, ANSI/TIA standards, CommScope and Corning system warranty guidelines and industry best practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

C. All test results shall be provided in both PDF (for printing) and original test data format.

7.2 UTP CABLE TESTING

A. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA-568 for the appropriate Category of cabling installed.

B. All horizontal UTP cables shall be tested as a permanent link. Testing must be done with a minimum of a Level IV tester for Cat6A cables.

C. Horizontal UTP cable test results must show a pass for parameters specified below:

1. Wire Map
2. ATTN – Attenuation
3. PSNEXT – Power Sum Near-End Cross-talk
4. PSACR – Power Sum Attenuation to Cross-talk Ratio
5. PSELFEXT – Power Sum Equal Level Far-End Cross-talk RL – Return Loss

D. All multi-pair voice backbone and riser cables be tested for continuity, opens, shorts and polarity on all cable pairs.

7.3 OPTICAL FIBER CABLE TESTING

A. All installed optical fiber cables shall be tested in accordance with TIA-568 and TIA-526.

B. OTDR and OLTS bidirectional tests shall be performed for all fiber cables after installation to ensure compliance. An image of each fiber optic connector end-face shall be taken, recorded and provided as part of the records.

C. The attenuation test results must include the loss generated by referenced test cords, each connector mated pair and cable. Loss results should be shown in -dB with test cords referenced out. No fiber optic permanent link will be accepted with a loss greater than the calculated link loss value referenced from the table below.

D. OM4 Multi-Mode Fiber Link Loss

LC Connector Mated Pair	0.5dB
Multi-Mode Cable	
Wavelength (nm)	(Maximum Attenuation dB/km)
850	3.0
1300	1.0

1. Note: Link Loss = Fiber Cable Loss + Mated Pair Loss (Example: a link with 3 connectors and a total length of 500m should have a maximum attenuation of 3.00 dB at 850nm and 2.00 dB at 1300nm)

E. Single-Mode Fiber Link Loss

LC Mated Connector Pair	0.3dB
Single-Mode Cable (Inside Plant)	
Wavelength (nm)	(Maximum Attenuation dB/km)
1310	1.0
1550	1.0
Single-Mode Cable (OSP)	
Wavelength (nm)	(Maximum Attenuation dB/km)
1310	0.4
1550	0.4

PART 8 - IDENTIFICATION AND ADMINISTRATION

8.1 OVERVIEW

A. All Communications system components (racks, equipment, cables, etc.) shall be labeled per CoH IT standard and TIA-606. Refer to CoH Design Guideline Spec Section 270553 for more information.

B. All labels shall be machine printed. No handwritten label is acceptable.

C. All labeling should be a unique identifier for the cabling infrastructure within a building and between buildings on a campus.

PART 9 - NETWOR EQUIPMENT AND SPECIAL SYSTEMS

9.1 WIRELESS ACCESS POINT AND NETWORK EQUIPMENT

A. The engineering design and configuration of the Wireless APs and active network equipment (switches, UPS, PDU) is by HITS Network team. Consult HITS Network team for equipment type, location, and quantity required for each project.

B. Refer to City's Data Communications Network Equipment design guideline spec section and contact HITS Network Team for more information.

9.2 OVERHEAD PAGING SYSTEM

A. Overhead paging system is required for certain program areas such as Fire Station and Clinic. Refer to City's PA system design guideline spec section 275113 and contact HITS Voice Team for more information.

9.3 PUBLIC SAFETY RADIO AND FIRE STATION ALERT SYSTEM

A. Radio and Station Alert system is required for all fire station projects.. Refer to City's Radio and Station Alert system design guideline spec section (to be released) and contact HITS PSC team for more information.

B. Radio communications equipment and cabling shall be installed per manufacturer instructions and the Motorola R-56 Quality Standards manual. The City of Houston Facility IT Standard will apply in situations where the R-56 manual does not.

