



**ERIENET LOCAL DEVELOPMENT  
CORPORATION  
REQUEST FOR PROPOSALS (RFP)**

**PROPOSALS FOR ERIENET POINT OF  
PRESENCE (POP) FITOUT AT THE RATH  
BUILDING**

**RFP #: 2024-01CI**

**RFP DATE: January 18, 2024  
DUE DATE: February 16, 2024**

**ERIENET LDC  
One Seneca Street, 29<sup>th</sup> Fl  
Buffalo, NY 14203**

**INQUIRIES AND PROPOSALS SHOULD BE DIRECTED TO:**

**COURTNEY ITALIA: [Courtney.Italia@erienet.com](mailto:Courtney.Italia@erienet.com)**

## TABLE OF CONTENTS

### RFP Documents

Table of Contents .....	Pg. 1
General Information .....	Pg. 2
General Information and Requirements .....	Pg. 2
Scope of Services .....	Pg. 7
Procurement Specific Requirements .....	Pg. 9
Procurement Selection & Evaluation Process .....	Pg. 13
Statement of Rights .....	Pg. 14
Proposal Form – Unit and Base Pricing .....	Pg. 20
Schedule A – Proposer Certification .....	Pg. 22
Schedule B – Standard Insurance Provisions.....	Pg. 23

### Technical Specifications

#### DIV 27 Communications

SECTION 27 05 11 – REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

SECTION 27 05 26 – GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

SECTION 27 05 28 – INTERIOR PATHWAYS

SECTION 27 10 00 – STRUCTURED CABLING GENERAL REQUIREMENTS

SECTION 27 11 00 – EQUIPMENT ROOM FITTINGS

SECTION 27 13 00 – BACKBONE CABLING

SECTION 27 15 00 – COMMUNICATIONS CAT 6 HORIZONTAL CABLE

SECTION 27 17 01 – CAT 6 TEST, IDENTIFICATION AND ADMIN.

### Reference Drawings:

ErieNet Rath POP Data Center Fit Out

Drawing Bid Set, February 16, 2024

Drawing T-000: Symbols and Abbreviations

Drawing T-500: Partial Floor Plan

Drawing T-700: Details

## **1. GENERAL INFORMATION**

ErieNet (“LDC”), is a not-for-profit, 501 (c) (3), Local Development Corporation operating in the State of New York. ErieNet is seeking proposals from a qualified telecommunications contractors for the fit out of the ErieNet Point of Presence (POP) located on the 15<sup>th</sup> floor of the Rath County Office Building, 95 Franklin Street, Buffalo, NY 14202.

The project is being funded by ErieNet LDC, charged with the construction, operation, sales, and marketing of the ErieNet network.

The mission of ErieNet is to deliver affordable broadband access to unserved areas; improve services in underserved communities; and enable world-class broadband investment and deployment county-wide. Through the development of a state-of the-art fiber optic network, ErieNet will enhance economic development opportunities, promote better quality of life for Erie County residents, and position Erie County as a globally competitive community.

The ErieNet LDC has engaged ECC Technologies, Inc. as its Design and Construction Manager for the ErieNet Network.

## **2. GENERAL INFORMATION AND REQUIREMENTS**

ErieNet is seeking contractors to fit out the newly constructed ErieNet POP on the 15<sup>th</sup> floor of the Rath Building. Refer to Specifications and drawing included as part of this RFP for scope of work.

The project is expected to begin in March of 2024 with a completion date of June 30, 2024.

- A.** Firms are encouraged to include Certified Minority Owned and Women Owned Business Enterprises (MBE/WBE) in their teams to meet goals of 15% MBE and 5% WBE participation. Certified MBE/WBE proposers should include the Erie County certification letter with the proposal.
- B.** If you are unable to meet the MBE/WBE goals, then include in your proposal a letter of explanation as to why, and what measures (due diligence) were taken to identify a valid M/WBE subcontractor.

**C. Schedule.**

RFP Advertisement	January 18, 2024
Pre-Proposal On-site and/or Teams	January 25, 2024 at 1:00 P.M.
RFP Questions Due	February 1, 2024
RFP Questions Response Due	February 7, 2024
RFP Due Date	February 16, 2024

Proposals must be submitted no later than 4:00 pm on February 16, 2024

**D. Inquiries.** All inquiries concerning this RFP are to be emailed to:

[Courtney.Italia@erienet.com](mailto:Courtney.Italia@erienet.com)

**E. Conditions of Proposal.** All costs incurred in the preparation of a proposal responding to this RFP will be the responsibility of the Offeror and will not be reimbursed by ErieNet.

**F. Instructions to Prospective Contractors/Submission of Proposals**

All firms wishing to participate in this process must register electronically to [Courtney.Italia@erienet.com](mailto:Courtney.Italia@erienet.com)

To participate in the pre-bid call, please register via email to [Courtney.Italia@erienet.com](mailto:Courtney.Italia@erienet.com)

**Request for Proposal  
SEALED PROPOSAL for the Fit out of the Rath Building ErieNet POP.**

***\*\* Proposals shall be emailed to [Courtney.Italia@erienet.com](mailto:Courtney.Italia@erienet.com) with subject line reading “Request for Proposal for the Fit out of the Rath Building ErieNet POP”*** Failure to do so may result in premature disclosure of your proposal. It is the responsibility of the Offeror to ensure that the proposal is received by ErieNet, by the date and time specified above. Late proposals will not be considered.

- a. Proposals shall be in a pdf format and emailed to [Courtney.Italia@erienet.com](mailto:Courtney.Italia@erienet.com)  
Proposals are required to be submitted by 4:00 pm on **February 16, 2024**.  
There will not be a public opening of Vendor proposals.
- b. Proposers **MUST** sign the Proposal Certification attached hereto as Schedule “A”. Unsigned proposals will be rejected.

## RESPONDENTS

- A. Right to Reject.** ErieNet reserves the right to reject any and all proposals received in response to this RFP. A contract for the accepted proposal will be drafted based upon the factors described in this RFP.
- B. Small and/or Minority-Owned Businesses.** Efforts will be made by ErieNet to utilize small businesses, women and/or minority owned businesses.
- C. Notification of Award.** It is expected that a decision selecting the successful Firm will be made within four (4) weeks of the closing date for the receipt of proposals. Upon conclusion of final negotiations with the successful Offeror, all Offerors submitting proposals in response to this Request for Proposal will be informed, in writing, of the name of the successful consultant.
- D.** No proposal will be accepted from, nor any agreement awarded to any proposer that is in arrears related to any debt or in default of any obligation owed to the LDC or Erie County. Additionally, no agreement will be awarded to any proposer that has failed to satisfactorily perform pursuant to any prior agreement with the LDC or Erie County.
- E.** ErieNet will only contract with firms that do not discriminate against employees or applicants for employment because of race, creed, color, national origin, sex, age, disability, marital status, sexual orientation, citizenship status or any other status protected by New York State and Federal laws.
- F.** ErieNet reserves the right to amend this RFP. ErieNet reserves the right to reject any or all proposals, or any part thereof, submitted in response to this RFP, and reserves the right to waive formalities, if such action is deemed to be in the best interest of ErieNet. ErieNet reserves the right to request additional information from any proposer.
- G. New York State Labor Law Requirements**
  - 1. General

The Contractor acknowledges this project is a public work and Contractor shall comply with all applicable provisions of the New York State Labor Law (“Labor Law”), including without limitation, the specific provisions cited in this Section.
  - 2. Working Hours

Contractor specifically agrees to comply with Labor Law Article 8 (§200 et seq.), including, but not limited to, the requirements that:

- a. No laborer, worker, or mechanic in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or any part of the work included in the Contract Documents shall be permitted or required to work more than eight hours in any one calendar day or more than five (5) days in any one week, except to the extent permitted in the case of extraordinary emergencies described in the Labor Law.
- b. The wages to be paid to each laborer, worker, or mechanic in the employ of the Contractor, Subcontractor, or other person doing or contracting to do all or any part of the work included in the Contract Documents for a legal day's work shall be not less than the prevailing rate of wages as defined by the Labor Law.
- c. Each laborer, workman or mechanic employed by the Contractor, a Subcontractor, or other person doing or contracting to do all or any part of the work included in the Contract Documents shall be provided the supplements required by Article 8 of the Labor Law.
- d. The minimum hourly rate of wage to be paid shall be not less than as designated by the Industrial Commissioner.
- e. The Contractor's and any Subcontractor's or other person's filing of payrolls in a manner prescribed by subdivision 3-a of Section 220 of the Labor Law shall be a condition precedent to the Owner's payment of any sums due and owing to the Contractor, Subcontractor or other party for work done on or with respect to the Project.

### 3. Wage Rates

Contractor specifically agrees, as required by the Labor Law, that the contract may be forfeited and no sum paid for any work done thereunder on a second conviction for willfully paying less than:

- a. the prevailing wage rates as provided in Labor Law Section 220 as amended, or,
- b. the minimum wage rates as provided in Labor Law Section 220-d, as amended.
- c. Contractor shall comply with prevailing wage rates as issued by the State of New York Department of Labor for the location and duration of this Project.
- d. Contractor shall comply with all the requirements of the Labor Law Section 220-a, as amended, regarding mandatory submission of certified payroll records, which shall be included with each application for payment.

#### 4. Anti-Discrimination

Contractor specifically agrees, as required by the provisions of Section 220-e of the Labor Law, as amended, that:

- a. In the hiring of employees for the performance of work under the Contract or any subcontract hereunder, no contractor, subcontractor, nor any person acting on behalf of such contractor or subcontractor, shall by reason of race, creed, color, sexual orientation, or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates;
- b. No contractor, subcontractor, nor any person on his behalf, shall in any manner, discriminate or intimidate any employee hired for the performance of work under the contract on account of race, creed, color, sexual orientation, or national origin.
- c. There may be deducted from the amount payable to the Contractor by the LDC under the contract a penalty at fifty dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of the contract; and
- d. The contract may be canceled or terminated by the LDC, and all monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of this section of the contract.

#### 5. Sexual Harassment Training

Contractor hereby certifies that each employee assigned by the Contractor to the Project shall annually complete Sexual Harassment Prevention Training that meets or exceeds Section 201-g of the New York Labor Law. Upon request by the LDC, Contractor shall provide the LDC with a copy of Contractor's Sexual Harassment Prevention Training Program and proof of each employee's annual completion of such Sexual Harassment Prevention Training. Contractor shall indemnify, defend and hold the LDC and Contractor's employees, officers, directors and board members harmless from and against any and all claims, suits, actions, debts, liabilities, fines, penalties and expenses, including, attorneys' fees, arising from or caused by Contractor or any

of Contractor's employees, subcontractors, suppliers or agents failure to comply with Section 201-g of the New York Labor Law.

### **3. SCOPE OF SERVICES**

This Scope of Work has been prepared as a proposal guideline. It is the respondent's responsibility to propose a scope that the respondent feels would be necessary to complete the project.

The following is a description of the Services to be performed and completed by the successful Proposer:

1. The ErieNet PoP Fit-out Project is part of a larger Erie County Capital Project to renovate the County Data Center on the 15<sup>th</sup> Floor of the Rath County Office Building. The ErieNet PoP is a secure room within the larger data center that has been assigned to ErieNet.
2. The SELECTED CONSULTANT shall coordinate their construction with the Erie County Data Center Consultant.
3. The SELECTED CONSULTANT shall meet with ErieNet LDC, Erie County, ECC Technologies, and potentially others to discuss project scope. The SELECTED CONSULTANT must understand that in-person meetings with the LDC, in Buffalo may be required.
4. The SELECTED CONSULTANT shall become familiar with all necessary documents, agreements, and regulations relevant to the project, including ECC Technologies' ErieNet PoP design and construction documents.
5. The SELECTED CONSULTANT shall perform all work necessary to meet the project timeline as outlined in the Project Schedule.
5. The ErieNet LDC will expect the SELECTED CONSULTANT to perform the scope of services listed below. Proposals should clearly address all items and follow the requirements and procedures where applicable. Any exceptions to this RFP, Specifications, and/or Drawings will be clearly documented and explained with any mitigating measures offered within the proposer's proposal.



**A. Scope** *(Tasks include, but are not limited to):*

The services and materials to be provided under this Contract, in accordance with the Contract Documents, consists of supplying and delivering all materials, equipment, labor and incidentals necessary or convenient for the construction of fit out of the ErieNet Rath POP at the Rath Building on the 15<sup>th</sup> Floor, and carry out all of the duties and obligations imposed upon the Contractor by the RFP, and RFP Specifications.

Currently, Erie County has a capital construction project underway to renovate their existing Data Center on the 15<sup>th</sup> Floor of the Rath Building. The ErieNet Point of Presence (POP) Room is contained within the Erie County Data Center. This Contract will require coordination with the above referenced Erie County Data Center capital project.

The main features of the work shall include, but not be limited to the following:

1. Provide labor, materials, equipment, and services as specified.
2. All equipment shall be new, and UL listed.
3. All materials furnished and all work performed shall comply with all State, County and Local Codes and ErieNet LDC contract terms and conditions.
4. All equipment and work shall comply with FCC regulations.
5. Contractor is responsible for providing storage, personnel, and equipment to complete the project.

**B. Construction Services**

The Contractor shall be responsible for construction services. Included will be all labor, equipment, tools, materials, project management, and other services or components as detailed in the Contractor's Proposal.

All work shall meet or exceed appropriate local, city, county, state, or federal codes and regulations. This includes, but is not limited to, OSHA, NEC, and EPA requirements. The Contractor shall work with LDC, Project Engineers, Construction Manager, Contract Administrators, and other designees to secure all required inspections, permits, and/or approvals, unless it is stated otherwise, including any electrical, traffic and safety permits required.

The Contractor shall provide all items, articles, materials, operation and/or methods listed, mentioned, or scheduled on the drawings and/or herein including all labor, material, equipment, and all incidentals necessary and required for the completion of the work.

**C. Construction Schedule**

The Contractor shall complete the project within (100) calendar days after contract award.

#### **D. Materials**

All materials throughout this installation shall be new and the best of their respective kind. All materials shall be installed in a neat, accurate, professional, and workmanlike manner.

All products shall conform to applicable standards of the National Electrical Manufacturer's Association and/or the American National Standards Institute and shall be listed by Underwriter's Laboratory. All equipment must be identified as to the manufacturer.

The Contractor shall be responsible for protecting all finished work, equipment, supplies, and materials from loss, injury, and/or damages from any cause whatsoever until final acceptance by LDC.

#### **E. As-Built Drawings and Documentation**

Contractor shall red-line drawings during the course of construction to show cable numbers, pull boxes, conduit and building entrance points or other locations deemed necessary by the LDC. Any deviations or changes to the contract drawings will be documented within the red-line set of drawings. This should be done on a daily basis.

The Contractor shall convert red-line drawings to electronic AutoCAD As-Built's. Upon completion of the construction of this system, the Contractor shall provide the LDC with two sets of completed As-Built drawings and one copy of these drawings in electronic format. These must be submitted as a condition of system acceptance and Contractor payment.

### **4. PROCUREMENT SPECIFIC REQUIREMENTS**

#### **A. SUBCONTRACTS**

If the Contractor is proposing to subcontract any of the work, a detailed scope of services as well as submission of sub-Contractor company information, personnel, qualifications, and proof of sufficient insurance must be provided to the LDC for approval. Contractors must provide a list of all proposed Sub-Contractors along with detailed information regarding their financial and technical ability 20 days in advance of commencement of work.

#### **B. TIME TO CONSTRUCT**

Contractors are required to provide and coordinate project schedules showing expected timeframes for the construction.

## **C. PRICING**

The Contractor agrees to provide the LDC with their best available price for the duration of the contract. If the Contractor provides a lower cost to any other similarly situated to the LDC, the LDC's charges must be lowered to a matching or lower rate. Contractor shall provide written detail identifying and comparing such best available price to other pricing that it offers.

## **D. PAYMENT**

Payment will be made upon the completion of the scope of work included in the Project. Monthly invoices will be accepted showing the percent complete to date. A 5% retainage will be held until completion of the entire project and the LDC acceptance. ErieNet reserves the right to hold retainage if deficiencies are found on the work that has been invoiced, until such time that any deficiencies are corrected to ErieNet's satisfaction.

Payment will be made upon Construction Administrators approval of invoice and in accordance with New York State Prompt Payment legislation.

### **1. Schedule of Values and Payment Applications**

- a. Applications for payment shall be made monthly on the current Form G702 Application and Certificate for Payment and G703 Continuation Sheet for operations completed in accordance with the Approved Schedule of Values. Applications shall be based on the contract prices of labor and materials incorporated into the Work and of materials suitably stored and secured up to the last day of the previous month, less retainage and less the aggregate of previous payments. Change orders when approved shall be listed at the bottom of the last sheet of the payment application.
- b. At least twenty (20) days prior to date established for each progress payment, each Contractor shall submit to the Architect for its review, a preliminary pencil copy of an itemized Application for Payment completed in accordance with the approved Schedule(s) of Values.
- c. Such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives but not included in Change Orders. Such items, if anticipated to be paid from an Allowance, shall be listed under that associated Allowance."
- d. Such applications may not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor or material supplier because of a dispute or other reason.
- e. All supporting data requested by the Architect from Subcontractors and material suppliers necessary to substantiate the Contractor's right to payment shall be furnished by the Contractor.

- f. Until the Contract-scheduled date of Substantial Completion (including authorized adjustment), the Owner shall pay 95% of the amount due the Contractor on account of progress payments, less an amount equal to 200% of the amount of any Claims, liens, or judgments against the Contractor which have not been satisfactorily discharged.
- g. Retainage shall be 5% plus an amount equal to 200% of the amount of any Claims, liens, or judgments against the Contractor which have not been satisfactorily discharged.
- h. At Substantial Completion, when satisfied with the progress of the Work, the Owner, with Consent of Surety, may adjust the amount retained from previous progress payments. The full retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Owner and the Architect, if the Surety withholds his consent or for other good and sufficient reasons.
- i. Contractor shall submit electronic (PDF) final copies of their Application for Payment, incorporating those revisions noted on the pencil copies, to the Architect within two (2) days after being notified that the draft copy, with revisions, is acceptable.
- j. The final copies of each Application for Payment (Form G702) shall be signed by an officer of the Contractor whose signature shall be notarized in the space provided.
- k. Applications shall be based on the completed Work as described above less retainage, and less the aggregate of previous payments. Change Orders when approved shall be listed at the bottom of the last sheet of the payment application.”
- l. Procedures required by Owner shall include, but are not necessarily limited to, submission by the Contractor to the Architect of bills of sale and bills of lading for such materials and equipment, provision of opportunity for the Architect’s visual verification that such materials and equipment are in fact in storage; and, if stored off-site, submission by the contractor of verification that such materials and equipment are stored in a bonded warehouse.
- m. All such materials and equipment, including materials and equipment stored on-site but not yet incorporated into the Work, and upon which partial payments have been made, shall become the property of the Owner. The care and protection of such materials and equipment shall remain the responsibility of the Contractor until incorporation into the Work, including property storage and maintenance of insurance coverage against theft, damage and fire on a replacement cost basis without voluntary deductible.”
- n. Stored Materials - If the Contractor intends to request payment for materials stored on the site in accordance with the provisions of the Contract Documents, he must identify same on the current Contractor’s Application for Payment form. The value of previous months’ “stored materials” shall be included in the “Work Completed” column of the current application.

#### **E. NYS DEPT. OF LABOR PREVAILING WAGE RATE SCHEDULES**

This contract does require the payment of NYS prevailing wage and supplements.

#### **F. FORCE MAJEURE**

Neither party will be liable for losses, defaults or damages which result from delays in performing any or all of the obligations or responsibilities imposed upon it in any contract resulting from this Request for Proposal because of acts of God, acts of government, earthquakes, floods, or other causes beyond the reasonable control of the party so delayed in, or so unable to perform, provided that such party was not negligent and shall have used reasonable efforts to avoid and overcome such cause. Such party will resume full performance of such obligations and responsibilities promptly upon removal of any such cause.

#### **G. SHOP DRAWINGS AND SUBMITTALS**

The Contractor shall furnish to the LDC for review and approval three (3) sets of illustrations, equipment specifications, shop drawings, and engineering data sheets on all equipment proposed to be furnished and installed within thirty (30) days after date of the contract. These will be promptly reviewed by the LDC, and one (1) set will be returned to the Contractor. Each submittal will be stamped “*Approved as submitted*”, “*Approved as noted*”, “*Returned for correction*”, or “*Revise as noted and resubmit*”. In the case of the latter two categories, the submittal shall either be corrected or revised as indicated and three (3) sets returned for review. No installation work shall be started by the Contractor prior to obtaining the approval of these submittals. Articles so submitted shall be understood to be offered by the Contractor as fulfilling all the requirements of the contract, and no approval given by LDC shall relieve the Contractor from compliance with the general terms of the specifications in regards to the articles so approved.

#### **H. BUILD PRACTICES/STANDARDS**

Contractors are required to be in full compliance with the following minimum practices/standards:

- National Electric Safety Code (NESC), latest edition
- National Electric Code (NEC), latest edition
- ANSI/TIA/EIA-758

## **5. PROCUREMENT EVALUATION & SELECTION PROCESS**

This contract will be awarded in accordance with the Competitive Proposal procurement methods per ErieNet's Procurement Policy. The intent of this RFP is to award a contract to the responsible firms that qualifications and other factors considered, are most advantageous to ErieNet, based on the opinion of ErieNet's Board members. Only ErieNet is in the position to determine its own best interest; therefore, ErieNet shall be the sole and final judge in determining the quality and appropriateness of candidates.

All suppliers and vendors should understand that ErieNet is committed to an open, fair, and transparent selection process. All RFP submissions will be reviewed, objectively scored, and ranked. Short listed companies may be interviewed prior to recommendation for selection.

The following criteria, not necessarily listed in order of importance, will be used to review the proposals. ErieNet reserves the right to weigh its evaluation criteria in any manner it deems appropriate. Proposer shall provide the following information with their proposal:

- a) Proposer's demonstrated capability to provide the material and services.
- b) Proposer's experience to perform the proposed services.
- c) Proposer's commitment to including Certified Minority and Women Owned Business Enterprises (MBE/WBE) in their teams in order to meet Erie County's goals of 15% MBE and 5% WBE participation. Certified MBE/WBE proposers should include the Erie County certification letter with the proposal.
- d) Proposer's financial ability to provide the services.
- e) Evaluation of the proposer's cost proposal and unit pricing. It should be noted that while price is not the only consideration, it is an important one.
- f) A determination that the proposer has submitted a complete and responsive proposal as required by this RFP.
- g) An evaluation of the proposer's submitted product specifications and supporting information meets the RFP technical specifications and delivery schedule.
- h) The proposer's presentation at and the overall results of any interview conducted with the proposer.
- i) Proposers must be concise as possible with their responses.

ErieNet may develop a short list of proposals, and interviews/presentations may be required. Scoring and ranking will include the following factors:

### **A. VALUE (40%)**

1. Material Costs

2. Labor Cost
3. Total Contract Value

**B. PERFORMANCE (25%)**

1. Completeness and compliance with the RFP documents, including all required submittal information and proposal forms.
2. References with contact information for projects of similar scope and solution completed within last 3 years.
3. Ability to meet or exceed specifications.
4. Distinguishing features of proposed solution
5. Ability to demonstrate vendor financial viability.

**C. CONSTRUCTION SCHEDULE (25%)**

**D. MWBE GOALS (10%)**

The highest-ranking firm after scoring and interviews will be recommended to the ErieNet Board of Director for authorization to enter into contract. Scores and ranking of all firms will be provided to the ErieNet LDC for a final award determination.

