



INFORMATION SERVICES & TECHNOLOGY  
Enabling The Enterprise

## Standard Cable Specifications

Document 16471-1 Station and Backbone Cabling

Document 16471-2 Voice Network Summary

Document 16471-3 Data Network Summary

March 27, 2007

## SECTION 16471-1

### STATION AND BACKBONE CABLING

#### PART 1 GENERAL

##### 1.01 Description of Work

- A. At the University of Medicine and Dentistry of New Jersey (UMDNJ) the contractor shall furnish and install station and backbone cabling and termination equipment between telecommunications rooms and station outlet locations. The drawings, along with this specification section, form the work to be accomplished.
- B. The contractor shall be responsible for providing all equipment and material necessary to complete this installation. The contractor shall use industry-standard construction practices so that project management, project coordination, and construction techniques comply with all federal, state, and local codes and regulations.
- C. UMDNJ reserves the right to purchase the required services, including all specified materials, in a phased manner consistent with the overall project schedule. In addition, UMDNJ reserves the right to purchase the most recent version of equipment available at the time of installation.
- D. The contractor shall be responsible for furnishing and installing all necessary equipment and materials identified in this section and the drawing package for the successful performance of the identified work.
- E. Cabling shall be installed in such a manner so that normal day-to-day operations are not affected, and that interruptions to UMDNJ's normal workday activities are kept to a minimum.

##### 1.02 Submittals

- A. The contractor shall be certified by the manufacturer to install the specified cabling systems that will provide a manufacturer's extended warranty of 25 years (minimum). The current warranty is called NetClear. **Proof of the manufacturer's certifications shall be submitted as part of the bid response.**

- B. The contractor shall submit for approval, 5 sets of catalog cut-sheets for all materials to be used in this installation. Each cut-sheet shall be identified with the manufacturer's name, part number, acquisition lead-time, and date of submittal. UMDNJ will not be responsible for any materials ordered by the contractor before the cut-sheet for the item in question has been approved.
- C. Failure to provide a complete cut-sheet submittal for a specific item will result in rejection. The contractor will then be required to resubmit the specified documentation for the rejected item.
- D. The contractor shall forward cut-sheet submittals in sufficient time to permit proper consideration and approval. The contractor shall time each submission to assure adequate lead time for procuring items required by this contract, and shall inform UMDNJ of any time constraints concerning submittal approvals that are critical to the completion of the project. Delays attributable to rejected cut-sheet submittals shall not serve as a basis for extending time for contract completion.
- E. After an item has been approved, changes in make, manufacturer, or part number shall not be permitted, unless:
  - 1. Satisfactory written evidence is presented by the contractor, and approved by UMDNJ, that the manufacturer cannot make the scheduled delivery date of an approved item.

Or

  - 2. Other conditions become apparent indicating approval of the item to be substituted will be in the best interest of UMDNJ.
- F. The contractor shall submit a cable and outlet identification plan to UMDNJ for approval before final cable and faceplate labels are installed.
- G. As part of the "as-built" submission, the contractor shall submit 5-copies of the completed test results with 15 working days of test completion, in both electronic and printed format. Two (2) of the five copies shall be submitted to the voice vendor prior to project completion. These copies should be submitted to the voice vendor in both paper and CAD format. The submission shall include copies of the printouts of all cables tested using an electronic pair scanner (as specified in the Testing section of this specification).

H. The contractor shall submit 5 copies of the marked-up “as-built” drawing(s) to UMDNJ within 15 working days of completion of the work (or each phase of the work). Two (2) of the five copies shall be submitted to the voice vendor prior to project completion. These copies should be submitted to the voice vendor in both paper and CAD format. Documentation to UMDNJ must be provided in Visio format. As a minimum, the contractor shall annotate on a clean set of prints, the following information:

1. The location of cable outlets, including all new outlet locations designated in “Red”.
2. Outlet designations.
3. The approximate routing of all cabling installed.
4. All other pertinent information concerning the performance of the work regarding “as-built” conditions that will provide a more accurate set of drawings.

I. As a part of the “as-built” package for this project, the contractor shall submit 5-copies of a cable run summary for the installed cable system. Two (2) of the five copies shall be submitted to the voice vendor prior to project completion. These copies should be submitted to the voice vendor in both paper and CAD format. The cable run summary shall include the following information for each cable:

1. The outlet number.
2. The cable number.
3. The telecommunications closet designation.
4. The termination location, such as rack, patch panel, and port assignment.

#### 1.03 Reference Codes and Standards

- A. National Electric Code, ANSI/NFPA 70-1999.
- B. EIA/TIA Standard 568A, “Commercial Building Standards for Telecommunications Cabling.”
- C. EIA/TIA Standard 569, “Commercial Building Standards for Telecommunications Pathways & Spaces.”
- D. EIA/TIA Standard 606, “Labeling and Administration Standards for Telecommunications Cabling in Commercial Buildings”.
- E. EIA/TIA Standard 607, “Bonding and Grounding for Telecommunications Cabling and Equipment in Commercial Buildings”.

- F. BICSI “Telecommunications Distribution Methods Manual”, 1998.
  - G. All other applicable electrical and building codes.
- 1.04 Permits
- A. The contractor shall be responsible for procuring all licenses and permits to perform the work.
- 1.05 General Work Standards
- A. All work shall be performed in a professional manner, using practices of good craftsmanship.
  - B. All cables shall have the specified connectors affixed using the tools specified by the manufacturer.
  - C. All cables shall be terminated using the tools specified by the manufacturer.
  - D. All cables and outlets shall be labeled in accordance with the Cable Labeling and Identification section of this documentation.
  - E. The contractor shall be responsible for the daily removal of trash, debris, spent reels, and all other refuse related to this installation.

## PART 2 PRODUCTS

### 2.01 General

- A. Items not listed in this document or shown on the drawings, but necessary for the complete and proper performance of the work as specified, shall be considered part of the work. The contractor shall verify exact types and quantities of all materials with UMDNJ before purchase.
- B. The contractor shall furnish and install a complete solution for the voice and data station cabling system.
- C. All components for the cabling system shall comply with all product specifications contained in this document, and shall consist of the following subsystems:
  - 1. Work Area Subsystem
  - 2. Horizontal Subsystem
  - 3. Backbone Subsystem
  - 4. Equipment Room Subsystem

### 2.02 Work Area Subsystem

- A. The connection between the information outlet and the station equipment in the work area is provided by the Work Area Subsystem. It consists of cords, adapters, and other transmission electronics.
- B. At each work station, the outlet location will have (4) four-pair cables (wall, ceiling or system furniture):
  - 1. Provide either (1) **single-gang** surface-mounted outlet box or (1) flush-mounted faceplate shall be installed and two dual jack inserts shall be installed in each single-gang surface-mounted outlet box and each flush-mounted faceplate.
  - 2. Each outlet requires one 1" stub-up conduit above finished ceiling.
- C. All terminating hardware at each work station consisting of (4) four-pair station cables shall:
  - 1. Conform to TIA/EIA 568A (or TIA/EIA 568B standard when it is released) - Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section.
  - 2. Be part of the UL LAN Certification and Follow-up Program.

