April 5, 2023

To: All Planholders

Subject: ADDENDUM #2 – SCO ID# 19-21349-02B; Code # 41923; Item # 304 – UNC PARCS Design

Please be advised the above referenced project is hereby amended, clarified, and / or changed as provided in the attached documents:

1. Addendum Narrative – 1 page
2. Specification Revisions – 13 pages (Section 271100 – Communications System Components)
3. Drawing Revisions – (revisions are clouded and tagged within the sheets)
    a. Construction Drawings Cover Sheet
    b. Electrical (E) Sheets: 2 electrical sheets,

These provisions shall become part of the bid package and Bidders shall acknowledge receipt of the addendum by signing in the space proved below and return this page with the bid submittal. All other terms and conditions and specifications of the bid process remain unchanged.

Signature: _____

(Bidder)

Sincerely,

Ethan Hill, PE
Kimley-Horn and Associates
Raleigh, NC

The following list represents selected comments to clarify the bidding requirements as part of this addendum.

1. **Comment:** A non-mandatory pre-bid meeting was held on February 28, 2023. Information regarding this meeting is included in Addendum 01.

2. **Comment:** The original bid opening was 3:00pm on March 28, 2023. Insufficient bids were received to meet the SCO formal bidding requirement. Therefore, bids were not opened and returned to the bidder. The project will be re-bid and bids will be opened at 3:00pm on April 12, 2023.

3. **Comment:** Kyle Coble becomes the project manager once contractor is under contract.

4. **Comment:** All prospective bidders are encouraged to walk all parking decks and lots prior to bid.

5. **Comment:** Davis Library Lot has been removed from the scope of the project. Prospective bidders are to remove the appropriate scope and quantities from the bid.

6. **Comment:** The updates to Specification 271100 as part of this addendum includes:

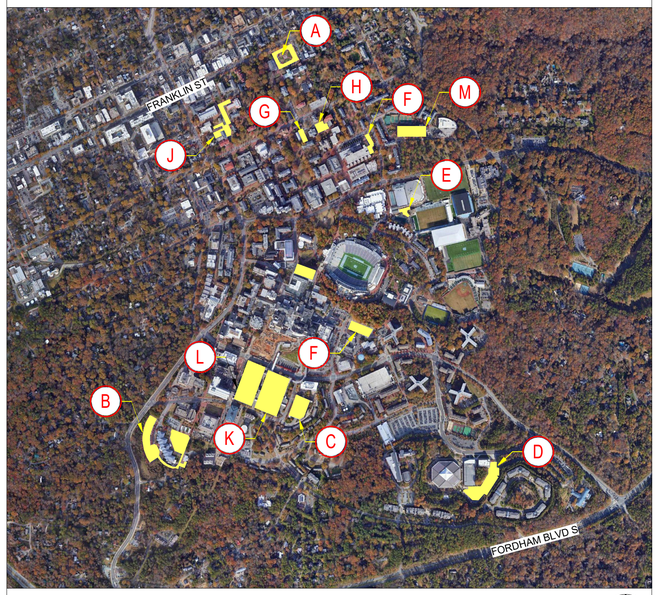
    a. Section 2.5.B. The telecommunication equipment wall-mounted was changed from a NEMA 4X, IP55 to a NEMA 3R.
    b. Section 2.5.C. Exterior telecommunication enclosures changes from a NEMA 4X to a NEMA 3R.
    c. Section 3.1.E. This section is deleted from the scope of work. All CAT6 cabling will be provided by others.
    d. Section 3.4.B.10. UTP performance tests is deleted from the scope of work. All CAT6 cabling will be provided by others.
    e. For additional updates to this specification, see Addendum 01.

7. **Comment:** Review Addendum 01 for additional questions and responses.

UNC PARKING ACCESS AND REVENUE CONTROL SYSTEM DESIGN

CONSTRUCTION DOCUMENTS
SCO ID# 19-21349-02B

VICINITY MAP



CHAPEL HILL, NC 27514

A. MOREHEAD PLANETARIUM LOT
B. AMBULATORY CARE CENTER LOT
C. JACKSON DECK
D. DEAN SMITH LOT
E. CARMICHAEL LOT
F. DAVIS LIBRARY LOT
G. STEELE LOT
H. CALDWELL LOT
J. SWAIN LOT
K. DOGWOOD DECK
L. CARDINAL DECK
M. COBB DECK

DRAWING INDEX

PROJECT TEAM

OWNER

UNIVERSITY OF NORTH CAROLINA

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CONTACT:
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PARKING

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KIMLEY-HORN AND ASSOCIATES INC.

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ELECTRICAL / COMMUNICATIONS

ENGINEERED DESIGNS, INC.

CONTACT:
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brad.wynne@engineereddesigns.com

MAKE SURE ALL UNDERGROUND UTILITIES ARE LOCATED PRIOR TO WORK. CONTRACTOR MUST CALL 811 AND THE EDS MAIN NUMBER: 919-962-8394. CONTRACTOR MUST ALLOW THREE (3) WORKING DAYS FOR LOCATE REQUESTS TO CLEAR.

811 Know what's below. Call before you dig.

SCOPE OF WORK SUMMARY:
Project includes removing and salvaging the existing parking access and revenue control system lane equipment (PARCS), removal and replacing many of the concrete islands they are mounted to, and installing new infrastructure in preparation for SKIDATA to install their equipment at 12 different parking facilities throughout the UNC campus that serve both visitor and employee users. This work includes selective demolition, forming and pouring new islands, running new power and communication cables to the islands in existing/new pathways.

