



Division of Finance and Business Operations

Wayne State University
DeRoy Apartments Connectivity
WSU Project Number 134-243844
Prevailing Wage Work

FOR:

Board of Governors
Wayne State University
Detroit, Michigan

Owner's Representative:

Thomas J. Edwards, Project Manager
Facilities Planning & Management
Design & Construction Services
5454 Cass
Wayne State University
Detroit, Michigan 48202

Owner's Agent:

Valerie Kreher, Senior Buyer
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3720 / 313-577-3747 fax
rfpteam2@wayne.edu

Consultant:

DiClemente Siegel Design Inc.
28105 Greenfield Road
Southfield, MI 48076

October 24, 2014

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INFORMATION FOR BIDDERS

OWNER: Board of Governors
Wayne State University

PROJECT: DeRoy Apartments Connectivity
Project No. 134-243844

LOCATION: Wayne State University
5200 Anthony Wayne Drive
Detroit, Michigan 48202

OWNER'S AGENT: Valerie Kreher, Senior Buyer
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3720 / 313-577-3747 fax
rfpteam2@wayne.edu

OWNER'S REPRESENTATIVE: Thomas J. Edwards, Project Manager
Facilities Planning & Management
Design & Construction Services
Wayne State University
5454 Cass Avenue
Detroit, Michigan 48202

Architect: DiClemente Siegel Design Inc.
28105 Greenfield Road
Southfield, MI 48076

SPECIAL NOTE: Right to reject any and all proposals, either in whole or in part and to waive any irregularities therein is reserved by the Owner.

BIDS ADVERTISED: October 24, 2014

BIDDING: Bidding documents may be obtained by vendors from the University Purchasing Web Site at http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html beginning **October 24, 2014**. When visiting the Web Site, click on the "**Construction**" link in green. Copies of the RFP will not be available at the pre-proposal meeting.

MANDATORY Pre-Bid Conference: 10:30 am, local time, November 3, 2014 to be held at Wayne State University – Student Center Building, 5221 Gullen Mall (Enter from the North End), Conference Room 470, Detroit, MI, 48202. Late Arrivals may not be permitted to submit bids.

OPTIONAL Second Walk Through: (if needed) To be determined at the conclusion of the pre-bid conference, by those in attendance.

DUE DATE FOR QUESTIONS: Due Date for questions shall be **November 6, 2014 at 12:00 Noon**. All questions must be reduced to writing and emailed to the attention of Valerie Kreher, Senior Buyer at rfpteam2@wayne.edu, copy to Robert Kuhn, Senior Buyer.

Bids Due: Sealed proposals for lump-sum General Contract will be received at the office of the Procurement & Strategic Sourcing located at 5700 Cass Avenue, Suite 4200, Detroit, MI 48202 on **November 14, 2014**, until 2:00 p.m. (local time).

No public bid opening will be held.

Bid Qualification Meeting: Bidders must be available for bid prequalification meeting the day following the bid opening. The lowest qualified bidder will be contacted and requested to meet with Facilities Planning & Management at their office located at 5454 Cass Avenue, Detroit, MI 48202. During the prequalification, the Vendor must provide a

Project Schedule and a Schedule of Values, including a list of Contractor's suppliers, subcontractors and other qualifications.

An unsigned contract will be given to the successful Contractor at the conclusion of the Pre Award meeting, if all aspects of the bid are in order. The Contractor has 5 business days to return the contract to the Project Manager for University counter signature. The contractor must also submit a Performance Bond as outlined above and a Certificate of Insurance in the same 5 business day period. In the event the Contractor fails to return the documents in this 5 day period, the University reserves the right to award the contract to the next most responsive bidder.

All available information pertaining to this project will be posted to the Purchasing web site at

http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html.

Information that is not posted to the website is not available/not known

INSTRUCTIONS TO BIDDERS

OWNER: Board of Governors
Wayne State University

PROJECT: **DeRoy Apartments Connectivity**
Project No. 134-243844

LOCATION: Wayne State University
5200 Anthony Wayne Drive,
Detroit, Michigan 48202

OWNER'S AGENT: **Valerie Kreher, Senior Buyer**
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3720 / 313-577-3747 fax
rfpteam2@wayne.edu

1. PROPOSALS

- A. The Purchasing Agent will receive sealed Proposals for the work as herein set forth at the place and until the time as stated in the "Information for Bidders", a copy of which is bound herewith in these specifications. **No public bid opening will be held.**
- B. Proposals shall be for a **lump-sum General Contract for the entire work of the Project as provided in the Form of Proposal.**
- C. Proposals shall be submitted in duplicate on forms furnished with the Bidding documents. The forms must be fully filled out in ink or typewritten with the signature in longhand, and the completed forms shall be without alterations, interlineations, or erasures. Forms shall contain no recapitulations of the work to be done. Each proposal shall be delivered in an opaque sealed envelope, marked "**PROPOSAL**" AND SHALL BEAR THE NAME OF THE PROJECT AND THE NAME OF THE BIDDER. Proposals submitted by telephone or telegraph will not be accepted. Modifications by telephone or telegraph to previously submitted proposals will not be accepted.
- D. (*revised 5-29-2009*) All base bids must be conforming to the detailed specifications and drawings provided by the University, including any Addenda issued. Voluntary Alternates will only be considered if the Contractor has also submitted a conforming base bid. Any stipulation of voluntary alternates or qualifications contrary to the Contract requirements made by the Bidder in or accompanying his proposal as a condition for the acceptance of the Contract will not be considered in the award of the Contract and will cause the rejection of the entire Proposal.
- E. **The competency and responsibility of Bidders will be considered in making the award. The Owner does not obligate himself to accept the lowest or any other bids. The Owner reserves the right to reject any and all bids and to waive any informalities in the Proposals.**

2. PROPOSAL GUARANTEE (revised 3-22-2012)

- A. A certified check or bank draft payable to the Owner, or satisfactory Bid Bond executed by the Bidder and Surety Company, in an amount equal to not less than five percent (5%) of the maximum proposal amount shall be submitted with each Proposal, which amount may be forfeited to the Board of Governors, Wayne State University, if the successful Bidder refuses to enter into a Contract within ninety (90) days from receipt of Proposals.
- B. Bond must be issued by a Surety Company with an "A rating as denoted in the AM Best Key Rating Guide"

- C. The bid deposit of all bidders except the lowest three will be returned within three (3) days after the bids are opened. After the formal Contract and bonds are approved, the bid deposit will be returned to the lowest three bidders, except when forfeited.
- D. Bid bonds shall be accompanied by a Power of Attorney authorizing the signer of the bond to do so on behalf of the Surety Company.
- E. Withdrawal of Proposals is prohibited for a period of ninety (90) days after the actual date of opening thereof.

3. CONTRACT SECURITY (revised 3-22-2012)

- A. The successful Bidder will be required to furnish a Performance Bond and Labor and Material Payment bond in an amount equal to 100% of the contract award amount, and include such cost in the Proposal, complying with the laws of the State of Michigan. The graduated formula no longer applies.
- B. Performance Bond and Labor and Material Payment Bond shall be from a surety company acceptable to the Owner and made payable as follows:
 - (1) A bond for 100% of the contract award amount to the Board of Governors of Wayne State University, and guaranteeing the payment of all subcontractors and all indebtedness incurred for labor, materials, or any cause whatsoever on account of the Contractor in accordance with the laws of the State of Michigan relating to such bonds.
 - (2) A bond for 100% of the contract award amount to the Board of Governors of Wayne State University to guarantee and insure the completion of work according to the Contract.
- C. The only acceptable Performance Bond shall be the AIA A312 – 2010.
- D. Bond must be issued by a Surety Company with an “A rating as denoted in the AM Best Key Rating Guide”.

4. BOND CLARIFICATION

For bids below \$50,000.00,

- A. Bid bond will not be required.
- B. Performance Bond will not be required.

5. INSPECTION

- A. Before submitting his Proposal, each Bidder shall be held to have visited the site of the proposed work and to have familiarized himself as to all existing conditions affecting the execution of the work in accordance with the Contract Documents. No allowance or extra consideration on behalf of the Contractor will subsequently be made by reason of his failure to observe the Conditions or on behalf of any subcontractor for the same reason.

6. EXPLANATION TO BIDDERS AND ADDENDA

- A. Neither the Owner nor Representative nor Purchasing Agent will give verbal answers to any inquiries regarding the meaning of drawings and specifications, and any verbal statement regarding same by any person, previous to the award, shall be unauthoritative.
- B. Any explanation desired by Bidders must be requested of the Purchasing Agent in writing, and if explanation is necessary, a reply will be made in the form of an Addendum, a copy of which will be forwarded to each Bidder registered on the Bidders' List maintained by Procurement & Strategic Sourcing.
- C. All addenda issued to Bidders prior to date of receipt of Proposals shall become a part of these Specifications, and all proposals are to include the work therein described.

7. INTERPRETATION OF CONTRACT DOCUMENTS

- A. If any person contemplating submitting a bid for the proposed Contract is in doubt as to the true meaning of any part of the drawings, specifications, or other Contract Documents, he may submit to the Purchasing Agent, a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the Contract Documents will be made by an addendum duly issued. A copy of such addendum will be mailed and delivered to each registered Bidder. Each proposal submitted shall list all addenda, by numbers, which have been received prior to the time scheduled for receipt of proposal.

8. SUBSTITUTION OF MATERIALS AND EQUIPMENT*

- A. Whenever a material, article or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided that the material, article, or piece of equipment so proposed is, in the opinion of the Architect, of equal substance, appearance and function. It shall not be purchased or installed by the Contractor without the Architect's written approval.

9. TAXES

- A. The Bidder shall include in his lump sum proposal and make payment of all Federal, State, County and Municipal taxes, including Michigan State Sales and Use Taxes, now in force or which may be enacted during the progress and completion of the work covered.

10. REQUIREMENTS FOR SIGNING PROPOSALS AND CONTRACTS

- A. The following requirements must be observed in the signing of proposals that are submitted:
- (1) Proposals that are not signed by individuals making them shall have attached thereto a Power of Attorney, evidencing the authority to sign the Proposal in the name of the person for whom it is signed.
 - (2) Proposals that are signed for partnership shall be signed by all of the partners or by an Attorney-in-Fact. If signed by an Attorney-in-Fact, there must be attached to the Proposal a Power of Attorney evidencing authority to sign the Proposal, executed by the partners.
 - (3) Proposals that are signed for a corporation shall have the correct corporate name thereof and the signature of the President or other authorized officer of the corporation, manually written in the line of the Form of Proposal following the words "signed by". If such a proposal is signed by an official other than the President of the Corporation, a certified copy of resolution of the Board of Directors, evidencing the authority of such official to sign the bid, shall be attached to it. Such proposal shall also bear the attesting signature of the Secretary of the Corporation and the impression of the corporate seal.

11. QUALIFICATIONS OF BIDDERS

- A. The Owner may request each of the three (3) low bidders to submit information necessary to satisfy the Owner that the Bidder is adequately prepared to fulfill the Contract. Such information may include past performance records, list of available personnel, plant and equipment, description of work that will be done simultaneously with the Owner's Project, financial statement, or any other pertinent information. This information and such other information as may be requested will be used in determining whether a Bidder is qualified to perform the work required and is responsible and reliable.

12. SPECIAL REQUIREMENTS

- A. The attention of all Bidders is called to the General Conditions, Supplementary General Conditions,

and Special Conditions, of which all are a part of the Specifications covering all work, including Subcontracts, materials, etc. Special attention is called to those portions dealing with Labor Standards, including wages, fringe benefits, Equal Employment Opportunities, and Liquidated Damages.

- B. Prior to award of the project, the apparent low bidder will be required to produce a schedule of values which will include the proposed subcontractors for each division of work and whether the subcontractor is signatory or non-signatory. A contract will not be issued to the apparent low bidder until this document is provided. A contractor will have one week to produce this document. If the required document is not received within this time, the bidder will be disqualified.

13. NOTICE OF AWARD/ACCEPTANCE OF BID PROPOSAL (revised 12-15-2009)

- A. The Proposal shall be deemed as having been accepted when a copy of the Contract (fully executed by both the vendor and the appropriate signatory authority for the University), with any/all Alternates, Addenda, and Pre-Contract Bulletins, as issued by the office or agent of the Owner has been duly received by the Contractor. After signing the Contracts, the Contractor shall then return all copies, plus any required bonds and certificates of insurance, to the office of the Owner's Representative, at 5454 Cass, Wayne State University, Detroit, MI 48202. Construction will begin when the fully-executed contract has been returned to the Contractor.

14. TIME OF STARTING AND COMPLETION

- A. It is understood that the work is to be carried through to substantial completion with the utmost speed consistent with good workmanship and to meet the established start and completion dates.
- B. The Contractor shall begin work under the Contract without delay, upon receipt of a fully-executed contract from the Owner, and shall substantially complete the project ready for unobstructed occupancy and use of the Owner for the purposes intended within the completion time stated in the Contract.
- C. The Contractor shall, immediately upon receipt of fully-executed contract, schedule his work and expedite deliveries of materials and performance of the subcontractors to maintain the necessary pace for start and completion on the aforementioned dates.

15. BIDDING DOCUMENTS

- A. Bid specifications are not available at the University, but are available beginning **October 24, 2014** through Wayne State University Procurement & Strategic Sourcing's Website for Advertised Bids: http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html. The plans for this project can be viewed in advance and/or printed from the above website. Copies of the RFP will not be available at the pre-proposal meeting.

B. DOCUMENTS ON FILE (revised 12-2007)

- (1) *Wayne State University Procurement & Strategic Sourcing's Website.*
All available information pertaining to this project will be posted to the Purchasing web site at http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html. Information that is not posted to the website is not available/not known.
- (2) Notification of this Bid Opportunity has been sent to *DUNN BLUE (for purchase of Bid Documents only), DODGE REPORTS, REED CONSTRUCTION, CONSTRUCTION NEWS and the CONSTRUCTION ASSOCIATION OF MICHIGAN (CAM).*
- (3) Please note: Effective December 1, 2007, bid notices will be sent only to those Vendors registered to receive them via our Bid Opportunities list serve. To register, to http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html, and click on the "Join our Listserve" link at the top of the page.

NOTICE OF MANDATORY PRE-BID CONFERENCE

PROJECT: **DeRoy Apartments Connectivity,**

PROJECT NOS.: **No. 134-243844**

It is **MANDATORY** that each Contractor proposing to bid on this work must attend a pre-bid conference at the following location:

Wayne State University
Student Center Building, 5221 Gullen Mall (Enter from the North End), Conference Room 470
Detroit MI 48202

10:30 am, local time, November 3, 2014

The purpose of this conference is to clarify the procedures, scope of work, and to identify any omissions and/or inconsistencies that may impede preparation and submission of representative competitive bids.

An attendance list shall be prepared and minutes of the conference shall be furnished to all those attending.

Any clarifications or corrections that cannot be made at the conference will be by Addendum.

For your convenience a map of the University and appropriate parking lots can be downloaded and printed from: **<http://campusmap.wayne.edu/>**. Guest parking in any of the University student and guest lots is **\$7.00**. A detailed list of Cash & Coin operated lots can be viewed at **http://purchasing.wayne.edu/cash_and_credit_card_lots.php**. Cash lots dispense change in quarters. Due to time constraints, Vendors are encouraged to avoid parking at meters on the street (especially blue "handicapped" meters).

All available information pertaining to this project will be posted to the Purchasing web site at **http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html**. Information that is not posted to the website is not available/not known.

AGENDA

- I. Welcome and Introductions
 - A. Wayne State University Representatives
 - B. Vendor Representatives
 - C. Sign in Sheet- be sure to include your fax number and email address (LEGIBLY) on the sign in sheet.

- II. Brief Overview of Wayne State University
 - A. Purpose and Intent of RFP.
 - B. Detailed review of the RFP and the requirements for a qualified response.
 - C. Review of all pertinent dates and forms that are REQUIRED for a qualified response.

- III. Vendor Questions/Concerns/Issues
 - A. Questions that can be answered directly by the appropriate person in this meeting will be answered and both question and answer will be recorded in the minutes of the meeting.
 - B. Questions that need to be researched will be answered and a nature of clarification will be emailed to the appropriate ListServ. See http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_Bid_Listserve.html for a list of ListServ Bid Lists.
 - C. Minutes will be emailed to all participants of the meeting within a reasonable amount of time. (be sure to include your email address/addresses on the sign in sheet)
 - D. Questions and concerns that come up after this meeting are to be addressed to **Valerie Kreher**, Procurement & Strategic Sourcing. Discussion with other University members is seriously discouraged and could lead to disqualification from further consideration. All questions and answers will be recorded and emailed to all participants of the RFP.
 - E. Due date for questions is **November 6, 2014, 12:00 noon.**

- IV. Proposal Due Date- **November 14, 2014, 2:00 p.m.**

- V. Final Comments

- VI. Adjourn

VENDOR NAME _____

GENERAL CONTRACT - PROPOSAL FORM (revised 1 - 2011)

Please Note – Vendors must Pre-qualify themselves when responding to this bid opportunity. Our Prequalification questions can be found on page 4 of this section.

OWNER: Board of Governors
Wayne State University

PROJECT: DeRoy Apartments Connectivity

PROJECT NO.: WSU PROJECT No. 134-243844

PROJECT TYPE: Electrical, General Work

PURCHASING AGENT: Valerie Kreher, Senior Buyer
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3720/ 313-577-3747 fax
rfpteam2@wayne.edu

OWNER'S REPRESENTATIVE: Thomas J. Edwards, Project Manager
Design & Construction Services
Facilities Planning & Management
Wayne State University
5454 Cass Avenue
Detroit, Michigan 48202

TO: Board of Governors
Wayne State University
Detroit, Michigan

BASE PROPOSAL:

The undersigned agrees to enter into an Agreement to complete the entire work of the DeRoy Apartments Connectivity (Project No. 134-243844) in accordance with the Bidding Documents for the following amounts:

_____ \$ _____ Dollars

ALTERNATES: The following alternates to the base proposal(s) are required to be offered by the respective bidder. The undersigned agrees that the following amounts will be added to or deducted from the base bid as indicated, for each alternate which is accepted.

ALTERNATE NO. 1:

The undersigned agrees to enter into an agreement to complete the Alternate # 1 work of eliminating all the CAT6E UTP cable for voice and data from the eighth floor MDF(s) to all locations on floors two through seven and to provide all labor and material associated with the work in accordance with the Bidding Documents for the following amounts:

(select one) ADD _____ \$ _____ Dollars
 or
 DEDUCT _____ \$ _____ Dollars

LAWN REPLACEMENT:

The undersigned agrees that, in the event of existing lawn or landscaping damage, due to the Contractor's work, that has not been properly addressed and repaired to the satisfaction of the University, the University may repair/replace the lawn and/or landscaping, and that the expense will be at a **unit cost of \$10.00 per square yard for lawn, and landscaping at a rate of 1.5 times the cost of said repairs**, the full cost of which shall be reimbursed by the contractor.

CONTRACT CHANGE ORDERS: (revised 4-01-2011)

The undersigned agrees to the following pricing formula and rates for changes in the contract work:

1. For subcontract work, Contractor's markup for handling, overhead, profit and bonding on subcontractors sell price, shall not exceed **5%**.
 - 1.1. **For subcontract work that is provided on a time and material basis, the subcontractor shall be permitted a single markup for handling, overhead, profit and bonding of 5%. When a markup is identified in the subcontractor's hourly labor rate, additional markup on labor is not permitted.**
 - 1.1.1 **For changes that are based upon a lump sum value, subcontractor shall provide all labor and material back-ups to ensure that duplicative charges are avoided and authorized mark-ups for OH&P can be confirmed**
2. For work by his own organization, Contractor's markup for job* and general overhead, profit and bonding shall not exceed **5%** of the net labor** and material costs.

Within 14 days of the project's contract execution Contractor shall provide to the Owner; Subcontractor's hourly labor rate breakdown details. This requirement shall extend to the lowest level of subcontractor participation.

* Job and general overhead includes supervision and executive expenses; use charges on small tools, scaffolding, blocking, shores, appliances, etc., and other miscellaneous job expenses.

** Net labor cost is the sum of the base wages, fringe benefits established by governing trade organizations, applicable payroll taxes, and increased expense for contractor's liability insurance (Workman's Compensation, P.L. and P.D.).

TIME OF COMPLETION:

(revised 4-01-2011)

The Contract is expected to be fully executed on or about 25 calendar days after successful bidder qualification and recommendation of award. The undersigned agrees to start construction **immediately after** receipt of a fully executed contract, and to complete the work as follows:

Substantial Completion will be completed no later than **March 20, 2015**.

LIQUIDATED DAMAGES:

It is understood and agreed that, if project is not completed within the time specified in the contract plus any extension of time allowed pursuant thereto, the actual damages sustained by the Owner because of any such delay, will be uncertain and difficult to ascertain, and it is agreed that the reasonable foreseeable value of the use of said project by Owner would be the sum of **\$250.00, Two Hundred Fifty Dollars per day**, and

therefore the contractor shall pay as liquidated damages to the Owner the sum of **\$250.00, Two Hundred Fifty Dollars per day** for each day's delay in substantially completing said project beyond the time specified in the Contract and any extensions of time allowed thereunder.

TAXES:

The undersigned acknowledges that prices stated above include all applicable taxes of whatever character or description. Michigan State Sales Tax is applicable to the work. Bidder understands that the Owner reserves the right to reject any or all bids and to waive informalities or irregularities therein.

ADDENDA:

The undersigned affirms that the cost of all work covered by the following Addenda are included in the lump sum price of this proposal.

Addendum No.____Date_____ Addendum No.____Date_____

Addendum No.____Date_____ Addendum No.____Date_____

Addendum No.____Date_____ Addendum No.____Date_____

Addendum No.____Date_____ Addendum No.____Date_____

Addendum No.____Date_____ Addendum No.____Date_____

CONTRACTOR'S PREQUALIFICATION STATEMENT & QUESTIONNAIRE:

Our Minimum Requirements for Construction Bids are:

WSU considers this project: **Electrical, General Work.**

Criteria	Small Project bid less than \$50,000	Medium Project bid between \$50,001 and \$250,000	Large Project bid between \$250,001 and \$2 million	Very Large Project bid greater than \$2 million
EMR Rating (Experience Modification Rating)	1.0 or Less	1.0 or Less	1.0 or Less	1.0 or Less
Bondable Vendor	N.A.	Required	Required	Required
Length of Time in Construction Business	2 Years	3 Years	5 Years	5 Years
Demonstrated Experience in Projects Similar in Scope and Price in the last 3 years	1 or more	1 or more	2 or more	3 or more
Unsuccessful Projects on Campus in last 3 years	None Allowed	None Allowed	None Allowed	None Allowed
Failure to comply with Prevailing Wage and/or Project Labor requirements	None Allowed	None Allowed	None Allowed	None Allowed
Withdrawn University Bid (with or without Bond forfeiture) within the last 3 years **	1 or less	1 or less	1 or less	1 or less
Company currently not in Chapter 11 of the US Bankruptcy Code	1 Year	2 Years	3 Years	3 Years

** Withdrawal of a bid is subject to the University suspension policy, for a period up to one year.

Contractors must complete the following information to determine their eligibility to participate in this bid. This information is required with your Bid to the University

Failure to complete this form in its entirety will result in your bid being disqualified.

Check one of the following on the makeup of your company:

_____ Corporation

_____ Individual

_____ Partnership

_____ Joint Venture

_____ Other (Explain)

1. How many years has your organization been in business as a contractor? _____

2. How many years has your organization been in business under its present business name? _____

3. List states in which your organization is legally qualified to do business. _____

4. Provide the Name and Address of your Liability Insurance Carrier. _____

5. What is your current EMR Rating? _____

The minimum requirement is an EMR Rating of 1.0 or less for all projects. Bidders with a rating higher than 1.0 understand that their bid may be disqualified, at the sole discretion of the University.

6. What percentage of work performed on projects are by company employees; excluding any hired subcontracting and outsourced relationships, for the bid submitted? _____ %

7. What percentage of work performed on your companies behalf are by subcontracted business relationships; disallowing 1099 contracting work forces, for the bid submitted? _____ %

8. Have you ever failed to complete any work awarded to you? If so, attach a separate sheet of explanation. Include the name of the Project, the customer, the dates of the work, and the amount of the contract?

9. Have you withdrawn a bid after a University bid opening and/or refused to enter into a contract with the University upon notification of award within the last 3 years? If so, state the Project Name and Number, and the date of bid submission below.

10. Has any officer or partner of your organization ever been an officer or partner of another organization that failed to complete a construction contract? If so, attach a separate sheet of explanation.

11. List the construction experience of the principals and superintendents of your company.

Name: _____ Title: _____

Name: _____ Title: _____

Name: _____ Title: _____

12. List the construction Projects, and approximate dates, when you performed work similar in Scope to this project.

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

13. List the construction Projects, and approximate dates, when you performed work similar in Dollar Amount to this project.

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

14. Is your Company "bondable"? Yes _____ No _____

15. What is your present bonding capacity? \$ _____

16. Who is your bonding agent?

NAME: _____

ADDRESS: _____

PHONE: (_____) _____

CONTACT: _____

17. Does your company agree to provide financial reports to the University upon request? Failure to agree may result in disqualification of your bid. Yes _____ No _____

18. Does your company agree that all of the Terms and Conditions of this RFP and Vendor's Response Proposal become part of any ensuing agreement? Yes _____ No _____

19. Does your company agree to execute a contract containing the clauses shown in Section 00500 "Agreement Between Contractor and Owner for Construction"? Yes _____ No _____

If "No", clearly note any exceptions to any information contained in the contract documents and include with your proposal.

20. Did your company quote based upon **Prevailing Wage Rates**? Yes _____ No _____

Note: Contractors submitting proposals for this project may, at the discretion of the University, be required to submit references including contact information to be used to assist in the post bid evaluation process for the subject project

ACKNOWLEDGEMENT OF MINIMUM QUALIFICATIONS:

The undersigned has read and understands the minimum qualifications for University construction projects, and has completed the Prequalification section completely and accurately. The undersigned understands that a contractor, who fails to meet the minimum qualifications **in the category identified for this project, will be disqualified from consideration for the project.**

ACCEPTANCE OF PROPOSAL:

The undersigned agrees to execute a Contract, being the Wayne State University standard form titled "Agreement Between Contractor and Owner for Construction" (see section 00500 of the bid documents), provided that we are notified of the acceptance of our Proposal within sixty (60) days of the date set for the opening thereof.

The undersigned below understands that the bid will be disqualified if the Prequalification information above is not completed in its entirety.

NAME OF COMPANY: _____

OFFICE ADDRESS: _____

PHONE NUMBER: _____ DATE _____

FAX NUMBER: _____

SIGNED BY: _____

Signature

(Please print or type name here)

TITLE _____

EMAIL ADDRESS: _____ @ _____

PREVAILING WAGE RATE SCHEDULE (revised 4-05-2010)

- A. See also Page 00100-4 Section 12.B
- B. Wayne State University requires all project contractors, including subcontractors, who provide labor on University projects to compensate at a rate no less than prevailing wage rates.
- C. The rates of wages and fringe benefits to be paid to each class of laborers and mechanics by each VENDOR and subcontractor(s) (if any) shall be not less than the wage and fringe benefit rates prevailing in Wayne County, Michigan, as determined by the United States Secretary of Labor. Individually contracted labor commonly referred to as "1099 Workers" and subcontractors using 1099 workers are not acceptable for work related to this project.
- D. To maintain compliance with State of Michigan Ordinances, Certified Payroll must be provided for each of the contractor's or subcontractor's payroll periods for work performed on this project. Certified Payroll should accompany all Pay Applications. Failure to provide certified payroll will constitute breach of contract, and pay applications will be returned unpaid, and remain so until satisfactory supporting documents are provided.

A Prevailing Wage Rate Schedule has been issued from the State of Michigan that is enclosed in this section

Additional information can be found on the University Procurement & Strategic Sourcing's web site at the following URL address:

<http://purchasing.wayne.edu/vendors/wage-rates.php>

If you have any questions, or require rates for additional classifications, please contact:

Michigan Department of Consumer & Industry Services,
Bureau of Safety and Regulation, Wage and Hour Division,
7150 Harris Drive,
P.O. Box 30476,
Lansing, Michigan 48909-7976

http://www.michigan.gov/dleg/0,1607,7-154-27673_27706---,00.html

F. Wayne State University's Prevailing Wage Requirements:

When compensation will be paid under prevailing wage requirements, the University shall require the following:

- A. The contractor shall obtain and keep posted on the work site, in a conspicuous place, a copy of all current prevailing wage and fringe benefit rates.
- B. The contractor shall obtain and keep an accurate record showing the name and occupation of and the actual wages and benefits paid to each laborer and mechanic employed in connection with this contract.
- C. The contractor shall submit a completed certified payroll document [U.S. Department of Labor Form WH 347] verifying and confirming the prevailing wage and benefits rates for all employees and subcontractors for each payroll period for work performed on this project. The contractor shall include copies of pay stubs for all employee or contract labor payments related to Wayne State University work. The certified payroll form can be downloaded from the Department of Labor website at <http://www.dol.gov/whd/forms/wh347.pdf>.
- D. A properly executed sworn statement is required from all tiers of contractors, sub-contractors and suppliers which provide services or product of \$1,000.00 or greater. Sworn statements must accompany applications for payment. All listed parties on a sworn statement and as a subcontractor must submit Partial or Full Conditional Waivers for the amounts invoiced on the payment application. A copy of the acceptable WSU Sworn Statement and Waiver will be provided to the awarded contractor.

- E. Apprentices for a skilled trade must provide proof of participation in a Certified Apprenticeship Program and the level of hours completed in the program.
- F. Daily project sign-in sheets and field reports for the project must be turned in weekly.

Note: Contractor invoices WILL NOT be processed until all listed certified payroll documents are received.

- G. If the VENDOR or subcontractor fails to pay the prevailing rates of wages and fringe benefits and does not cure such failure within 10 days after notice to do so by the UNIVERSITY, the UNIVERSITY shall have the right, at its option, to do any or all of the following:
 - 1. Withhold all or any portion of payments due the VENDOR as may be considered necessary by the UNIVERSITY to pay laborers and mechanics the difference between the rates of wages and fringe benefits required by this contract and the actual wages and fringe benefits paid;
 - 2. Terminate this contract and proceed to complete the contract by separate agreement with another vendor or otherwise, in which case the VENDOR and its sureties shall be liable to the UNIVERSITY for any excess costs incurred by the UNIVERSITY.
 - 3. Propose to the Director of Purchasing that the Vendor be considered for Debarment in accordance with the University's Debarment Policy, found on our website at <http://purchasing.wayne.edu/docs/appm28.pdf>

Terms identical or substantially similar to this section of this RFP shall be included in any contract or subcontract pertaining to this project.
- H. The current applicable prevailing wage rates as identified by the State of Michigan Department of Consumer & Industry Services, Bureau of Safety and Regulation, Wage and Hour Division are attached. Refer to item C above if additional information is required.
- I. Prior to award of the project, the apparent low bidder will be required to produce a schedule of values which will include the proposed subcontractors for each division of work and whether the subcontractor is signatory or non-signatory. A letter of intent or **contract will not** be issued to the apparent low bidder until this document is provided. The apparent low bidder will have one week to produce this document. If the required document is not received within this time, the bidder will be disqualified, and the next low bidder will be required to provide this schedule of values.

