January 13, 2020

Request for Proposal
Structured Cabling System

For

TSD Bid # 9898
Troy School District
4400 Livernois
Troy, MI 48098

Prepared by

Convergent Technology Partners, LLC
6197 Miller Rd, Suite 4
Swartz Creek, MI 48373
810.720.3820
www.ctpartners.net

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SCHEDULE OF EVENTS

The following is a projected schedule of events for this project. The schedule may change depending upon the results of the responses and a final schedule will be established prior to contracting with the Contractor.

EVENT	DATE
Bid Release	January 13, 2020
Mandatory Pre-bid meeting Date and time – 10:00 A.M. Located at 1522 E. Big Beaver, Troy 48083 – Main lobby	January 16, 2020
Final Date and time for Questions - 12:00 P.M. EDT	January 20, 2020
Bid Due Date/time – 11:00 A.M. Administration Bldg. 4400 Livernois, Troy, MI	January 27, 2020
Immediately following due date/time Services Bldg. – 4420 Livernois, Troy, MI – Lab 1&2	January 27, 2020
Contract Award	February 18, 2020
Project Kickoff – week of	February 24, 2020
Project Start Date	March 2, 2020
Substantial Completion	April 24, 2020
Project Completion and Closeout	May 1, 2020

BID PROPOSAL FORM

OWNER: Troy School District
Administration Building
4400 Livernois
Troy, Michigan 48098
Attn: Todd Hensley, Purchasing Supervisor

PROJECT: Structured Cabling System – Bid # 9898

NAME OF BIDDER: _____

BASE BID:

Lump sum bid for all work specified and shown on the drawings as indicated for base bid in the amount of:

_____ Dollars ($_____)

The Bid Proposal amount shall be shown in both words and figures. In the case of discrepancy, the amount shown is words shall govern.

BASE BID: The undersigned, having examined the Bid Documents and examined the conditions affecting the Work/Project, hereby proposes and agrees to furnish all of the labor, materials, and equipment and perform all work necessary to complete the Work/Project as required by the Bid Documents for the stipulated sum identified above and detailed in Supplemental A (Cost Analysis Worksheet). The Bid Documents set forth the terms and conditions upon which the Bidder will provide a "turnkey" solution for the installation and operation of the project for use by the Owner and represents and warrants that the design, operation and functionality of the project are in accordance with the Bid Documents. All prices provided by the Bidder on this Bid Proposal Form must include all cables, connectors, equipment etc. that are necessary to the make the project fully operational for the intent and purpose stated in the Bid Documents

BID SECURITY

Enclosed herewith find (Certified Check)/ (Bid Bond) in the amount of $_____ being five percent (5%) of the maximum Bid Proposal herein, made payable to Troy School District or naming Troy School District as obligee. The proceeds of which are to remain the property of Troy School District, if the Bidder does not, within ten (10) days after notice of the acceptance of Bid Proposal, enter into the Contract.

TAXES

Please identify the amount, if any, of this Bid Proposal that has been attributed to sales or use tax. If an amount has been attributed to such tax, please identify which components of the Bid to which the tax has been attributed.

_____

_____

_____

SUBCONTRACTORS

Bidders must provide attach complete list of proposed subcontractors (one per discipline), if any are proposed to be utilized on the project. Listing two or more subcontractors per discipline will be grounds for disqualification.

EXCEPTIONS

Any Exceptions to the terms and conditions contained in the RFP or contract are identified below:

_____

_____

_____

_____

_____

ADDENDA

This RFP incorporates the following Addenda:

Addendum No. ____ Dated _____ Addendum No. ____ Dated _____

Addendum No. ____ Dated _____ Addendum No. ____ Dated _____

Addendum No. ____ Dated _____ Addendum No. ____ Dated _____

BID PROPOSAL FORM SUPPLEMENTS:

The following Bid Form Proposal Supplements are attached hereto and are considered an integral part of this Bid Proposal Form:

- SUPPLEMENTAL A – Cost Analysis Worksheet
- SUPPLEMENTAL B – Unit Pricing
    - Bill of Material
- SUPPLEMENTAL C – Alternates
- SUPPLEMENTAL D – Familial Disclosure Affidavit
- SUPPLEMENTAL E – Iran Economic Sanctions Act Compliance Affidavit

BIDDER NAME: _____

ADDRESS: _____

_____

_____

DATE: _____

TELEPHONE: _____

EMAIL ADDRESS: _____

If award is made to our firm based upon our Bid Proposal, we agree to enter into the form of Contract with the School District in accordance with this Request for Proposal, the contract and our Bid Proposal.

My signature certifies that the Bid Proposal as submitted complies with all terms and conditions as set forth in this Request for Proposal, unless specifically enumerated as an exception as part of this Bid Proposal Form.

I hereby certify that I am authorized to sign as a Representative for the Firm:

_____ _____

(Printed Name) (Title)

_____

(Authorized Signature)

COST ANALYSIS WORKSHEET

SUPPLEMENTAL A

Note this form must be returned with bid submission, filled out completely and accurately or the bidder may be disqualified from consideration.

OWNER: Troy School District
Administration Building
4400 Livernois
Troy, Michigan 48098
Attn: Todd Hensley, Purchasing Supervisor

BIDDER: _____

ADDRESS: _____

_____

BASE BID BREAKDOWN

	COMPONENT	**Cost**
Structured Cabling System	Material	
	Labor	
	Sub Total	
	Performance and Payment Bond	
	Proposal Total	

UNIT PRICING

SUPPLEMENTAL B

BILL OF MATERIAL: All bid proposals shall include a detailed Bill of Materials that notes each item, part number, and installed unit price. Provide this Bill of Materials, attached to and submitted with the Bid Proposal. Bill of Materials pricing will be used for price revisions prior to award.

Provide installed unit pricing, which shall be considered firm pricing during the contract period and not subject to change, will be used to determine costs for additions and deletions during the contract period (after award). All unit pricing shall include all labor, materials, licenses, software, fees etc. The Owner reserves the right to adjust any or all quantities at any time.

UP1	Category 6 UTP cable drop, labeled, terminated tested	$
UP2	Category 6 UTP patch panel – twenty-four port	$
UP3	Category 6 UTP patch panel – forty-eight port	$
UP4		$

ALTERNATES
SUPPLEMENTAL C

Mandatory Alternate 1: None

Add/Deduct _____ Dollars ($ _____)

Mandatory Alternate 2: None

Add/Deduct _____ Dollars ($ _____)

Mandatory Alternate 3: None

Add/Deduct _____ Dollars ($ _____)

Voluntary Alternate 1: *(Description)*

Add/Deduct _____ Dollars ($ _____)

Voluntary Alternate 2: *(Description)*

Add/Deduct _____ Dollars ($ _____)

FAMILIAL DISCLOSURE AFFIDAVIT

SUPPLEMENTAL D

The undersigned, the owner or authorized officer of _____ (the "Bidder"), pursuant to the familial disclosure requirement provided in the Troy School District (the "School District") Request For Proposals, hereby represents and warrants that, except as provided below, no familial relationships exist between the owner or any employee of the Bidder, and any member of the Board of Education of the School District or the Superintendent of the School District.

List any Familial Relationships:

BIDDER:

_____

By:

_____

Title:

_____

STATE OF MICHIGAN
COUNTY OF _____

This instrument was acknowledged before me on the _____ day of _____, 2019, by

_____.

_____

, Notary Public

_____ County, Michigan

My Commission Expires: _____

Acting in the County of: _____

AFFIDAVIT OF COMPLIANCE – IRAN ECONOMIC SANCTIONS ACT

SUPPLEMENTAL E

Michigan Public Act No. 517 of 2012

The undersigned, the owner or authorized officer of the below named applicant (the "Applicant"), pursuant to the compliance certification requirement provided in the Troy School District (the "School District") Structured Cabling System (the "RFP"), hereby certifies, represents and warrants that the Applicant (including its officers, directors and employees) is not an "Iran linked business" within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the "Act"), and that in the event Applicant is awarded a contract as a result of the aforementioned RFP, the Applicant will not become an "Iran linked business" at any time during the course of performing the Work or any services under the contract.

The Applicant further acknowledges that any person who is found to have submitted a false certification is responsible for a civil penalty of not more than $250,000.00 or 2 times the amount of the contract or proposed contract for which the false certification was made, whichever is greater, the cost of the School District's investigation, and reasonable attorney fees, in addition to the fine. Moreover, any person who submitted a false certification shall be ineligible to bid on a request for proposal for three (3) years from the date it is determined that the person has submitted the false certification.

APPLICANT:

By:

Title:

Date:

STATE OF Michigan
COUNTY OF _____)

This instrument was acknowledged before me on the _____ day of _____, _____, by

_____.

_____, Notary Public _____ County,

_____

My Commission Expires: _____

Acting in the County of: _____

BIDDING REQUIREMENTS & INSTRUCTION TO BIDDERS

PART 1 - GENERAL

1.1 The Troy School District is seeking bids and proposals for a Structured Cabling System (hereafter "Cabling system") in the recently purchased, former ITT building (Niles Relocation) located at 1522 E. Big Beaver, Troy 48083.

1.2 At the time of RFP creation, the location of furniture, location and type of conduit and boxes or raceway for telecommunications, etc. have not been determined. It is a safe assumption that cable locations within each room will change or be further defined after award. The Bidder shall provide for this provision in their pricing.

1.3 The site is an abandoned ITT building with large amounts of low voltage/telecommunications cabling that must be removed and/or remediated. Attendance at the mandatory pre-bid meeting is required for the Bidder to investigate site conditions and properly price this scope. The Bidder shall provide for this provision in their pricing, that shall be non-negotiable after award.

1.4 **Bid documents may be obtained from the purchasing page (under Departments, Business Services) of the District's web site at www.troy.k12.mi.us.**

1.5 **Due on or before date and time indicated on the schedule of events ("Due Date")**, the Owner will receive bid proposals for the project. The Owner will not consider or accept a bid proposal received after the due date for bid proposal submission. All bid proposals received after the due date will be returned by making them available to the respective Bidder, unopened, for said Bidder to pick-up at their sole cost and expense. Bid proposals shall be submitted to:

Troy School District
Technology Department
Attn: Beth Soggs
4420 Livernois
Troy, Michigan 48098
Attn: Todd Hensley, Purchasing Supervisor

1.6 PROPOSALS/QUOTES

A. Bidders must submit a complete set of all bid documents as indicated herein. Proposals or bids that are incomplete or missing required documents will not be accepted. Proposals must consist of the original forms in the original format to be accepted.

B. Three (3) "hard" copies and two (2) "soft" (electronic) copies on a USB "flash" drive of the proposals is to be submitted in sealed packaging, clearly marked: "STRUCTURED CABLING SYSTEM" and shall be identified with the Bidder's name and address and the date and time of the bid proposal opening. The Owner is not

responsible for any postal or delivery delays. No email, facsimile or other electronic bid proposals will be accepted.

C. Proposals will be opened publicly on the time and date specified in Schedule of Events at the Owner's facility. The public opening and reading of bids will take place in the Services Building (Labs 1&2), 4420 Livernois, Troy, MI.

1.7 PROPOSAL FORMAT

A. The Bid response shall be structured as follows in both the hard and electronic copies:

1. Section 1 – Proposal Form, Submittal Letter with Executive Summary
2. Section 2 – System/Solution Proposal, Bid Bond and Pricing
3. Section 3 - Narratives, System Description, Information, and Brochures
    a. Comprehensive Narrative/System Description of the proposed System/Solution
    b. Information, Diagrams or Schematics supporting the System/Solution Narrative
    c. Bill of Material and installed pricing, Catalog Cut sheets, Brochures, Equipment Configuration
4. Section 3 - Resume of Qualification, References
    a. Bidder's qualifications (Company and proposed Staff)
        1) Company's Level of Manufacturer's Certification (Included in cover letter)
    b. Resume of Qualification including:
        1) Three (3) verifiable references demonstrating direct experience on recent systems of similar type and size, including contact names and phone numbers of projects that qualify
        2) Technical resumes of experience for the vendor's Project Manager and on-site installation supervisor who will be assigned to this project.
        3) A list of subcontractors and their training and certification
5. Section 4 – Proposed Contracts
    a. Maintenance Contract and pricing for consideration
6. Section 5 – Alternate System/Solution Proposal (If Applicable)
    a. Alternate solutions will be accepted <u>provided the base bid requirements are met</u> first. Alternate proposals must meet all base bid performance requirements to be accepted. The Owner may review alternate solutions but is under no obligation to consider or award them regardless of cost.
    b. Comprehensive Narrative/System Description of the proposed Alternate System/Solution
    c. Information, Diagrams or Schematics supporting the proposed Alternate System/Solution Narrative

d. Bill of Material and installed pricing, Catalog Cut sheets, Brochures, Equipment Configuration

B. The “hard copy” Bids shall be submitted on 8 1/2" by 11" paper, single sided, single spaced using 10 to 12-point print, in 3 ring binders, clearly labeled to show the Bidder's name.

C. The “soft copy” Bid shall be in the same structure as the “hard copy” Bids, bound in a .pdf file, submitted on an USB drive with the hard copies.

1. The electronic copy must be formatted in the same manner as the hard copy format, with separate PDFs per section, and contain an exact copy of the Hard Copy.

1.8 SECURITY

A. The Bid Proposal shall be accompanied by a Bid Security of a certified check or cashier's check payable to the Owner or by a satisfactory Bid Bond Entity naming the Owner as the obligee and executed by the Bidder and a surety company authorized to do business in the State of Michigan, in an amount identified in the Instructions to Bidders. The check or amount of Bid Bond shall be forfeited to the Owner upon failure of the Contractor to enter into the Contract. The Contractor's Bid security will be retained until the Contractor has signed the contract and has furnished the required Certificates of Insurance and other required Bonds and documents required by the RFP. Bonds signed by an Attorney-In-Fact must be accompanied by a certified and effectively dated copy of their Power of Attorney.

B. The Owner reserves the right to retain the Bid security of all Bidders until the Contractor enters into the contract or until ninety (90) days after bid opening, whichever is later. If the Contractor refuses to enter into the Contract, the Owner may retain their Bid Security as liquidated damages but not as a penalty.

1.9 PERFORMANCE AND LABOR AND MATERIAL PAYMENT BONDS

A. At or prior to delivery of the signed Contract, the Owner will require the Contractor to secure and post a Labor and Material Payment Bond and a Performance Bond including bonding for all subcontractors, each in the amount of 100% of the Contract Sum including bonding for all subcontractors. Surety shall be a company incorporated in the United States and must appear on the U.S. Treasury Departments approved surety list and be adaptable to the Owner. The Contractor shall obtain such bonds in a manner consistent with Michigan law.

