

Cook Memorial Public Library District

Infrastructure Cabling Request for Bid

August 7, 2009

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BIDDING REQUIREMENTS

SECTION 00010 – TABLE OF CONTENTS

	Page
SECTION 00010 – TABLE OF CONTENTS	1
SECTION 00015 – LIST OF DRAWINGS	2
SECTION 00100 – ADVERTISEMENT FOR BIDS AND GENERAL INFORMATION.....	3
SECTION 00200 – INSTRUCTIONS TO BIDDERS.....	5
SECTION 00310 – PRELIMINARY SCHEDULES	20
SECTION 00410 – BID FORM	21
CRIMINAL CODE CERTIFICATION	30
EQUAL EMPLOYMENT OPPORTUNITY	31
SEXUAL HARASSMENT POLICY	33
TAX CERTIFICATION	34
SUBSTANCE ABUSE PREVENTION ON PUBLIC WORKS PROJECTS	34
SECTION 00700 – OWNER GENERAL CONDITIONS OF THE CONTRACTOR AND SUPPLEMENTARY CONDITIONS FOR CONSTRUCTION.....	35
PART 1 – GENERAL	35
PART 2 – PRODUCT – NOT USED	36
PART 3 – EXECUTION – NOT USED.....	36
SECTION 17000 – E&A GENERAL TECHNOLOGY REQUIREMENTS.....	37
PART 1 – GENERAL	37
PART 2 – PRODUCTS.....	49
PART 3 – EXECUTION	53
SECTION 17100 – COMMUNICATIONS CABLE AND EQUIPMENT	62
PART 1 – GENERAL	62
PART 2 – PRODUCTS.....	68
PART 3 – EXECUTION	86
SECTION 17120 – COMMUNICATIONS SYSTEM IDENTIFICATION AND LABELING	100
PART 1 – GENERAL	100
PART 2 – PRODUCTS.....	101
PART 3 – EXECUTION	101
SECTION 17160 – COMMUNICATION GROUNDING & BONDING.....	105
PART 1 – GENERAL	105
PART 2 – MATERIALS.....	107
PART 3 – EXECUTION	109
APPENDIX: PREVAILING WAGE RATE	111

SECTION 00015 – LIST OF DRAWINGS

T100 - Title/Index Page

Cook Park Technology Floor Plan

T200 – Basement Level Floor Plan

T201 – First Level Floor plan - Module 1

T202 – First Level Floor plan - Module 2

Aspen Drive Technology Floor Plan

T203 – First Floor plan

Technology Details

T300 - Technology Details

T301 - Technology Details

SECTION 00100 – ADVERTISEMENT FOR BIDS AND GENERAL INFORMATION

LEGAL NOTICE COOK MEMORIAL PUBLIC LIBRARY DISTRICT DATA AND VOICE INFRASTRUCTURE CABLING

ADVERTISEMENT FOR BIDS

The Board of Library Trustees of the Cook Memorial Public Library District (Attn: Assistant Director Mary Ellen Stembal), 114 N. Milwaukee Avenue, Libertyville, IL 60048 will receive sealed bids until 2:00 p.m. on September 8, 2009, for the purpose of securing a contract for data and voice infrastructure cabling at Cook Park and Aspen Drive Libraries. The bids will be publicly opened and read aloud at 801A Technology Way, Libertyville, IL 60048.

Bids shall be submitted in the form and manner contained in the Bidding Requirements.

A mandatory pre-bid conference for this project will be held at on August 24, 2009 at 2:00 p.m. at the District Warehouse located at 801A Technology Way, Libertyville, IL 60048.

A copy of the Bidding Requirements, which includes drawings and specifications, may be obtained after August 10, 2009, by contacting Sandi Parr at Elert & Associates, 140 Third Street South, Stillwater, MN 55082, phone (651) 705-1221.

In general, the work will include furnishing and installing fiber optic and copper backbone cables at Cook Park Library, horizontal station cables for data services, and equipment as needed at specified locations at Cook Park Library and Aspen Drive Library.

No bid will be considered unless the bidder shall furnish evidence satisfactory to the Board of Library Trustees that the Bidder has the necessary facilities, abilities, experience, equipment, and financial and physical resources available to fulfill the conditions of the Contract and execute the work, should the Contract be awarded to such Bidder.

Prevailing wage rates must be paid as determined by the Illinois Department of Labor.

Each bid must be accompanied by a bid bond or cashier's check in the amount of 10% of the total bid, made payable to Cook Memorial Public Library District, as a guarantee that the successful Bidder will promptly execute a satisfactory contract, will furnish a satisfactory performance and payment bond and proceed with the work. Upon failure to do so, the Bidder shall forfeit the amount deposited as liquidated damages and no mistakes or errors on the part of the Bidder shall excuse the Bidder or entitle the Bidder to a return of the aforementioned amount. Each bid must be clearly identified on the outside of the envelope as **"Bid for Infrastructure Cabling"** and shall show the name and address of the Bidder. If the bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "Sealed Bid Enclosed" on the face thereof.

The successful Bidder shall be required to provide a Performance Bond and a Material and Labor Payment Bond in the amount of 100% of the Contract Amount, as well as liability and property insurance as required by the Bidding Requirements before commencing work. The successful Bidder shall enter into a formal contract based on the conditions and requirements in the Bidding Requirements and the Bidding Requirements shall be incorporated into the Contract. The successful Bidder will be required to comply with the provisions of all State of Illinois and federal laws concerning public works projects, including but not limited to the Illinois Human Rights Act.

The Board of Library Trustees reserves the right to reject any and all bids, including without limitation the rights to reject any or all nonconforming, non-responsive, unbalanced, or conditional bids, and reserves the right to waive any technicalities and irregularities.

By order of the Board of Library Trustees of the Cook Memorial Public Library District, Lake County, Illinois.

Dated this ____ day of _____, 2009 at Libertyville, Illinois.

Secretary, Board of Library Trustees
Cook Memorial Public Library District,
Lake County, Illinois

SECTION 00200 – INSTRUCTIONS TO BIDDERS

1.01 DEFINITIONS

The following terms may be used within this document:

- A. Documents: The complete package of Bidding and Contract Requirements, related Division 17 sections, drawings, schedules, and addendums that make up this Request for Bid.
- B. Work: The provision of products and/or services to meet the requirements specified in these documents.
- C. Owner: Refers to Cook Memorial Public Library District.
- D. Consultant: Refers to Elert & Associates.
- E. Bidder: Vendors who are engaged in the process of submitting a bid for consideration by the Owner and Consultant.
- F. Contractor: The Bidder engaged by the Owner with a contract to complete the Work.
- G. Notice to Proceed: Written notice provided by Cook Memorial Public Library District to the Contractor authorizing the Contractor to proceed with the Work and establishing the date for completion of the Work.

1.02 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders shall examine all documents, shall visit each site and record their own investigations, and shall inform themselves of all conditions under which the Work is to be performed at the sites of the Work, the structure of the ground, the obstacles which may be encountered, all of the conditions of the documents, including superintendence of the Work, requirements of temporary environmental controls, the time of completion, furnishing a list of subcontractors, and all other relevant matters which may affect the Work or the bid process.
- B. Failure to make the examination shall not result in any Change Order requests.
- C. The Bidder shall base the bid on materials complying with the plans and specifications, and shall list all materials where the bid form requires.

1.03 PROJECT SITE(S) INSPECTIONS

- A. The Contractor shall visit the project site(s) and become thoroughly familiar with all elements of the project.
- B. The Contractor shall verify all conditions required for the project.
- C. Failure to thoroughly review the site(s) and conditions will not relieve the Contractor from completing the job as specified. Ignorance of the site conditions will not be the basis for any change order request.

1.04 MANDATORY PRE-BID CONFERENCE

- A. A mandatory pre-bid conference for this project will be held at on August 24, 2009 at 2:00 p.m. at the District Warehouse located at 801A Technology Way, Libertyville, IL 60048.
- B. The purpose of this meeting is to provide potential bidders with more information and to answer questions.

1.05 BID SECURITY

- A. Each bid shall be accompanied by a bid bond or cashier's check in the sum of not less than 10% of the total bid amount made payable to Owner, conditioned upon the Bidder entering into a contract with Owner in accordance with the terms of its bid. Any bonding company used must be licensed in the state of Illinois.
- B. It is agreed that the bid security will constitute liquidated damages, and not a penalty, for the failure or refusal of the successful Bidder to execute and deliver the contractual documents, in a correct form, within ten (10) days after receipt of the contractual documents. No mistakes or error on the part of the Bidder shall excuse the Bidder or entitle the Bidder to a return of the bid security.
- C. This bid security shall be returned within 30 days after the bid opening for all except the Successful Bidder. For the Successful Bidder, return shall be made after the execution of the Contract and receipt of the Performance Bond, Labor and Material Payment Bond and certificates of insurance.

1.06 INSURANCE

- A. The successful Bidder shall purchase and maintain such insurance as will protect it from claims set forth below which may arise out of or result from its operations under the contract whether the operations be by them, by a subcontractor, or by anyone employed by them.

- B. The successful Bidder agrees to indemnify and save the Owner harmless from any and all claims, demands, damages, actions, or causes of action, arising or to arise against the Owner by reason of the successful Bidder's performance of the contract, as more fully set forth in Section 1.25.
- C. Such insurance shall be acquired for and on behalf of the successful Bidder in protecting them from claims for damages for bodily injuries, including sickness or disease, death and for care and loss of services, as well as from claims for property damages, including loss of use, which may arise from operations under the contract, whether such operations be by the selected Bidder or anyone directly or indirectly employed by them.
- D. The successful Bidder is required to carry the following insurance coverage and types at a minimum:
1. Comprehensive General Liability: Coverage shall have minimum limits of \$1,000,000 each occurrence and \$5,000,000 aggregate combined single limit for bodily injury liability and property damage liability. This shall include premises and operations, independent contractors, products and complete operations, contractual liability, and personal injury liability. This shall be maintained for three (3) years after completion of work if this policy is on a claim made basis.
 2. Business and Auto Liability: Coverage shall have minimum limits of \$500,000 per occurrence and \$1,000,000 aggregate, combined single limit for bodily injury liability and property damage liability. This shall include owned vehicles, hired and non-owned vehicles, and employee non-ownership.
 3. Property Insurance: Coverage shall be all risk and shall be in a broad form basis, including coverage for explosion, collapse, and damage in and around facilities. The coverage also should include off-site and in-transit exposures.
 4. Worker's Compensation:
State: Statutory
Applicable Federal: Statutory
Employer's Liability: \$100,000 per Accident, per Employee
 \$1,000,000 Disease, Policy aggregate
 \$100,000 Disease, each Employee
- E. Professional Liability Insurance in the amount per claim per occurrence equal to a minimum of \$1,000,000 with insurance to be maintained for three (3) years after completion of the work.

- F. Certificates shall name the Owner as an additional insured on all liability policies except for professional liability. The successful Bidder shall furnish prior to the start of work, certificates of insurance. Certificates furnished by the successful Bidder or its subcontractors shall contain a clause stating, "Owner is to be notified in writing at least thirty (30) days prior to cancellation of, expiration of, or any material change in, the policy." Such notice is to be sent to Owner's Purchasing Agent.
- G. The company providing insurance for the successful Bidder and its subcontractors must be licensed to do business in the State of Illinois and be acceptable to the Owner.
- H. The successful Bidder shall be responsible for all losses that fall under any deductibles on required insurance coverage.
- I. The Contractor shall require that every subcontractor of any tier obtain insurance of the same character as that required of Contractor, naming the same additional insured and subject to the same restrictions and obligations as set forth for the Contractor's insurance in the Documents.

1.07 INTERPRETATIONS AND CHANGES BY ADDENDA

- A. If any Bidder is in doubt as to the meaning of any part of the Plans or Specifications, s/he may submit a written request to Elert & Associates for an interpretation of that part. It shall be the responsibility of the Bidder to gain a clear and comprehensive understanding of the bid documents requirements. It shall be the responsibility of the Bidder to obtain interpretations or clarifications before submitting a bid. Any interpretation or change will be made only by addendum numbered, dated, and issued to each Bidder on record of receiving a set of bid documents. Neither Elert & Associates nor Owner shall be responsible for any other explanations or interpretations of the documents.
- B. Requests should be sent to:

Felix Fayngersh
Elert & Associates
140 Third Street South
Stillwater, MN 55082
Fax (651) 430-2661
- C. Questions may not be directed to Owner personnel or any other parties.
- D. Requests and questions may be submitted only until 1:00 p.m. on September 3, 2009.

- E. No addenda will be issued later than 48 hours prior to the time and date for receipt of bids except an addendum postponing or withdrawing the request for bids. This time limit does not include weekends or holidays.

1.08 PREPARATION OF BID

- A. The Bidder shall submit the bid on the furnished form. The blank spaces on the bid must be filled in correctly with ink or typewriter. Pencil is unacceptable. A bid containing an alteration or erasure of any price contained in the bid, which is used in determining the lowest responsible bid, may be rejected unless the alteration or erasure is corrected as herein provided.
- B. An alteration or erasure may be crossed out and the correction printed in ink or typewritten adjacent to it and initialed in ink by the person signing the bid. In the event that any price used in determining the lowest responsible bid is expressed in both written and numerical form, the written representation shall govern all cases. If the Design and Specifications include alternates, each Bid shall include each alternate. Bids that fail to include each alternate may be rejected.
- C. The Bidder must submit with her/his bid all catalogues, drawings, specifications, descriptive information, and other details of equipment or materials included in its bid but not specifically named by manufacture and model number in this specification, so that the merits of the various designs may be determined by the Consultant. Failure to comply may be cause for rejection.
- D. Bids must contain the signature of an authorized agent empowered to bind the Bidder in a contract.

1.09 INCURRING COSTS

- A. Owner is not liable for any costs incurred with replying to this Bid.

1.10 CONTRACTOR QUALIFICATIONS

- A. By submitting the bid, the Bidder certifies as to meeting the following requirements:
 - 1. Has completed five (5) or more projects of at least 90% of the size or value of the division of Work being bid and the type of work completed is similar to the Work being bid. If a greater magnitude of experience is deemed necessary, other than size or value of the work, such requirements will be described in the appropriate technical section of these specifications.

2. Has access to all necessary equipment and has organizational capacity and technical competence necessary to do the work properly and expeditiously.
3. Maintains a permanent place of business in the state of Illinois.
4. Maintains a minimum of fifteen (15) full time installers.
5. Employs at least one (1) full time RCDD. Proof shall accompany bid response.
6. Employs a minimum of three (3) full time installers/technicians certified in the connectivity solutions that will be installed on this project. Proof of certification and list of certified installers must accompany bid response.
7. Provides sworn financial statement upon request, which evidences the Bidder has adequate financial resources to complete the work being proposed, as well as all other work the Bidder is presently under contract to complete.
8. Is bondable for the terms of the proposed contract.
9. Has a documented safety program with a history of satisfactory past performance as determined by the Owner in consultation with the Consultant.
10. A minimum of three (3) like job references from within the last two years are required to accompany bid response and must include job description, point of contact, mailing address, and telephone number.
11. Has a record of satisfactorily completing past projects. Criteria that will be considered in determining satisfactory completion of projects by Contractor will include the following:
 12. Completed contracts in accordance with the Contract Documents.
 13. Diligently pursued execution of the work and completed contracts according to the established time schedule.
 14. Fulfilled guarantee requirements of the Contract Documents.
- B. The Owner will make such investigations as is deemed necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. Before award of contract can be approved, the Owner shall be satisfied that the Bidder involved meets the above requirements. The Owner reserves the right to reject the bid if the evidence submitted by, or investigation of, the Bidder fails to satisfy Owner that the Bidder is responsible and qualified to carry out the obligations of the contract and to complete the work contemplated therein.

1.11 CONSIDERATION OF BIDS

- A. The Owner reserves the right to accept or reject any or all bids, or parts of bids, and to waive any technicalities and irregularities therein.

1.12 ALTERNATE BIDS

- A. Bidder shall carefully read requests for Alternate Bids and shall thoroughly examine the Construction Site(s) to determine the extent the various changes and conditions will affect the Bid.
- B. Space is provided in the Bid Form for requested Alternate Bids. Failure to submit a Bid for any requested Alternate Bid may result in rejection of the entire Bid.
- C. Bidder shall state the amount to be added to or deducted from the Base Bid for making the changes, including all incidentals, omissions, additions, and adjustments as may be necessary or required by such changes. If there is no difference in price, the Bidder shall state, "No Change."
- D. All work required to execute the alternates shall conform to project specifications, drawings, and manufacturer instructions.
- E. Description of requested Alternate Bids as follows:

Alternate Bid No. 1:

All work and material required to install data outlets at Cook Park and Aspen Drive libraries utilizing Category 6 cable and components, in lieu of the Category 5e cable and components. See Section 17100 for details.

1.13 UNIT PRICES

- A. In cases where any part of the bid is to be received on the unit price basis, the quantities stated are approximate only, and will be used in making a comparison of bids. Each Bidder will be required to make her/his own estimates of the actual quantities involved and to calculate her/his unit price accordingly.
- B. The unit price may be used to add or deduct quantities of units as represented by the unit price.
- C. Failure to provide requested unit prices may result in the rejection of the Contractor's bid.
- D. A bid including unit prices may be rejected if it is found to be unbalanced.

1.14 TAXES

- A. In submitting the bid, the Bidder is understood to have included in the bid price any applicable State or Federal sales, excise, or use tax on all materials, supplies, and equipment that are to be used in the project.
- B. The Contractor acknowledges that the Owner is a tax exempt entity under the laws of the State of Illinois and that Owner shall, as part of its undertakings under this Contract, provide to the Contractor all certificates of exemptions and tax exempt numbers needed to entitle the Contractor to purchase material and other items to be used on the Work or incorporated into the Work on a tax exempt basis, said exemptions specifically to include but not be limited to the "Illinois Retailer's Occupation Tax" (sales tax). The Contractor shall warrant that all material costs and scheduled values have been calculated so as to give the Owner its full benefit of its tax-exempt status, and the Contractor shall require that all subcontracts include a requirement that subcontractors purchase materials so as to give the Owner the full benefit of its tax exempt status. The Owner shall not be liable for, and shall be entitled to a credit against the Contract Sum or Contract Price for any sales tax paid by the Contractor or any subcontractor of any tier which is shown to have been charged to the Owner as part of the Contract Sum or Contract Price, as a component of the schedule of values, as a unit price, or otherwise.

1.15 DOCUMENT SUBMISSION AND DELIVERY

- A. An original bid and two copies shall be submitted. The original and each copy shall be organized in a three-ring binder. Each copy shall include all documents, specifications, drawings, and papers to be considered in the bid evaluation. The original bond or security shall be placed with the original bid document. Each copy and the original document shall be placed into a separate sealed envelope that shall be marked to indicate the following:
1. The name and address of the Bidder
 2. The name of the project, "Bid for Infrastructure Cabling" and location
 3. Due date of Bid
 4. "If mailed, "Sealed Bid Enclosed"
- B. The bid shall be mailed or submitted as follows:

Original and one copy:	One copy for time/date stamp:
Cook Memorial Public Library District Attn: Assistant Director Stembal 114 N. Milwaukee Avenue Libertyville, IL 60048	Elert & Associates Attn: Felix Fayngersh 140 Third Street South Stillwater, MN 55082

- C. Bids arriving at Elert & Associates will not be opened until authorized by the Owner. Oral, telephone, fax, or telegraphic bids will not be accepted. No bid may be modified once it has been received by Elert & Associates and/or Owner.

1.16 WITHDRAWAL OF BIDS

- A. A Bidder may withdraw its bid at any time before the time set for the opening of bids, and a bid may be withdrawn if the Owner has not acted on it after sixty (60) days have passed from the scheduled closing time for the receipt of bids.

1.17 BID OPENING

- A. The official opening of the bids will occur at the appointed time and place as designated in Section 00310. Bidders are not required to be present at the bid opening. Information revealed publicly at that time will include only Bidder name and address, total cost amounts of base bid and alternates, and whether the bid is considered complete and qualified with regard to the required response format.

1.18 BID ACCEPTANCE

- A. The Owner reserves the right to accept or reject any or all bids, including non-conforming, nonresponsive, unbalanced or conditional bids, and to waive any technicalities or irregularities in the process. A bid once submitted shall be deemed final and binding on the Bidder, and shall constitute an option with the Owner to enter into a contract upon the terms set forth in the bid. All bid prices must be valid for 60 days from bid due date.

1.19 BID AWARD

- A. The Owner reserves the right to award the bid in whole or in part, by item, and/or by group of items where such actions serve the best interests of the Owner. Owner reserves the right to award alternates in any order that serves the best interests of the Owner.
- B. In awarding the Contract, Cook Memorial Public Library District may take into consideration the Bidder's skill, facilities, capacity, experience, responsibility, previous work record, past history with the Owner, costs, the necessity of prompt and efficient completion of work described in the proposal documents, or other factors Cook Memorial Public Library District considers relevant. Inability of Bidder to meet these conditions may be cause for rejection of the proposal.

1.20 CONTRACT

- A. The Bidder that is determined to be the successful lowest responsible bidder by the Owner shall enter into a contract with the Owner which shall incorporate by reference these Bidding Requirements.

1.21 COMMENCEMENT AND COMPLETION

- A. The successful Bidder must agree to coordinate the work schedule with General Contractor, Electrical Contractor, and Owner and commence the work on or before a date to be specified in a written "Notice to Proceed" and to fully complete all the work per the schedule outlined in Section 00310. Completion time will be converted to a specific date at the time the "Notice to Proceed" is issued. Refer also to General Conditions; article entitled "Time for Completion of the Project."

1.22 ARBITRATION AND MEDIATION

- A. Notwithstanding any inconsistent or contrary provision in any other provision of the Contract Documents, no claim or dispute arising under this Contract shall be subject to arbitration or mediation unless the parties mutually agree on a submission to arbitration or mediation, which submission shall be in writing and signed by the parties and shall set forth a specific statement of the nature of the dispute and shall contain an express statement on the limitations of the powers of the arbitrator or mediator. The parties mutually agree that in the absence of such submission, arbitration or mediation cannot be demanded or compelled by either party.

1.23 NO DAMAGES FOR DELAY

- A. The Contractor agrees that in the event of delay for any reason caused by any party or person, it will be fully compensated for the delay by an extension of time to complete the Contract and will not seek additional compensation

1.24 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- A. The successful Bidder will be required to produce a performance bond in the amount of 100 percent of the award bid and a labor and material payment bond in the amount of 100 percent of the award bid. These bonds must be furnished within 10 days of award and before commencing Work.
- B. Said bonds shall be written by a surety authorized to do surety business in Illinois and acceptable to the Owner, in the Owner's discretion. The cost thereof shall be paid by the Contractor.

1.25 COMPLIANCE WITH LAWS/STANDARDS

- A. The successful Bidder shall abide by all Federal, State, and local laws; statutes and ordinances; and rules and regulations now in effect or hereinafter adopted pertaining to this Contract or to the facilities, programs, and staff for which the successful Bidder is responsible.