SEE ATTACHED STATE PREVAILING WAGE INFORMATION

State of Michigan

WHPWRequest@michigan.gov

Official Request #: 1492

Requestor: Wayne State University

Project Description: DeRoy Apartments Connectivity - Provide, Install and Relocate Infrastructure

Project Number: 134-243844

Wayne County

Official 2014 Prevailing Wage Rates for State Funded Projects

Issue Date: 10/24/2014

Contract must be awarded by: 1/22/2015

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<u>Classification</u>		Last Updated	Straight Time and a Hourly	Double Time	Overtime Provision
Asbestos & Lead Abatement Laborer					
Asbestos & Lead Abatement Laborer	MLDC	10/1/2014	\$40.25	\$53.64	\$67.03 H H H X X X D Y
4 ten hour days @ straight time allowed Monday-Saturday, must be consecutive calendar days					
Asbestos & Lead Abatement, Hazardous Material Handler					
Asbestos and Lead Abatement, Hazardous Material Handler	AS207	10/1/2014	\$40.25	\$53.58	\$66.90 H H H X X X D Y
4 ten hour days @ straight time allowed Monday-Saturday,					
Boilermaker					
Boilermaker	BO169	8/14/2009	\$54.70	\$81.08	\$107.45 H H H H H H D Y
Apprentice Rates:					
1st 6 months			\$40.31	\$59.49	\$78.67
2nd 6 months			\$41.45	\$61.21	\$80.95
3rd 6 months			\$42.57	\$62.88	\$83.19
4th 6 months			\$43.69	\$64.57	\$85.43
5th 6 months			\$44.81	\$66.24	\$87.67
6th 6 months			\$49.53	\$73.40	\$97.26
7th 6 months			\$49.32	\$73.01	\$96.69
8th 6 months			\$51.58	\$76.40	\$101.21

Official Request #: 1492

Requestor: Wayne State University

Project Description: DeRoy Apartments Connectivity - Provide, Install and Relocate

Project Number: 134-243844

County: Wayne

Official Rate Schedule

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copy

Official 2014 Prevailing Wage Rates for State Funded Projects

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Classification		Last Updated	Straight Time and a Half	Double Time	Overtime Provision
Name	Description		Hourly	Half	Time
Bricklayer					
Bricklayer, stone mason, pointer, cleaner, caulker	BR1	10/15/2014	\$52.43	\$78.65	\$104.86 H H D H D D D Y
Apprentice Rates:					
	First 6 months		\$31.87	\$47.81	\$63.74
	2nd 6 months		\$33.72	\$50.60	\$67.44
	3rd 6 months		\$35.57	\$53.37	\$71.14
	4th 6 months		\$37.42	\$56.14	\$74.84
	5th 6 months		\$39.27	\$58.92	\$78.54
	6th 6 months		\$41.12	\$61.70	\$82.24
	7th 6 months		\$42.97	\$64.46	\$85.94
	8th 6 months		\$44.82	\$67.24	\$89.64
Carpenter					
Diver	CA 687 D	6/25/2014	\$64.65	\$93.14	\$121.63 X X H X X H H D Y
Four 10s allowed M-Sat; double time due when over 12 hours worked per day					
Carpet and Resilient Floor Layer, (does not include installation of prefabricated formica & parquet flooring which is to be paid carpenter rate)	CA1045	6/12/2014	\$49.21	\$70.18	\$91.14 X X H X X X D Y
Apprentice Rates:					
	1st 6 months		\$24.23	\$32.71	\$41.18
	2nd 6 months		\$28.25	\$38.73	\$49.22
	3rd 6 months		\$30.35	\$41.88	\$53.42
	4th 6 months		\$32.44	\$45.02	\$57.60
	5th 6 months		\$34.54	\$48.17	\$61.80
	6th 6 months		\$36.63	\$51.31	\$65.98
	7th 6 months		\$38.74	\$54.48	\$70.20
	8th 6 months		\$40.82	\$57.59	\$74.36
Carpenter	CA687Z1	6/24/2014	\$55.24	\$79.04	\$102.84 X X H X X H H D Y
four 10s allowed Mon-Sat; double time due when over 12 hours worked per day					
Apprentice Rates:					
	1st year		\$33.82	\$46.92	\$60.00
	3rd 6 months		\$36.21	\$50.49	\$64.78
	4th 6 months		\$38.58	\$54.05	\$69.52
	5th 6 months		\$40.97	\$57.64	\$74.30
	6th 6 months		\$43.33	\$61.17	\$79.02
	7th 6 months		\$45.72	\$64.77	\$83.80
	8th 6 months		\$48.09	\$68.32	\$88.54

Official Request #: 1492

Requestor: Wayne State University

Project Description: DeRoy Apartments Connectivity - Provide, Install and Relocate

Official Rate Schedule

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Project Number: 134-243844

County: Wayne

Official 2014 Prevailing Wage Rates for State Funded Projects

Issue Date: 10/24/2014

Contract must be awarded by: 1/22/2015

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Piledriver Four 10s allowed Monday-Saturday; double time due when over 12 hours worked per day	CA687Z1P 6/24/2014	\$55.24	\$79.04	\$102.84 X X H X X H H D Y

Apprentice Rates:

1st 6 months	\$33.82	\$46.92	\$60.00
2nd 6 months	\$38.58	\$54.05	\$69.52
3rd 6 months	\$43.33	\$61.17	\$79.02
4th 6 months	\$48.09	\$68.32	\$88.54

Cement Mason

Cement Mason	br1cm 10/15/2014	\$50.05	\$71.17	\$92.28 X X H H H H H D N
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Apprentice Rates:

1st 6 months	\$29.13	\$39.45	\$49.77
2nd 6 months	\$31.20	\$42.54	\$53.87
3rd 6 months	\$35.31	\$48.67	\$62.01
4th 6 months	\$39.46	\$54.85	\$70.23
5th 6 months	\$41.52	\$57.91	\$74.30
6th 6 months	\$45.67	\$64.10	\$82.52

Cement Mason	CE514 11/10/2011	\$46.30	\$64.89	\$83.48 H H D H H H H D N
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Apprentice Rates:

1st 6 months	\$26.77	\$36.07	\$45.36
2nd 6 months	\$28.68	\$38.91	\$49.13
3rd 6 months	\$32.50	\$44.59	\$56.66
4th 6 months	\$36.32	\$50.26	\$64.19
5th 6 months	\$38.24	\$53.11	\$67.98
6th 6 months	\$42.06	\$58.79	\$75.51

Drywall

Drywall Taper Four 10s allowed Monday-Thursday	PT-22-D 9/5/2014	\$44.41	\$57.66	\$70.91 H H D H D D D D Y
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Apprentice Rates:

First 3 months	\$31.16	\$37.79	\$44.41
Second 3 months	\$33.81	\$41.76	\$49.71
Second 6 months	\$36.46	\$45.73	\$55.01
Third 6 months	\$39.11	\$49.71	\$60.31
4th 6 months	\$40.43	\$51.69	\$62.95

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County: Wayne

Official 2014 Prevailing Wage Rates for State Funded Projects

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<u>Classification</u>		Last Updated	Straight Time and a Half	Double Time	Overtime Provision
Name	Description		Hourly	Half	
Electrician					
Inside Wireman	EC-58-IW	10/2/2014	\$58.91	\$77.39	\$95.87 H H H H H H D N
	Apprentice Rates:				
	0-1000 hours		\$36.73	\$44.12	\$51.51
	1000-2000 hours		\$38.58	\$46.89	\$55.21
	2000-3500 hours		\$40.43	\$49.67	\$58.91
	3500-5000 hours		\$42.27	\$52.44	\$62.59
	5000-6500 hours		\$45.97	\$57.98	\$69.99
	6500-8000 hours		\$49.67	\$63.53	\$77.39
Sound and Communication Installer/Technician					
Sound and Communication Installer/Technician	EC-58-SC	10/2/2014	\$37.48	\$50.29	\$63.09 H H H H H H D N
	Apprentice Rates:				
	Period 1		\$24.67	\$31.07	\$37.47
	Period 2		\$25.95	\$32.99	\$40.03
	Period 3		\$27.24	\$34.93	\$42.61
	Period 4		\$28.51	\$36.83	\$45.15
	Period 5		\$29.79	\$38.75	\$47.71
	Period 6		\$31.07	\$40.67	\$50.27
Elevator Constructor					
Elevator Constructor	EL 36	8/7/2007	\$56.46		\$94.99 D D D D D D D Y
Elevator Constructor					
	Apprentice Rates:				
	1st Year Apprentice		\$37.74		\$58.93
	2nd Year Apprentice		\$41.90		\$66.94
	3rd Year Apprentice		\$43.98		\$70.95
	4th Year Apprentice		\$48.14		\$78.96

Official Request #: 1492

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 County: Wayne

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Issue Date: 10/24/2014

Contract must be awarded by: 1/22/2015

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Glazier Glazier If a four 10 hour day workweek is scheduled, four 10s must be consecutive, M-F.	GL-357 10/2/2014	\$47.35	\$65.97	\$84.58 H H H H H H D Y

Apprentice Rates:

1st 6 months	\$32.45	\$43.62	\$54.78
2nd 6 months	\$33.94	\$45.85	\$57.76
3rd 6 months	\$36.92	\$50.33	\$63.72
4th 6 months	\$38.41	\$52.56	\$66.70
5th 6 months	\$39.90	\$54.79	\$69.68
6th 6 months	\$41.39	\$57.03	\$72.66
7th 6 months	\$42.88	\$59.27	\$75.64
8th 6 months	\$45.86	\$63.73	\$81.60

Heat and Frost Insulator

Spray Insulation	AS25S 3/5/2007	\$20.14	\$29.14	H H H H H H H N
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Heat and Frost Insulator and Asbestos Worker

Heat and Frost Insulators and Asbestos Workers Four 10s must be worked for a minimum of 2 weeks consecutively, Monday thru Thursday. All hours worked in excess of 10 will be paid at double time. All hours worked on the fifth day, Monday thru Friday will paid at time and one-half.	AS25 1/29/2014	\$60.25	\$76.00	\$91.74 H H H H H H D Y
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Apprentice Rates:

1st Year	\$46.08	\$54.74	\$63.40
2nd Year	\$49.23	\$59.46	\$69.70
3rd Year	\$50.80	\$61.82	\$72.84
4th Year	\$53.95	\$66.54	\$79.14

Ironworker

Fence, Sound Barrier & Guardrail erection/installation and Exterior Signage work Four ten hour work days may be worked during Monday-Saturday.	IR-25-F1 8/13/2014	\$34.20	\$46.45	\$58.69 X X H X X X H D Y
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Apprentice Rates:

60% Level	\$23.04	\$30.39	\$37.73
65% Level	\$24.37	\$32.33	\$40.29
70% Level	\$25.70	\$34.27	\$42.84
75% Level	\$27.02	\$36.21	\$45.39
80% Level	\$28.34	\$38.13	\$47.93
85% Level	\$29.67	\$40.08	\$50.49

Official Request #: 1492

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County: Wayne

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Siding, Glazing, Curtain Wall 4 tens may be worked Monday thru Thursday @ straight time.	IR-25-GZ2 9/4/2014	\$46.41	\$58.07	\$69.73 X X H H H H D D Y

Apprentice Rates:

Level 1	\$29.48	\$36.09	\$42.68
Level 2	\$31.59	\$38.83	\$46.05
Level 3	\$33.71	\$41.58	\$49.44
Level 4	\$35.83	\$44.33	\$52.82
Level 5	\$37.94	\$47.07	\$56.20
Level 6	\$40.06	\$49.82	\$59.58

Pre-engineered Metal Work	IR-25-PE-Z1 6/3/2014	\$45.24	\$55.53	\$65.81 X X H X X X X D Y
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Apprentice Rates:

1st Year	\$26.11	\$31.58	\$37.06
3rd 6 month period	\$28.23	\$34.46	\$40.68
4th 6 month period	\$30.36	\$37.35	\$44.33
5th 6 month period	\$32.48	\$40.21	\$47.95
6th 6 month period	\$34.61	\$43.99	\$53.37

Reinforced Iron Work	IR-25-RF 9/3/2014	\$55.36	\$82.91	\$110.45 H H D H D D D D N
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Apprentice Rates:

Level 1	\$36.01	\$53.89	\$71.75
Level 2	\$38.38	\$57.43	\$76.49
Level 3	\$40.74	\$60.98	\$81.21
Level 4	\$43.28	\$64.78	\$86.29
Level 5	\$45.81	\$68.59	\$91.35
Level 6	\$48.35	\$72.39	\$96.43

Rigging Work	IR-25-RIG 9/3/2014	\$61.33	\$91.67	\$122.00 H H H H H H D N
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Apprentice Rates:

Level 1 & 2	\$36.63	\$54.59	\$72.55
Level 3	\$39.46	\$58.84	\$78.21
Level 4	\$42.28	\$63.07	\$83.85
Level 5	\$45.11	\$67.31	\$89.51
Level 6	\$47.94	\$71.56	\$95.17

Official Request #: 1492

Requestor: Wayne State University

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Project Number: 134-243844

County: Wayne

Official 2014 Prevailing Wage Rates for State Funded Projects

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Decking 4 tens may be worked Monday thru Thursday @ straight time. If bad weather, Friday may be a make up day. If holiday celebrated on a Monday, 4 10s may be worked Tuesday thru Friday. Work in excess of 12 hours per day must be paid @ double time.	IR-25-SD 9/4/2014	\$53.29	\$79.63	\$105.96 X X H H H H D D Y
Structural, ornamental, welder and pre-cast 4 tens may be worked Monday thru Thursday @ straight time. If bad weather, Friday may be a make up day. If holiday celebrated on a Monday, 4 10s may be worked Tuesday thru Friday. Work in excess of 12 hours per day must be paid @ double time.	IR-25-STR 9/3/2014	\$61.46	\$91.84	\$122.21 H H H H H H D D Y

Apprentice Rates:

Levels 1 & 2	\$36.05	\$54.01	\$71.97
Level 3	\$38.88	\$58.26	\$77.63
Level 4	\$41.70	\$62.49	\$83.27
Level 5	\$44.53	\$66.73	\$88.93
Level 6	\$47.36	\$70.98	\$94.59
Level 7	\$50.18	\$75.20	\$100.23
Level 8	\$53.01	\$79.46	\$105.89

Industrial Door erection & construction	IR-25-STR-D 9/4/2014	\$42.02	\$62.68	\$83.33 H H H H H H D D Y
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Laborer

Construction Laborer, Demolition Laborer, Mason Tender, Carpenter Tender, Drywall Handler, Concrete Laborer, Cement Finisher Tender, Concrete Chute, and Concrete Bucket Handler	L33401-A-CC 7/15/2013	\$43.54	\$61.94	\$80.33 H H H H H H D D Y
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If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.

Apprentice Rates:

0-1,000 work hours	\$37.60	\$53.03	\$68.45
1,001 - 2,000 work hours	\$38.79	\$54.81	\$70.83
2,001 - 3,000 work hours	\$39.98	\$56.60	\$73.21
3,001 - 4,000 work hours	\$42.35	\$60.15	\$77.95

Official Request #: 1492

Requestor: Wayne State University

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Signal Man (on sewer & caisson work), Air, Electric or Gasoline Tool Operator, Concrete Vibrator Operator, Acetylene Torch & Air Hammer Operator; Scaffold Builder, Caisson Worker	L33401-B-SB 7/16/2013	\$43.80	\$62.33	\$80.85 H H H H H H D Y
<p>If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.</p>				
Furnace Battery Heater Tender, Burning Bar & Oxy-Acetylene Gun	L33401-D-HH 7/16/2013	\$44.04	\$62.69	\$81.33 H H H H H H D Y
<p>If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.</p>				
Expediter Man, Top Man and/or Bottom Man (Blast Furnace Work or Battery Work)	L33401-E-EX 7/16/2013	\$44.79	\$63.81	\$82.83 H H H H H H D Y
<p>If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.</p>				
Cleaner/Sweeper Laborer; Furniture Laborer	L33401-F-CL 7/16/2013	\$38.09	\$53.76	\$69.43 H H H H H H D Y
<p>If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.</p>				
Lansing Burner, Blaster & Powder Man; Air, Electric or Gasoline Tool Operator (Blast Furnace Work or Battery Work)	L334C 7/16/2013	\$44.29	\$63.06	\$81.83 X X H X H H H D Y

Official Request #: 1492

Requestor: Wayne State University

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County: Wayne

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Classification		Last Updated	Straight Time and a Half	Double Time	Overtime Provision
Name	Description		Hourly	Half	Time
Plasterer Tender, Plastering Machine Operator	LPT-1	10/25/2013	\$43.54	\$61.94	\$80.33 X X H H H H H D Y

If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.

Apprentice Rates:

0 - 1,000 hours	\$37.60	\$53.03	\$68.45
1,001 - 2,000 hours	\$38.79	\$54.81	\$70.83
2,001 - 3,000 hours	\$39.98	\$56.60	\$73.21
3,001 - 4,000 hours	\$42.35	\$60.15	\$77.95

Laborer - Hazardous

Class A performing work in conjunction with site preparation and other preliminary work prior to actual removal, handling, or containment of hazardous waste substances not requiring use of personal protective equipment required by state or federal regulations; or a laborer performing work in conjunction with the removal, handling, or containment of hazardous waste substances when use of personal protective equipment level "D" is required.	LHAZ-Z1-A	11/1/2013	\$43.54	\$61.94	\$80.33 H H H H H H H D Y
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Apprentice Rates:

0-1,000 work hours	\$37.60	\$53.03	\$68.45
1,001-2,000 work hours	\$38.79	\$54.81	\$70.83
2,001-3,000 work hours	\$39.98	\$56.60	\$73.21
3,001-4,000 work hours	\$42.35	\$60.15	\$77.95

Class B performing work in conjunction with the removal, handling, or containment of hazardous waste substances when the use of personal protective equipment levels "A", "B" or "C" is required.	LHAZ-Z1-B	11/4/2013	\$44.54	\$63.44	\$82.33 H H H H H H H D Y
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Apprentice Rates:

0-1,000 work hours	\$38.36	\$54.17	\$69.97
1,001-2,000 work hours	\$39.59	\$56.01	\$72.43
2,001-3,000 work hours	\$40.83	\$57.87	\$74.91
3,001-4,000 work hours	\$43.30	\$61.58	\$79.85

Official Request #: 1492

Requestor: Wayne State University

Project Description: DeRoy Apartments Connectivity - Provide, Install and Relocate

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Project Number: 134-243844

County: Wayne

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Laborer Underground - Tunnel, Shaft & Caisson				
Class I - Tunnel, shaft and caisson laborer, dump man, shanty man, hog house tender, testing man (on gas), and watchman.	LAUCT-Z1-1 9/6/2013	\$37.87	\$48.66	\$59.44 X X X X X X D Y
Apprentice Rates:				
0-1,000 work hours		\$33.05	\$41.43	\$49.80
1,001-2,000 work hours		\$34.02	\$42.88	\$51.74
2,001-3,000 work hours		\$34.98	\$44.32	\$53.66
3,001-4,000 work hours		\$36.91	\$47.21	\$57.52
Class II - Manhole, headwall, catch basin builder, bricklayer tender, mortar man, material mixer, fence erector, and guard rail builder.	LAUCT-Z1-2 9/6/2013	\$37.98	\$48.82	\$59.66 X X X X X X D Y
Apprentice Rates:				
0-1,000 work hours		\$33.14	\$41.56	\$49.98
1,001-2,000 work hours		\$34.10	\$43.00	\$51.90
2,001-3,000 work hours		\$35.07	\$44.45	\$53.84
3,001-4,000 work hours		\$37.01	\$47.37	\$57.72
Class III - Air tool operator (jack hammer man, bush hammer man and grinding man), first bottom man, second bottom man, cage tender, car pusher, carrier man, concrete man, concrete form man, concrete repair man, cement invert laborer, cement finisher, concrete shoveler, conveyor man, floor man, gasoline and electric tool operator, gunnite man, grout operator, welder, heading dinky man, inside lock tender, pea gravel operator, pump man, outside lock tender, scaffold man, top signal man, switch man, track man, tugger man, utility man, vibrator man, winch operator, pipe jacking man, wagon drill and air track operator and concrete saw operator (under 40 h.p.).	LAUCT-Z1-3 9/6/2013	\$38.04	\$48.91	\$59.78 X X X X X X D Y
Apprentice Rates:				
0-1,000 work hours		\$33.18	\$41.62	\$50.06
1,001-2,000 work hours		\$34.15	\$43.07	\$52.00
2,001-3,000 work hours		\$35.12	\$44.53	\$53.94
3,001-4,000 work hours		\$37.07	\$47.45	\$57.84

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Class IV - Tunnel, shaft and caisson mucker, bracer man, liner plate man, long haul dinky driver and well point man.	LAUCT-Z1-4 9/6/2013	\$38.22	\$49.18	\$60.14 X X X X X D Y

Apprentice Rates:

0-1,000 work hours	\$33.32	\$41.83	\$50.34
1,001-2,000 work hours	\$34.30	\$43.30	\$52.30
2,001-3,000 work hours	\$35.28	\$44.77	\$54.26
3,001-4,000 work hours	\$37.24	\$47.71	\$58.18

Class V - Tunnel, shaft and caisson miner, drill runner, keyboard operator, power knife operator, reinforced steel or mesh man (e.g. wire mesh, steel mats, dowel bars)	LAUCT-Z1-5 9/6/2013	\$38.47	\$49.56	\$60.64 X X X X X D Y
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Apprentice Rates:

0-1,000 work hours	\$33.50	\$42.10	\$50.70
1,001-2,000 work hours	\$34.50	\$43.60	\$52.70
2,001-3,000 work hours	\$35.49	\$45.09	\$54.68
3,001-4,000 work hours	\$37.48	\$48.07	\$58.66

Class VI - Dynamite man and powder man.	LAUCT-Z1-6 9/6/2013	\$38.80	\$50.05	\$61.30 X X X X X D Y
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Apprentice Rates:

0-1,000 work hours	\$33.75	\$42.47	\$51.20
1,001-2,000 work hours	\$34.76	\$43.99	\$53.22
2,001-3,000 work hours	\$35.77	\$45.51	\$55.24
3,001-4,000 work hours	\$37.79	\$48.53	\$59.28

Class VII - Restoration laborer, seeding, sodding, planting, cutting, mulching and topsoil grading and the restoration of property such as replacing mail boxes, wood chips, planter boxes and flagstones.	LAUCT-Z1-7 9/6/2013	\$32.08	\$39.97	\$47.86 X X X X X D Y
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Apprentice Rates:

0-1,000 work hours	\$28.71	\$34.91	\$41.12
1,001-2,000 work hours	\$29.38	\$35.92	\$42.46
2,001-3,000 work hours	\$30.06	\$36.94	\$43.82
3,001-4,000 work hours	\$31.41	\$38.97	\$46.52

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Classification	Name	Description	Last Updated	Straight Time and a Half Hourly	Double Time	Overtime Provision
Landscape Laborer						
	LLAN-Z1-A	Landscape Specialist includes air, gas, and diesel equipment operator, skidsteer (or equivalent), lawn sprinkler installer on landscaping work where seeding, sodding, planting, cutting, trimming, backfilling, rough grading or maintenance of landscape projects occurs.	6/26/2014	\$28.58	\$39.49	\$50.39 X X H X X X H D Y
		Sundays paid at time & one half. Holidays paid at double time.				
	LLAN-Z1-B	Skilled Landscape Laborer: small power tool operator, lawn sprinkler installers' tender, material mover, truck driver when seeding, sodding, planting, cutting, trimming, backfilling, rough grading or maintaining of landscape projects occurs	6/26/2014	\$24.36	\$33.16	\$41.95 X X H X X X H D Y
		Sundays paid at time & one half. Holidays paid at double time.				
Marble Finisher						
	BR1-MF	Marble Finisher A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.	10/20/2014	\$43.48	\$54.29	\$65.10 H H D H D D D D Y

Apprentice Rates:

Level 1	\$19.04	\$25.12	\$31.20
Level 2	\$20.24	\$26.92	\$33.60
Level 3	\$27.01	\$33.96	\$40.90
Level 4	\$28.47	\$36.14	\$43.82
Level 5	\$29.99	\$37.84	\$45.70
Level 6	\$31.61	\$39.86	\$48.10
Level 7	\$33.30	\$41.59	\$49.87
Level 8	\$34.79	\$43.48	\$52.17

Official Request #: 1492

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Marble Mason				
Marble Mason A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.	BR1-MM 10/17/2014	\$50.29	\$64.51	\$78.72 H H D H D D D D Y
Apprentice Rates:				
Level 1		\$25.14	\$32.65	\$40.15
Level 2		\$28.20	\$36.49	\$44.78
Level 3		\$33.41	\$41.97	\$50.53
Level 4		\$36.15	\$45.66	\$55.17
Level 5		\$38.42	\$48.17	\$57.92
Level 6		\$42.07	\$53.56	\$65.05
Level 7		\$42.74	\$54.38	\$66.02
Level 8		\$43.67	\$55.78	\$67.88
Operating Engineer				
Crane with boom & jib or leads 120' or longer	EN-324-A120 6/12/2014	\$57.11	\$74.62	\$92.13 X X H H D D D D Y
Crane with boom & jib or leads 140' or longer Work in excess of 12 per day M-F shall be paid at double time.	EN-324-A140 6/12/2014	\$57.93	\$75.85	\$93.77 X X H H D D D D Y
Crane with boom & jib or leads 220' or longer Work in excess of 12 per day M-F shall be paid at double time.	EN-324-A220 6/12/2014	\$58.23	\$76.30	\$94.37 X X H H D D D D Y
Crane with boom & jib or leads 300' or longer Work in excess of 12 per day M-F shall be paid at double time.	EN-324-A300 6/12/2014	\$59.73	\$78.55	\$97.37 X X H H D D D D Y
Crane with boom & jib or leads 400' or longer Work in excess of 12 per day M-F shall be paid at double time.	EN-324-A400 6/12/2014	\$61.23	\$80.80	\$100.37 X X H H D D D D Y
Compressor or welding machine Work in excess of 12 per day M-F shall be paid at double time.	EN-324-CW 6/12/2014	\$46.26	\$58.35	\$70.43 X X H H D D D D Y

Official Request #: 1492

Requestor: Wayne State University
 Project Description: DeRoy Apartments Connectivity - Provide, Install and Relocate

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 County: Wayne

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Forklift, lull, extend-a-boom forklift Work in excess of 12 per day M-F shall be paid at double time.	EN-324-FL 6/12/2014	\$53.57	\$69.31	\$85.05 X X H H D D D Y
Fireman or oiler Work in excess of 12 per day M-F shall be paid at double time.	EN-324-FO 6/12/2014	\$45.23	\$56.80	\$68.37 X X H H D D D Y
Regular crane, job mechanic, concrete pump with boom Work in excess of 12 per day M-F shall be paid at double time.	EN-324-RC 6/12/2014	\$56.25	\$73.33	\$90.41 X X H H D D D Y
Regular engineer, hydro-excavator, remote controlled concrete breaker Work in excess of 12 per day M-F shall be paid at double time.	EN-324-RE 6/12/2014	\$55.28	\$71.88	\$88.47 X X H H D D D Y

Apprentice Rates:

0-999 hours	\$44.32	\$55.94	\$67.55
1,000-1,999 hours	\$45.99	\$58.45	\$70.89
2,000-2,999 hours	\$47.64	\$60.92	\$74.19
3,000-3,999 hours	\$49.30	\$63.41	\$77.51
4,000-4,999 hours	\$50.96	\$65.90	\$80.83
5,000-5,999 hours	\$52.62	\$68.39	\$84.15

Operating Engineer - DIVER

Diver/Wet Tender/Tender/Rov Pilot/Rov Tender	GLF D 4/2/2014	\$52.80	\$79.20	\$105.60 H H H H H H D N
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Operating Engineer - Marine Construction

Diver/Wet Tender, Engineer (hydraulic dredge)	GLF-1 2/12/2014	\$65.00	\$84.85	\$104.70 X X H H H H D Y
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Holiday pay= \$124.55 per hour, wages & fringes

Subdivision of county all Great Lakes, islands therein, & connecting & tributary waters

Crane/Backhoe Operator, 70 ton or over Tug Operator, Mechanic/Welder, Assistant Engineer (hydraulic dredge), Leverman (hydraulic dredge), Diver Tender	GLF-2 2/12/2014	\$63.50	\$82.60	\$101.70 X X H H H H D Y
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Holiday pay = \$120.80 per hour, wages & fringes

Official Request #: 1492

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County: Statewide

Official 2014 Prevailing Wage Rates for State Funded Projects

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
<u>Subdivision of county</u> All Great Lakes, islands therein, & connecting & tributary waters				
Friction, Lattice Boom or Crane License Certification	GLF-2B 2/12/2014	\$64.50	\$84.10	\$103.70 X X H H H H H D Y
Holiday pay = \$123.30				

<u>Subdivision of county</u> All Great Lakes, islands, therein, & connecting & tributary waters				
Deck Equipment Operator, Machineryman, Maintenance of Crane (over 50 ton capacity) or Backhoe (115,000 lbs or more), Tug/Launch Operator, Loader, Dozer on Barge, Deck Machinery	GLF-3 2/12/2014	\$59.30	\$76.30	\$93.30 X X H H H H H D Y
Holiday pay = \$110.30 per hour, wages & fringes				

<u>Subdivision of county</u> All Great Lakes, islands therein, & connecting & tributary waters				
Deck Equipment Operator, (Machineryman/Fireman), (4 equipment units or more), Off Road Trucks, Deck Hand, Tug Engineer, & Crane Maintenance 50 ton capacity and under or Backhoe 115,000 lbs or less, Assistant Tug Operator	GLF-4 2/12/2014	\$53.60	\$67.75	\$81.90 X X H H H H H D Y
Holiday pay = \$96.05 per hour, wages & fringes				

<u>Subdivision of county</u> All Great Lakes, islands therein, & connecting & tributary waters				
Operating Engineer Hazardous Waste Class I Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HWCI-Z1A 1/20/2012	\$51.84	\$67.86	\$83.87 H H H H H H H D Y
Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.				

Apprentice Rates:

1st 6 months	\$41.63	\$52.85	\$64.05
2nd 6 months	\$43.23	\$55.25	\$67.25
3rd 6 months	\$44.83	\$57.64	\$70.45
4th 6 months	\$46.43	\$60.04	\$73.65
5th 6 months	\$48.03	\$62.44	\$76.85
6th 6 months	\$49.64	\$64.86	\$80.07

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HWCI-Z1B 1/20/2012	\$50.89	\$66.43	\$81.97 H H H H H H D Y

Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Apprentice Rates:

1st 6 months	\$40.97	\$51.85	\$62.73
2nd 6 months	\$42.52	\$54.17	\$65.83
3rd 6 months	\$44.07	\$56.50	\$68.93
4th 6 months	\$45.64	\$58.86	\$72.07
5th 6 months	\$47.19	\$61.19	\$75.17
6th 6 months	\$48.74	\$63.51	\$78.27

Level D - Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWCI-Z1D 1/20/2012	\$49.59	\$64.48	\$79.37 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Apprentice Rates:

1st 6 months	\$40.06	\$50.49	\$60.91
2nd 6 months	\$41.54	\$52.71	\$63.87
3rd 6 months	\$43.04	\$54.96	\$66.87
4th 6 months	\$44.53	\$57.19	\$69.85
5th 6 months	\$46.02	\$59.42	\$72.83
6th 6 months	\$47.50	\$61.65	\$75.79

Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWCI-Z1DCL 1/20/2012	\$49.34	\$64.11	\$78.87 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Apprentice Rates:

1st 6 months	\$39.89	\$50.23	\$60.57
2nd 6 months	\$41.36	\$52.44	\$63.51
3rd 6 months	\$42.83	\$54.64	\$66.45
4th 6 months	\$44.31	\$56.86	\$69.41
5th 6 months	\$45.79	\$59.08	\$72.37
6th 6 months	\$47.27	\$61.30	\$75.33

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Operating Engineer Hazardous Waste Class II				
Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HWCII-Z1A 1/20/2012	\$47.61	\$61.51	\$75.41 H H H H H H D Y
Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.				
Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HWCII-Z1B 1/20/2012	\$46.66	\$60.09	\$73.51 H H H H H H D Y
Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.				
Level D - Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWCII-Z1D 1/20/2012	\$45.36	\$58.14	\$70.91 H H H H H H D Y
Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.				
Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWCII-Z1DCL 1/20/2012	\$45.11	\$57.76	\$70.41 H H H H H H D Y
Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.				

Operating Engineer Hazardous Waste Crane w/ Boom & Jib leads 140' or longer

Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HW140-Z1A 1/20/2012	\$54.49	\$71.83	\$89.17 H H H H H H D Y
Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.				

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HW140-Z1B 1/20/2012	\$53.54	\$70.41	\$87.27 H H H H H H D Y

Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Level D Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HW140-Z1D 1/20/2012	\$52.24	\$68.46	\$84.67 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HW140-Z1DCL 1/20/2012	\$51.99	\$68.08	\$84.17 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Operating Engineer Hazardous Waste Crane w/ Boom & Jib leads 220' or longer

Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HW220-Z1A 1/20/2012	\$54.79	\$72.28	\$89.77 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HW220-Z1B 1/20/2012	\$53.84	\$70.86	\$87.87 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Level D Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HW220-Z1D 1/20/2012	\$52.54	\$68.91	\$85.27 H H H H H H D Y
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Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HW220-Z1DCL 1/20/2012	\$52.29	\$68.53	\$84.77 H H H H H H D Y

Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Operating Engineer Hazardous Waste Regular Crane, Job Mechanic, Dragline Operator, Boom Truck Operator, Power Shovel Operator and Concrete Pump with boom

Level D When Capping Landfill Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWRC-Z1DCL 1/20/2012	\$49.69	\$64.63	\$79.57 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Operating Engineer Hazardous Waste Regular Crane, Job Mechanic, Dragline Operator, Boom Truck Operator, Power Shovel Operator and Concrete Pump with Boom Operator

Level D - Coveralls, safety boots, glasses or chemical splash goggles and hard hats.	EN-324-HWRC-Z1D 1/20/2012	\$50.56	\$65.94	\$81.31 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Operating Engineer Hazardous Waste Regular Crane, Job Mechanic, Dragline Operator, Boom Truck Operator, Power Shovel Operator and Concrete Pump with booms

Level B & C protection. B - Pressure demand, full face SCBA or pressure demand supplied air respirator w/ escape SCBA w/chemical resistant clothing. C - Full face piece, air purifying canister-equipped respirator w/chemical resistant clothing.	EN-324-HWRC-Z1B 1/20/2012	\$51.86	\$67.89	\$83.91 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Operating Engineer Hazardous Waste Regular Crane, Job Mechanic, Dragline Operator, Boom Truck Operator, Power Shovel Operators and Concrete Pump with booms

Level A - Fully encapsulating chemical resistant suit w/ pressure demand, full face piece SCBA or pressure demand supplied air respirator w/ escape SCBA. The highest available level of respiratory, skin and eye protection.	EN-324-HWRC-Z1A 1/20/2012	\$52.81	\$69.31	\$85.81 H H H H H H D Y
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Four 10 hour days may be worked Monday-Thursday with Friday as a straight-time make up day.