Kimley»Horn
NC LICENSE #F-0102 2022 ©

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SEALS

NORTH CAROLINA PROFESSIONAL SEAL 046486 ENGINEER ETHAN HILL

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

UNC PARKING ACCESS AND REVENUE CONTROL SYSTEM DESIGN

Chapel Hill, NC

SCO ID# 19-21349-02B
CODE #: 41923
ITEM #: 304

NO:	DATE	DRAWING ISSUE DESCRIPTION
3	04/04/23	BID ADDENDUM 2
1	02/15/23	ISSUED FOR BID

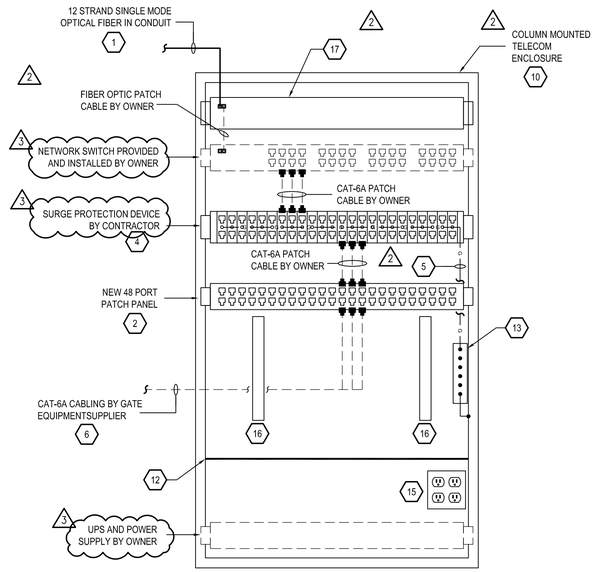
DESIGNED BY: EEH
DRAWN BY: PCM
CHECKED BY: APC
SCALE: As indicated
DATE: 10/21/2022
PROJECT NO: 012196015
FILENAME:

COVER SHEET

CONSTRUCTION DOCUMENTS

G0001

4/4/2023 3:55:44 PM Autodesk Docs://012196015 UNC PARCS/UNC PARCS - BP2 - 3rd22_Struct_v2022.rvt

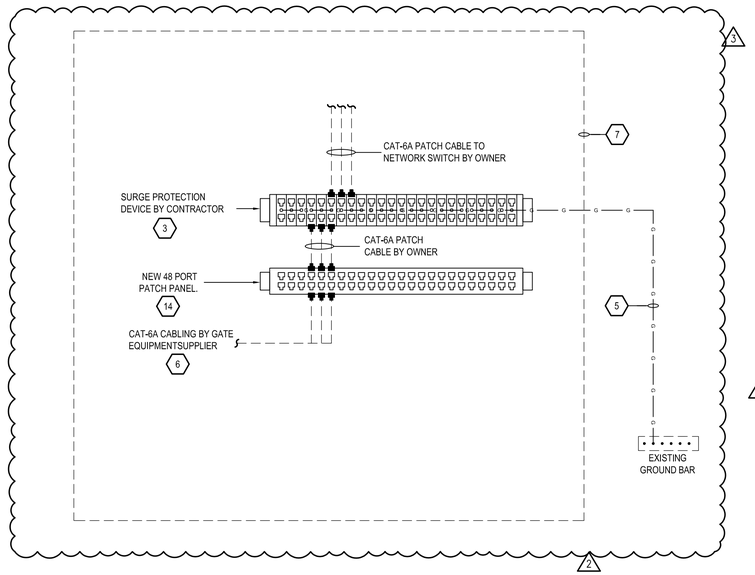


2 3 E2001 TELECOMMUNICATIONS RISER DIAGRAM DETAIL 3 2

SCALE: N.T.S.

NOTE: DIAGRAM SHOWN IS APPLICABLE TO THE FOLLOWING LOCATION(S):

- JACKSON DECK UPPER LEVEL



1 E2001 TELECOMMUNICATIONS RISER DIAGRAM DETAIL 1

SCALE: N.T.S.

NOTE: DIAGRAM SHOWN IS APPLICABLE TO THE FOLLOWING LOCATION(S):

- JACKSON DECK LOWER LEVEL
- [illegible]
- STEELE LOT
- CALDWELL LOT
- SWAIN LOT

NOTE: DIAGRAM SHOWN IS APPLICABLE TO THE FOLLOWING LOCATION(S):

- DOGWOOD DECK MASON FARM ROAD ENTRANCE
- DOGWOOD DECK EAST DRIVE ENTRANCE
- DOGWOOD DECK MAINTENANCE COURTYARD
- DOGWOOD DECK EAST DRIVE EXIT
- DOGWOOD DECK LEVEL 1 PAY ON FOOT
- CARDINAL DECK MASON FARM ROAD
- CARDINAL DECK WEST DRIVE SOUTH ENTRY
- CARDINAL DECK COURTYARD EXIT
- COBB DECK PAUL GREEN DRIVE WEST
- COBB DECK PAUL GREEN DRIVE EAST

TELECOMMUNICATIONS ENCLOSURE LISTING NOTE

TELECOMMUNICATION EQUIPMENT ENCLOSURES SHALL BE THIRD PARTY LABELED, INCLUSIVE OF ALL COMPONENTS, CERTIFYING THAT THE ASSEMBLY OF ALL COMPONENTS IS LISTED AS AN ENCLOSED CONTROL PANEL COMPLIANT WITH UL CATEGORY LISTING ASSOCIATED WITH UL 60950-1 STANDARD FOR INFORMATION CONTROL EQUIPMENT - SAFETY-PART 1: GENERAL REQUIREMENTS OR ALTERNATIVELY, UL 294 STANDARD FOR ACCESS CONTROL SYSTEM UNITS IN ACCORDANCE WITH NC GENERAL STATUE 66-25. FIELD EVALUATION OF THE ASSEMBLY IS PERMITTED WHERE REQUIRED TO ACHIEVE THIRD PART LABELING / LISTING AS NOTED.

TELECOMMUNICATIONS RISER DIAGRAMS NOTE

TELECOMMUNICATIONS RISER DIAGRAMS SHOWN ARE INTENDED TO DEPICT ARRANGEMENT OF TELECOMMUNICATIONS EQUIPMENT, CABLING, ETC. FOR THE DECKS AND LOTS INCLUDED AS PART OF THIS PROJECT NECESSARY TO PROVIDE NETWORK CONNECTIVITY BETWEEN THE UNC TELECOMMUNICATIONS SYSTEM AND THE NEW PARCS EQUIPMENT. CONTRACTOR SHALL REFER TO REMOTE NETWORK ENCLOSURE REQUIREMENTS ON SHEET E2002, PLANS, AND SPECIFICATIONS FOR ADDITIONAL INFORMATION AND DETAILS RELATING TO EQUIPMENT SPECIFICATIONS, CONDUIT REQUIREMENTS, CABLING QUANTITIES, ETC. NOT EXPLICITLY CAPTURED ON THESE DIAGRAMS. 2

EXTERIOR CABLING RATING NOTE

UNLESS OTHERWISE NOTED, ALL COMMUNICATION CABLING ROUTED OUTSIDE OF TELECOM ROOMS AND / OR TELECOM EQUIPMENT ENCLOSURES INDICATED SHALL BE RATED FOR OUTDOOR INSTALLATION AND SUITABLE FOR INSTALLATION IN CONDUIT BELOW GRADE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

NOTES KEYED TO DIAGRAMS 2

3 1 CONTRACTOR SHALL PROVIDE 12 STRAND, SINGLE MODE FIBER OPTIC CABLE AS DESCRIBED ON THE FLOOR PLANS. CONTRACTOR SHALL COORDINATE FINAL TERMINATIONS ONTO UNC IT EQUIPMENT WITH UNC IT PRIOR TO MAKING ANY CONNECTIONS.

