



UNIVERSITY OF

SOUTH FLORIDA

University
of South
Florida

July 1

2023

Division 27
Data/Communications Guidelines

Category 6A
Specification

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GENERAL

1.1 SCOPE OF WORK

- A. THIS DOCUMENT SPECIFIES **UNIVERSITY OF SOUTH FLORIDA** REQUIREMENTS FOR PRODUCT DESIGN, PERFORMANCE, QUALITY ASSURANCE, AND CONTRACTOR RESPONSIBILITIES FOR EXECUTION OF WORK TO INSTALL A COMPLETE CATEGORY 6A STRUCTURED CABLING SYSTEM. EXECUTION OF WORK INCLUDES DELIVERY AND STORAGE OF MATERIALS, PREPARATION, INSTALLATION, FIELD-TESTING, AND PROJECT COMPLETION TASKS. SYSTEM CERTIFICATION AND WARRANTY SUBMITTAL REQUIREMENTS FOR COMPLETED WORK AND FUTURE MOVES, ADDS AND CHANGES (MAC'S) ARE ALSO SPECIFIED IN THIS DOCUMENT. COMPLIANCE TO APPLICABLE CODES, STANDARDS AND REGULATIONS IS REQUIRED FOR ALL CONSTRUCTION WORK PERFORMED.

1.2 SUMMARY

- A. SECTION INCLUDES PRODUCTS AND EXECUTION REQUIREMENTS PERTAINING TO DIVISION 27 SYSTEMS. COPPER AND FIBER BACKBONE AND HORIZONTAL CABLING ALONG WITH SUPPORT SYSTEMS ARE COVERED UNDER THIS DOCUMENT.
- B. PRODUCT SPECIFICATIONS, GENERAL DESIGN CONSIDERATIONS, AND INSTALLATION GUIDELINES ARE PROVIDED IN THIS DOCUMENT. QUANTITIES FOR ALL CABLING PRODUCTS SHALL BE PROVIDED AS REQUIRED TO COMPLETE CABLING TO ALL WORK STATIONS AS SHOWN ON FLOOR PLANS.
- C. THE APPROVED CONTRACTOR SHALL FURNISH THE REQUIRED MATERIALS AND LABOR TO COMPLETE THE CATEGORY 6A CABLING INFRASTRUCTURE SPECIFIED IN THE CONTRACT DOCUMENTS.
- D. CONSTRUCTION WORK SHALL COMPLY WITH CONTRACT DRAWINGS, SPECIFICATIONS, PROJECT COMPLETION SCHEDULES, AND APPLICABLE CODES AND STANDARDS.
- E. WORK SHALL INCLUDE ALL DETAILED EXECUTION REQUIREMENTS, SUCH AS PREPARATION, INSTALLATION, SYSTEM CERTIFICATION, AND PROJECT CLOSEOUT ACTIVITIES ACCORDING TO THE CONTRACT.
- F. THE SAME MANUFACTURER'S PRODUCT SHALL BE UTILIZED THROUGHOUT THE ENTIRE PROJECT FOR ALL COPPER AND FIBER OPTIC CABLING AND CONNECTIVITY.
- G. SUBSTITUTIONS: NO SUBSTITUTED PRODUCTS SHALL BE INSTALLED EXCEPT WITH WRITTEN APPROVAL BY OWNER.

1.3 DATA AND VOICE COMMUNICATIONS CONTRACT WORK

- A. GENERAL:
- a) FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT AND SERVICES FOR THE INSTALLATION IN ACCORDANCE WITH GENERAL PROVISIONS OF THE SPECIFICATIONS AND THE CONTRACT DRAWINGS.
 - b) COMPLETELY COORDINATE WITH WORK OF ALL OTHER TRADES.
 - c) PROVIDE ALL SUPPLEMENTARY OR MISCELLANEOUS ITEMS, APPURTENANCES AND DEVICES INCIDENTAL TO OR NECESSARY FOR A SOUND, SECURE AND COMPLETE INSTALLATION, WHETHER OR NOT SPECIFICALLY INDICATED IN THE CONTRACT DOCUMENTS.
 - d) PROVIDE ALL FLOOR PENETRATIONS, FLOOR SLEEVES, CONDUIT RACEWAYS, WALL PENETRATIONS, ETC. NOT SHOWN ON THE ELECTRICAL PLANS BUT NEEDED FOR THE ROUTING OF CABLING PROVIDED HEREIN.
 - e) PROVIDE FIRESTOPPING.
 - f) PROVIDE LABOR FOR PATCH CORD INSTALLATION AT HORIZONTAL PATCH PANEL IN THE TR AND TC.
 - g) PROVIDE LABOR FOR TESTING HORIZONTAL AND BACKBONE CABLING.
 - h) PROVIDE LABOR FOR WIRELESS LAN ACCESS POINT, ANTENNAS AND POWER INJECTOR INSTALLATION AND SYSTEM TESTING.
 - i) PROVIDE TELECOMMUNICATIONS GROUNDING AND BONDING.
- B. PROVIDE COMPLETE INSTALLATION FOR STRUCTURED TELECOMMUNICATIONS CABLING SYSTEM INCLUDING BUT NOT LIMITED TO:
- a) CATEGORY 6A UTP HORIZONTAL CABLES.
 - b) MULTIMODE & SINGLEMODE OPTICAL FIBER BACKBONE CABLES.
 - c) WORK AREA TELECOMMUNICATION OUTLETS.
 - d) WALL MOUNTED OUTLETS.
 - e) EQUIPMENT MOUNTING RACKS AND RACK ENCLOSURES.
 - f) CATEGORY 6A MODULAR PATCH PANELS.
 - g) OPTICAL FIBER PATCH PANELS.

- h) OPTICAL FIBER CONNECTORS.
- i) DATA CATEGORY 6A PATCH CORDS
- j) OPTICAL FIBER PATCH CORDS.
- k) WIRE MANAGEMENT PANELS.
- l) FIELD TESTING.
- m) CONDUIT FLOOR SLEEVES, CONDUIT AND SUPPORTS REQUIRED FOR INSTALLATION OF ALL CABLING.
- n) FIRESTOPPING.

1.4 SUBMITTALS

- A. SUBMITTALS SHALL BE COMPLETE AND AT ONE TIME. PARTIAL SUBMITTALS WILL NOT BE CONSIDERED.
- B. MATERIAL LISTS, SCHEDULE OF VALUES, LISTS OF SUBCONTRACTORS, AND PROOF OF CONTRACTOR QUALIFICATIONS SHALL BE PROVIDED TO ENGINEER UPON REQUEST AND SHALL FOLLOW THE GUIDELINES AS STATED IN THE GENERAL REQUIREMENTS (DIVISION 1 OF THE SPECIFICATION).
- C. SHOW DRAWINGS SHALL BE SUBMITTED. ALL COMMUNICATION SYSTEM SHOP DRAWINGS SHALL INCLUDE:
 - a) MANUFACTURER'S DATA (SPECIFICATIONS, "CUT SHEETS").
 - b) WIRING DIAGRAMS FOR ALL INSTALLED CABLING.
 - c) EQUIPMENT RACK/CABINET LAYOUTS.
 - d) PROPOSED LABELING SCHEMES AND LABELING METHOD.
 - e) LIST OF CABLING DISTANCES (TYPICAL AND MAXIMUM) FOR ALL STRUCTURED CABLING
 - f) SUBMIT COPIES OF CERTIFICATIONS FOR ALL TECHNICIANS AND THE PROJECT MANAGER WHO WILL SUPPORT THIS PROJECT. THE CERTIFICATIONS SHALL INCLUDE:
 - a) STRUCTURED CABLING AND TERMINATION EQUIPMENT INSTALLATION CERTIFICATIONS FOR COPPER AND OPTICAL FIBER CONNECTIVITY AND CABLING.

- b) APPROVED MANUFACTURER CLASSES SATISFACTORILY COMPLETED.
 - g) CONTRACTOR SHALL SUBMIT A TEST PLAN THAT DEFINES THE TESTS REQUIRED TO ENSURE THAT THE SYSTEM MEETS TECHNICAL, OPERATIONAL, AND PERFORMANCE SPECIFICATIONS 20 WORK DAYS PRIOR TO PROPOSED TEST DATE.
 - h) CONTRACTOR WILL SUBMIT PRIOR TO TESTING, ALL CERTIFICATES OF CALIBRATION(S) FOR TEST EQUIPMENT BEING USED ON THE PROJECT
 - i) WORK SHALL NOT PROCEED WITHOUT THE OWNER'S APPROVAL OF THE SUBMITTED ITEMS.
- D. DRAWINGS & INSPECTION OF SITE:
- a) FLOOR PLAN DRAWINGS ARE TO SCALE AND TYPICALLY ARE NOT DIMENSIONED. THE CONTRACTOR SHALL NOT USE SCALE DRAWINGS FOR EQUIPMENT PLACEMENT AND CLEARANCES. DIMENSIONS GIVEN ON DRAWINGS SHALL ALWAYS TAKE PRECEDENCE OVER SCALED DRAWINGS.
 - b) ANY EXISTING WIRES, UTILITIES, OR EQUIPMENT SHOWN ON THE DRAWINGS ARE SHOWN FOR GENERAL INFORMATION AND TO THE BEST KNOWLEDGE OF THE ENGINEER. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING WIRES, UTILITIES, OR EQUIPMENT.
 - c) THE CONTRACTOR SHALL FIELD VERIFY DISTANCES AND EQUIPMENT PLACEMENTS COORDINATING LOCATIONS WITH OTHER TRADES, CONSTRUCTION MANAGERS, AND GENERAL CONTRACTOR PRIOR TO INSTALLATION.
 - d) THE CONTRACTOR SHALL REVIEW ALL SITE CONDITIONS PRIOR TO SUBMITTING A BID ON THIS PROJECT. ANY OBVIOUS DISCREPANCIES BETWEEN THE SITE CONDITIONS AND BIDDING DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AT THE TIME OF BIDDING SO CLARIFICATION CAN BE MADE BY ADDENDUM.
 - e) CHANGE ORDER REQUESTS FOR ADDITIONAL COSTS RELATED TO THE CONTRACTORS MISUNDERSTANDING RELATED TO THE AMOUNT OF WORK INVOLVED AND LACK OF KNOWLEDGE RELATED TO THE SITE CONDITIONS WILL NOT BE ALLOWED.
- E. TEST REPORTS:
- a) SUBMIT COPIES OF COMPLETE REPORTS OF ALL TESTING PERFORMED TO THE GENERAL CONTRACTOR, WITH COPIES TO THE GC AND ENGINEER UPON COMPLETION OF JOB.

1.5 APPROVED CONTRACTOR

- A. THE CONTRACTOR SHALL HAVE EXPERIENCE IN THE INSTALLATION AND TESTING OF SIMILAR SYSTEMS AS SPECIFIED HEREIN AND SHALL PROVIDE REFERENCES UPON REQUEST (INCLUDING THE PROJECT NAME, ADDRESS, DATE OF IMPLEMENTATION, CLIENT NAME, TITLE, TELEPHONE NUMBER, AND PROJECT DESCRIPTION).
- B. ALL MEMBERS OF THE INSTALLATION TEAM MUST BE CERTIFIED BY THE MANUFACTURER AS HAVING COMPLETED THE NECESSARY TRAINING TO COMPLETE THEIR PART OF THE INSTALLATION. ALL PERSONNEL SHALL BE ADEQUATELY TRAINED IN THE USED OF SUCH TOOLS AND EQUIPMENT AS REQUIRED.
- C. THE CONTRACTOR BIDDING ON COMMUNICATION SYSTEMS SPECIFIED HEREIN SHALL BE CERTIFIED BY THE CONNECTIVITY MANUFACTURER TO INSTALL, SERVICE, AND WARRANTY THE SPECIFIED PRODUCT PRIOR TO THE TIME OF BID AND THROUGHOUT THE DURATION OF THE INSTALLATION. MANUFACTURER CERTIFICATIONS SHALL NOT BE PROJECT SPECIFIC AND SHOULD BE VALID FOR ANY AND ALL PROJECTS COMPLETED BY CONTRACTOR.
- D. THE CONTRACTOR MUST BE CERTIFIED TO INSTALL A FIRE-STOP SYSTEM.
- E. THE CONTRACTOR SHALL OWN AND MAINTAIN TOOLS, INSTALLATION EQUIPMENT, AND TEST EQUIPMENT NECESSARY FOR SUCCESSFUL INSTALLATION AND TESTING OF OPTICAL AND CATEGORY 5E, 6 & 6A PREMISE DISTRIBUTION SYSTEMS.
- F. THE OWNER RESERVES THE RIGHT TO REQUIRE THE CONTRACTOR TO REMOVE FROM THE PROJECT ANY SUCH EMPLOYEE THE OWNER DEEMS TO BE INCOMPETENT, CARELESS OR INSUBORDINATE.
- G. THE CONTRACTOR SHALL HAVE HIS PLACE OF BUSINESS, OFFICIAL OFFICE NOT A RESIDENTIAL DWELLING, LOCATED NO MORE THAN 140 MILES FROM THE JOB SITE.
- H. THE CONTRACTOR MUST MAINTAIN A STATE CONTRACTOR'S LICENSE AS REQUIRED BY THE STATE.
- I. THE CONTRACTOR SHALL PROVIDE COPIES OF CERTIFICATES FOR PROOF OF MANUFACTURER'S TRAINING, MANUFACTURER'S CERTIFIED INSTALLER, AUTHORIZED DISTRIBUTOR IN THE SHOP DRAWING SUBMITTAL AND AT THE REQUEST OF THE ENGINEER TO VERIFY COMPLIANCE WITH SPECIFICATION PRIOR TO RECOMMENDATIONS FOR AWARDED BID.
- J. THE APPROVED CONTRACTOR SHALL ASSUME THE FOLLOWING RESPONSIBILITIES:
 - a) EXECUTE CONSTRUCTION IN ACCORDANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS.
 - b) ADHERE TO PROJECT SCHEDULES AND JOB SITE RULES.

- c) ADHERE TO THE QUALITY, REGULATORY, LOGISTICS, AND DOCUMENTATION REQUIREMENTS.
- d) FURNISH THE CABLING SYSTEM CERTIFICATION AND WARRANTY PROVISIONS OUTLINED IN PART 1.
- e) ADHERE TO THE PRODUCT REQUIREMENTS OUTLINED IN PART 2.
- f) ADHERE TO THE EXECUTION GUIDELINES OUTLINED IN PART 3.

K. **CONTRACTOR SHALL ALSO BE INCLUDED IN THE APPROVED CONTRACTORS LIST THROUGH USF PURCHASING / INFORMATION TECHNOLOGY CURRENT ITN CONTRACT.**

1.6 APPROVED PRODUCT MANUFACTURERS

- A. THE MANUFACTURER OF THE CONNECTIVITY PRODUCTS SPECIFIED IN THIS DOCUMENT, AS REQUIRED FOR CONSTRUCTION OF THE CABLING INFRASTRUCTURE PER CONTRACT DOCUMENTS SHALL BE:
 - a) HUBBELL PREMISE WIRING CATEGORY 6A
- B. THE MANUFACTURER OF THE CABLING PRODUCTS SPECIFIED IN THIS DOCUMENT, AS REQUIRED FOR CONSTRUCTION OF THE COPPER CABLE INFRASTRUCTURE PER CONTRACT DOCUMENTS SHALL BE:
 - a) GENERAL CABLE CORPORATION CATEGORY 6A
 - b) PAIGE DATA COMM GAMECHANGER (FOR EXTENDED LENGTH DESIGNS)
- C. THE MANUFACTURER OF THE FIBER OPTIC CABLING PRODUCTS SPECIFIED IN THIS DOCUMENT, AS REQUIRED FOR CONSTRUCTION OF THE FIBER OPTIC CABLE PER CONTRACT DOCUMENTS SHALL BE:
 - a) OCC
 - b) GENERAL CABLE CORPORATION
- D. PRODUCT SUBSTITUTIONS ARE PERMITTED UNDER THE CONDITIONS STATED BELOW.
(1.7 A)

1.7 PRODUCT SUBSTITUTIONS

- A. PRODUCT SUBSTITUTIONS FROM OTHER MANUFACTURERS ARE PROHIBITED AND SHALL REQUIRE THE APPROVAL OF USF REPRESENTATIVE 20 DAYS PRIOR TO BID OPENING.

1.8 QUALITY ASSURANCE

- A. INSTALLED CATEGORY 6A BALANCED UTP AND FIBER CABLING SYSTEMS, PATHWAYS AND DISTRIBUTION FACILITIES SHALL ADHERE TO MANUFACTURER'S INSTRUCTIONS, CONTRACT DRAWINGS AND SPECIFICATIONS, AND APPLICABLE CODES, STANDARDS AND REGULATIONS.
- B. INSTALLED CATEGORY 6A BALANCED UTP CABLING SYSTEMS AND FIELD TEST RESULTS SHALL STRICTLY ADHERE TO REQUIREMENTS OF ANSI/TIA-568-C.0, ANSI/TIA-568-C.1 AND ANSI/TIA/EIA-568-C.2.
- C. INSTALLED OPTICAL FIBER CABLING SYSTEMS AND FIELD TEST RESULTS SHALL STRICTLY ADHERE TO REQUIREMENTS OF ANSI/TIA-568-C.0 AND ANSI/TIA/EIA-568-C.3.
- D. WHERE APPLICABLE, ALL EQUIPMENT, COMPONENTS, ACCESSORIES AND HARDWARE SHALL BE UL LISTED FOR THE INTENDED PURPOSE OF THE INSTALLATION.
- E. INSTALLED PRODUCTS SHALL BE MANUFACTURED BY AN ISO 9001 CERTIFIED FACILITY.
- F. INSTALLED PRODUCTS SHALL BE FREE FROM DEFECTS IN MATERIAL OR WORKMANSHIP FROM THE MANUFACTURER, AND SHALL BE OF THE QUALITY INDICATED.
- G. ALL METHODS OF CONSTRUCTION THAT ARE NOT SPECIFIED IN THE CONTRACT DOCUMENTS SHALL BE SUBJECT TO CONTROL AND APPROVAL BY THE OWNER OR OWNER'S REPRESENTATIVE.
- H. INSTALLED PRODUCTS SHALL BE LOT-TRACEABLE BY DATE CODE.
- I. ALL CRITICAL INTERNAL MANUFACTURING OPERATIONS FOR INSTALLED PRODUCTS SHALL HAVE DOCUMENTED IN-PROCESS INSPECTION AND TESTING ACCORDING TO ISO9001.

1.9 DRAWINGS

- A. APPROVED OR PRELIMINARY CONTRACT DRAWINGS FURNISHED AT THE TIME OF BID SOLICITATION SHALL SERVE AS THE BASIS FOR PRODUCT SELECTION, CREATION OF BILLS OF MATERIAL, AND DETERMINATION OF LABOR CONTENT.
- B. CHANGES, ADDITIONS, OR DELETIONS TO CONTRACT DRAWINGS PRIOR TO AWARDING OF THE CONTRACT, SHALL REQUIRE AN AMENDMENT TO THE ORIGINAL BID.
- C. PRIOR TO SUBMITTING THE BID, IN REVIEWING THE CONTRACT DRAWINGS, THE APPROVED CONTRACTOR SHALL:

- a) REQUEST THE ATTENTION OF THE ENGINEER, OWNER, OR DESIGN AGENCY TO CLARIFY ANY MATERIALS, APPARATUS OR WORK BELIEVED TO BE INCORRECT, INADEQUATE, OMITTED, OR IN VIOLATION OF APPLICABLE CODES, STANDARDS OR REGULATIONS.
 - b) NOTE ANY CONTINGENCIES RELATED TO UNKNOWN ASPECTS OF ANY DRAWINGS OR SPECIFICATIONS.
- D. CONTRACT DRAWINGS, PRIOR TO EXECUTION OF THE PROJECT, SHALL BE FORMALLY APPROVED AND RELEASED BY THE ENGINEER OR DESIGN AGENCY, AND SHALL BE APPROVED BY THE OWNER OR OWNER'S REPRESENTATIVE.
- E. EXECUTION OF WORK SHALL BE ACCORDING TO APPROVED DRAWINGS, IN ADDITION TO APPLICABLE SPECIFICATIONS AND CONTRACTUAL OBLIGATIONS.

1.10 APPLICABLE STANDARDS, CODES, AND REGULATIONS

A. INSTALLATION STANDARDS: CABLE INSTALLATION SHALL COMPLY WITH THE FOLLOWING:

- a) AMERICAN NATIONAL STANDARDS INSTITUTE, (ANSI)
 - a) ANSI/TIA-568-C.0, "GENERIC TELECOMMUNICATIONS CABLING FOR CUSTOMER PREMISES", PUBLISHED 2009
 - b) ANSI/TIA-568-C.1, "COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD", PUBLISHED 2009
 - c) ANSI/TIA-568-C.2, "BALANCED TWISTED-PAIR TELECOMMUNICATION CABLING AND COMPONENTS STANDARD", PUBLISHED 2009
 - d) ANSI/TIA-568-C.3, "OPTICAL FIBER CABLING COMPONENTS STANDARD", PUBLISHED 2008.
 - e) ANSITIA/EIA-569-B, COMMERCIAL BUILDING STANDARDS FOR TELECOMMUNICATIONS PATHWAYS AND SPACES, 2003.
 - f) ANSITIA/EIA-569-B.2, COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD. BALANCED TWISTED PAIR CABLING COMPONENTS.
 - g) ANSI/TIA/EIA-606-A, ADMINISTRATION STANDARD FOR COMMERCIAL TELECOMMUNICATIONS INFRASTRUCTURE, 2002.
 - h) ANSI/TIA-607-B, COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS, 2011.