1.26 INDEMNIFICATION

- A. To the fullest extent permitted by Illinois law, the Contractor shall indemnify and hold harmless the Cook Memorial Public Library District and its officers, employees and agents, from lawsuits, actions, costs (including attorneys' fees), claims or liabilities of any character caused by, resulting from, arising out of or occurring in connection with the Contractor's performance of Work under the Contract, provided that any such lawsuit, action, cost, claim or liability is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting there from but only to the extent caused by the negligent act, misconduct or omission of the Contractor or anyone or entity directly or indirectly employed by the Contractor for whose acts the Contractor may be liable. In connection with any such claims, lawsuits, actions or liabilities, the Cook Memorial Public Library District, its officers, agents, employees, representatives and their assigns shall have the right to defense counsel of their choice. The Contractor shall be solely liable for all costs of such defense and for all expenses, fees, judgments, settlements and all other costs arising out of such claims, lawsuits, actions or liabilities.

1.27 DEFAULT

- A. Force Majeure: Neither party shall be held responsible for delay or failure to perform when such delay or failure is due to any of the following unless the act or occurrence could have been foreseen and reasonable action could have been taken to prevent the delay or failure: fire, flood, epidemic, strikes, wars, acts of God, unusually severe weather, acts of public authorities, or delays or defaults caused by public carriers, provided the defaulting party gives notice as soon as possible to the other party of the inability to perform.
- B. Inability to Perform: The successful Bidder shall make every reasonable effort to maintain staff, facilities, and equipment to deliver the services to be purchased by the Owner. The successful Bidder shall immediately notify the Owner in writing whenever it is unable to; or reasonably believes it is going to be unable to provide the agreed upon quality and quantity of services. Upon such notification, the Owner shall determine whether such inability requires a modification or cancellation of this Contract.

- C. Duties to Mitigate: Both parties shall use their best efforts to mitigate any damages that might be suffered by reason of any event giving rise to a remedy hereunder.

1.28 NON-DISCRIMINATION AND SEXUAL HARASSMENT POLICY

- A. The Contractor as a party to a public contract agrees to refrain from unlawful discrimination in employment and take all necessary actions to assure equality of employment.
- B. By submission of the bid proposal, the Bidder certifies that it is an “equal opportunity employer” as defined by federal and state law. The Equal Opportunity Clause, Section 6.1 of the Rules and Regulations of the Department of Human Rights of the State of Illinois, is a material part of any contract awarded on the basis of this proposal.
- C. It is unlawful to discriminate on the basis of race, color, religion, sex, sexual orientation, national origin or ancestry, citizenship status, age, marital status, physical or mental handicap unrelated to the individual’s ability to perform the essential functions of the job, military status or unfavorable discharge for military service. The Bidder shall comply with standards set forth in Title VII of the Civil Rights Act of 1964, 42 U.S.C. Section 2000 et seq. and the Human Rights Act of the State of Illinois (775 ILCS 5/1-101 et seq.).
- D. The Bidder hereby agrees that the Contract to be awarded shall be performed in compliance with all requirements of the Illinois Human Rights Act, 775 ILCS 5/1-101 et seq., and that the Contractor and its subcontractors shall not engage in any prohibited form of discrimination in employment as defined in the Act. The Contractor shall maintain, and require that its subcontractors maintain, policies of equal employment opportunity which shall prohibit discrimination against any employee or applicant for employment on the basis of race, religion, color, sex, sexual orientation, national origin or ancestry, citizenship status, age, marital status, physical or mental disability unrelated to the individual’s ability to perform the essential functions of the job, military status, or unfavorable discharge from military service. Contractors and all subcontractors shall comply with all requirements of the Act and of the Rules of the Illinois Department of Human Rights with regard to posting information on employees’ rights under the Act. Contractors and all subcontractors shall place appropriate statements identifying their companies as equal opportunity employers in all advertisements for workers to be employed in work to be performed under this contract.

- E. Pursuant to Section 2-105 (A)(4) of the Illinois Human Rights Act, the Contractor and each Subcontractor shall adopt and maintain written sexual harassment policies that shall include, at a minimum, the following information:
1. the illegality of sexual harassment;
 2. the definition of sexual harassment under State law;
 3. a description of sexual harassment, utilizing examples;
 4. the contractor/subcontractor's internal complaint process, including penalties;
 5. the legal recourse, investigative and complaint process available through the Department and Commission;
 6. directions on how to contact the Department and the Commission; and
 7. protection against retaliation as provided by Section 6-101 of the Illinois Human Rights Act.
- F. A copy of these policies shall be provided to the Owner or Consultant on request.
- G. The successful Bidder shall comply with any applicable federal or state law regarding non-discrimination. The following list includes, but is not meant to limit, laws which may be applicable:
1. State Statute, Illinois Human Rights Act, 775 ILCS 5/1-101 *et seq.* as amended, which generally prohibits discrimination because of race, color, creed, religion, national origin, sex, marital status, status with regard to public assistance, disability, or age.
 2. The Equal Employment Opportunity Act of 1972, as amended, 42 U.S.C. 2000e *et seq.*, which prohibits discrimination in employment because of race, color, religion, sex, or national origin.
 3. The Rehabilitation Act of 1973, as amended, 29 U.S.C. 701 *et seq.* and 45 C.F.R. 84.3 (J) and (K) implementing Sec. 504 of the Act which prohibits discrimination against qualified handicapped persons in the access to or participation in federally-funded services or employment.
 4. The Age Discrimination in Employment Act of 1967, as amended, which generally prohibits discrimination because of age.
 5. The Equal Pay Act of 1963, as amended, 29 U.S.C. 206, which provides that an employer may not discriminate on the basis of sex by paying employees of different sexes differently for the same work.

6. The Job Training Partnership Act of 1982, as amended, and JTPA regulations which prohibit discrimination under any program funded in whole or in part with JTPA funds because of race, color, religion, sex, national origin, age, handicap, or political affiliation or beliefs. Although certain restrictions apply, generally, persons cannot be denied participation in a JTPA program simply because of their citizenship.

1.29 ACCESS TO RECORDS/AUDIT

- A. The successful Bidder's books, records, documents, and accounting procedures and practices relevant to the Contract are subject to examination by the Owner. Such data are also subject to review by the Comptroller General of the United States, or a duly authorized representative, if federal funds are used for any work under the Contract. The successful Bidder agrees to maintain such data for a period of three (3) years from the date services or payment was last provided or made or longer if any audit in progress requires a longer retention period.

1.30 SAFETY

- A. The successful Bidder will comply with all State and Federal laws as they relate to employee safety, i.e., AHERA, OSHA, Confined Space Entry, Employee Right to Know, Respiratory Protection, NESHAP, Look Out Tag Out, etc.
- B. The Contractor(s) shall attend a one-hour training session on safety rules at each job site. The Contractor is subject to job site safety rules set forth by the Project Manager (Construction Manager).

1.31 TOBACCO, ALCOHOL, AND ILLEGAL DRUG POLICY

- A. The Owner is Tobacco Free in accordance with Illinois law. All employees of the successful Bidder and any subcontractors will be held to this regulation.
- B. Possession and/or use of alcohol or illegal drugs are prohibited on the campus of the Owner. The Owner's published rules regarding this matter shall apply to all workers related to this project and are available upon request.

1.32 AMERICANS WITH DISABILITIES ACT OF 1990

- A. The successful Bidder shall have thorough and complete knowledge of the Americans with Disabilities Act of 1990. The successful Bidder also agrees to provide complete capabilities to meet or exceed all requirements of this Act for this project with regard to the products and services to be supplied by the Bidder.

1.33 PARKING REGULATIONS

- A. The successful Bidder agrees to comply with the Owner's published rules and regulations regarding vehicles and campus parking. The successful Bidder will be responsible for their motorized vehicles and all violations identified to their vehicles.

1.34 PREVAILING WAGE

- A. The Contractor shall pay not less than the prevailing hourly rate of wages, and the generally prevailing rate of hourly wages for legal holiday and overtime work, as determined by the Illinois Department of Labor and as set forth in the schedule of prevailing wages appended to the Instructions to Bidders for this Contract to all laborers, workers, and mechanics performing work under this Contract. All bonds provided by the Contractor under the terms of this contract shall include such provisions as will guarantee the faithful performance of the Contractor's obligations under this clause and under the Prevailing Wage Act, 820 ILCS 130/1 et. seq.

Should the Department of Labor revise any prevailing rate of hourly wages, such revised rate shall be applicable to this Contract; however, in no event shall the increase in any prevailing rate of hourly wages be a basis for a change order or other claim for an increase in the Contract Sum. The Contractor and each of its subcontractors participating on the Project shall make and keep those records required under Section 5 of the Prevailing Wage Act. The Contractor and any of its subcontractors shall submit a monthly certified payroll statement to verify the payment of prevailing wages as required under the Prevailing Wage Act.

- B. Prevailing wage rates must be posted per State law. A copy of the current rate for Lake County is attached and shall be incorporated into the Contract Documents.

SECTION 00310 – PRELIMINARY SCHEDULES

Pre-Bid Meeting	August 24, 2009
Bid Opening	September 8, 2009
Bid Award Date.....	September 24, 2009
Estimated Commencement of Work at Aspen Drive Library	October 1, 2009
Estimated Commencement of Work at Cook Park Library.....	TBD
Estimated Completion of Contract Work at Aspen Drive Library	December 28, 2009
Estimated Completion of Contract Work at Cook Park Library	TBD

The Owner reserves the right to adjust these dates up to two weeks in either direction depending on the progress of the project. The Owner would provide notice to the Contractor of such change in schedule at least 30 days in advance.

SECTION 00410 – BID FORM**1.01 BIDDER’S QUALIFICATIONS AND SUPPORT CAPABILITIES****A. Information about the Bidder**

Company Name _____

Legal Name (if different) _____

Years in Business _____

Number of Years Installing Systems Similar to This Bid _____

Contact Person _____

Full Mailing Address _____

Telephone Number _____

Fax Number _____

Email Address _____

Name and Phone Number of Bonding Company _____

Number of Full-Time Employees _____

Number of Technical/Installation Personnel (minimum of 2) _____

Names and titles of personnel who would work on this project (attach brief experience listings for each focusing on similar projects):

Name of person who would be Project Manager for this project (attach experience listing with similar projects): _____

1.02 QUALIFICATIONS AND REQUIREMENTS**A. No exceptions may be taken to the following:**

1. If more than one (1) Bidder or company is involved in the installation, training, and/or support after installation, there must be a Prime Contractor. This Prime Contractor assumes responsibility for all other entities involved.

List Prime Contractor here: _____

- B. The response must include a statement from all involved Bidders agreeing that the configuration will work as specified and that all Bidders will work under the Prime Contractor to resolve any configuration or interoperability problems during the installation process at no additional cost to the client. Write statement below.

C. Experience and Existing Customers

1. How many similar systems has the Bidder installed within 200 miles of the Owner? How many statewide? How many nationwide?

Area _____ Statewide _____ Nationwide _____

D. Workload

1. How many installations of this type are currently underway by your company?
2. How many projects do you estimate your company will be doing concurrently with the project in this RFB?

E. References

1. To be a qualified Bidder, the Bidder must include below three (3) references with similar equipment installed. Preference will be given to Bidders with references for implementations at organizations most similar to the client. **References will be contacted – please verify information before submitting.** All references will be called. Please inform your contacts that a 10-15 minute call may be anticipated.

Reference 1

Organization Name _____

Address _____

Type of Business _____

Contact Person _____

Telephone Number _____

Fax Number _____

Secondary Contact Person _____

Telephone Number _____

Fax Number _____

Dates of Installation _____

Description of System _____

Reference 2

Organization Name _____

Address _____

Type of Business _____

Contact Person _____

Telephone Number _____

Fax Number _____

Secondary Contact Person _____

Telephone Number _____

Fax Number _____

Dates of Installation _____

Description of System _____

Reference 3

Organization Name _____

Address _____

Type of Business _____

Contact Person _____

Telephone Number _____

Fax Number _____

Secondary Contact Person _____

Telephone Number _____

Fax Number _____

Dates of Installation _____

Description of System _____

F. Subcontractors/Partners

1. The applicable terms and provisions of the contract documents shall bind every subcontractor. Further information about subcontractors may be requested prior to award.
2. Identify all subcontractors or partners used for any purposes. Failure to disclose subcontractors/partners may lead to disqualification. Include separate sheet(s) labeled "Subcontractors/Partners," if necessary.

Business Name	Years Experience	Function	Minority Status
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

G. References for Subcontractors/Partners

1. Include below two (2) references for EACH subcontractor (duplicate this page if needed for multiple subcontractors). Again, preference will be given to Bidders with references for implementations at organizations most similar to the client.

Reference 1

Organization Name _____

Address _____

Type of Business _____

Contact Person _____

Telephone Number _____

Fax Number _____

Dates of Installation _____

Description of System _____

Reference 2

Organization Name _____

Address _____

Type of Business _____

Contact Person _____

Telephone Number _____

Fax Number _____

Dates of Installation _____

Description of System _____

H. Service after Installation

1. How many service personnel trained in maintaining the proposed system does Bidder employ in the client's area? Please indicate location closest to the client.
 - a. Service Personnel _____
 - b. Location _____
2. List names and job titles of service personnel who would be assigned to this customer after installation:

3. Provide the address of Bidder's service center(s) closest to the client:
Company _____
Address _____

Telephone Number _____
4. Who will maintain parts inventory? At what location?
Company _____
Address _____

Telephone Number _____
5. What critical component parts are kept in stock at this location?

6. What response time can Bidder supply in an emergency situation?
Phone Response: _____ hours On-site response _____ hours
7. What response time does Bidder offer in a non-emergency situation?
Phone Response: _____ hours On-site response _____ hours

I. PRICE SUMMARY

To: Cook Memorial Public Library District (a joint venture)
(a corporation)
(a partnership)
We _____ (an individual)
(Cross out inapplicable)
of _____
Street City County State Zip

Hereby agree to execute the proposed contract, to furnish a satisfactory Performance Bond and Labor and Material Payment Bond in the amounts specified within ten (10) days of offering, to provide the required certificates of insurance and to provide all labor and material required for the construction of the project designated above, for the prices hereinafter set forth, in strict accordance with the Contract Documents prepared by Elert & Associates, 140 Third Street South, Stillwater, MN 55082 for Cook Memorial Public Library District and dated August 7, 2009.

SINGLE BASE BID

BASE BID: ALL WORK required to fully complete the project in accordance with the Contract Documents, for the sum of _____ Dollars
(\$ _____)

Alternate Bid No. 1:

All work and material required to install data outlets at Cook Park and Aspen Drive libraries utilizing Category 6 cable and components, in lieu of the Category 5e cable and components. See Section 17100 for details.

For the sum of _____ Dollars
(\$ _____)

UNIT PRICES:

BEFORE SUBSTANTIAL COMPLETION OF WORK IN AFFECTED AREA

Provide and install telecommunication outlet consisting of two (2) data cables 250' long as per specifications in Section 17100 & drawings.

ADD/DELETE

\$ _____ Each

Provide and install telecommunication outlet consisting of two (2) data cables 150' long, as per specifications in Section 17100 & drawings.

ADD/DELETE

\$ _____ Each

Provide and install telecommunication outlet consisting of two (2) data cables 100' long, as per specifications in Section 17100 & drawings.

ADD/DELETE

\$ _____ Each

Provide and install telecommunication outlet consisting of one (1) data cable 250' long, as per specifications in Section 17100 & drawings.

ADD/DELETE

\$ _____ Each

Provide and install telecommunication outlet consisting of one (1) data cable 150' long, as per specifications in Section 17100 & drawings.

ADD/DELETE

\$ _____ Each

Provide and install telecommunication outlet consisting of one (1) data cable 100' long, as per specifications in Section 17100 & drawings.

ADD/DELETE

\$ _____ Each

Provide and install one (1) 2" EMT sleeve through a block wall.

ADD/DELETE

\$ _____ Each

1.03 COMMENCEMENT AND COMPLETION OF CONTRACT WORK

- A. The undersigned agrees, if awarded the contract, to commence the Contract work on or before a date to be specified in a written Notice to Proceed, and to complete the work within the time dictated in the Instructions to Bidder.

1.04 ADDENDUM RECEIPT

- A. We acknowledge receipt of the following Addenda:

Addendum No. _____ Date _____

Addendum No. _____ Date _____

Addendum No. _____ Date _____

Addendum No. _____ Date _____

Addendum No. _____ Date _____

Prior to signing, Bidder's attention is directed to instructions to Bidders to avoid the possibility of invalidating this bid. By signing this bid form, such action certifies that the Bidder has personal knowledge of the following:

1. That said Bidder has examined the drawings and specifications, carefully prepared the bid form, and has checked the same in detail before submitting said bid;
2. That all of said work will be performed at the Bidder's own proper cost and expense, that the Bidder will furnish all necessary materials, labor, tools, machinery, apparatus, and other means of construction in the manner provided in the applicable specifications, and at the time dictated in the contract.

In addition, Bidder certifies personal knowledge of compliance with the attached certifications for:

1. Criminal Code – Bidding Requirement
2. Equal Employment Opportunity
3. Sexual Harassment Policy
4. Tax
5. Substance Abuse Prevention on Public Works Projects

(Firm Name)

(Area Code & Telephone Number)

(Seal, if bid is by a corporation)

By _____
(Signature of Bidder)

Date: _____

CRIMINAL CODE CERTIFICATION

AS REQUIRED BY:
STATE OF ILLINOIS CRIMINAL CODE OF 1961
PURSUANT TO PA 85-1295

Ch. 720, Article 5, Sec, 33E-11, 2002 Ill. Compiled Statutes,

I, the individual whose signature appears below on this bid/contract for

hereby certify that the bidding party/contracting party is not barred from bidding on the contract as a result of a violation of either Section 33E-3 or Section 33E-4 of ch. 720, Article 5, 2002, Ill. Compiled Stat, as amended.

Bidder/Contractor:

Signed: _____

Title: _____

Dated: _____

EQUAL EMPLOYMENT OPPORTUNITY

Section I. This EQUAL EMPLOYMENT OPPORTUNITY CLAUSE is required by the Illinois Human Rights Act and the Rules and Regulations of the Illinois Department of Human Rights published at 44 Illinois Administrative Code Section 750, et seq.

Section II. In the event of the Contractor's noncompliance with any provision of this Equal Employment Opportunity Clause, the Illinois Human Right Act, or the Rules and Regulations of the Department of Human Rights (hereinafter referred to as the Department) the Contractor may be declared ineligible for future contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations, and this Contract may be canceled or voided in whole or in part, and other sanctions or penalties may be imposed or remedies involved as provided by statute or regulation.

During the performance of this Agreement, the Contractor agrees:

A. That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status or an unfavorable discharge from military service; and further that it will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any such underutilization.

B. That, if it hires additional employees in order to perform this Contract, or any portion hereof, it will determine the availability (in accordance with the Department's Rules and Regulations) of minorities and women in the area(s) from which it may reasonably recruit and it will hire for each job classification for which employees are hired in such a way that minorities and women are not underutilized.

C. That, in all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, sexual orientation, marital status, national origin or ancestry, citizenship status, age, or physical or mental handicap unrelated to ability, military status or an unfavorable discharge from military service.

D. That it will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising such labor organization or representative of the Vendor's obligations under the Illinois Human Rights Act and Department's Rules and Regulations. If any labor organization or representative fails or refuses to cooperate with the Contractor in its efforts to comply with the Act and Rules and Regulations, the Contractor will promptly notify the Department and the contracting agency and will recruit employees from other sources when necessary to fulfill its obligations under the Contract.

E. That it will submit reports as required by the Department's Rules and Regulations, furnish all relevant information as may from time to time be requested by the Department or the contracting agency, and in all respects comply with the Illinois Human Rights Act and Department's Rules and Regulations.

F. That it will permit access to all relevant books, records, accounts and work sites by personnel of the contracting agency and Department for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and Department's Rules and Regulations.

G. That it will include verbatim or by reference the provisions of this Equal Employment Opportunity Clause in every subcontract it awards under which any portion of this Contract obligations are undertaken or assumed, so that such provisions will be binding upon such subcontractor. In the same manner as the other provisions of this Agreement, the Contractor will be liable for compliance with applicable provisions of this clause by such subcontractors; and further it will promptly notify the contracting agency and the Department in the event any subcontractor fails or refuses to comply therewith. In addition, the Contractor will not utilize any subcontractor declared by the Illinois Human Rights Department to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations.

ACKNOWLEDGED AND AGREED TO:

BY: _____

ATTEST: _____

DATE: _____

SEXUAL HARASSMENT POLICY

_____, having submitted a bid for _____
(Name of Contractor) _____ (General Description
of Work Bid on) to the Cook Memorial Public Library District, hereby certifies that said
contractor has a written sexual harassment policy in place in full compliance with 775
ILCS 5/2-105 (A) (4).

By: _____
Authorized Agent of Contractor

Subscribed and sworn to before
me this ____ day of _____, 2009.

Notary Public

Attest: _____

TAX CERTIFICATION

I, _____, having been first duly sworn depose and state as follows:

I, _____, am the duly authorized agent for _____, which has submitted a proposal to the Cook Memorial Public Library District for

_____ and I hereby certify
(Name of Project)

that _____ is not

delinquent in the payment of any tax administered by the Illinois Department of Revenue, or if it is:

- a. it is contesting its liability for the tax or the amount of tax in accordance with procedures established by the appropriate Revenue Act; or
- b. it has entered into an agreement with the Department of Revenue for payment of all taxes due and is currently in compliance with that agreement.

By: _____

Title: _____

Subscribed and Sworn to
Before me this _____
Day of _____, 2009

SUBSTANCE ABUSE PREVENTION ON PUBLIC WORKS PROJECTS

The Contractor certifies that it has in place a written program that meets or exceeds the program requirements of the Substance Abuse Prevention on Public Works Projects Act (Public Act 95-0635), and will provide a copy thereof to the Cook Memorial Public Library District prior to commencement of work on the Project.

