

COMPUTER NETWORK DESIGN GUIDELINE FOR NEW SYSTEMS

DOCUMENT NUMBER: 27000

APPLICATION: ELEMENTARY, MIDDLE AND HIGH SCHOOL

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NOTES:

The attached specification should be utilized in the design of computer network systems.

ATTACHMENTS:

Data/Communication Guidelines, dated 08-01-17

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1.1 SCOPE OF WORK

THIS DOCUMENT SPECIFIES HILLSBOROUGH COUNTY PUBLIC SCHOOLS REQUIREMENTS FOR PRODUCT DESIGN, PERFORMANCE, QUALITY ASSURANCE, AND CONTRACTOR RESPONSIBILITIES. THIS DOCUMENT SPECIFIES THE EXECUTION OF WORK TO INSTALL A COMPLETE 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.

- A. MODIFICATIONS TO EXISTING SYSTEMS SHALL CONFORM TO THE REQUIREMENTS OF STANDARD DOCUMENT NUMBER 16760 – COMPUTER NETWORK GUIDE & 16765 – COMPUTER NETWORK DESIGN GUIDELINE FOR EXISTING SYSTEMS.

1.2 SUMMARY

- A. THE APPROVED CONTRACTOR SHALL FURNISH, SUPPLY AND INSTALL A COMPLETE STRUCTURED CABLING INFRASTRUCTURE. INITIAL INSTALLATION AND ALL ADDS- MOVES AND CHANGES OF THE DATA NETWORK INFRASTRUCTURE SHALL BE INCLUDED IN 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 OR AGREED UPON.

1.3 DATA AND VOICE COMMUNICATIONS CONTRACT WORK

- A. GENERAL:
 - 1. FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT AND SERVICES FOR THE INSTALLATION IN ACCORDANCE WITH THE SCOPE OF WORK.
 - 2. COMPLETELY COORDINATE WITH WORK OF ALL OTHER TRADES.
 - 3. 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.
 - 4. PROVIDE ALL FLOOR PENETRATIONS, FLOOR SLEEVES, CONDUIT RACEWAYS, WALL PENETRATIONS, ETC. NOT SHOWN ON THE ELECTRICAL PLANS BUT NEEDED FOR THE ROUTING OF CABLING. MAKE SURE ALL FIRE RATING ARE CREATED AND OR RETURNED TO THE LEVELS REQUIRED BY CODE OR BUILDING REQUIREMENTS
 - 5. PROVIDE LABOR FOR TESTING HORIZONTAL AND BACKBONE CABLING.
 - 6. PROVIDE FIRESTOPPING.
 - 7. PROVIDE LABOR FOR WIRELESS LAN ACCESS POINT, ANTENNAS AND POWER INJECTOR INSTALLATION AND SYSTEM TESTING. INCLUDES THE MOUNTING OF WIRELESS ACCESS POINTS.
 - 8. PROVIDE TELECOMMUNICATIONS GROUNDING AND BONDING.
- B. PROVIDE COMPLETE INSTALLATION FOR STRUCTURED TELECOMMUNICATIONS CABLING SYSTEM INCLUDING BUT NOT LIMITED TO:

1. A CENTRAL DATA DISTRIBUTION POINT IN A DESIGNATED COMMUNICATIONS EQUIPMENT ROOM AND REMOTE SATELLITE DATA DISTRIBUTION POINTS
2. EQUIPMENT RACKS AND/OR CABINETS
3. STRUCTURED CABLING, INCLUDING:
 - a FIBER OPTIC CABLE DISTRIBUTION
 - b TWISTED PAIR (TP) COPPER CABLING DISTRIBUTION
4. WORK AREA TELECOMMUNICATION OUTLETS.
5. MODULAR PATCH PANELS.
6. OPTICAL FIBER PATCH PANELS.
7. OPTICAL FIBER CONNECTORS.
8. HORIZONTAL AND VERTICAL WIRE MANAGEMENT.
9. NECESSARY PATHWAYS AND SPACES, INCLUDING:
 - a CONDUIT
 - b RACEWAYS
 - c CABLE SUPPORTS
10. NECESSARY POWER CIRCUITS, SURGE SUPPRESSION AND PROPER PLANNING REQUIRED FOR ISSUES SUCH AS: SEGMENTATION AND GROUNDING TEST.
11. FIRE STOPPING.
12. GROUNDING AND BONDING.
13. FIELD TESTING.
14. ADMINISTRATION.

1.4 SUBMITTALS

- A. SUBMITTALS SHALL BE COMPLETE AND AT ONE TIME. PARTIAL SUBMITTALS WILL NOT BE CONSIDERED. THE PACKAGE SHALL INCLUDE THE FOLLOWING: DATA SHEETS, DRAWINGS AND INSTRUCTIONS IF AVAILABLE. WORK SHALL NOT PROCEED WITHOUT THE OWNER'S APPROVAL OF THE SUBMITTAL

PACKAGE ANY PRODUCTS INSTALLED WITHOUT OWNERS' APPROVAL SHALL BE REMOVED AT CONTRACTORS EXPENSE.

1. CABLE
 - a FIBER OPTIC
 - b UTP AND/OR STP
 2. CONNECTIVITY (PATCH PANEL & MODULAR JACK)
 - a FIBER OPTIC
 - b UTP AND/OR STP
 3. WORK AREA OUTLETS
 4. CABINETS, RACKS AND ENCLOSURES
- B. BILL OF MATERIAL LISTS
- C. LISTS OF SUBCONTRACTORS AND PROOF OF CONTRACTOR QUALIFICATIONS SHALL BE PROVIDED TO HILLSBOROUGH COUNTY PUBLIC SCHOOLS REPRESENTATIVE UPON REQUEST. SUBMIT COPIES OF CERTIFICATIONS FOR ALL TECHNICIANS AND THE PROJECT MANAGER WHO WILL SUPPORT THIS PROJECT.
1. STRUCTURED CABLING AND TERMINATION EQUIPMENT INSTALLATION CERTIFICATIONS FOR COPPER AND OPTICAL FIBER CONNECTIVITY AND CABLING.
 2. ALL CONTRACTOR EMPLOYEES MUST HAVE CLEARANCE TO FACILITIES PER THE JESSICA LUNDSFORD REQUIREMENTS. NO EMPLOYEE WILL PERMITTED INTO ANY FACILITY WITH OUT CLEARANCES.
 3. APPROVED MANUFACTURER CLASSES SATISFACTORILY COMPLETED.
- D. PROPOSED LABELING SCHEMES AND LABELING METHOD.
- E. SHOW DRAWINGS SHALL BE SUBMITTED. ALL COMMUNICATION SYSTEM SHOP DRAWINGS SHALL INCLUDE:
1. WIRING DIAGRAMS FOR ALL INSTALLED CABLING.
 2. EQUIPMENT RACK/CABINET LAYOUTS.
 3. LIST OF CABLING DISTANCES (TYPICAL AND MAXIMUM) FOR ALL STRUCTURED CABLING
- F. CONTRACTOR INSPECTION OF SITE:
1. COMMUNICATIONS FLOOR PLAN DRAWINGS ARE TO SCALE AND TYPICALLY ARE NOT DIMENSIONED. THE CONTRACTOR SHALL NOT SCALE DRAWINGS FOR EQUIPMENT PLACEMENT AND CLEARANCES. DIMENSIONS GIVEN ON DRAWINGS SHALL ALWAYS TAKE PRECEDENCE OVER SCALED DRAWINGS.

2. 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.
 3. THE CONTRACTOR SHALL FIELD VERIFY DISTANCES AND EQUIPMENT PLACEMENTS COORDINATING LOCATIONS WITH OTHER TRADES, CONSTRUCTION MANAGERS, AND GENERAL CONTRACTOR PRIOR TO INSTALLATION.
 4. 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 HILLSBOROUGH COUNTY PUBLIC SCHOOLS REPRESENTATIVE PRIOR TO THE TIME OF BIDDING SO CLARIFICATION CAN BE MADE BY ADDENDUM.
 5. 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.
- G. TEST REPORTS: SUBMIT COPIES OF COMPLETE REPORTS OF ALL TESTING PERFORMED TO THE GENERAL CONTRACTOR, WITH COPIES TO THE HILLSBOROUGH COUNTY PUBLIC SCHOOLS REPRESENTATIVE UPON COMPLETION OF JOB.

1.5 APPROVED CONTRACTOR QUALIFICATIONS

- A. THE CONTRACTOR SHALL HAVE EXPERIENCE IN THE INSTALLATION AND TESTING OF SIMILAR SYSTEMS AS SPECIFIED HEREIN AND SHALL HAVE COMPLETED AT LEAST TWO PROJECTS OF SIMILAR SIZE AND SCOPE WITHIN THE LAST 24 MONTHS. THE CONTRACTOR SHALL PROVIDE REFERENCES UPON REQUEST (INCLUDING THE PROJECT NAME, ADDRESS, AND 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 SHALL OWN AND MAINTAIN TOOLS, INSTALLATION EQUIPMENT, AND TEST EQUIPMENT NECESSARY FOR SUCCESSFUL INSTALLATION AND TESTING OF OPTICAL AND CATEGORY 6 & 6A PREMISE DISTRIBUTION SYSTEMS.
- E. HILLSBOROUGH COUNTY PUBLIC SCHOOLS RESERVES THE RIGHT TO REQUIRE THE CONTRACTOR TO REMOVE FROM THE PROJECT ANY SUCH EMPLOYEE THE OWNER DEEMS TO BE INCOMPETENT, CARELESS OR INSUBORDINATE.
- F. THE CONTRACTOR MUST MAINTAIN A STATE CONTRACTOR'S LICENSE AS REQUIRED BY THE STATE.

1.6 QUALITY ASSURANCE

- A. INSTALLED CATEGORY RATED UTP AND FIBER CABLING SYSTEMS, PATHWAYS AND DISTRIBUTION FACILITIES SHALL ADHERE TO MANUFACTURER'S INSTRUCTIONS, SUBMITTED DRAWINGS AND SPECIFICATIONS, AND APPLICABLE CODES, STANDARDS AND REGULATIONS.
- B. INSTALLED CATEGORY RATED UTP CABLING SYSTEMS AND FIELD TEST RESULTS SHALL STRICTLY ADHERE TO REQUIREMENTS OF ANSI/TIA-568.O-D AND ANSI/TIA-568-C.2.
- C. INSTALLED OPTICAL FIBER CABLING SYSTEMS AND FIELD TEST RESULTS SHALL STRICTLY ADHERE TO REQUIREMENTS OF ANSI/TIA-568.0-D AND ANSI/TIA-568.3-D.
- D. WHERE APPLICABLE, ALL EQUIPMENT, COMPONENTS, ACCESSORIES AND HARDWARE SHALL BE NEW AND 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 HILLSBOROUGH COUNTY PUBLIC SCHOOLS 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.

1.7 DRAWINGS

- A. FLOOR PLANS:
 - 1. THE LOCATION OF THE MDF, ALL IDF'S AND ALL DATA OUTLET LOCATIONS, INCLUDING THE TYPE AND LABELING OF THE OUTLET.
 - 2. THE LOCATION OF THE ASSOCIATED ELECTRICAL OUTLET, (IMMEDIATELY ADJACENT). THE DOCUMENTS WILL ALSO IDENTIFY THE NEAREST PANELBOARD TO EACH MDF/IDF AND INSURE THAT THE PANELBOARD CAN SUPPLY AT LEAST 4-20A 120 VOLT CIRCUIT. PANELBOARD LOCATIONS SHALL BE INDICATED ON THE DRAWINGS.
 - 3. THE ROUTING AND DISTANCES OF ALL DATA AND FIBER OPTIC CABLES, AND ASSOCIATED CONDUIT SIZES.
 - 4. ALL FIRE RATED WALL OR STRUCTURAL PENETRATIONS AND SLEEVE REQUIREMENTS.
 - 5. ROUTING OF ALL EXPOSED CONDUIT (EXPOSED CONDUIT IS TO BE PROVIDED ONLY WHERE ALLOWED AT EXISTING FACILITIES.)
- B. RISER DIAGRAMS:
 - 1. MDF AND IDF'S SHOWING, IN ELEVATION, THE LOCATION OF THE RACK AND SPACES REQUIRED FOR ALL FIBER TRAYS, NETWORK ELECTRONICS, COPPER PATCH PANELS AND WIRE MINDERS.
 - 2. ALL CABLE ROUTING DETAILS AT THE RACKS.

3. THE NUMBER, TYPE AND CONDUIT SIZES OF ALL FIBER RUNS INTERCONNECTING THE MDF AND THE IDF'S.
 4. THE RACK ROOM NUMBER, BUILDING NUMBER AND SIZE.
 5. THE TOTAL NUMBER AND TYPE OF DATA DROPS SERVED BY THE MDF OR IDF, SUCH AS WIRELESS –WL, COMPUTER – C, CLOCK – CLK, VIDEO PROJECTOR – VP, AIR CONDITIONING – A/C, CAMERA – CAM.
- C. DETAILS:
1. THE MDF AND IDF ENLARGED PLANS WITH ALL DIMENSIONED CLEARANCES, ADJACENT SHELVING/CABINETS AND MISCELLANEOUS EQUIPMENT NECESSARY TO JUDGE THE SUITABILITY OF THE ARRANGEMENT AND POSSIBILITIES FOR FUTURE EQUIPMENT AND RACK EXPANSION. MDF AND IDF DETAILS SHALL SHOW CONDUIT ARRANGEMENTS.
 2. CONDUIT DETAILS INCLUDING BUT NOT LIMITED TO SURFACE MOUNTED CONDUIT DATA DROP DETAIL, CABLING SUPPORT DETAILS, FIRE RATED WALL/STRUCTURAL PENETRATION DETAILS AND EXTERIOR EXPOSED CONDUIT DETAILS (ONLY WHERE ALLOWED).
 3. A LEGEND OF CLEARLY DRAWN SYMBOLS WITH WRITTEN DEFINITIONS SHALL BE PROVIDED.
 4. PROVIDE THE TOTAL NUMBER OF DROPS FOR EACH RACK EXTENDING TO ROOMS.
 5. PROVIDE AND SHOW A SURGE SUPPRESSANT POWER STRIP AT EACH RACK WITH A MINIMUM OF 6 20-AMP OUTLETS AND A MINIMUM OF A 20-AMP CIRCUIT BREAKER MOUNTED IN THE RACK.

1.8 APPLICABLE STANDARDS, CODES, AND REGULATIONS

- A. INSTALLATION STANDARDS: CABLE INSTALLATION SHALL COMPLY WITH THE FOLLOWING:
1. AMERICAN NATIONAL STANDARDS INSTITUTE, (ANSI)
 - a. NSI/TIA-568.0-D, "GENERIC TELECOMMUNICATIONS CABLING FOR CUSTOMER PREMISES", OR CURRENT UPDATED STANDARD.
 - b. ANSI/TIA-568.1-D, "COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD", OR CURRENT UPDATED STANDARD.
 - c. ANSI/TIA-568-C.2, "BALANCED TWISTED-PAIR TELECOMMUNICATION CABLING AND COMPONENTS STANDARD", OR CURRENT UPDATED STANDARD.
 - d. ANSI/TIA-568.3-D, "OPTICAL FIBER CABLING COMPONENTS STANDARD", OR CURRENT UPDATED STANDARD.

- e ANSI/TIA-568.4-D, "COAXIAL CABLING COMPONENT STANDARD ", OR CURRENT UPDATED STANDARD.
 - f ANSITIA/EIA-569-D, COMMERCIAL BUILDING STANDARDS FOR TELECOMMUNICATIONS PATHWAYS AND SPACES, OR CURRENT UPDATED STANDARD.
 - g ANSI/TIA-607-C, COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS, OR CURRENT UPDATED STANDARD.
 - h ANSI/TIA/EIA-942-A, TELECOMMUNICATIONS INFRASTRUCTURE FOR DATA CENTERS, OR CURRENT UPDATED STANDARD.
 - i ANSI/TIA-4966, TELECOMMUNICATIONS INFRASTRUCTURE STANDARD FOR EDUCATIONAL FACILITIES
 - j ANSI/ICEA S-83-596, FIBER OPTIC PREMISES DISTRIBUTION CABLE, 2001.
 - k ANSI/TIA/EIA-598, COLOR CODING OF OPTICAL FIBER CABLES, 2001
 - l ANSI/ICEA S-87-640, FIBER OPTIC OUTSIDE PLANT DISTRIBUTION CABLE, 1999.
 - m ANSI/TIA/EIA-492AAAC, DETAIL SPECIFICATION FOR 850NM LASER-OPTIMIZED 50UM CORE DIAMETER/125 UM CLADDING DIAMETER CLASS 1A GRADED INDEX MULTIMODE OPTICAL FIBERS, 2003.
 - n ANSI/TIA/EIA-492CAAA, DETAIL SPECIFICATION FOR CLASS IVA DISPERSION-UNSHIFTED SINGLEMODE OPTICAL FIBERS, 2002.
 - o ANSI/TIA/EIA-758: CUSTOMER-OWNED OUTSIDE PLANT TELECOMMUNICATIONS CABLING STANDARD OR CURRENT UPDATED STANDARD.
 - p ANSI/TIA/EIA-526-7, OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED SINGLEMODE FIBER PLANT: OFSTP-7, 2002.
 - q ANSI/TIA/EIA-526-14-A, OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED MULTIMODE FIBER PLANT: OFSTP-14A, 2003.
 - r ANSI/TIA/EIA-TSB-125, GUIDELINES FOR MAINTAINING OPTICAL FIBER POLARITY THROUGH REVERSE-PAIR POSITIONING, 2001.
 - s ANSI/TIA/EIA-TSB-140, ADDITIONAL GUIDELINES FOR FIELD TESTING LENGTH, LOSS, AND POLARITY OF OPTICAL FIBER CABLING SYSTEMS, 2004.
 - t ANSI/TIA/EIA-606-B, ADMINISTRATION STANDARD FOR COMMERCIAL TELECOMMUNICATIONS INFRASTRUCTURE, OR CURRENT UPDATED STANDARD.
 - 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.
2. NATIONAL FIRE PROTECTION ASSOCIATION, INC., NFPA 70
- a NATIONAL ELECTRIC CODE (NEC), 2014, OR CURRENT UPDATED STANDARD. .

- b NEC ARTICLE 250: GROUNDING
 - c NEC ARTICLE 386: SURFACE METAL RACEWAYS
 - d NEC ARTICLE 388: SURFACE NON-METALLIC RACEWAYS
 - e NEC ARTICLE 800: COMMUNICATIONS CIRCUITS
 - f NEC ARTICLE 770: OPTICAL FIBER CABLES AND RACEWAY
3. 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
4. NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)
- a ANSI/NEMA WD-6-2002: WIRING DEVICES – DIMENSIONAL REQUIREMENTS
 - b NEMA 250-2003: ENCLOSURES FOR ELECTRICAL EQUIPMENT
5. FEDERAL COMMUNICATIONS COMMISSION (FCC) TITLE 47, CODE OF FEDERAL REGULATIONS, PART 68: CONNECTION OF TERMINAL EQUIPMENT TO THE TELEPHONE NETWORK, 1998.
6. U.S. PUBLIC LAW 336. 101ST CONGRESS, ADA: AMERICANS WITH DISABILITIES ACT OF 1992.
7. IEEE 802.3AF, DATA TERMINAL EQUIPMENT (DTE) POWER OVER MEDIA DEPENDENT INTERFACE (MDI). 15.4 WATTS
8. IEEE 802.3AT, DATA TERMINAL EQUIPMENT (DTE) ENHANCED POWER OVER MEDIA DEPENDENT INTERFACE (MDI). 25 WATTS
9. IEEE 802.3BT, DATA TERMINAL EQUIPMENT (DTE) ENHANCED POWER OVER MEDIA DEPENDENT INTERFACE (MDI). 100 WATTS
10. IEEE 802.3AE, SPECIFICATION FOR 10 GBIT/S ETHERNET OPERATION OVER OPTICAL FIBER.
11. TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL, 13TH ED., BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI). OR CURRENT ADDITION.