9.4 EMERGENCY RESPONDER RADIO COVERAGE SYSTEM

A. The Houston Construction Code requires Emergency Responder Radio Coverage (ERRC) compliance in all buildings.

B. Refer to City's ERRC design guideline specification section 275319 and contact HITS PSC team for more information.

9.5 CELLULAR DISTRIBUTED ANTENNA SYSTEM (DAS)

A. **Sufficient cellular signal coverage is required in all new construction facilities. City of Houston has existing agreement with major carriers to provide cellular boosters if necessary, therefore the DAS system itself is typically not in the Capital Improvement Project's scope of work, but the construction team shall coordinate with HITS at the beginning of the construction phase for cellular testing to determine if cellular booster is required. If so, power and raceway required for the cellular DAS system shall be provided by the construction project.**

9.6 ROOM SCHEDULING AND DIGITAL SIGNAGE SYSTEM

A. All conference room scheduling devices shall be Evoko Liso Room Manager ERM2001. Provide one (1) 1-port data outlet and wall mount kit at each scheduler location.

B. All digital signage player shall be by HD2 (Houston Dynamic Displays). Provide Enterprise license for each digital signage player installed. Provide one (1) duplex power outlet and one (1) 1-port data outlet behind each digital signage player.

C. No substitution is allowed without prior written approval from HITS.

D. Refer to City's IT Design Guideline Specification Section 274116 and contact HITS Desktop team for more information.

9.7 INTEGRATED AUDIO-VIDEO SYSTEM

A. Follow City's standard on AV system products and room configurations City's for all projects.

B. Refer to City's IT Design Guideline Specification Section 274116 and contact HITS Desktop team for more information.

9.8 MASTER ANTENNA TELEVISION SYSTEM

A. **Each department manages it's own CATV subscription. The A&E team shall verify with end user department if coax cable distribution is required for the project. If so, the Mech or Elec rooms (instead of MDF or IDF room) shall be used as the CATV demarc and wiring closets.**

B. **Coax Drop Cables: All new installation of horizontal TV cables shall be RG6 quad-shield coax home run to the CATV wiring closet.**

C. **Coax Cable Terminations: Horizontal TV coax cables shall be terminated into RG6 F-connector flush mounted to a faceplate at TV, and terminated to wall mounted splitter in the CATV wiring closet.**

D. **TV Riser Cabling: The riser cable shall be trunk cable from the CATV demarc to each wiring clsoet.**

E. **Refer to City's IT Design Guideline Specification Section 274131 and contact HITS Network team for more information.**

PART 10 - VARIANACE REQUEST FORM

10.1 VARIANCE REQUEST CIRCUMSTANCES

A. This Standard shall be followed for all City projects requiring HITS' service. There may be circumstances that may require a project to request a waiver from this standard. Specific implementations that require approval of a waiver and coordination with HITS include, but not limited to:

1. Locate prohibited non-IT equipment in the MDF/IDF rooms.
2. City's standard is to have a minimum of one (1) dedicated IT room (MDF/IDF) per floor, and all horizontal data cables shall be within the permanent distance limit (295-ft). Any exception to this requires prior approval.
3. No sufficient clearance (3-ft) around equipment racks.

10.2 VARIANCE REQUEST FORM

A. In order to be considered for a waiver, a department/vendor must submit the request to the Chief Information Officer with support documents to justify the variance:

1. Description of the requested variance in details (current standard and proposed change)
2. Business need and reason for the variance.
3. Assessment of impact to IT system's performance and security.
4. Assessment of impact to the project schedule and budget.

B. See Appendix C for CoH IT Standard Variance Request Form.

10.3 VARIANCE REQUEST REVIEW AND APPROVAL

A. All requests shall be submitted at a minimum of two weeks in advance for review and processing.

B. The Chief Information Officer will approve or reject the waiver request, based on the justification provided in the requesting memo.

PART 11 - APPENDIX

11.1 APPENDIX LIST

A. Appendix A: CoH IT Construction Project Responsibility Matrix

B. Appendix B: HITS IT Standard Variance Request Form

C. Appendix C: HITS IT Standard Example Drawings – MDF/IDF Room Layouts
D. Appendix D: HITS IT Standard Example Drawings – MDF Room and Rack Elevations
E. Appendix E: HITS IT Standard Example Drawings – IDF Room and Rack Elevations
F. Appendix F: Abbreviation List