2 CONTRACTOR SHALL PROVIDE 48 PORT, 1U RACK MOUNTED, CAT-6A PATCH PANEL. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

3 3 CONTRACTOR SHALL PROVIDE A 24-PORT, 1U, WALL MOUNTED CAT-6A SURGE PROTECTION DEVICE AS REQUIRED TO PROTECT ALL CAT-6A CABLING LEAVING TELECOM ROOM TO SERVE PARCS / LANE EQUIPMENT. IN ADDITION, PROVIDE A MINIMUM 1U, 19" WIDE x 6" DEEP, STEEL POWDER COATED HINGED BRACKET TO MOUNT DEVICE ON WALL. COORDINATE MOUNTING LOCATION WITH OWNER PRIOR TO ROUGH-IN. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

4 CONTRACTOR SHALL PROVIDE A (MINIMUM OF 1) 24-PORT, 1U, RACK MOUNTED CAT-6A SURGE PROTECTION DEVICE (SPD). COORDINATE QUANTITY OF SPD DEVICES (MAXIMUM OF 2) WITH GATE EQUIPMENT SUPPLIER / OWNER TO ENSURE THAT THERE ARE AN ADEQUATE QUANTITY PORTS TO PROTECT ALL CAT-6A CABLING LEAVING TELECOM ROOM TO SERVE PARCS / LANE EQUIPMENT. REFER TO SPECIFICATIONS AND NOTE 10 OF "REMOTE NETWORKING ENCLOSURE REQUIREMENTS" ON SHEET E2002 FOR ADDITIONAL REQUIREMENTS.

5 CONTRACTOR SHALL PROVIDE COPPER #6 AWG GROUND CONDUCTOR(S) TO GROUND SPD'S TO THE GROUND BAR AS REQUIRED.

6 GATE EQUIPMENT SUPPLIER SHALL PROVIDE AND INSTALL ALL CAT6A CABLING LEAVING TELECOM ROOMS AND/ OR TELECOM EQUIPMENT ENCLOSURES AND TERMINATE AT GATE EQUIPMENT VIA CONTRACTOR SUPPLIED CONDUIT. SEE PLANS FOR ADDITIONAL REQUIREMENTS.

3 7 EXISTING PLYWOOD BACKBOARD. COORDINATE THE LOCATION OF NEW EQUIPMENT TO BE MOUNTED ON BACKBOARD WITH OWNER PRIOR TO ROUGH-IN. IN THE EVENT THERE IS NOT ADEQUATE ROOM ON THE EXISTING BACKBOARD, PROVIDE A NEW 4'-0" x 8'-0" x 3/4" FIRE RATED PLYWOOD BACKBOARD, PAINTED WHITE, LEAVING FIRE RATINGS VISIBLE. COORDINATE MOUNTING LOCATION WITHIN TELECOM ROOM WITH OWNER.

8 NOT USED.

9 NOT USED.

3 10 CONTRACTOR SHALL PROVIDE A WALL MOUNTED, NEMA 3R ENCLOSURE FOR HOUSING EQUIPMENT AS SHOWN. ENCLOSURE SHALL BE A MINIMUM 36"H x 24"W x 30"D AND INCLUDE DOUBLE HINGED / LOCKABLE DOOR WITH REAR ACCESS WITH A 19" WIDE OPEN FRAMED EQUIPMENT RACK AS REQUIRED FOR SECURING EQUIPMENT SHOWN. ENCLOSURE SHALL ALSO INCLUDE A NON-METALLIC CABLE MANAGEMENT SYSTEM WITH REMOVABLE COVER AS REQUIRED FOR SECURING AND NEATLY ARRANGING CABLING WITHIN. FINAL DIMENSIONS OF ENCLOSURE IS TO BE DETERMINED BY CONTRACTOR BASED ON ACTUAL EQUIPMENT PROVIDED / INSTALLED WITH AN ADDITIONAL 20% GROWTH CAPACITY. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND COORDINATE OWNER PROVIDED EQUIPMENT DIMENSIONS / REQUIREMENTS TO ENSURE THERE IS ADEQUATE SPACE WITHIN THE ENCLOSURE.

11 CONTRACTOR SHALL PROVIDE AN EXTERIOR RATED NEMA 3R ENCLOSURE FOR HOUSING EQUIPMENT AS SHOWN. ENCLOSURE SHALL BE MINIMUM 20 RU HIGH x 24" WIDE x 30" DEEP AND INCLUDE HINGED / LOCKABLE DOOR / COVER AND HINGED BACK-PANEL WITH A 19" WIDE OPEN FRAMED EQUIPMENT RACK AS REQUIRED FOR SECURING EQUIPMENT SHOWN. ENCLOSURE SHALL ALSO INCLUDE A CABLE MANAGEMENT SYSTEM FOR SECURING AND NEATLY ARRANGING CABLING WITHIN. FINAL DIMENSIONS OF ENCLOSURE IS TO BE DETERMINED BY CONTRACTOR BASED ON ACTUAL EQUIPMENT PROVIDED / INSTALLED WITH AN ADDITIONAL 20% GROWTH CAPACITY AND THE ABILITY TO FIT INSIDE THE ISLAND FOOTPRINT WHERE INSTALLED. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND COORDINATE OWNER PROVIDED EQUIPMENT DIMENSIONS / REQUIREMENTS TO ENSURE THERE IS ADEQUATE SPACE WITHIN THE ENCLOSURE. REFER TO NOTE 1 OF "REMOTE NETWORKING ENCLOSURE REQUIREMENTS" ON SHEET E2002 FOR ADDITIONAL REQUIREMENTS.