3. Meet or exceed the specifications for plenum-rated LANMARK-2000 Category 6 cable (*see appendix A*).
- D. All terminating hardware for (4) four-pair station cables shall meet or exceed the manufacturer's electrical and mechanical specifications. *Refer to manufacturer's website for current and additional specifications.*
  - E. Approved materials for faceplates, surface-mounted outlets, and outlet inserts can be found in appendix B (*see appendix*).
  - F. Station cabling shall meet or exceed the electrical and mechanical specifications of the manufacturer. *See manufacturer's website for current specifications.*
  - G. Cabling shall meet or exceed the electrical and mechanical specifications of the manufacturer. *See manufacturer's website for current specifications.*

### 2.03 Cable Tray (*see appendix*)

- A. Cable Hangers
  1. Caddy cable hangers should be used to support data station cabling from the building structure and should not exceed 48 UTP cables.
- B. Cable Tray
  1. The cable tray is Cablofil:
  2. The cable tray shall be a minimum of 12-inches wide by 4-inches deep and a maximum of 24-inches wide by 4-inches deep. Installation shall be mounted to allow easy access.
  3. The cable tray should be supported with approved Cablofil mounting hardware.
  4. Installed cable tray should adhere to EIA/TIA & BICSI standards and be based on a 50% fill ratio.
  5. In instances where wall mounting is not an option due to congestion or lack of space in the ceiling, the cable tray must be supported by the structure above the ceiling with threaded rod on both sides and cradled on the underside.
  6. Under no circumstance should center-hung brackets support the cable tray.
  7. Cable tray must be extended to the center of the longest wall in each Telco room where the station cabling will be terminated (*see appendices E and F, Typical IDF/MDF*).

## 2.04 Backbone Subsystem

- A. The main cable route connecting Telecommunications Rooms within a building is called the Backbone Subsystem. The Backbone Subsystem links the main cross-connect in the equipment room (MDF) to intermediate cross-connects in the telecommunications room (IDF).
- B. Between the MDF and each IDF, 300-pair 24-AWG ARMM voice backbone cabling shall be installed for voice backbone cabling. This cable shall be UL-listed CMR for placement in a riser environment.
- C. Between the MDF and each IDF, multimode and single-mode fiber optic cable shall be installed for data backbone cabling.
- D. Each 62.5/125 multimode fiber optic cable shall consist of 24-elements that meet or exceed the specifications noted in Appendix D. Description and part numbers also noted in appendix (*see appendix D*).
- E. Each 8.3/125 single-mode fiber optic cable shall consist of 12-elements that meet or exceed the specifications noted in appendix D. Description and part numbers also noted in appendix (*see appendix D*).
- F. All fiber optic cable to be installed within buildings shall be placed within minimum 1-inch diameter innerduct UL-listed for installation in a riser environment, “Orange” in color.
- G. One rack-mounted patch panels for fiber optic cables should be placed in each IDF and MDF. Use Ortronics Product Family. (*see appendix D*)

## 2.05 The Telecommunication Rooms Subsystem (VEF, MDF & IDF)

- A. The Telecommunications Rooms Subsystem consists of shared (common) electronic communications equipment and the transmission media required to terminate this equipment on distribution hardware.
  - 1. The room that contains the cable entrance from the street is referred to as the Vault Entrance Facility (VEF) *see appendix E*.
  - 2. The main telecommunications room is referred to as the Main Distribution Facility (MDF) *see appendix E*.
  - 3. The other telecommunications rooms located throughout the building are referred to as Intermediate Distribution Facilities (IDF) *see appendix F*.

- B. Patch Panels for Copper Station and Backbone Cabling
1. Patch panels for 4-pair station and 300-pair backbone cables shall be rated to support Category 6 specifications, and will facilitate interconnection to the voice and data equipment using contractor-supplied patch cords, as designated by UMDNJ.
  2. Patch panels shall be provided in 48-port increments, and shall be installed in the specified Ortronics floor mounted rack (*see appendix I*).
  3. The part numbers for the patch panels and support brackets can be found in *appendix I*.
- C. Integrated Patch Panels with Tie Cables for Data Network Interconnection
1. Cross-connect cables for data network interconnection shall be rated to meet or exceed the requirements to support IEEE 802.3 100BASE-T specifications, and will facilitate connection to the data networking equipment using contractor-supplied Category 6 cables, as designated by UMDNJ. These cables are custom made for UMDNJ. These cables consist of:
    - a. CAT 6 24-port panel with pre-terminated inserts.
    - b. Bundle Cable is CAT 6 6-port pre-terminated hydra to hydra.
    - c. Please refer to *appendix H* for *specifications and part number*.
- D. Equipment Racks
1. Equipment racks shall meet or exceed the specifications noted in *attachment J*:
  2. Equipment racks shall be grounded with 6-AWG green-insulated ground wire. *See attachment J* for part information.
- E. Wall-Mounted 110-Blocks for Voice Backbone Cabling
1. In each IDF, 300-pair voice backbone cabling shall be terminated using wall-mounted 300-pair 110-blocks and 110C-5 clips; *see appendix K* for part information.

2. In the MDF, all 300-pair backbone cables shall be terminated using wall-mounted 300-pair 110-blocks and 110C-5 clips; *see appendix K for part information.*
  3. In each IDF, the connection between the 110-blocks and the voice patch panels shall be made using Berk-Tek Power Sum 25-pair, category 3 plenum cable (*see appendix G*).
- F. Ladder Rack within Telecommunications Rooms
1. Ladder Rack shall be steel, black in color and meet or exceed the specifications noted in *appendix L*.
  2. Part information can be found in *appendix L*:
- G. Patch Cables
1. *See appendix M for specifications and part number.*
  2. These cables are custom made for UMDNJ.

## 2.06 Fire Stop

- A. The contractor shall be responsible for fire stopping all conduits, sleeves, floor openings, and wall penetrations used for this cable installation. The fire stopping shall meet the requirements of the National Electric Code, and all Federal, State, and local codes. In the event of conflict, the more stringent fire-stopping requirement shall prevail.

## 2.07 Cable Labeling and Identification

- A. Labels for all cabling installed shall be machine-printed, self-laminating labels of sufficient size to accept the approved cable identification scheme.
- B. Labels for all faceplates, patch panels, patch cords, and terminating blocks installed shall be machine-printed, self-laminating labels of sufficient size to accept the approved identification.
- C. The contractor shall submit a cable and outlet identification plan to UMDNJ for approval before final cable labels are installed.
- D. Each cable and patch panel port shall be labeled individually with a unique cable number, using machine-printed labels.

