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NEW YORK/NEW JERSEY

*NYU Langone Medical Center  
BMS Restoration and Mitigation: Core Network Design*

*Documents Issued for RFP*

## *NYULMC BMS Restoration and Mitigation: Core Network Design*

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## NYULMC BMS Restoration and Mitigation: Core Network Design

### 1. General Overview

This report is Automated Logics finalized solution to Industrial Building Technologies (IBT) building management system (BMS) network recommendations. The final solution presented is the combined effort and work between ALC, IBT, Macro Consultants, NYUMC facilities, and NYUMCIT to address all present, future, and budget concerns for purchasing and implementing a new BMS network.

The overall design consists of layer 2 managed switches (core switches) running a ring protocol over a fiber optic ring. Below the core switches are layer 2 access layer switches that connect back to the core using existing 100mbps copper. All critical locations, the core, and critical paths leading back to the core will include power, emergency power, and an industrial grade uninterrupted power supply (UPS). See Diagram 1 below.

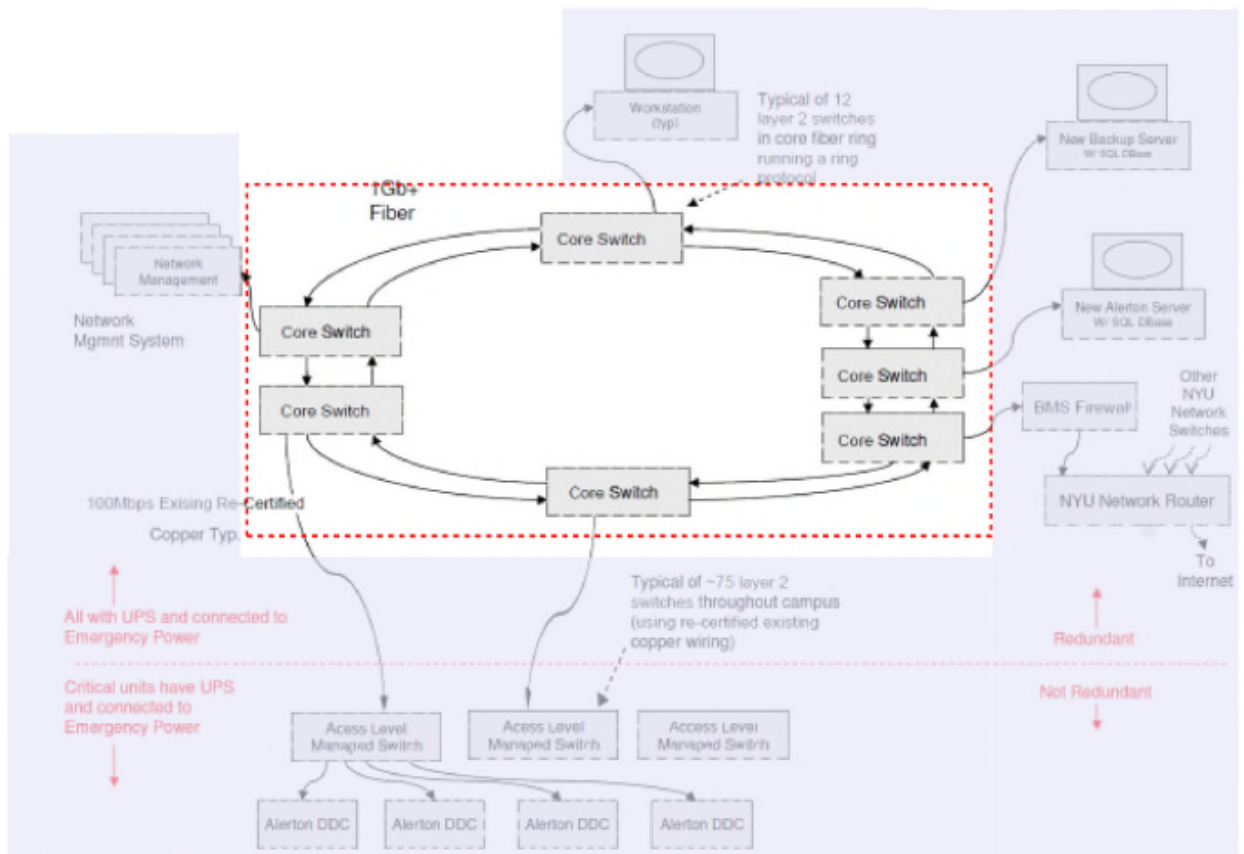


Diagram 1 – Network Topology Overview

## 2. Core Network Project Overview

The project to consist of 12 managed layer 2+ switches configured in a fiber ring topology over a fiber backbone. This will require installation of panels in twelve locations within NYULMC as well as fiber connections to each switch as detailed in Appendix D “NYULMC BMS Network Core Floorplan Diagrams” A ring protocol will be implemented to provide a counter rotating self-healing ring such that, in the event of damage to any segment between any switch, switch fiber port, or the switch itself, traffic will be rerouted back through the section of the broken ring that remains continuous to the network.

### a. Core Project Specifications

1. The installation will comply with applicable provisions of New York State Building Code and New York State Electrical Code and all other applicable Codes.
2. All electrical work to be in accordance with the NYULMC Electrical Design Guidelines (see Appendix-B)
3. All furnishing of material and installation work to be in accordance with the NYULMC Fiber Cabling Plant Installation and Equipment Specifications (see Appendix-A)
4. ALL Conduit labeled “BMS FIBER” every five (5) Feet
5. Pullbox must be installed:
  - a. Every 100 Feet
  - b. After ever two (2) 90 degree bends
6. All conduit bends must be 10 times the diameter of the conduit.
- 7 All fiber for this project will be in Electric Metallic Tubing (EMT) or Rigid Metal Conduit (RMC).
- 8 All fiber in mechanical rooms to be in EMT.
- 9 EMT approved manufacturers:
  - i. Allied Tube & Conduit/Tyco
  - ii. Republic
  - iii. Robroy Industries
  - iv. Triangle
  - v. Western
  - vi. Wheatland
- 10 All fiber run outdoors or exposed to the elements to be in rigid steel and use rigid conduit and fittings.
- 11 RMC approved manufactures:
  - i. Ocal Inc.
  - ii. Occidental Coating Company
  - iii. Perma-Cote
  - iv. Robroy Industries “Plasti-Bond-Red”

v. Triangle

- 12 All fiber to be in properly sized conduit and any bends not to exceed the fiber manufactures bend radius specifications.
- 13 All conduits to be run concealed in finished areas and exposed in machine rooms.
- 14 All pulling of fiber should use appropriate tensioning equipment to not exceed fiber tension specifications.
- 15 Contractor to furnish fiber, conduit, fittings, splices, pull boxes, patch panels, terminators, and any associated tools or necessary equipment, as well as all project management, coordination, engineering to provide a fully operational system.
- 16 Contractor to provide a detailed submittal for all work and receive written approval prior to the installation of any work.
- 17 Contractor to refer to Section 2–c and Section 2-d drawings for pre-determined fiber paths and core switch locations. Any deviations from these pre-determined paths must be approved in writing by the NYU Project Manager.
- 18 All fiber to enter Automated Logic core switch enclosures and terminated with LC connectors. Provide patch panels when necessary. Provide sufficient fiber within core panels to connect to switching devices in a neat and workman-like manner in accordance with industry standard practices.
- 19 Refer to the NYU Langone Medical Center installation standards (which will be made part of this contract) for required practices, procedures and standards.
- 20 All Panels and conduit must be properly bonded to earth ground via an inter-system bonding termination or another accessible location per NEC article 770.100 and in accordance with industry standards and practices.
- 21 All fiber to be certified per IEEE, TIA/EIA, and or ISO/IEC standards to ensure installation meets applicable specifications.
- 22 All fiber certification to includes two parts; Tier 1 or Basic Test Regimen and Tier 2 or Extended Test Regimen.

- Tier one fiber optic cabling certification is performed with a power meter and light source or optical loss to measure the absolute loss of the link and compare it to the limits in the standard.

- Tier two fiber optic cabling certification and troubleshooting can be performed with an OTDR.

Test each fiber (even dark fibers) in all fiber optic cables.

Perform the following tests:

- A. Point-to-point continuity testing to determine that fiber routing and polarization is correct and matches the documentation. Use a visual fiber tracer, visible fault locator, or OLTS power meter and source. Trace the fiber from end-to-end through any interconnections.
- B. End-to-end insertion loss using an OLTS power meter and source. Test by using TIA/EIA 526-7 method. Total loss shall be less than the calculated maximum loss based upon the light power budget for the run. Test single-mode fiber at 1310 and 1550 nm, unless otherwise required by standards. If the selected switch uses laser sources, test with appropriate laser sources to ensure that tests verify performance with that type of source.
- C. Utilize OTDR testing to verify cable installation and splice performance. However, OTDR testing shall not be used to determine cable loss.

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- D. Confirm the run length documented during installation using the length feature available on the OTDR (can be done using an OLTS if feature is available).
- E. If testing shows variances from expected losses troubleshoot the problems and correct them.
- F. Provide a certificate showing that the fiber optic cable was installed to manufacturer requirements and tested to be fully operational.

## b. Automated Logic Scope of Work

### General Conditions

1. Each bidder is required to include in their price the following scope of work from Automated Logic Corporation. The pricing for this scope of work shall be entered on the bid form under “Item 3: HVAC Controls (As per “ALC Scope of Work”. This scope of work is to be provided by Automated Logic Corporation, 100 Delawanna Avenue, Clifton, New Jersey 07014. The contact for this pricing is Rudy Machacek, phone – (914)-447-2705, email - [rudy.machacek@automatedlogic.com](mailto:rudy.machacek@automatedlogic.com) .
2. ALC Scope of Work is as follows:
  - A. Automated Logic Corporation will provide the required project management including: (please note this scope of work **does not** release the successful bidder from supplying a full time project manager for the project to attend all required meetings and coordinate labor as required)
    - Coordination of the installation of the BMS Core Network between NYU Langone Facilities department and the successful electrical contractor.
    - Coordination and scheduling of all power shutdowns and network shutdowns.
    - Coordinate scheduling and access for the successful electrical contractor, for the installation of the BMS Core Network.
    - Facilitate weekly construction progress meetings with NYU Langone Facilities staff, Macro Consultants, IBT LLC and the successful electrical contractor.
    - Provide guidance and instruction to the successful electrical contractor.
    - Direct successful electrical contractor in the locations and methods of installation for the required UPS panels and network switch panels.
    - Provide in the field quality insurance for the installation of the BMS Core Network.
    - Coordinate and distribute all shop drawing submittals for required approvals.
    - Coordinate and distribute all material submittals for required approvals.
    - Coordinate delivery of final as-built drawings and OEM manuals.

- Coordinate and facilitate commissioning of the BMS Core Network.
- B. Automated Logic Corporation will provide the following network devices and panels for installation by the successful electrical contractor:
- Furnish/configure and assemble Switch / UPS Panels for twelve (12) core locations, for installation by the electrical contractor. Panels to include Alcatel-Lucent Omniswitch 6855 network switch, Allen Bradley UPS Model 1609-HBat with AB 1609-SPD Surge Protector, AB 1609-ENET Smart Card, convenience outlet, ethernet consolidation point, fiber fuse panel, panduit and covers, terminal strip for power connections.
- C. Automated Logic Corporation will provide the following scope of work in relation to the network devices and panels:
- Furnish panel drawings detailing panel dimensions, layout and power requirements.
  - Oversee installation of network switch panels including installation location and methods.
  - Provide 1 year parts and labor warranty.