12 CONTRACTOR SHALL PROVIDE PHYSICAL BARRIER BETWEEN 120V AND LOW-VOLTAGE EQUIPMENT / CABLING WITHIN THE TELECOMMUNICATIONS EQUIPMENT ENCLOSURE IN ACCORDANCE WITH NEC ARTICLE 725.136.

13 CONTRACTOR SHALL PROVIDE COPPER GROUND BAR MOUNTED WITHIN ENCLOSURE AND PROVIDE 1-#6G TO BOND GROUND BAR TO ENCLOSURE. SURGE PROTECTION DEVICE AS REQUIRED.

3 14 CONTRACTOR SHALL PROVIDE 48 PORT, 1U, WALL MOUNTED, CAT-6A PATCH PANEL. IN ADDITION, PROVIDE A MINIMUM 1U, 19" WIDE x 6" DEEP, STEEL POWDER COATED HINGED BRACKET TO MOUNT DEVICE ON WALL. COORDINATE MOUNTING LOCATION WITH OWNER PRIOR TO ROUGH-IN. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

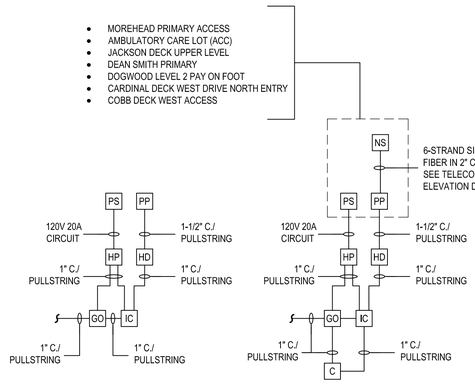
15 CONTRACTOR SHALL PROVIDE A 20 A, QUAD RECEPTACLE WITHIN THE ENCLOSURE AND CIRCUIT AS REQUIRED. SEE FLOOR PLANS FOR ADDITIONAL REQUIREMENTS. BOND BRANCH CIRCUIT EQUIPMENT GROUND CONDUCTOR TO GROUND BAR AS REQUIRED. REFER TO NOTE 4 OF "REMOTE NETWORKING ENCLOSURE REQUIREMENTS" ON SHEET E2002 FOR ADDITIONAL REQUIREMENTS.

16 PROVIDE NON-METALLIC CABLE MANAGEMENT WITH FINGERED SLOTS AND REMOVABLE COVER AS REQUIRED FOR SECURING AND NEATLY ARRANGING CABLING WITHIN THE TELECOMMUNICATIONS EQUIPMENT ENCLOSURE.

17 PROVIDE 6-PORT, 1RU RACK MOUNTED FIBER OPTIC DATA OUTLET FOR CONNECTION OF FIBER TO OWNER PROVIDED NETWORK SWITCH. REFER TO NOTES 7 & 8 OF "REMOTE NETWORKING ENCLOSURE REQUIREMENTS" ON SHEET E2002 FOR ADDITIONAL REQUIREMENTS.

- MOREHEAD PRIMARY ACCESS
- AMBULATORY CARE LOT (ACC)
- JACKSON DECK UPPER LEVEL
- DEAN SMITH PRIMARY
- DOGWOOD LEVEL 2 PAY ON FOOT
- CARDINAL DECK WEST DRIVE NORTH ENTRY
- COBB DECK WEST ACCESS

NS NETWORK SWITCH BY OWNER
PP PATCH PANEL
PS POWER SOURCE
HP POWER STUB UP LOCATION
HD DATA CONDUIT STUB UP LOCATION
IC ISLAND COLUMN EQUIPMENT BY GATE EQUIPMENT SUPPLIER
GO GATE OPERATOR BY GATE EQUIPMENT SUPPLIER
C LPR CAMERA BY GATE EQUIPMENT SUPPLIER



TYPICAL CONDUIT ROUTING RISER

TYPICAL LANE WITHOUT CAMERA

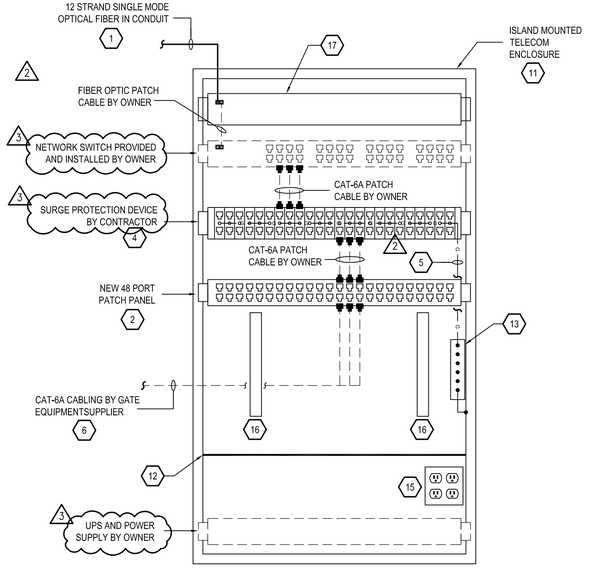
TYPICAL LANE WITH CAMERA

2 4 E2001 CONDUIT RISER DIAGRAM

SCALE: N.T.S.

NOTES:

1. RISER DIAGRAM IS TYPICAL FOR LANE EQUIPMENT. REFER TO PLAN SHEETS FOR ADDITIONAL REQUIREMENTS.
2. ELECTRICAL CONTRACTOR TO PROVIDE ALL CONDUIT / PULLSTRING.
3. GATE EQUIPMENT SUPPLIER TO PROVIDE ALL CAT6A CABLING AND CONNECTIONS TO EQUIPMENT AS REQUIRED.
4. UNLESS OTHERWISE DIRECTED ON NEW WORK PLANS, 120V 20A CIRCUIT(S) SERVING GATE EQUIPMENT ARE EXISTING TO BE RE-USED.



2 2 E2001 TELECOMMUNICATIONS RISER DIAGRAM DETAIL 2

SCALE: N.T.S.