1.10 FAMILIAL DISCLOSURE AFFIDAVIT

A. Each bid proposal must be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the owner or any employee of the bidder and any member of the board of education or the superintendent of

troy school district. The board of education will not accept a bid proposal that does not include this sworn and notarized disclosure statement.

1.11 AFFIDAVIT OF COMPLIANCE – IRAN ECONOMIC SANCTIONS

A. Each bid proposal must be accompanied by the Iran economic sanctions affidavit of compliance in compliance with Michigan public act no. 517 of 2012. The board of education will not accept a bid proposal that does not include this sworn and notarized disclosure statement.

1.12 RESERVATION OF RIGHTS

A. The Owner reserves the right, in its sole and absolute discretion (for this provision and all other provisions contained in this RFP), to accept or reject, in whole or in part, any or all bid proposal with or without cause, to waive any irregularities or informalities in this RFP process or any bid proposal, and to award the contract to other than the low bidder, when in the opinion of the Owner, such action will best serve the Owner's interests.

1.13 WITHDRAWAL OF BID PROPOSALS/QUOTES

A. Bid proposals submitted shall not be withdrawn and shall be irrevocable for a minimum period of ninety (90) calendar days following the due date for receipt of bid proposals set forth above.

1.14 REQUESTS FOR CLARIFICATION

A. Bidders may request that the Owner clarify information contained in this RFP. All such requests must be made in writing via email to Mr. Eric Helsel, Convergent Technology Partners, at ehelsel@ctpartners.net. Requests for clarifications and inquiries may only be made via email.

1.15 CONTRACT

A. The form of contract that the successful bidder (“contractor”) will be expected to sign with Troy School District is attached.

1.16 BOARD OF EDUCATION APPROVAL

A. Implementation of the proposed project is fully contingent on the approval of the Troy School District Board of Education.

1.17 RESTRICTION ON COMMUNICATION

A. From the issue date of this RFP until a Contractor is selected and the contract is awarded a prospective Contractor shall not communicate about the subject of this RFP or a Contractor’s bid proposal with the Owner, its Board of Education, or any individual member, administrators, faculty, staff, students, or employees, except for additional requests for clarification in accordance with the paragraph above.

1.18 RELEASE OF CLAIMS

A. Each Bidder by submitting its Proposal releases the Owner from any and all claims arising out of, and related to, this RFP process and selection of a Contractor.

1.19 PROPOSAL COST

A. Respondents of this RFP are responsible for any and all costs incurred by them or others acting on their behalf in preparing or submitting a bid proposal, or otherwise responding to this RFP, or any negotiations incidental to its bid proposal or this RFP.

1.20 COLLUSIVE BIDDING

A. All Bidders certify that its bid proposal is made without any previous understanding, agreement or connection with any person, firm or corporation making a bid proposal for the same project and is in all respects fair, without outside control, collusion, fraud or otherwise illegal action.

1.21 INSURANCE REQUIREMENTS

A. The contractor, and any and all of their subcontractors, shall not commence work under this contract until they have obtained the insurance required under this paragraph, and shall keep such insurance in force during the entire life of this contract. All coverage shall be with insurance companies licensed and admitted doing business in the state of Michigan and acceptable to the Owner. The requirements below should not be interpreted to limit the liability of the contractor:

1. Workers' compensation insurance, including employers' liability coverage, in accordance with all applicable statutes of the state of Michigan.

2. Commercial general liability insurance on an "occurrence basis" with limits of liability not less than $2,000,000 per occurrence and aggregate. Coverage shall include, but not limited to, the following: (a) contractual liability; (b) products and completed operations; (c) independent contractors' coverage; (d) broad form general liability extensions or equivalent; (e) explosion, collapse, and underground, if applicable.

3. Automobile liability, including Michigan no-fault coverages, with limits of liability not less than $1,000,000 per occurrence combined single limit for bodily injury, and property damage. Coverage shall include all owned vehicles, all non-owned vehicles, and all hired vehicles.

4. Additional insured: policy(ies) and coverages as described above, excluding workers' compensation insurance, shall include an endorsement stating the following shall be additional insureds: The Owner, all elected and appointed officials, all employees and volunteers, agents, all boards, commissions, and/or authorities and board members, including employees and volunteers thereof. It is understood and agreed by naming the Owner as additional

insured, coverage afforded is primary and any other insurance the Owner may have in effect shall be considered secondary and/or excess.

B. Proof of insurance coverage: the contractor shall provide the Owner at the time the contracts are returned by him/her for execution a certificate of insurance as well as the required endorsements. In lieu of required endorsements, a copy of the policy sections, where coverage is provided for additional insured and cancellation notice, may be acceptable. Copies of all policies mentioned above shall be furnished, if so requested.

1.22 DEFINITIONS

A. Bid Documents are defined as the Instructions to Bidders, Schedule of Events, this RFP, including any Supplemental forms, Attachments, Appendices, Specifications, Drawings and, Other Information as noted herein (Narratives, diagrams, etc.), Addenda and the Contract.

B. Addenda are written or graphic instruments issued prior to the due date of bid proposals which modify or interpret the Bid Documents by additions, deletions, clarifications or corrections. All Addenda issued to Bidders prior to the due date of bid proposals shall become part of the Bid Documents and all bid proposals are to include the Project/Work therein described. Each Bid Proposal submitted shall list all Addenda that have been received prior to the due date of bid proposals.

C. As used in these Instructions to Bidders, the term "Bid Proposal" means a bid proposal prepared and submitted in response to this RFP.

D. As used in these Instructions to Bidders, the term "PSC" refers to the Professional Service Contractor and means Convergent Technology Partners and its assigned representative.

E. Throughout this RFP and Contract, the “Owner” will be used to refer to Troy School District and bidders submitting bid proposals will be referred to as "Bidders" or "Vendors” and a successful Bidder or Vendor will be referred to as a “Contractor”.

F. Throughout this RFP and Contract the Project may also be referred to as “SCS”, “Structured Cabling”, “Cabling Project” or “Cabling System”.

1.23 BIDDER’S REPRESENTATION

A. Each Bidder, by submitting a Bid Proposal, represents that the Bidder has read and understands the Bid Documents and is familiar with the local conditions under which the project is to be performed. Bidders will be held to have compared the Sites with Bid Documents and have satisfied themselves to all conditions affecting the execution of the Work/Project.

1.24 EXAMINATION OF BID DOCUMENTS

A. A mandatory bidder’s conference will be held per the schedule of events for answering questions from the Bidders and reviewing the site and existing conditions/system. The location of the Bidder’s conference is:

B. As the Scope of Work contains abatement of existing cabling, bidders shall be prepared to do a full site survey after the pre-bid meeting. Other dates and times may be coordinated with the School District for this survey.

C. Before submitting a Bid Proposal, each Bidder shall examine the RFP documents carefully and shall read the Specifications and the Bid Documents. Each Bidder shall gather complete information prior to bidding as to existing conditions and limitations under which the Work/Project is to be performed and shall include in its Bid Proposal a sum to cover the cost of items necessary to perform the Work/Project as set forth in the Bid Documents.

D. No allowance or additional fees will be made to a Bidder because of lack of such examination or knowledge. The submission of a Bid Proposal will be considered as conclusive evidence that the Bidder has made such examination. An on-site-inspection of the Sites during the Bidder's Conference will be for all Bidders and their subcontractors, if any. Vendors may use subcontractors in connection with the Work/Project performed under this RFP provided the Owner has approved the subcontractors. In using subcontractors, the Vendor agrees to be responsible for all their acts and omissions to the same extent as if the subcontractors were employees of the Vendor.

1.25 REQUESTS FOR CLARIFICATION

A. Bidders may request that the Owner clarify information contained in this RFP. All such requests must be made in writing via email to Eric Helsel, Convergent Technology Partners, at ehelsel@ctpartners.net. Only a written interpretation or correction by Addendum shall be binding on Bidders. No explanations or interpretations requested or made orally will be considered binding. All questions will be responded to in writing. Requests for Clarifications and inquiries may only be made via email – **please note in the subject line the RFP name**. The deadline for all Requests for Clarification is per the Schedule of Events. The aggregated answers to all Requests for Clarification will be provided in an addendum to the RFP which will be issued and posted on the District's web site at www.troy.k12.mi.us no less than three (3) business days prior to the bid opening date for all potential proposers to view.

1.26 BIDDING PROCEDURES

A. All Bids Proposal must be submitted on the Bid Proposal Forms provided as part of the Bid Documents and in accordance with the Advertisement to Bid and Instructions to Bidders. Bidders must provide a complete list of proposed subcontractors (one per discipline) as indicated on the Bid Forms. Listing two or more subcontractors per discipline will be grounds for disqualification.

B. All Bidders must provide a proposal for the Base Bid that meets or exceeds the specifications set forth in this RFP. However, all Bidders may suggest Alternates if

it is felt that the alternate proposal better suits the intent of this RFP. Any Alternate must be listed as such with separate pricing sheets. Any variance of the feature/functionality of the Base Bid must be identified in any Alternates proposed.

C. Prior to the due date for bid proposals, all Addenda will be available for inspection wherever the Bid Documents are kept available for that purpose. No Addendum will be issued later than three (3) days prior to the due date for bid proposals. It is each Bidders responsibility to ascertain prior to submitting a Bid Proposal that he/she has received all Addenda issued and shall acknowledge their receipt in their Bid Proposal Form.

D. All Bids must be signed as follows:

1. Corporations: Signature of an officer of the firm who is authorized to bind the corporation.
2. Partnerships: Signature of one partner who is authorized to bind the firm and all of its Partners.
3. Bids submitted by Joint Ventures shall be signed by one of the Joint Ventures and shall be accompanied by a certified copy of the Power of Attorney authorizing the individual signing to bind all the Joint Ventures. If a certified copy of the Joint Venture's certificate submitted with the Bid Proposal indicates that all Joint Ventures have signed, no authorization is required.
4. Individuals signing on own behalf: No authorization is required.
5. Individual signing on behalf of another: Power of Attorney or comparable evidence of authority shall accompany Bid.

E. Bid proposals shall be prepared on unaltered Bid Forms which are a part of this RFP. Beyond listing of exceptions, bidders shall make no additional stipulations on the Bid Form nor qualify the Bid Proposal in any other manner. Unauthorized conditions, limitations, or provisions attached to the Bid Proposal will be cause for rejection of the Bid Proposal. If alterations by erasure or interlineations are made for any reason, explain over such erasure or interlineations with a signed statement from the Bidder. No additional charges, other than those listed on the Bid Proposal Form and other Bid submissions, shall be made. Prices quoted will include verification/coordination of order, all costs for shipping, delivery to all Sites, insurance, payment and performance bonds, unpacking, setup, installation, operation, testing, cleanup, training and all other requirements contained in the bid documents.

F. Bids shall be submitted in a sealed envelope. Identified on the face of the envelope:

1. Project name
2. Name and address of Bidder
3. Notation “Structured Cabling System Bid #9898”

G. No responsibility shall attach to the PSC, the Owner, or the authorized representatives of either one, for the premature opening of any Bid Proposal which is not properly addressed, delivered and/or identified. In such event, that Bid Proposal will not be considered, and the Bidder will be automatically disqualified from consideration.

H. Negligence in preparation, improper preparation, errors in and/or omissions in the Bid Proposal shall not relieve the Bidder from fulfillment of all applicable obligations and requirements of contained in the Bid Documents.

I. The Owner or PSC in making copies available of the Bid Documents to Bidders do so only for the purpose of obtaining bid proposals on the project and do not confer a license or grant of use to a Bidder for any other purpose.

J. All Bidders must complete, sign and return the attached "FAMILIAL DISCLOSURE AFFIDAVIT" and "Iran Sanctions Affidavit" with their Bid Proposal.

K. Bidders must include a Bill of Material (BOM), along with installed line item pricing for all components proposed, including maintenance and support, with the total listed where indicated in the Bid Proposal Forms. Failure to provide the BOM with line item pricing may result in disqualification of the Bid proposal.

L. The Owner considers this RFP legally binding and will require that this Request for Proposal and the Bid Proposal be incorporated by reference into any subsequent Contract between the Contractor and the Owner. It should be understood by the Bidder that this means that the Owner expects the Bidder to satisfy all requirements and specifications contained in the RFP. Any exceptions to the RFP must be explicitly noted in the Bid Proposal. Lack of listing all exceptions will be considered acceptance of all specifications as presented in this RFP.

1.27 SUBSTITUTIONS

A. Each Bid Proposal shall be based upon equipment described in the Bid Documents.

B. In addition to the Base Bid, the submission of voluntary alternates is acceptable. If a voluntary alternate is submitted for consideration, it shall be expressed on the Bid Form as an "add" or "deduct" amount from the Base Bid. If a voluntary alternate is submitted, the Bidder shall also submit enough information in the form of drawings, specifications, and a complete description of the proposed substitute, the cost savings or advantages. Additionally, provide the name of the material or equipment for which it is substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation, enough for analysis of the alternate. The Owner reserves the right to unilaterally accept or reject, in whole or in part, any voluntary alternates.

1.28 CONSIDERATION OF BIDS

A. The Bidder acknowledges the right of the Owner to accept or reject any or all Bid proposals, in whole or in part, with or without cause, to waive any irregularities or informalities in this RFP process or any Bid Proposal, and to award the contract to

other than the low bidder. In addition, the Bidder recognizes the right of the Owner to reject a Bid Proposal:

1. If the Bidder fails to furnish any required Bid Security, or to submit the data required by the Bid Documents; or
2. If the Bid Proposal is in any way incomplete (see checklist on bid form) or irregular; or
3. If the Bidder's performance was unsatisfactory under a prior contract for the construction, repair, modification, or demolition of a facility with the Owner, or a contractor in privacy of contract with the Owner, which was funded, directly or indirectly, by the Owner;

B. The Owner shall have the right to accept alternates in any order or combination and to determine the lowest qualified Bid based on the sum of the base bid and the alternates accepted.

C. Once the contract is awarded to the Contractor, the contract is contingent upon Owner's Board approval and the Contractor providing the Owner with all documents required by the RFP prior to commencement of the Work/Project (i.e. Insurance Certificates, etc.). Further, the Owner reserves the unrestricted right to modifying the contract amount by changing the scope of Work/project and/or components. Any such action will be taken before specific work on a building or on a project component has commenced. Contract amount shall be reduced or increased based on the unit pricing values.

D. Bidders to whom an award of a contract is under consideration shall submit to the Owner upon his/her request a properly executed Contractor's Qualification Statement, AIA Document A305 or other information format specified by the Owner.