**c. Approved Low Voltage Vendors**

- 1) Mason Technologies Inc  
517 Commack Road  
Deer Park, NY 11729  
631-234-6565
  
- 2) StarCom Communications Services, Inc.  
41 Central Drive  
Farmingdale, NY 11735
  
- 3) Telnet Communications, Inc  
16 Shenandoah Ave.  
Staten Island, NY 10314
  
- 4) Data-Tele Contractors, Inc.  
657 Maple Ave  
Ridgefield, NJ 07657

## **Appendix A – NYUMC Fiber Cabling Plant Installation and equipment Specifications**

### **FIBER CABLING PLANT SPECIFICATIONS**

#### **1.0 - GENERAL**

##### **1.1 DESCRIPTION**

- A NYUMC PROJECT MANAGER general conditions for contracts, referred to herein as the general conditions, together with the following telecommunications cabling specifications, which amend, modify and supplement various articles and provisions of the general conditions, are made part of the Contract and shall apply to all work under the Contract.
  
- B The Contractor shall comply with all applicable NYUMC standards and with all Federal, State, County, City, and other applicable codes, ordinances and regulations.
  
- C Local electrical and building codes may differ from national codes. Where there are instances of ambiguity refer to the NYU Medical Center (NYUMC) PROJECT MANAGER for interpretation.
  
- D This telecommunication specification is not intended as a complete material list of items required by the Contract. The contractor must provide all tools and materials necessary to complete the project.
  
- E It is the intent of these specifications to provide a complete workable telecommunications cabling system ready for the Owner's use. Any item not specifically shown on the drawings or called for in the specifications, but normally required to carry out the work, is to be considered part of the Contract.

- F Any given item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item shall not be permitted, unless approved in writing by the NYUMC PROJECT MANAGER.
  
- G These specifications are materials and performance specifications. Actual installation shall be as indicated on the Drawings. Any discrepancies found between the Specifications and the Drawings shall be immediately brought to the attention of the NYU Medical Center PROJECT MANAGER. Installation and details indicated on the Drawings shall govern if they differ from the Specifications.
  
- H Certain terms such as "shall, provide, install, complete, start up" are not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.
  
- I. Provide all items and work indicated on the drawings and all items and work called for in this specification and in the statement of work. This includes all labor, materials, incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, test equipment, supervision, consumable items, fees, licenses, insurance, etc., necessary to provide a complete telecommunications cabling system.

## 1.2 WORK INCLUDED

- A This Specification covers the construction of a Fiber Optic Cabling system for the NYU Medical Center.
  
- B The work covered by this Contract includes the construction described, including all labor necessary to perform and complete such construction, all materials and equipment in Project incorporated or to be incorporated in Project in such construction and all services, facilities, tools and equipment necessary or used to perform and complete such construction. The scope of this work includes, but is not limited to, providing the following:

1. All UTP and optical fiber communications backbone wiring at each NEMA enclosure at each Mechanical room space indicated.
2. All UTP and Optical fiber tie cables between equipment racks/cabinets/frames within NEMA enclosures as indicated.
3. All horizontal UTP telecommunications cabling between individual work area outlet locations in Mechanical space and NEMA Enclosures.
4. All termination blocks, equipment racks, modular patch panels, fiber panels, vertical wiring channels, cross connect supports block mounting rails, and guide rings required to terminate or cross connect communications cables in the NEMA Enclosures at Mechanical spaces.
5. Termination Equipment in NEMA Enclosures as indicated on the Plans.
6. Patching between the horizontal cable termination equipment and active equipment
7. All jacks, connectors, flush, surface mount outlet boxes, terminating devices, faceplates, etc. required to terminate communications cables.
8. UTP and OF wire managers as indicated on drawings.
9. All non-specified miscellaneous hardware, i.e., nuts, bolts, tie wraps, wire rings, supporting hardware, etc.
10. All cable supports (e.g., split "D" rings, J-hooks, Velcro strips, etc.) Including all necessary mounting and installation hardware, wherever cables are installed within the suspended ceiling, as well as cable supports within the NEMA enclosures.
11. Labeling and documentation of all cables, racks, outlets and hardware installed under this contract.
12. Testing and test documentation for all cabling as described below.
13. Preparation and submission of shop drawings, as-built drawings, testing reports and cable documentation as described below.

14. Fire-stopping of all rated wall and floor penetrations created by or on behalf of the Contractor through rated walls and floors.
15. Grounding of all NEMA Enclosures.

### 1. 3 RELATED WORK NOT INCLUDED IN THIS SECTION AND SPECIFIED ELSEWHERE, UNLESS OTHERWISE NOTED.

1. Raceways, ladder racks, wire molding and conduits specified under Electrical Specifications, and those provided for under separate contract.
2. All labeling of backbone cabling , conduit and work station cabling as indicated in as required by NYUMC.
3. Cutting, patching, and painting.

### 1. 4 ABBREVIATIONS AND DEFINITIONS

#### A Abbreviations

ANSI	American National Standards Institute
APWA	America Public Works Association
ASTM	American Society For Testing and Materials
AT&T	AT&T OSP Systems 900-200-318
BICSI	Building Industries Consulting Services International
CFR	Code of Federal Regulations
CON	Conduit
EIA	Electronic Industries Alliance
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories, Inc.
FCC	Federal Communications Commission

FM (FMS)	Factory Mutual (Factory Mutual System)
FS	Federal Specifications
FT	Feet
IEEE	Institute of Electrical and Electronic Engineers
IES/NA	Illuminating Engineering Society of North America
IPCEA	International Power Cable Engineers Association
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
OEM	Original Equipment Manufacturers
OSHA	Occupational Safety and Health Administration
REA	Rural Electrification Administration
RUS	Rural Utilities Service
TIA	Telecommunications Industries Association
UL	Underwriters Laboratories

## B Definitions

1. "PROVIDE" means to "Furnish" and "Install" to supply, purchase, transport, place, erect, connect, test and turn over to Owner, complete and ready for regular operation, the work referred to.
2. "SUPPLY" means to purchase, procure, acquire, and deliver complete with related accessories.
3. "INSTALL" means to move from property line, set in place, join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to Owner of equipment and/or components. Installation is to be complete and ready for regular operation.
4. "FURNISH" means to purchase and supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application for the particular work referred to.
5. "WIRING" or "CABLING" includes the furnishing of all fittings, conductors, connectors, grounding accessories, tape, connections, splices, and all other items necessary for such work.
6. "AS DIRECTED" means as directed by the Architect/NYU Medical Center PROJECT MANAGER, or his representative.
7. "CONCEALED" means embedded in masonry or other construction, or installed underground, or behind wall furring or within double partitions, or installed within hung ceilings.
8. "EXPOSED" means not installed underground or "CONCEALED" as defined above.
9. "SUBMIT" means submit to NYU Medical Center PROJECT MANAGER for review. Refer to Architectural General and Special Conditions for proper procedures.

10. "APPROVED" means as accepted and authorized, in writing, by the NYU Medical Center PROJECT MANAGER.
11. SUBSURFACE STRUCTURE means something located underground that is constructed, as a building or work of civil engineering.
12. "OWNER" means NYU Medical Center PROJECT MANAGER
13. "CONSTRUCTION MANAGER" means NYU Medical Center
14. NYU Medical Center Contracting Officer Representative. means NYU MEDICAL CENTER PROJECT MANAGER
15. "Notice To Proceed" means NYU Medical Center written approval from PROJECT MANAGER to contractor to begin work.

## 1.5 SUBMITTALS

- A Submit shop drawings (see attached example of shop drawing submittal), (30) days (min) prior to notice to proceed. Shop drawings shall consist of one (1) set of electronic PDF Drawings and three (3) sets of prints of drawings, diagrams, and/or manufacturer's data for the following items in Contract Documents:
1. Point-to-point wiring diagrams for all cable installed under this Contract.
  2. Diagrams showing wiring from distribution frames, equipment locations,
  3. Detailed plan views and elevations of the telecommunications closets showing all terminal blocks, equipment racks, patch panels, wire routing, wire management, labeling, etc.
  4. Detailed plan views and elevations of main distribution frames showing all terminal blocks, equipment racks, patch panels, wire routing, wire management, labeling, etc.



5. Detailed drawings showing mounting details for telecommunications outlets.
  8. Detailed plan views of each floor showing major cable routes .
  9. Drawings shall show evidence of coordination with other trades.
- B All submittals shall contain job title and reference to the applicable drawing and specification article. All identification shall clearly indicate with ink. Clearly readable photocopies are acceptable. Submit hard copies and PDF. Files.
- C All drawings shall be submitted sufficiently in advance of field requirements to allow sufficient time for any review and re-submittal that may be required. All submittals shall be complete and contain all required and detailed information.
- D Acceptance of any submitted data or shop drawing shall not relieve Contractor from responsibility for errors, omissions or inadequacies of any sort.
- E Submittals provided in a manner not complying with the above listed methods shall be marked "NOT ACCEPTED" and returned without review.
- F Before installing any active equipment provide one (1) copy that equipment's installation instructions to the NYU Medical Center PROJECT MANAGER. In addition, securely attach a copy of such instructions at the equipment during any work on the equipment.
- G Any work performed without written permission, shop drawing and equipment approval shall be subject to change without charge or penalty to the Owner if found non compliant with contract documents by the Architect or the NYU Medical Center PROJECT MANAGER
- H Warranty all portions of the work against faulty and improper material and workmanship for a period of two (2) years from date of final acceptance by NYU MEDICAL CENTER PROJECT MANAGER except that where warranty or warranties for longer terms are specified, such longer terms shall apply.
- I. Submit manufacturer's product data sheets for all material and equipment products proposed. Provide physical samples of products if directed by Owner or NYU Medical Center PROJECT MANAGER. Alternatives shall not be considered without a complete product data submittal.
- J. Within fifteen (15) working days after notice to proceed by the Owner or Construction Manager or after execution of Owner/Contractor Agreement, submit to the NYU Medical Center PROJECT MANAGER for review a complete typed list of all equipment manufacturers and material suppliers for the equipment intended to be furnished and installed on this project as well as names of all subcontractors, whom

the contractor proposes to employ, if any. The Owner/PROJECT MANAGER reserves the right to reject with justification any sub-Contractors proposed for use by the Contractor.

