



Educational Service Unit 6

210 5<sup>th</sup> Street

Milford, NE 68405

# Network Infrastructure Wiring Specifications

---

12/05/2018

# Table of Contents

Table of Contents	2
<b>I. GENERAL</b>	<b>3</b>
A. Scope of Document	3
B. Scope of Work	3
C. Clarification of specifications and bid documents	4
<b>II. REGULATORY REQUIREMENTS</b>	<b>5</b>
A. ANSI/TIA:	5
B. ISO/IEC	6
C. National Electric Codes	6
D. OSHA Standards and Regulations – all applicable	6
E. Local Codes and Standards – all applicable	6
F. BICSI	6
<b>III. QUALITY ASSURANCE</b>	<b>7</b>
A. Contractor Qualifications	7
B. System Performance Warranty	7
C. Product Substitutions	8
D. Maintenance of Patch Fields	8
<b>IV. ESU 6 CABLING AREAS</b>	<b>9</b>
A. Copper Wire Specifications:	9
B. Single Mode Fiber Backbone:	9
C. Overhead Pathways for Horizontal Cable and Telecommunications Rooms:	9
D. Circuit Designation and Labeling	10
E. Rack and Cabinet Grounding	10
<b>V. TESTING AND ACCEPTANCE</b>	<b>14</b>
A. General	14
B. Copper Channel Testing	14
C. Fiber Testing	14
D. System Documentation	14
E. Submission of Test Results	15
<b>VI. FIRESTOPPING</b>	<b>16</b>
A. Description	16
B. Execution	16
<b>VII. BID FORM</b>	<b>17</b>
<b>VIII. BID FORM ALTERNATES</b>	<b>18</b>
<b>IX. BID DOCUMENTS</b>	<b>19</b>
A. Base Bid: New Addition: Copper Ethernet Locations	19
B. Base Bid: New Addition: Fiber Location	20
B. Alternate #1 Plan and Bid Sheet: Conference, Board, Room 3, and Kitchen	21
C. Alternate #2 Plan and Bid Sheet: Basement Area	22
D. Alternate #3 Plan and Bid Sheet: CAT6E to CAT6E	23

# I. GENERAL

## A. Scope of Document

---

1. The purpose of this document is to provide infrastructure design and installation guidelines for ESU 6 communications cabling infrastructure projects. The owner of these facilities will be referred to herein as "ESU 6". These guidelines are both to ensure standardization of network transport systems design and layout internal to ESU 6, as well as to provide basic information necessary to cabling contractors and installation firms wishing to bid for installation work within these facilities. These installers shall be referred within this document as "Contractor".
2. The documentation includes: Product specifications, structured cabling design considerations and installation guidelines and refers to current, accepted low-voltage cabling Standards.
3. In all instances where Standards are cited, it is assumed Installer will have familiarity with and implicitly follow the recommendations of the most current version of the Standard referenced at the time of installation. Compliance with most current Standards is the sole responsibility of the Contractor.
4. Anywhere cabling Standards conflict with National or local electrical or safety codes, Contractor shall defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either. Knowledge and execution of applicable codes is the sole responsibility of the Contractor. Any code violations shall be remedied at the Contractor's expense.

## B. Scope of Work

---

ESU 6 requests bids for 235 Ethernet drops for CAT6E office connections, 10 CAT6A Ethernet drops for access points, 11 CAT6A Ethernet drops for security cameras and 9 CAT6E Ethernet drops for audio/visual connections. ESU6 also requests bids for 12 strands of single mode fiber from the existing MDF to a new IDF at 210 5<sup>th</sup> Street, Milford, NE. ESU 6 requests alternate bids for the following: 1) Conference and Board Room Rewiring 2) Basement Wiring 3) Substituting CAT6A for all 235 office connections.

On any ESU 6 cabling infrastructure project the following is assumed:

1. Contractor shall provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents unless explicitly instructed otherwise by ESU 6. All deviations from this must be by written instruction from ESU 6.
2. Contractor shall be solely responsible for all parts, labor, testing, documentation and all other associated processes and physical apparatus necessary to turn-over the completed system fully warranted and operational for acceptance by ESU 6.
3. Contractor shall remove all trash, spent packaging and debris from the installation daily.
4. Contractor shall remove and responsibly dispose of all cable, cable appliances and support structures rendered obsolete by the network upgrade per requirements of Regulatory References cited in this document, recycling these materials where possible.
5. Contractor shall provide performance verification testing of all installed links using up-to-date and industry accepted test equipment appropriate to the types of links being tested and according to all requirements and Standards cited within this document. All testers used shall be factory calibrated within one year of use with references set daily prior to testing. References shall be reset any time testers are left unused for more than two hours.
6. Contractor shall provide valid test data in electronic format and hard copy indicating passing of all installed links according to applicable Standards and requirements cited under "Testing and Acceptance" section of this document. ESU 6 reserves the right to require more stringent test requirements than those cited in the Standards. Such requirements will be requested in writing prior to installation.

7. ESU 6 will provide racks, conduits, patch cables, along with vertical and horizontal wire management in the racks.
8. Final acceptance of the installation shall be in writing by ESU 6.

**BASE BID: New Addition**

- 235 orange CAT6E Ethernet drops for office connections.
- 11 blue CAT6A Ethernet drops for security cameras.
- 10 yellow CAT6A Ethernet drops for access points.
- 9 gray CAT6E Ethernet drops for audio/visual connections.
- 12 strands of single mode fiber from the existing MDF to a new IDF.

Note:

- Page 18 and 19 of this RFP includes a diagram of the new building addition. Including location of drops, color of cable and description.
- Page 21 of this RFP includes a Provided By list and a table for bid items.

**ALTERNATE #1: Conference Room, Board Room, Room 3, and Kitchen Area**

- 36 orange CAT6A Ethernet drops for the conference room, board room, room 3, and kitchen areas.
- 8 yellow CAT6A Ethernet drops for the access points in the conference and board rooms.

Note:

- Page 22 of this RFP includes a diagram of the existing conference rooms. Including location of drops, color of cable and description.
- Page 23 of this RFP includes a Provided By list and a table for bid items.

