DIVISION 270000 – COMMUNICATION

Latest Update: 07-31-2024 See Underlined Text for Latest Edits.
(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off "Underlines")

PART 1 – GENERAL REQUIREMENTS:

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including the General and supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE:

A. The communication contractor shall furnish all labor, material, tools, equipment and services necessary and incidental for installing all communication systems shown on the drawings, indicated in the specifications, or necessary to provide a finished installation. The finished installation shall be in perfect working condition and be ready for continuous and satisfactory operation. The project area is located in:

Note: Engineer to complete above paragraph.

1.3 SUMMARY OF WORK:<Consult with UMB Project Manager and UMB CITS Standards and Edit as required>

A. Work Included: The following work shall be included:

1. Furnish and install, including termination and testing of, UTP Workstation cables (Horizontal Cabling) between the Communications outlet locations and the respective serving TR.

2. Furnish and install testing of connectors, outlets, jacks, faceplates, etc., required to terminate optical fiber and workstation (horizontal) cables.

3. Provide labeling and documentation for all cables, faceplates, patch panels, racks and termination blocks, riser conduits, cable trays, and grounding system installed under this work. This includes maps of all outlet locations with final telecommunications outlet ID number.

4. Furnish and install wire management components, J-Hooks, and miscellaneous 'nuts and bolts' type components to provide a complete and working cable system.

5. Prepare and submit of Shop Drawings, termination schedules, test results, as-built drawings, and component documentation as described within these specifications.

6. Furnish and install Firestopping of floor and rated wall penetrations specifically provided for the distribution of telecommunication cables. Required floor and wall ratings are to be maintained.

7. Patch panels.

8. Four post Racks.

9. Entrance protection.

10. Provide UTP/FIBER Patch Cords as specified by the project.

11. DEMOLITION: Where indicated on the electrical/communications drawings to remove the existing communications outlets/jacks, the contractor shall also remove the communications cabling to respective communications closets. Prior to removing the cabling the contractor shall verify exact cabling that has to be removed and shall coordinate with the UMB Project Manager, UMB SOM IT and UMB CITS.

B. Work Specified Elsewhere:

1. Installation of conduits, pull boxes, plywood backboards, and floor boxes (provided under Electrical work), as specified in Division 26.

2. Installation of workstations, terminals, telephones, and similar equipment (installed by Owner and their representatives).

3. Cutting, patching, and painting of walls, unless damaged performing the work described herein.

1.4 CODES & REGULATIONS:

A. The installation shall comply fully with all government authorities, laws and ordinances, regulations and codes applicable to the installation.

B. Should any change in plans or specifications be required to comply with governmental regulations, the Contractor shall notify the Owner at the time of submitting the Shop Drawings.

C. Local Electrical and building codes may be differ with national codes. Follow the most stringent code or recommendations. Where there are instances of ambiguity refer to the Owner/Engineer for interpretation.

D. All equipment shall be equal to or exceed the minimum requirements of NEMA, IEEE, ASME, ANSI, and Underwriters' Laboratories.

E. Telecommunications distribution, installation, administration, and testing must comply with the latest version of applicable Federal, State and local laws, codes, ordinances, regulations, and standards, especially the latest version of ANSI/TIA/EIA-568, 569, 606, 607 and ANSI/NECA/BICSI 568-2001. Other standards for materials, equipment and installation practices include ADA, ANSI, ASTM, BICSI, EPA, FCC, IEEE, NEC, NECA, NEMA, NFPA, OSHA, REA, and UL.

1.5 RESPONSIBILITY

A. The construction manager/general contractor (CM/GC) shall be responsible for all work included in Division 27. The delegation of work to the contractors shall not relieve him of this responsibility. Contractors who perform work under these sections shall be responsible to the CM/GC.

1.6 SITE EXAMINATION:

A. Failure to visit the site and become familiar with existing project conditions prior to bidding will not relieve the Contractor of responsibility for complying with the Contract Documents.

1.7 OUTAGES:

A. For all work requiring an outage, the communication contractor shall submit an outage request to the UMB Project Manager, using the UMB Standard Request for Outage Form which is available through the UMB Design and Construction Web Site at https://www.umaryland.edu/designandconstruction/resources/contractors/

B. The existing systems shall remain operational unless turned off by University personnel during the construction of the project. For each outage request include a photograph or description of the area affected by the outage.

C. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled at least ten business (10) days in advance with the UMB Design and Construction Department. Outages shall be performed during normal duty hours. If necessary, some outage work may be performed outside normal hours if approved by UMB.

D. The communication contractor shall include in his price the cost of all premium time required for outages and other work which interferes with the normal use of the building, which will be performed, in most cases, during other than normal work time and at the convenience of the University.

1.8 SUBMITTALS:

A. General Requirements: For general requirements see Architectural Specification Division 01 Section "Submittal Procedures".

1. After contract award and before material is ordered submit electrically all shop drawings, drawings and such other descriptive data as the Engineer may require to demonstrate compliance with the contract documents as required by the contract clauses, plus the number required for himself and his subcontractors, for review and approval.

2. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable publication references, years of satisfactory service, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.

3. All equipment shall be approved and listed by Underwriters' Laboratories (UL) and shall bear nameplate indicating same.

4. Submittals will be reviewed for general compliance with design concept in accordance with contract documents, but dimensions, quantities, or other details will not be verified.

5. Refer to drawings and scope information for applicability of products. Submittals shall include the following items: <Engineer must edit the list for project requirement>

6. Submittals shall include the following items: Note: Engineer must edit the list for the project requirements.

   a. Article 2.2, Fire Stops & Smoke Seals for Wall & Floor Sleeve Applications
   b. Article 2.3, Sleeves
   c. Article 2.5, Cable Media
   d. Article 2.6, Termination Hardware
   e. Article 2.7, Equipment Racking
   f. Article 2.8, Distribution
   g. Article 2.9, Administration
   h. Article 2.10, Identification
   i. Article 2.11, O & M Manual
   j. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Submittals.

7. Submittal File Format: File formats and names for each submittal shall be electronically as follows:

a. File Formats:
   1) Product Data: "pdf" file format.
   2) Design Shop Drawings: "pdf" and "dwg" file formats.
   3) Coordinated Drawings: "pdf" or "dwg" file formats.
   4) Schedules: "xl" file format.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.