1.29 TAXES

A. Installation services for the tangible personal property purchased by the Owner is not subject to sales taxation. Moreover, the Owner is exempt from taxation on all tangible personal property purchased by the Owner for its use and consumption; however, this exemption would not apply to any materials required under the Bid Documents that are deemed to be a component of a construction/improvement project to the Owner's Sites/Facilities. All prices submitted on the Bid Proposal Form shall be inclusive of all applicable taxes.

1.30 PERMITS AND FEES

A. All prices submitted on the Bid Proposal Form shall be inclusive of any and all Applicable and/or required permits and fees.

1.31 MICHIGAN RIGHT-TO-KNOW LAW

A. All Contractors must conform to the provisions of the Michigan Right-To-Know Law, 1986 PA 80, which requires employers to:

1. Develop a communication program designed to safeguard the handling of hazardous chemicals through labeling of chemical containers, and development and availability of Material Safety Data Sheets.
2. Provide training for employees who work with these chemicals; and
3. Develop a written hazard communications program.

B. The law also provides for specific employee rights. These include:

1. The right to be notified (by employer or Contractor posting) of the location of Safety Data Sheet (SDS);
2. The right to be notified (by employer or Contractor posting) of new or revised SDS no later than five working days after receipt; and
3. The right to request copies of SDS from their employers or Contractors.

C. Provisions of Michigan's Right-to-Know Law may be found in those sections of the Michigan Occupational Safety and Health Act (MIOSHA), which contain Right-to-Know provisions, and the Federal Hazard Community Standard, which is part of the MIOSHA Right-to-Know Law through adoption.

1.32 QUALIFICATIONS

A. The system Contractor must be a manufacturer representative or distributor of equipment used in the system(s) bid. Further, this contractor must have a minimum of five years of experience in the specific application of the equipment proposed for these systems.

B. The contractor shall maintain permanent service facilities within 150 miles of the owner’s facility capable of furnishing adequate inspection and service to the system. The facilities shall include a permanent source of factory trained service technicians experienced in servicing the associated system bid and shall provide warranty and manufacturer suggested maintenance service to afford the Owner maximum coverage. The contractor shall also provide a central source of support to guarantee immediate answers to Owner’s problems and questions.

1. The Vendor shall maintain at their facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

C. The contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of the systems bid and have personnel who are trained and certified in the use of such tools and equipment.

1.33 WITHDRAWAL OF BIDS

A. A Bidder may withdraw its Bid Proposal by written request from an authorized Bidder representative, at any time prior to the due date of bid proposals.

B. No Bidder may withdraw a Bid Proposal for a period of ninety (90) calendar days, following the due date for receipt of bid proposals, and all bid proposals shall be subject to acceptance by the Owner during this ninety (90) day period.

1.34 EXECUTION OF CONTRACT

A. The Contractor to whom the contract is awarded shall, within ten (10) calendar days after Notice of Award and receipt of the contract from the Owner, execute and deliver required copies to the Owner.

B. At or prior to delivery of the executed Contract, the Contractor to whom the contract is awarded shall deliver to the Owner those Certificates of Insurance required by the Bid Documents and such Labor and Materials Payment Bonds and Performance Bond as are required by Owner and any other documents required by this RFP.

C. **The Owner shall approve the provided Bonds and Certificates of Insurance before the Contractor may proceed with the Work/Project.** Failure or refusal to provide Bonds, Certificates of Insurance or any other documents required by this RFP in a form(s) satisfactory to the Owner shall subject the Contractor to loss of time from the allowable construction period equal to the time of delay in furnishing the required material.

1.35 POST BID INFORMATION

A. Bid Form(s) shall be submitted as indicated in the Bid Documents. The Bid Form(s) requires all proposed subcontractors for the project to be named; no more than one per discipline.

1.36 TIME OF COMPLETION

A. The Bidder agrees to complete the Work within the timeframes listed in the Schedule of Events.

1.37 EQUAL OPPORTUNITY

A. The Contractor and all its subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin.

PART 2 - PRODUCT – NOT USED

PART 3 - EXECUTION

3.1 SITE REQUIREMENTS

A. No systems will not be taken off-line or removed from service without coordination of the Owner's representative, and the staff of the affected building. Arrangements must be made by the Contractor to coordinate any such activities.

B. The building is currently unoccupied and is accessible during normal business hours, however, will be renovated during the construction period. The Contractor

is required to coordinate all work and schedule with the General Contractor and other trades.

C. All unused existing telecommunications cabling and equipment shall be removed and properly disposed of by this contractor.

D. Applicable Codes, Standards, Best Practices, Industry Norms

1. All Work performed on this Project will be installed in accordance with telecommunications best practices and standards, the current edition of the National Electrical Code®, the current edition of the BICSI Telecommunications Distribution Methods Manual, the current edition of the BICSI Cabling Installation Manual, the latest issue of the ANSI/TIA/EIA Standards as published by Global Engineering Documents as TIA/EIA Commercial Building Telecommunications Standard, and all local codes and ordinances.

3.2 QUALITY ASSURANCE

A. Project Manager

1. The Contractor will provide a full-time Project Manager who will act as a single point of contact for all activities regarding this Project. The Project Manager must be a management employee and will not be involved in personally performing craft installation Work

2. The Project Manager is required to attend necessary meetings for coordination.

3. The Project Manager will be required to make on-site decisions regarding the scope of the Work and any changes required by the Work.

4. The Project Manager will be totally responsible for all aspects of the Work and shall have the authority to make immediate decisions regarding implementation or Owner approved changes to the Work.

B. Compliance with Laws and Regulations

1. The Contractor performance of the Work shall comply with all applicable federal, state, and local laws, rules, and regulations and Owner policies, procedure, rules and regulations. The Contractor shall give required notices, shall procure necessary governmental licenses and inspections, and shall pay without burden to the Owner, all fees and charges in connection therewith unless specifically provided otherwise. In the event of violation, the Contractor shall pay all fines and penalties; including attorney's fees and other defense costs and expenses in connection therewith.

C. Federal Communications Commission

1. Equipment requiring FCC registration or approval shall have received such approval and shall be appropriately identified.

D. Codes, Standards, and Ordinances

1. All Work shall conform to the latest edition of the National Electrical Code®, Michigan Electrical Code, the Building Code, and all local codes and ordinances, as applicable. ANSI/TIA/EIA-568 and ANSI/TIA/EIA-569 shall be adhered to during all installation activities. Methodologies outlined in the latest edition of the BICSI Telecommunications Distribution Methods Manual shall also be used during all installation activities. Should conflicts exist with the foregoing, the authority having jurisdiction for enforcement will have responsibility for making interpretation. The Contractor is wholly responsible to meet or exceed all codes, standards, regulation, manufacturer installation standards and industry best practices.

3.3 SAFETY

A. The Contractor shall take the necessary precautions and bear the sole responsibility for the safety of the methods employed in performing the Work. The Contractor shall at all times comply with the regulations set forth by federal, state, and local laws, rules, and regulations concerning "OSHA" and all applicable state labor laws, regulations, and standards. The Contractor shall indemnify and hold harmless the Owner from and against all liabilities, suits, damages, costs, and expenses (including attorney's fees and court costs) that may be imposed on the Owner because of the Contractor, or its subcontractor, or supplier's failure to comply with the regulations stated herein.

3.4 INSPECTION, ACCEPTANCE, AND TITLE

A. Inspection and Acceptance will be upon successful installation unless otherwise provided. Title to/or risk of loss or damage to all items shall be the responsibility of the Contractor until acceptance by the Owner, unless loss or damage results from negligence by the Owner. If the materials or services supplied to the Owner are found to be defective or do not conform to the specifications, the Owner reserves the right to cancel the Contract upon written notice to and return products at the Contractor's expense, based upon the terms of the Contract.

1. When the Owner is referred to in this section of the RFP relative to inspections, the Owner has designated the PSC as the party to perform such inspections on behalf of the Owner. Notwithstanding the above, the Owner may also perform such inspections along with the PSC.

B. The Owner shall at all times have access to the Work wherever it is in preparation or in progress and shall provide proper facilities for such access and for inspection.

C. The Contractor shall not close up any Work until the Owner or AHJ (if applicable) has inspected the Work. Should the Contractor close up the work prior to inspection by The Owner or AHJ (if applicable), the Contractor shall uncover the Work for inspection at no cost to the Owner, and then recover the Work according to the specifications contained herein. The Contractor shall notify the Owner or AHJ (if applicable) in writing when the Work is ready for inspection. The Owner or AHJ (if applicable) will inspect the Work as expeditiously as possible after receipt of notification from the Contractor.

3.5 STATUS REPORTS, MEETINGS AND COORDINATION

A. It shall be the Contractor's responsibility to provide the Owner / PSC with written weekly project status reports while actively engaged in craft work and a summary report at the beginning of periods of inactivity between phases or construction delays noting status at that time and expected date of return to work in addition to the requirements listed below. These reports are required and shall include, but not be limited to:

1. Project completion percentage.
2. All problems that were encountered.
3. Any foreseeable problems that may arise.
4. Work completed during the previous period and work scheduled for the next period.
5. General status of the project

B. The Owner / PSC reserves the right to hold additional status meetings on a regular basis with the Contractor's Project Manager.

END OF SECTION

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1. SUMMARY

A. The successful bidder/contractor (hereafter referred to as the Contractor) shall supply equipment, materials, labor, and services to provide the following systems including, but not limited to:
   1. Grounding of communications systems components.
   2. Labeling of all cabling, terminations and equipment
   3. Testing and test documentation as indicated in each Section.
   4. Fire stopping.
   5. Extended warranty and manufacturer's certification of systems, products, and labor.

B. Provide all equipment, materials, labor, whether specifically mentioned or not, which are necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.

1.2. RELATED SECTIONS

A. Division 27

1.3. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this section.

B. As indicated in each section.

1.4. REFERENCES

A. Local Codes and Standards - all applicable
   1. Anywhere low-voltage cabling Standards conflict with electrical or safety Codes, Contractor shall defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either. Knowledge and execution of applicable codes is the sole responsibility of the Contractor. Any code violations committed at the time of installation shall be remedied at the Contractor's expense. Contractor is responsible to bring any perceived conflicts between project documents and referenced Standards or Codes to the attention of the PSC for resolution.

B. Contractors shall adhere to latest ratified editions of the following; this list is not all inclusive:
   1. American Society for Testing and Materials (ASTM)
   2. American National Standards Institute (ANSI)
   3. Insulated Cables Engineers Association (ICEA)
   4. National Electrical Manufacturers Association (NEMA)
   5. Institute of Electrical and Electronics Engineers (IEEE)
      a. National Electric Safety Code (NESC IEEE C2)

6. American National Standards Institute (ANSI) Telecommunications Industry Association (TIA)
   a. ANSI/TIA 455-78 - Optical Fibers – Part 1-40: Measurement Methods and Test Procedures – Attenuation
   b. ANSI/TIA-526-7 (OFSTP-7)- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant – OFSTP-7
   c. TIA/TSB 140 - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
   d. ANSI/TIA-568- Commercial Building Telecommunications Cabling Standard
   e. ANSI/TIA-568 - Balanced Twisted-Pair Telecommunications Cabling and Components
   f. ANSI/TIA-568: Optical Fiber Cabling Components
   g. ANSI/TIA-569 - Telecommunications Pathways and Spaces
   h. ANSI/TIA-598- Optical Fiber Cable Color Coding
   i. ANSI/TIA-606 - Administration Standard for Telecommunications Infrastructure
   j. ANSI/TIA-607 - **Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises**
   k. ANSI/TIA-758 – Customer-Owned Outside Plant Telecommunications Cabling Standard
   l. ANSI/IEE E 1100 Recommended Practice for Powering and Grounding Electronic Equipment
   m. ANSI NECA 1 Standard For Good Workmanship In Electrical Construction
7. ISO/IEC 11801– Information Technology – Generic Cabling For Customer Premises
8. NFPA 70 National Electrical Code (NEC) As adopted by the State of Michigan 2019
9. Rural Utility Services (USDA – RUS)
10. Restriction of Hazardous Substances Directive 2002/95/EC (RoHS)
11. Underwriters Laboratories (UL)
    a. UL 2024A Optical Fiber Cable Routing Assemblies for non-metallic cable pathways
12. NEMA VE1/CSA22.2 Metal Cable Tray systems for ladder rack and cable tray systems
13. Building Industry Consulting Services International (BICSI)
    a. Telecommunications Distribution Design Manual (TDMM)
    b. Information Technology Systems Installations Methods Manual (ITSIMM)
    c. BICSI – Outside Plant Design Reference Manual (OSPDRM)

C. Federal, state, and local codes, rules, regulations, and ordinances

1. The Contractor shall perform all work according to Federal, State, and local codes, rules, regulations, and ordinances governing the work. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply. OSHA Standards and Regulations – all applicable
2. Anywhere low-voltage cabling Standards conflict with electrical or safety Codes, Contractor shall defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either. Knowledge and execution of applicable codes is the sole responsibility of the Contractor. Any code violations committed at the time of installation shall be remedied at the Contractor's expense. Contractor is responsible to bring any perceived conflicts between project documents and referenced Standards or Codes to the attention of the Owner and Owner's PSC for resolution.

D. Manufacturers' Recommendations
E. Best Practices and Industry Norms
F. Others as indicated in each section.

1.5. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled, meeting the National Electrical code or National Building Code and tested by a qualified testing agency, and marked for intended location and application
B. Telecommunications Pathways and Spaces: Comply with TIA-569, the National Electrical Code and the National Building Code.
C. Grounding: Comply with ANSI/TIA-607 and the National Electrical Code.
D. Warranty
   1. See Section 270500 "Common Work Results for Communications".

1.6. PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior equipment cable until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings in IT spaces is complete.
B. This contractor shall examine the conditions under which the system installation is to be performed and notify the Owner's Representative or Design Professional in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to provide a workmanlike installation.
C. Review areas of potential interference and resolve conflicts before proceeding with the work. Coordinate ceiling layout and wall layout and other work that penetrates or is supported throughout the space of the building. All work shall be flush and workmanlike in all finished areas.

1.7. COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers.
B. Coordinate service entrance arrangement with local exchange carrier.
C. Meet jointly with other equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
D. Record agreements reached in meetings and distribute them to other participants.
E. Adjust arrangements and locations of distribution frames, cross -connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
F. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.
G. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

1.8. PERMITS, FEES, and CERTIFICATES OF APPROVAL.

A. The Contractor SHALL make application and pay for all required permits. Low-voltage telecommunications cabling requires an electrical permit from the State of Michigan.
B. As prerequisite to commencing work, the Contractor shall supply to the owner certificates of inspection from an inspection agency acceptable to the owner and approved by local municipality and utility company serving the project.
C. As indicated in each section.