NOTE: DIAGRAM SHOWN IS APPLICABLE TO THE FOLLOWING LOCATION(S):

- MOREHEAD PRIMARY ACCESS
- AMBULATORY CARE LOT (ACC)
- DEAN SMITH PRIMARY
- DOGWOOD LEVEL 2 PAY ON FOOT
- CARDINAL DECK WEST DRIVE NORTH ENTRY
- COBB DECK WEST ACCESS

Kimley»Horn

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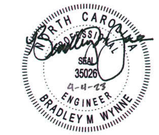
SEALS



THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

UNC PARKING ACCESS AND REVENUE CONTROL SYSTEM DESIGN

Chapel Hill, NC

SCO ID# 19-21349-02A
CODE #: 41923
ITEM #: 304

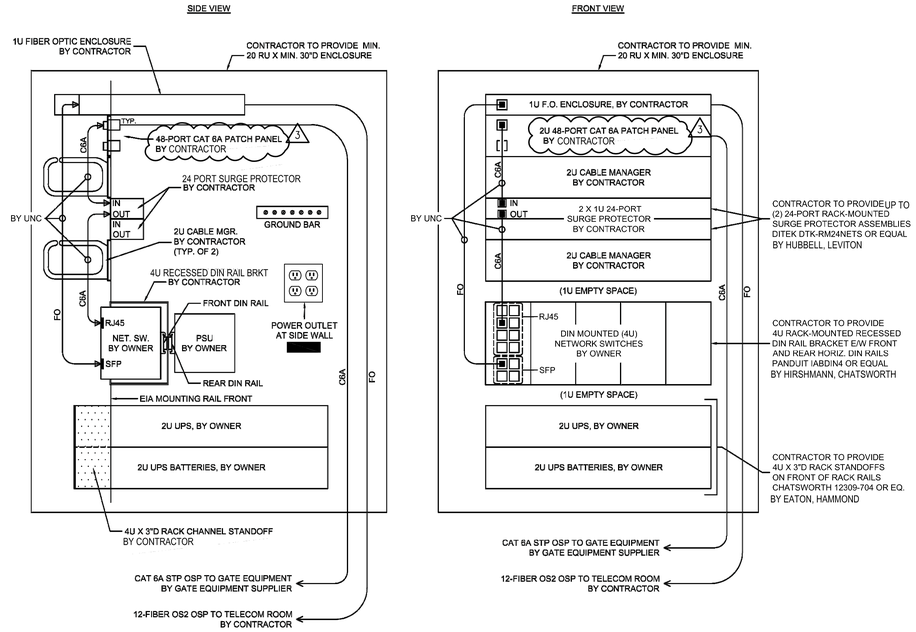
NO:	DATE	DRAWING ISSUE DESCRIPTION
3	04/04/23	BID ADDENDUM 02
2	03/17/23	BID ADDENDUM 01
1	02/15/23	ISSUED FOR BID

DESIGNED BY: SEG
DRAWN BY: SEG
CHECKED BY: BMW
SCALE: As indicated
DATE: 10/21/2022
PROJECT NO: 095-20
FILENAME:

TELECOMMUNICATIONS RISER DIAGRAMS & DETAILS

CONSTRUCTION DOCUMENTS

E2001



1 E2002 **REMOTE NETWORKING ENCLOSURE REQUIREMENTS**

SCALE: N.T.S.

REMOTE NETWORKING ENCLOSURE REQUIREMENTS NOTES

THE PROVISIONING OF THE REMOTE NETWORKING ENCLOSURES FOR THE PARCS PROJECT MUST ADHERE TO THE FOLLOWING REQUIREMENTS AND AS SHOWN IN THE ATTACHED DIAGRAM.

1. THE ENCLOSURE MUST BE A MINIMUM OF 20 RU HIGH AND A MINIMUM OF 30" DEEP, AND THE EIA EQUIPMENT MOUNTING RAILS MUST BE RECESSED BY 6" FROM THE FRONT OF THE ENCLOSURE. PROVIDE GROUNDING BUS BAR MOUNTED IN THE REAR AREA OF THE ENCLOSURE, TO NOT INCREASE THE HEIGHT REQUIREMENT OF THE ENCLOSURE, AND VERTICALLY POSITIONED TOWARD THE UPPER HALF, TO NOT INTERFERE WITH THE OWNER'S ACCESS TO THE SWITCH POWER SUPPLY UNITS OR TO CONFLICT WITH THE FIBER OPTIC ENCLOSURE AT THE TOP.

2. THE ENCLOSURE MODEL PROVIDED MUST PROVIDE FOR SUFFICIENT VENTILATION TO DISSIPATE THE COMBINED HEAT GENERATED FROM THE FOLLOWING EQUIPMENT PROVIDED BY OWNER:

   - EXTREME NETWORKS MODEL 16804 INDUSTRIAL NETWORK SWITCH - QTY. 5
   - MEAN WELL MODEL SDR-480-48 INDUSTRIAL POWER SUPPLY - QTY. 5
   - FALCON ELECTRIC MODEL SSG3KRM-1 INDUSTRIAL UPS - QTY. 1

3. THE ENCLOSURE MODEL PROVIDED SHALL HAVE FACTORY INSTALLED REMOVABLE GLAND PLATES TO ADD FUTURE AIR CONDITIONING UNITS AND FAN KITS WITHOUT THE NEED FOR CUSTOM FIELD MODIFICATIONS. IT IS THE INTENT THAT THE REMOVABLE GLAND PLATES ARE SUITABLE FOR STANDARD AIR CONDITIONING UNITS AND FAN KITS (i.e. NOT CUSTOM) OFFERED BY ENCLOSURE MANUFACTURER. CONTRACTOR SHALL PROVIDE DOCUMENTATION OF AIR CONDITIONING UNIT AND FAN KITS THAT ARE COMPATIBLE FOR OWNER'S FUTURE REFERENCE. AIR CONDITIONING UNITS AND FAN KITS ARE NOT TO BE PROVIDED AS PART OF THIS PROJECT. (3)

4. ALL ENCLOSURES ARE TO BE SERVED WITH A 20 AMP POWER CIRCUIT, PROVIDING A NEMA L5-20R QUAD POWER OUTLET MOUNTED IN THE REAR AREA OF THE ENCLOSURE, TO NOT INCREASE THE HEIGHT REQUIREMENT OF THE ENCLOSURE, AND VERTICALLY POSITIONED TOWARD THE UPPER HALF, TO NOT INTERFERE WITH THE OWNER'S ACCESS TO THE SWITCH POWER SUPPLY UNITS OR TO CONFLICT WITH THE FIBER OPTIC ENCLOSURE AT THE TOP.