- E. Each outlet shall be labeled individually with a unique identification number, using machine-printed labels.
- F. Each patch cord shall be labeled individually with a unique identification number, using machine-printed labels.
- G. Cable labels that are cut off during the installation process shall be replaced with new labels after final dress and termination in such a position that permits the label to be easily read.

## PART 3      INSTALLATION

### 3.00    Conduits, Sleeves and Pull Boxes

- A.    UMDNJ/IST requires all backbone and facilities cabling to be installed in conduits and or sleeves. Pull boxes are required and must be installed according to EIA/TIA standards.
- B.    The requirements for all telecommunications related conduit/sleeves will be provided by IST. The installation must be facilitated by the General Contractor and installed by others (i.e., electrician).
- C.    All conduits outside of the building must be PVC; all conduits inside the building must be EMT.

*Listed below are minimum requirements. The exact amounts needed are determined on a project by project basis and by the amount of cabling required.*

- 1.    MDF
  - a.    From manhole if no VEF room is available – requires a minimum of 2, 4” conduits.
  - b.    If not below stacked IDF rooms – requires a minimum of 4, 4” conduits to the IDF room above.
  - c.    From VEF room (if available) – requires 2, 4” conduits.
- 2.    IDF
  - a.    Between stacked IDF rooms – requires a minimum of 4, 4” sleeves.
- 3.    VEF
  - a.    From manhole – requires a minimum of 2, 4” conduits.
- 4.    Inter-Building Tie-Cable
  - a.    If a new facility is adjacent to an existing building, it is a UMDNJ/IST standard to connect the buildings via tie cabling (i.e., fiber & copper) – requires a minimum of 2, 4” conduits.

### 3.01    Station Cable Installation

- A.    The contractor shall provide to UMDNJ, for approval, proposed cable run diagrams detailing the approximate routing of cable between the IDF and outlet locations.

- B. The contractor shall furnish and install (4) cables to each outlet location (including system furniture) except for wall phones. Wall phones must be single cable run (*see appendix P*).
- C. All 4-pair UTP cables shall be run using a star topology format from the telecommunications closet to each outlet location, with the length of each horizontal cable not exceeding 295-feet (90-meters).
- D. The contractor shall not exceed the minimum bending radius and maximum pulling tension of the 4-pair UTP cable during handling and installation.
- E. Each cable installed between the telecommunications room and each outlet location shall be continuous without any joints or splices.
- F. Where cable is being placed above suspended ceilings, the contractor shall support station cabling using the specified cable supports and/or cable tray attached to the existing building structure and framework, in accordance with the reference codes and standards listed in Section 2.03.
- G. All telecommunications outlets shall be installed at 18-inches to center above finished floor, unless otherwise noted and approved. The contractor shall verify the location and elevation of each telecommunications outlet before beginning cabling.
- H. At each outlet location, Category 6 station cables shall be terminated using the specified Category 6 outlet inserts and color-coded icons.

### 3.02 Backbone Cabling Installation

- A. Please refer to the construction drawings for backbone cable placement.
- B. The contractor shall furnish and install the specified 24-element multimode fiber optic cable between the MDF and each IDF.
- C. The contractor shall furnish and install the specified 12-element single-mode fiber optic cable between the MDF and each IDF.
- D. The contractor shall furnish and install the specified 300-pair 24-AWG voice backbone cable between the MDF and each IDF.

### 3.03 Racks and Cable Tray Installation

- A. The contractor shall furnish and install (1) floor-mounted equipment rack in the MDF and each IDF (*see appendix J*). Installation in the MDF is required if the MDF room will be also be used as an IDF.
- B. The contractor shall furnish and install (2) Rittal cabinets in the MDF room (*see appendix Q*). This rack will be used for the installation of all data equipment and fiber LIUs.
- C. The contractor shall assemble each equipment rack per manufacturer's directions. The contractor shall insure that each rack is plumb and stable upon completion of assembly.
- D. The specified fiber optic patch panels and video patch panels (where required) shall be installed in the specified racks.
- E. The contractor shall install the specified cable tray in the MDF and each IDF. Cable tray shall be installed and supported from appropriate building structure in accordance with the manufacturer's directions.
- F. When the cable tray passes from the hallway into the MDF/IDF, it needs to continue to the center of the wall where the station panel wall field will be located (*see appendix E, typical IDF/MDF*).
- G. The ladder rack shall be installed within the MDF/IDF and shall be attached to each wall, surrounding the perimeter of the room.

### 3.04 Cable Termination

- A. In each IDF, all 4-pair unshielded twisted-pair station cabling shall be terminated on the specified 48-port Category 6 hinged patch panels mounted in floor-mounted racks with hinged-brackets (*see appendix J*).
- B. In each IDF, all voice backbone cabling shall be terminated on wall-mounted 300-pair 110-blocks. The contractor shall also install the specified 48-port Category 6 patch panels installed in floor mounted racks with hinged panels. Extend the voice backbone cable to the patch panels, providing (1) pair for each patch panel port. Use the specified 25-pair cables (*see schedule in Appendix G*). Each pair shall appear on pins 4 and 5 of each patch panel port. Lengths of 25 pair and patch cables will vary and should be determined in the field.

- C. The Contractor must extend the pairs to support all of the red ports (voice panel). In addition, a separate panel (miscellaneous voice) must be installed to support miscellaneous voice connections (i.e., fax lines, modems) see appendix G.
- D. All fiber optic cable shall be terminated using the specified SC-type connectors.
- E. The Contractor shall furnish and install all termination equipment according to the manufacturer's instructions.

### 3.05 Grounding

- A. In each MDF/IDF, the electrical contractor shall install the specified ground bus bar in close proximity to the nearest acceptable building ground (provided by others) at 12-inches above finished floor. Care shall be taken in the location of the bus bar to avoid conflict with subsequent cable and equipment installation.
  - a. In each MDF/IDF, the cabling/telecommunications contractor shall install the specified ground wire from all existing and new equipment racks to the ground bus bar. Ground wire shall be routed around the walls of the room 6-inches above the floor, while not interfering with subsequent cable installations. Ground wire shall be installed behind (or under) all cables emanating from below, and shall be secured every 8-inches. The impedance of the ground system shall not exceed 1-ohm (*see appendix N*).
  - b. Please note that in the location that a PBX is installed, that a separate ground cable must be installed within conduit to the service panel that services the power for the PBX. *See PBX Grounding Specifications in Appendix O.*

### 3.06 Floor and Wall Penetrations

- A. The general contractor is responsible for installing all required floor, wall, and building penetrations.
- B. UMDNJ shall approve the location of all required floor, wall, and building penetrations before the contractor can begin this portion of the work.

### 3.07 Fire-Stop

- A. The contractor shall furnish and install fire-stop material in all floor, wall, and building penetrations after all cabling has been installed, in accordance with the National Electric Code. All other codes shall be consulted, and the code(s) that place the most stringent conditions shall be satisfied.