APPENDIX A - IT CONSTRUCTION PROJECT RESPONSIBILITY MATRIX

SYSTEM	COMPONENTS	BUDGET	PLAN/DESIGN	FURNISH	INSTALL
AUDIO-VIDEO SYSTEM	SMARTBOARD (SURFACE HUB)	CONSTRUCTIONS	A&E	GC	GC*
AUDIO-VIDEO SYSTEM	PROJECTORS	CONSTRUCTIONS	A&E	GC	GC
AUDIO-VIDEO SYSTEM	PROJECTION SCREEN	CONSTRUCTIONS	A&E	GC	GC
AUDIO-VIDEO SYSTEM	TV FOR AV PRESENTATION	CONSTRUCTIONS	A&E	GC	GC
AUDIO-VIDEO SYSTEM	CONTROL PANELS	CONSTRUCTIONS	A&E	GC	GC
AUDIO-VIDEO SYSTEM	MICROPHONE/SPEAKERS	CONSTRUCTIONS	A&E	GC	GC
AUDIO-VIDEO SYSTEM	AV NETWORK SWITCH	CONSTRUCTIONS	A&E	GC	GC
AUDIO-VIDEO SYSTEM	SWITCHER/DSP/AMP	CONSTRUCTIONS	A&E	GC	GC
AUDIO-VIDEO SYSTEM	EQUIPMENT RACK	CONSTRUCTIONS	A&E	GC	GC
AUDIO-VIDEO SYSTEM	AV CABLING	CONSTRUCTIONS	A&E	GC	GC
DAS - CELLUALR	ANTENNAS, CABLING AND DAS EQUIPMENT	CARRIER	CARRIER	CARRIER	CARRIER
DAS - EMERGENCY RADIO	ANTENNAS, CABLING AND DAS EQUIPMENT	CONSTRUCTIONS	A&E	GC	GC
DESKTOP EQUIPMENT	COMPUTERS	DEPARTMENT	DEPARTMENT	DEPARTMENT	DEPARTMENT
DESKTOP EQUIPMENT	MONITORS	DEPARTMENT	DEPARTMENT	DEPARTMENT	DEPARTMENT
DESKTOP EQUIPMENT	DOCKING STATIONS	DEPARTMENT	DEPARTMENT	DEPARTMENT	DEPARTMENT
DESKTOP EQUIPMENT	PRINTERS	DEPARTMENT	DEPARTMENT	DEPARTMENT	DEPARTMENT
DIGITAL SIGNAGE	TV AND MOUNTING BRACKET	CONSTRUCTIONS	A&E	GC	GC
DIGITAL SIGNAGE	SIGNAGE PLAYER AND LICENSE	CONSTRUCTIONS	A&E	GC	GC*
DIGITAL SIGNAGE	DATA CABLE FOR DIGITAL SIGNAGE	CONSTRUCTIONS	A&E	GC	GC
IT SYSTEM - GENERAL	GROUNDING/BONDING SYSTEM	CONSTRUCTIONS	A&E	GC	GC
IT SYSTEM - GENERAL	POWER CIRCUIT AND OUTLETS	CONSTRUCTIONS	A&E	GC	GC
IT SYSTEM - GENERAL	CONDUITS, SLEEVES, BACKBOXES, PULLBOXES	CONSTRUCTIONS	A&E	GC	GC
NETWORKING	CAT6/6A CABLING SYSTEM	CONSTRUCTIONS	A&E	GC	GC
NETWORKING	FIBER CABLING SYSTEM	CONSTRUCTIONS	A&E	GC	GC
NETWORKING	IT EQUEIPMENT RACKS/CABINETS	CONSTRUCTIONS	A&E	GC	GC
NETWORKING	CABLE TRAYS IN MDF/IDF	CONSTRUCTIONS	A&E	GC	GC
NETWORKING	CABLE TRAYS IN HALLWAYS	CONSTRUCTIONS	A&E	GC	GC
NETWORKING	NETWORK SWITCHES	CONSTRUCTIONS	HITS	**GC**	GC*
NETWORKING	UPS	CONSTRUCTIONS	HITS	**GC**	GC*
NETWORKING	PDU	CONSTRUCTIONS	HITS	**GC**	GC
NETWORKING	WIFI AP DEVICE AND BRACKET	CONSTRUCTIONS	HITS	**GC**	GC*
NETWORKING	DATA OUTLETS FOR PHONES/PC/AP/ETC.	CONSTRUCTIONS	A&E	GC	GC
NETWORKING	CABLE TV CABLING	CONSTRUCTIONS	A&E	GC	GC
NETWORKING	CABLE TV TV DEVICE AND MOUNTING BRACKET	CONSTRUCTIONS	A&E	GC	GC
PAGING	SPEAKERS AND CABLES	CONSTRUCTIONS	A&E	GC	GC
PAGING	PAGING EQUIPMENT	CONSTRUCTIONS	A&E	GC	GC*
RADIO AND STATION ALERT	STATION ALERT SYSTEM	CONSTRUCTIONS	A&E	GC	GC*
RADIO AND STATION ALERT	RADIO CONTROL CABLES	CONSTRUCTIONS	A&E	GC	GC
RADIO AND STATION ALERT	RADIO ANTENNAS	CONSTRUCTIONS	A&E	GC	GC
RADIO AND STATION ALERT	ANTENNA CABLES	CONSTRUCTIONS	A&E	GC	GC
RADIO AND STATION ALERT	RADIO AND ALERT EQUIPMENT	CONSTRUCTIONS	A&E	GC	GC
ROOM SCHEDULER	SCHEDULER DEVICE	CONSTRUCTIONS	A&E	GC	GC*
ROOM SCHEDULER	DATA CABLE FOR SCHEDULER	CONSTRUCTIONS	A&E	GC	GC
VOICE/DATA/CATV INCOMING SERVICES	CABLING AND EQUIPMENT	CARRIER	CARRIER	CARRIER	CARRIER
VOICE/DATA/CATV INCOMING SERVICES	RACEWAY AND POWER	CONSTRUCTIONS	A&E	GC	GC
VOICE/DATA INCOMING SERVICES	VOCIE/DATA SERVICE SUBSCRIPTION	DEPARTMENT	HITS	HITS	N/A
VOICE/DATA INCOMING SERVICES	CATV SERVICE SUBSCRIPTION	DEPARTMENT	DEPARTMENT	DEPARTMENT	N/A
VOICE/PHONE	VoIP PHONES	DEPARTMENT	DEPARTMENT	DEPARTMENT	DEPARTMENT
VOICE/PHONE	RED PHONES	CONSTRUCTIONS	A&E	GC	GC*
VOICE/PHONE	ELEVATOR PHONE	CONSTRUCTIONS	A&E	GC	GC*