1. As-builts must be provided by the contractor within (2) weeks prior to final acceptance of completion of work. As builts shall consist of one (1) set of Cad version 12, 1 set PDF and three (3) sets of paper prints of drawings.
2. Maintain on a daily basis at the project site a complete black and white set of "As-Built Drawings", reflecting an accurate set of field drawings of all deviations between work shown on drawings and that actually installed.
  - a Floor plans with furniture layers showing outlet identification and wiring distribution routes for all cable installed under this Contract.
  - b Riser diagrams showing wiring from distribution frames, equipment locations, distribution frames and/or equipment
  - c Detailed plan views and elevations of the telecommunications closets showing all terminal blocks, equipment racks, patch panels, wire routing, wire management, labeling, etc.
  - d Detailed plan views and elevations of main distribution frames showing all terminal blocks, equipment racks, patch panels, wire routing, wire management, labeling, etc.
  - e Detailed elevations of equipment.
  - f Detailed plan views of each floor showing major cable routes.
3. All as-built drawings shall contain job title and date and shall be signed the Contractor's project manager.

#### 1. 6 REVIEWS

- A. NYU Medical Center PROJECT MANAGER's review is for general compliance with the design concept and contract documents. Markings or comments or the lack thereof do not relieve the Contractor from compliance with the project plans and specifications. The Contractor remains solely responsible for details and accuracy, for confirming and Project Manager relating all quantities and dimensions, for selecting fabrication processes, for techniques of construction, for performing his work in a safe manner, and for coordinating his work with that of other trades.
- B. No part of the work shall be started in the shop or in the field until NYU MEDICAL CENTER PROJECT MANAGER have reviewed and approved the shop drawings and samples for that portion of the work.
- C. A minimum period of ten (10) working days, exclusive of transmittal time, will be required in the NYU Medical Center PROJECT MANAGER each time a shop drawing, product data and/or samples are submitted for review. This time period must be considered by the Contractor when scheduling his work.

#### 1. 7 MATERIALS HANDLING

- A. All products and materials are to be new, clean, free of defects and free of damage.
- B. Delivery of Materials: The Contractor shall be responsible for the receipt, safe storage and delivery of materials and equipment to the job site. Deliver materials (except bulk materials) in the manufacturer's unopened container, fully identified with manufacturer's name, trade name, type, class, grade, size and color.
- C. Storage of Materials: Provide and maintain all products and materials in a manner that will protect them from damage, weather and entry of debris, and Project Manager erosion. All materials must be readily accessible for inspection until installed. Store all items vulnerable to moisture damage in dry, heated spaces.
- D. Floor Loading: Do not store or place material on floors in excess of the floors' designed load limits.

- E Security: At all times during the project, store all materials in a secure fashion to prevent the loss of these materials due to pilferage or theft. Maintain and protect all equipment, materials, and tools from loss or damage from all causes until final acceptance by the Owner.
- F Damaged Material: Do not install damaged items. Take immediate steps to obtain replacement or effect complete repairs. No installation of repaired items shall be accepted by the Owner unless the Owner has given prior approval for use of such items.

## 1. 8 ORGANIZATION OF WORK

- A The work called for under Contract shall be carried on simultaneously with the work of other trades in a manner so as not to delay the overall progress of the work. Promptly furnish all information and measurements relating to the work as required to other trades involved at the project. Cooperation with other trades is necessary in order to complete the project.
- B Provide all work necessary to meet all construction schedules.
- C Maintain a complete file of shop drawings available at all times to the NYU Medical Center PROJECT MANAGER.
- D All work shall remain accessible so as to permit the NYU Medical Center PROJECT MANAGER observation of the work during the course of construction.

## 1. 9 COORDINATION OF THE WORK

- A Certain materials may be supplied by the Owner to be installed under this Contract. Examine the Contract Documents to ascertain these items.
- B Carefully check space requirements with other trades and the physical confines of the area of work to insure that all material can be installed in the allotted spaces including finished suspended ceilings. Make modifications as required and approved.
- C Coordinate all work with and work under the direction of the General Contractor. Transmit to other trades in a timely manner all information required for work to be provided under their respective Sections in ample time for installation.
- D Wherever work interconnects with work of other trades, coordinate with other trades to insure that they have the information necessary to properly install all the necessary connections and equipment. Identify all items of work that require

access so that the ceiling trade will know where to install access doors and panels, and where to leave ceiling spaces accessible for wiring installation activities.

- E Due to the type of installation, a fixed sequence of operation is required to properly install the complete systems. Coordinate project and schedule work with the Construction Manager and Project Manager in advance with the construction sequence.
- F Attend all construction meetings at the project site or other location as requested by the Owner or Construction Manager.

## 1.10 ALTERNATIVE MATERIALS AND EQUIPMENT

- A. Other manufacturers are subject to the review and approval of NYU Medical Center PROJECT MANAGER.
- B Submit proposals to supply alternative materials or equipment, in writing, to the NYU Medical Center PROJECT MANAGER minimum (15) days prior to the date equipment must be ordered to maintain project schedule.
- C A description of the difference between the contract requirements and that proposed, the comparative features of each, and the effect of the change on the end result performance. Include the impact of all changes on other contractors and acknowledge the inclusion of implementation costs.
- D A list of the contract requirements that must be revised if the change is accepted, including any suggested specification revisions.
- E Include a description and estimate of costs the Owner may incur in implementing the change, such as test, evaluation, operating and support costs.
- F A projection of any effects the proposed change would have on collateral costs to the Owner.
- G A statement of the time by which a contract modification accepting the change must be issued, noting any effect on the contract completion time or the delivery schedule.
- H A statement indicating the reduction to the contract price if the Owner accepts the change. Be responsible for appropriate modifications to all trades.
- I Include all revisions required to adapt alternatives in such proposals, including revisions by other trades. No increase in the contract price will be considered to accommodate the use of alternative equipment.

- J The substitution must fit into available space conditions and must function properly in coordination with the rest of the system.

## 1. 11 RESPONSIBILITY FOR EVALUATION

- A The NYU Medical Center PROJECT MANAGER makes no representations, regarding the character or extent of the subsoils, water levels, existing structural, mechanical and electrical installations, above or below ground, or other subsurface conditions which may be encountered during the work. This Contractor must make his own evaluation of existing conditions, which may affect methods, or cost of performing the work, based on his own examination of the facility or other information. Failure to examine the drawings or other information does not relieve the Contractor of his responsibility for satisfactory accomplishment of the work.

## 1. 12 QUALITY ASSURANCE

- A Comply with the current requirements of the, National Electrical Code, National Electrical Safety Code (NEC), OSHA, Building Industries Consulting Services International (BICSI) and the standards, recommendations, rules, regulations and requirements of the Federal Communications Commission. Comply with current governing codes, ordinances and regulations, as well as with requirements of the utility companies.
- B All equipment shall be equal to or exceed the minimum requirements of, NEC, NESC (C2-1997) IEEE, ASME, ANSI, RUS, NFPA, TIA and UL.
- C Comply with the requirements of agencies or authorities having jurisdiction over any part of the work and secure all necessary permits.
- D Plans, specifications, codes and standards are minimum requirements. Where requirements differ, apply the more stringent. Where there are ambiguities, refer to the NYU Medical Center PROJECT MANAGER for interpretation.
- E Should any change in plans or specifications be required to comply with governing regulations, notify the NYU Medical Center PROJECT MANAGER at the time of submitting this PROPOSAL
- F Execute work in strict with Project Manager Accordance with the best practices of the trades in a thorough, substantial, workmanlike manner by competent workmen. Provide a competent, experienced full-time Foreman/ Project manager with a minimum of seven years of related experience who is authorized to make decisions on behalf of the Contractor. Foreman/ Project Manager must supervise the project at all times.

## 1. 13 SITE VISIT

- A Prior to submission of proposal, visit and examine the site of the proposed work to determine the existing conditions that may affect the work. The Contractor shall be held responsible for any assumptions in regard thereto.
- B Verify all dimensions in the field and document the cable lengths and materials to be furnished and installed. The provision and installation of non-specified miscellaneous hardware, i.e., nuts, bolts, adapters, etc., shall also be the Contractor's responsibility.
- C Particular attention must be paid to the accessibility of ceiling spaces, and the location of ceiling mounted hardware and equipment. Existing site conditions, existing contract documents and the construction schedule must be carefully reviewed to determine all required interfacing and timing of the work.
- D Existing Contract Documents will be made available for review through the Construction Manager.
- E The contractor prior to commencing work must verify the locations of existing utilities indicated on the drawings. Any significant changes to the design necessary to meet field conditions shall be brought to the immediate attention of the Owner ,CM and the NYU Medical Center PROJECT MANAGER. Contractor shall receive written approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.

## 2.0 PRODUCTS

### 2.1 GENERAL

- A Provide products and materials that are new, clean, free of defects and free of damage and erosion.
- B All products and materials used in this project will not contain asbestos, P.C.B.'s or any other material which is considered hazardous by the Department of Environmental Protection or any other agency having jurisdiction.
- C If products and materials are specified or indicated on the drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of shop drawings and submittals.
- D All materials furnished shall bear the UL label provided that a standard has been established for the material in question.
- E Any given item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item will not be permitted, unless specifically noted.
- F No substitutions will be permitted without the written consent of the NYU Medical Center Substitutions will be considered on all products where noted.
- G The materials listed in this specification may be subject to change. The Contractor shall contact the NYU Medical Center PROJECT MANAGER for final confirmation of material types and quantities prior to ordering, or restocking charges will be disallowed.
- H For products with lists of multiple acceptable manufacturers, part numbers are provided only for the first manufacturer on the list.

### 2.2 COMPONENT SPECIFICATIONS

- A. Any Part numbers listed in this section have been coordinated with the latest manufacturers product literature, and are accurate at the time of writing. They are, however, subject to change by the manufacturers at any time. If a specific part number is invalid, provide product from same or equal manufacturer meeting component description.



- B. 12 Port Category 6 Mini patch panel hinged mounting TIA/ EIA compliant Category 6, 10 inches High by 2.5 inches wide. Used inside NEMA 3R enclosures for connecting premise cabling to switch equipment
  - 1. Ortronics Clarity 12 Port Category 6 mini patch panel hinged mounting Ortronics #ORPMP612H
  
- C. Category 6 24 port patch panel for Consolidation point at existing mechanical room enclosures compliant with performance requirements per EIA/TIA Category 6, Standard density to allow for patching between premise plant and New NEMA Enclosure
  - 1. Ortronics Clarity 6 24 – Port Category 6 Patch Panel – OR-PSD66U24
  
- D. Hinged wall Mount Bracket for Consolidation point
  - 1. 3.5 inches high x 19 inches Wide x 6 Inches Deep for wall mount patch panel used as consolidation point adjacent existing Equipment enclosures in mechanical rooms. Ortronics Hinged Wall Bracket Or-604004396
  
- E. Cable Construction Category 6 – Four Pair 100 ohm UTP 22AWG to 24AWG Thermoplastic jacket insulated solid conductors that are formed into four individually tightly twisted pairs and enclosed by a thermoplastic jacket Color code – white/blue// blue, white/orange// orange, white/ green// green, white/ brown// brown. The cable shall meet the mechanical requirements of ANSI/ICEA S-80-576 applicable to four- pair inside wiring cable for plenum or general cable (unless otherwise noted always use plenum cable) within a building. The cable shall also meet the physical design requirements of clauses 4.3.3.1 to 4.3.3.6 of ANSI/TIA/EIA-568.C, 568C.2. and all related sections The cable pairs will be assembled with a flex-web core separator or approved equal, with ripcord under an overall jacket. Cables will contain print with descending footage markers from 1000 to 0 on each 1000 foot reel or box.