2. Cabling administration drawings and printouts.

3. Wiring diagrams to show typical wiring schematics, including the following:

   a. Cross-connects.
   b. Patch panels.
   c. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.

5. Provide test reports with corrective measures documented.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector, and RCDD.

D. Source quality-control reports.

E. Field quality-control reports.

F. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.9 QUALITY ASSURANCE:

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff. RCDD, testers, and installers shall be certified by the manufacturer of the product being installed.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.

2. Installation Supervision: Installation shall be under the direct supervision of RCDD, who shall be available at all times when Work of this Section is performed

at Project site. A Level 2 Installer must be present at all times when Work of this Section is performed at Project site.

3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.10 REGULATIONS AND PERMITS: <Coordinate with UMB and Delete if not Required>

A. The Contractor shall obtain and pay for all permits, certificates of inspection, etc., required by the authorities having jurisdiction over this work. The certificates shall be delivered to the Engineer before the date of final acceptance of the project.

B. Obtain applicable permits from Baltimore City to do work in City Streets. The City charges a compensatory fee when parking meters are required to be out of service.

C. Manhole Permit – Obtain permit from Baltimore City for manhole. Copy permit to UMB Environmental Health & Safety (EH&S) Group for UMB approval.

1.11 WORK PERFORMANCE

A. All communication work must comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J, OSHA Part 1910 subpart S and OSHA Part 1910 subpart K in addition to other references required by the contract.

B. Before initiating any work, a job specific work plan must be developed by the contractor. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, and safety equipment to be used and exit pathways.

C. Job site and worker safety are the responsibility of the contractor. Compliance with the requirements of NFPA 70E is subject to ongoing inspection by University personnel and failure to comply will result in an immediate Stop Work order being issued and enforced at the contractor's expense.

1.12 IDENTIFICATION BADGES:

A. Contractors must obtain photo identification cards for all employees who will be at the construction site. The University will charge the contractor twenty five dollars ($25.00) for each badge as a deposit of which twenty dollars ($20.00) will be returned when the badge is returned. Lost photo I.D. card will cost twenty five dollars ($25.00) for another replacement card. (The above charges are subject to change without notice.)

1.13 HAZARDOUS MATERIALS:

A. Identification and removal of hazardous materials (asbestos, lead paint, PCBs) is not part of this contract. If questionable material is encountered, notify the University Project

Manager and the University Environmental Health and Safety in writing immediately. The University shall then arrange for investigation and possible abatement of the material. Contractor shall schedule his work to accommodate hazardous material removal by the Owner.

1.14 GUARANTEE/WARRANTEE:

A. All materials, equipment, etc. provided by the general contractor and/or his subcontractors shall be guaranteed and warranted to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial completion and acceptance of work by UMB. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner, within a reasonable time, to be specified by UMB. In default thereof, owner may have such work done and charge the cost of same to the contractor. In addition to the above statement the Guarantee/Warranty Period shall include all labor cost related to all warranty work.

B. Furnish a manufacturer's "Permanent Link" performance warranty for all horizontal communications wiring for a minimum period of fifteen (15) years from the date of acceptance of the work. Where a manufacturer's warranty is longer than fifteen (15) years, the Contactor shall offer the longer warranty. The Permanent Link Performance Warranty shall be issued and signed by the component manufacturer and shall list the University of Maryland as the holder of the warranty. The Permanent Link Performance Warranty shall cover all labor and material for all "Link" components.

PART 2 – PRODUCTS:

2.1 LISTED MANUFACTURERS:

A. Listed Manufacturers: The manufacturers indicated in Part 2 represent the basis for design and identify the minimum level of quality for materials and equipment, specified in this Division, that are acceptable to UMB. Unless "or equal" is included as an option, substitutions are not allowed, except under the following condition. During bid phase, contractors may submit material and equipment by non-listed manufacturers provided said submittals meet the requirements of these specifications. All submitted materials and equipment are subject to approval by the A/E and UMB. Reference: Division 1 Substitution Section.

2.2 FIRE STOPS & SMOKE SEALS FOR WALL & FLOOR SLEEVE APPLICATIONS
<Delete if Section 260000 is used for the Project>

A. General: Provide fire stops, and smoke sealant materials for all electrical communication services penetrating through rated assemblies. See Architectural Specification Division 07, Section "Penetration Firestopping" for sealant material requirements. Services include:

1. Electrical penetrations include conduits and cables.

B. New Construction: All new penetrations shall be provided with a pipe sleeve and sealant materials.

C. Existing Construction: All new service penetrations through existing rated assemblies shall be provided with a pipe sleeve and sealant materials. All existing unsealed penetrations for services passing through existing rated assemblies within the project area shall be provided with sealant materials.

D. Project Area: The project area shall include the finished spaces and related sections of the utility shafts within the project area footprint.

E. Wall Pipe Sleeve Applications: Pipe sleeves shall be required for all new conduit penetrations through rated wall assemblies and non-rated CMU walls. Where pipe sleeves are installed in non-rated CMU walls fire rated sealant materials are not required. Provide acoustical caulking to seal the annular spaces between the sleeve and the bare pipe or pipe insulation on each end with one half (1/2) inch caulking all around the annular space.

F. Floor Pipe Sleeves Applications: Pipe sleeves are required for all new conduit risers passing through floor slabs.

2.3 SLEEVES

A. Steel Pipe Sleeves: Steel pipe sleeves shall be standard black steel pipe Type E, Grade B, with plain ends conforming to ASTM A53/A53M.

2.4 GENERAL REQUIREMENTS:

A. The part numbers indicated here in are for reference, please verify with the manufacturer and UMB CITS.
<Engineer to consult with the Project Manager and UMB CITS to verify exact part numbers>

2.5 CABLE MEDIA:<Edit for project requirement>

A. Four (4) Pair Cable:

1. Data Cable – CMP

a. Four (4) pair unshielded twisted pair (22-24AWG), solid copper conductors, 100 ohms nominal impedance +/- 15%, minimum bandwidth 500 MHz, green CMP Plenum jacket. Complies with ANSI/TIA 568-C.2 Category 6a performance specifications.

b. Manufacturer: Comm Scope, BerkTek, Superior Essex.