- i) ANSI/TIA/EIA-942, TELECOMMUNICATIONS INFRASTRUCTURE FOR DATA CENTERS, 2004.
- j) ANSI/TIA-1179, HEALTHCARE FACILITY TELECOMMUNICATIONS INFRASTRUCTURE STANDARD
- k) ANSI/ICEA S-83-596, FIBER OPTIC PREMISES DISTRIBUTION CABLE, 2001.
- l) ANSI/TIA/EIA-598, COLOR CODING OF OPTICAL FIBER CABLES, 2001
- m) ANSI/ICEA S-87-640, FIBER OPTIC OUTSIDE PLANT DISTRIBUTION CABLE, 1999.
- n) ANSI/TIA/EIA-492AAC, DETAIL SPECIFICATION FOR 850NM LASER-OPTIMIZED 50UM CORE DIAMETER/125 UM CLADDING DIAMETER CLASS 1A GRADED INDEX MULTIMODE OPTICAL FIBERS, 2003.
- o) ANSI/TIA/EIA-492CAA, DETAIL SPECIFICATION FOR CLASS IVA DISPERSION-UNSHIFTED SINGLEMODE OPTICAL FIBERS, 2002.
- p) ANSI/TIA/EIA-758: CUSTOMER-OWNED OUTSIDE PLANT TELECOMMUNICATIONS CABLING STANDARD, 2004.
- q) ANSI/TIA/EIA-526-7, OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED SINGLEMODE FIBER PLANT: OFSTP-7, 2002.
- r) ANSI/TIA/EIA-526-14-A, OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED MULTIMODE FIBER PLANT: OFSTP-14A, 2003.
- s) ANSI/TIA/EIA-TSB-125, GUIDELINES FOR MAINTAINING OPTICAL FIBER POLARITY THROUGH REVERSE-PAIR POSITIONING, 2001.
- t) ANSI/TIA/EIA-TSB-140, ADDITIONAL GUIDELINES FOR FIELD TESTING LENGTH, LOSS, AND POLARITY OF OPTICAL FIBER CABLING SYSTEMS, 2004.
- u) ANSI/EIA-310-D, CABINETS, RACKS, PANELS, AND ASSOCIATED EQUIPMENT, 1992.
- v) ANSI/TIA/EIA-604 (SERIES), FOCIS FIBER OPTIC CONNECTOR INTERMATEABILITY STANDARD, 2000-2003.
- b) NATIONAL FIRE PROTECTION ASSOCIATION, INC., NFPA 70
- c) NATIONAL ELECTRIC CODE (NEC), 2005.

- a) NEC ARTICLE 250: GROUNDING
 - b) NEC ARTICLE 386: SURFACE METAL RACEWAYS
 - c) NEC ARTICLE 388: SURFACE NON-METALLIC RACEWAYS
 - d) NEC ARTICLE 800: COMMUNICATIONS CIRCUITS
 - e) NEC ARTICLE 770: OPTICAL FIBER CABLES AND RACEWAY
- d) UNDERWRITER'S LABORATORY, INC. (UL)
- a) UL-5A: STANDARD FOR NON-METALLIC RACEWAYS AND FITTINGS
 - b) UL-5: STANDARD FOR SURFACE METAL RACEWAYS AND FITTINGS
 - c) UL-5C: STANDARD FOR SURFACE RACEWAYS AND FITTINGS FOR USE WITH DATA, SIGNAL, AND CONTROL CIRCUITS
 - d) UL-50: STANDARD FOR ENCLOSURES FOR ELECTRICAL EQUIPMENT
 - e) UL-94-V0: TESTS FOR FLAMMABILITY OF PLASTIC MATERIALS
 - f) UL-498: ATTACHMENT PLUGS AND RECEPTACLES
 - g) UL-1479: FIRE TESTS OF THROUGH-PENETRATION FIRESTOPS (IN ACCORDANCE WITH ASTM E814).
 - h) UL-1863: STANDARD FOR SAFETY OF COMMUNICATIONS CIRCUIT ACCESSORIES
- e) NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)
- a) ANSI/NEMA WD-6-2002: WIRING DEVICES – DIMENSIONAL REQUIREMENTS
 - b) NEMA 250-2003: ENCLOSURES FOR ELECTRICAL EQUIPMENT
- f) FEDERAL COMMUNICATIONS COMMISSION (FCC) TITLE 47, CODE OF FEDERAL REGULATIONS, PART 68: CONNECTION OF TERMINAL EQUIPMENT TO THE TELEPHONE NETWORK, 1998.
- g) U.S. PUBLIC LAW 336. 101ST CONGRESS, ADA: AMERICANS WITH DISABILITIES ACT OF 1992.

- h) IEEE 802.3AF, DATA TERMINAL EQUIPMENT (DTE) POWER OVER MEDIA DEPENDENT INTERFACE (MDI), 2003.
 - i) IEEE 802.3AT (CURRENT DRAFT), DATA TERMINAL EQUIPMENT (DTE) ENHANCED POWER OVER MEDIA DEPENDENT INTERFACE (MDI).
 - j) IEEE 802.3AE, SPECIFICATION FOR 10 GBIT/S ETHERNET OPERATION OVER OPTICAL FIBER.
 - k) TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL, 12TH EDITION, BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI).
 - l) WIRELESS DESIGN REFERENCE MANUAL, 3RD EDITION, BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI).
 - m) ANSI/BICSI 001-2009, INFORMATION TRANSPORT SYSTEMS DESIGN STANDARD FOR K-12 EDUCATIONAL INSTITUTIONS, BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI).
 - n) BICSI 002-2010, DATA CENTER DESIGN AND IMPLEMENTATION BEST PRACTICES, BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI).
 - o) ANSI/NECA/BICSI 568-2006, STANDARD FOR INSTALLING COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING.
 - p) INFORMATION TRANSPORT SYSTEMS BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI), INSTALLATION METHODS MANUAL, 5TH EDITION.
 - q) NETWORK DESIGN REFERENCE MANUAL, 7TH EDITION, BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI).
- B. THIS DOCUMENT IS NOT A SUBSTITUTE FOR ANY CODE, STANDARD OR REGULATION. THE APPROVED CONTRACTOR MUST BE AWARE OF LOCAL CODES THAT MAY IMPACT THE BID SUBMITTAL OR EXECUTION OF THE PROJECT. THE CURRENT REVISION OF ANY APPLICABLE CODE, STANDARD, OR REGULATION SHALL TAKE PRECEDENCE AT THE POINT OF PROJECT EXECUTION, UNLESS OTHERWISE RECOGNIZED BY LOCAL AUTHORITIES. APPLICABLE STANDARDS OR CODES THAT AFFECT CONSTRUCTION, WHICH ARE LISTED AS NORMATIVE REFERENCES WITHIN ANY GOVERNING DOCUMENT, ARE ALSO THE RESPONSIBILITY OF THE APPROVED CONTRACTOR FOR COMPLIANCE.

1.11 MATERIALS:

- A. ALL MATERIALS SHALL BE UL OR ETL LISTED AND VERIFIED AND SHALL BE MARKED AS SUCH.

- B. PRODUCTS SHALL BE REGULARLY CATALOGUED ITEMS OF THE MANUFACTURER AND SHALL BE SUPPLIED AS A COMPLETE UNIT IN ACCORDANCE WITH THE MANUFACTURER'S STANDARD SPECIFICATIONS WITH ANY OPTIONAL ITEMS REQUIRED FOR PROPER INSTALLATION UNLESS OTHERWISE NOTED.
- C. ALL MATERIALS USED ON THIS PROJECT SHALL BE NEW. USED AND REFURBISHED EQUIPMENT IS NOT PERMITTED UNLESS APPROVED BY UNIVERSITY OF SOUTH FLORIDA. PROVIDE EQUIPMENT TO SITE IN ORIGINAL PACKAGING WHENEVER PRACTICAL.
- D. MATERIAL SHALL BE DELIVERED TO THE SITE IN THE ORIGINAL PACKING.

1.12 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. MATERIALS DELIVERED TO THE CONSTRUCTION SITE SHALL BE STORED IN A DRY, SECURE AREA, PREFERABLY INDOORS. STORAGE TEMPERATURE OF MATERIALS SHALL ADHERE TO MANUFACTURER'S RECOMMENDATIONS. MOVEMENT OF PACKAGED MATERIALS SHALL BE IN A MANNER TO AVOID DAMAGE OF CONTENTS. ON-SITE STORAGE, EITHER INDOORS OR TRAILER, SHALL HAVE PERMISSION BY THE OWNER, AND SHALL NOT INTERFERE WITH OTHER CONSTRUCTION ACTIVITY.
- B. INSTALLATION OF CATEGORY 6A CABLE SHALL BE WITHIN THE RECOMMENDED TEMPERATURE RANGE SPECIFIED BY THE MANUFACTURER. CABLE INSTALLATION TEMPERATURE ABOVE 50F IS RECOMMENDED.
- C. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING ALL DELIVERIES AND PROVIDING PROPER RECEIPT, HANDLING, AND STORAGE OF ALL MATERIALS. PROTECT ALL EQUIPMENT FROM PHYSICAL DAMAGES (DENTS, SCRATCHES, DUST, WATER, PAINT, CHEMICALS, AND TEMPERATURE EXTREMES) AND VANDALISM, OR THEFT. THE CONTRACTOR SHALL REPLACE ANY DAMAGED OR STOLEN EQUIPMENT. THE CONTRACTOR IS RESPONSIBLE FOR ALL EQUIPMENT UNTIL FINAL PROJECT ACCEPTANCE BY OWNER.
- D. THE CONTRACTOR IS RESPONSIBLE FOR CLEANING THE WORKSITE EVERY BUSINESS DAY AND REMOVE DEBRIT FROM THE FACILITY.

1.13 WARRANTY

- A. UNIVERSITY OF SOUTH FLORIDA REQUIRES A LINK WARRANTY FOR THE PROJECT.
- B. UNIVERSITY OF SOUTH FLORIDA REQUIRES A CHANNEL WARRANTY ON ANY POE LINKS
- C. THE LENGTH OF THE EXTENDED WARRANTY SHALL BE A MINIMUM OF TWENTY-FIVE (25) YEARS.

- D. WARRANTY COVERING ALL COMPONENTS, EQUIPMENT AND WORKMANSHIP SHALL BE SUBMITTED IN WRITING WITH SYSTEM DOCUMENTATION.
- E. THE WARRANTY PERIOD SHALL BEGIN ON THE SYSTEM'S FIRST USE BY THE OWNER.
- F. SHOULD THE CABLING SYSTEM FAIL TO PERFORM ITS EXPECTED OPERATION WITHIN THIS WARRANTY PERIOD DUE TO INFERIOR OR FAULTY MATERIAL AND/OR WORKMANSHIP, THE CONTRACTOR SHALL PROMPTLY MAKE ALL REQUIRED CORRECTIONS WITHOUT COST TO THE OWNER
- G. UPON COMPLETION OF THE PROJECT THE TELECOMMUNICATION CONTRACTOR SHALL FORWARD THE SIGNED WARRANTY REGISTRATION FORM AND WARRANTY CERTIFICATE TO THE OWNER.

PART 2 PRODUCTS

2.1 WORK AREA CONNECTORS

- A. CATEGORY 6A JACKS
 - a) JACKS SHALL BE STANDARD 8-POSITION, RJ-45 STYLE, UN-KEYED, FCC COMPLIANT.
 - b) JACKS SHALL BE DESIGNED FOR 4-PAIR, 100 OHM BALANCED UNSHIELDED TWISTED PAIR (UTP) CABLE.
 - c) EACH JACK SHALL BE SINGLE UNIT CONSTRUCTION, WITH SNAP – FIT TO INDUSTRY STANDARD KEYSTONE OPENING (.760" X .580").
 - d) JACK HOUSINGS SHALL BE HIGH IMPACT UL 94 V-0 RATED THERMOPLASTIC.
 - e) JACKS SHALL HAVE A TEMPERATURE RATING OF -10 °C (14°F) TO 70°C (158 °F).
 - f) JACK HOUSINGS SHALL FULLY ENCASE AND PROTECT PRINTED CIRCUIT BOARDS AND IDC FIELDS.
 - g) MODULAR JACK CONTACTS SHALL ACCEPT A MINIMUM OF 25 MATING CYCLES WITHOUT DEGRADATION OF ELECTRICAL OR MECHANICAL PERFORMANCE.
 - h) JACK CONTACTS SHALL MAINTAIN A MINIMUM DEFLECTION FORCE OF 100 GRAMS WHILE MATED WITH AN FCC-STANDARD RJ-45 PLUG.

- i) JACK CONTACTS SHALL BE FORMED FLAT FOR INCREASED SURFACE CONTACT WITH MATED PLUGS.
- j) JACK CONTACTS SHALL BE CONSTRUCTED OF BERYLLIUM COPPER FOR MAXIMUM SPRING FORCE AND DURABILITY. CONTACT PLATING SHALL BE A MINIMUM OF 50 MICRO-INCHES OF HARD GOLD IN THE CONTACT AREA OVER 50 MICRO-INCH OF NICKEL.
- k) JACK TERMINATION METHOD SHALL FOLLOW THE INDUSTRY STANDARD..
- l) JACKS SHALL HAVE THE CATEGORY 6A DESIGNATION, VISIBLE FROM THE FRONT WHEN INSTALLED.
- m) JACKS SHALL TERMINATE 26-22 AWG SOLID OR STRANDED CONDUCTORS.
- n) JACKS SHALL NOT REQUIRE SPECIAL CORDS, SPECIALTY TOOLS OR SPECIAL INSTALLATION REQUIREMENTS.
- o) STUFFER CAP SHALL HAVE 4 RETENTION SNAPS TO ASSURE CONDUCTOR STRAIN RELIEF.
- p) JACKS SHALL NOT ACCEPT FCC COMPLIANT 6 POSITION PLUGS.
- q) JACKS SHALL ACCEPT OPTIONAL HINGED DUST COVERS.
- r) JACKS SHALL BE COMPATIBLE WITH ANSI/TIA/EIA-606-A COLOR CODE LABELING.
- s) JACKS SHALL ACCEPT SNAP-ON ICONS FOR SPECIFIC IDENTIFICATION.
- t) JACKS SHALL BE AVAILABLE IN VARIOUS COLORS TO MEET SPECIFIC CUSTOMER APPLICATIONS.
- u) JACKS SHALL HAVE ATTACHED WIRING INSTRUCTION LABELS TO PERMIT EITHER T568A OR T568B WIRING CONFIGURATIONS.
- v) CATEGORY 6A JACKS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY 3, 5, AND 5E CATEGORY 6 CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.
- w) JACKS SHALL BE MANUFACTURED IN THE USA.
- x) ALL TRANSMISSION PERFORMANCE PARAMETERS SHALL BE INDEPENDENTLY VERIFIED BY A UL OR ETL THIRD PARTY TESTING ORGANIZATION.
- y) THE MANUFACTURER SHALL PROVIDE CATEGORY 6A COMPONENT COMPLIANCE CERTIFICATES FROM THIRD PARTY TESTING ORGANIZATION UPON REQUEST.

- z) JACKS SHALL BE UL LISTED 1863.
- aa) JACKS SHALL BE UL LISTED CSA CERTIFIED.
- bb) JACKS SHALL EXCEED IEEE 802.3AF DTE POWER SPECIFICATION TO 4 TIMES THE RATED CURRENT LIMITS WITH NO DEGRADATION OF PERFORMANCE OR MATERIALS.
- cc) JACKS SHALL BE TESTED TO IEEE 802.3AF, 802.3AT AND 802.3BT
- dd) JACKS SHALL BE THIRD PARTY VERIFIED, ERROR FREE 10 GIGABIT ETHERNET PERFORMANCE TO IEEE 802.3AN.
- ee) CATEGORY 6A JACKS SHALL MEET OR EXCEED THE 4-CONNECTOR CHANNEL PERFORMANCE REQUIREMENTS OF CATEGORY 6A, PER THE ANSI/TIA/EIA-568-C.2 STANDARD.
- ff) CATEGORY 6A MODULAR JACKS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) **Hubbell (HUB-HJU6A**) **= COLOR**
 Green = GN = data
 Yellow = Y = wireless access points
 Purple = P = security cameras
 - b) **Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department**

B. FIBER OPTIC - LC DUPLEX FLUSH MOUNT KEYSTONE ADAPTER

- a) KEYSTONE ADAPTERS ARE FACTORY LOADED WITH LC MM SIMPLEX ADAPTERS
- b) KEYSTONE ADAPTERS ARE USED WHEN FIBER CONNECTORS ARE NEEDED AT THE WORK AREA.
- c) FLUSH MOUNTED
- d) INSERTION LOSS: <0.5DB
- e) HIGH RETENSION PHOSPHOR BRONZE ALIGNMENT SLEEVE

- f) MEETS TIA/EIA-568-C.3 SPECIFICATION
 - g) ADAPTER SNAP-IN FORCE: 15+/- 5 LB
 - h) WHITE ADAPTER BEZEL
 - i) FIBER OPTIC ADAPTER, SC SIMPLEX, FLUSH MOUNT, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) HUBBELL (SFFLCW)
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Informationa Technology Department
- C. FIBER OPTIC - SC SIMPLEX FLUSH MOUNT KEYSTONE ADAPTER
- a) KEYSTONE ADAPTERS ARE FACTORY LOADED WITH SC MM SIMPLEX ADAPTERS
 - b) KEYSTONE ADAPTERS ARE USED WHEN FIBER CONNECTORS ARE NEEDED AT THE WORK AREA.
 - c) FLUSH MOUNTED
 - d) INSERTION LOSS: <0.5DB
 - e) HIGH RETENSION PHOSPHOR BRONZE ALIGNMENT SLEEVE
 - f) MEETS TIA/EIA-568-C.3 SPECIFICATION
 - g) ADAPTER SNAP-IN FORCE: 15+/- 5 LB
 - h) WHITE ADAPTER BEZEL
 - i) FIBER OPTIC ADAPTER, SC SIMPLEX, FLUSH MOUNT, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) HUBBELL (SFFSCW)
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Informationa dn Technology Department

2.2 FACE PLATES

- A. REAR LOADING WITHOUT DESIGNATION WINDOW
- a) FACEPLATES SHALL BE CONSTRUCTED OF HIGH IMPACT, UL94 V-0 RATED THERMOPLASTIC.
 - b) FACEPLATES SHALL BE COMPATIBLE WITH STANDARD NEMA OPENINGS AND BOXES.
 - c) FACEPLATES SHALL BE 2.75" W X 4.5" H (69.8 MM X 114.3 MM) FOR SINGLE GANG AND 4.5" X 4.5" (114.3 X 114.3 MM) FOR DOUBLE GANG.
 - d) PORT SIZE IN EACH FACEPLATE SHALL FIT THE CATEGORY 6A MODULAR JACK OR SNAP-FIT FIBER OPTIC, AUDIO, AND VIDEO MODULES FOR MULTIMEDIA APPLICATIONS.
 - e) FACEPLATES SHALL PROVIDE FOR ANSI/TIA/EIA-606-A COMPLIANT WORKSTATION OUTLET LABELING.
 - f) #6-32 PAN HEAD PHILLIPS/SLOTTED MOUNTING SCREWS SHALL BE INCLUDED WITH EACH FACEPLATE.
 - g) FACEPLATES SHALL BE UL LISTED AND CSA CERTIFIED.
 - h) WORK AREA FACEPLATES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) HUBBELL (NSP1*WUSF SERIES) * = NUMBER OF PORTS
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information Technology Department

2.3 CABLE

- A. CATEGORY 6A UTP
- a) CABLE CONSTRUCTION SHALL BE FOUR TWISTED PAIRS OF 23 AWG INSULATED SOLID CONDUCTORS, WITH A RIPCORD, SURROUNDED BY A TIGHT OUTER JACKET.
 - b) RIPCORD SHALL BE DIRECTLY UNDERNEATH THE OUTER JACKET.
 - c) CABLE SHALL BE MARKED WITH MANUFACTURER AND PERTINENT INFORMATION. UL, ETL, OR CSA AGENCY CERTIFICATION OR VERIFICATION

MARKINGS SHALL BE MARKED ON THE CABLE JACKET ACCORDING TO THE CERTIFYING AGENCY'S REQUIREMENTS.

- d) COLOR CODING OF THE PAIRS SHALL BE AS FOLLOWS:
 - a) PAIR 1: WHITE/BLUE; BLUE
 - b) PAIR 2: WHITE/ORANGE; ORANGE
 - c) PAIR 3: WHITE/GREEN; GREEN
 - d) PAIR 4: WHITE/BROWN; BROWN
- e) PLENUM OR RISER RATED JACKETS
- f) CABLE SHALL BE SUPPLIED IN 1000 FT SPOOLS.
- g) CABLE SHALL EXCEED CATEGORY 6A TRANSMISSION REQUIREMENTS SPECIFIED IN ANSI/TIA/EIA-568-C.2.
- h) CABLE SHALL BE UL AND C(UL) LISTED.
- i) CATEGORY 6A UTP HORIZONTAL DISTRIBUTION CABLE, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) **GENERAL –RISER –(7143822 SPOOL) YELLOW**
GENERAL – RISER – (7143802 PULL-PAC) YELLOW
 - b) **GENERAL –PLENUM –(7141871 SPOOL) YELLOW**
GENERAL – PLENUM – (7141822 SPOOL PAC) YELLOW
GENERAL – PLENUM – (7141802 PULL-PAC) YELLOW

BLACK CABLING APPROVED WHERE APPLICABLE SHALL BE:

 - c) **GENERAL – PLENUM – (7141828 SPOOL) BLACK**
GENERAL – PLENUM – (7141807 PULL – PAC) BLACK
GENERAL – RISER – (7143828 SPOOL) BLACK
GENERAL – RISER – (7143807 PULL-PAC) BLACK

B. BACKBONE DISTRIBUTION CABLE – FIBER OPTIC

- a) MULTIMODE AND SINGLEMODE FIBER BACKBONE DISTRIBUTION CABLE SHALL BE AVAILABLE IN MULTI-STRAND CONSTRUCTIONS WITH ARMORED JACKET FOR INTRABUILDING APPLICATIONS. MULTIMODE FIBER BACKBONE DISTRIBUTION CABLE FOR 10/40/100 GBIT/S APPLICATIONS SHALL BE CONSTRUCTED WITH 50/125 MICRON LASER-OPTIMIZED OPTICAL FIBER, OM3 OR OM4.
- b) LASER-OPTIMIZED 50/125 MICRON FIBER SHALL BE CLASS 1A FIBER IN COMPLIANCE WITH ANSI/TIA/EIA-492AAC.
- c) OFNR OR OFNP WILL BE DETERMINED AT EACH SITE.
- d) THE CONTRACTOR WILL BE RESPONSIBLE TO ASSURE THAT THE PROPER TYPE OF JACKETING IS BEING USED. FAILURE TO MEET THE LOCAL CODE WILL BE CAUSE FOR REPLACEMENT OF CABLE AT NO EXPENSE TO <CUSTOMER>.
- e) FIBER SHALL BE FUSION SPLICED WITH FACTORY TERMINATED CONNECTIONS AT EACH TERMINATION POINT
- f) SINGLEMODE FIBER SHALL BE DISPERSION UN-SHIFTED FIBER IN COMPLIANCE WITH ANSI/TIA/EIA-492CAA.
- g) INTRABUILDING FIBER DISTRIBUTION CABLE DESIGN SHALL BE ACCORDING TO ANSI/ICEA S-83-596.
- h) MULTIMODE AND SINGLEMODE BACKBONE FIBER DISTRIBUTION CABLE, WHEN INSTALLED, SHALL EXCEED THE PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.3.
- i) MULTIMODE AND SINGLEMODE BACKBONE FIBER DISTRIBUTION CABLE, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) OCC MANUFACTURER OR GENERAL MANUFACTURER
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Informationa Technology Department