* Setup and configuration by HITS

Notes:

1. The responsibility might be different for specific projects. Verify with project PM and HITS for each project.

APPENDIX B - COH IT STANDARD VARIANCE REQUEST FORM

Request Date:		Description of Current Standard: (include section and page No.)	
Project Name:			
Project Location:		Description of Proposed change: (Attach support documents, if any)	
CoH PM Name:			
Telephone:			
IT Consultant:		Reason for Variance Request:	
Contact Person:			
Telephone:			
IT Contractor:		Assessment of Impact to IT system Performance and Security	
Contact Person:			
Telephone:		Assessment of Impact to Project Budget and Schedule	
Variance Request Party			

FOR HITS USE ONLY:

Change Review Committee Meeting Outcome:

☐ APPROVED

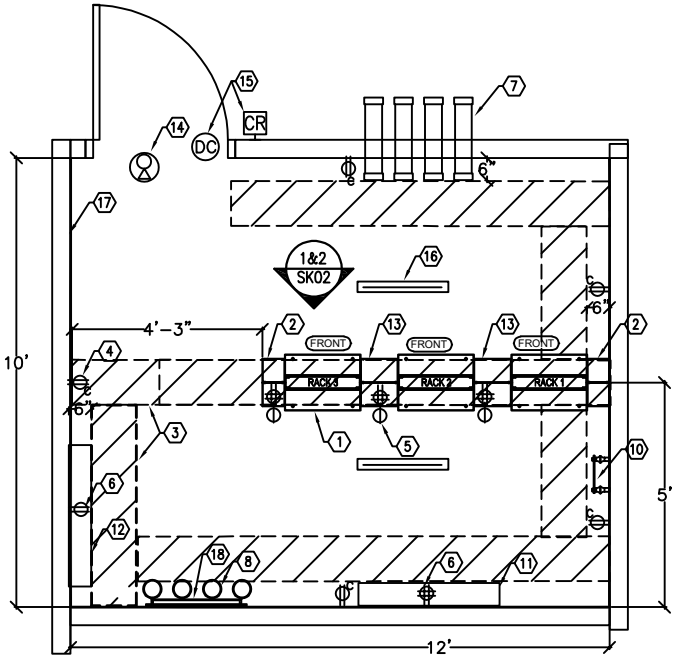
☐ APPROVED AS NOTED

☐ REJECTED

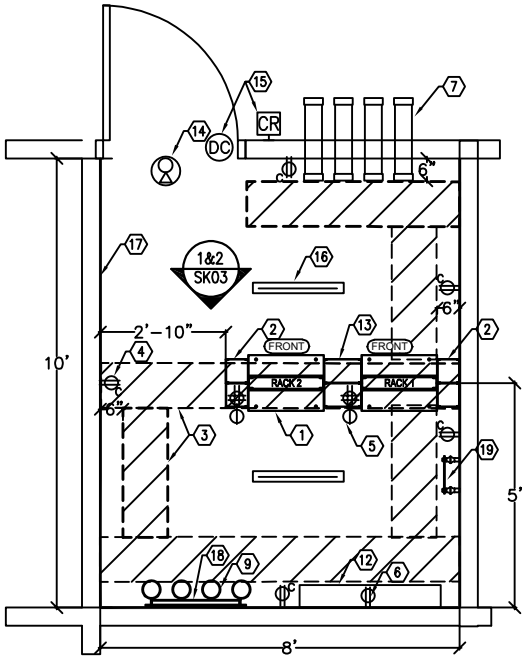
Chief Information Officer
(SIGNATURE ON FILE)

Date

APPENDIX C – MDF/IDF ROOM LAYOUTS



1 **MDF ROOM ENLARGED PLAN**
Scale: NTS



1 **IDF ROOM ENLARGED PLAN**
Scale: NTS

GENERAL NOTES:

1. ROOM LAYOUT AND DIMENSIONS ARE SHOWN FOR DESIGN CONCEPT ONLY. A LARGER ROOM IS REQUIRED IF ADDITIONAL EQUIPMENT RACK IS REQUIRED.