Superior Essex 66-240-2B

## F. Reduced Diameter Category 6, 28 AWG patch cords

1. Each cord is factory tested: Ensures every cord shipped meets Category 6 channel specifications.
2. Reduced diameter mini patch cord : takes up less cable management space and leaves more space for airflow
3. Premium plug designed for reduced OD 28 awg patch cable: Protects performance integrity through the plug termination .
4. Snagless plug design: Protects plugs when pulling through cable managers or pathways .
5. Premium 28 awg conductor cordage: Reliable performance and durable cord life. Blue Jacket
6. Compatible with both T568A and T568B wiring: Provides universal wiring ability. Exceeds TIA 568C.2
7. •Backwards compatible to Category 3, 5, and 5e: Supports lower category installations and components
8. Typical Applications: IEEE 802.3 1000Base-T (Gigabit Ethernet), 10-100Base-T, TIA/EIA-854 1000Base-TX, ATM CB1G

Ortronics # RDC6XX-06, Lengths 1 ft to 25 feet available

## G. Fiber wall mount panel ( Single mode or Multimode options)

This compact unit has a 1.5 inch frontal projection and is optimized for use in locations such as Box-in-a-Box applications, building entrances, terminals, wiring closets, open office and other areas where space is a premium.

The SPH-01P housings have a stacking feature to allow up to three independent SPH-01P housings to be stacked and function as one wall-mount unit allowing capacity expansion without consuming additional wall space.

The built-in splice tray with routing guides provide both

protection and segregation of the cable and fiber during initial install and any future MAC work that is needed. This durable black metal housing can be used for splice management, cross-connect or both for up to 12 single fiber heat-shrink splices, and the improved splice organizer will also handle six ribbon heat-shrink splices if so desired. The single-panel housing can be mounted in multiple orientations including a DIN rail mounting option to allow fiber protection and cone activity in electronic and/or control cabinet applications as well as standard wall mounting.

## Corning SPH-01P- wall mount housing

### 1 Fiber connector Housing panels ( Single Mode and Mutimode )

Corning closet connector housing panels (CCH-CP) are offered in a variety of fiber counts for use with LANscape® solutions hardware products for a “onesize-fits-all” approach. Used with factory-installed or field-installable connectors, these panels provide interconnect or cross-connect capability in a housing at main cross-connects, intermediate cross-connects, telecommunication rooms or work areas. Available with a variety

of industry-standard adapter types, the CCH-CP provides an efficient way to securely mate two connectors and offers multimode and single-mode applications in 6-, 8-, 12-, 16- and 24-fiber count options, plus 36-, 72-, 96- and 144-fiber count options with MTP® connector adapters.

LC Duplex Panel (12-fiber)

Closet Connector Housing Panels (CCH-CP)

CCH-CP12-A9 – ( Single Mode option)

CCH-CP12-E4 – ( Multimode option)

## H. Optical Fiber Cable

1. SINGLE MODE OPTICAL FIBER CABLE ( 6 strand fiber between Core switches in each designated Mechanical room.

Corning FREEDM® loose tube gel-free plenum cables are flame-retardant, indoor/outdoor, plenum-rated cables suitable for installation in interbuilding and intrabuilding backbones in aerial, duct and riser or plenum applications. The loose tube design offers mechanical ruggedness and environmental durability while the all-dielectric cable construction requires no grounding or bonding. The water-swellable yarn eliminates the need for gel-filling compound and allows more efficient and craft-friendly cable preparation. The 250 µm color-coded fibers allow quick and easy identification during installation.

The flexible, flame-retardant outer jacket is UV-resistant and enables direct exposure to sunlight. Interlocking armor is available for special applications requiring additional mechanical durability. The plenum rating of this cable eliminates the need to transition splice when entering the building and minimizes routing restrictions once inside the building. Meeting the requirements of the National Electrical Code® (NEC®) Article 770, the cables are also OFNP and FT-6 listed.

Note: This cable is available in 12 different jacket colors – blue, orange, green, brown, slate, white, red, black, yellow, violet, rose and aqua. The colored jacket allows for easy visual identification of the cables while still providing all of the required environmental protection of an indoor/outdoor cable jacket. Black is the standard jacket color using the part numbers shown here.

Temperature Range Storage-40 °C to 70 °C (-40 °F to 158 °F )

Installation-10 °C to 60 °C (14 °F to 140 °F )

Operation-40 °C to 70 °C (-40 °F to 158 °F )

## Mechanical Characteristics Cable

Max. Tensile Strength, Short-Term -2700 N (600 lbf)

Max. Tensile Strength, Long-Term- 810 N (180 lbf)

Min. Bend Radius Installation-167 mm (6.6 in)

Min. Bend Radius Operation-111 mm (4.4 in)

Nominal Outer Diameter-11.4 mm (0.45 in) 127 kg/km (85 lb/1000 ft)

RoHS-Free of hazardous substances according to RoHS 2002/95/EG

Fiber Name-Single-mode (OS2)

Fiber Category -G.652.D Fiber Code E

Performance Option Code 01

Wavelengths-1310 nm / 1383 nm / 1550 nm

Maximum Attenuation-0.4 dB/km / 0.4 dB/km / 0.3 dB/km

□

Corning 006EWP-T4101D20

2. Multimode (OM4) optical fiber cable pigtail assemblies ( MULTIMODE OPTION).  
Factory manufactured fiber pigtails pigtail shall be 10, 14, and 20 foot lengths. Single

cable outer jacket and dielectric strength member provide extra protection for additional handling, OFNR (Riser) Rated. Patch fiber shall match diameter of fiber cable.

To be used for fusion splicing to single mode backbone cable and connecting to the rear of fiber panel. Quantities as indicated on drawings and Statement of Work.

Multi mode LC duplex connector equipped with ceramic ferrule with composite housing compliant to requirements of TIA/EIA 568-C, -C.1.3, -C.3 The connector shall have a guaranteed insertion loss of .35db and return loss of less than or equal to -20 dB .LC, Multimode Fiber Pigtail 2 Meter # 000301T4180003M Or Approved Equivalent.

3. Single mode optical fiber cable pigtail assemblies. Factory manufactured fiber pigtails pigtail shall be 10, 14, and 20 foot lengths. Single cable outer jacket and dielectric strength member provide extra protection for additional handling, OFNR (Riser) Rated. Patch fiber shall match diameter of fiber cable.  
To be used for fusion splicing to single mode backbone cable and connecting to the rear of fiber panel. Quantities as indicated on drawings and Statement of Work. Single mode LC duplex connector equipped with ceramic ferrule with composite housing compliant to requirements of TIA/EIA 568-C, -C.1.3, -C.3 The connector shall have a guaranteed insertion loss of .5db and return loss of less than or equal to -55 dB.LC Compatible Ultra PC Single Mode, Single Fiber Pigtail 2 Meter # 000402R5120003M Or Approved Equivalent.
4. Mutimode mode optical fiber cable patch assemblies( MULTIIMODE OPTION). Factory manufactured heat shrink sleeve, Tight buffered dual zip cord type, Cable outer jacket and dielectric strength member provide extra protection for additional handling, OFNR (Riser) Rated. Patch fiber shall match diameter of fiber cable.fiber patch shall be 10, 14, and 20 foot lengths. To be used for patching between Multimode mode optical fiber panels and transport equipment. Quantities as indicated on drawings and Statement of Work. Single mode LC duplex connector equipped with ceramic ferrule with composite housing compliant to requirements of TIA/EIA 568-C, -C.1.3, and -C.3. the connector shall have a guaranteed insertion loss of .35 db and return loss of less than or equal to -20 dB .  
Fiber Optic Patch Cord, 2 Fibers, LC Duplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, Multimode (OM4), 2 meters  
Corning 050502Q5120002M
5. Single mode optical fiber cable patch assemblies. Factory manufactured fiber patch shall be 10, 14, and 20 foot lengths. Dual fiber Zip. Cable outer jacket and dielectric strength member provide extra protection for additional handling, OFNR (Riser) Rated. Patch fiber shall match diameter of fiber cable. To be used for patching between single mode optical fiber panels and transport equipment. Quantities as indicated on drawings and Statement of Work. Single

mode LC simplex connector equipped with ceramic ferrule with composite housing compliant to requirements of TIA/EIA 568-C, -C.1.3, and -C.3. the connector shall have a guaranteed insertion loss of .5db and return loss of less than or equal to -55 dB Compatible Ultra PC Single Mode, Single Fiber Patch cord Or Approved Equivalent.

Fiber Optic Patch Cord, 2 Fibers, LC Duplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, Single-mode (OS2), 2 meters

Corning 04002R5120002M

Or Approved Equivalent.

- I. Multi Mode OM4 (MULTIMODE OPTION) cable 6 strand fiber between Core switches in each designated Mechanical room.)
  1. Multi-Mode OM4 loose tube gel-free plenum cables are flame-retardant, indoor/outdoor, plenum-rated cables suitable for installation in interbuilding and intrabuilding backbones in aerial, duct and riser or plenum applications. The loose tube design offers mechanical ruggedness and environmental durability while the all-dielectric cable construction requires no grounding or bonding. The water-swellable yarn eliminates the need for gel-filling compound and allows more efficient and craft-friendly cable preparation. The 250 µm color-coded fibers allow quick and easy identification during installation. The flexible, flame-retardant outer jacket is UV-resistant and enables direct exposure to sunlight.. The plenum rating of this cable eliminates the need to transition splice when entering the building and minimizes routing restrictions once inside the building. Meeting the requirements of the National Electrical Code® (NEC®) Article 770, the cables are also OFNP and FT-6 listed. Note: This cable is available in 12 different jacket colors – blue, orange, green, brown, slate, white, red, black, yellow, violet, rose and aqua. The colored jacket allows for easy visual identification of the cables while still providing all of the required environmental protection of an indoor/outdoor cable jacket. Black is the standard jacket.  
Temperature Range Storage- -40 °C to 70 °C (-40 °F to 158 °F )  
Installation- Operation -40 °C to 70 °C (-40 °F to 158 °F )

Mechanical Characteristics Cable

Weight - 127 kg/km (85 lb/1000 ft)

Max. Tensile Strength, Short-Term -2700 N (600 lbf)

Max. Tensile Strength, Long-Term- 810 N (180 lbf)

Min. Bend Radius Installation- 171 mm (6.7 in)

Min. Bend Radius Operation-111 mm (4.4 in)

Nominal Outer Diameter-11.4 mm (0.45 in)

RoHS-Free of hazardous substances according to RoHS 2002/95/EG

Fiber Name-Multi -50  $\mu$ m  
Fiber Category –MM (OM4)  
Performance Option Code 90  
Wavelengths-850 nm / 1300 nm  
Maximum Attenuation-0.3 dB/km / 1.0 dB/km  
Serial 1 Gigabit Ethernet - 1100 m / 600 m  
Serial 10 Gigabit Ethernet - 550 m / - m  
Min. Overfilled Launch (OFL) Bandwidth - 3500 MHz\*km / 500 MHz\*km  
Minimum Effective Modal Bandwidth (EMB) - 4700 MHz\*km / - MHz\*km

Corning 006TWP-T4190D2

2. Optical fiber heat shrink protective sleeves (Single mode and Multimode options) - transparent plastic tube and stainless steel rod design to prevent stress and protect fusion fiber optic splices. Ethylene vinyl acetate (eva) with heat-activated memory, which causes them to shrink under heat. Sleeves shrink tightly to exclude air and hold rod firmly, preventing abrasion of delicate glass fibers. Shall be provided for spliced fibers in all splice trays for fiber pigtailed and cable splicing. Protective sleeves must match fiber coating diameters.