- 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 SCOPE 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. THE MOST STRINGENT RULE WILL APPLY.
- C. MATERIALS:
1. ALL MATERIALS SHALL BE UL OR ETL LISTED AND SHALL BE MARKED AS SUCH.
 2. ALL COMMUNICATIONS CATEGORY RATED COMPONENTS SHALL BE ETL VERIFIED.
 3. 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.
 4. MATERIAL SHALL BE DELIVERED TO THE SITE IN THE ORIGINAL VIRGIN PACKING.

1.9 MAINTENANCE

- A. ALL MATERIALS USED ON THIS PROJECT SHALL BE NEW. USED AND REFURBISHED EQUIPMENT IS NOT PERMITTED UNLESS APPROVED BY HILLSBOROUGH COUNTY PUBLIC SCHOOLS. PROVIDE EQUIPMENT TO SITE IN ORIGINAL PACKAGING WHENEVER PRACTICAL.
- B. 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.
- C. 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.
- D. THE 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.
- E. 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.

- F. THE CONTRACTOR IS RESPONSIBLE FOR CLEANING THE WORKSITE EVERY BUSINESS DAY AND REMOVE DEBRIT FROM THE FACILITY.

1.10 DOCUMENTATION

A. TEST RESULTS

1. ALL TEST RESULTS ARE TO BE SAVED ELECTRONICALLY. TEST DOCUMENTATION SUBMITTED ELECTRONICALLY VIA EMAIL AND SHALL BE CLEARLY MARKED WITH THE WORDS "PROJECT, RELATED PROJECT OR JOB TEST DOCUMENTATION", 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 SUBMISSION.
2. 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).
3. THE TEST EQUIPMENT NAME, MANUFACTURER, MODEL NUMBER, SERIAL NUMBER, SOFTWARE VERSION AND LAST CALIBRATION DATE SHALL ALSO BE PROVIDED IN THE TEST RESULTS DOCUMENTATION.
4. 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.
5. THE OWNER 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

1. 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 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.
2. 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

1. ANY DEVIATION FROM THE APPROVED CONTRACT DRAWINGS OR SPECIFICATIONS SHALL BE SUBMITTED AS A WRITTEN CHANGE ORDER.
2. 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 HILLSBOROUGH COUNTY PUBLIC SCHOOLS. IF THE WORK IS SHOWN TO BE INCORRECT THE

CONTRACTOR WILL HAVE TO CORRECT THE PROBLEM AT NO COST TO HILLSBOROUGH COUNTY PUBLIC SCHOOLS.

3. SIGNIFICANT CHANGES MAY REQUIRE A WRITTEN QUOTATION OF ADDITIONAL LABOR AND MATERIALS FROM THE CONTRACTOR.
 4. IT IS THE RESPONSIBILITY OF THE OWNER (HILLSBOROUGH COUNTY PUBLIC SCHOOLS) 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. ANY CHANGES NOT APPROVED BY THE OWNER'S REPRESENTATIVE WILL BE RESPONSIBILITY OF THE CONTRACTOR AND AT NO COST TO HILLSBOROUGH COUNTY PUBLIC SCHOOLS.
 5. 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
1. AS REQUIRED IN THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL CORRECT PUNCH-LISTS ITEMS DETERMINED TO BE IN VIOLATION OF DRAWINGS, SPECIFICATIONS, CODES, STANDARDS OR REGULATIONS.
 2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TIMELY RE-WORK OF FAULTY CABLING OR HARDWARE INSTALLATIONS.
 3. HILLSBOROUGH COUNTY PUBLIC SCHOOLS RESERVES THE RIGHT TO WITHHOLD FINAL PAYMENT UNTIL PUNCH LIST ITEMS ARE RESOLVED SATISFACTORILY.

1.11 WARRANTY

- A. HILLSBOROUGH COUNTY PUBLIC SCHOOLS REQUIRES:
1. A PERMANENT LINK WARRANTY FOR THE VOICE AND DATA STRUCTURED CABLING ON THE PROJECT. MANUFACTURER REQUIRES PERMANENT LINK TEST.
 2. A CHANNEL WARRANTY FOR THE WIRELESS DATA STRUCTURED CABLING ON THE PROJECT. MANUFACTURE REQUIRES CHANNEL TEST.
- B. THE LENGTH OF THE EXTENDED WARRANTY SHALL BE A MINIMUM OF TWENTY-FIVE (25) YEARS.
- C. WARRANTY COVERING ALL COMPONENTS, EQUIPMENT AND WORKMANSHIP SHALL BE SUBMITTED IN WRITING WITH SYSTEM DOCUMENTATION.
- D. THE WARRANTY PERIOD SHALL BEGIN ON THE SYSTEM'S FIRST USE BY THE OWNER.
- E. 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

- F. UPON COMPLETION OF THE PROJECT THE TELECOMMUNICATION CONTRACTOR SHALL FORWARD THE SIGNED WARRANTY REGISTRATION FORM AND WARRANTY CERTIFICATE TO THE OWNER.
- G. THE MANUFACTURER WARRANTS CATEGORY RATED CABLING SYSTEM, OPTICAL FIBER CABLING AND CONNECTING COMPONENTS FREE OF DEFECTS IN MATERIAL OR WORKMANSHIP.
- H. CATEGORY RATED SYTEM AND OPTICAL FIBER CABLING AND COMPONENTS ARE WARRANTED TO PERFORM THE INTENDED APPLICATION UPON COMPLETION OF PROPER INSTALLATION AND TESTING.
- I. WARRANTY COVERAGE INCLUDES APPLICATION ASSURANCE AND COMPLIANCE TO APPLICABLE PERFORMANCE SPECIFICATIONS.
- J. INSTALLED CATEGORY RATED CABLING SYSTEMS MAY BE GRANTED A LINK OR CHANNEL WARRANTY UNDER THE CONDITIONS STATED BELOW.
 - 1. A CERTIFIED INSTALLER REGISTERED WHO HAS COMPLETED A MANUFACTURER'S TRAINING PROGRAM PERFORMS THE CONSTRUCTION.
 - 2. CONTRACTORS PERFORMING THE CERTIFIED INSTALLATION ARE PROPERLY REGISTERED IN THE MANUFACTURER'S WARRANTY PROGRAM.
 - 3. THE CHANNEL COMPONENTS ARE SUPPLIED ENTIRELY BY ONE MANUFACTURER, INCLUDING PATCH CORDS.
 - 4. CATEGORY RATED CABLE USED IN THE INSTALLATION IS QUALIFIED, RECOGNIZED AND WARRANTED BY CONNECTIVITY MANUFACTURER.
 - 5. FIELD TEST EQUIPMENT USED FOR CATEGORY RATED CABLING IS MINIMUM LEVEL III CLASSIFICATION AND COMPLIES WITH TIA/EIA-568.0-D REQUIREMENTS.
 - 6. REQUIRED TEST RESULTS, PROJECT DOCUMENTATION, INCLUDING AS-BUILT DRAWINGS ARE TO BE STORED ON A STORAGE DEVICE AND SUBMITTED TO THE MANUFACTURER AND HILLSBOROUGH COUNTY PUBLIC SCHOOLS – IT AND SHARED SERICES BY THE REGISTERED CONTRACTOR.

1.12 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 CONTRACTOR.
- 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.
- E. REQUIRED TEST RESULTS, ELECTRONICALLY DELIVERED, AND PROJECT DOCUMENTATION INCLUDING AS-BUILT DRAWINGS, ARE SUBMITTED TO THE MANUFACTURER AND HILLSBOROUGH COUNTY PUBLIC SCHOOLS – IT AND SHARED SERICES BY THE REGISTERED CONTRACTOR.

1.13 CLEANUP

- A. THE CONTRACTOR SHALL CLEAN UP ALL DEBRIS RELATED TO THIS WORK ON A REGULAR BASIS 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.

PART 2 PRODUCTS**2.1 WORK AREA CONNECTORS**

- A. CONNECTORS – CATEGORY 6A MODULAR JACKS
 - 1. **DESIGN REQUIREMENTS**
 - a. CATEGORY 6A JACKS SHALL BE STANDARD FCC-COMPLIANT 8-POSITION, UN-KEYED RJ-45 STYLE, WITH SNAP-IN MOUNTING FEATURES.
 - b. JACKS SHALL BE DESIGNED FOR 4-PAIR, 100 OHM BALANCED UNSHIELDED TWISTED PAIR (UTP) CABLE DESIGNED .
 - c. CATEGORY 6A JACKS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY 3, 5, AND 5E CATEGORY 6 CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.
 - d. CATEGORY 6A JACKS SHALL BE INTEROPERABLE OTHER CATEGORY 6A COMPONENT CABLING SYSTEMS.
 - e. JACKS SHALL BE COMPATIBLE WITH ANSI/TIA/EIA-606-A COLOR CODE LABELING.
 - f. JACKS SHALL HAVE A TEMPERATURE RATING OF -10 °C (14°F) TO 70°C (158 °F).
 - 2. **DIMENSIONS**
 - a. JACK'S MATING INTERFACE SHALL BE BUILT WITH A SNAP – FIT TO STANDARD KEYSTONE OPENING (.760" X .580").
 - b. JACK SHALL BE PRODUCED IN A SMALL COMPACT FORM FACTOR (.670 WIDE X .790 HIGH X 1.050 LONG)
 - 3. **MATERIAL**
 - a. JACK HOUSINGS SHALL BE HIGH IMPACT UL 94 V-0 RATED THERMOPLASTIC.
 - b. JACK SHALL STABILIZE INTENDED APPROPRIATE PANTONE COLOR OVER TIME.
 - c. JACK MATERIAL SHALL NOT DRIFT OVER TIME.
 - d. JACK SHALL BE ENVIRONMENTALLY TESTED FOR LIFE SPAN SIMULATION, BEYOND TIA ANSI/TIA/EIA-568-C.1 STANDARD.

- e JACKS SHALL HAVE THE C6A DESIGNATION MOLDED IN, VISIBLE FROM THE FRONT WHEN INSTALLED
 - f JACK SHALL HAVE A UNIVERSAL WIRING LABEL, DISPLAYING T568A AND T568B WIRING FORMATS.
4. **PCB**
- a JACK'S SHALL UTILIZE A 2-LAYER PRIMARY PRINTED CIRCUIT BOARD.
 - b JACK'S PRIMARY PRINTED CIRCUIT BOARD SHALL HAVE MINIMIZED COMPENSATION TO CONTROL BALANCE AND RL.
 - c JACK SHALL HAVE A SECONDARY PRINTED CIRCUIT BOARD.
 - d JACK'S SECONDARY PRINTED CIRCUIT BOARD SHALL CONTROL NEXT AND BALANCE.
 - e JACK SHALL HAVE RF COMPENSATION TO SUPPRESS ALIEN CROSS-TALK (AXT) IN COMPLIANCE WITH ANSI/TIA/EIA-568-C.2 REQUIREMENTS.
 - f JACK HOUSINGS SHALL FULLY ENCASE AND PROTECT PRINTED CIRCUIT BOARD AND IDC CONTACT FIELDS.
5. **CONTACTS NOSE**
- a JACK RJ-45 CONTACTS SHALL ACCEPT A MINIMUM OF 2500 MATING CYCLES WITHOUT DEGRADATION OF ELECTRICAL OR MECHANICAL PERFORMANCE.
 - b RJ-45 CONTACTS SHALL MAINTAIN A MINIMUM DEFLECTION FORCE OF 100 GRAMS WHILE MATED WITH AN TIA-STANDARD RJ-45 PLUG.
 - c CONTACTS SHALL BE FORMED FLAT FOR INCREASED SURFACE CONTACT WITH MATED PLUGS.
 - d CONTACTS SHALL BE ARRANGED ON THE PC BOARD IN A STRAIGHT LINE, 8 CONTACTS INLINE.
 - e CONTACTS SHALL BE CONSTRUCTED OF BERYLLIUM COPPER FOR MAXIMUM SPRING FORCE AND DURABILITY.
 - f CONTACTS SHALL FOLLOW THE ZERO-CONTACT PATENT REQUIREMENTS FOR OPTIMIZED PERFORMANCE.
 - g CONTACTS 1-2, 4-5 & 7-8 SHALL HAVE A HAVE A "S" BEND AND CROSS OVER FOR OPTIMIZED NEXT.
 - h CONTACT ARRAY SHALL BE OVER-MOLDED WITH A PRECISION GLASS FILLED MATERIAL, MAINTAINING A STABILIZED CONTACT FORM LIFE SPAN OF JACK.
 - i CONTACT ASSEMBLY AND SECONDARY PRINTED CIRCUIT BOARD ASSEMBLY SHALL BE ASSEMBLED IN A CONTROLLED ENVIRONMENT BEFORE MOUNTED TO THE PRIMARY PRINTED CIRCUIT BOARD.

- j CONTACT PLATING SHALL BE A MINIMUM OF 50 MICRO-INCHES OF PRECIOUS METAL IN THE CONTACT AREA OVER 50 MICRO-INCH OF NICKEL.

6. **CONTACTS IDC**

- a JACK TERMINATION METHOD SHALL FOLLOW THE INDUSTRY STANDARD 110 IDC PUNCH-DOWN.
- b IDC CONTACT TERMINATION TOWERS SHALL HAVE A TAPERED PAIR-SPLITTING FEATURES TO AID WIRE INSERTION AND MINIMIZE PAIR UN-TWIST.
- c JACKS SHALL UTILIZE A PAIRED PUNCH-DOWN SEQUENCE TO MAXIMIZE ELECTRICAL PERFORMANCE AND MINIMIZE NEXT.
- d IDC CONTACTS SHALL BE CONSTRUCTED WITH PHOSPHOR BRONZE.
- e IDC CONTACTS SHALL BE DESIGNED TO PROVIDE A GAS TIGHT TERMINATION WITH A CONDUCTOR CROSS REDUCTION OF 14%-17% (+/- 2%).
- f JACKS SHALL TERMINATE 24-22 AWG SOLID CONDUCTORS.
- g JACKS SHALL TERMINATE INSULATED CONDUCTORS WITH OUTSIDE DIAMETERS UP TO .050".

7. **INSTALLATION**

- a JACKS SHALL NOT REQUIRE SPECIAL CORDS, SPECIALTY TOOLS OR SPECIAL INSTALLATION REQUIREMENTS.
- b JACKS SHALL BE COMPATIBLE WITH SINGLE CONDUCTOR STANDARD 110 IMPACT TERMINATION TOOLS.
- c JACKS SHALL BE COMPATIBLE WITH A 4-PAIR SINGLE PUNCH IMPACT TOOL DESIGNED SPECIFICALLY FOR THE PURPOSE.
- d JACKS SHALL NOT REQUIRE ANY SPACE CONSTRAINTS, PROXIMITY, OR SPECIAL PLACEMENT REQUIREMENTS.
- e JACKS SHALL BE INSTALLED IN ALL STANDARD KEYSTONE PRODUCTS.

8. **FEATURES**

- a EACH JACK SHALL BE A SINGLE UNIT OF CONSTRUCTION.
- b STUFFER CAP SHALL HAVE 4 RETENTION SNAPS TO MAINTAIN CONDUCTOR STRAIN RELIEF.
- c JACKS SHALL ACCEPT OPTIONAL HINGED DUST COVERS.
- d JACKS SHALL ACCEPT SNAP-ON ICONS FOR SPECIFIC IDENTIFICATION.
- e JACKS SHALL BE AVAILABLE IN VARIOUS COLORS TO MEET SPECIFIC CUSTOMER APPLICATIONS.

- f STUFFER CAP SHALL HAVE A SPECIFIC COATING TO SUPPRESS ALIEN CROSS-TALK (ANEXT) BETWEEN ADJACENT JACKS INSTALLED IN HIGH-DENSITY FACEPLATES OR MODULAR PANELS

9. **PERFORMANCE REQUIREMENTS**

- a ALL TRANSMISSION PARAMETERS SHALL BE INDEPENDENTLY VERIFIED BY ETL THIRD PARTY TESTING ORGANIZATION. TRANSMISSION TESTING SHALL BE TO 650 MHZ. THE TIA/EIA-568-C.2 SPECIFICATION LIMIT IS 500 MHZ.
- b CATEGORY 6A JACKS SHALL EXCEED TRANSMISSION REQUIREMENTS SPECIFIED IN ANSI/TIA/EIA-568-C.2.
- c CATEGORY 6A JACKS SHALL EXCEED NEXT COMPONENT REQUIREMENTS SPECIFIED IN ANSI/TIA/EIA-568-C.2 BY 7DB @ 34DB.
- d CATEGORY 6A JACKS SHALL EXCEED NEXT COMPONENT REQUIREMENTS SPECIFIED IN ISO 11801 CLASS EA BY 4DB @ 37DB
- e JACKS SHALL EXCEED ALL CATEGORY 6A LINK AND CHANNEL REQUIREMENT FROM 2-100 METERS WITH COMPONENT COMPLIANT PRODUCTS.
- f THE MANUFACTURER SHALL PROVIDE STANDARDS-COMPLIANCE CERTIFICATES FROM THIRD PARTY TESTING ORGANIZATION UPON REQUEST.
- g JACKS SHALL BE UL LISTED 1863.
- h JACKS SHALL EXCEED IEEE 802.3 DTE POWER SPECIFICATION TO 4 TIMES THE RATED CURRENT LIMITS WITH NO DEGRADATION OF PERFORMANCE OR MATERIALS.
- i JACKS SHALL BE THIRD PARTY VERIFIED TO 10 GIGABIT ETHERNET PERFORMANCE ACCORDING TO IEEE 802.3AN.
- j CATEGORY 6A JACKS SHALL MEET OR EXCEED 4-CONNECTOR CHANNEL PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.2 STANDARD.
- k THE 4-CONNECTOR CHANNEL TEST CONFIGURATION SHALL UTILIZE CATEGORY 6A JACKS, PATCH PANELS AND PATCH CORDS, FROM THE SAME MANUFACTURER, WITH QUALIFIED CATEGORY 6A CABLE.