5. THE ENCLOSURE MODEL PROVIDED SHALL HAVE FACTORY INSTALLED PROVISIONS / MOUNTING HARDWARE FOR THE ABILITY TO MOUNT A FUTURE SOLAR SHIELD WITHOUT THE NEED FOR CUSTOM FIELD MODIFICATIONS. IT IS THE INTENT THAT THE ENCLOSURE PROVISIONS ARE SUITABLE FOR ACCEPTING THE STANDARD SOLAR SHIELD OFFERING (i.e. NOT CUSTOM) BY THE ENCLOSURE MANUFACTURER. CONTRACTOR SHALL PROVIDE DOCUMENTATION OF SOLAR SHIELD THAT IS COMPATIBLE WITH THE ENCLOSURE FOR OWNER'S FUTURE REFERENCE. SOLAR SHIELDS ARE NOT TO BE PROVIDED AS PART OF THIS PROJECT.

6. NOT USED.

7. THE FIBER OPTIC CABLES ARE TO TERMINATE IN A 1 RU RACK-MOUNTED FIBER OPTIC ENCLOSURE ON BOTH ENDS, CORNING PCH-01U OR EQUAL BY HUBBLE, LEVITON.

8. THE FIBER OPTIC CONNECTOR/ADAPTOR PANELS USED IN THE FIBER OPTIC ENCLOSURES ARE TO BE 12-FIBER SINGLE MODE (OS2) DUPLEX TYPE-LC, CORNING CCH-CP12-A9 OR EQUAL BY HUBBELL, LEVITON.

9. THE FIBER OPTIC CONNECTORS USED ARE TO BE SINGLE MODE (OS2) TYPE-LC, CORNING 95-200-99 OR EQUAL BY HUBBLE, LEVITON.

10. THE CATEGORY 6A SURGE PROTECTORS ARE TO BE 24-PORT 1U RACK-MOUNTED MODELS, DITEK DTK-RM24NETS OR EQUAL BY EATON, LEVITON, PROVIDING UP TO TWO UNITS PER ENCLOSURE FOR A 48-CHANNEL TOTAL CAPACITY WITHIN A 2U SPACE. COORDINATE QUANTITY WITH OWNER. DIN-MOUNTED OR OTHER VERSIONS OR CONFIGURATIONS MAY BE USED INSTEAD, IF THEY WILL NOT EXCEED THE 2U TOTAL RACK SPACE ALLOTMENT OR THE RACK HEIGHT IS INCREASED ACCORDINGLY.

11. TO ACCOMMODATE THE OWNER'S DIN-MOUNTED NETWORK SWITCHES AND POWER SUPPLIES, THE CONTRACTOR MUST PROVIDE A 4U RACK-MOUNTED RECESSED DIN BRACKET, PANDUIT IABDIN4 OR EQUAL BY HAMMOND, EATON.

12. TO ACCOMMODATE THE DEPTH OF THE OWNER'S UPS EQUIPMENT WITHIN A 30" ENCLOSURE DEPTH, THE CONTRACTOR MUST PROVIDE A PAIR OF 4U X 3"D RACK CHANNEL STANDOFFS, CHATSWORTH 12309-704 OR EQUAL BY HAMMOND, EATON.

13. ALL FRONT-OF-RACK PATCHING INSIDE OF THE ENCLOSURES SHALL BE PROVIDED BY UNC, INCLUDING FROM PATCH PANEL TO SURGE PROTECTORS, FROM SURGE PROTECTORS TO NETWORK SWITCHES (BY OWNER), AND FROM FIBER OPTIC ENCLOSURE TO NETWORK SWITCHES.

(2) NEW SHEET NOTE:

THIS SHEET WAS CREATED DURING THE "BID ADDENDUM 01" SUBMITTAL DATED 03/17/23 AND WAS NOT INCLUDED IN THE "ISSUED FOR BID" SUBMISSION DATED 02/15/23.

Kimley»Horn
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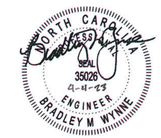
SEALS



THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

UNC PARKING ACCESS AND REVENUE CONTROL SYSTEM DESIGN

Chapel Hill, NC

SCO ID# 19-21349-02A
CODE #: 41923
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NO:	DATE	DRAWING ISSUE DESCRIPTION
3	04/04/23	BID ADDENDUM 02
2	03/17/23	BID ADDENDUM 01
1	02/15/23	ISSUED FOR BID

DESIGNED BY: SEG
DRAWN BY: SEG
CHECKED BY: BMW
SCALE: As Indicated
DATE: 10/21/2022
PROJECT NO: 095-20
FILENAME:

TELECOMMUNICATIONS REMOTE NETWORKING ENCLOSURE REQUIREMENTS

CONSTRUCTION DOCUMENTS

E2002

SECTION 271100 - COMMUNICATIONS SYSTEM COMPONENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Telecommunications Cabling
2. Cable connecting hardware and patch panels.
3. Telecommunications Surge Protection
4. Telecommunications Enclosures.
5. Telecommunications Backboard
6. Grounding.

B. Related Requirements:
1. Section 012300 “Alternates”

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment enclosures, include dimensional layout plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.
3. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
4. Wiring diagrams to show typical wiring schematics, including the following:

    a. Cross-connects.
    b. Patch panels.

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

C. Certification Test Plan as described in paragraph “FIELD QUALITY CONTROL” below.

1. Test plan shall include sample of testing documentation and proposed test equipment.
2. Test procedures documented as part of the Certification Test Plan shall confirm that each specification statement has been met or exceeded.

1.3 INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an "approved" third-party testing agency, and marked for intended location and application. Third-party testing agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to Label Electrical & Mechanical Equipment.

B. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of Registered Communications Distribution Design (RCDD).
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as Commercial Installer, Level 2 to perform the on-site inspection.
4. As part of Add Alternate No. 1, Installer shall be a Hubbell Mission Critical certified or approved equal.

C. Manufacturer Qualifications: Materials shall be provided by manufacturers regularly engaged in the manufacture of unshielded twisted pair, fiber optics, connectors, hardware, and related systems.