2. ROOM LAYOUT NEED TO BE ADJUSTED IF NECESSARY TO MEET SPECIFIC PROJECT'S REQUIREMENTS. FINAL LAYOUT SHALL BE REVIEWED AND APPROVED BY HITS.

KEYED NOTES:

(1) 19"W X 7'H 2–POST RACK.

(2) 6"W VERTICAL CABLE MANAGEMENT.

(3) 12"W LADDER TRAY MOUNTED AT 7'6" AFF

(4) CONVENIENCE DUPLEX POWER RECEPTACLES AT 18"AFF FOR EVERY 6' INTERVAL.

(5) ONE (1) L5–30R AND ONE (1) 5–20R QUAD ON DEDICATED CIRCUITS MOUNTED AT 90"AFF ABOVE EACH EQUIPMENT RACK FACING THE BACK. (REFER TO ELEC)

(6) PROVIDE DEDICATED POWER CIRCUITS FOR WALL MOUNTED EQUIPMENT (SECURITY, ETC.)

(7) FOUR (4) 4" SLEEVES (EZ–PATH 44+)

(8) FOUR (4) 4" UNDERGROUND CONDUITS TERMINATED AT 4"AFF

(9) FOUR (4) 4" SLEEVES CONNECTING STACKED MDF/IDF ROOMS.

(10) PRIMARY BONDING BUSBAR (PBB).

(11) SPACE FOR CARRIER'S EQUIPMENT.

(12) WALL MOUNTED EQUIPMENT (SECURITY, ETC.)

(13) 10"W VERTICAL CABLE MANAGEMENT.

(14) VIDEO SURVEILLANCE CAMERA MOUNTED ON WALL AT 9'AFF.

(15) CARD READER AND DOOR POSITION SENSOR FOR ACCESS CONTROL.

(16) LIGHT FIXTURE ON EACH SIDE OF EQUIPMENT RACKS.

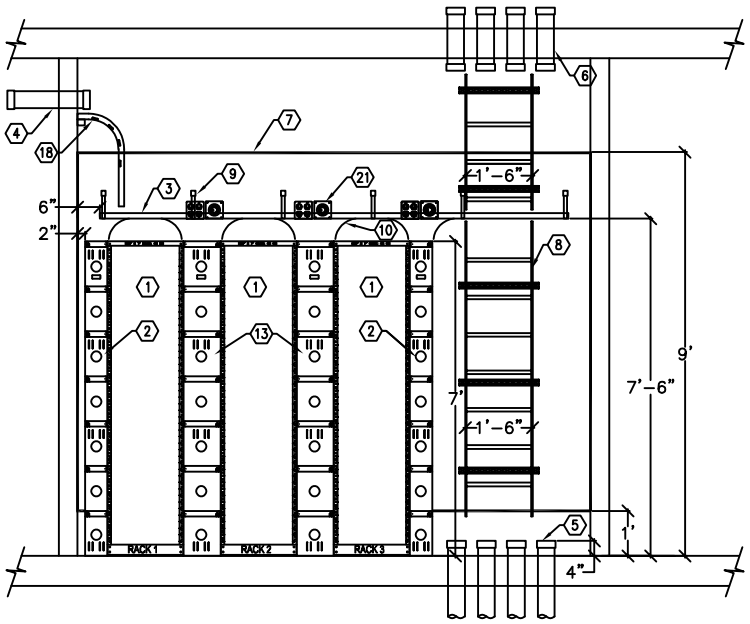
(17) 8'H 3/4" AC GARDE PLYWOOD ON MINIMUM OF 3 WALLS.