**6. STATEMENT OF RIGHTS**

**A. UNDERSTANDINGS**

**Please take notice**, by submission of a proposal in response to this request for proposals, the proposer agrees to and understands:

- that any proposal, attachments, additional information, etc. submitted pursuant to this Request for Proposals constitute merely a suggestion to negotiate with ErieNet LDC and is not a bid under Section 103 of the New York State General Municipal Law.
- submission of a proposal, attachments, and additional information shall not entitle the proposer to enter into an agreement with ErieNet for the required services.
- by submitting a proposal, the proposer agrees and understands that ErieNet is not obligated to respond to the proposal, nor is it legally bound in any manner whatsoever by submission of same.

- that any and all counterproposals, negotiations or any communications received by a proposing entity, its officers, employees or agents from ErieNet, its officers, employees or agents, shall not be binding against ErieNet, its officers, employees or agents unless and until a formal written agreement for the services sought by this RFP is duly executed by both parties and approved by the ErieNet LDC Board.
  
- In addition to the foregoing, by submitting a proposal, the proposer also understands and agrees that ErieNet reserves the right, and may at its sole discretion exercise, the following rights and options with respect to this Request for Proposals:
  - To reject any or all proposals.
  - To issue amendments to this RFP.
  - To issue additional solicitations for proposals
  - To waive any irregularities in proposals received after notification to proposers affected.
  - To select any proposal as the basis for negotiations of a contract, and to negotiate with one or more of the proposers for amendments or other modifications to their proposals.
  - To conduct investigations with respect to the qualifications of each proposer.
  - To exercise its discretion and apply its judgment with respect to any aspect of this RFP, the evaluation of proposals, and the negotiations and award of any contract.
  - To enter into an agreement for only portions (or not to enter into an agreement for any) of the services contemplated by the proposals with one or more of the proposers.
  - To select the proposal that best satisfies the interests of ErieNet and not necessarily on the basis of price or any other single factor.
  - To interview the proposer(s).
  - To request or obtain additional information ErieNet deems necessary to determine the ability of the proposer; and
  - To modify dates.
  
- All proposals prepared in response to this RFP are at the sole expense of the proposer, and with the express understanding that there will be no claim, whatsoever, for reimbursement from ErieNet for the expenses of preparation. ErieNet assumes no responsibility or liability of any kind for costs incurred in the preparation or submission of any proposal.



- While this is an RFP and not a bid, ErieNet reserves the right to apply the case law under General Municipal Law § 103 regarding bidder responsibility in determining whether a proposer is a responsible vendor for the purpose of this RFP process.
- ErieNet is not responsible for any internal or external delivery delays which may cause any proposal to arrive beyond the stated deadline. To be considered, proposals MUST arrive at the place specified herein and be time stamped prior to the deadline.

## **B. CONTRACT**

- Refer to Attachment A: ErieNet Standard Agreement.
- NO RIGHTS SHALL ACCRUE TO ANY PROPOSER BY THE FACT THAT A PROPOSAL HAS BEEN SELECTED BY ERIENET FOR SUBMISSION TO THE ERIENET LDC BOARD FOR APPROVAL. THE APPROVAL OF SAID LDC BOARD MAY BE NECESSARY BEFORE A VALID AND BINDING CONTRACT MAY BE EXECUTED BY ERIENET.

## **C. INDEMNIFICATION AND INSURANCE**

The proposer accepts and agrees that language in substantially the following form will be included in the contract between the proposer and ErieNet:

“In addition to, and not in limitation of the insurance requirements contained herein the Vendor agrees:

(a) that except for the amount, if any, of damage contributed to, caused by or resulting from the negligence of ErieNet, the Vendor shall indemnify and hold harmless ErieNet, its officers, employees and agents from and against any and all liability, damage, claims, demands, costs, judgments, fees, attorneys' fees or loss arising directly or indirectly out of the acts or omissions hereunder by the Vendor or third parties under the direction or control of the Vendor; and

(b) to provide defense for and defend, at its sole expense, any and all claims, demands or causes of action directly or indirectly arising out of this Agreement and to bear all other costs and expenses related thereto.

Upon execution of any contract between the proposer and ErieNet, the proposer will be required to provide proof of the insurance coverage described in Schedule “B”.

Insurance coverage in amount and form shall not be deemed acceptable until approved by ErieNet Attorney.

#### **D. PERFORMANCE BOND**

Contractor shall furnish a Performance Bond in an amount equal to one hundred percent (100%) of the Contract Price, as security for the faithful performance of all Contractor's obligations under the Agreement. This Bond shall remain in effect at least one (1) year after the date of final payment — Performance Bond, and be executed by such sureties as:

- (a) Are licensed to conduct business in the state where the Project is located, and
- (b) Are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department.
  - All Bonds signed by an agent must be accompanied by a certified copy of the authority to act. All bonds must be acceptable to the ErieNet.
  - If the surety of any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located, or it ceases to meet the requirements of Section 5. CONTRACTOR shall within five days thereafter substitute another Bond and surety, both of which shall be acceptable to ErieNet.
  - ErieNet will accept only bonds or notes of the United States of America, New York State, or political subdivisions thereof in lieu of all or part of the cash retainage.
- (c) CONTRACTOR shall execute bonds acceptable to ErieNet as specified herein below:
- (d) Performance Bond: one hundred percent (100%) of contract price and may be in the form of one (1) or two (2) bonds.
- (e) CONTRACTOR to provide line-item pricing for the performance bond and maintenance bond.

#### **E. NON-COLLUSION**

The proposer, by signing the proposal, does hereby warrant and represent that any ensuing agreement has not been solicited, secured or prepared directly or indirectly, in a manner contrary to the laws of the State of New York and the ErieNet LDC, and that said laws have not been violated and shall not be violated as they relate to the procurement or the performance of the agreement by any conduct, including the paying or the giving of any fee, commission, compensation, gift, gratuity or consideration of any kind, directly or indirectly, to any ErieNet employee, officer or official.

## **F. CONFLICT OF INTEREST**

All proposers must disclose with their proposals the name of any officer, director or agent who is also an employee of ErieNet or County of Erie. Further, all proposers must disclose the name of any ErieNet or County employee who owns, directly or indirectly, an interest of ten percent or more in the firm or any of its subsidiaries or affiliates.

There shall be no conflicts in existence during the term of any contract with ErieNet. The existence of a conflict shall be grounds for termination of a contract.

## **G. COMPLIANCE WITH LAWS**

By submitting a proposal, the proposer represents and warrants that it is familiar with all federal, state, and local laws and regulations and will conform to said laws and regulations. The preparation of proposals, selection of proposers and the award of contracts are subject to provisions of all Federal, State and County laws, rules and regulations.

## **H. CONTENTS OF PROPOSAL**

The New York State Freedom of Information Law as set forth in Public Officers Law, Article 6, Sections 84 et seq., mandates public access to government records. However, proposals submitted in response to this RFP may contain technical, financial background or other data, public disclosure of which could cause substantial injury to the proposer's competitive position or constitute a trade secret. Proposers who have a good faith belief that information submitted in their proposals is protected from disclosure under the New York Freedom of Information Law shall:

a) insert the following notice in the front of its proposal:

**“NOTICE”**

**The data on pages \_\_\_\_ of this proposal identified by an asterisk (\*) contains technical or financial information constituting trade secrets or information the disclosure of which would result in substantial injury to the proposer's competitive position.**

**The proposer requests that such information be used only for the evaluation of the proposal but understands that any disclosure will be limited to the extent that ErieNet considers proper under the law. If ErieNet enters into an agreement with this proposer, ErieNet shall have the right to use or disclose such information as provided in the agreement, unless otherwise obligated by law.”**

and

b) clearly identify the pages of the proposals containing such information by typing in bold face on the top of each page:

**“THE PROPOSER BELIEVES THAT THIS INFORMATION IS PROTECTED FROM DISCLOSURE UNDER THE STATE FREEDOM OF INFORMATION LAW.”**

ErieNet assumes no liability for disclosure of information so identified, provided that ErieNet has made a good faith legal determination that the information is not protected from disclosure under applicable law or where disclosure is required to comply with an order or judgment of a court of competent jurisdiction.

The contents of the proposal, which is accepted by ErieNet, except portions "Protected from Disclosure", may become part of any agreement resulting from this RFP.

## **I. EFFECTIVE PERIOD OF PROPOSALS**

All proposals must state the period for which the proposal shall remain in effect (i.e. how much time does ErieNet have to accept or reject the proposal under the terms proposed). Such period shall not be less than 180 days from the proposal date.

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## 7. PROPOSAL FORM

### PRICE PROPOSAL FORM

#### 1. BASE PROPOSAL

Include all equipment, layout, shipping, delivery, integration, testing, and warranty costs as described by the RFP Specifications and Drawings.

**Total Cost (inclusive of Performance Bond)** \$ \_\_\_\_\_

#### 2. Breakout Costs

**Material** \$ \_\_\_\_\_

**Labor** \$ \_\_\_\_\_

**Supervision** \$ \_\_\_\_\_

**Performance Bond** \$ \_\_\_\_\_

**Other** \$ \_\_\_\_\_

#### PROPOSAL FORM SUBMITTED BY:

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Printed Name & Title

\_\_\_\_\_  
Date

#### ADDENDUM ACKNOWLEDGMENT

The Vendor acknowledges receipt of Addendums and submits all forms related to this project in compliance with the information contained within Addendums:

**Addendum No.1:** Yes / No / NA

**Addendum No.2:** Yes / No / NA

**Addendum No.3:** Yes / No / NA

## **PRICE PROPOSAL FORM (continued)**

---

**Authorized Signature**

---

**Printed Name & Title**

---

**Date**

**SCHEDULE “A”**

**PROPOSER CERTIFICATION**

The undersigned agrees and understands that this proposal and all attachments, additional information, etc. submitted herewith constitute merely an offer to negotiate with ErieNet and is NOT A BID. Submission of this proposal, attachments, and additional information shall not obligate or entitle the proposing entity to enter into a service agreement with ErieNet for the required services. The undersigned agrees and understands that ErieNet is not obligated to respond to this proposal nor is it legally bound in any manner whatsoever by the submission of same. Further, the undersigned agrees and understands that any and all proposals and negotiations shall not be binding or valid against ErieNet, its directors, officers, employees or agents unless an agreement is signed by a duly authorized officer of ErieNet and, if necessary, approved by the ErieNet LDC Board.

It is understood and agreed that ErieNet reserves the right to reject consideration of any and all proposals including, but not limited to, proposals which are conditional or incomplete. It is further understood and agreed that ErieNet reserves all rights specified in the Request for Proposals.

It is represented and warranted by those submitting this proposal that except as disclosed in the proposal, no officer or employee of ErieNet is directly or indirectly a party to or in any other manner interested in this proposal or any subsequent service agreement that may be entered.

Proposer Company Name: \_\_\_\_\_

Signature \_\_\_\_\_

Name (Printed) \_\_\_\_\_

Title \_\_\_\_\_

Date \_\_\_\_\_

## SCHEDULE "B"

### STANDARD INSURANCE PROVISIONS

#### INSTRUCTIONS FOR ERIENET LDC STANDARD INSURANCE CERTIFICATE

- I. Insurance shall be procured, and certificates delivered before commencement of work or delivery of merchandise or equipment.
  
- II. CERTIFICATES OF INSURANCE
  - A. Shall be made to the "ErieNet LDC, 95 Franklin St, Buffalo NY, 14202."
  
  - B. ECC Technologies, Inc., 2136 Five Mile Line Rd., Rochester, NY 14526 will be named as additional insured.
  
  - C. Coverage must comply with all specifications of the contract.
  
  - D. Must be executed by an insurance company, agency, or broker, which is licensed by the Insurance Department of the State of New York. If executed by a broker, notarized copy of authorization to bind or certify coverage must be attached.
  
- III. Minimum coverage with limits are as follows (Column A):

Vendor Classification	A Construction and Maintenance	B Purchase or Lease of Merchandise or Equipment	C Professional Services	D Property Leased To Others Or Use Of Facilities Or Grounds	E Concessionaires Services	F Livery Services	G All Purposes Public Entity Contracts
Commercial Gen. Liab.	\$1,000,000 per occ.	\$1,000,000 CSL	\$1,000,000 CSL	\$1,000,000	\$1,000,000 CSL	\$1,000,000	\$1,000,000 CSL
General Aggregate	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000
Products Completed Operations Liability	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000
Blanket Broad Form Contractual Liability	INCLUDE						
Contractual Liability		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Broad Form P.D.	INCLUDE						
X.C.U. (explosion, collapse, Underground)	INCLUDE						



Liquor Law				INCLUDE	INCLUDE		
Auto Liab.	<b>\$1,000,000 CSL</b>		\$1,000,000 CSL	\$1,000,000 CSL	\$1,000,000 CSL	\$1,000,000 CSL	\$1,000,000 CSL
Owned	<b>INCLUDE</b>		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Hired	<b>INCLUDE</b>		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Non-Owned	<b>INCLUDE</b>		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Excess/Umbrella Liab.	<b>\$4,000,000</b>	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$5,000,000	\$1,000,000
Worker's Compensation	<b>STATUTORY</b>	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY
& Employer's Liability							
Disability Benefits	<b>STATUTORY</b>	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY
Professional Liability			\$5,000,000				
ErieNet, To Be Named Additional Insured	<b>Gen. Liab., Auto Liab., &amp; Excess</b>	Broad Form Vendors May Be Required	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess

- IV. Construction contracts require excess Umbrella Liability limits of \$10,000,000.
- V. Coverage must be provided on a primary-noncontributory bases.
- VI. Designated Construction Project General Aggregate Limit Per Project Endorsement CG 25 03 is required.
- VII. In the event the concessionaire is required to have a N.Y.S. license to dispense alcoholic beverages an endorsement for liquor liability is required.
- VIII. Waiver of Subrogation: Required on all lines unless noted.
- IX. Transportation of people in buses, vans or station wagons requires \$5,000,000 excess liability.
- X. Workers Compensation: State Workers' Compensation/Disability Benefits Law.

Use Applicable Certificates Below:

Workers Compensation Forms

CE-200	Exemption
C105.2	Commercial Insurer
SI-12	Self-Insurer
GSI-105.2	Group Self Insured
U-26.3	New York State Insurance Fund

DBL (Disability Benefits Law) Forms

CE-200	Exemption
DB-120.1	Insurers
DB-155	Self-Insured

- XI. The "ACORD" form certificate may be used in place of ErieNet Standard Insurance Certificate, provided that all of the above referenced requirements are incorporated into the "ACORD" form certificate.



## SECTION 27 05 11

### REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. This Section, Requirements for Communications Installations, applies to all sections of Division 27.
- B. Furnish and install communications cabling, systems, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of transformers, cable, and other items and arrangements for the specified items are shown on drawings.

##### 1.02 MINIMUM REQUIREMENTS

- A. References to industry and trade association standards and codes are minimum installation requirement standards.
- B. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

##### 1.03 QUALIFICATIONS (PRODUCTS AND SERVICES)

- A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.
- B. Product Qualification:
  - 1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
  - 2. The Owner reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.
- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

##### 1.04 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts shall be available.
- B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
  - 1. Components of an assembled unit need not be products of the same manufacturer.
  - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
  - 3. Components shall be compatible with each other and with the total assembly for the intended service.



4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Testing Is Specified:
  1. The Owner shall have the option of witnessing factory tests. The contractor shall notify the Owner a minimum of 15 working days prior to the manufacturers making the factory tests.
  2. Four copies of certified test reports containing all test data shall be furnished to the Engineer prior to final inspection and not more than 90 days after completion of the tests.
  3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Owner.

#### **1.05 EQUIPMENT REQUIREMENTS**

- A. Where variations from the contract requirements are requested in accordance with the GENERAL CONDITIONS, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

#### **1.06 EQUIPMENT PROTECTION**

- A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:
  1. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing and operating and repainting if required.
  2. Damaged equipment shall be, as determined by the Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
  3. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
  4. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

#### **1.07 1.7 WORK PERFORMANCE**

- A. Job site safety and worker safety is the responsibility of the contractor.
- B. For work on existing stations, arrange, phase and perform work to assure communications service for other buildings at all times.
- C. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by GENERAL CONDITIONS.
- D. Coordinate location of equipment and pathways with other trades to minimize interferences. See the GENERAL CONDITIONS.



### **1.08 EQUIPMENT INSTALLATION AND REQUIREMENTS**

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Inaccessible Equipment:
  - 1. Where the Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
  - 2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

### **1.09 EQUIPMENT IDENTIFICATION**

- A. Install an identification sign which clearly indicates information required for use and maintenance of equipment.
- B. Nameplates shall be laminated black phenolic resin with a white core with engraved lettering, a minimum of 6 mm (1/4 inch) high. Secure nameplates with screws. Nameplates that are furnished by manufacturer as a standard catalog item, or where other method of identification is herein specified, are exceptions.

### **1.10 SUBMITTALS**

- A. Submit in accordance with GENERAL CONDITIONS.
- B. The Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage, or installation of equipment or material which has not had prior approval will not be permitted at the job site.
- C. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings, and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
  - 1. Mark the submittals, "SUBMITTED UNDER SECTION \_\_\_\_\_".
  - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
  - 3. Submit each section separately.
- E. The submittals shall include the following:
  - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
  - 2. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
  - 3. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
- F. Manuals: Submit in accordance with GENERAL CONDITIONS.



1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hard-back binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test, and furnish the remaining manuals prior to contract completion.
2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
4. The manuals shall include:
  - a) Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
  - b) A control sequence describing start-up, operation, and shutdown.
  - c) Description of the function of each principal item of equipment.
  - d) Installation and maintenance instructions.
  - e) Safety precautions.
  - f) Diagrams and illustrations.
  - g) Testing methods.
  - h) Performance data.
  - i) Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
  - j) Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.
- G. Approvals will be based on complete submission of manuals together with shop drawings.

#### **1.11 TRAINING**

- A. Training shall be provided in accordance with the GENERAL CONDITIONS.
- B. Training shall be provided for the particular equipment or system as required in each associated specification.
- C. A training schedule shall be developed and submitted by the contractor and approved by the Engineer at least 30 days prior to the planned training.

**END OF SECTION**



## **SECTION 27 05 28**

### **INTERIOR PATHWAYS**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes to form complete, coordinated, raceway systems. Raceways are required for all communications cabling unless shown or specified otherwise.
- B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.
- C. Provide all labor, materials, tools and equipment required for the complete installation of work called for in the contract documents.

##### **1.02 RELATED WORK**

- A. Bedding of conduits.
- B. Mounting board for communication closets.
- C. Sealing around penetrations to maintain the integrity of fire rated construction: Section 07 84 00, FIRESTOPPING.
- D. Fabrications for the deflection of water away from the building envelope at penetrations: Section 07 60 00, FLASHING AND SHEET METAL.
- E. Sealing around conduit penetrations through the building envelope to prevent moisture migration into the building
- F. Identification and painting of conduit and other devices.
- G. General electrical requirements and items that is common to more than one section of Division 27: Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
- H. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents: Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS.

##### **1.03 SUBMITTALS**

In accordance with GENERAL CONDITIONS, furnish the following:

- A. Shop Drawings:
  - 1. Size and location of panels and pull boxes
  - 2. Layout of required conduit penetrations through structural elements.
  - 3. The specific item proposed and its area of application shall be identified on the catalog cuts.
- B. Certification: Prior to final inspection, deliver to the Engineer A certification that the material is in accordance with the drawings and specifications and has been properly installed.



#### **1.04 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. National Fire Protection Association (NFPA):
  - 1. 70-05 National Electrical Code (NEC)
- C. Underwriters Laboratories, Inc. (UL):
  - 1. 1-03 Flexible Metal Conduit
  - 2. 5-01 Surface Metal Raceway and Fittings
  - 3. 6-03 Rigid Metal Conduit
  - 4. 50-03 Enclosures for Electrical Equipment
  - 5. 360-03 Liquid-Tight Flexible Steel Conduit
  - 6. 467-01 Grounding and Bonding Equipment
  - 7. 514A-01 Metallic Outlet Boxes
  - 8. 514B-02 Fittings for Cable and Conduit
  - 9. 514C-05 Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
  - 10. 651-02 Schedule 40 and 80 Rigid PVC Conduit
  - 11. 651A-03 Type EB and A Rigid PVC Conduit and HDPE Conduit
  - 12. 797-03 Electrical Metallic Tubing
  - 13. 1242-00 Intermediate Metal Conduit
- D. National Electrical Manufacturers Association (NEMA):
  - 1. TC-3-04 PVC Fittings for Use with Rigid PVC Conduit and Tubing
  - 2. FB1-03 Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

### **PART 2 - PRODUCTS**

#### **2.01 CONDUIT:**

- A. Conduit Size: In accordance with the NEC, but not less than 13 mm (1/2 inch) unless otherwise shown.
  - 1. Rigid galvanized steel: Shall Conform to UL 6, ANSI C80.1.
  - 2. Rigid aluminum: Shall Conform to UL 6A, ANSI C80.5.
  - 3. Rigid intermediate steel conduit (IMC): Shall Conform to UL 1242, ANSI C80.6.
  - 4. Electrical metallic tubing (EMT): Shall Conform to UL 797, ANSI C80.3. Maximum size not to exceed 105 mm (4 inch) and shall be permitted only with cable rated 600 volts or less.
  - 5. Flexible galvanized steel conduit: Shall Conform to UL 1.
  - 6. Liquid-tight flexible metal conduit: Shall Conform to UL 360.
  - 7. Direct burial plastic conduit: Shall conform to UL 651 and UL 651A, heavy wall PVC or high-density polyethylene (PE).





8. Surface metal raceway: Shall Conform to UL 5.

## **2.02 CONDUIT FITTINGS:**

### **A. Rigid steel and IMC conduit fittings:**

1. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
2. Standard threaded couplings, locknuts, bushings, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
3. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
4. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
5. Erickson (union-type) and set screw type couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case-hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
6. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.

### **B. Rigid aluminum conduit fittings:**

1. Standard threaded couplings, locknuts, bushings, and elbows: Malleable iron, steel or aluminum alloy materials; Zinc or cadmium plate iron or steel fittings. Aluminum fittings containing more than 0.4 percent copper are prohibited.
2. Locknuts and bushings: As specified for rigid steel and IMC conduit.
3. Set screw fittings: Not permitted for use with aluminum conduit.

### **C. Electrical metallic tubing fittings:**

1. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
2. Only steel or malleable iron materials are acceptable.
3. Couplings and connectors: Concrete tight and rain tight, with connectors having insulated throats. Use gland and ring compression type couplings and connectors for conduit sizes 50 mm (2 inches) and smaller. Use set screw type couplings with four set screws each for conduit sizes over 50 mm (2 inches). Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
4. Indent type connectors or couplings are prohibited.
5. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.

### **D. Flexible steel conduit fittings:**

1. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
2. Clamp type, with insulated throat.

### **E. Liquid-tight flexible metal conduit fittings:**

1. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
2. Only steel or malleable iron materials are acceptable.



3. Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.
- F. Direct burial plastic conduit fittings:
  1. Fittings shall meet the requirements of UL 514C and NEMA TC3.
  2. As recommended by the conduit manufacturer.
- G. Surface metal raceway fittings: As recommended by the raceway manufacturer.
  1. Expansion and deflection couplings:
    - a) Conform to UL 467 and UL 514B.
    - b) Accommodate, 19 mm (0.75 inch) deflection, expansion, or contraction in any direction, and allow 30-degree angular deflections.
    - c) Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.
    - d) Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.