B. Twenty Five (25) Pair Binder Cable:

1. Inter-building Cable (OSP)

a. Twenty five (25) twisted pair per binder – 24 AWG, solid copper conductors, 100 ohms nominal impedance +/- 20%, OSP jacket. Complies with EIA/TIA 568 Category 3 performance specifications. North of Howard Hall, the OSP cable shall be gel-filled. South of Howard Hall, the OSP cable may be air core.

2. Intra-building Cable - Riser and/or Tie (CMR or CMP)

a. Twenty five (25) twisted pair per binder – 24 AWG, solid copper conductors, 100 ohms nominal impedance +/- 20%, plenum jacket (if necessary), complying with ANSI/TIA 568-C.2; category 5e or 6a performance specifications.

C. Optical Fiber:

1. Inter-building Cable (OFNP)

a. Shall be a hybrid cable containing both multimode and singlemode under a single plenum jacket, unless otherwise noted. We suggest the use of armored fiber. Fiber without an armor jacket must be installed in a protective corrugated flexible raceway "Innerduct".

b. Multimode: 50/125-micrometer, 12-fiber, nonconductive, tight buffer with aramid yarn strength member (i.e. Kevlar™), plenum jacket, indoor/outdoor rated (-20^{0}C to +85^{0}C), optical fiber cable. 900 µm buffer diameter, numerical aperture 0.29 +/- 0.02, minimum bandwidth of 4700 MHz at 850 nm, 500 MHz at 1300 nm, maximum attenuation 3.0 dB/km at 850 nm and 1.0 dB/km at 1300 nm.

c. Single mode - 9/125 µm tight buffer construction with aramid yarn strength member (ie Kevlar™), indoor/outdoor rated (-20°C to +85°C). 8-9 µm Core diameter, and 125µm Cladding diameter, maximum attenuation 1.0 dB/km at 1310 nm and 1.0 dB/km at 1550 nm.

d. Manufacturer: OCC Part Number: DX or GX Series (ie 12MM / 24SM hybrid armored fiber would have a part number of DX036DGAJ9KAA2)

2. Intra-building Cable – Riser and/or Tie (OFNR or OFNP)

a. Shall be a hybrid cable containing both multimode and singlemode under a single plenum (if necessary) jacket, unless otherwise noted.

b. Multimode – 50/125-micrometer, 12-fiber, nonconductive, tight buffer with aramid yarn strength member (i.e. Kevlar™), plenum jacket, indoor/outdoor rated (-20^{0}C to +85^{0}C), optical fiber cable. 900 µm buffer diameter, numerical aperture 0.29 +/- 0.02, minimum bandwidth of 4700 MHz at 850 nm, 500 MHz at 1300 nm, maximum attenuation 3.0 dB/km at 850 nm and 1.0 dB/km at 1300 nm.

c. Single mode – 9/125 µm tight buffer construction with aramid yarn strength member (ie Kevlar™), indoor rated (-20°C to +65°C). 8-9 µm Core diameter, and 125µm Cladding diameter, maximum attenuation 1.0 dB/km at 1310 nm and 1.0 dB/km at 1550 nm.

d. Manufacturer: OCC, Lucent/Avaya, Siecor/Corning
Part Number: OCC, DX Series (ie 12 MM / 12 SM would have a Part Number of DX024DGAJ9KAA2)
Lucent/Avaya Accumax Series (ie LGCC-06/12D-S/LRX)
Siecor MIC (ie 018X81-A7132-24)

3. Patch Cords – UTP:

a. Four (4) pair unshielded twisted pair (22-24AWG), stranded copper conductors, 100 ohms nominal impedance +/- 15%, green (other colors may be requested) jacket. Must be 100% factory transmission tested in a Category 6a channel.

b. Manufacturer: The Siemon Company, Ortronics
Part Number: Siemon – ZM6A-XX-(07) (XX = length)
Ortronics Clarity – OR-MC6A0X-05 (X = length)

c. Provide seven (7) feet length patch cords for patch panel termination and provide ten (10) feet length patch cords for work stations.

D. Patch Cords - Optical Fiber:

1. Multimode:

a. 50/125 µm, zipcord cable patch cord, with an aqua/purple jacket. Supports all bandwidths, dual-window, and low-loss. Complies with Bellcore FDDI, ANSI/TIA-568-C.3, and ICEA standards.

b. Manufacturer: Lucent/Avaya, Siecor/Corning or equivalent

2. Singlemode:

a. Duplex LC to Duplex LC, 8-9/125 µm, zip cord cable patch cord, with a yellow jacket. Supports all bandwidths, dual-window, and low-loss. Complies with ANSI/TIA-568-C.3 and ICEA standards.

b. Manufacturer: Siecor/Corning or equivalent

2.6 TERMINATION HARDWARE: <Edit for project requirement>

A. Standard Communications Outlet:

1. The Standard Communications Outlet for wall-mounted installation shall consist of a flush mounted single-gang wall box two (2) inches wide x four (4) inches high x two and one half (2-1/2) inches deep, with the following receptacle configuration: two (2, four (4) pair green, plenum, Category 6a UTP data cables terminated on eight (8) position, eight (8) conductor RJ45 receptacles, in a single gang stainless steel faceplate. These jacks shall be wired according to the 568B pinout. At certain locations a subset of this outlet may be installed, upon approval by UMB CITS.

   a. The "Ortronics Tracjack" shall be mounted in a vertical position with the data-1 jack in the top left and the data-2 jack next to it. The blanks will be mounted below.

2. A standard wall phone outlet for wall-mounted installation shall consist of a flush mounted single-gang wall box two (2) inches wide x four (4) inches high x two and one half (2 -1//2) inches deep, with one separately sheathed Category 6a UTP green plenum data cable with a stainless steel faceplate.

B. Termination Blocks:

1. Voice (UTP) – Indoor Building Entrance Terminal and Solid State Digital Surge Protection Modules (for installation in BDF between OSP Interbuilding Copper and patch panel)

2. Manufacturer: Circa, or approved equivalent.

C. Data & Voice (UTP):

1. Rack mounted nineteen (19) inch Category 6a, modular forty eight (48) port patch panels. Standard density preferred complying with ANSI/TIA 568-C Category 6a performance.