(18) VERTICAL CABLE RUNWAY.

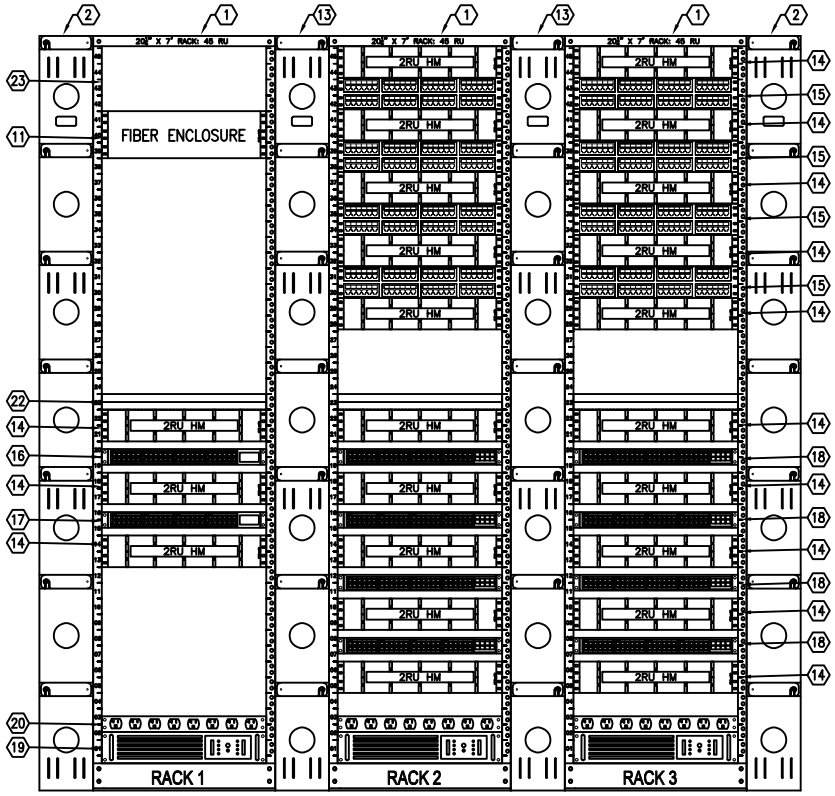
(19) SECONDARY BONDING BUSBAR(SBB).

CITY OF HOUSTON	
SHEET TITLE: MDF/IDF ROOM LAYOUTS	
PROJECT TITLE: HITS IT STANDARD EXAMPLE DRAWING	
SCALE: NTS	DRAWING NUMBER:
DATE: 07/15/2025	SK–01

APPENDIX D – MDF ROOM AND RACK ELEVATIONS



1 MDF ROOM ELEVATION
Scale: NTS



2 MDF RACK ELEVATION
Scale: NTS

GENERAL NOTES:

1. ROOM/RACK ELEVATIONS ARE SHOWN FOR DESIGN CONCEPT ONLY. MAKE ANY ADJUSTMENT AS NECESSARY TO MEET PROJECT'S SPECIFIC REQUIREMENTS.
2. TOP HALF (RU 23 TO 45) OF RACK IS RESERVED FOR COPPER AND FIBER CABLE TERMINATIONS, AND BOTTOM HALF SHALL BE RESERVED FOR INSTALLATION OF ACTIVE EQUIPMENT (SWITCHES, UPS, PDU, ETC.)

KEYED NOTES:

(1) 19"W X 7'H 2–POST RACK.

(2) 6"W VERTICAL CABLE MANAGEMENT.