Splice Protection, Heat-Shrink Fusion Splice Protectors, 60 mm long, and package of 50

Corning - 2806031-01

- a. Fiber optic consumables - kit includes all tools and supplies required for cable sheath removal and fusion splicing.

Fusion Splicing Tool Kit M67-003 Or Approved Equivalent.

3. Fusion Splicing Consumables Kit Includes All Items Required To Replenish The M67-003 Tool Kit –

M67-004 Or Approved Equivalent. Order As Required.

- J. Microprocessor - controlled precision fusion splicer that utilizing profile alignment system (pas) and local injection and detection (lid) technologies. Completes each fiber splice in less than (30) seconds. Evaluates cleaved fiber ends. Displays splice loss results and messages on high contrast color LCD. Typical splice loss less than .05db



M90E Series 6000 Microprocessor-Controlled Fusion Splicer Or  
Approved Equivalent

- K. Fiber cleaver - consistently provides cuts averaging less than .5 degrees from perpendicular with 95% less than 1 degree. Ceramic or diamond blade. Blade life up to 10,000 cleaves.

Fbc -006 Or Approved Equivalent

1. Vertical Power Strip : to provide power to transport equipment along the full height of a rack where indicated on Engineering Drawings. Mounted in rear of double sided vertical rack cabling section.(10) 120 volt, 3 prong outlets 20 amp. Power strip shall be hardwired to dedicated electrical circuit. UL listed.

Recommended Manufacturer: Leviton, Hubble.

Or approved equivalent

2. Wire Management Rings. For use in organizing patch cables and cross connect wire. Split "D". High strength plastic. Screw mounted.

Recommended Manufacturer: Siemon.

Type: Cable Hanger

PN: S145

Or approved equivalent

3. Velcro cable ties. For bundling cabling as required and securing cable bundles to racks as required. With integral brass grommets for screw attachment. Attach to backboards using flat headed screws with rigid support. Lengths vary as required. Types vary as required.

Recommended Manufacturer: Chatsworth, Velcro., Siemon

Or approved equivalent

4. Polyethylene spiral cable wrapping. To manage and protect cable bundles between grommeted face plates and surface mounted station boxes.

Recommended Manufacturer: Panduit or approved equal

5. Split basket, open mesh cable grips for support of multiple pair riser cables as required in IDF rooms, data centers and all exposed vertical distribution.

Recommended Manufacturer: Hubbell, Kellems Division or approved equal

Part No.: Based on Size(s) Required

6. "J" Hooks. 1" wide. 1.5" & 2" inside diameter. Suitable for attachment to beam flanges, "U" channel, purlins, deck plates, wood joists and smooth or threaded rod. for use as a cable support in ceilings and beneath access floors. Provided every 4' for open cable runs. Provided every 2' on pedestals beneath access floor.

Recommended Manufacturer: Erico

Part No.: CAT-32 - 2"  
CAT -21 - 1.5"

Or approved equivalent

## K. LABELS

1. Labels. Self adhesive, self laminating, with white matte finish printing area, clear plastic shield. Pin feed for machine printing. Used for backbone cable and conduit identification. Labels shall be provided on both ends of all cables, as noted in the specifications. Used for labeling conduit and cable every 5feet along conduit and cable run.
  - a. Custom 3.0" x 4.0" labels - Brady PN: Y4057851 - Qty of 5000.
  - b. Custom 3.0" x 8.0" labels - Brady PN: Y4057815 - Qty of 5000.
  - c. Ink ribbon for above labels - Brady PN: IP-R4307
  - d. Brady IP300 printer - Brady PN: IP-300  
Or approved equivalent
2. Labels. White polyester. Laser printable. Used for faceplates. 1.00"x.4".

Recommended Manufacturer: W. H. Brady Co.

Part Number: CL-211-619 or approved equal

3. Labels. White polyester. Laser printable. Used for patch panels.

Recommended Manufacturer: W. H. Brady Co.

Part Number: CL-041-619 (.75"x.25")  
CL-311-619 (1"X.5") or approved equal

L. Testing Equipment

1. OTDR: Recommended: Model 340 OTDR Plus Multitester II with single mode, multimode modules, built in hard drive, and Level 2 emulation software. Equipped with rechargeable batteries or approved equivalent.
  
2. 4-Pair UTP automated cable tester: Tester shall be compliant with EIA/TIA TIA/EIA-568-C.1, 568-C.2 /Level II E (for Category 5e) and Level III for Category 6. Equipment must be capable of bi-directional testing and test to Level IIE standards for both Permanent and Channel for Category 5e Cabling systems. Category 6 Test equipment must be compliant with base line specifications set forth in TIA/EIA 568-B.2.1 annex B. All Category 6 components under test must also be compliant with TIA/EIA 568-C.1, C.2, C.2.1 Test equipment type must be approved by NYU Medical Center technical representative prior to use on the job. WireScope , Fluke are pre-approved.
  
3. Optical fiber inspection scope: (Multimode) Cambridge Instruments 10X fiber scope or equivalent.

**EXECUTION**

**3.1 GENERAL**

- A Installation: Follow manufacturers' instructions for installing, connecting, and adjusting all equipment and communications cabling. Where no instructions are included or available, follow industry standards.
  
- B Examine and compare the Communications Cabling Drawings and Specifications with the Drawings and Specifications of other trades; report any discrepancies between them to the NYU Medical Center PROJECT MANAGER; and obtain from him written instructions for changes necessary in the work. Install and coordinate the Communications Cabling work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interferences in a manner accepted by the NYU Medical Center PROJECT MANAGER.
  
- C All repairs or changes required in the work of the Contractor, caused by Contractor's neglect, shall be made at the Contractor's own expense. The Contractor shall also assume responsibility for the protection of any finished work of other trades from damage or defacement by the Contractors personnel, his sub-contractors or by any action taken on his behalf during installation of the cabling system set forth in this specification and its associated plans and documents, and remedy any such injury or damages as required.

- D The locations of outlets, panels, equipment racks and other equipment indicated on the drawings are approximate and are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed.
- E Exercise particular caution with reference to the location of patch panels, termination blocks, outlets, etc. Have precise and definite locations of all outlets accepted by the Architect before proceeding with the installation.
- F Keep all items protected before and after installation with dust and moisture proof barrier materials. It shall be the contractor's responsibility to ensure the integrity of these protective measures throughout the life of the project.
- G Clean up all debris generated by installation activities. Ensure that safe ingress and egress from all work sites is maintained during movement and installation of materials.
- H The use of drywall mounting rings without permanent back boxes is not acceptable, unless otherwise approved by NYU Medical Center PROJECT MANAGER.
- I Maintain a current copy of this specification at the job site at all times.

### 3.2 CABLE DISTRIBUTION

- A Follow room boundaries when pulling cables through ceilings for distribution into walls, conduits, wiring channels, outlets, etc.
- B All workstation cable distribution from the telecommunication rooms to all work locations (except as noted) shall be overhead.
- C Utilize cable tray as is indicated on the Drawings. Cable shall be loose bundled into the cable trays. No cable ties or wrapping shall be used to secure the cables in the cable trays outside of the telecommunications rooms.
- D All overhead cable distribution from the cable trays/conduits to points of vertical transition to work areas shall be supported by means of "J" hooks on 4 foot centers. Ceiling support grids and service hangers shall not be used for support of communications cabling.
- E No more than 18- 4-pair cables shall be suspended in each 2" J hook. If smaller cable supports are used, do not fill support more than 50% full.

### 3.3 EMI/RFI AVOIDANCE

- A To avoid electromagnetic interference (EMI) cables shall be routed in such a way as to maintain the following minimum distance from possible sources of EMI:
  - 1. Three inches from power lines of 2KVA or less installed in conduits or grounded flexible armor below access floors.
  - 2. Three inches from fluorescent fixtures with remotely installed ballasts.
  - 3. Five inches from power lines 2 KVA or less.
  - 4. Twelve inches from power lines of between 2 to 5 KVA.
  - 5. Thirty six inches from power lines of 5 KVA or greater.
  - 6. Twelve inches from high voltage lighting, including fluorescent lighting.
  - 7. Forty inches from transformers or motors.
  - 8. Maintain a minimum twelve inch separation between telecommunication cables running exposed in ceiling or floor voids and parallel electrical cables/conduits. If distance requirements cannot be maintained consult with the Telecom Designer to review and determine if separation requirements can be reduced.
  
- A Telecommunication cables, which must cross electrical cables/conduits, shall do so only at 90 degree angles.
  
- B Provide permanent cable bridges beneath access floors when crossing electrical services. Utilize "J" hooks mounted 2' OC (maximum) to pedestals to create sub-floor supports.
  
- C Refer to NEC for minimum safety separation requirements as stated in TIA/EIA TIA 568C.0

### 3.4 STAFFING

- A Keep a qualified foreman in charge of the work at all times. The foreman shall be present in the field at all times during the performance of the work. Such foreman shall be replaced if the Owner, PROJECT MANAGER or Architect deems the foreman as not performing their duties and promptly to complete the work.
  
- B Designate in writing to the NYU Medical Center PROJECT MANAGER a dedicated full time foreman as contact for resolution of problems, job coordination, additions, changes, etc. The Contractor's foreman shall have full authority to represent the

- Contractor in making decisions and executing the work in an acceptable manner. The foreman must have a minimum of seven years of experience.
- C Provide a supervisory work force sufficient to maintain efficient performance of the Contractor's responsibilities.
  - D Use only skilled, experienced and reliable work force and shall discontinue the services of anyone employed on this project upon written request by the Owner, Architect or NYU Medical Center PROJECT MANAGER.
  - E Provide adequate training to all personnel with responsibilities for the installation of the equipment and cabling described herein. These shall include the personnel of any sub-Contractors approved for use in the project.
  - F Cable Contractors shall be qualified (at minimum) to perform the work activities and be knowledgeable of the following:
    - 1. Color coding of American standard telephone cables
    - 2. Bonding and grounding of shields
    - 3. Testing conductors for electrical continuity
    - 4. Testing conductor insulation
    - 5. Installation, termination, connectorization, and testing of unshielded twisted pair cable, connectors, and termination blocks.
    - 6. Installation, termination, connectorization, and testing of shielded twisted pair cable.
    - 7. Installation, termination, connectorization, and testing of coaxial cable.
    - 8. Installation, termination, fusion splicing, connectorization, and testing of optical fiber cable.
    - 9. Other testing as set forth in this specification.
  - G Craft personnel shall be required to provide and use the proper tools in the performance of each activity. The tools must be in good working order. The NYU Medical Center PROJECT MANAGER reserves the right to review the tools and tool maintenance procedures of the Contractor and require replacements to be obtained.
  - H Telephone and data industry cable installation standards, TIA/EIA standards, and Manufacturer's instructions shall be used for in-process quality control and final acceptance of the work installation.