2. Manufacturer: The Siemon Company, Ortronics
   Part Number: Ortronics Clarity – OR-PHD610U48 (High Density)

D. Data (Fiber):

1. Rack-mounted nineteen (19) inch optical fiber patch panel with hinged front door, mounting guides, and designation panels. Populate panels complete with coupler panels and LC couplers.

2. Manufacturer: Siecor/Corning or approved equivalent
   Part Number: CCH rack mounted units, CCH-CP12-A9

(single mode panels), CCH-CP12-E4 (multimode panels)

E. Modular Connectors/Outlets:

1. Data (UTP Workstation Outlet):

a. Eight (8) pin modular outlet, non-keyed, angled front complying with EIA/TIA 568-C Category 6a performance. Outlet wired standards compliant 568B pinning. Outlets must be white.
b. Manufacturer: The Siemon Company, Ortronics
Part Number: Ortronics Clarity 6a Trac Jack (OR-TJ6A)

2. Data (Wall Phone Outlet):

a. 8 pin modular outlet, non-keyed, 180° flush-front complying with ANSI/TIA 568-C Category 6a performance. Outlet wired standards compliant 568B pinning. Outlets must be white.
b. Manufacturer: Ortronics
Part Number: Ortronics Clarity 6a TracJack (OR-TJA)

Fiber in Workstation outlet was removed.

3. Faceplates:

a. Workstation Outlet: Stainless Steel, single gang, four (4) port (Siemon) or 6 port (Ortronics).
Manufacturer: The Siemon Company, Ortronics
Ortronics (OR-403STJ14 or OR-403STF16)
b. Wall Phone Outlet: Stainless Steel, single gang, one (1) port, Ortronics.
Manufacturer: Ortronics
Part Number: Ortronics (OR-403ST1WP)

4. Blank Inserts:

a. White, flat inserts for faceplates
Manufacturer: The Siemon Company, Ortronics
Part Number: Ortronics (OR-42100002)

F. Optical Fiber Connectors:

1. Connectors:

a. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-10. Comply with ANSI/TIA-568-C.3
b. Connectors: Quick-connect, duplex, Type LC, as manufactured for each cable type with insertion loss not more than 0. 5 dB/1km.

2.7 EQUIPMENT RACKING:

A. Equipment Racks:

1. Standard rack, lightweight aluminum construction, bolted assembly, nineteen (19) inch width, Black coated. Mounting channels are EIA-310-D compliant. Includes assembly hardware, and fifty (50) each #12-24 mounting screws.

a. Manufacturer: CPI or approved equivalent
Part Number: 55053-703

2. Four (4) post server rack, black coated, nineteen (19) inch width, approximate thirty (30) inch depth.

a. Manufacturer: CPI or approved equivalent
Part Number: 15053-703

B. Wire Management Hardware:

1. Rack Mount:

a. Horizontal:

1) Shall be one (1) RU or Rack Unit high.
2) Manufacturer: Ortronics or UMB CITS approved equivalent
Part Number: OR-808004759

b. Vertical:

1) Double-sided vertical trough with lockable cabling latches, protective edge guards and pass through ports and can be used to bay two (2) racks together. Includes assembly hardware.
2) Manufacturer: CPI or UMB CITS approved equivalent
Part Number: 11729-703

C. Wall Mount:

1. D-Rings:

a. Metal, closed, rolled steel edges, large size minimum five (5) inch width x three and one quarter (3.25) inch height.
b. Manufacturer: CPI or equivalent
Part Number: 10943-000

2. White backboards with spools:

a. Single or double height white backboards with B20 distribution posts (mushroom spools).
b. Manufacturer: AllenTel or equivalent.
Part Number: GB187D1 (single) or GB187B1 (double).

3. Blue backboards:

a. Full height blue backboards for mounting of 66 Blocks.
b. Manufacturer: AllenTel or equivalent.
Part Number: GB183B1.

2.8 DISTRIBUTION:

A. Ladder Rack:

1. Ladder Rack for IDF /BDF:

a. Open rung cable runway twelve (12) inches wide with runway radius drop outs, eight (8) inch cable retaining post and end cap, complete with heavy-duty butt-splice hardware, junction splice hardware, end feet hardware, protective end caps, five eighths (5/8) inch ceiling support hardware and any other hardware to complete a Cat 6a installation. Constructed of steel tubing with twelve (12) inch rung spacing, black coated.
b. Manufacturer: CPI or UMB CITS approved equivalent
Part Number: 10250-712, twelve (12) inch wide ladder rack.

B. Cable Tray:

1. Aluminum, center spine tray for horizontal cables with a bottom-rung design. Size and design in accordance with ANSI/TIA/EIA-569-B Pathways and Spaces.

2. Manufacturer: Wiremold Spec-Mate or equivalent
Part Number: CA 04 09 18 (Part # for a ten (10) foot long section of tray with one (1) inch wide rungs, four (4) inches high, spaced nine (9) inches apart and an overall tray width of eighteen (18) inches.

C. Fasteners:

1. Plenum-rated cable hanger should have a wide base to provide support for Category 6a cable and fiber optic cable. Size in accordance with ANSI/TIA/EIA-569-B Pathways and Spaces.

2. Manufacturer: Hilti, Erico or approved equivalent
Part Number: Hilti X-ECH or Erico Cable Cat CAT32

D. Corrugated Flexible Raceway (AKA Innerduct):

1. Indoor:

a. Flexible non-metallic corrugated plenum innerduct with a pre-installed pull line. Riser rated may be used in riser applications only. Size in accordance with ANSI/TIA/EIA-569-B Pathways and Spaces.
b. Manufacturer: Pyramid or equivalent
Part Number: PLM100T (for 1 inch)

2. Outdoor:

a. Orange Flexible non-metallic corrugated plenum innerduct with a pre-installed pull line. Size in accordance with ANSI/TIA/EIA-569-B Pathways and Spaces.

2.9 ADMINISTRATION:

A. Labels:

1. The communications workstation outlet faceplate shall be labeled with a pre-printed or machine printed, smudge resistant appropriately sized to fit, white label with black print.