**ALTERNATE #2: Basement Area**

- 27 orange CAT6A Ethernet drops for the basement offices.
- 2 yellow CAT6A Ethernet drops for access points in the basement.
- 12 strands of single mode fiber from basement mechanical room to the existing MDF on the main floor.

Note:

- Page 24 of this RFP includes a diagram of the basement office and conference room. Including location of drops, color of cable and description.
- Page 25 of this RFP includes a Provided By list and a table for bid items.

**ALTERNATE #3: Upgrade 235 Orange Ethernet drops from CAT6E to CAT6A**

- Upgrade 235 Orange Office Drops from CAT6E to CAT6A

**C. Clarification of specifications and bid documents**

---

1. Quantities of telecommunications equipment, typical installation details, cable routing conventions and support structure types for a specific project may be provided as an RFP attachment to this document if applicable.
2. If bid documents on individual projects appear to conflict with this specification, Contractor shall obtain formal clarification in writing from ESU 6 to resolve the conflict.
3. This specification defines generic requirements for future facilities whose exact environments, properties and layouts are unknown. It is the responsibility of the installing contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of ESU 6 any design features that may be in conflict or otherwise improved.

## II. REGULATORY REQUIREMENTS

Contractor is responsible for knowledge and application of current versions of all applicable Standards and Codes. In cases where listed Standards and Codes have been updated, Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.

### A. ANSI/TIA:

---

- a. ANSI/TIA-568-C.0 (September 2010) Generic Telecommunications Cabling for Customer Premises
- b. TIA-568-C.0-1 (September 2010) Generic Telecommunications Cabling for Customer Premises- Addendum 1, Updated Reference for Balanced Twisted-Pair Cabling
- c. ANSI/TIA-568-C.1 (February 2009) Commercial Building Telecommunications Cabling Standards
- d. TIA-568-C.1-2 (November 2011) Commercial Building Telecommunications Cabling Standard, Addendum 2 General Updates
- e. ANSI/TIA-568-C.2 (August 2009) Balance Twisted Pair Communications and Components Standards
- f. ANSI/TIA-568-C.3 (June 2008) Optical Fiber Cabling Components Standard
- g. ANSI/TIA-568-C.3-1 (December 2011) Optical Fiber Cabling Component Standard- Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors
- h. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard
- i. TIA-942 (April 2005) Telecommunications Infrastructure Standard for Data Centers
- j. ANSI/TIA-942-1 (March 2008) Data Center Coaxial Cabling Specifications and Application Distances
- k. TIA-942-2 (March 2010) Telecommunications Infrastructure Standard for Addendum 2- Additional Media and Guidelines for Data Centers
- l. TIA-569-B (October 2004) Commercial Building Standard for Telecommunications Pathways and Spaces
- m. TIA-569-B-1 (May 2009) Temperature and Humidity Requirements for Telecommunications Spaces
- n. ANSI/TIA-606-B (March 2012) Administration Standard for Telecommunications Infrastructure
- o. TIA-607-B (September 2011) Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises
- p. TIA-758-A (August 2004) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
- q. TIA-1152 (September 2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- r. ANSI/TIA-862-A (April 2011) Building Automation Systems Cabling Standard
- s. TIA-1179 (July 2010) Healthcare Facility Telecommunications Infrastructure Standard

**B. ISO/IEC**

---

- a. ISO 11801 - Generic Cabling for Customer Premises

**C. National Electric Codes**

---

- a. National Electrical Safety Code (NESC) (IEEE C2-2012)
- b. National Electrical Code (NEC) (NFPA 70)

**D. OSHA Standards and Regulations – all applicable**

---

**E. Local Codes and Standards – all applicable**

---

**F. BICSI**

---

- a. Telecommunications Distribution Methods Manual, 12th Edition
- b. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
- c. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
- d. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
- e. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
- f. AV Design Reference Manual, 1st Edition
- g. Network Design Reference Manual, 7th Edition
- h. Outside Plant Design Reference Manual, 5th Edition
- i. Wireless Design Reference Manual, 3rd Edition

Anywhere cabling Standards conflict with electrical or safety Codes, Contractor shall defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either. Knowledge and execution of applicable codes is the sole responsibility of the Contractor. Any code violations committed at the time of installation shall be remedied at the Contractor's expense.

### III. QUALITY ASSURANCE

#### A. Contractor Qualifications

---

Any contractor offering a proposal for the ESU 6 network infrastructure project must meet the minimum requirements listed below. Contractors shall also provide written, hard copy documentation of these qualifications with their proposal.

1. Must complete a mandatory walk through with ESU 6 contact Jamen Hall.
2. Have a minimum of 5 years documented experience in the communications structured cabling business.
3. Be a current Panduit Certified Installer or Systimax Certified Installer installation contractor.
4. Have a minimum of one full-time BICSI RCDD on staff.
5. Deploy onsite technicians specializing in communications copper and fiber optic cabling systems and related infrastructure support systems and trained toward that purpose.
6. A least 30% of Contractor technicians on project shall have a current certified solution certificate.
7. Have completed 2 projects similar in size and scope within the last 18 months and include with their bid written references for these projects.
8. A copy of the above referenced certification documents proving compliance with these Contractor requirements shall be submitted with the quote to be valid for consideration by ESU 6.
9. Further Contractor stipulations are listed under "System Performance Warranty" section below.

#### B. System Performance Warranty

---

1. Contractor shall provide a 25-year Panduit Certification PLUS or Systimax Network Infrastructure System warranty. Interjection into the link of components from other manufacturers shall void this warranty.
2. To offer this warranty, Contractor shall meet the warranty requirements listed below:
  - a. Installation firm must be a current with either Panduit or Systimax and in good standing. Contractor will include a copy of the company certification with the bid.
  - b. Contractor shall name a supervisor with current Certification to serve on site as a quality and methods liaison responsible to inspect and assure all terminations are compliant to factory methods taught in a Certified Training and according to all Standards cited in the Regulatory References section of this document. The quality and methods liaison shall have a current, up-to-date certificate in both copper and fiber. Copies of the copper and fiber certificates of this liaison shall be submitted with the bid.
  - c. Contractor agrees all components comprising active links shall be of the same copper Category or fiber OM designation as the system being installed. Contractor shall under no circumstances mix different Categories or OM classes of cable or termination devices (connectors) within the same link or system.
  - d. Contractor shall install all racking and support structures according to a TIA Standards in such fashion to maintain both Standards and Manufacturer recommendations for uniform support and protection, segregation of different cable types, maintenance of maximum pulling tensions, minimum bend radius, approved termination methods as well as adhering to industry accepted practices of good workmanship.
  - e. Contractor is responsible for understanding and submitting to Panduit or Systimax all documents

required prior to project start to apply for this warranty. These include but are not limited to the project information form and SCS warranty agreement.