C. BACKBONE DISTRIBUTION CABLE – OPTICAL FIBER, INDOOR/OUTDOOR

- a) MULTIMODE AND SINGLEMODE FIBER BACKBONE CABLE SHALL BE AVAILABLE IN MULTI-STRAND CONSTRUCTIONS. CABLE DESIGN SHALL BE SUITABLE FOR THE ENVIRONMENTAL AND MECHANICAL CONDITIONS OF THE INSTALLATION.
- b) RISER(OFNR) AND PLENUM (OFNP) FIBER OPTIC CABLES

- c) THESE CABLES CAN BE INSTALLED IN CONDUITS OR INNER-DUCTS. INTRABUILDING FIBER SHALL BE ARMORED
- d) THE TIGHT BUFFER FEATURE OF THESE INDOOR/OUTDOOR CABLES ELIMINATES THE NEED FOR BREAKOUT KITS AND OR OTHER SPECIAL TERMINATION EQUIPMENT.
- e) THE OUTER JACKET IS COMPRISED OF A RUGGED UL LISTED SUNLIGHT RESISTANT POLYMER THAT ALLOWS FOR THE CABLE TO BE EXPOSED TO DIRECT SUNLIGHT WITHOUT THE CONCERN OF MATERIAL DEGRADATION AND GREATLY REDUCES MOISTURE MIGRATION.
- f) FIBER SHALL BE FUSION SPLICED WITH FACTORY TERMINATED CONNECTIONS AT EACH TERMINATION POINT
- g) 900 ÌM TIGHT BUFFERED FIBERS - ALL DIELECTRIC
- h) MULTIMODE INDOOR/OUTDOOR DISTRIBUTION CABLE FOR 10 GBIT/S APPLICATIONS SHALL BE CONSTRUCTED WITH 50/125 MICRON LASER-OPTIMIZED OPTICAL FIBER. LASER-OPTIMIZED 50/125 MICRON FIBER SHALL BE CLASS 1A FIBER IN COMPLIANCE WITH ANSI/TIA/EIA-492AAC.
- i) MULTIMODE AND SINGLEMODE BACKBONE OSP FIBER DISTRIBUTION CABLE, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) OCC MANUFACTURER OR GENERAL MANUFACTURER
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Informationa dn Technology Department

D. BACKBONE DISTRIBUTION CABLE – OPTICAL FIBER, LOOSE-TUBE

- a) MULTIMODE AND SINGLEMODE FIBER BACKBONE OSP CABLE SHALL BE AVAILABLE IN MULTI-STRAND CONSTRUCTIONS FOR OUTSIDE PLANT (OSP) APPLICATIONS. CABLE DESIGN SHALL BE SUITABLE FOR THE ENVIRONMENTAL AND MECHANICAL CONDITIONS OF THE INSTALLATION.
- b) LOOSE TUBE OSP CABLE WILL BE USED IN AREAS WHERE EXCESSIVE MOISTURE POTENTIAL EXISTS. APPLICATIONS REQUIRING GOOD OZONE, MOISTURE, WEATHER RESISTANCE
- c) BUILDING INTERCONNECTIONS AND DATA TRUNK
- d) DUCTS BETWEEN BUILDINGS AND AERIAL LASHING
- e) DIELECTRIC CENTRAL STRENGTH MEMBER

- f) DRY OR WATERBLOCK GEL BLOCKING FOR MOISTURE PROTECTION
- g) POLYETHYLENE JACKET FOR WEATHER AND UV PROTECTION
- h) INSTALLER MUST FOLLOW TERMINATION INSTRUCTIONS FROM THE MANUFACTURER
- i) BREAKOUT KITS WILL BE REQUIRED FOR TERMINATION
- j) FIBER SHALL BE FUSION SPLICED WITH FACTORY TERMINATED CONNECTIONS AT EACH BUILDING TERMINATION POINT
- k) MULTIMODE AND SINGLEMODE BACKBONE OSP FIBER DISTRIBUTION CABLE, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) OCC MANUFACTURER OR GENERAL MANUFACTURER
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

2.4 CONNECTORS – FIBER OPTIC

A. CONNECTOR, SC

- a) PRE-POLISHED SC CONNECTORS SHALL REQUIRE NO FIELD POLISHING AND REQUIRE NO ADHESIVES FOR TERMINATION.
- b) PRE-POLISHED FIBER CONNECTOR BASIC DESIGN SHALL BE A FACTORY PRE-POLISHED SC-STYLE OPTICAL FIBER CONNECTOR PIGTAIL
- c) PIGTAILS SHALL BE FUSION SPLICED IN THE FIELD AT <0.5 DB LOSS.
- d) CONNECTOR MATERIALS SHALL BE DESIGNED TO COMPLY WITH:
 - a) ANSI/TIA/EIA-568-C.3.
 - b) TELCORDIA GR-326
 - c) IEC61754-20 A
 - d) TIA-604-10
- e) CONNECTOR DESIGN AND TERMINATION TECHNIQUE SHALL BE INDEPENDENT OF CABLE TYPE OR MANUFACTURER, AND SHALL BE COMPATIBLE FOR EITHER 900 MICRON BUFFER OR 250 MICRON BUFFER DISTRIBUTION CABLES.

- f) PRE-POLISHED SC FIBER CONNECTORS, WHEN PROPERLY INSTALLED ONTO QUALIFIED CABLE, SHALL MEET THE 10 GB/S ETHERNET PERFORMANCE REQUIREMENTS OF IEEE802.3.
- g) SC FIBER CONNECTORS, PROPERLY INSTALLED ONTO QUALIFIED CABLE, SHALL EXCEED THE MECHANICAL AND ENVIRONMENTAL PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.3.
- h) SC OPTICAL FIBER OPTIC CONNECTORS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) OCC MANUFACTURER OR GENERAL MANUFACTURER
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

B. CONNECTOR, LC

- a) PRE-POLISHED LC CONNECTORS SHALL REQUIRE NO FIELD POLISHING AND REQUIRE NO ADHESIVES FOR TERMINATION.
- b) PRE-POLISHED FIBER CONNECTOR BASIC DESIGN SHALL BE A FACTORY PRE-POLISHED LC-STYLE OPTICAL FIBER CONNECTOR PIGTAIL
- c) PIGTAILS SHALL BE FUSION SPLICED IN THE FIELD AT <0.5 DB LOSS.
- d) CONNECTOR MATERIALS SHALL BE DESIGNED TO COMPLY WITH:
 - a) ANSI/TIA/EIA-568-C.3.
 - b) TELCORDIA GR-326
 - c) IEC61754-20 A
 - d) TIA-604-10
- e) CONNECTOR DESIGN AND TERMINATION TECHNIQUE SHALL BE INDEPENDENT OF CABLE TYPE OR MANUFACTURER, AND SHALL BE COMPATIBLE FOR EITHER 900 MICRON BUFFER OR 250 MICRON BUFFER DISTRIBUTION CABLES.
- f) PRE-POLISHED LC FIBER CONNECTORS, WHEN PROPERLY INSTALLED ONTO QUALIFIED CABLE, SHALL MEET THE 10 GB/S ETHERNET PERFORMANCE REQUIREMENTS OF IEEE802.3.

- g) LC FIBER CONNECTORS, PROPERLY INSTALLED ONTO QUALIFIED CABLE, SHALL EXCEED THE MECHANICAL AND ENVIRONMENTAL PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.3.
- h) LC OPTICAL FIBER OPTIC CONNECTORS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) OCC MANUFACTURER
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

2.5 PATCH CORDS

A. CATEGORY 6A

- a) CATEGORY 6A PATCH CORDS SHALL BE STRANDED UTP CABLE CONSTRUCTION USING A SMOKE-COLORED POLYCARBONATE 8-POSITION RJ-45 PLUG WITH A LOW-PROFILE OVER-MOLDED STRAIN RELIEF BOOT ON EACH END.
- b) PLUG SHALL HAVE VERTICALLY STAGGERED, TRIFURCATED COPPER ALLOY CONTACTS, EACH HAVING 50 MICRO-INCHES OF GOLD PLATING OVER NICKEL UNDER-PLATE.
- c) PATCH CORDS SHALL BE CONSTRUCTED WITH CATEGORY 6A PATCH CABLE, WITH 24 AWG 7/32 TINNED COPPER STRANDED CONDUCTORS, EACH INSULATED WITH POLYETHYLENE, WITH A TIGHT OVERALL JACKET.
- d) PLUG DIMENSIONS AND FUNCTION SHALL COMPLY WITH FCC CFR-47, PART 68.5.
- e) PLUG SHALL BE A 2-PIECE DESIGN, WITH AN OUTER BODY, PRE-LOADED WITH 8 TRIFURCATED CONTACTS, AND A DIELECTRIC WIRE PRE-ALIGNMENT ELEMENT TO AID IN PLUG TERMINATION DURING MANUFACTURING.
- f) DIELECTRIC WIRE PRE-ALIGNMENT ELEMENT SHALL POSITION INDIVIDUAL CONDUCTORS IN A MANNER TO OPTIMIZE NEAR-END CROSS-TALK (NEXT) PERFORMANCE. PRE-ALIGNMENT ELEMENT SHALL ALSO CONTROL VARIABILITY OF NEXT PERFORMANCE IN THE MANUFACTURING PROCESS.
- g) PATCH CORD STRAIN RELIEF BOOTS SHALL HAVE AN INTEGRAL SNAG-LESS FEATURE TO PROTECT PLUG RELEASE TAB DURING CABLE ROUTING. STRAIN RELIEF BOOT SHALL BE OVER-MOLDED PVC. STRAIN RELIEF BOOT SHALL BE A LOW PROFILE, TIGHT-FIT DESIGN TO MAXIMIZE CLEARANCE WITH ADJACENT PATCH CORD CONNECTIONS. STRAIN RELIEF BOOT DESIGN AND MATERIAL PROPERTIES SHALL AID IN SUPPRESSION OF ALIEN CROSS-TALK (ANEXT) WITH ADJACENT PATCH CORD CONNECTIONS.

- h) JACKET MATERIAL SHALL BE FLAME-RETARDANT PVC.
- i) PATCH CORDS SHALL BE MANUFACTURED USING A T568B WIRING FORMAT, AND SHALL FUNCTION SUITABLY FOR EITHER T568A OR T568B WIRING SCHEMES.
- j) STANDARD PATCH CORD LENGTHS SHALL RANGE FROM 3 FT TO 20 FT.
- k) CUSTOM MAKE-TO-ORDER PATCH CORDS SHALL BE AVAILABLE IN LENGTHS, RANGING FROM 25 FT TO 75 FT AND WITH A DELIVERY LEAD-TIME QUOTATION.
- l) CATEGORY 6A PATCH CORDS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY 3, 5, 5E, AND 6 CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.
- m) ALL TRANSMISSION PARAMETERS SHALL BE INDEPENDENTLY VERIFIED BY A UL OR ETL THIRD PARTY TESTING ORGANIZATION. TRANSMISSION TESTING SHALL BE TO 625 MHZ. THE TIA/EIA-568-C.2 SPECIFICATION LIMIT IS 500 MHZ. THE MANUFACTURER SHALL PROVIDE COMPLIANCE CERTIFICATES FROM THIRD PARTY TESTING ORGANIZATION UPON REQUEST.
- n) PATCH CORD PLUG AND CONTACTS SHALL WITHSTAND 2,000 MATING CYCLES WITH STANDARD CATEGORY 6A FCC-COMPLIANT JACKS OR PANELS.
- o) CATEGORY 6A PATCH CORDS SHALL EXCEED TRANSMISSION REQUIREMENTS SPECIFIED IN ANSI/TIA/EIA-568-C.2.
- p) PATCH CORDS SHALL BE UL LISTED 1863 AND CSA CERTIFIED.
- q) PATCH CORDS SHALL EXCEED IEEE 802.3 DTE POWER SPECIFICATION TO 4 TIMES THE RATED CURRENT LIMITS WITH NO DEGRADATION OF PERFORMANCE OR MATERIALS.
- r) CATEGORY 6A PATCH CORDS SHALL MEET OR EXCEED 4-CONNECTOR CHANNEL PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.2 STANDARD.
- s) CATEGORY 6A PATCH CORDS AS SPECIFIED IN THE CONTRACT DOCUMENTS SHALL BE
 - a) HUBBELL (NEXTSPEED ASCENT HC6A**YY SERIES)**= COLOR YY= LENGTH
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

B. FIBER OPTIC

- a) OPTICAL FIBER PATCH CORDS AND CROSS-CONNECT CORDS SHALL BE STANDARD SC, LC, AND SC-TO-LC HYBRID CONSTRUCTIONS. PATCH CORDS FOR 10 GBIT/S APPLICATIONS SHALL BE CONSTRUCTED WITH LASER OPTIMIZED 50/125 MICRON OPTICAL FIBER.
- b) INSTALLED MULTIMODE FIBER PATCH CORDS, WHEN INSTALLED, SHALL EXCEED THE PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.3.
- c) OPTICAL FIBER PATCH CORDS SHALL BE CONSTRUCTED WITH ARAMID-REINFORCED PVC LOOSE-JACKET DUPLEX OR SIMPLEX CABLE, WITH OPTICAL FIBER(S) HAVING A 900-MICRON PVC BUFFER COATING DIAMETER.
- d) CONNECTOR TERMINATIONS ON EACH END OF THE FIBER PATCH CORD SHALL BE HEAT-CURED EPOXY TYPE WITH A MACHINE POLISH, INSPECTED 100% FOR POLISH QUALITY AND MATED-PAIR INSERTION LOSS
- e) THE ARAMID (KEVLAR) STRENGTH MEMBER SHALL BE MECHANICALLY SECURED AT EACH CONNECTOR TO PROVIDE TENSILE STRAIN RELIEF OF THE OPTICAL FIBER.
- f) FACTORY MOUNTED CONNECTORS ON EACH END OF THE PATCH CORDS SHALL COMPLY WITH THE APPLICABLE ANSI/TIA/EIA-604 INTERMATEABILITY STANDARD.
- g) DUPLEX FIBER PATCH CORDS SHALL HAVE REVERSE-PAIR POLARITY ACCORDING TO ANSI/TIA/EIA-568-C.3 AND TIA/EIA-TSB-125.
- h) FIBER A-B POLARITY SHALL BE CLEARLY MARKED ON EACH END OF DUPLEX PATCH CORDS.
- i) MULTIMODE PATCH CORDS SHALL HAVE A MAXIMUM MATED-PAIR INSERTION LOSS OF 0.60 DB PER END, WITH A MINIMUM RETURN LOSS OF -20 DB.
- j) MULTIMODE AND SINGLEMODE FIBER PATCH CORDS SHALL EXCEED THE GIGABIT ETHERNET PERFORMANCE REQUIREMENTS OF IEEE 802.3Z STANDARD.
- k) OPTICAL FIBER PATCH CORDS, AS SPECIFIED IN THE CONTRACT DOCUMENTS SHALL BE
 - a) OCC MANUFACTURER
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

2.6 PATCH PANELS – CATEGORY 6A MODULAR PATCH PANEL

A. KEYSTONE 48 PORT 1RU PATCH PANEL

- B. PANEL FRAMES SHALL BE BLACK POWDER COATED 14 GAGE STEEL WITH ROLLED EDGES TOP AND BOTTOM FOR PROPER STIFFNESS.
- C. PANELS SHALL ACCOMMODATE 48 PORTS FOR EACH RACK MOUNT UNIT (1 RMU = 1.75 IN.).
- D. PANELS SHALL BE DESIGNED FOR 4-PAIR, 100 OHM BALANCED UNSHIELDED TWISTED PAIR (UTP) CABLE.
- E. CATEGORY 6A PANELS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY 3, 5, 5E, AND CATEGORY 6A CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.
- F. PANELS SHALL ACCEPT A CLIP-ON REAR CABLE MANAGEMENT SUPPORT BAR TO PROVIDE CABLE STRAIN RELIEF.
- G. PANELS SHALL BE MANUFACTURED IN THE USA.
- H. PANELS SHALL BE UL LISTED 1863 AND CSA CERTIFIED.
- I. CATEGORY 6A PATCH PANELS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) HUBBELL (UDX481EU)
 - b) ACCEPTABLE MANUFACTURERS: BASIS OF DESIGN OR EQUIVALENT AS APPROVED BY UNIVERSITY OF SOUTH FLORIDA – INFORMATION TECHNOLOGY DEPARTMENT

2.7 RACKS – FREE STANDING

- A. EACH BASIC RACK DELIVERED SHALL CONSIST OF: EQUIPMENT RACK, ISOLATION PADS, VERTICAL & HORIZONTAL CABLE ORGANIZERS, MOUNTING HARDWARE, A SINGLE SIDED SOLID SHELF- RACK MOUNTED, 18" WIDE BLACK LADDER RACK & MOUNTS TO SECURE TO RACK, A HORIZONTAL ELECTRICAL 20 AMP OUTLET STRIP(MINIMUM 6 RECEPTACALS) WITH MOUNTING BRACKETS.
- B. RACK MATERIAL SHALL BE STRUCTURAL ALUMINUM WITH A DURABLE BLACK POLYURETHANE POWDER COAT FINISH.
- C. INSTALLED RACKS SHALL HAVE A STATIC LOAD CAPACITY OF 500 LBS.
- D. RACKS SHALL BE AVAILABLE IN EITHER 19-INCH OR 23-INCH STANDARD RACK CONFIGURATIONS.

- E. TAPPED HOLES IN THE VERTICAL RAILS FOR MOUNTING OF PANELS SHALL BE #12-24 THREAD SIZE. COATING SHALL NOT INTERFERE WITH THREAD FIT. CAGE NUT DESIGNS ARE NOT ACCEPTABLE.
- F. STANDARD RACK HEIGHTS OF 7 FT (84 IN), AND HAVE A CAPACITY OF 45 RMU.
- G. RACK BASE ANGLES SHALL BE PRE-DRILLED FOR FLOOR MOUNTING, AND FOR ASSEMBLY TO VERTICAL RAILS.
- H. EACH RACK SHALL BE PROVIDED WITH, RACKS SHALL ACCOMMODATE EXPANSION OF CABLE CAPACITY AND ADDED VOLUME FOR CATEGORY 6A CABLING.
- I. FREE STANDING RACKS AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) OCC (CMR45) 2 – POST RACK
APC (AR204A) 4 – POST RACK
 - b) ACCEPTABLE MANUFACTURERS: BASIS OF DESIGN OR EQUIVALENT AS APPROVED BY UNIVERSITY OF SOUTH FLORIDA – INFORMATION TECHNOLOGY DEPARTMENT

2.8 CABLE MANAGEMENT – VERTICAL

- A. FINISH SHALL BE A BLACK POWDER COAT.
- B. VERTICAL MANAGEMENT SHALL HAVE A MEANS TO ATTACH TO THE EQUIPMENT RACK.
- C. CABLE PASS-THROUGH HOLES OF 4-INCH DIAMETER SHALL BE LOCATED AT REGULAR INTERVALS FOR FRONT-TO-REAR CABLE ROUTING. PASS-THROUGH HOLES SHALL ACCEPT CLIP-ON SPOOLS FOR BEND RADIUS CONTROL OF FIBER CABLING.
- D. CABLE ROUTING GATES SHALL BE FABRICATED FROM 14 GAGE CRS.
- E. GATES SHALL HAVE ROLLED EDGES TO CONTROL CABLE BEND RADIUS.
- F. COVERS MAY BE SPECIFIED AS AN OPTION TO CONCEAL CABLES IN THE VERTICAL ORGANIZER.
- G. HINGED FRONT COVER SHALL BE FABRICATED FROM 20 GAGE CRS.
- H. COVERS SHALL CLIP ONTO INSTALLED GATES WITHOUT FASTENERS.

- I. VERTICAL CABLE MANAGEMENT AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) PANDUIT (PRV12-PAN) WITH DOORS ON BOTH SIDES (PRD12-PAN)
 - b) ACCEPTABLE MANUFACTURERS: BASIS OF DESIGN OR EQUIVALENT AS APPROVED BY UNIVERSITY OF SOUTH FLORIDA – INFORMATIONAL TECHNOLOGY DEPARTMENT

2.9 CABLE MANAGEMENT – HORIZONTAL

- A. HORIZONTAL MANAGEMENT WILL BE CONSTRUCTED OF 16 GA COLD-ROLLED STEEL (CRS)
- B. FINISH SHALL BE A DURABLE, BLACK POWDER COAT.
- C. HORIZONTAL MANAGEMENT SHALL NOT HAVE HINGED COVER.
- D. SIZE: 1 & 2RU
- E. FRONT RING DEPTH: 4 & 7”
- F. ALL STEEL CONSTRUCTION - RUGGED, NON-FLAMMABLE, NO FASTENERS TO WEAR OR BREAK, NO FINGERS TO FUSS WITH.
- G. MODULAR COMPONENTS EASILY CONFIGURED IN FIELD TO ADAPT TO DEMANDING APPLICATIONS.
- H. GENEROUS SPACE BETWEEN RINGS ALLEVIATES CONGESTION.
- I. PASS-THRU HOLES WITH ROLLED EDGES.
- J. HORIZONTAL CABLE MANAGEMENT AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) ORTRONICS (OR-60400131) 1 RU WIRE MANAGER
 - b) ACCEPTABLE MANUFACTURERS: BASIS OF DESIGN OR EQUIVALENT AS APPROVED BY UNIVERSITY OF SOUTH FLORIDA – INFORMATION TECHNOLOGY DEPARTMENT

2.10 CABINETS, ENCLOSURE & ACCESSORIES

A. CONSOLIDATION POINT ENCLOSURES

- a) CONSOLIDATION POINT (CP) ENCLOSURES SHALL BE CONSTRUCTED OF 16 GA. COLD-ROLLED STEEL, WITH ZINC GALVANIZED FINISH.
- b) CP ENCLOSURES SHALL HAVE A REMOVABLE FRONT COVER, CONSTRUCTED OF 20 GA. COLD ROLLED STEEL, WITH ELECTROSTATIC POWDER COAT FINISH IN EITHER BLACK OR ELECTRIC IVORY COLORS.
- c) CP ENCLOSURES SHALL BE SUPPLIED COMPLETE WITH DETAILED INSTRUCTIONS, WALL-MOUNTING SCREWS, PANEL-MOUNTING FASTENERS, FIBER STORAGE SPOOLS AND FIBER FSP ADAPTER MOUNTING BRACKET.
- d) CP ENCLOSURES SHALL HAVE OPTIONAL ACCESSORIES AVAILABLE, INCLUDING A TRIM RING, LOUVERED DOOR, AND LOCK KIT.
- e) CP ENCLOSURES SHALL HAVE FEATURES TO PERMIT MOUNTING BETWEEN STUDS ON 16-INCH CENTERS FLUSH TO WALL, OR DIRECT WALL SURFACE MOUNTING.
- f) STUD-LOCATING TABS SHALL BE LOCATED ON EACH SIDE OF THE CP ENCLOSURE TO FACILITATE POSITIONING ONTO WALL STUDS.
- g) CABLE ENTRY KNOCKOUTS SHALL BE LOCATED ON THE TOP, BOTTOM, AND SIDES OF THE CP ENCLOSURE. A KNOCKOUT SHALL ALSO BE FURNISHED FOR MOUNTING A LOCK.
- h) CP ENCLOSURES SHALL HAVE TWO VERTICAL MOUNTING RAILS, PRE-TAPPED WITH #10-24 HOLES. TAPPED MOUNTING HOLES ALONG THE RAILS SHALL BE LOCATED ON 9.1-INCH CENTERS AND 10.2-INCH CENTERS.
- i) MOUNTING FEATURES SHALL BE LOCATED WITHIN THE ENCLOSURE TO ACCEPT A REMOVABLE FIBER FSP PANEL-MOUNTING BRACKET, WITH CAPACITY TO ACCEPT (2) FSP OR JACK-PACK PANELS FOR MULTI-MEDIA APPLICATIONS.
- j) CAPACITY OF THE CP ENCLOSURE SHALL BE 5 RACK-MOUNT UNITS (RMU), EACH ACCEPTING EITHER A 100-PAIR BLOCK OR 89-D BRACKET FOR 12-PORT PANELS.
- k) VERTICAL MOUNTING RAILS SHALL ACCEPT 110-STYLE/100-PAIR PUNCH-DOWN BLOCKS AND 89-D BRACKETS IN ANY RMU LOCATION.
- l) ZONE CEILING BOXES SHALL BE UL LISTED, AND PLENUM RATED FOR USE IN CEILING SPACE APPLICATIONS.
- m) CONSOLIDATION POINT ENCLOSURES USED IN HORIZONTAL CABLE RUNS, USING WALL-MOUNT, IN-FLOOR, OR CEILING-MOUNT INSTALLATION SHALL BE DESIGNED AND UL LISTED SPECIFICALLY FOR THE INTENDED PURPOSE.