Firm Name

By: _____
Name/Title

SECTION 00700 – OWNER GENERAL CONDITIONS OF THE CONTRACTOR AND SUPPLEMENTARY CONDITIONS FOR CONSTRUCTION

PART 1 – GENERAL

6.01 GOVERNING CLAUSE

1. The Governing General Conditions for the Contract of Construction (AIA Document A201, 2007 Edition) shall be hereafter referred to as the “General Conditions”.
2. AIA Document A201 “General Conditions” are hereby made part of the Contract Documents to the same extent as if reproduced in full, except as modified, amended, revised, rescinded, or supplemented by the Supplementary Conditions and Bid Documents. The following Sections and Subsections are deleted from the General Conditions: 2.2.1, 4.4.6, 4.5.2, 4.5.3, 4.6 (including 4.6.1, 4.6.2, 4.6.3, 4.6.4, 4.6.5, and 4.6.6), 8.3.3, and 13.7 (including 13.7.1).
3. These Supplementary Conditions shall take precedence in all cases of conflicting requirements with the General Conditions.
4. The Bid Documents are also incorporated herein as set forth in Section 1.21 above. In the event of a conflict between the Bid Documents and the General Conditions, the language in the Bid Documents shall take precedence.
5. Those portions of the AIA General Conditions that are not altered, modified, amended, or rescinded by the Supplementary Conditions, shall remain in full force and effect as published.
6. Copies of the Fifteenth Edition of AIA Document A201 may be requested for examination by contacting the offices of the project Consultant, Elert & Associates. Same may be purchased, at a nominal charge, from dealers in Architect’s supplies or from the American Institute of Architects, 1735 New York Avenue, NW, Washington, D.C. 20006 or from AIA, 2811 McKinney Avenue, Suite 218, Lock Box 104, Dallas, TX 75204-2537.
7. The mention in writing or representation by depiction of materials, services, or operations within the specification documents and or Bid package is binding upon the Contractor to provide and install such items, services, and operations without additional charge to Owner. Exceptions will be noted by the acronym (NIC) Not In Contract or (OFE) Owner Furnished Equipment. If this notation does not appear, then the Contractor shall assume the need to provide the item in question.

8. The Contractor will receive no allowances because of omissions in work due to unfamiliarity or its misunderstanding of Bid package details or construction documents.
9. The drawings and specifications documents form a part of the contract and shall be considered as bound therewith.
10. The submission of a Bid shall be deemed evidence of the Contractor's knowledge, review and examination of construction documents, drawings, specifications, and addenda issued for this project. No allowances will be made because of unfamiliarity with any portion.
11. Verbal direction will not be considered binding and in no event supersede or amend written documents, specifications or contract documents. Only written direction will be considered binding on the Contractor, Owner, or Consultant.
12. All reference to notifications required of the Contractor to the Owner or to the Consultant must be issued in writing.
13. In the event of an inconsistency or discrepancy between parts of the Bid package, the Contractor will be bound by the discrepancy clause herein.
14. The Contractor has the responsibility for determining the completeness of the BID package contents provided in its specific bid package received. Example: compare the table of contents against the package contents and look for missing page numbers in BID copy.
15. The Bidder agrees not to hold the Owner or Project Consultant responsible for simple typos, minor omissions, misspelling of words, or other specification inconsistencies, where reasonable persons, familiar with the type of work specified herein, would understand the scope as though such conditions did not exist.

PART 2 – PRODUCT – NOT USED

PART 3 – EXECUTION – NOT USED

SECTION 17000 – E&A GENERAL TECHNOLOGY REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. The provisions of the General Conditions, Supplementary Conditions, and the sections included under Bidding & Contract Requirements are included as part of this section as though bound herein.

1.02 BIDDING AND CONTRACT REQUIREMENTS

- A. Refer to Bidding and Contract Requirement Sections.

1.03 DOCUMENT OVERVIEW

- A. General: Section 17000 contains general technology requirements for the overall project. Sections following 17000 contain specific general, product, and execution requirements for each technology subsystem and discipline involved in the project.
- B. Interpretation: Sections following 17000 expand upon and have precedence over the requirements stated in Section 17000. Bidders should bring perceived conflicts between requirements to the Consultant for clarification.
- C. Inconsistency: In the event of an inconsistency or discrepancy that may exist in or between parts of this bid package, the following direction will be followed and govern: The Document, Section, phrase, or requirement with better quality, more stringent requirement, or greater amount or quantity of work or material will apply and shall be expected, delivered, or used. Such work or material shall be provided by the Contractor and installed at no additional cost to the Owner.
- D. Precedence: The following ordering shall be used when interpreting precedence of contract and project documents:
 - 1. The Contractor's contract has the highest precedence, if contract includes full terms and conditions of these specification documents, without exceptions.
 - 2. The second highest precedence is the "Document Discrepancy Clause" printed herein.
 - 3. The third highest precedence is any room matrices or equipment list appendices that may be included in these documents.
 - 4. The fourth highest precedence is the Written Specifications Work-specific Section (i.e., 17x10, 17x20, 17x30, etc.).

5. The fifth highest precedence is the Written Specifications Discipline-specific Section (i.e., 17100, 17200, 17300, etc.).
6. The sixth highest precedence is the Project Drawings pertaining to the specific Section.
7. The seventh highest precedence is the Section 17000 E&A General Technology Requirements.
8. The eighth highest precedence is the Construction Documents, Division 1 Supplementary Conditions Section.
9. The ninth highest precedence is the Construction Documents, Division 1 General Conditions Section.

E. References: References to related documents do not limit or release the Contractor from the responsibility of having the necessary knowledge of other non-referenced related documents.

1.04 DOCUMENT USAGE

- A. All Bid documentation or other parts of this bid package in part or in total, regardless of how obtained, will remain the property of Elert & Associates. Said documents are not to be used for any other work or project other than that for which they are commissioned. All other usage of these documents must be with prior written authorization from Elert & Associates. These documents are only intended for use at Owner's facilities at the Cook Park and Aspen Drive Libraries and may be retained for use by those two facilities.

1.05 DEFINITIONS

- A. Documents: The complete package of Bidding and Contract Requirements, E&A General Technology Requirements, related Division 17 sections, drawings, schedules, and addenda that comprise this Request for Bid.
- B. Work: The provision of products and/or services to meet the requirements specified in these documents.
- C. Owner: Refers to the party named in the Bidding and Contract Requirements as the advertising party.
- D. Consultant: Refers to Elert & Associates.
- E. Bidder: Vendors who are engaged in the process of submitting a bid for consideration by the Owner and Consultant.
- F. Offeror: See Bidder.

- G. NIC: The acronym (NIC) refers to Not in Contract. This notation means that the so noted item will be provided by others and shall be incorporated into the system by the Contractor.
- H. Final Acceptance: Written confirmation from the Owner and Consultant that the Contractor has executed the terms of the contract to the satisfaction of all concerned parties.
- I. Substantial Completion: As defined by AIA – A201. Generally, is the stage in progress of the Work when the Work is sufficiently complete and in accordance with the contract documents so the Owner can occupy or utilize the work fully and without limitation for its intended use. The Substantial Completion for the described in these documents will be reviewed and determined by the Consultant.
- J. Approved or Approval: Where approval is called for, only persons with the authorized authority may grant approval. The Owner reserves all rights to govern over and grant approval and will appoint authority of agents acting on its behalf.
- K. Contractor: The person(s) who sets forth a bid, bid or quote to furnish materials or labor for this project. The word “Contractor” means the Vendor, Bidder, Offeror, Bidder, or Contractor depending on the phase of the project that is referenced in this document.
- L. OFE: Refers to Owner Furnished Equipment. This notation means that the so noted item will be provided by the Owner and installed by the Contractor.
- M. System: Refers to a group of interacting, interrelated, or interdependent elements forming a whole functionally related group of elements.
- N. Standards: Refers to a requirement, method, procedure, or recommendation (guideline) defined by a group, organization, association, or committee intending to govern or provide guidelines for work that has been referenced herein this Bid package. If an actual standard does not exist, then an accepted and generally common industry practice will apply as if a true standard.
- O. As Required: The term ‘As required’ shall mean that the Contractor shall provide the quantity of said item that is necessary to fulfill the intent of the specifications. The Owner and the Consultant will reserve the right to make final determination of necessary quantities to provide for a complete system.
- P. Vendor: The person(s) who sets forth a bid, bid or quote to furnish materials specified herein for this project. The word Vendor can imply Contractor, subcontractor, or bidder depending on the phase of the project that is referenced in this document.

- Q. Wrench Tight: Tighter than may be easily loosened by the fingers, but barely snug tight by a wrench and easily loosened with its use.

1.06 REFERENCE STANDARDS

- A. Standards and other procedures referenced by this Bid package are as follows:

1. AIA – American Institute of Architects
1735 New York Avenue NW
Washington, DC 20006
312-626-7300
2. ANSI – American National Standards Institute
11 West 42nd Street, 13th Floor
New York, NY 10036
212-642-4900
3. BICSI – Building Industry Consulting Service International, Inc.
(RCDD Standards)
8610 Hidden River Parkway
Tampa, FL 33637
Phone: 813-979-1991 or 1-800-242-7405
Fax: 813-971-4311
4. CFR – Code of Federal Regulations
(Available from the Government Printing Office)
732 N. Capitol Street, NW
Washington, DC 20401
202-512-0000
(Material is usually first published in the Federal Register)
5. IEEE – Institute of Electrical and Electronics Engineers
345 East 47th Street
New York, NY 10017
212-705-7900
6. NECA – National Electrical Contractors Association
3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814-5372
301-657-3110
7. NEMA – National Electrical Manufacturers' Association
2101 L Street NW, Suite 300
Washington, DC 20037
202-457-8400

8. OSHA – Occupational Safety and Health Administration
(U.S. Department of Labor)
200 Constitution Avenue NW
Washington, DC 20210
202-219-5000
9. UL – Underwriters’ Laboratories
333 Pfingsten Road
Northbrook, IL 60062-2096
708-272-8800

- B. ISO – International Organization for Standardization
- C. ITU-T – International Telecommunication Union – Telecommunications Standardization Sector
- D. NEC – National Electrical Code
- E. NFPA – National Fire Protection Association
- F. ASTM – American Society of Testing and Materials
- G. Referenced standards and/or procedures will be binding on the Contractor and all work will be judged against such standards and procedures unless otherwise stated in writing.

1.07 BASIS OF DESIGN

- A. The design of the project described within this document has been accomplished using information provided to the Consultant by the Owner that the Consultant may or may not have been able to verify.

1.08 OMISSIONS

- A. The omission of or express reference to any part(s) necessary for or reasonably incidental to a complete and fully functional system and installation as intended will not be construed as a release from the Contractor providing and installing such parts.

1.09 VALUE ANALYSIS

- A. During the design process, every attempt is made to hold the overall system cost in-check with the use of equipment that can be bid to alternate sources where possible.

1.10 EXAMINATION OF EXISTING CONDITIONS

- A. Examination: The Contractor shall examine the facility and construction documents to the extent necessary to plan for efficient installation strategies prior to the delivery of materials to the site or the commencement of work. Failure to make the examination shall not result in any Change Order requests.
- B. Acceptance of Conditions: The commencement of work by the Contractor shall indicate acceptance of existing conditions, unless a written notice of exceptions has been provided to the Owner prior to commencement.
- C. Observation: If the Contractor observes, during preliminary examinations or subsequent work, existing violations of fire stopping, electrical wiring, grounding, or other safety- or code-related issues, the Contractor shall report these to the Owner in a timely manner.

1.11 DRAWING SYMBOLS

- A. General: Work, equipment, or material delineated or shown on the any drawing of this Bid package will be expected and provided by the Contractor unless noted otherwise.
- B. Interpretation: The project scope drawings utilize symbols and schematic block diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate in general items required for the intended construction and installation. The work shall be installed in accordance with the intent diagrammatically expressed on the drawings and described in the written specifications. The Contractor shall not make limiting interpretation that provides for incomplete work or a non-functioning system.

1.12 PRODUCT DELIVERY REQUIREMENTS

- A. Delivery: The Contractor shall have full responsibility for delivery of all required materials to meet the requirements of these specifications. All shipping and handling fees shall be included in the Contractor's base price.

1.13 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Storage: Storage of materials will remain the full responsibility of the Contractor until Final Acceptance.

- B. Protection: The Contractor shall take all necessary precautions to protect materials from the following:
 - 1. Theft
 - 2. Vandalism/Tampering
 - 3. Dents
 - 4. Scratches
 - 5. Dust
 - 6. Temperature
 - 7. Weather
 - 8. Cutting
 - 9. Paint
 - 10. Other hazardous conditions
- C. Replacement: The Contractor shall replace any damaged or lost material as required by the Owner or Consultant.
- D. Installed Materials: Installed materials remain the responsibility of the Contractor until Final Acceptance. The Contractor shall take necessary precautions to ensure the safety of installed materials.

1.14 CONTRACT MODIFICATION PROCEDURES

- A. Owner: The Owner may, without invalidating the contract, make changes by altering, adding to, or deducting from the work, with the contract sum being adjusted accordingly.
- B. Contractor: The Contractor shall respond to requested alterations, additions, or subtractions in writing and shall provide the Owner and the Consultant with copies of the Change Order Request.
- C. Requirements: To be considered for approval by the Owner, the Change Order Request must include:
 - 1. Description of contract change(s) made.
 - 2. Cost effect of change(s) on contract amount with unit prices.
 - 3. Time effect of change(s) on project completion.
- D. Approval: The Owner may approve or deny the Change Order Request. The Owner is not liable for any costs beyond the original contract until the Owner has signed the Change Order Request and passed copies to the Contractor and the Consultant. Any work performed prior to this approval is at the Contractor's own risk.

- E. Where a Change Order or a series of Change Orders authorize or necessitate an increase or decrease in either the cost of the Project totaling \$10,000 or more or the time of completion of the Project by 30 days or more, a written determination must be prepared and signed by the Owner or its designee stating that the circumstances necessitating the change in performance were not reasonably foreseeable at the time the contract was signed; or the change is germane to the original contract as signed; or the Change Order is in the best interest of the Owner and authorized by law in accordance with 720 ILCS 5/33E-9. In addition, any Change Order on the Project that authorizes or necessitates any increase in the total amount of the Contract that is 50% or more of the original Contract amount or that authorizes or necessitates any increase in the price of a subcontract under the Contract that is 50% or more of the original subcontract price, then the portion of the Contract that is covered by the Change Order must be resubmitted for bidding in the same manner for which the original Contract was bid in accordance with the Public Works Contract Change Order Act (50 ILCS 525/1 *et seq.*).

1.15 UNIT PRICING

- A. Unit pricing provided by the Contractor in its original bid or any subsequent change order requests shall be used to add or deduct quantities of units in any subsequent change orders.

1.16 PRODUCT SUBSTITUTION PROCEDURES

- A. Requests for Substitutions: After the contract has been awarded, should the Contractor request a change in the material that is to be supplied from that which was specified in the contract, the Contractor shall provide the Owner and the Consultant with a written request for said change that includes the reason(s) for the substitution request.
- B. Requirements: The Request for Substitution must include:
1. Reason for substitution.
 2. Material data sheets for both the proposed item(s) and the item(s) to be replaced.
 3. Cost savings to the Owner, if any.
- C. Approval: The Owner may approve or deny the Request for Substitution. The Owner reserves the right to govern over and proclaim whether proposed products are equal to the specifications. The Contractor shall not procure any substitute materials until the Owner has approved and signed the Request for Substitution and passed copies to the Contractor and the Consultant. Any procurement or work performed prior to this approval is at the Contractor's own risk.

1.17 OWNER FURNISHED PRODUCTS

- A. Delivery: The Owner is responsible for delivery of Owner Furnished Products to the project site, unless otherwise specified in this document.
- B. Placement: The Contractor is responsible for locating, inspecting, and moving Owner Furnished Products to their final installation position.
- C. Inspection: The Contractor shall report any damage, discrepancies in quantity, type, or function to the Owner and Consultant immediately upon discovery.
- D. Warranty: The Contractor assumes no responsibility for the material warranty for Owner Furnished Products. The Contractor shall be responsible for its own integrating, cabling, or otherwise installing of Owner Furnished Products under the same contract warranty conditions as other Contractor Furnished Products.

1.18 CONSTRUCTION PROGRESS MEETINGS

- A. The Contractor is required to attend job progress meetings for coordination in accordance with requirements set by the Construction Manager and Owner.
- B. The Contractor is required to attend job construction and progress meetings that the Owner deems necessary.
- C. The Contractor is required to request additional job construction coordination meetings it deems to be necessary to ensure its scope of responsibilities are performed seamlessly with the Owner and trades.

1.19 CONSTRUCTION PROGRESS DOCUMENTATION

- A. Completion: The Contractor shall complete and submit all construction progress documentation as requested by the Owner, the Consultant, or the project General Contractor.
- B. Failure to Complete: Failure to complete requested construction progress documentation may result in the withholding of payment by the Owner.

1.20 SUBMITTAL PROCEDURES

- A. Provision: The Contractor shall provide submittals to the Consultant prior to the procurement of equipment or commencement of work. Make corrections and additions, as necessary, to the design documents. Blue-line drawings shall be prepared and submitted on 24" x 36" paper. Equipment lists, data sheets, etc. shall be 8½" x 11" size, punched and inserted in a 3-ring binder.

- B. Prior to Work: Submittals shall be provided to the Consultant within ten (10) days after the notice to proceed. Submittals are identified in section(s) following Section 17090.
- C. Review: The submittals must be received and stamped “reviewed” by the Consultant prior to the procurement of material or the commencement of work. Any procurement or work performed prior to this approval is at the Contractor’s own risk.
- D. Project Timeline: The project timeline will not be altered due to lateness of submittals. The Contractor will remain bound to deliver a timely, complete, and finished project as stipulated in its contract.
- E. Failure to Provide: The failure of the Contractor to provide submittals as required herein may result in the withholding of payment for work and/or the cancellation of the contract.

1.21 OWNER’S REMEDY

- A. If the Contractor fails to perform the work as required by these specifications and construction documents in a timely manner or provides substandard work, the Consultant and or Owner will issue a notice document that describing the needed corrective action(s). If the Contractor fails to take corrective action(s) then the Consultant will issue a notice of default including the Owner’s intent to seek remedy if the default condition is not corrected promptly. The Owner reserves the right to take any and all action necessary to remedy the default condition and to back-charge the defaulting Contractor for such remedies.

1.22 CLOSEOUT PROCEDURES

- A. Notification: The Contractor shall provide written notification to Consultant and to the Owner when the Contractor is satisfied that the work has been completed and is ready for inspection.
- B. Closeout Submittals: The Contractor shall provide closeout submittals to the Consultant in accordance with the requirements found in this Bid package. The Consultant shall receive the closeout submittals no less than 72 hours prior to the scheduled inspection time.
- C. Inspection: The Contractor shall be present for the inspection by the Consultant. The Contractor shall supply all testing equipment needed to verify compliance with the specifications found in this Bid package.
- D. Punch List: Work or materials found to be incomplete, of unsatisfactory quality, failing to meet the specifications in the Bid package, and/or unacceptable to the Consultant or Owner shall be documented by the Consultant and provided to the Contractor to rectify.

- E. Re-Inspection: If a re-inspection is necessary, the costs of the additional travel, hours, and expenses of the Owner and Consultant will be deducted by the Owner from the contract amount due the Contractor.
- F. Punch List Approval: The punch list shall be considered complete only after having been signed by the Owner and Consultant.
- G. Payment Authorization: Final payment will be authorized only after all closeout procedures and requirements have been followed and fulfilled by the Contractor and approved in writing by the Owner and Consultant, including punch list(s) and/or re-inspection(s).

1.23 PAYMENT PROCEDURES

- A. Terms: Unless stated otherwise in the contract between the Owner and the Contractor, the Owner will pay the Contractor on a monthly basis for work completed, based on inspection and sign-off by the Owner or Owner's Agent, up to ninety percent (90%) of the total contract amount. The remaining ten percent (10%) will be paid upon Final Acceptance.
- B. Application: Payments to the Contractor will only be made after the Contractor has issued the proper Application for Payment. Pay request must be on the Consultant's supplied AIA form(s). Contractor's Application for Payment must be provided:
 - 1. On AIA Document G702 with AIA G703 support pages
 - 2. In accordance with Division 1 General Conditions
 - 3. In accordance with governing AIA Document A201, Fifteenth Edition, 1997
- C. The Owner or Owner's representative must review and sign the Contractor's Application for payment prior to payment being issued.
- D. The Contractor's payments will not be processed if any of the following conditions exist:
 - 1. Contractor's submittals are not provided or current as required herein
 - 2. Contractor's work is not in compliance with the specification
 - 3. Application for payment has not been submitted on the proper form and with required support documentation
- E. For every party listed on a Contractor's Payment Application, contractor must provide a full or partial waiver of lien, as appropriate, before payment will be made to Contractor. Contractor's partial or final waiver of lien must be included. Payment certificates shall not be issued without such mechanic's lien waivers and contractors' sworn statement unless they are conditioned upon receipt of such waiver and statements.

- F. Notwithstanding any language in the General Conditions or any other provision of the Contract Documents to the contrary or inconsistent with this provision, the Owner shall not be deemed to waive any claim or right to assert a claim by making any progress payment or final payment.

1.24 SOFTWARE

- A. The Consultant uses the following software:

1. AutoCAD version 2007
2. Microsoft Word 2003
3. Microsoft Excel 2003
4. Microsoft Visio 2003

1.25 PROJECT MANAGEMENT

- A. Project Manager: The Contractor shall appoint a Project Manager who will be the main point of contact regarding the project for the Owner and the Consultant.

- B. Responsibility: The Project Manager is responsible for the following:

1. The successful completion of the contract in a timely manner.
2. The work and performance of all employees and sub-contractors that have been hired by the Contractor.
3. Completing and submitting all required submittals and documentation.
4. Attending all project coordination meetings as required by the Owner, Consultant, and General Contractor. Contractor is responsible for taking minutes of these meetings and distributing copies to all participants.
5. Coordinating with Owner, Consultant, Architect, General Contractor, and other contractors involved in the project to ensure smooth flow of work and on-time project completion.
6. Providing a written monthly progress update to the Owner and Consultant.
7. Reporting all unexpected conditions and problems that may result in delay or expense to the Owner and Consultant immediately upon discovery.

- C. Changes: If the Contractor seeks to change the Project Manager during the course of the project, such change is subject to prior written approval from the Owner.

1.26 QUALITY ASSURANCE

- A. Assurance: It is the intent of these Specifications to describe and provide for a complete, professional, and reliable installation. Professional performance standards by the Contractor and equipment will be required.
- B. Qualifications: Contractor employees who are engaged in installation shall be properly trained in the tasks they are expected to perform.
- C. Acceptability: In all cases, the Owner shall determine the acceptability of work.
- D. Regulatory Requirements: The Contractor shall comply with all code requirements that apply to the work being performed.
- E. Certifications: Where manufacturer certifications are required for warranty or for authorized resale, the installation personnel shall have received such certification prior to the start of the installation of those manufacturer's materials.

1.27 QUALITY CONTROL

- A. Installation: During the installation period, when connections are made to the Owner's existing infrastructure, the Contractor shall use care to ensure that no negative results occur that could reduce or hamper existing systems.
- B. Testing: The Contractor shall complete required testing prior to the inspection by the Owner and Consultant. Test data shall be properly documented and recorded and made available for final inspection.
- C. Confirmation: Testing may be repeated at the request of the Owner or Consultant during the inspection process.