10. **COLOR APPLICATION FOR NETWORK JACKS**

- a HJ6AY(25) YELLOW DATA

b	HJ6AB(25)	BLUE	PHONE
c	HJ6AGN(25)	GREEN	WIRELESS
d	HJ6AP(25)	PURPLE	VIDEO CAMERA
e	HJ6ABK(25)	BLACK	COPY MACHINES
f	HJ6AR(25)	RED	SERVERS
g	HJ6AW(25)	WHITE	PROJECTORS

11. **DESIGN REQUIREMENTS**

- 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) JACKS SHALL UTILIZE A 2-LAYER PRINTED CIRCUIT BOARD TO CONTROL NEXT.
- g) JACK HOUSINGS SHALL FULLY ENCASE AND PROTECT PRINTED CIRCUIT BOARDS AND IDC FIELDS.
- h) HOUSING SHALL BE ULTRASONICALLY WELDED FOR TAMPER RESISTANCE.
- i) MODULAR JACK CONTACTS SHALL ACCEPT A MINIMUM OF 2000 MATING CYCLES WITHOUT DEGRADATION OF ELECTRICAL OR MECHANICAL PERFORMANCE.
- j) JACK CONTACTS SHALL MAINTAIN A MINIMUM DEFLECTION FORCE OF 100 GRAMS WHILE MATED WITH AN FCC-STANDARD RJ-45 PLUG.
- k) JACK CONTACTS SHALL BE FORMED FLAT FOR INCREASED SURFACE CONTACT WITH MATED PLUGS.
- l) JACK CONTACTS SHALL BE ARRANGED ON THE PC BOARD IN 2 STAGGERED ARRAYS, ONE ARRAY HAVING 6 CONTACTS AND THE OTHER ARRAY HAVING 2 CONTACTS.
- m) JACK CONTACTS SHALL BE CONSTRUCTED OF BERYLLIUM COPPER FOR MAXIMUM SPRING FORCE AND DURABILITY.
- n) CONTACT PLATING SHALL BE A MINIMUM OF 50 MICRO-INCHES OF HARD GOLD IN THE CONTACT AREA OVER 50 MICRO-INCH OF NICKEL.

- o) JACK TERMINATION METHOD SHALL FOLLOW THE INDUSTRY STANDARD 110 IDC PUNCH-DOWN.
- p) IDC CONTACT TERMINATION TOWERS SHALL HAVE TAPERED PAIR-SPLITTING FEATURES TO AID WIRE INSERTION AND MINIMIZE PAIR UN-TWIST.
- q) IDC CONTACTS SHALL BE ARRANGED IN STAGGERED ARRAYS OF 4 SETS OF 2 CONTACTS.
- r) JACKS SHALL HAVE THE CATEGORY 6 DESIGNATION, VISIBLE FROM THE FRONT WHEN INSTALLED.
- s) BOTTOM OF JACK SHALL HAVE DATE CODE AND AN ABBREVIATED CATALOG NUMBER.
- t) JACKS SHALL UTILIZE A PAIRED PUNCH-DOWN SEQUENCE TO MAXIMIZE ELECTRICAL PERFORMANCE.
- u) IDC CONTACTS SHALL BE PHOSPHOR BRONZE WITH 100 MICRO-INCH TIN LEAD 60/40 PLATING OVER NICKEL.
- v) JACKS SHALL TERMINATE 26-22 AWG SOLID OR STRANDED CONDUCTORS.
- w) JACKS SHALL TERMINATE INSULATED CONDUCTORS WITH OUTSIDE DIAMETERS UP TO .050".
- x) JACKS SHALL NOT REQUIRE SPECIAL CORDS, SPECIALTY TOOLS OR SPECIAL INSTALLATION REQUIREMENTS.
- y) JACKS SHALL BE COMPATIBLE WITH SINGLE CONDUCTOR STANDARD 110 IMPACT TERMINATION TOOLS.
- z) JACKS SHALL BE COMPATIBLE WITH A 4-PAIR SINGLE PUNCH IMPACT TOOL DESIGNED SPECIFICALLY FOR THE PURPOSE.
- aa) JACKS SHALL INCLUDE A TRANSLUCENT STUFFER CAP FOR WIRE RETENTION AND TO PERMIT VISUAL INSPECTION.
- bb) STUFFER CAP SHALL HAVE RETENTION SNAPS TO ASSURE CONDUCTOR STRAIN RELIEF.
- cc) JACKS SHALL ACCEPT FCC COMPLIANT 6 POSITION PLUGS.
- dd) JACKS SHALL ACCEPT OPTIONAL HINGED DUST COVERS.
- ee) JACKS SHALL BE COMPATIBLE WITH ANSI/TIA/EIA-606-A COLOR CODE LABELING.
- ff) JACKS SHALL ACCEPT SNAP-ON ICONS FOR SPECIFIC IDENTIFICATION.
- gg) JACKS SHALL BE AVAILABLE IN VARIOUS COLORS TO MEET SPECIFIC CUSTOMER APPLICATIONS.
- hh) JACKS SHALL HAVE ATTACHED WIRING INSTRUCTION LABELS TO PERMIT EITHER T568A OR T568B WIRING CONFIGURATIONS.

- ii) CATEGORY 6 JACKS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY 3, 5, AND 5E CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.

12. **PERFORMANCE REQUIREMENTS**

- jj) ALL TRANSMISSION PERFORMANCE PARAMETERS SHALL BE INDEPENDENTLY VERIFIED BY A UL OR ETL THIRD PARTY TESTING ORGANIZATION.
- kk) CATEGORY 6 JACKS SHALL EXCEED CATEGORY 6 TRANSMISSION REQUIREMENTS FOR CONNECTING HARDWARE, AS SPECIFIED IN ANSI/TIA/EIA-568-B.2-1, TRANSMISSION PERFORMANCE SPECIFICATIONS FOR 4-PAIR 100 OHM CATEGORY 6 CABLING.
- ll) CATEGORY 6 JACKS SHALL EXCEED 10 GB/S TRANSMISSION REQUIREMENTS FOR CONNECTING HARDWARE, UNDER THE CONSTRAINTS OF ANSI/TIA-TSB-155 (CURRENT DRAFT).
- mm) THE MANUFACTURER SHALL PROVIDE CATEGORY 6 COMPONENT COMPLIANCE CERTIFICATES FROM THIRD PARTY TESTING ORGANIZATION UPON REQUEST.
- nn) JACKS SHALL BE UL LISTED 1863 AND CSA CERTIFIED.
- oo) JACKS SHALL EXCEED IEEE 802.3 DTE POWER SPECIFICATION TO 4 TIMES THE RATED CURRENT LIMITS WITH NO DEGRADATION OF PERFORMANCE OR MATERIALS.
- pp) JACKS SHALL BE THIRD PARTY VERIFIED, ERROR FREE GIGABIT ETHERNET PERFORMANCE TO IEEE 802.3 STANDARD.
- qq) JACKS SHALL EXCEED 4 GB/S DATA TRANSMISSION CAPACITY WITHIN THE BANDWIDTH OF 1 – 250 MHZ WHEN CONFIGURED IN A 4-CONNECTOR CHANNEL.
- rr) JACKS SHALL EXCEED THE 4-CONNECTOR CHANNEL PERFORMANCE REQUIREMENTS OF CATEGORY 6, PER THE ANSI/TIA/EIA-568-B.2-1 STANDARD.
- ss) JACKS SHALL EXCEED THE 4-CONNECTOR CATEGORY CHANNEL PERFORMANCE REQUIREMENTS FOR 10 GB/S TRANSMISSION OVER CATEGORY 6, ACCORDING TO TIA/TSB-155 (CURRENT DRAFT).
- tt) THE 4-CONNECTOR CHANNEL TEST CONFIGURATION SHALL UTILIZE CATEGORY 6 PATCH PANELS AND CATEGORY 6 PATCH CORDS, FROM THE SAME MANUFACTURER, WITH QUALIFIED CATEGORY 6 CABLE.
- uu) THE 4-CONNECTOR CATEGORY 6 CHANNEL PERFORMANCE MARGINS IN THE TABLE BELOW SHALL BE GUARANTEED, PROVIDED THE CONFIGURATION SATISFIES REQUIREMENT NO. 11 ABOVE.

13. **COLOR APPLICATION**

- vv) YELLOW – DATA
- ww) BLUE – PHONE
- xx) GREEN – WIRELESS

- yy) PURPLE – VIDEO CAMERA
 - zz) BLACK – COPY MACHINES
 - aaa) RED – SERVERS
 - bbb) WHITE - PROJECTORS
14. **CATEGORY 6 JACKS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE KEYSTONE JACKS THAT FIT INTO A MODULAR PACH PANEL, FACEPLATE, & WALL MOUNT BOX**

2.2 FACE PLATES

A. REAR LOADING W/DESIGNATION WINDOW

- a) FACEPLATES SHALL BE CONSTRUCTED OF HIGH IMPACT, UL94 V-0 RATED THERMOPLASTIC.
- b) 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.
- c) FACEPLATES SHALL ACCEPT MODULES LOADED WITH KEYSTONE SNAP-IN JACKS.
- d) FACEPLATES SHALL ACCEPT MODULES LOADED WITH SNAP-FIT FIBER OPTIC, AUDIO, AND VIDEO CONNECTORS FOR MULTIMEDIA APPLICATIONS.
- e) FACEPLATES SHALL PROVIDE FOR ANSI/TIA/EIA-606-A COMPLIANT WORKSTATION OUTLET LABELING.
- f) FACEPLATES SHALL BE PROVIDED WITH CLEAR PLASTIC AND COLOR-MATCHED LABEL FIELD COVERS.
- g) TWO #6-32 PAN HEAD PHILLIPS/SLOTTED MOUNTING SCREWS SHALL BE INCLUDED WITH EACH SINGLE GANG FACEPLATE.
- h) FOUR #6-32 PAN HEAD PHILLIPS/SLOTTED MOUNTING SCREWS SHALL BE INCLUDED WITH EACH DOUBLE GANG FACEPLATE.
- i) FACEPLATE MODULES SHALL SNAP FIRMLY INTO FRONT OF FACEPLATE AND POSITION FLUSH TO OUTER PLATE SURFACE.
- j) COLOR-MATCHED SNAP-IN BLANK INSERTS SHALL BE AVAILABLE SEPARATELY TO FILL UNUSED OPENINGS AS REQUIRED.
- k) COLOR-MATCHED SNAP-FIT BLANK MODULES SHALL BE AVAILABLE SEPARATELY TO FILL UNUSED OPENINGS AS REQUIRED
- l) FACEPLATES SHALL BE COMPATIBLE WITH STANDARD NEMA OPENINGS AND BOXES.
- m) FACEPLATES SHALL BE COMPATIBLE WITH RACEWAY FITTINGS, SURFACE MOUNT BOXES, SERVICE FITTINGS, SERVICE POLES, FLUSH MOUNT BOXES AND DRYWALL RINGS.
- n) FACEPLATES SHALL BE UL LISTED 1863 AND CSA CERTIFIED.

2.3 CABLE

- A. CATEGORY 6A UTP
1. PLENUM - CABLE CONSTRUCTION SHALL BE FOUR TWISTED PAIRS OF 23 AWG INSULATED SOLID CONDUCTORS, WITH A RIPCORD, A STAR FILLER, SURROUNDED BY A TIGHT OUTER JACKET.
 2. NON-PLENUM - CABLE CONSTRUCTION SHALL BE FOUR TWISTED PAIRS OF 23 AWG INSULATED SOLID CONDUCTORS, WITH A RIPCORD, A STAR FILLER, SURROUNDED BY A TIGHT OUTER JACKET.
 3. SHALL BE CATEGORY 6A COMPONENT COMPLIANT, VERIFIED BY UL OR ETL
 4. NO MINIMUM COMPLIANT CABLE WILL BE ACCEPTED. HILLSBOROUGH COUNTY PUBLIC SCHOOLS REQUIRES ADDITIONAL BANDWIDTH. MINIMUM ACCEPTABLE 750 MHz
 5. RIPCORD SHALL BE DIRECTLY UNDERNEATH THE OUTER JACKET.
 6. 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.
 7. 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
 8. JACKET COLOR TO BE SPECIFIED BY USE.
 - a CATEGORY 6A – SHALL BE YELLOW JACKET - Y
 - b CATEGORY 6A OSP (OUTSIDE PLANT) – SHALL BE BLACK - BK
 9. PLENUM, RISER or OSP RATED JACKETS
 10. OSP CABLES MUST BE USED IN LOCATIONS THAT MEET BICSI AND THE NEC DEFFINITION OF WET LOCATION.
 11. CABLE SHALL BE SUPPLIED IN 1000 FT SPOOLS
 12. CABLE SHALL EXCEED CATEGORY 6A TRANSMISSION REQUIREMENTS SPECIFIED IN ANSI/TIA-568-C.2.
 13. CABLE SHALL BE UL AND C (UL) LISTED.
- B. CATEGORY 6 UTP
1. PLENUM - CABLE CONSTRUCTION SHALL BE FOUR TWISTED PAIRS OF 23 AWG INSULATED SOLID CONDUCTORS, WITH A RIPCORD, A FILLER, SURROUNDED BY A TIGHT OUTER JACKET.

2. NON-PLENUM - CABLE CONSTRUCTION SHALL BE FOUR TWISTED PAIRS OF 23 AWG INSULATED SOLID CONDUCTORS, WITH A RIPCORD, A FILLER, SURROUNDED BY A TIGHT OUTER JACKET.
 3. SHALL BE CATEGORY 6 COMPONENT COMPLIANT, VERIFIED BY UL OR ETL
 4. NO MINIMUM COMPLIANT CABLE WILL BE ACCEPTED. HILLSBOROUGH COUNTY PUBLIC SCHOOLS REQUIRES ADDITIONAL BANDWIDTH. MINIMUM ACCEPTABLE 550 MHz
 5. RIPCORD SHALL BE DIRECTLY UNDERNEATH THE OUTER JACKET.
 6. 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.
 7. 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
 8. JACKET COLOR TO BE SPECIFIED BY USE.
 - a CATEGORY 6 – SHALL BE WHITE JACKET - W
 - b CATEGORY 6 OSP (OUTSIDE PLANT) – SHALL BE BLACK - BK
 9. PLENUM, RISER or OSP RATED JACKETS
 10. OSP CABLES MUST BE USED IN LOCATIONS THAT MEET BICSI AND THE NEC DEFFINITION OF WET LOCATION.
 11. CABLE SHALL BE SUPPLIED IN 1000 FT SPOOLS OR 1000 FT REELEX BOXES.
 12. CABLE SHALL EXCEED CATEGORY 6 TRANSMISSION REQUIREMENTS SPECIFIED IN ANSI/TIA/EIA-568-C.2.
 13. CABLE SHALL BE UL AND C (UL) LISTED.
- C. HORIZONTAL DISTRIBUTION CABLE – FIBER OPTIC – ZIP
1. 12-STRAND OR 24-STRAND MULTIMODE OR SINGLE MODE OPTICAL FIBER HORIZONTAL DISTRIBUTION CABLE FOR 10 GBIT/S APPLICATIONS SHALL BE CONSTRUCTED WITH GRADED INDEX 50/125 MICRON LASER OPTIMIZED FIBERS OM4 SPECIFICATION.
 2. CABLE CONSTRUCTION SHALL BE ALL-DIELECTRIC, SINGLE SHEATH WITH SINGLE OR MULTIPLE FIBER PAIRS, AVAILABLE IN PLENUM (OFNP) OR RISER (OFNR) VERSIONS.
 3. INSTALLED MULTIMODE FIBER CABLE, WHEN TERMINATED, SHALL EXCEED THE PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.3.

4. HORIZONTAL FIBER, 2 STRAND LOMMF, ZIP STYLE, 500M MAXIMUM LENGTH, EXTENDED DISTANCES MAY REQUIRE SINGLE MODE
- D. BACKBONE DISTRIBUTION CABLE – FIBER OPTIC
1. 12-STRAND OR 24-STRAND MULTIMODE AND SINGLEMODE FIBER BACKBONE DISTRIBUTION CABLE SHALL BE AVAILABLE IN MULTI-STRAND CONSTRUCTIONS FOR INTRABUILDING APPLICATIONS. MULTIMODE FIBER BACKBONE DISTRIBUTION CABLE FOR 10 GBIT/S APPLICATIONS. SINGLE MODE FIBER SHOULD BE USED ON GREATER DISTANCES THAT EXCEED MULTI-MODE SPECIFICATIONS.
 2. SHALL BE CONSTRUCTED WITH 50/125 MICRON LASER-OPTIMIZED OPTICAL FIBER, OM4, 500M MAXIMUM LENGTH, EXTENDED DISTANCES MAY REQUIRE ANOTHER CABLE OR SINGLE MODE
 3. LASER-OPTIMIZED 50/125 MICRON FIBER SHALL BE CLASS 1A FIBER IN COMPLIANCE WITH ANSI/TIA/EIA-492AAAC.
 4. OFNR OR OFNP WILL BE DETERMINED AT EACH SITE. 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 HILLSBOROUGH COUNTY PUBLIC SCHOOLS.
 5. SINGLEMODE FIBER SHALL BE DISPERSION UN-SHIFTED FIBER IN COMPLIANCE WITH ANSI/TIA/EIA-492CAAA.
 6. INTRABUILDING FIBER DISTRIBUTION CABLE DESIGN SHALL BE ACCORDING TO ANSI/ICEA S-83-596.
 7. MULTIMODE AND SINGLEMODE BACKBONE FIBER DISTRIBUTION CABLE, WHEN INSTALLED, SHALL EXCEED THE PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.3.
- E. BACKBONE DISTRIBUTION CABLE – OPTICAL FIBER, INDOOR/OUTDOOR
1. 12-STRAND OR 24-STRAND 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.
 2. RISER (OFNR) AND PLENUM (OFNP) FIBER OPTIC CABLES
 3. THESE CABLES CAN BE INSTALLED IN CONDUITS OR INNER-DUCTS.
 4. THE TIGHT BUFFER FEATURE OF THESE INDOOR/OUTDOOR CABLES ELIMINATES THE NEED FOR BREAKOUT KITS AND OR OTHER SPECIAL TERMINATION EQUIPMENT.
 5. 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.
 6. ALL FIBER 50/125 10G 500 METER, LOMMF OM43, 500M MAXIMUM LENGTH, EXTENDED DISTANCES MAY REQUIRE ANOTHER CABLE OR SINGLE MODE

7. EXCEEDS TIA/EIA 568-C.3 OPTICAL PERFORMANCE
8. 900 μM TIGHT BUFFERED FIBERS - ALL DIELECTRIC
9. 12-STRAND OR 24-STRAND 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-492AAAC.

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

1. 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.
2. LOOSE TUBE OSP CABLE WILL BE USED IN AREAS THAT EXCESSIVE MOISTURE ARE PRESENT. APPLICATIONS REQUIRING GOOD OZONE, MOISTURE, WEATHER RESISTANCE
3. BUILDING INTERCONNECTIONS AND DATA TRUNK
4. DUCTS BETWEEN BUILDINGS AND AERIAL LASHING, 300M MAXIMUM LENGTH, EXTENDED DISTANCES MAY REQUIRE ANOTHER CABLE OR SINGLE MODE
5. DIELECTRIC CENTRAL STRENGTH MEMBER
6. DRY OR WATERBLOCK GEL BLOCKING FOR MOISTURE PROTECTION
7. POLYETHYLENE JACKET FOR WEATHER AND UV PROTECTION
8. INSTALLER MUST FOLLOW TERMINATION INSTRUCTIONS FROM THE MANUFACTURER
9. BREAKOUT KITS WILL BE REQUIRED FOR TERMINATION

2.4 CONNECTORS – FIBER OPTIC

- A. PRE-POLISHED FIBER CONNECTOR BASIC DESIGN SHALL BE A FACTORY PRE-POLISHED SC-STYLE OPTICAL FIBER CONNECTOR WITH A ZIRCONIUM CERAMIC FERRULE.
- B. INDEX-MATCHING GEL IS FACTORY-INJECTED INTO THE CLEAVED FIBER STUB SPLICE TO MINIMIZE CONNECTOR INSERTION LOSS.
- C. SC MULTIMODE FACTORY PRE-POLISHED CONNECTORS SHALL HAVE 50 MICRON PRE-INSTALLED FIBERS.
- D. CONNECTOR MATERIALS SHALL BE DESIGNED WITH THERMAL STABILITY TO COMPLY WITH ENVIRONMENTAL REQUIREMENTS OF ANSI/TIA/EIA-568.3-D AND TELCORDIA GR-1081-CORE.
- E. PRE-POLISHED SC CONNECTORS SHALL REQUIRE NO FIELD POLISHING AND REQUIRE NO ADHESIVES FOR TERMINATION.