- n) CONSOLIDATION POINT ENCLOSURES, AS SPECIFIED IN THE CONTRACT DOCUMENTS SHALL BE:
 - a) HUBBELL (CPEI)
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

B. CABINETS – FULL SIZE NETWORK AND SERVER

- a) NETWORK AND SERVER CABINETS SHALL BE FREE STANDING, FULL-SIZE ENCLOSED CABINETS, WITH A FORMED, WELDED AND POWDER COATED CONSTRUCTION.
- b) NETWORK AND SERVER CABINETS SHALL BE SUITABLE FOR EQUIPMENT ROOMS, TELECOMMUNICATIONS ROOMS, ENTRANCE FACILITIES AND DATA CENTERS. HEAVY-DUTY, WELDED FOUR-POST FRAME
- c) CHOICE OF 19" OR 23" EIA SQUARE HOLE OR #12-24 TAPPED RAILS
- d) VENTILATION OPTIONS FOR DOORS, SIDE PANELS, TOP, AND BASE, INCLUDING PERFORATION, VENTS, AND FANS
- e) AVAILABLE IN A VARIETY OF SIZES FOR ANY APPLICATION AND EQUIPMENT STANDARD
- f) NETWORK AND SERVER CABINETS, AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) HUBBELL CABINETS
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

C. CABINETS – WALL MOUNT

- a) BASIC DESIGN SHALL BE A THREE PIECE MODULAR SWIVEL-TYPE, 14 GAGE STEEL, REINFORCED WELDED ENCLOSURE WITH A REMOVABLE FRONT DOOR, AND REMOVABLE REAR SECTION.
- b) SHALL BE CONSTRUCTED OF 14 GAGE COLD ROLLED STEEL (CRS)
- c) FINISH SHALL BE BLACK OR OFFICE WHITE DURABLE POWDER COAT ON ALL SURFACES.

- d) INSTALLED CABINETS SHALL HAVE A STATIC LOAD CAPACITY OF 400 LBS IN THE OPEN OR CLOSED POSITION. FULL LOAD CAPACITY SHALL NOT CAUSE INTERFERENCE WITH OPENING OR CLOSURE OF CENTER SECTION.
- e) CABINETS SHALL BE EQUIPPED WITH PANEL-MOUNTING RAILS COMPLIANT TO ANSI/EIA-310-D. RAIL LOCATION SHALL BE ADJUSTABLE, WITH NOTCHES TO FACILITATE POSITIONING.
- f) STANDARD CABINET HEIGHTS OF 24", 36", AND 48" SHALL BE AVAILABLE, EACH IN DEPTHS OF 20", 26", AND 36".
- g) REAR SECTION SHALL BE REMOVABLE TO FACILITATE WALL INSTALLATION, AND HAVE A 16" HOLE PATTERN SUITABLE FOR MOUNTING TO PLYWOOD BACKBOARDS, STEEL OR WOOD STUDDED WALLS, CINDER BLOCK OR CONCRETE WALLS.
- h) REAR SECTION TOP SURFACE SHALL HAVE ECCENTRIC KNOCKOUTS FOR CONDUIT ENTRY. ECCENTRIC KNOCKOUTS SHALL ACCOMMODATE CONDUIT SIZES INCLUDING ¾", 1.0", 2.5", AND 3.0".
- i) CABINET SHALL HAVE DEDICATED BONDING POINTS FOR PROPER GROUNDING ACCORDING TO ANSI-J-STD-607A.
- j) CENTER SECTION SHALL HAVE SLOTS FOR VENTILATION, AND SHALL ACCEPT DUST FILTERS FOR COOLING FAN APPLICATIONS. A GASKET KIT SHALL BE AVAILABLE SEPARATELY TO ENHANCE PROTECTION FROM DUST ENTRY.
- k) CABINET SHALL HAVE PROVISIONS FOR MOUNTING TO AN ACCESSORY MOBILE BASE FOR USE AS A FLOOR-STANDING UNIT. MOBILE BASE SHALL BE AVAILABLE SEPARATELY.
- l) CABINETS SHALL BE UL LISTED.
- m) WALL-MOUNTED CABINETS SHALL BE FORMED/WELDED AND POWDER COATED CONSTRUCTION, SIZED APPROPRIATELY FOR THE CABLE INSTALLATION, AND SHALL ACCEPT 19-INCH PATCH PANELS.
- n) WALL-MOUNTED CABINETS MAY SERVE AS A SMALL TELECOMMUNICATIONS ROOM, HORIZONTAL OR INTERMEDIATE CROSS CONNECT FACILITY, OR CONSOLIDATION POINT.
- o) WALL-MOUNT CABINETS AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) HUBBELL (QUADCAB)

- b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

D. FRAMES – WALL MOUNT - HINGED

- a) SUPPORTS HEAVY OR DEEP EQUIPMENT IN LOCATIONS WITH LIMITED FLOOR SPACE
- b) QUICK RELEASE LATCHES – RAKE FRAME HINGES BOTH LEFT AND RIGHT
- c) CABLE TIE SLOTS ALONG BOTH SIDES AND INSIDE TOP AND BOTTOM FOR SECURING CABLES
- d) FRAME WILL BE CONSTRUCTED OF 16 GA
- e) ALL SURFACES WILL BE FINISHED WITH A DURABLE BLACK POWDER COAT.
- f) 70 LBS LOAD CAPACITY
- g) MOUNTING HOLES WILL BE 16" ON CENTER FOR EASY ATTACHEMENT TO ANY STANDARD WALL STUDS.
- h) EIA-310-D UNIVERSAL SPACING TAPPED #12-24 FRONT AND BACK
- i) WALL-MOUNT HINGED FRAMES AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) HUBBELL (HPWWMR**)
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

E. BRACKETS – WALL MOUNT – HINGED

- a) BOTTOM OR SIDE HINGES ALLOWS ACCESS TO THE REAR OF COMPONENTS MOUNTED ON THE WALL
- b) WALL BRACKETS WILL BE CONSTRUCTED OF 16 GA STEEL
- c) ALL SURFACES WILL BE FINISHED WITH A DURABLE BLACK POWDER COAT.
- d) WILL BE AVAILABLE IN 1RU TO 6RU
- e) MOUNTING HOLES WILL BE 16" ON CENTER FOR EASY ATTACHEMENT TO ANY STANDARD WALL STUDS.

- f) EIA-310-D UNIVERSAL SPACING TAPPED #12-24 FRONT AND BACK
- g) HEIGHT WILL BE FROM 24" (12RU) TO 48" (26RU)
- h) WALL-MOUNT HINGED BRACKETS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) HUBBELL (HPWWB*U*)
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

F. ENCLOSURES – WALL MOUNT

- a) REMOTE EQUIPMENT BOX BASIC DESIGN SHALL BE A ONE-PIECE, 16-GAGE STEEL, REINFORCED WELDED ENCLOSURE WITH A PRE-CONFIGURED LEFT-HINGED DOOR.
- b) BASIC UNIT DELIVERED SHALL INCLUDE: (1) WALL MOUNT ENCLOSURE BODY WITH VENTED DOOR ASSEMBLED, WITH (2) SETS OF UNIVERSAL #12-24 TAPPED MOUNTING RAILS FOR COMMUNICATIONS EQUIPMENT, (2) SETS OF HUB MOUNTING BRACKETS, (2) NSQ LOCKS, AND (1) SET OF PANEL MOUNTING BRACKETS.
- c) BODY AND DOOR MATERIAL SHALL BE 16-GAGE COLD ROLLED STEEL (CRS).
- d) BASIC DIMENSIONS SHALL BE STANDARD HEIGHTS OF 24.5", 32.5" OR 42.5" BY 24.2" WIDTH, IN 7" OR 10" DEPTH VERSIONS.
- e) FINISH SHALL BE LIGHT GRAY OR BLACK DURABLE POLYURETHANE POWDER COAT ON ALL SURFACES.
- f) INSTALLED CABINETS SHALL HAVE A STATIC LOAD CAPACITY OF 100 LBS.
- g) INSTALLED MOUNTING RAILS SHALL ACCEPT 19" RACK-MOUNT PANELS AND EQUIPMENT WITH ANSI/EIA-310-D MOUNTING PATTERN.
- h) CABINET SHALL ACCEPT A MAXIMUM HUB DEPTH OF 14.5" FOR 32" HEIGHT UNITS, AND 22" FOR 42" HEIGHT UNITS.
- i) INSTALLED CABINET SHALL HAVE SUFFICIENT STORAGE CAPACITY FOR THE MAXIMUM NUMBER OF FEEDER AND DISTRIBUTION CABLES.
- j) BODY SHALL HAVE A PATTERN OF KEY-SHAPED HOLES ON 16" CENTERS FOR STUD-MOUNTING. MOUNTING IS SUITABLE FOR ¾" PLYWOOD BACKBOARDS, STEEL OR WOOD STUDDED WALLS, CINDER BLOCK, OR CONCRETE WALLS.

- k) THE WEIGHT OF THE CABINET SHALL NOT EXCEED 50LB (22.7KG).
 - l) BODY INNER BACK WALL SHALL HAVE CLIP FEATURES TO ACCEPT OPTIONAL MOUNTING BRACKETS FOR EQUIPMENT, SUCH AS PANELS, 110 BLOCKS, HUBS, SWITCHES, ROUTERS, UPS UNITS, POWER SUPPLIES, AUDIO/VIDEO, COAX SPLITTERS, FIBER BRACKETS, AND OTHER SUITABLE NETWORKING DEVICES.
 - m) BODY SHALL HAVE ECCENTRIC KNOCKOUTS IN THE TOP, BOTTOM, AND SIDES FOR CONDUIT ENTRY. ECCENTRIC KNOCKOUTS SHALL ACCOMMODATE CONDUIT SIZES INCLUDING ¾", 1.0", 2.5", AND 3.0".
 - n) CABINET SHALL HAVE DEDICATED GROUNDING AND BONDING LOCATIONS ACCORDING TO ANSI J-STD-607-A.
 - o) DOOR SHALL BE LOCKABLE.
 - p) VENTILATION: DOOR VENTILATION PATTERN SHALL MEET THE REQUIREMENTS OF UL1950 FOR FIRE CONTAINMENT AND INGRESS OF FOREIGN PARTICLES.
 - q) REMOTE EQUIPMENT CABINETS SHALL BE UL LISTED.
 - r) INSTALLED CABINETS SHALL PERFORM TO NEMA 2 RATING.
 - s) TAMPER RESISTANCE, VENTILATION, AND HEAT DISSIPATION PERFORMANCE SHALL MEET DESIGN REQUIREMENTS.
 - t) WALL-MOUNTED ENCLOSURES MAY SERVE AS A SMALL TELECOMMUNICATIONS ROOM, HORIZONTAL OR INTERMEDIATE CROSS CONNECT FACILITY, OR CONSOLIDATION POINT.
 - u) WALL-MOUNT ENCLOSURES AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) HUBBELL (REBOX ENCLOSURES)
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department
- G. ENCLOSURES – FIBER RACK MOUNT
- a) RACK-MOUNTED, POWDER COATED FORMED COLD ROLLED STEEL ENCLOSURE.
 - b) SWING-OUT OR PULL-OUT INNER TRAY SHALL PROVIDE ACCESS TO INNER CABLES AND CONNECTIONS, AND MAINTAIN PROPER CABLE BEND RADIUS THROUGHOUT THE RANGE OF MOTION.

- c) FIBER RACK-MOUNT ENCLOSURES SHALL BE A 19-INCH FORMED/WELDED AND POWDER COATED MODULAR DESIGN, SIZED ACCORDING TO THE CABLE INSTALLATION.
 - d) FIBER RACK-MOUNT ENCLOSURES MAY SERVE AS A MAIN, HORIZONTAL, OR INTERMEDIATE CROSS CONNECT FACILITY.
 - e) PANEL MOUNTING BRACKETS SHALL BE CONFIGURABLE TO EITHER 19" OR 23" RACKS PER ANSI/EIA-310-D.
 - f) ENCLOSURE CHASSIS SHALL HAVE TWO MOUNTING BRACKET LOCATIONS FOR EITHER FLUSH MOUNT OR CENTER MOUNT ON THE RACK.
 - g) INNER TRAY MOUNTING POSTS FOR MODULAR FPR3SP PANELS SHALL ALSO ACCEPT MULTI-MEDIA FSP PANELS FOR INTEGRATION OF TWISTED PAIR (UTP) COAXIAL, OR OTHER CABLE MEDIA.
 - h) INNER TRAY SHALL HAVE A THREADED MOUNTING BOSS TO ACCEPT A MOUNTING STUD FOR SPLICE TRAYS. SPLICE TRAY CAPACITY SHALL BE (2) 10" SPLICE TRAYS, EACH WITH 24-SPLICE CAPACITIES (48 SPLICES TOTAL). SPLICE TRAY MOUNTING BOSS SHALL ALSO ACCEPT A STUD FOR MOUNTING 1-RMU BLOWN FIBER ADAPTER BRACKETS.
 - i) INNER TRAY MOUNTING POSTS FOR MODULAR PANELS SHALL ALSO ACCEPT 12-FIBER MTP-STYLE CASSETTES FOR "PLUG & PLAY" INSTALLATIONS.
 - j) INNER TRAY SHALL HAVE REAR CABLE TIE-DOWN FEATURES TO ACCEPT VARIOUS DIAMETER BACKBONE CABLES ENTERING THE ENCLOSURE.
 - k) ENCLOSURES SHALL BE CONSTRUCTED OF 16 GAGE COLD ROLLED STEEL (CRS)
 - l) FIBER RACK-MOUNT ENCLOSURES AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) OCC (RTC SERIES)
 - b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department
- H. ENCLOSURES – FIBER WALL MOUNT
- a) BASIC FIBER ENCLOSURE DESIGN SHALL BE A FORMED COLD ROLLED STEEL ENCLOSURE WITH A SINGLE HINGED COVER.
 - b) ENCLOSURE MATERIAL SHALL BE 16-GAGE COLD ROLLED STEEL (CRS).

- c) FINISH SHALL BE DURABLE BLACK ELECTROSTATIC POWDER COAT ON ALL SURFACES.
- d) ENCLOSURES SHALL BE AVAILABLE IN 24 PORT AND 48 PORT CAPACITIES.
- e) ENCLOSURES SHALL BE SUPPLIED COMPLETE WITH MANUFACTURER'S INSTRUCTIONS AND HARDWARE. SCREWS FOR WALL MOUNTING ARE NOT INCLUDED.
- f) ENCLOSURE REAR SIDE SHALL HAVE PRE-PUNCHED, KEY-SHAPED HOLES TO PERMIT FASTENING TO SUITABLE STRUCTURES AND WALL SURFACES.
- g) ENCLOSURE TOP AND BOTTOM SHALL HAVE A KNOCKOUT, EACH VERTICALLY ALIGNED, TO PERMIT CONDUIT AND CABLE ENTRY, AND VERTICAL STACKING OF MULTIPLE UNITS.
- h) COVER SHALL BE LOCKABLE WITH A KEYED LOCK AVAILABLE SEPARATELY.
- i) ENCLOSURES SHALL BE SUPPLIED WITH CABLE ROUTING CLIPS.
- j) FIBER WALL-MOUNT ENCLOSURES SHALL BE A FORMED/WELDED AND POWDER COATED DESIGN, SIZED ACCORDING TO THE CABLE INSTALLATION. FIBER WALL-MOUNT ENCLOSURES MAY SERVE AS A HORIZONTAL CROSS CONNECT, CONSOLIDATION POINT, OR MUTOA ENCLOSURE.
- k) FIBER WALL-MOUNT ENCLOSURES AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a) NOT PREFERRED AND SPECIFIED BY CUSTOMER DURING DESIGN
- l) ADAPTER PANELS – OPTICAL FIBER
- m) OPTICAL FIBER ADAPTER PANELS SHALL BE A MODULAR DESIGN POWDER COATED STAMPED METAL CONSTRUCTION.
- n) AVAILABLE IN SC, ST, LC, AND MT-RJ ADAPTER CONFIGURATIONS
- o) HIGH OR LOW-DENSITY VERSIONS.
- p) ADAPTER PANELS SHALL HAVE QUICK-RELEASE SNAP FASTENERS TO FIT DIRECTLY INTO FIBER ENCLOSURES.
- q) FIBER PATCH PANELS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) HUBELL (FSP SERIES PANELS)

- b) Acceptable Manufacturers: Basis of Design or equivalent as approved by University of South Florida – Information and Technology Department

2.11 FIRE STOP MATERIAL

- A. CABLES PASSING THROUGH FIRE-RATED FLOORS OR WALLS SHALL PASS THROUGH FIRE-RATED WIRING DEVICES WHICH CONTAIN AN INTUMESCENT INSERT MATERIAL THAT ADJUSTS AUTOMATICALLY TO CABLE ADDITIONS OR SUBTRACTIONS.
- B. THE DEVICE (PER CODE REQUIREMENTS) SHALL INCLUDE BOTH INTERNAL AND EXTERNAL FIRESTOPPING.
- C. CABLES PENETRATING THROUGH FIRE-RATED FLOORS OR WALLS SHALL UTILIZE FIRE-RATED PATHWAY DEVICES CAPABLE OF PROVIDING AN F RATING EQUAL TO THE RATING OF THE BARRIER IN WHICH THE DEVICE IS INSTALLED.
- D. THE DEVICE SHALL BE TESTED FOR SMOKE LEAKAGE (L RATING) AND SHALL NOT REQUIRE THE USE OF ANY OPTIONAL SEALING MATERIALS TO ACHIEVE THE PUBLISHED RATING.
- E. THE DEVICE SHALL UTILIZE A FIRE AND SMOKE SEALING SYSTEM THAT AUTOMATICALLY ADJUSTS TO THE ADDITION OR REMOVAL OF CABLES.
- F. WIRING DEVICES SHALL BE CAPABLE OF ALLOWING A 0 TO 100-PERCENT VISUAL FILL OF CABLES.
- G. WIRE DEVICES SHALL BE OF A SUFFICIENT SIZE TO ACCOMMODATE THE QUANTITY AND SIZE OF ELECTRICAL WIRES AND DATA CABLES REQUIRED AND SHALL BE SUITABLE FOR USE WITH NEW OR EXISTING CABLE INSTALLATIONS.
- H. THE INSTALLED DEVICE (IN NORMAL USE) SHALL REQUIRE NO MAINTENANCE AND SHALL ACCOMMODATE FUTURE CABLE CHANGES WITHOUT MECHANICAL ADJUSTMENT AND/OR REMOVAL OR REPLACEMENT OF PROTECTIVE MATERIALS.
- I. WIRE DEVICES TO BE PROVIDED WITH STEEL WALL PLATES ALLOWING FOR SINGLE OR MULTIPLE DEVICES TO BE GANGED TOGETHER.
- J. THE DEVICE SHALL BE MODULAR AND SHALL PROVIDE MECHANICAL INSTALLATION OPTIONS FOR COMMON WALL AND FLOOR CONSTRUCTIONS AS WELL AS COMMON CONSTRUCTION CONDITIONS INCLUDING OVER-SIZED OR DAMAGED OPENINGS OR EXISTING SLEEVES.
- K. ACCEPTABLE MANUFACTURERS:
- a) SPECIFIED TECHNOLOGIES INC. (EZ-PATH) OR APPROVED EQUAL

2.12 INNER-DUCT

- A. FIBER OPTIC CABLE SHALL BE INSTALLED WITH INNERDUCT FOR PROTECTION OF FIBER CABLES IN A SHARED PATHWAY
- B. THE INNER DUCT WILL BE RATED FOR THE ENVIRONMENT THAT IT IS BEING INSTALLED IN. PLENUM AND RISER RATED
- C. THREE INNER DUCTS WILL BE RUN BETWEEN CLOSETS. ONE FOR CURRENT INSTALLATION, TWO SPARE FOR FUTURE APPLICATIONS.
- D. SIZE: 1"
- E. FLEXIBLE & LIGHTWEIGHT FOR EASE OF HANDLING
- F. PRE-THREADED WITH PULL LINE
- G. INNER DUCT, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a) PREMIER CONDUIT