1.9. DEFINITIONS

A. PSC – Professional Services Contractor (Convergent Technology Partners)
B. As indicated in individual sections

1.10. SUBMITTALS

A. Shop Drawings:
    1. Provide cable routing diagrams.
    2. Provide logical fiber optic diagrams.
    3. Show patch panel numbering for all patch panels.
    4. Provide a schedule of materials list with quantities and manufactures indicated for all materials installed in the project.
    5. Provide system block diagram including interconnection and numbering of all connections.
    6. Provide fabrication drawings for any proposed custom-built equipment.
    7. Submit for initial review 3 weeks after notice to proceed and for final review at substantial Completion.
B. Product Data:

1. Provide manufacturer's product data specifications sheets indicating products being submitted and any long lead time items.
2. Provide submittals for products with long lead times (4) weeks prior to ordering the materials.
3. Provide submittals (3) weeks after receiving notice to proceed and prior to installation of any of the product.

C. Schedule
   1. Submit a coordinated schedule (3) weeks after notice to proceed to include the following;
      a. Preconstruction meeting and walkthrough.
      b. Start and duration of system milestones.
      c. Punch List.
      d. Final Punch List.

D. Cable Test Results:
   1. Category X UTP cable: test per current version of TIA 568 and associated addenda, TSB and errata using the Permanent Link method.
   2. All Fiber Optic Testing shall be submitted to the engineer and copies to the Owner's Representative for all fibers furnished as part of this installation
      a. Submit manufacturer's test reports for each reel of cable provided prior to installation, including on-reel test results at 1310 and 1550nm for single-mode.
      b. Submit Contractor's OTDR or Power Meter/Light Source test results after bundled fiber terminations are installed. (Required for 4th Level Extended Warranties)
      c. All optical fibers shall be tested for continuity and attenuation both before and after installation.
      d. All newly installed fiber optic cable and components for network equipment use must be rated and installed to comply with the IEEE 802.3z1000Base-X Ethernet Gigabit Standard.
      e. All fiber optic backbone cables shall home-run either through conduit, utilize an interlocking armor outer jacket or inner duct from each Entrance Facility (EF) to the Main Telecommunications Equipment Room (ER), which houses the data switching equipment. The standard inter-building fiber optic backbone shall consist of single- mode fiber optic cable to all buildings. All OSP fiber optic cable installed underground shall be waterproofed utilizing dry waterproofing compounds, no gel filled cables will be allowed.
      f. Submit soft copy of test results for all fiber optic cable OTDR test results on USB or other suitable electronic format and in pdf format. Test results in comma separated variable (CSV) format shall be used whenever possible. Provide proprietary software on the digital media

to enable viewing of the soft-copy test results. (Required for 4th Level Extended Warranties)

E. Project Record Drawings
   1. Submit project record documents at Contract Closeout.
   2. The contractor shall deliver three (3) sets of as-built drawings to the owner within four (4) weeks of completion of the project. A set of as-built drawings shall be provided to the owner in suitable electronic form (i.e., USB) and utilizing software that is acceptable to the owner and PSC. The contractor shall deliver the digital media to the owner/PSC within six (6) weeks of completion of the project.
      a. As-built Drawings must contain;
         1) Distances for segments/cable runs
         2) Labeling
         3) Cable locations by type, with optical fiber showing strand count

F. Submit, within 3 weeks after notice to proceed, the names and qualifications of those persons who will have management and supervisory positions over the employees on the job site. Submit the name of the supervisory person who will be on the job site daily and have responsibility for day-to- day decisions. Submit the name of the person who will attend meetings and have authority to make decisions for issues and requirements that arise from such meetings.

G. Upon request by the engineer/designer (PSC), the Owner, and/or the Owner's representative will furnish a list of references with specific information regarding the type of project and involvement in providing other products and/or support equipment used on this project.

H. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA-National Electrical Manufacturer's Assn.), this equipment shall be labeled as certified or complying with the standards.

I. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout.
   1. All hardware proposed must be the current offering of the manufacturer and receive the highest level of standard support offered by the manufacturer. Factory refurbished hardware which is in "new condition" as well as used, shopworn, prototype, demonstrator models, etc. are not acceptable.
   2. The System must consist of standards-based products or components whose performance, reliability, and maintainability can be demonstrated.

1.11. QUALITY ASSURANCE

A. Submit documentation with the bid listing the names of employees that will be used on this project indicating their experience, level of expertise, and certificates of training.
B. Complete Quality Assurance requirements.
C. Submit documentation from the manufacturer of the optical fiber cable and components that they are either ISO 9000 or TL9000 Certified.

1.12. WARRANTY

A. Submit at project closeout, a signed and registered product warranty and applications assurance. See individual (system) Sections for warranty requirements.
B. All software required to run or view the test data must accompany the application.
C. Copies of as built drawings must be submitted to the manufacturer via electronic or hard copy. (Drawings must be in AutoCAD or Visio)
D. Submit a statement, at notice to proceed, of any Contractor warranties in addition to the manufacturer's stated and supplied warranties. Submit at closeout signed copies of the Contractor provided warranties that are in addition to manufacturer's stated and supplied warranties.

1.13. DELIVERY, STORAGE, AND HANDLING

A. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and misalignment. Coordinate with the owner for secure storage of equipment and materials.
B. Do not store equipment where conditions fall outside manufacturer's recommendations for environmental conditions.
C. Follow manufacturer's recommended procedures for storage of materials & equipment.
D. Do not install damaged equipment; remove from site and replace damaged equipment with new equipment.

1.14. SEQUENCE AND SCHEDULING

A. Refer to Schedule of Events and Submittals Section above.
B. Coordinate schedule and activities with Owner/ PSC/ General Contractor / Construction Manager.

1.15. USE OF THE SITE

A. Use of the site shall be at the owner's direction in matters in which the owner deems it necessary to place restriction.
B. Access to building wherein the work is performed shall be as directed by the owner.
C. The owner will occupy the premises during the entire period of construction for conducting his or her normal business operations. Cooperate with the owner to minimize conflict and to facilitate the owner's operations.
D. Schedule necessary shutdowns of plant services with the owner and obtain written permission from the owner.

E. Proceed with the work without interfering with ordinary use of streets, aisles, passages, exits, and operations of the owner.

1.16. CONTINUITY OF SERVICES

A. Take no action that will interfere with, or interrupt, existing building services or systems unless previous arrangements have been made with the owner's representative. Arrange the work to minimize shutdown time

B. Owner's personnel will perform shutdown of operating systems. The contractor shall give three (3) days' advance notice for systems shutdown.

C. Should services or systems be inadvertently interrupted, immediately furnish labor, including overtime, material, and equipment necessary for prompt restoration.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Provide products as indicated in individual articles.

B. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.

C. Provide proof the manufacturer selected has successfully had these same products installed at other facilities and provide references with name, title, address, phone number & e-mail address of each point of contact within each referenced account.

D. Provide proof the manufacturer has 20 years or more of designing, manufacturing and providing fiber optic cables, within the continental United States.

E. Provide proof the manufacturer is located within the U.S., is incorporated within the U.S. and that the major products (fiber optic cables, cable assemblies and termination hardware) are manufactured within the U.S.

F. Substitutions: Substitution requests will be considered only if submitted to Owner's Representative not less than 7 working days prior to project bid date. Acceptance or rejection of proposed substitution is at Owner's Representatives sole discretion. No exceptions. Requests for substitutions shall be considered not approved unless approval is issued in writing by Owner's Representative.

G. Rejection: For equipment, cabling, wiring, materials, and all other products indicated or specified as no substitutions or no alternates, Owner does not expect nor desire requests for substitutions and alternate products other than those specified. Owner reserves right for Owner's Representative to reject proposed substitution requests and submissions of alternates without review or justification.

PART 3 - EXECUTION

3.1. PRE-INSTALLATION SITE SURVEY

A. Prior to the start of systems installation, The Contractor will meet at the project site with the owner's representative and representatives of trades per-

forming related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the general contractor shall be necessary to plan the crucial scheduled completions of the equipment rooms and telecommunications rooms.

B. Examine areas and conditions under which existing cable and material/equipment is to be remediated/ removed and where the new system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.
C. Exact location cable terminations shall be field verified with owner.

3.2. HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

A. The contractor shall be responsible for safekeeping own materials and subcontractor's property, such as equipment and materials, on the job site. The owner assumes no responsibility for protection of above-named property against fire, theft, and environmental conditions.

3.3. CLEANUP

A. Touch-up, repair or replace damaged products before substantial completion.
B. All work materials shall be removed at the end of each workday and the work area left in the same condition as found. Upon completion of the work, the Contractor must remove all tools, equipment and all rubbish and debris from the premises and must leave the premises clean and neat.

3.4. FIRE STOPPING SYSTEMS

A. Comply with TIA 569 and BICSI "Fire stop Systems" chapter

3.5. PROTECTION OF OWNER'S FACILITIES

A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during construction.
B. Protect installed products until completion of project
C. Remove protection at completion of work.
D. Should it be found by the engineer that the materials, or any portion thereof, furnished and installed under this contract fail to comply with the specifications and drawings, with respect or regard to the quality, amount of value of materials, appliances, or labor used in the work, it shall be rejected and replaced by the contractor, and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the contractor's expense.

3.6. INSTALLATION

A. Prior to pulling cable through conduit, mandrel the conduits to remove foreign material before pulling commences.
B. Only install cable in conduits or sleeves that have been reamed and bushed. If bushings are not present, provide and install same.
C. Beginning installation means contractor accepts existing conditions.
D. Contractor shall furnish all required installation tools to facilitate Cable installation without damage to the cable jacket. Such equipment is to include, but

not be limited to, sheaves, winches, cable reels, cable reel jackets, duct entrance funnels, pulling tension gauges, and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices that may move or wear in a manner to pose a hazard to the cable or employees shall not be used.

E. Cable pulling shall be done in accordance with cable manufacturer's recommended procedures and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and minimum bending radii shall not be exceeded. Any cable bent or kinked to a radius less than recommended shall not be installed.
F. During cable 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 to feed cable and operate pulling machinery.
G. Pulling lubricant shall be used to ease pulling tensions. Lubricant shall be of a type that is non- injurious to the cable material used. Lubricant shall not harden or become adhesive with age. (i.e. - Polywater)
H. Avoid abrasion and other damage to cables during installation.
I. All exposed cable shall be labeled at 35-foot (maximum) intervals with tags indicating ownership, cable type, and fiber type installed.

3.7. LABELING

A. All labeling shall be in accordance with ANSI/TIA-606 unless otherwise noted by the owner or in individual sections.
B. Mark up floor plans showing Cable routes, segments, Cable type, and marking of cables. Turn these drawings over to the owner two (2) weeks prior to move-in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion.
C. The contractor shall deliver three (3) sets of as-built drawings to the Owner's Representative within four (4) weeks of completion of the project. A set of as-built drawings shall be provided to the owner in digital form (i.e., CD-ROM or other suitable format) and utilizing software that is acceptable to the owner. The contractor shall deliver the digital media to the owner within six (6) weeks of completion of the project.

3.8. COOPERATION

A. The contractor shall cooperate with other trades and owner's personnel in locating work in a proper manner. 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 installation before installing.

3.9. TESTING AND ACCEPTANCE

A. The equipment must meet or exceed the agreed acceptance criteria during a 30-day acceptance period, which begins on the installation (cut-over) date. The system will then be accepted following this successful 30-day period.
B. Test procedures must meet manufacturer's standards.
C. The Contractor shall correct, in a timely manner, any failure to comply with Contract Documents as reasonably determined by Owner.
D. If final acceptance is significantly delayed because of defective new equipment or because the installation is not in accordance with the Contract Documents, the Contractor shall pay for all the Owner's additional time and expenses resulting from the delay and any extensions of Acceptance Testing.
E. As additionally indicated in each Section.
F. Optical Fiber
    1. The contractor shall provide to engineer/Owner's representative, the cable manufacturer's test report for each reel of fiber cable provided. These test reports shall include manufacturer's on-reel attenuation test results at 1310 nm and 1550 nm for single-mode for each optical fiber of each reel prior to shipment from the manufacturer.
    2. The contractor will perform an attenuation test with an OTDR or Power Meter of each optical fiber of each fiber cable reel prior to installation. The contractor shall supply this test data to the engineer prior to installation.
    3. The fibers utilized in the installation shall be traceable to the manufacturer. On-the-reel bandwidth performance as tested at the factory (for multimode fibers) shall be provided upon request.
    4. Optical fiber bundle shall be tested before utilization as follows:
        a. Perform all tests and provide copies of all test results to the engineer/Owner's Representative.
        b. The contractor is responsible for supplying all equipment and personnel necessary to conduct the acceptance tests. The bidder should detail the proposed test plan for each cable type including equipment to use, test frequencies, and wavelengths, etc.
        c. The contractor shall conduct acceptance testing according to a schedule coordinated with the owner. Representatives of the Owner may be in attendance to witness the test procedures.
        d. The contractor shall offer adequate advance notice (at least one week) to the Owner' Representative as to allow for such participation.
        e. The contractor is to describe how they will conduct the tests and provide copies of all test results to the PSC/engineer Owner's Representative.
    5. The contractor shall provide written reports of all test data in written form to the Owner and the PSC.

6. In the event that test results are not satisfactory, the contractor shall make adjustments, replacements, and changes as necessary and shall then repeat the test or tests that disclosed faulty or defective material, equipment, or installation method, and shall perform additional tests as the engineer deems necessary.
   a. Tests related to connected equipment of others shall only be done with the permission and presence of the contractor involved. The contractor shall perform only that testing as required to prove the fiber connections are correct.
   b. Three (3) record copies of all test data shall be submitted to the PSC/engineer for approval. The contractor shall notify the PSC/engineer at least one week in advance of the test date so that the PSC/engineer may be present.

END OF SECTION

BONDING & GROUNDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1. SUMMARY

A. Section Includes:

1. Commercial building grounding and bonding requirements for telecommunication infrastructure.

2. Requirements for bonding and communications cabling, equipment, pathways, spaces, and mounting equipment.

1.2. RELATED SECTIONS:

A. Section 27 05 00 – Common Work Results

B. Section 27 00 00 - Telecommunications.

1.3. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.4. CODES, STANDARDS AND REFERENCES

A. The Contractor shall adhere to the latest edition of the following codes, standards, and references. Additionally, the Contractor shall adhere to all other codes, regulation and standards not stated here:

1. As listed in Section 270500

2. As listed in each section

1.5. SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1.6. SYSTEM DESCRIPTION

A. Provide a communications bonding and grounding system as described in this document, documents and drawings specific to that project, and in compliance with the above cited Codes, Standards and Agencies.