- F. 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.
- G. AQUA OR VIOLET HOUSING
- H. PRE-POLISHED SC FIBER CONNECTORS, WHEN PROPERLY INSTALLED ONTO QUALIFIED CABLE, SHALL MEET THE 10 GB/S ETHERNET PERFORMANCE REQUIREMENTS OF IEEE802.3.
- I. SC FIBER CONNECTORS, PROPERLY INSTALLED ONTO QUALIFIED CABLE, SHALL EXCEED THE MECHANICAL AND ENVIRONMENTAL PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568.3-D.

2.5 PATCH CORDS

- A. CATEGORY 6A
 - 1. CATEGORY 6A PATCH CORDS SHALL BE CONSTRUCTED WITH A POLYCARBONATE PLUG HAVING VERTICALLY STAGGERED, TRIFURCATED CONTACTS, EACH HAVING 50 MICRO-INCHES OF GOLD PLATING.
 - 2. PLUG DIMENSIONS AND FUNCTION SHALL COMPLY WITH FCC 47, PART 68.5.
 - 3. PATCH CORDS SHALL BE CONSTRUCTED WITH CATEGORY 6A PATCH CABLE, WITH 26 AWG 7/32 TINNED COPPER STRANDED CONDUCTORS, EACH INSULATED WITH POLYETHYLENE, AND OVERALL JACKET WITH UL FLAME-RETARDANT PVC.
 - 4. PATCH CORDS SHALL BE MANUFACTURED USING A T568B WIRING FORMAT, AND SHALL FUNCTION SUITABLY FOR EITHER T568A OR T568B WIRING SCHEMES.
 - 5. PATCH CORDS SHALL BE AVAILABLE IN THE FOLLOWING COLORS:
 - a YELLOW – DATA
 - b BLUE – PHONE
 - c GREEN – WIRELESS
 - d PURPLE – VIDEO CAMERA
 - e BLACK – COPY MACHINES
 - f RED – SERVERS
 - g WHITE - PROJECTORS
 - 6. STANDARD PATCH CORD LENGTHS SHALL RANGE FROM 3 FT. TO 5 FT. AT THE PATCH PANEL WITH A 50% DISTRIBUTION RATIO OF EACH LENGTH, 10 FT. PATCH CORDS SHALL BE INSTALLED AT THE DEVICE DETERMINED BY HILLSBOROUGH COUNTY PUBLIC SCHOOLS – IT AND SHARED SERVICES DEPARTMENT.
 - 7. PATCH CORDS INSTALLED INTO PATCH PANELS OR DEVICES SHALL FOLLOW THE HILLSBOROUGH COUNTY PUBLIC SCHOOL APPLICATION COLOR CODE.

8. CATEGORY 6A PATCH CORDS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY RATED CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.
 9. PATCH CORDS SHALL BE OF THE SAME MANUFACTURER AS THE CATEGORY 6A WORK AREA OUTLET.
 10. PATCH CORDS SHALL MEET OR EXCEED THE COMPONENT TRANSMISSION REQUIREMENTS FOR CONNECTING HARDWARE, AS SPECIFIED IN ANSI/TIA/EIA-568-C.2 STANDARD.
 11. PATCH CORDS SHALL BE CUL AND UL LISTED.
- B. CATEGORY 6
1. CATEGORY 6 PATCH CORDS SHALL BE CONSTRUCTED WITH A POLYCARBONATE PLUG HAVING VERTICALLY STAGGERED, TRIFURCATED CONTACTS, EACH HAVING 50 MICRO-INCHES OF GOLD PLATING.
 2. PLUG DIMENSIONS AND FUNCTION SHALL COMPLY WITH FCC 47, PART 68.5.
 3. PATCH CORDS SHALL BE CONSTRUCTED WITH CATEGORY 6 PATCH CABLE, WITH 24 AWG 7/32 TINNED COPPER STRANDED CONDUCTORS, EACH INSULATED WITH POLYETHYLENE, AND OVERALL JACKET WITH UL FLAME-RETARDANT PVC.
 4. PATCH CORDS SHALL BE MANUFACTURED USING A T568B WIRING FORMAT, AND SHALL FUNCTION SUITABLY FOR EITHER T568A OR T568B WIRING SCHEMES.
 5. PATCH CORDS SHALL BE AVAILABLE IN THE FOLLOWING COLORS:
 - a. YELLOW – DATA
 - b. BLUE – PHONE
 - c. GREEN – WIRELESS
 - d. PURPLE – VIDEO CAMERA
 - e. BLACK – COPY MACHINES
 - f. RED – SERVERS
 6. STANDARD PATCH CORD LENGTHS SHALL RANGE FROM 3 FT. TO 5 FT. AT THE PATCH PANEL WITH A 50% DISTRIBUTION RATIO OF EACH LENGTH, 10 FT. PATCH CORDS SHALL BE INSTALLED AT THE DEVICE DETERMINED BY HILLSBOROUGH COUNTY PUBLIC SCHOOLS – IT AND SHARED SERVICES DEPARTMENT.
 7. PATCH CORDS INSTALLED INTO PATCH PANELS OR DEVICES SHALL FOLLOW THE HILLSBOROUGH COUNTY PUBLIC SCHOOL APPLICATION COLOR CODE.
 8. CATEGORY 6 PATCH CORDS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY RATED CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.
 9. PATCH CORDS SHALL BE OF THE SAME MANUFACTURER AS THE CATEGORY 6 WORK AREA OUTLETS.

10. PATCH CORDS SHALL MEET OR EXCEED THE COMPONENT TRANSMISSION REQUIREMENTS FOR CONNECTING HARDWARE, AS SPECIFIED IN ANSI/TIA/EIA-568-C.2 STANDARD.
11. PATCH CORDS SHALL BE CUL AND UL LISTED.

C. FIBER OPTIC

1. OPTICAL FIBER PATCH CORDS AND CROSS-CONNECT CORDS SHALL BE STANDARD SC AND SC-TO-LC HYBRID CONSTRUCTIONS. PATCH CORDS FOR 10 GBIT/S APPLICATIONS SHALL BE CONSTRUCTED WITH LASER OPTIMIZED 50/125 MICRON OPTICAL FIBER.
2. INSTALLED MULTIMODE or SINGLE MODE FIBER PATCH CORDS, WHEN INSTALLED, SHALL EXCEED THE PERFORMANCE REQUIREMENTS OF ANSI/TIA-568.3-D.
3. 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.
4. 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
5. THE ARAMID (KEVLAR) STRENGTH MEMBER SHALL BE MECHANICALLY SECURED AT EACH CONNECTOR TO PROVIDE TENSILE STRAIN RELIEF OF THE OPTICAL FIBER.
6. FACTORY MOUNTED CONNECTORS ON EACH END OF THE PATCH CORDS SHALL COMPLY WITH THE APPLICABLE ANSI/TIA/EIA-604 INTERMATEABILITY STANDARD.
7. DUPLEX FIBER PATCH CORDS SHALL HAVE REVERSE-PAIR POLARITY ACCORDING TO ANSI/TIA-568.3-D AND TIA/EIA-TSB-125.
8. FIBER A-B POLARITY SHALL BE CLEARLY MARKED ON EACH END OF DUPLEX PATCH CORDS.
9. 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.
10. MULTIMODE AND SINGLEMODE FIBER PATCH CORDS SHALL EXCEED THE GIGABIT ETHERNET PERFORMANCE REQUIREMENTS OF IEEE 802.3Z STANDARD.

2.6 PATCH PANELS – FIELD CONFIGURABLE

- A. HPJ-SERIES MODULAR PATCH PANEL BASIC DESIGN SHALL BE A RIGID 19" RACK-MOUNTABLE CROSS MEMBER WITH RECESSED KEYSTONE OPENINGS, IN 24 AND 48-PORT CONFIGURATIONS.
- B. PANEL MATERIAL SHALL BE 14-GAGE COLD ROLLED STEEL.
- C. FINISH SHALL BE BLACK DURABLE POLYURETHANE POWDER COAT ON ALL METAL SURFACES.
- D. POWDER COATING SHALL COMPLY WITH APPLICABLE ASTM STANDARDS FOR EXPOSED METAL, AND RESISTANCE TO FLAKING, CRACKING, OR CHIPPING.

- E. KEYSTONE MODULES SHALL BE MOLDED IN A HIGH IMPACT UL TERMOPLASTIC.
- F. KEYSTONE MODULES SHALL BE MOLDED IN A 6-PORT CONFIGURATION
- G. KEYSTONE MODULES SHALL BE FRONT LOADABLE
- H. KEYSTONE MODULES SHALL HAVE LABEL FIELDS INTEGRATED INTO THE 6-PORT CONFIGURATION
- I. BASIC UNIT DELIVERED SHALL INCLUDE (1) PANEL, (4) #12-20 MOUNTING SCREWS, (4 or 8) 6-PORT KEYSTONE JACK MODULES, PRINTABLE LABELS AND LABEL HOLDERS.
- J. PANELS SHALL BE AVAILABLE IN 1U (1.75") AND 2U (3.5") SIZES, UN-LOADED.
- K. PANEL SHALL HAVE ROLLED EDGES TOP AND BOTTOM TO MAXIMIZE STIFFNESS.
- L. PANELS SHALL ACCOMMODATE A MINIMUM OF 24 PORTS FOR EACH RACK MOUNT UNIT (1 RMU = 1.75").
- M. MAXIMUM AVAILABLE PORT DENSITY SHALL BE 48-KEYSTONE OPENINGS IN A 1-RMU PANEL.
- N. RECESSED KEYSTONE OPENINGS, WITH STANDARD DIMENSIONS OF .760" X .580", SHALL ACCEPT HJ, HXJ-SERIES JACKS AND SNAP-FIT FIBER OPTIC, AUDIO, VIDEO, AND MULTI-MEDIA CONNECTORS.
- O. RECESSED KEYSTONE OPENINGS SHALL BE DESIGNED TO PROVIDE FLUSH MOUNTING AND REAR LOADING OF XJ-SERIES JACKS AND SNAP-FIT CONNECTORS, TO PROVIDE SECURITY AND AESTHETICS.
- P. PANELS SHALL ACCEPT AN OPTIONAL REAR CABLE MANAGEMENT SUPPORT BAR TO DRESS CABLES AND PROVIDE STRAIN RELIEF.
- Q. PANELS SHALL HAVE INDIVIDUAL PORT IDENTIFICATION NUMBERS ABOVE EACH PORT
- R. PANELS SHALL BE UL LISTED 1863.

2.7 TERMINATION BLOCKS – CATEGORY 6

- A. CONSTRUCTION SHALL BE A POLYCARBONATE BASE, EITHER WALL-MOUNT OR RACK-MOUNT STYLE, WITH INDIVIDUAL 4-PAIR CONNECTING BLOCKS.
- B. CATEGORY 6-110 WIRING BLOCKS SHALL BE AVAILABLE IN 64-PAIR OR 192-PAIR CAPACITIES, WITH OR WITHOUT DETACHABLE STANDOFF LEGS.
- C. WIRING BLOCKS SHALL BE AVAILABLE AS KITS THAT INCLUDE WIRING BLOCKS, LABEL STRIPS, AND THE APPROPRIATE QUANTITY OF CONNECTING BLOCKS FOR TERMINATION TO FULL CAPACITY.
- D. WIRING BLOCKS AND CONNECTING BLOCKS SHALL BE CONSTRUCTED OF UL94-V0 RATED HIGH-IMPACT FLAME-RETARDANT POLYCARBONATE BLEND THERMOPLASTIC.
- E. WIRING BLOCKS SHALL ACCEPT 26-22 AWG SOLID OR STRANDED CONDUCTORS. WIRING BLOCKS SHALL ACCEPT CONDUCTOR INSULATION DIAMETERS OF .050 IN TO .070 IN MAXIMUM.
- F. WIRING BLOCKS SHALL HAVE THROUGH-OPENINGS TO PERMIT REAR CABLE ENTRY AND DIRECT ROUTING TO EACH POINT OF TERMINATION.

- G. CONNECTING BLOCKS SHALL WITHSTAND A MINIMUM OF 200 RE-TERMINATIONS WITHOUT DEGRADATION TO ELECTRICAL OR MECHANICAL PERFORMANCE.
- H. CATEGORY 6-110 TERMINATION BLOCKS SHALL MEET OR EXCEED CATEGORY 6 TRANSMISSION REQUIREMENTS FOR CONNECTING HARDWARE, AS SPECIFIED IN ANSI/TIA/EIA-568-C.0, TRANSMISSION PERFORMANCE SPECIFICATIONS FOR 4-PAIR 100 OHM CATEGORY 6 CABLING.
- I. 6-110 TERMINATION BLOCKS SHALL BE UL LISTED.

2.8 RACKS – FREE STANDING – 2 POST

- A. RACKS SHALL BE AVAILABLE IN 19-INCH STANDARD RACK CONFIGURATIONS.
- B. RACKS SHALL BE AVAILABLE IN 3, 6, 10 AND 16 INCH Width CONFIGURATIONS.
- C. RACK MATERIAL SHALL BE STRUCTURAL ALUMINUM WITH A DURABLE BLACK POLYURETHANE POWDER COAT FINISH.
- D. INSTALLED RACKS SHALL HAVE A STATIC LOAD CAPACITY OF 1000 LBS.
- E. TAPPED HOLES IN THE VERTICAL RAILS FOR MOUNTING OF PANELS SHALL BE #12-24 THREAD SIZE. COATING SHALL NOT INTERFERE WITH THREAD FIT.
- 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. 10 AND 16 INCH RACK SHALL HAVE WITH 10/16 INCH CHANNEL FOR INTEGRATED CABLE MANAGEMENT.
- I. 10 AND 16 INCH RACK WILL HAVE AN INTEGRATED CABLE WATERFALL WITH A TOP PLATE FOR MOUNTING THE LADDER RACK.
- J. EACH RAIL WILL BE MARKED WITH RACK UNITS
- K. *NOTE: EACH BASIC RACK DELIVERED SHALL CONSIST OF: EQUIPMENT RACK, ISOLATION PADS, GROUND BAR, AND A VERTICAL ELECTRICAL 20 AMP OUTLET STRIP (MINIMUM 6 RECEPTACALS) WITH MOUNTING BRACKETS.*

2.9 RACKS – FREE STANDING – 4 POST

- A. RACK MATERIAL SHALL BE 12 GA COLD ROLL STEEL WITH A DURABLE BLACK POWDER COAT FINISH.
- B. INSTALLED RACKS SHALL HAVE A STATIC LOAD CAPACITY OF 2000 LBS. IF MOUNTED TO FLOOR.
- C. RACKS SHALL BE AVAILABLE IN 19-INCH STANDARD RACK CONFIGURATION.
- D. TAPPED HOLES IN THE VERTICAL RAILS FOR MOUNTING OF PANELS SHALL BE #12-24 THREAD SIZE. COATING SHALL NOT INTERFERE WITH THREAD FIT.
- E. STANDARD RACK HEIGHTS OF 7 FT (84 IN), HAVE A DEPTH OF 36 INCHES, AND HAVE A CAPACITY OF 45 RMU.

- F. RACK BASE ANGLES SHALL BE PRE-DRILLED FOR FLOOR MOUNTING, AND FOR ASSEMBLY TO VERTICAL RAILS.
- G. *NOTE:* EACH BASIC RACK DELIVERED SHALL CONSIST OF: EQUIPMENT RACK, ISOLATION PADS, 18" WIDE BLACK LADDER RACK & MOUNTS TO SECURE TO RACK, GROUND BAR, AND A VERTICAL ELECTRICAL 20 AMP OUTLET STRIP (MINIMUM 6 RECEPTACALS) WITH MOUNTING BRACKETS.

2.10 CABLE MANAGEMENT – VM SERIES CABLE MANAGEMENT

- A. OPEN BASKET DESIGN OFFERS:
 - 1. AIRFLOW
 - 2. MINIMIZES WEIGHT
 - 3. MAXIMUM CABLE CAPACITY WITH UNOBSTRUCTED ACCESS TO CABLE
- B. EASY POWER STRIP MOUNTING
- C. SNAP IN SPOOLS WITH ABILITY TO PUT THEM WHERE THEY WILL DO THE MOST GOOD
- D. HINGES OPEN BOTH LEFT AND RIGHT
- E. CONSTRUCTION:
 - 1. STEEL WIRE FRAME CHASSIS
 - 2. COLDED ROLLED STEEL MOUNTING RAILS
 - 3. EXTRUDED ALUMINUM DOOR FRAME WITH POWDER COATED METALIC INSERT
- F. MOUNTS TO 84" EQUIPMENT RACKS
- G. CHANNEL WIDTH: 6"W

2.11 CABLE MANAGEMENT – HORIZONTAL – HM SERIES

- A. HORIZONTAL MANAGEMENT WILL BE CONSTRUCTED OF 16 GA COLD-ROLLED STEEL (CRS)
- B. FINISH SHALL BE A DURABLE, BLACK POWDER COAT.
- C. SIZE: 2RU
- D. FRONT RING DEPTH: 4 - INCH OR 7- INCH
- E. ALL STEEL CONSTRUCTION - RUGGED, NON-FLAMMABLE, NO FASTENERS TO WEAR OR BREAK, NO FINGERS TO FUSS WITH.
- F. MODULAR COMPONENTS EASILY CONFIGURED IN FIELD TO ADAPT TO DEMANDING APPLICATIONS.
- G. GENEROUS SPACE BETWEEN RINGS ALLEVIATES CONGESTION.
- H. HINGED FRONT COVER - LOCKS IN PLACE WHEN COMPLETELY OPEN TO PREVENT COVER FROM BEING REMOVED OR LOST.

2.12 CABINETS, ENCLOSURE & ACCESSORIES**A. CABINETS – FULL SIZE NETWORK AND SERVER**

1. NETWORK AND SERVER CABINETS SHALL BE FREE STANDING, FULL-SIZE ENCLOSED CABINETS, WITH A FORMED, WELDED AND POWDER COATED CONSTRUCTION.
2. NETWORK AND SERVER CABINETS SHALL BE SUITABLE FOR EQUIPMENT ROOMS, TELECOMMUNICATIONS ROOMS, ENTRANCE FACILITIES AND DATA CENTERS. HEAVY-DUTY, WELDED FOUR-POST FRAME
3. CHOICE OF 19" OR 23" EIA SQUARE HOLE OR #12-24 TAPPED RAILS
4. VENTILATION OPTIONS FOR DOORS, SIDE PANELS, TOP, AND BASE, INCLUDING PERFORATION, VENTS, AND FANS
5. AVAILABLE IN A VARIETY OF SIZED FOR ANY APPLICATION AND EQUIPMENT STANDARD

B. CABINETS – WALL MOUNT

1. 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.
2. SHALL BE CONSTRUCTED OF 14 GAGE COLD ROLLED STEEL (CRS)
3. FINISH SHALL BE BLACK OR OFFICE WHITE DURABLE POWDER COAT ON ALL SURFACES.
4. 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.
5. CABINETS SHALL BE EQUIPPED WITH PANEL-MOUNTING RAILS COMPLIANT TO ANSI/EIA-310-D. RAIL LOCATION SHALL BE ADJUSTABLE, WITH NOTCHES TO FACILITATE POSITIONING.
6. STANDARD CABINET HEIGHT OF 24", DEPTHS OF 26".
7. REAR SECTION SHALL BE REMOVABLE TO FACILITATE WALL INSTALLATION, AND HAVE A 16" HOLE PATTERN SUITABLE FOR MOUNTING TO PLYWOOD BACKBOARDS, STEEL OR WOOD STUDDER WALLS, CINDER BLOCK OR CONCRETE WALLS.
8. 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".
9. CABINET SHALL HAVE DEDICATED BONDING POINTS FOR PROPER GROUNDING ACCORDING TO ANS/TIA-607-C.
10. 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.
11. CABINET SHALL HAVE PROVISIONS FOR MOUNTING TO AN ACCESSORY MOBILE BASE FOR USE AS A FLOOR-STANDING UNIT. MOBILE BASE SHALL BE AVAILABLE SEPARATELY.