### **2.03 CONDUIT SUPPORTS:**

- A. Parts and hardware: Zinc-coat or provide equivalent corrosion protection.
- B. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
- C. Multiple conduit (trapeze) hangers: Not less than 38 mm by 38 mm (1-1/2 by 1-1/2 inch), 12 gage steel, cold formed, lipped channels; with not less than 9 mm (3/8 inch) diameter steel hanger rods.
- D. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.

### **2.04 OUTLET, JUNCTION, AND PULL BOXES:**

- A. UL-50 and UL-514A.
- B. Cast metal where required by the NEC or shown, and equipped with rustproof boxes.
- C. Sheet metal boxes: Galvanized steel, except where otherwise shown.
- D. Flush mounted wall or ceiling boxes shall be installed with raised covers so that front face of raised cover is flush with the wall. Surface mounted wall or ceiling boxes shall be installed with surface style flat or raised covers.

### **2.05 WIREWAYS:**

- A. Equip with hinged covers, except where removable covers are shown.

### **2.06 INNERDUCT:**

- A. Standard HDPE
  1. Textile Innerduct: Standard Outdoor Textile Innerduct: Micro (33mm), 2-inch, 3-inch and 4-inch single or multi-cell polyester/nylon textile innerduct containing 1250lb polyester flat woven pull tape as manufactured by MaxCell:
    - a) MaxCell Group/TVC Communications



- b) 600 Plum Creek Dr.
- c) Wadsworth, OH. 44281
- d) 1-888-387-3828
- 2. Textile innerduct fittings
  - a) Conduit Plugs: Compression-type conduit plugs with locking nuts for sealing and securing one or more textile innerducts within a 4-inch inside diameter conduit, e.g.: a 4-inch plug with nine holes for cables in a 3 pack (9-cell) configuration
  - b) Termination Bags: Inflation-type bags for sealing and securing around one or more textile innerducts and cables within 2-inch outside diameter or larger conduit.
  - c) Pull Tape: measuring and pulling tape constructed of synthetic fiber, printed with accurate sequential footage marks. Color-coded.

## **2.07 SURFACE METALLIC RACEWAY**

- A. Refer to drawings for additional surface raceway sizes, cable fill tables, and cable radius requirements.
- B. TYPE SR-2 (V2400 series)
  - 1. .875" H x 1.875" W
  - 2. Metallic two-piece raceway with single compartment.
  - 3. Color shall be Ivory color and have a durable finish with a scratch-resistant surface that can be field painted.
  - 4. Refer to Drawings for additional information and requirements.
  - 5. Provide the following fittings:
    - a) Entrance end fitting - nominal maximum dimensions of 2.62" W x 2.25" H x 3" L. and 1" conduit knockout.
    - b) Back entrance end fitting - same as entrance end fitting with internal radius.
    - c) Tee fittings to connect to SR-3 (3000 Series) and SR-4 (4000 Series) raceway where T section to SR-2 (2400 Series) has maximum width equal to SR-2 raceway
    - d) Bridge fitting with radius for spanning existing raceways in varying widths from ½" to 2.
    - e) Flat Internal and external elbows UL verified for a 2" [51mm] bend radius and exceeding the recommendations of EIA/TIA 569A. Internal or external radius control must be provided. Derate fill capacities when internal radius control is provided, as recommended by the manufacturer.
    - f) Surface 2" x 4" or 4" x 4" boxes, with 2.25" depth as called for.
  - 6. Design Make: Wiremold V2400 series raceway, V2475D series bridge fittings, V2410 series entrance end fittings, V2415 T fittings.
  - 7. Acceptable Manufacturers: Hubbell, Mono-Systems or approved equal.
- C. TYPE SR-3 (V3000 Series)
  - 1. 1.5" H x 2.75"W
  - 2. Metallic two piece raceway with single compartment.



3. Color shall be Ivory color and have a durable finish with a scratch-resistant surface that can be field painted.
  4. Refer to Drawings for additional information and requirements.
  5. Provide the following fittings:
    - a) Entrance end fitting - nominal maximum dimensions of 2.75"W x 2"H x 2.125" L. and 1" conduit knockout.
    - b) Back entrance end fitting - same as entrance end fitting with internal radius.
    - c) Tee fittings to connect to SR-2 (2400 Series) raceway where T section to SR-2 has maximum width equal to SR-2 raceway
    - d) Flat Internal and external elbows UL verified for a 2" [51mm] bend radius and exceeding the recommendations of EIA/TIA 569A using internal or external radius components. Internal or external radius control must be provided. Derate fill capacities when internal radius control is provided, as recommended by the manufacturer.
  6. Design Make: Wiremold V3000 series raceway, with V3011, V3010 and V3018 fittings.
  7. Acceptable Manufacturers: Hubbell, Mono-Systems or approved equal.
- D. TYPE SR-4 and SR-4d (V4000 Series)
1. 1.75" H x 4.75" W
  2. Metallic two-piece raceway with single or divided compartment as called for on plans.
  3. Color shall be Ivory color and have a durable finish with a scratch-resistant surface that can be field painted.
  4. Provide the following fittings:
    - a) Entrance end fitting - nominal maximum dimensions of 4.75" W x 2.75"H x 6.5" L. and 1.25" conduit knockout.
    - b) Back entrance end fitting - same as entrance end fitting with internal radius.
    - c) T fittings to connect to SR-2 (2400 Series) raceway where T section to SR-2 has maximum width equal to SR-2 raceway
    - d) Flat Internal and external elbows with fiber optic radius
  5. Design Make: Wiremold V4000 Series raceway, with V4010, V4017FO, V4015FO and V4011FO fittings.
  6. Acceptable Manufacturers: Hubbell, Mono-Systems or approved equal
- E. TYPE SR-7 (V700 Series)
1. One-piece raceway
  2. Color shall be Ivory color and have a durable finish with a scratch-resistant surface that can be field painted.
  3. Utilized for wall mounted phones and miscellaneous branch circuit power only.
  4. Provide internal and external 90-degree fittings with radius.
  5. Provide miscellaneous boxes, extension rings, fittings and supports designed and manufactured by the raceway manufacturer as required making a complete job.
  6. Design Make: Wiremold V700

7. Acceptable Manufacturers: Hubbell, Mono-Systems or approved equal.

## 2.08 WIRE MESH CABLE TRAY

- A. Cable Tray Finish: Carbon Steel with Zink plating.
- B. Cable tray will consist of continuous, rigid, welded steel wire mesh cable management system, to allow continuous ventilation of cables and maximum dissipation of heat, with UL Classified splices where tray acts as Equipment Grounding Conductor (EGC). Wire mesh cable tray will have continuous Safe/T/Edge T/welded top side wire to protect cable insulation and installers.
- C. Provide splices, supports, and other fittings necessary for a complete, continuously grounded system.
  - 1. Mesh: 2 x 4 inches (50 x 100 mm).
  - 2. Straight Section Lengths: 118 inches (3,000 mm).
  - 3. Wire Diameter: Patented design includes varying wire sizes to meet application load requirements; to optimize tray strength; and to allow tray to remain lightweight.
  - 4. Safe/T/Edge: Patented Safe/T/Edge technology on side wire to protect cable insulation and installers' hands.
  - 5. Fittings: Wire mesh cable tray fittings are field/fabricated from straight tray sections, in accordance with manufacturer's instructions and Item 2.3.
  - 6. CF Series Cable Tray Size:
  - 7. Depth: Cable tray shall be available in the following depths:
    - a) [1 inch (30 mm)]
    - b) [2 inches (54 mm)]
    - c) [4 inches (105 mm)]
    - d) [6 inches (150 mm)]
  - 8. Width: Cable tray width will be available in the following widths:
    - a) [2 inches (50 mm)]
    - b) [4 inches (100 mm)]
    - c) [6 inches (150 mm)]
    - d) [8 inches (200 mm)]
    - e) [12 inches (300 mm)]
    - f) [18 inches (450 mm)]
    - g) [20 inches (500 mm)]
    - h) [24 inches (600 mm)]
  - 9. Length: Cable tray section length will be 118 inches (3000mm) unless otherwise shown on drawings.
- D. Support cable tray as recommended by manufacture. Provide a safety loading factor of 1.5 for uniformly distributed loads when supported as a simple span in accordance with the NEMA standard listed.
- E. Refer to drawing for additional Cable Tray details and requirements
- F. Design Makes: Legrand Cablofil Wire Mesh



- G. Acceptable Manufacturers:
  - 1. Cooper B/line Flextray
  - 2. Approved equal

## **2.09 CABLE HANGERS (J-HOOK)**

- A. Provide prefabricated, zinc coated, carbon steel hangers designed specifically for UTP and Optical Fiber cable installations.
- B. Hangers shall have open top, rolled edges and a 3" or 4" minimum diameter loop.
- C. Provide beam clamps, rod fasteners, flange clips and brackets as job conditions require.
- D. Design Make CADDY CAT CM

## **2.10 COMMUNICATIONS/POWER POLES**

- A. Provide aluminum multi-service power pole.
- B. Pole shall include 2 electrically isolated channels to act as raceway for communications cabling and future electrical wiring.
- C. Include ceiling trim plate, low voltage entrance fitting, T-bar mounting bracket and carpet / floor grippers.
- D. Design Make: Legrand TPP series or approved equal

## **2.11 Floor Boxes**

- A. ACCEPTABLE MANUFACTURERS
  - 1. FSR
    - a) FL-500P-4
    - b) COVER PART# FL-500P-PLP-GRY-C

## **PART 3 - EXECUTION**

### **3.01 PENETRATIONS**

- A. Cutting or Holes:
  - 1. Locate holes in advance where they are proposed in the structural sections such as ribs or beams. Obtain the approval of the Engineer prior to drilling through structural sections.
  - 2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Engineer as required by limited working space.
- B. Fire Stop: Where conduits, wireways, and other communications raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING, with rock wool fiber or silicone foam sealant only. Completely fill and seal clearances between raceways and openings with the fire stop material.
- C. Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight as specified in Section 07 92 00, JOINT SEALANTS.



### **3.02 INSTALLATION, GENERAL**

#### **A. Install conduit as follows:**

1. In complete runs before pulling in cables or wires.
2. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new undamaged material.
3. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
4. Cut square with a hacksaw, ream, remove burrs, and draw up tight.
5. Mechanically continuous.
6. Independently support conduit at 8'0" on center. Do not use other supports i.e., (suspended ceilings, suspended ceiling supporting members, lighting fixtures, conduits, mechanical piping, or mechanical ducts).
7. Support within 300 mm (1 foot) of changes of direction, and within 300 mm (1 foot) of each enclosure to which connected.
8. Close ends of empty conduit with plugs or caps at the rough-in stage to prevent entry of debris, until wires are pulled in.
9. Conduit installations under fume and vent hoods are prohibited.
10. Secure conduits to cabinets, junction boxes, pull boxes and outlet boxes with bonding type locknuts. For rigid and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
11. Flashing of penetrations of the roof membrane is specified in Section 07 60 00, FLASHING AND SHEET METAL.
12. Do not use aluminum conduits in wet locations.
13. Unless otherwise indicated on the drawings or specified herein, all conduits shall be installed concealed within finished walls, floors and ceilings.

#### **B. Conduit Bends:**

1. Make bends with standard conduit bending machines.
2. Conduit hickey may be used for slight offsets, and for straightening stubbed out conduits.
3. Bending of conduits with a pipe tee or vise is prohibited.

#### **C. Layout and Homeruns:**

1. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted approved by the Engineer.

### **3.03 CONCEALED WORK INSTALLATION**

#### **A. In Concrete:**

1. Conduit: Rigid steel, IMC or EMT. Do not install EMT in concrete slabs that are in contact with soil, gravel or vapor barriers.
2. Align and run conduit in direct lines.
3. Install conduit through concrete beams only when the following occurs:
  - a) Where shown on the structural drawings.



- b) As approved by the Engineer prior to construction, and after submittal of drawing showing location, size, and position of each penetration.
  - 4. Installation of conduit in concrete that is less than 75 mm (3 inches) thick is prohibited.
    - a) Conduit outside diameter larger than 1/3 of the slab thickness is prohibited.
    - b) Space between conduits in slabs: Approximately six conduit diameters apart, except one conduit diameter at conduit crossings.
    - c) Install conduits approximately in the center of the slab so that there will be a minimum of 19 mm (3/4 inch) of concrete around the conduits.
  - 5. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to insure low resistance ground continuity through the conduits. Tightening set screws with pliers is prohibited.
- B. Furred or Suspended Ceilings and in Walls:
- 1. Conduit for conductors 600 volts and below:
    - a) Rigid steel, IMC, or EMT. Different type conduits mixed indiscriminately in the same system is prohibited.
  - 2. Align and run conduit parallel or perpendicular to the building lines.
  - 3. Connect recessed lighting fixtures to conduit runs with maximum 1800 mm (six feet) of flexible metal conduit extending from a junction box to the fixture.
  - 4. Tightening set screws with pliers is prohibited.

### **3.04 EXPOSED WORK INSTALLATION**

- A. Unless otherwise indicated on the drawings, exposed conduit is only permitted in mechanical and electrical rooms.
- B. Conduit for Conductors 600 volts and below:
  - 1. Rigid steel, IMC, or EMT. Different type of conduits mixed indiscriminately in the system is prohibited.
- C. Align and run conduit parallel or perpendicular to the building lines.
- D. Install horizontal runs close to the ceiling or beams and secure with conduit straps.
- E. Support horizontal or vertical runs at not over 2400 mm (eight foot) intervals.
- F. Surface metal raceways: Use only where shown.
- G. Painting:
  - 1. Paint exposed conduit.

### **3.05 EXPANSION JOINTS**

- A. Conduits 75 mm (3 inches) and larger, that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
- B. Provide conduits smaller than 75 mm (3 inches) with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 125 mm (5 inch) vertical drop midway between the ends. Flexible conduit shall have a copper





green ground bonding jumper installed. In lieu of this flexible conduit, expansion and deflection couplings as specified above for 375 mm (15 inches) and larger conduits are acceptable.

- C. Install expansion and deflection couplings where shown.
- D. Seismic Areas: In seismic areas, provide conduits rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes on both sides of the joint. Connect conduits to junction boxes with 375 mm (15 inches) of slack flexible conduit. Flexible conduit shall have a copper green ground bonding jumper installed.

### **3.06 CONDUIT SUPPORTS, INSTALLATION**

- A. Safe working load shall not exceed 1/4 of proof test load of fastening devices.
- B. Use pipe straps or individual conduit hangers for supporting individual conduits. Maximum distance between supports is 2.5 m (8 foot) on center.
- C. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and 90 kg (200 pounds). Attach each conduit with U-bolts or other approved fasteners.
- D. Support conduit independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.
- E. Fasteners and Supports in Solid Masonry and Concrete:
  - 1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
  - 2. Existing Construction:
    - a) Steel expansion anchors not less than 6 mm (1/4 inch) bolt size and not less than 28 mm (1-1/8 inch) embedment.
    - b) Power set fasteners not less than 6 mm (1/4 inch) diameter with depth of penetration not less than 75 mm (3 inches).
    - c) Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.
- F. Hollow Masonry: Toggle bolts are permitted.
- G. Bolts supported only by plaster or gypsum wallboard are not acceptable.
- H. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.
- I. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
- J. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- K. Spring steel type supports or fasteners are prohibited for all uses except: Horizontal and vertical supports/fasteners within walls.
- L. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

### **3.07 BOX INSTALLATION**

- A. Boxes for Concealed Conduits:
  - 1. Flush mounted.



2. Provide raised covers for boxes to suit the wall or ceiling, construction and finish.
- B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling in operations.
- C. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.
- D. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example, "SIG-FA JB No. 1".

### **3.08 COMMUNICATION SYSTEM CONDUIT**

- A. Install the communication raceway system as shown on drawings.
- B. Minimum conduit size of 19 mm (3/4 inch), but not less than the size shown on the drawings.
- C. All conduit ends shall be equipped with insulated bushings.
- D. All 100 mm (four inch) conduits within buildings shall include pull boxes after every two 90-degree bends. Size boxes per the NEC.
- E. Vertical conduits/sleeves through closets floors shall terminate not less than 75 mm (3 inches) below the floor and not less than 75 mm (3 inches) below the ceiling of the floor below.
- F. Terminate conduit runs to/from a backboard in a closet or interstitial space at the top or bottom of the backboard. Conduits shall enter communication closets next to the wall and be flush with the backboard.
- G. Where drilling is necessary for vertical conduits, locate holes so as not to affect structural sections such as ribs or beams.
- H. All empty conduits located in communication closets or on backboards shall be sealed with a standard non-hardening duct seal compound to prevent the entrance of moisture and gases and to meet fire resistance requirements.
- I. Conduit runs shall contain no more than four quarter turns (90-degree bends) between pull boxes/backboards. Minimum radius of communication conduit bends shall be as follows (special long radius):



Sizes of Conduit Trade Size	Radius of Conduit Bends mm, Inches
3/4	150 (6)
1	230 (9)
1-1/4	350 (14)
1-1/2	430 (17)
2	525 (21)
2-1/2	635 (25)
3	775 (31)
3-1/2	900 (36)
4	1125 (45)

- J. Furnish and install 19 mm (3/4 inch) thick fire-retardant plywood specified in Section 06 10 00, ROUGH CARPENTRY on the wall of communication closets where shown on drawings. Mount the plywood with the bottom edge 300 mm (one foot) above the finished floor.
- K. Furnish and pull wire in all empty conduits. (Sleeves through floor are exceptions).
- L. Furnish SMART LB Fittings shall be utilized on all communication conduits. Refer to [www.smartlb.com](http://www.smartlb.com) for additional information. Smart LB Die cast Aluminum LB fitting shall be used with Liquidtight, "EMT", "IMC" or "Rigid" Metallic conduit and fittings. Smart LB PVC LB fitting shall be used with Sch 40 rigid PVC, "Sch 80 rigid PVC", "ENT", "PVC Flex Duct", "PVC General Purpose Duct", "PVC Riser Duct", Type NM Liquidtight conduit and "rigid nonmetallic Power and Communication Ducts"
- M. Textile Innerduct (MaxCell):
  - 1. Aboveground, Exterior and Interior Conduit Installations: Outdoor textile innerduct (Standard or Detectable as desired).
  - 2. Interior Exposed Locations
    - a) Non-plenum Areas: Indoor textile innerduct
    - b) Plenum Areas: Plenum-listed indoor innerduct
  - 3. When installed in 4" conduit, use two 3" 3-Cell packs with an additional pull tape on the outside for future pulls in each conduit.
  - 4. Cable Tray: use standard outdoor or indoor textile innerduct

**END OF SECTION**



## **SECTION 27 10 00**

### **STRUCTURED CABLING GENERAL REQUIREMENTS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total general requirements for the project communications systems and equipment:
  - 1. Contract Documents
  - 2. Division 00 –Procurement & Contracting Requirements Group
  - 3. Division 1 – General Requirements
  - 4. Section 27 11 00 – Equipment Room Fittings
  - 5. Section 27 13 00 – Backbone Cabling
  - 6. Section 27 15 01 – Horizontal Cabling CAT 6A

##### **1.02 REFERENCES**

- A. All work shall be performed in accordance with the following Codes and industry Standards, unless noted otherwise:
  - 1. NFPA 70 – National Electrical Code, current version adopted by local or State AHJ.
  - 2. TIA/EIA 568-B – Commercial Building Telecommunications Cabling Standard, current version.
  - 3. TIA/EIA 569-B – Commercial Building Standard for Telecommunications Pathways and Spaces, current version.
  - 4. TIA/EIA 606-A – Administration Standard for Commercial Telecommunications Infrastructure, current version.
  - 5. J-STD-607-A – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, current version.
  - 6. IEEE 241 – IEEE Recommended Practice for Electric Power Systems in Commercial Buildings, pertaining to communication systems.
  - 7. TIA/EIA 758-A – Customer-Owned Outside Plant Telecommunications Cabling Standard

##### **1.03 WARRANTY**

- A. The telecommunications contractor must be an approved installer of the specified manufacturer's copper & fiber cable. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with the specified manufacturer's copper & fiber cable extended warranty programs.

##### **1.04 SUMMARY**

- A. This Section includes general requirements specifically applicable to Division 27.
- B. The Contractor shall be responsible for:



1. Providing all additional materials, and the necessary labor and services required to ensure all components of the system are completely installed in accordance with the intent of the Contract Documents.
  2. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.
  3. Coordinating the details of facility equipment and construction for all specification divisions that affect the work covered under this Division.
  4. Coordinating all activities with the overall construction schedule.
  5. Developing bill of materials, perform material management and efficient use of the materials whether they are issued by the Contractor, the owner or purchased by the Contractor.
  6. Ensure materials in excess of those required to complete the project are kept in their original condition and packaging for restocking.
  7. Ensure project is properly registered for the specified manufacturer's copper & fiber cable extended warranty programs.
- C. Intent of Drawings:
1. Communications plan drawings show only general locations of equipment, devices, raceways, cable trays, boxes, etc. All dimensioned locations and elevations are approximate. The Contractor is responsible for the field coordination of communications work with the other trades prior to beginning work.
  2. The Contractor shall be responsible for the proper placement and routing of equipment, cable, raceways, cable tray, and related components according to the Contract Documents and subject to prior review by Designer.
  3. Refer all conflicts between Contract Documents to contractor for resolution.

## 1.05 DEFINITIONS

- A. Active Equipment: Electronic equipment used to develop various WAN and LAN services.
- B. Backbone: Collective term sometimes used to describe the campus and vertical distribution subsystem facilities and media interconnecting service entrances, communications rooms, and communications cabinets.
- C. Bonding: Permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.
- D. Building Equipment Room (BER): Room in each building used to distribute communications services to Telecommunications Rooms (TR) in the same building. Typically, the BER contains passive equipment used for electrical protection (protectors) and building cross-connect, and active network equipment used for LANs. The BER may also serve the function of a TR.
- E. Cabinet: Freestanding, floor-mounted modular enclosure designed to house and protects rack-mounted electronic equipment.
- F. Cable Tray: Vertical or horizontal open supports usually made of aluminum or steel that is fastened to a building ceiling or wall. Cables are laid in and fastened to the trays. A cable tray is not a raceway.
- G. Campus: Grounds and buildings of a multi-building premises environment.



- H. Channel: The end-to-end transmission path between two points at which application specific equipment is connected; may include one or more links, cross-connect jumper and/or patch cords, and work area station cords. Does not include connection to active equipment.
- I. Communications Equipment Room –See Telecommunications Room (TR)
- J. Cross-Connect: Equipment used to terminate and tie together communications circuits.
- K. Cross-Connect Jumper: A cluster of twisted-pair conductors without connectors used to establish a circuit by linking two cross-connect termination points.
- L. Fiber Optic Distribution Unit (FDU): Cabinet with terminating equipment used to develop fiber optic cross-connect facilities.
- M. Grounding: A conducting connection to earth, or to some conducting body that serves in place of earth.
- N. Hinged Cover Enclosure: Wall-mounted box with a hinged cover that is used to house and protect electrical devices.
- O. Horizontal: Pathway facilities and media connecting Telecommunications Rooms (TR) to Telecommunications Outlets (TO).
- P. Innerduct: Flexible sheath used to enclose cables and protect them from damage. It is commonly used when running fiber optic cable through underground conduits originally designed for large-diameter telephone cables. Max-Cell Innerduct is a fabric based innerduct that enables a higher density of communication cables to be pulled.
- Q. Jack: Receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight-position/eight-contact modular jacks.
- R. Link: A transmission path between two points, not including terminal equipment, work area cables, and equipment cables; one continuous section of conductors or fiber, including the connecting hardware at each end.
- S. Local Area Network (LAN): Data transmission facility connecting a number of communicating devices, e.g., serial data, Ethernet, token ring, etc. Typically, the network is limited to a single site.
- T. Main Equipment Room (MER): The room used to distribute communication services to all Building Equipment Rooms (BER's) on the premises, and to interconnect premises services with the telephone companies. Typically, the MER contains passive equipment used for electrical protection (protectors) and main campus cross-connect, and active equipment used for PBX, WAN, and LAN.
- U. Media: Twisted-pair, coaxial, and fiber optic cable or cables used to provide signal transmission paths.
- V. Mounting Frame: Rectangular steel framework which can be equipment rack or wall mounted to support wiring blocks, patch panels, and other communications equipment.
- W. Passive Equipment: Non-electronic hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, wiring blocks, fiber optic termination hardware, etc.
- X. Patch Cords: A length of wire or fiber cable with connectors on one or both ends used to join communications circuits at a cross-connect.
- Y. Patch Panel: System of terminal blocks or connectors used with patch cords that facilitate administration of cross-connect fields.
- Z. Pathway: Facility for the placement of communications cable. A pathway facility can be composed of several components including conduit, wireway, cable tray, surface raceway, underfloor systems, raised floor, ceiling support wires, etc.