- f. Contractor is responsible for understanding and submitting to Panduit or Systimax all documents required at project end. These include completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested as described in warranty agreement.
- g. Test results shall be delivered in the tester native format and represent the full test report. Summaries shall not be accepted.
- h. Upon acceptance of Warranty, Panduit or Systimax shall mail a notification letter to the Contractor and a notification letter and warranty certificate to ESU 6.

### C. Product Substitutions

---

- 1. Substitution of products for those specified within this document is not allowed. No products will be accepted or substituted other than what is specified in this document.
  - a. Contractor shall be responsible for and assume all costs for removal and replacement of any substituted materials or products not approved in writing from ESU 6. Such costs shall include, but not be limited to labor, materials as well as any penalties or fees for late completion.

### D. Maintenance of Patch Fields

---

- 1. Any persons with Contractor or ESU 6, adding or moving copper or fiber optic patch (equipment) cords shall do so in a neat, workmanlike fashion in keeping with the original system concept and according to all industry best practices as outlined in cabling standards and applicable BICSI publications referenced previously in this document. Persons performing such moves, adds or changes (MACs) shall further adhere to the following:
  - a. Existing cabling management pathways shall be used with care taken to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between different types of copper cables.
  - b. Cables shall be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 1 times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568-C.0.
  - c. All patch cords used shall be of same copper Category or fiber OM/OS designation or higher than the media used in the permanent links.
  - d. Patching in all cases shall be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted.
  - e. All patch cords or jumpers must be completely contained within supplied cable management paths. Cables draped across the front cabinets or racks will not be accepted.



## IV. ESU 6 CABLING AREAS

### A. Copper Wire Specifications:

---

1. All office Ethernet drops will be cabled with an orange CAT6E cable and all audio/visual Ethernet drops will be cabled using gray CAT6E solution Panduit PUP6004\*\* or Systimax 2071 cable. All audio/visual (gray) Ethernet cables will be wired to the MDF. All office (orange) Ethernet cables will be wired to the new IDF. Each cable will be terminated using a modular plug in both locations. Each station cable will be identified by labeling each end a S100X150YAJ Panduit label. Each face plate will be labeled with a C195X040Y1J Panduit label.
2. All access points (using a yellow cable), and security cameras (using blue cable) will be cabled with a CAT6A solution using a solid foil cable Panduit PUP6AV04\*\* or Systimax X10D cable. All office, access points, and security cameras will be wired to the new IDF. Each cable will be terminated to a modular patch panel and a field termination plug. Each station cable will be identified by labeling each end a S100X150YAJ Panduit label.

### B. Single Mode Fiber Backbone:

---

1. All fiber backbone connections within the building shall be made by using 12 strand single mode Panduit FSDR912Y or Systimax equivalent, 9/125 micron, OS1/OS2, plenum rated indoor interlocking fiber cable. Contractor shall be responsible for selecting and installing fiber cable with proper flammability rating (riser or plenum) for the environment and according to previously referenced Standards and Codes. Contractor shall be responsible for bonding to ground metallic armor at cable ends; see part number **ACGK** series in Grounding section of this document. All single mode fiber will be ran in a conduit provided by ESU6.
2. Single mode fiber cable shall meet the following criteria:
  - a. To be used in intrabuilding backbone, building backbone, and horizontal installations for riser (OFCR), plenum (OFCP), and harsh environments.
  - b. Be available in 12 fiber counts.
  - c. Have clear sheath markings provide positive identification, quality traceability, and length verification.
  - d. Have 900µm standards-based color-coded buffer coating that protects fibers during handling and allows for easy identification and stripping.
  - e. Cable contains flexible buffer tubes to allow for quick breakout and ease of routing.
  - f. Support 10Gig network transmission speeds up to 10 Gb/s for OS1/OS2 with an 1310nm or 1550nm in both directions per IEEE 802.3ae.

### C. Overhead Pathways for Horizontal Cable and Telecommunications Rooms:

---

1. Above Ceiling Cable Pathways - Horizontal Distribution
  - a. Above ceiling pathways shall be constructed of Panduit J-Pro or J-Mod hook support systems. Such system shall have a variety of sizes, colors, and configurations of J-hooks available to create high performance communication cable management pathways that employ modular methods and feature complete horizontal and vertical bend radius control to prevent degradation of cable

performance. J-hook system shall be rated suitable for use in air handling spaces.

- b. Contractor shall install above ceiling supports no further than 5 feet apart as per TIA-569-B and support system shall be sized by contractor such that newly installed cable represents not more than a 40% fill ratio for future cables.
- c. Overfilled supports or systems spacing supports further than 5 feet apart at installation will not be accepted and are the sole responsibility of the Contractor who shall remove and reinstall at Contractors expense.

**D. Circuit Designation and Labeling**

---

- 1. Contractor is responsible for complete labeling of all installed systems according to recommendations from the TIA 606-B and the TIA 942 series of Standards, including all relevant addenda.
- 2. All labels shall be machine generated by laser printer or thermal transfer hand-held labeling system. Hand written labels will not be accepted.
- 3. Contractor shall use cables specified in this document for individual components and sub-systems printed using the labeling systems listed in the table below.

ESU 6 approved labeling software and hand-held labeler are as follows:

Part Number	Description
<b>PROG-EM2GO</b>	Easy-Mark Labeling Software for PC, supplied on USB Flash Drive.
<b>LS8EQ-KIT-ACS</b>	Panduit PanTher hand-held label printing system in kit. Includes LS8EQ printer with QWERTY keypad, one cassette of S100X150VAC self-laminating labels, six AA alkaline batteries, LS8E-ACS, LS8-CASE, LS8-PCKIT, LS8-IB, LS8-WS, quick reference card and operator's manual.