PART 2 – PRODUCTS

2.01 BASIC EQUIPMENT AND MATERIALS REQUIREMENTS

- A. All equipment and materials used to accomplish the goals of this project shall meet the standards for good engineering practice as defined within this document.
- B. The products specified in these specifications are intended to establish a baseline or operational, functional, and performance-based standards that all proposed products must meet or exceed by functionality and quality.

2.02 FACTORY-ASSEMBLED PRODUCTS

- A. Reference to specific equipment manufacturers does not imply that all products produced by that manufacture meet the specification requirements.
- B. The Contractor affirms that all equipment shall be new and unused with full manufacture's warranties and supplement such warranties as required by the specification.
- C. Where a product is available from a factory/manufacture to meet the needs as outlined that product shall be used without modification to insure the full factory warranty is maintained.
- D. All like materials used shall be of the same manufacture, model, and quality unless otherwise specified.
- E. No software or firmware is to be used unless specifically authorized by the Owner or its appointed representative.

2.03 RACKS, CABINETS, HARDWARE

- A. Equipment Racks and Cabinets: Provide racks and cabinets as specified herein and/or described in accompanying documents, appendices or drawings. Verify that any existing racks and/or cabinets provided by others are complete, bringing any discrepancies to the attention of the Owner and the Consultant prior to beginning the installation.
- B. Shelves and Mounts: Contractor shall supply necessary mounting hardware to install rack-mounted equipment. Mounting hardware shall be a product of the manufacture of the equipment to be mounted, or manufacture of the rack system, or approved by either for use with their product. Provide supporting channels, shelves, rack mounts, rack ears as recommended by equipment manufacturers.
- C. Screws and Washers: Contractor shall provide screw head type appropriate to the level of security required for the equipment and racking. All screws shall include polyethylene or nylon washer.
 - 1. Public Access Areas: Star post security screws shall be used for all hardware and equipment mounted in equipment racks and consoles in areas that are accessible to the public.
 - 2. Restricted Access Areas: Philips head screws may be used where a secure room entrance or locked rack/console door prevents public access.

2.04 POWER DEVICES

- A. Power Strips: Unless otherwise specified, power strips shall be UL listed, surface mounted, rated for 15 amp continuous electronic loads. Outlets shall be 125 volt, 15 amp, 3 wire, grounded, NEMA 5-15R. Cords shall be 14/3 SJT with molded plug.
- B. Power Distribution Panels: Unless otherwise provided, power distribution panels shall be UL listed, rack mounted, rated for 15 amp continuous electronic loads with switch and pilot light. Up to eight outlets shall be mounted to the back, each rated 125 volt, 15 amp, 3 wire, grounded, NEMA 5-15R. Switch and pilot shall be mounted to the front. Cords shall be 14/3 SJT with molded plug.

2.05 CABLE AND CONNECTORS

- A. Cable: Cable shall be selected and applied in a manner defined by signal type, consistent with best industry practices. Highest quality products shall be used with attention given to transmission characteristics, termination methods, resistive and complex impedance at operating frequencies and insulating material characteristics. Where required by the NEC (National Electrical Code), substitutions of air handling plenum cable shall exactly match the normally applied product and shall meet the standards of UL (Underwriter's Laboratory) Standard #900 and the NEC Articles 800 and 820.
- B. Connectors: Highest quality products shall be used with attention given to transmission characteristics, termination methods, resistive and complex impedance at operating frequencies and insulating material characteristics. Strain relief's and cable clamps shall be sized for the connector and the cable.
- C. Color: Cable and Connector color shall be coordinated with the Consultant to maintain consistency with cable and connector color schemes used by other trades.

2.06 CABLE MANAGEMENT

- A. Plastic Cable Ties and Lashing Strips: Single use white nylon plastic cable ties appropriate screw fittings or mounting clips may be used above ceilings for wire management.
- B. Velcro Cable Ties and Lashing Strips: Below ceiling level and within equipment enclosures, Velcro wire straps shall be used. Velcro straps shall be black, with no logo or decoration, except as authorized by the Consultant.

2.07 ANCILLARY HARDWARE

- A. The Contractor will provide ancillary and required accessory items necessary to furnish to the Owner a complete and fully functional system.
- B. The exclusion of / or limitation in the language used in the drawings or specifications shall not be interpreted as meaning that ancillary or accessories items of work or equipment necessary to complete or make the installed system fully functional can be omitted.

2.08 GROUNDING HARDWARE

A. Mechanical Connectors

- 1. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lock washers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.
- 2. Split bolt connector types are NOT allowed.
- 3. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

B. Compression Connectors

- 1. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99% by IACS standards.
- 2. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.
- 3. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.
- 4. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.
- 5. Each connector shall be factory filled with an oxide-inhibiting compound.

C. Wire

- 1. Material: Stranded copper (aluminum not permitted). AWG #3 and AWG #6.
- 2. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used on the same facility.

2.09 COMPATIBILITY OF RELATED EQUIPMENT

- A. All equipment and systems specified in these documents shall be assumed to be compatible with the systems already installed at the Owner site(s) and as identified in this document as related to this project.
- B. All equipment and systems proposed shall be compatible with all other equipment and systems as offered by the Contractor, thus placing the responsibility on the Contractor to insure proper interaction.

2.10 SPARE PARTS

- A. The Contractor is requested to submit a list of suggested spare parts with an offered price, allowing Owner to select appropriate parts.
- B. The Contractor shall state where spare parts can be obtained after the installation.

2.11 MAINTENANCE MANUALS

- A. A maintenance manual shall be produced by the Contractor showing interconnection of equipment and any special procedures necessary for proper operation of the systems.

PART 3 – EXECUTION

3.01 GENERAL

- A. The Contractor shall provide, furnish, deliver, transport, erect, install, configure, and connect completely all of the material and equipment described herein or depicted on any Bid package document or drawing, and leave all systems in first class operating condition.
- B. General: Contractor shall cooperate and coordinate with other Contractors placement and execution of all Work. Interference between the works of various Contractors shall be resolved before installation. In the event of conflict of space requirements or location with other trades, refer the matter to the Owner and the Construction Manager for decision.
- C. Related Work: References to the following related work do not limit or release the Contractor from the responsibility of coordination with other trades, or from having the necessary knowledge of other non-referenced work.
 - 1. Work by General Contractor.
 - 2. Work by other Technology Contractors.
 - 3. Work by the Electrical Contractor, including electrical rough-ins and surface mount raceway.

- D. Delays: The Contractor shall coordinate with all other trades to avoid causing delays in the installation schedule.
- E. AC Power: The Contractor shall coordinate with the General Contractor its requirements for proper AC power to service all equipment installed by the Contractor.
- F. Grounding: The Contractor shall coordinate with the General Contractor its requirements for proper ground system to their equipment.
- G. Coordinate, with the GC and Electrical Contractor, the installation of surface-mounted-raceway where not provided but made necessary by non-penetrable wall.
- H. The Contractor shall field verify and coordinate the proposed use of surface mounted raceway at any location with the project Consultant and Owner.

3.02 BASIC EXECUTION REQUIREMENTS

- A. General: The Contractor is responsible to follow industry standards of good practice for the listed telecommunications and networking equipment.
- B. Aesthetic Factors: With the installation of equipment and cables, consideration shall be given not only to operation efficiency but also to overall aesthetic factors. The Contractor shall redo any Work deemed by the Owner to appear sloppy, hastily done or unprofessional at no cost to the Owner. The Owner or Owner's agent shall have final decision over whether work must be redone.
- C. The Contractor is responsible to move back into place ceiling tiles that were removed by this contractor. The contractor is responsible to replace all ceiling tiles that were damaged by this contractor.
- D. All manufactured items, materials, and equipment shall be applied, installed, connected, erected, used and adjusted, as recommended by the manufacturers, or as indicated in their published literature unless specifically noted herein to the contrary.
- E. Work shall be properly protected during construction, including the shielding of soft or fragile materials, protecting against dust and dirt, protecting and supporting cable ends of the floor and from other trades, protecting floor box lids, and the temporary plugging of open conduits during construction. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.

- F. The Contractor shall keep work area neat, orderly and free from accumulation of waste materials. Remove all trash and debris from the building and job site as required to maintain a clean work environment at all times. Telecommunication contractor shall remove rubbish from the job site.
- G. Ceiling Grid: Contractor will not hang cable supports from ceiling grid wire.
- H. Contractor will not shoot into the roof deck for mounting cable hangers.
- I. Equipment and enclosures shall be mounted plumb and square in relation to the structure.

3.03 PREPARATION

- A. Prior to any installation, the Contractor shall prepare the site by removing any remaining debris, leveling equipment racks (where appropriate), and verifying all information and systems stated to be in-place are in-fact ready for use.
- B. Prior to installation, the Contractor shall insure that all required major equipment has been secured and is ready for installation.

3.04 CLEANING

- A. Daily Requirement: At the end of each work period or day, the Contractor shall remove all excess packing, drilling remnants, and other non-equipment related parts, materials or debris to insure a clean, safe and professional working environment.

3.05 FIRE STOPPING

- A. Fire Stopping: The Contractor is responsible for applying fire-stopping material in and around any openings that it creates or are created for it where code or good engineering practice suggests or requires the use of fire stopping material. The Contractor shall ensure that all fire-stopping materials meet appropriate codes and are applied according to good engineering practice.

3.06 WATERPROOFING

- A. Waterproofing: The Contractor is responsible for creating a waterproof seal in and around any openings that it creates or are created for it that enter or exit a structure to the outside environment. The Systems Contractor shall ensure that all waterproof materials meet appropriate codes and are applied according to good engineering practice.

3.07 RACKS, CABINETS, AND HARDWARE

- A. Racks and Cabinets: Contractor shall assemble and install racks and cabinets as normal operations shall be placed within the front reach limits for a user seated directed by the manufacturer.
- B. Installation Hardware: Install hardware in a secure manner. Screws shall be tightened to a torque just sufficient to secure equipment without deforming washers beyond their original diameter.
- C. Considerations: All rack mount equipment shall be secured as recommended by the manufacturer with consideration to airflow, power and in/out connections.
- D. Cross Connections: Where cross connections are required between equipment, interconnections shall be installed using cable management technology to secure the cables in a neat and orderly fashion, applying best industry practices.

3.08 GROUNDING

- A. General: Install Products in accordance with manufacturer's instructions. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.
- B. Conduit Bonding: All separate ground wires shall be enclosed in rigid galvanized steel conduit and bonded at both ends to the rigid galvanized steel conduit with an approved fitting. Install conductor in separate rigid conduit. Bond conduit as described above.
- C. Testing: Inspect grounding and bonding system conductors and connections for tightness and proper installation. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms.

3.09 CABLE

- A. Cable Treatment: Cable shall be stored and handled to assure that it is not stretched, kinked, crushed or abraded in any way. Bend radiuses shall meet manufacturer specifications and/or recommendations. Cable should not be installed in ambient temperatures or moisture conditions above or below the rating of the manufacturer.

B. Lengths:

1. All cables, regardless of length, shall be marked with a labeling scheme approved by the Consultant.
2. All cables shall be separated into like groups according to signal or power levels.
3. All power cables shall be grouped to one side of the equipment rack while low-level cables to the other side.
4. All equipment rack wiring and cabling shall be neatly dressed.
5. All cables shall have service loops.
6. Rack cabling shall be adequately supported with Velcro wire wraps and horizontal support cable managers fastened to rack frame.
7. All external wire and cables shall be supported at least every 5 feet from the structure or as required to maintain not more than 12" cable sag between supports and without over tensioning the cables.
8. The cables shall be supported by J-hooks, cable tray, or ladder rack.
9. All cables are to run at right angles to the structure, placed above ceiling in halls or corridors.
10. Cables shall not run above red iron joist.

C. Concealment: The Contractor shall make every effort to conceal wiring and other apparatus into walls, floors and ceilings assuming code and good engineering practice allows and suggests. All cabling systems installed in public areas shall be installed within walls, ceiling or floors -or- within surface wiring pathways as dictated by codes and good engineering practice.

D. Cable Ties and Velcro Straps: Ties and straps shall be installed snugly without deforming cable insulation. Ties shall be spaced at uneven intervals not to exceed 4-foot. No sharp burrs should remain where excess length of the cable tie has been cut.

E. Obstruction: Contractor shall notify Owner immediately of obstruction or hazard is discovered in a pathway provided by others.

3.10 CONNECTORS

A. Preparation: Cables shall be carefully prepared and connectors installed as directed by the manufacturer. Proper stripping devices and crimping tools shall be used.

- B. Terminations: Connectors shall be carefully fitted to mating devices on equipment to avoid damage to mating contacts, inserts, or bodies. Specialized terminations shall be made in a neat and secure manner suited to the service of the wire and as directed by the manufacturer. In all cases where the manufacturer specifies the terminations, those terminations shall be used.
- C. Adapters: Adapters shall only be used where the identity of the necessary type of connector is unknown at the time of installation, such as for owner-provided equipment, or in anticipation of future equipment upgrades, with the Consultant's approval.

3.11 EQUIPMENT INSTALLATION

- A. General: The Contractor shall make system properly operational and physically secure by mounting equipment and related accessories into furniture, consoles and racks as required. Manufacturer's guidelines for installation shall be followed. Discrepancies in installation procedure or inability to complete a given task due to a shortage of materials or malfunctioning equipment shall be reported to the Consultant immediately upon discovery.
- B. Equipment Placement: The Contractor shall locate equipment as indicated on Drawings and as specified herein. Where such information is not provided, contractor shall consult owner for equipment placement.
- C. Equipment Installation: Equipment shall be installed as directed by the manufacturer using equipment manufacturer's desktop mounting frames, equipment tubs, installation hardware and techniques. The Contractor shall be responsible for moving equipment from storage and for providing necessary personnel or devices to carry and lift equipment around obstacle and into operating position.

3.12 DEMOLITION

- A. Where demolition is indicated on drawings or project documents, the Contractor shall be responsible for the removal, collection, transportation, and recycling of all indicated cabling and components, including the delivery of the cable to the recycling center. If material is to remain on-site for more than 7 (seven) days after removal, the Contractor shall coordinate with the Owner for acceptable storage location.

- B. The Contractor shall field-verify existing conditions prior to beginning demolition work. All discrepancies between existing conditions and Owner's written instructions shall be reported to the Owner's Representative prior to the start of work in order to prevent disturbance of existing installation(s). Beginning work shall indicate acceptance of existing conditions. The Contractor is responsible for immediately restoring any outages caused as a result of removing or damaging adjacent cabling, systems, or services.
- C. Where it is not possible to remove cables without damaging other cables that are to remain, such as in a shared conduit, the Contractor shall cut cables at entry and exit point of constriction, leaving a minimum of 24" of cable at each end.
- D. Contractor shall provide and install blank cover-plates for any outlets that are to be left in place and from which all cables have been removed. Cover plates shall match the project standard color and finish.
- E. If the Contractor removes anything from an opening in a fire-rated wall, the Contractor shall restore the fire-rating condition of the wall to the same condition as before the Contractor started its work. Depending on the size of the opening, this may involve sheetrock patching, in addition to use of other appropriate fire-stopping materials.

3.13 ROUGH-IN

- A. The Contractor shall make every effort to install systems per this specification in a timely manner including rough in of cabling and other apparatus where appropriate to stay on schedule.
- B. Where cabling and/or equipment is installed prior to other trades completing their work in an area, the Contractor shall take necessary precautions to cover, wrap or otherwise protect to reduce possible damage due to plastering, painting, cleaning, or other such work.

3.14 CUTTING, DRILLING, PATCHING, AND PAINTING

- A. The Contractor is responsible for the coordination of work when any cutting or drilling is required in the performance of the installation of the specified systems.
- B. The Contractor is responsible for the returning of all surfaces (including walls, floors and ceilings) to their previous condition after any cutting.

3.15 LABELING

- A. All rack-mounted equipment and hardware shall be labeled as required herein.
- B. Provide all proposed wording and / or numbering scheme for labeling to the Consultant for review and written approval prior to procurement or installation.
- C. All labels used must be permanent and secure. Provide labeling as follows unless otherwise noted in a specific section:
 - 1. All labels shall be sized to match the other labels used for same purpose. Similarly, provide engraved labels of like size in other locations.
 - 2. For enclosed racks containing equipment, provide labels on each equipment rack rear door or console rear panel reading "No user serviceable parts. Refer service to qualified technician".
 - 3. Position at the front top center section of each equipment rack a label that states the name of system Installer and system Consultant.
 - 4. Connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked in a manner approved by the Consultant.
 - 5. Custom panel nomenclature shall be engraved, etched, or screened. Markings for these items are purposely detailed in the construction drawings to ensure consistency and clarity. Verify markings and placement with the Consultant prior to procurement. Submit label sample layouts for Project Consultant's approval.
 - 6. All terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled in a manner acceptable to the Consultant.
 - 7. All labeling information shall appear on the As-Built drawings.

3.16 TESTING

- A. Prior to energizing or testing the system, ensure the following:
 - 1. All products are installed in a proper and safe manner per the manufacturer's instructions.
 - 2. Dust, debris, solder, splatter, etc., is removed.
 - 3. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
 - 4. All products are neat, clean and unmarred and parts securely attached.

5. Electronic devices are properly grounded.
6. Test each AC power receptacle with a circuit checker for proper hot, neutral and ground connections prior to plugging in equipment.

3.17 ADDITIONAL ENGINEERING SERVICES

- A. The Contractor is responsible for securing necessary engineering services where needed to meet the needs of the installation.
- B. Only when the Contractor can show that additional engineering services are needed as a result of changes to the scope of the services being requested will the Owner entertain a Change Order for these services.

SECTION 17100 – COMMUNICATIONS CABLE AND EQUIPMENT

PART 1 – GENERAL

Unless noted otherwise, “Contractor” shall refer to the Telecommunication Contractor.

1.01 SCOPE

- A. In general, the work will include furnishing and installing fiber optic and copper backbone at Cook Park Library cables, horizontal station Category 5e cables for data, and equipment as needed to specified locations at Cook Park and Aspen Drive Libraries.
- B. The Contractor shall provide and install pathways for the telecommunication cables including but not limited to “J-hook” system, sleeves, and cable tray at the telecommunication rooms.
- C. The others will provide, configure, and move the network electronics for the LAN within the existing MERs and will be responsible for the connection of the new cabling infrastructure to the LAN. The Contractor shall be available on site during the crossover to assist with any cabling issues that may occur during the transition.
- D. All cables and related termination, support, and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in the following section[s].
- E. There will also be fire-stopping needs associated with this project.

1.02 RELATED WORK

- A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Illinois Electrical Code, and present manufacturing standards.
- B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
- C. Other applicable standards are as follows:
 - 1. ANSI/IEEE C2 – National Electrical Safety Code
 - 2. NFPA 70-2005 – National Electrical Code
 - 3. TIA/EIA 568-B-1, 2, 3 and TIA/EIA 568-C 0 and 1 Standards

4. IEEE/ANSI 142-1982 – Recommended Practice for Grounding of Industrial and Commercial Power Systems
5. ASTM B633 – Specification for Electrodeposited Coatings of Zinc on Iron and Steel
6. ASTM A510 – Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

1.03 SUBMITTALS

- A. Submit five (5) sets, of which two (2) will be returned to the Contractor, of Shop Drawings for all materials proposed. Submittals shall be sent to the Consultant for review and approval.

1. Drawing

- a. Detail drawings including a complete list of equipment and material. Detail drawings shall contain complete wiring and schematic diagrams and other details required to demonstrate that the system has been coordinated and will function properly as a system. Drawings shall include equipment rack details, elevation drawings of telecommunications closet walls, and outlet faceplate details for all outlet configurations, sizes and types of all cables. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation. Manufacturer's Recommendations.
- b. Where installation procedures or any part thereof, are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations, prior to installation shall be provided. Installation of the item will not be allowed to proceed until the recommendations are received and approved.
- c. Work shall not proceed without the approved submittals.

1.04 RECORD DRAWING AND DOCUMENTATION

A. General

1. Upon completion of the installation, the contractor shall provide three (3) full documentation sets to the Consultant for approval. Documentation shall include the items detailed in the sub-sections below.

2. Documentation shall be submitted within five (5) working days of the completion of each testing phase (subsystem, cable type, area, floor, etc.). This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. CAD generated (final) copies of all drawings shall be submitted within 20 working days of the completion of each testing phase.
3. The Contractor shall provide copies of the original test results.
4. All documentation, including hard copy and electronic forms shall become the property of the Owner.
5. The Consultant may request that a 10% random field re-test be conducted on the cable system - at no additional cost - to verify documented findings.
6. Tests shall be a repeat of those defined above and under Testing and Acceptance. If findings contradict the documentation submitted by the Contractor, additional testing can be requested to the extent determined necessary by the Consultant, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

B. Test Data - Copper Media

1. The test result records saved by the tester shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection, and archiving of these test records. A guarantee must be made that these results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test. The ‘csv’ format (comma separated value format) is not acceptable.
2. The database for the completed job – including twisted-pair copper cabling links, if applicable – shall be stored and delivered on CD-ROM; this CD-ROM shall include the software tools required to view, inspect, and print any selection of test reports.
3. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:
 - a. The identification of the link in accordance with the naming convention defined in the overall system documentation.
 - b. The overall Pass/Fail evaluation of the Copper link-under-test including the RL and NEXT worst-case margin (margin is defined as the difference between the measured value and the test limit value). Any “Pass*” or “Warning” test results shall be considered a “FAIL” for the permanent link under test. In order to achieve an overall “Pass Condition,” the test result for each individual test parameter must be “PASS.”

- c. The overall Pass/Fail evaluation of the Fiber link-under-test includes the Attenuation worst-case margin (margin is defined as the difference between the measured value and the test limit value).
- d. The date and time the test results were saved in the memory of the tester.

1.05 TEST DATA – FIBER OPTIC MEDIA

- A. The test result information for each link shall be recorded in the memory of the field tester upon completion of the test.
- B. The test result records saved by the tester shall be transferred into a Windows-based database utility that allows for the maintenance, inspection, and archiving of these test records. A guarantee must be made that these results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test.
- C. The database for the completed job shall be stored and delivered on CD-ROM; this CD-ROM shall include the software tools required to view, inspect, and print any selection of test reports.
- D. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information.
- E. The identification of the link in accordance with the naming convention defined in the overall system documentation.
- F. The overall Pass/Fail evaluation of the link-under-test including the Attenuation worst-case margin (margin is defined as the difference between the measured value and the test limit value as defined in 3.14).
- G. The date and time the test results were saved in the memory of the tester.
- H. General information to be provided in the electronic database containing the test result information for each link:
 - 1. The identification of the customer site as specified by the end-user.
 - 2. The overall Pass/Fail evaluation of the link-under-test.
 - 3. The name of the standard selected to execute the stored test results.
 - 4. The cable type and the value of the ‘index of refraction’ used for length calculations.
 - 5. The date and time the test results were saved in the memory of the tester.
 - 6. The brand name, model, and serial number of the tester.