2. Manufacturer: “Brother P-Touch III”, “Panduit LS- five (5) inch or equivalent.

B. Icons:

1. The communications workstation outlet shall have each data jack marked with a green icon, and each fiber jack marked with a red icon.

2. Manufacturer: Siemon, Ortronics

2.10 IDENTIFICATION:

A. General:

1. Identification shall be in accordance with ANSI/TIA-606-B, unless otherwise noted.

2.11 PROJECT OPERATION AND MAINTENANCE MANUAL – ELECTRONIC FILES

A. Project O & M Manual File: The project OM Manual shall include one (1) electronic copy of each approved submittal and any manufacturer's maintenance manuals, and all warranty certificates included in Division 27. Also include the address, phone number and contact person for each supplier. Using the UMB Standard O&M Manual Template referenced in Division 01 Closeout Procedures insert the submittal files include both a bookmark and tree structure for accessing each submittal file in the manual.

PART 3 – EXECUTION:

3.1 GENERAL REQUIREMENTS – EXECUTION

A. All construction work that creates excessive noise will not be permitted during normal business hours. See Division 01 Specification Section "Cutting and Patching" for requirements.

B. General provisions of the contract apply. All work performed and materials provided shall conform to all applicable codes and standards.

C. Prior to starting work, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

D. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways.

E. Leave all areas broom clean daily. Remove all construction debris and trash from the site daily.

F. Contractor shall do all cutting, drilling, and patching required by his work. All repairs to finish shall be of like kind, color, and quality as existing. Structural members shall not be cut without approval from the architect.

G. Take necessary precautions to protect building's occupants and contents and prevent the spread of dust and dirt into occupied areas.

3.2 SLEEVES

A. Non-Fire-Rated Soundproof Partition Penetrations: Where new and existing conduits pass through interior partitions with sound proofing provide a pipe sleeves. Seal the annular spaces between construction openings, the sleeves, and conduits with soundproof insulation material equal to the width of the opening. The soundproof insulation shall match the insulation in the partition.

3.3 CONTRACT DOCUMENTS:

A. Contract drawings for communications work are diagrammatic, intended to convey scope and general arrangement.

B. Correction of faulty work due to resolving discrepancies without authorization shall be the responsibility of the Contractor.

C. Should the Contractor discover any discrepancies or omissions on the drawings or in the specifications, he shall notify the Engineer of such conditions prior to the bid date. Otherwise, it will be understood that the drawings and specifications are clear as to what is intended and shall be as interpreted by the Engineer.

3.4 COORDINATION:

A. Coordinate all work and cooperate with all other trades to facilitate execution of work.

3.5 HORIZONTAL DISTRIBUTION:

A. Infrastructure:

1. Horizontal distribution is the means by which communications services are brought from the Horizontal Cross-Connect in each IDF to the user station location, or communications outlet.

2. The following guidelines address horizontal distribution in structures were suspended ceilings are installed in corridors:

a. Each floor will be equipped with a center hung cable tray (approved by UMB CITS) running from the IDF, above the suspended ceiling in corridors, to provide an access path to each communications outlet. Cable trays shall be bonded to telecomm grounding system. Cable tray shall be installed above corridors/open area/common area so that future access does not interfere with office/cubicle occupants.

b. Where the center hung cable tray is not possible; "J" hooks specifically designed for category 6a installations such as “Caddy Cable Cat” or Hilti X-ECH fasteners shall be installed at four (4) foot intervals. “J” hooks shall be installed above corridors/open area/common area so that future access does not interfere with office/cubicle occupants.

c. At least (3) three, four (4) inch electrical metallic tubing (EMT) conduits, and one (1) empty spare conduit for future use, will be installed to provide access to the center hung cable tray from the IDF, if the tray cannot be run into the IDF.

d. The center hung cable tray shall be installed as low as possible above the suspended ceiling and secured according to the National Electric Code.

e. Ideally, eighteen (18) inch clearance should be maintained on the free side of the center hung cable tray, and at least twelve (12) inch clearance above the center hung cable tray (per ANSI/EIA/TIA 569-B Pathways and Spaces). Worst case, there shall be at least 3 inches between the top of the suspended ceiling and the bottom of the cable tray**.**

f. The telecommunications center hung cable tray should be on the opposite side of the ceiling space from cable ladder racks or other distribution used for electrical service. Also avoid light fixtures; check electrical light fixture plans before installing cable tray in hallways so as to keep tray as far away as possible.

g. Where possible, all 90-degree turns should be made by two (2) 45-degree turns.

h. Workstation outlet boxes shall be installed at the same elevation as the other power outlets in the room, eighteen (18) inches A.F.F.) unless otherwise noted. Check the Americans with Disabilities Act (ADA) for the latest handicap access regulations.

i. Standard Communications Outlet eighteen (18) inches.

j. Standard Wall Mounted Outlets forty eight (48) inches.

k. Each standard communications outlet will be served by one (1) inch EMT conduits connected to the wall box and stubbed through the wall above the suspended ceiling and run to an easily accessible area for future additions and maintenance. The conduits shall have bushings to protect the cable.

l. Where EMT conduit installation is not possible, one and one quarter (1-1/4) inch flexible steel conduit (aka Greenfield) shall be the only acceptable substitute.

m. The one (1) inch EMT conduit connected to the wall box shall be installed so that no bend is sharper than a six (6) inch radius.

n. All EMT conduit runs longer than one hundred (100) feet from point to point, or exceeding two 90-degree bends, shall contain accessible pull boxes.

o. Follow manufacturers' instructions for installing and terminating components and telecommunications cabling.

p. Ensure that all telecommunications cable supports (conduits, support grips, cable tray, and J-Hooks) are fully installed before proceeding with cable installation. At no time shall cables be installed and left unsupported. At no time shall cables be tie-wrapped to any other supporting structure in lieu of specified cable supports. Do not bundle or tie-wrap cable even within the approved cable supports?

q. Do not lay telecommunications cables unprotected on the floor at any time, either in the IDF /BDF or workstation areas. If cables must be left on any floor, protect the cables so that they may not be walked on or have any material or equipment placed or rolled on top.

r. Maintain manufacturer's recommended minimum bend radii of the cables at any time. Do not stretch, stress, tightly coil, bend or crimp the workstation cables when leaving them out of the way of other trades during the staging of the work. All severely stressed or crimped cables will be replaced by the contractor at the contractor's expense.

s. Keep all items protected before and after installation, with dust and waterproof barrier materials as required. It shall be the contractor's responsibility to ensure the integrity of these protective measures throughout the life of the product.

t. The contractor shall protect all telecommunications equipment from damage at all times during the construction. Equipment in the IDF /BDF shall not be installed until such time as other trades have completed their work in that area so that the equipment will not be moved or damaged.

u. Ensure that safe ingress and egress from all work areas are maintained during movement and installation of materials.

v. Clean up all debris generated by installation activities. Keep the telecommunications areas free of debris at all times.