1. Manufacturers must have products in satisfactory use for a minimum of five years.

1.5 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components associated with the telecommunication system(s) specified herein that fail in materials or workmanship within the specified warranty period.

1. Warranty period shall be a minimum twenty-five (25) years.

B. Warranties noted above shall start from the date of project Final Acceptance.

PART 2 - PRODUCTS

2.1 GENERAL TELECOMMUNICATIONS REQUIREMENTS

A. Telecommunications components, installation, testing, etc. provided shall comply with the requirements defined in the UNC Design Guidelines, B-26 Communications Infrastructure Version 2021 document found at the following website:

1. https://facilities.unc.edu/wp-content/uploads/sites/256/2021/08/b-26-communications-infrastructure.pdf

2.2 SINGLE-MODE, OUTDOOR OPTICAL FIBER CABLE (OS2)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

1. Corning.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Superior Essex Inc.

B. Description: Single mode, 9/125-micrometer, ~~6 or~~ 12 fibers as indicated on plans, tight buffer, nonconductive optical fiber cable.

C. Maximum Attenuation: 0.5 dB/km at 1310 nm; 0.5 dB/km at 1550 nm.

D. Jacket:

1. Jacket Color: Confirm color with UNC prior to purchase.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.
4. Shall be rated for indoor / outdoor use.

E. Standards:

1. Comply with TIA-492CAAB for detailed specifications.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with ICEA S-104-696 for mechanical properties.

F. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262; Type OFNP in listed plenum communications raceway; or Type OFN, Type OFNG, Type OFNP, or Type OFNR in metallic conduit.

G. Connector Type:

1. For connections within Telecommunication Rooms to existing CCH Connector Panels: Type LC complying with TIA-604-10-B connectors.
2. For connections to rugged industrial switches located in field enclosures: Single Mode, Small Form Factor, Type LC complying with TIA-604-10-B connectors.

H. Plugs and Plug Assemblies:

1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.25 dB.
3. Marked to indicate transmission performance.

~~2.3 CATEGORY 6A TWISTED PAIR CABLE~~

~~A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:~~

~~1. Superior Essex~~
~~2. Hubbell Premise Wiring.~~
~~3. General Cable~~
~~4. Belden Inc.~~

~~B. Description: Four-pair, balanced twisted pair cable, certified to meet transmission characteristics of Category 6A cable at frequencies up to 500 MHz.~~

~~C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA 568-C.2 for Category 6A cables.~~

~~D. Conductors: 100-ohm, 23 AWG solid copper.~~

~~E. Shielding/Screening: Unshielded twisted pairs (UTP).~~

~~F. Cable Rating: CM / CMG~~

~~1. Where installed outside building footprints and / or below grade, cabling shall be outdoor rated and suitable for installation in conduit system(s) below grade. Basis of design is Superior Essex, Part Number 04-001-A8.~~

~~G. Jacket: Thermoplastic, confirm color with Owner.~~

~~H. Plugs and Plug Assemblies where required at remote locations:~~

~~1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four pair, 100-ohm, unshielded or shielded twisted pair cable with locking mechanism similar to basis of design Hubbell Cobra Jack.~~
~~2. Standard: Comply with TIA-568-C.2.~~

~~2.4~~2.3 CATEGORY 6A CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Premise Wiring.
2. Ortronics, Inc.; a subsidiary of Legrand Group.
3. Belden Inc.

4. Panduit Corp.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks: 48 port, 1 RU suitable for terminating Category 6A cables unless otherwise noted.

D. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

~~2.5~~2.4 TELECOMMUNICATIONS SURGE PROTECTION DEVICE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Circa
2. Ditek
3. ITW Linx
4. L-Com

B. General: Surge protection devices shall be provided suitable for protecting Category 6A data channels and include the following features:

1. IP20 enclosure.

a. Provide mounting for surge protection device(s) as shown on plans as required to properly secure to mounting surface (e.g., telecommunications backboard, enclosure sub-panel, rack, etc.) as required and in accordance with manufacturer's recommendations.

2. UL 497B listed.
3. Operating Temperature: -40 deg F to 167 deg F
4. Suitable for Power of Ethernet (PoE)
5. Response time: 1-5 Nanoseconds
6. Ratings:

a. Nominal System Voltage: 48VDC
b. Voltage Protection Rating (L-L): 150V
c. Voltage Protection Rating (L-PE): 550V
d. Nominal Discharge Current (In): 15A 8/20µs
e. Maximum Discharge Current (Imax): 10kA 8/20µs

C. Connections:

1. Copper – Category 6A, RJ-45 / 8P8C Connectors

~~2.6~~2.5 ENCLOSURE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. DDB Unlimited
2. Hubbell Premise Wiring.
3. Chatsworth Products
4. Great Lakes Data Racks & Cabinets

B. Telecommunication Equipment Enclosures (Wall Mounted):

1. Wall mounted with hinged, three-part design, NEMA ~~4X, IP55~~3R rated, steel enclosure, suitable for outdoor installations unless otherwise noted.
2. Ventilated with Hinged door in front cover.
3. Hinged mid-section to wall mounting plate for back access to equipment without removal from wall.
4. Provide with internal rack mounting system suitable for mounting 19" telecommunications equipment as shown on plans.
5. Provide cable management for arranging and securing cabling within the enclosure.
6. Refer to plans for additional requirements.

C. Exterior Telecommunication Equipment Enclosures (Island Mounted):

1. Floor mounted, ventilated, NEMA ~~4X~~ 3R steel enclosure, suitable for outdoor installations unless otherwise noted.
2. Hinged door in front and back cover with lockable latching mechanism.

    a. Confirm keying / locking mechanism with Owner prior to purchase.

3. Metal barriers to separate wiring of different systems and voltage.
4. Provide with internal rack mounting system suitable for mounting 19" telecommunications equipment as shown on plans.
5. Provide cable management for arranging and securing cabling within the enclosure.
6. Final enclosure size shall be coordinated with lane island(s) where shown installed to ensure the footprint can be located on the lane island without protruding into drive aisles.
7. Refer to plans for additional requirements.