(3) 12"W LADDER TRAY MOUNTED AT 7'6" AFF

(4) FOUR (4) 4" SLEEVES (EZ–PATH 44+)

(5) FOUR (4) 4" UNDERGROUND CONDUITS TERMINATED AT 4"AFF

(6) FOUR (4) 4" SLEEVES CONNECTING STACKED MDF/IDF ROOMS.

(7) 8'H 3/4" AC GARDE PLYWOOD ON MINIMUM OF 3 WALLS.

(8) VERTICAL CABLE RUNWAY.

(9) 6"H RUNWAY RETAINER POST.

(10) RUNWAY RADIUS DROP.

(11) FIBER ENCLOSURE

(12) HORIZONTAL CABLE MANAGER–1RU

(13) 10"W VERTICAL CABLE MANAGEMENT.

(14) HORIZONTAL CABLE MANAGER–2RU

(15) DATA PATCH PANEL–48PORT

(16) NETWORK ROUTER (ALLOCATE 2RU FOR EACH ROUTER)

(17) NETWORK SWITCH–CORE (ALLOCATE 2RU FOR EACH SWITCH)

(18) NETWORK SWITCH–EDGE (ALLOCATE 2RU FOR EACH SWITCH)

(19) UPS(APC3000)

(20) PDU

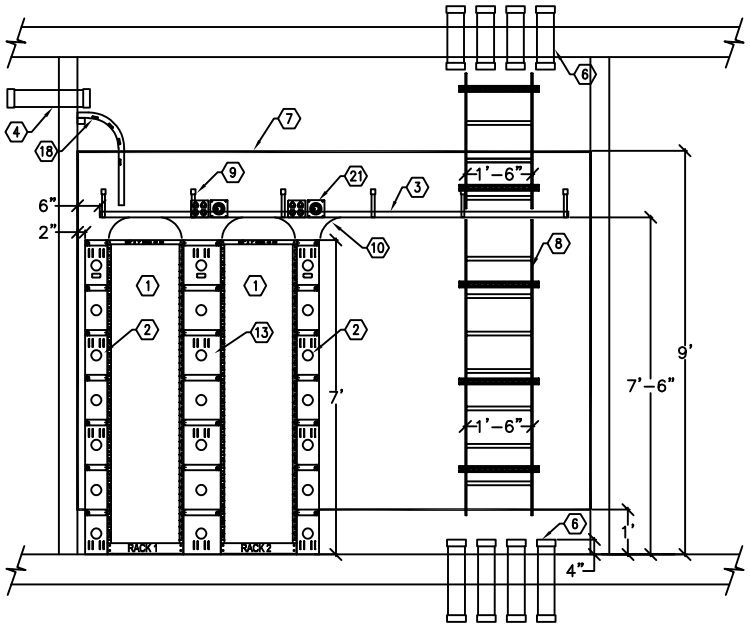
(21) POWER RECEPTACLES AT BACK OF RACK AT 90"AFF

(22) 1RU SLIDING EQUIPMENT SHELF

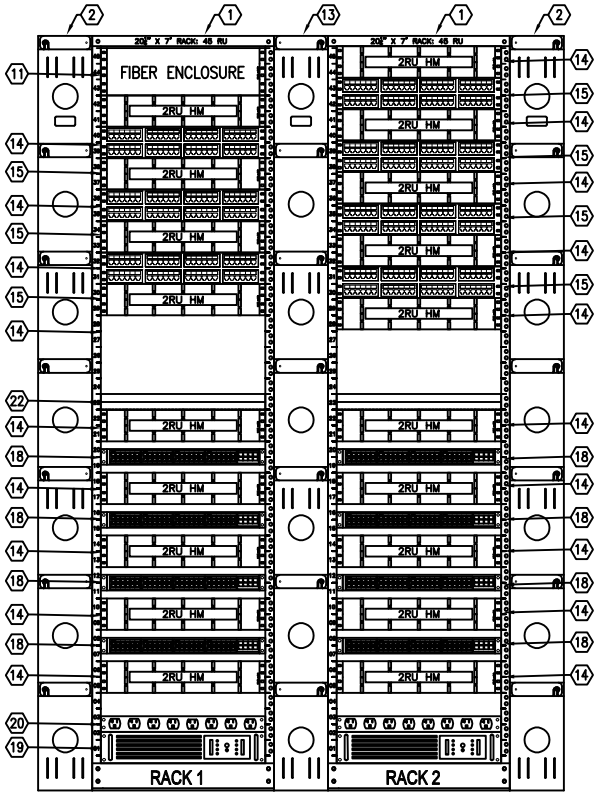
(23) 4RU SPACE RESERVED FOR CARRIER'S EQUIPMENT