Official Request #: 1492

Requestor: Wayne State University

Project Description: DeRoy Apartments Connectivity - Provide, Install and Relocate

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a

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Project Number: 134-243844
County: Wayne

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Official 2014 Prevailing Wage Rates for State Funded Projects

Issue Date: 10/24/2014

Contract must be awarded by: 1/22/2015

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Operating Engineer Steel Work				
Forklift, 1 Drum Hoist	EN-324-ef 9/5/2014	\$58.16	\$76.37	\$94.58 H H D H H H D D Y
Crane w/ 120' boom or longer	EN-324-SW120 9/5/2014	\$60.86	\$80.42	\$99.98 H H D H H H D D Y
Crane w/ 120' boom or longer w/ Oiler	EN-324-SW120-O 9/5/2014	\$61.86	\$81.92	\$101.98 H H D H H H D D Y
Crane w/ 140' boom or longer	EN-324-SW140 9/5/2014	\$62.04	\$82.19	\$102.34 H H D H H H D D Y
Crane w/ 140' boom or longer W/ Oiler	EN-324-SW140-O 9/5/2014	\$63.04	\$83.69	\$104.34 H H D H H H D D Y
Boom & Jib 220' or longer	EN-324-SW220 9/5/2014	\$62.31	\$82.60	\$102.88 H H D H H H D D Y
Crane w/ 220' boom or longer w/ Oiler	EN-324-SW220-O 9/5/2014	\$63.31	\$84.10	\$104.88 H H D H H H D D Y
Boom & Jib 300' or longer	EN-324-SW300 9/5/2014	\$63.81	\$84.85	\$105.88 H H D H H H D D Y
Crane w/ 300' boom or longer w/ Oiler	EN-324-SW300-O 9/5/2014	\$64.81	\$86.35	\$107.88 H H D H H H D D Y
Boom & Jib 400' or longer	EN-324-SW400 9/5/2014	\$65.31	\$87.10	\$108.88 H H D H H H D D Y
Crane w/ 400' boom or longer w/ Oiler	EN-324-SW400-O 9/5/2014	\$66.31	\$88.60	\$110.88 H H D H H H D D Y
Crane Operator, Job Mechanic, 3 Drum Hoist & Excavator	EN-324-SWCO 9/5/2014	\$60.50	\$79.88	\$99.26 H H D H H H D D Y

Apprentice Rates:

0-999 hours	\$47.87	\$61.43	\$75.00
1,000-1,999 hours	\$49.81	\$64.35	\$78.88
2,000-2,999 hours	\$51.74	\$67.24	\$82.74
3,000-3,999 hours	\$53.68	\$70.15	\$86.62
4,000-4,999 hours	\$55.62	\$73.07	\$90.50
5,000 hours	\$57.56	\$75.97	\$94.38

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Crane Operator w/ Oiler	EN-324-SWCO-O 9/5/2014	\$61.50	\$81.38	\$101.26 H H D H H H D D Y
Compressor or Welder Operator	EN-324-SWCW 9/5/2014	\$53.15	\$68.86	\$84.56 H H D H H H D D Y
Hoisting Operator, 2 Drum Hoist, & Rubber Tire Backhoe	EN-324-SWHO 9/5/2014	\$59.86	\$78.92	\$97.98 H H D H H H D D Y
Oiler	EN-324-SWO 9/5/2014	\$51.64	\$66.59	\$81.54 H H D H H H D D Y
Tower Crane & Derrick where work is 50' or more above first level	EN-324-SWTD50 9/5/2014	\$61.59	\$81.52	\$101.44 H H D H H H D D Y
Tower Crane & Derrick 50' or more w/ Oiler where work station is 50' or more above first level	EN-324-SWTD50-O 9/5/2014	\$62.59	\$83.02	\$103.44 H H D H H H D D Y
Operating Engineer Underground				
Class I Equipment	EN-324A1-UC1 10/14/2014	\$51.74	\$66.98	\$82.22 H H H H H H H D Y
	Apprentice Rates:			
	0-999 hours	\$41.79	\$52.45	\$63.12
	1,000-1,999 hours	\$43.32	\$54.75	\$66.18
	2,000-2,999 hours	\$44.84	\$57.03	\$69.22
	3,000-3,999 hours	\$46.36	\$59.31	\$72.26
	4,000-4,999 hours	\$47.89	\$61.61	\$75.32
	5,000-5,999 hours	\$49.41	\$63.89	\$78.36
Class II Equipment	EN-324A1-UC2 10/14/2014	\$47.01	\$59.89	\$72.76 H H H H H H H D Y
Class III Equipment	EN-324A1-UC3 10/14/2014	\$46.28	\$58.79	\$71.30 H H H H H H H D Y
Class IV Equipment	EN-324A1-UC4 10/14/2014	\$45.71	\$57.94	\$70.16 H H H H H H H D Y
Master Mechanic	EN-324A1-UMM 10/14/2014	\$51.99	\$67.81	\$83.63 H H H H H H H D Y

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Classification		Last Updated	Straight Time and a Half Hourly	Double Time	Overtime Provision
Name	Description				
Painter					
Painter (8 hours of repaint work performed on Sunday shall be paid time & one half rate)	PT-22-P	10/8/2014	\$42.82	\$55.63	\$68.43 H H D H D D D D Y
Four 10s allowed Monday-Thursday with Friday makeup day if job down due to weather, holiday or other conditions beyond the control of the employer.					
Apprentice Rates:					
First 6 months			\$30.02	\$36.43	\$42.83
Second 6 months			\$33.86	\$42.19	\$50.51
Third 6 months			\$35.14	\$44.11	\$53.07
Fourth 6 months			\$36.42	\$46.03	\$55.63
Fifth 6 months			\$37.70	\$47.95	\$58.19
Final 6 months			\$38.98	\$49.87	\$60.75
Pipe and Manhole Rehab					
General Laborer for rehab work or normal cleaning and cctv work-top man, scaffold man, CCTV assistant, jetter-vac assistant	TM247	10/15/2012	\$27.20	\$36.70	H H H H H H H H N
Tap cutter/CCTV Tech/Grout Equipment Operator: unit driver and operator of CCTV; grouting equipment and tap cutting equipment	TM247-2	10/15/2012	\$31.70	\$43.45	H H H H H H H H N
CCTV Technician/Combo Unit Operator: unit driver and operator of cctv unit or combo unit in connection with normal cleaning and televising work	TM247-3	10/15/2012	\$30.45	\$41.57	H H H H H H H H N
Boiler Operator: unit driver and operator of steam/water heater units and all ancillary equipment associated	TM247-4	10/15/2012	\$32.20	\$44.20	H H H H H H H H N
Combo Unit driver & Jetter-Vac Operator	TM247-5	10/15/2012	\$32.20	\$44.20	H H H H H H H H N
Pipe Bursting & Slip-lining Equipment Operator	TM247-6	10/15/2012	\$33.20	\$45.70	H H H H H H H H N

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County: Statewide

Official 2014 Prevailing Wage Rates for State Funded Projects

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Classification	Name	Description	Last Updated	Straight Time and a Half Hourly	Double Time	Overtime Provision
Pipefitter	Pipefitter	PF-636	6/30/2014	\$66.73	\$87.93	\$105.13 H H D H D D D D Y
		Apprentice Rates:				
		1st & 2nd periods		\$26.93	\$35.28	\$42.28
		3rd period		\$28.93	\$38.28	\$46.28
		4th period		\$30.18	\$40.16	\$48.78
		5th period		\$31.43	\$42.03	\$51.28
		6th period		\$32.68	\$43.90	\$53.78
		7th period		\$33.93	\$45.78	\$56.28
		8th period		\$34.93	\$47.28	\$58.28
		9th period		\$35.93	\$48.78	\$60.28
		10th period		\$37.36	\$50.92	\$63.14
Plasterer	Plasterer	BR1P	11/1/2012	\$45.04	\$67.56	\$90.08 H H H H H H D N
		Apprentice Rates:				
		1st 6 months		\$32.11	\$48.17	\$64.22
		2nd 6 months		\$33.40	\$50.10	\$66.80
		3rd 6 months		\$34.69	\$52.04	\$69.38
		4th 6 months		\$37.28	\$55.92	\$74.56
		5th 6 months		\$39.87	\$59.81	\$79.74
		6th 6 months		\$42.45	\$63.68	\$84.90
Plasterer		PL67	9/8/2010	\$44.72	\$60.11	\$75.50 H H H X D D D D N
		Apprentice Rates:				
		1st 6 months		\$29.33	\$37.02	\$44.72
		2nd 6 months		\$30.87	\$39.34	\$47.80
		3rd 6 months		\$32.41	\$41.64	\$50.88
		4th 6 months		\$35.49	\$46.26	\$57.04
		5th 6 months		\$38.56	\$51.16	\$63.76
		6th 6 months		\$41.64	\$55.49	\$69.34

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County: Wayne

Official 2014 Prevailing Wage Rates for State Funded Projects

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<u>Classification</u>		Last Updated	Straight Time and a Half Hourly	Double Time	Overtime Provision
Name	Description				
Plumber					
Plumber	PL-98	7/18/2013	\$64.45	\$84.87	\$101.29 H H D H D D D D Y
Apprentice Rates:					
	Period 1		\$19.93	\$26.43	\$32.93
	Period 2		\$23.90	\$31.40	\$38.90
	Period 3		\$30.60	\$39.19	\$47.77
	Period 4		\$31.23	\$40.13	\$49.03
	Period 5		\$32.39	\$41.87	\$51.35
	Period 6		\$33.54	\$43.59	\$53.65
	Period 7		\$34.69	\$45.32	\$55.95
	Period 8		\$35.86	\$47.07	\$58.29
	Period 9		\$37.01	\$48.80	\$60.59
	Period 10		\$38.16	\$50.53	\$62.89
Roofer					
Commercial Roofer	RO-149-WOM	8/18/2008	\$48.46	\$62.29	\$76.62 H H D H H H D D N
Straight time is not to exceed ten (10) hours per day or forty (40) hours per week.					
Apprentice Rates:					
	Apprentice 1		\$32.62	\$39.86	\$48.04
	Apprentice 2		\$36.80	\$44.80	\$53.30
	Apprentice 3		\$38.22	\$46.93	\$56.14
	Apprentice 4		\$39.25	\$48.48	\$58.20
	Apprentice 5		\$40.47	\$50.30	\$60.64
	Apprentice 6		\$41.87	\$52.40	\$63.44
Sewer Relining					
Class I-Operator of audio visual CCTV system including remote in-ground cutter and other equipment used in conjunction with CCTV system.	SR-I	5/6/2014	\$42.26	\$57.09	\$71.91 H H H H H H H D N
Class II-Operator of hot water heaters and circulation system; water jetters; and vacuum and mechanical debris removal systems and those assisting.	SR-II	5/6/2014	\$40.73	\$54.79	\$68.85 H H H H H H H D N

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Official 2014 Prevailing Wage Rates for State Funded Projects

Issue Date: 10/24/2014

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Classification		Last Updated	Straight Time and a Half	Double Time	Overtime Provision
Name	Description		Hourly	Half	Time
Sheet Metal Worker					
Sheet Metal Worker	SHM-80	9/9/2014	\$61.83	\$78.74	\$95.65 H H D X H H H D Y
A 4 10 schedule may be worked, 4 consecutive days Monday thru Friday.					

Apprentice Rates:

1st & 2nd Periods Indentured after 6-1-11	\$39.18	\$46.79	\$54.40
3rd & 4th Periods Indentured after 6-1-11	\$40.88	\$49.34	\$57.80
5th & 6th Periods Indentured after 6-1-11	\$42.56	\$51.86	\$61.16
7th & 8th Periods Indentured after 6-1-11	\$44.25	\$54.40	\$64.54
9th & 10th Periods Indentured before 6-1-11	\$51.92	\$64.44	\$76.96

Siding and decking	SHM-80-SD	1/13/2014	\$42.07	\$54.28	\$66.48 H H H H H H D Y
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Sprinkler Fitter

Sprinkler Fitter	SP 704	10/1/2014	\$64.32	\$85.38	\$106.43 H H D H D D D D Y
4 ten hour days allowed Monday-Friday Double time pay due after 12 hours worked M-F					

Apprentice Rates:

1st Period	\$28.05	\$36.47	\$44.89
2nd Period	\$41.16	\$50.63	\$60.11
3rd Period	\$43.27	\$53.80	\$64.33
4th Period	\$45.37	\$56.95	\$68.53
5th Period	\$47.48	\$60.11	\$72.75
6th Period	\$49.58	\$63.27	\$76.95
7th Period	\$51.69	\$66.43	\$81.17
8th Period	\$53.79	\$69.58	\$85.37
9th Period	\$55.90	\$72.75	\$89.59
10th Period	\$58.00	\$75.89	\$93.79

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Classification	Name	Description	Last Updated	Straight Time and a Half Hourly	Double Time	Overtime Provision
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Terrazzo	Terrazzo Finisher	BR1-TRF	10/17/2014	\$43.97	\$55.03	\$66.08 H H D H D D D D Y
A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.						

Apprentice Rates:

Level 1	\$19.04	\$25.12	\$31.20
Level 2	\$20.24	\$26.92	\$33.60
Level 3	\$27.01	\$33.96	\$40.90
Level 4	\$28.47	\$36.14	\$43.82
Level 5	\$29.99	\$37.84	\$45.70
Level 6	\$31.61	\$39.86	\$48.10
Level 7	\$33.30	\$41.59	\$49.87
Level 8	\$34.79	\$43.48	\$52.17

Terrazzo Worker	BR1-TRW	10/17/2014	\$49.73	\$63.67	\$77.60 H H D H D D D D Y
A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.					

Apprentice Rates:

Level 1	\$25.14	\$32.65	\$40.15
Level 2	\$28.20	\$36.49	\$44.78
Level 3	\$33.41	\$41.97	\$50.53
Level 4	\$36.15	\$45.66	\$55.17
Level 5	\$38.42	\$48.17	\$57.92
Level 6	\$42.07	\$53.56	\$65.05
Level 7	\$42.74	\$54.38	\$66.02
Level 8	\$43.67	\$55.78	\$67.88

Tile	Tile Finisher	BR1-TF	10/17/2014	\$43.50	\$54.32	\$65.14 H H D H D D D D Y
A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.						

Apprentice Rates:

Level 1	\$19.04	\$25.12	\$31.20
Level 2	\$20.24	\$26.92	\$33.60
Level 3	\$27.01	\$33.96	\$40.90
Level 4	\$28.47	\$36.14	\$43.82
Level 5	\$29.99	\$37.84	\$45.70
Level 6	\$31.61	\$39.86	\$48.10
Level 7	\$33.30	\$41.59	\$49.87
Level 8	\$34.79	\$43.48	\$52.17

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Classification Name Description	Last Updated	Straight Time and a Hourly Half	Double Time	Overtime Provision
Tile Layer A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.	BR1-TL 10/17/2014	\$49.68	\$63.59	\$77.50 H H D H D D D D Y

Apprentice Rates:

Level 1	\$25.14	\$32.65	\$40.15
Level 2	\$28.20	\$36.49	\$44.78
Level 3	\$33.41	\$41.97	\$50.53
Level 4	\$36.15	\$45.66	\$55.17
Level 5	\$38.42	\$48.17	\$57.92
Level 6	\$42.07	\$53.56	\$65.05
Level 7	\$42.74	\$54.38	\$66.02
Level 8	\$43.67	\$55.78	\$67.88

Truck Driver

on all trucks of 8 cubic yard capacity or less (except dump trucks of 8 cubic yard capacity or over, tandem axle trucks, transit mix and semis, euclid type equipment, double bottoms and low boys)	TM-RB1 8/8/2013	\$41.92	\$37.85	H H H H H H H H Y
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of all trucks of 8 cubic yard capacity or over	TM-RB1A 8/8/2013	\$41.30	\$38.00	H H H H H H H H Y
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on euclid type equipment	TM-RB1B 8/8/2013	\$41.45	\$38.23	H H H H H H H H Y
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Underground Laborer Open Cut, Class I

Construction Laborer	LAUC-Z1-1 9/5/2013	\$37.72	\$48.43	\$59.14 X X X X X X X D Y
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Apprentice Rates:

0-1,000 work hours	\$32.94	\$41.26	\$49.58
1,001-2,000 work hours	\$33.90	\$42.70	\$51.50
2,001-3,000 work hours	\$34.85	\$44.13	\$53.40
3,001-4,000 work hours	\$36.76	\$46.99	\$57.22

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Classification		Last Updated	Straight Time and a Half	Double Time	Overtime Provision
Name	Description		Hourly	Half	Time
Underground Laborer Open Cut, Class II					
Mortar and material mixer, concrete form man, signal man, well point man, manhole, headwall and catch basin builder, guard rail builders, headwall, seawall, breakwall, dock builder and fence erector.	LAUC-Z1-2	10/25/2013	\$37.83	\$48.60	\$59.36 X X X X X D Y
Apprentice Rates:					
0-1,000 work hours			\$33.02	\$41.38	\$49.74
1,001-2,000 work hours			\$33.98	\$42.82	\$51.66
2,001-3,000 work hours			\$34.95	\$44.27	\$53.60
3,001-4,000 work hours			\$36.87	\$47.15	\$57.44
Underground Laborer Open Cut, Class III					
Air, gasoline and electric tool operator, vibrator operator, drillers, pump man, tar kettle operator, bracers, rodder, reinforced steel or mesh man (e.g. wire mesh, steel mats, dowel bars, etc.), cement finisher, welder, pipe jacking and boring man, wagon drill and air track operator and concrete saw operator (under 40 h.p.), windlass and tugger man, and directional boring man.	LAUC-Z1-3	9/5/2013	\$37.88	\$48.67	\$59.46 X X X X X D Y
Apprentice Rates:					
0-1,000 work hours			\$33.06	\$41.44	\$49.82
1,001-2,000 work hours			\$34.02	\$42.88	\$51.74
2,001-3,000 work hours			\$34.99	\$44.33	\$53.68
3,001-4,000 work hours			\$36.92	\$47.23	\$57.54
Underground Laborer Open Cut, Class IV					
Trench or excavating grade man.	LAUC-Z1-4	9/5/2013	\$37.96	\$48.79	\$59.62 X X X X X D Y
Apprentice Rates:					
0-1,000 work hours			\$33.12	\$41.53	\$49.94
1,001-2,000 work hours			\$34.09	\$42.99	\$51.88
2,001-3,000 work hours			\$35.06	\$44.44	\$53.82
3,001-4,000 work hours			\$36.99	\$47.33	\$57.68
Underground Laborer Open Cut, Class V					
Pipe Layer	LAUC-Z1-5	9/5/2013	\$38.02	\$48.88	\$59.74 X X X X X D Y
Apprentice Rates:					
0-1,000 work hours			\$33.16	\$41.59	\$50.02
1,001-2,000 work hours			\$34.14	\$43.06	\$51.98
2,001-3,000 work hours			\$35.11	\$44.51	\$53.92
3,001-4,000 work hours			\$37.05	\$47.43	\$57.80

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Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a

of all prevailing wage and fringe benefit rates prescribed in a contract.

Project Number: 134-243844

County: Wayne

Official 2014 Prevailing Wage Rates for State Funded Projects

Issue Date: 10/24/2014

Contract must be awarded by: 1/22/2015

Page 29 of 29

Classification		Last Updated	Straight Time and a Half	Double Time	Overtime Provision
Name	Description		Hourly	Half	Time
Underground Laborer Open Cut, Class VI					
Grouting man, top man assistant, audio visual television operations and all other operations in connection with closed circuit television inspection, pipe cleaning and pipe relining work and the installation and repair of water service pipe and appurtenances.	LAUC-Z1-6	9/5/2013	\$35.47	\$45.06	\$54.64 X X X X X X D Y

Apprentice Rates:

0-1,000 work hours	\$31.25	\$38.73	\$46.20
1,001-2,000 work hours	\$32.10	\$40.00	\$47.90
2,001-3,000 work hours	\$32.94	\$41.26	\$49.58
3,001-4,000 work hours	\$34.63	\$43.79	\$52.96

Underground Laborer Open Cut, Class VII					
Restoration laborer, seeding, sodding, planting, cutting, mulching and topsoil grading and the restoration of property such as replacing mail boxes, wood chips, planter boxes, flagstones etc.	LAUC-Z1-7	9/5/2013	\$32.09	\$39.99	\$47.88 X X X X X X D Y

Apprentice Rates:

0-1,000 work hours	\$28.72	\$34.93	\$41.14
1,001-2,000 work hours	\$29.39	\$35.93	\$42.48
2,001-3,000 work hours	\$30.07	\$36.95	\$43.84
3,001-4,000 work hours	\$31.42	\$38.98	\$46.54

Official Request #: 1492

Requestor: Wayne State University

Project Description: DeRoy Apartments Connectivity - Provide, Install and Relocate

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a

copy

of all prevailing wage and fringe benefit rates prescribed in a contract.

Project Number: 134-243844

County: Wayne

WAYNE STATE UNIVERSITY
PAYMENT PACKAGE DOCUMENT REQUIREMENTS (Revised 5-06-2011):

Review and comply with Section 410 of Bid Front End Documents.
Review and comply with Article 15 of the Supplemental General Conditions.

AIA DOCUMENT G702 & G703 – (or facsimile thereof) Payment Application Checklist:

- Correct Project Name – Found on your contract.
- Correct Project Number – Found on your contract.
- Purchase Order Number – Required prior to beginning work.
- Correct Application Number. (i.e. 1, 2, 3, etc.)
- Correct Period Reporting Dates – Applications support docs must be sequential and within application range.
- Approved & Executed Change Orders must be listed. (Cannot invoice for unapproved changes.)
- Schedule of values percentages and amounts match the approved Pencil Copy Review – Signed by the Architect, Contractor, and University Project Manager.
- Correct Dates – Back dating not accepted.
- Signed and Notarized.

SWORN STATEMENT – Checklist:

- List all contractors, sub-contractors, suppliers... ≥ \$1000.00
 - Contractor's Sworn Statement amounts must coincide with Column "C" of the schedule of values document. Any unassigned or uncommitted value of contract shall be shown on an entry "Contractor – Unassigned" followed by the amount necessary to cause the „contracted to date" column of the sworn statement to equate with the schedule of value column totals.
 - Current Date – Back dating not accepted.
 - Signed and Notarized.
- A Sworn Statement is required from every Sub Contractor on the job with a material purchase or sub-subcontract of \$1,000 or more. (all the way down to the bottom tier)

**DEPT. of LABOR FORM WH-347 – Certified Payroll Checklist:
(Union and Non-Union)**

- For every contractor & sub-contractors work, for each week within the application for payment reporting period. (For every „boot" on the floor representing the weeks within the application period)
- Wayne State University Project Number – Found on your contract.
- List ALL workers who have worked on the project site.
- Make sure workers addresses are listed.
- NO Social Security Numbers, if present they MUST be blackened out or listed in XXX-XX-1234 format.
- Work classifications based on the job specific Prevailing Wage Schedule descriptions. If you require rates for additional classifications, contact the Michigan Department of Consumer & Industry Services. (Refer to Section 410 of Bid Front End Documents.)
- http://www.cis.state.mi.us/bwuc/bsr/wh/revised_rates/whc_tbl.htm
- Apprenticeship program status – proof of enrolled program and current completion required for any workers paid at Apprenticeship rates.
- Rate of Pay verified against the Prevailing Wage Schedule with an hourly costs breakdown of fringes paid. (Refer to attachment for State of Michigan instructions and example)
- Authorized signatures on affidavit.

**APPLICATION PACKAGE SUPPORTING DOCUMENTATION –
Must accompany all package reporting periods: (Union and Non-Union)**

- Copies of Pay Stubs may be required for each Certified Payroll period reported – (Social Security Numbers MUST be blackened out or listed in XXX-XX-1234 format. Pay stubs need to reflect claimed participation of fringes like Medical, Dental, Retirement or 1099 classification.)
- Proof of Ownership for any „Owner Operator" (Sole Proprietor) contractors not claiming their time under prevailing wage act. – (Must list their hours and dates worked on the WH-347 Form and enter EXEMPT on the income brackets.). The Owner Operator must provide copies of "DBA" registration form confirming status as exempt from prevailing wage requirements.

- Proof of Stored Materials – (Detailed Bill of Sale, certificate of insurance or endorsement page specifically insuring the stored materials, pictures, when large value. WSU reserves the right to on site verification of material. Stored material must be separated from ordinary inventory and labeled for WSU project.
- Partial Unconditional Waivers – Must release the accumulated amount paid for work and be immediately provided, or provided with the subsequent application for payment. Waivers shall be provided for contractors, sub-contractors, and suppliers listed on the Sworn Statements. (This is required at all tiers)
- Full Unconditional Waivers – Prime Contractor must deliver fully executed Full Unconditional Waiver upon receipt of final payment. Full Unconditional waivers may be required of sub-contractors and suppliers in advance of final Contractor payment on bonded projects This requirement shall be determined on a project-by-project basis. Full Unconditional waivers shall be required in advance of or at the time of final payment on all non-bonded projects from all subcontractors and suppliers listed on Sworn Statements, or who have provided a notice of furnishing.
- Partial Conditional Waivers – The Contractor shall provide a Partial Conditional Waivers covering the entire amount of the application for payment. For non-bonded Projects – A partial conditional waiver from all subcontractors must accompany any application for payment within which a subcontractor draw is included.
- Sworn Statements – Required for all Sub Contractors, and Sub-subcontractors (etc.) with any contracts or purchases exceeding \$1,000.

FINAL PAYMENT EXCHANGE – Checklist:

- Clear and concise As-Built drawings.
- Operation and Maintenance Manuals.
- Required training must be completed (if applicable).
- Warranty of work in accordance with project documents.
- Certificate of Substantial Completion.
- Full Unconditional Waiver

The Project Manager may provide additional requirements as may apply to individual jobs

Revised 5-6-2011

WAYNE STATE UNIVERSITY

**AGREEMENT BETWEEN THE UNIVERSITY AND CONTRACTOR
FOR CONSTRUCTION SERVICES (rev 6-2013)**

Executed as of the _____ day of _____, 2014 by and between:

The Board of Governors, Wayne State University
Detroit, Michigan 48202
(The University)

and

CONTRACTOR'S_NAME
CONTRACTOR'S_ADDRESS

regarding

DeRoy Apartments Connectivity
5200 Anthony Wayne Drive
WSU Project No. 134-243844

In consideration of the mutual covenants and conditions contained herein, the Parties agree as follows:

Article 1 - Scope of Work

- 1.1 This Agreement provides for **Provide, and install a new infrastructure to distribute CAT6E voice/data cable as well as relocating the existing wireless cable infrastructure,** located at **5200 Anthony Wayne Drive.** The documents listed in Article 4 fully define the scope of work.
- 1.2 The Contractor shall furnish all the labor, materials, equipment, services, and supervision to perform all the work shown on the drawings and specifications listed in Article 18, including any addenda issued during the bid phase, and approved change orders issued during the construction phase.
- 1.3 The Contractor shall notify the University in writing within five (5) calendar days when the Contractor discovers any condition that will affect the contract amount or the completion date.

Article 2 - Time of Completion

- 2.1 The work to be performed under this Agreement shall commence upon the Contractor's receipt of a fully-executed Agreement, and substantial completion shall be achieved by **March 20, 2015.**

Article 3 - The Contract Sum

- 3.1 The University shall pay the Contractor a **"lump sum/not-to-exceed (pick one)"** amount of \$\$\$\$\$\$ (**"Amount in words 00" /100** dollars) for the performance of all work associated with the Contractor's Base Bid **"and Alternates (List)".**
- 3.2 The University may, at its sole discretion, during the life of the contract, award the following alternates at the amounts indicated: **"(If section 3.2 is not used, delete all text and enter Deleted"**

	Description	Amount
	Alternate #1	
	Alternate #2	
	Alternate #3	
3.3	In the event additional work becomes necessary, the following unit prices will apply: "(If section 3.3 is not used, delete all text and enter Deleted)"	
	Work Item	Unit Price
	1.	
	2.	
	3.	

Article 4 - The Contract Documents

- 4.1 The Contract Documents shall consist of this Agreement, the drawings and specifications as listed in Article 18, the General Conditions of the Contract for Construction as defined by AIA Document A201 1970 Edition, except as otherwise provided herein, and Wayne State University's Supplementary General Conditions 1997 Edition.
- 4.2 For any inconsistencies found among or between these Contract Documents, the language contained in this Agreement shall prevail over all other documents and the Supplementary General Conditions shall prevail over the General Conditions. In the event of a conflict between the Drawings and Specifications, the requirement for the higher quantity and/or higher quality shall prevail.

Article 5 – Examination of Premises

- 5.1 The Contractor acknowledges that the University provided the opportunity for a thorough examination of the project site and its surroundings and that the Contractor knows of no conditions preventing accomplishment

of the full scope of work within the time and for the amount specified in this Agreement.

- 5.2 The University will deny all claims for additional time and/or cost for conditions that could have been reasonably discovered during such an examination.

Article 6 - The Architect/Engineer

- 6.1 The Architect/Engineer for this project is:
"(List the Architect and Engineer separately if appropriate)"

DiClemente Siegel Design Inc.
28105 Greenfield Road
Southfield, MI 48076
(Architect Phone No / Fax No)

- 6.2 The University will appoint a Project Manager who will be the University's point of contact for all matters of contract administration including, but not limited to, interpretation of documents, defining the scope of work, approving work schedules, and approving contract payments.

Article 7 - Additional Work

- 7.1 The University reserves the right to let other Agreements in connection with this work. The Contractor will afford other Contractors or the University's own workforce reasonable opportunity for the delivery and storage of their material and for the performance of their work and shall properly connect and coordinate its work with theirs.
- 7.2 If any part of the Contractor's work depends for proper execution or results upon the work of another Contractor or the University's own workforce, the Contractor shall inspect and promptly report to the University's Project Manager any defects in such work that render it unsuitable for such proper execution and results. The Contractor's failure to so inspect and report shall constitute an acceptance of the work of others as fit and proper for reception of the Contractor's work and as a waiver of any claim or defense against the University or other contractor which relies in whole or in part upon the contention that such work was unsuitable for proper execution and resolution.

Article 8 - Dispute Resolution

- 8.1 Jurisdiction over all claims, disputes, and other matters in question arising out of or relating to this contract or the breach thereof, shall rest in the Court of Claims of the State of Michigan. No provision of this agreement may be construed as Wayne State University's consent to submit any claim, dispute or other matter in question for dispute resolution pursuant to any arbitration or mediation process, whether or not provisions for dispute resolution are included in a document which has been incorporated by reference into this agreement. Specifically, all references to Arbitration contained in the General Conditions are superceded by this Article.
- 8.2 In any claim or dispute by the Contractor against the University, which cannot be resolved by negotiation, the Contractor shall submit the dispute in writing for an administrative decision by the University's Vice President for Finance and Administration, within 30 days of the end of negotiations. Any decision of the Vice President shall be made within 45 days of receipt from the Contractor and is final unless it is challenged by the Contractor by filing a lawsuit in the Court of Claims of the State of Michigan within one year of the issuance of the decision. The Contractor agrees that appeal to the Vice President is a condition precedent to filing suit in the Michigan Court of Claims.
- 8.3 For purposes of this section, the "end of negotiations" shall be deemed to have occurred when:
 - 8.3.1 Either party informs the other that pursuant to this section, negotiations are at an impasse; or
 - 8.3.2 The Contractor submits the dispute in writing to the Vice President.

- 8.4 Unless otherwise agreed by the University in writing, and notwithstanding any other rights or obligations of either of the parties under any Contract Documents or Agreement, the Contractor shall continue with the performance of its services and duties during the pendency of any negotiations or proceedings to resolve any claim or dispute, and the University shall continue to make payments in accordance with the Contract Documents; however, the University shall not be required or obligated to make payments on or against any such claims or disputes during the pendency of any proceeding to resolve such claims or disputes.

Article 9 - Termination for Convenience

- 9.1 Upon thirty days written notice to the Contractor, the University may, without cause and without prejudice to any other right or remedy of the University, elect to terminate the contract. In such case, the Contractor shall only be paid (without duplication of any items), using a Close out Change Order, for the following:
- 9.1.1 For completed and acceptable work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
- 9.1.2 For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted work, including fair and reasonable sums for overhead and profit on such expenses.
- 9.2 The Contractor shall not be paid on account of loss of anticipated profits or revenue, delay or disruption, or other economic loss arising out of or resulting from such termination. For purposes of this section, "fair and reasonable sums for overhead and profit" shall be determined by reference to Michigan law, without reference to principles used for such determinations in arbitration.

Article 10 - Progress Payments

- 10.1 On or before the 20th day of each month, the Contractor shall submit a written application for payment, using form AIA G702, to the Architect/Engineer and the University's Project Manager for review. The Architect/Engineer shall have ten (10) calendar days to accept or reject the Contractor's application for payment. Acceptable applications for payment shall then be submitted to the University for Payment of authorized amount(s) within thirty (30) calendar days of receipt by the University's Project Manager.
- 10.2 The application for payment shall contain a full schedule of values organized and sorted by subcontractor, by Construction Specifications Institute standard work categories, or in another format acceptable to the University.
- 10.3 Monthly progress payments shall show the percentage of work installed as of the date of the application, less amount previously installed and the amount due for the application period. The Contractor shall deduct a 10% retainage from the balance due for each progress payment and indicate the net amount due on each application.
- 10.4 When 50% of the work associated with this Agreement is installed, the Contractor shall not deduct additional retainage from the balance due from the University. When substantial completion is achieved and acknowledged by the Architect/Engineer, the Contractor and the University in writing, the University shall remit to the Contractor all but 2% of the retainage. The remaining 2% shall be retained by the University until the final payment is authorized and remitted to the Contractor.

Article 11 - Acceptance and Final Payments

- 11.1 Final payment shall be due thirty (30) days after the completion of the work, including all punch list items, provided the work is fully completed and the Agreement fully performed.
- 11.2 Upon receipt of written notice that the work is ready for final inspection and acceptance, the Architect/Engineer shall promptly inspect the work. When the Architect/Engineer concludes that the work is acceptable and the Agreement to be fully performed, the Architect/Engineer shall promptly issue a final certificate with an original signature, stating that the work provided is complete and acceptable and that the entire remaining balance found to be due the Contractor shall be remitted by the University once the final

application for payment is received.

- 11.3 If, after the work has been substantially completed, full completion thereof is materially delayed through no fault of the Contractor, and the Architect/Engineer so certifies, the University shall, upon certificate of the Architect/Engineer, and without terminating the Contract, make payments of the balance due for that portion of the work fully completed and accepted. Such payments shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Article 12 - Non-Discrimination

- 12.1 The Contractor agrees that it will not discriminate against any employee or applicant for employment, to be employed in the performance of this Agreement, with respect to hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment, because of race, color, religion, sex, age, national origin, or ancestry. Breach of this covenant may be regarded as material breach of this Agreement.
- 12.2 The Contractor further agrees that it will, in all subcontracts relating to the performance of the work under this Agreement, provide in its subcontracts that the subcontractor will not discriminate against any employee or applicant for employment, to be employed in the performance of such contract, with respect to hire, tenure, terms, conditions or privileges of employment, or any matter directly or indirectly related to employment because of race, sex, age, color, religion, national origin or ancestry. Breach of this covenant may also be regarded as a material breach of this Agreement.

Article 13 – Laborers and Mechanics

- 13.1 All laborers and mechanics must be covered by Worker's Compensation and Employer's Liability Insurance as required by Federal and Michigan law. The Contractor shall also require all of its Subcontractors to maintain this insurance coverage.
- 13.2 The Contractor acknowledges and shall abide by the University's prohibition on use of 1099 independent contractors and owner / operator business entities. The Contractor shall ensure that all classifications of laborers and construction mechanics performing Work on the Project job site are employees of the Contractor or any Trade Contractor for any tier thereof, and that each worker is covered by workers compensation insurance.