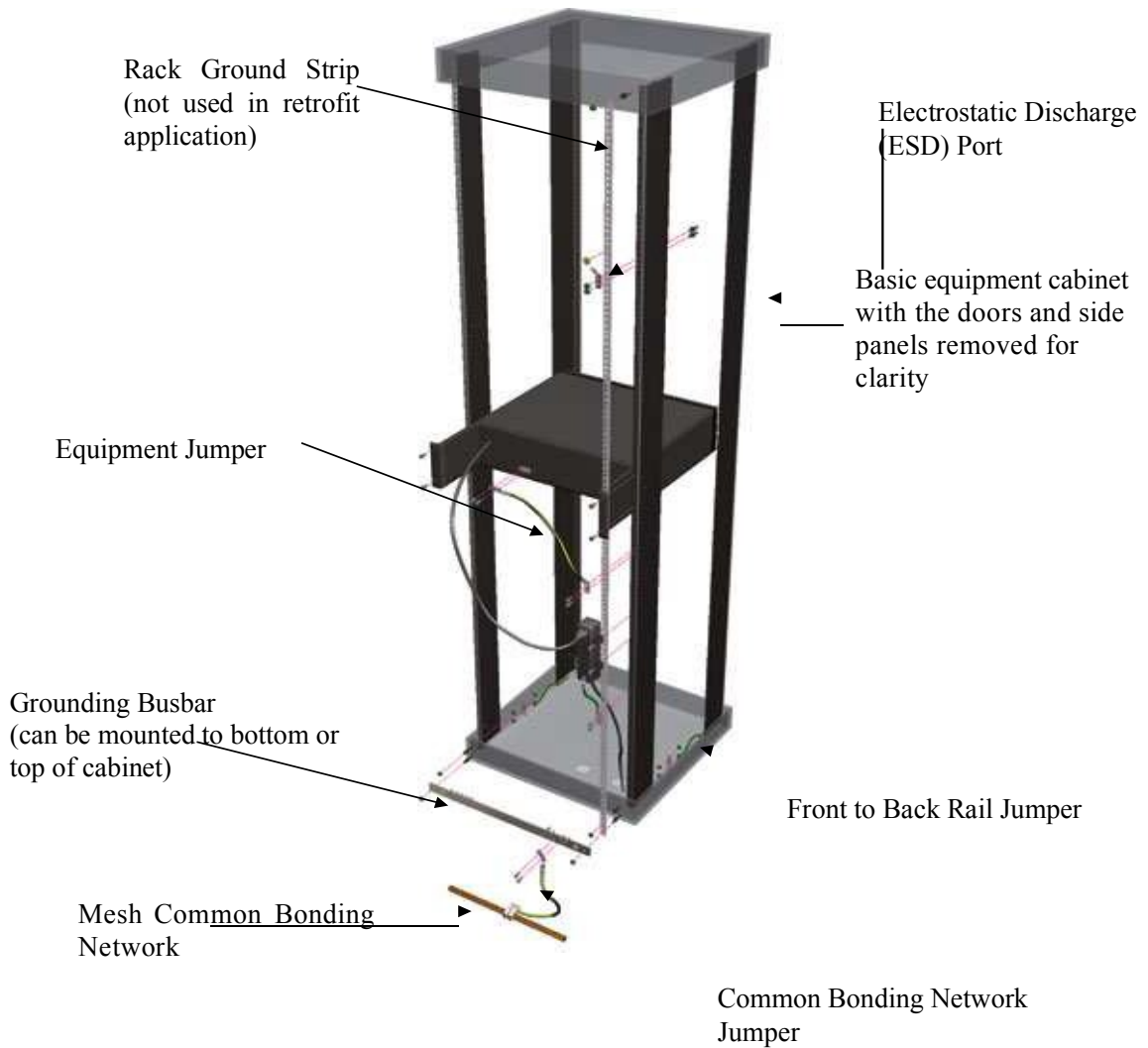
**E. Rack and Cabinet Grounding**

---

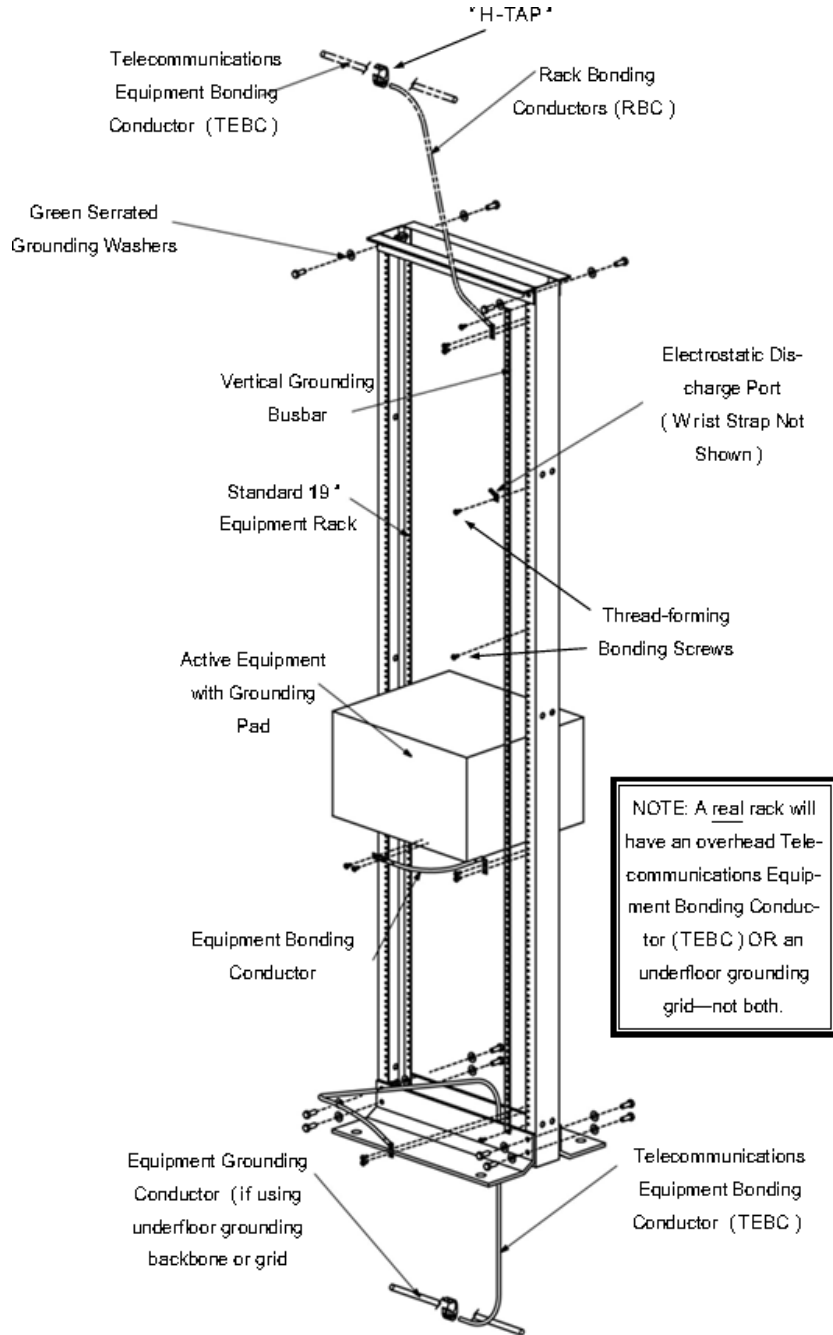
- 1. Contractor is responsible for bonding to ground all newly and existing placed equipment and installed racks or cabinets per the TIA 607-B Standard.
- 2. All newly or existing installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.
- 3. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.
- 4. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with and EBC (equipment bonding conductor) kit built to that purpose.
- 5. Contractor shall take care to clean (wire brush, scotchbrite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.
- 6. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at

Contractor's expense.

7. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.
8. Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.
9. A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets these ESC ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.
10. Armored cables shall be properly bonded to the earthing system with a kit built to that purpose.
11. For examples of rack and cabinet grounding refer to the illustrations below.



Properly Grounded/Earthed Cabinet (Back of Cabinet Shown)



Properly Grounded/Earthed Two Post Rack (Back of Cabinet Shown)

ESU 6 approved grounding products are as follows:

Part Number	Description
LCC series	Panduit two-hole compressing lugs for code conductors in BICSI hole spacing.
HTCT series	Panduit HTAPs. Must be selected according AWG size of run and tap conductors.
CLRCVR series	Panduit clear covers for HTAPs. Must be selected according to HTAP being covered.
RGS134-1Y	Grounding strip (vertical busbar) for newly installed racks or cabinets with screw rails. 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
RGS134B-1	Grounding strip for newly installed racks or cabinets with cage nut rails: 78.70" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker, three cage nut bonding studs, eight #12-24 bonding nuts and three strip clips.
RGCBNJ660P22	Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm <sup>2</sup> ) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread forming screws and a copper compression HTAP* <b>for connecting to a #6 to #2 awg sized bonding backbone.</b>
RGCBNJ660PY	Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm <sup>2</sup> ) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread forming screws and a copper compression HTAP* <b>for connecting to a #2 awg to 250 kcmil bonding backbone.</b>