2.13 PROTECTION UNITS – COPPER CABLE

- A. UL LISTED PROTECTION FOR DATA COMMUNICATION CIRCUITS. THE 4 PAIR BLOCK PROTECTS NETWORKS FROM TRANSIENTS THAT CAN HARM SENSITIVE ELECTRONIC EQUIPMENT.
- B. ULTRA LOW CAPACITANCE SOLID STATE TECHNOLOGY ALLOWS FOR CAT 6 PERFORMANCE WHILE PROVIDING QUICK REACTION TO HAZARDOUS ELECTRICAL SURGES WITHOUT NETWORK DEGRADATION.
- C. DESIGNED TO PROTECT DATA NETWORKS OPERATING BELOW 65 VOLTS.
- D. THESE PROTECTORS PROVIDE OPTIMUM TRANSMISSION PERFORMANCE FOR PROTOCOLS OPERATING AT TRANSMISSION SPEEDS UP TO 250 MHZ.
- E. UL LISTED
- F. 65V MODEL IS IDEAL FOR POWER OVER ETHERNET (POE) CIRCUIT PROTECTION
- G. 110 TERMINATION
- H. COVER INCLUDED
- I. FACTORY LOADED WITH 65V SOLID STATE MODULES
- J. INNER DUCT, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:

- a) PORTA SYSTEMS (606)

PART 3 EXECUTION

3.1 PREPARATION –

A. CABLE PATHWAYS AND FIRESTOPS

- a) CABLE PATHWAYS, INCLUDING CONDUIT, CABLE TRAY, LADDER RACK, RACEWAY, SLOTS, SLEEVES, ETC. SHALL BE LOCATED AND MOUNTED ACCORDING TO CONTRACT DRAWINGS AND MANUFACTURER'S INSTRUCTIONS. PATHWAYS SHALL NOT BE INSTALLED IN WET AREAS.
- b) NOTE: USF IS REQUIRING THE USE OF 1" CONDUIT TO STUB IN THE WORKSTATION.
- c) CABLE PATHWAY FILL RATIO, BEND RADIUS, RUN LENGTH, NUMBER OF BENDS, AND PROXIMITY TO EMI SOURCES SHALL BE IN ACCORDANCE WITH ANSI/TIA/EIA-569-B. MAXIMUM CABLE COUNT OF THE INITIAL INSTALLATION SHALL NOT EXCEED 40% FILL RATIO IN ANY PATHWAY.
- d) IN ACCORDANCE WITH NEC 2005, POWER WIRING AND COMMUNICATIONS CABLING SHALL NOT SHARE THE SAME PATHWAY OR OUTLET.
- e) CABLE PATHWAYS SHALL BE SECURED TO A STRUCTURAL MEMBER OF THE BUILDING, OR PERMANENT WALL STUDS. WALL SURFACES FOR RACEWAY MOUNTING SHOULD BE FINISHED COMPLETE.
- f) CEILING DATA AND DEVICE LOCATION PATHWAYS AND BOXES SHALL BE SECURED TO STRUCTURAL MEMBER OF THE BUILDING.
- g) METALLIC PATHWAYS SHALL BE ELECTRICALLY CONTINUOUS, FREE OF SHARP EDGES, AND PROPERLY BONDED TO AN APPROVED GROUND. EMI SOURCES SUCH AS BALLASTS, MOTORS, AND BUS CONDUCTORS SHALL BE AVOIDED BY USING PROPER SEPARATION DISTANCES.
- h) PATHWAYS THAT PENETRATE FIRE-RATED BARRIERS SHALL BE FIRE STOPPED WITH REUSABLE INTUMESCENT PUTTY ACCORDING TO LOCAL CODES AND RECOGNIZED PRACTICES. FIRE STOP MATERIALS OR DEVICES SHALL BE QUALIFIED TO UL-1479, IN ACCORDANCE WITH ASTM E814. FIRE STOP METHOD SHALL HAVE P.E. APPROVAL.
- i) CORE DRILLING OF HOLES FOR FIRE-RATED POKE-THROUGH OUTLET DEVICES SHALL HAVE APPROVAL BY A STRUCTURAL ENGINEER OR P.E. ON THE CONTRACT DRAWINGS PRIOR TO START OF WORK.

- j) PATHWAYS FOR VERTICAL CABLE RUNS, SUCH AS SLOTS AND SLEEVES, SHALL BE INSTALLED IN THE PROPER LOCATION IN ACCORDANCE WITH APPLICABLE CODES AND STANDARDS.
- B. TELECOMMUNICATIONS ROOMS AND EQUIPMENT ROOMS
- a) TELECOMMUNICATIONS ROOM (TR) LAYOUT, LOCATION AND DESIGN SHALL BE IN ACCORDANCE WITH THE GUIDELINES OF ANSI/TIA/EIA-569-B. TR'S ON EACH FLOOR OF THE BUILDING SHOULD BE CENTRALLY LOCATED AND VERTICALLY ALIGNED TO SIMPLIFY BACKBONE CABLE AND PATHWAY ROUTING. TR'S SHALL NOT BE INSTALLED IN WET AREAS, OR NEAR EMI SOURCES OR CAUSTIC CHEMICALS. PLUMBING INFRASTRUCTURE SHALL NOT ENTER TR. ALL TR LOCATIONS SHALL BE COORDINATED WITH USF REPRESENTATIVE
 - b) LAYOUT OF RACK, CABINET OR ENCLOSURE LOCATIONS SHALL BE ACCORDING TO CONTRACT DRAWINGS.
 - c) RACKS AND CABINETS SHALL BE SECURED TO THE FLOOR USING PROPER ANCHORS AND FASTENERS.
 - d) ALL WALLS SHOULD BE COVERED WITH $\frac{3}{4}$ " A-C GRADE PLYWOOD PAINTED GRAY FIRE RETARDANT PAINT. THIS PLYWOOD SHALL BE FIRE-RATED TO MEET APPLICABLE CODES AND SECURELY FASTENED TO THE WALL STUDS. THE PLYWOOD WILL BE INSTALLED TO GIVE UP TO 8 FT OF WORKSPACE ON THE WALL AND SHALL BE MIN 6 INCHES OFF THE FINISHED FLOOR. THE WALL SHOULD BE LIGHT IN COLOR WORKSPACE TO ENHANCE ROOM LIGHTING, UNLESS ALTERED BY USF REPRESENTATIVE.
 - e) OPEN CEILINGS ARE PREFERRED IN TR ROOMS. INTERIOR WALLS SHOULD BE FINISHED FROM FLOOR TO STRUCTURAL DECK ABOVE.
 - f) MOUNT AND ASSEMBLE RACKS, CABINETS, BRACKETS AND ENCLOSURES PER MANUFACTURER'S INSTRUCTIONS. MOUNT PATCH PANELS AND CABLE MANAGEMENT ACCESSORIES IN THE SPECIFIED LOCATIONS.
 - g) ADJOINING PATHWAYS (LADDER RACK, CABLE TRAY, ETC.) SHALL BE PROPERLY SECURED AND POSITIONED TO ALLOW ADEQUATE BEND RADIUS OF CABLES ENTERING THE RACK OR CABINET.
 - h) RACKS AND LADDER TRAY WITHIN TR SHALL BE GROUNDED AND BONDED IN ACCORDANCE WITH ANSI/TIA-942
- C. WALL OUTLETS AND RECESSED WALL BOXES
- a) WALL OUTLET AND CABLE DROP PATHWAY LOCATION SHALL BE ACCORDING TO CONTRACT DRAWINGS. GUIDELINES FROM ANSI/TIA/EIA-569-B SHOULD BE FOLLOWED FOR LOCATION WITH ELECTRICAL OUTLETS AND OUTLET HEIGHT ABOVE FINISHED FLOOR, TYPICALLY 18" AFF.

- b) OUTLET BOXES SHALL BE FASTENED SECURELY TO A WALL STUD OR STRUCTURAL ELEMENT, IN A MANNER TO PERMIT FLUSH MOUNTING OF THE FACEPLATE WITH THE FINISHED WALL.
- c) MULTI-CONNECT BOXES SHALL BE INSTALLED IN A MANNER TO COMPLY WITH SEPARATION RULES FOR POWER AND COMMUNICATIONS WIRING IN CLOSE PROXIMITY.
- d) REFER TO SPECIFIC MANUFACTURER'S RECOMMENDATIONS FOR WALL OUTLET SELECTION, CABLE DEPLOYMENT, AND TERMINATION OF JACKS INTO FACEPLATES. NOTE: DUE TO THE LARGER SIZE OF FUTURE CABLES, USE IS REQUIRING THE INSTALLATION OF A 2-GANG BOX WITH A SINGLE GANG MUD RING TO ALLOW FOR PROPER CABLE BEND RADIUS WHEN THE FACEPLATE IS INSTALLED.

3.2 INSTALLATION

A. CABLE SUPPORT

- a) THIS CONTRACTOR SHALL FURNISH AND INSTALL ALL SUPPORTS FOR CABLES SPECIFIED IN THIS SECTION.
- b) CABLE SUPPORTS SHALL BE SPACED RANDOMLY, BUT NO FURTHER THAN 5'-0" APART AND MAINTAINING ALIGNMENT.
- c) IN EACH TELECOMMUNICATIONS ROOM THE INNER-DUCTS ENTERING THE SPACE WILL BE COMBINED, IN A SIZE APPROPRIATE METALIC BOX THAT IS MOUNTED ON THE WALL. THE COMBINED INNERDUCTS WILL THEN BE ROUTED TO THE RACK AND THE FIBER BAY.
- d) PROVIDE ALL ADDITIONAL CABLE MANAGEMENT PRODUCTS, SLEEVES OR CONDUIT RACEWAYS AS REQUIRED TO PROTECT EXPOSED CABLING AND COMPLETE THE INSTALLATION OF CABLES IN A NEAT MANNER.
- e) A HORIZONTAL CONDUIT DISTRIBUTION SYSTEM CONSISTS OF CONDUITS RADIATING FROM THE TELECOMMUNICATIONS ROOM TO THE WORKSTATION OUTLETS IN THE FLOOR, WALLS, CEILINGS, AND COLUMNS OF A BUILDING. WHEN USING A CONDUIT DISTRIBUTION SYSTEM UTILIZE THE MOST DIRECT ROUTE FOLLOWING THE BUILDING STRUCTURE.
- f) THE SIZE AND NUMBER OF CONDUITS OR SLEEVES USED FOR BACKBONE PATHWAYS DEPENDS ON THE USABLE FLOOR SPACE SERVED BY THE BACKBONE SYSTEM. AT LEAST THREE 4 TRADE SIZE SLEEVES ARE RECOMMENDED.
- g) CONDUIT IS ONLY REQUIRED IF BUILDING CODES OR ENVIRONMENTAL CONDITIONS NECESSITATE IT. RIGID OR EMT METAL CONDUITS ARE DEEMED

SUITABLE FOR BUILDING INSTALLATION. ADEQUATE PLANNING SHOULD ALLOW FOR A MINIMUM OF ONE 1 INCH CONDUITS TO EACH WORKSTATION.

- h) CONDUIT FILL RATIOS SHALL NOT EXCEED 40%; CONTACT YOUR CABLE MANUFACTURER TO GET RECOMMENDATION ON FILL RATES.
- i) NO CONDUIT RUN SHOULD BE DESIGNED WITH MORE THAN TWO (2), 90 DEGREE BENDS BETWEEN PULL POINTS OR PULL BOXES. IF A RUN REQUIRES MORE THAN TWO 90 DEGREE BENDS, INSTALL A PULL BOX.
 - a) EXCEPTIONS:
 - i. THE TOTAL RUN IS NOT LONGER THAN 33 FT.
 - ii. THE CONDUIT SIZE IS INCREASED TO THE NEXT TRADE SIZE.
 - iii. ONE OF THE BENDS IS LOCATED WITHIN 12 IN OF THE CABLE FEED END. (THIS EXCEPTION ONLY APPLIES TO PLACING OPERATIONS WHERE CABLE IS PUSHED AROUND THE FIRST BEND.)
- j) ALL CONDUITS WILL BE EQUIPPED WITH A CONTIGUOUS LENGTH OF PLASTIC OR NYLON PULL STRING WITH A MINIMUM RATING OF 200 LBS. (90 KG)
- k) A CONDUIT RUN SHOULD NOT BE DESIGNED WITH CONTINUOUS CLOSED SECTIONS LONGER THAN 100 FT WITHOUT PULL POINTS OR PULL BOXES INSTALLED.
- l) ALL CONDUITS SHOULD TERMINATE ABOVE THE INSTALLED CABLE TRAYS AND ALLOW FOR PROPER CABLE RACKING. CABLE WATERFALLS SHOULD BE CONSIDERED IN AREAS THAT HAVE EXCESSIVE DISTANCE BETWEEN THE CONDUIT AND LADDER RACK.
- m) TRAYS AND CONDUITS LOCATED WITHIN THE CEILING SHALL PROTRUDE INTO THE ROOM A DISTANCE OF 1 TO 2 IN WITHOUT A BEND AND ABOVE 8 FT HIGH. CLEAR, UNOBSTRUCTED ACCESS TO THE LADDER RACK AND CONDUITS SHALL BE PROVIDED WITHIN TELECOMMUNICATIONS ROOMS.
- n) CONDUITS ENTERING THROUGH THE FLOOR SHALL TERMINATE AT LEAST TWO (2) INCHES ABOVE THE FINISHED FLOOR
- o) LOCATE SLOT/SLEEVE SYSTEMS IN PLACES WHERE MAINTENANCE OF CABLING IS PRACTICAL.

- p) IF POSSIBLE, LOCATE SLEEVES, SLOTS, AND/OR CONDUITS ON THE LEFT SIDE OF THE ROOM; THIS PLACEMENT ENHANCES THE USE OF WALL SPACE FROM LEFT TO RIGHT.
 - q) WHEN POSSIBLE, ENTRANCE CONDUIT AND DISTRIBUTION CONDUIT/CABLE TRAY SHOULD ENTER AND EXIT ON THE SAME WALL; IF THIS IS NOT POSSIBLE, LADDER RACK INSIDE THE ROOM SHOULD BE PROVIDED FOR DISTRIBUTION FROM WALL TO WALL.
 - r) ALL FLOOR PENETRATIONS SHALL BE CORE DRILLED WITH A MAXIMUM 1/4 INCH SIZE GREATER THAN THE EXTERIOR DIMENSION OF THE RISER CONDUIT
 - s) CONDUITS ENTERING THROUGH A WALL SHALL BE REAMED AND BUSHED, AND TERMINATED AS CLOSE TO CABLE TRAY OR LADDER RACK
 - t) TERMINATING ABOVE A SUSPENDED CEILING MUST TERMINATE NOT LESS 3 INCHES ABOVE FINISHED CEILING AND FINISHED WITH BUSHING OPENING.
 - u) ALL CONDUIT WILL BE LABELED FOR EASY IDENTIFICATION
 - v) ALL FLOOR PENETRATIONS SHALL BE AT COLUMNS, EXTERIOR WALLS OR IN EQUIPMENT ROOMS.
 - w) CABLES SHALL BE SUPPORTED AT HEIGHT OF BOTTOM FLANGE OF STRUCTURAL BEAMS USING A RIGID SUPPORT METHOD (I.E. THREADED ROD, BEAM CLAMPS, ETC.)
 - x) DO NOT SUPPORT CABLES FROM DUCTWORK, SPRINKLER PIPING, WATER PIPING, WASTE PIPING, CONDUIT, CEILING WIRE, OR OTHER SYSTEM SUPPORTS.
 - y) THE CONDUITS OR SLEEVE WILL BE INSTALLED PER TIA/EIA-569-B AND SEAL ALL PENETRATION WITH APPROVED FIRE STOP PRODUCT.
 - z) PROVIDE INDEPENDENT SUPPORT SYSTEM FOR EACH LOW VOLTAGE CABLING SYSTEM.
- B. CABLE:
- a) CATEGORY 6A CABLE WILL BE RUN FOR DATA. CATEGORY 5 GELLED FILLED CABLE WILL BE RUN IN THE BACKBONE FOR ALL COMMUNICATIONS APPLICATIONS. CERTAIN ENVIRONMENTS MAY REQUIRE THE USE OF DIFFERENT CABLES AND/OR CABLE JACKETS.
 - b) ALL TERMINATIONS WILL UTILIZE T568B TERMINATION. INSTALLATIONS OUT OF COMPLIANCE WITH THIS WIRING REQUIREMENT SHALL BE CORRECTED AT NO COST TO USF.

- c) MAXIMUM CABLE LENGTHS TO BE 295 FEET (90 M) INCLUDING SERVICE LOOP. PROVIDE ALL NECESSARY INSTALLATION MATERIALS, TOOLS AND EQUIPMENT TO PERFORM INSULATION DISPLACEMENT TYPE TERMINATIONS AT ALL COMMUNICATIONS OUTLETS, PATCH PANELS.
- d) ALL COMMUNICATIONS CABLING THAT HAS BECOME ABANDONED AS PART OF NEW RENOVATION PROJECTS, PREVIOUS RENOVATION PROJECTS, OR TEMPORARY COMMUNICATION CABLES USED DURING THE CONSTRUCTION PROCESS SHALL BE COMPLETELY REMOVED.
- e) REFER TO DETAILED MANUFACTURER'S GUIDELINES FOR DEPLOYMENT OF CATEGORY 6A CABLE. CERTAIN RESTRICTIONS APPLY, AND SPECIFIC TECHNIQUES ARE RECOMMENDED.
- f) ALL CABLING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS' WRITTEN BEND RADIUS AND PULLING TENSIONS. GENERAL INDUSTRY GUIDELINES RECOMMEND THE FOLLOWING BEND RADIUS AND PULLING TENSIONS:
 - a) TENSILE LOADING ON A SINGLE 4-PAIR COPPER UTP CABLE SHALL NOT EXCEED 25 LBF.
 - b) BEND RADIUS OF A SINGLE 4-PAIR COPPER UTP CABLE SHALL NOT EXCEED 4 TIMES THE DIAMETER OF THE CABLE.
 - c) BEND RADIUS OF MULTI-PAIR COPPER UTP AND OPTICAL FIBER CABLE SHALL NOT EXCEED 10 TIMES THE DIAMETER OF THE CABLE.
- g) ALL CONDUITS AND CONDUIT SLEEVES SHALL HAVE BUSHINGS OR GROMMETS SHALL BE INSTALLED PRIOR TO THE INSTALLATION OF COMMUNICATIONS CABLES TO AVOID DAMAGE AND ABRASIONS TO CABLE SHEATHING AND INSULATION. IF BUSHINGS HAVE ARE INSTALLED BY THE ELECTRICAL CONTRACTOR, THE COMMUNICATIONS CABLING CONTRACT SHALL FURNISH AND INSTALL BUSHINGS PRIOR TO PULLING COMMUNICATIONS CABLING.
- h) HORIZONTAL CABLE LENGTH FOR 4-PAIR COPPER UTP CAT6A CABLES SHALL NOT EXCEED 295 FEET. PRIOR TO BIDDING AND INSTALLATION, THE CONTACTOR SHALL REVIEW THE DRAWINGS AND VERIFY NO CABLE RUN EXCEEDS 295 FEET AND NOTIFY THE COMMUNICATIONS DESIGNER OF CABLE RUNS THAT MAY EXCEED 295 FEET.
- i) SPLICES ARE NOT PERMITTED IN ANY VOICE OR DATA CABLING..
- j) AVOID PLACING COPPER CABLES NEAR SOURCES OF EXTREME HEAT (I.E. BOILERS, RADIATORS, HEAT COILS).

- k) MAINTAIN CABLE TWISTS FOR ALL UTP CABLES. FOR TERMINATIONS CABLE SHEATHING SHALL BE STRIPPING BACK NO MORE THAN ½" BACK FROM TERMINATION POINT FOR ALL CATEGORY 6A CABLES.
- l) ALL CABLES SHALL BE SUPPORTED BY CABLE TRAY, CABLE RUNWAY, OR J-HOOKS. WHEN LARGE QUANTITIES OF CABLES LEAVE TRAYS OR RUNWAYS, CABLES SHALL BE SUPPORTED BY DROP-OUTS OR CABLE SUPPORT HARDWARE MANUFACTURED SPECIFICALLY FOR THE PURPOSE OF SUPPORTING CABLES. J-HOOKS SHALL BE INSTALLED A MINIMUM OF EVERY 5 FEET AND CABLING SHALL MAINTAIN MINIMAL DEFLECTION AND STRAIN (LESS THAN 12" DEFLECTION). CABLES SHALL NOT BE SUPPORTED FROM CEILING GRID WIRES. CABLES SHALL NOT RUN ABOVE IRON JOISTS.
- m) ALL CABLES SHALL BE SEPARATED INTO LIKE GROUPS.
- n) ANY CABLING INSTALLED IN EQUIPMENT ROOMS SHALL BE NEATLY PLACED IN CABLE TRAYS, CABLE RUNWAYS, OR HORIZONTAL AND VERTICAL RACK/CABINET CABLE MANAGERS
- o) VELCRO CABLE TIES MAY BE USED TO SECURE PERMANENTLY INSTALLED HORIZONTAL AND BACKBONE CABLING; ANY VELCRO INSTALLED IN PLENUM CEILING SPACES SHALL BE RATED FOR USE IN PLENUM SPACES. VELCRO SHOULD BE TIGHTED TO THE POINT OF CHANGING THE CABLE GEOMETRY. TIE WRAPS, OR ZIP TIES SHALL NEVER BE USED.
- p) VELCRO STRAPS SHALL BE UTILIZED IN THE TR AND INSIDE TC ENCLOSURES FOR ALL CABLE BUNDLING. TIE WRAPS SHALL BE PROHIBITED IN THE TELECOMMUNICATION ROOMS.
- q) SEPARATION: MAINTAIN THE FOLLOWING DISTANCES BETWEEN CABLES, OTHER SYSTEM CABLES AND OTHER BUILDING SYSTEMS:
 - a) ONE (1) FOOT FROM FLUORESCENT LIGHTS.
 - b) ONE (1) FOOT FROM POWER CABLE IN PARALLEL
 - c) ONE (1) FOOT FROM ELECTRICAL CONDUITS, OTHER SYSTEMS CABLES OR OTHER ELECTRICAL EQUIPMENT.
 - d) FOUR (4) FEET FROM MOTORS AND TRANSFORMERS
 - e) THREE (3) FEET FROM HOT WATER PIPING OR OTHER MECHANICAL EQUIPMENT.
 - f) TEN (10) FEET FROM BUS CONDUCTORS OR HIGH-CURRENT BRANCH CIRCUITS

- g) ALL LOW VOLTAGE CABLES SHALL BE RUN PARALLEL OR AT RIGHT ANGLES TO BUILDING STRUCTURAL FRAMEWORK. DO NOT RUN CABLES DIAGONALLY ACROSS CEILING SPACE WITHOUT WRITTEN AUTHORIZATION BY THE ARCHITECT'S ELECTRICAL ENGINEER OR USF REPRESENTATIVE.
 - h) COMMUNICATIONS CABLING THAT MUST CROSS POWER CABLES OR CONDUIT SHALL CROSS AT A 90-DEGREE ANGLE, AND SHALL NOT MAKE PHYSICAL CONTACT.
 - r) FIRE SEAL AROUND ALL CABLES RUNNING THROUGH RATED FLOORS AND WALLS. FIRESTOP ALL CABLES AND PATHWAYS THAT PENETRATE FIRE-RATED BARRIERS USING APPROVED METHODS AND ACCORDING TO LOCAL CODES UTILIZING INTUMESCENT PUTTY.
 - s) LEAVE SPARE PULL STRING WITH EVERY OUTLET INSTALLED.
 - t) DO NOT INSTALL CABLE IN WET AREAS, OR IN PROXIMITY TO HOT WATER PIPES OR BOILERS.
 - u) CABLE ENDS FOR TERMINATION SHALL BE CLEAN AND FREE FROM CRUSH MARKS, CUTS, OR KINKS LEFT FROM PULLING OPERATIONS. INSTALLED CABLE JACKETS SHALL HAVE NO ABRASIONS WITH EXPOSED CONDUCTOR INSULATION OR BARE COPPER "SHINERS". THE INSTALLER IS RESPONSIBLE TO REPLACE DAMAGED CABLES.
 - v) BACKBONE CABLES SHALL BE INSTALLED AND BUNDLED SEPARATELY FROM HORIZONTAL DISTRIBUTION CABLES. BACKBONE AND HORIZONTAL CABLE BUNDLES SHALL BE LOOSE AND RANDOM.
 - w) BACKBONE CABLES SPANNING MORE THAN THREE FLOORS SHALL BE SUPPORTED AT THE TOP OF THE CABLE RUN WITH A WIRE MESH GRIP AND ON ALTERNATING FLOORS, UNLESS OTHERWISE SPECIFIED BY LOCAL CODES OR MANUFACTURER'S GUIDELINES.
 - x) VERTICAL RUNS OF BACKBONE CABLES ENTERING EACH TR SHALL BE SECURELY FASTENED ALONG A PROPERLY PREPARED WALL IN THE TR ON EACH FLOOR. USE OF CABLE LADDER IS RECOMMENDED.
- C. COMMUNICATIONS INFRASTRUCTURE
- a) MAXIMUM CABLE LENGTHS TO BE 295 FEET (90 M) INCLUDING SERVICE LOOP. PROVIDE ALL NECESSARY INSTALLATION MATERIALS, TOOLS AND EQUIPMENT
 - b) SUPPORT AND SECURE CABLES AT PATCH PANELS USING REAR CABLE MANAGEMENT BRACKET, SPOOLS OR MANAGEMENT DEVISE.