Article 14 - Prevailing Wages

- 14.1 The Contractor and each subcontractor shall pay to each class of mechanics and laborers not less than the wage and fringe benefit rates prevailing in the Detroit Metropolitan Area, as determined by the United States Department of Labor. The Contractor shall post on site, in a conspicuous place, a copy of all applicable wage and benefit rates, and shall provide the University with a copy of the applicable wage and benefit rates.
- 14.2 The Contractor and each subcontractor shall keep an accurate record showing the name and occupation of and the actual benefits and wages paid to each laborer and mechanic employed in connection with this contract. The Contractor and each subcontractor shall make certified payroll records available to the University's representatives upon request.
- 14.3 If a Contractor or subcontractor fails to pay the prevailing rates of wages and fringe benefits and does not cure such failure within ten (10) days after notice to do so by the University, the University shall have the right, at its option, to do any or all of the following:
- 14.3.1 Withhold all or any portion of payments due the Contractor as may be considered necessary by the University to pay laborers and mechanics the difference between the rates of wages and fringe benefits required by this Agreement and the actual wage and fringe benefits paid.
- 14.3.2 Terminate part or all of this Agreement or any subagreement and proceed to complete the

Agreement or subagreement by separate agreement with another Contractor or otherwise, in which case the Contractor and its sureties shall be liable to the University for any excess costs incurred by the University.

- 14.4 The Contractor shall include terms identical or substantially similar to this section in any Agreement or subagreement pertaining to the project.

Article 15 - Save Harmless

- 15.1 The Contractor shall indemnify, defend and hold harmless the University, its agents and employees from any and all loss, damage, claims, and causes of action whatsoever, including all costs, expenses and attorneys' fees arising out of Contractor's performance of obligations under the terms and conditions of this agreement. Such responsibility shall not be construed as liability for damage caused by or resulting from the negligence of the University, its agents other than the Contractor, or its employees.

Article 16 - Liquidated Damages

- 16.1 It is understood and agreed that, if the project is not completed within the time specified in the Agreement plus any extension of time allowed pursuant thereto, the actual damages sustained by the University because of any such delay will be uncertain and difficult to ascertain, and it is agreed that the reasonable foreseeable value of the use of said project by the University would be the sum of **\$250.00, Two Hundred Fifty Dollars** per day. Therefore, the Contractor shall pay as liquidated damages to the University the sum of **\$250.00, Two Hundred Fifty Dollars** per day for each day's delay in substantially completing said project beyond the time specified in this Agreement and any extensions of time allowed thereunder.

"ENTER N/A FOR ABOVE AMOUNT IF NO LIQUIDATED DAMAGES"

Article 17- Interpretation

- 17.1 This Agreement shall be interpreted and construed according to the laws of the State of Michigan.
- 17.2 If one part of this Agreement is found to be void by legal or legislative action, the remainder of the contract remains in full effect.

Article 18 - Drawings and Specifications

18.1 The Technical Specifications and the Project Manual dated **October 24, 2014**, and the following List of Drawings represents the scope of work as defined in the Contract Documents from Article 4.

DRAWINGS

Drawing No.:	Description	dated
<u>Title Drawing Index</u>		
G-1	Title Sheet	October 24, 2014
<u>Electrical Drawing Index</u>		
E-1	General Electrical Information	October 24, 2014
E-2	Enlarged Floor Plans Electrical And Details	October 24, 2014
<u>Technology Drawing Index</u>		
T-1	General Technology Information	October 24, 2014
T-2	MDF Room Eighth Floor & Enlarged Plans	October 24, 2014
T-3	Floor Plan Technology Floor 1	October 24, 2014
T-4	Floor Plan Technology Floor 2	October 24, 2014
T-5	Floor Plan Technology (Typical for Floors 3-7)	October 24, 2014
T-6	Floor Plan Technology (Typical for Floors 8-15)	October 24, 2014
T-7	Technology Backbone Riser Diagram and Details	October 24, 2014

IN WITNESS WHEREOF the parties to these presents have hereunto set their hands as of the day and year first written above.

Signed, sealed and delivered
in the presence of:

CONTRACTOR'S NAME GOES HERE

By _____
signature

Please print name here

Date signed

Title

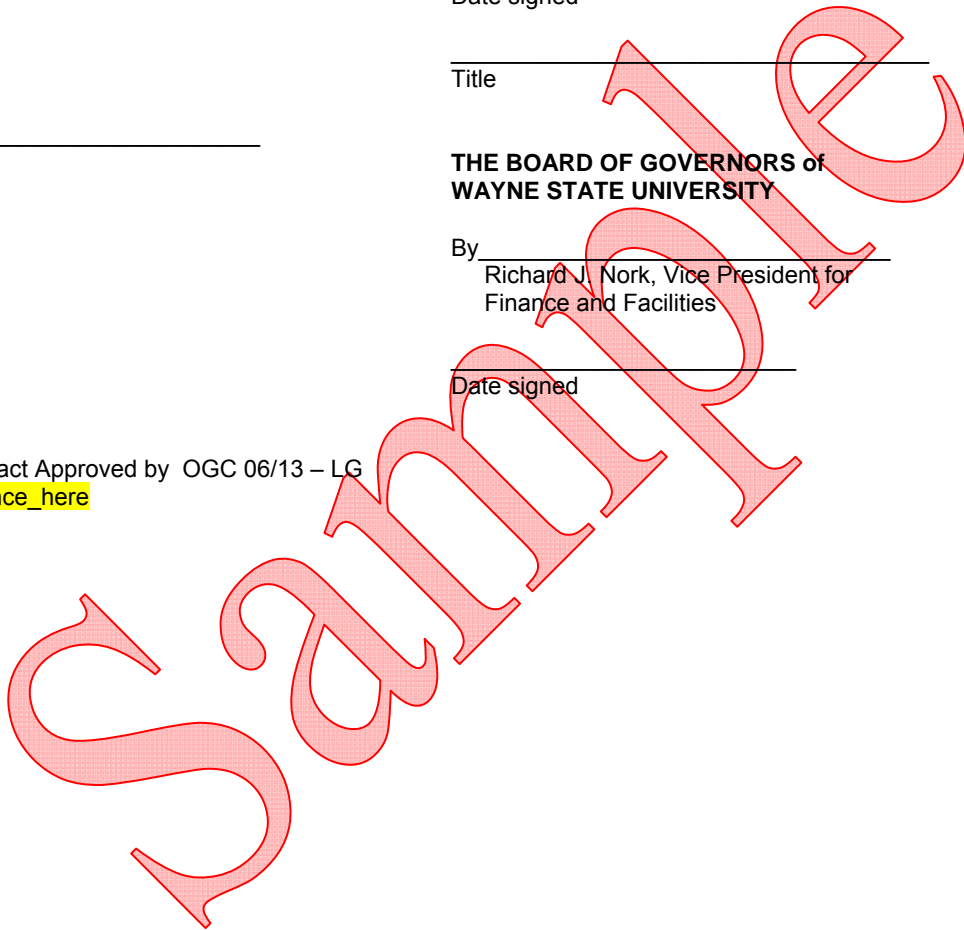
Witness

**THE BOARD OF GOVERNORS of
WAYNE STATE UNIVERSITY**

By _____
Richard J. Nork, Vice President for
Finance and Facilities

Date signed

Form Contract Approved by OGC 06/13 – LG
File_reference_here



FORM OF GUARANTEE

PROJECT: DeRoy Apartments Connectivity

OWNER: BOARD OF GOVERNORS, WAYNE STATE UNIVERSITY

CONTRACTOR: _____

DATE: _____

Know all men by these presents that, in consideration of my (our) having been awarded the Contract or Subcontract for complete furnishing and installation of:

DeRoy Apartments Connectivity (Project No. 134-243844)

For: **Board of Governors, Wayne State University**

In conformity with drawings and specifications prepared by Architect or Engineer, **DiClemente Siegel Design Inc.**, and known as the buildings indicated above, I (we) do hereby agree that, should I (we) be notified that the said work has proved faulty, etc., that I (we) will return to the buildings within three (3) working days of the receipt of such notice, and will furnish the necessary labor and material to repair such work to the satisfaction of the Owner and without cost to the Owner.

The Agreement shall remain in full force and effect **for a one year period (DATE TBD)**

WITNESS:

signed: _____
Subcontractor

by: _____

address: _____

city/state/zip: _____

signed: _____
General Contractor

by: _____

(THIS FORM TO BE FILED IN DUPLICATE.)

GENERAL CONDITIONS (Revised 10-2009)

- A. Although AIA Document A201 - Twelfth Edition (April 1970) - "General Conditions of the Contract for Construction" is not bound herein, it forms a part of these construction documents.
- B. A reference copy of AIA Document A201 - Twelfth Edition (April 1970) - "General Conditions of the Contract for Construction" is on file at the following location:

Wayne State University
Finance & Facilities Management
Procurement & Strategic Sourcing
Academic / Administrative Services Building
5700 Cass Avenue
Detroit Michigan 48202

SUPPLEMENTARY GENERAL CONDITIONS
OF
THE CONTRACT FOR CONSTRUCTION

Facilities Planning & Management - Design & Construction Services
Wayne State University

WSU SUPPLEMENTARY GENERAL CONDITIONS
OF THE
CONTRACT FOR CONSTRUCTION

NOTE: The following items related to A.I.A. General Conditions, A.I.A. Document A-201 - Twelfth Edition (April 1970), by specific number being amended to. These items, as amendments, shall have precedence over the article being amended.

ARTICLE 1 - CONTRACT DOCUMENTS

1.1 DEFINITIONS

1.1.5 The Agreement

The Agreement executed by the Contractor and the Owner.

1.2 EXECUTION, CORRELATION, INTENT, AND INTERPRETATIONS

1.2.6 "General Conditions and "Supplementary General Conditions" apply with equal force to all Contractors, Subcontractors work, and extra work required under this Contract.

1.2.7 Precedence of Drawings and Specifications.

The Agreement has precedence over WSU Supplementary General Conditions.

WSU Supplementary General Conditions have precedence over A.I.A. A-201 General Conditions of the Contract.

Specifications have precedence over drawings. Full-size drawings have precedence over scale drawings. Large-scale plans and details have precedence over small-scale plans and details. Figured dimensions have precedence over plans and elevations.

ARTICLE 2 - ARCHITECT

2.1 DEFINITION

2.1.1.1 The term Architect or Architect/Engineer as used in these specifications refers to Facilities Planning and Management - Design Services, and/or Consulting Architect/Engineer.

2.2 ADMINISTRATION OF THE CONTRACT

2.2.16 The Architect will assign Field Representatives to make periodic visits to the project for the purpose of assisting the Architect in carrying out his field responsibilities at the site. The duties, responsibilities and limitations of authority of any such Field Representative shall be as follows:

- a. Explain Contract Documents: Assist the Contractor via the Contractor's Superintendent to understand the intent of the Contract Documents.
- b. Observations: Conduct on-site observations and spot checks of the work in progress as a basis for determining conformance of the work, material, and equipment with the Contract Documents.
- c. Additional Information: Obtain from the Architect, additional details or information, if and when required, at the job site for proper execution of the work.
- d. Modifications: Consider and evaluate suggestions or modifications that may be submitted by the Contractor and report them with recommendations to the Architect for final decision.
- e. Construction Schedule and Completion: Be alert to the completion, and report same to the Architect. When the construction work has been completed in accordance with the Contract Documents, advise the Architect that the work is ready for general inspection and

acceptance.

- f. Job Conferences: Attend and report to the Architect on all required conferences held at the job site.
- g. Observe Tests: See that tests which are required by the Contract Documents are actually conducted; observe, record and report to the Architect all details relative to the test procedures; and advise the architect's office in advance of the schedules of tests.
- h. Inspection by Others: If inspectors, representing local, state or federal agencies having jurisdiction over the project, visit the job site, accompany such inspectors during their trips through the project, record the outcome of these inspections, and report same to the Architect's office.
- i. Shop Drawings: Do not permit the installation of any materials and equipment for which shop drawings are required unless such drawings have been duly approved and issued by the Architect.
- j. Contractor's Requisitions for Payment: Review and make recommendations to the Architect for disposition.
- k. List of Items for Correction: After substantial completion, make a list of items for correction before final inspection and check each item as it is corrected.
- l. Owner's Occupancy of the Building: If the Owner occupies (to any degree) the building prior to actual completion of the work by the Contractor, be especially alert to possibilities of claims for damage to completed work prior to the acceptance of the building.
- m. Owner Existing Operation: In the case of additions to or Demolitions of an existing facility, which must be maintained as an operational unit, be alert to conditions on the job site which may have an effect on the Owner's existing operation.
- n. Limitations of Authority: Do not become involved in any of the following areas of responsibility unless specific exceptions are established by written instructions issued by the Architect.
 - aa. Do not authorize deviations from the Contract Documents.
 - bb. Avoid conducting any test personally.
 - cc. Do not enter into the area of responsibility of the Contractor's field superintendent.
 - dd. Do not expedite job for Contractor unless so instructed by the Architect.
 - ee. Do not advise on or issue directions relative to any aspect of the building technique or sequence unless a specific technique or sequence is called for in the Specifications or by written instructions from the Architect.
 - ff. Do not approve shop drawings or samples.
 - gg. Do not authorize or advise the Owner to occupy the Project, in whole or in part, prior to the final acceptance of the building.
 - hh. Do not issue a Certificate for Payment.

ARTICLE 3 - OWNER

3.5 OWNER'S RIGHT TO DO WORK

- 3.5.1 The Owner may exercise his right, which is hereby acknowledged by the Contractor, to let independent of the Contract for the work herein specified, any other work on the premises even if of

like character and trades, and the Owner shall not be liable for any damage, loss or expense incurred by the Contractor through the fault of any other Contractor so employed by the Owner. The Contractor acknowledges the necessity of work by others, to be performed at approximately the same time as the work hereunder, and agrees to perform his work in full cooperation with the work of such other trades and/or Contractors, partially or entirely completed, by such other trades and/or Contractors, or by the Owner, when, in the opinion of the Architect, such access or use is necessary for the performance and completion of any portion or all of the work of others or of any work on the site.

3.6 OWNER'S ACCESS AND PARTIAL OCCUPANCY

3.6.1 The Owner shall have access to the work at all times, and at his election, may from time to time (prior to the stipulated contract completion date) occupy any of the units or parts of the project as the work in connection therewith is complete to such a degree as will, in the opinion of the Owner, permit their temporary or permanent use. The Owner will, prior to any such partial occupancy, give notice to the Contractor thereof and such occupancy shall be upon the following terms:

- a. Such occupancy shall not constitute an acceptance of work not performed in accordance with the Contract nor shall such occupancy relieve the Contractor of liability to perform any work by the Contract by not complete at the time of occupancy.
- b. Except as otherwise provided by an agreement at the time of such partial occupancy, the Contractor shall be relieved of all maintenance costs on units or parts so occupied.
- c. The Contractor shall not be responsible for wear and tear or damage resulting from partial occupancy.
- d. The Owner shall assume risk of loss with respect to any unit or part so occupied.
- e. The Contractor shall, if required by the Owner, furnish heat, light, water, or other such services to the units or parts occupied and the Owner shall make proper remuneration therefore to the Contractor.

3.6.2 The Contractor agrees that the Owner shall have the right, after seven (7) days' written notice to the Contractor, to place and install as much equipment and machinery during the progress of the work as is possible before the completion of the various parts of the work; and further agrees that such placing and installation of equipment shall not in any way evidence the completion of the work or any portion thereof, nor signify the Owner's acceptance of the work or any portion thereof. Should the Owner place or install such equipment and machinery with his own forces he shall be responsible for any damage to work of the Contractor caused by the Owner's work or workmen. Should the Owner have such placement or installation performed by another Contractor, then the Owner shall require said Contractor to be responsible for all such damage caused by his work, his workers, or his subcontractors.

ARTICLE 4 - CONTRACTOR

4.4 LABOR AND MATERIALS

4.4.3 All materials shall be so delivered, stored and handled to prevent the inclusion of foreign materials and the damage of materials by water or breakage. Packaged materials shall be delivered and stored in original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected. All materials shall be of the respective qualities specified herein.

4.4.4 The Contractor shall be responsible for the proper care and protection of all his materials, equipment, etc., delivered at the site. Building materials, equipment, etc., may be stored on the premises subject to the approval of the Architect.

4.4.5 To insure timely availability of critical materials in case of national emergency, the Contractor may order his subcontractors to proceed with fabrication of the same earlier than required by normal sequence of construction. In the event storage facilities are not available on the site or at the source of fabrication, the Owner will endeavor to provide such storage space as may be available to care for same. Where this is necessary, the Contractor shall be paid for all stored material on the

Owner's property or on the properties approved by the Owner upon approval of certified invoices. It shall be the Contractor's obligation to pay for all handling costs and damage to this material. The Contractor shall protect this property against damage.

4.6 TAXES

4.6.1 The Bidder shall include in his proposal and make payment of all Federal, State, County and Municipal taxes including Michigan State Sales and Use Taxes, now in force or which may be enacted during the progress and completion of the work covered.

4.7 PERMITS, FEES AND NOTICES

4.7.3 The Contractor shall pay highway or DPW fees for damages to sidewalks, streets, or other public property or to any public utilities.

4.7.4 Permits and licenses of a temporary nature necessary for the execution of the work shall be secured and paid for by the Contractor.

4.7.5 **Except for the General Building Permit (which is not required), the Contractor shall secure and pay for all other required permits, including the following:**

Electrical	-	State of Michigan
Plumbing	-	State of Michigan
Mechanical	-	State of Michigan
Elevator-		City of Detroit

4.7.6 The Contractor shall secure certificates of inspection and of occupancy that may be required by authorities having jurisdiction over the work. These certificates shall be delivered to the Architect upon completion of the work.

4.9 SUPERINTENDENT

4.9.2 The Contractor shall give sufficient supervision to the work, using his best skill and attention. He shall carefully study and compare all drawings, specifications, and other instructions, and shall at once report to the Architect any error, inconsistency, or omission which he may discover, but he shall not be held responsible for their existence or discovery.

4.9.3 The Contractor's superintendent shall periodically inspect the entire project to make certain that all of the stipulations of all of the articles of the General Conditions are being observed.

4.12 DRAWINGS AND SPECIFICATIONS AT THE SITE

4.12.1.1 Refer to Paragraph 4.12.1, of A.I.A. General Conditions of the Contract for Construction. Modify the last sentence of this paragraph to read:

"The Drawings, marked to record all changes made during construction, shall be incorporated in the Contractor's 'Informational Package'."

4.12.2 As a basic and interim step for the fulfillment of the "Informational Package", accurate records of all non-structural underground and concealed work shall be kept, including, but not limited to, all piping, conduit, equipment, and drainage and tunnel work. In addition, such records shall be available for review during various steps of the project.

4.13 SHOP DRAWINGS AND SAMPLES

4.13.9 Immediately before and as a condition of substantial completion, the Contractor shall provide the Owner an "Informational Package" and instructional sessions on the operation, maintenance, and service of the facility. The "Informational Package" shall include:

1. One (1) set of transparency (sepia) of the approved shop drawings and descriptive material submitted during construction. Any shop documents unobtainable in sepia shall be supplied in three (3) sets.
2. One (1) set of transparency (sepia) of constructional shop drawings with all installation revisions incorporated to reflect the as-built condition. Examples of constructional shop drawings are dimensioned conduit, piping and ductwork layout drawings.
3. Three (3) sets of instructional manuals on the installation, operation, maintenance and service of equipment and systems, including parts lists.

Examples of Specific Information Required:

1. Electrical
 - a. Conduit layout of light, power, and special systems, indicating dimensionally the locations and size of runs; circuit grouping and conductor size and number in conduit runs.
 - b. System description and elementary diagrams, connection and interconnection diagrams, and device internal diagrams.
2. Mechanical
 - a. Piping and ductwork layout indicating dimensionally the location and size of the runs.
 - b. Description and diagrams of control systems.

Following the submittal of the "Informational Package", the Contractor shall schedule and provide, at the Owner's convenience, instructional sessions for Owner's personnel to acquaint them with the operation, maintenance, and service of the system.

3. Elevators
 - a. Elementary diagrams and description of sequence of operation of the system control components, connection and interconnection diagrams, and device internal diagrams.

ARTICLE 5 - SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.3 Delete Article 5.2.3 in its entirety.

5.2.4 Delete Article 5.2.4 in its entirety.

ARTICLE 7 - MISCELLANEOUS PROVISIONS (Revised 6-13-2011)

7.5 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.5.1 The successful Bidder will be required to furnish a Performance Bond and Labor and Material Payment bond in an amount equal to 100% of the contract award amount, and include such cost in the Proposal, complying with the laws of the State of Michigan. The graduated formula no longer applies.

- A. Performance Bond and Labor and Material Payment Bond shall be from a surety company acceptable to the Owner and made payable as follows:
- (1) A Labor and Material Payment bond for 100% of the contract award amount to the Board of Governors of Wayne State University, and guaranteeing the payment of all subcontractors and all indebtedness incurred for labor, materials, or any cause whatsoever on account of the Contractor in accordance with the laws of the State of Michigan relating to such bonds.
 - (2) A Performance bond for 100% of the contract award amount to the Board of Governors of Wayne State University to guarantee and insure the completion of work according to the Contract.
- B. The only acceptable Performance Bond shall be the AIA A312 – 2010.**
- C. The Contractor shall include with his bid evidence of his ability to obtain a Performance Bond in the amount of 100% of the bid amount, and in accordance with the terms and conditions outlined in this section, Such evidence shall be project specific and shall be submitted on a form provided by the Surety or Agent thereof.

7.7 ROYALTIES AND PATENTS

- 7.7.1 The Contractor hereby agrees to indemnify, protect and save harmless the Architect and the Owner from and against any and all liability, loss or damage, and to reimburse the Owner and the Architect for any expenses, including legal fees and disbursements to which the Owner or the Architect may be put because of claims of litigation on account of infringement or alleged infringement of any letters patent or patent rights by reason of the work or materials, equipment, or other items used by the Contractor in its performance.

7.9 INTEREST

- 7.9.1 Delete Article 7.9 in its entirety.

ARTICLE 8 - TIME

8.1 DEFINITIONS

- 8.1.3 The Date of Substantial Completion of the Work is the Date certified by the Architect when construction of the entire work is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the Work for the use for which it is intended. It is the beginning date for the guarantees on all the Project Work.

8.3.5 LIQUIDATED DAMAGES

It is understood that if said Contract is not completed within the time specified in the Contract plus any extension of time thereto, the Contractor shall pay Liquidated Damages to the Owner as set forth in Article 11 of the Agreement between Contractor and Owner for Construction.

ARTICLE 9 - PAYMENT AND COMPLETION

9.3 PROGRESS PAYMENTS

- 9.3.1 On or before the 20th day of each month, the Contractor shall submit to the Architect on the Owner's Standard Form, a written application for payment showing the proportionate value of the work installed to date from which shall be deducted, a reserve of 10% and all previous payments, and the balance of the amount as approved by the Architect shall be due and payable to the Contractor on or about the 15th day of the succeeding month.

- 9.3.2.2 No payments will be made because of materials or equipment stored off the site, except as provided for in Subparagraph 4.4.5 of the Supplementary General Conditions or other special cases the Owner may approve.

9.6 FAILURE OF PAYMENT

9.6.1 Delete Article 9.6 in its entirety.

ARTICLE 11 - INSURANCE (Revised 3-22-2012)

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability specified herein, or required by law, whichever is greater, and shall include contractual liability insurance as applicable to the Contractor's obligations under Paragraph 4.18.

During the life of the Contract, the Contractor shall maintain the following types of insurance:

A. General Requirements

<u>Type of Insurance</u>	<u>Minimum Requirement</u>	
1. Comprehensive General Liability	Bodily Injury	\$ 500,000 each person \$1,000,000 aggregate
	Property Damage	\$ 500,000 each occurrence \$1,000,000 aggregate <u>or</u> \$2,000,000 combined single limit (CSL)
2. Fire Legal Liability		\$ 100,000
3. Comprehensive Automobile Liability (including Hired and non-owned vehicles)	Bodily Injury	\$ 500,000 each person \$1,000,000 each accident
	Property Damage	\$ 500,000 each accident <u>or</u> \$2,000,000 combined single limit (CSL)
4. Workers' Compensation (Employer's Liability)	Statutory - Michigan	\$100,000
5. Property - All Risk	In an amount sufficient to cover the total value of the contractor's property in the care, custody or control of WSU.	

B. Maximum Acceptable Deductibles

<u>Type of Insurance</u>	<u>Maximum Deductible</u>	
Comprehensive General Liability	\$5,000	
Fire Legal Liability		\$5,000
Comprehensive Automobile Liability	-0-	
Workers' Compensation	-0-	
Property - All Risk	\$ 500	

11.1.3 The Board of Governors, Wayne State University, shall be named as an additional insured but only with respect to accidents arising out of the performance of said contract. The contractor shall prepare a certificate of insurance which shall name the "Office of Risk Management; 5700 Cass Avenue" as the Wayne State University certificate holder.

11.1.3.1 The Contractor shall either 1) require each of his Subcontractors to procure and to maintain during the life of his subcontract, Subcontractors' Comprehensive General Liability, Automobile Liability and Property Damage Liability Insurance of the type and in the same amounts as specified in the Subparagraph, or 2) insure the activity of his subcontractors in his own policy.

11.2 OWNER'S LIABILITY INSURANCE

Delete Article 11.2 in its entirety.

11.3 PROPERTY INSURANCE

Delete Article 11.3 in its entirety and replace with the following:

11.3.1 The Contractor shall purchase and maintain property insurance upon the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the Owner, the Contractor, Subcontractors, and sub-subcontractors in the work and shall insure against the perils of Fire, Extended Coverage, Vandalism, and Malicious Mischief.

11.3.2 The Owner and Contractor waive all rights against each other for damages caused by fires or other perils to the extent covered by insurance provided under Subparagraph 11.3.1. The Contractor shall require similar waivers by Subcontractors and sub-subcontractors in accordance with Clause 5.3.1.5.

11.3.3 Insurance must be issued by an insurance company with an "A rating as denoted in the AM Best Key Rating Guide".

ARTICLE 12 - CHANGES IN THE WORK

12.1 CHANGE ORDERS

12.1.8 Percentage markups in pricing under Subparagraphs 12.1.3.1, 12.1.3.3, and 1.2.4 shall be as limited in the Contract Documents. Unit price of Subparagraph 12.1.3.2 shall represent total unit cost to the Owner and shall include the Contractor's markup for overhead and profit.

ARTICLE 14 - TERMINATION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 If the work is stopped for a period of thirty days under any order of any court or other public authority having jurisdiction, or as a result of any act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the contract or a subcontractor or their agents or employees or other persons performing any of the Work under a contract with the contractor, then the contractor may, upon seven days' written notice to the Owner and the Architect, terminate the contract and recover from the Owner payment for all Work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment, and machinery, including reasonable profit and damages.

ARTICLE 15 - ADDITIONAL CONDITIONS

15.1 SUBSTITUTION OF MATERIALS AND EQUIPMENT

15.1.1 Whenever a material, article, or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors, which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or piece of equipment so proposed is, in the opinion of the Architect, of equal substance, appearance, and function. It shall not be purchased or installed by the Contractor without the Architect's written approval.

15.2 NON-DISCRIMINATION PROVISION AND WAGE AND HOUR ACT

15.2.1 During the performance of this contract, the Contractor agrees as follows:

15.2.1.1 The Contractor shall not discriminate against any employee or applicant for employment because of sex, race, creed, color, age, or national origin. The Contractor will take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to

their sex, race, age, creed, color, or national origin.

- 15.2.1.2 Such action shall include but not be limited to, the following: employment; upgrading; demotion; or transfer; recruitment or recruitment advertising; layoff or terminations; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this non-discrimination clause.
- 15.2.1.3 The Contractor will, in all solicitations, or advertisements for employees, placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to sex, race, creed, color, age or national origin.
- 15.2.1.4 The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or worker's representative of the Contractor's commitments under Section 202 of Executive Order No. 11246 of October 27, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- 15.2.1.5 The Contractor will comply with all provisions of the Executive Order No. 11246 of October 27, 1965, and of the rules, regulations and relevant orders of the Secretary of Labor or other government agency or authority having jurisdiction.
- 15.2.1.6 The Contractor will furnish all information and reports required by Executive Order No. 11246 of October 27, 1965, and by the rules, regulations, and orders of the Secretary of Labor or other government agency or authority having jurisdiction, and will permit access to his books, records, and accounts by the administrative agency and the Secretary of Labor for the purposes of investigation to ascertain compliance with such rules, regulations and orders.
- 15.2.1.7 In the event of the Contractor's noncompliance with the non-discrimination clauses of this contract, or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further University contracts or federally-assisted contracts in accordance with procedure authorized in Executive Order No. 11246 of October 27, 1965, or by rule, regulation, or order of the Secretary of Labor or other government agency or authority having jurisdiction.
- 15.2.1.8 The Contractor will include in the provisions of Subparagraph 15.2.1.1 through 15.2.1.8 in every subcontract or purchase order unless exempted by rules, regulations or orders of the President's Committee on Equal Employment Opportunity issued pursuant to Section 204 of Executive Order No. 11246 of September 14, 1965, so that provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the Contractor becomes involved as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.
- 15.3 COMPLIANCE WITH COPELAND ANTI-KICKBACK ACT AND REGULATIONS
- 15.3.1 The Contractor shall comply with the Copeland Anti-Kickback Act and Regulations of the Secretary of Labor (29CFR, Part 3) which are herein incorporated by reference.
- 15.4 PREVAILING WAGES
- 15.4.1 Contractors and subcontractors shall pay all mechanics and laborers, including apprentices and trainees, no less than the wage and fringe benefit rates prevailing in the locality in which the work is performed. Wage and fringe benefit rates are determined by the Federal Government Department of Labor.
- 15.4.2 Classifications not provided in the schedule shall be determined prior to the award of the contract and shall be no less than the wage and fringe benefit rates determined by the Federal Department of Labor.

- 15.4.3 Contractors and subcontractors shall adhere to the ratios of apprentices to journey workers as determined by the Federal Department of Labor.
- 15.4.4 Contractors and subcontractors shall keep a copy of the prescribed wage and benefit rates posted at the construction site in a conspicuous place.
- 15.4.5 Contractors and subcontractors shall keep an accurate record of the name, occupation, and the actual benefits paid to each mechanic or laborer for the contract. This record shall be made available for reasonable inspection by the Federal Department of Labor and the Owner.

DRAWINGS

The Technical Specifications dated **October 24, 2014** and the following List of Drawings represent the scope of work as defined in the Contract Documents from Article 4.

DRAWINGS

Drawing No.:	Description	
<u>Title Drawing Index</u>		
G-1	Title Sheet	October 24, 2014
<u>Electrical Drawing Index</u>		
E-1	General Electrical Information	October 24, 2014
E-2	Enlarged Floor Plans Electrical And Details	October 24, 2014
<u>Technology Drawing Index</u>		
T-1	General Technology Information	October 24, 2014
T-2	MDF Room Eighth Floor & Enlarged Plans	October 24, 2014
T-3	Floor Plan Technology Floor 1	October 24, 2014
T-4	Floor Plan Technology Floor 2	October 24, 2014
T-5	Floor Plan Technology (Typical for Floors 3-7)	October 24, 2014
T-6	Floor Plan Technology (Typical for Floors 8-15)	October 24, 2014
T-7	Technology Backbone Riser Diagram and Details	October 24, 2014

GENERAL REQUIREMENTS**GENERAL****A. CONTRACTOR'S RESPONSIBILITY**

It is not the responsibility of the Architect/Engineer or Owner's Representative to notify the Contractor or subcontractors when to commence, to cease, or to resume work; nor in any way to superintend so as to relieve the Contractor of responsibility or of any consequences of neglect or carelessness by him or his subordinates. All material and labor shall be furnished at times best suited for all Contractors and subcontractors concerned, so that the combined work of all shall be properly and fully completed on the date fixed by the Contract.

The Contractor shall be responsible for all items contained in both the specifications and on the drawings for all trades. He shall be responsible for the proper division of labor according to current labor union agreements regardless of the division of responsibility implied in the contract documents.

B. CODES AND STANDARDS

Reference to standard specifications for workmanship, apparatus, equipment and materials shall conform to the requirements of latest specifications of the organization referenced, i.e., American Society for Testing Materials (ASTM), Underwriters Laboratories, Inc. (UL), American National Standards Institute, Inc. (ANSI), and others so listed in the Technical Specifications.

C. PERMITS, FEES AND NOTICES

See Supplementary General Conditions.

D. MEASUREMENTS

Before proceeding with each Work Item, Contractor shall locate, mark and measure any quantity or each item and report quantities to Engineer. If measured quantities exceed Engineer's estimate, Contractor shall obtain written authorization to proceed from Owner before executing Work required for that Work Item.

Measurement of quantities for individual Work Items will be performed by Contractor and reviewed by Engineer. Coordinate measurements with inspection as required in Section "Coordination."

Cost of Work included in Work Item for quantities as indicated in Contract Documents shall be included in Base Bid.

1. Additions to or deductions from lump sum price for quantities of each Work Item added to or deducted from Work respectively shall be at unit prices indicated in Bid Form and shall constitute payment or deductions in full for all material, equipment, labor, supervision and incidentals necessary to complete Work.

E. CONTRACTOR'S MEASUREMENTS

Before ordering material, preparing Shop Drawings, or doing any work, each Contractor shall verify, at the building, all dimensions which may affect his work. He assumes full responsibility for the accuracy of his figures. No allowance for additional compensation will be considered for minor discrepancies between dimensions on the drawings and actual field dimensions.

F. CONTINUITY OF SERVICE (*Revised 3-26-2012*)

Continuity of all existing services in the building shall be maintained throughout the construction period. Where it is necessary to tie into the existing electrical service, water or waste systems, it shall be done as directed by the Architect/Engineer. This Contract shall also provide temporary lines or bypasses that may be required to maintain continuous service in the building. All utility shutdowns must be approved by the Owners Representative / Project Manager, not less than **7 business days** prior to the event, so that proper notification can be posted.

G. SUBMITTALS

All submittals (except Shop Drawings) and samples required by the Specifications shall be submitted in triplicate unless otherwise specified for a particular item under an individual Specification Section.

Each sample shall be clearly identified on a tag attached, showing the name of the Project Consultant, the project number and title, the names of the Contractor, manufacturer (and supplier if same is not the manufacturer), the brand name or number identification, pattern, color, or finish designation and the location in the work.

Each submittal shall be covered by a transmittal letter, properly identified with the project title and number and a brief description of the item being submitted.