### 3.08 Splices

- A. All cabling shall be installed in one continuous run between termination locations. The use of junctions and splices will not be permitted.

### 3.09 Backboard Plywood

- A. In the MDF, all walls must be covered with ¾" fire-rated plywood built-out on 3 ½" metal studs. The fire-rated stamp shall be facing outward. The wood is NOT to be painted.
- B. In the IDF, only the wall directly behind the floor-mounted racks (formerly station panel wall) must be covered with ¾" fire-rated plywood. The fire-rated stamp shall be facing outward. The wood is NOT to be painted.

### 3.10 MDF/IDF/VEF Security

- A. IST requires swipe card, secured access to the MDF, IDF and VEF room doors.

### 3.11 MDF Furniture

- A. The installation of a workstation is required in the MDF room. This includes the purchase and installation of a 5'x3' basic desk and a chair with castors. IST/CST to determine the best location after completion of all cabinets, racks, etc.

### 3.12 HVAC

- A. MDF - Room should be kept between 65-70 degrees year round. Unit should be "stand alone" for the MDF with a separate control.
- B. IDF & VEF - Room should be equipped with either a send or return vent off of the building HVAC system and the average temperature should be kept between 65-70 degrees year round.

## PART 4 EXECUTION

### 4.01 General

- A. The contractor shall not exceed the recommended pulling tension of the cable manufacturer. Any cable that exhibits evidence of cuts, crimps, severe abrasions, and damage due to exceeding the manufacturer's specified pulling tension shall be replaced at the contractor's expense.
- B. The contractor shall install, dress, and terminate all station cabling in a professional manner, using practices of good craftsmanship. Where communications cabling must cross power cables/conduits, they shall cross at right angles (90-degrees) to the power runs. A 12-inch minimum separation between power cables/conduits and communications cabling shall be maintained when following the same route.
- C. The contractor shall be responsible for placing all new sleeves and penetrations required for successful cable installation.
- D. Upon completion of the cable installation, the contractor shall install fire-stopping/sealing material in all sleeves and penetrations used during this installation.
- E. Grounding of all equipment racks shall be installed in accordance with all manufacturer's specifications and recommendations, the National Electrical Code, and accepted industry standards for grounding communications cable and ancillary devices.

### 4.02 Testing

- A. The contractor shall procure and provide all necessary test equipment, test cables, adapters, load boxes, light sources, and any other hardware required to perform cable testing.
- B. Before beginning testing, the contractor shall submit a list of all test equipment to be used to UMDNJ for their approval.
- C. The contractor shall schedule all testing with UMDNJ in advance of testing. Additionally, UMDNJ reserves the right to witness testing of all installed cabling.

D. All Category 6 station cables shall be tested and certified for compliance with the proposed standards for EIA/TIA Category-6 cabling, with the following tests to be included:

- Wire Map
- Length
- Propagation Delay
- Delay Skew
- Impedance
- Attenuation
- Resistance
- Power-Sum Near End Cross-talk
- Power-Sum Far End Cross-talk

Print-outs of the test results for each station cable shall be furnished as part of the as-built package.

E. The contractor shall submit each test report to UMDNJ for approval. Approval is based upon the expected results for the cable being tested, and upon the corrective actions taken by the contractor when specific tests fail.

F. Each element of all new 24-element multimode fiber optic cabling shall be tested for continuity and attenuation in both directions at both 850 and 1300 nM, with a fiber optic light source and power meter. Before beginning testing, the contractor shall submit to UMDNJ, a design fiber - optic loss budget for the segment to be tested based upon the length of fiber optic cable installed. When tested at both windows in both directions, the measured attenuation of each fiber optic cable segment shall be less than or equal to the design attenuation of the segment being tested. Until this condition has been met, the installation shall not be considered complete, and will not be accepted.

G. Each element of all new 12-element single-mode fiber optic cabling shall be tested for continuity and attenuation in both directions at both 1310 and 1550 nM, with a fiber optic light source and power meter. Before beginning testing, the contractor shall submit to UMDNJ, a design fiber-optic loss budget for the segment to be tested, based upon the length of fiber optic cable installed. When tested at both windows in both directions, the measured attenuation of each fiber optic cable segment shall be less than or equal to the design attenuation of the segment being tested. Until this condition has been met, the installation shall not be considered complete, and will not be accepted.

#### 4.03 Damage

- A. Any cuts, abrasions, burns, stretched segments, and/or other damage that will be detrimental to the performance of that cable shall be cause for replacement of that entire segment of cable.
- B. Incidental damage to cables and connectors shall be corrected at the contractor's expense before testing and final acceptance of cables.

#### 4.04 Corrective Action

- A. If any cable tests fail for any reason, the cause of the failure shall be determined by the contractor. If a defective cable, outlet insert, wiring block, and/or patch panel is found to be the cause of failure; the material in question shall be replaced at the contractor's expense.

## PART 5 WARRANTY

### 5.01 System Acceptance

- A. Final acceptance and final payment will be made by UMDNJ upon satisfactory completion of the work and the submission and approval of all test records, cable run summaries, and as-built drawings. This includes cable testing, reports and certification that the cabling has been properly installed.
- B. The work will not be considered complete until:
  - 1. It has been inspected by UMDNJ.
  - 2. All discrepancies have been resolved.
  - 3. All test records, cable run summaries, and as-built documentation have been received.

### 5.02 Warranty

- A. The contractor shall provide Ortronics/BerkTek Net Clear and 25 year extended warranties for the cabling system installed. The warranty shall begin on the day of acceptance by UMDNJ for the installed work.

## PART 6 BIDDER'S INFORMATION

### 6.01 Project Management

- A. The contractor's project manager shall oversee the entire installation.
- B. The contractor's project manager shall coordinate the scheduling of work with UMDNJ Project Coordinator and the general contractor.

### 6.02 Bidder Profiles

- A. The bidder shall furnish their company-related information, describing the structure of the organization, principals and related company personnel, and examples of reference projects relative to the scope of this specification. The bidder shall include names, addresses, and telephone numbers for reference projects listed.

### 6.03 Bid Costs

- A. UMDNJ will not be responsible for any costs incurred in preparing responses to this document.

### 6.04 Right of Rejection

- A. UMDNJ reserves the right to accept or reject any or all responses to this specification. Additionally, UMDNJ reserves the right to enter into discussions and/or negotiations with more than 1 qualified bidder at the same time, should this action be in UMDNJ's best interest.
- B. UMDNJ reserves the right to terminate this contract, if in the opinion of UMDNJ, the performance of the contractor does not meet the standards set forth by UMDNJ in general, and in this specification in particular.