- c) INSTALL CATEGORY 3, MULTI-PAIR VOICE BACKBONE CABLES UTILIZING AN INDEPENDENT OPEN CABLING. THIS MAY REQUIRE GELLED FILLED CABLE FOR UNDER SLAB INSTALLATIONS.
 - d) FOR EACH VOICE CROSS-CONNECT, PROVIDE THE APPROPRIATE COLOR ICON AT EACH PATCH PANEL PORT AT THE TC'S AND/OR TR.
 - e) COMPLETE ALL CROSS-CONNECTS FOR ANALOG CENTRAL OFFICE FACILITIES AND ALARM LINES TO 110-TERMINATION BLOCK.
 - f) CROSS-CONNECTS SHALL BE COMPLETED AS PER CONSTRUCTION SCHEDULE.
- D. OPTICAL FIBER CABLE:
- a) ARMORED FIBER OF THE PROPER RATING WILL BE RUN BETWEEN EACH CLOSET.
 - b) CABLES FOR DIRECT BURIAL, AERIAL, OR OTHER OUTSIDE APPLICATIONS SHALL BE DESIGNED SPECIFICALLY FOR THE INTENDED PURPOSE.
 - c) ALL OPTICAL FIBER INSTALLATIONS SHALL BE INSTALLED USING OPEN CABLING METHODS. LIMIT CABLE-BENDING RADIUS TO 20 TIMES THE CABLE DIAMETER DURING INSTALLATION, AND 10 TIMES THE DIAMETER AFTER INSTALLATION. PROVIDE ALL REQUIRED TOOLS, MATERIALS, CONSUMABLES, AND EQUIPMENT NECESSARY FOR FIELD MOUNTING OF SC CONNECTORS.
 - d) DO NOT EXCEED THE MAXIMUM PULL TENSION SPECIFIED BY THE CABLE MANUFACTURER. USE APPROPRIATE LUBRICANTS AS REQUIRED TO REDUCE PULLING FRICTION. AVOID KINKING AND TWISTING OF CABLES DURING INSTALLATION.
 - e) LABEL EACH END OF EACH CABLE AS TO SOURCE AND DESTINATION. TERMINATE OPTICAL FIBERS IN CONSISTENT, CONSECUTIVE MANNER AT EACH END USING FUSION SPLICED FACTORY TERMINATED PIG-TAILS. LABEL OPTICAL FIBER RACEWAY CABLE WITH YELLOW "CAUTION - OPTICAL FIBER CABLE" TAGS EVERY 10 FEET. LEAVE 10 FEET OF SLACK AT EACH FIBER TERMINATION POINT. NEATLY COIL SLACK OPTICAL FIBER CABLE ON TOP OF RACK ABOVE OPTICAL FIBER PATCH PANEL ENCLOSURE AT EACH RACK LOCATION.
 - f) OPTICAL FIBER CABLE TERMINATIONS SHALL UTILIZE ENCLOSURES AND COMPONENTS IN QUANTITIES CONSISTENT WITH THE REQUIRED FIBER COUNTS AT EACH END OF EACH SEGMENT.
 - g) DURING INSTALLATION OF OPTICAL FIBER CABLE DO NOT ALLOW PULLING TENSION TO EXCEED CABLE MANUFACTURER'S SPECIFICATION FOR THE CABLE BEING INSTALLED. ONLY THE STRENGTH MEMBER OF THE CABLE SHALL BE SUBJECTED TO THE PULLING TENSION.

- h) CLEAN ALL OPTICAL FIBER CONNECTOR TIPS PRIOR TO INSERTING THEM INTO MATTING RECEPTACLES OR BULKHEADS. INSTALL ALL DUST COVERS
 - i) USING APPROVED METHODS, PULL CABLE INTO CONDUIT, OR PLACE INTO RACEWAY OR CABLE TRAY AS SPECIFIED. A PULL CORD (NYLON; 1/8" MINIMUM) SHALL BE CO-INSTALLED WITH ALL CABLE INSTALLED IN ANY CONDUIT.
 - j) WHERE CABLES ARE INSTALLED IN AIR RETURN PLENUM, RISER RATED CABLE SHALL BE INSTALLED IN METALLIC CONDUIT.
 - k) BACKBONE AND HORIZONTAL CABLES SHALL BE INSTALLED AND BUNDLED SEPARATELY IN ANY PATHWAY.
 - l) CABLES ABOVE CEILINGS OR BELOW ACCESS FLOORS SHALL BE INSTALLED IN CABLE TRAY OR OPEN-TOP CABLE HANGERS.
 - m) CABLE SLACK AND SERVICE COILS SHALL BE STORED PROPERLY ABOVE THE CEILING OR UNDER THE ACCESS FLOOR. PATHWAY FILL RATIO IN CONDUIT, TRAY, RACEWAY, ETC. SHALL NOT EXCEED 40% OF PATHWAY CROSS-SECTIONAL AREA.
 - n) A SERVICE COIL OF AT LEAST 1 METER IS RECOMMENDED WITHIN WORKSTATION OUTLETS, AND AT LEAST 2 METERS IS RECOMMENDED FOR TELECOMMUNICATIONS ENCLOSURES. MAIN TRUNK AND OSP CABLES SHALL ALSO HAVE A LARGE DIAMETER SERVICE COIL IN THE SPECIFIED LOCATION.
 - o) RECOMMENDED MAXIMUM SPACING OF CABLE SUPPORTS ABOVE THE CEILING IS 60 IN.
 - p) BACKBONE CABLES SPANNING MORE THAN THREE FLOORS SHALL BE SECURELY ATTACHED AT THE TOP OF THE CABLE RUN WITH A WIRE MESH GRIP AND ON ALTERNATING FLOORS OR AS REQUIRED BY LOCAL CODES.
 - q) VERTICAL RUNS OF CABLE SHALL BE SUPPORTED TO MESSENGER STRAND, CABLE LADDER, OR OTHER APPROVED STRUCTURE TO SUPPORT THE WEIGHT OF THE CABLE. DO NOT EXCEED MAXIMUM CABLE VERTICAL RISE LIMITS.
 - r) CABLES THAT ARE DAMAGED DURING INSTALLATION SHALL BE REPLACED BY THE CONTRACTOR.
- E. RACKS AND ENCLOSURES:
- a) FREESTANDING EQUIPMENT RACKS AND ENCLOSURES SHALL BE PROTECTED FREE OF ALL DUST, DEBRIS AND OTHER ENVIRONMENTAL ELEMENTS DURING CONSTRUCTION UNTIL SUBSTANTIAL COMPLETION WALK-THROUGH.

- b) EACH RACK, ENCLOSURE SHALL HAVE A DEDICATED #6 AWG GROUND WIRE TO A GROUNDING BUSBAR OR BUILDING GROUND AS DEFINED BY NEC.
- c) AN ISOLATION PAD WILL BE INSTALLED PRIOR TO FASTENING THE RACK TO THE FLOOR
- d) SECURE RACKS AND ENCLOSURES TO FLOOR USING RACK INSTALLATION KIT.

F. CATEGORY 6A JACKS

- a) REFER TO SPECIFIC MANUFACTURER'S GUIDELINES FOR TERMINATION OF JACKS AND DRESSING CATEGORY 6A CABLES INSIDE WALL OUTLETS AND SURFACE HOUSINGS. DUE TO THE LARGER SIZE OF CATEGORY 6A CABLE, SERVICE COILS IN OUTLET BOXES AND SURFACE HOUSINGS ARE NOT RECOMMENDED.
- b) TERMINATE JACKS ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
- c) ALL JACK WILL BE WIRED UTILIZING T568B.
- d) TO ASSURE 10GBASE-T PERFORMANCE, MAINTAIN WIRING PAIR TWISTS AS CLOSE AS POSSIBLE TO THE POINT OF TERMINATION. ALSO MINIMIZE THE LENGTH OF EXPOSED PAIRS FROM THE JACKET TO THE IDC TERMINATION POINT DURING INSTALLATION.
- e) THE LENGTH OF WIRING PAIR UN-TWIST IN EACH TERMINATION SHALL BE LESS THAN 0.5 INCHES (13 MM).
- f) JACKS SHALL BE PROPERLY MOUNTED IN PLATES, FRAMES, OR HOUSINGS WITH DUST CAPS FULLY INSTALLED OVER IDC CONTACTS.
- g) HORIZONTAL CABLES EXTENDING FROM MOUNTED JACKS SHALL MAINTAIN A MINIMUM BEND RADIUS OF AT LEAST 4 TIMES THE CABLE DIAMETER, UNLESS SPACE IS RESTRICTED. NOTE: REFER TO SPECIFIC MANUFACTURER'S RECOMMENDATIONS FOR RESTRICTED CABLE BEND RADIUS.
- h) CABLE TERMINATIONS SHALL MINIMIZE TENSILE OR BENDING STRAIN ON IDC CONTACTS AFTER ASSEMBLY OF FACEPLATE OR HOUSING TO THE WALL OUTLET.

G. CATEGORY 6A PATCH PANELS

- a) PROPERLY MOUNT PATCH PANELS INTO THE DESIGNATED RACK, CABINET, OR BRACKET LOCATIONS WITH THE #12-24 SCREWS PROVIDED.
- b) TERMINATE CABLES BEHIND THE PATCH PANEL ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

- c) TO ASSURE PERFORMANCE, MAINTAIN WIRING PAIR TWISTS AS CLOSE AS POSSIBLE TO THE POINT OF TERMINATION. ALSO MINIMIZE THE LENGTH OF EXPOSED PAIRS TO THE TERMINATION POINT DURING INSTALLATION.
 - d) THE LENGTH OF WIRING PAIR UN-TWIST IN EACH TERMINATION SHALL BE LESS THAN 0.5 INCHES (13 MM), AND SHALL BE KEPT TO A MINIMUM.
 - e) EACH TERMINATED AND DRESSED CABLE SHALL BE MAINTAINED PERPENDICULAR TO THE REAR COVER USING THE RECOMMENDED CABLE MANAGEMENT HARDWARE.
 - f) HORIZONTAL OR BACKBONE CABLES EXTENDING FROM THE REAR PANEL TERMINATIONS SHALL MAINTAIN A MINIMUM BEND RADIUS OF AT LEAST 4 TIMES THE CABLE DIAMETER.
 - g) PANELS SHALL BE PROPERLY LABELED ON THE FRONT AND CABLES SHOULD BE INDIVIDUALLY LABELED ON BACK
- H. OPTICAL FIBER CONNECTORS, HORIZONTAL AND BACKBONE
- a) METHOD OF CONNECTOR TERMINATION SHALL BE FACTORY TERMINATED PIGTAIL FUSION SPLICED
 - b) INSTALLED FIBER CONNECTORS SHALL HAVE PROPER CABLE SUPPORT, ROUTING AND STRAIN RELIEF.
 - c) INSTALLED CONNECTORS SHALL BE INSPECTED 100% FOR POLISH QUALITY, AND CONTAMINATION.
 - d) FIBERS TERMINATED FROM OSP CABLE SHALL HAVE BREAK-OUT KITS INSTALLED WHERE APPLICABLE.
 - e) FUSION SPLICES FOR PIGTAIL CONNECTIONS SHALL BE PROTECTED IN A SUITABLE ENCLOSURE.
- I. GROUNDING AND BONDING SYSTEMS: BASIC GUIDELINES
- a) TELECOMMUNICATIONS GROUNDING AND BONDING SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH NEC REQUIREMENTS, AND PER THE GUIDELINES OF ANSI EIA/TIA 607. INSTALLATION OF THE SYSTEM SHALL BE BY A LICENSED ELECTRICIAN.
 - b) THE TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB) SHALL BE BONDED TO THE BUILDING MAIN ELECTRICAL SERVICE GROUND (GROUNDING ELECTRODE CONDUCTOR OR GEC), USING APPROVED LUGS OR EXOTHERMIC WELD METHODS. BONDING TO THE GEC OR TMGB WITH SHEET METAL SCREWS IS PROHIBITED.

- c) THE TELECOMMUNICATIONS BONDING BACKBONE SHALL BE A MINIMUM 6 AWG COPPER WIRE CONDUCTOR. A TELECOMMUNICATIONS GROUNDING BUSBAR (TGB) SHALL BE INSTALLED IN THE TR ON EACH FLOOR, AND SHALL BE BONDED TO THE TBB. ALL METAL RACKS, CABINETS, AND ENCLOSURES SHALL BE BONDED TO THE TGB.
- d) TELECOMMUNICATIONS EQUIPMENT SHALL BE GROUNDED ACCORDING TO MANUFACTURER'S INSTRUCTIONS AND IN ACCORDANCE WITH APPLICABLE CODES.
- e) ALL METALLIC PATHWAYS, INCLUDING CONDUIT, RACEWAY LADDER OR CABLE TRAYS SHALL BE ELECTRICALLY CONTINUOUS AND SHALL BE BONDED TO GROUND ON EACH END.
- f) OSP CABLE ENTERING THE BUILDING OR BACKBONE CABLES HAVING METAL SHEATHS SHALL HAVE ISOLATION PROTECTION. ISOLATION PROTECTORS SHALL BE BONDED TO THE TMGB.

J. PROTECTION

- a) THE ELECTRICAL PROTECTION IS GOVERNED BY THE APPLICABLE ELECTRICAL CODES.
- b) TERMINATIONS FOR ENTRANCE FACILITY COPPER CABLE SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS' SPECIFICATIONS AND MEET LOCAL AHJ REQUIREMENTS. ALL COPPER INTER-BUILDING BACKBONE CABLES AND ANTENNAS REQUIRE PROTECTION DEVICES.
- c) THE ENTRANCE FACILITIES INCLUDE CONNECTIONS BETWEEN CABLING USED IN THE OUTSIDE ENVIRONMENT AND CABLING AUTHORIZED FOR IN-BUILDING DISTRIBUTION.
- d) THESE CONNECTIONS MAY BE ACCOMPLISHED VIA A SPLICE OR OTHER MEANS.
- e) IN THE ENTRANCE FACILITY THAT CONNECTS WITH THE ACCESS PROVIDER, YOU ARE REQUIRED TO ALWAYS CONTACT ACCESS PROVIDERS TO DETERMINE THE NEEDS AND POLICIES OF THE INSTALLATION.

K. FIRE STOP

- a) BEFORE BEGINNING INSTALLATION, VERIFY THAT SUBSTRATE CONDITIONS PREVIOUSLY INSTALLED UNDER OTHER SECTIONS ARE ACCEPTABLE FOR INSTALLATION OF FIRESTOPPING IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS AND TECHNICAL INFORMATION.

- b) SURFACES SHALL BE FREE OF DIRT, GREASE, OIL, SCALE, LANTANCE, RUST, RELEASE AGENTS, WATER REPELLANTS, AND ANY OTHER SUBSTANCES THAT MAY INHIBIT OPTIMUM ADHESION.
- c) PROVIDE MASKING AND TEMPORARY COVERING TO PROTECT ADJACENT SURFACES.
- d) DO NOT PROCEED UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
- e) INSTALL THROUGH-PENETRATION FIRESTOP SYSTEMS IN ACCORDANCE WITH PERFORMANCE CRITERIA AND IN ACCORDANCE WITH THE CONDITIONS OF TESTING AND CLASSIFICATION AS SPECIFIED IN THE PUBLISHED DESIGN.
- f) COMPLY WITH MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION OF FIRESTOPPING PRODUCTS.
- g) KEEP AREAS OF WORK ACCESSIBLE UNTIL INSPECTION BY AUTHORITIES HAVING JURISDICTION.WHERE DEFICIENCIES ARE FOUND, REPAIR FIRESTOPPING PRODUCTS SO THEY COMPLY WITH REQUIREMENTS.
- h) REMOVE EQUIPMENT, MATERIALS, AND DEBRIS, LEAVING AREA IN UNDAMAGED, CLEAN CONDITION.
- i) CLEAN ALL SURFACES ADJACENT TO SEALED OPENINGS TO BE FREE OF EXCESS FIRESTOPPING MATERIALS AND SOILING AS WORK PROGRESSES.

3.3 LABELING

A. GENERAL:

- a) ALL LABELS SHALL BE PERMANENT, MACHINE GENERATED LABELS PRODUCED BY A LABELING MACHINE. PATCH PANEL LABELS SHALL BE A PERMANENT POLYESTER MATERIAL WHITE IN COLOR WITH LABEL LETTERING BLACK IN COLOR. WORK AREA OUTLETS SHALL BE LABELED WITH FLEXIBLE NYLON WHITE IN COLOR WITH LABEL LETTERING BLACK IN COLOR. NO HAND WRITTEN LABELS WILL BE ACCEPTED.
- b) LABELING INFORMATION WILL BE REVIEWED AT PRE-INSTALL MEETING, AND THE OWNER SHALL APPROVE THE LABELING SCHEME PRIOR TO THE INSTALLATION OF ANY CABLING.
- c) SURFACES SHALL BE CLEANED BEFORE ATTACHING LABELS. ALL LABELS SHALL BE ATTACHED FIRMLY AND VERTICALLY PLUMB ON EQUIPMENT, FACEPLATES, PATCH PANELS TERMINATION BLOCKS, ETC.

- d) ALL LABELING OF CABLES, EQUIPMENT, AND COMPONENTS SHALL BE INCLUDED IN AS-BUILT DOCUMENTATION, FLOOR PLAN DRAWINGS, AND SCHEMATIC DEIGNS.

B. CABLING

- a) ALL STRUCTURED CABLES (HORIZONTAL AND BACKBONE) SHALL BE LABELED AT BOTH ENDS WITHIN 6" OF CABLE TERMINATION POINT. WHERE VOICE BACKBONE CABLES EXTEND BEHIND TERMINATION BLOCKS, CABLE LABELS SHALL BE PLACED AT A LOCATION ON THE CABLE WHERE THE LABELS ARE VISIBLE FROM THE FRONT OF THE TERMINATION BLOCKS.
- b) LABELS SHALL HAVE AN ADHESIVE BACKING AND SHALL WRAP COMPLETELY AROUND THE CIRCUMFERENCE OF THE CABLE JACKET. LABEL AND LETTERING SIZES SHALL BE OF APPROPRIATE SIZE IN REGARDS TO CABLE DIAMETER.

C. EQUIPMENT RACKS, TERMINATION HARDWARE, AND FACEPLATES

- a) ALL COMMUNICATIONS EQUIPMENT RACKS, CABINETS, FIBER ENCLOSURES, AND TERMINATION HARDWARE SHALL BE CLEARLY LABELED AT THE TOP, LEFT-HAND CORNER OF THE EQUIPMENT.
- b) EQUIPMENT RACKS AND CABINETS SHALL HAVE $\frac{3}{4}$ " TO 1" HIGH LETTERING AND SHALL BE LABELED WITH THE TELECOMMUNICATIONS ROOM NUMBER FOLLOWED BY AN ALPHANUMERIC CHARACTER IN SEQUENCE FOR EACH RACK/CABINET. (I.E. TR2-A REPRESENTS THE FIRST RACK/CABINET IN TELECOMMUNICATIONS ROOM #2)
- c) FIBER ENCLOSURES SHALL HAVE $\frac{3}{8}$ " TO $\frac{1}{2}$ " HIGH LETTERING AND SHALL BE LABELED WITH THE TELECOMMUNICATIONS ROOM NUMBER FOLLOWED BY AN ALPHANUMERIC CHARACTER OF THE RACK/CABINET AND THE ENCLOSURE NUMBER (I.E. TR1-B-1 REPRESENTS THE FIRST ENCLOSURES, SECOND RACK/CABINET IN TELECOMMUNICATIONS ROOM #1). ADDITIONALLY, EACH STRAND OF FIBER SHALL BE IDENTIFIED WITH THE TERMINATION LOCATION OF THE OPPOSITE END AND THE FIBER POSITION NUMBER ON THE OUTSIDE (OR INSIDE) FRONT COVER AND TOP, LEFT-HAND CORNER OF THE ENCLOSURE UNDER THE ENCLOSURE LABEL.
- d) MODULAR PATCH PANELS SHALL HAVE $\frac{3}{8}$ " TO $\frac{1}{2}$ " HIGH LETTERING. EACH PATCH PANEL PORT SHALL BE LABELED WITH THE ROOM NUMBER OF THE DATA OUTLET FOLLOWED BY A '-' FOLLOWED BY A LETTER AND NUMBER DESIGNATION. (I.E. 100-A1 100-A2 100-A3 100-B1 ETC)
- e) SEQUENTIALLY THROUGH ALL COMMUNICATIONS ROOMS. HORIZONTAL VOICE.
- f) DATA OUTLETS SHALL HAVE $\frac{3}{16}$ " ROOM WHERE CABLES ARE TERMINATED FOLLOWED BY A '-' FOLLOWED BY A LETTER AND NUMBER DESIGNATION. (I.E.