Contractor shall be responsible for all costs of packing, shipping and incidental expenses connected with delivery of the samples to the Project Consultant or other designated address.

If the initial sample is not approved, prepare and submit additional sets until approval is obtained.

Materials supplied or installed which do not conform to the appearance, quality, profile, texture or other determinant of the approval samples will be rejected, and shall be replaced with satisfactory materials at the Contractor's expense.

H. GENERAL/STANDARD ELECTRONIC EQUIPMENT AND INFRASTRUCTURE REQUIREMENTS (*Revised 11-2008*)**1. Compliance with WSU Standards for Communications Infrastructure**

- A. All applicable work, products, materials and methods shall comply with the latest version of the "WSU Standards for Communications Infrastructure" except as where noted.
- B. This document is available at the following website/URL: **<http://networks.wayne.edu/WSU-Communications-Standards.pdf>**

2. Automation System Program Code

- A. All automation system uncompiled and compiled program codes, source codes, custom modules, graphical user interface screen shots and any other automation system programming data and material (Program Code) shall be provided to the UNIVERSITY in hard copy and on CD Rom in an unencrypted format acceptable to the UNIVERSITY.
- B. Copyright for the Program Code shall be assigned to the UNIVERSITY for purposes of system maintenance.

PROTECTION OF OCCUPANCY (*Revised 3-2006*)**A. FIRE PRECAUTIONS**

Take necessary actions to eliminate possible fire hazards and to prevent damage to construction work, building materials, equipment, temporary field offices, storage sheds, and other property.

During the construction, provide the type and quantity of fire extinguishers and fire hose to meet safety and fire prevention practices by National Fire Protection Association (NFPA) Codes and Standards (available at <http://www.nfpa.org/>)

In the event that construction includes "hot work", the contractor shall provide the Owner's Representative with a copy of their hot work policy, procedures, or permit program. No hot work activity (temporary maintenance, renovation, or construction by operation of a gas or electrically powered equipment which produces flames, sparks or heat that is sufficient to start a fire or ignite combustible materials) shall be performed until such documents are provided. During such operations, all highly combustible or flammable materials shall be removed from the immediate working area, and if removal is impossible, same shall be protected with flame retardant shield.

Not more than one-half day's supply of flammable liquids such as gasoline, spray paint and paint solvent shall be brought into the building at any one time. Flammable liquids having a flash point of 100 degrees F. or below which must be brought into the building shall be confined in an Underwriters Laboratories (UL) labeled safety cans. The bulk supply of flammables shall be stored at least 75 feet from the building and other combustible materials. Spigots on drums containing flammable liquids are prohibited on the project site. Drums shall be equipped with approved vented pumps, and be grounded and bonded.

Only a reasonable working supply of combustible building materials shall be located inside the building.

All oil-soaked rags, papers, and other similar combustible materials shall be removed from the building at the close of each day's work, or more often if necessary, and placed in metal containers, with self-closing lids.

Materials and equipment stored in cardboard cartons, wood crates or other combustible containers shall be stored in an orderly manner and accessibly located, fire-fighting equipment of approved types shall be placed in the immediate vicinity of any materials or equipment stored in this type of crate or carton.

No gasoline, benzene, or like flammable materials shall be poured into sewers, manholes, or traps.

All rubbish shall be removed from the site and legally disposed of. Burning of rubbish, waste materials or trash on the site shall not be permitted.

The contractor shall be responsible for the conduct of employees relative to smoking and all smoking shall be in the area designated by the Architect/Engineer.

B. GENERAL SAFETY AND BUILDING PRECAUTIONS

Provide and maintain in good repair barricades, railings, etc., as required by law for the protection of the Public. All exposed material shall be smoothly dressed.

At dangerous points throughout the work environment provide and maintain colored lights or flags in addition to above guardrails.

Isolate Owner's occupied areas from areas where demolition and alteration work will be done, with temporary, dustproof, weatherproof, and fireproof enclosures as conditions may require and as directed by the Architect/Engineer.

Cover and protect furniture, equipment and fixtures to remain from soiling, dust, dirt, or damage when demolition work is performed in rooms or areas from which such items have not been removed.

Protect openings made in the existing roofs, floors, and other construction with weatherproof coverings, barricades, and temporary fire rated partitions to prevent accidents.

Repair any damage done to existing work caused by the construction and removal of temporary partitions, coverings, and barricades.

The Contractor will be held responsible for all breakage or other damage to glass up to the time the work is completed.

Provide protection for existing buildings, interior and exterior, finishes, walls, drives, landscaping, lawns (see below), etc. All damages shall be restored to match existing conditions to the satisfaction of the Architect/Engineer.

The Contractor and Owner will define the anticipated area of lawn damage at the project Pre-Construction Meeting. Whether the lawn is sparse or fully developed, any lawn damaged due to the Contractor's work will be replaced with sod by the University. The University's unit cost of \$10.00 per square yard and landscaping at a rate of 1.5 times the cost of the sod repairs, the full cost of which will be assessed against the Contractor. At the completion of the project, a deductive Change Order reflecting this cost will be issued.

The Contractor is to include an allowance in his bid for this corrective work.

C. INTERFERENCE WITH OWNER'S OPERATIONS

The Owner will be utilizing the Building Facilities to carry on his normal business operation during construction. The Contractor shall schedule performance of the work necessary to complete the project in such a way as to interfere as little as possible with the operation during construction. The Contractor shall schedule performance of the work necessary to complete the project in such a way as to interfere as little as possible with the operation of the Owner.

Work which will interfere with the Owner's occupancy, including interruptions to the Owner's mechanical and electrical services, and essentially noisy operations (such as jackhammering) shall be scheduled in advance. The schedule of alterations shall be approved by the Architect/Engineer and the work shall be done in accordance with the approved schedule.

It is understood that the work is to be carried through to completion with the utmost speed consistent with good workmanship and to meet the construction schedule.

The Contractor shall begin work under the Contract without delay upon receipt of the fully-executed contract and shall substantially complete the project ready for unobstructed occupancy and use of the Owner for the purposes intended within the completion time stated in the contract.

The Contractor shall, immediately upon award of contract, schedule his work and expedite deliveries of materials and performance of subcontractors to maintain the necessary pace to meet the construction schedule.

CONTRACTOR'S REPRESENTATION AND COORDINATION**A. FIELD SUPERINTENDENT**

Contractor shall assign a full time project manager/superintendent for the duration of the project. This person shall be experienced and qualified in all phases of the work and shall be present at the site during Contractor's working hours. The project manager shall have Contractor's full authority to represent Contractor in all routine operations including payment, changes to the work, and scheduling. Contractor shall not re-assign this individual without prior written permission of the Owner.

B. MEETINGS

When directed by the Architect/Engineer, meetings shall be held for the purpose of coordinating and expediting the work. The invited contractors or subcontractors will be required to have qualified representatives at these meetings, empowered to act in their behalf.

C. COORDINATION

The Contractor shall also provide a staff adequate to coordinate and expedite the work properly and shall at all times maintain competent supervision of its own work and that of its subcontractors to insure compliance with contract requirements.

The Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work under the Contractor.

D. CONSTRUCTION SCHEDULE

The Construction Schedule shall be prepared after the award of contract. Soon after, a pre-construction meeting is held with the Owner and the Architect/Engineer to determine the areas to which the Contractor will be allowed access at any one time.

The Contractor is alerted to the fact that areas in which he will be working will be occupied by students and employees of the University as well as the general public. The Contractor's access, to and from the project site, will be confined to limited areas so as not to unduly disrupt the normal activities of the University.

TEMPORARY FACILITIES

A. GENERAL

The following temporary facilities descriptions represent standard conditions. Verify accuracy with Architect/Engineer at time of bids.

B. CONTRACTOR'S OFFICE

Provide field offices as required. Locate temporary field offices on site where directed by Architect/Engineer.

Appearance and location of field offices shall be approved by the Architect/Engineer.

Provide for all other administrative facilities and storage off the Owner's property.

C. STORAGE OF MATERIALS

All materials shall be stored in areas designated by the Architect/Engineer. All stored materials shall be arranged for the minimum disruption to occupants and to allow full access to and throughout the building. Materials stored outdoors shall be neat and orderly and covered to prevent damage or vandalism.

D. PARKING**1. GENERAL**

University parking regulations will be strictly enforced.

Maintain Owner's parking areas free of dirt and debris resulting from operations under the contract.

2. STANDING AND UNLOADING/LOADING VEHICLES

All Contractors are to call Wayne State University Public Safety at 577-2222, and give at least 24 hours advance notice that they have vehicles that must be at the job site.

Vehicles will be permitted at the project site only as long as the vehicles are needed for loading/unloading, and must be immediately moved upon completion.

All unauthorized and/or unattended standing vehicles will be subject to ticketing and removal by University Police. Towed vehicles may be reclaimed by calling 577-2222, and paying any assessed charges.

3. COMPLIMENTARY PARKING

There is no complimentary parking for Contractor's employee vehicles.

4. WAYNE STATE UNIVERSITY PUBLIC/STUDENT PARKING AREAS

Public Parking, on a first-come first-served basis is available. Contact the office of the One Card System, at 313.577.9513 for information on availability of parking on a contractual basis.

E. TOILET FACILITIES

The Owner's designated existing toilet facilities may be used by workers on the project. Contractor shall maintain such facilities in a neat and sanitary condition.

F. TELEPHONE USE

If required, the Contractor shall provide and pay for a temporary telephone within the building for his use and that of his subcontractors.

No use of the Owner's telephone (except pay telephones) will be permitted.

G. ACCESS DEVICES

The Contractor shall furnish and maintain temporary hoists, ladders, railings, scaffolds, runways, and the like as required for safe, normal access to the permanent construction until the permanent facilities are complete. Each trade shall furnish such additional means of access as may be required for the progress and completion of the work. Such temporary access devices shall meet all applicable local, state, and federal codes and regulations.

H. HEAT AND VENTILATION

Provide cold weather protection and temporary heat and ventilation as required during construction to protect the work from freezing and frost damage.

Provide adequate ventilation as required to maintain reasonable interior building air conditions and temperatures, to prevent accumulation of excess moisture, and to remove construction fumes.

Tarpaulins and other materials used for temporary enclosures. Coverings and protection shall be flameproofed.

I. WATER SERVICE

Sources of water are available at the site. The Owner will pay for reasonable amounts of water used for construction purposes.

The Contractor shall provide, at the earliest possible date, temporary connections to the water supply sources and maintain adequate distribution for all construction requirements. The Contractor shall protect sources against damage.

Methods of conveying this water shall be approved by the Architect/Engineer and shall not interfere with the Owner's operations.

J. ELECTRICAL SERVICES

All charges for reasonable amounts of electrical power energy used for temporary lighting and power required for this work will be paid by the Owner.

The Contractor shall provide and maintain any temporary electrical lighting and power required for this work. At the completion of the work, all such temporary electrical facilities shall be removed and disposed of by the Contractor.

Temporary lighting and power shall comply with the regulations and requirements of the National Electrical Code

INSPECTIONS AND TESTS

The Architect/Engineer shall at all times have access to the work wherever it is in preparation or in progress and the Contractor shall provide proper facilities for such access and for observation.

No failure of the Architect/Engineer, during the progress of the work, to discover or reject materials or work not in accordance with the Contract Specifications and Drawings shall be deemed an acceptance thereof nor a waiver of defects therein. Likewise, no acceptance or waiver shall be inferred or implied due to payments made to contractor or by partial or entire occupancy of the work, or installation of materials that are not strictly in accordance with the Contract Specifications and Drawings.

Where tests are specifically called for in the Specifications, the Owner shall pay all costs of such tests and engineering services unless otherwise stated in the contract.

Where tests are not specifically called for in the Specifications, but are required by the Architect/Engineer or Consultant, the Owner shall pay all costs of such tests and engineering services unless the tests reveal that the workmanship or materials used by the Contractor are not in conformity with the Drawings, Specifications, and/or approved shop drawings. In such event, the Contractor shall pay for the tests, shall remove all work and materials so failing to conform and replace with work and materials that are in full conformity.

CLEAN-UP

The Contractor shall at all times keep the Owner's premises and the adjoining premises, driveways and streets clean of rubbish caused by the Contractor's operations and at the completion of the work shall remove all the rubbish, all of his tools, equipment, temporary work and surplus materials, from and about the premises, and shall leave the work clean and ready for use. If the contractor does not attend to such cleaning immediately upon request, the Architect/Engineer may cause such cleaning to be done by others and charge the cost of same to the Contractor.

The Contractor will be responsible for all damage from fire that originates in, or is propagated by, accumulations of rubbish or debris.

All rubbish and debris shall be disposed of off the Owner's property in an approved sanitary landfill site. No open burning of debris or rubbish will be permitted. Job site shall be left neat and clean at the completion of each day's operation.

PROJECT CLOSE-OUT

A. RECORD DRAWINGS

At beginning of job, provide one copy of Working Drawings, and record changes, between Working Drawings and "As Builts", including changes made by Addenda, Change Orders, Shop Drawings, etc. These shall be kept up to date. Update to indicate make of all mechanical and electrical equipment and fixtures installed. Keep these Record Prints in good condition and available for inspection by the Architect/Engineer.

Upon completion of the job, turn over to the Architect/Engineer Record Prints of Working Drawings showing all job changes.

B. OPERATING AND MAINTENANCE DATA

Prepare and furnish to the Architect/Engineer three (3) bound copies of "Operating and Maintenance Manual" on all equipment installed under this Contract.

Manual shall include copies of all Manufacturers' "Operating and Service Instructions", including Parts List, Control Diagrams, Description of Control Systems, Operating, Electrical Wiring, and any other information needed to understand, operate and maintain the equipment. The names and addresses of all subcontractors shall be included. These instructions shall be custom-prepared for this job -- catalog cuts will **not** be accepted. Equipment shall be cross-referenced to Section of Specifications and to location shown and scheduled on drawings.

Include Test-Adjust-Balance Report in the Manual.

C. FINAL INSPECTION

Secure final inspections from the State of Michigan as soon as the work is completed and immediately submit such Certificates to the Architect/Engineer.

D. GUARANTEES (See Sections 00510 and 01781)

Guarantees on material and labor from the General Contractor and his subcontractors shall be as required in Sections 00510 and 01781.

E. SWORN STATEMENT AND WAIVER OF LIENS (*revised 4-11-2012*)

Prior to final payment, the General Contractor shall provide a Contractor's Sworn Statement and Full Unconditional Waivers of Liens from all subcontractors for material and labor and from all suppliers who provide materials exceeding \$1,000. Sworn Statements and signed waivers from all Subcontractors must accompany Pay Applications or they will be returned for such documentation prior to approval.

ASBESTOS HAZARD

- A. The contractor shall not start any work in any area that has not been inspected for asbestos by the Owner's Industrial Hygiene Department, or a qualified representative of the Owner and approval is given for work to be done. If asbestos is found, safety measures as recommended by the Owner's Industrial Hygiene Department, or a qualified representative of the Owner, shall be completed, or approval given for work to be done before work is started. The contractor shall not perform any asbestos removal or containment work under the contract.

KEYS

- A. The Owner shall provide the contractor keys on loan to have access to the various spaces in order to complete the contract. Contractor will sign for and be responsible for each key on loan, returnable to Owner upon completion of the contract. In case of any lost keys, the Owner will backcharge the contract \$250.00 for each core change. In the event that a Contractor wants access to a secured area, he shall give the Owner a minimum 48-hour notice.

SUMMARY OF WORK

SUMMARY OF WORK

PROJECT: DeRoy Apartments Connectivity

WSU PROJECT NO.: Project No. 134-243844

PROJECT MANAGER: Thomas J. Edwards

1. EXAMINATION

The Contractor shall visit the site and become familiar with conditions under which he will be working. Also meet with the project manager and review site access, storage areas, etc.

2. Description of Work – Project includes **The scope will include re-routing existing cable and racks, relocating existing wireless rack on the 8th floor to an adjacent room and creating a new MDF room in this location to distribute new cabling to locations on all floors..**

3. The building is located at

Wayne State University
5200 Anthony Wayne Drive
Detroit, Michigan 48202



DiClemente Siegel Design Inc.
28105 Greenfield Road Southfield, MI 48076-3046
248.569.1430 FAX 248.569.0096
Engineering and Architecture

Wayne State University

**DeRoy Apartments
DeRoy Apartment Connectivity
5200 Anthony Wayne Drive
Detroit, MI**

WSU Project Number 134-243844

BIDS 10-24-14

SPECIFICATIONS

DSD Project No. 14-4801.00

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SECTION 260100 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide all equipment, materials, labor and services necessary to furnish, install, test and turn over to the Owner the following electrical work as required by these specifications and as shown on the drawings, including all shop drawings, test reports, record drawings, operations and maintenance manuals, Owner training and incidental items necessary to complete the project in every respect.
- B. The work shall include, but not be limited to the following:
- Provision of all wireways, conduits, surface raceways, and associated fittings for all feeders and branch circuits as indicated or required.
 - Provision of all pull and junction boxes as indicated or required.
 - Provision of all building wiring and connections for all feeder and branch circuits as indicated or required.
 - Conduit sleeves through walls and floors as indicated on the drawings.
 - Prior to core drilling concrete floors, electrical trades shall test for the presence of existing building systems piping and electrical conduits using an impulse induction type scanner. Refer to Section 260100, Item 3.7 (E).

1.2 RELATED SECTIONS

- A. The drawings and the general provisions of the contract, apply to each section of the Divisions 26 and 28 specifications.

1.3 REFERENCES

- A. Provide equipment and materials that conform to the applicable standards of the following organizations:
1. American National Standards Institute (ANSI).
 2. Institute of Electrical and Electronic Engineers (IEEE).
 3. National Electrical Manufacturers Association (NEMA).
 4. National Fire Protection Association (NFPA).
- B. All materials and equipment shall be listed and labeled by Underwriters Laboratories (UL), Electrical Testing Laboratories (ETL) or MET Laboratories (MET).
- C. Install equipment and materials in compliance with the following:
1. National Electrical Code (NEC).

2. Life Safety Code (NFPA-101).
3. Michigan Building Code (MBC).
4. Michigan Mechanical Code (MMC).
5. State of Michigan DLEG Bureau of Fire Services.
6. Owner's Inspection Authorities.
7. Manufacturers' instructions.
8. NFPA.
9. ADA & Michigan Barrier Free.
10. Michigan Rehabilitation Code for Existing Buildings.
11. Michigan Fire Prevention Code.
12. MIOSHA Standards.

1.4 DESIGN DOCUMENTS

- A. Contact the Owner's Representative about design questions and discrepancies between design documents before performing the work.
- B. Notify the Owner's Representative if existing code violations are uncovered that are not addressed in the design documents.

1.5 SUBMITTALS

- A. Proposed Product List: Include products specified in the following sections:
 - Section 260100 – Basic Electrical Requirements.
 - Section 260500 – Basic Electrical Materials and Methods.
 - Section 260519 – Cables and Wires.
 - Section 260526 – Grounding.
 - Section 269950 – WSU Preferred Manufacturers List.
- B. Submit for approval copies of shop drawings and product literature for the following equipment. Submittals shall include adequate information to prove that the systems, equipment and materials comply with the contract documents. Each copy of the submittals shall be marked to indicate the specific models, sizes, types and options being provided. Submittals not so marked will be rejected.
 1. Cable and Wires.
- C. Participate in the coordination drawing process and submit coordination drawings for approval.

1.6 RECORD DOCUMENTS

- A. Submit record drawings in electronic format (AutoCAD) for approval. Show the locations of equipment, riser information, the sizes of conduits and conductors, circuit numbers, and deviations from the design.

1.7 OPERATIONS AND MAINTENANCE MANUALS

- A. Submit for approval copies of operations and maintenance manuals. Each copy of the manuals shall be marked to indicate the specific models, sizes, types and options of the systems and equipment that were provided. Manuals not so marked will be rejected.

1.8 TRAINING

- A. Arrange for manufacturers to train The Owner's Personnel on the operation and maintenance of systems and equipment. Training shall not take place until Maintenance Personnel have been given 2 weeks to review the approved operations and maintenance manuals. Notify the Owner's Representative 3 working days in advance of training sessions.
- B. Walk the Owner's Maintenance Personnel through the project and identify the locations of electrical equipment hidden from plain view.
- C. Inform The Owner's Maintenance Personnel of changes to existing power distribution systems, fire alarm system and other special systems that could affect their maintenance activities.

1.9 QUALITY ASSURANCE

- A. Electrical work shall be performed by licensed Journeyman or registered Apprentice Electricians. The number of Apprentices on a project shall not exceed the number of Journeymen. Electricians shall carry a copy of their license or registration while working on The Owner's projects.
- B. Contact the Owner's Inspection Department before starting the project to arrange for periodic inspections. Normal inspections will be performed at no cost to the Contractor, but the costs for repeat re-inspections of rejected work may be deducted from the Contractor's final payment.

1.10 WARRANTY

- A. Guarantee work for a period of one year from the date of the Owner's final acceptance of the project (Substantial Completion). A manufacturer's warranty beginning upon equipment receipt or startup shall be extended to one year from final project acceptance. A manufacturer's warranty in excess of one year shall remain in effect for its entire time period.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SUBSTITUTIONS

- A. Provide equipment and materials from the manufacturers specified. Substitutions for specified products are acceptable only if proposed and approved in writing at the time of bid.

3.2 ELECTRICAL COORDINATION

- A. All Contractors must obtain approval from the University Project Manager prior to interrupting existing services. All service interruptions shall be at a time approved by the University. Include specification language covering off hours tie-ins.

3.3 SHIPPING, HANDLING AND STORAGE

- A. For deliveries of equipment to the Owner, notify the Owner's Representative of the deliveries 3 working days in advance. Deliveries shall occur on normal workdays between 8:00 AM and 2:00 PM. Deliveries that arrive without adequate notice may be rejected.

3.4 DEMOLITION

- A. Protect adjacent building services and materials indicated to remain. Install and maintain barriers to keep dirt, dust and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition is completed.

3.5 CLEANUP

- A. Remove and legally dispose of demolished items, rubbish and debris from the construction site daily, and at the completion of the work. Failure to do so may result in the cleanup being performed by others and all costs thereof being deducted from the Contractor's final payment.

3.6 EQUIPMENT PROTECTION

- A. Protect equipment and materials during shipment, storage and construction against damage and contamination.
- B. Items that become damaged or contaminated shall be restored to a "like new" condition or replaced at the Contractor's expense.

3.7 WORK PERFORMANCE

- A. Locate equipment as close as practical to the locations shown on the drawings. Should field conditions prevent the installation of equipment or materials as indicated on the drawings, make any deviations only with the prior approval of the Owner's Representative.
- B. Install and connect new work to existing work neatly and carefully. Existing work that is disturbed shall be repaired or replaced as necessary to restore it to its prior condition.
- C. Coordinate to ensure completion consistent with the project schedule. Do not unduly delay the startup, testing or turnover of project systems.

- D. Coordinate work to ensure a safe working space around electrical equipment and to ensure access to equipment requiring maintenance. Working space and access shall be sufficient for an adult to perform maintenance tasks safely without straddling or removing obstructions. Electrical work that encroaches on working space or that impedes maintenance shall be relocated at the Contractor's expense.
- E. Prior to core drilling concrete floors, test for the presence of electrical conduits. Use an impulse induction type scanner capable of detecting both metallic conduits and copper wires in PVC conduits. Tracers that scan for energized cables or that scan for injected high frequency signals are not acceptable. Notify the Owner's Inspection Department prior to all tests. Prior to core drilling, arrange for the Owner's Representative to notify building occupants of the potential for an unscheduled power outage. Conduits damaged during core drilling shall be restored immediately at the Contractor's expense.

3.8 EQUIPMENT AND WIRING IDENTIFICATION AND COLOR CODING

- A. Provide nameplates indicating equipment names or numbers and power sources as specified in Section 260500.
- B. Paint fire alarm system junction boxes and covers as specified in Section 260500.
- C. Conduits used for fire alarm system wiring shall be factory painted red: equal to "True Color" EMT as manufactured by Allied Tube & Conduit (size as indicated on drawings).
- D. Mark junction box covers with the panel and breaker numbers of the circuits contained within as specified in Section 260500.
- E. Color code and identify wiring in accordance with Section 260519

3.9 FIELD QUALITY CONTROL

- A. Arrange for testing of electrical systems, equipment and materials prior to final acceptance of the work. Acceptance tests shall be performed in accordance with Section 269500, and applicable codes, standards and manufacturers' instructions.
- B. Provide all test equipment, materials and labor necessary to perform the tests.
- C. Notify the Owner's Representative 3 working days in advance of tests. The Owner shall witness the tests unless the Owner's Representative waives such witnessing in writing.
- D. Notify manufacturers sufficiently in advance of tests for which the manufacturers should be present.
- E. Replace any equipment or materials found to be defective or found to be of lesser quality than that specified or shown on the drawings.
- F. Provide written test reports, signed and dated, for all tests prior to acceptance of the electrical equipment by the Owner.

END OF SECTION 260100

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide conduits, surface raceways, boxes, fittings and supports to form a complete, coordinated, and continuously grounded raceway system.

1.2 CONDUIT REQUIREMENTS

- A. Install conduit in accordance with NFPA 70 "Standard of Installation".
- B. Conduits indoors in general areas shall be electrical metallic tubing (EMT) with steel set screw fittings.
- C. Conduits used for fire alarm system wiring shall be factory painted red: equal to "True Color" EMT as manufactured by Allied Tube & Condit (size as indicated on drawings).
- D. Conduits indoors in hazardous areas or subjected to water, physical damage or abuse shall be galvanized rigid steel (RS) or intermediate metal conduit (IMC) with cast or malleable iron threaded fittings and bushings.
- E. Connections to recessed junction boxes, in areas with accessible ceilings:
 - 1. In existing 'metal stud and gypsum board partitions (walls)', where the wall is not being otherwise opened up, the final connections to new devices may be made flexible conduit and standard (separate) conductors. This flexible conduit shall:
 - a. Be increased in size as necessary to maintain the proper fill for the wiring to be installed.
 - b. Shall be installed and secured as required by NEC.
 - c. Shall be as short as it is necessary to serve the need and meet the NEC.
 - 2. In all other wall types and conditions use standard conduit, of the type appropriate for the wall construction.

1.3 SURFACE RACEWAY REQUIREMENTS

- A. When conduits in finished areas cannot be concealed in walls or above ceilings, surface raceways may be used where permitted. Boxes and fittings shall match and be from the same manufacturer as the raceways.

1.4 BOX REQUIREMENTS

- A. Provide sheet steel outlet boxes, extensions, and plaster rings for EMT and flexible metal conduit.
- B. Provide cast or malleable iron outlet boxes and covers for galvanized rigid steel conduits, intermediate metal conduits, and liquid tight flexible metal conduits.

- C. Boxes shall be sized for all conductors and devices to be contained within. Box extensions shall not be used to correct for undersized boxes. A single extension may be used as follows only if all free conductors extend at least 3 inches outside of the extension opening.
 - 1. On existing boxes in walls that are being furred out.
 - 2. On existing boxes for connecting to an existing circuit.
 - 3. On fire alarm boxes where required by the system manufacturer's instructions.
- D. Plaster rings shall not be considered box extensions, but their capacities may be included in box fill calculations.

1.5 SUPPORT REQUIREMENTS

- A. Surface mounted equipment shall be secured to wall or structure. The equipment shall be attached with toggle bolts to hollow tile, block or similar surfaces, and attached with screws or bolts and expansion shields to solid masonry or concrete.

PART 2 - PRODUCTS

2.1 CONDUITS

- A. Electrical metallic tubing shall be thin wall steel tubing, electro-galvanized or hot dipped galvanized inside and outside. Fittings and bushings shall be galvanized steel set screw type with two screws per connection for sizes over 2".
- B. Galvanized rigid steel conduit and intermediate metal conduit shall be hot dipped galvanized inside and outside, in 10' lengths and threaded on both ends. Fittings and bushings shall be cast or malleable iron, and hot dipped galvanized inside and outside.
- C. Flexible metallic conduit shall be galvanized steel or aluminum. Fittings shall be of steel with cadmium or galvanized finish. Fittings shall be machine screw clamp type, single or two-piece. Self-locking, twist-in type fittings are not acceptable.
- D. Liquid tight flexible metallic conduit shall consist of a flexible, galvanized steel core, a continuous copper ground strip and a polyvinyl chloride jacket. Fittings shall be steel liquid tight grounding type from the same manufacturer as the conduit.

2.2 SURFACE RACEWAYS

- A. Where surface raceways are called for on the drawings, or when conduits in finished areas cannot be concealed in walls or above ceilings, surface raceways shall be used. Boxes and fittings shall match and be from the same manufacturer as the surface raceway.
- B. Surface raceways shall consist of a base and cover, sized for the number of conductors contained within, complete with all connectors, fittings, bushings, boxes, covers and mounting hardware.
- C. Raceways shall be 600 volt rated, and be in compliance with the applicable paragraphs of NEC Article 352.

- D. They shall be non-flammable, and UL labeled, under UL 5, or UL 5A (as applicable).
- E. The completed raceway system shall be vandal resistant.
- F. Surface raceways shall accept cover plates, fire alarm devices and other standard wiring devices as specified elsewhere in these specifications.
- G. The cover plates used for devices shall be of the 'overlapping' type, and shall therefore cover the 'cut-end' of the raceway cover.
- H. The raceways shall have a select ivory (or white, or gray to match wall finish) color, "scuff" resistant finish, and the raceways shall be paintable.
- I. All components of the raceway system exposed to view shall be of the same color and shade.
- J. Barriers shall be provided when necessary to separate conductors of different voltages, or services.
- K. Surface raceways shall be steel as noted below:
 - 1. Metallic
 - a. Metallic raceways shall be of .040" thick (minimum) zinc plated or galvanized steel.
 - b. The acceptable levels of quality are, generically,
 - 1. "Wiremold V500 and V700" for smaller single channel raceway applications,
 - 2. "Wiremold V3000" for larger single channel raceway applications, and
 - 3. "Wiremold V4000" for larger multi-channel raceway applications.
- L. Use vertical surface raceways from junction boxes above the ceiling, to the horizontal portion of the surface raceway. Locate vertical section as close to room corners (or 'vertical breaks' in mid wall) as is possible. Use of exposed vertical conduits is not acceptable.

2.3 BOXES

- A. Boxes for outlets, connections and wire pulling shall be:
 - 1. Cast or formed from carbon steel sheets of commercial grade steel not less than 14-gauge.
 - 2. One-piece construction, zinc, or cadmium plated.
 - 3. Tapped for mounting plates and covers as required.

- B. Pull and junction boxes shall be:
 - 1. Fabricated from galvanized or painted code gauge cold rolled carbon steel sheets.
 - 2. Welded construction with flat removable covers fastened to the box with machine screws.
 - 3. Seams and joints shall be closed and reinforced with flanges formed of the same material from which the box is constructed or by continuous welding which will provide equivalent strength to flange construction.
 - 4. Preferably not provided with 'knockouts'.
- C. Box covers shall be fastened in place by machine screws or hinges and latches. Self-tapping or sheet metal fasteners are not acceptable.

2.4 SUPPORTS

- A. Hangers and brackets shall be made of steel pipe, channel iron, angle iron or prefabricated steel channel. Prefabricated steel channel shall be by B-Line, Hilti, Powerstrut or Unistrut.
- B. Anchors shall be lead shield anchors or plastic expansion anchors for small loads, and expansion or epoxy anchors for large loads. Power-driven anchors shall not be used.

2.5 LABELS AND DIRECTORIES

- A. Equipment nameplates shall be engraved .125 inch (1/8") thick lamicooid plastic. White, with black letters. The engraved letters shall be at least one quarter inch (1/4") high.
- B. Panel directories shall be neatly updated and typed on supplied card stock with panel, or card stock similar in thickness and material as those supplied with the panels.
- C. Arrange exposed conduits to maintain headroom and present neat appearance.

PART 3 - EXECUTION

3.1 RACEWAYS

- A. Size conduits in accordance with the NEC, but not less than the sizes shown on the drawings. Minimum power and control conduit size shall be 3/4". Minimum telecommunications conduit size shall be 3/4".
- B. Install concealed and exposed conduits parallel to or at right angles to building lines. Conduits shall not be embedded in concrete slabs except where specifically shown. Install surface raceways as close to room corners or trim features as possible to make the surface raceways less obvious.
- C. Conceal conduits wherever possible and practical. When conduits cannot be concealed in finished areas, use surface raceways with matching boxes from the same manufacturer as the raceways.

- D. Metal conduits, fittings, enclosures and raceways shall be mechanically joined together in a firm assembly to form a continuous electrical conductor providing effective electrical grounding continuity.
- E. Provide expansion fittings at the intervals specified in the manufacturer's instructions.
- F. Separate raceways from uninsulated steam pipes, hot water pipes, and other hot surfaces by a minimum of 4" horizontally or 12" vertically. Separate raceways from ventilation ducts and insulated pipes so that they do not come into contact with each other.
- G. Low voltage signal circuits shall be separated or shielded from power circuits to prevent the induction of noise into the signal circuits.
- H. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104°F.
- I. EMT entering sheet metal enclosures and outlet boxes shall be secured in place by a connector with a locknut. Rigid conduit shall be secured with locknut inside and outside and a bushing. Sufficient thread on the connector or conduit shall extend into the enclosure so that the bushing will butt tight into the connector or conduit. Bushings shall not be used as jamb nuts or in lieu of locknuts.
- J. Flexible metallic conduit to motors and similar equipment shall not exceed 3'-0" in length, and shall have adequate slack to absorb the maximum vibration.
- K. Install no more than the equivalent of three (3) 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.

3.2 SUPPORTS

- A. Support all electrical items independently of supports provided by the other trades.
- B. Support conduits and boxes using coated steel or malleable iron conduit straps or 1/4-inch minimum diameter threaded rod hangers. Suspended ceiling hangers or hanger wire shall not be used (except to support flexible metallic conduit and manufactured wiring systems).
- C. Route metallic conduit and manufactured wiring systems parallel to or perpendicular to building lines, and in a neat and workmanlike manner.