GJ672UH	Rack jumper (and cabinet) kits for smaller TR (5 bays or less) to bond individual rack or cabinet directly back to wall mounted busbar. One 72" length #6 AWG green wire with yellow horizontal stripe. Jumper is pre-terminated on one end with LCC6-14JAWH-L and the other end with LCC6-14JAW-L. This rack grounding jumper is 72" long. For other lengths replace the "72" in the part number. Available lengths are 72, 96, 120, 144, 168, 192, 216, 240, 264 and 288 inches.
RGESD2-1	Two-hole ESD port with 5/8" hole spacing; provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
RGESDWS	Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megaohm resistor and 4mm snap.
RGTBSG-C	Green thread-forming bonding screws for use to mount equipment that does not have a built-in grounding pad (terminal).
CNB4K	Green bonding cage nut, includes 4 #12-24 bonding cage nuts (.06 – .11 thick panel) and 4 #12-24 x 1/2" bonding screws with #2 Phillips/slotted combo hex head (use 5/16" or 8mm socket). Ideal for patch panel applications and bonding smaller equipment not equipped with a built-in grounding terminal.
CNBK	Green bonding cage nut, includes 50 #12-24 bonding cage nuts (.06 – .11 thick panel) and 50 #12-24 x 1/2" bonding screws with #2 Phillips/slotted combo hex head (use 5/16" or 8mm socket).
RGW-100-1Y	100 paint piercing bonding washers for 3/8" (M8) stud size; .875" (22.2mm) O.D.; provided with .16 oz. (5cc) of antioxidant. NOTE: Panduit racks come supplied with these. This is needed to construct non-Panduit racks.
RGEJ1024PHY	24" long pre-terminated equipment grounding jumper #10 AWG (6mm <sup>2</sup> ) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws.
RGEJ1036PFY	36" long pre-terminated equipment grounding jumper #10 AWG (6mm <sup>2</sup> ) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws.
GB2B0514TPI-1	Wall mounted telecommunications busbar suitable for small telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 24" in size.
GB4B1028TPI-1	Wall mounted telecommunications busbar suitable for larger telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 4" x 24" in size.
ACGK	Armored cable grounding kit. Contains one grounding terminal for #6 AWG grounding conductor, and one #10 mechanical clamp for cable diameters in 9/16" – 1 1/16" diameter range.
ACG24K-500	#6 AWG (16mm <sup>2</sup> ) jumper for armored cable diameter 0.85" (21.3mm) to 1.03" (26.2mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
ACG24K	#6 AWG (16mm <sup>2</sup> ) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
LTYK	Wall mounted busbar label kit. Label kit includes printed tag and one flame retardant cable tie.