7. The revision of the tester software and the revision of the test standards database in the tester.
 8. The detailed test results data to be provided in the electronic database for each tested optical fiber must contain the following information.
 - a. The identification of the link/fiber in accordance with the naming convention defined in the overall system documentation.
 - b. The insertion loss (attenuation) measured at each wavelength, the test limit calculated for the corresponding wavelength and the margin (difference between the measured attenuation and the test limit value).
 9. The link length shall be reported for each optical fiber for which the test limit was calculated.
- I. The Contractor shall provide accurate as-built Construction Drawings at the site during construction.
1. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (".dwg", AutoCAD rel. 2000 and ".dxf") formats on which as-built construction information can be added. These documents will be modified accordingly by the contractor to denote as-built information as defined above and returned to the Owner.
 2. The Contractors shall annotate the base drawings and return to the Consultant in hard copy (same plot size as originals) and electronic (AutoCAD rel. 2000 and ".dxf") form.

1.06 STATEMENTS

- A. Test plan defining the tests required ensuring that the system meets Owner operational and performance specifications 10 days prior to the proposed test date. The test plan must be approved before the start of any testing. The test plan shall identify the capabilities and functions to be tested, and include detailed instructions for the setup and execution of each test and procedures for evaluation and documentation of the results.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Vendor will be responsible for all materials until completion of project.
- B. Cable shall be stored according to manufacturer's recommendations as minimum. In addition, cable must be stored in a location protected from vandalism and weather.

- C. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F, the cable shall be moved to a heated (50 degrees F minimum) location. If necessary, cable shall be stored off site at the contractor's expense.
- D. If the Contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner.
- E. Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance for all products provided as a part of the premises distribution system. Specification sheets for all cable, connectors, and other equipment shall be provided.

1.08 WARRANTY

- A. A twenty (20) year Extended Product Warranty and System Assurance Warranty for this wiring system shall be provided by the manufacturer of the connectivity hardware. The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective products(s), labeling of the new components, and testing of the circuit(s).
- B. Extended Product Warranty – The Extended Product Warranty shall ensure against product defects, that all approved cabling components exceed the specifications of TIA/EIA-568B, and ISO/IEC IS 11801 for cabling links/channels, that the installation will exceed the loss and bandwidth requirements of TIA/EIA 568B ISO/IEC IS 11801 for fiber links/channels, for a twenty (20) year period. The warranty shall apply to all passive SCS components.
- C. System Assurance – The System Assurance shall cover the failure of the wiring system to support the application that it was designed to support, as well as additional application(s) introduced in the future by recognized standards or user forums that use the TIA/EIA 568B, or ISO/IEC IS 11801 component and link/channel specifications for cabling, for a twenty (20) year period.
- D. System Certification – Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

1.09 CODE REQUIREMENTS

- A. ANSI/IEEE C2 National Electrical Safety Code

B. NFPA 70-2005 National Electrical Code

C. EIA/TIA Standards

PART 2 – PRODUCTS

2.01 BACKBONE VOICE CABLING

- A. The voice backbone cable shall be installed as indicated on the drawing T301. The cables shall be OSP and CMP rated. These cables shall be terminated on wall mounted M66 type blocks at the building DEMARC, on rack mounted Category 3 patch panels at MER and TR racks and on 110 block at the transition point.
- B. Where cable is terminated on voice patch panel each pair of the backbone cable shall be terminated on a B/W pins of RJ-45 jacks at the patch panel.
- C. Voice Backbone Cable shall incorporate 24 AWG solid annealed Copper Conductors insulated with a polyvinyl chloride skin over expanded polyethylene. Conductors shall be twisted to form pairs and fully color-coded.
- D. The Voice Backbone Cable shall be sized as detailed on the drawings.
- E. The Voice Backbone Cable shall meet or exceed the EIA/TIA Category 3 performance requirements.
- F. All cables and equipment shall be furnished, installed, wired, and tested by the Contractor.
- G. The cables shall be Berk-Tek, General Cable, Essex, Mohawk, Commscope, or other equivalent products that meet these specifications.

2.02 HORIZONTAL COPPER CABLES

- A. All cables and equipment shall be furnished, tested, installed, and wired by the Contractor.
- B. All horizontal data cables shall terminate on modular patch panels in the telecommunications closet as specified on the drawings.
- C. This specification defines the requirements for commercially available high performance Category 5e cable.
- D. This cable shall be suitable for installation free-air, in building risers, in conduit and/or in cable tray and shall carry CMP rating.
- E. The cable design described herein shall meet and exceed transmission performance Category 6 cables.

- F. Cables shall be Underwriters Laboratory (UL) listed, comply with Article 800 (Communications Circuits) of the National Electrical Code, and shall meet the specifications of NEMA (low loss), UL 444, and ICEA. Conductor shall also conform to the requirements for solid annealed copper wire in accordance with ASTM B 3.
- G. All cables, termination components, and support hardware shall be furnished, tested, installed, and wired by the Contractor.
- H. The jacket color for data cables shall be yellow.
- I. IMPORTANT: Cable and termination components (jack, patch panel, wiring blocks) are specified to function as a system. The compatibility of the cable to be installed with the proposed termination components shall be recognized and documented by the termination component manufacturer.
- J. Category 6 cables (per alternates 1) shall be Berk-Teck Lanmark 1000 (Plenum) or equivalent products manufactured by Mohawk, Superior Essex, General or Commscope.
- K. Category 5E cable shall be Berk-Tek Lanmark 350, General 5500, Mohawk MegaLAN 400, Superior Essex "Cobra"

2.03 TIGHT-BUFFERED OPTICAL FIBER CABLES FOR INDOOR/ OUTDOOR DISTRIBUTION APPLICATIONS

A. General Considerations

- 1. The cable must meet the requirements of the National Electrical Code (NEC) Section 770.
- 2. Plenum Applications - Applicable Flame Tests: ANSI/UL 910 (NFPA 262-1994).
- 3. Cables shall be listed OFNP (OFCP).
- 4. Finished cables shall conform to the applicable performance requirements of Tables 8-6 and 8-7 of the Insulated Cable Consultants Association, Inc. (ICEA) *Standard for Fiber Optic Premises Distribution Cable* (ICEA S-83-596).

2.04 CABLE CONSTRUCTION

- A. The coated fiber shall have a layer of Teflon placed between the acrylate coating of the optical fiber and the thermoplastic buffer. The diameter of the thermoplastic buffer coating shall be $900 \pm 50 \mu\text{m}$. The fiber coating and buffer shall be removable with commercially available stripping tools in a single pass for connectorization or splicing.

- B. Cables with 2 to 24 fibers layered aramid yarns shall serve as the tensile strength member of the cable.
- C. A ripcord shall be applied between the aramid yarns and the outer jacket to facilitate jacket removal.
- D. The outer jacket shall be extruded over the aramid yarns for physical and environmental protection. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.
- E. The fibers shall be stranded around a dielectric central member.
- F. For cables containing 12-24 fibers, the fibers shall be arranged in two layers.
- G. The central member shall be over coated with a thermoplastic, when required; to achieve dimensional sizing to accommodate and support the 900 μm buffered fibers.
- H. The buffered fibers shall be grouped in 6-fiber subunits.
- I. The fibers shall be stranded around a dielectric central member in the subunit.
- J. Layered aramid yarns shall serve as the tensile strength member of the subunit.
- K. A ripcord may be applied between the aramid yarns and the subunit jacket to facilitate jacket removal.
- L. The subunit jacket shall be extruded over the aramid yarns for physical and environmental protection. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.
- M. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses. The nominal thickness of the cable outer jacket shall be sufficient to provide adequate cable protection while meeting the mechanical, flammability, and environmental test requirements of this document over the life of the cable.

- N. The indoor distribution cable specified herein shall be in inter-locking armor made of aluminum. The interlocking armor for plenum cables shall have a Plenum jacket. The color of the armor jacket, if specified for riser cables, shall match the jacket color of the optical fiber cable located inside of the armor. The armor for these cables shall be comparable to liquid tight flexible metal conduit if jacketed, or flexible metal conduit if not.
- O. The individual fibers shall be color-coded for identification. The optical fiber color-coding shall be in accordance with EIA/TIA-598 B "Optical Fiber Cable Color-Coding." The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers. Color-coded buffered fibers shall not adhere to one another.
- P. The outer jacket shall be marked with the manufacturer name or UL file number, date of manufacture, fiber type, flame rating, listing symbol, and sequential length markings every two feet. The marking shall be in contrasting color to the cable jacket. The cable jacket color shall be orange for cables containing multimode fibers and yellow for cables containing single-mode fibers.
- Q. Fiber optic cables shall be manufactured by Berk-Teck, Mohawk, Superior Essex or Commscope.

2.05 MULTIMODE OPTICAL FIBER IN TIGHT-BUFFERED CABLES

A. General Fiber Specifications

1. All fibers in the cable must be usable and meet required specifications.
2. Each optical fiber shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.
3. Each optical fiber shall consist of a doped silica core surrounded by a concentric glass cladding. The fiber shall be a matched clad design.
4. Each optical fiber shall be proof tested by the fiber manufacturer at a minimum of 100 kpsi (0.7 GN/m²).
5. The fiber shall be coated with a dual layer acrylate protective coating. The coating shall be in physical contact with the cladding surface.
6. The attenuation specification shall be a maximum value for each cabled fiber at 23± 50 °C on the original shipping reel.

B. Multimode (50/125 μm)

1. Each fiber in the cable must meet OM3 specifications.
2. Each optical fiber shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification. A germania-doped silica core surrounded by a concentric silica glass cladding shall comprise each optical fiber.
3. The fiber shall be a matched clad design manufactured by the outside vapor deposition process (OVD).
4. Each optical fiber shall be proof tested by the fiber manufacturer at a minimum of 100 kpsi (0.7 GN/m²).
5. The fiber shall be coated with a dual-layer acrylate protective coating. The coating shall be in physical contact with the cladding surface.
6. The multimode fiber shall meet TIA-492AAAC, "Detail Specification for 850-nm Laser-Optimized, 50- μm Core Diameter/125- μm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers." However, the cabled optical fiber shall have a minimum effective modal bandwidth (EMB) of 850 MHz•km at 850 nm in accordance with FOTP-220 for 10 Gigabit Ethernet.
7. The core diameter shall be $50.0 \pm 3.0 \mu\text{m}$.
8. The core non-circularity shall be $\leq 5\%$. The cladding diameter shall be $125.0 \pm 2.0 \mu\text{m}$.
9. The cladding non-circularity shall be $< 2.0\%$.
10. The core-clad concentricity shall be $\leq 3.0 \mu\text{m}$.
11. The coating diameter shall be $245 \pm 5 \mu\text{m}$.
12. The maximum cabled fiber attenuation shall be 3.5 dB/km at 850 nm and 1.5 dB/km at 1300 nm.
13. The cabled optical fiber shall support industry-standard IEEE 802.3 1000Base-SX (Gigabit Ethernet at 850 nm) physical layer specifications for 1000 meters and 1000Base-LX (Gigabit Ethernet at 1300 nm) for 600 meters.
14. The cabled optical fiber shall support industry-standard multi-gigabit Fiber Channel physical interface specifications.
15. There shall be no point discontinuity greater than 0.2 dB. The attenuation coefficient at 1380 nm shall not exceed the attenuation coefficient at 1300 nm by more than 3.0 dB/km.
16. The attenuation due to 100 turns of fiber around a 75 mm diameter mandrel shall not exceed 0.5 dB at 850 nm and 1300 nm.

2.06 INFORMATION OUTLET

A. General

1. Station cables shall each be terminated at their designated workstation location in the connector types described in the sub-sections below. Included are modular jacks, faceplates, and surface mount raceway. The combined assembly is referred to as the Standard Information Outlet (SIO). These connector assemblies shall snap into a mounting frame.
2. SIOs shall be mounted (1) where existing boxes are in place, (2) on surface mounted outlet boxes, and (3) on floor mount interface boxes.
3. The Telecommunications Outlet Frame shall accommodate the following:
 - a. A minimum of four (4) modular jacks, when installed on a wall-mounted assembly.
 - b. The outlet frame shall incorporate a mechanism for adjusting the surface plate to a plumb position.
4. Multiple Jacks - identified in close proximity on the drawings. The Contractor shall be responsible for determining the optimum compliant configuration based on the products proposed.
5. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the Contractor shall submit the proposed configuration for each SIO type for review by the Consultant.

B. Outlet Faceplates

1. Faceplate frames shall be vertical, single, and double gang frames with combination head screws, screw covers, labels. The faceplates shall mount onto standard U.S. NEMA boxes and adapters with screw to screw dimensions of 3.28". Each faceplate frame shall accept flat, sloped, sloped recessed, and blank module inserts that can be individually inserted and removed as required from the front of the frame without removing the frame.
2. Any unused jack positions shall be fitted with a removable blank inserted into the opening.
3. All standard information outlets and the associated jacks shall be of the same manufacturer throughout each school building.
4. Faceplates shall be manufactured by Ortronics, Panduit, Leviton, Siemon, or equivalent products that meet this specification.

2.07 MODULAR JACK

- A. Data jacks shall be non-keyed 8-pin modular jack.
- B. Termination components shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.
- C. The termination cap shall provide strain relief on the cable jacket, ensure cable twists are maintained to within 1/8", and include a wiring scheme label. The wiring scheme label shall be available with both T568A and T568B wiring schemes.
- D. All terminations for this project shall use the T568B wiring scheme.
- E. The modules shall terminate 4-pair 24 and 22 AWG 100 ohm solid unshielded twisted pair cable. They shall be universal in design, accepting 2, 3, or 4 pair modular plugs without damage to the outer jack contacts.
- F. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
- G. Modular jack contacts shall accept 2500 plug insertions.
- H. Modular jack contacts shall be formed flat for increases surface contact with mated plugs. These contacts shall be arranged on the PC board in 2 staggered arrays of 4 to maximize contact spacing and minimize crosstalk.
- I. Modular jack contacts shall be constructed of Beryllium copper for maximum spring force and resilience.
- J. Contact plating shall be a minimum of 50 micro inches of gold in the contact area over 50 micro-inch of nickel, compliant with FCC part 68.5.
- K. Jacks shall include translucent wire retention stuffer caps to hold terminated wires in place while allowing to conductors to be viewed in the IDC housing. Stuffer caps may also be used for wire termination with parallel jaw pliers.
- L. Jacks shall be compatible with EIA/TIA 606 color code labeling and accept snap on icons for identification or designation of applications.
- M. Category 6 jacks (Alternate 1) shall be manufactured by Ortronics OR-TJ600, Panduit Mini-Com TX6 PLUS, or equivalent products that meet this specification.
- N. Category 5e jacks shall be manufactured by Ortronics OR-TJ5E00, Panduit Mini-Com TX5E or equivalent products that meet this specification.

2.08 ADDITIONAL MODULES FOR COPPER CABLING

- A. Additional modules for copper shall include the following:
1. 50 and 75 Ohm BNC coax coupler modules, male-male
 2. F-type coax coupler module, male-male threaded
 3. RCA pass through connector modules with black, red, yellow, and white inserts
 4. S-Video connectors modules - coupler and punch down termination types
 5. Blank module to reserve space for future additions
- B. The connectors shall be designed to allow snap-in installation into the outlet faceplates.

2.09 FIBER OPTIC CONNECTOR

- A. The Optical Connector shall be LC-type (bayonet mount).
- B. The connector ferrule shall be ceramic or glass-in-ceramic. The optical fiber within the connector ferrule shall be secured with an adhesive.
- C. The attenuation per mated pair shall not exceed 0.35dB (individual) and 0.2-dB (average). Connectors shall sustain a minimum of 200 mating cycles per EIA/TIA-455-21 without violating specifications.
- D. The connector shall meet the following performance criteria:

<u>1. Test Procedure</u>	<u>Max. Attenuation Change</u>
Cable Retention (FOTP-6)	0.2-dB
Durability (FOTP-21)	0.2-dB
Impact (FOTP-2)	0.2-dB
Thermal Shock (FOTP-3)	0.2-dB
Humidity (FOTP-5)	0.2-dB

2.10 PATCH PANELS

- A. Cables shall be terminated at the telecommunication closets on high-density integrated patch panels incorporating Category 5e modules (NON-KEYED 8-pin), meeting the specifications for the telecommunications outlet detailed in the section above.
- B. The largest single patch panel configuration shall not exceed 48 ports. The patch panel shall consist of a Modular to 110-type connector system.

- C. The patch panel blocks shall have the ability to seat and cut 8 conductors (4 pairs) at a time and shall have the ability of terminating 22- through 26-gauge plastic insulated, solid and stranded copper conductors. Data blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.
- D. The patch panel must exceed ANSI/TIA/EIA 568-B.2-1 Category 5e component compliance standard. All pair combinations must be considered, with the worst-case measurement being the basis for compliance.
- E. The patch panels shall be interoperable and backwards compatible to lower performing cabling systems.
- F. Panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to ensure that all manufacturers' minimum bend radius specifications are adhered to.
- G. The patch panel shall have color-coded designation strips to identify cable count.
- H. Category 6 patch panels (Alternate 1) shall be manufactured by Ortronics OR-PHD68U48, Panduit DP 48688TG, or equivalent products that meet this specification.
- I. Category 5e patch panels shall be manufactured by Ortronics OR-PHD5E6U48HM, Panduit DP485E88TGY or equivalent products that meet this specification.

2.11 VOICE BACKBONE TERMINATION FIELD

- A. Voice backbone cables shall be terminated on the 24-port Category 3 patch panels, unless noted otherwise on the drawings.
- B. Each pair of the backbone cable shall be terminated on W/B pin of the patch panel port.
- C. The mechanical termination shall...
 - 1. Have the ability of terminating 22 - 26 AWG plastic insulated, solid and stranded copper conductors.
 - 2. Provide a direct connection between the cable and jumper wires.
 - 3. Have less than 0.2-dB of attenuation from 1 - 100 MHz.
 - 4. Have less than 100 mw of DC resistance.
 - 5. Have less than 5 mw of resistance imbalance.
 - 6. Have minimal signal impairments at all frequencies up to 100 MHz.

- D. Category 3 patch panels shall be manufactured by Ortronics, Panduit, Leviton, or Siemon.

2.12 FIBER OPTIC PATCH PANELS

- A. All terminated fibers shall be mated to duplex LC couplings mounted on enclosed patch panels. Couplers shall be mounted on a panel that, in turn, snaps into the enclosure. The proposed enclosure shall be designed to accommodate a changing variety of connector types, including SC, ST, Fixed Shroud Duplex (e.g. “FDDI Connector”), Biconic and FC by changing panels on which connector couplings are mounted.
- B. The patch panel enclosure shall be sized to accommodate the total fiber count to be installed at each location as defined in the specifications and drawings - including those not terminated (if applicable).
- C. Connector panels and connector couplings (sleeves, bulkheads, etc.) adequate to accommodate the number of fibers to be terminated shall be furnished and installed by the contractor.
- D. Patch panels shall be designed for easy installation, front removal, and expansion of snap-in adapter panels.
- E. Patch panels shall be enclosed assemblies affording protection to the cable subassemblies and to the terminated ends. The enclosures shall incorporate a hinged or retractable front cover designed to protect the connector couplings and fiber optic jumpers.
- F. The patch panel’s enclosure shall provide for strain relief of incoming cables and shall incorporate radius control mechanisms to limit bending of the fiber to the manufacturer’s recommended minimums or 1.2”, whichever is larger.
- G. Access to the inside of the patch panel enclosure during installation shall be from the front and rear. Panels that require any disassembly of the cabinet to gain entry will not be accepted.
- H. All patch panels shall provide protection to both the “facilities” and “user” side of the coupling. The patch panel enclosure shall be configured to require front access only when patching. The incoming cables (e.g., Backbone, Riser) shall not be accessible from the patching area of the panel. The enclosure shall provide a physical barrier to access of such cables.

- I. Fibers shall be terminated either by (1) splicing of factory-terminated cable assemblies (“pigtails”) or (2) the use of a “fan-out” kit. In the latter approach, individual fibers are to be secured in a protective covering – such as an Aramid reinforced tube for example - with connectors mated to the resulting assembly. In both instances, the proposed termination hardware shall incorporate a mechanism by which cable and sub-assemblies are secured to prevent damage. Splicing shall be by the “fusion” method. Individual splice loss shall not exceed 0.2 dB.
- J. Fiber optic patch panels shall be ADC FL-2000 series or equivalent products.

2.13 2-POST EQUIPMENT RACK

- A. Equipment racks shall be furnished and installed by the Contractor to house cable termination components (e.g., copper data and fiber optic) and network electronics (by others). Where additional equipment racks are required or where existing racks are in place and none are required, it shall be so noted on the drawings.
- B. The rack shall conform to the following requirements:
 - 1. The rack shall comply with State Building Codes for the seismic area in which it is to be installed.
 - 2. Rack shall be 84” in height and shall be self-supporting.
 - 3. Channel uprights shall be spaced to accommodate industry standard 19” mounting.
 - 4. Rack must be constructed of metal and have either a black coating or painted surface.
 - 5. Rack shall be double-side drilled and tapped to accept 12-24 screws. Uprights shall also be drilled on back to accept cable brackets, clamps, power strip(s), etc. Hole pattern on rack front shall be per EIA/TIA specifications (5/8"-5/8"-1/2"). Hole pattern on the rear shall be at 3" intervals to accept cable brackets.
 - 6. Rack should be supplied with a supply of spare screws (minimum of 24).
 - 7. Base footprint should be no smaller than 15”x20”.
 - 8. Rack should be supplied with a ground bar and #6 AWG Ground lug.
- C. Equipment rack shall be CPI 55054-503 or other manufacturer that meets these specifications.

2.14 4-POST EQUIPMENT RACK

- A. Where shown on the drawings, the Contractor shall provide and install 4-post adjustable equipment racks per drawings to house cable termination components (e.g., copper data and fiber optic) and network electronics or servers (by others). Prior to installation, the Contractor shall coordinate exact placement with Owner.
- B. The 4-post rack shall conform to the following requirements:
 - 1. Rack shall be 84" in height and shall be self-supporting.
 - 2. Channel uprights shall be spaced to accommodate industry standard 19" mounting.
 - 3. Rack must be constructed of aluminum.
 - 4. Rack shall be double side drilled and tapped to accept 12-24 screws. Uprights shall also be drilled on back to accept cable brackets, clamps, power strip(s), etc. Hole pattern on rack front shall be per EIA/TIA specifications (5/8"-5/8"-1/2"). Hole pattern on the rear shall be at 3" intervals to accept cable brackets.
 - 5. Rack should be supplied with at least 24 spare screws.
 - 6. Rack should be supplied with a ground bar and #6 AWG ground Terminal Block CPI part# 40167-001.
- C. Equipment rack shall be CPI part # 50120-X03.