3.3 PENETRATIONS, SLEEVES AND FIRE SEALS

- A. Cut floor and wall penetrations neatly and to the minimum size required for installation of the equipment and raceways.
- B. Provide galvanized steel pipe sleeves equivalent to Schedule 40 wall thickness for all conduits penetrating floors, exterior walls and roofs.
 - 1. Extend floor sleeves above floor a minimum of two (2) inches.

2. Embed sleeves in new concrete or step-core concrete and grout sleeves into existing concrete with epoxy grout. Sleeves shall be sized to provide 1/2" clearance between the outside surfaces of the item in which they are installed.
 3. Seal floor sleeves using fire-sealing systems approved by a Nationally Recognized Testing Laboratory and as detailed in UL Fire Resistant Directory, Volume 2, latest edition. The filler materials and methods used shall be rated at least equal to the fire resistance of the material being penetrated.
 4. Sleeves shall be flush with walls unless otherwise indicated.
- C. Patch both sides of wall penetrations cut for electrical equipment and raceways to seal against the passage of air, sound and fire.
1. Seal conduit penetrations in fire rated walls using fire-sealing caulk approved by a Nationally Recognized Testing Laboratory.
 2. Seal conduit penetrations in non-rated walls using masonry materials that match the wall construction.
 3. Fire seal between recessed outlet boxes located on opposite sides of a fire rated wall if the box openings are over 16 square inches and the boxes are less than 24 inches apart.

3.4 EXPANSION FITTINGS

- A. Provide expansion fittings at all building expansion joints. Expansion fittings shall be bonded to the raceway on both sides.
- B. Provide expansion fittings, in accordance with manufacture recommendations, in all areas subject to swings in temperature of more than 15 degrees C.
- C. Install expansion fittings in all locations where expected expansion difference is 1/4", or more, between boxes

3.5 IDENTIFICATION

- A. Provide nameplates and labels in accordance with Article 2.5.
 1. Lamicoid labels shall be mechanically secured in place with sheet metal screws and/or bolts and nuts
 2. Labels shall be neatly centered. Place labels in like positions on similar equipment.
- B. Color code wiring as noted in Section 260519.
- C. Color code junction boxes and box covers of fire alarm circuits with red paint.
- D. Mark junction box covers in indelible ink with the panel and breaker numbers of the circuits contained within.

END OF SECTION 260500

SECTION 260519 - CABLES AND WIRES

PART 1 - GENERAL (NOT APPLICABLE)

PART 2 - PRODUCTS

2.1 CABLE AND WIRE (600 VOLTS AND BELOW)

- A. Wire for above ground use shall be single conductor stranded copper, No. 12 AWG minimum, with NEC Type THHN insulation rated 90 degrees C, 600 volts.
- B. Exposed feeders (fire pump service, indoors): mineral-insulated, metal-sheathed cable, type MI.
- C. Control cable shall be single conductor stranded copper No. 14 AWG minimum; with NEC Type THHN insulation rated 90 degrees C, 600 volts.
- D. Instrumentation and special systems wire shall be in accordance with manufacturers' recommendations, but shall not be less than 20 AWG.

2.2 BUILDING WIRE AND CABLE

- A. All wire/cable shall be 98% copper minimum.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. Make wiring connections using wire and cable with insulation suitable for temperature encountered in heat producing equipment.
- B. Install all cables and wires (including telecommunications, low voltage control and power limited circuits) in raceways. Telecommunications raceways shall be continuous from outlet boxes to telecommunications rooms.
- C. Segregate wiring of different voltage levels. Circuits operating at different voltages shall not share raceways.
- D. Splice branch circuit wiring, and control and instrumentation wiring with wire nut connectors. Terminate control and instrumentation wiring with solderless compression ring or spade lugs. Compression connectors and lugs shall be crimped with tools specifically designed for the terminations being crimped.
- E. Provide home runs of No. 10 AWG wire for 20 amp branch circuits that exceed 150' in length.
- F. Ground the shields of shielded instrumentation and control cables at one end only. The shields at the other end shall be insulated from ground.
- G. Provide identification tags on all cables and conductors terminated in panels.

3.2 FIELD QUALITY CONTROL

- A. Perform testing in accordance with Section 269500 and submit test reports.

END OF SECTION 260519

SECTION 260526 - GROUNDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide grounding in accordance with the requirements of the NEC and University Inspection Authorities.
- B. The resistance of the completed ground system for standard installations shall not exceed 5 ohms. If any special equipment being installed requires a lower ground system resistance, that equipment manufacturer's maximum ground resistance shall apply.

1.2 MATERIAL REQUIREMENTS

- A. Ground conductors for all power distribution equipment, end-use equipment and all branch circuits, shall be insulated stranded copper conductors, color coded green or (a continuous) green color with 1 or more yellow stripes. The size shall be in accordance with NEC, except that none shall be smaller than No. 12 AWG.

1.3 REQUIREMENTS

- A. A separate grounding conductor shall be used for all new branch circuits.
- B. Conduit shall not be used as the ground conductor.
- C. Ground instrumentation and electronic devices in accordance with the NEC or the manufacturer's recommendations, whichever is stricter.
- D. Conduits and all other raceways shall be grounded/bonded in accordance with the NEC.
- E. The shields of shielded instrumentation cables shall have their drain wires grounded at one end only. The shield at the other end of the cables shall be isolated from ground.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.

- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.

1.06 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 6. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 4. Fitting and Accessory Materials: Same as channels and angles.
 5. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated and stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

- 1) Cooper B-Line, Inc.; a division of Cooper Industries.
- 2) Empire Tool and Manufacturing Co., Inc.
- 3) Hilti Inc.
- 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
- 5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts [Spring-tension clamps].
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 9 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc. Triangle PWC.
 - 2. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 3. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. EMT: ANSI C80.3.
- E. FMC: Zinc-coated steel.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel, Steel or die-cast, set-screw or compression type.
- H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

2.03 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Prime coating, ready for field painting.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Thomas & Betts Corporation.
 - b. Walker Systems, Inc.; Wiremold Company (The).
 - c. Wiremold Company (The); Electrical Sales Division.
 - d. Mono-Systems.

2.04 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. EGS/Appleton Electric.
 - 2. Hoffman.
 - 3. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 - 4. O-Z/Gedney; a unit of General Signal.
 - 5. RACO; a Hubbell Company.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy and aluminum, Type FD, with gasketed cover.
- D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- H. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.05 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.06 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.
- C. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Stainless steel. Include two for each sealing element.
 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 1. Exposed Conduit: Rigid steel conduit.
 2. Concealed Conduit, Aboveground: Rigid steel conduit.
 3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: EMT.
 2. Concealed in Ceilings and Interior Walls and Partitions: EMT.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 4. Damp or Wet Locations: Rigid steel conduit.
 5. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway, EMT.
 6. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: Plenum-type, optical fiber/communications cable raceway, EMT.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size except of switch legs may be ½ inch.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.02 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
 - 1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
 - 2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
 - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.
 - 1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
 - 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- O. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

- Q. Set metal floor boxes level and flush with finished floor surface.

3.03 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

3.04 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260533

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Snap switches.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Hubbell.
 - 2. Pass & Seymour.
 - 3. Bryant.

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hubbell; HBL5351 (single), CR5352 (duplex).
 - b. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, [feed] [non-feed]-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - b. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Satin-finished stainless steel.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations".
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Test straight blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

END OF SECTION 262726

SECTION 269950 – WSU PREFERRED MANUFACTURERS LIST

PART 1 - GENERAL

1.1 PREFERRED MANUFACTURERS LIST

- A. The Preferred Manufacturers List identifies manufacturers known to provide good quality products, meet specification and schedule requirements, provide technical support before and after the sale and provide service after installation. This list identifies frequently specified manufacturers only. It is intended to establish a standard of quality, and it shall not be construed as limited competition.
- B. This list shall be used when selecting products in construction.
- C. This list shall not be used by contractors to justify substitutions for products specified in the construction documents. ANY SUBSTITUTION FOR A SPECIFIED PRODUCT MUST BE APPROVED BY THE UNIVERSITY IN ADVANCE. A contractor requesting approval of a substitution shall do so only at the time of bid through the University Design and Construction Standards Committee.
- D. This list does not apply to the purchase of replacement or retrofit products needed to match or maintain existing installations.
- E. Note: All provided products shall have a manufacturing date within one (1) year from date of bidding or installation.

<u>Equipment</u>	<u>Manufacturers</u>
Metal Conduit	Triangle PWC, Wheatland, Allied Steel Conduit
Liquid Tight Flexible Metal Conduit	AFC, Electri-FlexCo, O.Z. Gedney
Electrical Metallic Tubing (EMT) Conductor	Triangle PWC, Wheatland, Allied Steel Conduit Southwire, Triangle, Rome, Cablec
Connectors – Split Bolt	ILSCO, Burndy, GB Electric
Connectors – Solderless	ILSCO, Burndy, Thomas & Betts
Connectors – Spring Wire	Ideal, 3M, Buchanan
Connectors – Compression	ILSCO, Burndy, Square D
Cable Splice Kits	RayChem, 3M, PLM
Fireproofing Tape	Scotch 3M
Surface Raceways	Mono-Systems, Thomas & Betts, Walker Systems, Wiremold
Wiring Devices – Receptacle	Hubbell, Bryant, Pass & Seymour
Wiring Devices – Cover Plates	Pass & Seymour, Hubbell, Bryant, Appleton

END OF SECTION 269950

SECTION 270000 – COMMUNICATIONS GENERAL

PART 1 - GENERAL

1.1 PURPOSE

- A. Division 27 Specifications are established to define the standards, criteria, and assumptions to be used to bid, plan, furnish, install, test, and document information transport pathways and systems for Wayne State University (WSU). These Specifications shall form the basis for implementation of the design, installation, inspection, and close-out process.
- B. Division 27 is based on NFPA 70 (NEC), National Electrical Safety Code (NEC), Institute of Electronic and Electrical Engineers IEEE, ANSI/TIA/EIA Telecommunication Standards, and BICSI methodologies. The requirements within those documents are not superseded herein unless specifically stated. As required, NEC and NESC code requirements cannot be superseded by this document at any time. ANSI/TIA/EIA standards and BICSI methodologies may be superseded, as specified, or may be made stricter by this document. The absence of a specific reference to an element of these codes, standards, and methodologies does not relieve all parties of compliance with them.
- C. Within this document use of the word “shall” marks mandatory requirements. Use of the word “may” or “should” suggests optional elements. All conflicts within this document shall be resolved by the Owner’s Representative (OR) in consultation with the Architect-Engineering Consultant (A-E C).
- D. Where any device or part of equipment is referred to in these specifications in the singular number (e.g. "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the Project Drawings.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00, Division 01, Division 02, and any others as published by the WSU, apply to this Section.
- B. Section 270500 – Common Work Results for Communications
- C. Section 271000 - Wayne State University, Standards for Communications Infrastructure. C&IT IT Customer Services & Telecommunications, Revised February 13, 2014.

1.3 SYSTEM DESCRIPTION

- A. Division 27 Specifications address information transport pathways, systems, spaces, media, grounding, identification, testing, and documentation requirements in support of multiple information transport infrastructures.
- B. Specific responsibilities of Division 27 include, but are not limited to:
 - 1. Identification of the interbuilding pathways, cabling, and space requirements necessary to connect the subject building(s) to the campus service facilities.
 - 2. Identification of the intrabuilding pathways, cabling, and space requirements necessary to house the data/voice/video cabling systems and associated electronic information transport equipment. Pathways and spaces shall be designed and installed to support the

- known systems and cabling requirements, as well as best effort provisions for those that may be required in the future.
3. Selection and sizing of backbone cabling media, installation, termination, testing, labeling, and documentation methods.
 4. Selection of horizontal distribution cabling media, work area requirements, and telecommunications outlet configurations, installation, termination, testing, labeling, and documentation methods.
 5. Selection of accessory items such as patch cables and custom cables.
 6. Additions to, and connection of, the communications grounding backbone furnished and installed by Division 26.
 7. Definition and establishment of administration and labeling schemes, conforming to WSU C&IT requirements.
 8. Securing all necessary permits and licenses, payment of all fees, and provision of all construction work notifications.
 9. Compliance with all applicable laws, ordinances, rules, and regulations.
 10. Mandatory Contractor Project Manager/Crew Lead attendance at a weekly project status meeting.
- C. It is the intent of the Project Drawings and Specifications to provide complete and workable Division 27 communication systems, ready for use by WSU. Any item, not specifically shown in the Project Drawings or called for in the Specifications but normally required for a fully functional system, is to be considered a part of this contract.

1.4 CODES & STANDARDS

- A. All work shall be in compliance with the following codes and agencies. Nothing contained within these Specifications shall be misconstrued to permit work not in conformance with the most stringent of applicable codes and standards. It is assumed that bidders have access to, and specific knowledge of, the listed reference materials in order to ensure conformity with them.
1. National Electrical Code (NEC)
 2. National Electrical Safety Code (NESC)
 3. National Fire Protection Association (NFPA)
 4. Federal, State, and Local Codes.
 5. National Electronic Manufacturer's Association (NEMA)
 6. Institute of Electronic and Electrical Engineers (IEEE)
 7. American National Standards Institute / Electronic Industries Association / Telecommunication Industries Association (ANSI/EIA/TIA)
 8. Occupational Safety & Health Administration (OSHA)
 9. Federal Communications Commission (FCC)
 10. American Society for Testing and Materials (ASTM)
- B. All materials, equipment, and installation practices shall meet the requirements of the following publications and standards including amendments, addenda, revisions, supplements and errata unless specifically instructed otherwise by the A-E Consultant. Publications are referenced in text by the basic designation only.
1. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard 2009, or most recent edition
 2. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard 2009, or most recent edition
 3. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard 2009, or most recent edition
 4. ANSI/TIA/EIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces
 5. ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure

6. ANSI J-STD-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications
 7. ANSI/TIA/EIA-758-A, Customer Owned Outside Plant Telecommunications Infrastructure Standard
 8. ANSI/EIA/TIA-853, A Full Duplex Ethernet Specification for 1000Mb/s (1000BASE-TX) operating Over Category 6 Balanced Twisted Pair Cabling
 9. TIA-942, Telecommunications Infrastructure Standard for Data Centers
 10. TIA TSB-162, Telecommunications Cabling Guidelines for Wireless Access Points
 11. IEEE Std 1100 (IEEE Emerald Book)
 12. IEEE Project 802.3af, Remote Powering via MDI/RJ-45
 13. IEEE Project 802.3af-2005/Corr1-2006, Isolation Requirements
 14. IEEE Project 802.3an-2006, 10GBASE-T Ethernet
 15. ANSI/NECA/BICSI-568-2006 Standard for Installing Commercial Building Telecommunications Cabling
 16. OSHA CFR Standards-29, Section 1910 or most current edition.
 - a. 1910.268 Telecommunications
 - b. 1910.146 Permit-Required Confined Spaces
 17. FCC Part 68.500
 18. ASTM B1-2001 Standard Specification for Hard-Drawn Copper Wire
 19. ASTM B8-2004 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 20. IEEE 81-1983 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
 21. NFPA 70-2005 National Electrical Code (NEC)
 22. UL 44-2005 Thermoset-Insulated Wires and Cables
 23. UL 65 Wired Cabinets
 24. UL 83-2003 Thermoplastic-Insulated Wires and cables
 25. UL 96 Lightning Protection Components
 26. UL 96A Installation Requirements for Lightning Protection Systems
 27. UL 467-2004 Grounding and Bonding Equipment
 28. UL 486A-486B-2003 Wire Connectors
 29. UL 497/497A/497B Protectors for Paired Conductors/Communications Circuits/Data and Fire Alarm Circuits
- C. All materials, equipment, and installation practices shall comply with accepted standards of workmanship as recognized by:
1. Building Industry Consulting Service International (BICSI)
 - a. Telecommunications Distribution Methods Manual (TDMM) 12th, or most recent, edition.
 - b. Information Transport Systems Installation Manual (ITSIMM) 4th, or most recent, edition.
 - c. Outside Plant Design Reference Manual (OSPDRM) 4th, or most recent, edition.
- D. References to industry and trade association standards and codes are minimum installation requirements.
- E. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.
- 1.5 DEFINITIONS
- A. APC: Angle Physical Connector – An optical fiber connector that is polished at an angle of 8 to 10 degrees to reduce the back reflection of the signal.

- B. Attenuation: The decrease in power of a signal, light beam, or lightwave, either absolutely or as a fraction of a reference value. Attenuation is the opposite of gain and is measured in decibels (dB).
- C. Backbone System: The cabling and connecting hardware that provides interconnection between Telecommunications Rooms, Equipment Room, and Entrance Facilities.
- D. BCT: Bonding Conductor for Telecommunications – A conductor that interconnects the building's service equipment (power ground) to the telecommunications grounding system.
- E. BET: Building Entrance Terminal - Cable termination equipment used to terminate outside plant (OSP) cables at or near the point of building entry.
- F. Conduit Chase Pipe: Short section of bushed EMT conduit with sufficient size and capacity to support horizontal cabling bundles from ceiling space, through ceiling tile, onto the cable runway system connecting wall to rack or cabinet.
- G. EF: Entrance Facility – A location within a building for both public and private network service cables. A facility that provides all necessary mechanical and electrical services for the entry of telecommunications cables into a building and that complies with all relevant regulations. Also referred to as SE: Service Entrance.
- H. Engineer: A-E Consultant Mechanical or Electrical Engineer of record and Technology Systems Designer for the Project.
- I. Engineering: WSU Engineering Department.
- J. ER: Equipment Room – A centralized space designed for telecommunications equipment that serves the occupants of a building. Equipment therein is considered distinct from a TR (Telecommunications Room) because of its nature or complexity. Also frequently referred to as MDF.
- K. Facilities: WSU Facilities Maintenance Department.
- L. Fusion Splicing: An optical fiber splicing method that consists of two clean (stripped of coating) cleaved fibers then joining them and fusing the ends together with an electric arc.
- M. GE: Grounding Equalizer – A conductor that interconnects elements of the telecommunications grounding infrastructure (formerly Telecommunications Bonding Backbone Interconnecting Bonding Conductor).
- N. Horizontal System: The cabling between, and including, the TO (Telecommunications Outlet) connector and the HC (Horizontal Cross-connect) in the Telecommunications Room.
- O. HC: Horizontal Cross-Connect – A group of connectors, such as patch panel or punchdown block, that allows equipment and backbone cabling to be cross-connected with patch cords or jumpers. Floor Distributor (FD) is the international term for HC. Also frequently referred to as IDF.
- P. J-Hook: A supporting device for horizontal cables that is shaped like a "J". It is attached to some building structures. Horizontal cables are laid in the opening formed by the "J" to provide support for cables.

- Q. LC: Lucent Connector - A small form factor (SFF) single fiber, optical fiber connector used for the termination of both multimode and single mode optical fiber cables. The housing mechanism of the LC connector (simplex and duplex) is a push-pull type connection.
- R. MC: Main Cross-Connect – The Cross-Connect normally located in the ER, or MDF for cross-connection and interconnection of entrance cables, first-level backbone cables, and equipment cables. Campus distributor is the international term for MC.
- S. Minor Pathway Support Hardware: Anchors, support brackets, clamps, clips, cable ties, D-rings, rack screws, velcro straps and etc. used to dress and secure cabling, conduits and surface raceways.
- T. Multimode Optical Fiber: Optical fiber with a core diameter of 50 or 62.5 micron (micrometer) and a cladding diameter of 125 micron; lightwave propagation allows many modes within multimode fiber. Also abbreviated as MM or FOMM.
- U. C&IT – Computing & Information Technology (WSU); having overall responsibility for the technical parameters and performance for the IT Infrastructure Upgrade Project.
- V. Optical Time Domain Reflectometer (OTDR): An instrument that measures transmission characteristics by sending a series of short light pulses down an optical fiber element/strand and provides a graphic representation of the backscattered light.
- W. Optical Loss Test Set (OLTS): A tool, consisting of a stabilized light source and optical power meter that directly measures loss by computing the difference between the optical power entering a fiber element/strand and the optical power exiting it.
- X. Police: WSU Police Service Department.
- Y. Primary Protector: A device that limits voltage between telecommunications conductors and ground (usually between 215 volt direct current [VDC] to 350 VDC). 2. A protective device placed on telecommunications conductors in accordance with codes and standards such as NFPA 70.
- Z. Radio Frequency (RF): The area (or band) of the electromagnetic spectrum where most radio communication takes place, typically from 100 KHz to 100 GHz. A frequency at which coherent electromagnetic radiation of energy is useful for communication purposes. Analog electrical signals sent on cable or over the air. Conventional (broadcast) television and radio, as well as cable TV, deliver RF signals to your television/radio.
- AA. RCDD: Registered Communications Distribution Designer – as recognized by BICSI (Building Industry Consulting Service International).
- BB. Safety: WSU Safety Office; having responsibility for the combination of safety, fire technology, and industrial hygiene.
- CC. SC: Subscriber Connector – An “full-size” optical fiber connector used for the termination of both multimode and single mode optical fiber cables (both simplex and duplex), having a square front profile with push-pull latching mechanism.
- DD. Secondary Protector: A secondary voltage protector installed in series with the indoor communications wire and cable between the primary protector and the equipment. The secondary protector provides over-current protection that will safely fuse at currents less than the current-carrying capacity of the device that it is intended to protect.

- EE. SE: Service Entrance - An entrance to a building for both public and private network service cables. A facility that provides all necessary mechanical and electrical services for the entry of telecommunications cables into a building and that complies with all relevant regulations. Also referred to as EF: Entrance Facility.
- FF. Single Mode Optical Fiber: Optical fiber with a relatively small core diameter of 8–9 micron (micrometer) and a cladding diameter of 125 micron; lightwave propagation is restricted to a single path, or mode, in single mode optical fiber. Also abbreviated as SM or FOSM.
- GG. Splice: A joining of conductors meant to be permanent. 2. A device that joins conducting or transmitting media. Also referred to as straight splice.
- HH. Splice Case: A metal or plastic housing with a semi-cylindrical cavity used to clamp around a cable splice, providing a closure.
- II. Structured Cabling: A building or campus telecommunications infrastructure that consists of a number of smaller elements (hence structured) called subsystems. For purposes of this Project, structured cabling shall be used to refer specially to the Horizontal System.
- JJ. TBB: Telecommunications Bonding Backbone - A copper conductor used to connect the Telecommunications Main Grounding Busbar (TMGB) to the Telecommunications Grounding Busbar (TGB) system.
- KK. TE: Telecommunications Enclosure - A case or housing for telecommunications cable terminations and cross-connect cabling.
- LL. TGB: Telecommunications Grounding Bus Bar - A common point of connection for telecommunications system and equipment bonding to ground, and located in the Telecommunications Room or Equipment Room.
- MM. TMGB: Telecommunications Main Grounding Bus Bar - A bus bar placed in a convenient and accessible location and bonded, by means of the bonding conductor for telecommunications, to the building service equipment (power) ground.
- NN. TO: Telecommunications Outlet - A device placed at the user workstation for termination of horizontal media and for connectivity of network equipment. Also referred to as WAO (Work Area Outlet).
- OO. Telecommunications Room – An enclosed space designed for housing telecommunications equipment, cable terminations, and cross-connects. The room is the recognized cross-connect between the Backbone and Horizontal Systems. Also frequently referred to as IDF.
- PP. Transition Splice: A planned splice point, at the building entrance, used to transition from non-rated outdoor to indoor-rated cable designs.
- QQ. WAO: Work Area Outlet - A device placed at the user workstation for termination of horizontal media and for connectivity of network equipment. Also referred to as TO (Telecommunications Outlet).

1.6 ACRONYMS & ABBREVIATIONS

- A. WSU: Wayne State University; located at 42. W. Warren Ave., Detroit, MI 48202
- B. ACR: Attenuation-to-Crosstalk Ration

- C. ADA: Americans with Disabilities Act
- D. A-E C: Architectural-Engineering Consultant
- E. AFF: Above Finished Floor
- F. ANSI: American National Standards Institute
- G. APC: Angle Physical Connector
- H. ASTM: American Society for Testing & Materials (ASTM International)
- I. AWG: American Wire Gauge
- J. BCT: Bonding Conductor for Telecommunications
- K. BET: Building Entrance Terminal
- L. BICSI: Building Industry Consulting Service International, Inc.
- M. BTU: British Thermal Unit
- N. CATV: Community Antenna Television (Cable Television)
- O. CD: Campus Distributor
- P. dB: Decibel
- Q. dBmV: Decibel MilliVolt
- R. EF: Entrance Facility
- S. EIA: Electronic Industries Association
- T. ELFEXT: Equal Level Far-End Crosstalk
- U. EMC: Electromagnetic Compatibility
- V. EMI: Electromagnetic Interference
- W. EMT: Electrical Metallic Tubing
- X. ER: Equipment Room
- Y. FCC: Federal Communications Commission
- Z. FD: Floor Distributor
- AA. FEXT: Far-End Crosstalk
- BB. FOMM: Fiber Optic Multimode
- CC. FOSM: Fiber Optic Single Mode

- DD. FOTP: Fiber Optic Test Procedure
- EE. Freq: Frequency
- FF. GE: Grounding Equalizer (replacing TBBIBC)
- GG. Gnd: Ground
- HH. HB: Handbox
- II. HC: Horizontal Cross-Connect
- JJ. HH: Hand Hole
- KK. HVAC: Heating, Ventilation, and Air Conditioning
- LL. Hz: Hertz
- MM. IC: Intermediate Cross-Connect
- NN. IDC: Insulation Displacement Connector
- OO. IDF: Intermediate Distribution Frame
- PP. IEEE: Institute of Electrical and Electronics Engineers
- QQ. ISO: International Standards Organization
- RR. ISP: Inside Cable Plant
- SS. LAN: Local Area Network
- TT. LC: Lucent Connector
- UU. LOMMF: Laser Optimized Multimode Fiber
- VV. Mbps: Megabits per second
- WW. MC: Main Cross-Connect
- XX. MDF: Main Distribution Frame
- YY. MH: Maintenance Hole
- ZZ. MHz: Megahertz
- AAA. MM: Multimode
- BBB. NEC: National Electrical Code, NFPA 70
- CCC. NESC: National Electric Safety Code
- DDD. NFPA: National Fire Protection Association

- EEE. NPI: (Corning Cable Systems) Network of Preferred Installers
- FFF. NRTL: Nationally Recognized Testing Laboratory
- GGG. OSHA: Occupational Safety and Health Administration
- HHH. OSP: Outside Cable Plant
- III. OTDR: Optical Time Domain Reflectometer
- JJJ. OLTS: Optical Loss Test Set
- KKK. OR: Owner's Representative
- LLL. PR: Pair
- MMM. RCDD: Registered Communications Distribution Designer
- NNN. RFI: Radio Frequency Interference
- OOO. RH: Relative Humidity
- PPP. SC: Subscriber Connector
- QQQ. SE: Service Entrance
- RRR. SM: Single Mode
- SSS. SOW: Scope of Work
- TTT. TBB: Telecommunication Bonding Backbone
- UUU. TBBIBC: Telecommunications Bonding Backbone Interconnecting Bonding Conductor
- VVV. TC: Telecommunications Closet
- WWW. TCO: Telecommunications Outlet
- XXX. TGB: Telecommunications Grounding Bus Bar
- YYY. TIA: Telecommunications Industry Association
- ZZZ. TMGB: Telecommunications Main Grounding Bus Bar
- AAAA. TO: Telecommunications Outlet
- BBBB. TR: Telecommunications Room
- CCCC. UL: Underwriters Laboratory
- DDDD. UPS: Uninterruptible Power Supply
- EEEE. WAO: Work Area Outlet

FFFF. WAP: Wireless Access Point

GGGG. UTP: Unshielded Twisted Pair

1.7 COORDINATION

- A. All Contractors shall schedule and conduct a coordination meeting with the Owner's Representative (OR) to confirm and coordinate scope of work requirements prior to commencement of work whether project is new construction, renovation, or retrofit. Project meetings shall be scheduled through the OR.

1.8 SUBMITTALS

- A. Refer to Division 01 for exact submittal procedures.
- B. Refer to each individual section for unique requirements, applicable only to that section.
- C. Approval of the OR shall be obtained for all equipment and material before delivery to the job site. Delivery, storage, or installation of equipment or material which has not had prior approval will not be permitted at the job site.
- D. The Contractor shall provide for review, without exception prior to material acquisition and installation, multiple copies of the following items, in quantity as required by the OR. Specific requirements shall be listed and described within each Division 27 section. Failure to submit required items shall disqualify the Bidder.
 - 1. Information that confirms compliance with contract documents.
 - 2. Product data sheets and catalog cuts; include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets.
 - 3. Backbone/riser/cabling diagrams
 - 4. Elementary and interconnection system schematics.
 - 5. Shop drawings, pictures, nameplate data, and test reports, as required.
 - 6. Specification sheets for test equipment.
 - 7. Bill of materials.
 - 8. Contracting firm qualifications and certifications.
 - 9. Installation team qualifications by individual.
 - 10. Current manufacturer certifications.
- E. Catalog Cuts submitted for approval shall be legible and clearly identify individual items being submitted. All hardcopy and scanned electronic transmittals, whether color or monochrome, must clearly convey all markings contained on each and every copy.
- F. Submittals are required for all equipment anchors and supports to include weights, dimensions, center of gravity, standard connections, and manufacturer's recommendations.
- G. Submittals for individual systems and equipment assemblies which consist of more than one (1) item or components shall be made for the system as a whole. Partial submittals will not be considered for approval.
 - 1. Mark the submittals, "SUBMITTED UNDER SECTION".
 - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
 - 3. Submit each section separately.
- H. Approvals shall be based upon complete submission of documents together with shop drawings.

1.9 COORDINATION DRAWINGS

- A. The Contractor shall provide Coordination Drawings for review, without exception prior to material acquisition and installation for approval to proceed. Coordination Drawings shall consist of to-scale floor plans and building sections as well as conduit and duct utilization plans. Include scaled cable tray/runway layout and relationships between components and adjacent structural and mechanical elements. Show the following:
1. Vertical and horizontal offsets and transitions.
 2. Clearances for access above and to the side of cable tray/runways, racks, and cabinets.
 3. Vertical elevation of cable tray/runways above floor or bottom of ceiling structure.
 4. Percent of anticipated fill for cable tray/basket, conduits and sleeves.

1.10 SAMPLES, REPORTS AND ADMINISTRATION DRAWINGS

- A. After approval and prior to installation, furnish the OR with material samples as listed and required within individual sections of Division 27 Specifications.
- B. Provide throughout installation:
1. Material samples, if requested by the OR.
 2. Periodic field quality control reports.
 3. Periodic cable test reports.
- C. Provide prior to completion:
1. Actual samples of labeling to be applied to cabling components, to be approved by the OR.
 2. Cable database listing patch panel station cable assignments. Database shall be provided on compact disc or other electronic media format when requested by the OR. Database shall be submitted to the requesting party within seven (7) calendar days.
 3. Cable administration drawings, as requested to assist WSU in the planning process. Drawings will be requested prior to final documentation and as Xerox reproductions of field copies.
- D. Provide at completion of each construction phase area, as defined by the OR:
1. Cable test and certification reports; summary hard copy or full test results on compact disc when requested by the OR. Reports shall be submitted to the requesting party within seven (7) calendar days.
 2. One (1) set of record drawings of the actual installation of the Division 27 systems. Drawings shall be given as full size originals and on disk in AutoCAD .DWG format

1.11 OPERATING AND MAINTENANCE MANUALS

- A. Provide at final completion, four (4) hardback bound sets of O&M (Operating and Maintenance) Manuals formatted as defined by Division 01 and WSU.
1. Furnish one (1) complete manual as specified in the technical section, but in no case later than prior to performance of systems or equipment test. Then furnish the remaining manuals prior to contract completion.
 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
 3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.

- B. In addition to the specific requirements contained within each Division 27 sub-section, each copy of the O&M Manual shall include, at minimum, items listed as follows:
1. One (1) copy of each approved submittal.
 2. Cable test and certification reports; summary hard copy and full test results on disc. Test results shall be delivered at the completion of each project phase and at any time when called for by the OR.
 3. Provide one (1) full-size hard copy set of record drawings (as-builts) to be submitted to the OR and A-E Consultant for approval, immediately upon completion of the installation.
 4. Instruction manuals including equipment and cable schedules, operating instructions, and manufacturer's instructions.
 5. Manufacturer Warranty Certificate.
 6. Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.
 7. Warranty contacts including but not limited to: names, telephone numbers (office and mobile).

1.12 QUALITY ASSURANCE

- A. Contracting firm shall be a company with a minimum of five (5) years successful installation experience with projects utilizing intrabuilding and interbuilding copper and optical fiber cabling system work similar to that required for this project.
- B. The Contractor shall provide a minimum of five (5) reference accounts at which similar work, both in scope and design, have been completed by this Contractor within the last three (3) years. Three (3) of the provided references shall relate directly to the healthcare environment. Upon request, the Contractor shall arrange a visit and consultation to referenced installations. No Contractor personnel shall be present during discussions with references. References are not required with bid but will be required of the apparent low bidder.
- C. The Contractor shall provide the experience profile of the prime contractor's project manager or job superintendent who shall be a certified RCDD responsible to manage the contract. Should the RCDD assigned to this project change during the installation, the replacement RCDD profile shall be re-submitted to the OR for review and approval.
- D. The Contractor shall be knowledgeable in WSU requirements as well as local, state, regional, and national codes and regulations. All work shall comply with the latest revision of codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall apply.
- E. Only installers trained and certified by the proposed manufacturer shall be allowed to install products. Installers must possess the highest level of certification available by the manufacturer for the specific copper cabling solution being installed.
- F. Only installers trained and certified by the proposed manufacturer shall be allowed to install firestop products.
- G. Only installers trained and certified by the proposed manufacturer shall be allowed to terminate and test optical fiber. Others specified above may pull/ place optical fiber cable under the supervision of an installer trained and certified by the manufacturer.
- H. The Contractor shall provide a narrative on the levels of registration/certification of their installers after the project is awarded but prior to commencement of work. The Contractor shall provide proof of registration/certification for the final list of installers prior to the commencement of work.