CITY OF HOUSTON	
SHEET TITLE: MDF ROOM AND RACK ELEVATIONS	
PROJECT TITLE: HITS IT STANDARD EXAMPLE DRAWING	
SCALE: NTS	DRAWING NUMBER:
DATE: 07/15/2025	SK–02

APPENDIX E – IDF ROOM AND RACK ELEVATIONS



1 IDF ROOM ELEVATION
Scale: NTS



2 IDF RACK ELEVATION
Scale: NTS

GENERAL NOTES:

1. ROOM/RACK ELEVATIONS ARE SHOWN FOR DESIGN CONCEPT ONLY. MAKE ANY ADJUSTMENT AS NECESSARY TO MEET PROJECT'S SPECIFIC REQUIREMENTS.
2. TOP HALF (RU 23 TO 45) OF RACK IS RESERVED FOR COPPER AND FIBER CABLE TERMINATIONS, AND BOTTOM HALF SHALL BE RESERVED FOR INSTALLATION OF ACTIVE EQUIPMENT (SWITCHES, UPS, PDU, ETC.)

KEYED NOTES:

1. 19"W X 7'H 2–POST RACK.
2. 6"W VERTICAL CABLE MANAGEMENT.
3. 12"W LADDER TRAY MOUNTED AT 7'6" AFF
4. FOUR (4) 4" SLEEVES (EZ–PATH 44+)
5. FOUR (4) 4" UNDERGROUND CONDUITS TERMINATED AT 4"AFF
6. FOUR (4) 4" SLEEVES CONNECTING STACKED MDF/IDF ROOMS.
7. 8'H 3/4" AC GARDE PLYWOOD ON MINIMUM OF 3 WALLS.
8. VERTICAL CABLE RUNWAY.
9. 6"H RUNWAY RETAINER POST.
10. RUNWAY RADIUS DROP.
11. FIBER ENCLOSURE
12. HORIZONTAL CABLE MANAGER–1RU
13. 10"W VERTICAL CABLE MANAGEMENT.
14. HORIZONTAL CABLE MANAGER–2RU
15. DATA PATCH PANEL–48PORT
16. NETWORK ROUTER (ALLOCATE 2RU FOR EACH ROUTER)
17. NETWORK SWITCH–CORE (ALLOCATE 2RU FOR EACH SWITCH)
18. NETWORK SWITCH–EDGE (ALLOCATE 2RU FOR EACH SWITCH)
19. UPS (APC3000)
20. PDU
21. POWER RECEPTACLES AT BACK OF RACK AT 90"AFF

CITY OF HOUSTON	
SHEET TITLE: IDF ROOM AND RACK ELEVATIONS	
PROJECT TITLE: HITS IT STANDARD EXAMPLE DRAWING	
SCALE: NTS	DRAWING NUMBER: SK–03
DATE: 07/15/2025	

APPENDIX F – ABBREVIATION LIST

A&E: Architects and Engineers
AP: Access Point
AV: Audio-Video
AFF: Above Finished Floor
BAS: Building Automation System
CD: Construction Documents (Phase)
COH: City of Houston
EMT: Electric Metallic Tube
DAS: Distributed Antenna System
DD: Design Development
GC: General Contractor
HH: Handhole
HITS: Houston Information Technology Services (Department)
IDF: Intermediate Distribution Frame
ID: Identification
I.D.: Inside Diameter
IT: Information technology
LAN: Local Area Network
MAN: Metropolitan Area Network
MEP: Mechanical, Electrical, Plumbing
MDF: Main Distribution Frame
MH: Manhole
MPOE: Minimum Point of Entry
O.D.: Outside Diameter
PDU: Power Distribution Unit
POTS: Plain Old Telephone Service
RCDD: Registered Communications Distribution Designer (Certificate)
RCP: Reflective Ceiling Plan
SD: Schematic Design (phase)
TIA: Telecommunications Industry Association
UON: Unless Otherwise Noted
UTP: Unshielded Twist Pair
UPS: Uninterruptable Power Supply
WAP: Wireless Access Point
WAN: Wide Area Network