2.15 WALL MOUNT SWING RACK

- A. The Wall Mount Swing Rack shall be constructed of 12-gauge steel with a black powder coat finish available in 48" heights accommodating 25 rack mount spaces. Rack shall swing either to the left or the right and incorporate quick-release spring-loaded hinges.
- B. The rack shall feature vented sides and solid front door.
- C. The rack rails shall be spaced to accommodate 19" of mounting space rail-to-rail. The rack rails shall be of 3" deep, U shaped construction with EIA-310-D standard hole patterns pre-tapped for 12/24 screws on both front and back.
- D. Rack mounting brackets shall be of 12 gauge steel construction and designed to support up to 100 lb. of equipment. Brackets shall be constructed so that they may be secured to studs in the wall on 16" centers. Brackets shall include integral cable tie-down points on both sides and on top and bottom. Brackets shall provide a full 18" of mounting depth behind the rack.

- E. Wall Mount Swing Rack shall be APW HSQ48S26 or other manufacturer that meets these specifications.

2.16 CABLE MANAGEMENT SYSTEM

- A. The cable management system shall be used to provide a neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures. The system shall be a complete cable management system comprised of floor mount racks, wall mount racks, vertical and horizontal cable managers to manage cables on both the front and rear of the rack. The system shall protect network investment by maintaining system performance, controlling cable bend radius and providing cable strain relief.

2.17 VERTICAL CABLE MANAGEMENT

- A. At the telecommunication rooms, vertical cable management shall be furnished and installed to adjacent racks to organize cables on front and rear of telecommunication racks.
- B. See the drawings for the size of vertical cable management.
- C. Vertical cable managers shall include components that aid in routing, managing and organizing cable to and from equipment. Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief. Panels shall be a universal design mounting to EIA 19" or 23" racks.
- D. Vertical cable management system shall feature the following:
 - 1. Open cabling section on the rear that provides easy access and routes cable bundles feeding into the back of patch panels and 1 RMU cable guides on the front designed for fanning and managing patch cords.
 - 2. Edge-protected pass through ports designed for easy routing of cable from front channel to back.
 - 3. Vertical slots along the center separator to allow securing of cable bundles neatly with management straps.
 - 4. Door/cover (front only) that is easily opened from the right or left and can be easily removed to allow for quick moves, adds, and changes.
 - 5. Movable wire retainers to retain the cables during cover removal.
- E. Vertical cable management shall be CPI part # 30161-703 or 30162-703.

2.18 HORIZONTAL CABLE MANAGEMENT

- A. Horizontal cable managers shall include components that aid in routing, managing, and organizing cable to and from equipment. Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief. Panels shall be a universal design mounting to EIA 19" or 23" racks and constructed of steel bases with PVC duct attached. The duct fingers shall include retaining tabs to retain the cables in place during cover removal. The covers shall be able to hinge from either side yet still be easily removed to allow for quick moves, adds, and changes.
- B. The cable managers shall be provided with movable wire retainers to retain the cables during cover removal and #12-24 mounting screws. An integral strain relief bracket shall be provided on either end of the duct to allow for easy cover placement.
- C. Horizontal cable management shall be CPI part # 30130-719.
- D. NOTE: Where cable termination hardware is wall mounted, the contractor shall be responsible for establishing a cable pathway for jumpers routed from the equipment rack(s) to the wall. This shall be in the form of slotted ducts, troughs, or other means. Routing of jumpers via the overhead cable tray or ladder rack system is not acceptable. The proposed method shall be included in the submittals required by this document and shall be approved by the Consultant prior to installation.

2.19 FIRE STOPPING MATERIALS

- A. All penetrations of firewalls must be approved by the Owner before any penetrations are made. Should the Contractor find it necessary to penetrate any walls extending to the slab, it will be the responsibility of that Contractor to provide satisfactory sleeving and fire caulking both inside and outside of that sleeving. If existing sleeving is to be utilized, it will be the responsibility of the Contractor to fire caulk inside the sleeving.
- B. The Contractor is responsible for adhering to the following standard:
 - 1. Conduit penetrations through fire-rated or smoke walls: Completely seal around the conduit penetration with Hilti FS 601 fire-rated sealant Tremco or 3M or equal.
 - 2. Conduit sleeves through fire-rated or smoke wall: Completely seal around the conduit penetration with Hilti FS 601 fire-rated sealant Tremco or 3M or equal. Completely seal inner opening of the conduit sleeve with fire wool packing and Hilti FS 611A intumescent firestop sealant.

3. Cable bundles through fire-rated or smoke walls (with out sleeves): Completely seal openings with Hilti FS 611A intumescent firestop sealant, Tremco or 3M or equal.
 4. Cable tray penetrations through fire-rated or smoke walls: Completely seal openings with Hilti FS 635 (trowelable type) Tremco or 3M or equal.
- C. A submitted response to this specification assumes that all firestopping will be provided as specified. The firestop manufacturer's specifications and instructions shall be submitted with the final documentation.

2.20 CABLE HOOK SYSTEMS

- A. In areas where the cables are required to be run "free-air," cable hook systems shall be used.
- B. Cable hooks shall be capable of supporting a minimum of 30 lbs. with a safety factor of 3.
- C. Spring steel cable hooks shall be capable of supporting a minimum of 100 lbs. with a safety factor of 3 where extra strength is required.
- D. Follow manufacturer's recommendations for allowable fill capacity for each size of cable hook.
- E. Installation and configuration shall conform to the requirements of the ANSI/ EIA/TIA Standards 568A & 569, NFPA 70 (National Electrical Code), and applicable local codes.
- F. Cable hooks shall...
 1. Have a flat bottom and provide a minimum of 1-5/8" cable bearing surface.
 2. Have 90-degree radiused edges to prevent damage while installing cables.
 3. Be designed so the mounting hardware is recessed to prevent cable damage.
 4. Have a stainless steel cable latch retainer to provide containment of cables within the hook.
 5. Have a retainer that shall be removable and reusable.
 6. Be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, and floor posts, to meet job conditions.

- G. Factory assembled multi-tiered cable hooks shall be used where required to provide separate cabling compartments, or where additional capacity is needed.
- H. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653 G90. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
- I. Cable hooks for corrosive areas shall be stainless steel, AISI type 304.
- J. Cable hooks shall be B-Line series BCH21, BCH32, BCH64, or other manufacturer that meets these specifications.

2.21 LADDER TYPE CABLE RUNWAY

- A. The Contractor shall provide of all necessary labor, supervision, materials, equipment, tests, and services to install ladder type cable runway in the existing MER rooms.
- B. The ladder type cable runway shall be installed over the new data racks and be interconnected with the existing cable tray.
- C. The solid runway stringers shall be made of 3/8" ASTM A36 structural steel bars. The stringers shall have height of 1-1/2" or 2". The cross members shall be made from 12 gage Cold Rolled Steel channel and have outside dimensions of 1" by 1/2".
- D. The cross-slats shall be welded 1/4" below the top to the stringers and spaced 9" on center.
- E. The solid runway shall be 12" widths.
- F. The cable runway shall be available in gray painted finishes.
- G. The cable runway shall be capable of supporting 115 lb/ft when supported at 5' intervals and 96 lb/ft.
- H. Contractor shall provide hardware for joining sections of cable runway in straight lines and at right angles. There should also be hardware available to mount and join the cable runway in various configurations and attachment methods.
- I. The cable runway shall be supported with 5/8-11 threaded rod or by other fastening methods. The contractor shall provide hardware for attaching the cable runway to the support rod or other devices.
- J. The cable runway system specified herein shall be the FieldMate CR Series Cable Runway System as manufactured by The Wiremold Company or other products that meet these specifications.

2.22 COPPER PATCH CORDS

- A. The Owner has the right to determine the final length of the patch cords after the contract is awarded.
- B. All Category 5e (Category 6 –Alternate 1) UTP patch cords shall be round and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted pairs within a flame retardant jacket and be backwards compatible with lower performing categories. Modular patch cords shall utilize ISO termination method that is designed to reduce and control near-end cross talk (NEXT) and far end cross talk (FEXT) without compromising signal impedance. All Office Area patch cords shall be plenum rated, and all Data Center patch cords shall be non-plenum rated.
- C. Both ends of the cord shall be equipped with modular 8-position (RJ45 style) plugs wired straight through with standards compliant wiring. All modular plugs shall exceed FCC CFR 47 part 68 subpart F and IEC 603.7 specifications, and have 50 micro inches of gold plating over nickel contacts. Cable shall be label-verifiable. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Category 6 cords shall have color-coded insert molded strain relief boot with a latch guard to protect against snagging. Additional color-coding shall be available by the use of snap-in icons.
- D. Patch cords shall be wired straight through. Pin numbers shall be identical at each end and shall be paired to match T568B patch panel jack wiring per ANSI/TIA/EIA-568-B. Patch cords shall be unkeyed.
- E. The manufacturer of the Office area patch cords shall be the same as the manufacturer for UTP termination hardware (jack and patch panels).
- F. The Contractor shall provide the following patch cords:
 - 3 feet Blue – 50. 3 feet Yellow -15
 - 6 feet Blue -600 6 feet Yellow-50
 - 10 feet Blue- 300

2.23 FIBER OPTIC PATCH CORDS

- A. The Contractor shall provide 3 mm diameter fiber patch cords.
- B. The patch cords shall be terminated on LC connectors.
- C. The patch cords shall meet OM3 specifications

- D. The fiber patch cords shall feature a pull-proof connector designed to prevent unintended disconnect.
- E. The patch cords shall be aqua color.
- F. The patch cords shall be manufactured by Orthotics or Panduit.
- G. The contractor shall provide two (2) -2 meter fiber optic patch cords.

2.24 UNSPECIFIED EQUIPMENT AND MATERIAL

- A. Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide a complete and functional structure cabling system installation shall be provided in a level of quality consistent with other specified items.

2.25 TWISTED PAIR TEST EQUIPMENT

- A. Test equipment used under this contract shall be from a manufacturer who has a minimum of five years experience in producing field test equipment. Manufacturers must be ISO 9001 certified.
- B. All test tools of a given type shall be from the same manufacturer and have compatible electronic results output. Test adapter cable must be approved by the manufacturer of the test equipment. Baseline accuracy of the test equipment must be TIA Level III or better, as indicated by independent laboratory testing.
- C. Test equipment must...
 - 1. Be capable of certifying Category 5, 5E, and 6 permanent links.
 - 2. Have a dynamic range of at least 100dB to minimized measurement uncertainty.
 - 3. Be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.
 - 4. Include S-band time domain diagnostics for NEXT and return loss.
 - 5. Be capable of running individual NEXT, return loss, etc., measurements in addition to AutoText.
 - 6. Include a library of cable types, stored by major manufacturer.
 - 7. Store at least 1000 Category 5e or 6 autotests in internal memory.
- D. The measurement reference plane of the test equipment shall start immediately at the output of the test equipment interface connector. There shall not be a time domain dead zone of any distance that excludes any part of the link from the measurements.

PART 3 – EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper and timely completion.
- B. Verify cable lengths comply with published standards.
- C. Notify the Owner of installation that would exceed maximum lengths prior to installation of cable.
- D. The Contractor shall consult with the Owner regarding alternative routing or location of cable.
- E. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION REQUIREMENTS

- A. The Contractor shall furnish and install all cables, connectors, and equipment as shown on drawings and as specified above.
- B. It is the Contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.
- C. Beginning installation means Contractor accepts existing conditions.
- D. The Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment includes, but is not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge, and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.
- E. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to ensure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a "break-away," or other approved method.
- F. The Contractor will be responsible for identifying and reporting to the General Contractor any existing damage to walls, flooring, tiles, and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable, raceway, or other hardware must be repaired by the Contractor.

- G. Repairs must match preexisting color and finish of walls, floors, and ceilings. Any contractor-damaged ceiling tiles, floor, and carpet are to be replaced to match color, size, style, and texture.
- H. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.
- I. Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation, an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
- J. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed.
- K. All wiring shall be run "free-air," in conduit, in a secured plastic raceway or in modular furniture as designated on the drawings. All cable shall be free of tension at both ends. PLENUM rated cable MUST be used in areas used for Air Handling.
- L. Avoid abrasion and other damage to cables during installation.
- M. Pulling lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.
- N. The cable system will be tested and documented upon completion of the installation as defined in the Section below.
- O. Should it be found by the Consultant that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected, and shall be removed and replaced by the Contractor. All work distributed by changes necessitated in consequence of said defects or imperfections shall be corrected at the Contractor's expense.

3.03 CABLE SUPPORT

- A. J-hooks fabricated to contain data voice and video cables may be used to support 25 cables or less in each hook. J-hooks are to be fastened to building steel with beam clamps, suspended from ceiling slab with threaded rod or anchored to the wall. All J-hooks to be hung straight and level. No other installation technique will be authorized unless pre-approved.
- B. Three tiered double-sided J-hook configurations shall contain a maximum of 25 cables per hook or 150 cables. Smaller configurations may be used as bundles decrease in size, maintaining no more than 25 cables per hook.
- C. Bundles surpassing 150 cables must be supported by hangars, fabricated of 3/8" threaded rod and 24" Unistrut. Hangars must also be installed where the installation of a three-tiered J-hook system is not appropriate for the ceiling space, or where blocked by other trades work.
- D. Cable bundles consisting of less than 10 cables may be supported by bridle rings or D-rings.
- E. All cable support in the main cable path must be installed every 4 feet. Small cable bundles (under 25) not in the main path may be supported every 5 feet.
- F. A sag must be maintained between supports of 6", to reduce cable strain. Tywraps are appropriate methods of securing cables, when properly used, and are not over tightened. Over tight tywraps dent and pinch the cable jackets and will not be allowed.
- G. Proper cable support is extremely important to the Owner, and care shall be taken by the Contractor to provide and install the appropriate supports. Supports found to be inadequate will be replaced.

3.04 FIBER OPTIC CABLE INSTALLATION REQUIREMENTS

- A. Cable slack shall be provided in each backbone fiber optic cable. This slack is exclusive of the length of fiber that is required to accommodate termination requirements and is intended to provide for cable repair and/or equipment relocation. The cable slack shall be stored in a fashion as to protect it from damage and be secured in the termination enclosure or a separate enclosure designed for this purpose. Multiple cables may share a common enclosure.
- B. A minimum of 5-meters (approx. 15-feet) of slack cable (each cable if applicable) shall be coiled and secured at one (1) end - preferably at the entrance room and/or main equipment room.

- C. Exact cable termination locations shall be field verified with the Owner.
- D. Where exposed, all backbone fiber optic cable shall be installed in protective inner duct. This includes areas where the cable is routed in cable tray and where making a transition between paths (e.g., between conduit & cable tray or into equipment racks). The inner duct should extend into the termination and/or storage enclosure(s) at system endpoints.

3.05 STATION CABLING

- A. Information outlet cables with copper media shall be located as detailed on the Project Drawings.
- B. The Contractor in determining materials quantities and routing should utilize these documents.
- C. Station cables shall be run to the information outlet from the telecommunications closet serving each area in conduit, free-air above drop ceiling, in cable tray and/or in modular furniture.
- D. The maximum station cable drop length for UTP cables shall not exceed 295-feet (90-meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the wiring closet to the outlet and must include any slack required for the installation and termination. The Contractor is responsible for installing station cabling in a fashion as to avoid unnecessarily long runs. Any area that cannot be reached within the above constraints should be identified and reported to the Consultant prior to installation. The Consultant should approve changes to the plan.
- E. The minimum station cable drop length for UTP cables shall be not less than 70 feet. The Contractor is responsible for installing station cabling in a fashion as to avoid runs less than 70 feet. If cable slack is required to accommodate the minimum length requirements, the Contractor is responsible for storing the slack in a fashion as to protect the cable from damage. The cable slack shall be secure above the ceiling tiles in a figure 8 form by means of “J” hooks or D-rings anchored to the building structure. The cable slack shall be coiled to maintain from 100% to 200% of the cable recommended minimum bend radius. Multiple cables may share a common support.
- F. All cables shall be installed splice-free unless otherwise specified.
- G. During pulling operation, an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
- H. Avoid abrasion and other damage to cables during installation.

- I. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.
- J. Where installed free-air, installation shall consider the following:
 - 1. Cable shall run at right angles and be kept clear of other trades' work.
 - 2. Cables shall be supported according to code utilizing "J-" or "Bridal-type" mounting rings anchored to ceiling concrete, walls, piping supports, or structural steel beams.
 - 3. Rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4x cable diameter).
 - 4. Supports should be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 6-inches, another support shall be used.
- K. Cable shall never be laid directly on the ceiling grid.
- L. Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports, or electrical or communications conduit.
- M. Manufacturers minimum bend radius specifications shall be observed in all instances. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
- N. Cable sheaths shall be protected from damage from sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.
- O. A coil of 1 foot in each cable shall be placed in the ceiling at the last support (e.g., J-Hook, Bridal Ring) before the cables enter a fishable wall, conduit, surface raceway, or box. At any location where cables are installed into movable partition walls or modular furniture via a service pole, approximately 15 feet of slack shall be left in each station cable under 250 feet in length to allow for change in the office layout without re-cabling. These "service loops" shall be secured at the last cable support before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

- P. To reduce or eliminate EMI, the following minimum separation distances from $\leq 480V$ Power lines shall be adhered to:
 - 1. Twelve (12) inches from power lines of $<5\text{-kVa}$.
 - 2. Eighteen (18) inches from high voltage lighting (including fluorescent).
 - 3. Thirty-nine (39) inches from power lines of 5-kVa or greater.
 - 4. Thirty-nine (39) inches from transformers and motors.
- Q. All openings shall be sleeved and firestopped per prevailing code requirements upon completion of cable installation.

3.06 INFORMATION OUTLET

- A. Information outlets shall be flush mounted on wall-mounted boxes, in floor-mounted boxes, and on modular furniture.
- B. Any outlets to be added where these conditions are not met shall be positioned at a height matching that of existing services or as directed otherwise by the Owner and the Consultant. Nominal height (from finished floor to center line of Outlet) in new installation shall be as follows:
 - 1. Standard Voice & Data Outlet (SIO) Reference Details & Drawings
 - 2. Wall-Mounted Telephone Outlet (Standard Voice only) Reference Details & Drawings
- C. The Contractor is to coordinate the style of the telecommunication outlets to be installed in the floor mount boxes and surface mount raceways with the Owner.

3.07 CABLE TERMINATION

- A. At the telecommunication closet, all data and voice cables shall be positioned on termination hardware in sequence of the Outlet I.D., starting with the lowest number.
- B. Termination hardware (blocks and patch panels) positioning and layout must be reviewed and approved by the Consultant prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.
- C. Cable Termination – Data UTP
 - 1. Data patch panels shall be designed and installed in a fashion as to allow future station cabling to be terminated on the panel without disruption to existing connections.

2. Data patch panels shall be sized to accommodate a minimum of 10% growth in the quantity of stations relative to the initial installation.
3. At information outlets and data patch panels, the installer shall ensure that the twists in each cable pair are preserved to within 0.5-inch of the termination for data/voice cables. The cable jacket shall be removed only to the extent required to make the termination.

D. Cable Termination – Fiber Optic

1. ALL fibers shall be terminated using the specified connector type.
2. All terminated fibers at the telecommunications closets shall be mated to couplings mounted on patch panels. Couplings shall be mounted on a panel that, in turn, snaps into the housing assembly. Any unused panel positions shall be fitted with a blank panel inhibiting access to the fiber optic cable from the front of the housing.
3. All couplings shall be fitted with a dust cap.
4. Fibers from multiple locations may share a common enclosure; however, they must be segregated on the connector panels and clearly identified. Fibers from multiple destinations may be secured in a common enclosure provided that they are clearly identified as such. Fibers from different locations shall not share a common connector panel (e.g., “insert”).
5. Slack in each fiber shall be provided as to allow for future re-termination in the event of connector or fiber end-face damage. Adequate slack shall be retained to allow termination at a 30” high workbench positioned adjacent to the termination enclosure(s). A minimum of 1-meter (~39”) of slack shall be retained regardless of panel position relative to the potential work area.

3.08 EQUIPMENT RACK

- A. The Contractor shall bolt the rack to the floor as recommended by the manufacturer. Multiple racks shall be joined and the ground made common on each. Rack shall also be stabilized by extending a brace extending to the wall. Alternately, overhead cable tray over which the cabling accesses the equipment rack(s) shall provide this function.
- B. A space between the rack upright and the wall (~4") should be planned to allow for cabling in that area. The rear of the rack should be ~40” from the wall to allow for access by maintenance personnel. In all cases, a minimum of 40” workspace in front of the rack is also required. Locations where these guidelines cannot be followed should be brought to the attention of the Consultant for resolution prior to installation.

- C. All hardware and equipment is to be mounted between 18” and 79” above floor level. This is to afford easy access and, in the case of the lower limit, prevent damage to the components. Positioning of hardware should be reviewed and approved by the Consultant and Site Coordinator(s) prior to installation.
- D. Equipment rack shall be equipped with cable management hardware as to allow an orderly and secure routing of twisted pair cabling to the data patch panels. At minimum, one such horizontal jumper management panel shall be placed below each fiber optic patch panel installed by the Contractor. Additional jumper management panels may be required pending installation of other cable types on the rack. The rack shall be grounded to the Telecommunications Ground (TGB) using a #6 AWG (or larger) insulated stranded copper conductor (GREEN jacket).

3.09 CABLE TRAY

- A. Install cable tray as indicated, in accordance with recognized industry practices, to ensure that the cable tray equipment complies with requirements of NEC and applicable portions of NFPA 70B and NECA’s “Standards of Installation” pertaining to general electrical installation practices.
- B. Coordinate installation of cable tray runway with other electrical work as necessary to properly interface installation of wire basket runway with other work.
- C. Provide sufficient space encompassing cable tray to permit access for installing and maintaining cables.
- D. Test wire basket runways to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B, Chapter 18, for testing and test methods.

3.10 COOPERATION

- A. The Contractor shall cooperate with other trades and Construction Manager personnel in locating work in a proper manner.
- B. Should it be necessary to raise or lower or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to the Owner, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

3.11 TESTING AND ACCEPTANCE

- A. The Contractor is responsible for performing acceptance tests as indicated below for each sub-system (e.g., backbone, station) as it is completed.
- B. The Contractor is responsible for supplying all equipment and personnel necessary to conduct the acceptance tests. Prior to testing, the Contractor should provide a summary of the proposed test plan for each cable type including equipment to use, set-up, test frequencies or wavelengths, results format, etc. The Consultant shall approve the method of testing.
- C. The Contractor shall visually inspect all cabling and termination points to ensure that they are complete and conform to the wiring pattern defined herein. The Contractor shall provide the Consultant with a written certification that this inspection has been made.
- D. The Contractor shall conduct acceptance testing according to a schedule coordinated with the Consultant. Representatives of the Owner may be in attendance to witness the test procedures. The Contractor shall provide a minimum of one (1) week advance notice to the Consultant and Owner as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.
- E. Tests related to connected equipment of others should be done only with the permission and presence of Contractor involved. The Contractor shall ascertain that testing only as required to prove the wiring connections are correct.
- F. The Contractor shall provide test results and describe the conduct of the tests including the date of the tests, the equipment used, and the procedures followed. At the request of the Consultant, the Contractor shall provide copies of the original test results.
- G. All cabling shall be 100% fault free unless noted otherwise. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the expense of the contractor. The applicable tests shall then be repeated.
- H. Backbone Cabling: Backbone Voice cables shall be free of shorts within the pairs, and be verified for continuity, pair validity, and polarity and conductor position on the termination blocks (e.g., 110). Any mis-positioned pairs must be identified and corrected. The percentage of “bad” pairs shall not exceed 1% in any Backbone (Riser or Tie) Cable based on total pair count. All bad pairs must be identified and documented.