~~2.7~~2.6 DIN RAIL MOUNTING

1. Comply with EN 60715 and DIN 50045, 50022 and 50035 standards.
2. Perforated, Galvanized steel with zinc plating and passivation.
3. 35mm X 75 mm deep
4. Lengths shall be coordinated with enclosure size.
5. Provide support brackets as required compatible with Din Rails

~~2.8~~2.7 TELECOMMUNICATIONS BACKBOARD

1. 4’-0” x 8’-0” x 3/4" thick fire retardant plywood backboard. Paint flat white leaving the plywood ratings visible.

~~2.9~~2.8 GROUNDING

A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with latest edition of J-STD-607.

C. Refer to plans for additional requirements.

~~2.10~~2.9 IDENTIFICATION PRODUCTS

A. Comply with latest edition of IA/EIA-606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. All patch panels shall be labeled to indicate the patch panel name. Labels shall be machine generated, high contrast and between 1/2” and 1” high.

C. Labeling schemes for patch panels, cables, fibers, etc. provided as part of this project shall be provided in accordance with the UNC Design Guidelines, B-26 Communications Infrastructure Version 2021 document.

D. Comply with requirements in Section 260553 "Identification for Electrical Systems."

~~2.11~~2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test preterminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

D. General Requirements for Copper and Optical Fiber Cabling:

1. Comply with TIA/EIA-568-B.1, TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Comply with NEC Articles 800 and 770.
4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
10. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Tracer Wire: Provide detectable, metallic tracer wire in all below grade conduit provided for fiber optic cabling.

~~E. UTP Cable Installation:~~

~~1. Comply with TIA/EIA-568-B.2.~~
~~2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.~~

~~F.~~E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

~~G.~~F. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systmes " for materials and installation requirements for telecommunication pathways.

3.2 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with latest edition of J-STD-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.3 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Administration Class: 2.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.

C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

4. Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

E. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Prior to testing, the Telecommunications Contractor shall submit a Certification Test Plan, subject to approval by UNC ITS CommTech Engineering, that reflect the requirements of this section.

    a. The Certification Test Plan shall be submitted / approved by UNC ITS CommTech Engineering prior to proceeding with any telecommunications installation work.
    b. Provide UNC Facilities Planning and Construction a minimum of twenty-one (21) work days in advance of any testing to be performed with details about the specific location of the test and functions to be tested.
    c. The Contractor shall provide an actual demonstration of each system requirement. All tests are subject to validation by means of a re-test, by Contractor, in the presence of the Owner's Representative.
    d. At the request of UNC ITS CommTech Engineering, the Contractor of Record shall re-test any component that UNC ITS CommTech Engineering deems not acceptable by virtue of the component in question failing the prescribed test or for which the testing methodology is in question. UNC ITS CommTech Engineering must be present for any re-testing that it requests. All personnel, materials, and equipment required for retesting shall be provided by the Contractor of Record without additional cost to the University. UNC ITS CommTech Engineering reserves the right to independently perform its own testing of materials and systems.

2. Testing shall consist of an end-to-end system test, encompassing the cable, patch panel termination, and faceplate termination, as appropriate.
3. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
4. Visually inspect cable placement, cable termination, grounding and bonding, equipment, and labeling of all components.
5. Optical Fiber Cable Tests:

    a. Power meter testing shall be required of all fiber optic cable.
    b. OTDR testing shall be required of all fiber optic cable exceeding 100m (328’). Traces shall be taken from both ends of the fiber. Launch jumpers shall be used at each end of the fiber. Launch jumpers shall be 100m (328’) in length. Reflected ghost patters that obscure critical trace information are not permitted. For each test, ensure that traces are viewable at the same linear scale. Traces shall be taken at 1310nm and 1550nm for single mode fiber. The OTDR pulse width shall be set small enough to resolve the launch cable connection to the fiber under test.
    c. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    d. Link End-to-End Attenuation Tests:

        1) Horizontal and Multimode Horizontal Link Measurements: Test at 1310 or 1550nm in one direction according to TIA-526-7-A, Method B, One Reference Jumper.
        2) Attenuation test results for horizontal links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

e. Presentation of Test Results:

1) Contractor shall utilize test equipment capable of saving results in electronic and printed form. Test results shall be presented in PDF form. Test results shall be saved and labeled according to UNC naming conventions (see CIG13), typically FS.strand_number. For example, cable segment FS.801 shall have strands FS.801.1, FS.801.2, FS.801.3, etc. Contact UNC ITS CommTech Engineering for naming specifics prior to testing.
2) OTDR traces shall not show backscatter beyond the end of the fiber.
3) In addition to PDF requirements, OTDR traces shall be provide in digital form. Contractor shall supply UNC ITS CommTech Engineering with a fully-licensed copy of software capable of viewing the trace details.

6. Visually inspect UTP jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
7. Visually confirm Category 6A marking of outlets, cover plates, outlet/connectors, and patch panels.
8. Visually inspect cable placement, cable termination, grounding and bonding, equipment, and labeling of all components.
9. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

~~10. UTP Performance Tests:~~

~~a. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:~~

~~1) Wire Map Review based on Category 6A parameters.~~
~~2) Length (physical vs. electrical, and length requirements).~~
~~3) Insertion loss.~~
~~4) Near-end crosstalk (NEXT) loss.~~
~~5) Power sum near-end crosstalk (PSNEXT) loss.~~
~~6) Equal level far-end crosstalk (ELFEXT).~~
~~7) Power sum equal level far-end crosstalk (PSELFEXT).~~
~~8) Return loss.~~
~~9) Propagation delay.~~
~~10) Delay skew.~~
~~11) DC Resistance~~
~~12) Open Pairs~~
~~13) Shorted Pairs~~
~~14) Split Pairs~~
~~15) Reversed Conductors~~

~~Loop Resistance.~~
~~DC Resistance Unbalance for both pair to pair and wire to wire.~~
~~Impedance.~~
~~Attenuation to Crosstalk Ratio Near-End (ACRN).~~
~~Power Sum Attenuation to Crosstalk Ratio Near End (PSACRN).~~
~~Attenuation to Crosstalk Ratio Far-End (ACRF).~~
~~Power Sum Attenuation to Crosstalk Ratio Far End (PSACRF).~~
~~Transverse Conversion Loss (TCL).~~
~~Equal Level Transverse Conversion Transfer Loss (ELTCTL).~~

~~11. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.~~

~~a. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.~~

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 271100