- I. The OR shall reserve the right to reject any unregistered or uncertified installers performing work for which they are not registered and certified. The Contractor shall be responsible for any loss of work, delays in schedules, or extra cost as a result of the use of unregistered/uncertified workers. Additional effort on the part of the Contractor to maintain the installation schedule as a result of the above mentioned loss time shall be the Contractor's responsibility and at the Contractor's additional expense.
- J. The Contractor shall provide to the OR the above required documentation for any worker on this project brought in after the submittal of initial documentation on installers. WSU shall periodically check installer identification and registrations/certifications during the installation.

1.13 QUALIFICATIONS

- A. The Contractor shall provide an RCDD and Installer-level BICSI Certification. A minimum percentage of fifty (50%) of the installation work force shall be BICSI Installer Level II, or possess other formal training equal to that provided by BICSI, as well as possessing a valid manufacturer certification. Up to fifty percent (50%) of installation force may be BICSI Installer Level I, or possess other formal training equal to that provided by BICSI. Work crew, not involved in installing cable elements (e.g. laborers delivering/moving materials, installing grounding by an electrician, or workers installing pathway elements) do not require BICSI or manufacturer certification or registration.
- B. The Contractor shall provide formal written evidence of the Manufacturer Certification for the system solution proposed, issued directly in the Bidder's company name, valid for the time frame in which the installation will be completed. The Contractor must be manufacturer certified for the structured cabling system approved for use with the components of this Project: Copper Horizontal System cabling by Leviton, Berk-Tek, General Cable, or Superior Essex and Optical Fiber Backbone System as a Corning Cable Systems NPI (Network of Preferred Installers) Program member and active participant.

PART 2 - PRODUCTS

2.1 QUALIFICATIONS (PRODUCTS AND SERVICES)

- A. **Manufacturers Qualifications:** The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this Project, and shall have manufactured this product for at least three (3) years.
- B. **Product Qualification:**
 - 1. Manufacturer's product shall have been in satisfactory operation in three (3) installations of similar size and scope as this Project for approximately three (3) years.
 - 2. WSU reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.
- C. **Service Qualifications:** There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to WSU within four (4) hours of receipt of notification that service is needed. Submit name and address of service organizations.

2.2 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items for which replacement parts shall be available.

- B. In addition to the requirement of SUBMITTALS, WSU reserves the right to request the manufacturer to arrange for a representative to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.
 - C. When more than one (1) unit of the same class of equipment is required, such units shall be the product of a single manufacturer.
 - D. Equipment Assemblies and Components:
 - 1. Components of an assembled unit need not be the products of the same manufacturer.
 - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - 3. Components shall be compatible with each other and with the total assembly for the intended service.
 - 4. Constituent parts which are similar shall be the product of a similar manufacturer.
 - E. Factory wiring shall be identified on the equipment being furnished and all wiring diagrams.
 - F. When factory testing is specified:
 - 1. WSU C&IT shall have the option of witnessing factory tests. The Contractor shall notify WSU C&IT through the OR a minimum of fifteen (15) working days prior to the manufacturer making the factory tests.
 - 2. Four (4) copies of certified test reports containing all test data shall be furnished to the OR prior to final inspection and not more than ninety (90) days after completion of the tests.
- 2.3 When equipment fails to meet factory test, and re-inspection is required, the Contractor shall be liable for all additional expenses, including expenses of the WSU.
- 2.4 EQUIPMENT PROTECTION
- A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold, and rain:
 - 1. During installation- panels, enclosures, controllers, circuit protective devices, and other like items shall be protected against entry of foreign matter and be vacuum cleaned both inside and out before re-painting (if required), testing and operating.
 - 2. Damaged equipment shall be, as determined by the OR, placed in first class operating condition or be returned to the source of supply for repair or replacement.
 - 3. Painted and other finished surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl; materials having all salient characteristics.
 - 4. Damaged paint or finished surfaces on materials shall be re-finished with the same quality of application or paint and workmanship as used by the manufacturer so that repaired areas are not perceptible.
- 2.5 BASIS OF DESIGN
- A. Manufacturers listed herein are preferred by WSU C&IT.
 - B. All approved manufacturers associated with WSU Standards for Communications Infrastructure are listed in the following table.
 - 1. Components listed as "Contractor Selected" are considered to be open-sourced at the discretion of the bidder.

Manufacturer	Part Number	Description	Section Reference
Erico-Caddy or B-Line		J-Hooks	WSU C&IT 17110
Carlson or Endot		Innerduct	WSU C&IT 17110
CPI, Homaco or Hubbell		Equipment Racks	WSU C&IT 17130
CPI, Homaco or Hubbell,Blackbox		Wall Mounted Equipment Racks	
CPI, Homaco or Hubbell, Blackbox		Vertical Cable Management	WSU C&IT 17130
CPI, Homaco or Hubbell, blackbox		Horizontal Cable Management	WSU C&IT 17130
CPI, Hubbell,Great Lakes Cabinets		Equipment Cabinets – and Wall Mounted	WSU C&IT 17130
Contractor Selected		Plywood Backboards	WSU C&IT 17130
CPI, Homaco, Hubbell or Cablofil		Telecommunications Cable Runway	WSU C&IT 17130
Hubbell, Superior-Essex/Bertek,Leviton-Ortronics, Beldon Data Twist, CommScope		CAT6E Cabling	WSU C&IT 17150
Superior-Essex, BerkTek-Ortronics, Beldon, Hubbell or Commscope		Intra-Building Copper Backbone (Voice Only)	WSU C&IT 17150
Systimax, Corning, BerkTek-Ortronics or Commscope		Intra-Building Fiber Optic Backbone	WSU C&IT 17150
Commscope, BerkTek-Ortronics, Superior-Essex, Hubbell or Belden		Copper Horizontal Cabling	WSU C&IT 17150
Commscope, Ortronics, Leviton, Hubbell, Belden	UNJ600 (Commscope)	UTP Jacks and Connectors	WSU C&IT 17150
Commscope, Ortronics, Leviton, Hubbell, or Belden	UMP610-24P	UTP Patch Panels	WSU C&IT 17150
Commscope, Ortronics, Leviton, Hubbell, or Belden		Cross-Connect Blocks	WSU C&IT 17150

Commscope, Ortronics, Leviton, Hubbell, Belden		Face Plates	WSU C&IT 17150
Same manufacturer & type as the cable, jacks & patch panels installed.		UTP Patch Cords	WSU C&IT 17150
Corning Cable Systems		Fiber Optic Connectors for both Inter-Building & Intra-Building Cables	WSU C&IT 17150
Commscope, Corning, BerkTek-Ortronics		Fiber Optic Patch Panels	WSU C&IT 17150
Commscope, Corning, BerkTek-Ortronics		Fiber Optic Splice Panels	WSU C&IT 17150
Brady, Brother P-Touch, Equivalent by Tester manufacturer, Equivalent by UTP Connectivity Manufacturer		Labels	WSU C&IT 17170
Commscope	2312K	0.500 Inch Diameter Hard-Line	WSU C&IT 17500
Commscope	2227V	Coaxial Branch/Drop Cable	WSU C&IT 17500
C-Cor, Philips or Equal		Taps, Couplers, Splitters, and Equalizers	WSU C&IT 17500
Pyramid, LRC, Gilbert, Commscope or Equal		Trunk Connectors	WSU C&IT 17500
Thomas & Betts	Snap-n-Seal	Branch Cable Connectors	WSU C&IT 17500
C-Cor Flexnet NL Series or Equal		Trunk Amplifiers, Line Extenders	WSU C&IT 17500
Philips or Equal	9-LPI	Line Power Inserters	WSU C&IT 17500
Exide or Lectro "Broadband" Series or Equal		Power Supplies	WSU C&IT 17500
Grayfox Gold	7530	Coax Jacks and Wall Plates	WSU C&IT 17500
		Twelve (12) Foot, Black, 75 Ohm, Type F Coaxial Jumper Cables, Quantities per Drawings	WSU C&IT 17500
		75-Ohm Terminators for Unused Taps	WSU C&IT 17500

EXECUTION

2.6 PROJECT CONDITIONS

- A. For work on existing stations; arrange, phase, and perform work so as to assure communications service for other buildings at all times.
- B. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior condition as required by Division 01.
- C. Remove and dispose of communications cabling, and other physical support elements, such as racks and panels, as required by construction phasing. Racks, panels, and electronic components shall be returned to the OR.
- D. Activities in all buildings are critical to the objectives of WSU. These objectives shall not be interrupted by the Contractor's work activities. The active information transport system and cabling associated with specific work beyond the construction area shall not be disrupted at any time. Unusual circumstances (e.g. voice cutovers) can occur and shall be declared and scheduled with as much notice as possible. Service disruptions, if needed, shall be at the convenience and schedule of WSU.
- E. Contractor shall ensure that all building fixtures have been re-installed to their original condition at the conclusion of the final shift of the day.

2.7 EQUIPMENT INSTALLATION AND REQUIREMENTS

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

2.8 WARRANTY

- A. The Contractor shall be manufacturer certified for the system proposed and bid and shall adhere to all warranty requirements for end-to-end installations.
- B. The Contractor shall submit any additional Contractor-specific warranties or guarantees to be offered on the project.
- C. The Contractor shall supply any and all necessary documentation needed to process and record the warranty(s) and to verify the installation solution.
- D. Warranty
 - 1. All installed cabling systems shall be warranted for two (2) years for components, parts, assemblies, and workmanship. During the two (2) year warranty period, Contractor shall take all necessary and appropriate action; free of charge, to correct any non-conformity with the warranties contained in the manufacturer agreement. During the two (2) year warranty period, Contractor shall provide to WSU, free of costs and charges, all support

necessary to ensure that the cabling system meets the requirements specified in this document and performance guarantees provided by the manufacturer. During the two (2) year warranty period, Contractor shall furnish, or cause to be furnished, all service, parts, and replacements necessary to maintain the cabling system in good working condition, at no cost to WSU.

2. The Contractor shall supply a full manufacturer's application assurance warranty for all new installations, to include approved termination hardware and cabling media from the proposed manufacturer's list of approved materials. Services to be provided by the manufacturer to WSU during the warranty period shall include, without limitation, the following.
3. Contractor shall provide service on WSU site as necessary including, but not limited to, fault isolation, diagnosis, and repair.
4. Records
 - a. Contractor shall maintain, at the job site, a current record of the cabling system configuration, including history and all adds, moves, and changes.
5. Replacement Parts
 - a. Contractor shall provide and install replacement parts, including new components,
6. Post-System Warranty Service
 - a. Option of Maintenance Service
 - b. Warranty of On-Site Response
 - 1) Regardless of the cause of the problem, Contractor shall ensure that parts, equipment, and materials are available to remedy the problems and its personnel are ready to begin work (such action being deemed a "response") within the contract time periods for the applicable warranty period.
7. Warranty of Security
 - a. Contractor shall warrant that its personnel, including all subcontractors, shall at all times comply with all WSU security regulations of which Contractor has been informed by WSU. Contractor also warrants that it has obtained all necessary licenses and permits required by federal, state, and local government.

2.9 FINAL CLEANING

- A. Contractor shall thoroughly clean all assemblies within all MDF, IDF and TC spaces before they are turned over to WSU for operation. Cleaning shall include, but not be limited to, all cable runway, racks and wire managers (inside and out), copper and optical fiber panels (inside and out). Should the MDF, IDF and/or TC be completed prior to the balance of the floor space that it serves, racks, cabinets, and wall frames shall be covered with plastic sheeting to repel dust and other contaminants to which they will be subjected.

2.10 WSU APPROVED LABELING FORMATS

- A. Labeling shall be furnished and applied to all components of Division 27 (WSU Division 17) according to requirements listed in Part 3 of each section. The Contractor shall make early contact with WSU C&IT (to verify any other special requirements for each project. Sample labels shall be made available upon request.

2.11 EQUIPMENT IDENTIFICATION

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

2.12 TRAINING

- A. Training shall be provided in accordance with Division 01 General Requirements.
- B. Training shall be provided for the particular equipment or system as required in each associated specification section.
- C. A training schedule shall be developed and submitted by the Contractor and approved by the OR at least thirty (30) days prior to the planned training.

END OF SECTION 270000

SECTION 270500 – COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00, Division 01, Division 02, and any others as published by WSU, apply to this Section.
- B. Drawings and provisions of the Contract including Division 26 Electrical.
- C. Section 270000 – Communications General
- D. Section 271000 - Wayne State University, Standards for Communications Infrastructure. C&IT IT Customer Services & Telecommunications, Revised October 31, 2012.

1.2 CODES AND STANDARDS

- A. Refer to Section 270000 – Communications General
- B. Refer to Division 01.

1.3 SUMMARY

- A. This Section includes:
 - 1. Grounding and Bonding for Communications Systems
 - 2. Hangers and Supports for Communications Systems
 - 3. Conduits and Back Boxes for Communications Systems
 - 4. Cable Runways for Communications Systems
 - 5. Surface Raceways for Communications Systems
 - 6. Vibration and Seismic Controls for Communications Systems
 - 7. Identification for Communications Systems
 - 8. Cable Routing, Separation, and Distance
 - 9. Communications Room Provisions
 - 10. Common Installation Requirements
 - 11. Firestopping
- B. All references to Division 26, contained herein, are the responsibility of the Electrical Contractor.

1.4 DEFINITIONS

- A. Refer to Section 270000 – Communications General

1.5 ACRONYMS & ABBREVIATIONS

- A. Refer to Section 270000 – Communications General

1.6 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in location required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating

work, and plumbing lines shall not interfere with or otherwise impede access to, and the routing of communication cabling with cable runway, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the Owner immediately, before proceeding with installation.

- B. Other than minor adjustments shall be submitted to the Owner for approval before proceeding with the work.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26.
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So that connecting raceways, cables, wireways, cable runways, and busways will be clear of obstructions and of the working and access space of other equipment.
- D. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- E. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 26.
- F. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- G. The location of TO(s) and WAO(s) shown on the Drawings is approximate, and the Owner shall have the right to relocate any TO(s) or WAO(s) before they are installed without additional cost.

1.7 SUBMITTALS

- A. Refer to Section 270000 – Communications General
- B. After approval and prior to installation, furnish the Owner with one (1) sample of each of the following:
 - 1. Surface raceway and pathway hangers, clamps and supports.
- C. Shop drawings submitted to the Owner:
 - 1. Shall include the location of system grounding electrode connections and the routing of aboveground and underground grounding electrode conductors.
- D. Test Reports submitted to the Owner: Shall include certified test reports of ground resistance.
- E. Certifications: Two (2) weeks prior to final inspection, submit four (4) copies of the following to the Owner:
 - 1. Certification that the grounding materials and installation is in accordance with the drawings and specifications.
 - 2. Certification, by the Contractor, that the complete grounding installation has been properly installed and tested.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN REFERENCE PART NUMBERS

- A. Bidder shall confirm all reference part numbers, listed within Division 27, as current and suitable for the items described and specified and shall file a formal RFI for all perceived discrepancies prior to bidding.
- B. Refer to Section 270000 Communications General, Part 2.

2.2 GROUNDING AND BONDING – BUILDING RISER

- A. Telecom System Grounding Riser Conductor: Telecommunications Grounding Riser shall be in accordance with J-STD-607A. Use a minimum 50mm² (3/0 AWG) insulated stranded copper grounding conductor unless indicated otherwise.
- B. Refer to Division 26 Section 260526 and specific instructions of the A-E Consultant related to conductor sizing and methods of grounding and bonding shall supersede any references within Division 27 for the building backbone.

2.3 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes 6 mm² (10 AWG) and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes 25 mm² (4 AWG) and larger shall be permitted to be identified per NEC.
- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes 6 mm² (10 AWG) and smaller shall be ASTM B1 solid bare copper wire.

2.4 SPLICES AND TERMINATION COMPONENTS

- A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

2.5 SYSTEM GROUNDING BUSBARS

- A. Refer to Division 26. Busbars shall be furnished and installed by Electrical Contractor, as specified herein. Division 27 Product Specifications for TMGB and TGB bars shall supersede any as given in Division 26.
 - 1. TMGB (Telecommunications Main Grounding Busbar) also referred to as “Master Signal Ground” shall be a pre-drilled solid copper busbar with two-hole lug connections for use with standard-sized lugs. Minimum dimensions shall be 6mm (0.25”) thick by 600mm by 100mm (4” wide and 24” in length). The TMGB shall be listed by a NRTL (Nationally Recognized Testing Laboratory).
 - 2. TGB (Telecommunications Grounding Busbar) also referred to as “Room Signal Grounding” shall be a pre-drilled copper bus-bar with two-hole lug connections for use with standard-sized lugs. Minimum dimensions shall be 6mm (0.25”) thick by 100mm by 300mm (4” wide and 12” in length). The TGB shall be listed by a NRTL (Nationally Recognized Testing Laboratory).

2.6 GROUND CONNECTIONS

- A. Above grade:

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

- B. Cable Shields: Make ground connections to multipair communications cables with metallic shields using shield bonding connectors with screw stud connection.

2.7 EQUIPMENT RACK AND CABINET GROUND BARS

- A. Furnish and install solid copper ground bars designed for mounting on the framework of open or cabinet- enclosed equipment racks with minimum dimensions of 4 mm thick by 19 mm wide (3/8 inch x 3/4 inch).

2.8 GROUND TERMINAL BLOCKS

- A. At any equipment mounting location (e.g. backboards and hinged cover enclosures) where rack- type ground bars cannot be mounted, provide screw lug-type terminal blocks.

2.9 SPLICE CASE GROUND ACCESSORIES

- A. Splice case grounding and bonding accessories shall be supplied by the splice case manufacturer when available. Otherwise, use 16mm² (6 AWG) insulated ground wire with shield bonding connectors.

2.10 HANGERS AND SUPPORTS

- A. Product selection shall be subject to Part 3 installation requirements.
- B. Erico/Caddy CableCAT Wide Base Supports.
- C. Erico/Caddy Vertical Backbone Cable Support.
- D. Panduit Corporation J-Mod and J-Pro Cable Support System.

2.11 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

- A. Refer to Section 260529.

2.12 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

- A. Refer to Section 260533.

2.13 CABLE RUNWAYS – COMMUNICATIONS SPACES

- A. Refer to Section 271000.

2.14 SURFACE RACEWAYS

- A. Refer to Section 260533.

2.15 SLEEVES FOR RACEWAYS AND CABLES

- A. Refer to Section 260500.

2.16 SLEEVE SEALS

- A. Refer to Section 260500.

2.17 GROUT

- A. Refer to Section 260500.

2.18 IDENTIFICATION

- A. Materials by Brady, Brother, and Panduit in compliance with ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure

2.19 IDENTIFICATION FOR ELECTRICAL

- A. Refer to Section 260553.

2.20 PLYWOOD

- A. All walls, and area above door openings, must be covered with 3/4" Grade A-C fire-retardant plywood, sanded smooth.
- B. All plywood must contain fire-retardant stamp as per building codes and, upon installation, shall be left exposed in a minimum of one (1) unused-area of each individual sheet or separate segment of backboard, if painted.

2.21 CONDUIT CHASE PIPES

- A. Conduit Chase Pipes shall be provided within Telecom Room (TR) spaces in any case where ceiling tile has been provided and must be breached.
- B. Electrical Metallic Tubing (EMT) and Fittings
 1. 4" trade size
 - a. Manufactured to ANSI C80.3 (EMT Zinc Coated)
 - b. UL Standard 797 (EMT – Steel)
 2. Arlington insulated bushings

2.22 FIRESTOP DEVICES

- A. The approved pathway through wall penetrations, up to 8" thick, is the E-Z Path (sleeve system) by STI, or approved equal. The Contractor shall identify penetration points for horizontal cabling, but must obtain pre-approval from the Owner prior to installation.
- B. For cable basket/tray penetrations through rated walls, intumescent firestop pillows shall be installed. E-Z Path Series SSB Firestop Pillows or approved equal.
- C. For floor penetrations thicker than 8", the use of metallic conduit shall be approved. Metallic conduit sleeves shall be 4" minimum. The Owner shall pre-approve the size, quantity, and locations of the pathways. Refer to Division 26.

PART 3 - EXECUTION

3.1 FIELD CONDITIONS

- A. Examine all elements intended for Communications. Check pathways, raceways, cable runways, and other elements for compliance with space allocations, installation tolerances, installation hazards or impediments, and other conditions affecting installation. Verify that all work required in the field is adequately described in the plans. Proceed with installation only after unsatisfactory conditions and discrepancies have been brought to the attention of the Owner and corrected.
- B. Unless otherwise noted, the footages for cabling and materials shown on the Project Drawings are based upon available plant records, architectural drawings, or the A-E Consultant's route and pathway assumptions. The Contractor shall be required to perform field surveys and measurements, prior to ordering materials.

3.2 GROUNDING AND BONDING - GENERAL

- A. An approved grounding system, as specified herein, shall always be required in each communications space; ER, TR, EF, and any other information transport systems distribution space.
- B. All grounding and bonding systems for communications shall be carefully reviewed and pre-approved by the Owner in consultation with WSU Engineering and Facilities Maintenance Department in cooperation with WSU C&IT Department.
- C. All communications rack, cabinet, cable runway (within ER and TR spaces), wall frame, and equipment grounding shall be furnished and installed by the Contractor
- D. The Telecommunications Bonding Backbone (TBB) also referred to as the Communications Signal/Riser Grounding System shall have a single point of attachment at the main electrical grounding electrode conductor. The TBB, along its associated busbars and connections shall be furnished and installed by the Contractor.
- E. System Grounding:
 - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
 - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
 - 3. Isolation transformers and isolated power systems shall not be system grounded.
- F. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.
- G. Route conductors on short direct paths that have minimum resistive and inductive impedance as follows:
 - a. Bonding conductors shall be routed with minimum bends or changes in direction.
 - b. Bonding connections shall be made directly to the points being bonded.
 - c. Do not bend the grounding conductor wires into tight angles. Changes in direction shall be of the widest radius possible.
 - d. Unnecessary connections or splices in bonding conductors shall be avoided. When absolutely necessary, use an approved connection and position it in an accessible location.

3.3 INACCESSIBLE GROUNDING CONNECTIONS

- A. Make grounding connections, which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.4 CORROSION INHIBITORS

- A. When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

3.5 TELECOMMUNICATIONS SYSTEM

- A. Bond telecommunications system grounding equipment to the electrical grounding electrode system.
- B. Furnish and install all wire and hardware required to properly ground, bond and connect communications raceway, cable runway, metallic cable shields, and equipment to an approved ground source.
- C. Ground bonding jumpers shall be continuous with no splices. Use the shortest length of bonding jumper possible.
- D. Provide ground paths that are permanent and continuous with a resistance of 1 ohm or less from raceway, cable runway, and equipment connections to the building grounding electrode. The resistance across individual bonding connections shall be 10 milliohms or less.
- E. Above-Grade Grounding Connections: When making bolted or screwed connections to attach bonding jumpers, remove paint to expose the entire contact surface by grinding where necessary; thoroughly clean all connector, plate and other contact surfaces; and apply an appropriate corrosion inhibitor to all surfaces before joining.
- F. Bonding Jumpers:
 - 1. Use insulated ground wire of the size and type shown on the Drawings or use a minimum of 16 mm² (6 AWG) insulated copper wire.
 - 2. Assemble bonding jumpers using insulated ground wire terminated with compression connectors.
 - 3. Use compression connectors of proper size for conductors specified. Use connector manufacturer's compression tool.
- G. Bonding Jumper Fasteners:
 - 1. Conduit: Fasten bonding jumpers using screw lugs on grounding bushings or conduit strut clamps, or the clamp pads on push-type conduit fasteners. When screw lug connection to a conduit strut clamp is not possible, fasten the plain end of a bonding jumper wire by slipping the plain end under the conduit strut clamp pad; tighten the clamp screw firmly. Where appropriate, use zinc-plated external tooth lock washers.
 - 2. Wireway and Cable Runway: Fasten bonding jumpers using zinc-plated bolts, external tooth lock washers, and nuts. Install protective cover, e.g., zinc-plated acorn nuts on any bolts extending into wireway or cable runway to prevent cable damage.
 - 3. Ground Plates and Busbars: Fasten bonding jumpers using two-hole compression lugs. Use tin-plated copper or copper alloy bolts, external tooth lock washers, and nuts.
 - 4. Unistrut and Raised Floor Stringers: Fasten bonding jumpers using zinc-plated, self-drill screws and external tooth lock washers.

3.6 TELECOMMUNICATIONS ROOM (TR) GROUNDING

- A. Telecommunications Ground Busbars (TGB):
 - 1. Provide communications room telecommunications ground busbar hardware at 950 mm (18 inches) at locations indicated on the Drawings.
 - 2. Connect the telecommunications room ground busbars to other room grounding busbars as indicated on the Grounding Riser diagram.
- B. Telephone-Type Cable Runway Systems: aluminum pan installed on telephone-type cable runway serves as the primary ground conductor within the communications room. Make ground connections by installing the following bonding jumpers:
 - 1. Install a 16 mm² (6 AWG) bonding between the telecommunications ground busbar and the nearest access to the aluminum pan installed on the cable rack.
 - 2. Use 16 mm² (6 AWG) bonding jumpers across aluminum pan junctions.
- C. Self-Supporting and Cabinet-Mounted Equipment Rack Ground Bars:
 - 1. When ground bars are provided at the rear of lineup of bolted together equipment racks, bond the copper ground bars together using solid copper splice plates supplied by the ground bar manufacturer.
 - 2. Bond together nonadjacent ground bars on equipment racks and cabinets with 16 mm² (6 AWG) insulated copper wire bonding jumpers attached at each end with compression-type connectors and mounting bolts.
 - 3. Provide a 16 mm² (6 AWG) bonding jumper between the rack and/or cabinet ground busbar and the aluminum pan of an overhead cable runway or the raised floor stringer as appropriate.
- D. Backboards: Provide a screw lug-type terminal block or drilled and tapped copper strip near the top of backboards used for communications cross-connect systems. Connect backboard ground terminals to the aluminum pan in the telephone-type cable runway using an insulated 16 mm² (16 AWG) bonding jumper.
- E. Other Communication Room Ground Systems: Ground all metallic conduit, wireways, and other metallic equipment located away from equipment racks or cabinets to the cable runway pan or the telecommunications ground busbar, whichever is closer, using insulated 16 mm² (6 AWG) ground wire bonding jumpers.

3.7 STRUCTURED GROUNDING SYSTEM FOR NETWORK EQUIPMENT

- A. Structured grounding system shall provide a low resistance, verifiable, dedicated path to a locally provided TGB for purposes of maintaining performance, protection, and network reliability.
- B. All Equipment Room (ER) spaces designed to support rack mounted network equipment shall require a structured grounding system to which all communications rack, cabinet, cable runway, wall frame, and equipment grounding shall be terminated.
- C. All open frame rack assemblies and cabinets shall require vertical rack grounding strips (RGS). Strips shall be mounted on the back side of the vertical rack rails for two-post assemblies and on the back side of the front post for four-post assemblies. These mounting arrangements apply to racks based on both UTP and F/UTP cabling. Contractor shall confirm details with the Owner prior to proceeding with the installation.
- D. Furnish and install equipment including, but not limited to:
 - 1. Copper Compression HTAP(s)
 - 2. Copper Compression Two-Hole Lugs

3. Rack-Mounted Grounding Strips(s)
4. Cabinet-mounted Front-to-Rail Jumper(s)
5. Paint-piercing Bonding Screws and Studs
6. Paint-piercing Grounding Washers
7. ESD (Electrostatic Discharge) Studs and Static Wrist Straps (one per rack or cabinet).

3.8 COMMUNICATIONS CABLE GROUNDING

- A. Bond all metallic cable sheaths in multi-pair communications cables together at each splicing and/or terminating location to provide 100 percent metallic sheath continuity throughout the communications distribution system.
1. At terminal points, install cable shield bonding connectors provide a screw stud connection for ground wire. Use a bonding jumper to connect the cable shield connector to an appropriate ground source like the rack or cabinet ground bar.
 2. Bond all metallic cable shields together within splice closures using cable shield bonding connectors or the splice case grounding and bonding accessories provided by the splice case manufacturer. When an external ground connection is provided as part of splice closure, connect to an approved ground source and all other metallic components and equipment at that location.

3.9 COMMUNICATIONS CABLE BASKET AND RUNWAY SYSTEMS

- A. Bond the metallic structures of one cable runway in each runway run following the same path to provide 100 percent electrical continuity throughout these cable runway systems as follows:
1. Splice plates provided by the cable runway manufacturer can be used for providing a ground bonding connection between cable runway sections when the resistance across a bolted connection is 10 milliohms or less. The Subcontractor shall verify this loss by testing across one splice plate connection in the presence of the Contractor.
 2. Install a 16 mm² (6 AWG) bonding jumper across each cable runway splice or junction where splice plates cannot be used.
 3. When cable runway terminations to cable rack, install 16 mm² (6 AWG) bonding jumper between cable runway and cable rack pan.

3.10 COMMUNICATIONS RACEWAY GROUNDING

- A. Conduit: Use insulated 16 mm² (6 AWG) bonding jumpers to ground metallic conduit at each end and to bond at all intermediate metallic enclosures.
- B. Wireway: use insulated 16 mm² (6 AWG) bonding jumpers to ground or bond metallic wireway at each end at all intermediate metallic enclosures and across all section junctions.
- C. Cable Tray Systems: Use insulated 16 mm² (6 AWG) bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 16 meters (50 feet).

3.11 GROUND RESISTANCE

- A. Grounding system resistance to ground shall not exceed 5 ohms. Make necessary modifications or additions to the grounding electrode system, as identified on Project Drawings, for compliance without additional cost to WSU. Final tests shall assure that this requirement is met.
- B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate

grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- C. Services at power company interface points shall comply with the power company ground resistance requirements.
- D. Below-grade connections shall be visually inspected by the Owner prior to backfilling. The Contractor shall notify the Owner 24 hours before the connections are ready for inspection.

3.12 HANGERS AND SUPPORTS

- A. Communications cabling shall be contained within a combination of open spaces, enclosed conduits, raceways, and cable runways. These pathways are designed to provide the capacity to properly install high performance communications cabling for present and future applications.
- B. Where cabling is installed within conduit, cable runways, and raceways, pathways shall be furnished and installed by Division 26.
- C. Where conduit, cable runways, or raceways are not provided, Division 27 shall furnish and install independent supports so that no cable rests directly on ceiling tile, mechanical ductwork, or other supporting structures.
- D. Cables shall be neatly routed and bundled above the suspended ceiling structure in bundles limited to a quantity of cables as per manufacturer specifications and installation practices for Category 6A UTP or as applicable to the media being installed. High performance sling-type supports shall be used for adds/moves/changes or low cable c pathways. High performance J-Hook supports shall also be used.
- E. Suspended ceiling support wires shall not be used for cabling support. Cables shall not be laid directly on ceiling tiles or rails. Cables placed in hangers in the ceiling area shall be routed high and away from all other electrical and mechanical systems so as to avoid contact with light fixtures, ventilation ducts, sprinkler system or plumbing piping, motors or any other electrical devices.
- F. The maximum separation between support points for all cabling shall be five (5) feet
- G. All cable pathway support elements shall be certified by the manufacturer for a high performance twisted pair installation, when applicable. In all cases, support products shall be approved for the support of Category 6 or higher cables, including optical fiber.

3.13 HANGERS AND SUPPORTS FOR ELECTRICAL

- A. Refer to Section 260529.

3.14 CONDUITS AND BACK BOXES

- A. Refer to Section 260533.

3.15 CABLE RUNWAY – COMMUNICATIONS SPACES

- A. Refer to Section 271000.

3.16 SURFACE RACEWAYS

- A. Refer to Section 260533.

3.17 SLEEVES FOR RACEWAYS AND CABLES

- A. Refer to Section 260500.

3.18 SLEEVE SEALS

- A. Refer to Section 260500.

3.19 GROUT

- A. Refer to Section 260500.

3.20 IDENTIFICATION

- A. All cables, conductors, racks, cabinets, frame, and panels shall be labeled as per the requirements of ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure.

3.21 COMMON INSTALLATION REQUIREMENTS

- A. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall mounting items.
- B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- D. Right of Way: Give to piping systems installed at a required slope.
- E. The Contractor shall contact the Owner before commencement of work and shall coordinate with all Owner personnel and all other trades. Commencement of work shall be coordinated through the Owner.

3.22 CABLE ROUTING, SEPARATION, AND DISTANCE

- A. Whenever possible, primary cable routing paths shall follow the logical structure of the building. When a wall must be breached, provide sleeved openings. Cabling shall enter and exit these areas at 90° angles. Route all cables and cable raceways parallel to or perpendicular to building structure. No diagonal runs shall be permitted, unless noted otherwise.
- B. To reduce or eliminate the field effect of EMI on data signaling, cable runs shall be kept a minimum distance from EMI sources. Refer to ANSI/NECA/BICSI-568-2006 Standard for Installing Commercial Building Telecommunications Cabling.
 - 1. Minimum separation distance from possible sources of EMI:
 - a. 5 inches (125mm) from power lines of 2 KVA or less.
 - b. 12 inches (305mm) from lighting fixtures.
 - 2. Minimum separation distance from possible sources of EMI exceeding 5KVA:

Condition	Min. Separation Distance
Unshielded power lines or electrical equipment in proximity to open or non-metal pathways.	24 in. (610 mm)
Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway.	12 in. (300 mm)
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway.	6 in. (150 mm)
Electrical motors and transformers.	47 in. (1200 mm)

- C. Communications cabling shall not be run in parallel with any high voltage electrical wiring.
- D. The maximum length of horizontal communications cables shall be limited to 90 meters from the TO (Telecommunications Outlet) to the ER or TR point of termination.
- E. All cabling shall be installed as single continuous homerun pulls from Connector Block to Patch Panel, and TO to Patch Panel. No inline connectors or splices in any form shall be permitted.
- F. Cable routing from the cable runway onto the distribution frame shall be neatly organized and supported by cable support brackets, clips, loops, radius drops, spools, etc., as required to minimize tension and stress on the connector block terminations.