### 3 .5 CABLE SLACK MANAGEMENT

- A. Label each cable as noted below. At least 9" of slack shall be left at each terminal box or behind each faceplate after jack installation is completed to allow for easy dismounting and extension of outlet covers and wire terminations.

## 3.6 CABLE TESTING AND MULTIMODE/ SINGLE MODE FIBER INSTALLATION AND SPLICING

- A Test all metallic and optical fiber cables installed under these specifications.
- B Conform with the testing requirements set forth in the EIA/TIA Telecommunications Systems Bulletin TSB-67 "Transmission Performance Specification for Field Testing of Unshielded Twisted Pair Cabling Systems" and current ANSI/TIA/EIA-568
- C All UTP field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.
- D Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.
- E Pre-installation testing.
  - 1. Visually inspect all cables, cable reels, and shipping cartons to detect any damage incurred during shipping and transport. Any cable reel that is delivered on its side shall not be accepted and shall be returned. Return visibly damaged items to the manufacturer.
  - 2. When post-manufacture test data has been provided by the manufacturer on the reel or shipping carton, submit copies to the NYU Medical Center PROJECT MANAGER prior to installing cables.
  - 3. Optical fiber cables shall have a visible light continuity check performed on each fiber utilizing an OTDR at the respective singlemode and multimode wavelengths. In addition to continuity, verify that measured cable lengths conform with lengths provided by the manufacturer of the cable.
  - 4. Mark reels as tested/inspected and submit associated test results to NYU Medical Center PROJECT MANAGER.
  - 5. Do not accept any cable with less than the manufacturers guaranteed number of serviceable fibers.
- G. Post Installation Testing



1. Conduct cable testing as described below upon completion of installation. Only test fully completed systems. Partial testing is not acceptable, except by prior written approval from the NYU Medical Center PROJECT MANAGER.
2. Paired and multi-conductor metallic cables - Perform an end-to-end test for continuity, ground fault, intermittent faults, proper cross connection, shorts, crossed pairs, insertion loss (test up to 16Mhz at lengths up to 295 feet when not cross connected), NEXT (test up to 16Mhz at lengths up to 295 feet when not cross connected) and basic ISDN for each cable pair/conductor.
3. Cable pair testing shall be done from the work area outlet, through all connectors, patches and cross connects to patch panels for both data and voice designated station cables.
4. Backbone cable pairs not cross connected to horizontal cables shall be tested from the MDF to their furthest termination point.
5. All other cables shall be tested from end-to-end. Testing shall include all attached patch cords, cross-connects etc.
  - a. For 4-pair UTP cabling, in addition to the end-to-end test for continuity, ground fault, proper cross connection, shorts and crossed pairs for each cable pair/conductor, test parameters shall also include length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return Loss, attenuation, propagation delay, and delay skew. Utilize automated test equipment (see below) for all 4-pair UTP cable testing to allow for single-pass testing of all measured parameters. Test all horizontal 4-pair cables bi-directionally, in accordance with the requirements of ANSI/TIA/EIA 568-C including all addendums for Level IIE and Level III testing.
  - b. All 4-pair Category 5E and 6 UTP cabling not cross connected within the closet shall be tested as a channel by temporarily patching them to rack mounted patch panels. All 4-pair UTP cross connected or patched within the closet shall be tested as a channel.
  - c. For 4 and 25 pair, EIA-RS232, AUI, proprietary and V.35 cables: Replace the entire cable if a bad pair or conductor is found. For cables with a pair count of 600 pairs or higher replace if more than the manufacturer's allotment of spare pairs are bad.
  - d. For multi-pair EIA categorized cable, test the cable in accordance with the appropriate testing criteria set forth in TIA/EIA 568-C, from each of cable, in addition to other continuity tests.

- e. EIA categorized cable assemblies which fail to meet the most stringent applicable testing levels defined in TIA/EIA, 568-C including all addendums shall be entirely replaced.
6. Multimode Optical Fiber Cable Testing:
- a. After installation of connectors, visually inspect each fiber end-face at 10X magnification. Refinish any fibers showing visible defects and/or striations in the core area.
  - b. Perform End-to-end, bi-directional attenuation (loss) test for each fiber strand at 850nm and 1300nm wavelengths. Conduct tests in accordance with EIA/TIA-526-14-A, Method B and with test instrument manufacturer's printed instructions.
  - c. Calculate the total expected link loss based on the number of mated connector pairs, the connector's published loss per mated pair and the cable's published loss based on distance. Demonstrate that measured link loss does not exceed the calculated link loss by more than 5%.
  - d. Strands whose measured attenuation fall outside the acceptable range shall be subject to further inspection and testing to determine the nature of the fault. At a minimum, an OTDR shall be used to determine a loss factor for each connector pair, the exact length of the fiber and to identify the presence of any core damage.
  - e. Faults related to connectorization shall be corrected, and the fiber re-tested as stated above, until acceptable attenuation measurements are received.
  - f. Where defects cannot be corrected, replace any cable having fewer than the manufacturers guaranteed number of serviceable fibers.
7. Single Mode Optical Fiber, Installation, Splicing and Testing
- a. Connection Characteristics: Splicing efficiency between fiber optics is a function of light loss across the fiber junctions measured in decibels (dB). An attenuation loss of 0.03 dB or less in a splice is acceptable. Any return loss will not be acceptable for a splice.

- b Fiber Alignment: Fiber splicing techniques shall be conducted in such a manner that the of the fibers to be spliced will be aligned as perfectly as possible to allow maximum light transmission from one fiber to the next. The following two fiber alignment techniques shall be employed when fusion splicing fibers.
  - c Profile Alignment System (PAS) - Fiber are aligned by injecting light at right angles. A CCD camera detects the fiber refractive inlet profile in the X and Y Axis for Fiber Optimization. This Alignment method shall only be used if the LID ( Local Injection Detection) method cannot be employed ( if light can not be injected through the fiber macrobend).
  - d Local Injection Detection (preferred method) - A type of fusion splicer that injects light through a macrobend prior to the splice point and senses the light through another macrobend past the splice point. This allows the splicer to achieve maximum to alignment.
5. Splice Loss:
- a Undesirable splice losses are caused by poor splicing techniques. Splicing irregularities such, as improper cleaves and dirty splices, shall be avoided.
  - b Splice loss can also be caused by fiber defects, such as non-identical diameters, not in center of the fiber, and noncircular.
6. Handling Precautions: The following precautions shall be observed:
- a Avoid damaging the cable during handling operations prior to splicing. Minor damage may change the transmission characteristics of the fibers to the extent that the cable section will have to be replaced;
  - b The cable manufacturer's requirements for maximum cable pulling tension shall not exceed more than 80% of the maximum rating. The cable manufacturer's requirements for minimum bending radius shall be observed. Unless the cable manufacturer's recommendation is more stringent,

the minimum bending radius for fiber optic cable shall be 20 times the cable diameter under load.

- c The cable manufacturer's recommendations concerning buffer tube bending radius shall be observed. Unless the cable manufacturer's recommendation is more stringent, the minimum bending radius for buffer tubes shall be between 38 millimeters (mm) (1.5 in.) and 76 mm (3.0 in.). The bending limitations on buffer tubes are intended to prevent kinking. Buffer tube kinking may cause excessive optical loss or fiber breakage.
- d Handle unprotected glass fibers carefully to avoid introducing flaws such as scratched or broken fibers.
- e Personnel Safety: Observe all OSHA requirements with regard to outside plant cable construction, including but not limited to following safety precautions:
- f Safety glasses shall be worn when handling glass fibers;
- g Never view open-ended fibers with the naked eye or a magnifying device. Improper viewing of a fiber end that is transmitting light may cause irreparable eye damage; Warning labels to this effect shall be installed on all patch panels , enclosures and on all cable within 5 feet of the termination point and remain fully visible throughout the installation process.
- h Dispose of bare scrap fibers by using the sticky side of a piece of tape to pick up and discard loose fiber ends. Fiber scraps easily penetrate the skin and are difficult to remove. Fiber debris shall be deposited of separately and identified from other garbage and debris in order to avoid injury.

## 7 Equipment Requirements:

- a Fiber optic splices shall be made in areas where temperature, humidity, and cleanliness can be controlled. Fusion splicing techniques require a work station that is environmental controlled.

- b Fusion splicing equipment/ tools shall be kept in proper working condition. Regular maintenance in accordance with manufacturer's recommendations shall be observed. If equipment/ tools requires recalibration or repair ( i.e. Fusion Splicer, Cleaver or test equipment, etc), the Contractor shall have replacement equipment on site, as to not cause a delay in the project schedule or cause a loss in productive work because of equipment failure, at no additional cost to the Owner.
8. Cable Preparation:
- a Refer to engineering working drawings for the cable slack needed at splice points to reach the splicing workstation. Provide sufficient slack required for future maintenance activity as well as initial construction activities. Slack provided shall not be less than 10 meters (30 feet). Re the amount of slack actually used for each splice point on as built drawings to assist future maintenance and restoration efforts.
  - b If the cable contains a rip, the cable jacket shall be ring cut approximately 15 cm (6 in.) from the end and the 15 cm (6 in.) of cable jacket shall be removed to expose the rip. The rip shall be used to slit the jacket to the tape mark.
  - c If the cable does not contain rip, the cable jacket shall be slit using a sheath splitter. No cuts shall be made into the cable nor shall the buffer tubes be damaged.
  - d After the cable sheath has been removed, the binder tape shall be removed from the cable. The cable shall not be crushed or deformed.
  - e The buffer tubes shall be unstranded one at a time. The buffer tubes shall not be kinked.
  - f Each buffer tube shall be inspected for kinks, cuts, and flat spots. If damage is detected, an additional length of cable jacket shall be removed and all of the buffer tubes shall be cut off at the point of damage.

9. Fiber Optic Color Code: The standard fiber optic color code for buffer tubes and individual fibers shall be as follows:

a Buffer Tube and Fiber No.Color

Blue

Orange

Green

Brown

Slate

White

Red

Black

Yellow

Violet

Rose

Aqua

Blue/Black Tracer

Orange/Black Tracer

Green/Black Tracer

Brown/Black Tracer

Slate/Black Tracer

White/Black Tracer

Red/Black Tracer

Black/Yellow Tracer

Yellow/Black Tracer

Violet/Black Tracer

Rose/Black Tracer

Aqua/Black Tracer

10. Buffer Tube Removal:

- a The splice shelf manufacturer's recommendation shall be followed concerning the total length of buffer tube to be removed. Identify the length to be removed with plastic tape.
- b Utilize a scrap buffer tube to determine the cutting tool adjustment required to ring cut a buffer tube without damaging the fibers.
- c Buffer tubes shall be removed by carefully ring cutting and removing approximately 15 to 46 cm (6 to 18 in.) of buffer tube at a time. The process shall be repeated until the required length of buffer tube has been removed, including the tape identification marker.

11. Coated Fiber Cleaning:

- a Each coated fiber shall be cleaned. The cable manufacturer's recommendations shall be followed concerning the solvent required to clean

the coated fibers. Reagent grade isopropyl alcohol is a commonly used cleaning solvent.