## V. TESTING AND ACCEPTANCE

### A. General

---

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA 1152 AND ANSI/TIA-568 C.2 and C.3. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced to ensure 100% useable copper conductors or fiber strands in all cables installed.

### B. Copper Channel Testing

---

1. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA 1152 and ANSI/TIA 568-C.2 for the appropriate Category of cabling installed using a test unit meeting a minimum IEC IIIe level of accuracy.
2. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.
3. Contractor shall set references according to manufacturer's recommendation prior to each day's testing and reset references anytime tester is left unused for more than two hours.

### C. Fiber Testing

---

1. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA-C.0 and shall be within limits specified within ANSI/TIA-C.3
2. Backbone single mode fiber cabling shall be tested at 1310 and 1550 nm in both directions.
3. Test set-up and performance shall be conducted in accordance with ANSI/568-C.0 Standard, Method B.
4. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY BASIC LINK LOSS TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA 568-C.3 Standard.
5. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

### D. System Documentation

---

1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to ESU 6 for approval. Documentation shall include the items detailed below.
2. Documentation shall be submitted within ten (10) working days of the completion of each testing

phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the ESU 6, the telecommunications contractor shall provide copies of the original test results.

3. ESU 6 may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the Contractor, additional testing can be requested to the extent determined necessary by ESU 6, including a 100% re-test. Contractor shall assume all costs for retesting.

#### **E. Submission of Test Results**

---

1. Documentation shall be provided in electronic format within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document.
2. A copy of all stations and WAP installations shall be labeled and identified on a current blue print and supplied on the wall in the room designated as the data center.
3. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation.
4. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
5. The field test equipment shall meet the requirements of ANSI/TIA-568-C series of Standards. The appropriate and most current level tester shall be used to verify Category 6 cabling systems.
6. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports. When repairs and re-tests are performed, the problem found, and corrective action taken shall be noted, and both the failed and passed test data shall be documented.
7. Final acceptance of the installation shall be in writing by ESU 6.

## VI. FIRESTOPPING

### A. Description

---

1. A firestop system is comprised of the item or items penetrating the fire rated structure; the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, heat, vapor and pressurized water stream.

### B. Execution

---

1. All penetrations through fire rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating items i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.
2. Firestop systems shall be approved by a qualified Professional Engineer (PE, licensed actual or reciprocal) in the state where the work is to be performed. A drawing showing the proposed firestopped system, stamped/embossed by the assigned PE, shall be provided to the ESU 6 Milford's Technical Representative prior to installing the firestop system.
3. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.



## VII. BID FORM THE PROJECT AND THE PARTIES

**A. TO:**

Owner  
Educational Service Unit 6  
210 5th Street  
Milford, NE 68405

**B. FOR:**

Project  
ESU6 Network Instructure Wiring Specifications  
210 5th Street  
Milford, NE 68405

**C. DATE:** \_\_\_\_\_ (**BIDDER TO ENTER DATE**)

**D. OFFER**

Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by ESU 6 for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

\_\_\_\_\_ dollars  
(\$ \_\_\_\_\_), in lawful money of the United States of America.

**E. ACCEPTANCE**

- This offer shall be open to acceptance and is irrevocable for thirty days from the bid closing date.
- If this bid is accepted by Owner within the time period stated above, we will:
  - Execute the Agreement within seven days of receipt of Notice of Award.
  - Commence work within seven days after written Notice to Proceed of this bid.
- If this bid is accepted within the time stated, and we fail to commence the Work the Project shall be awarded to a new bidder.

**F. CONTRACT TIME**

If this Bid is accepted, we will complete the Work by March 1, 2019.

**G. ADDENDA**

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.

Alternate #1 Dated \_\_\_\_\_.  
Alternate #2 Dated \_\_\_\_\_.  
Alternate #3 Dated \_\_\_\_\_.

**H. BID FORM SIGNATURE(S)**

The Corporate Seal of

\_\_\_\_\_  
(Bidder - print the full name of your firm)  
was hereunto affixed in the presence of:

\_\_\_\_\_  
(Authorized signing officer, Title)  
(Seal)

\_\_\_\_\_  
(Authorized signing officer, Title)

**I. IF THE BID IS A JOINT VENTURE OR PARTNERSHIP, ADD ADDITIONAL FORMS OF EXECUTION FOR EACH MEMBER OF THE JOINT VENTURE IN THE APPROPRIATE FORM OR FORMS AS ABOVE.**

**END OF SECTION**

## VIII: BID FORM ALTERNATES

---

### **PARTICULARS:**

The following is the list of alternates referenced in the bid submitted by: (Bidder)

To (Owner): Educational Service Unit 6

Dated \_\_\_\_\_ and which is an integral part of the bid form.

### **ALERNATES LIST:**

The following amounts shall be added to or deducted from the bid amount.

- Alternate #1: Conference Room, Board Room, Room 3, and Kitchen Areas
- ADD \$ \_\_\_\_\_
  
- Alternate #2: Basement Area
- ADD \$ \_\_\_\_\_
  
- Alternate #3: Upgrade 235 Orange Office Drops from CAT6E to CAT6A
- ADD \$ \_\_\_\_\_