3.12 COPPER STATION CABLES

- A. Station Cabling – Testing shall be from the jack at the outlet in the work area to the termination block on which the cables are terminated at the MER or TR.
- B. Testing shall be of the Permanent Link. However, Contractor shall warrant performance based on channel performance and provide patch cords that meet channel performance criteria. All cabling not tested strictly in accordance with these procedures shall be retested at no cost to the Owner.
- C. Testing shall be from the jack at the SIO to the patch panel on which the cables are terminated at the wiring hub.
- D. Horizontal “Station” cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and Wire Map (Conductor Position on the Modular Jack). Any defective, split, or mis-positioned pairs must be identified and corrected.
- E. Testing of the cabling systems rated at TIA Category 5e / Category 6 (Alternate 1) and above shall be performed to confirm proper functioning and performance.
- F. Testing of the transmission performance of station cables Category 5e / Category 6 shall include the following:
 - 1. Length
 - 2. Attenuation
 - 3. Pair to Pair NEXT
 - 4. ACR
 - 5. PSNEXT Loss
 - 6. Return Loss
 - 7. Pair to Pair ELFEXT Loss (Equal Level Far End Cross-talk)
 - 8. PSEFEXT Loss
 - 9. Propagation Delay
 - 10. Delay Skew
 - 11. Return Loss
- G. The maximum length of station cable shall not exceed 90 meters, which allows 10 meters for equipment and patch cables.

- H. In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacements, and changes as are necessary, and shall then repeat the test or tests that disclosed faulty or defective material, equipment, or installation method, and shall make additional tests as the Engineer deems necessary at no additional expense to the project or user agency.
- I. All data shall indicate the worst-case result, the frequency at which it occurs, the limit at that point, and the margin. These tests shall be performed in a swept frequency manner from 1 MHz to highest relevant frequency, using a swept frequency interval that is consistent with TIA and ISO requirements. Information shall be provided for all pairs or pair combination and in both directions when required by the appropriate standards.
- J. Cables shall be tested to the maximum frequency defined by the standards covering that performance category. Transmission Performance Testing shall be performed using a test instrument designed for testing to the specified frequencies. Test records shall verify "PASS" on each cable and display the specified parameters - comparing test values with standards based "templates" integral to the unit. The overall Pass/Fail evaluation of the Copper link-under-test including the RL and NEXT worst-case margin (margin is defined as the difference between the measured value and the test limit value). Any "Pass*" or "Warning" test results shall be considered a "FAIL" for the permanent link under test. In order to achieve an overall "Pass Condition," the test result for each individual test parameter must be "PASS."

3.13 FIELD TEST REQUIREMENTS FOR FIBER OPTIC CABLING SYSTEM

- A. General Requirements – The fibers utilized in the installed cable shall be traceable to the manufacturer. Upon request by the Owner, the Contractor shall provide cable manufacturer's test report for each reel of cable provided. These test reports shall include manufacturer's on-reel attenuation test results at 850-nm and 1300-nm for each optical fiber of each reel prior to shipment from the manufacturer.
- B. On the reel bandwidth performance as tested at the factory. Factory data shall be provided upon request.
- C. Every fiber optic backbone link in the installation shall be tested in accordance with the field test specifications defined by the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-B or by the appropriate network application standard(s) whichever is more demanding. See 3.14.

- D. The test shall include the representative connector performance at the connecting hardware associated with the mating of patch cords. The test does not, however, include the performance of the connector at the interface with the test equipment.
- E. 100% of the installed cabling links must be tested and must pass the requirements of the standards mentioned in above and as further detailed in 3.14. Any failing link must be diagnosed and corrected at no additional cost to the Owner. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Section 3.14
- F. 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. The manufacturer of the fiber optic cable and/or the fiber optic connectors
 - 2. The manufacturer of the test equipment used for the field certification
 - 3. Training organizations authorized by BICSI
- G. Field test instruments for multimode fiber cabling shall meet the requirements of ANSI/TIA/EIA-526-14A. The light source shall meet the launch requirements of ANSI/EIA/TIA-455-50B, Method A. This launch condition can be achieved either within the field test equipment or by use of an external mandrel wrap (as described in clause 11 of ANSI/TIA/EIA-568-B.1) with a Category 1 light source.
- H. Field test instruments for single mode fiber cabling shall meet the requirements of ANSI/EIA/TIA-526-7.
- I. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
- J. The fiber optic launch cables and adapters must be of high quality and the cables shall not show excessive wear resulting from repetitive coiling and storing of the tester interface adapters.
- K. The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in Section 3.14).
- L. The Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter.

- M. A representative of the Owner shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase five business days before testing commences.
- N. A representative of the Owner will select a random sample of 5% of the installed links. 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 end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

3.14 PERFORMANCE TEST PARAMETERS

- A. The link attenuation shall be calculated by the following formulas specified in ANSI/TIA/EIA standard 568-B.
- B. $\text{Link Attenuation} = \text{Cable_Attn} + \text{Connector_Attn} + \text{Splice_Attn}$
- C. $\text{Cable_Attn (dB)} = \text{Attenuation_Coefficient (dB/km)} * \text{Length (Km)}$
- D. The values for the Attenuation_Coefficient are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation_Coefficient (dB/km)
Multimode 62.5/125 μm	850	3.5
	1300	1.5
Multimode 50/125 μm	850	3.5
	1300	1.5
Single-mode (Inside plant)	1310	0.5
	1550	0.4
Single-mode (Outside plant)	1310	0.4
	1550	0.5

- E. $\text{Connector_Attn (dB)} = \text{number_of_connector_pairs} * \text{connector_loss (dB)}$
- F. Maximum allowable mated connectors_loss = 0.50 dB
- G. $\text{Splice_Attn (dB)} = \text{number of splices (S)} * \text{splice_loss (dB)}$
- H. Maximum allowable splice_loss = 0.1 dB
- I. Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices (i.e., link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers).
- J. Test equipment shall measure the link length and automatically calculate the link loss based on the above formulas.

- K. The above link test limits attenuation are based on the use of the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1 The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.
- L. The backbone link (multimode/single mode) shall be tested in two directions at both operating wavelengths to account for attenuation deltas associated with wavelength.
- M. Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A.
- N. Because backbone length and the potential number of splices vary depending upon site conditions, the link attenuation equation shall be used to determine limit (acceptance) values.
- O. Multimode backbone links are designed to be used with network applications that use laser light sources (underfilled launch conditions). However, link attenuation equation has been based upon the use of a light source categorized as Category 1, Overfilled.
- P. Single mode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1. All single mode links shall be certified with test tools using laser light sources at 1310 nm and 1550 nm.

SECTION 17120 – COMMUNICATIONS SYSTEM IDENTIFICATION AND LABELING

PART 1 – GENERAL

1.01 SCOPE

- A. This section describes the products and execution requirements relating to labeling of telecommunications cabling, termination components, and related sub-systems at the Cook Memorial Libraries. Covered systems include the following:
 - 1. Labeling of equipment room backboards and equipment racks
 - 2. Labeling of all station cable and terminating equipment
 - 3. Labeling of all telecommunications grounds and related components

1.02 RELATED WORK

- A. See Section 17100 - Communications Cable and Equipment.

1.03 REFERENCE STANDARDS

- A. ANSI/NFPA - National Electric Code
- B. Illinois State Electrical Code - Volumes 1 & 2
- C. NEMA, UL, TIA/EIA, and ANSI Standards where applicable standards have been established
- D. ANSI/TIA/EIA 606

1.04 SUBMITTALS

- A. Submit in accordance with provisions of Section 17000 and Shop Drawings of all materials proposed.
- B. Prior to installation, the Contractor shall provide samples of all label types planned for the project. These samples shall include examples of the lettering to be used. Samples shall be mounted on 8 1/2" x 11" sheets annotated explaining their proposed use.

PART 2 – PRODUCTS**2.01 LABELS**

- A. All labels shall be permanent, and be machine generated (e.g., Brady or Panduit). No handwritten or non-permanent labels shall be allowed. Labels shall be Brady “I.D. Pro” or XC-Plus or equivalent. Labeling on backboards and/or equipment racks may be pre-cut adhesive type.
- B. Characters on all labels shall be black printed on a white background.
- C. Label size should be appropriate to the cable size(s), outlet faceplate layout, patch panel design, or other related equipment sizes and layouts.
- D. All labels to be used on cables shall be self-laminating, white/transparent vinyl and be wrapped around the cable sheath. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminated over the full extent of the printed area of the label.
- E. Labels used to identify Innerduct carrying fiber optic cable shall be labeled with a durable yellow Polyethylene tag that reads “CAUTION Fiber Optic Cable” and includes blank spaces for adding (1) fiber count and (2) destination information. An example of a compliant product is the VIP Products “Caution Write-On Coverall Tag.”

PART 3 – EXECUTION**3.01 GENERAL**

- A. Clean surfaces before attaching labels.
- B. Install all labels firmly. Labels attached to terminating equipment such as backboards, faceplates, 110 blocks, and patch panels shall be installed plumb and neatly on all equipment.

3.02 LABELING OF CABLING AND TERMINATION COMPONENTS**A. Backboard and Equipment Racks**

- 1. Backboards and equipment racks shall be labeled by the Contractor identifying the telecommunication room. Additionally, equipment racks shall have an alpha character after the room number unique to that particular communications closet. For example, MER-A would be the first rack in MER.
- 2. Character height shall be 1-inch (minimum).

3.03 FIBER OPTIC BACKBONE, RISER CABLES, AND TERMINATION COMPONENTS

- A. All fiber optic backbone and copper (inter-building, riser and tie) cables shall be identified AT BOTH ENDS with a designation that identifies where the opposite end of the same cable terminates (e.g., Equipment Room or Telecommunications Room I.D.). In addition, labeling of all fiber optic cables shall include the number of fibers in the cable.
- B. Each fiber optic termination panel shall be clearly labeled indicating the destination of the cable(s) and the fiber number of each fiber position. The cable identifiers are to be secured to (1) the side and (2) the front cover of the panel enclosure.

3.04 STANDARD INFORMATION OUTLET (SIO) FACEPLATES

- A. All faceplates shall be clearly labeled indicating the destination of the cable(s) (telecommunication room number), the data patch panel(s) letter designation, the data port number(s) on the data patch panel(s), and the voice cable number(s).
- B. Telecommunications outlets are to be labeled (1) on the cover of the assembly and (2) on each cable terminated at that location.
- C. Station cables shall be labeled within two inches of the cable end.

3.05 DATA AND VOICE PATCH PANELS

- A. All data patch panels shall be clearly labeled indicating the telecommunication room number, the data patch panel letter designation, and the data port number on the data patch panel [ports 1 through 48]. Each telecommunication room shall start with Data Patch Panel 'A' and continue through the alphabet.
- B. All voice patch panels shall be clearly labeled indicating the telecommunications room number and the voice cable\port number. The voice cables shall start with Number V001 in the main closet and shall then count consecutively through all the telecommunication rooms. The voice patch panels shall be installed to allow the voice cable numbers to grow 20% within each telecommunication room.
- C. Station cables at the patch panels shall be labeled within two inches of the cable end.

- D. A Data Port Schedule for each telecommunication room shall be created in spreadsheet format (Excel) with the telecommunication room number, data patch panel letter designations, data port numbers, and room numbers identified in the spreadsheet. In addition, for each data patch panel port, a field shall be provided in the spreadsheet for the Owner to manage the cabling infrastructure by recording the device and any special notes pertaining to the room utilizing the data cable terminated to the port.
- E. A Voice Port Schedule for the entire cabling infrastructure shall be created in spreadsheet format (Excel) with the telecommunication room number, voice port numbers and room numbers identified in the spreadsheet. In addition, for each voice patch panel port a field shall be provided in the spreadsheet for the Owner to manage the cabling infrastructure by recording the device and any special notes pertaining to the room utilizing the voice cable terminated to the port.
- F. Refer to Telecommunication “T” Series Project Drawings for Standard Information Outlet Faceplate and Data & Voice Patch Panel labeling scheme requirements. A sample of the Data and Voice Port Schedules is to be provided, in the Cable Record Book and in Electronic Format (Excel Spreadsheet), to the Owner with final documents have been provided on the Project Drawings.

3.06 FIBER OPTIC CABLES AND TERMINATION COMPONENTS

- A. All fiber optic cables, termination enclosure and connector panel, splice closure, pull box, and innerduct (where not installed in conduit) shall be clearly labeled.
- B. In addition, labeling of all fiber optic cables shall include the number of fibers in the cable.
- C. Each fiber optic termination panel shall be clearly labeled indicating (1) the destination(s) of the cable(s) and (2) fiber number of each fiber position. The cable identifiers are to be secured to (1) the side and (2) the front cover of the panel enclosure.

3.07 GROUND SYSTEM LABELING

- A. All Grounds should be labeled as close as practicable (for ease of access to read the label) to the point of termination. Labels shall be nonmetallic and include the following statement: “WARNING if this connector or cable is loose or must be removed, please call the building telecommunications manager.” Refer to ANSI/TIA/EIA 606A for additional labeling requirements.

3.08 INNERDUCT LABELING

- A. All innerduct containing fiber optic cable installed under this project shall be labeled where exposed. This includes areas where the innerduct is (1) installed alone in risers, tunnels, or trays, (2) where there are transit manholes and/or pull boxes, and (3) in equipment rooms.
- B. The innerduct shall be labeled with a durable yellow Polyethylene tag that reads “CAUTION: Fiber Optic Cable” and includes blank spaces for adding fiber count and destination information.
- C. The destination of the cable(s) contained in the innerduct and the fiber count shall be marked on the tag. Hand lettering is acceptable on this tag, using indelible type ink.
- D. The tag shall be secured to the innerduct(s) using self-locking ties.
- E. Innerduct shall be labeled on each floor in a riser installation, in each pullbox or at 25-foot intervals in a tunnel or tray installation.

SECTION 17160 – COMMUNICATION GROUNDING & BONDING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Related Sections
- B. Applicable Publications
- C. Work Sequencing and Coordination
- D. Telecommunications Submittals
- E. Quality Assurance
- F. Project Record Documents
- G. Qualifications
- H. Regulatory Requirements
- I. Performance Requirements
- J. Materials
- K. Execution

1.02 RELATED SECTIONS

- A. Section 17000 – Telecommunications General Requirements
- B. Section 17100 – Communications Cable and Equipment
- C. Section 17120 – Communication System Identification and Labeling

1.03 APPLICABLE PUBLICATIONS

- A. American National Standards Institute (ANSI) Publication: C2-93
National Electrical Safety Code
- B. Electronic Industries Alliance and Telecommunication Industries
Association (EIA/TIA) Publications:
 - 1. EIA/TIA 568B - Commercial Building Telecommunications Wiring
Standard
 - 2. EIA/TIA 569A - Commercial Building Standard for
Telecommunications Pathways and Spaces

3. EIA/TIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications

- C. Institute of Electrical and Electronic Engineers (IEEE) Publication: 142-1991 Recommended Practice for Grounding of Industrial and Commercial Power Systems
- D. National Fire Protection Association (NFPA) Publication: 70-96 National Electrical Code (NEC)
- E. Underwriters Laboratories, Inc. (U.L.) Publication
 - 1. 83-1983 Thermoplastic Insulated Wires
 - 2. 467-84 (R86) Grounding and Bonding

1.04 WORK SEQUENCING AND COORDINATION

- A. The Contractor shall coordinate interconnection to the existing main ground electrode in each building with the Electrical Contractor on site and the Owner representative. All connections to the existing buildings systems should be performed without affecting the existing building grounding system. However, if any out of service activity is required, the work shall be coordinated a minimum of fourteen (14) days in advance with the Owner representative.

1.05 SUBMITTALS

- A. The Owner shall receive the following Contractor submittals:
 - 1. Product data for:
 - a. Ground bus bars
 - b. Conductors
 - c. Connections (all types)
 - 2. Test Reports for point-to-point resistance tests
 - 3. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.06 QUALITY ASSURANCE

- A. All grounding and bonding system work shall be tested and documented as defined in this section.

- B. For products or workmanship specified by association, trade, Federal, or State Standards, the Contractor shall comply with the requirements of the standard, except when more rigid requirements required by applicable codes or Owner standards shall apply.
- C. The Contractor shall conform to reference standard by date of issue current on final design documents.

1.07 PROJECT RECORD DOCUMENTS

- A. The Contractor shall accurately record and submit to the Engineer of Record complete data regarding signal ground wire pathways, points of bonding, and point of connection to building grounds.

1.08 QUALIFICATIONS

- A. Products specified in this Section shall be manufactured by a company with a minimum of three years' documented experience specializing in manufacturing such products.
- B. The Contractor shall provide the Engineer of Record with a letter or product specification catalog from the manufacturer as evidence of the three years of documented experience listed above.

1.09 REGULATORY REQUIREMENTS

- A. Telecommunications grounding and bonding shall conform to requirements of NFPA 70 and ANSI C2.
- B. The Contractor shall furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the Engineer of Record as suitable for purposes specified and shown.

1.10 PERFORMANCE REQUIREMENTS

- A. Point-to-Point Resistance: 2 ohms or less.

PART 2 – MATERIALS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall conform to the respective standards and to the specifications stated herein. Electrical ratings shall be as indicated. Except where specifically indicated otherwise, the Contractor shall provide only new materials having all legally required approvals and/or labels. Materials shall conform to the requirements of UL 467 where applicable.

2.02 GROUNDING AND BONDING CONDUCTOR

- A. Telecommunications Bonding Backbone (TBB) conductors shall be ASTM B8 bare stranded copper. This conductor shall be installed in 1 inch plenum innerduct. The gauge of the connecting ground cable, known as the TBB shall follow J-STD-607-A guidelines, as is shown in the table below.

Sizing of the TBB	
TBB Length in Linear Feet	TBB Size AWG
Less than 13	6
14-20	4
21-26	3
27-33	2
34-41	1
42-52	1/0
53-66	2/0
Greater than 66	3/0

- B. Bonding conductors shall be ASTM B8 6 AWG isolated stranded copper. Insulation shall be type XHHW-2 insulation with a dielectric constant of 3.5 or less.

2.02 GROUND CONNECTIONS

A. Above Grade:

1. Bonding Jumpers: Compression type connectors, using zinc-plated fasteners and external tooth lockwashers.
2. Ground Busbars: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.
3. Rack and Cabinet Ground Bars: One-hole compression-type lugs using zinc-plated or copper alloy fasteners.

- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe

- C. To provide electrical continuity between ladder rack segments use Auxiliary Cable Bracket, *PANDUIT* part number GACB-1 or equivalent. Use grounding jumper, *PANDUIT* part number GACBJ618U or equivalent, to connects to the auxiliary cable brackets.

- D. *PANDUIT® STRUCTUREDGROUND™* or equivalent Grounding System (kits, components, and hardware shall be used to connect the grounding system.

2.03 GROUND BUS BARS

- A. The Contractor shall provide ground bar with tapped standard NEMA bolt holes for 2-hole compression connectors, mounting brackets and insulators, sizes as indicated:
 - 1. 1/4" x 4" x 12", Lyncole XIT or approved equal in the MERs
 - 2. 1/4" x 4" x 5.25", Lyncole XIT or approved equal in all other telecommunication spaces.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. The Contractor shall provide grounding and bonding in accordance with the requirements of NFPA 70, IEEE 142, EIA/TIA 568B, EIA/TIA569B, EIA/TIA 607, state and local codes, and to requirements specified herein. Codes shall be complied with as a minimum requirement, with these specifications prevailing when they are more stringent. AWG #3/0 wire shall be installed in 1" plenum rated innerduct.

3.02 BONDING

- A. Metallic conduits, wireways, metal enclosures of busways, cable boxes, equipment housings, cable racks, and all non-current carrying metallic parts of the installed telecommunications services shall be grounded with #6 AWG green insulated copper wire. The metallic conduit system shall be used for equipment and enclosure grounding but not as a system ground conductor.
- B. All metallic conduit stub-ups shall be grounded, and where multiple stub-ups are made within an equipment enclosure, they shall be equipped with grounding bushings and bonded together and to the enclosure and the enclosure ground bus.
- C. Each metallic raceway, pipe, duct, and other metal object entering the buildings shall be bonded together. The Contractor shall use #6 AWG green insulated copper conductors.
- D. The Contractor shall bond telecommunications equipment and busbars separately.

3.03 SIGNAL REFERENCE GROUNDING AND BONDING

- A. Each identified telecommunications space within a building shall have a common signal reference ground. The signal reference ground shall conform to the following:
1. Within the building, all communication spaces shall be separately bonded to each other and connected to the primary building ground in accordance with the provisions of EIA/TIA 607A. The communication ground shall not ground any other equipment or be connected to any potential high voltage source. All racks, frames, drain wires, and installed communication equipment shall only be grounded to this common reference ground with a minimum size #6 AWG green insulated copper wire.
 2. The Contractor shall provide a continuous plenum insulated copper electrical conductor or bare copper conductor placed in 1" plenum rated innerduct. The copper conductor shall be connected to a 1/4" x 4" x 5.25" telecommunications grounding bus bar (TGB) installed on the plywood backboard in wall mounted cabinet.
 3. The ground wires at MER shall be terminated and bonded together via a telecommunications main grounding bus bar (TMGB) of minimum 1/4" x 4" x 12" dimensions. This point of single reference for all closets in a building shall be grounded with a minimum #4/0 AWG green insulated ground conductor to the main building ground.

3.04 FIELD TESTS

- A. As an exception to requirements that may be stated elsewhere in these documents, the Inspector of Record shall be given five (5) working days notice prior to each test. The Contractor shall provide all test equipment and personnel and shall provide written copies of all test results.
- B. Grounding and bonding system conductors and connections shall be inspected for tightness and proper installation.
- C. The Contractor shall provide personnel and test equipment for point-to-point resistance tests before connecting equipment. Perform point-to-point tests in each building to determine the resistance between the main grounding system and all MER/TR ground bus bars. Investigate and correct point-to-point resistance values that exceed 0.5 ohm. The Contractor shall record resistance measurements at all test point locations.