B. Bond the following items within the telecommunications grounding system.

1. All communications system active equipment.

2. All PDU and surge protection equipment.

3. Raised floor systems.
4. Underfloor grounding grids (a.k.a. “supplemental bonding grids” or SBGs) for computer or telecommunications rooms.
5. Metallic raceway systems, including metallic cable trays.
6. Communications equipment enclosures (cabinets) or cross-connect frames.
7. Broadband passive devices.
8. Metallic splice cases.
9. Metallic cable screens, armor or shields.
10. All metal cable conduit.
11. Electrical service panels in entrance facilities, telecommunications and equipment rooms.
12. Wall and rack mounted grounding bus bars.
13. Exposed building steel that is within 6 feet of equipment racking systems.
14. Building steel extending to earth in outside-plant.
15. All related bonding accessories.

1.7. DESIGN REQUIREMENTS

A. Quality Assurance:

1. Grounding to conform to applicable building codes.
2. Cable and equipment to be installed in a neat and workmanlike manner.
3. Methods of construction that are not specifically described or indicated in the contract documents to be subject to the control and approval of the OWNER or their official representatives.
4. Equipment and materials specified shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed.
5. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to written approval by from the Owner per the Substitutions Policy listed below.
6. Materials and Methods shall comply in every way with above cited Standards and Codes.

PART 2 - MATERIALS

2.1. GENERAL

A. Provide products as indicated in individual articles. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.

B. Materials shall be consistent throughout the building. Where two or more units of the same class of equipment or wiring are required, these units shall be the standard product of a single manufacturer and shall be the same product with the same material, model and manufacturer number.

2.2. PRODUCT CERTIFICATION

A. Components shall be UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Owner. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

2.3. APPROVED MANUFACTURERS

A. Panduit

B. Hubbell

C. Belden

2.4. TELECOMMUNICATIONS BONDING BACKBONE (TBB) GROUNDING CONDUCTORS:

A. To be bare or insulated copper, of minimum conductor size #6 AWG and sized at 2 kcmil per linear foot up to a maximum size of 750 kcmil. (For details on TBB sizing see "Execution" section at end of this document).

B. Where un-insulated, to be identified with green tape at termination location.

C. Labeled in accordance with recommendations set forth in ANSI/TIA-606 Administration Standard for Telecommunications Infrastructure.

2.5. Two-hole, Long-barrel Copper Compression Lugs for Grounding Conductors:

A. Meets ANSI/TIA-607 requirements for network systems grounding applications.

B. Tested by Telcordia – meets NEBS Level 3 with AWG conductor.

C. UL Listed and CSA Certified with AWG conductor for use up to 35 KV** and temperature rated 90°C when crimped with specified manufacturers' material, crimping tools and dies.

D. Color-coded barrels marked with specified manufacturers' die index numbers for proper crimp die selection.

E. Have long barrel to maximize number of crimps and provides premium wire pull-out strength and electrical performance.

F. Have "inspection window" over tongue to visually assure full conductor insertion.

G. Be tin-plated to inhibit corrosion.

H. Available with NEMA and BICSI hole-sizes and spacing.

2.6. Code/Flex Conductor H-TAPs:

A. Used as a splice, or to tap smaller (pigtail) conductors into larger continuous conductors.

B. Each HTAP terminates a wide range of conductor sizes and combinations of code and flex conductors Class G, H, I and Locomotive to suit a variety of applications.

C. Tap grooves are separated from one another, allowing them to function independently so HTAP can be used with single or multiple conductors, providing maximum design and installation flexibility.

D. Color coded and marked with die index numbers for proper crimp die selection.

E. UL Listed and CSA Certified, with wide size range of conductor sizes and rated for applications up to 600 V when crimped with Panduit tools and dies, or with other specified manufacturers' crimping tool and dies.

F. Tin plated to inhibit corrosion.

G. Available with an assortment of clear covers with integrated label fields.

2.7. Code Conductor, Thin Wall, Tin-plated C-TAP (splice):

A. For copper-to-copper splicing or pigtail tap splicing.

B. Wide wire range-taking capability minimizes inventory requirements.

C. Color-coded for proper crimp die selection.

D. Ribbed design provides high strength.

E. Made from high conductivity wrought copper.

F. Tin-plated to inhibit corrosion and oxidation.

G. UL Listed and CSA Certified with AWG conductor to 600 V and temperature rated to 90°C when crimped with Panduit and specified manufacturers' crimping tools and dies.

2.8. Access Floor Grounding Clamps:

A. Bonds crossed grid conductors to each other, and bonds the access floor pedestals to the conductors.

B. Specifically designed to bond perpendicular Mesh-BN (a.k.a. MCBN or Mesh Common Bonding Network) conductors per TIA-942 and ANSI/TIA-607

C. Bonds to the pedestal with a single bolt to simplify installation.

D. Accommodates conductor sizes from #6 – 1/0 AWG, minimizing inventory requirements.

E. Bonds both round and square access floor pedestals for greater flexibility.

F. Crossing grounding conductors affixed and bonded using a split bolt quad clamp which requires only one nut to install.

G. Split bolt design allows easy insertion of perpendicular conductors speeding installation and is UL 467 Listed and CSA

1. Split bolt is UL Listed and CSA Certified for use up to 600 V and temperature rated 90°C.

H. Each clamp accepts up to two conductors for a high-performance bond with faster installation.

I. Wide wire range-taking capability minimizes inventory requirements.

J. Split-bolt made from high strength, electrolytic bronze to provide reliable grounding connections.

2.9. IEEE Universal Beam Grounding Clamp:

A. For bonding structural steel (ex: I-beams) into bonding network

B. Universal, fits on a wide range of standard (angled) and wide flange (parallel) structural steel beams.

C. Provide a mounting pad suitable for a two-hole compression lug.

D. Installs quickly and easily with standard 1/4" key hex wrench tooling.

E. UL 467 Listed and CSA 22.2 Certified for grounding and bonding suitable for direct burial in earth or concrete.

F. Comply with vibration tests per MIL-STD-202G (METHOD 201A).

2.10. Split Bolt for Bonding Cable Trays:

A. Made from high strength copper alloy to resist corrosion and provide premium electrical and mechanical performance.

B. Wire range-taking capability minimizes inventory requirements.

C. Nut hex provides correct fit with socket, box, or open-end wrenches resulting in proper torqueing of electrical connection.

D. Pressure bar provides secure connection on a full range of conductor combinations used with each connector assuring premium wire pull-out strength.

E. UL Listed and CSA Certified with AWG conductor for use up to 600 V and temperature rated 90°C.

F. Available in tin-plated version for bonding to galvanized wire baskets and Flex Tray.

2.11. Auxiliary Cable Brackets (Conductor Pathway):

A. Used for mounting telecommunications bonding conductors outside of cable tray.

B. Maintain minimum 2" separation between bonding conductors and all other types of cabling per TIA 607-B.

C. Bonds ladder rack, wire basket sections together without drilling holes or applying other split-bolt clamps.

D. Supports grounding conductors in the telecommunications room, allows separation of grounding conductors from other cables.

E. Holds up to four conductors in sizes up to 750 kcmil.

F. Bonds to all cable tray.

G. Paint piercing teeth provide electrical continuity between cable pathway sections while minimizing debris.

H. Front and back mounting screw options allow easy installation and visual inspection.

I. Can be mounted above or below the cable pathway system for flexibility.

J. Meet requirements ANSI/TIA-607.

2.12. Wall-mount Busbars (TGB and TMGB and labeling):

A. Meet BICSI and ANSI/TIA-607 requirements for network systems grounding applications.

B. Employ BICSI hole spacing to fit 2-hole lugs.

C. Be made of high conductivity copper and tin-plated to inhibit corrosion.

D. Come pre-assembled with brackets and insulators attached for quick installation.

E. Identify busbars to meet TIA/EIA-606.

2.13. Vertical Grounding Strip Busbars for Racks and Cabinets:

A. Provides clean bond to any rack mounted equipment regardless of whether or not equipment has an integrated grounding terminal.

B. Bonds up to 45 RU per rack.

C. Comes in EIA Universal mounting hole pattern.

D. Complies with US and International grounding requirements.

E. Comes in threaded rail and cage nut versions.

2.14. Rack Bonding Conductor Kits (RBC):

A. Bonds the rack or cabinet to the telecommunications grounding busbar (TGB or TMGB).

B. Jumper kits available with both ends factory terminated to provide a bolt-on solution.

C. Jumper kits available with one end factory terminated to attach to the rack or cabinet; free end accommodates unique length requirements.

D. Engineered to comply with US and international grounding requirements.

2.15. Equipment Jumper Kits (Unit Bonding Conductor or "UBC"):

A. Used to ground large, chassis-style rack mounted equipment that have built-in grounding pads or terminals.

B. Bond network equipment to grounding strip or grounding busbar.

C. Jumper kit available with both ends factory terminated to provide a bolt-on solution.

D. Jumper kit available with one end factory terminated to attach to the grounding strip or grounding busbar; free end accommodates unique equipment terminations.

E. Use jumpers with 90° bent lug, on grounding strip side, for high density grounding requirements up to one ground point per RU.

F. Use jumpers with 45° bent lugs on grounding strip side, for improved cable management.

G. Engineered to comply with US and International grounding requirements.

2.16. Surge Suppressor Jumper Kit:

A. Bonds power or data line surge suppressor to grounding strip or grounding busbar.

B. Both ends factory terminated to provide a bolt-on solution.

C. Engineered to comply with US and International grounding requirements.

2.17. Miscellaneous Bonding Accessories:

A. Anti-oxidation Paste (contact aid) For Copper to Copper and Copper to Steel Connections

B. Anti-oxidation Paste (contact aid) For Aluminum Pad-to-Pad or Thread-to-Thread Aluminum Connections

C. Green thread-forming bonding screws for bonding smaller equipment on threaded rack rails through the equipment mounting flange.

D. Green bonding cage nuts from bonding smaller equipment on cage nut rails through the equipment mounting flange.

E. Thread forming screws for bonding two-hole lugs to vertical busbars on threaded rack rails.

F. Green paint piercing grounding washers for assuring electrical continuity between painted parts of equipment racks as described in TIA 607-B Standard.

G. Bonding hardware kits (studs) for forming low-resistance bond between the rack or cabinet and painted rack mounted appliances and equipment.

PART 3 - EXECUTION

3.1. GENERAL

A. This Specification document describes a generic enterprise communications bonding and grounding system for the construction of a complete and functioning grounding system without prior knowledge of the particular facilities where it will be used. It is the responsibility of the installing contractor to adapt these general guidelines and principles to the requirements of the actual environments where the systems are to be implemented.

B. System shall provide equipment ground connections (bonds) from the premises entrance facility and outside-plant earthing system to each telecommunication room telecommunication ground busbar, through the racking systems to bond the network equipment.

C. Entire grounding link from equipment to earth should be visually verifiable except where hidden by walls, conduit or pathways.

D. Installing contractor shall label all elements of the communications bonding network according to guidelines defined in ANSI/TIA-607 and ANSI/TIA 606.

E. It is the responsibility of the installer to be knowledgeable of all previously cited Standards and Codes and to bring to the attention of the Owner any conflicts or discrepancies to achieve a fully functioning, standards-compliant earthing system.

3.2. INSTALLATION

A. Telecommunications Bonding Backbone (TBB):

1. Bonding and grounding conductors may be insulated or un-insulated and shall not decrease in size as the grounding path moves closer to earth.

2. Connections (bonds) between the telecommunications grounding network and associated electrical panels shall be done by a qualified electrician in accordance with guidelines in TIA 607-B and applicable electrical codes.

3. Bonding Conductors should be continuous and routed in the shortest possible straight-line path, avoiding changes in elevation and sharp bends.

4. TBB conductors shall be protected from mechanical damage and built so as to minimize splicing. Where splicing is unavoidable, they shall be done using irreversible compression splices (C-TAPS) built to that purpose. See

the "Materials" section of this document for appropriate compression splices.

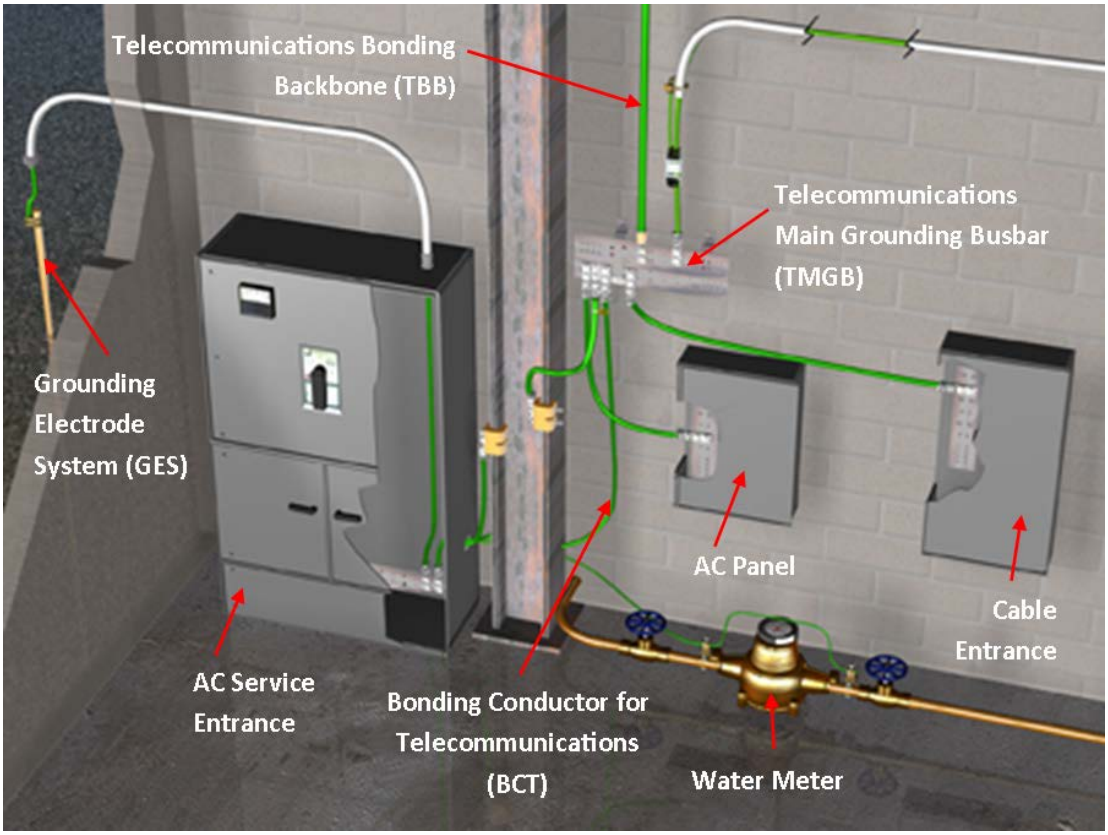
5. TBB in multi-story buildings with multiple risers (multiple TBBs) shall employ a grounding equalizer (GE) between vertical grounding backbones at the top floor of the building and minimally at every third floor in between to the lowest floor level. The GE shall be no smaller than the largest sized TBB.
6. Routing grounding conductors through ferrous metal conduit should be avoided, but if it is necessary due to building constraints, any grounding conductor running through ferrous conduit longer than 3 feet shall be bonded at the end using appropriately sized HTAP and Conduit grounding clamps as described TIA 607-B using appliances described for that purpose in the "Materials" section of this document.
7. Conductors used to bond TBB to conduit ends shall be of #6 AWG size or larger.
8. Conductor sizing shall be based upon project specification (drawings and notes) for that installation. These sizes are based on TBB length per TIA 607-B recommendations. Contractor shall bring to the attention of the Owner anywhere TBB project specified sizing appears insufficient per the Table below:

Sizing of the TBB	
TBB Length in Linear meters (feet)	TBB Size (AWG)
Less than 4 (13)	6
4-6 (14-20)	4
6-8 (21-26)	3
8-10 (27-33)	2
10-13 (34-41)	1
13-16 (42-52)	1/0
16-20 (53-66)	2/0
20-26 (67-84)	3/0
26-32 (85-105)	4/0
32-38 (106-125)	250 kcmil
38-46 (126-150)	300 kcmil
46-53 (151-175)	350 kcmil
53-76 (176-250)	500 kcmil

76-91 (251-300)	600 kcmil
Greater than 91 (301)	750 kcmil

B. Entrance Facilities and Telecommunications Main Grounding Busbar (TMGB):

1. TMGB shall be located in the entrance facility, near the electrical panel to which it will be bonded but installed to maintain clearances required by applicable electrical codes.
2. TMGB shall be sized according to the anticipated number of bonded connections needed
3. TMGB shall have tinned surface to restrain oxidation and be cleaned and antioxidant paste applied prior to fastening conductors.
4. Connectors on TBB which attach to TMGB shall be of two-hole, long-barrel compression lugs of the LCC series as specified in the "Materials" section of this document.
5. Building steel within six feet of the communications grounding system should be bonded into the system with appropriate hardware listed in "Materials" section of this document.
6. All cables containing a metallic shield or armor shall have that shield properly bonded into the communications grounding system using the appropriately sized Armored Cable Grounding Kit listed in the "Materials" section of this document.
7. The illustration below depicts for reference the general location and layout of the TMGB and associated grounding elements in a typical entrance facility.

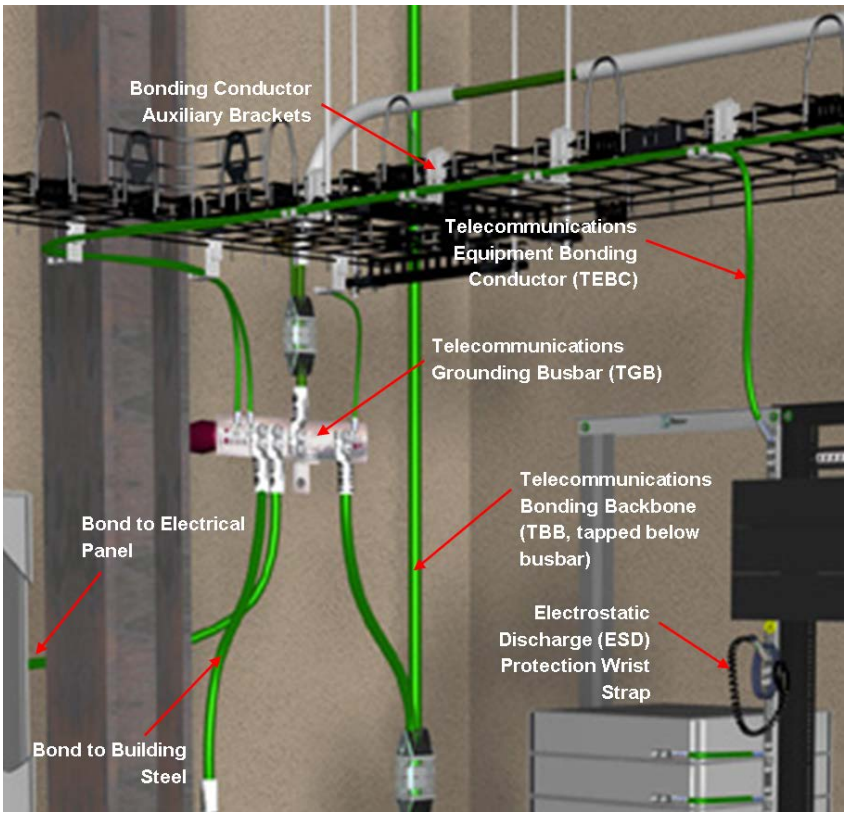


C. Telecommunications Rooms and Telecommunications Grounding Busbar (TGB):

1. Each telecommunications room shall have its own TGB to which equipment and dead steel (building steel and support structures) in that room are bonded.
2. The TGBs shall have a tinned surface to inhibit oxidation and be sized according to the anticipated number of bonded connections that will be needed.
3. TGBs shall be sized according to the anticipated number of bonded connections needed.
4. TMGs shall have tinned surfaces to restrain oxidation and shall be cleaned and have an antioxidant paste applied to both bonding surfaces prior to fastening conductors.
5. Connectors on backbone and rack/cabinet bonding conductors which attach to TGB shall be of two-hole, long-barrel compression lugs as specified in the "Materials" section of this document.
6. Building steel within six feet of the communications grounding system should be bonded into the system with beam clamps and other hardware

appropriate to that purpose listed in "Materials" section of this document.

7. Racks and cabinets shall have individual Rack Bonding Conductors (RBC) bonding to the Telecommunications Equipment Bonding Conductor (TEBC). DAISY CHAINING OR SERIAL CONNECTIONS OF ONE RACK OR CABINET TO ANOTHER WILL NOT BE ACCEPTED.
8. In smaller Telecommunications Rooms (3-5 racks) it is acceptable to have telecommunications equipment bonding conductors (TEBC) that go directly from each individual rack to the TGB. DAISY CHAINING OF RACKS WILL NOT BE ACCEPTED.
9. Rack Bonding Conductors (RBC) or above rack row grounds (TEBC) shall be installed to maintain a minimum of 2" separation from all other types of cable - power or communications.
10. To maintain this segregation of cables some telecommunications rooms may lend themselves to the installation of Auxiliary Conductor Brackets for routing bonding conductors outside of, yet parallel to ladder rack or basket tray. See "Auxiliary Brackets" in "Materials" section of this document.
11. Bonding conductor support systems like auxiliary brackets shall be spaced no further apart than three-foot intervals.
12. All cables containing metallic shielding or armor shall be properly bonded into the communications grounding system using the appropriately sized Armored Cable Grounding Kit listed in the "Materials" section of this document.
13. The illustration below depicts for reference the general location and layout of a typical telecom room and associated bonding connections into the TGB.



Telecommunications Grounding in Small TR—Note in this illustration individual Telecommunications Equipment Bonding Conductors (TEBC) go direct from rack to the busbar

D. Bonding within Racks and Cabinets:

1. Racks and Cabinets shall be bonded into the communications bonding network with conductors of #6 AWG or larger.

2. Depending on size of the telecommunications room, Rack Bonding Conductors (RBC) may tap into underfloor or overhead grounding conductors, or for smaller TRs (3-5 racks or cabinets), may go directly from the rack to the wall mounted busbar.

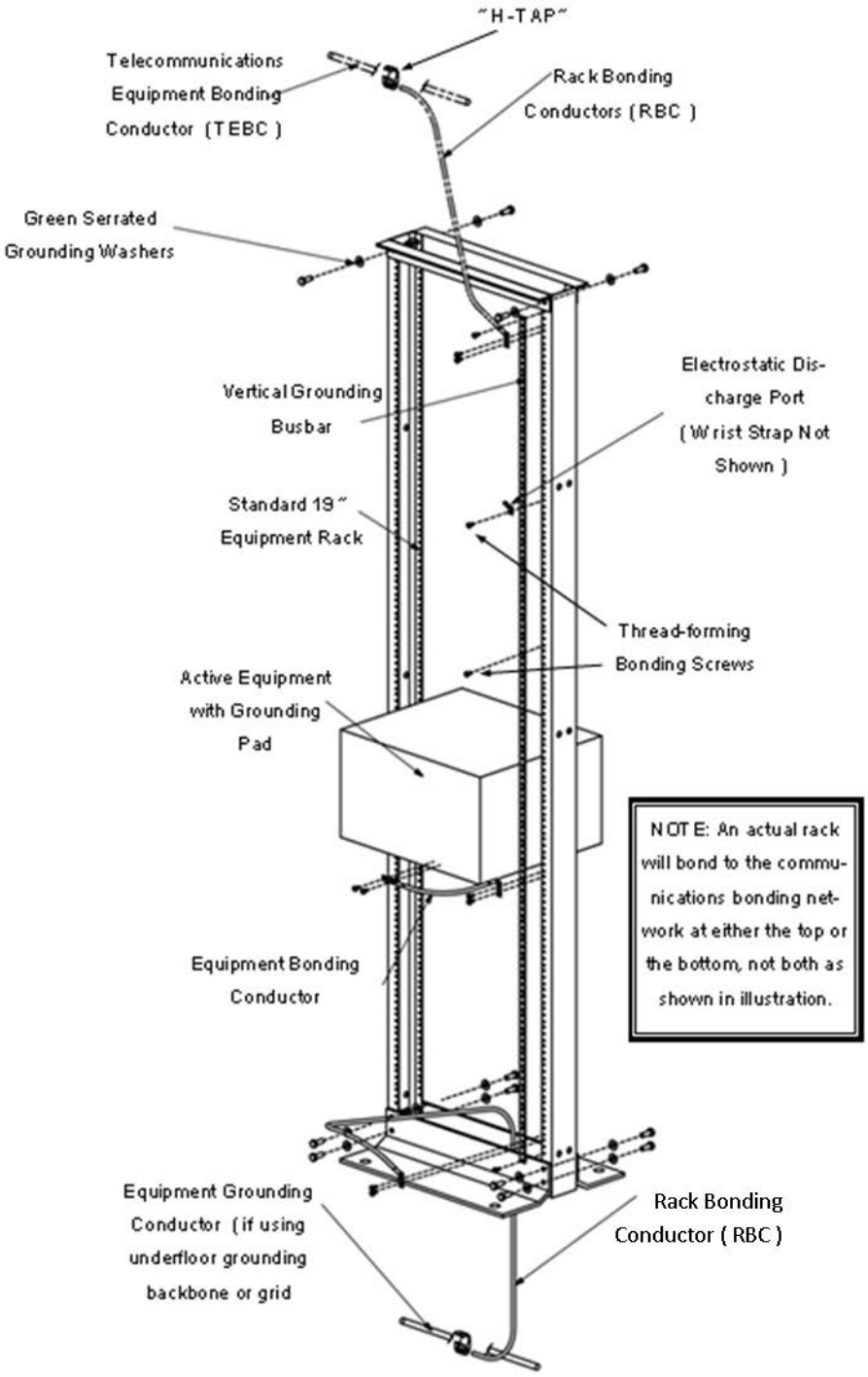
3. Racks, cabinets and similar enclosures shall not be attached serially (daisy-chained) but must have individual RBC into the grounding system.

4. Newly installed racks and cabinets shall have vertical grounding busbars installed along one rail to provide clean bonding landing point for all rack mount equipment. For part numbers vertical busbars see "Materials" section of this document. Grounding busbars shall not be isolated from the rack or cabinet.

5. All painted components of racks/cabinets shall be assembled using serrated grounding washers and thread-forming screws to ensure

electrical continuity between the different structural components of the rack/cabinet.

6. Larger equipment (chassis switches) with integral grounding terminals or pads shall be bonded to the vertical busbar with equipment grounding kits attached to those terminals and bonding them to the rack-mounted busbars. For kit part numbers see the "Materials" section of this document.
7. Anywhere two metallic surfaces are to be bonded, contractor shall clean the contact areas of paint or oxidation using abrasive pads and apply film of anti-oxidation compound between surfaces prior to bonding.
8. All cable fittings shall be of two-hole (LCC series) compression-type. Mechanical screw-lugs on racking systems will not be accepted and must be removed and replaced at contractor's expense.
9. All screws used to affix compression lugs to rack-mounted vertical busbars shall be of the thread forming type made specifically for electrical bonding.
10. Smaller equipment (servers, TOR switches) not having integral grounding pads must be bonded to the rack through the equipment mounting flanges using green thread-forming grounding screws with serrations under the head to cut through paint, coatings and oxidation that may be present on the equipment flange. Such equipment shall have minimally one grounding screw per piece of equipment.
11. Existing (installed) racking systems containing live active equipment may be retrofitted for Standards-compliant bonding using rack retrofitting kits listed in the "Materials" section of this document.
12. The following illustration demonstrates how the racks shall be bonded:



3.3. FIELD QUALITY CONTROL

A. On installations confined to a single telecommunications room, the installing contractor shall visually verify continuity of communications bonding system from equipment, through racking systems, to overhead or underfloor backbone to the wall mounted busbar in that telecommunications room.

B. Contractor shall further verify the use of all appropriate bonding accessories in the racking systems such as grounding washers, thread-forming grounding screws and the presence of electro-static discharge ports and wrist straps within reach of all equipment to be maintained.

C. On greenfield (new) projects involving installation of a building-wide telecommunications backbone, installing contractor is further responsible for visually verifying sizing and sound installation of the telecommunications bonding backbone including presence of properly sized and installed grounding equalizer conductors between backbones contained in separate risers.

D. Inspecting Contractor shall verify that any conduit longer than three feet through which a grounding conductor passes is properly bonded to the grounding conductor as described in this document.

E. During inspections contractor shall verify compliance with all stipulations specified in this document and compliance with all regulatory references (Standards and Codes) cited.

F. All opens or gaps in the bonding system during final inspections will be recorded in the inspection report and remedied.

G. During inspections, contractor shall check all grounding and bonding system conductors and connections for tightness and proper installation, including checking proper dies were used on compression taps and fittings by checking embossed die numbers on those connections.

H. the Owner may request a test of 10% of bonded connections within the grounding system with a volt-ohm meter. Resistance tests taken on either side of a compression or exothermic bond shall be less than .2 (2/10) of one ohm in resistance.

    1. Bonded joints to be tested may be random or individually tagged by a representative of the Owner.

I. Contractor shall Test system at bonded points indicated and provide results in report form.

    1. Based upon test results, the Owner reserves the right to request testing on 100% of exothermic and compression bonds within the installed grounding system.