### 6.05 Pricing Information

- A. The bidder shall submit pricing for furnishing and installing the complete cabling system, as described in this specification package.
- B. The bidder shall submit unit pricing as follows:
  - 1. To install an additional outlet
  - 2. To delete an outlet from contract
  - 3. Patch Cords
  - 4. Racks
  - 5. Patch Panels

6. To install an additional wall phone (single cable run)
  7. To delete a wall phone from contract (single cable run)
- C. The bidder shall provide an hourly rate sheet for all personnel and labor categories, for the following:
- Straight-time work (during normal business hours).
  - Evening work (Monday through Friday, outside normal business hours).
  - Weekend time.
- C. The bidder shall furnish a list of company holidays as a part of their response.

## PART 7 APPENDICES

- a) Termination Hardware for 4-pair Station Cables
- b) Approved Materials for Faceplates, Surface-Mounted Outlets and Inserts
- c) Cable Tray Components
- d) Fiber Optic Cabling (2 pages)
- e) Typical MDF & Verizon Entrance Facility (VEF) Layout
- f) Typical IDF Layout
- g) Typical Station Panel Layout
- h) Rack Mounted Patch Panels
- i) Patch Panels for Rack Mount Solution
- j) Equipment Racks and Components
- k) Wall Mounted 110 Blocks
- l) Ladder Rack Components and Typical Layout
- m) Patch Cables
- n) IDF/MDF Grounding Requirements (3 pages)
- o) Nortel PBX Grounding Requirements
- p) Wall Phone Single Cable Terminations IDF Specification
- q) Rittal Cabinets for MDF Room

## PART 8 SECTIONS 16471-2 & 16471-3

- A. Voice Network
- B. Data Network

**END OF SECTION**

## APPENDIX A

### Termination Hardware for 4-pair Station Cables

<b>Description</b>	<b>Part No.</b>	<b>Color</b>
Lanmark-2000 UTP	10033829	White

## APPENDIX B

### Approved Materials for Faceplates, Surface-Mounted Outlets and Inserts

1. The voice and data outlet inserts and housings (flush or surface mounted) shall be “Fog White” in color.

<b>Description</b>	<b>Ortronics Part No.</b>
Voice/Data Outlet Inserts	OR-S22600
Flush Mounted Housing	OR-40300158
Surface Mounted Housing	OR-40300185
*Surface Mounted Housing for Systems Furniture	OR-40400049

2. The Blank filler Snap-in Icons shall be placed into the jack inserts:

<b>Description</b>	<b>Ortronics Part No.</b>
Red	OR-40322500
White	OR-40309500
Blue	OR-40326500
Yellow	OR-40324500
Green Ortronics (for single wall phone installations only. See Appendix D).	OR-40325500

\*Please note that systems furniture outlets and inserts should be determined based on the type of furniture proposed for installation. The Ortronics product family should be specified.

## APPENDIX C

### Cable Tray Components

Description	Part No.
Cable Support Clips	FAS product family
Parts will be reviewed and determined on individual project basis	

Description	Part No.
24"x 4"	CF 105/600 EZ
12"x 4"	CF 105/300 EZ
18" x 4"	CF 105/450 EZ

## APPENDIX D

### Fiber Optic Cabling (pg. 1 of 2)

#### 24-Strand Multimode Specifications:

- FDDI-grade.
- ANSI/TIA/EIA-568A.
- 900-micron tight-buffered design.
- UL-rated OFNR for installation in riser environment.
- Operating Temperature: 0° C to +70° C.
- Orange jacket.
- Industry-standard color-coding for identifying individual elements and sub-units of each fiber optic cable.
- Performance requirements and mechanical specifications must meet manufacturer's specifications.

Description	Ortronics Part No.
Multimode fiber optic cable	Berk-Tek PRD6B024-CB3510-25
Multimode fiber optic connectors	Ortronics Part No. OR-205KAS9FA-62 (SC compatible)

#### 12-Strand Singlemode Specifications:

- ANSI/TIA/EIA-568A.
- 900-micron tight-buffered design.
- UL-rated OFNR for installation in riser environment.
- Operating Temperature: 0° C to +70° C.
- Yellow jacket.
- Industry-standard color-coding for identifying individual elements and sub-units of each fiber optic cable.
- Performance requirements and mechanical specifications must meet manufacturer's specifications.

## APPENDIX D

### Fiber Optic Cabling – pg. 2 of 2

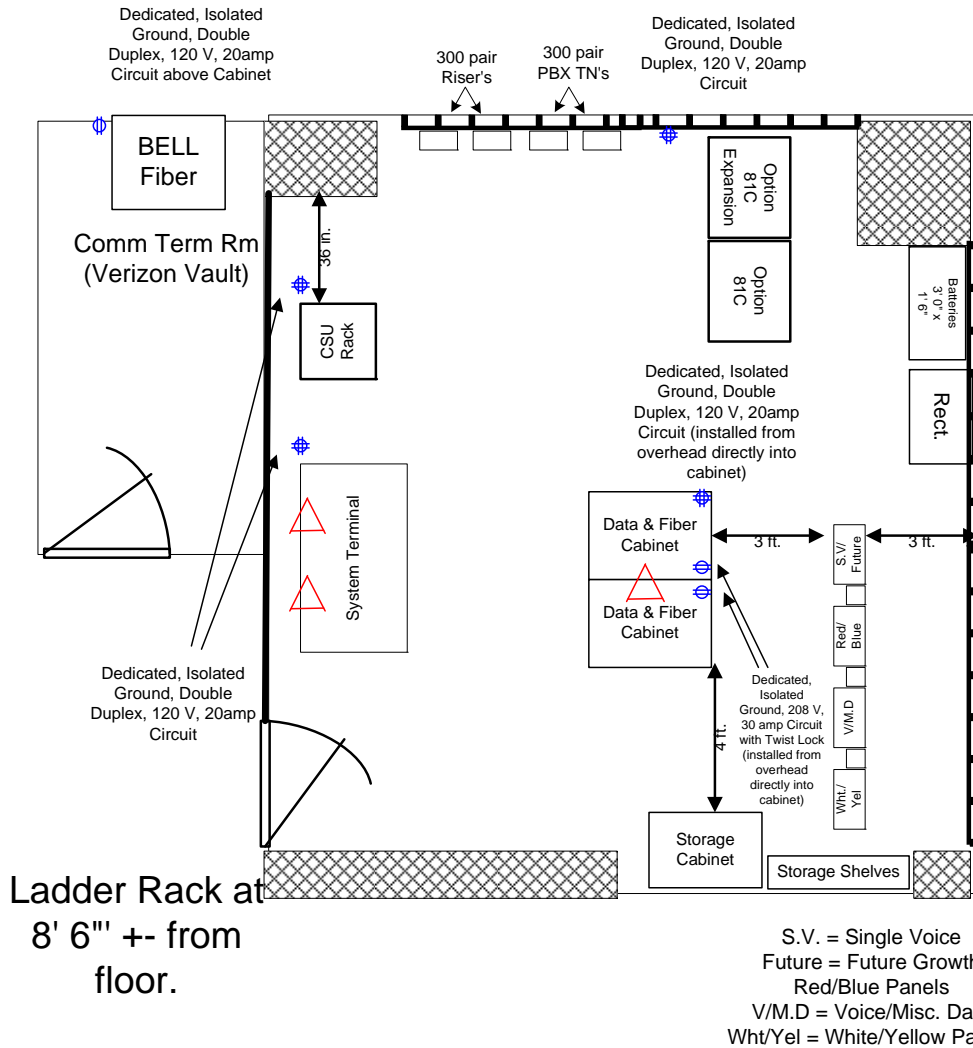
<b>Description</b>	<b>Ortronics Part No.</b>
Single-mode fiber optic cable	Berk-Tek PDR012-AB1010
Single-mode fiber optic connectors	Ortronics Part No. OR-205KAS9FA-09 (SC compatible)