APPENDIX: PREVAILING WAGE RATE

Lake County Prevailing Wage for August 2009

Trade Name	RG	TYP	C	Base	FRMAN	*M-F>8	OSA	OSH	H/W	Pensn	Vac	Trng
=====	==	===	=	=====	=====	=====	===	===	=====	=====	=====	=====
ASBESTOS ABT-GEN		ALL		35.200	35.700	1.5	1.5	2.0	9.130	8.370	0.000	0.400
ASBESTOS ABT-MEC		BLD		29.930	0.000	1.5	1.5	2.0	9.170	9.260	0.000	0.320
BOILERMAKER		BLD		43.020	46.890	2.0	2.0	2.0	6.720	9.890	0.000	0.350
BRICK MASON		BLD		39.030	42.930	1.5	1.5	2.0	8.800	10.67	0.000	0.740
CARPENTER		ALL		40.770	42.770	1.5	1.5	2.0	9.840	9.790	0.000	0.490
CEMENT MASON		ALL		40.300	42.300	2.0	1.5	2.0	8.900	11.08	0.000	0.150
CERAMIC TILE FNSHER		BLD		33.600	0.000	2.0	1.5	2.0	6.950	8.020	0.000	0.540
COMMUNICATION TECH		BLD		32.270	34.370	1.5	1.5	2.0	9.040	8.720	1.290	0.470
ELECTRIC PWR EQMT OP		ALL		31.790	40.830	1.5	1.5	2.0	4.750	8.900	0.000	0.240
ELECTRIC PWR GRNDMAN		ALL		24.630	40.830	1.5	1.5	2.0	4.750	6.900	0.000	0.180
ELECTRIC PWR LINEMAN		ALL		37.810	40.830	1.5	1.5	2.0	4.750	10.58	0.000	0.280
ELECTRIC PWR TRK DRV		ALL		25.440	40.830	1.5	1.5	2.0	4.750	7.120	0.000	0.190
ELECTRICIAN		BLD		37.540	41.290	1.5	1.5	2.0	10.51	11.26	1.500	0.530
ELEVATOR CONSTRUCTOR		BLD		44.930	50.550	2.0	2.0	2.0	9.525	8.210	2.700	0.000
FENCE ERECTOR		ALL		30.700	32.200	1.5	1.5	2.0	7.950	8.430	0.000	0.500
GLAZIER		BLD		37.000	38.500	1.5	1.5	2.0	7.340	12.05	0.000	0.740
HT/FROST INSULATOR		BLD		42.050	44.550	1.5	1.5	2.0	9.670	10.81	0.000	0.520
IRON WORKER		ALL		40.750	42.750	2.0	2.0	2.0	10.95	15.99	0.000	0.300
LABORER		ALL		35.200	35.950	1.5	1.5	2.0	9.130	8.370	0.000	0.400
LATHER		ALL		40.770	42.770	1.5	1.5	2.0	9.840	9.790	0.000	0.490
MACHINIST		BLD		42.770	44.770	1.5	1.5	2.0	7.750	8.690	0.650	0.000
MARBLE FINISHERS		ALL		28.650	0.000	1.5	1.5	2.0	7.920	9.970	0.000	0.550
MARBLE MASON		BLD		38.030	41.830	1.5	1.5	2.0	8.000	9.970	0.000	0.550
MATERIAL TESTER I		ALL		25.200	0.000	1.5	1.5	2.0	9.130	8.370	0.000	0.400
MATERIALS TESTER II		ALL		30.200	0.000	1.5	1.5	2.0	9.130	8.370	0.000	0.400
MILLWRIGHT		ALL		40.770	42.770	1.5	1.5	2.0	9.840	9.790	0.000	0.490
OPERATING ENGINEER		BLD	1	43.800	47.800	2.0	2.0	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		BLD	2	42.500	47.800	2.0	2.0	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		BLD	3	39.950	47.800	2.0	2.0	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		BLD	4	38.200	47.800	2.0	2.0	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		FLT	1	47.250	47.250	1.5	1.5	2.0	6.850	5.600	1.900	0.000
OPERATING ENGINEER		FLT	2	45.750	47.250	1.5	1.5	2.0	6.850	5.600	1.900	0.000
OPERATING ENGINEER		FLT	3	40.700	47.250	1.5	1.5	2.0	6.850	5.600	1.900	0.000
OPERATING ENGINEER		FLT	4	33.850	47.250	1.5	1.5	2.0	6.850	5.600	1.900	0.000
OPERATING ENGINEER		HWY	1	42.000	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		HWY	2	41.450	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		HWY	3	39.400	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		HWY	4	38.000	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
OPERATING ENGINEER		HWY	5	36.800	46.000	1.5	1.5	2.0	9.600	6.550	1.900	1.000
ORNAMNTL IRON WORKER		ALL		39.050	41.300	2.0	2.0	2.0	7.950	13.19	0.000	0.500
PAINTER		ALL		38.000	42.750	1.5	1.5	1.5	8.350	9.400	0.000	0.670
PAINTER SIGNS		BLD		30.820	34.600	1.5	1.5	1.5	2.600	2.470	0.000	0.000
PILEDRIIVER		ALL		40.770	42.770	1.5	1.5	2.0	9.840	9.790	0.000	0.490
PIPEFITTER		BLD		43.150	46.150	1.5	1.5	2.0	7.660	9.550	0.000	1.570
PLASTERER		BLD		36.840	39.050	2.0	1.5	2.0	8.250	10.33	0.000	0.150
PLUMBER		BLD		39.500	41.500	1.5	1.5	2.0	9.040	8.250	0.000	0.400
ROOFER		BLD		37.000	40.000	1.5	1.5	2.0	7.250	5.270	0.000	0.330
SHEETMETAL WORKER		BLD		40.460	43.700	1.5	1.5	2.0	9.580	12.35	0.000	0.610
SIGN HANGER		BLD		27.360	28.210	1.5	1.5	2.0	4.350	2.530	0.000	0.000
SPRINKLER FITTER		BLD		40.500	42.500	1.5	1.5	2.0	8.500	6.850	0.000	0.500
STEEL ERECTOR		ALL		40.750	42.750	2.0	2.0	2.0	10.95	15.99	0.000	0.300
STONE MASON		BLD		39.030	42.930	1.5	1.5	2.0	8.800	10.67	0.000	0.740
TERRAZZO FINISHER		BLD		35.150	0.000	1.5	1.5	2.0	6.950	10.57	0.000	0.380
TERRAZZO MASON		BLD		39.010	42.010	1.5	1.5	2.0	6.950	11.91	0.000	0.510

TILE MASON	BLD	40.490	44.490	2.0	1.5	2.0	6.950	9.730	0.000	0.610
TRAFFIC SAFETY WRKR	HWY	24.300	25.900	1.5	1.5	2.0	3.780	1.875	0.000	0.000
TRUCK DRIVER	ALL 1	32.200	32.750	1.5	1.5	2.0	5.700	5.500	0.000	0.150
TRUCK DRIVER	ALL 2	32.350	32.750	1.5	1.5	2.0	5.700	5.500	0.000	0.150
TRUCK DRIVER	ALL 3	32.550	32.750	1.5	1.5	2.0	5.700	5.500	0.000	0.150
TRUCK DRIVER	ALL 4	32.750	32.750	1.5	1.5	2.0	5.700	5.500	0.000	0.150
TUCKPOINTER	BLD	39.200	40.200	1.5	1.5	2.0	7.830	10.25	0.000	0.770

Legend:

M-F>8 (Overtime is required for any hour greater than 8 worked each day, Monday through Friday.)
 OSA (Overtime is required for every hour worked on Saturday)
 OSH (Overtime is required for every hour worked on Sunday and Holidays)
 H/W (Health & Welfare Insurance)
 Pensn (Pension)
 Vac (Vacation)
 Trng (Training)

Explanations

LAKE COUNTY

The following list is considered as those days for which holiday rates of wages for work performed apply: New Years Day, Memorial/Decoration Day, Fourth of July, Day, Veterans Day, Thanksgiving Day, Christmas Day. Generally, any of these holidays which fall on a Sunday is celebrated on the following Monday. This then makes work performed on that Monday payable at the appropriate overtime rate for holiday pay. Common practice in a given local may alter certain days of celebration such as the day after Thanksgiving for Veterans Day. If in doubt, please check with IDOL.

EXPLANATION OF CLASSES

ASBESTOS - GENERAL - removal of asbestos material/mold and hazardous materials from any place in a building, including mechanical systems where those mechanical systems are to be removed. This includes the removal of asbestos materials/mold and hazardous materials from ductwork or pipes in a building when the building is to be demolished at the time or at some close future date.

ASBESTOS - MECHANICAL - removal of asbestos material from mechanical systems, such as pipes, ducts, and boilers, where the mechanical systems are to remain.

CERAMIC TILE FINISHER

The grouting, cleaning, and polishing of all classes of tile, whether for interior or exterior purposes, all burned, glazed or unglazed products; all composition materials, granite tiles, warning detectable tiles, cement tiles, epoxy composite materials, pavers, glass, mosaics, fiberglass, and all substitute materials, for tile made in tile-like units; all mixtures in tile like form of cement, metals, and other materials that are for and intended for use as a finished floor surface, stair treads, promenade roofs, walks, walls, ceilings, swimming pools, and all other places where tile is to form a finished interior or exterior. The mixing of all setting mortars including but not limited to thin-set mortars, epoxies, wall mud, and any other

sand and cement mixtures or adhesives when used in the preparation, installation, repair, or maintenance of tile and/or similar materials. The handling and unloading of all sand, cement, lime, tile, fixtures, equipment, adhesives, or any other materials to be used in the preparation, installation, repair, or maintenance of tile and/or similar materials. Ceramic Tile Finishers shall fill all joints and voids regardless of method on all tile work, particularly and especially after installation of said tile work. Application of any and all protective coverings to all types of tile installations including, but not be limited to, all soap compounds, paper products, tapes, and all polyethylene coverings, plywood, masonite, cardboard, and any new type of products that may be used to protect tile installations, Blastrac equipment, and all floor scarifying equipment used in preparing floors to receive tile. The clean up and removal of all waste and materials. All demolition of existing tile floors and walls to be re-tiled.

COMMUNICATION TECHNICIAN

Low voltage construction, installation, maintenance and removal of telecommunication facilities (voice, sound, data and video) including outside plant, telephone, security systems and data inside wire, interconnect, terminal equipment, central offices, PABX, fiber optic cable and equipment, micro waves, V-SAT, bypass, CATV, WAN (wide area network), LAN (local area networks), and ISDN (integrated system digital network), pulling of wire in raceways, but not the installation of raceways.

MARBLE FINISHER

Loading and unloading trucks, distribution of all materials (all stone, sand, etc.), stocking of floors with material, performing all rigging for heavy work, the handling of all material that may be needed for the installation of such materials, building of scaffolding, polishing if needed, patching, waxing of material if damaged, pointing up, caulking, grouting and cleaning of marble, holding water on diamond or Carborundum blade or saw for setters cutting, use of tub saw or any other saw needed for preparation of material, drilling of holes for wires that anchor material set by setters, mixing up of molding plaster for installation of material, mixing up thin set for the installation of material, mixing up of sand to cement for the installation of material and such other work as may be required in helping a Marble Setter in the handling of all material in the erection or installation of interior marble, slate, travertine, art marble, serpentine, alberene stone, blue stone, granite and other stones (meaning as to stone any foreign or domestic materials as are specified and used in building interiors and exteriors and customarily known as stone in the trade), carrara, sanionyx, vitrolite and similar opaque glass and the laying of all marble tile, terrazzo tile, slate tile and precast tile, steps, risers treads, base, or any other materials that may be used as substitutes for any of the aforementioned materials and which are used on interior and exterior which are installed in a similar manner.

MATERIAL TESTER I: Hand coring and drilling for testing of materials; field inspection of uncured concrete and asphalt.

MATERIAL TESTER II: Field inspection of welds, structural steel, fireproofing, masonry, soil, facade, reinforcing steel, formwork, cured concrete, and concrete and asphalt batch plants; adjusting

proportions of bituminous mixtures.

TRAFFIC SAFETY - work associated with barricades, horses and drums used to reduce lane usage on highway work, the installation and removal of temporary lane markings, and the installation and removal of temporary road signs.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION

Class 1. Two or three Axle Trucks. A-frame Truck when used for transportation purposes; Air Compressors and Welding Machines, including those pulled by cars, pick-up trucks and tractors; Ambulances; Batch Gate Lockers; Batch Hopperman; Car and Truck Washers; Carry-alls; Fork Lifts and Hoisters; Helpers; Mechanics Helpers and Greasers; Oil Distributors 2-man operation; Pavement Breakers; Pole Trailer, up to 40 feet; Power Mower Tractors; Self-propelled Chip Spreader; Skipman; Slurry Trucks, 2-man operation; Slurry Truck Conveyor Operation, 2 or 3 man; Teamsters; Unskilled dumpman; and Truck Drivers hauling warning lights, barricades, and portable toilets on the job site.

Class 2. Four axle trucks; Dump Crets and Adgetors under 7 yards; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment under 16 cubic yards; Mixer Trucks under 7 yards; Ready-mix Plant Hopper Operator, and Winch Trucks, 2 Axles.

Class 3. Five axle trucks; Dump Crets and Adgetors 7 yards and over; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnatrailers or turnapulls when pulling other than self-loading equipment or similar equipment over 16 cubic yards; Explosives and/or Fission Material Trucks; Mixer Trucks 7 yards or over; Mobile Cranes while in transit; Oil Distributors, 1-man operation; Pole Trailer, over 40 feet; Pole and Expandable Trailers hauling material over 50 feet long; Slurry trucks, 1-man operation; Winch trucks, 3 axles or more; Mechanic--Truck Welder and Truck Painter.

Class 4. Six axle trucks; Dual-purpose vehicles, such as mounted crane trucks with hoist and accessories; Foreman; Master Mechanic; Self-loading equipment like P.B. and trucks with scoops on the front.

OPERATING ENGINEERS - BUILDING

Class 1. Mechanic; Asphalt Plant; Asphalt Spreader; Autograde; Backhoes with Caisson attachment; Batch Plant; Benoto; Boiler and Throttle Valve; Caisson Rigs; Central Redi-Mix Plant; Combination Back Hoe Front End-loader Machine; Compressor and Throttle Valve; Concrete Breaker (Truck Mounted); Concrete Conveyor; Concrete Paver; Concrete Placer; Concrete Placing Boom; Concrete Pump (Truck Mounted); Concrete Tower; Cranes, All; Cranes, Hammerhead; Cranes, (GCI and similar Type); Creter Crane; Crusher, Stone, etc.; Derricks, All; Derricks, Traveling; Formless Curb and Gutter Machine; Grader, Elevating; Grouting Machines; Highlift Shovels or Front Endloader 2-1/4 yd. and over; Hoists, Elevators, outside type rack and pinion and similar machines; Hoists, one, two and three Drum; Hoists, Two Tugger One Floor; Hydraulic Backhoes; Hydraulic Boom Trucks; Hydro Vac (and similar equipment); Locomotives, All; Motor Patrol; Pile Drivers and Skid Rig; Post Hole Digger; Pre-Stress Machine; Pump Cretes Dual Ram; Pump Cretes; Squeeze Cretes-screw Type Pumps; Raised and Blind Hole Drill; Roto Mill Grinder; Scoops - Tractor Drawn; Slip-form

Paver; Straddle Buggies; Tournapull; Tractor with Boom and Side Boom; Trenching Machines.

Class 2. Boilers; Broom, All Power Propelled; Bulldozers; Concrete Mixer (Two Bag and Over); Conveyor, Portable; Forklift Trucks; Greaser Engineer; Highlift Shovels or Front Endloaders under 2-1/4 yd.; Hoists, Automatic; Hoists, inside Freight Elevators; Hoists, Sewer Dragging Machine; Hoists, Tugger Single Drum; Laser Screed; Rock Drill (self-propelled); Rock Drill (truck mounted); Rollers, All; Steam Generators; Tractors, All; Tractor Drawn Vibratory Roller; Winch Trucks with "A" Frame.

Class 3. Air Compressor; Combination - Small Equipment Operator; Generators; Heaters, Mechanical; Hoists, Inside Elevators - (Rheostat Manual Controlled); Hydraulic Power Units (Pile Driving, Extracting, and Drilling); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Pumps, Well Points; Welding Machines (2 through 5); Winches, 4 small Electric Drill Winches; Bobcat (up to and including 3/4 cu. yd.).

Class 4. Bobcats and/or other Skid Steer Loaders; Oilers; and Brick Forklift.

OPERATING ENGINEERS - FLOATING

Class 1. Craft foreman (Master Mechanic), diver/wet tender, engineer (hydraulic dredge).

Class 2. Crane/backhoe operator, mechanic/welder, assistant engineer (hydraulic dredge), leverman (hydraulic dredge), and diver tender.

Class 3. Deck equipment operator (machineryman), maintenance of crane (over 50 ton capacity) or backhoe (96,000 pounds or more), tug/launch operator, loader, dozer and like equipment on barge, breakwater wall, slip/dock or scow, deck machinery, etc.

Class 4. Deck equipment operator (machineryman/fireman), (4 equipment units or more) and crane maintenance 50 ton capacity and under or backhoe weighing 96,000 pounds or less, assistant tug operator.

OPERATING ENGINEERS - HEAVY AND HIGHWAY CONSTRUCTION

Class 1. Craft Foreman; Asphalt Plant; Asphalt Heater and Planer Combination; Asphalt Heater Scarfire; Asphalt Spreader; Autograder/GOMACO or other similar type machines; ABG Paver; Backhoes with Caisson attachment; Ballast Regulator; Belt Loader; Caisson Rigs; Car Dumper; Central Redi-Mix Plant; Combination Backhoe Front Endloader Machine, (1 cu. yd. Backhoe Bucket or over or with attachments); Concrete Breaker (Truck Mounted); Concrete Conveyor; Concrete Paver over 27E cu. ft.; Concrete Placer; Concrete Tube Float; Cranes, all attachments; Cranes, Hammerhead, Linden, Peco & Machines of a like nature; Crete Crane; Crusher, Stone, etc.; Derricks, All; Derrick Boats; Derricks, Traveling; Dowell machine with Air Compressor; Dredges; Field Mechanic-Welder; Formless Curb and Gutter Machine; Gradall and Machines of a like nature; Grader, Elevating; Grader, Motor Grader, Motor Patrol, Auto Patrol, Form Grader, Pull Grader, Subgrader; Guard Rail Post Driver Mounted; Hoists, One, Two and Three Drum; Hydraulic Backhoes; Backhoes with shear attachments; Mucking Machine; Pile Drivers and Skid Rig; Pre-Stress Machine; Pump Cretes Dual Ram; Rock Drill - Crawler or Skid Rig; Rock Drill - Truck Mounted; Roto Mill Grinder; Slip-Form Paver;

Soil Test Drill Rig (Truck Mounted); Straddle Buggies; Hydraulic Telescoping Form (Tunnel); Tractor Drawn Belt Loader (with attached pusher - two engineers); Tractor with Boom; Tractaire with Attachments; Trenching Machine; Truck Mounted Concrete Pump with Boom; Raised or Blind Hole; Drills (Tunnel Shaft); Underground Boring and/or Mining Machines; Wheel Excavator; Widener (APSCO).

Class 2. Batch Plant; Bituminous Mixer; Boiler and Throttle Valve; Bulldozers; Car Loader Trailing Conveyors; Combination Backhoe Front Endloader Machine (less than 1 cu. yd. Backhoe Bucket or over or with attachments); Compressor and Throttle Valve; Compressor, Common Receiver (3); Concrete Breaker or Hydro Hammer; Concrete Grinding Machine; Concrete Mixer or Paver 7S Series to and including 27 cu. ft.; Concrete Spreader; Concrete Curing Machine, Burlap Machine, Belting Machine and Sealing Machine; Concrete Wheel Saw; Conveyor Muck Cars (Haglund or Similar Type); Drills, All; Finishing Machine - Concrete; Greaser Engineer; Highlift Shovels or Front Endloader; Hoist - Sewer Dragging Machine; Hydraulic Boom Trucks (All Attachments); Hydro-Blaster; All Locomotives, Dinky; Pump Cretes; Squeeze Cretes-Screw Type Pumps, Gypsum Bulker and Pump; Roller, Asphalt; Rotory Snow Plows; Rototiller, Seaman, etc., self-propelled; Scoops - Tractor Drawn; Self-Propelled Compactor; Spreader - Chip - Stone, etc.; Scraper; Scraper - Prime Mover in Tandem (Regardless of Size); Tank Car Heater; Tractors, Push, Pulling Sheeps Foot, Disc, Compactor, etc.; Tug Boats.

Class 3. Boilers; Brooms, All Power Propelled; Cement Supply Tender; Compressor, Common Receiver (2); Concrete Mixer (Two Bag and Over); Conveyor, Portable; Farm-Type Tractors Used for Mowing, Seeding, etc.; Fireman on Boilers; Forklift Trucks; Grouting Machine; Hoists, Automatic; Hoists, All Elevators; Hoists, Tugger Single Drum; Jeep Diggers; Pipe Jacking Machines; Post-Hole Digger; Power Saw, Concrete Power Driven; Pug Mills; Rollers, other than asphalt; Seed and Straw Blower; Steam Generators; Stump Machine; Winch Trucks with "A" Frame; Work Boats; Tamper - Form-Motor Driven.

Class 4. Air Compressor; Combination - Small Equipment Operator; Directional Boring Machine; Generators; Heaters, Mechanical; Hydraulic Power Unit (Pile Driving, Extracting, or Drilling); Hydro-Blaster; Light Plants, All (1 through 5); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Pumps, Well Points; Tractaire; Welding Machines (2 through 5); Winches, 4 Small Electric Drill Winches.

Class 5. Bobcats (all); Brick Forklifts; Oilers.

TERRAZZO FINISHER

The handling of sand, cement, marble chips, and all other materials that may be used by the Mosaic Terrazzo Mechanic, and the mixing, grinding, grouting, cleaning and sealing of all Marble, Mosaic, and Terrazzo work, floors, base, stairs, and wainscoting by hand or machine, and in addition, assisting and aiding Marble, Masonic, and Terrazzo Mechanics.

Other Classifications of Work:

For definitions of classifications not otherwise set out, the Department generally has on file such definitions which are available. If a task to be performed is not subject to one of the

classifications of pay set out, the Department will upon being contacted state which neighboring county has such a classification and provide such rate, such rate being deemed to exist by reference in this document. If no neighboring county rate applies to the task, the Department shall undertake a special determination, such special determination being then deemed to have existed under this determination. If a project requires these, or any classification not listed, please contact IDOL at 217-782-1710 for wage rates or clarifications.

LANDSCAPING

Landscaping work falls under the existing classifications for laborer, operating engineer and truck driver. The work performed by landscape plantsman and landscape laborer is covered by the existing classification of laborer. The work performed by landscape operators (regardless of equipment used or its size) is covered by the classifications of operating engineer. The work performed by landscape truck drivers (regardless of size of truck driven) is covered by the classifications of truck driver.