    2. All bonded connections failing the test described above shall be remedied and retested by the installation contractor at contractor's expense.

END OF SECTION

FIRE STOPPING, SMOKE, AND ACOUSTICAL SEALING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2. SUMMARY

A. This section includes labor, materials and equipment necessary to complete the installation required for the items specified under this Section, including but not limited to:

1. Firestopping of Through Penetrations in Fire Rated Assemblies.

2. Smoke and Acoustical Sealing in Non-Rated Assemblies.

1.3. SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards and listing numbers of systems in which each product is to be used.

B. Schedule of UL System Drawings for Fire Rated Construction: Submit schedule of all expected opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

C. UL System Drawings for Fire Rated Construction: Furnish copies of all UL Systems identified in schedule above. Include any engineering recommendations.

D. Certificates: Product Certificate of Compliance from the by manufacturer certifying material compliance with applicable code and specified performance characteristics.

E. Installation Instructions: Submit manufacturer's printed installation instructions.

1.4. QUALITY ASSURANCE

A. Products/Systems: Provide firestopping systems that comply with the following requirements:

B. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop system acceptable to authorities having jurisdiction.

C. Firestopping products bear the classification marking of qualified testing and inspection agency.

D. Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the

necessary training to install firestop products in accordance with specified requirements.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Deliver in manufacturer's original, unopened, undamaged containers, identification labels intact identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instruction for multi-component products.

B. Handle and store products according to manufacturer's recommendations published in technical materials. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.

C. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.6. PROJECT CONDITIONS

A. Do not install products when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not install products when substrates are wet due to rain, frost, condensation, or other causes.

C. Do not use materials that contain flammable solvents.

D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

F. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings

1.7. PERFORMANCE REQUIREMENTS

A. References:

1. ANSI/TIA-1179-A "Healthcare Facility Telecommunications Infrastructure".

2. ANSI/TIA-EIA-569-D "Telecommunications Pathways and Spaces"

3. ASTM E90, "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements".

4. ASTM E814, "Fire Tests of Through Penetration Firestops".

5. CAN/ULC S115, "Standard Method of Fire Tests of Firestops Systems."

6. UL 1479, "Fire Tests of Through Penetration Firestops".

7. National Fire Protection Association (NFPA) – NFPA 101: Life Safety Code.
8. National Fire Protection Association (NFPA) – NFPA 70: National Electrical Code.
9. Underwriters Laboratories Inc. (UL) – Fire Resistance Directory

B. Fire rated cable pathway devices shall be used in fire-rated construction for ALL low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:

1. Meet the hourly fire-rating of fire rated wall and or floor penetrated.
2. Be tested for the surrounding construction and cable types involved.
3. Have UL Systems permitting cable loads from; "Zero to 100% Visual Fill." This requirement eliminates need for fill-ratio calculations to be made by cable technicians to ensure cable load is within maximum allowed by UL System.
4. Be "Maintenance-Free", having a corresponding Evaluation Services Report from a Nationally Recognized Third Party Laboratory. Maintenance-Free is defined as; No action required by cabling technician to open and/or close pathway for cable moves, adds or changes, such as, but not limited to:
    a. Opening or closing of doors.
    b. Spinning rings to open or close fabric liner.
    c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
    d. Evaluation Services Report (ESR) from an accredited Nationally Recognized Third-party Laboratory certifying compliance with this definition of "Maintenance-Free" and all relevant codes and standards.
5. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
6. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.
7. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

C. Non-rated cable pathway devices shall be used in non-fire-rated construction for all low-voltage, video, data and voice cabling, optical fiber raceways and

certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:

1. Limit the movement of smoke and sound of wall and or floor penetrated.
2. Restore the STC Rating of the penetrated assembly.
3. Provide L Ratings of greater than 1 CFM when empty and greater than 2.5 CFM at all other loading up to 100 percent.
4. Accommodate cable loads from; “Zero to 100% Visual Fill.”
5. Not have inner fabric liner that tightens around and compresses cables tightly together encouraging potential cable damage or interference.
6. Be “Maintenance-Free”, maintenance-free is defined as; No action required by cabling technician to open and/or close pathway for cable moves, adds or changes, such as, but not limited to:
    a. Opening or closing of doors.
    b. Spinning rings to open or close fabric liner.
    c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
    d. Furnish letter from manufacturer certifying compliance with this definition of “Zero-Maintenance”.
7. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
8. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.
9. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

D. As an alternate to using a fire-rated or non-rated cable pathway device for a single or tow low voltage cables (up to an aggregate cross sectional area of 0.52 in. (14mm) O.D.) penetrating one or two-hour, gypsum board/stud wall assemblies or non-rated assemblies, either as a through-penetration or as a membrane-penetration, a fire-rated cable grommet may be substituted. The product shall consist of a molded, two-piece, plenum-rated grommet having a foam fire and smoke sealing membrane that conforms to the outside diameter of the individual cable. The grommet product shall be capable of locking into place to secure the cable penetration within the wall assembly. The grommet

shall be UL Classified and tested to the requirements of ASTM E814 (UL 1479) and CAN/ULC S115.

E. Where non-mechanical pathways must be utilized, such as sealing (caulking) around single or grouped conduits, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction. Provide letter from manufacturer certifying compliance with this section.

F. Cable pathway shall replace conduit sleeves in walls and floors, and the following;

1. When installed individually in floors, devices shall pass through core-drilled or preformed opening utilizing tested floor plates.

2. When multiple units are ganged in floors, devices shall be anchored by means of a tested grid.

3. When installed individually in walls, devices shall pass through core drilled opening utilizing tested wall plates or integrated flanges.

4. When multiple units are ganged in walls, devices shall be anchored by means of a tested adjustable gang bracket.

G. Cable tray shall terminate at each barrier and resume on the other side such that cables pass independently through devices. Cable tray shall be properly supported on each side of the barrier.

PART 2 - PRODUCT

A. General: Use only products that have been tested for specific fire resistance rated construction conditions or acoustical and smoke related requirements conforming to construction assembly type, penetrating item type, annular space requirements, and rating involved for each separate instance.

B. Firestop Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:

C. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:

D. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag, the following products are acceptable:

E. Fire-Rated Cable Grommet: Molded, two-piece grommet with an integral fire and smoke sealing foam membrane for sealing individual cable penetrations through framed wall assemblies. Grommet snaps together around cable and locks tightly into the wall.

F. Fire-Rated Cable Pathways: Device modules comprised of steel pathway with self-adjusting intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:

G. Smoke and Acoustical Pathways: Device module comprised of a nonmetallic pathway with integral self-adjusting smoke and sound sealing system for cable penetrations through non-fire-resistance rated wall or floor assemblies, the following products are acceptable:

H. Circuit Integrity Wrap: Endothermic Wrap incorporating foil scrim evaluated for protection of cable pathways incorporating mission critical and/or critical life safety circuits, including but not limited to Electrical Metallic Tubing (EMT), Rigid Metallic Conduit (RMC), and/or Cable Tray with a maximum weight of no greater than 1.4 lbs/ft2. The following products are acceptable:

PART 3 - EXECUTION

3.1. EXAMINATION

A. Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of firestopping in accordance with manufacturer's installation instructions and technical information.

B. Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to protect adjacent surfaces.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. General: Install systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of products.

3.3. FIELD QUALITY CONTROL

A. Keep areas of work accessible until inspection by authorities having jurisdiction.

B. Where deficiencies are found, repair firestopping products so they comply with requirements.

3.4. ADJUSTING AND CLEANING

A. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

3.5. DOCUMENTATION

A. Place system stickers on each side of wall penetrations.

B. Place a reproduction (photo copy) of the UL System description in a document protector and mount to the wall next to the wall penetration

C. Highlight the section of the system description that list the allowed cable types.

END OF SECTION

STRUCTURED CABLING SYSTEMS

PART 1 - GENERAL

1.1. SUMMARY

A. All hardware, enclosures, racks, equipment and other equipment as indicated herein and on project drawings and documents, and as required for a complete installation per industry norms, standards and best practices

B. Section Includes:

1. Demolition of all existing, unused telecommunications cable
2. Category 6 cabling, termination and testing
3. Cable support and accessories
4. IT Room renovation
5. Bonding and Grounding
6. Firestop

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.3. CODES, STANDARDS AND REFERENCES

A. The Contractor shall adhere to the latest edition of the following codes, standards, and references. Additionally, the Contractor shall adhere to all other codes, regulation and standards not stated here:

1. As listed in Section 270500
2. Manufacturers Recommendations
3. Best Practices and Industry Norms

1.4. SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. Cable - Include the following installation data for each type used:

a. Nominal OD.

b. Minimum bending radius.

c. Maximum pulling tension.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring diagrams to show typical wiring schematics including the following:

a. Patch panels.

b. Cross – connects and patch cords

c. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.

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

C. Field quality-control reports.

D. Qualification Data: For installer, qualified layout technician, installation supervisor, and field inspector.

1.5. QUALITY ASSURANCE

A. Bidder qualifications:

1. Work under this section shall be performed by and the equipment shall be provided by the approved telecommunications contractor and key personnel. Qualifications shall be provided for the telecommunications system contractor, the telecommunications system installer, and the supervisor (if different from the installer). A minimum of 30 days prior to installation, submit documentation of the experience of the telecommunications contractor and of the key personnel.

2. The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment. The telecommunications contractor shall demonstrate experience in providing successful telecommunications systems within the past 5 years of similar scope and size. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the telecommunications contractor.

3. Minimum Manufacturer Qualifications

a. Cabling, equipment and hardware manufacturers shall have a minimum of 3 years' experience in the manufacturing, assembly, and factory testing of components which comply with TIA-568, TIA-569, TIA 606 and TIA-607.

B. Installer Qualifications

1. Installers: Installation personnel shall be certified by the manufacturer for the installed product.

2. Installation Supervision: Installation shall be under the direct supervision of BICSI ITS Technician or ITS 2 Installer or equivalent certification, who shall be present at all times when Work of this Section is performed at Project site.

3. Project Manager and Quality Assurance: Project shall be managed and supervised by a current BICSI RCDD.

4. Cable Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Telecommunications Pathways and Spaces: Comply with TIA-569

D. Bonding and Grounding: Comply with TIA-607 and attached specification

E. Test Plan - Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the components and accessories for each cable type specified, 30 days prior to the proposed test date for approval. Include procedures for certification, validation, and testing. Test plan shall include all test requirements detailed herein at a minimum.

F. Regulatory Requirements - In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

G. Standard Products - Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship unless specific manufacturer and/or part numbers is included herein. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single

manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

H. Material and Equipment Manufacturing Date - Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

1.6. CABLE DELIVERY, STORAGE, AND HANDLING

A. Test each pair of UTP backbone cable upon receipt at Project site for open and short circuits.

1.7. PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cable, equipment frames and cable trays until spaces are enclosed and weather tight, wet work in spaces is complete and dry.

1.8. COORDINATION

A. Coordinate layout and installation of telecommunications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

B. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.

1. Record agreements reached in meetings and distribute them to other participants.

2. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

3. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other telecommunications, electronic safety and security, and related systems that share space in the equipment room.

4. Coordinate location of power raceways and receptacles with locations of telecommunications equipment requiring electrical power to operate.

5. Coordinate layout and installation of telecommunications pathways and cabling with General Contractor and all associated trades.

1.9. SYSTEM DESCRIPTION

A. Category 6 UTP cable, terminations and testing as indicated on drawings and herein.

1. Wall Phones

2. Work Area Outlets
3. Cameras and WAP locations above ceiling

B. IT room renovations

1. MDF – demolition/removal of all unused equipment, racks and cabling from the space, remediation of the existing 7’ aluminum relay rack for reuse with the new Structured Cabling System.

1.10. DEFINITIONS AND ABBREVIATIONS

1. Unless otherwise specified or indicated herein, electrical and electronics terms used in this specification shall be as defined in TIA-568, TIA-569, TIA-606 and IEEE 100 and herein.
2. BICSI: Building Industry Consulting Service International.
3. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
4. EMI: Electromagnetic interference.
5. IDC: Insulation displacement connector.
6. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
7. RCDD: Registered Communications Distribution Designer.
8. TDMM (BICSI): Telecommunications Design Methods Manual
9. UTP: Unshielded twisted pair.
10. LAN: Local area network.
11. Cable tray: A fabricated structure consisting of sides and bottom constructed of steel with dimensions not exceeding 12” x 4” or a basket tray consisting of sides and bottom constructed of wire mesh not exceeding 2” x 4” (50mm x 100mm) spacing.
12. PSC – Professional Services Contractor (Convergent Technology Partners)
13. SCS – Structured Cabling System
14. WAO – Work Area Outlet
15. APC – Angle Polished Connector
16. UPC – Uniform Polished Connector

1.11. WARRANTY

A. Provide minimum twenty-year end-to-end manufacturer warranty on structured cabling system.

B. Provide minimum one-year manufacturer warranty Labor and Material on all other product/work.

PART 2 - PRODUCT

2.1. Components shall be UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Owner. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard. Provide a complete system of telecommunications cabling and pathway components using star topology. Provide support structures and pathways, complete with outlets, cables, connecting hardware and telecommunications cabinets/racks. Cabling and interconnecting hardware and components for telecommunications systems shall be UL listed or third-party independent testing laboratory certified and shall comply with NFPA 70 and conform to the requirements specified herein.

2.2. Category 6 Plenum Rated UTP Cable:

A. Approved manufacturers

1. Belden
2. CommScope
3. Hubbell
4. Panduit

B. Cable, jacks and MDF cross-connect patch cords shall be color coded by use:

1. Purple/violet – Wireless access points
2. Blue – Data/VoIP
3. Green – Security

C. Data outlets - Patch cords shall be 1’ in length, using the same color coding as corresponding cable being patched.

D. WAP and Camera outlets - Patch cords shall be 3’ in length, using the same color coding as corresponding cable being patched.

E. End device patch cords by Owner

2.3. Category 6 UTP connectivity – manufacturer to match or be partners with cable manufacturer for manufacturer 20-year end to end warranty.

A. Keystone modular Patch Panels

1. Provide separate patch panels for Data, Cameras and Wireless Access points.

a. Provide 48 port panels for Data, 48 port panels for Wireless Access points and 24 port panels for cameras.

2. Patch panels shall be placed in the rack as follows: panel, 2u empty (OFE switch), panel, panel, 2u empty (OFE switch) etc.

3. Mount data panels at the top of the rack, wireless access points below data panels and camera panels below wireless access point panels. Coordinate final location with Owner/PSC before mounting.