**END OF SECTION**

# IX: BID DOCUMENTS

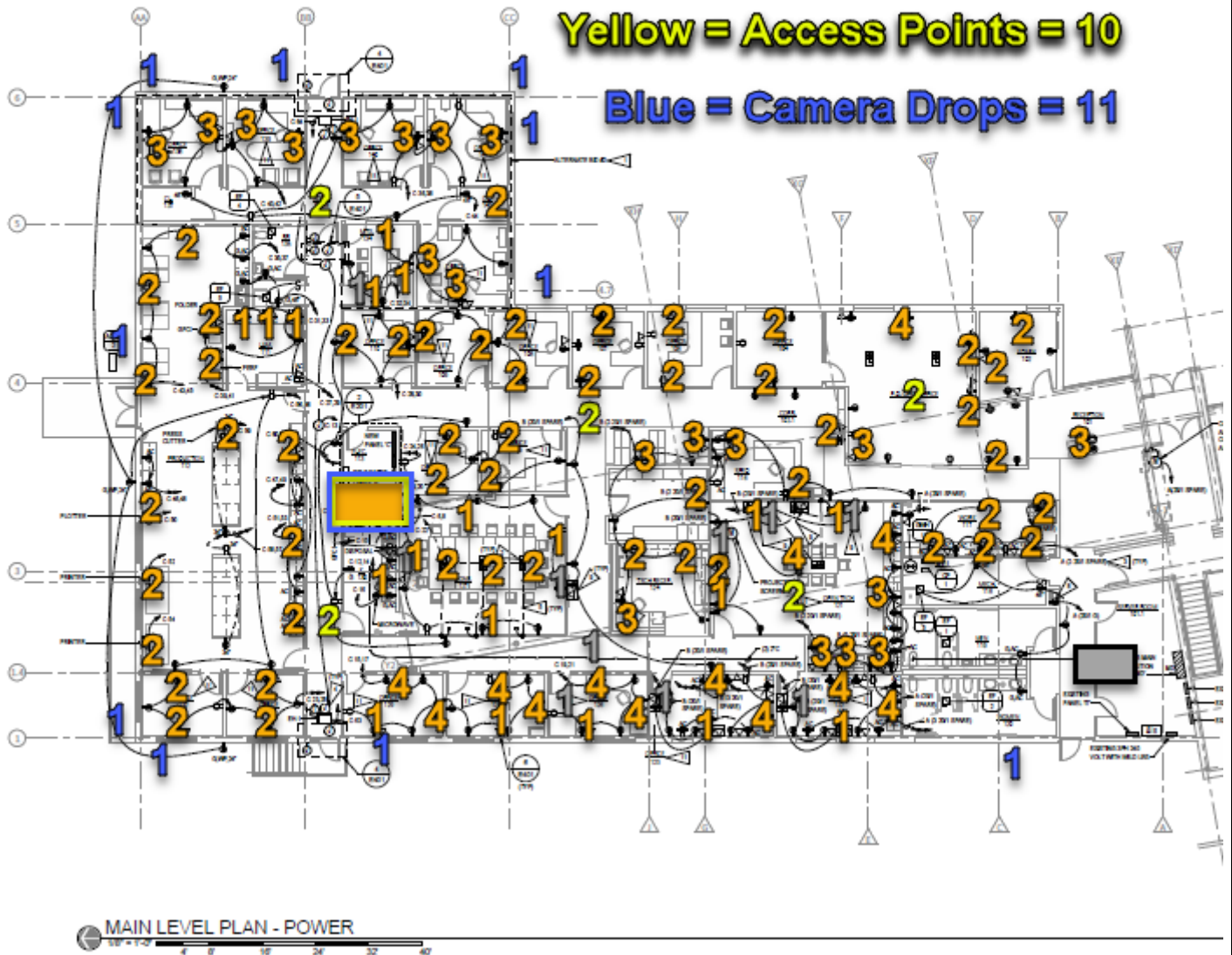
## Base Bid – New Addition: Copper Ethernet Locations