12. CABINETS INSTALLED INTO CLASSROOMS SHALL HAVE SOUND DAMPENING MATERIALS INSTALLED INSIDE CABINETS TO REDUCED NOISE.
 13. CABINETS SHALL BE UL LISTED.
 14. WALL-MOUNTED CABINETS SHALL BE FORMED/WELDED AND POWDER COATED CONSTRUCTION, SIZED APPROPRIATELY FOR THE CABLE INSTALLATION, AND SHALL ACCEPT 19-INCH PATCH PANELS.
 15. WALL-MOUNTED CABINETS MAY SERVE AS A SMALL TELECOMMUNICATIONS ROOM, HORIZONTAL OR INTERMEDIATE CROSS CONNECT FACILITY, OR CONSOLIDATION POINT.
- C. FRAMES – WALL MOUNT - HINGED
1. SUPPORTS HEAVY OR DEEP EQUIPMENT IN LOCATIONS WITH LIMITED FLOOR SPACE
 2. QUICK RELEASE LATCHES – RAKE FRAME HINGES BOTH LEFT AND RIGHT
 3. CABLE TIE SLOTS ALONG BOTH SIDES AND INSIDE TOP AND BOTTOM FOR SECURING CABLES
 4. FRAME WILL BE CONSTRUCTED OF 16 GA
 5. ALL SURFACES WILL BE FINISHED WITH A DURABLE BLACK POWDER COAT.
 6. 70 LBS LOAD CAPACITY
 7. MOUNTING HOLES WILL BE 16” ON CENTER FOR EASY ATTACHEMENT TO ANY STANDARD WALL STUDS.
 8. EIA-310-D UNIVERSAL SPACING TAPPED #12-24 FRONT AND BACK
 9. FRAMES SHALL NOT BE INSTALLED INTO CLASSROOMS.
- D. BRACKETS – WALL MOUNT – HINGED
1. BOTTOM OR SIDE HINGES ALLOWS ACCESS TO THE REAR OF COMPONENTS MOUNTED ON THE WALL
 2. WALL BRACKETS WILL BE CONSTRUCTED OF 16 GA STEEL
 3. ALL SURFACES WILL BE FINISHED WITH A DURABLE BLACK POWDER COAT.
 4. WILL BE AVAILABLE IN 1RU TO 6RU
 5. MOUNTING HOLES WILL BE 16” ON CENTER FOR EASY ATTACHEMENT TO ANY STANDARD WALL STUDS.
 6. EIA-310-D UNIVERSAL SPACING TAPPED #12-24 FRONT AND BACK
 7. HEIGHT WILL BE FROM 24” (12RU) TO 48” (26RU)
 8. FRAMES SHALL NOT BE INSTALLED INTO CLASSROOMS.
- E. ENCLOSURES – WALL MOUNT

1. REMOTE EQUIPMENT BOX BASIC DESIGN SHALL BE A ONE-PIECE, 16-GAGE STEEL, REINFORCED WELDED ENCLOSURE WITH A PRE-CONFIGURED LEFT-HINGED DOOR.
2. 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.
3. BODY AND DOOR MATERIAL SHALL BE 16-GAGE COLD ROLLED STEEL (CRS).
4. BASIC DIMENSIONS SHALL BE STANDARD HEIGHTS OF 24.5", 32.5" OR 42.5" BY 24.2" WIDTH, IN 7" OR 10" DEPTH VERSIONS.
5. FINISH SHALL BE LIGHT GRAY OR BLACK DURABLE POLYURETHANE POWDER COAT ON ALL SURFACES.
6. INSTALLED CABINETS SHALL HAVE A STATIC LOAD CAPACITY OF 100 LBS.
7. INSTALLED MOUNTING RAILS SHALL ACCEPT 19" RACK-MOUNT PANELS AND EQUIPMENT WITH ANSI/EIA-310-D MOUNTING PATTERN.
8. CABINET SHALL ACCEPT A MAXIMUM HUB DEPTH OF 14.5" FOR 32" HEIGHT UNITS, AND 22" FOR 42" HEIGHT UNITS.
9. INSTALLED CABINET SHALL HAVE SUFFICIENT STORAGE CAPACITY FOR THE MAXIMUM NUMBER OF FEEDER AND DISTRIBUTION CABLES.
10. 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.
11. THE WEIGHT OF THE CABINET SHALL NOT EXCEED 50LB (22.7KG).
12. 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.
13. 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".
14. CABINET SHALL HAVE DEDICATED GROUNDING AND BONDING LOCATIONS ACCORDING TO ANSI/TIA-607-C.
15. DOOR SHALL BE LOCKABLE.
16. CABINETS INSTALLED INTO CLASSROOMS SHALL HAVE SOUND DAMPENING MATERIALS INSTALLED INSIDE CABINETS TO REDUCED NOISE.
17. VENTILATION: DOOR VENTILATION PATTERN SHALL MEET THE REQUIREMENTS OF UL1950 FOR FIRE CONTAINMENT AND INGRESS OF FOREIGN PARTICLES.
18. REMOTE EQUIPMENT CABINETS SHALL BE UL LISTED.

19. INSTALLED CABINETS SHALL PERFORM TO NEMA 2 RATING.
 20. TAMPER RESISTANCE, VENTILATION, AND HEAT DISSIPATION PERFORMANCE SHALL MEET DESIGN REQUIREMENTS.
 21. WALL-MOUNTED ENCLOSURES MAY SERVE AS A SMALL TELECOMMUNICATIONS ROOM, HORIZONTAL OR INTERMEDIATE CROSS CONNECT FACILITY, OR CONSOLIDATION POINT.
- F. ENCLOSURES – FIBER RACK MOUNT
1. RACK-MOUNTED, POWDER COATED FORMED COLD ROLLED STEEL ENCLOSURE.
 2. 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.
 3. FIBER RACK-MOUNT ENCLOSURES SHALL BE A 19-INCH FORMED/WELDED AND POWDER COATED MODULAR DESIGN, SIZED ACCORDING TO THE CABLE INSTALLATION.
 4. FIBER RACK-MOUNT ENCLOSURES MAY SERVE AS A MAIN, HORIZONTAL, OR INTERMEDIATE CROSS CONNECT FACILITY.
 5. PANEL MOUNTING BRACKETS SHALL BE CONFIGURABLE TO EITHER 19" OR 23" RACKS PER ANSI/EIA-310-D.
 6. ENCLOSURE CHASSIS SHALL HAVE TWO MOUNTING BRACKET LOCATIONS FOR EITHER FLUSH MOUNT OR CENTER MOUNT ON THE RACK.
 7. 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.
 8. INNER TRAY MOUNTING POSTS FOR MODULAR PANELS SHALL ALSO ACCEPT 12-FIBER MTP-STYLE CASSETTES FOR "PLUG & PLAY" INSTALLATIONS.
 9. INNER TRAY SHALL HAVE REAR CABLE TIE-DOWN FEATURES TO ACCEPT VARIOUS DIAMETER BACKBONE CABLES ENTERING THE ENCLOSURE.
 10. ENCLOSURES SHALL BE CONSTRUCTED OF 16 GAGE COLD ROLLED STEEL (CRS)
- G. ENCLOSURES – FIBER WALL MOUNT
1. BASIC FIBER ENCLOSURE DESIGN SHALL BE A FORMED COLD ROLLED STEEL ENCLOSURE WITH A SINGLE HINGED COVER.
 2. ENCLOSURE MATERIAL SHALL BE 16-GAGE COLD ROLLED STEEL (CRS).
 3. FINISH SHALL BE DURABLE BLACK ELECTROSTATIC POWDER COAT ON ALL SURFACES.
 4. ENCLOSURES SHALL BE AVAILABLE IN 24 PORT AND 48 PORT CAPACITIES.
 5. ENCLOSURES SHALL BE SUPPLIED COMPLETE WITH MANUFACTURER'S INSTRUCTIONS AND HARDWARE. SCREWS FOR WALL MOUNTING ARE NOT INCLUDED.

6. ENCLOSURE REAR SIDE SHALL HAVE PRE-PUNCHED, KEY-SHAPED HOLES TO PERMIT FASTENING TO SUITABLE STRUCTURES AND WALL SURFACES.
7. ENCLOSURE TOP AND BOTTOM SHALL HAVE A KNOCKOUT, EACH VERTICALLY ALIGNED, TO PERMIT CONDUIT AND CABLE ENTRY, AND VERTICAL STACKING OF MULTIPLE UNITS.
8. COVER SHALL BE LOCKABLE WITH A KEYED LOCK AVAILABLE SEPARATELY.
9. ENCLOSURES SHALL BE SUPPLIED WITH CABLE ROUTING CLIPS.
10. 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.

H. ADAPTER PANELS – OPTICAL FIBER

1. OPTICAL FIBER ADAPTER PANELS SHALL BE A MODULAR DESIGN POWDER COATED STAMPED METAL CONSTRUCTION.
2. AVAILABLE IN SC ADAPTER CONFIGURATIONS
3. HIGH OR LOW-DENSITY VERSIONS.
4. ADAPTER PANELS SHALL HAVE QUICK-RELEASE SNAP FASTENERS TO FIT DIRECTLY INTO FIBER ENCLOSURES.

2.13 INNER-DUCT

1. FIBER OPTIC CABLE SHALL BE INSTALLED WITH INNERDUCT FOR PROTECTION OF FIBER CABLES IN A SHARED PATHWAY
2. THE INNER DUCT WILL BE RATED FOR THE ENVIRONMENT THAT IT IS BEING INSTALLED IN. PLENUM AND RISER RATED
3. THREE INNER DUCTS WILL BE RUN BETWEEN CLOSETS. ONE FOR CURRENT INSTALLATION, TWO SPARE FOR FUTURE APPLICATIONS.
4. SIZE: 1"
5. FLEXIBLE & LIGHTWEIGHT FOR EASE OF HANDLING
6. PLACE MULTI DUCT SYSTEM INSIDE INNERDUCT – 3 CELLS
7. PRE-THREADED WITH PULL LINE
8. INNER DUCT, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a PREMIER CONDUIT
 - b MAXCELL

2.14 PROTECTION UNITS – COPPER CABLE

1. UL LISTED PROTECTION FOR DATA COMMUNICATION CIRCUITS. THE 4 PAIR BLOCK PROTECTS NETWORKS FROM TRANSIENTS THAT CAN HARM SENSITIVE ELECTRONIC EQUIPMENT.
2. ULTRA LOW CAPACITANCE SOLID STATE TECHNOLOGY ALLOWS FOR CAT 6 PERFORMANCE WHILE PROVIDING QUICK REACTION TO HAZARDOUS ELECTRICAL SURGES WITHOUT NETWORK DEGRADATION.
3. DESIGNED TO PROTECT DATA NETWORKS OPERATING BELOW 65 VOLTS.
4. THESE PROTECTORS PROVIDE OPTIMUM TRANSMISSION PERFORMANCE FOR PROTOCOLS OPERATING AT TRANSMISSION SPEEDS UP TO 250 MHZ.
5. UL LISTED
6. 65V MODEL IS IDEAL FOR POWER OVER ETHERNET (POE) CIRCUIT PROTECTION
7. 110 TERMINATION
8. COVER INCLUDED
9. FACTORY LOADED WITH 65V SOLID STATE MODULES
10. INNER DUCT, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a PORTA SYSTEMS (606)

PART 3 EXECUTION

3.1 APPROVED CONTRACTOR RESPONSIBILITIES

- A. THE APPROVED CONTRACTOR SHALL ASSUME THE FOLLOWING RESPONSIBILITIES:
 1. EXECUTE CONSTRUCTION IN ACCORDANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS.
 2. ADHERE TO PROJECT SCHEDULES AND JOB SITE RULES.
 3. ADHERE TO THE QUALITY, REGULATORY, LOGISTICS, AND DOCUMENTATION REQUIREMENTS.
 4. ADHERE TO THE PRODUCT REQUIREMENTS OUTLINED IN PART 2 ABOVE.
 5. ADHERE TO THE EXECUTION GUIDELINES OUTLINED BELOW.
 6. FURNISH THE CABLING SYSTEM CERTIFICATION AND WARRANTY PROVISIONS OUTLINED IN PART 4 BELOW.

3.2 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 6 CABLE SHALL BE WITHIN THE RECOMMENDED TEMPERATURE RANGE SPECIFIED BY THE MANUFACTURER. CABLE INSTALLATION TEMPERATURE ABOVE 50F IS RECOMMENDED.

3.3 PREPARATION –**A. CABLE PATHWAYS AND FIRESTOPS**

1. 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.
2. 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.
3. IN ACCORDANCE WITH NEC 2005, POWER WIRING AND COMMUNICATIONS CABLING SHALL NOT SHARE THE SAME PATHWAY OR OUTLET UNLESS SEPARATED BY A PHYSICAL BARRIER.
4. 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.
5. 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.
6. PATHWAYS THAT PENETRATE FIRE-RATED BARRIERS SHALL BE FIRE STOPPED 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.
7. 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.
8. 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

1. 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.
2. LAYOUT OF RACK, CABINET OR ENCLOSURE LOCATIONS SHALL BE ACCORDING TO CONTRACT DRAWINGS.
3. RACKS AND CABINETS SHALL BE SECURED TO THE FLOOR USING PROPER ANCHORS AND FASTENERS.
4. ALL WALLS SHOULD BE COVERED WITH ¾", A-C GRADE PLYWOOD. THIS PLYWOOD SHALL BE FIRE-RATED TO MEET APPLICABLE CODES AND SECURELY FASTENED TO THE WALL. THE PLYWOOD WILL BE INSTALLED TO GIVE UP TO 8 FT OF WORKSPACE ON THE WALL AND SHALL BE 6 INCHES OFF THE FINISHED FLOOR. THE WALL SHOULD BE LIGHT IN COLOR WORKSPACE TO

ENHANCE ROOM LIGHTING, UNLESS ALTERED BY HILLSBOROUGH COUNTY PUBLIC SCHOOLS REPRESENTATIVE.

5. MOUNT AND ASSEMBLE RACKS, CABINETS, BRACKETS AND ENCLOSURES PER MANUFACTURER'S INSTRUCTIONS. MOUNT PATCH PANELS AND CABLE MANAGEMENT ACCESSORIES IN THE SPECIFIED LOCATIONS.
6. 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.

C. WALL OUTLETS AND RECESSED WALL BOXES

1. 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.
2. 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.
3. MULTI-CONNECT BOXES SHALL BE INSTALLED IN A MANNER TO COMPLY WITH SEPARATION RULES FOR POWER AND COMMUNICATIONS WIRING IN CLOSE PROXIMITY.
4. ALL CLASS ROOMS TO HAVE 1) 6-PLEX DATA OUTLET FOR STUDENT COMPUTERS, 1) DUPLEX DATA FOR TEACHER, 1) DUPLEX MOUNTED NEAR CEILING FOR VIDEO PROJECTOR AS WELL AS ALL NECESSARY ELECTRICAL OUTLETS AND RACEWAYS FOR CABLING
5. REFER TO SPECIFIC MANUFACTURER'S RECOMMENDATIONS FOR WALL OUTLET SELECTION, CABLE DEPLOYMENT, AND TERMINATION OF JACKS INTO FACEPLATES.

D. SURFACE HOUSINGS AND MUTOA OUTLETS

1. RACEWAY OR CONDUIT SHOULD BE DEPLOYED TO THE SURFACE HOUSING LOCATION. FOR THROUGH-WALL CABLE ENTRY, CUT THE WALL OPENING TO MATCH THE OPENING IN THE HOUSING BASE.
2. LAY OUT MOUNTING HOLES ONTO THE DESIRED WALL LOCATION. FOR WALLBOARD, CONCRETE OR CINDER BLOCK WALLS, DRILL TO THE PROPER DEPTH AND INSTALL ANCHORS.
3. ALWAYS USE PROPER WALL ANCHORS. INSTALLING MOUNTING SCREWS DIRECTLY INTO WALLBOARD WITHOUT USING ANCHORS CAN CAUSE SCREW PULLOUT AND DETACHMENT OF THE SURFACE HOUSING. MOUNTING THE BASE PLATE TO STUDS IS RECOMMENDED.
4. MOUNT BASE PLATE OF SURFACE BOX OR MUTOA TO OUTLET LOCATION USING PROPER FASTENERS. NOTE: FURNITURE AND WALL OUTLET APPLICATIONS REQUIRE MOUNTING OF BASE PLATE PRIOR TO CABLE PULLING AND CONNECTOR TERMINATION.
5. INSTALL COVER ONTO BASE PLATE.
6. ALL BUILDINGS WILL HAVE MULTIPLE WIRELESS ACCESS POINTS. EACH ACCESS POINT REQUIRES 1) DUPLEX DATA CONNECTION TERMINATED TO A BISCUIT SUSPENDED ABOVE THE CEILING WITH A 10 FT SERVICE LOOP. THE CEILING GRID IS TO BE MARKED WITH HALF-INCH GREEN DOT STICKER TO SHOW WHERE THESE DROPS ARE LOCATED. FOR REFERENCE ON THE NUMBER OF ACCESS POINT DROPS NEEDED, ESTIMATE 1) DUPLEX PER EVERY TWO CLASSROOMS, PER BUILDING, PER FLOOR

7. REFER TO DETAILED MANUFACTURER'S GUIDELINES FOR CABLE DEPLOYMENT AND TERMINATION OF JACKS INTO SURFACE HOUSINGS. DUE TO THE LARGER SIZE OF CATEGORY 6 CABLES, PROPER CABLE BEND RADIUS MUST BE MAINTAINED. CERTAIN RESTRICTIONS MAY APPLY WHEN DRESSING CATEGORY 6 CABLING INTO SURFACE HOUSINGS.