- b Manufacturer specified cleaning wipes shall be used for cleaning the coated fibers. Each fiber shall be carefully wiped one at a time. Caution shall be exercised to avoid removing the coloring agent from the fiber coating.
  - c In accordance with the splicing method used, the splice shelf manufacturer's recommendation shall be followed concerning the length of fiber coating to be removed.
  - d After the fiber coating has been removed, the bare fibers shall be cleaned prior to splicing. Each fiber shall be wiped again with a manufacturer approved wipe. Avoid aggressive wiping of bare fiber shall be avoid as it lowers the fiber tensile strength.
12. Fiber Cleaving: Cleaving tools shall be clean and have sharp cutting edges to minimize fiber scratches and improper cleave angles..
- a Cleaved Fiber Handling: The cleaved and cleaned fiber shall not be allowed to touch other objects and shall be inserted into the splicing device.
13. Completion of the Splice:
- a The splice shall be completed by the LID and/or POS fusion splicing method.
  - b Each spliced fiber shall be routed through the organizer tray one at a time as splices are completed to prevent tangled spliced fibers. The splice shelf manufacturer's recommendation shall be followed concerning the splice tray selection.
14. Single Mode Fiber testing
- a Perform end-to-end, bi-directional attenuation (loss) test for each fiber strand at 1310nm and 1550nm wavelengths. Conduct tests in accordance with



TIA/EIA-526-7, Method A.1 and with test instrument manufacturer's printed instructions.

- b Calculate the total expected link loss based on the number of mated connector pairs, the connector's published loss per mated pair and the cable's published loss based on distance. Demonstrate that measured link loss does not exceed the calculated link loss by more than 2%.
- c In addition to power meter/source testing, an OTDR single signature trace shall be performed and documented at both wavelengths of 1310nm and 1550nm. This trace shall provide an analysis of each fiber strand, indicating the following: Overall length, location and measurement of each event or component and uncover faults. The OTDR equipment must match the tested fiber wavelength and diameter.
- d Perform a bidirectional optical return loss test for each fiber strand at 1310 and 1550 nm wavelengths. Conduct tests in accordance with TIA/EIA 455-5 and test instrument manufacturer's instructions.

## H. Post Installation Test Reports

1. Remove all defective cables from the cable pathways. Do not abandon cables in place.
2. The NYU Medical Center PROJECT MANAGER reserves the right to observe the conduct of any or all portions of the testing process.
3. The NYU Medical Center PROJECT MANAGER further reserve the right to conduct, using contractor equipment and labor, a random re-test of up to five (5) percent of the cable plant to confirm documented test results.
4. All test results and corrective procedures are to be documented and submitted to the NYU Medical Center PROJECT MANAGER within ten (10) working days of test completion.
5. Prior to testing, submit for review and approval copies of test report forms proposed for use.
6. Each test report form shall contain the following general information: Date of preparation, Date of test, project name, Contractors name, media type, make, model and serial number of test equipment used, date of last calibration and names of test crew.

7. Paired and multi-conductor metallic cable test reports: as a minimum, also provide: cable number, cable type, pair or conductor count, individual pair or conductor numbers, number of cross connects and/or patches in each pair, results of each test for each pair or conductor, total number of serviceable pairs or conductors in cable.
8. 4-Pair UTP cables. Provide test reports created by automated cable tester for each tested cable.
9. Optical fiber test reports: as a minimum, also provide cable number, fiber count, individual fiber numbers, connector types, number of connectors/patches, Calculated maximum link loss, length of run, measured link loss for each fiber.
10. In addition to the tests specified above, be prepared to be present while the Owner or Owner's designated representatives install and conduct performance tests of the transport electronics connected to the cabling system. Be prepared to conduct on-the-spot cable tests and effect cable plant repairs, as necessary. Successful equipment performance tests do not relieve the Contractor from the specified testing, repair, and documentation requirements.

### 3 .7 ACCEPTANCE

- A Once the testing has been completed, and all as-built and testing documentation is delivered to the NYU Medical Center PROJECT MANAGER is satisfied that all work is in accordance with the Contract Documents, the NYU Medical Center PROJECT MANAGER shall notify the Contractor in writing of the acceptance of the work performed. The date of this acceptance shall constitute the start date of the Warranty.

### 3 .8 CABLE CONNECTOR PROTECTION

- A All installed connectors shall be protected and insulated by one of the following methods.
  1. Any installed connector exposed to construction activities shall be protected with a clear, heat sealed 3 mil plastic bag sealed shut with waterproof tape after installation. The bag must be removable for testing. Any protective bags removed for testing or other installation activities must be replaced immediately after such activities are completed.
  2. Any connector, which is normally shipped with an insulating protective cover over the connector pins shall be left with the cover in place after the

connector, has been installed on the cable. The protective cover shall be taped in place if easily dislodged.

3. Any connector fouled or damaged as a result of activities related to the construction process shall be replaced.

### 3 .9 CABLE IDENTIFICATION SYSTEM

- A Use color coding in accordance with the TIA/EIA 606-B standards.
- B Terminations (jacks, face plates, wall outlets, etc.) at the user locations shall be labeled with (at minimum) machine generated black uppercase lettering on a permanent adhesive label stock, covered with a permanent water resistant sealer. Labeling stock and/or lettering must be used that provides a high contrast with the color of the terminating equipment and faceplates.
- C All lateral cabling shall be labeled with machine generated black uppercase lettering on a permanent adhesive label stock, covered with a permanent water resistant sealer.
- D Labels shall be placed on both ends of the cable and at least 4 inches from the point at which the cable jacket is opened to expose individual copper pairs or fiber strands, or from the connector or terminal block. All labels shall be visually and physically accessible at work locations, and when cables are mounted to frames, blocks, racks, etc. where the proper mounting procedure allows ready access to individual cables. When cables are mounted to punch down wiring blocks with integrated labeling capacity, the wiring labels shall be affixed on cables as above, and the blocks shall be labeled using machine generated black uppercase lettering on a permanent adhesive stock, duplicating the information on the cable identification label.
- E Provide all cable tags. Label each tag with the appropriate cable number as shown on the drawings, and as indicated by the NYU Medical Center PROJECT MANAGER.
- F Cable identification numbers shown on the plans are presented in an abbreviated format. All cables ID's shall (at minimum) indicate their floor, originating closet ID, and cable ID.
- G After pulling and terminating cables place the appropriate cable tag as noted above. Temporary tags are acceptable for use during construction. All temporary tags must be removed and replaced with permanent machine generated tags prior to acceptance.
- H If at any time during the job the permanent cable tag becomes illegible or is defaced or removed, immediately replace it with a duplicate pre-printed cable tag.

- I Label each outlet of modular patch panels.
- J All optical fiber cables shall be labeled every 5 feet along each cable run.
- K All conduit supporting installed optical fiber backbone shall be installed with labels every 5 feet along entire conduit run.
- L Adhesive strip fed labels (eg: "P-Touch") shall not be utilized as cable tags.

### 3.10 OTHER IDENTIFICATION REQUIREMENTS

- A Furnish a nameplate for each patch panel, cross connect field, equipment rack, etc. Unless otherwise noted, use a machine printed, permanent adhesive label stock, covered with a permanent water resistant sealer.
- B Furnish a nameplate for each major cable tray section. Unless otherwise noted, use a machine printed, permanent adhesive label stock, covered with a permanent water resistant sealer. Indicate the floor, a unique sequential number and the length on the tray segment on each label. Labels shall be provided on both sides of each tray, every 10' (maximum)

### 3.11 TERMINATING BLOCKS, DISTRIBUTION RACKS AND PATCH PANELS

- A Location and placement of the required terminating and distribution hardware shall be as shown on the drawings.
- B The equipment shall be assembled and installed as per the manufacturers' printed instructions.
- C The Contractor shall be responsible for the provision of all frames, blocks, terminations, supports, frame anchors, and mounting hardware necessary to fully install a complete communications cabling system.
- D All horizontal UTP cables shall be terminated on patch panel for Category 6 cable plant. Category 6 systems as noted on Design Drawings.
- E All single mode backbone shall be spliced with LC pigtails and placed within designated optical fiber termination panels in the telecommunications closets and the MDF.
- F After dressing UTP cable to its final location, its sheath shall be removed to a point that allows the conductor to be splayed and terminated in a neat and uniform

fashion. Every effort shall be made to maintain sheath integrity by removing only as much as is practical to accomplish termination.

- G All due care shall be taken to ensure that the integrity of the pair twists are maintained between the open segment of the cable sheath and the termination blocks.

### 3.12 CABLE PULLING

- A To limit the incidence of micro-bending of the individual fiber strands, mesh-type, swivel-eye fiber optic pulling grips shall be employed for all fiber optic cable pulling. This type of pulling grip is recommended for all other building cable as required.
- B Pulling tension on 4-pair UTP cable shall not exceed 25 lbs.

### 3.13 CABLE INSTALLATION

- A. Furnish and install the communications cables/wires in accordance with the drawings, specifications, statement of work, and cable placement schedules (when schedules and drawings are provided) by the NYU Medical Center PROJECT MANAGER and manufacturer's specifications.
- B. Completely install each UTP and OF riser cable as an uninterrupted conductor section from the NEMA enclosure as indicated. There shall be no splices or mechanical couplers installed between the cable points of origin and termination. Consolidation points will be allowed to redirect existing category cables to new NEMA enclosure.

- C. Terminate all singlemode optical fiber riser cables with LC connectors and pigtails (singlemode) and mount the connectors into duplex LC couplers unless otherwise noted. All connectors and couplers shall be marked "A" or "B" to meet the requirements of the TIA/EIA 568-C.3 for maintenance of OF polarity.
- D. Most work locations shall be equipped with, at least, one set of standard lateral communication cables to consist of:
  - 1. Three 4-pair TIA/EIA 568-C. and all related sub sections, Category 6 unshielded twisted pair cables mounted into double gang faceplate.
  - 2. Provide all other outlet configurations in accordance with the plans.
- E. Completely install each lateral station cable as an uninterrupted conductor section from the appropriate telecommunications closet to the designated and appropriate user-end termination point, as indicated on the drawings. There shall be no splices or mechanical couplers installed between the cable points of origin and termination.
- F. Four-pair connector blocks shall be utilized on the horizontal termination blocks or Towers. Five-pair connector blocks shall be utilized for the risers.
- G. Outlet ID's shown on the drawings and the cable schedules (when submitted) reference the floor room, rack , patch panel and port i.d. . For example:  
2<sup>nd</sup> floor, closet A rack 3 panel A port 1

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- H. Cables terminated in flush mounted, or surface mounted poke through fittings, or surface raceway fittings shall be mounted into NEMA adapters. The adapters shall be mounted into NEMA punched plates.
- I. .
  - 1. Terminate, and test this cable in accordance with the specific providers practices. Label these cables in accordance with the Drawings and Specifications.

### 3.0 BID FORMAT

4 .1 Provide the following information for all items listed below:

- A UNIT PRICES with units indicated (eg: ea, ft, etc.) to furnish and install each item. Provide furnish and install prices separately.

- B QUANTITIES for each item.
- C TOTAL PRICES for each item.