**Gray = Audio/Visual Drops = 9**

**Orange = Office Drops = 235**

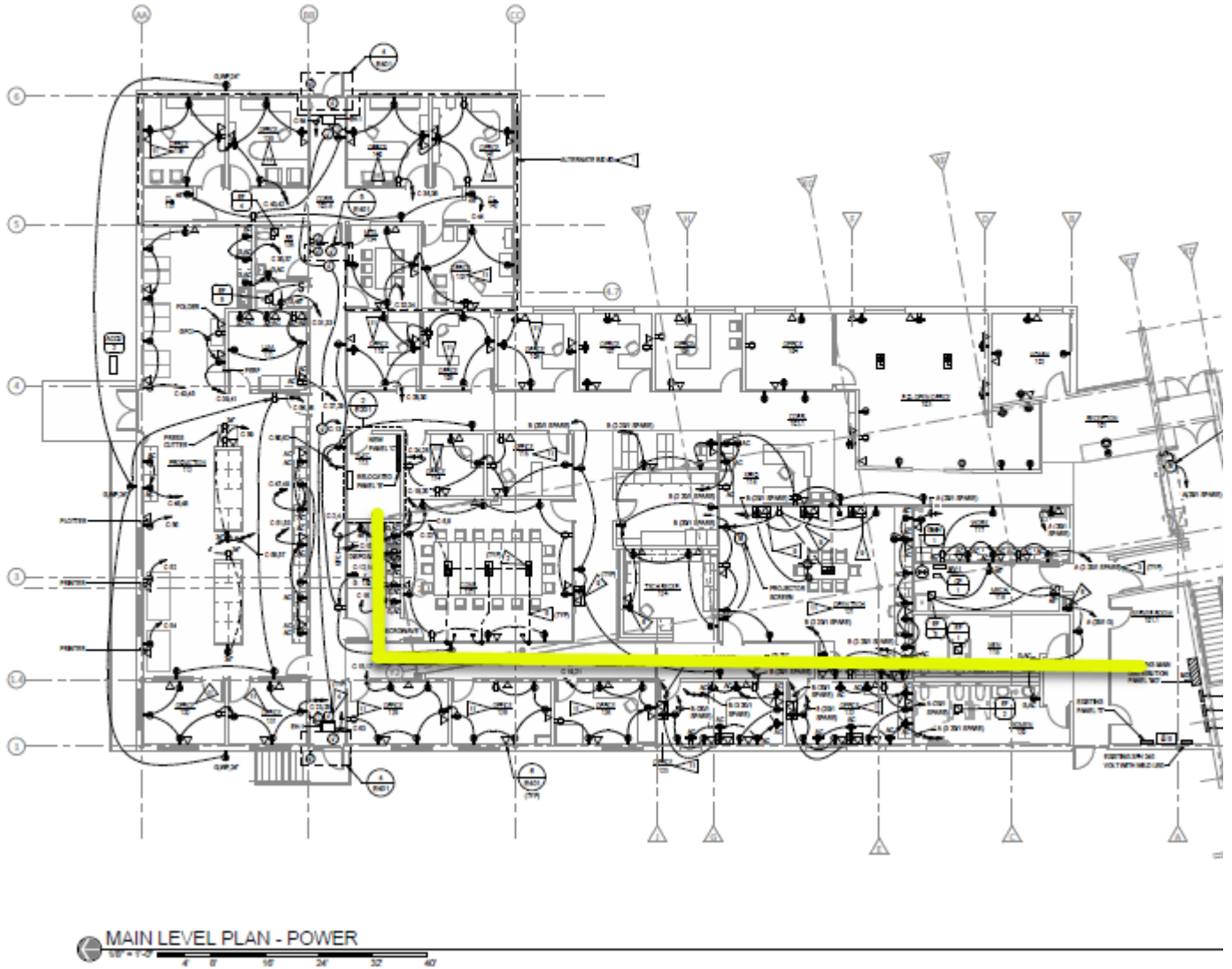
**Yellow = Access Points = 10**

**Blue = Camera Drops = 11**



Base Bid – New Addition: Fiber Location

**Yellow = Single Mode Fiber = 12 Strand**



Description	Color	Count	Cost per Drop	Total
CAT6E Audio/Video Drops	Grey	9		
CAT6E Offices Drops	Orange	235		
CAT6A Access Point Drops	Yellow	10		
CAT6A Security Camera Drops	Blue	11		
Single Mode Fiber / 12 Strand	Yellow			
<b>Total Base Bid</b>				

Alternate #1 – Conference Room, Board Room, Room 3 and Kitchen Area

**Orange = Office Drops = 36**

**Yellow = Access Points = 8**



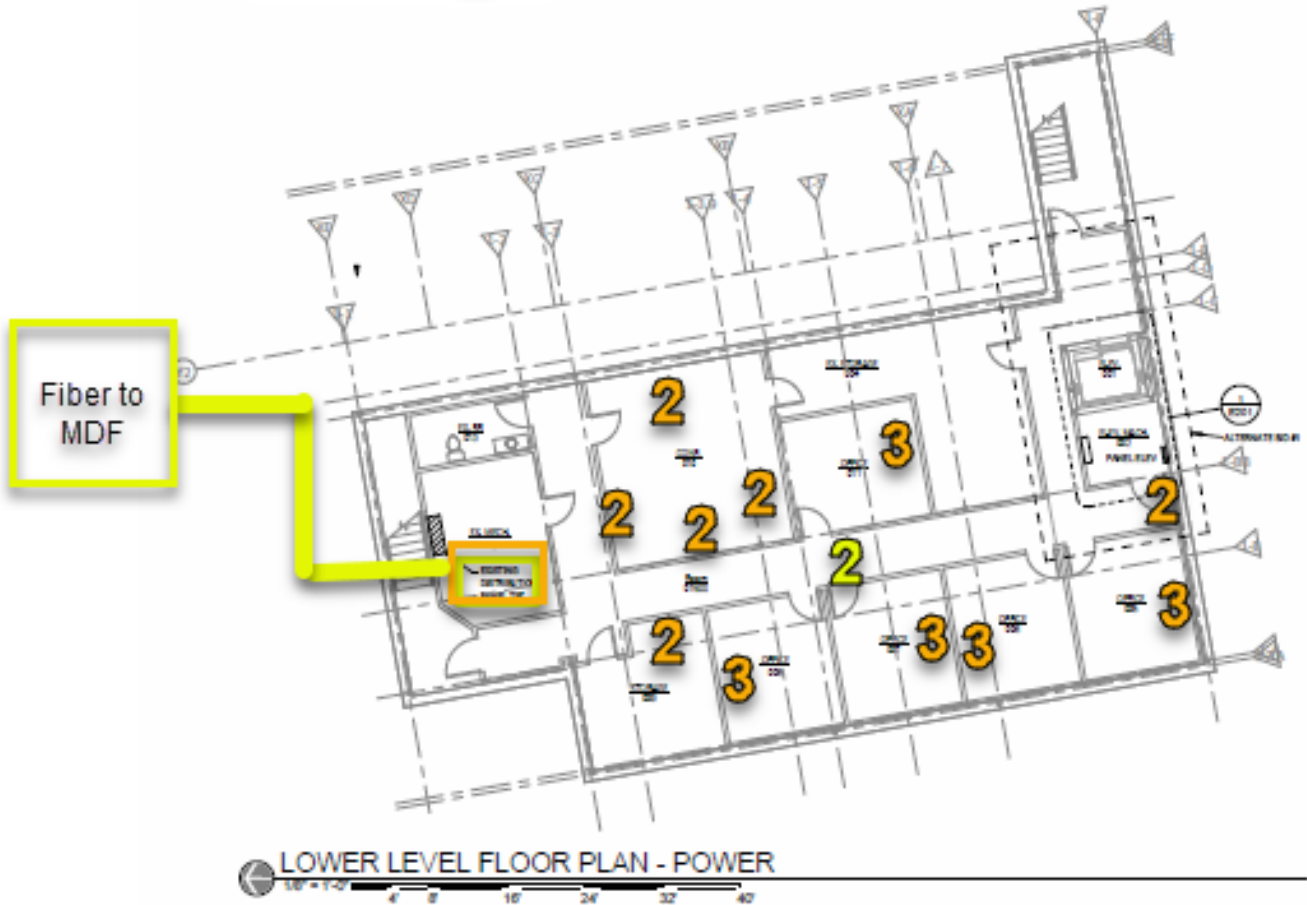
Description	Color	Count	Cost per Drop	Total
CAT6A Offices Drops	Orange	36		
Access Point Drops	Yellow	8		
Total Alternate #1 Bid				

Alternate #2 – Basement Area

**Orange = Office Drops = 27**

**Yellow = Access Points = 2**

**Yellow = Single Mode Fiber = 12 Strand**



Description	Color	Count	Cost per Drop	Total
CAT6A Offices Drops	Orange	27		
Access Point Drops	Yellow	2		
Total Alternate #2 Bid				

**Alternate #3 – Upgrade 235 Orange Ethernet drops from CAT6E to CAT6A**

Description	Color	Count	Cost per Drop	Total
Upgrade 235 Orange Office Drops from CAT6E to CAT6A	Orange	235		
Total Alternate #3 Bid				