#### Fiber Rack Mount Cabinet:

<b>Description</b>	<b>Ortronics Part No.</b>
Rack Mount Fiber Cabinet	OR-61500014-00

# APPENDIX E

## Typical MDF Room Layout (20'x20') Typical Verizon Entrance Facility (8'x8')



3/4" Fire-rated plywood on 3 1/2" metal studs on all walls in MDF to start 12" from door frame.

3, 50 Amp 208V Hard Wired Circuits in Seal tight terminated in a cut off switch (Hard wired directly into rectifier)

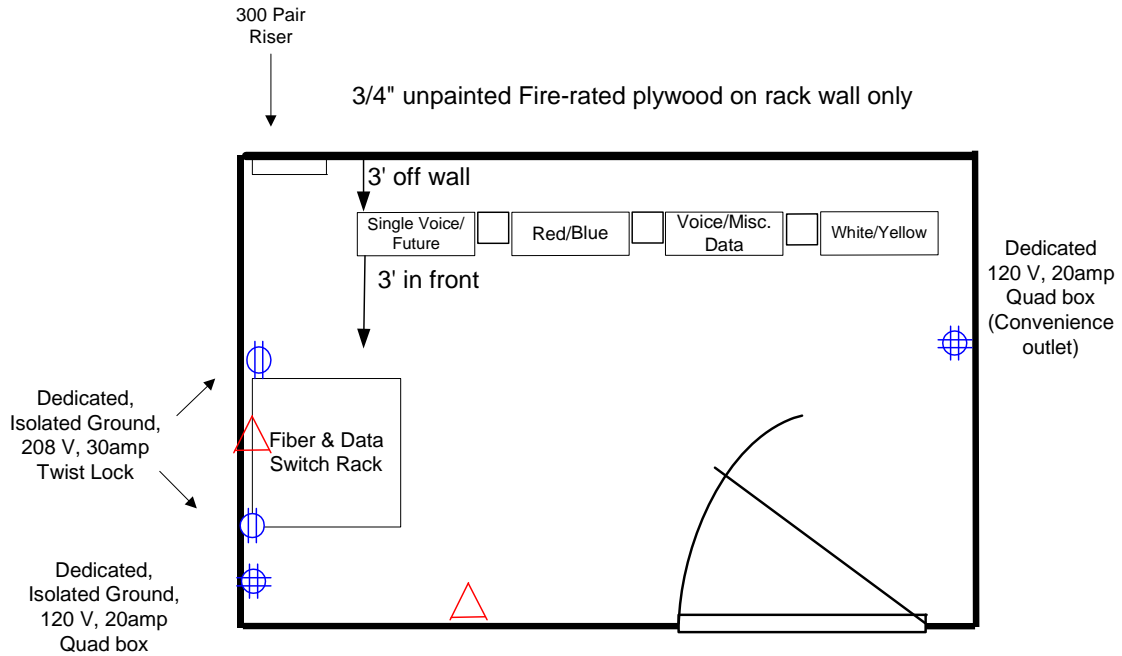
All elec. outlets to be installed at standard height unless noted.

Tel/data outlet

Ladder rack installation in MDF needs to be coordinated with ceiling grid

# APPENDIX F

## Typical IDF Room Layout (10'x12')



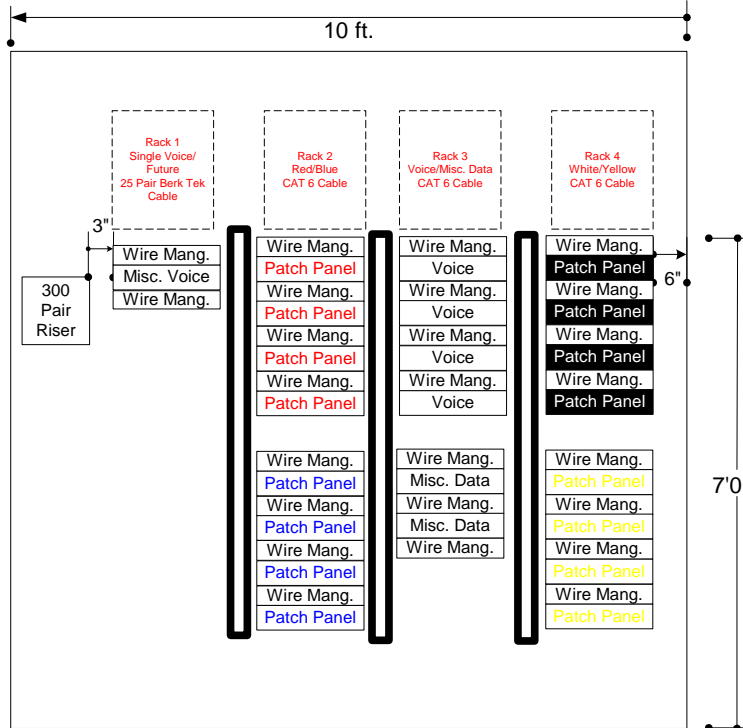
△ Tel/data outlet

Ladder Rack at  
8' 6" +/- from floor.

All elec. outlets to be installed at  
standard height unless noted.

# APPENDIX G

## Typical Station Panel Layout



## APPENDIX H

### Rack Mounted Integrated Patch Panels with Tie Cables

The part numbers for the panels, swing brackets and cables shall be as follows:

<b>Description</b>	<b>Part No.</b>
CAT 6 24 port panel w/ pre terminated inserts	202768-xx (xx = footage)
CAT 6 bundled pre- terminated (6 port) hydra to hydra	202769-xx (xx = footage)

These integrated patch panels and cables are custom made for UMDNJ and are procured through IST CST Telecommunications.