100-A1 100-A2 100-A3 100-B1 ETC) HIGH LETTERING WITH THE LABELING METHOD AS INDICATED. DATA OUTLETS SHALL BE IDENTIFIED WITH THE

- g) THE RACK/CABINET NUMBER, THE PATCH PANEL NUMBER, AND THE JACK POSITION NUMBER SHALL MATCH ON BOTH ENDS. THE CONTRACTOR SHALL TERMINATE ALL CABLING IN A SEQUENTIAL METHOD.

3.4 TESTING

A. CATEGORY 6A CABLE TESTING

- a) PERMANENT LINK TESTING SHALL BE COMPLETED ON ALL HORIZONTAL (STATION) CABLES. THE CONTRACTOR WILL BE RESPONSIBLE TO SUPPLY A LINK WARRANTY.
- b) CATEGORY 6A CABLING SYSTEMS SHALL BE TESTED AS AN INSTALLED HORIZONTAL PERMANENT LINK CONFIGURATION. JACKS AND FACEPLATES SHALL BE ASSEMBLED COMPLETE AND PROPERLY MOUNTED INTO OUTLET BOXES. PANELS SHALL BE TERMINATED COMPLETE AND FULLY DRESSED WITH PROPER CABLE MANAGEMENT
- c) ALL WIRING SHALL BE CERTIFIED TO MEET OR EXCEED THE SPECIFICATIONS AS SET FORTH IN TIA/EIA-568B FOR CATEGORY 6A REQUIREMENTS FOR PERMANENT LINK. ALL TEST WILL BE PERFORMED TO 250MHZ.
- d) FIELD TESTING SHALL INCLUDE THE FOLLOWING PARAMETERS FOR EACH PAIR OF EACH CABLE INSTALLED:
 - a) NAME OF THE PERSON PERFORMING THE TEST.
 - b) TEST EQUIPMENT MANUFACTURER AND MODEL NUMBER.
 - c) CABLE I.D. THE TEST SHEETS WILL BE IN NUMERICAL ORDER BY CABLE ID.
 - d) DATE OF TEST.
 - e) WIRE MAP (PIN TO PIN CONNECTIVITY AND POLARITY CHECK)
 - f) LENGTH (IN FEET)
 - g) INSERTION LOSS.
 - h) NEAR END CROSSTALK (NEXT).
 - i) POWER SUM NEAR END CROSSTALK (PSNEXT).

- j) EQUAL-LEVEL FAR END CROSSTALK (ELFEXT).
 - k) POWER SUM EQUAL-LEVEL FAR END CROSSTALK (PSELFEXT).
 - l) RETURN LOSS.
 - m) DELAY SKEW.
 - n) ATTENUATION TO CROSSTALK RATIO (ACR).
- e) A "PASS" INDICATION SHALL BE OBTAINED FOR EACH LINK, USING AT MINIMUM A LEVEL III TESTER THAT COMPLIES WITH TIA/EIA-568-C.2 FIELD TEST REQUIREMENTS.
- f) RECORD TEST RESULTS FOR EACH CABLE AND TURN OVER TO THE GENERAL CONTRACTOR UPON COMPLETION OF THE JOB. CORRECT MALFUNCTIONS WHEN DETECTED, AND RE-TEST TO DEMONSTRATE COMPLIANCE. NOTE: TEST EQUIPMENT SHALL BE A TYPE III CABLE TESTER.

B. OPTICAL FIBER TESTING:

- a) TEST PROCEDURES SHALL BE AS DESCRIBED BY THE TIA/EIA-568-C.0: COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD, PARTS 2 AND 3 AND TIA/EIA-526-14-A-1998 - OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED MULTIMODE FIBER CABLE PLANT-OFSTP-14A
- b) PREINSTALLATION TESTING:
- a) TEST EACH CONDUCTOR OF EVERY OPTICAL FIBER CABLE ON THE REEL WITH A LIGHT SOURCE AND A POWER METER.
 - b) OBTAIN THE CABLE MANUFACTURER POWER METER TEST RESULTS FOR EACH REEL USED ON THE PROJECT. USING THE ATTACHED OPTICAL FIBER TEST FORM RECORD THE READINGS AND THE MANUFACTURER'S REEL NUMBER. PRIOR TO COMPLETION OF PROJECT, TURN OVER THE COMPLETED OPTICAL FIBER TEST FORM, OPTICAL FIBER CABLE REEL ID TAGS AND OPTICAL FIBER CABLE MANUFACTURER'S TEST RESULTS.
- c) ACCEPTANCE TESTING:
- a) EACH TERMINATED FIBER STRAND IN THE HORIZONTAL OR BACKBONE INFRASTRUCTURE SHALL BE TESTED INDIVIDUALLY AS A PERMANENT LINK. A FIBER PERMANENT LINK IS DEFINED AS A LENGTH OF INDIVIDUAL FIBER STRAND WITH A CONNECTOR TERMINATED ON EACH END.

- b) TESTING FOR MULTIMODE SHALL BE AT 850 AND 1300 NANOMETERS. TOTAL LINK INSERTION LOSS (DB) SHALL BE WITHIN THE SPECIFIED LINK LOSS BUDGET.
- c) TIER 1 TESTING FOR EACH INSTALLED SINGLEMODE LINK SHALL BE PERFORMED AS AN OPTICAL POWER INSERTION LOSS MEASUREMENT, AS DEFINED BY ANSI/TIA/EIA-526-7. TESTING FOR SINGLEMODE SHALL BE AT 1310 AND 1550 NANOMETERS. TOTAL LINK INSERTION LOSS (DB) SHALL BE WITHIN THE SPECIFIED LINK LOSS BUDGET.
- d) TIER 2 TESTING, IF REQUIRED FOR EACH INSTALLED SINGLEMODE OR MULTIMODE LINK, SHALL BE PERFORMED AS AN OTDR MEASUREMENT, AS DEFINED IN TIA-TSB-140. WE REQUIRE TIER 2 TESTING ON ALL FIBERS INSTALLED IN THE FACILITY FOR FUTURE TROUBLESHOOTING.
- e) MULTIMODE OPTICAL FIBER ATTENUATION SHALL BE TESTED ON ALL INDIVIDUAL FIBERS OF EACH CABLE SEGMENT USING AN LED LIGHT SOURCE AND POWER METER TO DETERMINE THE ACTUAL LOSS. THESE TESTS SHALL BE PERFORMED AT THE 850NM AND 1300NM WINDOWS IN BOTH DIRECTIONS. TEST SET UP AND PERFORMANCE SHALL BE IN ACCORDANCE WITH ANSI/TIA/EIA-526-14A, METHOD B.
- f) A REFERENCE POWER MEASUREMENT SHALL BE OBTAINED BY CONNECTING ONE END OF TEST JUMPER 1 TO THE LIGHT SOURCE AND THE OTHER END TO THE POWER METER. AFTER RECORDING THE REFERENCE POWER MEASUREMENT, TEST JUMPER 1 SHALL BE DISCONNECTED FROM THE POWER METER WITHOUT DISTURBING THE LIGHT SOURCE AND ATTACHED TO THE CABLE PLANT. THE POWER METER SHALL BE MOVED TO THE FAR END OF THE CABLE PLANT AND ATTACHED TO THE CABLE PLANT WITH TEST JUMPER 2.
- g) READINGS MUST NOT BE HIGHER THAN THE "OPTIMAL ATTENUATION LOSS." THE OAL WILL BE CALCULATED USING THE MANUFACTURER'S FACTORY CERTIFIED TEST RESULTS, (DB/KM) CONVERTED TO THE ACTUAL INSTALLED LENGTHS PLUS THE MANUFACTURER'S BEST PUBLISHED ATTENUATION LOSSES FOR THE CONNECTOR AND/OR SPLICE INSTALLED ON THIS PROJECT. (0.30+/-0.30 FOR CONNECTORS AND 0.10 FOR SPLICES). THE CONSTRUCTION MANAGER SHALL USE THE OAL FOR COMPARISON WITH THE END TO END POWER LOSS TEST RESULTS PRIOR TO ACCEPTANCE.
- h) TEST RESULTS: MUST BE COMPLETED AND TURNED OVER TO THE GENERAL CONTRACTOR PRIOR TO ACTIVE EQUIPMENT INSTALLATION. SPECIFIC DUE DATES FOR OPTICAL FIBER WILL BE ESTABLISHED AT PRE-INSTALL MEETING.

3.5 DOCUMENTATION

A. TEST RESULTS

- a) ALL TEST RESULTS ARE TO BE SAVED AND DELIVERED ELECTRONICALLY. TEST DOCUMENTATION SUBMITTED ON DISK SHALL BE CLEARLY MARKED ON THE COVER WITH THE WORDS "PROJECT TEST DOCUMENTATION", THE PROJECT NAME, AND THE DATE OF COMPLETION (MONTH AND YEAR). FOR MULTIPLE BUILDINGS, THE BUILDING NAME, INCLUDING FLOOR OR WING I.D. SHOULD ALSO BE INCLUDED ON THE TEST RESULTS DISK.
- b) FILE NAMES OF THE TEST RESULTS RECORDED FOR EACH LINK SHALL MATCH THE OFFICIAL IDENTIFICATION. TEST RESULTS SHALL INCLUDE A COMPLETE RECORD FOR EACH LINK, INCLUDING TYPE OF TEST, CABLE TYPE, CABLE/PORT I.D., MEASUREMENT DIRECTION, REFERENCE SETUP, DATE, AND TECHNICIAN'S NAME(S).
- c) THE TEST EQUIPMENT NAME, MANUFACTURER, MODEL NUMBER, SERIAL NUMBER, SOFTWARE VERSION AND LAST CALIBRATION DATE SHALL ALSO BE PROVIDED IN THE TEST RESULTS DOCUMENTATION.
- d) WHEN REPAIRS AND RE-TESTS ARE PERFORMED, THE PROBLEM CAUSE AND CORRECTIVE ACTION TAKEN SHALL BE NOTED, AND BOTH THE FAILED AND PASSED TEST DATA SHALL BE DOCUMENTED.
- e) THE OWNER, ENGINEER, LEAD PROJECT MANAGER, OR OWNER'S REPRESENTATIVE RESERVE THE RIGHT TO REQUEST VERIFICATION OF TEST RESULTS WITH A RE-TEST OF INSTALLED CABLES, ON A SAMPLING BASIS. RE-TESTING SHALL BE AT THE EXPENSE OF THE INSTALLER UNLESS OTHERWISE NOTED IN THE CONTRACT DOCUMENTS.

B. AS BUILT DRAWINGS

- a) DEVIATIONS FROM THE APPROVED DRAWINGS, WHETHER OR NOT A CHANGE ORDER IS SUBMITTED, SHALL BE CLEARLY DENOTED AS BUILT ON THE WORKING HARD COPY DRAWING BY THE TELECOMMUNICATIONS CONTRACTOR. AS-BUILT DRAWINGS SHALL BE RETURNED PROMPTLY TO THE OWNER OR DESIGN AGENT FOR COMPLETION OF DRAFTING REVISIONS TO THE ORIGINAL DESIGN. SEE "DOCUMENTATION – CHANGE ORDERS" BELOW. MANUFACTURER'S WARRANTY REGISTRATIONS MAY ALSO REQUIRE AS-BUILT DRAWINGS.
- b) FLOOR PLAN DRAWINGS SHALL AT MINIMUM INCLUDE DETAILED CABLE AND PATHWAY LAYOUTS, EXACT LOCATIONS OF WORKSTATION OUTLETS, AND CABLE DISTRIBUTION HARDWARE LOCATIONS. WORKSTATION OUTLETS SHALL HAVE ALPHANUMERIC IDENTIFIERS ON THE DRAWINGS AS SPECIFIED BY THE END USER OR OWNER.

C. CHANGE ORDERS

- a) ANY DEVIATION FROM THE APPROVED CONTRACT DRAWINGS OR SPECIFICATIONS SHALL BE SUBMITTED AS A WRITTEN CHANGE ORDER.
- b) EXECUTION OF WORK, TO PERFORM CHANGES, SHALL NOT PROCEED WITHOUT PRIOR WRITTEN APPROVAL. ANY CHANGES DONE WITHOUT WRITTEN APPROVAL WILL BE AT NO COST TO USF . IF THE WORK IS SHOWN TO BE INCORRECT THE CONTRACTOR WILL HAVE TO CORRECT THE PROBLEM AT NO COST TO USF .
- c) SIGNIFICANT CHANGES MAY REQUIRE A WRITTEN QUOTATION OF ADDITIONAL LABOR AND MATERIALS FROM THE TELECOMMUNICATIONS CONTRACTOR.
- d) IT IS THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE TO BEAR THE ADDED COST OF ANY SUBSTANTIAL CABLING SYSTEM DESIGN CHANGES. THE CONTRACTOR WILL NOT PROCEED WITH ANY CHANGE ORDERS WITHOUT WRITTEN APPROVAL BY THE OWNER'S REPRESENTATIVE OF USF IT. ANY CHANGES NOT APPROVED BY THE OWNER'S REPRESENTATIVE OF USF IT WILL BE RESPONSIBILITY OF THE CONTRACTOR AND AT NO COST TO USF .
- e) FIELD CHANGES THAT ARE COMPLETED WITHOUT ISSUANCE OF REVISED DRAWINGS SHALL BE CLEARLY DENOTED ON THE WORKING AS-BUILT DRAWING. REFER TO "AS-BUILT DRAWINGS" ABOVE.

D. PUNCH LISTS AND CORRECTIVE ACTION

- a) AS REQUIRED IN THE CONTRACT DOCUMENTS, THE TELECOMMUNICATIONS CONTRACTOR SHALL CORRECT PUNCH-LISTS ITEMS DETERMINED TO BE IN VIOLATION OF DRAWINGS, SPECIFICATIONS, CODES, STANDARDS OR REGULATIONS.
- b) THE CONTRACTOR SHALL BE RESPONSIBLE FOR TIMELY RE-WORK OF FAULTY CABLING OR HARDWARE INSTALLATIONS.
- c) THE OWNER RESERVES THE RIGHT TO WITHHOLD FINAL PAYMENT UNTIL PUNCH LIST ITEMS ARE RESOLVED SATISFACTORILY.

3.6 MANUFACTURER'S WARRANTY

- A. THE MANUFACTURER WARRANTS CATEGORY 6A CABLING, OPTICAL FIBER CABLING AND CONNECTING COMPONENTS FREE OF DEFECTS IN MATERIAL OR WORKMANSHIP.
- B. CATEGORY 6A AND OPTICAL FIBER CABLING AND COMPONENTS ARE WARRANTED TO PERFORM THE INTENDED APPLICATION UPON COMPLETION OF PROPER INSTALLATION AND TESTING.
- C. WARRANTY COVERAGE INCLUDES APPLICATION ASSURANCE AND COMPLIANCE TO APPLICABLE PERFORMANCE SPECIFICATIONS.

- D. INSTALLED CATEGORY 6A CABLING SYSTEMS MAY BE GRANTED A FULL CHANNEL WARRANTY UNDER THE CONDITIONS STATED BELOW.
- a) A CERTIFIED INSTALLER REGISTERED WHO HAS COMPLETED A MANUFACTURER'S TRAINING PROGRAM PERFORMS THE CONSTRUCTION.
 - b) CONTRACTORS PERFORMING THE CERTIFIED INSTALLATION ARE PROPERLY REGISTERED IN THE MANUFACTURER'S WARRANTY PROGRAM.
 - c) CABLE USED IN THE INSTALLATION IS QUALIFIED AND RECOGNIZED BY CONNECTIVITY MANUFACTURER.
 - d) INSTALLED LINK SYSTEMS ARE PROPERLY DOCUMENTED AND TESTED WITH A "PASS" RESULT. THE COUNTY REQUIRES A LINK TEST AND THE USE OF MANUFACTURER PATCH CORDS TO RECEIVE A CHANNEL WARRANTY.
 - e) FIELD TEST EQUIPMENT USED FOR CATEGORY 6A CABLING IS MINIMUM LEVEL III CLASSIFICATION, AND COMPLIES WITH TIA/EIA-568-C.2 REQUIREMENTS.
 - f) REQUIRED TEST RESULTS, SUBMITTED ELECTRONICALLY, AND PROJECT DOCUMENTATION INCLUDING AS-BUILT DRAWINGS, ARE SUBMITTED TO THE MANUFACTURER BY THE REGISTERED CONTRACTOR.

3.7 MOVES, ADDS AND CHANGES

- A. MOVES, ADDS AND CHANGES INITIATED BY THE OWNER, END USER, PROJECT MANAGER, OR DESIGN AGENT, WHICH ARE BEYOND THE SCOPE OF WORK IN THE ORIGINAL CONTRACT, SHALL REQUIRE A REVISED QUOTATION BY THE TELECOMMUNICATIONS CONTRACTOR TO USE IT.
- B. IT IS THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE TO BEAR THE ADDED COST OF ANY SUBSTANTIAL CABLING SYSTEM DESIGN CHANGES.
- C. MOVES, ADDS AND CHANGES SHALL EITHER BE ISSUED IN REVISED DRAWINGS, OR OTHERWISE SHALL BE CLEARLY DENOTED ON AS-BUILT DRAWINGS.
- D. MOVES, ADDS AND CHANGES THAT AFFECT INSTALLATIONS COVERED IN A MANUFACTURER'S WARRANTY SHALL BE PERFORMED BY A CERTIFIED CONTRACTOR THAT IS PROPERLY REGISTERED IN THE MANUFACTURER'S WARRANTY PROGRAM.

3.8 SYSTEM MAINTENANCE AND REPAIR

- A. MAINTENANCE OF THE CABLING INFRASTRUCTURE IS TO BE DONE BY AUTHORIZED PERSONNEL ONLY, OR VOID OF MANUFACTURER'S WARRANTY MAY RESULT. IT IS THE RESPONSIBILITY OF THE OWNER OR END USER TO UTILIZE A CERTIFIED INSTALLER TO MAINTAIN WARRANTY COVERAGE ON EXISTING OR NEW CABLING INFRASTRUCTURE.

- B. THE TELECOMMUNICATIONS CONTRACTOR SHALL FURNISH A QUOTATION FOR TIME AND MATERIAL TO PERFORM MAINTENANCE AND REPAIRS. THE OWNER HAS THE FIRST RIGHT OF REFUSAL OF SELECTING A SUITABLE CONTRACTOR OR QUALIFIED INTERNAL PERSONNEL TO PERFORM MAINTENANCE AND REPAIRS ON STRUCTURED CABLING.
- C. ADDITIONS OF NEW CABLING, EITHER HORIZONTAL OR BACKBONE, SHALL BE COMPLETED, TESTED, AND DOCUMENTED INTO PERMANENT BUILDING RECORDS. NEW CABLING INSTALLATIONS INTENDED TO BE COVERED BY THE MANUFACTURER'S WARRANTY SHALL ADHERE TO THE DOCUMENTATION SUBMITTAL AND SYSTEM CERTIFICATION PROVISIONS STATED ABOVE.

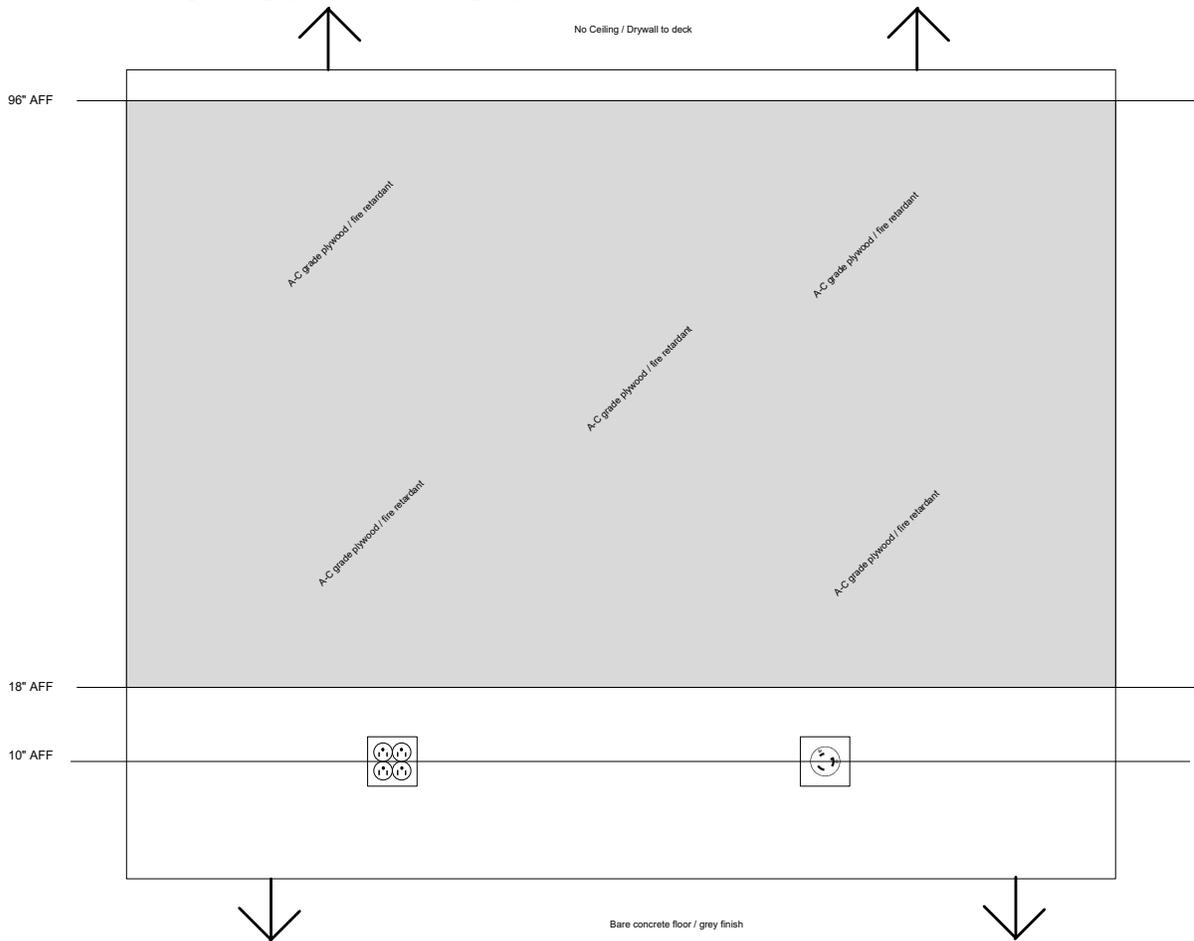
3.9 CLEANUP

- A. THE COMMUNICATIONS CONTRACTOR SHALL CLEAN UP ALL DEBRIS RELATED TO THIS WORK ON A DAILY BASIS, OR AS OTHERWISE REQUIRED, LEAVING THE JOB SITE IN A CLEAN, SAFE CONDITION.
- B. PROTECT ALL EQUIPMENT FROM DAMAGE DURING CONSTRUCTION. EQUIPMENT NOT PROTECTED SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.