3.4 INSTALLATION

A. CABLE SUPPORT

1. THIS CONTRACTOR SHALL INSTALL ALL SUPPORTS FOR CABLES SPECIFIED IN THIS SECTION. TRADITIONAL LADDER RACK WILL BE USED IN EACH TELECOMMUNICATIONS ROOM, BASKET TRAY AND J-HOOKS WILL BE USED IN THE HORIZONTAL.
2. CABLE SUPPORTS SHALL BE SPACED RANDOMLY, BUT NO FURTHER THAN 5'-0" APART.
3. INNER-DUCTS WILL BE RUN BETWEEN EACH CLOSET OR TELECOMMUNICATIONS ROOM. ONE FOR CURRENT INSTALLATION WITH THREE MULTI CELLS FOR FUTURE INSTALLATIONS OR CHANGES. 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.
4. 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.
5. A HORIZONTAL CONDUIT 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 LINES.
6. 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.
7. 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 LOCATION IF CODE REQUIRES CONDUIT FOR VOICE AND DATA CABLES.
8. CONDUIT FILL RATIOS SHALL NOT EXCEED 40%; CONTACT YOUR CABLE MANUFACTURER TO GET RECOMMENDATION ON FILL RATES. NO CONDUIT OR FIRE SLEEVE TO EXCEED A 40 % FILL CAPACITY. ALL PRECAUTION MUST BE TAKEN TO KEEP CROSS TALK BETWEEN DATA CABLES AND OTHER COMMUNICATION CABLES TO A MINIMUM
9. ALL CONDUIT USED FOR FIBER RUNS MUST MAINTAIN A RADIUS BEND 10 TIMES THE INSIDE DIAMETER OF THE CONDUIT BEING USED

10. ALL CONDUIT USED FOR UTP CABLING MUST MAINTAIN A BEND RADIUS 6 TIMES THE INSIDE DIAMETER OF CONDUIT BEING USED AND NOT EXCEED A 40 PERCENT FILL CAPACITY

11. 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.)

12. ALL CONDUITS WILL BE EQUIPPED WITH A CONTIGUOUS LENGTH OF PLASTIC OR NYLON PULL STRING WITH A MINIMUM RATING OF 200 LBS. (90 KG)

13. A CONDUIT RUN SHOULD NOT BE DESIGNED WITH CONTINUOUS CLOSED SECTIONS LONGER THAN 100 FT WITHOUT PULL POINTS OR PULL BOXES INSTALLED.

14. ALL CONDUITS SHOULD TERMINATE ABOVE OR IN THE INSTALLED LADDER RACKS AND ALLOW FOR PROPER CABLE RACKING. CABLE WATERFALLS SHOULD BE CONSIDERED IN AREAS THAT HAVE EXCESSIVE DISTANCE BETWEEN THE CONDUIT AND LADDER RACK.

15. 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.

16. CONDUITS ENTERING THROUGH THE FLOOR SHALL TERMINATE AT LEAST TWO (2) INCHES ABOVE THE FINISHED FLOOR

17. LOCATE SLOT/SLEEVE SYSTEMS IN PLACES WHERE PULLING AND TERMINATION WILL BE EASY.

18. 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.

19. 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.

20. ALL FLOOR PENETRATIONS SHALL BE CORE DRILLED WITH A MAXIMUM 1/4 INCH SIZE GREATER THAN THE EXTERIOR DIMENSION OF THE RISER CONDUIT

21. CONDUITS ENTERING THROUGH A WALL SHALL BE REAMED AND BUSHED, AND TERMINATED AS CLOSE AS PRACTICABLE TO THE TERMINATING RACK OR WALL

22. TERMINATING ABOVE A SUSPENDED CEILING MUST TERMINATE NOT LESS 3 INCHES ABOVE FINISHED CEILING AND FINISHED WITH BUSHING OPENING.

23. ALL CONDUIT WILL BE LABELED FOR EASY IDENTIFICATION
 24. ALL FLOOR PENETRATIONS SHALL BE AT COLUMNS, EXTERIOR WALLS OR IN EQUIPMENT ROOMS.
 25. CABLES SHALL BE SUPPORTED AT HEIGHT OF BOTTOM FLANGE OF STRUCTURAL BEAMS USING A RIGID SUPPORT METHOD (I.E. THREADED ROD, BEAM CLAMPS, ETC.)
 26. DO NOT SUPPORT CABLES FROM DUCTWORK, SPRINKLER PIPING, WATER PIPING, WASTE PIPING, CONDUIT, CEILING WIRE, OR OTHER SYSTEM SUPPORTS.
 27. THE CONDUITS OR SLEEVE WILL BE INSTALLED PER TIA/EIA-569-B AND SEAL ALL PENETRATION WITH APPROVED FIRE STOP PRODUCT.
 28. PROVIDE INDEPENDENT SUPPORT SYSTEM FOR EACH LOW VOLTAGE CABLING SYSTEM.
- B. COPPER CABLE:
1. ALL UNSHIELDED TWISTED PAIR TO BE CATEGORY 6 AND TERMINATED TO CATEGORY 6 CERTIFIED PATCH PANELS AND WALL JACKS.
 2. ALL CATEGORY 6 UNSHIELDED TWISTED PAIR CABLES TO BE HOME RUN TO THE DATA SYSTEM ROOM FOR THAT BUILDING AND BE NO LONGER THAN 275 FT
 3. UNDER NO CIRCUMSTANCES IS UTP CABLING TO BE RUN OUTSIDE UNLESS IN GROUNDED CONDUIT
 4. UNSHIELDED TWISTED PAIR CABLING MAY BE FREE WIRED ABOVE CEILINGS SUPPORTED BY "J" HOOKS NO MORE THAN 4 FOOT APART
 5. EACH UTP CABLE TO BE LABELED 2 INCHES BACK FROM TERMINATION WITH EACH END NOTING WERE THE OPPOSITE END IS TERMINATED
 6. CATEGORY 6 CABLE WILL BE RUN FOR DATA. CATEGORY 6 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.
 7. ALL CATEGORY 6 CABLING AND FIBER MUST BE PLENUM RATED
 8. **ALL TERMINATIONS WILL UTILIZE T568B WIRING IN HILLSBOROUGH COUNTY PUBLIC SCHOOLS FACILITY.** ANY CONTRACTOR NOT COMPLYING WITH THIS WIRING REQUIREMENT WILL FIX THE PROBLEM AT NO COST TO HILLSBOROUGH COUNTY PUBLIC SCHOOLS.
 9. MAXIMUM CABLE LENGTHS TO BE 295 FEET (90 M) INCLUDING SERVICE LOOP AND (10) METERS OF PATCH CORDS. PROVIDE ALL NECESSARY INSTALLATION MATERIALS, TOOLS AND EQUIPMENT TO PERFORM INSULATION DISPLACEMENT TYPE TERMINATIONS AT ALL COMMUNICATIONS OUTLETS, PATCH PANELS.
 10. 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.
 11. REFER TO DETAILED MANUFACTURER'S GUIDELINES FOR DEPLOYMENT OF CATEGORY 6 CABLE. CERTAIN RESTRICTIONS APPLY, AND SPECIFIC TECHNIQUES ARE RECOMMENDED.

12. 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.
13. 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.
14. HORIZONTAL CABLE LENGTH FOR 4-PAIR COPPER UTP 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.
15. SPLICES ARE NOT PERMITTED IN ANY VOICE OR DATA CABLE.
16. AVOID PLACING COPPER CABLES NEAR SOURCES OF EXTREME HEAT (I.E. BOILERS, RADIATORS, HEAT COILS).
17. 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 6 CABLES.
18. 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.
19. ALL CABLES SHALL BE SEPARATED AND BUNDLED INTO LIKE GROUPS. NO BUNDLES LARGER THAN 24 CABLES.
20. SERVICE LOOPS SHALL BE PROVIDED AT BOTH ENDS OF INSTALLED HORIZONTAL AND BACKBONE CABLING. A 4 FOOT SERVICE LOOP SHALL BE INSTALLED IN THE CEILING SPACE NEAR WORKSTATION OUTLETS (EXCESSIVE CABLE SHALL NOT BE COILED IN OUTLET BOXES). A 4 FOOT SERVICE LOOP SHALL BE PROVIDED IN COMMUNICATION ROOMS AND SHALL BE INSTALLED TO ALLOW FOR FUTURE EQUIPMENT RACK/CABINET_RELOCATIONS WITHOUT THE NEED TO RE-TERMINATE PATCH PANELS; THE 4' SERVICE_LOOP SHALL BE NEATLY BUNDLED AND SECURED IN CEILING SPACE WITH LARGE D-RINGS OR PLACE IN CABLE TRAYS. CABLE SLACK AND SERVICE COILS SHALL BE STORED PROPERLY ABOVE THE CEILING OR UNDER THE ACCESS FLOOR. A "FIGURE-EIGHT" SERVICE LOOP IS RECOMMENDED FOR CATEGORY 6 CABLING TO REDUCE EMI COUPLING. LOOSE, RANDOM BUNDLING IS RECOMMENDED.

21. ANY CABLING INSTALLING IN EQUIPMENT ROOMS SHALL BE NEATLY PLACED IN CABLING TRAYS, CABLING RUNWAYS, OR HORIZONTAL AND VERTICAL RACK/CABINET CABLE MANAGERS
22. NO CABLING TO BE BOUND WITH PLASTIC TIE STRAPS. VELCRO ONLY AND LOOSELY WRAPPED VELCRO STRAPS SHALL BE UTILIZED IN THE TR AND INSIDE TC ENCLOSURES FOR ALL CABLE BUNDLING.
23. 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 HILLSBOROUGH COUNTY PUBLIC SCHOOLS REPRESENTATIVE.
 - h COMMUNICATIONS CABLING THAT MUST CROSS POWER CABLES OR CONDUIT SHALL CROSS AT A 90-DEGREE ANGLE, AND SHALL NOT MAKE PHYSICAL CONTACT.
24. 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.
25. LEAVE SPARE PULL STRING WITH EVERY OUTLET INSTALLED.
26. DO NOT INSTALL CABLE IN WET AREAS, OR IN PROXIMITY TO HOT WATER PIPES OR BOILERS.
27. 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.
28. BACKBONE CABLES SHALL BE INSTALLED AND BUNDLED SEPARATELY FROM HORIZONTAL DISTRIBUTION CABLES. BACKBONE AND HORIZONTAL CABLE BUNDLES SHALL BE LOOSE AND RANDOM.
29. 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.

30. 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

1. TELEPHONE INTER-BUILDING AND STATION CABLING

- a INTER-BUILDING VOICE BACKBONE CABLING SHALL BE TERMINATED ON M1-50 BLOCKS ON 89-B STANDOFF BRACKETS.
- b ALL CABLING BETWEEN BUILDINGS SHALL TERMINATE ON PORTAGAS TYPE SURGE ARRESTOR OR EQUIVALENT.
 - i. ARRESTOR SHALL HAVE A MAXIMUM SINGLE IMPULSE TRANSIENT ENERGY RATING OF 124 JOULES (8X20 MICROSECOND WAVEFORM), MINIMUM.
 - ii. ARRESTOR SHALL HAVE A MAXIMUM SINGLE IMPULSE RATING OF 10,000 AMPS (8X20 MICROSECOND WAVEFORM), MINIMUM.
- c THE HORIZONTAL CATEGORY 5 EXTENDED OVERHEAD CABLING WILL ALSO BE USED FOR VOICE STATION CABLING (GENERIC INFRASTRUCTURE).
- d VOICE AND DATA JACKS WILL BE HOUSED IN THE SAME OUTLET BOX WITH APPLICATION COLOR CODE VOICE (BLUE) AND DATA (YELLOW).

2. MAIN DISTRIBUTION FRAME (MDF):

- a THE SCHOOL CAMPUS MDF SHALL BE LOCATED IN A DESIGNATED SYSTEMS ROOM NEAR THE MEDIA CENTER,
- b PROVIDE A DEDICATED SPACE FOR THE COMPUTER NETWORKING EQUIPMENT (SERVERS, ROUTERS, CONTROLLERS, ETC.).
- c THE LOCATION MUST MEET THE PROPER ENVIRONMENTAL CONTROLS, LIGHTING REQUIREMENTS, CLEARANCE REQUIREMENTS AND POWER AVAILABILITY.
- d THE LOCATION MUST BE WITHIN 50' OF AN OUTSIDE WALL.

3. INTERMEDIATE DISTRIBUTION FRAME (IDF):

- a EACH INDIVIDUAL BUILDING ON THE SCHOOL CAMPUS SHALL HAVE AN IDF, LOCATED WITHIN A DESIGNATED SYSTEMS ROOM.
- b THE LOCATION MUST MEET THE PROPER ENVIRONMENTAL CONTROLS, LIGHTING REQUIREMENTS, CLEARANCE REQUIREMENTS AND POWER AVAILABILITY.
- c THE IDF SHALL BE THE CONNECTION POINT FOR THE BUILDING'S NETWORK DEVICES TO THE MAIN SWITCH NEAR THE MEDIA CENTER, VIA FIBER.
- d THE IDF SHALL BE AS CENTRALLY LOCATED AS POSSIBLE WITHIN THE INDIVIDUAL BUILDING, WITH A MAXIMUM 275 FEET OF CABLING FROM THE HUB PATCH PANEL TO THE FARTHEST COMMUNICATIONS OUTLET.

- e THE IDF RACK SHALL BE A 2 POST 19 X 84 WITH ALL NECESSARY HARDWARE AND CROSS BAR TO SUPPORT ALL CABLES AND FIBERS UNLESS ANOTHER DESIGN IS PRE-APPROVED (IN WRITING) BY THE OWNER. PROVIDE A 45-RACK UNIT, WITH VERTICAL WIRE MANAGEMENT ON BOTH SIDES, CAPABLE OF SUPPORTING A MINIMUM OF 750 POUNDS. FOR RENOVATION PROJECTS, IF PHYSICAL SPACE IS LIMITED WITHIN AN EXISTING SYSTEMS ROOM THEN A WALL-MOUNTED CABINET WITH A MINIMUM DEPTH OF 26" MAY BE USED (NOT ACCEPTABLE AT NEWLY CONSTRUCTED SYSTEMS ROOMS). WHERE A DESIGNATED SYSTEMS ROOM IS NOT PROVIDED, A WALL-MOUNTED LOCKABLE CABINET **MUST** BE PROVIDED LOCATED AS DIRECTED. UNDER NO CIRCUMSTANCES WILL RACKS OR CABINETS BE LOCATED IN STUDENT OR STAFF OCCUPIED AREAS OR PUBLIC AREAS.
 - 4. MAXIMUM CABLE LENGTHS TO BE 295 FEET (90 M) INCLUDING SERVICE LOOP AND (10) METERS OF PATCH CORDS. PROVIDE ALL NECESSARY INSTALLATION MATERIALS, TOOLS AND EQUIPMENT
 - 5. SUPPORT AND SECURE CABLES AT PATCH PANELS USING REAR CABLE MANAGEMENT BRACKET, SPOOLS OR MANAGEMENT DEVISE.
 - 6. INSTALL CATEGORY 3, MULTI-PAIR VOICE BACKBONE CABLES UTILIZING AN INDEPENDENT OPEN CABLING. THIS MAY REQUIRE GELLED FILLED CABLE FOR UNDER SLAB INSTALLATIONS.
 - 7. FOR EACH VOICE CROSS-CONNECT, PROVIDE THE APPROPRIATE COLOR ICON AT EACH PATCH PANEL PORT AT THE TC'S AND/OR TR.
 - 8. COMPLETE ALL CROSS-CONNECTS FOR ANALOG CENTRAL OFFICE FACILITIES AND ALARM LINES TO 110-TERMINATION BLOCK.
 - 9. CROSS-CONNECTS SHALL BE COMPLETED AS PER CONSTRUCTION SCHEDULE.
- D. OPTICAL FIBER CABLE:
- 1. FIBER –
 - a ANY FIBER RUN UNDER SLAB, CONSIDERED A WET ENVIRONMENT BY THE NEC OR BICSI, WILL BE OUTSIDE PLANT FIBER. NO INDOOR/OUTDOOR WILL BE ALLOWED IN THE ENVIRONMENT.
 - b ALL NETWORKS TO HAVE FIBER BACKBONES DESIGNED AROUND A 10 GIG STAR TOPOLOGY
 - c ALL FIBER TO BE A MINIMUM OF A 12-STRAND OR 24-STRAND COUNT 50/125 UM OM4 MULTIMODE FIBER AND HOME RUN FROM EACH IDF TO AN MDF WITH NO CONNECTS
 - d UNDER NO CIRCUMSTANCES IS ANY OTHER CABLING TO BE RUN IN THE SAME CONDUIT AS FIBER UNLESS THE CONDUIT IS CORRECTLY SIZED AND AN INNER DUCT PER CABLE IS USED. IF MULTIPLE FIBERS ARE RUN IN THE SAME CONDUIT EACH FIBER MUST HAVE IT'S OWN INNER DUCT
 - e ALL FIBER TO BE TERMINATED WITH SC TYPE CONNECTORS IN LIU'S
 - f ALL FIBER RUN'S OUTSIDE MUST BE IN CONDUIT OR HAVE A PROTECTIVE METAL JACKET AND BE OUTDOOR RATED.

- g ALL FIBER 50/125 10G 500 METER, LOMMF OM43, 500M MAXIMUM LENGTH, EXTENDED DISTANCES MAY REQUIRE ANOTHER CABLE OR SINGLE MODE
2. COLLAPSED FIBER BACKBONE:
 - a THE COLLAPSED BACKBONE WILL HAVE MULTIPLE SWITCHED SEGMENTS OPERATING AT 10 GIG.
 - b PHYSICALLY, THE COLLAPSED BACKBONE WILL CONSIST OF RISER RATED INDOOR / OUTDOOR TIGHT BUFFERED 24-COUNT FIBER (OCC BX) OR EXACT EQUIVALENT RUNNING FROM THE MDF TO EACH PERMANENT BUILDING TO SUPPORT THE HORIZONTAL COPPER DISTRIBUTION.
 - c THE DESIGN MUST ACCOMMODATE A FUTURE 6-COUNT FIBER TO BE RUN (BY OTHERS) FROM THE NEAREST IDF TO THE CLOSEST PORTABLE CLASSROOM BUILDING TO THE PERMANENT BUILDINGS TO ESTABLISH A SECOND TIER IXC IN THIS FIRST PORTABLE. FROM THIS FIRST PORTABLE BUILDING, A (6) COUNT FIBER WILL THEN BE RUN TO EACH OUTLYING PORTABLE. THIS SECOND FIBER TIER WILL UTILIZE POWER POLES FOR A SYSTEM OF AERIAL FIBER DISTRIBUTION.
 - d NETWORK ELECTRONICS: ALL ACTIVE COMPONENTS OF THE NETWORK WILL BE SUPPLIED AND INSTALLED BY THE HCPS NETWORK DEPARTMENT. INFORMATION ON CURRENT NETWORK ELECTRONIC MODELS CAN BE REQUESTED FROM THE HCPS NETWORK DEPARTMENT FOR RACK DESIGN REQUIREMENTS.
 3. ALL NETWORKS TO HAVE FIBER BACKBONES DESIGNED AROUND A 10 GIG STAR TOPOLOGY HOME RUN FROM EACH IXC TO AN MXC WITH NO CROSS CONNECTS
 4. FIBER OPTIC CABLE FROM THE MAIN HUB TO EACH INTERMEDIATE HUB SHALL BE A MINIMUM OF 24 FIBERS, 50/125, OM4 TIGHT BUFFERED, INDOOR/OUTDOOR RISER RATED. ALL FIBER SHALL BE PROTECTED EITHER BY CONDUIT OR ARMOR JACKETED
 5. INNER-DUCTS OF THE PROPER RATING WILL BE RUN BETWEEN EACH CLOSET W/ 3 MULTI CELLS IN EACH INNER-DUCT.
 6. CABLES FOR DIRECT BURIAL, AERIAL, OR OTHER OUTSIDE APPLICATIONS SHALL BE DESIGNED SPECIFICALLY FOR THE INTENDED PURPOSE.
 7. 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.
 8. 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.
 9. LABEL EACH END OF EACH CABLE AS TO SOURCE AND DESTINATION. TERMINATE OPTICAL FIBERS IN CONSISTENT, CONSECUTIVE MANNER AT EACH END. PLACE ALL MATERIAL IN INNER-DUCT BETWEEN LABEL OPTICAL FIBER RACEWAY CABLE WITH YELLOW "CAUTION_ - OPTICAL FIBER CABLE" TAGS EVERY 10 FEET. LEAVE 4 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.