3.6 HORIZONTAL CABLING:

A. The following requirements pertain to the horizontal or station wire itself.

1. Station wire runs from the station outlet to the cross-connect point in the IDF (aka the horizontal link) shall be no longer than ninety (90) meters (two hundred ninety

five (295) feet) of cable distance including ten (10) feet of slack in the IDF and one (1) foot of slack at the outlet.

2. Horizontal cabling shall be installed in a Star topology.

3. Station wire shall be constructed of 24 AWG thermo-plastic insulated solid copper conductors formed into four individually twisted pairs and enclosed by a thermo-plastic jacket. All horizontal cable shall be rated type CMP per Section 800 of the National Electric Code, except for those cables installed in Bressler Building, Howard Hall, the Medical School Teaching Facility and future laboratory facilities which may be NEC rated type CM where permitted by code. If there is any uncertainty about which type to use, then always use CMP type.

4. Splicing shall not be allowed in station wiring.

5. Transition points or Consolidation points between the outlet and the IDF are not allowed.

6. The diameter of each four (4) pair cable shall be less than 6.35 mm (0.25 in).

7. Unshielded media is subject to crosstalk and electrical interference. During installation, care shall be taken to avoid environments that may expose the media to higher levels of electromagnetic interference from such sources as:

   a. Fluorescent lighting.
   b. Power cables.
   c. HVAC equipment.
   d. Commercial radio frequency transmissions.
   e. Electric motors.
   f. Dynamometers.
   g. Resistance welding equipment.

8. Guidelines for maintaining separation between unshielded twisted pair cable and interference sources are:

   a. Maintain at least a three hundred five (305) mm (twelve (12) inches) separation from fluorescent or neon lighting fixtures.
   b. Maintain at least a one (1) meter (three point three (3.3) foot) separation from transformers, motors or other sources of electromagnetic fields.
   c. Maintain separation from unshielded power cables for voltages up to 480 volts:

      1) Less than 2 kva: 127 mm (five (5) inches)
      2) 2 to 5 kva: 305 mm (twelve (12) inches)
      3) More than 5 kva: 915 mm (thirty six (36) inches)

d. Under-cabinet fluorescent fixtures installed in modular furniture or on walls can cause interference depending upon the proximity of the communications equipment to the fluorescent ballast.

3.7 VERTICAL DISTRIBUTION:

A. IDF and BDF:

1. A Building Distribution Frame and Intermediate Distribution Frame (BDF/IDF) is an area within a building set aside for the exclusive purpose of housing equipment associated with the telecommunications wiring system. Each BDF/IDF house's an increasing variety of communications equipment, hardware, cable, etc.

2. BDF/IDFs must be designed to accommodate the following:

a. Riser cables from the riser system, telecomm grounding system, cables to interconnect IDFs when there is more than one room per floor, Category 6 data cable and fiber optic patch panels, data communications hardware, wire and equipment racks, station wiring, electrical outlets, Lightning protection panels for OSP cable, blue mounting boards for voice fields and white mounting boards for cross-connect fields, "66" type terminating blocks for the voice cable (only when VoIP is not wanted).

3. Prior to the installation of any equipment in the BDF and any of the IDFs, the Contractor shall provide floor layout drawings and elevation layout drawings for the BDF and each of the IDFs. These drawings must be pre-approved by UMB CITS before any work is started in these rooms. These drawings must show the proposed locations of all blue backboards for voice, "66 type" terminating blocks, distribution panels, wire and equipment racks, security boxes, control boxes, electrical outlets, power supplies, and anything else required for all communications systems which are part of this specification.

4. The following should be used as a general guideline for designing BDF/IDFs that house the riser systems:

a. IDFs must be located so that station wire runs from the station outlet to the cross-connect point in the IDF be no longer than ninety (90) meters (two hundred ninety five (295) feet) of cable distance.

b. BDF/IDFs must be single purpose spaces and cannot be shared by other utilities, janitorial storage, etc.

c. A minimum of one IDF per floor is required. IDFs shall be designed such that station outlets are served by the IDF located on the same floor. In some

cases, where buildings are small, and the amount of jacks on the floor is low, consolidating 2 or 3 floors of cabling into one IDF may be considered.

d. The placement of IDFs adjacent to building columns and exterior walls may greatly restrict flexibility with regard to the layout of a raceway system and subsequent routing of cables.

e. BDF/IDFs should be designed so they are stacked one above the other.

f. A minimum of three (3), four (4) inch riser conduits will connect the IDFs. These conduits must be threaded and capped at both ends. Conduit penetrating the ceiling should extend only far enough below the ceiling to permit installation of a bushing and cap. Conduit penetrating the floor should extend a minimum of one (1) inch AFF, and a maximum of three (3) inches AFF. All such conduits should be a maximum of two (2) inches from the finished plywood wall.

g. An AWG #6 solid ground wire will be installed in the vertical riser from the basement to the top floor for the telecomm grounding system. This ground shall be attached to the building's approved grounding point used for the building electrical service.

h. A walk-in IDF of a minimum of eight (8) feet by ten (10) feet is preferred. A single three (3) foot solid door shall be provided and mounted to swing outside the room. This space should be accessible from a corridor.

i. Where a shallow IDF is the only available alternative, it shall not be less than three (3) feet by eight (8) feet. This type room should be equipped with two (2), three (3) foot doors hinged to swing outside the room.