#### 4 .2 TOTAL COSTS

- A Provide total costs to complete the job. Include total costs for all labor, all materials, and a grand total.

#### 4 .3 PRICING

- A. Hourly Labor Rate.
  - B. Per hour labor rate including overhead, profit and supervision.
  - C. All price quotes shall be good for (90) ninety days after Proposal submission.
- 
- A Optical Fiber backbone cabling. Costs to furnish and install including supports, termination, at both ends, patch panels, splice trays, pigtails, connectors dressing tagging, firestop, testing PER CABLE FOOT
    - 1. 4 Strand Optical Fiber cables –plenum, multimode
    - 2. 12 Strand Optical Fiber cables –plenum, multimode.
    - 3. 24 Strand Optical Fiber cables –plenum, multimode
    - 4. 48 Strand Optical Fiber cables –plenum, multimode
    - 5. 12 Strand Optical Fiber cables –plenum, single Mode.
    - 6. 24 Strand Optical Fiber cables –plenum, single Mode.
    - 7. 48 Strand Optical Fiber cables –plenum, single Mode.

#### B Wire Management

- 1. Wire management rings 3"
  - 2. Jacks. Including termination of cable end at workstation.
- 
- C Outlets. Including faceplates, dust covers and related hardware, and mounting of terminated cables, labeling, and securing faceplates. Provide separate furnish costs for the faceplate.
    - 1. Standard outlet – double gang face plate with (1) dual and (1) single Ortronics Category 6 568B Module Tracjack or equal

- D NEMA 3R enclosure.
  
- E Modular patch panels/assemblies. Price to include all components.
  - 1. Multi ring wire management
  - 2. Strain relief bars
  - 3. 24 port standard density Category 6
  
- F Testing. Provide pricing for end-to-end testing as per the specification.
  - 1. Horizontal cables, each.
  
- G Patch cord - Provide pricing.
  - 1. Modular to modular. Category 6. Mounting. 8'
  - 2. 4 pair Category 6 4 pair cross connect 15 feet
  - 3. Modular to modular. Category 6. Snagless patch Project Managerd. 8'
  - 4. SM OF Patch Dual Duplex Lc to dual simplex 2 meter
  
- H Cable Supports. Including assembly, mounting, placement and attachment of supports, bends, transitions, junctions, all necessary fittings, and grounding.
  - 1. Kellums grips
  - 2. J-Hooks. Cost per hook assembly. Include price of threaded rod and "J" hooks for ceiling mounts and other clamps for beams and access floor supports.
  
- I Plywood. 3/4" FR plywood. Per 4'x8' sheet.
  
- J Miscellaneous supplies needed to complete all the work.

**\*\*\*\*\* END OF SECTION \*\*\*\*\***



## Appendix B – NYULMC Electrical Design Guidelines

### NYULMC Electrical Design Guidelines

Real Estate Development + Facilities

March 2014 40

#### A. Codes, Regulations and Design Standards.

I. The installation will comply with applicable provisions of the New York State Building Code and New York Electrical Code and all other applicable Codes.

#### B. Design Criteria

I. All connections to the existing electrical distribution systems to be done with double hole lugs and utilize compression type copper connectors. If this is not possible, the design scheme shall be discussed and approved by Facilities Operations.

##### II. Emergency Power

A. Emergency Power shall be provided per NFPA Standards, Joint Commission Standards, CMS Standards and New York Electrical code requirements. Emergency power to be reviewed with Facilities Operations prior to design.

#### C. Naming Convention

##### I. Switch Panel Naming Scheme

Note: Name each panel as shown on the design drawings from Automated Logic (Appendix B and C).

##### D. Emergency Panel Naming Scheme

Example: LS-PP-G4-61-HCC-CE1

LS - PP G4 61 - HCC - C E 1

Panel #

Location

N,S,E,W

A,B,C,D

Floor Level

FED From

EB - Energy Building

SB - Science Building

KP - Kimmel Pavilion

TH - Tisch Hospital

MSB - Medical Science Building

HCC - Health Care Center

SKB - Skirball

660 - 660 1st Ave

GBH - Greenberg Hall

SML - Smilow

MIL - Milhauser

AMB- Ambulatory Surgery

ATS #

Generator Plant

G0 - Reserved for Future Use

G1 - Kimmel Pavilion

G2 - Skirball

G3 - Science Building

G4 - HCC

G5 - Smilow

G6 - Energy Building

G7 - 660

G8 - GBH

G9 - Outpatient Surgical Center

G10 - VZ 30th Street

Panel Type

DPH - Distribution Panel

PPH - Power Panel

LPH - Lighting Panel

LP - Lighting Panel

PP - Power Panel

RP - Receptacle Panel

Panel System

LS - Emergency (Article 517 Life Safety) in Patient Care Buildings and Life Safety in

Non-Critical Patient Care Building (Article 517)

EM - Standby (Includes Article 517 Required Mechanical Loads)

## E. Various

I. The following is a list of electrical gear that shall have heat runs/burn-ins performed prior to turnover.

- a. Uninterruptible Power Supply (UPS) – 24 hour burn in
- b. Uninterruptible Power Supply Rack Type – 30 minute burn in
- c. Automatic Transfer Switch (ATS) – 4 Hour Burn In
- d. Static Transfer Switch (STS) – 24 hour Burn In

II. Proper wire color schemes shall be used for all panels.

III. Isolated Ground (IG) receptacles are not allowed.

IV. Labelling of source and load shall be every 5'.

V. All emergency power shall be in conduit.

VI. All boxes (splice, pull, etc) shall be labelled with source and load

## F. Cable Pulling Lubricants

I. Cable pulling lubricant shall not be used on isolated power systems.

The following shall not be specified without approval from NYULMC's division of EH&S:

Chemicals that are known (IARC group 1) or probable (IARC group 2a) human carcinogens.

Hazardous substances listed in OSHA 1910 subpart Z.

Products containing volatile organic compounds (VOCs) in excess of 50 grams/liter.

Products whose Safety Data Sheet (SDS) rates health, fire and/or reactivity as exceeding "1" on a scale of 0 to 4.

Products emitting strong odors.

Approved Manufacturers:

- A. American Polywater Corporation - Type "J"
- B. Electro Compound Company - "Poly-Ease" or "Y-ER Ease"
- C. Ideal Industries - "Wire Lube"

## G. Cable Tray and Fittings

Approved Manufacturers:

- A. Atlas
- B. Burndy
- C. Cooper B-Line Systems
- D. M.P. Husky Corp.
- E. P-W Industries

## H. Electrical Conductors, Copper, 600 Volt or Less

All shall be UL Listed.

Approved Manufacturers:

- A. American Insulated Wire
- B. General Cable/Cablec
- C. Pirelli
- D. Rome
- E. Southwire

## I. Electrical Metallic Tubing (EMT)

All shall be UL Listed.

Approved Manufacturers:

- A. Allied Tube & Conduit/Tyco
- B. Republic
- C. Robroy Industries
- D. Triangle
- E. Western
- F. Wheatland

J.

Enclosed Switches

Approved Manufacturers:

- A. General Electric
- B. Siemens
- C. Square D

K. Flexible Metal Conduit

Note: All shall be UL Listed.

Approved Manufacturers:

- A. AFCB. ALFLEX
- C. American Metal Molding
- D. Anaconda
- E. Cerro
- F. International Metal Hose

L. Flexible Metal Conduit Fittings

All shall be UL Listed.

Approved Manufacturers:

- A. Appleton
- B. Efcor
- C. Midwest
- D. OZ/Gedney
- E. Raco/Hubbell
- F. Steel City/Thomas & Betts

M. Fuses

Approved Manufacturers:

A. Ferraz –Shawmut – Amp-Trap 2,000 with a fuse window

O. Liquid-tight Flexible Metal Conduit Fittings

All shall be UL Listed.

Approved Manufacturers:

- A. American Brass Company
- B. Midwest
- C. O.Z./Gedney

P. Overcurrent Protective Devices

Approved Manufacturers:

- A. Boltswitch
- B. General Electric
- C. Square D
- D. Siemens

Q. Receptacles

All receptacles shall be hospital grade and illuminated. Coverplates shall be metal, NOT plastic. Receptacles shall be consistent in orientation. Normal Power color shall be gray, duplex and illuminated face. Emergency power shall be red, duplex and illuminated face.

Approved Manufacturers:

- A. Hubbell

R. Rigid Aluminum Conduit and Fittings

All shall be UL Listed.

Approved Manufacturers:

- A. Alcoa
- B. Anchor-Harvey
- C. Harvey
- D. Kaiser
- E. Reynolds

## 35. Rigid Nonmetallic Electrical Conduit and Fittings

All shall be UL Listed.

Approved Manufacturers:

- A. Carlon/Lamson & Sessions
- B. Certainteed
- C. Triangle

## 36. Rigid Steel Conduit and Fittings (exposed to the weather)

All shall be UL Listed.

Approved Manufacturers:

- A. Ocal Inc.
- B. Occidental Coating Company
- C. Perma-Cote
- D. Robroy Industries "Plasti-Bond-Red"
- E. Triangle

## 37. Rigid Steel and Intermediate Metal Conduit

All shall be UL Listed.

Approved Manufacturers:

- A. Allied
- B. Republic
- C. Triangle
- D. Western
- E. Wheatland

## 38. Rigid Steel and Intermediate Metal Conduit Fittings

All shall be UL Listed.

Approved Manufacturers:

- A. Appleton
- B. Cooper Crouse-Hinds
- C. Efcor
- D. Midwest
- E. O.Z./Gedney
- F. Raco/Hubbell
- G. Spring City
- H. Steel City/Thomas & Betts
- I. Thomas & Betts

## 40. System Identification

Equipment Labels shall be engraved plastic nameplates with a black surface and white core with engraved letters. Engraved lettering shall be a minimum of 2" in letter height.

Labelling of source and load shall be every 5' in concealed areas and 10' in unconcealed areas.

## 41. Transient Voltage Surge Suppression

Approved Manufacturers:

- A. Current Technology
- B. General Electric
- C. Liebert
- D. United Technologies

## 42. Type "AC" (Armored Cable) Conductor Cables, 600 Volts or Less

All shall be UL Listed. MC cable is not permitted. Armored Cable shall be hospital grade BX.

Approved Manufacturers:

- A. AFC
- B. Alfex
- C. Southwire

## 43. Vibration Isolation Devices and Seismic Restraints

Approved Manufacturers:

- A. Amber/Booth Company
- B. Korfund Dynamics Corporation
- C. Mason Industries, Inc.
- D. Vibration Eliminator Company
- E. Vibration Mounting and Controls, Inc.

## 45. Wire Connectors and Lugs

All shall be UL Listed.

Approved Manufacturers:

- A. AMP
- B. Anderson/Hubbell

- C. Burndy
- D. Homac
- E. Ideal
- F. ITT-Blackburn
- G. MAC
- H. Thomas & Betts
- I. Tyco Electronics/AMP
- J. Union Connector Co.
- K. 3M

## 46. UPS (Central)

Approved Manufacturers:

- A. Liebert
- B. Mitsubishi

## 47. UPS (Rack Mounted)

Approved Manufacturers:

- A. Liebert
- B. APC

END OF ELECTRICAL SECTION