10. OPTICAL FIBER CABLE TERMINATIONS SHALL UTILIZE ENCLOSURES AND COMPONENTS IN QUANTITIES CONSISTENT WITH THE REQUIRED FIBER COUNTS AT EACH END OF EACH SEGMENT.
11. DURING OPTICAL FIBER CONNECTOR TERMINATION, VISUALLY INSPECT ALL TERMINATIONS WITH A 200 OR 400-POWER MICROSCOPE.
12. FOLLOW ALL OF THE CONNECTOR MANUFACTURER'S RECOMMENDATIONS.
13. UNACCEPTABLE FLAWS IN THE TERMINATIONS WILL INCLUDE, BUT NOT LIMITED TO, SCRATCHES, FULL OR PARTIAL CRACKS, BUBBLES, PITS, EPOXY RESIDUAL, DIRT, DUST, OIL, MOISTURE, GRINDING AND SANDING DEBRIS. THE ACCEPTABLE TERMINATION WILL SHOW A CONNECTOR TIP THAT IS FREE OF ALL IMPERFECTIONS IN 100% OF THE CORE AND 80% OF THE CLADDING. ALL UNACCEPTABLE CONNECTORS SHALL BE INSPECTED AFTER REWORK.
14. 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.
15. CLEAN ALL OPTICAL FIBER CONNECTOR TIPS PRIOR TO INSERTING THEM INTO MATTING RECEPTACLES OR BULKHEADS. INSTALL ALL DUST COVERS
16. 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.
17. WHERE CABLES ARE INSTALLED IN AIR RETURN PLENUM, RISER RATED CABLE SHALL BE INSTALLED IN METALLIC CONDUIT.
18. BACKBONE AND HORIZONTAL CABLES SHALL BE INSTALLED AND BUNDLED SEPARATELY IN ANY PATHWAY.
19. CABLES ABOVE CEILINGS OR BELOW ACCESS FLOORS SHALL BE INSTALLED IN CABLE TRAY OR OPEN-TOP CABLE HANGERS.
20. 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.
21. 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.
22. DO NOT OVER-TIGHTEN TIE-WRAPPS OR CLAMPS AROUND CABLE BUNDLES.
23. RECOMMENDED MAXIMUM SPACING OF CABLE SUPPORTS ABOVE THE CEILING IS 60 IN.
24. 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.
25. 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.

26. CABLES THAT ARE DAMAGED DURING INSTALLATION SHALL BE REPLACED BY THE CONTRACTOR.

E. RACKS AND ENCLOSURES:

1. FREESTANDING EQUIPMENT RACKS AND ENCLOSURES SHALL BE PROTECTED FREE OF ALL DUST, DEBRIS AND OTHER ENVIRONMENTAL ELEMENTS DURING CONSTRUCTION UNTIL SUBSTANTIAL COMPLETION WALK-THROUGH.
2. EACH RACK, ENCLOSURE SHALL HAVE A DEDICATED #6 AWG GROUND WIRE TO A GROUNDING BUSBAR OR BUILDING GROUND AS DEFINED BY NEC.
3. AN ISOLATION PAD WILL BE INSTALLED PRIOR TO FASTENING THE RACK TO THE FLOOR
4. SECURE RACKS AND ENCLOSURES TO FLOOR USING RACK INSTALLATION KIT.

5. RACKS –

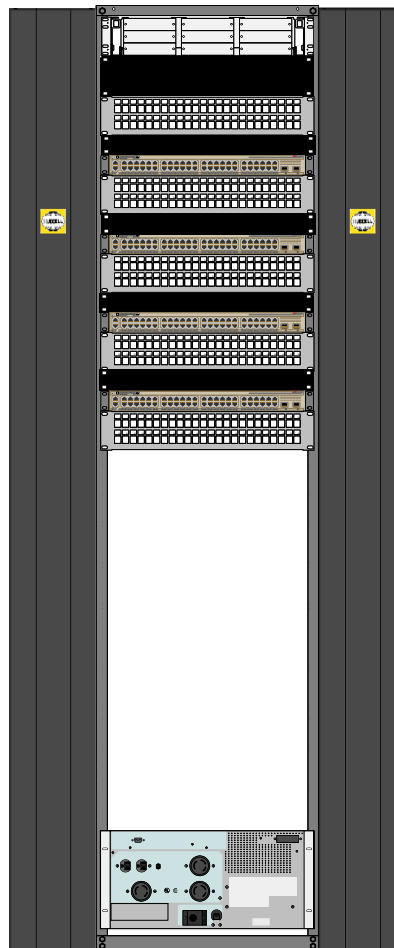
a ALL DATA RACKS TO BE A 2 POST 19 X 84 WITH ALL NECESSARY HARDWARE AND CROSS BAR TO SUPPORT ALL CABLES AND FIBERS AND BE 45 RACK UNIT, WITH VERTICAL WIRE MANAGEMENT ON BOTH SIDES AND MUST BE CAPABLE OF SUPPORTING A MINIMUM OF 750 POUNDS.

b THE APPROVED RACK WILL BE MANUFACTURED FOR DATA EQUIPMENT, NOT AUDIO, 19" W X 84" H, 45 RACK UNIT, STANDARD RACK WITH VERTICAL WIRE MANAGEMENT ON SIDES. RACK MUST BE CAPABLE OF ACCEPTING LADDER RACK FOR SUPPORT AND BE CAPABLE OF A MINIMUM OF 750 POUNDS.

c ALL 2 POST RACKS CROSS ANCHORED TO A 3/4 INCH 4 BACKBOARD PAINTED RETARDANT GRAY PAINT MOUNT.

d IF A CABINET IS TO BE 24 TO 26" INCHES IN MOUNTED TO A 3/4 INCH BOARD CUT TO HAVE A MINIMUM OF 1 INCH WIDER AND TALLER THAN CABINET AND PAINTED RETARDANT PAINT.

e ANY CABINET INSTALLED INTO A CLASSROOM SHALL HAVE SOUND DAMPING MATERIALS INSTALLED.



- Fiber Enclosure
- 2RU Blank Panel
- Patch Panel – Field Config
- 1RU Blank Panel Switch
- Patch Panel – Field Config
- 1RU Blank Panel Switch BOTH
- Patch Panel – Field Config
- 1RU Blank Panel Switch
- Patch Panel – Field Config
- 1RU Blank Panel Switch
- Patch Panel – Field Config

BARS MUST BE X 8 PLYWOOD WITH FIRE WITH CORRECT

USED IT MUST BE DEPTH AND BE PLYWOOD BACK

Uninterruptable Power Supply

WITH GRAY FIRE

- f ALL 2 POST RACKS MUST MAINTAIN A MINIMUM OF 4FT FROM WALL SO TECHS CAN WORK BEHIND A FULLY POPULATED RACK
 - g OPEN RACKS SHALL NEVER BE INSTALLED INTO CLASSROOMS
 - h 4 POST SERVER RACK WITH TWO SHELVES
 - i THE FOLLOWING TO BE USED FOR RACK SIZING AND LAYOUT DESIGN. ALL MDFS AND IDFS DESIGNS AND LAYOUTS ARE TO BE MADE WITH THE NETWORK ELECTRONICS NEEDED TO ACTIVATE ALL COPPER AND FIBER IN MIND. IF A RACK IS MORE THAN 80% FULL A SECOND AND POSSIBLE THIRD RACK MUST BE INSTALLED TO ACCOMMODATE NETWORK ELECTRONICS AND FUTURE NEEDS.
 - j CONTACT HCPS'S NETWORK DEPARTMENT FOR CURRENT NETWORK ELECTRONICS MODELS BEING USED. (SEE DIAGRAM FOR TYPICAL MDF/IDF)
 - i. 24 OR 48 PORT SWITCH'S 17.32(W) X 11.81(D) X 1.72(H) IN (44 X 30 X 4.36 CM) (1U HEIGHT) NOT INCLUDING POWER CORD AND FIBER CONNECTIONS
 - ii. MODULAR CHASSIS - (4U HEIGHT) OR (7U HEIGHT) NOT INCLUDING POWER CORD AND FIBER CONNECTIONS
 - iii. FIBER SWITCH CHASSIS - 17.32(W) X 18.31(D) X 3.39(H) IN (44.0 X 46.5 X 8.61 CM) (2U HEIGHT) NOT INCLUDING POWER CORD AND FIBER CONNECTIONS
 - iv. THERE SHALL BE 1 RU OF SPACE BETWEEN BOTTOM OF SWITCH AND HORIZONTAL MANGER.
 - k WIRE MANAGEMENT BOTH VERTICAL AND HORIZONTAL
 - l FIBER LIU SHALL BE AT THE TOP OF THE RACK, THEN VOICE PATCH PANELS, AND THEN DATA PATCH PANELS.
 - m UPS'S UP TO 4 RU IN HEIGHT
- F. CATEGORY RATED JACKS
1. REFER TO SPECIFIC MANUFACTURER'S GUIDELINES FOR TERMINATION OF JACKS AND DRESSING CATEGORY RATED CABLES INSIDE WALL OUTLETS AND SURFACE HOUSINGS. DUE TO THE LARGER SIZE OF CATEGORY RATED CABLE, SERVICE COILS IN OUTLET BOXES AND SURFACE HOUSINGS ARE NOT RECOMMENDED. SEE REQUIREMENTS FOR CATEGORY RATING.
 2. TERMINATE JACKS ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
 3. ALL JACK WILL BE WIRED UTILIZING T568B.
 4. 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.
 5. THE LENGTH OF WIRING PAIR UN-TWIST IN EACH TERMINATION SHALL BE LESS THAN 0.5 INCHES (13 MM).

6. JACKS SHALL BE PROPERLY MOUNTED IN PLATES, FRAMES, OR HOUSINGS WITH DUST CAPS FULLY INSTALLED OVER IDC CONTACTS.
 7. 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.
 8. CABLE TERMINATIONS SHALL MINIMIZE TENSILE OR BENDING STRAIN ON IDC CONTACTS AFTER ASSEMBLY OF FACEPLATE OR HOUSING TO THE WALL OUTLET.
- G. CATEGORY RATED PATCH PANELS
1. ALL MEDIA WILL BE SEPARATED ON THE PATCH PANELS. EXAMPLE: PATCH PANEL ONE ALL YELLOW MODULAR CATEGORY RATED JACKS FOR DATA APPLICATIONS, PATCH PANEL TWO ALL BLUE MODULAR CATEGORY RATED FOR VOICE APPLICATIONS, PATCH PANEL THREE ALL GREEN MODULAR CATEGORY RATED JACKS FOR WIRELESS APPLICATIONS, PATCH PANEL FOUR ALL PURPLE MODULAR CATEGORY RATED JACKS FOR VIDEO/CAMERA APPLICATIONS, PATCH PANEL FIVE ALL RED MODULAR CATEGORY RATED JACKS FOR SERVER APPLICATIONS AND PATCH PANEL SIX ALL BLACK MODULAR CATEGORY RATED JACKS FOR COPIER APPLICATIONS. CATEGORY RATING SHALL BE DETERMINED.
 2. PROPERLY MOUNT PATCH PANELS INTO THE DESIGNATED RACK, CABINET, OR BRACKET LOCATIONS WITH THE #12-24 SCREWS PROVIDED.
 3. TERMINATE CABLES BEHIND THE PATCH PANEL ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
 4. TO ASSURE 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.
 5. 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.
 6. EACH TERMINATED AND DRESSED CABLE SHALL BE MAINTAINED PERPENDICULAR TO THE REAR COVER USING THE RECOMMENDED CABLE MANAGEMENT HARDWARE.
 7. HORIZONTAL OR BACKBONE CABLES EXTENDING FROM THE REAR PANEL TERMINATIONS SHALL MAINTAIN A MINIMUM BEND RADIUS OF AT LEAST 4 TIMES THE CABLE DIAMETER.
 8. CABLE TERMINATIONS SHALL HAVE MINIMAL TENSILE OR BENDING STRAIN ON PANEL IDC CONTACTS IN EACH INSTALLED LOCATION.
 9. PANELS SHALL BE PROPERLY LABELED ON THE FRONT AND BACK WITH THE CABLE NUMBER AND PORT CONNECTIONS FOR EACH PORT.
- H. CATEGORY 6-110 BLOCKS
1. FOLLOW MANUFACTURER'S INSTRUCTIONS. WALL MOUNTING SURFACES SHOULD BE PREPARED WITH A 3/4" PLYWOOD BACKBOARD WITH TWO COATS OF FIRE RATED PAINT.
 2. MOUNT 6-110 WIRING BLOCKS IN THE DESIRED LOCATION.

3. ROUTE CABLES THROUGH THE OPENINGS IN THE WIRING BLOCK BASE.
 4. TERMINATE UTP CABLES TO THE 6-110 BLOCK ACCORDING TO MANUFACTURER'S INSTRUCTIONS, USING THE CONNECTING BLOCKS AND PROPER TERMINATION TOOL.
 5. TO MAXIMIZE TRANSMISSION PERFORMANCE, MAINTAIN WIRING PAIR TWISTS AS CLOSE AS POSSIBLE TO THE POINT OF TERMINATION.
 6. THE LENGTH OF WIRING PAIR UN-TWIST IN EACH TERMINATION SHALL BE LESS THAN 0.5 INCHES (13 MM).
 7. TO MINIMIZE ALIEN CROSSTALK, EACH TERMINATED CABLE SHALL BE CENTERED WITHIN EACH DESIGNATED IDC CONTACT FIELD TO MAXIMIZE AIR SPACE BETWEEN ADJACENT CABLES.
 8. CABLES EXTENDING FROM THE BLOCK TERMINATIONS SHALL MAINTAIN A MINIMUM BEND RADIUS OF AT LEAST 4 TIMES THE CABLE DIAMETER.
 9. CABLE TERMINATIONS SHALL HAVE MINIMAL TENSILE OR BENDING STRAIN ON IDC CONTACTS AFTER TERMINATION. NOTE: USE THE APPROPRIATE CABLE MANAGEMENT HARDWARE TO RELIEVE CABLE STRAIN AND TO CONTROL BEND RADIUS.
- I. HARSH ENVIRONMENT HOUSING AND CONNECTIVITY
1. MOUNT CONNECTOR HOUSING FROM FRONT OF DEVICE, BUT INSTALL GASKET OR OPTIONAL PROTECTIVE CAP BEFORE MOUNTING CONNECTOR HOUSING INTO DEVICE.
 2. SECURE CONNECTOR HOUSING TO DEVICE USING SUPPLIED PLASTIC NUT. TIGHTEN NUT WITH 6-7 INCH/POUNDS OF TORQUE.
 3. ENSURE THAT MOUNTING SURFACE IS CLEAN AND FREE OF DEBRIS.
 4. INSTALLING THE JACK INTO THE MOUNTED CONNECTOR HOUSING.
 5. INSTALL THE TERMINATED JACK INTO THE MOUNTED CONNECTOR HOUSING BY TILTING THE JACK AND SECURING THE FIXED LATCH IN THE CONNECTOR OPENING. ROTATE THE JACK, SECURING THE SPRING LATCH.
 6. CLEAN AND REMOVE ANY OBSTRUCTIONS FROM THE SURFACE THAT THE WALL PLATE ASSEMBLY WILL BE INSTALLED AGAINST.
 7. PLACE WASHERS PROVIDED WITH HI IMPACT SERIES PLATES ONTO SCREWS. ALIGN RUBBER GASKET ON BACK SIDE OF PLATE PRIOR TO INSTALLING TO BOX/WALL BY PLACING SCREWS THROUGH PLATE AND RUBBER GASKET.
 8. SECURE THE WALL PLATE ASSEMBLY TO BOX/WALL BY TIGHTENING SCREWS WITH 5 INCH/POUNDS OF TORQUE.
 9. ATTACH PATCH CORDS AND FIELD TERM PLUG ASSEMBLIES (SOLD SEPARATELY) TO THE MOUNTED CONNECTOR
- J. OPTICAL FIBER CONNECTORS, HORIZONTAL AND BACKBONE

1. METHOD OF CONNECTOR TERMINATION, SHALL BE EITHER PIGTAIL SPLICE, EPOXY ADHESIVE, ANAEROBIC ADHESIVE, OR MECHANICAL TERMINATION AS SPECIFIED IN THE CONTRACT DOCUMENTS.
2. INSTALLED FIBER CONNECTORS SHALL HAVE PROPER CABLE SUPPORT, ROUTING AND STRAIN RELIEF.
3. INSTALLED CONNECTORS SHALL BE INSPECTED 100% FOR POLISH QUALITY, AND CONTAMINATION.
4. FIBERS TERMINATED FROM OSP CABLE SHALL HAVE BREAK-OUT KITS INSTALLED WHERE APPLICABLE.
5. FUSION SPLICES FOR PIGTAIL CONNECTIONS SHALL BE PROTECTED IN A SUITABLE ENCLOSURE.

TIA TBB/GE LENGTH TABLE	
Linear Length ft.	Size (AWG)
Less than 13	6
14 - 20	4
21 - 26	3
27 - 33	2
34 - 41	1
42 - 52	1/0
53 - 66	2/0
67 - 84	3/0
85 - 105	4/0
106 – 125	250 kcmil
126 - 150	300 kcmil
151 – 175	350 kcmil
176 – 250	500 kcmil
251 - 300	600 kcmil
301+	750 kcmil

K. GROUNDING AND BONDING SYSTEMS: BASIC GUIDELINES

1. ALL COMMUNICATIONS BONDING AND GROUNDING IS TO BE IN ACCORDANCE WITH ANSI/TIA607-C STANDARD, THE NATIONAL ELECTRICAL CODE (NEC) AND THE NFPA. SERVICE ENTRANCE CABLES ARE TO BE GROUNDED IN COMPLIANCE WITH ANSI/TIA607-C & ANSI/NFPA 70 AND LOCAL REQUIREMENTS AND PRACTICES.
2. A STRANDED COPPER WIRE CABLE (THNN) IS TO BE EXTENDED BETWEEN THE MDF AND IDFS UTILIZING THE TABLE PROVIDED IN ANSI/TIA607-C FOR TBB SIZING.
3. THE CABLE CONNECTING THE BUSS-BAR LOCATED IN THE MDF AND THE BUILDING MAIN ELECTRICAL SERVICE GROUND POINT, WILL BE SIZED THE SAME AS THE LARGEST CABLE USED IN THE SYSTEM.
4. EACH BUSS-BAR IN THE FACILITY WILL BE CONNECTED TO BUILDING STEEL (IF AVAILABLE), AND THE ELECTRICAL PANEL (IF AVAILABLE), IN THE TELECOMMUNICATIONS CLOSETS.
5. ALL GROUNDING RUNS IN THE TR'S WILL UTILIZE #6 AWG STRANDED COPPER CABLE AND UL APPROVED CONNECTING HARDWARE.
6. ALL BUSS-BARS WILL BE PREDRILLED 0.25" COPPER. WITH ALL ASSOCIATED HARDWARE. BUSS-BARS IN THE MDF WILL BE 4" WIDTH WITH A LENGTH TO BE ESTABLISHED BY THE CONNECTIONS NEEDED.
7. ALL BOLTS AND NUTS USED WILL BE STAINLESS STEEL.
8. BONDING METHODS WILL BE TO ESTABLISH BONDS FOR THE ELECTRONIC EQUIPMENT.