- AA. Private Branch Exchange (PBX): Private communications switching system located on the user's premises. A PBX switches voice and data calls within a building or premises and between the premises and facilities provided by public common carrier networks.
- BB. Protectors: Electrical protection devices used to limit foreign voltages on metallic communications circuits.
- CC. Raceway: An enclosed channel designed expressly for holding wires or cables; may be of metal or insulating material. The term includes conduit, tubing, wireway, underfloor raceway, and surface raceway; does not include cable tray.
- DD. Racks: An open, freestanding, floor-mounted structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment rack.
- EE. Telecommunication Outlet (TO): Connecting device mounted in a work area used to terminate horizontal cable and interconnect cabling with station equipment.
- FF. Telecommunications Room (TR): Distributes communications services to users within a serving zone and interconnects with the BER. Typically, the TER contains passive equipment used for cross-connect and active network equipment used for LANs. TR is sometimes referred to as the communications equipment room.
- GG. Wide Area Network (WAN): Active communications transmission facilities extending beyond the premises.
- HH. Wiring Block: Punch down terminating equipment used to develop twisted-pair cross-connect facilities.

#### **1.06 SYSTEM DESCRIPTION**

- A. The Owner will implement a comprehensive integrated communications distribution system, as described in paragraph B below, to provide wiring infrastructure which may be used to support one or more of the following services and systems:
  - 1. Voice & Data Telecommunications.
  - 2. Mass Notification Systems.
- B. The communications distribution system consists of the following major subsystems, as specified elsewhere:
  - 1. Inter-building Backbone: The inter-building subsystem refers to all twisted pair and fiber optic backbone communications cabling connecting the Main Building Equipment Room (BER) to each building equipment room (BER) in all buildings on the campus / region. This project includes modification to the fiber backbone as shown on the drawings and further detailed in the Specifications.
  - 2. Intra-building Backbone: The intra-building subsystem refers to all twisted-pair and fiber optic backbone communications cabling connecting the Main Telecommunications Room (TR) to each Telecommunication Room (TR) in the buildings.
  - 3. Communication Rooms: The communications room contains the distribution subsystem comprised of the passive components used to terminate cabling subsystems and distribute communications services. This subsystem includes installations in the Building Equipment Rooms (BERs), in Telecommunications Rooms (TRs) and Telecommunications Enclosures (TEs). Complete work as shown in the drawings and as specified in Section 271100.
  - 4. Horizontal Distribution: Horizontal distribution building cable to telecommunication outlets (TOs). Section 271500 is included for termination & testing required for the installation of



Cat 6 patch panels in the Telecommunications Rooms (TRs) as described by the drawings and also in the case any additional wiring is identified as necessary as a result of field conditions and approved by the Designer

5. Work Area Distribution Subsystem: Patch cords, adapters, and devices located between the TO and station equipment. Complete work as shown in the drawings and as specified in Section 271600.
- C. The communications distribution system is based on a combination of, but not limited to, the following communications transmission technologies:
  1. 100-ohm 4-pair unshielded twisted-pair cable. (Cat 6)
  2. 100-ohm multi-pair unshielded twisted-pair cable. (Cat 3)
  3. 8.3/125-micron single-mode fiber optic cable.
  4. 8-position telecommunications jacks.
  5. 8-position telecommunications patch panels
  6. Insulation displacement connector (IDC) type field terminated wiring blocks
  7. Outside plant copper splice enclosures
  8. Building entrance protection
  9. Factory Terminated copper patch cords
  10. Rack mount fiber optic hardware
  11. Wall mounted fiber optic hardware
  12. Fiber optic connectors & hardware
  13. Factory terminated fiber optic patch cords
  14. Outside plant fiber splice enclosures
- D. The work locations and limits of work are shown on the drawings.

#### **1.07 DESIGN CRITERIA**

- A. Compliance by the Contractor with the provisions of this specification does not relieve him of the responsibilities of furnishing materials and equipment of proper design, mechanically and electrically suited to meet operating guarantees at the specified service conditions.
- B. The following are incorporated into the design:
  1. The communications room installations are designed to be as similar as possible.
  2. Electrical protection is provided for all exposed inter-building twisted-pair cabling.
  3. The location of communication rooms is intended to restrict the maximum horizontal sub-system wiring length (defined as a channel between a telecommunications room cross-connect termination field and a served TO) to 295 feet (90 meters).

#### **1.08 WARRANTY**

- A. The Contractor shall provide a manufacturer's warranty on the horizontal and backbone systems as specified in Section 27 13 00 and 27 15 00.
- B. In addition to the standard warranty requirements, the Contractor shall provide the following during the warranty period:
  1. Within 24 hours after notification of a defect, the Contractor shall start to make the necessary corrections and inform the appropriate Project Manager of the planned corrective





actions. The Contractor shall follow this initial contact with continuous effort and complete any required corrective work within 15 days after notification.

#### **1.09 QUALIFICATIONS**

- A. Communications Pathway Installation: The Contractor shall have 5 years of documented experience installing raceway and cable tray systems for each of the types and system material components specified in the Contract Documents, e.g., cable tray. In the case of newer technologies that do not have a 3-year history, the contractor shall have documented experience for at least half of the lifetime of the new technology.
- B. The Contractor selected for this project must be certified by the manufacturer of the products installed, adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this project.
- C. The telecommunications contractor must be an approved installer of the specified manufacturer's copper & fiber cable. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with the specified manufacturer's copper & fiber cable extended warranty programs.
- D. Company certificate & letter from manufacturer stating Contractor's certification is in good standing, shall be included with submittal.
- E. Certified Installer must register project with the specified cable manufacturers, as applicable, and must provide a warranty on the installation workmanship & testing for a length of no less than twenty (20) years.
- F. The Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of optical, Category 5e, Category 6 and Category 6a premise distribution systems and have personnel who are adequately trained in the use of such tools and equipment.
- G. A resume of qualification shall be submitted with the Contractor's proposal indicating the following:
  - 1. A list of recently completed projects of similar type and size with contact names and telephone numbers for each.
  - 2. A list of test equipment proposed for use in verifying the installed integrity of metallic and fiber optic cable systems on this project.
  - 3. A technical resume of experience for the contractor's Project Manager and on-site installation supervisor who will be assigned to this project.
  - 4. A list of technical product training attended by the contractor's personnel that will install the structured cabling system shall be submitted with the response.
  - 5. Any sub-contractors, who will assist the Contractor in performance of this work, shall have the same training and certification as the Contractor.

#### **1.10 SUBMITTALS**

- A. General:
  - 1. Provide ongoing inspection and permit certificates and certificates of final inspection and acceptance from the authority having jurisdiction.
  - 2. Manufacturer's standardized schematic diagrams and catalog cuts shall not be acceptable unless applicable portions of same are clearly indicated and non-applicable portions clearly deleted or crossed out.



3. When the specifications include product descriptions, model numbers, part numbers, etc. that have been superseded, changed, or discontinued, the contractor shall submit a comparable substitution for review by the A/E.
4. The specified manufacturer's copper & fiber cable extended warranty program certificates stating that the communications installer is in good standing in applicable program.
- B. Provide all applicable portions of the following information with the Bid:
  1. Documentation establishing qualifications to perform installation functions as required in 1.9 above:
  2. Statement demonstrating an understanding of project scope and schedule which includes the following information:
    - a) Where (city, office) the project will be staffed.
    - b) Project organizational chart with team names; e.g., project manager, A/Es, principal skilled technicians, and contractors.
- C. Provide all applicable portions of the following information within 10 days after award:
  1. Project schedule in hard copy. Include, at a minimum, major tasks, milestones, dependencies, staffing, and durations for each task.
  2. Contractor shall then work with contractor to merge this schedule into the overall construction schedule.
  3. Provide the following information for materials, components, and equipment to be furnished by the contractor:
    - a) Descriptive literature, manufacturer's specification data sheets, and manuals.
    - b) Individual price and delivery schedules.
    - c) Manufacturer's product test data with indicator arrows. The submittal shall be in the same order as products in 27 11 00, 27 13 00 and 271600.
    - d) Final Performance testing criteria and data for communications distribution system cabling systems.

#### **1.11 DEFINITION OF ACCEPTANCE**

- A. System acceptance shall be defined as that point in time when the following requirements have been fulfilled:
  1. All submittals and documentation have been submitted, reviewed, and approved.
  2. The complete system has successfully completed all testing requirements.
  3. All Owner staff personnel training programs have been completed.
  4. All punch list items have been corrected and accepted.
  5. Project registration for warranty by manufacturer.

#### **1.12 PROJECT RECORD DOCUMENTS**

- A. Provide detailed project record documentation within 30 days after completion of the work.
  1. Maintain separate sets of red-lined record drawings for the communications work which show the exact placement and identification of as-built system components.



2. Provide communication pathway record drawings which indicate exact placement and routing for all components, e.g., maintenance holes, handholes, conduit, wireway, cable tray, pull boxes, enclosures, telecommunications outlet boxes, etc.
3. Provide communication room record drawings which indicate exact placement for all components; e.g., conduit, wireway, cable tray, backboards, equipment cabinets, equipment racks, cross-connect equipment, etc.
4. Provide communication wiring and cabling record "As-Builds" drawings and schedules which indicate exact placement, cable foot marking, routing, and connection details for all components, e.g., twisted-pair and fiber optic cables, splices, cable cross-connect termination locations, enclosures, telecommunications outlets, cross-connect jumpers, patch cords, etc.
5. Provide network schematics when appropriate.

## **PART 2 PRODUCTS**

### **2.01 APPROVALS AND SUBSTITUTIONS**

- A. Equivalent product(s) may be considered for substitution for those products specified, however, the equivalent product(s) must be approved and show demonstrated and documented equivalence to the product(s) specified. Documentation shall include, but is not limited to: product samples, data sheets, and actual test data. The request for product substitution, and supporting documentation, must be submitted, in writing, prior to submitting the bid. Written approval for product substitution must be submitted with the bid.

## **PART 3 EXECUTION**

### **3.01 WORKMANSHIP**

- A. Manufactured products, materials, equipment, and components shall be provided, conditioned, applied, installed, connected, and tested in accordance with the manufacturer's specifications and printed instructions
- B. The installation of all system components shall be carried out under the direction of qualified personnel. Appearance shall be considered as important as mechanical and electrical efficiency. Workmanship shall meet or exceed industry standards.

### **3.02 SERVICE CONTINUITY**

- A. Maintain continuity of communications services to all functioning portions of the process or buildings during hours of normal use.
- B. Arrange temporary outages for cutover work with electrical contractor or general contractor. Keep outages to a minimum number and a minimum length of time in order to provide minimum impact.

### **3.03 LAYOUT AND TOLERANCES**

- A. Follow as closely as practicable the design shown on the drawings. Make all necessary measurements in the field to verify exact locations and ensure precise location and fit of specified items in accordance with the drawings. Make no substantial alterations without prior approval of the Designer and the A/E.
- B. Perform all work to the lines, grades, and elevations indicated on the drawings. Provide experienced, competent personnel to locate and lay out the work and provide them with suitable tools, equipment, and other materials required to complete layout and measurement work. Use lasers or other approved methods to establish line and grade.



### **3.04 CONSTRUCTION REVIEW**

- A. The A/E and the Designer will review and observe installation work to ensure compliance by the Contractor with requirements of the Contract Documents.
- B. The Contractor shall inspect and test completed communications installations to demonstrate specified performance levels including the following:
  - 1. Furnish all instruments and personnel required for the inspections and tests.
  - 2. Perform tests in the presence of the A/E and Designer.
  - 3. Demonstrate that the system components operate in accordance with the Contract Documents.
- C. Review, observation, assistance, and actions by the Architect/Engineer (A/E) or General Contractor (GC) shall not be construed as undertaking supervisory control of the work or of methods and means employed by the Contractor. The A/E's and General Contractor's review and observation activities shall not relieve the contractor from the responsibilities of these Contract Documents.
- D. The fact that the A/E, GC or the owner does not make early discovery of faulty or omitted work shall not bar the A/E, GC or the owner from subsequently rejecting this work and insisting that the contractor make the necessary corrections.
- E. Regardless of when discovery and rejection are made, and regardless of when the Contractor is ordered to correct such work, the Contractor shall have no claim against the A/E, GC or the Owner for an increase in the Subcontract price, or for any payment on account of increased cost, damage, or loss.

**END OF SECTION**



## **SECTION 27 11 00**

### **EQUIPMENT ROOM FITTINGS**

#### **PART 1 GENERAL**

##### **1.01 SUMMARY**

- A. The communications equipment room will be referred as Telecommunications Room (TR) in this document is intended to house racks, cabinets and equipment necessary for the support of the communications cabling infrastructure.

##### **1.02 RELATED DOCUMENTS**

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total general requirements for the project communications systems and equipment:
  - 1. Contract Documents
  - 2. Division 00 – Procurement & contracting Requirements Group
  - 3. Division 1 – General Requirements
  - 4. Section 27 10 00 – Structured Cabling General Requirements
  - 5. Section 27 13 00 – Backbone Cabling
  - 6. Section 27 15 01 – Horizontal Cabling CAT 6A

##### **1.03 REFERENCES**

- A. All work shall be performed in accordance with the following codes and industry standards, unless noted otherwise:
- B. NFPA 70 – National Electrical Code, current version adopted by local or State AHJ.
- C. TIA/EIA-568-B – Commercial Building Telecommunications Cabling Standard, current version.
- D. TIA/EIA-569-B – Commercial Building Standard for Telecommunications Pathways and Spaces, current version.
- E. TIA/EIA-606-A – Administration Standard for Commercial Telecommunications Infrastructure, current version.
- F. J-STD-607-A – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, current version.
- G. IEEE 241 – IEEE Recommended Practice for Electric Power Systems in Commercial Buildings, pertaining to communication systems.
- H. TIA-310- D Cabinets, Rack, and Associated Equipment

##### **1.04 WARRANTY**

- A. The telecommunications contractor must be an approved installer of the specified manufacturer's copper & fiber cable. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with the specified manufacturer's copper & fiber cable extended warranty programs.



## **PART 2 PRODUCTS**

### **2.01 APPROVALS AND SUBSTITUTIONS**

- A. All products shall be provided as specified, without exception, unless approved in writing prior to the bid. All products shall be "NEW".
- B. Non-compliant products installed as a part of this Contract shall be removed and replaced and all costs for removal and replacement shall be borne solely by the Contractor.

### **2.02 TELECOMMUNICATIONS BACKBOARDS**

- A. AC-rated plywood, fire-retardant treated, 3/4 inches by 48 inches by 96 inches (19 by 1220 by 2440 mm).

### **2.03 EQUIPMENT ENCLOSURES**

- A. TAA and EIA compliant 19" gangable equipment enclosure 42 rack units and 43.3 Inches Deep.
  - 1. Fully welded construction for strength
  - 2. 24-1/4" overall width provides space for side cabling or cooling airflow
  - 3. Convenient lacing points and slotted rail brackets for cable management
  - 4. Standard front and rear adjustable 10-32 threaded rackrail with numbered spaces
  - 5. Extra-wide rackrail features cable pass-throughs to facilitate front-to-rear cabling
  - 6. Includes full profile mesh front door and rear doors.
  - 7. Include solid top panel with side cable entry grommets.
  - 8. Include solid side panels
  - 9. Vertiv VR3100TAA
  - 10. Will bolt to Liebert Model # CR-020-RW In-row Cooler being provided by others.
  - 11. Provide bolting hardware to connect racks to in-row coolers.
  - 12. Refer to Drawings.

### **2.04 AIR MANAGEENT KITS**

- A. Vertiv VRA2002 – 19 inch Metal Air Flow Blanking Kit
  - 1. 1u to 8U
  - 2. Black
  - 3. Refer to Drawings for quantities.

### **2.05 RACK EXTENDABLE SHELVES**

- A. Vertiv VRA3000
  - 1. 1 Rack Unit, 250LB capacity, Black

### **2.06 HORIZONTAL WIRE MANAGERS**

- A. 19 inches wide, two rack units high with cover, for copper management
  - 1. Vertiv VRA1001
  - 2. Provide as shown on Drawings.



- B. 19 inches wide, one rack unit high with cover, for fiber management
  - 1. Corning CJP-01U
  - 2. Provide as shown on Drawings.

## **2.07 POWER DISTRIBUTION UNITS (PDU)**

- A. Vertiv #VP8930
- B. Provide (1) Vertical PDU's in each for the following Racks:  
Rack A2, Rack A3, Rack A4, Rack B1, Rack B2, Rack B3, Rack B4.

## **2.08 UPS**

- A. Liebert GXT5-5000MVRT4UXLN with PD5-004 Input Output module.
- B. PD5-004 module has L14-30P input, with (4) L5-20R and (2) L5-30R Output receptacles.
- C. Provide (1) External Battery Cabinet (GXT5-EBC144VRT2U) with associated cable #4114284.
- D. Network Communications Card, Part No. RDU101.
- E. Provide all mounting rails as required.

## **2.09 CABLE RUNWAY**

- A. 17.71 inches wide, 10-foot lengths, steel construction, Telco Style.
- B. Cablofil CF-54/450-EZ
- C. Refer to Drawing for required accessories.
- D. Refer to Ortronics-Cablofil catalog for additional part numbers and accessories required proper installation of specified cable runway.

# **PART 3 EXECUTION**

## **3.01 INSTALLATION PRACTICES**

- A. All materials shall be installed as per the manufacturers' instructions, unless noted otherwise.
- B. Furnish and install telecommunication backboards on wall of communication equipment rooms as indicated. The bottom of the backboards shall be placed approximately six inches above finished floor (AFF), and must extend to a minimum height AFF of eight feet. Mount backboards with the smooth side facing away from the wall, and paint the backboard with two coats of fire-resistant white paint prior to mounting. A minimum of six appropriate fasteners shall be used for every sixteen square feet of backboard.
- C. Free-standing equipment racks shall be fastened to the communications room floor using a minimum of four 3/8-inch concrete anchors.
- D. Equipment racks shall be positioned according to drawings with a minimum of 3 feet clearance in front and back. The contractor shall field verify the dimensions of the room prior to installation of racks and report any discrepancies to the owner or owner's representative.
- E. Vertical wire managers for free-standing racks shall be bolted to the side or front of the rack using the manufacturers recommended hardware.



- F. All equipment racks, cabinets, enclosures, cable tray, conduits, and patch panels shall be bonded to the Telecommunications Grounding Busbar (TMG) (one per Telecommunications Room), which shall be bonded to the Telecommunications Main Grounding Busbar (TMGB), which shall be grounded to the main electrical ground in the main electrical room. Coordinate with electrical contractor. Coordinate exact routing and connection points with the electrical work. All surfaces that are used as a bond shall be filed to bare metal before completing connections.
- G. Install cable tray as shown in drawing package. The locations shown may need to be adjusted slightly in the field to assure proper placement.
- H. All tray sections shall be field cut to length as required with a minimum number of splice points. All field cuts shall be made using the manufacturers recommended equipment.

### **3.02 LABELING**

- A. Label all racks within the ErieNet POP as indicated on the drawings. Provide Engraved Plastic Labels, 3/16 thick with adhesive backing. Black face with white engraved lettering. (Coordinate with Owner). Provide Submittal on this product.
- B. Label the telecommunications grounding busbar and bonding conductor within the BEF, TR, and TE with a unique identifier, beginning with the number one, i.e. TGB-TR-1. (Coordinate with Designer).
- C. Label all patch panels and wiring blocks within the BEF, TR, and TE with a number and a unique identifier, beginning with the AA, i.e. TR1-AA. (Coordinate with Designer)

**END OF SECTION**





## **SECTION 27 13 00**

### **BACKBONE CABLING**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total general requirements for the project communications systems and equipment:
  - 1. Contract Documents
  - 2. Division 00 – Procurement & Contracting Requirements Groups
  - 3. Division 01 – General Requirements
  - 4. Section 27 05 43 – Exterior Pathways
  - 5. Section 27 10 00 – Structured Cabling General Requirements
  - 6. Section 27 11 00 – Equipment Room Fittings

##### **1.02 REFERENCES**

- A. All work shall be performed in accordance with the following Codes and industry Standards, unless noted otherwise:
  - 1. NFPA 70 – National Electrical Code, current version adopted by local or State AHJ.
  - 2. TIA/EIA-568-B – Commercial Building Telecommunications Cabling Standard, current version.
  - 3. TIA/EIA-569-B – Commercial Building Standard for Telecommunications Pathways and Spaces,
  - 4. TIA/EIA-606-A – Administration Standard for Commercial Telecommunications Infrastructure.
  - 5. J-STD-607-A – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, current version.
  - 6. IEEE 241 - IEEE Recommended Practice for Electric Power Systems in Commercial Buildings” pertaining to communication systems.
  - 7. TIA/EIA 758-A – Customer-Owned Outside Plant Telecommunications Cabling Standard
- B. This Section specifies the requirements necessary to furnish and install an inter-building and intra-building twisted-pair and fiber optic cable distribution subsystem including:
  - 1. Cabling, splice closures, and related components.
  - 2. Placement, splicing, termination, and other required services.

##### **1.03 SYSTEM DESCRIPTION**

- A. Inter-building Backbone: The inter-building subsystem refers to all twisted-pair and fiber optic backbone communications cabling connecting the Main Building Equipment Room (BER) to each building equipment room (BER) in all buildings on the campus.



- B. Intra-building Backbone: The intra-building subsystem refers to all twisted-pair and fiber optic backbone communications cabling connecting the Main Distribution Frame (MDF) to each secondary Telecommunication Room or Intermediate Distribution Frame (IDF) in the building.
- C. Backbone cabling consists of copper and optical fiber cables and associated connecting hardware.
- D. Contractor shall furnish and install all materials necessary for a complete and working system.
- E. Field terminated optical fiber jumpers shall not be allowed.

#### **1.04 WARRANTY**

- A. The telecommunications contractor must be an approved installer of the specified manufacturer's copper & fiber cable. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with the specified manufacturer's copper & fiber cable extended warranty programs.
- B. Telecommunications Contractor shall administer the warranty process with the responsible manufacturer's representative.
- C. All necessary documentation that must be provided to the manufacturer will be furnished by the Telecommunications Contractor immediately following 100% testing of all cables. All test results must be submitted to the specified cable manufacturer in the certification tester's original software on CD, if required by warranty
- D. Telecommunications contractor shall insure that the issuing manufacturer provides the Owner with the appropriate warranty certification within 30 calendar days of the final project completion.
- E. Provide a One Year Warranty on all Optical Fiber Backbone and associated termination components.