COMMUNICATIONS ROOM (Telecommunication Room (TR) Entrance Facility (EF)) BUILDING SPECIFICATIONS

Telecommunication Rooms (TRs) and Entrance Facilities (EFs) are dedicated to providing voice and data services for both convenience and life safety. As a result the University of South Florida requires that no equipment unrelated to these services be housed in this space. A/V amplifiers, fire panels, and all building control systems that may anticipate occupying any space within shall coordinate equipment footprint with IT before doing so. Pipes, conduits, cables, etc that MUST pass through this space shall be coordinated with USF IT relative to the path they follow.

Each TR and EF shall be fitted with plywood to wrap the entire room. Plywood specifications shall be a 3/4" AC grade plywood with a gray fire retardant finish.



TR and EF floors shall be finished with sealed or painted concrete floors, color gray.

TR and EF floors shall have a distributed load rating of 250 lbs per square foot.

TR and EF lighting shall satisfy a minimum illumination of 50 foot-candles measured 3 feet off the floor.

Each TR and EF room shall MAINTAIN a maximum room temp of 74 degrees Fahrenheit after all equipment has been installed. Anticipated BTU's will be provided by USF IT to aid in calculating adequate cooling.

TR and EF electrical outlets shall be included on emergency power if available.

MTR, TR, and EFs shall be equip with a minimum of (1) L-5-30 twist lock receptacle for every two-rack design configuration. A minimum of two standard outlets (as shown in image) shall also be included for convenience as well as other systems potentially housed within these rooms. Exact locations to be coordinated with USF upon room layout design.

TR and EF room sizes shall be calculated as such:

Minimum size TR and EF serving a floor space up to 10,000 square feet shall be no less than 10 feet wide and have a depth no less than 10 feet with an out swing door. (depth shall increase by 2 feet in the event the door cannot swing out due to egress requirements.)

Minimum size TR and EF serving a floor space of 10,000 to 18,000 square feet shall be no less than 10 feet wide and have a depth no less than 12 feet with an out swing door. (depth shall increase by 2 feet in the event the door cannot swing out due to egress requirements.)

Minimum size TR and EF serving a floor space greater than 18,000 square feet shall be no less than 10 feet wide and have a depth no less than 14 feet with an out swing door. (depth shall increase by 2 feet in the event the door cannot swing out due to egress requirements.)

Structural building supports shall not be located in the floor space of any TR or EF. If it must, minimum size measurements shall be taken from that point to the opposing wall.

A fire extinguisher shall be located in each TR and EF near the door.

Water and sewer facilities shall not occupy any space within the TR and EF.

Sprinkler pipes and cooling condensation installed in and through the TR and EF shall be installed with a drip pan below to funnel any leaking water or condensate away from racks and equipment.

TRs and EFs shall not be fitted with acoustical ceiling and shall contain finished walls from floor to deck above.

EFs shall have a minimum of 2 – 4” conduits from nearest communications manhole. Conduits shall be fitted with plastic bushings and be clean and dry, clear of all debris, and contain a min 250lb test pull line.

TRs and EFs shall contain a minimum of 3 – 4” sleeves between them. Conduits shall be fitted with plastic bushings and contain a pull string.

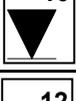
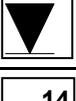
USF IT will assist design team in room layouts for each designated TR and EF space.

Horizontal Structured Cabling (Data)

All data infrastructure shall be provided, installed, and terminated to completion by USF IT.

USF IT will match finishes employed by electrical outlets. (i.e. white, off white, ivory, stainless, ect. For finished wall plates.)

All pathways and penetrations for structured cabling shall be provided by general contractor. This includes all cable trays and conduits to location.

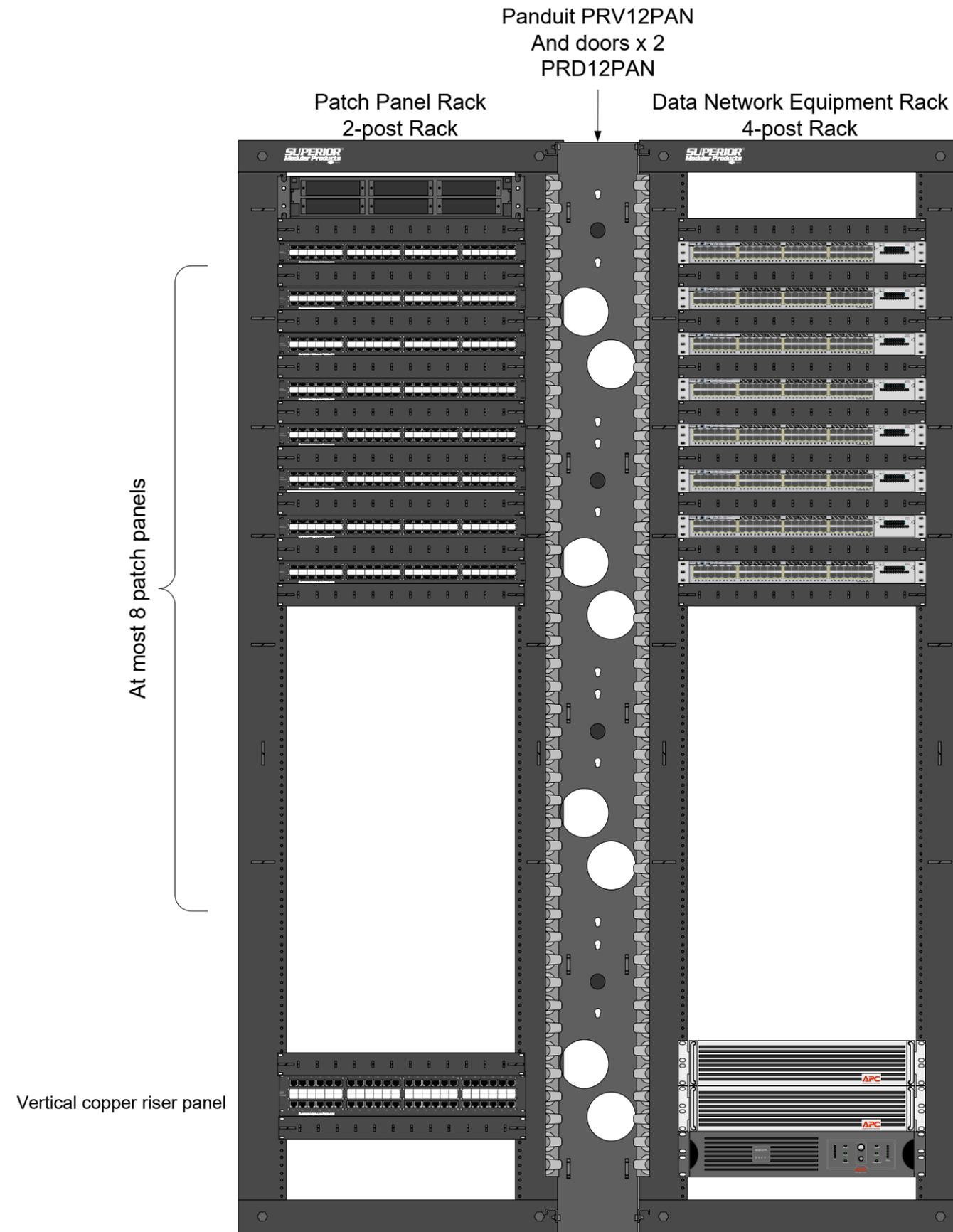
| Item Number | Symbol | Description | Typical Installed Locations |
|-------------|---|---|---|
| 1 |  | 1 CAT 6A cable, 3 Port Faceplate | Break Room or Courtesy Phone Location. Wireless location. Projector location. |
| 2 |  | 2 CAT 6A cables, 3 Port Faceplate | Laboratory with locations around the perimeter. |
| 3 standard |  | 3 CAT 6A cables, 3 Port Faceplate | Normal Work Area of 100 sqft or less. |
| 4 |  | 4 CAT 6A cables, 4 Port or 6 Port Faceplate | Computer Laboratory. |
| 5 |  | 6 CAT 6A cables, 6 Port Faceplate | A/V classroom standard, as needed by customer |
| 6 |  | 8 CAT 6A cables, multimedia outlet | As needed by customer. |
| 7 |  | 10 CAT 6A cables, multimedia outlet | As needed by customer. |
| 8 |  | 12 CAT 6A cables, Multimedia Outlet Box | As needed by customer. |
| 9 |  | 14 CAT 6A cables, Multimedia Outlet Box | As needed by customer. |
| 10 |  | 2 CAT 6A Data, Above Ceiling | For Wireless Access Points. |

| | | | |
|----|---|---|--|
| 11 |  | Symbol inside of square shall indicate floor mounted location | |
| 12 |  | Symbol inside of circle shall indicate ceiling mounted location | |

Typical building designs shall include one standard (3-data) communication outlet for every office.

One (2-data) communication outlet approximately every 100 square feet of workable space or coordinated to specific user requirements.

Typical 2-Rack TR Layout



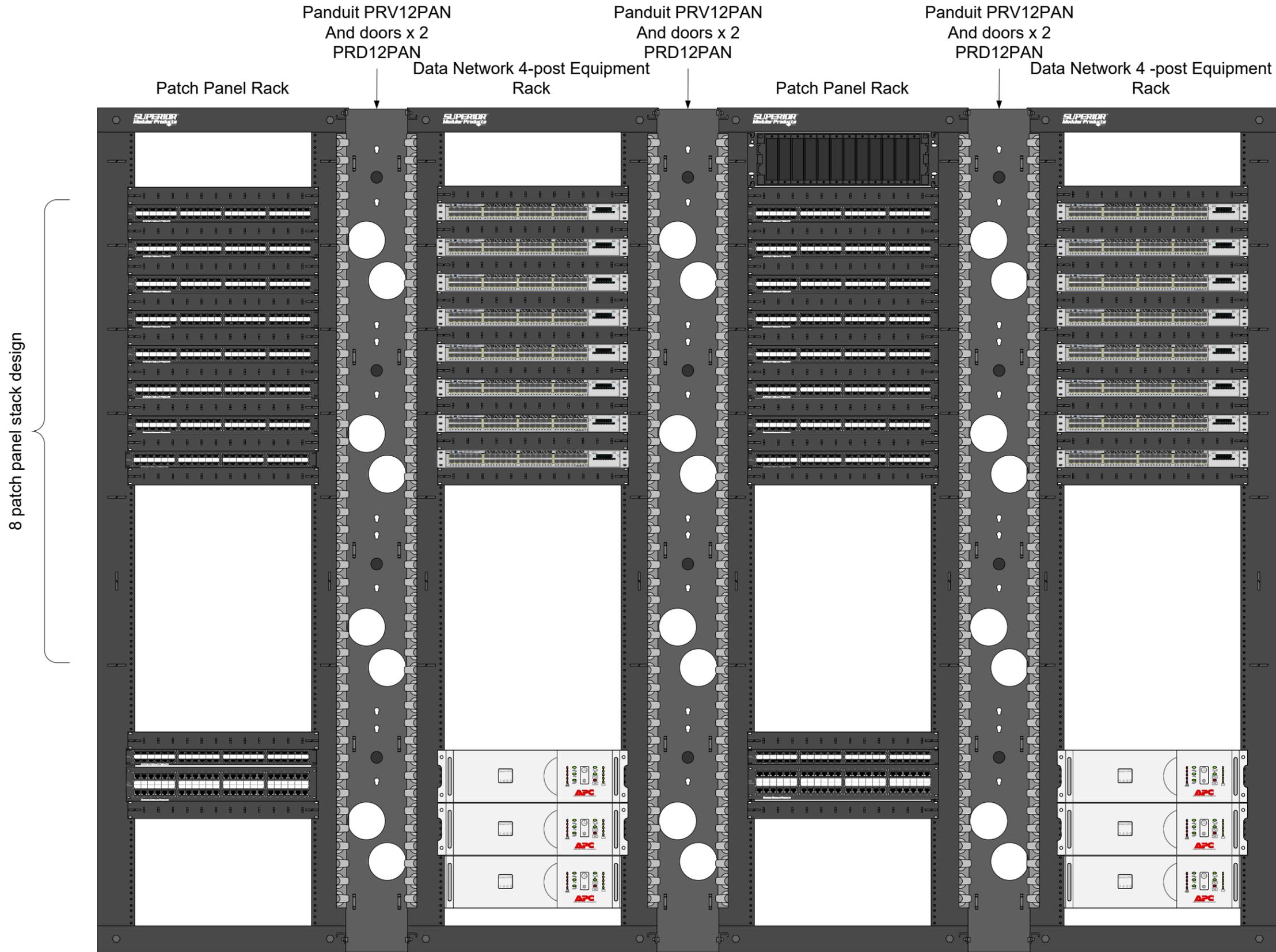
Notes:

1. Accommodates 1 – 384 cables
2. Power and cooling requirements:
Max Power: 3,000 W
Max Cooling: 10,500 BTU/h
3. At most 8 patch panels.
4. Each patch panel has at most 48 connections (to match up with 48-port switches)
5. Wire management above and below every patch panel
6. Wire management above and below every 48-port switch
7. Switches should be aligned with the patch panel they service
8. Effort should be made to keep a single patch panel serviced only by the adjacent switch
9. In order to accommodate future horizontal wiring expansion, the vertical copper riser panels should be positioned near where indicated.
10. UPS requires single L5-30 outlet, preferably on a generator-backed circuit if available.

Equipment list:

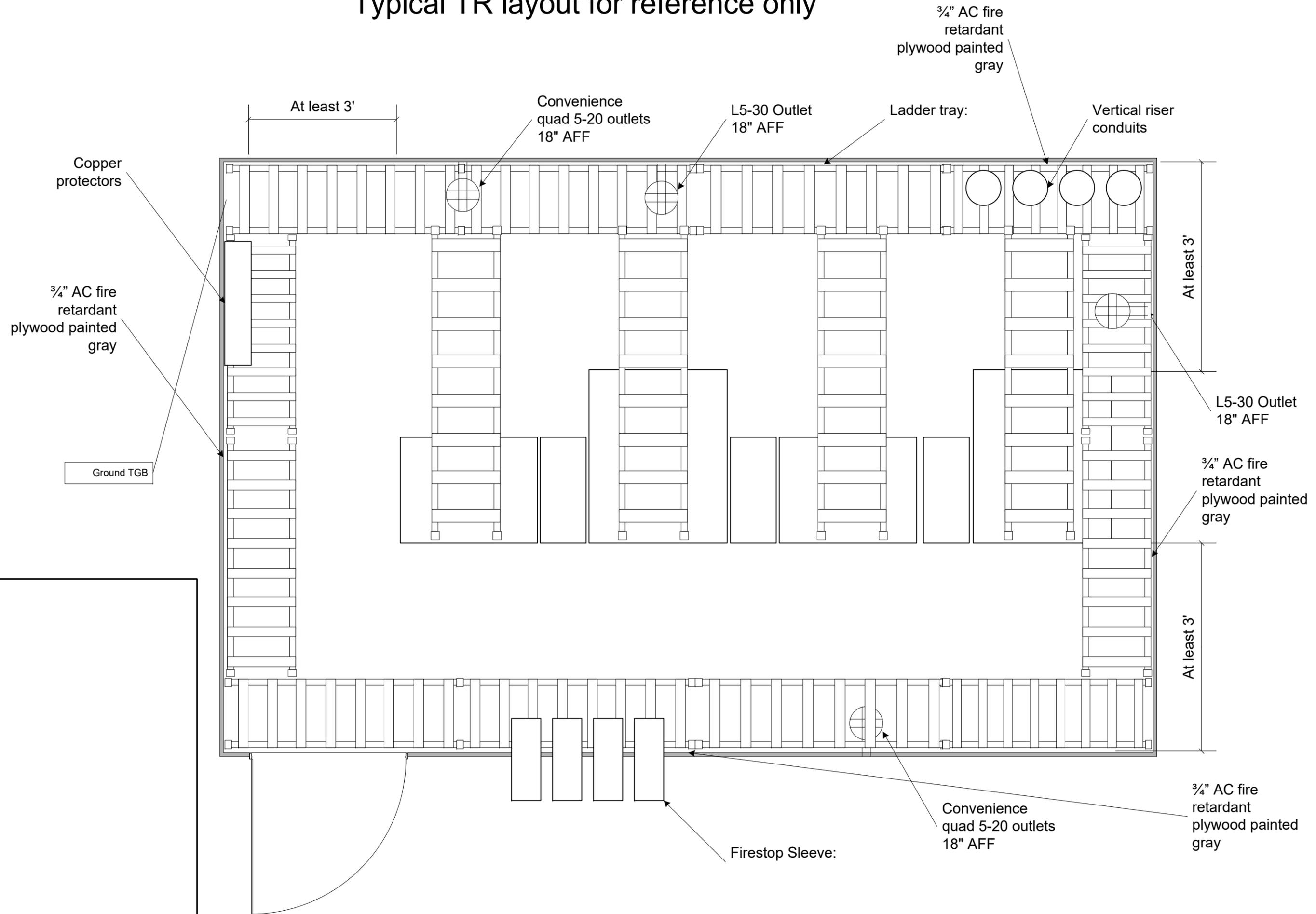
- 2-post rack: CMR45 - OCC Rack Max 45RU cable management rack
- 4-post rack: AR204a – APC NetShelter 4 Post Open Frame Rack 44U #12-24 Threaded Holes
- 48-port Cat6a patch panels: Hubbell UDX48EU1
- Vertical wire manager: PRV12 – PAN Panduit Patchrunner Vertical Cable Manager
- Vertical wire manager doors: PRD12-PAN (qty 2) – Panduit Patchrunner Dual-Hinged Door
- Horizontal wire manager: Ortronics OR60400131 Cable Manager
- Copper Riser patch panel: DCC2482/2502 – Optical Cable Corporation Telco Panel
- Fiber LIU: OCC RTC-series LIU's

Typical 4-Rack TR Layout



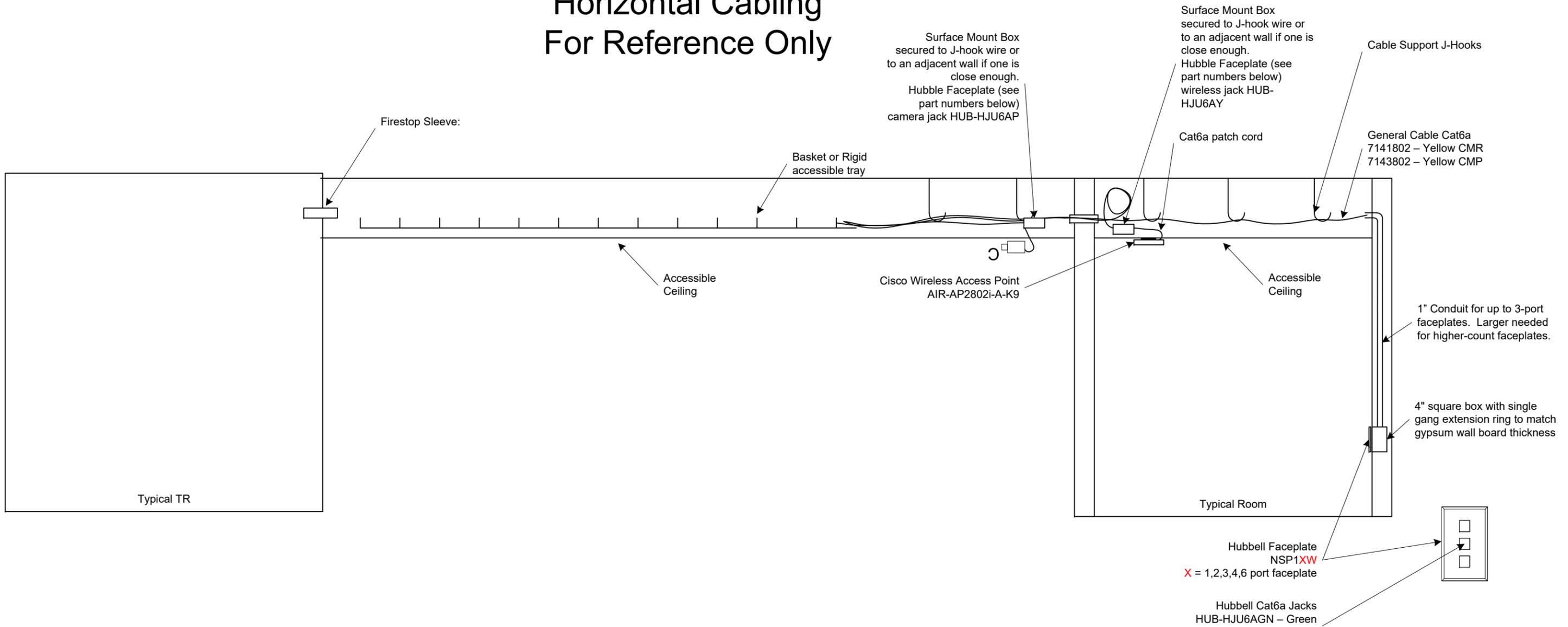
- Notes:**
1. Accommodates 1 – 768 cables
 2. Power and cooling requirements:
Max Power: 7,604 W
Max Cooling: 21,000 BTU/h
 3. At most 8 patch panels per rack.
 4. Each patch panel has at most 48 connections (to match up with 48-port switches)
 5. Wire management below every patch panel
 6. Wire management below every 48-port switch
 7. Switches should be aligned with the patch panel they service
 8. Effort should be made to keep a single patch panel serviced only by the adjacent switch
 9. In order to accommodate future horizontal wiring expansion, the vertical copper riser panels should be positioned near where indicated.
 10. UPS's requires single L5-30 outlet each, preferably on a generator-backed circuit if available.

Typical TR layout for reference only



- Notes:**
- Ground bar
 - Room dimensions
 - Power
 - Plywood
 - Air Conditioning

Horizontal Cabling For Reference Only



Vertical Cabling Materials

IDF

Singlemode Fiber:



IDF

24ct SM



24ct SM

BDF