## APPENDIX I

### Patch Panels for Rack Mount Solution

<b>Description</b>	<b>Ortronics Part No.</b>
Patch Panel, T568-B Wired, 48-Port, High Density, (2) RU High	OR-PHD66U48
Wire Manager, w/(5) Distribution Rings, (2) RU High	OR-808004410
Label/Module Strips for Patch Panel, Red	OR-70400408-22
Label/Module Strips for Patch Panel, Blue	OR-70400408-26
Label/Module Strips for Patch Panel, White	OR-70400408
Label/Module Strips for Patch Panel, Yellow	OR-70400408-24
Red Blank Snap-ins	OR-40322500
White Blank Snap	OR-40309500
Blue Blank Snap	OR-40326500
Yellow Blank Snap	OR-40324500

## APPENDIX J

### Equipment Racks and Components

<b>Description</b>	<b>Part #</b>
Equipment Rack	OR-60400163
Height	84-inches (44 rack spaces)
Width:	19-inches
Depth:	12-inches
Installation:	Bolt to the floor
Cable Management:	Vertical wire management provided
Cable Runway Support Bracket	CPI Part No. 12121-712
Ground Bus Bar Kit	CPI Part No. 13622-010 (IDF) CPI Part No. 40153-012 (MDF)
One Mounting Hole Ground Terminal Block	CPI Part No. 08009-001

## APPENDIX K

### Wall Mounted 110 Blocks

<b>Description</b>	<b>Part No.</b>
IDF 300 pair 110-blocks & 110 c-5 clips	Ortronics Part No. OR-30200095
MDF 300 pair 110-blocks & 110 c-5 clips	Ortronics Part No. OR-30200095

## APPENDIX L

### Ladder Rack Components & Typical Layout

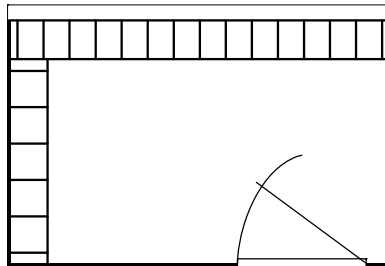
*Specifications:*

<i>Ladder Rack</i>	12" wide.
<i>Rung Spacing</i>	12" intervals (maximum)

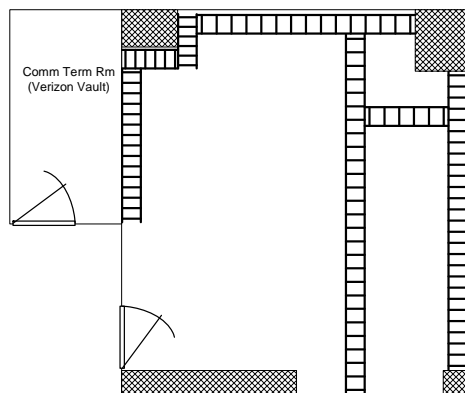
*Part Information:*

Description	CPI Part No.
Ladder Rack: 12-inch	10250-712
Wall Angle Support Kit	11421-712
Triangle Support Bracket	11746-712
J-Bolt Kit	11308-005
Junction Splice Kit	11302-001
Protective End Caps	10642-001

*Typical Layout IDF*



*Typical Layout MDF*



## APPENDIX M

### Patch Cables

*Specifications:*

1. Patch cables shall be 4-pair, 24-AWG stranded cable that is terminated on a “straight-thru” basis using 8-position, 8-conductor plugs. All patch cables shall meet or exceed the performance requirements for Category 6.

*Part Info:*

1. Patch cables for data applications shall be “Gray” in color, and shall be provided in the following lengths:

<b>Length</b>	<b>Part No.</b>
3-Feet	PC-568BC6-03-GY
5-Feet	PC-568BC6-05-GY
7-Feet	PC-568BC6-07-GY
10 -Feet	PC-568BC6-10-GY

2. Patch cables for voice applications shall be “Yellow” in color, and shall be provided in the following lengths:

<b>Length</b>	<b>Part No.</b>
3-Feet	PC-568BC6-03-YW
5-Feet	PC-568BC6-05-YW
7-Feet	PC-568BC6-07-YW
10 -Feet	PC-568BC6-10-YW

*Purchase Info:*

These integrated patch panels and cables are custom made for UMDNJ and are procured through IST CST Telecommunications.

## APPENDIX N

### IDF & MDF Grounding Requirements

#### *IDF Grounding Requirements*

1. An isolated ground conductor must be connected to a ground bus bar in the IDF to building steel, preferably grounded to an I-beam.
2. A minimum #6 AWG conductor is to be installed from building steel to the bus bar specified below.

#### **Chatsworth Products, Inc.**

**Part number: 13622-010 10" x 2" BUSBAR KIT**

**BusBar Kit, Wall-Mount**

**Solid copper ground bars 1/4" thick for wall and backboard mounting.**

**Provides 3.45-inch standoff from backboard**

**Kit consists of:**

- 1 each busbar
- 2 each insulators
- 2 each standoff brackets and assembly screws

Note the URL. <http://www.chatsworth.com/CPICatalog/section1/pg68.asp>

#### *MDF Grounding Requirements*

1. An isolated ground conductor must be connected to a ground bus bar in the MDF to building steel, preferably grounded to an I-beam.
2. A minimum #6 AWG conductor is to be installed from building steel to the bus bar specified below.

#### **Chatsworth Products, Inc.**

**Part number: 40153-012 12" x 4" BUSBAR KIT**

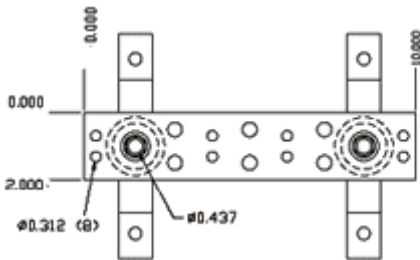
**BusBar Kit, Wall-Mount**

**Solid copper ground bars 1/4" thick for wall and backboard mounting.**

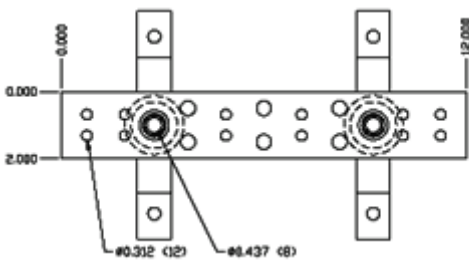
**Provides 2.75-inch standoff from backboard**

**Kit consists of:**

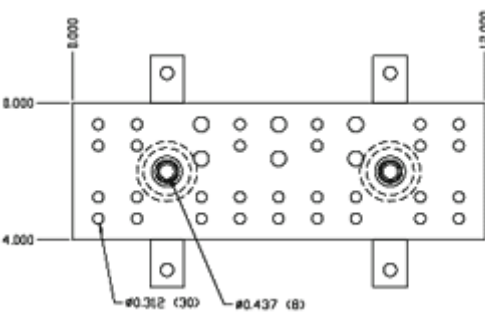
- 1 each busbar
- 2 each insulators
- 2 each standoff brackets and assembly screws