### **PART 2 PRODUCTS**

#### **2.01 APPROVALS AND SUBSTITUTIONS**

- A. All products shall be provided as specified, without exception, unless approved in writing prior to the bid. All products shall be "NEW".
- B. Non-compliant products installed as a part of this Contract shall be removed and replaced and all costs for removal and replacement shall be borne solely by the Contractor(s).

#### **2.02 INTER-BUILDING FIBER OPTIC CABLE**

- A. Outside Plant Tight Buffer, ISP/OSP Riser Cable
  - 1. Corning Freedom One Tight Buffered Cables
  - 2. Interior / Exterior Use with Water Blocking technology
  - 3. 12 Strand SMF (OS2): Corning Part # 012E8P – 31131-29
  - 4. Riser Rated
  - 5. Install in Inner Duct inside of facilities.

#### **2.03 INTRA-BUILDING FIBER OPTIC CABLE**

- A. MIC, Tight Buffered indoor single mode fiber optic cable



1. Corning MIC, Plenum rated, Indoor, Interlocking Armored Cable, 24 Fiber, SMF -28 Ultra Fiber. Loose Tube, All-dielectric cable, Single Mode (OS2).
- B. Corning Catalog No. 024E88-33131-D3

## **2.04 INTER-BUILDING MULTIPAIR COPPER CABLE**

- A. Outside plant multipair PE-89 copper cable
  1. Superior Essex SEALPIC-FSF twisted-pair cable with 22-AWG solid conductor, covered by a medium-density polyethylene jacket outer jacket. For additional part numbers see <http://www.superioressex.com>.
    - a) SEALPIC-FSF 09-062-02, 25-pair
    - b) SEALPIC-FSF 09-065-02, 50-pair
    - c) SEALPIC-FSF 09-073-02, 200-pair

## **2.05 INTRA-BUILDING MULTIPAIR COPPER CABLE**

- A. General purpose 25 pair category 3 unshielded twisted pair
  1. Superior Essex Category 3 Power Sum Twisted-pair cable with 24-AWG solid conductor, 100-ohm unshielded twisted-pair core covered by a PVC outer jacket. CMP Rated.
    - a) Power Sum, Gray jacket part number 18-475-36. For additional jacket colors and part numbers see [www.berktek.com](http://www.berktek.com).

## **2.06 BUILDING ENTRANCE PROTECTION**

- A. Building Entrance Protector Housing, 110-style block Output, 24AWG cable stub (25FT) Input
  1. Emerson BEP T 25 SC 25, 25-pair
  2. Emerson BEP T 100 SC 25, 100-pair
- B. Build Entrance Protector 240V Solid State Modules w/4ohm heat coil
  1. Emerson R4C1FS

## **2.07 TERMINATION BLOCKS**

- A. Cat 3, 110-Style Blocks- for Intra-building multipair cable termination
  1. 300-pair 110 Field Termination Kit with back panel, wall -mount.
    - a) Ortronics P/N OR-30203461
  2. 25-pair 110 Field Termination Kit with back panel, wall -mount.
    - a) Ortronics P/N OR-8050F66M150

## **2.08 OSP COPPER SPLICE ENCLOSURE**

- A. Underground splice enclosure, re-enterable, Tyco P/N XAGA 1000 and applicable accessories. Refer to <http://us.telecomosp.com/>

## **2.09 OSP FIBER SPLICE ENCLOSURE**



- A. Underground splice enclosure, re-enterable, Tyco FOSC 400 and applicable accessories. Refer to <http://us.telecomosp.com/>

## 2.10 FIBER OPTIC TERMINATION HARDWARE

- A. Rack Mount Fiber Optic Termination Hardware
1. Fiber optic termination hardware is rack mountable, lockable, and holds various panels based on connector choice and density requirements of the owner.
    - a) 2U Combination patch/splice, holds 6 splice trays, holds 4 adapter panels, Corning Connector Housing, Corning P/N CCH-02U, Confirm width of Owner's rack prior to ordering.
      - 1) Accessories
        - i. Connector Panels shall be Corning CCH-CP12-6C (SC Simplex APC) – P03-RH
        - ii. Splice cassette shall be Corning CCH-CP12-6C P00-RE
      - b) 4U Combination patch/splice, holds 12 splice trays, holds 12 adapter panels, Corning Connector Housing, Corning P/N CCH-04U, **Option for 23 Inch wide Cabinets**
        - 1) Accessories
          - iii. Connector Panels shall be Corning CCH-CP12-6C (SC Simplex APC) – P03-RH
          - iv. Splice cassette shall be Corning CCH-CP12-6C P00-RE
- B. Wall Mount Fiber Optic Termination Hardware
1. Fiber optic termination hardware is wall mountable, lockable, and holds various panels based on connector choice and density requirements of the owner.
    - a) Patch/splice, holds 4 adapter panels, Corning WCH Connector Housing, Corning P/N WCH-04U
    - b) Accessories
      - 1) WCH-STRNRLF-KIT
      - 2) WCH-DUST-CVR
      - 3) WCH-SPLC-4-8

## 2.11 FIBER OPTIC PIGTAIL MODULES

- A. Factory terminated fiber optic pigtail modules.
1. 12-SC Simplex singlemode, UPC, Corning P/N CCH-RM 12-3C-P03 RH
- B. FIBER OPTIC SPLICE TRAYS
- C. Indoor/outdoor splice trays for Heat Shrink Fusion splicing
1. Type 2S, 12 fiber splice tray, clear cover, Corning P/N M67-048-C

## 2.12 FIBER OPTIC PATCH CABLES

- A. (100) OS2 / SMF, Yellow, 1M. SC Simplex APC - SC Simplex APC -Single cord



- B. (100) 0S2/ SMF, Yellow, 2M, SC Simplex APC - SC Simplex APC -Single cord
- C. Confirm color and length with Owner prior to ordering.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Contractor shall furnish and install all materials necessary for a complete and working system.
- B. Contractor must be a Certified Installer for the specified fiber and copper cable manufacturers prior to, during, and through completion of the system installation, and must be able to provide the manufacturer's extended warranty.
- C. Campus Fiber (OFNR) shall be installed in conduit or innerduct when routed inside of buildings.
- D. Fiber optic splicing shall be performed with a core alignment fusion splicer. No mechanical splices or terminations are permitted.
- E. Field terminated fiber jumpers shall not be allowed.
- F. All work shall be performed in a professional manner.
- G. Splices in backbone cables outside of the specified locations shall not be permitted unless approved by the Designer.
- H. Install and route all copper and fiber cables so as to maintain the minimum cable bend radius limits specified by the manufacturer, or twenty times the cable diameter for fiber and four times the cable diameter for copper, whichever is greater.
- I. During installation and termination do not exceed a pulling force (tensile loading) for copper and fiber cables. Refer to manufacturer data sheets for maximum pulling force. Break-away swivels are recommended.
- J. Use only practices and tools recommended by the manufacturer to terminate all conductors at connecting blocks. Stuffer caps shall be used. However, stuffer caps shall not be used as a termination tool or other non-approved termination means shall not be used.
- K. Maintain the twisted pair (TP) cable jacket as close as possible to the point of termination.
- L. Maintain the twisted pair (TP) cable pair twists as close as possible to the point of termination.

### **3.02 TESTING PROCEDURES**

- A. Unshielded Twisted Pair Cable (High pair count)
  - 1. All copper backbone cables shall be tested for the following:
    - a) Continuity
    - b) Shorts
    - c) Transposed, reversed or split pairs
    - d) Grounded conductor
    - e) Provide written documentation of all test results.
- B. Optical Fiber
  - 1. Testing procedures shall be in accordance with the following:
    - a) ANSI/TIA/EIA-568-A



- b) ANSI/TIA/EIA-568-B.1
  - c) ANSI/TIA/EIA-526-7, Method B
  - d) ANSI/TIA/EIA-526-14, Method B
  - e) Proposed TSB-140 Tier one & two Fiber Certification (Current draft).
2. Test Equipment
- a) Optical power meter and source (Certification tester Fluke or Agilent preferred)
  - b) Optical Time-Domain Reflectometer (OTDR) shall be used for fiber segments 300 ft and longer.
3. Testing
- a) All Singlemode optical fibers shall be tested at both 1310 nm and 1550 nm wavelengths for end-to-end insertion loss and Bi-Directional (MTR to TR-1, TR-1 to MTR) testing is required.

### **3.03 LABELING**

- A. All backbone cables are to be labeled using a machine printed label at each end of the cable at approximately 12 inches of the termination point, and again at approximately 48 inches from the termination point. Handwritten labels shall not be used.
- B. All wiring blocks, connector panels, or other termination points shall be labeled with the cable identifier as well as the pair or conductor identifier.
- C. The labels shall denote, at a minimum, the starting and end points of the cable, as well as a unique cable identifier, i.e. FTO-A.FTO-B-1.
- D. Note all labeling information on the as-built drawings.

**END OF SECTION 27 13 00**



## **SECTION 27 15 01**

### **COMMUNICATIONS HORIZONTAL CABLING – Cat 6A**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. The project includes the installation of new Cat. 6A cabling and associated components. The existing raceways and pathways will be utilized in most case and new raceways and pathways will be required in locations where cabling does not currently exist. Pathways and raceways may need to be modified to accommodate cable fill and bend requirements. Refer to drawing and related specifications sections for additional information.
- B. Horizontal (distribution) communications wiring and connecting hardware from the Telecommunications Room (MDF, IDF, TR) to Telecommunication Outlets / Network Jacks throughout the site.

##### **1.2 RELATED DOCUMENTS**

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total general requirements for the project communications systems and equipment:
  - 1. Contract Documents
  - 2. Division 00 – Procurement & Contracting Requirements Group
  - 3. Division 1 – General Requirements
  - 4. Section 27 10 00 – Structured Cabling General Requirements
  - 5. Section 27 05 26 – Grounding and Bonding for Communications Systems
  - 6. Section 27 11 00 – Communications Equipment Room Fittings
  - 7. Section 27 17 01 – Testing, Identification and Administration for Category 6A Cables

##### **1.3 REFERENCES**

- A. All work shall be performed in accordance with the following codes and industry standards, unless noted otherwise:
  - 1. NFPA 70 – National Electrical Code, current version adopted by local or State AHJ.
  - 2. TIA/EIA-568-B – Commercial Building Telecommunications Cabling Standard, current version.
  - 3. TIA/EIA-569-B – Commercial Building Standard for Telecommunications Pathways and Spaces, current version.
  - 4. TIA/EIA-606-A – Administration Standard for Commercial Telecommunications Infrastructure, current version.
  - 5. J-STD-607-A – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, current version.
  - 6. IEEE 241 - IEEE Recommended Practice for Electric Power Systems in Commercial Buildings” pertaining to communication systems.



## **1.4 SYSTEM DESCRIPTION**

- A. The horizontal distribution subsystem refers to all intra-building twisted-pair and fiber optic communications cabling connecting Telecommunication Rooms (MDF, IDF, TR's) to telecommunication outlets / network jacks located at individual work areas.
- B. Horizontal cabling may consist of a combination of the following types of cable:
  - 1. Category 6A, (100 Ohm, 23 Gauge AWG, 4-pair, unshielded twisted pair, plenum rated) cables.
- C. The Horizontal System includes cables, jacks, patch panels, connecting blocks, patch cords, fiber connectors and jumpers as well as the necessary support systems, such as cable managers and faceplates.
- D. Cables may be routed through conduit, cable trays, spaces below raised floors, open ceiling areas, non-ventilated spaces above ceiling tile, and through plenum air-handling spaces above ceiling tile.
- E. Furnish and install all materials necessary for a complete and working system.

## **1.5 WARRANTY**

- A. The contractor must be an approved certified installer of the cabling manufacturer and is responsible for workmanship and installation practices in accordance with the cabling manufacturer's guidelines. The certified contractor shall have 30% of their technicians trained on copper & fiber installations and testing by the cabling manufacturer. Provide a one (1) year warranty.

## **PART 2 - PRODUCTS**

### **2.1 APPROVALS AND SUBSTITUTIONS**

- A. All products shall be provided as specified, unless an approved equal is provided.
- B. Non-compliant products installed as a part of this Contract shall be removed and replaced and all costs for removal and replacement shall be borne solely by the Contractor(s).
- C. All products shall be "NEW".

### **2.2 CATEGORY 6A STATION CABLING**

- A. Category 6A unshielded twisted pair (**Superior Essex 10Gain Cat 6A**)



1. 100 ohm, Category 6A, 23AWG, 4-pair unshielded twisted pair, CMP rated, color Blue. Part No. 6A-246-2B.
  - a. Maximum insertion loss of 2.0 dB/100M at 1 MHz, 19.7 dB/100M at 100 MHz, 32.6 dB/100M at 250 MHz and 42.7 dB/100M at 400 MHz.
  - b. Electrical characteristics must be characterized to 550 MHz.
  - c. Each pair in the cable must be insulated with FEP
  - d. Cable must be third party verified by ETL.
  - e. 0.22" (5.5mm) Nominal Diameter

## 2.3 MODULAR JACKS

### A. Category 6A modular jacks

1. 8-position modular jack, Category 6A, IDC terminals, T568A/B wiring scheme
2. Each jack must be stamped or have icons to identify it as CAT 6A.
3. Color – Fog White.
  - a. Ortronics HDJ6A

## 2.01 BISCUIT BLOCKS

### A. Two Port Keystone Surface Mount Blocks

1. 2 port, label field, surface mount, Accepts Ortronics Cat 6A Keystone Jacks
  - a) Ortronics #OR-KSSMB2

## 2.4 WORK AREA OUTLETS

### A. Flush mounted faceplates

1. One port TracJack faceplate with mounting lugs for wall phone, constructed from stainless steel, mounts within a single gang wall box.
  - a. Ortronics OR-403STJ1WP.
2. One port TracJack faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a single gang wall box.
  - a. Ortronics OR-40300549.
3. Two port faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a single gang wall box.
  - a. Ortronics OR-40300548.
4. Three port TracJack faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a single gang wall box.
  - a. Ortronics OR-40300547.
5. Four port TracJack faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a single gang wall box.
  - a. Ortronics OR-40300546.
6. Six port TracJack faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a single gang wall box.



- a. Ortronics OR-40300545.
  - 7. Six port TracJack faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a double gang wall box.
    - a. Ortronics OR-40300555.
  - 8. Eight port TracJack faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a double gang wall box.
    - a. Ortronics OR-40300554.
  - 9. Twelve port TracJack faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a double gang wall box.
    - a. Ortronics OR-40300620.
  - 10. All faceplate colors are to be coordinated with architect to match finish.
- B. Surface mounted outlet boxes (TracJack)
- 1. Two port TracJack surface mount box, constructed from high impact thermo-plastic, with recessed label fields.
    - a. Ortronics OR-404TJ2.
  - 2. Four port TracJack surface mount box, constructed from high impact thermo-plastic, with recessed label fields.
    - a. Ortronics OR-404TJ4
  - 3. Six port TracJack surface mount box, constructed from high impact thermo-plastic, with recessed label fields.
    - a. Ortronics OR-404TJ6
  - 4. All surface box colors are to be coordinated with architect to match finish.

## **2.5 TERMINATION BLOCKS**

- A. Category 6 110-style blocks
- 1. Category 6, 288 Pair, 110-style, with mounting legs, wall -mount.
    - a. Ortronics OR-110ABC6300.
  - 2. Category 6, 96 Pair, 110-style, with mounting legs, wall -mount.
    - a. Ortronics OR-110ABC6100.
  - 3. Category 6, 288 Pair, 110-style, without mounting legs, rack-mount.
    - a. Ortronics OR-110DBC6300.
  - 4. Category 6, 96 Pair, 110-style, without mounting legs, rack-mount.
    - a. Ortronics OR-110DBC6100.
- B. Wiring Troughs



1. Horizontal trough for routing of patch cords and cross-connect wire, with mounting legs.
  - a. Ortronics OR-30200140.
2. Horizontal trough for routing of patch cords and cross-connect wire, without mounting legs.
  - a. Ortronics OR-70400272.

C. 110 block labels (Cat 6)

1. Clear plastic holder for 110 blocks with paper inserts, for blocks with legs
  - a. Ortronics OR-70400646.
2. Clear plastic holder for 110 blocks with paper inserts, for blocks without legs
  - a. Ortronics OR-70400680.

D. Mounting Brackets

1. 19 inch rack mount brackets for 200 pair 110 termination blocks and wiring troughs.
  - a. Ortronics OR-30600150.

## **2.6 PATCH PANELS**

A. Category 6A modular patch panels

1. 48 port, 8-position modular jack flat panel, high density, 6 port modules, Category 6A, IDC terminals, T568A/B wiring scheme.
  - a. Ortronics #PSDHJU48

## **2.7 PATCH CORDS/JUMPERS**

1. Category 6A modular patch cords (Legrand V-Series)
2. Factory terminated double ended, 8-position to 8-position, modular, stranded conductors, Category 6A, 4 pair, 28 gauge, Legrand #576-A10-XX (Blue).
3. Provide the following quantities and lengths for use to interconnect horizontal cabling to the Network Switches in telecom closets:
  - a. (48) 1-foot patch cables
  - b. (10) 3-foot Patch Cables
  - c. (10) 7-foot patch cables



4. Provide all patch cables required to interconnect far end network devices to Horizontal Cabling jacks.
5. Confirm Patch Cable colors and lengths with Owner prior to ordering.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Horizontal cabling includes cables, jacks, patch panels, connecting blocks, and patch cords, as well as the necessary support systems, such as cable managers and faceplates.
- B. Contractor shall furnish and install all materials necessary for a complete and working system.
- C. Contractor must be a certified manufacturer installer prior to, during, and through completion of the system installation.
- D. Field terminated copper and fiber optic patch cords and jumpers shall not be allowed. All patch cords shall be pre-terminated by the manufacturer.
- E. All work shall be performed in a professional manner.
- F. Install cable after interior of building has been physically protected from the weather and all mechanical work likely to damage cabling has been completed.
- G. Before installing cabling, ensure all cable pathways are completely and thoroughly cleaned:
- H. Inspect conduit, wireway, cable trays, and innerduct installed by others.
- I. Clean any additional enclosed raceway and innerduct systems furnished.
- J. Provide protection for exposed cables where subject to damage.
- K. Provide abrasion protection for any cable or wire bundles, which pass through holes or across edges of sheet metal. Protective bushings shall be used to protect cables.
- L. Cable ties and other cable management clamps shall be no more than hand tightened and shall fit snugly, but not compress, crimp, or otherwise change the physical characteristics of the cable jacket or distort the placement of twisted-pair components. Replace any cable exhibiting stresses due to over tightening of cable management devices. Plenum spaces require Plenum rated cable ties.



- M. Where possible, route cables in overhead cable trays and inside wire management systems attached to the equipment cabinets and racks. Use plastic ties or ducts to restrain cabling installed outside of wire management systems on racks or in cabinets. Cable trays shall not exceed 50% fill.
- N. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
- O. Cable raceways shall not be filled greater than the TIA/EIA-569-A maximum fill for the particular raceway type.
- P. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids, plumbing pipes, and electrical conduits.
- Q. Horizontal distribution cables shall be bundled in groups of no more than the amount of cables designed for by the cable support manufacturer recommends based on cable OD and weight. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- R. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.
- S. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
- T. All Conduit Sleeves and wire way trays penetrating fire walls shall have 3M Fire Barrier Pillows installed. Contractor is responsible to place fire barrier pillows on all existing penetrations that will be reused to run new cable and all new penetrations required for the new cable installation. Fire barrier Pillows shall be placed per manufacturer's recommendation to create a 2 hour fire barrier.

### **3.2 UNSHIELDED TWISTED PAIR CABLE INSTALLATION PRACTICES**

- A. Cable shall be installed in accordance with manufacturer recommendations and best industry practices.
- B. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
- C. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.



- D. The cable's minimum bend radius and maximum pulling tension shall not be exceeded Bend radius for UTP = 4 X Cable OD, FTP = 8 X Cable OD.
- E. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
- F. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.  
Separation from Power Lines:
- G. Provide the following minimum separation distances between pathways for copper communications cables and power wiring of 480 volts or less:
  - 1. Open or Nonmetal Communications Pathways:
    - a. 12 inches from electric motors, fluorescent light fixtures, and unshielded power lines carrying up to 3 kVA.
    - b. 36 inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
    - c. 48 inches from large electrical motors or transformers.
  - 2. Grounded Metal Conduit Communications Pathways:
    - a. 2 1/2 inches from electrical equipment and unshielded power lines carrying up to 2 kVA.
    - b. 6 inches from electrical equipment and unshielded power lines carrying from 2 kVA to 5 kVA.
    - c. 12 inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
    - d. 3 inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying from 2 kVA to 5 kVA.
    - e. 6 inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying more than 5 kVA.

### **3.3 UNSHIELDED TWISTED PAIR TERMINATION**

- A. Cables shall be coiled to house the cable coil without exceeding the manufacturers bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 36" of fiber slack shall be stored; Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.
- B. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B.1 document, manufacturer's recommendations and best industry practices.
- C. All 4 pair cables shall be terminated on the jack and patch panels using T568-B wiring scheme.



- D. Pair untwist at the termination shall not exceed 12 mm (one-half inch).
- E. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the UTP cable. 8 times for FTP cables.
- F. The cable jacket shall be maintained to within 25mm (one inch) of the termination point.
- G. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).
- H. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- I. The cable jacket shall be maintained as close as possible to the termination point. Cable shall not have more than 1.0" removed.

### **3.4 TESTING AND LABELING PROCEDURES**

- A. Refer to Specifications Section 271701 – Testing, Identification and Administration for Category 6 Cable.
- B. All horizontal cables are to be labeled using a machine printed label at each end of the cable at approximately 12 inches of the termination point, and again at approximately 48 inches from the termination point. Handwritten labels shall not be used.
- C. All patch panel ports and telecommunication outlet ports shall be labeled with the cable identifier.
- D. The labels shall denote the Telecommunications outlet ID, as well as the unique cable number for that Telecom Outlet, i.e. A-001-A for cable number 1, A-001-B for cable number 2, and so forth. Owner may provide specific labeling requirements coordinate with owner.
- E. Note all labeling information on the as-built drawings.

END OF SECTION



## SECTION 27 17 01

### TESTING, IDENTIFICATION AND ADMINISTRATION OF CATEGORY 6A CABLE

#### PART 1 GENERAL

##### 1.01 WORK INCLUDED

- A. Provide all labor, materials, tools, field-test instruments and equipment required for the complete testing, identification and administration of the work called for in the Contract Documents.
- B. In order to conform to the overall project event schedule, the cabling contractor shall survey the work areas and coordinate cabling testing with other applicable trades.
- C. In addition to the tests detailed in this document, the contractor shall notify the Owner or the Owner's representative of any additional tests that are deemed necessary to guarantee a fully functional system. The contractor shall carry out and record any additional measurement results at no additional charge.

##### 1.02 SCOPE

- A. This Section includes the minimum requirements for the test certification, identification and administration of horizontal balanced twisted pair cabling.
- B. This Section includes minimum requirements for:
  - 1. Copper cabling test instruments
  - 2. Copper cabling testing
  - 3. Identification
    - a) Labels and labeling
  - 4. Administration
    - a) Test results documentation
    - b) As-built drawings
- C. Testing shall be carried out in accordance with this document.
- D. Testing shall be performed on each cabling link. (100% testing)
- E. All tests shall be documented.