j. All walls, ceilings and floors must be made non-porous with paint or sealant to minimize dust.

k. The BDF/IDF walls shall be lined with eight (8) foot high, three quarter (3/4) inch fire treated plywood mounted six (6) inches AFF. Anchors for plywood panels shall be sufficient to support equipment apparatus.

l. Minimum ceiling height for BDF/IDF is eight (8) feet six (6) inches. Dropped ceilings shall not be used within the BDF/IDF.

m. All BDF/IDF shall be equipped with a minimum of four dedicated non-switched receptacles. This will be dependent on the equipment to be installed. These must be connected to emergency power sources. In addition there shall be at least one (1) “convenience” outlet installed in the room which does not have to be on emergency power.

n. All BDF/IDF shall be equipped with Quad NEMA 5-20 Emergency Power Receptacles mounted in the center of each wall at a height of eighteen (18) inches AFF, ninety six (96) inches AFF, or on the equipment rack whichever is deemed suitable for the specific project by UMB CITS. These should be shown on floor layout and elevation drawings.

o. The cross-connect hardware should be connected to the telecomm grounding system installed in the vertical riser from the basement to the top floor.

p. A minimum of one fluorescent light fixture will be required. It shall be located to provide adequate lighting providing a minimum of at least 50-foot candles, measured at three (3) feet AFF, with a standard wall switch located near the door. For EMI protection, mount lights no closer than twelve (12) inches from cable sleeves, cable trays, and patch panels**.**

q. Plumbing lines (water, soil or steam) may not pass through the BDF or IDF. Integrity of fire separations shall be maintained in all cases. Rest rooms or janitor closets may not be placed above BDF or IDFs.

r. Sleeves or conduit entering these spaces from telephone outlets shall penetrate the IDF walls at a height above the plywood panels and extend only far enough to install bushings.

s. BDF/IDF environments must be capable of being maintained at a temperature of no less than 50^0F and no greater than 75^0F Fahrenheit. BDF/IDFs should be well ventilated and able to maintain a humidity of less than 55% (non-condensing). A positive pressure shall be maintained with a minimum of one air change per hour. When active devices are present, a sufficient number of air changes should be provided to dissipate the heat. HVAC should be continuous, twenty four (24) hours a day, seven (7) days a week, and three hundred sixty five (365) days a year.

t. Each IDF and BDF must contain at least 1 standard equipment rack and one (1), four (4) post server rack.

3.8 RISER CABLE:

A. General:

1. All vertical riser cable shall be rated type CMR per Section 800 of the National Electric Code. Horizontal riser (aka Tie Cable) shall be rated type CMP or type ARMM per Section 800 of the NEC, except that cable installed in Bressler

Building, Howard Hall, the Medical School Teaching Facility and future laboratory facilities may be NEC rated CMR were permitted by code.

2. Any riser cable that enters an air plenum area must be plenum rated ("NEC" type CMP) or may be enclosed in metal conduit.

3. Each BDF/IDF shall be served by a copper riser cable and a "Data" riser fiber cable in separate sheaths.

4. Riser cable sheaths shall be grounded only at the BDF. Riser cable sheaths entering and leaving each IDF will be bonded together, voice to voice and data to data, using industry standard bonding techniques.

5. All riser cables shall be routed in such a way as to not interfere with the operation or maintenance of any device along its path, including electrical wiring, fluorescent lighting fixtures, transformers, etc. All riser cables paths shall be routed into corners when going vertical through a IDF. All riser cable paths should be shown on elevation drawings. All riser cable shall be fastened to a vertical wall-mounted cable ladder rack (or approved equivalent) at a minimum of three (3) foot intervals. Riser must not be supported by any other utility raceway, electrical or mechanical apparatus.

B. Copper:

1. Pair twists of any pair shall not be exactly the same as any other pair within the same twenty five (25) pair cable. The pair twists lengths shall be selected by the manufacturer to ensure compliance with the crosstalk requirements of this standard, but shall not be less than two twists per foot.

2. All pairs and groups of pairs shall be color-coded using standard REA color-coding. Color code integrity shall be maintained whenever cables are spliced.

3. Transmission requirements of riser cable shall be the same as those for station wire with respect to resistance, resistance unbalance in a pair, mutual capacitance of a pair, and capacitance unbalance to ground. Other requirements are as listed in the cable specifications section.

C. Fiber:

1. There shall be a minimum of twelve (12) Single-Mode Fibers and twelve (12) Multi-mode Fibers from the BDF to each IDF on every floor.

2. All fiber must be manufacturer certified as to bandwidth.

3. The outer jacket of the fiber optic cables shall be color coded orange and print marked with the words "Fiber Optic Cable" no more than one 1m. (three point two eighths (3.28) feet) apart. The fiber optic cable shall be distinguishable from the existing electrical cables presently installed.

4. Each and every fiber in the cable shall be color coded or numerically identified so as to properly identify dedicated fibers. This coding shall be documented in the final as built drawings submitted to the University upon completion of the installation.

5. The cable shall be riser (type OFNR) or plenum (type OFNP) rated, as required.

6. The University requires that all fibers be terminated directly into interconnection units that provide for fiber termination, protection, and cross connection. Use Siecor/Corning CCH rack mount units as stated in the Products section.

7. A separate panel or panels shall be furnished and installed for each cable terminated in a building. Each panel shall be sized to include mounting positions for all strands in the cable it serves. A service loop of not less than 10 feet will be provided in each panel.

8. Each fiber strand shall be mounted in the patch panel for its cable and identified on the panel with its color code or unique number.

9. The cable shall be installed, terminated and tested according to TIA/EIA-568-B.3, unless otherwise noted in these specifications.

10. When a large conduit (four (4) inches or greater) is to be used for optical fiber cable placed in innerduct, the whole conduit shall be sectioned with a minimum of three (3) innerducts. This is to be used for OSP Fibers as well.

3.9 FIRESTOPPING**:**

A. Apply fire stopping to penetrations of fire-rated floor and wall assemblies for electronic security installations to restore original fire-resistance rating of assembly.