B. 8p8c “RJ45” keystone style jacks

C. Faceplates: Wall phone, Keystone wall plates, 106 style frames, and surface mounted jack housings

2.4. Telecommunications Grounding/bonding Bus Bar and bonding to approved ground including all accessories - meets BICSI and TIA-607-B requirements for network systems grounding applications

A. 1/4"W x 2"H x 12"L – Tin-plated copper or Copper

B. 1/4" Stud Hole with 5/8" Hole Spacing – Six (6)

C. 3/8" Stud Hole with 1" Hole Spacing – Three (3)

D. Wall mounted

2.5. Vertical power strip 15, 12 outlets, surge protected, comply with UL 1363.

A. Built-in surge suppression rated at 1050 joules

B. 12 NEMA 5-15R outlets with 2.48-in. center-to-center spacing

C. 15-ft. AC line cord

D. Lighted power switch with transparent guard to prevent accidental shutoff

E. 15A resettable circuit breaker

2.6. Pathways

A. General Requirements: Provide telecommunications pathways in accordance with TIA-569 and as specified herein and on project drawings and associated documents. Provide system furniture pathways in accordance with UL 1286.

B. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable and approved for use with Category 6 UTP cable. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.

1. J-hooks

2. Saddles

C. Cable Guides and Fasteners

1. Provide cable guides specifically manufactured for the purpose of routing cables, wires and patch cords vertically on equipment racks and telecommunications backboards (to accommodate cross-connect wiring, etc.).
2. Cable guides of ring or bracket type devices mounted on rack and backboard for horizontal cable management and individually mounted for vertical cable management. Mount cable guides with screws, nuts and lock washers.
3. Hook and Loop (I.e. Velcro®) shall be used to fasten cables. Tie-wraps or similar type fasteners shall not be used.

PART 3 - EXECUTION

3.1. SUMMARY

A. At the time of RFP creation, the location of furniture, location and type of conduit and boxes or raceway for telecommunications, etc. have not been determined. It is a safe assumption that cable locations within each room will change or be further defined after award. The Contractor shall coordinate final locations prior to installation.

3.2. WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays (if specified) except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

B. Install plenum cable in environmental air spaces, including plenum ceilings.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3. DEMOLITION AND REMEDIATION

A. The contractor shall be responsible for identification and demolition of all unused telecommunications cabling. Care shall be taken to not disturb other systems (Electrical, Fire alarm, Intrusion Detection (security), HVAC, Control wiring, etc.). Any systems disturbed shall be immediately restored by this contractor.

B. Telecommunications cable definition:

1. Any low voltage cable or wires used for transmission, communication or control of telecommunications systems. The following list is an example and is not all inclusive: Network, Telephone, Paging, Audio-Video, Security, etc.
2. This shall not include carrier owned material

C. The contractor shall be responsible for properly supporting all existing remaining (used) and new cabling or wires per codes and standards.

D. Any cable that the Owner desires to left for reuse later shall be properly identified, labeled for use and properly coiled and supported in the ceiling. If any cable is to be left for later use it must be additionally labeled on both ends “FOR FUTURE USE”.

E. The contractor shall be responsible for identification and demolition of all other unused product. The following list is representative and not all encompassing:

1. Wall mounted racks, camera panels and power supplies, termination blocks, telephone equipment, etc.

2. This shall not include carrier owned material

3.4. INSTALLATION OF CABLES

A. General Requirements for Cabling:

1. Comply with NECA 1

2. Comply with TIA-568.

3. Comply with BICSI TDMM, "Cable Termination Practices."

4. Install 110-style IDC termination hardware unless otherwise indicated.

5. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.

6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

7. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI TDMM, "Cabling Termination Practices". Install lacing bars and distribution spools.

9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

10. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.

B. Project specific requirements for cabling:

1. Service loops:
    a. In the telecommunications equipment room, install a 10-foot-long service loop on the end of each telecommunications cable.
    b. Install a 12-inch-long service loop on each horizontal cable at the workstation end.
    c. All Access Points and Camera locations shall be terminated in the ceiling with on 8p8c jack in surface mount housing. The cable shall have a 15-foot long service loop coiled and left attached to the ceiling structure.
2. Cables of different uses (color coded) shall be grouped together in separate patch panels.
3. Pathways by others – it is expected to reuse existing conduit as practical, new conduit provided by renovation and raceway provided by renovation.

C. Pulling Cable: Comply with BICSI TDMM, "Pulling Cable." Monitor cable pull tensions.
1. UTP Cable Installation:
    a. Comply with TIA-568 and manufacturer's instructions.
    b. Do not remove more than the minimum of cable jacket required for termination. To maintain cable geometry do not untwist UTP cables more than 1/2 inch from the point of termination.
    c. Optical Fiber Cable Installation:
    d. Comply with TIA-568 and manufacturer's instructions.
    e. Cable shall be terminated on connecting hardware that is rack mounted.
2. Open-Cable Installation:
    a. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
    b. Suspend UTP cable not in a wire way or pathway a minimum of 8 inches above ceilings by approved cable supports not more than 60 inches apart.
    c. Approved supports include Category 6 rated J – hooks, saddles etc.
    d. All cable shall be independently suspended from building structure using rated support components. The use of tie wraps and bridle rings is prohibited
    e. Cable shall not be supported directly by structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Separation from EMI Sources (Copper UTP and SDI Cabling):

1. Comply with BICSI TDMM and TIA-569 for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between open telecommunications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

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

e. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.

f. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.

g. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

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

i. Electrical Equipment Rating Less Than 2 kVA: No requirement.

j. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.

k. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

l. Separation between Telecommunications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

m. Separation between Telecommunications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5. FIRESTOPPING

A. Comply with TIA-569, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

C. Firestop all new or existing penetrations for fire, smoke and acoustics

1. Penetrations used by new cabling

2. Unused penetrations from demolition of existing cabling

3.6. IT ROOM RENOVATIONS

A. Remove and dispose of all unused cable, equipment, racks, blocks, etc. and clean up space for reuse. The following list is representative and not all encompassing: Wall mounted open rack(s), Wall mounted termination blocks and patch panels, Camera panels and equipment, Wall mounted Paging Interface/amplifier.

B. Do not disturb service provider cable and equipment (I.e. – ATT Fiber), Building Security (Intrusion Detection), 7’ Aluminum Relay Rack and attached cable tray, etc. This list is representative and not all encompassing.

C. The Contractor shall coordinate any equipment desired by the Owner to be kept for spares/reuse at other facilities prior to disposal.

3.7. BONDING AND GROUNDING

A. It is the Contractors responsibility during renovation of the IT room to provide a fully function and code/standard compliant bonding and grounding system – see section on bonding and grounding.

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

C. Comply with TIA-607-A.

D. Comply with Bonding and Grounding section contained herein.

E. Bond metallic equipment and cable shield to the grounding bus bar, using not smaller than No. 6 AWG stranded copper equipment grounding conductor.

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

G. Bond the shield of shielded cable to the grounding bus bar in telecommunications rooms and spaces.

3.8. IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606.

B. Paint and label colors for equipment identification shall comply with TIA-606 for Class 3 level of administration or as modified by owner.

C. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

D. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

E. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.

F. Label each unit and field within distribution racks and frames.

G. Label all components of the grounding system per TIA – 606 and TIA-607.

H. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

I. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

2. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware.

3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

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

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

J. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, pathways and cables, termination hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA-606. Furnish electronic record of all drawings, in software and format selected by Owner.

3.9. OUTLET, TERMINATION AND CABLE LABELS

A. Work Area Outlets shall be labeled per their origination – “IT room number-Rack or cabinet number-Panel number in the rack or cabinet-Port number of the panel”.

1. E.g.: “MDF-01-02-36” = MDF, first rack, second patch panel from top, 36th port”.

2. All outlets in the same room or space shall originate from the same IT room.
3. Buildings with only one IT room may omit the room number from the label.
4. Labels shall be visible and readable from 36”
5. All cables shall have a unique identifier – there shall be no duplicate numbers

B. Racks or cabinets shall be labeled at the top of the assembly – Font type shall be “Arial” or “Times New Roman” with minimally a 48-point (.5”) font size.

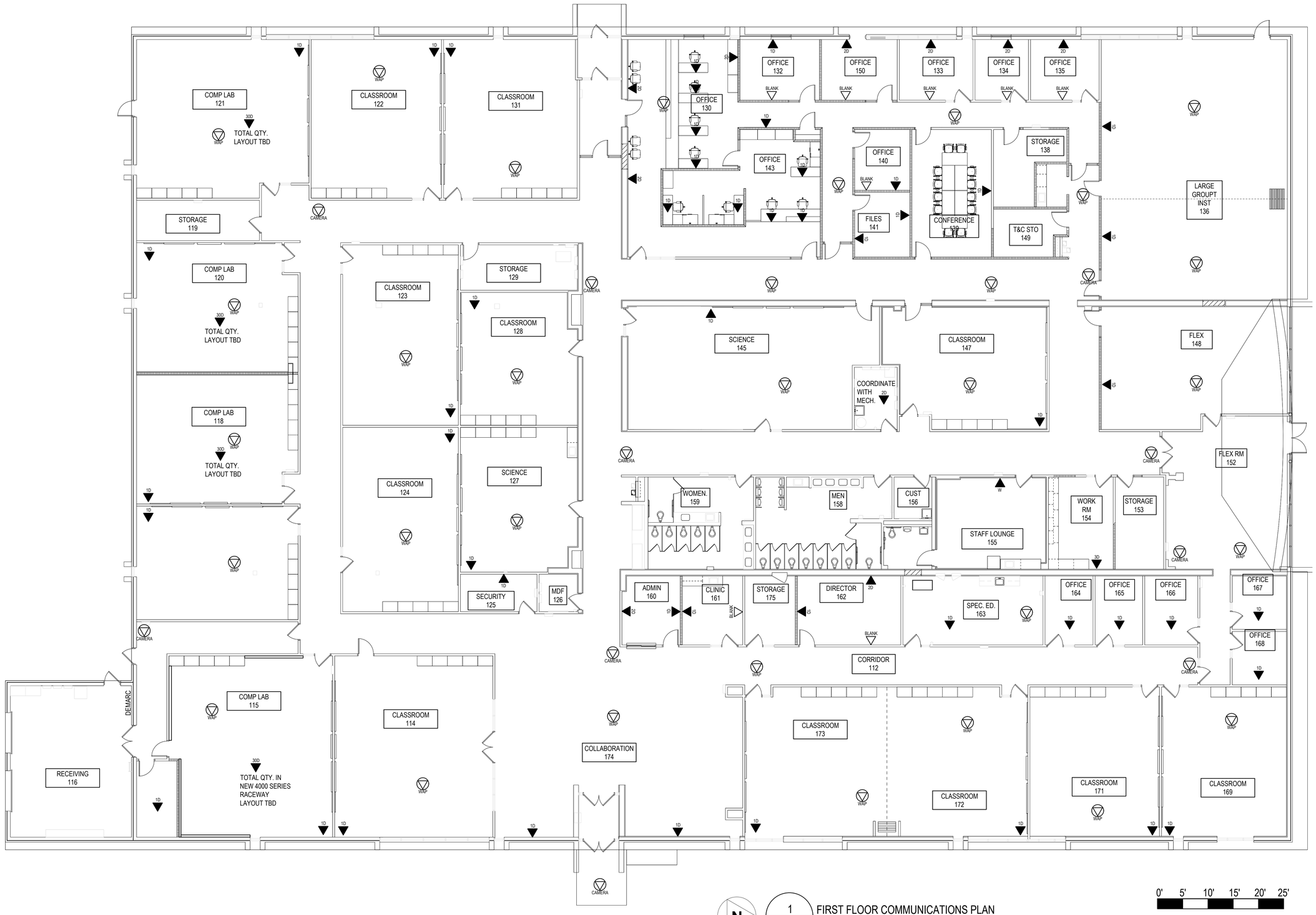
C. Patch panels shall be labeled at the top left corner with the panel numbered from the top of the rack or enclosure (E.g. 01 the first panel from top, 03 third panel from top, etc.). Font type shall be “Arial” or “Times New Roman” with minimally a 24-point (.25”) font size.
1. Panels shall have manufacturer prelabeled port numbers – port number shall not be relabeled.

D. Cable shall be labeled with the same information as “Work Area Outlets” above with wraparound self-laminating adhesive labels at both ends of cable.

3.10. FIELD QUALITY CONTROL

A. Perform tests and inspections
1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in telecommunications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test instruments shall meet or exceed applicable requirements in TIA-568 for Category 6 Permanent Link. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for permanent link test configuration.
4. Horizontal UTP shall be tested using the Permanent Link Method.

END OF SECTION



N

1 / TT101 FIRST FLOOR COMMUNICATIONS PLAN
NTS

0' 5' 10' 15' 20' 25'

GENERAL NOTES

1. PLAN SHOWS QUANTITY OF CAT6 CABLE ONLY, FINAL LOCATION WITHIN SPACE/ROOM TBD - LOCATIONS OF SOME OUTLETS AND OPEN BOXES ARE SHOWN
2. REUSE EXISTING CONDUIT AND RACEWAY
3. GC WILL BE PROVIDING NEW BOXES AND CONDUIT IN NEW WALLS AND AT TEACHER LOCATIONS
4. ALL UNUSED BOXES TO BE BLANKED OFF
5. FINAL TYPE OF TERMINATION PLATE (WALL-PHONE, IN RACEWAY, WALL PLATE, ETC.) TBD
6. ALL CABLE TO BE HOME-RUN FROM MDF
7. WAP AND CAMERA LOCATIONS - (1) ONE CAT6 UTP CABLE TERMINATED WITH 8P8C JACK IN SURFACE MT ENCLOSURE ABOVE CEILING

1/10/2020	REVIEW	EGH
DATE	ISSUE	AUTHOR

TROY SCHOOL DISTRICT

ITT BUILDING TECHNOLOGY RENOVATIONS
1522 E. Big Beaver, Troy MI 48083

CONVERGENT TECHNOLOGY PARTNERS
6197 Miller Road Suite 4
Swartz Creek, MI 48473
Phone: 810.720.3820
www.ctpartners.net
TECHNOLOGY DESIGN I CONSULTING I PLANNING

TT-101

TSD Cabling RFP 9898 Bid tabulation
1/27/20 11AM

	Price	Shipping	Bond	PLM	Addenda	Unit Pricing	Cost Breakdown	Iran affidavit	Familial disclosure	BOM	Alts?
AmComm	$39,000.00		x					x	x		
Newkirk Electric	$56,200.00		x					x	x		
TTI	$49,590.26		x					x	x		
Moss	$39,896.89		x					x	x		
Conference Technologies	$44,809.21		x					x	x		
AMR	$47,563.00		x					x	x		
Trendset Communications	$ 53,163.90		x					x	x		
Complete Interactive Technologies	$ 52,237.00		x					x	x		