##### 1.03 QUALITY ASSURANCE

- A. All testing procedures and field-test instruments shall comply with applicable requirements of:
  - 1. ANSI/TIA-1152, Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
  - 2. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises.
  - 3. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard
  - 4. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standards.
  - 5. ANSI/TIA-606-B, Administration Standard for Commercial Telecommunications Infrastructure, including the requirements specified by the customer, unless the customer specifies their own labeling requirements.
- B. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:





1. Manufacturer of the connectors or cable.
  2. Manufacturer of the test equipment used for the field certification.
  3. Training organizations (e.g., BICSI, A Telecommunications Association headquarters in Tampa, Florida; ACP [Association of Cabling Professionals™] Cabling Business Institute located in Dallas, Texas)
- C. The Owner or the Owner's representative shall be invited to witness and/or review field-testing.
1. The Owner or the Owner's representative shall be notified of the start date of the testing phase five (5) business days before testing commences.
  2. The Owner or the Owner's representative will select a random sample of 5% of the installed links. The Owner or the Owner's representative shall test these randomly selected links and the results are to be stored in accordance with Part 3 of this document. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the representative shall repeat 100% testing at no cost to the Owner.

#### **1.04 SUBMITTALS**

- A. Manufacturers catalog sheets and specifications for the test equipment.
- B. A schedule (list) of all balanced twisted-pair copper links to be tested.
- C. Sample test reports.

#### **1.05 ACCEPTANCE OF TEST RESULTS**

- A. Unless otherwise specified by the Owner or the Owners representative, each cabling link shall be in tested for:
1. Wire Map
  2. Length
  3. Propagation Delay
  4. Delay Skew
  5. DC Loop Resistance – recorded for information only
  6. DC Resistance Unbalance – recorded for information only
  7. Insertion Loss
  8. NEXT (Near-End Crosstalk)
  9. PS NEXT (Power Sum Near-End Crosstalk)
  10. ACR-N (Attenuation to Crosstalk Ratio Near-End) – recorded for information only
  11. PS ACR-N (Power Sum Attenuation to Crosstalk Ratio Near-End) – recorded for information only
  12. ACR-F (Attenuation to Crosstalk Ratio Far-End)
  13. PS ACR-F (Power Sum Attenuation to Crosstalk Ratio Far-End)
  14. Return Loss
  15. TCL (Transverse Conversion Loss) – recorded for information only
  16. ELTCTL (Equal Level Transverse Conversion Transfer Loss) – recorded for information only
  17. PS ANEXT (Power Sum Alien Near-End Crosstalk) – sampled per section 3.2
  18. Average PS ANEXT (Average Power Sum Alien Near-End Crosstalk) – sampled per section 3.2



19. PS AACR-F (Power Sum Alien Attenuation to Crosstalk Ratio Far-End) – sampled per section 3.2
20. Average PS AACR-F (Average Power Sum Alien Attenuation to Crosstalk Ratio Far-End) – sampled per section 3.2
- B. All installed cabling Permanent Links shall be field-tested and pass the test requirements and analysis as described in Part 3. Any Permanent Link that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected Permanent Link meets performance requirements. The final and passing result of the tests for all Permanent Links shall be provided in the test results documentation in accordance with Part 3.
- C. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

## **PART 2 PRODUCTS**

### **2.1 BALANCED TWISTED-PAIR CABLE TESTERS**

- A. The field-test instrument shall be within the calibration period recommended by the manufacturer, typically 12 months.
- B. Certification tester
  1. Accuracy
    - a) Level IIIe accuracy in accordance with ANSI/TIA-1152
    - b) Independent verification of accuracy
    - c) Acceptable manufacturers
      - 1) Fluke Networks
  2. Permanent Link Adapters
    - a) RJ45 plug must meet the requirements for NEXT, FEXT and Return Loss in accordance with ANSI/TIA-568-C.2 Annex C
    - b) Twisted pair Category 5e, 6, 6A, 7 or 7A cords are not permitted as their performance degrades with use and can cause false Return Loss failures
  3. Results Storage
    - a) Must be capable of storing > 10,000 results for all measurements found in 2.1.B.4 below
  4. Measurement capabilities
    - a) Wire Map
    - b) Length
    - c) Propagation Delay
    - d) Delay Skew
    - e) DC Loop Resistance
    - f) DC Resistance Unbalance
    - g) Insertion Loss
    - h) NEXT (Near-End Crosstalk)
      - i) PS NEXT (Power Sum Near-End Crosstalk)
      - j) ACR-N (Attenuation to Crosstalk Ratio Near-End)
      - k) PS ACR-N (Power Sum Attenuation to Crosstalk Ratio Near-End)



- l) ACR-F (Attenuation to Crosstalk Ratio Far-End)
- m) PS ACR-F (Power Sum Attenuation to Crosstalk Ratio Far-End)
- n) Return Loss
- o) TCL (Transverse Conversion Loss)
- p) ELTCTL (Equal Level Transverse Conversion Transfer Loss)
- q) Time Domain Reflectometer
- r) Time Domain Xtalk Analyzer
- s) PS ANEXT (Power Sum Alien Near-End Crosstalk)
- t) Average PS ANEXT (Average Power Sum Alien Near-End Crosstalk)
- u) PS AACR-F (Power Sum Alien Attenuation to Crosstalk Ratio Far-End)
- v) Average PS AACR-F (Average Power Sum Alien Attenuation to Crosstalk Ratio Far-End)

C. PC Software

- 1. Windows® based.
- 2. Must show when 3 dB and 4 dB rules are applied
- 3. Re-certification capability, where results must have their Cable IDs suffixed with (RC).
- 4. Built in PDF export – no additional third-party software permitted.
- 5. Built-in statistical analysis.

## 2.2 IDENTIFICATION

A. Labels

- 1. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.
- 2. Shall be preprinted using a mechanical means of printing (e.g., laser printer).
- 3. Where used for cable marking, provide vinyl substrate with a white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable. If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow – so that the labels are easily distinguishable.
- 4. Where insert type labels are used provide clear plastic cover over label.
- 5. Provide plastic warning tape 6 inches wide continuously printed and bright colored 18” above all direct buried services, underground conduits and duct-banks.
- 6. Acceptable Manufacturers:
  - a) Brady Corporation
  - b) Silver Fox
  - c) Brothers

#### Administration

- B. Administration of the documentation shall include test results of each Permanent Link.
- C. The test result information for each link shall be recorded in the memory of the field-test instrument upon completion of the test.
- D. The test result records saved within the field-test instrument shall be transferred into a Windows® -based database utility that allows for the maintenance, inspection and archiving of these test records.
- E. Alien Crosstalk measurements shall be stored to a PC upon completion of the test.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

#### 3.02 BALANCED TWISTED PAIR CABLE TESTING

- A. Field-test instruments shall have the latest software and firmware installed.
- B. Permanent Link test results including the individual frequency measurements from the tester shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
- C. Permanent Link testing shall be performed on each cabling segment (connector to connector). Sampling is not acceptable.
- D. Alien Crosstalk testing shall be performed using a sampling plan. An acceptance quality level (AQL) of 0,4 %, normal inspection, general inspection level I as defined in ISO 2859-1 for populations of up to 500,000 links shall be used. The following table represents this sampling level.

Installation size (No. of total links)	Sample size (No. of links to test)
3 – 33	100%
34 – 3,200	33
3,201 – 35,000	126
35,001 – 150,000	201
150,001 – 500,000	315

Disturbed (Victim) links chosen for Alien Crosstalk testing shall be an equal combination of short, medium and long links.

- E. Permanent Link adapters made from twisted pair Category 5e, 6, 6A, 7 or 7A cords are not permitted as their performance degrades with use and can cause false Return Loss failures.
- F. The installer shall build a reference link. All components shall be anchored so it is not possible to disturb them. The technician is to conduct a Category 6A Permanent Link test each day to ensure no degradation of the tester or its Permanent Link adapters.
- G. Wire Map Measurement
  - 1. The wire map test is intended to verify pin-to-pin termination at each end and check for installation connectivity errors. For each of the 8 conductors in the cabling, the wire map indicates:
    - a) Continuity to the remote end
    - b) Shorts between any two or more conductors

- c) Reversed pairs
  - d) Split pairs
  - e) Transposed pairs
  - f) Distance to open on shield
  - g) Any other miss-wiring
- 2. The correct connectivity of telecommunications outlets/connectors is defined in ANSI/TIA-568-C.2. Two color schemes are permitted. The user shall define which scheme is to be used. The field tester shall document which color scheme was used.
- H. Length Measurement
  - 1. The length of each balanced twisted pair shall be recorded.
  - 2. Since physical length is determined from electrical length, the physical length of the link calculated using the pair with the shortest electrical delay shall be reported and used for making the pass or fail determination.
  - 3. The pass or fail criteria is based on the maximum length allowed for the Permanent Link as specified in ANSI/TIA-568-C.2 plus the nominal velocity of propagation (NVP) uncertainty of 10%. For a Permanent Link, the length measurement can be 325 ft. (99 m) before a fail is reported.
- I. Propagation Delay measurement
  - 1. Is the time it takes for a signal to reach the end of the link.
  - 2. The measurement shall be made at 10 MHz per ANSI/TIA-1152.
  - 3. The propagation delay of each balanced twisted pair shall be recorded.
  - 4. Is not to exceed 498 ns per ANSI/TIA-568-C.2 Section 6.3.18.
- J. Delay Skew measurement
  - 1. Is the difference in propagation delay @ 10 MHz between the shortest delay and the delays of the other wire pairs.
  - 2. The delay skew of each balanced twisted pair shall be recorded.
  - 3. Is not to exceed 44 ns per ANSI/TIA-568-C.2 Section 6.3.19.
- K. DC Resistance
  - 1. Often reported as Resistance, is the loop resistance of both conductors in the pair.
  - 2. Is not specified in ANSI/TIA-1152, but shall be recorded for all four pairs.
- L. DC Resistance Unbalance
  - 1. Often reported as Resistance Unbalance, is the difference in resistance of the two wires within the pair.
  - 2. Is not specified in ANSI/TIA-1152 for a Permanent Link, but shall be recorded for all four pairs.
- M. Insertion Loss
  - 1. Is the loss of signal strength over the cabling (in dB).
  - 2. The frequency resolution shall be:
    - a) 1 – 31.25 MHz: 150 kHz
    - b) 31.25 – 100 MHz: 250 kHz
    - c) 100 – 250 MHz: 500 kHz

- d) 250 – 500 MHz: 1000 kHz
- 3. Worst case shall be reported for all four pairs in one direction only.
- 4. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (\*).
- 5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.7.
- N. NEXT (Near-End Crosstalk)
  - 1. Is the difference in amplitude (in dB) between a transmitted signal and the crosstalk received on other wire pairs at the same end of the cabling.
  - 2. The frequency resolution shall be:
    - a) 1 – 31.25 MHz: 150 kHz
    - b) 31.25 – 100 MHz: 250 kHz
    - c) 100 – 250 MHz: 500 kHz
    - d) 250 – 500 MHz: 1000 kHz
  - 3. Shall be measured in both directions. (12 pair to pair possible combinations)
  - 4. Both worst case and worst margins shall be reported.
  - 5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.8.
  - 6. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (\*).
  - 7. The Time Domain Xtalk data shall be stored for any marginal or failing NEXT results.
- O. PS NEXT (Power Sum Near-End Crosstalk)
  - 1. Is the difference (in dB) between the test signal and the crosstalk from the other pairs received at the same end of the cabling.
  - 2. The frequency resolution shall be:
    - a) 1 – 31.25 MHz: 150 kHz
    - b) 31.25 – 100 MHz: 250 kHz
    - c) 100 – 250 MHz: 500 kHz
    - d) 250 – 500 MHz: 1000 kHz
  - 3. Shall be measured in both directions. (8 pair possible combinations)
  - 4. Both worst case and worst margins shall be reported.
  - 5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.9.
  - 6. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (\*).
  - 7. The Time Domain Xtalk data shall be stored for any marginal or failing PS NEXT results.
- P. ACR-N (Attenuation Crosstalk Ratio Near-End)
  - 1. Is a calculation of NEXT minus Insertion Loss of the disturbed pair in dB.
  - 2. The frequency resolution shall be:
    - a) 1 – 31.25 MHz: 150 kHz
    - b) 31.25 – 100 MHz: 250 kHz

- c) 100 – 250 MHz: 500 kHz
  - d) 250 – 500 MHz: 1000 kHz
- 3. Shall be calculated in both directions.
- 4. Is not specified in ANSI/TIA-1152, but shall be recorded for all 12 possible combinations.
- Q. PS ACR-N (Power Sum Attenuation Crosstalk Ratio Near-End)
  - 1. Is a calculation of PS NEXT minus Insertion Loss of the disturbed pair in dB.
  - 2. The frequency resolution shall be:
    - a) 1 – 31.25 MHz: 150 kHz
    - b) 31.25 – 100 MHz: 250 kHz
    - c) 100 – 250 MHz: 500 kHz
    - d) 250 – 500 MHz: 1000 kHz
  - 3. Shall be calculated in both directions.
  - 4. Is not specified in ANSI/TIA-1152, but shall be recorded for all 8 possible combinations.
- R. ACR-F (Attenuation Crosstalk Ratio Far-End)
  - 1. Is a calculation of FEXT minus Insertion Loss of the disturbed pair in dB.
  - 2. The frequency resolution shall be:
    - a) 1 – 31.25 MHz: 150 kHz
    - b) 31.25 – 100 MHz: 250 kHz
    - c) 100 – 250 MHz: 500 kHz
    - d) 250 – 500 MHz: 1000 kHz
  - 3. Shall be measured in both directions. (24 pair to pair possible combinations)
  - 4. Both worst case and worst margins shall be reported.
  - 5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.11.
  - 6. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (\*).
- S. PS ACR-F (Power Sum Attenuation to Crosstalk Ratio Far-End)
  - 1. Is a calculation of PS FEXT minus Insertion Loss of the disturbed pair in dB.
  - 2. The frequency resolution shall be:
    - a) 1 – 31.25 MHz: 150 kHz
    - b) 31.25 – 100 MHz: 250 kHz
    - c) 100 – 250 MHz: 500 kHz
    - d) 250 – 500 MHz: 1000 kHz
  - 3. Shall be measured in both directions. (8 pair possible combinations)
  - 4. Both worst case and worst margins shall be reported.
  - 5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.13.



6. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (\*).

T. Return Loss

1. Is the difference (in dB) between the power of a transmitted signal and the power of the signals reflected back.
2. The frequency resolution shall be:
  - a) 1 – 31.25 MHz: 150 kHz
  - b) 31.25 – 100 MHz: 250 kHz
  - c) 100 – 250 MHz: 500 kHz
  - d) 250 – 500 MHz: 1000 kHz
3. Shall be measured in both directions. (8 pair possible combinations)
4. Both worst case and worst margins shall be reported.
5. Shall be ignored at all frequencies where the Insertion Loss is less than 3 dB for that pair.
6. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.6.
7. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (\*).
8. The Time Domain Reflectometer data shall be stored for any marginal or failing Return Loss results.

U. TCL (Transverse Conversion Loss)

1. Is the ratio (in dB) between a differential mode signal injected at the near-end and the common-mode signal measured at the near-end on the same wire pair.
2. The frequency resolution shall be:
  - a) 1 – 31.25 MHz: 150 kHz
  - b) 31.25 – 100 MHz: 250 kHz
  - c) 100 – 250 MHz: 500 kHz
  - d) 250 – 500 MHz: 1000 kHz
3. Shall be measured in both directions.
4. Is not specified in ANSI/TIA-1152 for a Permanent Link, but shall be recorded for all 8 possible combinations.

V. ELTCTL (Equal Level Transverse Conversion Transfer Loss)

1. Is the ratio (in dB) between a differential mode signal inject at the near-end and the common-mode signal measured at the far end on the same wire pair minus the Insertion Loss of that pair.
2. The frequency resolution shall be:
  - a) 1 – 31.25 MHz: 150 kHz
  - b) 31.25 – 100 MHz: 250 kHz
  - c) 100 – 250 MHz: 500 kHz
  - d) 250 – 500 MHz: 1000 kHz
3. Shall be measured in both directions.





4. Is not specified in ANSI/TIA-1152 for a Permanent Link, but shall be recorded for all 8 possible combinations.

W. PS ANEXT (Power Sum Alien Near-End Crosstalk)

1. Takes into account the combined alien crosstalk (statistical) on a receive pair from all external near-end disturbers operating simultaneously.
2. The frequency resolution shall be:
  - a) 1 – 31.25 MHz: 150 kHz
  - b) 31.25 – 100 MHz: 250 kHz
  - c) 100 – 250 MHz: 500 kHz
  - d) 250 – 500 MHz: 1000 kHz
3. The disturbed (victim) link shall have links to the left and right of it and if present, links above and below it.
4. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links
5. Should be measured in both directions if the link is patch panel to patch panel. If the link is patch panel to telecommunications outlet, then it shall be measured from the patch panel end only.
6. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.21.

X. Average PS ANEXT (Power Sum Alien Near-End Crosstalk)

1. Is calculated by averaging the individual PSANEXT loss values, in dB, for all four pairs in the disturbed (victim) link.
2. The frequency resolution shall be:
  - a) 1 – 31.25 MHz: 150 kHz
  - b) 31.25 – 100 MHz: 250 kHz
  - c) 100 – 250 MHz: 500 kHz
  - d) 250 – 500 MHz: 1000 kHz
3. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.22.

Y. PS AACR-F (Power Sum Alien Attenuation to Crosstalk Ratio Far-End)

1. AFEXT loss is the coupling of crosstalk at the far-end from external link pairs into a disturbed (victim) pair of the 4-pair link under test. PS AACR-F is the calculated power sum from all external pairs into the disturbed (victim) pair.
2. The frequency resolution shall be:
  - a) 1 – 31.25 MHz: 150 kHz
  - b) 31.25 – 100 MHz: 250 kHz
  - c) 100 – 250 MHz: 500 kHz
  - d) 250 – 500 MHz: 1000 kHz
3. The disturbed (victim) link shall have links to the left and right of it and if present, links above and below it.



4. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links
  5. Should be measured in both directions if the link is patch panel to patch panel. If the link is patch panel to telecommunications outlet, then it shall be measured from the patch panel end only.
  6. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.25.
- Z. Average PS AACR-F (Power Sum Alien Attenuation to Crosstalk Ratio Far-End)
1. Is calculated by averaging the individual PS AACR-F values, in dB, for all four pairs in the disturbed (victim) link.
  2. The frequency resolution shall be:
    - a) 1 – 31.25 MHz: 150 kHz
    - b) 31.25 – 100 MHz: 250 kHz
    - c) 100 – 250 MHz: 500 kHz
    - d) 250 – 500 MHz: 1000 kHz
  3. The disturbed (victim) link shall have links to the left and right of it and if present, links above and below it.
  4. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links
  5. Should be measured in both directions if the link is patch panel to patch panel. If the link is patch panel to telecommunications outlet, then it shall be measured from the patch panel end only.
  6. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.26.

### 3.03 ADMINISTRATION

- A. Test results documentation
1. Test results saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., “as saved in the field-test instrument”. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.
  2. The test results documentation shall be available for inspection by the Owner or the Owner’s representative during the installation period and shall be passed to the Owner’s representative within 5 working days of completion of tests on cabling served by a telecommunications room or of back-bone cabling. The installer shall retain a copy to aid preparation of as-built information.
  3. The database for the complete project, including twisted-pair copper cabling links, if applicable, shall be stored and delivered on CD or DVD prior to Owner acceptance of the building. This CD or DVD shall include the software tools required to view, inspect, and print any selection of the test reports.
  4. Circuit IDs reported by the test instrument should match the specified label ID (refer to specifications section 271501 Part 3.04 for more information).
  5. For Permanent Link testing, the detailed test results documentation data is to be provided in an electronic database for each tested balance twisted-pair and shall contain the following information
    - a) The overall Pass/Fail evaluation of the link-under-test
    - b) The date and time the test results were saved in the memory of the tester

- c) The identification of the customer site as specified by the end-user
  - d) The name of the test limit selected to execute the stored test results
  - e) The name of the personnel performing the test
  - f) The version of the test software and the version of the test limit database held within the test instrument
  - g) The manufacturer, model and serial number of the field-test instrument
  - h) The adapters used
  - i) The factory calibration date
  - j) Wire Map
  - k) Propagation Delay values, for all four pairs
  - l) Delay Skew values, for all four pairs
  - m) DC Resistance values, for all four pairs
  - n) DC Resistance Unbalance, values for all four pairs
  - o) Insertion Loss, worst case values for all four pairs
  - p) NEXT, worst case margin and worst-case values, both directions
  - q) PS NEXT, worst case margin and worst-case values, both directions
  - r) ACR-F, worst case margin and worst-case values, both directions
  - s) PS ACR-F, worst case margin and worst-case values, both directions
  - t) Return Loss, worst case margin and worst-case values, both directions
  - u) TCL, worst case values both directions
  - v) ELTCTL, worst case values, both directions.
  - w) Time Domain Crosstalk data if the link is marginal or fails
  - x) Time Domain Reflectometer data if the link is marginal or fails
6. For Alien Crosstalk testing, the detailed test results documentation data is to be provided in an electronic database for each tested balance twisted-pair and shall contain the following information
- a) The overall Pass/Fail evaluation of the link-under-test
  - b) The date and time the measurements were made
  - c) The identification of the customer site as specified by the end-user
  - d) The name of the test limit selected to execute the stored test results
  - e) The name of the personnel performing the test
  - f) The version of the test software
  - g) PS ANEXT, worst case margin for all four pairs
  - h) Average PS ANEXT, worst case margin
  - i) PS AACR-F, worst case margin for all four pairs
  - j) Average PS AACR-F, worst case margin










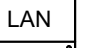





B. Record copy and as-built drawings
































































1. Provide record copy drawings periodically throughout the project as requested by the Construction Manager or Owner, and at end of the project on a CD or DVD. Record copy drawings at the end of the project shall be in CAD format and include notations reflecting the as built conditions of any additions to or variation from the drawings provided such as, but not limited to cable paths and termination point. The as-built drawings shall include, but are not limited to block diagrams, frame and cable labeling, cable termination points, equipment room layouts and frame installation details. The as-builts shall include all field changes made up to construction completion:
  - a) Field directed changes to pull schedule.
  - b) Horizontal cable routing changes.
  - c) Associated detail drawings.