B. Comply with TIA/EIA-569-A, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.10 IDENTIFICATION:

A. Communications Outlet Labeling:

1. The contractor shall provide permanent labeling of outlet jacks, termination blocks, racks, etc. Each outlet will be labeled with one (1) label only. Each termination point will have a unique label also.
2. Each outlet shall have an identification code consisting of 5 digits (6 if "LL" is used instead of "B"). The first digit shall indicate the floor of the building where the closet serving the outlet is located. The letter "G" shall be used for the ground floor, "1" for the first floor, etc. The letter "B" shall be used for basements, "S" for subbasement, "LL" for lower level, and "M" for mezzanine.
3. The second digit shall be the closet identifier. The letter "N" shall be used to indicate the north closet, the letter "S" shall be used to indicate the south closet, the letter "E" shall be used to indicate the east closet, and the letter "W" shall be used to indicate the west closet. If there is only one closet per floor, we use the letter "N".
4. The last three digits shall denote the number of the outlet. Outlet numbers one (1) through nine (9) shall be preceded with two (2) zeros (e.g. 1N008). Outlet number ten (10) through ninety nine (99) shall be preceded with one zero (e.g. 1N028).

B. In the Telecommunications Room, data patch panels will be labeled with both the outlet # and the jack #. For instance, for outlet # 1N028, the patch panel will read1N028-D1, and 1N028-D2.

C. The color code for Communication Outlet Icons is as follows:

1. Category 6 data jack green.

D. Optical Fiber:

1. An engraved tag indicating the source and destination shall be on the fiber cable, and on each interconnection unit.

3.11 TESTING:

A. General:

1. All UTP cables shall be tested in accordance with TIA/EIA-568-C Standards.

   a. Data UTP shall be tested in a permanent link configuration.
   b. All test results shall be provided to UMB CITS for approval.

2. All Optical fiber cable testing shall at a minimum, quantify the attenuation range, optical loss, bandwidth, and misalignment.

   a. The Contractor shall test all fiber optic cable on the reel prior to installation to insure fiber strands are continuous (in perfect working order), that the

fiber optic cable meets manufacturer's specifications and is free from any physical damage.

b. The Contractor shall test all fiber optic cabling and equipment after installation to insure proper operation according to the specifications herein and on the drawings.

c. For optical fiber installation between the BDF, there shall be two cables run from the BDF and two of the campus fiber hubs, Howard Hall, School of Nursing, Pearl St. Garage, HSF, and 620 W Lexington, all fibers shall be tested end-to-end, from both directions, and at the following bandwidths, 850 and 1300 nm for multi-mode fiber, and 1300 and 1550 nm for single mode fiber, using an optical time domain reflectometer (OTDR). The OTDR must have been certified within the immediate prior six-month period. The light source or OTDR must operate within the range of 850 +/- 30 nm or 1300 +/- 20 nm for multimode testing in accordance with ANSI/EIA/TIA-526-14. The light source or OTDR must operate within the range of 1310 +/- 10 nm or 1550 +/- 20 nm for single-mode testing in accordance with ANSI/EIA/TIA-526-7.

d. The fibers shall also be tested one (1) way using a Optical Loss Test Set (Power Meter) using the following wavelengths:

1) 850 & 1300, and 1310 & 1550 for riser backbone.
2) 850 or 1300, and 1310 or 1550 for horizontal.

e. For optical fiber installation between the BDF and a IDF, the contractor shall provide two (2) way loss testing through the use of a power meter.

f. All traces and results of testing shall be presented to UMB CITS for approval.

g. Protective covers shall be in place on all connectors when they are not in use to protect against dirt or dust. Any fiber found to be defective as a result of installation, physical inspection, or operational test shall be replaced at the contractor's expense.

3.12 DEMOLITION:

A. The demolition in the renovation areas indicated on the drawings shall be complete and include all work in the area unless noted otherwise.

B. Existing systems passing through areas of demolition to serve equipment beyond the demolition areas shall remain in service, or be suitably relocated and restored to normal operation, throughout the demolition and reconstruction of the area. The Contractor shall investigate and identify such equipment prior to demolition.

C. Provide temporary service to equipment disturbed by the demolition until such time as the permanent service can be restored.

D. Where conduit and wiring to remain are inadvertently damaged or disturbed, cut out and remove damaged portion and all damaged wiring from the source or pull box to the destination connection point. Provide new wiring of equal capacity.

E. Exposed conduit to be demolished shall be removed in its entirety. Concealed conduit, abandoned in place, shall be cut out approximately two (2) inches beyond the face of adjacent construction, plugged, and the adjacent surface patched to match existing.

F. Wiring to be demolished shall be removed from both concealed and exposed conduit. No wiring which becomes unused as a result of the contract shall be abandoned in place.

G. Equipment specified or indicated to be demolished, shall be removed from the project site and shall not be reused.

3.13 CUTTING AND PATCHING:

A. Cutting and patching associated with the work in the existing structure shall be performed a neat and workmanlike manner. Existing surfaces that are damaged by the contractor shall be repaired or provided with new materials to match existing.

B. Structural members shall not be cut or penetrated. Holes cut through concrete and/or masonry to accommodate new work shall be cut by reciprocating or rotary, non-percussive methods.

C. Patching of areas disturbed by installation of new work and/or required demolition shall match existing adjacent surfaces as to material, texture and color.

3.14 CUTTING, WELDING, BURNING

A. Before the contractor and/or any sub-contractor commences any cutting, welding, burning or other type of hot work at UMB, the contractor must request a Hot Work Permit from the UMB Office of the Fire Marshal. Hot Work Permits must be requested online at https://www.umaryland.edu/fire-marshal/hot-work-permits/ at least one (1) day before beginning hot work.

B. The hot work permit copy shall remain on the job site at the hot work location until such work is completed.

3.15 CLEAN – UP:

A. Excessive debris and dirt, such as occurs from cutting through masonry or plaster walls shall be cleaned up from the equipment and removed immediately after the work of cutting through the walls.

B. Debris shall be removed from UMB property.

C. Ceiling panels shall be replaced as soon as work is finished in the area, and shall be kept free of dirty fingerprints. Where work is being done in corridors used by patients and visitors, ceiling panels shall be replaced at the close of the day's work even if work is at the particular location is incomplete.

D. All areas shall be left broom-clean at the end of the work period.

END OF DIVISION 270000