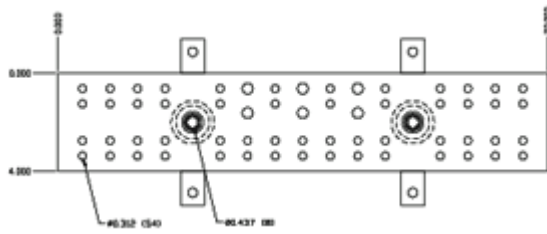
**13622-010**  
(4) Lugs, 5/8" hole centers  
(3) Lugs, 1" hole centers



**13622-012**  
(6) Lugs, 5/8" hole centers  
(3) Lugs, 1" hole centers



**40153-012**  
(15) Lugs, 5/8" hole centers  
(3) Lugs, 1" hole centers



**40153-020**  
(27) Lugs, 5/8" hole centers  
(3) Lugs, 1" hole centers

## BICSI & ANSI/EIA/TIA Grounding Busbars

The CPI 13622 series Telecommunications Grounding Busbar (TGB) provides a central ground attachment point for telecommunications systems, computers and other equipment located in the data room. The CPI 40153 series Telecommunications Main Grounding Busbar (TMGB) provides a central ground attachment point for telecommunications bonding backbones, equipment and the building's ground electrode system. All CPI Grounding Busbars are UL Listed.

Hole patterns on Busbars accommodate two-hole lugs per the recommendation of BICSI and ANSI/EIA/TIA-607 standards. Insulators electrically isolate Busbars from the wall or other mounting surfaces, thereby controlling the current path.

- Mounting brackets are manufactured from high-quality 300 series stainless steel
- Mounting holes are 3/8" diameter spaced 5.75" apart
- Busbars mount on the wall, floor or ceiling
- Ships preassembled and consists of: - 1 Busbar  
- 2 insulators  
- 2 stand-off brackets  
- 4 stainless steel bolts  
- 4 lock washers  
- 4 flat washers
- Sold individually
- Busbar assemblies with lug kits also available
- Other configurations available on request

PART NUMBER	DESCRIPTION / SIZE	SHIPPING WEIGHT
13622-010	10" TGB PATTERN 2"W X 1/4"H X 10"L	3 lb
13622-012	12" TGB PATTERN 2"W X 1/4"H X 12"L	4 lb
40153-012	12" TMGB PATTERN 4"W X 1/4"H X 12"	7 lb
40153-020	20" TMGB PATTERN 4"W X 1/4"H X 20"L	8 lb

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## **APPENDIX O**

### **Nortel PBX Grounding Requirements**

1. For system ground, an isolated single point ground system must be provided. The isolated ground should be sourced from Xo of a dedicated transformer or supplied from the neutral to/ground bond in the main service panel.
2. For isolated ground conductor must be connected to a ground bus in the switch room AC panel that is located from the frame of the panel.
3. The ground cable must be installed within  $\frac{3}{4}$ " conduit to the AC panel.
4. A minimum #6 AWG conductor is to be installed from the AC sub-panel IG bus to the same busbar specified in Appendix B.

## APPENDIX P

### Wall Phone Single Cable Terminations IDF Specification

Description	Ortronics Part No.	Quantity
Patch Panel, T568-B Wired, 48-Port, High density, (2) RU High Active Pins 4 & 5	OR-PHD66U48	1
Wire Manager, w/(5) Distribution Rings, (2) RU High (without routing clips)	OR-60400057	2
Flush Mounted Wall Plate	OR-40300158	N/A
Single Jack Insert	OR-S21600	N/A
Quad Plate Icon, Green	OR-40325500	1

Single cable runs are permitted in the following instances only and when no additional data will be required in that specific area:

1. Wall phone in a hallway.
2. Waiting room courtesy phone.

## APPENDIX Q

### Rittal Cabinets for MDF Room

Description	Part No.	Quantity
Rittal Cabinet	#9969220	2

Each cabinet must include the following additional parts:

1. Vented rear doors
2. Smoked front doors
3. Casters
4. Extra set of rails

## **SECTION 16471-2**

### **VOICE NETWORK STANDARDS**

#### 1.01 Description

- A. The University of Medicine and Dentistry of New Jersey, (UMDNJ) has standardized on Nortel Networks Meridian 1 PBX, (Private Branch Exchange) telephone systems and Nortel Networks Call Pilot voice mail systems. These systems are designed for enterprise deployment and offer features such as redundancy and battery back-up.
- B. For new facilities and / or renovations, the deployment of new PBX telephone sets is required.
- C. The telephone service will be provided via Direct Inward Dial service (DID) and system extensions, via leased voice circuits. Analog services are provisioned for fax machines, disaster back-up lines and system management.

## SECTION 16471-3

### DATA NETWORK STANDARDS

#### 1.01 Description

##### A. Technology

The University of Medicine and Dentistry of New Jersey (UMDNJ) has standardized on Cisco Systems Data network equipment. Other manufacturer's equipment is not supported by IST, nor may it be connected to the UMDNJ network infrastructure.

Chassis based solutions, offer various levels of redundancy and flexibility, and are designed for enterprise deployments. UMDNJ IST has standardized on chassis based solutions for deployment in health-care and research areas where bandwidth, throughput, reliability and up-time are required. The up-link, or (connection back to the network), will be provisioned at Ten Gigabit and the switched ports will be set to 100 mbps full duplex. For servers or other specialized computing devices, the ports may be set to 1000 mbps full duplex.

In common or administrative areas, either a chassis based or a stack-able solution may be considered. The stack-able solution does not provide redundancy, nor does it have the flexibility of a chassis based solution. I.e.; if additional functionality is required, the stack-able switch may need to be replaced with a chassis based solution. The up-link, or connection back to the network, will be set at one Gigabit and the switched ports will be set to 10mbps full duplex. For servers or other specialized computing devices, the ports may be set to 100 mbps full duplex.

##### B. Network Connectivity to New Facilities

Network connectivity to new facilities is based on the distance between the new location and a UMDNJ Campus or bandwidth requirements. Network connectivity can be provisioned to a new facility via a wide area network, (WAN) circuit or via the deployment of fiber optic cable.

<b>Network Requirement</b>	<b>Distance &gt; 2 miles</b>	<b>Distance &lt; 2 miles</b>	<b>Bandwidth</b>
Minimal bandwidth	WAN	WAN	1.5 mbps to 155 mbps
High bandwidth	Fiber Optic	WAN	155 mbps to 10 gbps

### **C. Wireless**

In new facilities, wireless access will be provisioned in common areas such as; lounges, atriums and conference centers.

A wireless survey will be performed by an external contractor to determine the locations of the wireless access points, to ensure optimal connectivity. Cisco wireless access points will be deployed to these locations and will be configured to utilize the 802.11 a, b and g protocols.

### **D. Port Activations**

All white ports, (the top right connection on a quad plate) will be pre-patched into the network. Specific ports will be activated based on requests placed by the occupants of the facility. All other ports will be disabled for security purposes.