**END OF SECTION**



COMMUNICATIONS SYSTEMS	
	CEILING MOUNTED WIRELESS ACCESS POINT
	WALL MOUNTED WIRELESS ACCESS POINT
	EXTERIOR MOUNTED ANTENNA
	COMMUNICATIONS OUTLET AND (#) NUMBER OF NETWORK JACKS
	EXISTING COMMUNICATIONS OUTLET AND (#) NUMBER OF JACKS
	EXISTING COMMUNICATIONS OUTLET TELEPHONE OR NETWORK TO BE REMOVED INCLUDING ASSOCIATED CABLING BACK TO SOURCE.
	CEILING COMMUNICATIONS OUTLET AND (#) NUMBER OF NETWORK JACKS
	TEXT ADJACENT TO TELEPHONE SYMBOL INDICATES PHONE MOUNTING/PLACEMENT (Y) AND PHONE TYPE (Z). REFER TO LIST BELOW FOR DEFINITIONS
<div><div>W</div><div>D</div><div>A</div><div>ELV</div><div>FAX</div><div>KEM</div><div>B</div><div>B-IP</div><div>C</div><div>E</div><div>O</div><div>S</div><div>V</div><div>CBE</div></div> <div><div>WALL MOUNTED DEVICE</div><div>DESK PLACEMENT</div><div>ANALOG LINE</div><div>ELEVATOR LINE</div><div>FAX LINE</div><div>KEY EXPANSION MODULE</div><div>BASIC TYPE PHONE (ANALOG)</div><div>BASIC TYPE PHONE (IP)</div><div>CONFERENCE TYPE PHONE</div><div>ENHANCED TYPE PHONE</div><div>OFFICE TYPE PHONE</div><div>STANDARD TYPE PHONE</div><div>VIDEO TYPE PHONE</div><div>CALL BOX ENCLOSURE</div></div>	
	2 POST DATA RACK
	DATA CABINET - "W" INDICATES WALL MOUNT
	4 POST DATA RACK
	CABLE LADDER RACK
	MAIN TELECOMMUNICATIONS GROUNDING BUS BAR
	TELECOMMUNICATIONS GROUNDING BUS BAR
	UNDERGROUND TELECOMMUNICATIONS CONDUITS

AUDIO VISUAL LEGEND	
	AUDIO VIDEO INPUT
	COMBINATION CLOCK/SPEAKER DIGITAL EMERGENCY DISPLAY
	DIGITAL EMERGENCY DISPLAY
<div><div>L= LARGE DISPLAY</div><div>DS= DOUBLE SIDED LARGE DISPLAY</div><div>PE= PROTECTIVE ENCLOSURE</div></div>	
	IP SPEAKER - CEILING TYPE
	ANALOG CEILING SPEAKER
	ANALOG HORN
	IP SPEAKER - WALL TYPE
	ANALOG WALL SPEAKER
	NOTIFICATION APPLIANCE CIRCUIT BOOSTER
	VOLUME CONTROL
	CLOCK
	COMBINATION CLOCK/SPEAKER
	PA SYSTEM RACK
	IP ELECTRONIC DISPLAY
<div><div>DSC= DUAL SIDED CEILING MOUNT</div><div>DSW= DUAL SIDED WALL MOUNT</div></div>	

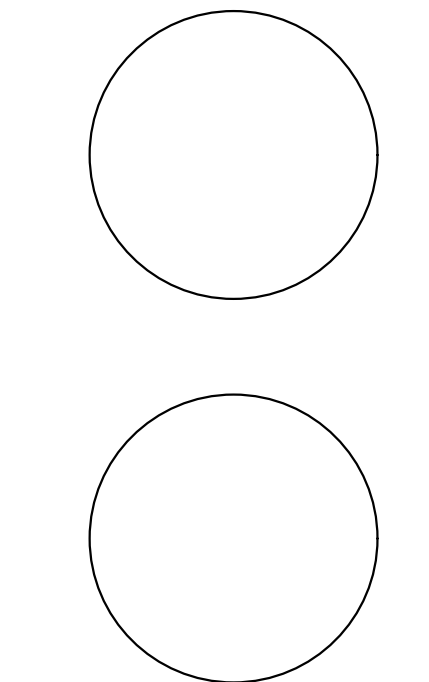
SECURITY LEGEND	
	CARD READER
	DOOR ACCESS CONTROL PANEL
	DOOR RELEASE BUTTON
	DOOR CONTACT F=FLOOR TYPE
	MAIN DISTRIBUTION FRAME (DATA RACK)
	MISCELLANEOUS
	MAIN LUGS ONLY
	MULTI MODE FIBER
	MAIN TELECOMMUNICATIONS GROUND BAR
	NORMALLY CLOSED
	NATIONAL ELECTRIC CODE
	NATIONAL ELECTRICAL MANUFACTURES ASSOCIATION
	NON FUSED
	NATIONAL FIRE PROTECTION ASSOCIATION
	NOT IN CONTRACT
	NORMALLY OPEN OR NUMBER
	NOT TO SCALE
	POLE
	PROTECTIVE ENCLOSURE
	PHASE
	PANEL
	POLYVINYL CHLORIDE
	POWER
	POWER SUPPLY
	QUANTITY
	RIGID GALVANIZED STEEL
	SINGLE MODE FIBER
	SPARE
	SAFETY SWITCH
	SHUNT TRIP
	SWITCH
	SYMMETRICAL
	TELEPHONE
	TELECOMMUNICATIONS GROUND BAR
	TELECOMMUNICATIONS INTERMEDIATE DISTRIBUTION FRAME
	TELECOMMUNICATIONS MAIN DISTRIBUTION FRAME
	TELECOM SERVICE ROOM
	TYPICAL
	UNDERGROUND OR UNDERGRADE
	UNDERWRITERS LABORATORIES
	UNLESS OTHERWISE NOTED, UNLESS NOTED OTHERWISE
	UON, UNO
	VOLT
	VERIFY IN FIELD
	VANDAL PROOF
	WIRE
	WIRE GUARD
	WEATHER PROOF
	TRANSFORMER
	EXPLOSION PROOF
	DELTA
	WYE
	PHASE

EXISTING, NEW, REMOVAL NOTATION LEGEND	
	DASHED AND / OR HATCHED INDICATES EXISTING EQUIPMENT TO BE REMOVED
	SOLID LIGHT INDICATES EXISTING TO REMAIN EQUIPMENT
	HEAVY & SOLID INDICATES EQUIPMENT TO BE PROVIDED NEW
<div>(E)</div>	EXISTING EQUIPMENT TO REMAIN. MAINTAIN EXISTING ELECTRICAL CONNECTIONS UNLESS OTHERWISE NOTED
<div>(RE)</div>	EXISTING EQUIPMENT TO BE REMOVED AND RELOCATED AS SHOWN. DISCONNECT AND REMOVE, REINSTALL AT NEW LOCATION AND RECONNECT ITEM AS REQUIRED
<div>(R)</div>	EXISTING EQUIPMENT TO BE REMOVED AND REPLACED WITH NEW.

GENERAL ABBREVIATIONS	
A	AMPERES
ACLG	ABOVE CEILING
ADA	AMERICANS WITH DISABILITIES ACT
AF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AHJ	AUTHORITY HAVING JURISDICTION
AIC	AMPERE INTERRUPTING CAPACITY
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ATS	AUTOMATIC TRANSFER SWITCH
BFG	BELOW FINISH GRADE
BLDG	BUILDING
BMS	BUILDING MANAGEMENT SYSTEM (BY M.C.)
C	CONDUIT
CB	CIRCUIT BREAKER
CBE	CALL BOX ENCLOSURE
CBM	CERTIFIED BALLAST MANUFACTURERS
CLF	CURRENT LIMITING FUSE
CU	COPPER
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ERCB	ELECTRICAL ROOM GROUND BAR
EWC	ELECTRIC WATER COOLER
F	FUSE
FA	FIRE ALARM
FDP	FIBER DISTRIBUTION PANEL
FLA	FULL LOAD AMPERES
FT	FEET
GFCI	GROUND-FAULT CIRCUIT INTERRUPTER
GFI	GROUND-FAULT INTERRUPTER
GND, G	GROUND OR GROUNDING
HOA	HAND, OFF, AUTOMATIC SWITCH
IDF	INTERMEDIATE DISTRIBUTION FRAME (DATA RACK)
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
IP	INTERNET PROTOCOL
KCMIL	THOUSAND CIRCULAR MILS
KVA	KILOVOLT AMPERES
KW	KILOWATTS
LTG	LIGHTING
LPM	LIGHTNING PROTECTION MODULE
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MDF	MAIN DISTRIBUTION FRAME (DATA RACK)
MISC	MISCELLANEOUS
MLO	MAIN LUGS ONLY
MTF	MULTI MODE FIBER
MTGB	MAIN TELECOMMUNICATIONS GROUND BAR
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURES ASSOCIATION
NF	NON FUSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN OR NUMBER
NTS	NOT TO SCALE
P	POLE
PE	PROTECTIVE ENCLOSURE
PH	PHASE
PNL	PANEL
PVC	POLYVINYL CHLORIDE
PWR	POWER
PS	POWER SUPPLY
QTY	QUANTITY
RGS	RIGID GALVANIZED STEEL
SMF	SINGLE MODE FIBER
SP	SPARE
SS	SAFETY SWITCH
ST	SHUNT TRIP
SW	SWITCH
SYM	SYMMETRICAL
TEL	TELEPHONE
TGB	TELECOMMUNICATIONS GROUND BAR
TIDF	TELECOMMUNICATIONS INTERMEDIATE DISTRIBUTION FRAME
TMDF	TELECOMMUNICATIONS MAIN DISTRIBUTION FRAME
TSR	TELECOM SERVICE ROOM
TYP	TYPICAL
UG	UNDERGROUND OR UNDERGRADE
UL	UNDERWRITERS LABORATORIES
UNO, UNO	UNLESS OTHERWISE NOTED, UNLESS NOTED OTHERWISE
V	VOLT
VIF	VERIFY IN FIELD
VP	VANDAL PROOF
W	WIRE
WG	WIRE GUARD
WP	WEATHER PROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
△	DELTA
▽	WYE
∅	PHASE

GENERAL DEMOLITION NOTES	
A.	WHEN EXISTING CONSTRUCTION, WHICH IS TO REMAIN, IS DAMAGED DURING THE COURSE OF REMOVAL AS A RESULT OF THE CONTRACTOR'S WORK, IT SHALL BE REPAIRED AND/OR REPLACED WITH SIMILAR OR LIKE MATERIALS, AS MUCH AS POSSIBLE, SUBJECT TO THE OWNERS APPROVAL. THE CONTRACTOR IS RESPONSIBLE FOR THE REMOVAL AND REPLACEMENT OF EXISTING CONSTRUCTION IN THE WAY OF DIVISION 26, 27 & 28 NEW WORK. PROTECT BUILDING AND FURNISHINGS FROM DAMAGE.
B.	COORDINATE PHASING OF WORK WITH OWNER'S AUTHORIZED REPRESENTATIVE. IT IS THE REQUIREMENT OF THE PROJECT THAT THE CONSTRUCTION WORK BE PHASED TO FACILITATE MINIMUM IMPACT TO THE NORMAL OPERATION OF THE FACILITY. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO THOROUGHLY REVIEW THE GENERAL CONDITIONS AND THE BID DOCUMENTS FOR THE PHASING REQUIREMENTS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE FOR ALL TEMPORARY SERVICES TO FACILITY PHASING REQUIREMENTS WITHOUT INTERRUPTION OF THE COMMUNICATION AND SECURITY SYSTEMS.
C.	EXISTING CONDITIONS ARE TAKEN FROM FIELD OBSERVATIONS AND PRIOR CONSTRUCTION DOCUMENTS WHEN AVAILABLE AND ARE NOT GUARANTEED. PRIOR TO SUBMITTING BID, CONTRACTOR IS TO VISIT SITE AND IDENTIFY EXISTING CONDITIONS AND DIFFICULTIES THAT WILL AFFECT THE REMOVAL WORK. NO COMPENSATION WILL BE GRANTED FOR ADDITIONAL WORK CAUSED BY UNFAMILIARITY WITH SITE CONDITIONS THAT ARE VISIBLE OR READILY CONSTRUED BY EXPERIENCED OBSERVERS. THIS CONTRACTOR SHALL PARTICIPATE IN SURVEY OF THE EXISTING COMMUNICATION AND SECURITY SYSTEMS. THE CONTRACTOR SHALL DISCONNECT AND CAP ALL SERVICE LINES TO BE DISCONNECTED FOR THOSE SERVICES WHICH NORMALLY ARE INCLUDED IN THIS FIELD OF WORK. PARTICULAR CARE SHALL BE TAKEN TO AVOID CREATING HAZARD OR CAUSING DISRUPTION IN ADJOINING AREAS. NOT ALL DEVICES TERMINATIONS, JUNCTION BOXES AND WIRING HAVE BEEN SHOWN FOR DRAWING CLARITY.
D.	REFER TO ALL OTHER TRADES CONTRACT DRAWINGS AND SPECIFICATIONS FOR EXACT QUANTITIES AND LOCATIONS OF ALL EQUIPMENT BEING ABANDONED OR REMOVED, WHICH WILL REQUIRE DE-ENERGIZING OF EQUIPMENT, REMOVAL AND BLANK-OFF BY THE DIVISION 26 CONTRACTOR.
E.	DISCONNECT AND REMOVE EXISTING COMMUNICATION AND SECURITY EQUIPMENT AND ASSOCIATED CONTROLS, BOXES, CONDUIT, WIRE, ETC. WHERE INDICATED OR WHERE LOCATED ON OR WITHIN WALLS, CEILINGS OR FLOORS TO BE REMOVED, UNLESS OTHERWISE INDICATED. REMOVE CIRCUITS BACK TO THEIR ORIGIN UNLESS OTHERWISE REQUIRED FOR EXISTING EQUIPMENT TO REMAIN. OPERATION AND CIRCUITING OF EQUIPMENT TO REMAIN SHALL NOT BE ALTERED DUE TO THE REMOVALS.
F.	MAINTAIN AND RESTORE, IF INTERRUPTED BY REMOVALS OR IN PATH OF NEW CONSTRUCTION, ALL CIRCUITS, CONDUITS AND FEEDERS PASSING THROUGH AND SERVING UNDISTURBED AREAS (SHOWN OR NOT SHOWN).
G.	ALL EXISTING CONDUITS STUBBED THROUGH FLOOR SERVING ITEMS TO BE REMOVED AND NOT SHOWN OR REQUIRED TO BE REUSED, SHALL BE CUT OFF FLUSH WITH SLAB, LEVEL WITH CONCRETE.
H.	IN ANY AREA REQUIRING THE PERFORMANCE OF ANY TRADE'S WORK, DIVISION 26, 27 & 28 CONTRACTOR SHALL CAREFULLY REMOVE AND STORE ANY OR ALL COMMUNICATION AND SECURITY ITEMS IN PATH OF WORK, REINSTALLING AND RECONNECTING SAME AS REQUIRED, IN ACCORDANCE WITH THE PLANS AND/OR AS DIRECTED AFTER COMPLETION OF OTHER TRADE'S WORK IN THAT AREA.
I.	INVENTORY MAJOR COMMUNICATION AND SECURITY ITEMS THAT ARE REMOVED AND PROVIDE A LIST TO THE OWNER FOR THEIR SELECTION OF ITEMS TO BE RETAINED. ALL ITEMS REJECTED BY THE OWNER SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE. ALL EQUIPMENT INDICATED TO BE TURNED OVER TO THE OWNER SHALL BE DISCONNECTED AND REMOVED FROM THE EXISTING SYSTEMS IN GOOD WORKING CONDITION AND DELIVERED (INCLUDING LOADS) AND UNINSTALLATION IS THE RESPONSIBILITY OF THE CONTRACTOR. THE STORAGE OF ALL MATERIAL SHALL BE IN AREAS OR LOCATIONS APPROVED BY THE OWNER. THE STORAGE OF ALL MATERIAL IS THE RESPONSIBILITY OF THE CONTRACTOR, AFTER COMPLETION OF ALL REMOVAL OR NEW WORK, THE CONTRACTOR SHALL REINSTALL THE CEILING SYSTEMS TO MATCH THE ORIGINAL INSTALLATIONS. ANY CEILING SYSTEM COMPONENT DAMAGED DURING REMOVAL, STORAGE OR REINSTALLATION SHALL BE REPLACED WITH NEW AT NO EXPENSE TO THE OWNER.
K.	UNLESS SHOWN ON THE DRAWINGS, IT IS THE RESPONSIBILITY OF THIS CONTRACT TO PATCH AND FINISH ALL EXISTING CONDUIT PENETRATIONS THROUGH FLOORS AND WALLS AFTER REMOVAL.
L.	EXISTING COMMUNICATION AND SECURITY EQUIPMENT, ACCESSORIES, WIRING OR CONDUIT THAT WILL NOT BE UTILIZED FOR THE INSTALLATION OR OPERATION OF THE NEW COMMUNICATION AND SECURITY SYSTEM SHALL BE DISCONNECTED AND REMOVED. NO EQUIPMENT, ACCESSORIES, WIRING OR CONDUIT SHALL BE ABANDONED IN PLACE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW, TEST AND DOCUMENT THE OPERATION OF EXISTING COMMUNICATION AND SECURITY AND SPECIAL SYSTEMS SERVING RENOVATED AREAS AND SYSTEMS THAT MIGHT EXTEND OUTSIDE OF THE RENOVATED AREA TO PREVENT THE POSSIBILITY OF DAMAGE OR INTERRUPTION OF EXISTING SYSTEMS WHILE PERFORMING REMOVAL WORK. ALL COMMUNICATION AND SECURITY SYSTEMS SHALL BE FULLY INVESTIGATED BEFORE DISCONNECTING OF SYSTEMS TO AVOID INTERRUPTING AREAS OR SYSTEMS OUTSIDE THE INTENDED SCOPE. THE CONTRACTOR SHALL REVIEW ALL SHUT DOWNS AND REMOVAL REQUIREMENTS WITH THE OWNER. AFTER RENOVATING EXISTING ELECTRICAL WORK, THE CONTRACTOR SHALL ENSURE THAT ALL REMAINING AND NEW EQUIPMENT WILL OPERATE PROPERLY.
M.	ALL COMMUNICATION AND SECURITY WORK INDICATED TO REMAIN SHALL BE SUITABLY PROTECTED TO PREVENT ANY DAMAGE.

GENERAL NOTES (APPLY TO ALL DRAWINGS)	
A.	SLEEVE AND SEAL ALL WALL AND FLOOR PENETRATIONS. PROVIDE FIRE STOPPING FOR ALL FIRE-RATED PENETRATIONS. UTILIZE REMOVABLE FIRESTOPPING MATERIAL AT CABLE TRAY PENETRATIONS. PROVIDE ACOUSTICAL SEALANT FOR ALL NON RATED PENETRATIONS. ALL FIRE RATINGS SHALL BE MAINTAINED.
B.	MAINTAIN SERVICE CLEARANCES OF ALL EQUIPMENT.
C.	COORDINATE EXACT LOCATION OF ALL CONDUIT ROUTES, EQUIPMENT AND DEVICES WITH EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
D.	MINIMUM CONDUIT SIZE SHALL BE 1" FOR TELECOMMUNICATIONS AND 1/2" FOR ALL OTHER CIRCUITS. PROVIDE NYLON PULL STRING IN ALL EMPTY CONDUITS.
E.	PROVIDE CONDUIT/WIRING (CIRCUITING) AND REQUIRED EQUIPMENT CONNECTIONS TO ALL DEVICES/EQUIPMENT. PROVIDE AS PART OF THIS PROJECT. CONNECT TO CIRCUIT(S) AS INDICATED.
F.	PROVIDE MATCHING BRANCH CIRCUITING AND FEEDERS TO RELOCATE EQUIPMENT, DEVICES, ETC., AND MAINTAIN FEED-THROUGH WIRING AND SYSTEMS TO REMAIN. PROVIDE CUTTING, PATCHING AND PAINTING TO MATCH SURROUNDING SURFACE UNLESS NOTED OTHERWISE.
G.	PROVIDE INDIVIDUAL PUBLIC ADDRESS BRANCH CIRCUITING FROM EACH ROOM SPEAKER, AND ZONAL PUBLIC ADDRESS BRANCH CIRCUITING FROM EACH CORRIDOR/EXTERIOR SPEAKER TO INTERCOM & PAGING SYSTEM RACK. PROVIDE HARDWARE, PUNCH DOWN BLOCKS AND TESTING.
H.	PROVIDE INDIVIDUAL TELEPHONE / DATA RACEWAY FROM EACH TELEPHONE / DATA OUTLET TO ACCESSIBLE CEILING; FIRE STOPPED AT RATED PENETRATIONS.
I.	ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF NFPA CODES, FIRE CODE OF NEW YORK STATE, BUILDING CODE OF NEW YORK STATE AND NEW YORK STATE EDUCATION DEPARTMENT DESIGN STANDARDS AND AS REQUIRED BY ANY OTHER CODES, REGULATIONS AND LAWS OF LOCAL, STATE AND FEDERAL GOVERNMENTS AND OTHER AUTHORITIES WITH LAWFUL JURISDICTION. APPROVED FOR INTENDED SERVICE. ALL MATERIAL AND EQUIPMENT SHALL BE UL, NEMA, ANSI, IEEE, ADA & CEM.
J.	INSTALL EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND CONDITIONS FOR WARRANTY AND GUARANTEE. PROVIDE ALL ACCESSORIES REQUIRED FOR A COMPLETE AND SATISFACTORY INSTALLATION READY FOR CONTINUOUS USE.
K.	EQUIPMENT OR MATERIALS SHALL BE NEW AND FOR ANY GIVEN SYSTEM BE A PRODUCT OF THE SAME MANUFACTURER, UNLESS NOTED OTHERWISE.
L.	EXISTING SYSTEMS FEEDERS AND BRANCH CIRCUITS WHICH PASS THROUGH ALTERED AREAS AND SERVE OTHER AREAS SHALL BE MAINTAINED AS REQUIRED AND AS DIRECTED BY THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND AVOIDING THESE FEEDERS AND BRANCH CIRCUITS. IF DISTURBED, THEY SHALL BE REPAIRED AND BROUGHT BACK ON-LINE AS SOON AS POSSIBLE AND AT THE CONTRACTORS EXPENSE.
M.	COORDINATE ARRANGEMENT, MOUNTING AND SUPPORT OF ELECTRICAL CONDUIT TO ALLOW MAXIMUM POSSIBLE HEADROOM IN THE CEILING CAVITIES.
N.	CUT AND PATCH BUILDING CONSTRUCTION AS REQUIRED. PROVIDE U.L. LISTED FIRE STOP METHODS FOR PENETRATIONS OF FIRE-RATED BUILDING COMPONENTS OR BARRIERS PER CONTRACT SPECIFICATIONS. WATERPROOF ALL EXTERIOR OUTDOOR PENETRATIONS. THIS WORK SHALL BE SUBJECT TO INSPECTION AND APPROVAL. OBTAIN WRITTEN AUTHORIZATION FROM PROJECTS' STRUCTURAL ENGINEER PRIOR TO PENETRATING OR CUTTING ANY STRUCTURAL COMPONENTS. EXCEPT AS NOTED IN SPECIFICATIONS, ALL CUTTING AND PATCHING OF BUILDING CONSTRUCTION REQUIRED TO ACCOMMODATE THE WORK OF THIS CONTRACT SHALL BE THE RESPONSIBILITY OF THE DIVISION 27 & 28 CONTRACTOR.
O.	DIVISION 26, 27 & 28 CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO COMMENCEMENT OF ANY WORK OR SHOP FABRICATION. REQUIRED CHANGES TO WORK SHOWN ON CONSTRUCTION DRAWINGS SHALL BE APPROVED BY THE ENGINEER IN WRITING, OTHER TRADES AND OWNER AS REQUIRED PRIOR TO ANY CONSTRUCTION.
P.	COORDINATE THE WORK OF THIS CONTRACT WITH THE WORK OF OTHER CONTRACTS. COORDINATE WITH THE GENERAL CONTRACTOR FOR ALL ROOF PENETRATIONS, SOFFITS, CHASES, AND PADS. COORDINATE WITH MECHANICAL AND PLUMBING CONTRACTORS, SPECIFICATIONS, AND SCHEDULES ON DRAWINGS FOR DETERMINATION OF RESPONSIBILITY TO FURNISH AND INSTALL ELECTRICAL COMPONENTS OF MECHANICAL EQUIPMENT. COORDINATE SHUTDOWN OF EXISTING SYSTEMS WITH OWNER AND OTHER TRADES.
Q.	DIVISION 26, 27 & 28 CONTRACTOR SHALL PROVIDE NECESSARY SUPPORT FRAMING, STIFFENERS, BRACING, AND HANGERS WHETHER SHOWN OR NOT TO ENSURE A COMPLETE AND DURABLE SYSTEM. SUPPORT FRAMING CONNECTIONS SHALL BE WELDED UNLESS SPECIFICALLY SHOWN OTHERWISE. ACTUAL SUPPORTS MAY VARY FROM THOSE SHOWN IN DETAILS AND AS REQUIRED FOR EQUIPMENT TO BE FURNISHED OR FOR EXISTING FIELD CONDITIONS.