9. ALL ARMORED CABLE WILL BE BONDED AT ON END TO THE BUSS-BAR.
10. ALL METALLIC PATHWAYS, INCLUDING CONDUIT, RACEWAY LADDER OR CABLE TRAYS SHALL BE ELECTRICALLY CONTINUOUS AND SHALL BE BONDED TO GROUND ON EACH END.
11. OSP CABLE ENTERING THE BUILDING OR BACKBONE CABLES HAVING METAL SHEATHS SHALL

D. WIRELESS ACCESS POINTS

1. CABLES WILL BE RUN TO PREDERMINED LOCATIONS FOR WAP'S (WIRELESS ACCESS POINT'S)
2. ALL CABLES AND CONNECTIVITY WILL BE TERMINATED IN A SURFACE BOX. THE SURFACE BOX WILL BE EITHER PLENUM OR RISER RATED, DETERMINED BY THE RATING REQUIRED IN THE SPACE.
3. ALL CABLES AND MODULAR JACKS WILL BE COLORED PER REQUEST IN PART 2.

E. POWER REQUIREMENTS

1. THE ELECTRICAL IS GOVERNED BY THE APPLICABLE ELECTRICAL CODES.
2. THE POWER CIRCUITS FOR THE CAMPUS NETWORK POWER REQUIREMENT SHALL BE OBTAINED FROM A PANELBOARD THAT IS DEDICATED TO COMPUTER RELATED CIRCUITS.
3. THE PANEL SHALL BE LABELED "COMPUTER CIRCUITS ONLY".
4. EACH OF THESE PANELS SHALL BE PROVIDED WITH A SURGE SUPPRESSOR.
5. NETWORK POWER CIRCUITS SHALL NOT BE CIRCUITED TO PANELS CONTAINING HVAC EQUIPMENT, KITCHEN EQUIPMENT, SHOP EQUIPMENT, OR ANY OTHER EQUIPMENT WITH A LARGE MOTOR LOAD OR LOAD WITH A HIGH HARMONIC CONTENT.
6. THE USE OF EXISTING PANELS IS GENERALLY NOT RECOMMENDED, BUT MAY BE PERMITTED ONLY AFTER CAREFUL REVIEW BY THE OWNER.
 - a) IF PERMITTED, ALL EXISTING PANELS USED FOR COMPUTER CIRCUITS SHALL HAVE A SURGE SUPPRESSOR ADDED.
7. ALL RACKS MUST BE PROVIDED WITH A MINIMUM OF ONE **(1)** DEDICATED 20-AMP, 120-VOLT CIRCUIT, AND QUAD RECEPTACLE.
 - a) ACTUAL NUMBER OF CIRCUITS TO BE DETERMINED BY NETWORK ELECTRONIC NEEDS.
8. POWER RECEPTACLES SHALL BE LOCATED ADJACENT TO COMMUNICATIONS OUTLETS IN ALL ROOMS.
 - a) THESE OUTLETS SHALL BE CIRCUITED TO A 20-AMP, 120-VOLT POWER CIRCUIT FROM THE COMPUTER PANELBOARD.
 - b) THESE CIRCUITS SHALL NOT HAVE MORE THAN FIVE (5) WORKSTATION RECEPTACLES PER CIRCUIT.

- 9. EACH 20A CIRCUIT SHALL HAVE A DEDICATED NEUTRAL.
- 10. PANEL BOARD FEEDERS WITH OVERSIZED NEUTRALS AND A 200% NEUTRAL BUS IN THE COMPUTER PANEL SHOULD BE CONSIDERED WHERE THERE ARE HIGH CONCENTRATIONS OF COMPUTER WORKSTATIONS.

i. TRANSIENT VOLTAGE SURGE SUPPRESSION

- 11. A TRANSIENT VOLTAGE SURGE SUPPRESSOR SHALL BE PROVIDED AT THE SERVICE ENTRANCE AND AT ALL COMPUTER SYSTEM PANEL BOARDS.
- 12. SUPPRESSORS SHALL BE LISTED IN ACCORDANCE WITH UL 1449, STANDARD FOR SAFETY, TRANSIENT VOLTAGE SURGE SUPPRESSORS.
- 13. 3 PHASE, 4W PLUS GROUND CONFIGURATIONS, THE TVSS SHALL PROVIDE SUPPRESSION ELEMENTS BETWEEN L-N, L-G AND N-G.
- 14. INTERNAL PROTECTION:
 - a) TVSS SHALL BE MARKED WITH A SHORT CIRCUIT CURRENT RATING AND SHALL NOT BE INSTALLED AT A POINT ON THE SYSTEM WHERE THE AVAILABLE FAULT CURRENT IS IN EXCESS OF THAT RATING.
 - i. THIS IS A SCHOOL BOARD REQUIREMENT, REGARDLESS OF WHETHER OR NOT IT IS A CURRENT CODE REQUIREMENT.
 - b) TVSS SHALL INCLUDE THERMAL CUTOFF LINKS ON L-N, L-G AND N-G MODES.
 - c) VISIBLE INDICATION OF PROPER SUPPRESSOR CONNECTION AND OPERATION SHALL BE PROVIDED.
 - d) SUPPRESSORS SHALL BE DESIGNED FOR CLOSE NIPPLE INSTALLATION. THE MOUNTING POSITION OF THE SUPPRESSOR SHALL PERMIT A STRAIGHT AND SHORT LEAD LENGTH CONNECTION BETWEEN THE SUPPRESSOR AND THE POINT OF CONNECTION TO THE PANELBOARD. CONDUCTORS SHALL BE GENTLY TWISTED TOGETHER TO REDUCE INDUCTIVE EFFECTS.
 - e) A BREAKER OR SAFETY SWITCH MUST BE PROVIDED AS AN APPROPRIATE DISCONNECT. (NOTE THAT THE ABSOLUTE BEST WAY TO IMPLEMENT TVSS ON A BRANCH PANEL IS WITH HARD BUSSED INTEGRAL INSTALLATION. THE TVSS IS CONNECTED DIRECTLY TO THE BUSS, WHICH ELIMINATES LEAD LENGTHS. THESE COME ONLY FROM OEM COMPANIES WITH THE ENTIRE FAULT CURRENT AND COORDINATION DETAILS ARE ALREADY WORKED OUT.)
 - f) SUPPRESSORS FOR THE SERVICE ENTRANCE SHALL MEET OR EXCEED THE FOLLOWING CRITERIA:
 - i. MAXIMUM SINGLE IMPULSE CURRENT RATING: 150,000 AMPERE PER PHASE (8/20 μ SEC. WAVEFORM).
 - ii. PULSE LIFE RATING: CATEGORY C (8/20 μ SEC. WAVEFORM): 1,000 OCCURRENCES WITH NO CLAMPING DRIFT.

- iii. UL 1449 CLAMPING VOLTAGE SHALL NOT EXCEED THE FOLLOWING:
 - 1. VOLTAGE L-N & L-G N-G
 - 2. 120/208 400 400
 - 3. 277/480 800 800

- g) SUPPRESSORS FOR DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS SHALL MEET OR EXCEED THE FOLLOWING CRITERIA:
 - i. MAXIMUM SINGLE IMPULSE CURRENT RATING: 75,000 AMPERES PER PHASE (8/20 μ SEC. WAVEFORM).
 - ii. PULSE LIFE RATING: CATEGORY C (8/20 μ SEC. WAVEFORM): 1,000 OCCURRENCES WITH NO CLAMPING DRIFT.
 - iii. UL 1449 CLAMPING VOLTAGE MUST NOT EXCEED THE FOLLOWING:
 - (i) VOLTAGE L-N & L-G N-G
 - (ii) 120/208 400 400
 - (iii) 277/480 800 800

- h) THE SUPPRESSOR SHALL HAVE A WARRANTY GUARANTEE FOR A PERIOD OF ONE YEAR, INCORPORATING A ONETIME FREE REPLACEMENT IF THE SUPPRESSOR IS DESTROYED BY LIGHTNING WITHIN THE WARRANTY PERIOD.

ii. UNINTERRUPTIBLE POWER SUPPLY

- 15. AN UNINTERRUPTIBLE POWER SUPPLY (UPS) SHALL BE PROVIDED AT THE MDF AND IDFS.
 - a) THE UPS AT THE MDF SHALL BE RATED AT A MINIMUM OF 1500 VA
 - i. THE 1500 VA UPS SHALL BE EQUIPPED WITH (6 OR MORE) NEMA 5-15R

 - b) IN THE IDF IT SHALL BE RATED FROM 650 TO 1400 VA, DEPENDING ON POWER REQUIREMENTS OF TOTAL ELECTRONICS IN THE RACK.
 - i. THE 650 VA SHALL BE EQUIPPED WITH (4) NEMA 5-15R RECEPTACLES.

 - c) ALL UPS SHALL HAVE INTERNAL SURGE SUPPRESSION FOR THE INCOMING POWER CIRCUIT.

- d) THE UPS SHALL HAVE LED'S TO INDICATE THE UPS STATUS
 - e) THEY SHALL HAVE HOT SWAP BATTERIES, INTELLIGENT BATTERY MANAGEMENT, OVERLOAD INDICATOR, RACK MOUNT, REPLACEMENT BATTERY INDICATOR, SOFTWARE, SITE WIRING FAULT INDICATOR, AUTOMATIC VOLTAGE REGULATION (AVR), NETWORK INTERFACE CARD FOR REMOTE COMMUNICATIONS, AND USER REPLACEABLE BATTERIES.
 - a. NO UPS OVER 650 VA IS TO BE MOUNTED IN ANY SWING GATE TYPE RACK UNLESS EXTRA BRACING IS ADDED TO THE RACK TO SUPPORT THE WEIGHT OF THE UPS AND ELECTRONICS WHEN THE GATE IS OPENED.
2. 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.
 3. THE ENTRANCE FACILITIES INCLUDE CONNECTIONS BETWEEN CABLING USED IN THE OUTSIDE ENVIRONMENT AND CABLING AUTHORIZED FOR IN-BUILDING DISTRIBUTION.
 4. THESE CONNECTIONS MAY BE ACCOMPLISHED VIA A SPLICE OR OTHER MEANS.
 5. 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.

III. FIRE STOP

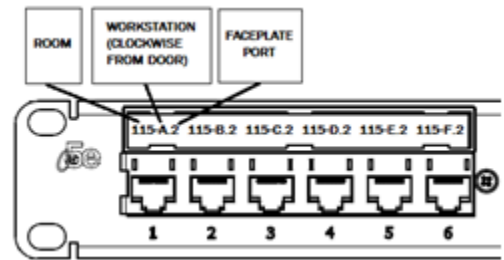
1. BEFORE BEGINNING INSTALLATION, VERIFY THAT SUBSTRATE CONDITIONS PREVIOUSLY INSTALLED UNDER OTHER SECTIONS ARE ACCEPTABLE FOR INSTALLATION OF FIRESTOPPING IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS AND TECHNICAL INFORMATION.
2. SURFACES SHALL BE FREE OF DIRT, GREASE, OIL, SCALE, LAITANCE, RUST, RELEASE AGENTS, WATER REPELLANTS, AND ANY OTHER SUBSTANCES THAT MAY INHIBIT OPTIMUM ADHESION.
3. PROVIDE MASKING AND TEMPORARY COVERING TO PROTECT ADJACENT SURFACES.
4. DO NOT PROCEED UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
5. 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.
6. COMPLY WITH MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION OF FIRESTOPPING PRODUCTS.
7. KEEP AREAS OF WORK ACCESSIBLE UNTIL INSPECTION BY AUTHORITIES HAVING JURISDICTION.WHERE DEFICIENCIES ARE FOUND, REPAIR FIRESTOPPING PRODUCTS SO THEY COMPLY WITH REQUIREMENTS.
8. REMOVE EQUIPMENT, MATERIALS, AND DEBRIS, LEAVING AREA IN UNDAMAGED, CLEAN CONDITION.

9. CLEAN ALL SURFACES ADJACENT TO SEALED OPENINGS TO BE FREE OF EXCESS FIRESTOPPING MATERIALS AND SOILING AS WORK PROGRESSES.

B. LABELING

I. GENERAL:

1. **ALL LABELS SHALL BE PERMANENT, MACHINE GENERATED LABELS PRODUCED BY A LABELING MACHINE.** LABELS SHALL BE A PERMANENT POLYESTER MATERIAL CLEAR IN COLOR WITH LABEL LETTERING BLACK IN COLOR. NO HAND WRITTEN LABELS WILL BE ACCEPTED.

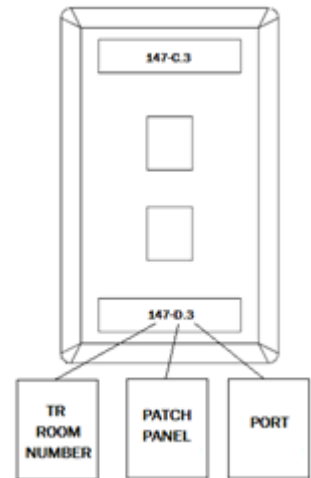


2. LABELING INFORMATION WILL BE REVIEWED AT PRE-INSTALL MEETING, AND THE OWNER SHALL APPROVE THE LABELING SCHEME PRIOR TO THE INSTALLATION OF ANY CABLING.
3. SURFACES SHALL BE CLEANED BEFORE ATTACHING LABELS. ALL LABELS SHALL BE ATTACHED FIRMLY AND VERTICALLY PLUMB ON EQUIPMENT, FACEPLATES, PATCH PANELS TERMINATION BLOCKS, ETC.

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

II. CABLING

1. 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.



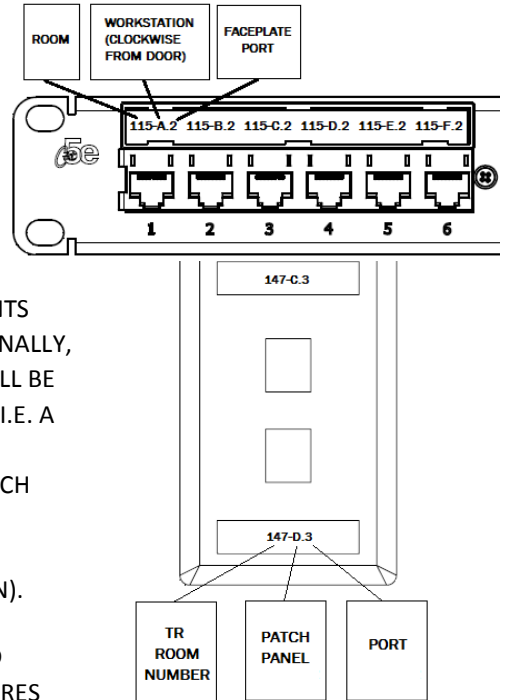
2. LABELS SHALL HAVE AN ADHESIVE BACKING AND SHALL WRAP COMPLETELY AROUND THE CIRCUMFERENCE OF THE CABLE JACKET. LABEL AND LETTERING SIZES SHALL BE OF APPROPRIATE SIZE IN REGARDS TO CABLE DIAMETER.

III. EQUIPMENT RACKS, TERMINATION HARDWARE, AND FACEPLATES

1. ALL COMMUNICATIONS EQUIPMENT RACKS, CABINETS, FIBER ENCLOSURES, AND TERMINATION HARDWARE SHALL BE CLEARLY LABELED AT THE TOP, LEFT-HAND CORNER OF THE EQUIPMENT.
2. EQUIPMENT RACKS AND CABINETS SHALL HAVE 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. 147-2 REPRESENTS THE SECOND RACK/CABINET IN TELECOMMUNICATIONS ROOM #147)

3. FIBER ENCLOSURES SHALL HAVE 3/8" TO 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. 1471-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.

4. MODULAR PATCH PANELS SHALL HAVE 3/8" TO 1/2" HIGH LETTERING AND SHALL BE LABELED WITH THE WORKSTATION ROOM NUMBER FOLLOWED BY AN ALPHANUMERIC CHARACTER OF THE FACEPLATE (CLOCKWISE FROM THE DOOR, LOOKING IN) AND THE PORT IN THE FACEPLATE (I.E. 115-A.2) REPRESENTS THE SECOND PORT IN THE FACEPLATE. ADDITIONALLY, EACH JACK POSITION ON THE PATCH PANEL SHALL BE IDENTIFIED WITH THE JACK POSITION NUMBER (I.E. A 48-PORT PATCH PANEL SHALL HAVE NUMBER 1 THROUGH 48 SILK SCREEN PRINTED ON THE PATCH PANEL OR SHALL HAVE LABELING STRIPS WITH NUMBERS 1 THROUGH 48 MACHINE PRINTED ABOVE/BELOW CORRESPONDING JACK POSITION).



5. VOICE TERMINATION BLOCKS SHALL BE LABELED SIMILAR TO PATCH PANELS AND FIBER ENCLOSURES WHEN INSTALLED IN EQUIPMENT RACKS AND CABINETS. VOICE BACKBONE CABLE PAIRS SHALL BE LABELED STARTING WITH V001 STARTING AT THE MAIN COMMUNICATIONS ROOM AND CONTINUING SEQUENTIALLY THROUGH ALL COMMUNICATIONS ROOMS. HORIZONTAL VOICE CABLES (STATION CABLES) TERMINATED SHALL BE LABELED SIMILAR TO DATA PATCH PANELS.

6. VOICE AND DATA OUTLETS SHALL HAVE 3/16" HIGH LETTERING WITH THE LABELING METHOD AS INDICATED. VOICE AND DATA OUTLETS SHALL BE IDENTIFIED WITH THE TELCOMMUNICATIONS ROOM WHERE CABLES ARE TERMINATED, THE RACK/CABINET NUMBER, THE PATCH PANEL NUMBER, AND THE JACK POSITION NUMBER (I.E. 147-C-2 REPRESENTS THE OUTLET IS LOCATED ON THE THIRD PATCH PANEL IN SECOND PORT. THE CONTRACTOR SHALL TERMINATE ALL CABLING IN A SEQUENTIAL METHOD.

C. TESTING

I. .CATEGORY 6 CABLE TESTING

1. PERMANENT LINK TESTING SHALL BE COMPLETED ON ALL HORIZONTAL (STATION) CABLES. THE CONTRACTOR WILL BE RESPONSIBLE TO SUPPLY A CHANNELL WARRANTY; BUT HILLSBOROUGH COUNTY PUBLIC SCHOOLS IS REQUIRING THAT THE CONTRACTOR SUPPLY ALL MANUFACTURER PATCH CORDS PER THE CONTRACT.
2. CATEGORY 6 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

3. ALL WIRING SHALL BE CERTIFIED TO MEET OR EXCEED THE SPECIFICATIONS AS SET FORTH IN TIA-568C FOR CATEGORY 6 REQUIREMENTS FOR PERMANENT LINK. ALL TESTS WILL BE PERFORMED TO 250MHZ.
4. 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).
5. A "PASS" INDICATION SHALL BE OBTAINED FOR EACH LINK, USING AT MINIMUM A LEVEL III TESTER THAT COMPLIES WITH TIA/EIA-568-B.2 FIELD TEST REQUIREMENTS.
6. 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.

II. OPTICAL FIBER TESTING:

1. TEST PROCEDURES SHALL BE AS DESCRIBED BY THE TIA/EIA-568-B: 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
2. 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.
3. 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.