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PROJECT INFORMATION

Project Number  
2024-01CI  
Client Name  
**ERINET LDC**

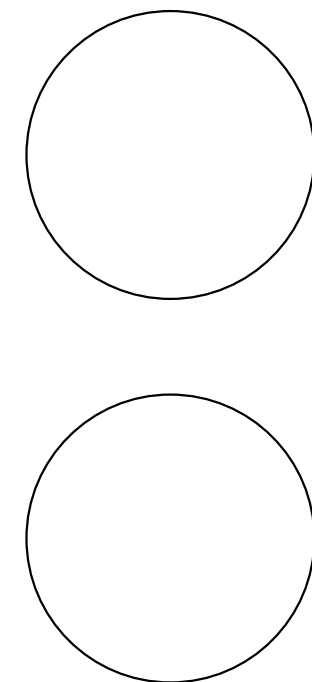
Project Name  
**ERINET POP DATA  
CENTER FIT OUT**

Address  
950 FRANKLIN STREET, BUFFALO, NY 14502

PROJECT ISSUE & REVISION SCHEDULE

No.	Date	Description
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PROFESSIONAL STAMPS

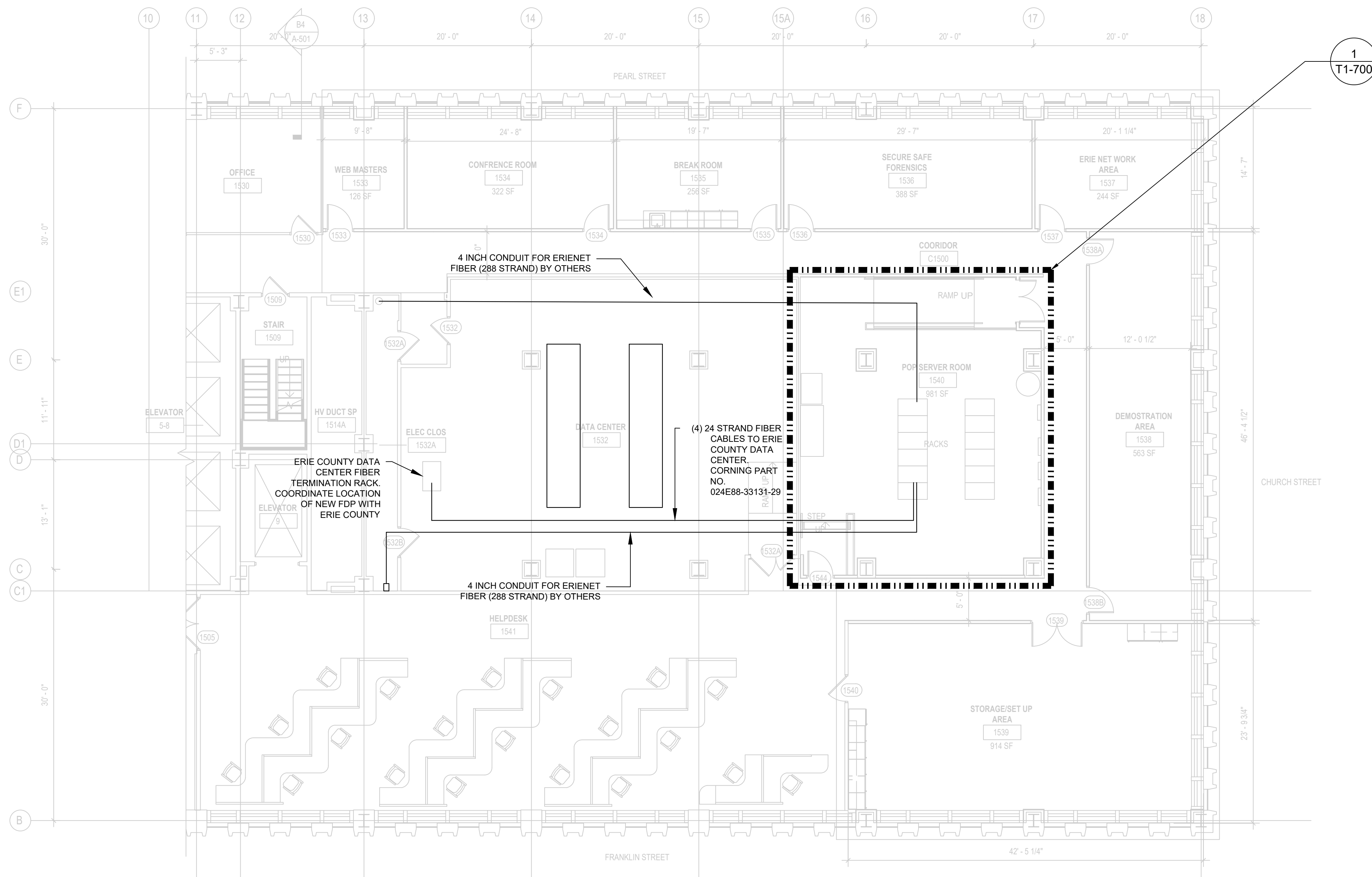


SHEET INFORMATION

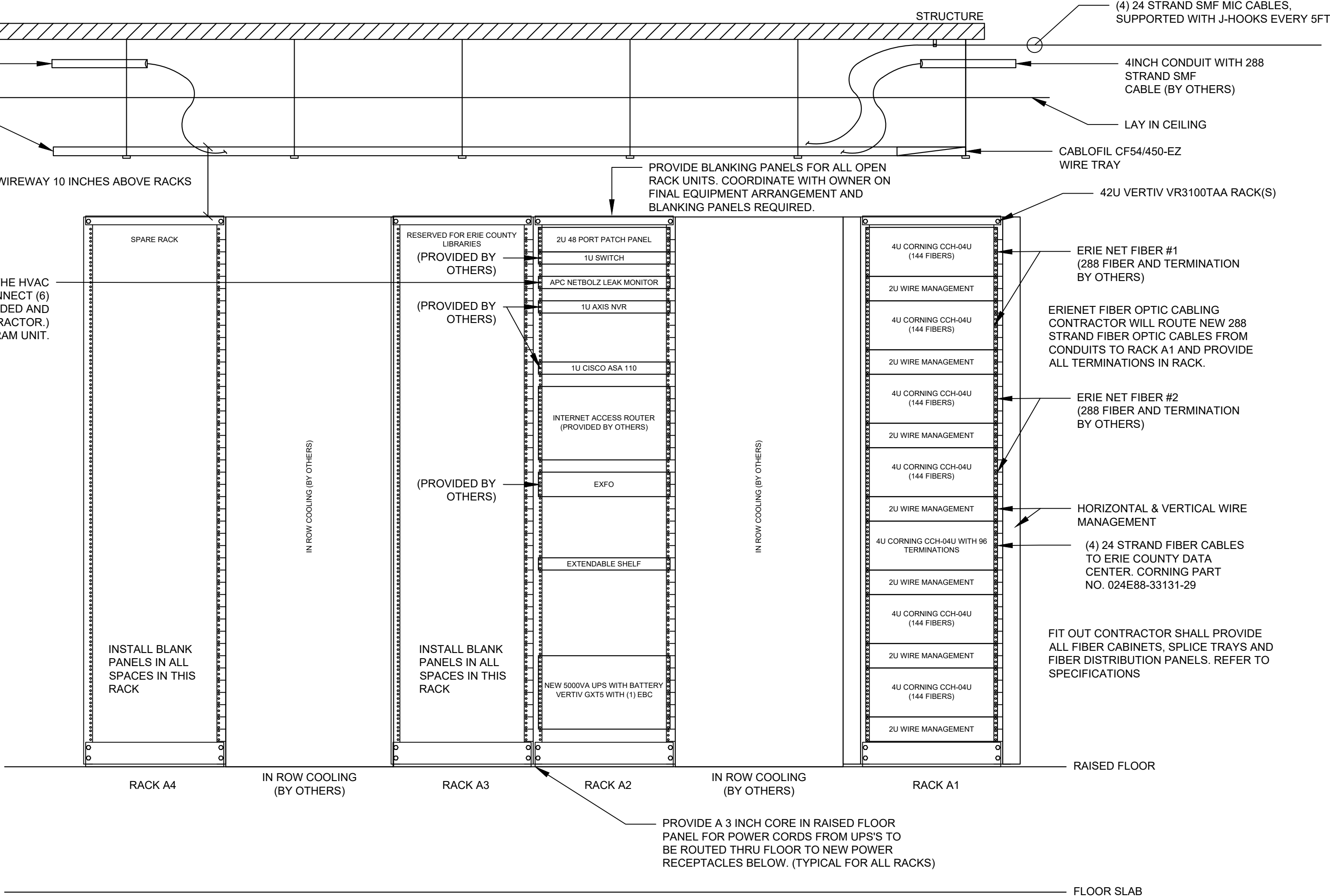
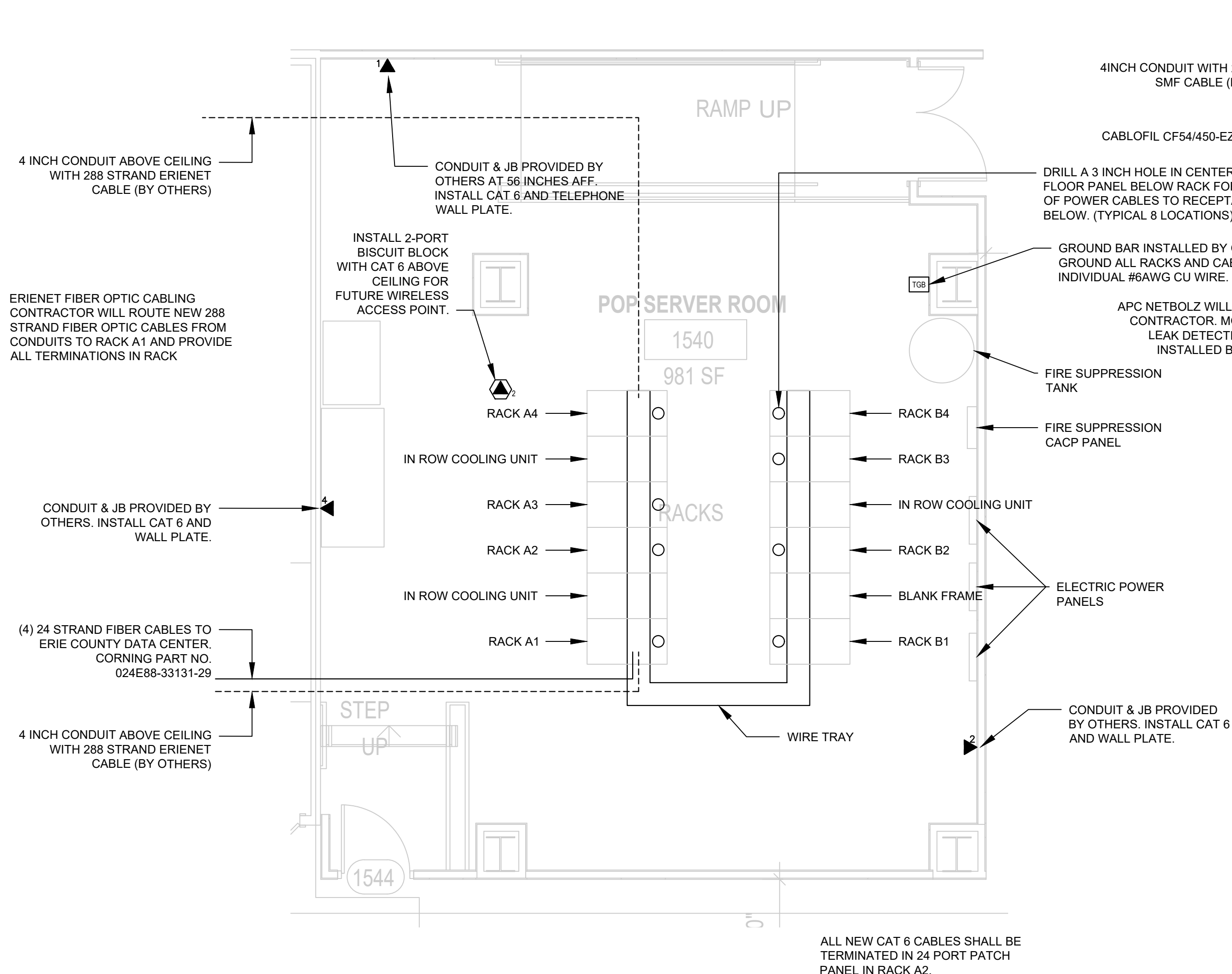
Issued 01-03-2024	Scale AS NOTED
Project Status	
Drawn By AH	Checked By BH
Drawing Title <b>PARTIAL 15TH FLOOR</b>	

Drawing Number

**T-500**



**1 RATH ERIE NET DATA CENTER FIT OUT (15TH FLOOR)**  
T-500 SCALE: 1/8"=1'-0"

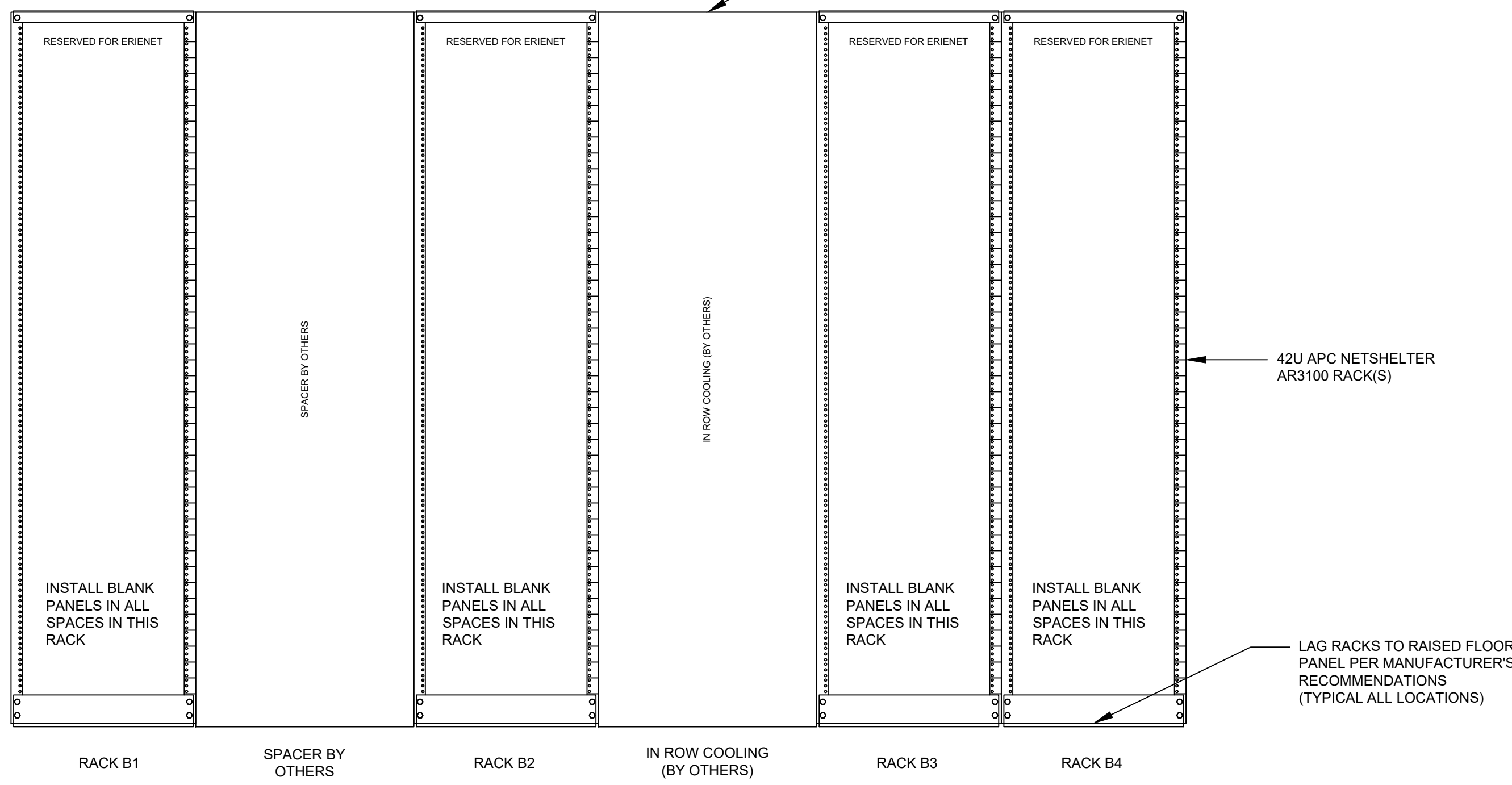
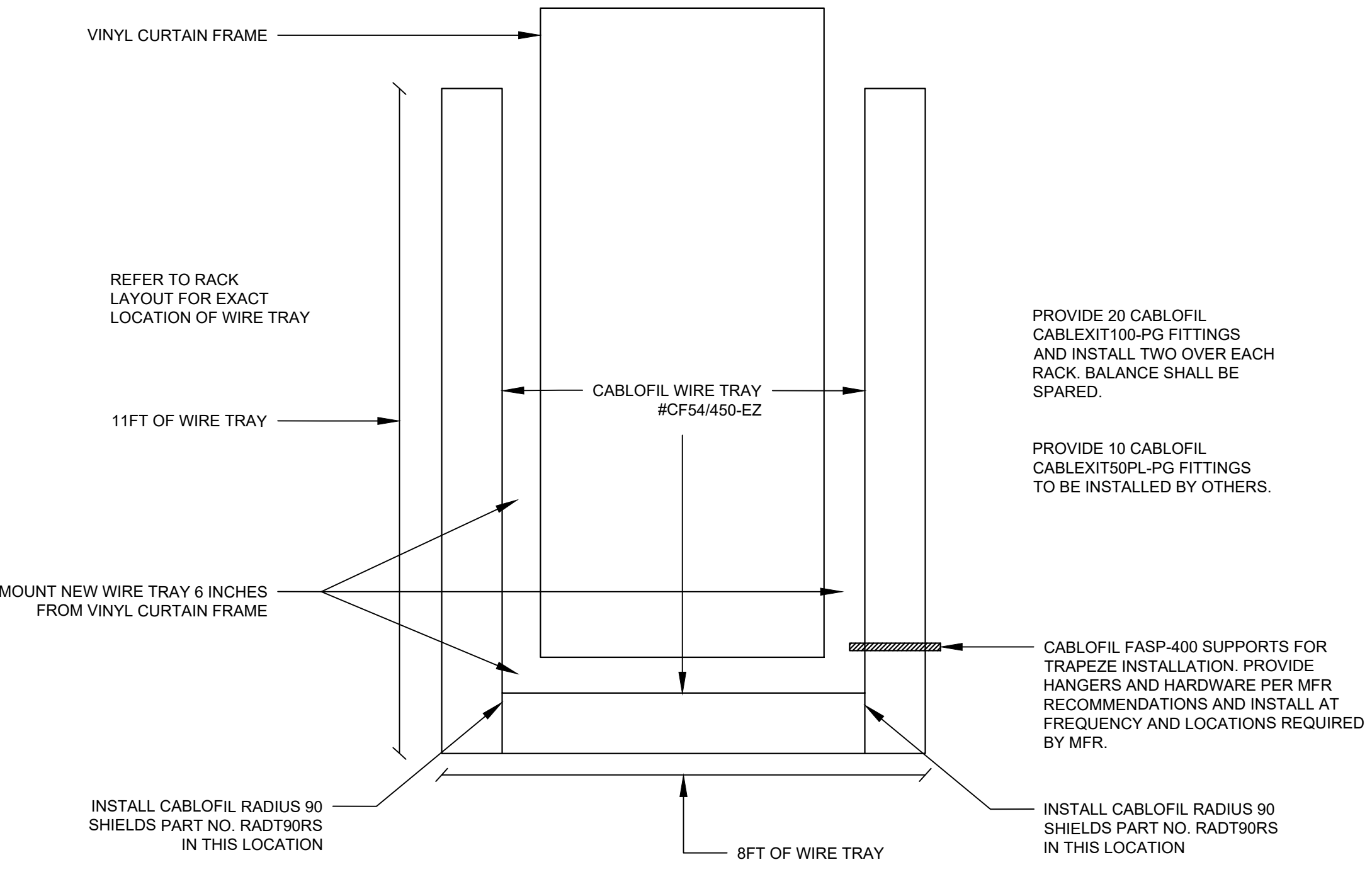


1 ERIENET RATH POP - DATA CENTER  
T-700 SCALE: 1/4"=1'-0"

3 ERIENET RATH POP - RACKS A1 THRU A4 ELEVATIONS  
T-700 SCALE: 1"=1'-0"

PROVIDE (1) VERTICAL PDU'S IN EACH FOR THE FOLLOWING RACKS:  
RACK A2, RACK A3, RACK A4, RACK B1, RACK B2  
RACK B3, RACK B4

COORDINATE RACK INSTALLATION WITH HVAC CONTRACTOR  
INSTALLING IN-ROW COOLING, BOLT RACKS AND IN-ROW  
COOLING UNITS TOGETHER PER MANUFACTURERS  
RECOMMENDATIONS. (TYPICAL ALL LOCATIONS)



2 WIRE TRAY DETAIL  
T-700 SCALE: 1/2"=1'-0"

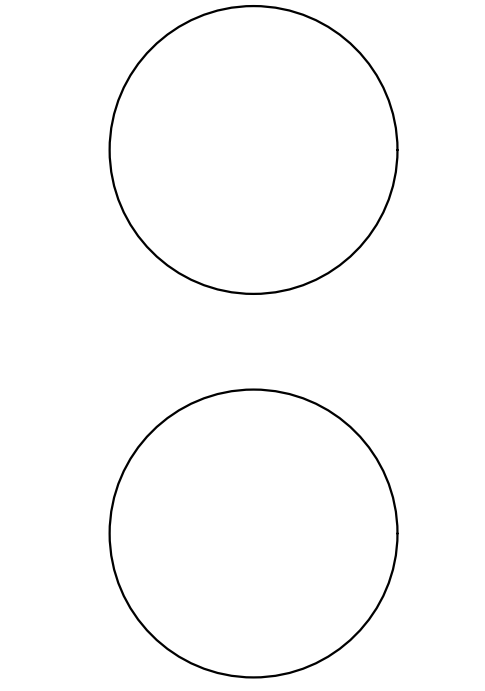
4 ERIENET RATH POP - RACKS B1 THRU B4 ELEVATIONS  
T-700 SCALE: 1"=1'-0"



PROJECT INFORMATION  
Project Number  
2024-01CI  
Client Name  
ERINET LDC  
Project Name  
ERINET POP DATA  
CENTER FIT OUT  
Address  
950 FRANKLIN STREET, BUFFALO, NY 14502

PROJECT ISSUE & REVISION SCHEDULE  
No. Date Description

PROFESSIONAL STAMPS



SHEET INFORMATION  
Issued  
01-03-2024  
Project Status  
Scale  
AS NOTED  
Drawn By  
AH  
Checked By  
BH  
Drawing Title  
DETAILS