3.23 TELECOMMUNICATIONS ROOM (TR) PROVISIONS

A. PLYWOOD BACKBOARDS

1. Furnish and install for all walls, and areas above door openings, $\frac{3}{4}$ " Grade A-C fire-retardant plywood, sanded smooth.
2. All plywood must contain fire-retardant stamp as per building codes and, upon installation, shall be left exposed in a minimum of one (1) unused-area of each individual sheet or separate segment of backboard, if painted.
3. The plywood should be mounted vertically starting at 6" AFF, and secured to the walls using flush-mounted fasteners designed and listed to secure wood to the specific wall/stud material.
4. Mount plywood to cover entire area on which cable runway, equipment, terminating hardware, and cable management rings may be mounted.
5. Securely fasten plywood to wall framing members. Use flush hardware and supports to mount plywood. Ensure that the strength and placement of the hardware are sufficient to handle the total anticipated load (static and dynamic) and mounting of equipment.

B. CONDUIT CHASE PIPES

1. Furnish and install 4" EMT conduit "Chase Pipes" within ER, TR, EF, and other information transport system spaces where communications cabling must pass through suspended ceiling tiles enroute to point of cabling termination.
2. Chase Pipes shall be securely mounted to the wall above cable runway segments using slotted unistrut and 4" pipe clamps. Reamed and bush pipes at both ends prior to cabling rough-in.

3.24 FIRESTOPPING/WATERBLOCKING/INSPECTION

- A. Determination of all fire-rated structures shall be by the WSU Engineering and Facilities Management Department.

- B. All conduits, sleeves, and penetrations of fire-rated walls, into which communications cables are pulled or reserved for communications cables, shall be sealed with an approved fire-retardant method and materials in accordance with UL (Underwriter's Laboratory Inc.) Fire Resistance Directory.
- C. All openings provided shall be fire stopped after cabling has been installed whether filled, partially filled, or un-used.
- D. The Contractor shall affix a permanent "WARNING FIRE-STOP SEAL – DO NOT DISTURB" label on both sides of all fire-stop breaches. The label shall contain the following information.
 - 1. Contractor name, address, and contact information.
 - 2. Installer's name & date.
 - 3. UL listing number (Firestop product).
 - 4. F Rating.
- E. An above ceiling inspection will be required by the Owner and the Contractor after all cable has been installed and tested. Following this inspection and review of test results, all conduits, cable runways, and raceways which penetrate a firewall will be fire stopped. Conduits less than 1.5 inches in diameter are not required to be fire stopped. All conduits leaving any TR will be closed with approved products as listed in Specification 07 84 13., Materials are to be contractor furnished and installed.
- F. Water blocking materials shall be re-usable where ever possible, and shall be readily removable to allow for future reuse of conduits.
- G. After the Contractor has notified the Owner of the completion of fire stopping, an above ceiling inspection will be done for compliance with codes. The inspection will be conducted with the Owner and other state and local inspection personnel as WSU may desire. All violations will be corrected before final acceptance. It will be the responsibility of the Contractor to pay for and coordinate the inspection.

END OF SECTION 270500

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Grounding conductors.
 - 2. Grounding connectors.
 - 3. Grounding busbars.
 - 4. Grounding rods.
 - 5. Grounding labeling.

1.3 DEFINITIONS

- A. BCT: Bonding conductor for telecommunications.
- B. EMT: Electrical metallic tubing.
- C. TGB: Telecommunications grounding busbar.
- D. TMGB: Telecommunications main grounding busbar.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:
 - 1. Ground rods.
 - 2. Ground and roof rings.
 - 3. BCT, TMGB, TGBs, and routing of their bonding conductors.

- B. Qualification Data: For installation supervisor, and field inspector.
- C. Qualification Data: For testing agency and testing agency's field supervisor.
- D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Result of the ground-resistance test, measured at the point of BCT connection.
 - b. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Installation Supervision: Installation shall be under the direct supervision of ITS, who shall be present at all times when Work of this Section is performed at Project site.
 - 2. Field Inspector: Currently registered by BICSI as a registered communications distribution designer to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS

- A. Comply with J-STD-607-A.

2.2 CONDUCTORS

- A. Comply with UL 486A-486B.
- B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
 - 1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
 - 2. Cable Tray Equipment Grounding Wire: No.6 AWG.
- C. Cable Tray Grounding Jumper:
 - 1. Not smaller than No. 6 AWG and not longer than 12 inches If jumper is a wire, it shall have a crimped grounding lug with two holes and long barrel for two crimps. If jumper is a

flexible braid, it shall have a one-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

- A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.
- B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
 1. Electroplated tinned copper, C and H shaped.
- C. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.
- D. Busbar Connectors: Cast silicon bronze, solderless compression type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.
- E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

- A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4"x2"x4'ft. The busbar shall be NRTL listed for use as TMGB and shall comply with J-STD-607-A.
 1. Predrilling shall be with holes for use with lugs specified in this Section.
 2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
- B. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 in x 2 in x 2' ft. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.
 1. Predrilling shall be with holes for use with lugs specified in this Section.

2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch ((50-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.)
 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
- C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.
1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
 2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19 equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

- A. Ground Rods: Copper-clad 3/4 inch by 10 feet in diameter.

2.6 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch . Overlay shall provide a weatherproof and UV-resistant seal for label.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.
- B. Inspect the test results of the ac grounding system measured at the point of BCT connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

- B. Comply with NECA 1.
- C. Comply with J-STD-607-A.

3.3 APPLICATION

- A. Conductors: Install solid conductor for 8 AWG and smaller and stranded conductors for 6 AWG and larger unless otherwise indicated.
 - 1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than 6 AWG.
 - 2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than 6 AWG.
- B. Underground Grounding Conductors: Install bare copper conductor, 2 AWG minimum.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.
- D. Conductor Support:
 - 1. Secure grounding and bonding conductors at intervals of not less than 36 inches.
- E. Grounding and Bonding Conductors:
 - 1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
 - 2. Install without splices.
 - 3. Support at not more than 36-inch intervals.
 - 4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.
 - a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

- A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than 3 AWG.

3.5 GROUNDING BUSBARS

- A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.
- B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

- A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than 6 AWG.
- B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
- C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
 - 1. Use crimping tool and the die specific to the connector.
 - 2. Pretwist the conductor.
 - 3. Apply an antioxidant compound to all bolted and compression connections.
- D. Primary Protector: Bond to the TMGB with insulated bonding conductor.
- E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot of conductor length, up to a maximum size of No. 3/0 AWG 168 kcmils unless otherwise indicated.
- F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install vertically mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.
- G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.
- H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.
- I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when grounding screened, balanced, twisted-pair cables.
- J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.
- K. Access Floors: Bond all metal parts of access floors to the TGB.

- L. Equipment Room Signal Reference Grid: Provide a low-impedance path between telecommunications cabinets, equipment racks, and the reference grid, using 6 AWG bonding conductors.
 - 1. Install the conductors in grid pattern on 4-foot (centers, allowing bonding of one pedestal from each access floor tile.
 - 2. Bond the TGB of the equipment room to the reference grid at two or more locations.
 - 3. Bond all conduits and piping entering the equipment room to the TGB at the perimeter of the room.

- M. Towers and Antennas:
 - 1. Ground Ring: Buried at least 30 inches below grade and at least 24 inches from the base of the tower or mounting.
 - 2. Bond each tower base and metallic frame of a dish to the ground ring, buried at least 18 inches below grade.
 - 3. Bond the ground ring and antenna grounds to the equipment room TMGB or TGB, buried at least 30 inches below grade.
 - 4. Bond metallic fences within 6 feet of towers and antennas to the ground ring, buried at least 18 inches below grade.
 - 5. Special Requirements for Roof-Mounted Towers:
 - a. Roof Ring: Meet requirements for the ground ring except the conductors shall comply with requirements in Section 264113 "Lightning Protection for Structures."
 - b. Bond tower base footings steel, the TGB in the equipment room, and antenna support guys to the roof ring.
 - c. Connect roof ring to the perimeter conductors of the lightning protection system.
 - 6. Waveguides and Coaxial Cable:
 - a. Bond cable shields at the point of entry into the building to the TGB and to the cable entrance plate, using No. 2 AWG bonding conductors.
 - b. Bond coaxial cable surge arrester to the ground or roof ring using bonding conductor size recommended by surge-arrester manufacturer.

3.7 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- B. Comply with IEEE C2 grounding requirements.
- C. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches extends above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- D. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, bonding

conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect grounding conductors to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.8 IDENTIFICATION

- A. Labels shall be preprinted or computer-printed type.
 - 1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
 - 2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
 - 3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.
 - a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.
 - 3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.
 - a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.
- D. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.
- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 270526



Standards for Communications Infrastructure

C&IT Infrastructure And Operations
Wayne State University
5925 Woodward
Detroit, Michigan 48202-3555

Revised: 13 February 2014

By: Pete Garabedian

This document is available online in Adobe Acrobat (.pdf) format

at

<http://computing.wayne.edu/docs/wsucommstandards.pdf>

Revision History

- 13 February 2014** Updated to add new systems requirements, specifications, clarify wording, revised tester to be used, test specifications, numbers, bullets, etc. Update online copy of this document in pdf format.
- 31 October 2012** Updated to add & clarify systems requirements, specifications, clarify wording, remove redundant specifications, numbers, bullets, etc. Update URL name location & update online copy of this document in pdf format.
- 31 October 2010** Updated to include additional manufacturers of approved structure cabling systems, clarify wording, Add page numbers, fix table of contents page numbers, etc. Update URL for online copy of this document in .pdf format.
- 15 June 2009** Updated to include additional manufacturers of approved structure cabling systems. Update URL for online copy of this document in .pdf format.
- 29 April 2005** Updated to include exact manufacturer product names for approved Category 6e (cat6e) structured cabling system components. Add URL for online copy of this document in Adobe Acrobat (.pdf) format.
- 1 December 2004** First publication of completely revised document. All sections rewritten.

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Acknowledgements

C&IT Infrastructure And Operations expresses its appreciation to the following participants in their review of this document:

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WSU Telecommunications Design Requirements

Applicable Standards:

Unless specifically indicated otherwise in this document, all telecommunications infrastructure shall be design in accordance with the following standards including all appropriate addendums and revisions:

ANSI/TIA-568-C	Commercial Building Telecommunications Cabling Standard
ANSI/TIA-606-B	Administration Standard for Commercial Telecommunications Infrastructure
ANSI J-STD-607-B	Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
ANSI/TIA-758	Customer Owned Outside Plant telecommunications Cabling Standard
BICSI	Telecommunications Distribution Methods Manual (TDMM)
BICSI	Telecommunications Cabling Installation Manual (TCIM)
ANSI/TIA 569-C	Commercial Building Standards For Telecommunications Pathways And Spaces

Design Deliverables:

Programming	<ul style="list-style-type: none">• With specific input from C&IT, generate outlet schedule based on functional use summary in the statement of needs/program statement.• Provide preliminary area requirements for entrance facility and telecommunication rooms• Identify extent of site work necessary to bring services to building• Where wireless networks are to be the primary connection to the network, an independent consultant with demonstrated expertise in wireless systems shall be commissioned to provide access point layout, equipment selection and input on other construction methods that may affect wireless transmissions.
Schematic Design	<ul style="list-style-type: none">• Concept Sketches showing preliminary telecommunications rooms and sizes and zone plan showing areas served by rooms.• Preliminary backbone riser diagrams showing interrelationships• Concept sketch showing major pathways for backbone and horizontal cabling

- | | |
|-----------------------------|--|
| Design Development | <ul style="list-style-type: none"> • Preliminary drawings identifying device layouts for typical spaces. • Preliminary drawing showing main cable tray layouts. • Preliminary drawing showing communication backbone riser. • Preliminary drawing showing communication grounding riser. |
| Construction Documents | <ul style="list-style-type: none"> • Identify all device locations on scaled plan drawings • Identify outlet configurations by unique symbol and/or schedule • Identify all intended pathways and raceways for horizontal and backbone cable. • Provide enlarged telecommunications room plans indicating placement of racks, cable runway, wall mounted systems, ground bus locations. • Provide rack elevations indicating all patch panels placement, cable management, structural supports, ground connections and space allocated for owner provided network electronics and any UPS/power conditioners. • Provide backboard elevations indicating space allocated for wall fields, equipment, etc. • Indicate location and provide details for all grounding apparatus. • Provide CSI format specifications for cable, connectors, cable management hardware, etc. |
| Construction Administration | <ul style="list-style-type: none"> • Review shop drawings for cable, connectors, and hardware for compliance with project specifications and WSU requirements. • Make periodic construction visits to observe the installation for conformance to project specifications and proper installation practices. • Perform final punchlist including follow-up to verify punchlist items have been completed. |

Systems and Performance:

- | | |
|--------------------|---|
| Data System | <ul style="list-style-type: none"> • Designed to support 1 Gbps Ethernet to the desktop over UTP copper cable (CAT 6E) . • Inter-building backbone shall support 10Gbps Ethernet • Intra-building backbone shall support DWDM (Dense Wave Division Multiplexing) |
| Voice System | <ul style="list-style-type: none"> • Specific design to be coordinated with WSU C&IT. |
| Video Distribution | <ul style="list-style-type: none"> • Specific design to be coordinated with WSU C&IT. |
| Wireless Networks | <ul style="list-style-type: none"> • Specific design to be coordinated with WSU C&IT. |

Site and Service Considerations:

- Incoming Services:
- Provide minimum of (4) 4" conduits from nearest telecommunications manhole, tunnel, etc. into service entrance facility. (two for WSU, one for AT&T & one for emergency maintenance spare).
 - These conduits shall be HDPE if buried underground. Steel conduit when cast in concrete. PVC conduit is not allowed.
 - Provide three 1 ¼" inner ducts in all of the service entrance conduits. In each Inner duct, a pull string must be installed.
 - The inner ducts installed must extend 6 to 8 inches past the conduit at both ends.
 - Coordinate with AT&T
 - Coordinate with C&IT for further definition of design requirements.
 - Minimum of 1) 208Volt 30 Amp three phase dedicated circuit.
 - Minimum of 1) 120Volt 20 Amp dedicated circuit.
- Manholes, Handholes:
- Provide additional manholes and/or hand holes to minimize cable pulls to 400', and two 90 degree bends.
 - In Streets & Driveways, provide **5'x5'x5' concrete handhole with round steel rim and cover.**
 - In sidewalks, provide **5'x5'x5' concrete handhole with round steel rim and cover**
 - Only in Green Areas, provide 24"w x 42"d x 36"l "Quazite" hand holes. (locate hand holes in green space only)
 - Provide a # 10 gauge solid copper tracer wire in all exterior conduits for future conduit locating usage.
 - Upon completion, before final payment the following must be provided:
 - Provide a site plan of installed conduit showing conduit location, quantities & depth.
 - No exception to this will be allowed.

Grounding:

- Ground Bus
- Provide ¼" x 2" x 4' ground bus in the main telecommunications room.
 - Provide ¼" x 2" x 2' ground bus in each telecommunications room.
- Bonding Backbone
- Provide a #4/0 AWG insulated copper bonding backbone from the main ground bus in the service entrance facility (MDF) to the intermediate rooms (IDF) with #6 jumper to TGB's.
 - Do not route bonding backbone within 18" of electrical feeders.

Equipment

- Bond all racks, cabinets, etc to ground bus in each telecommunications room with #6 AWG insulated ground conductor.

Performance:

- Minimum 2 ohms

Telecommunications Rooms (MDF, IDF):

Spacing Criteria

- Stack rooms wherever possible
- Cable length shall not exceed 250'. If this is the case, additional closets will need to be built.
- Provide one room for every 10 to 20,000 sft and less than 250 ft. in length of cable.
- Centrally locate rooms to minimize horizontal cable lengths.

Security

- All new communication rooms will be fitted with the new WSU / Best lock key series # 88672.
- All communication rooms will have WSU OneCard card electronics installed to access room via ID card swipe.
- This design & layout must be coordinated with at least 1 person from WSU FP&M, WSU C&IT & WSU OneCard office.

Room sizes

- Provide minimum of one (10' x 12') MDF telecommunications room per building.
- Provide one IDF telecommunications room per floor, min. (exceptions for multi-story buildings with small floor plate.)
- Based on density served.
- 8' x 10' for rooms serving (175) outlets or 3 racks, and 10 x 12' for rooms serving between (176) and (325) outlets, or 6 racks.
- Adjust room sizes accordingly for additional systems (video, security, access control, etc.)

Layout

- Allow minimum of 24" deep for rack equipment, 36" clearance behind racks and 36" in front of racks.
- Allow for 12" deep equipment on wall fields when calculating clearances.
- Doors shall always swing out, provided it meets code requirements.
- Provide Fire Rated ¾" grade plywood. Do not paint.
- Provide 12" ladder rack around 3 sides of room & to each equipment rack.
- Ladder rack shall be secured to top of equipment racks
- Provide minimum 2 racks per TR

Lighting

- Locate lighting in front of and behind racks. (not above) at minimum height of 7'-6" AFF.

Power

- Provide 50fc minimum at floor level.
- Whenever possible provide dedicated 12 circuit panel board in each telecommunication room for 120 Volt 20 Amp and 208 Volt 30 Amp circuits. The circuit panel should be the type with built in surge protection and line conditioning specifically designed for electronic equipment. Preferred location for dedicated panel board is inside the telecommunication rooms.
- Whenever possible all dedicated 208 volt and 120 volt circuits shall be connected to the building generator and/or building UPS.
- Whenever possible provide dedicated feeder/riser for all telecommunications room dedicated panel boards. No other loads should be served by this feeder.
- Provide a minimum of one 120 Volt 20 amp dedicated circuit for each equipment rack plus one additional 20A circuit for service outlets, one on each wall.
- Provide 8 plug grounded power strip at the bottom of each equipment rack for each 120 volt circuit.
- Provide a minimum of one 208 Volt 30A three phase dedicated circuit in each telecommunication room for network switches. The receptacle required is a NEMA L21-30R. An additional circuit may be required depending on the type and quantity of equipment installed.
- Provide a dedicated 208 volt, 30 amp, 3 phase "Smart/Switched" PDU/Power Strip for each 208 volt circuit..
- Provide 8" space at the bottom of each rack for owner provided rack mounted UPS and/or power conditioner.

Environmental

- Provide cooling based on 75% of total electrical room wattage.

Pathways:

Backbone

- Provide minimum (4) 4" sleeves through floors in stacked rooms. These sleeves should be sized progressively smaller or less of them as you move away from the serving closet. Size with 30% growth after cable is installed.
- Where rooms are not stacked, provide minimum (2) 4" conduits continuous between rooms.
- Connect TR's on same floor with minimum of (1) 4" conduit.
- Conduit between rooms shall have no more than (2) 90 degree bends and/or over 150' without pull box. Pull boxes shall be sized per the amount of conduits.
- Sleeves shall consist of GRS conduit with bushings and stub above the floor a minimum of 4".

Horizontal, accessible ceiling spaces:

- Provide cable trays down corridors whenever possible. If cost prohibitive, J-hooks are acceptable. Provide J-Hooks for cable bundles of 24 and below.
- Route main cable runs through accessible corridor spaces and drop off into each room from the main runs.
- Whenever possible do not route main cable trays or cable bundles through classrooms or offices.
- Maintain 12" minimum between cable tray fluorescent lighting.
- Whenever possible terminate cable to the nearest communication room on the same floor. Only in special cases will the horizontal cable terminate in a communication room on a different floor. Coordinate this location with FP&M and / or C&IT project manager.

Backbone Cabling:

Inter Building (between building hubs)

- Provide 15' slack loop in telecommunications room.
- Provide 30' slack loop in manhole
- Minimum 96 strand (glass fiber as manufactured by corning) between hub buildings.

Inter Building (between buildings hub to endpoint)

- Minimum 18 strand multi-mode and 30 strand single mode (glass fiber as manufactured by corning) between hub and endpoint buildings.
- Provide 15' slack loop in each telecommunications room.
- Single, composite cable is preferred.

Intra Building

- Minimum 12 mmf/12 smf.
- 15' slack at each end.

Horizontal Cabling:

Data:

- Category "6E" UTP cable. (Refer to section 10.4 C)
- Terminate on its own patch panel in equipment rack.
- Cable shall be Green and jacks shall be orange located in the outlet bottom position (vertical) or the outlet right position (horizontal).
- Provide cable and connectors only from WSU preferred manufacturers list. (Refer to section 10.4 C)
- Provide 2 gray patch cords per data outlet.

Voice:

- Category 6E UTP cable. (Refer to section 10.4 C)
- Terminate on its own patch panel in the equipment rack.
- Cable shall be Yellow and jacks shall be White located in the outlet top position (vertical) or the outlet left position (horizontal).
- Provide cable and connectors only from WSU preferred manufacturers list. (Refer to section 10.4 C)
- If terminated on wall fields, design adequate slack loops in closets to move from wall fields to racks in future.
- Provide 2 yellow patch cords per voice outlet.

Security Cameras:

- Category 6E UTP cable. (Refer to section 10.4 C)
- Terminate on wireless patch panel in rack, not in data panel.
- Cable shall be purple and jacks shall be orange located in the outlet bottom position (vertical) or the outlet right position (horizontal).
- Provide cable and connectors only from WSU preferred manufacturers list. (Refer to section 10.4 C)
- Provide 2 purple patch cords per data outlet.

Wireless Access Points:

- Category 6E UTP cable. (Refer to section 10.4 C)
- Terminate on wireless patch panel in rack, not in data panel.
- Cable installed in the walls shall be Green and jacks shall be orange located in the outlet bottom position (vertical) or the outlet right position (horizontal).
- Provide cable and connectors only from WSU preferred manufacturers list. (Refer to section 10.4 C)
- Provide 2 green patch cords per voice outlet.

OneCard Installation:

General

- All OneCard design, hardware, software & installations must be coordinated & approved by Business & Auxiliary Operations – IT Business Operations Department & Computing & Information Technology – Network Services Department.
- OneCard equipment will be located in its own enclosure(s), in C&IT communication rooms whenever possible.
- OneCard equipment is never to be collocated in enclosures with any other equipment..
- OneCard equipment will require its own dedicated 120volt 20 amp circuit.
- No exception to any of these bullets will be allowed.

Workstation Outlets:

General

- Unless noted otherwise, a typical outlet shall consist of (1) data and (1) voice.
- Every enclosed space shall be provided with a minimum of (1) data and (1) voice.
- The data cable shall be Green and jacks shall be orange located in the outlet bottom position (vertical) or the outlet right position (horizontal).
- The voice cable shall be Yellow and jacks shall be White located in the outlet top position (vertical) or the outlet left position (horizontal).

- Classrooms
 - (1) D, (1) V at each FSR box in the front of the room.
 - Wall phone near door.
- Offices
 - (1) D, (1) V at desk location. (Typical corner opposite door unless furniture layout or program statement indicates otherwise).
- Conference Room
 - A conference room table of 10 seats or less, provide (1) 2" sleeve through the floor to the table for multi media connectivity.
 - A conference room table of 10 seats or more, provide (2) 2" sleeves through the floor to the table for multi media connectivity.
- Public Spaces
 - Provide a data drop for each vending, copier, ATM machine or any other network device.
- Research Buildings
 - Provide (2) data and (1) voice at select locations. This will provide the ability to provide 2 different types of network connectivity. Coordinate with project manager.
- Voice Over IP Buildings
 - Provide (1) data at each location. This will provide voice and data network connectivity.
- Labs
 - Use specific user requirements or outfit as a typical classroom.
- Furniture Coordination
 - (1) V, (1) D per cubicle. Coordinate raceways with furniture specifier. Outlets must be mounted in the furniture provided raceway. Double stick for mounting is not acceptable. Outlets lying on the floor are not acceptable.
 - Voice/Data jacks mounted on the wall may route voice/data patch cords directly through systems furniture, or they can be wired permanently with a cable whip from the wall, ceiling or floor to the systems furniture. This installation must comply with NEC code specifying low voltage & high voltage cables must be separated by a divider channel. It is the responsibility of the communications cabling contractor to meet this standard and install correctly.
 - WSU / C&IT / IT Customer Services / Telecommunication cabling vendors & or technicians will not fish any wire or patch cord through systems furniture raceway. They will NOT cut any holes, remove knock outs, provide or install jacks & face plates in the systems furniture.

Administration (Labeling):

- Number Scheme:
 - [Room Number] – [jack number + function]. Ex: 222-V01, 222-D01, 222-V02, 222-D02, 223-V01, 223-D01, etc.

- Voice / Data Jacks
 - [room number] –[Jack Number + Function].
Ex: 222-V01, 222-D01, 222-V02, 222-D02, etc.
- Security Cameras
 - CAM-[room number] terminated in access point patch Panels. If outside, use WSU building number.
- Wireless Access Points
 - WAP-[room number] terminated in its own group of patch panels. If in corridor use closest room number.
- Room Numbers
 - Use final room numbers that have been approved by WS facilities as actual room numbers. DO NOT use room numbers that appear on construction documents that are temporary/pending room numbers.
- Inter Backbone & Endpoint Fiber Cables between buildings**
 - For backbone cables, [cable type]-[WSU Building Number]. Example: BC-193 = hub to hub inter-building backbone cable for building 193. EC-062 = hub to endpoint inter-building backbone cable for building 062. RC-193 = inter-building redundant backbone cable for building 193. RC-062= inter building redundant backbone cable for building 062.
- Intra Building Fiber Riser Cables Between Communication Rooms**
 - For building riser cables between communication rooms, [cable type]-[WSU Building Number]-[floor number]-[communication room number]. Example: BRC-027.03.315

Testing and Documentation:

- Testing Criteria:
 - Comply with TIA testing requirements
 - To be done by the cabling installation contractor. They must be certified to install the product line chosen. No exception to this will be allowed.
 - Comply with manufacturer testing requirements.
 - Testing shall demonstrate compliance with all parameters of manufacturer’s stated performance.
- Documentation:
 - Upon completion, before final payment the following must be provided.
 - Provide the manufacture warranty certificate upon completion.
 - Provide (1) electronic copy of test results in PDF file format.
 - No Exception to this will be allowed

Frequently Asked Questions:

(future use)

SECTION 17010 - TELECOMMUNICATIONS GENERAL **REQUIREMENTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions including division 1 specifications apply to work in this section.

1.2 SUMMARY

- A. This Section includes telecommunications general administrative and procedural requirements. The following requirements are included in this Section to supplement the requirements specified in Division 1 Specification Sections.

1.3 DRAWINGS

- A. The Drawings must show the location of equipment racks & elevations, Ladder rack on 3 walls, power outlet locations, general arrangement of equipment, electrical systems and related items. The installation will follow as closely as elements of the construction will permit.
- B. The Drawings must show a conduit & cabling riser diagram from MDF & related IDFs. Copper pair & fiber strand counts will be detailed showing the distribution of riser cabling between the MDF & related IDFs.
- C. Deviations from the Drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer and WSU C&IT.
- D. The architectural and structural Drawings take precedence in all matters pertaining to the building structure, mechanical Drawings in all matters pertaining to mechanical trades and electrical Drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the Drawings for the various trades, report such conflicts or differences to the Architect and WSU C&IT for resolution.

1.4 INSPECTION OF SITE

- A. Visit the site, examine and verify the conditions under which the work must be conducted before submitting proposal.

- B. The submitting of a proposal implies that the Contractor has visited the site and understands the conditions under which the work must be conducted.

1.5 CONTRACT BREAKDOWN

- A. WSU Facilities Department retains the installation and coordination for all projects initiated by that department.. WSU C&IT retains the design review, installation and coordination for all other voice, data & video projects not initiated by WSU Facilities.
- B. Within two (2) weeks following award of contract, submit to the Architect/Engineer for approval a contract amount breakdown. Breakdown shall be submitted on a form similar to the form available at the Architect's/Engineer's office. All requests for payment shall be based on the approved breakdown.

1.6 TEMPORARY FACILITIES

- A. Provide and remove upon completion of the project, in accordance with the general conditions, a complete temporary telephone service during construction, as required.

1.7 ALTERNATES

- A. See Alternate Section and other applicable parts of the Specifications.

1.8 GUARANTEE

- A. Contractor guarantees that the installation is free from defects and agrees to replace or repair, any part of this installation which becomes defective within a period of one year following final acceptance, provided that such failure is due to defects in the equipment, material or installation or to follow the Specifications and Drawings. File with the Owner any and all guarantees from the equipment manufacturers and warranty certificates.

1.9 CODES, PERMITS AND FEES

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for telecommunications work shall be secured and paid for by the Contractor. All work shall conform to all applicable codes, rules and regulations.
- B. Rules of local service providers shall be complied with. Check with the local exchange carrier supplying service to the installation and determine all raceways and devices required including, but not limited to, all terminal cabinets, backboards, space requirements, etc.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed Drawings or diagrams which may

be required by the governing authorities. Where the Drawings and/or Specifications indicate materials or construction in excess of code requirements, the Drawings and/or Specifications shall govern.

1.10 STANDARDS OF MATERIAL AND WORKMANSHIP

- A. All materials shall be new, never used, reused, reconditioned, or refurbished components. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:

A.N.S.I.	American National Standards Institute
A.S.T.M.	American Society for Testing Materials
BICSI	Building Industry Consulting Services International
I.C.E.A.	Insulated Cable Engineer's Association
I.E.E.E.	Institute of Electrical and Electronics Engineers
N.E.C.	National Electrical Code
N.E.M.A.	National Electrical Manufacturer's Association
TIA	Telecommunications Industry Association
U.L.	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Agency

- B. Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved.
- C. All equipment of the same or similar systems shall be by the same manufacturer.

1.11 RECORD DRAWINGS

- A. Provide complete operating and maintenance instruction manuals covering all telecommunications equipment herein specified, together with parts lists. All literature shall be furnished in triplicate for Owner and shall be bound in book or ring binder form as directed by Architect/Engineer.
- B. The operating and maintenance instructions shall include a brief, general description for all electrical systems including, but not limited to:
1. Routine maintenance procedures.
 2. Trouble-shooting procedures.
 3. Contractor's telephone numbers for warranty repair service.
 4. Shop Drawings.
 5. Recommended spare parts lists.
 6. Names and telephone numbers of major material suppliers.
- C. Provide revised telecommunications working Drawings indicating "as-built" conditions. Drawings shall indicate all changes that have occurred during construction. Properly and identify backbone and horizontal wiring pathways.

Locate all network and workstation devices. Identify all devices on plan with proper labeling. Identify outside plant backbone conduits, man holes & fiber cables installed on a site plan. "as-Built" Drawings shall be submitted on AutoCAD 2000 or newer electronic DWG file format. Provide (1) copy paper and (1) copy electronic DWG file.

- D. Provide a site plan with elevations showing any man holes, hand holes or conduit installed outside.

1.12 MATERIAL AND EQUIPMENT MANUFACTURERS

- A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of telecommunications equipment and shall be of the manufacturer's latest design.
- B. No substitutions will be allowed without WSU C&IT approval.

1.13 SHOP DRAWINGS/SUBMITTALS

- A. All shop drawings shall be submitted in groupings of similar and/or related items (cable and connectors, equipment cabinets and racks, etc.). Incomplete submittal groupings will be returned unchecked.
- B. Provide detailed layout shop drawings (on transparent media) of backbone and horizontal cabling distribution, pathways, equipment room layouts, details and related information necessary of installation and maintenance. After review by the Engineer and WSU C&IT, a copy of Drawings will be stamped and returned to the Contractor.
- C. Submit for approval eight (2) copies of shop drawings for all telecommunications systems or equipment but not limited to the items listed below. Where items are referred to by symbolic designation on the Drawings and Specifications, all submittals shall bear the same designation. Refer to other sections of the Specifications for additional requirements.

1. Structured cabling system components
2. Structured cable system raceways and supports
3. Outside plant cabling and components
4. Outside plant ducts manholes, hand holes & conduit systems on a site plan with elevations.
5. Equipment racks and cabinets including management components
6. Labeling equipment
7. Telecommunications grounding components
8. Conduit, inner duct, junction and pullboxes
9. Surface raceway components
10. Manholes, hand holes and all accessories

11. Telephone system components
12. Data network system components
13. Audio/video system components
14. Access control system components
15. Security Camera system components

1.14 USE OF EQUIPMENT

- A. The use of any equipment or any part thereof for purposes other than testing even with the Owner's consent shall not be construed to be an acceptance of the work on the part of the Owner, nor be construed to obligate the Owner in any way to accept improper work or defective materials.

1.15 WORK SPECIFIED UNDER OTHER DIVISIONS

- A. The following items are an integral part of the telecommunications system and will be provided by the Electrical Contractor & or Telecommunications Contractor.
 1. Raceways
 2. Boxes, cabinets and enclosures.
 3. Grounding and Bonding
 4. Underground Utilities

1.16 CONTRACTOR QUALIFICATIONS

- A. The Installing Contractor for each communications system shall have a minimum of 5 years of experience with the types of systems specified. They must be certified to install, test & warranty the product specified prior to a bid submittal. **No exception to this will be allowed.**
- B. The Installing Contractor shall submit a reference list consisting of a minimum of [3] [5] installations of equivalent size and complexity of this contract. The reference list shall contain the following information for each installation:
 1. Name of project, square footage, location and brief description of systems.
 2. Date of completed installation.
 3. Contact name and phone number of facility representative.
 4. Total bid amount of each system installed.
 5. Final contract amount of each system installed, including all change orders and bulletins.
- C. The Installing Contractor shall submit with the bid the names and registration numbers of members of the firm that have a valid membership and are certified with BICSI as Registered Communications Distribution Designers (RCDD). This Contractor shall identify at least one RCDD assigned to this project in the bid.

- D. The bidding, shop drawing submittal, procurement of materials, the installation as-builts and record documents shall be reviewed and overseen by the RCDD(s) assigned to the project.
- E. The Contractor's bid, shop drawing submittals, as-builts and record documents shall bear the valid seal of the RCDD(s) assigned to this project.
- F. The Installing Contractor of the video system shall submit with the bid names and license numbers of all members of the firm that hold a valid commercial general class license with the FCC. The Contractor shall identify at least one FCC licensed technician/engineer assigned to this project with the bid.
- G. All calculations, shop drawings, testing, certification and as-built documents shall be directly supervised by the licensed technician/engineer assigned to the project.
- H. The contractor must provide a copy of the manufacturer's certification that the contractor is currently certified to install, test & warranty the proposed system prior to a bid submittal. See Section 17110, 7.5A & section 17010, 1.16A. No exception to this will be allowed.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

- A. Install all equipment in strict accordance with all installation specifications set by the equipment manufacturer. Where such directions are in conflict with the Drawings and Specifications, report such conflicts to the Architect/Engineer and WSU C&IT for resolution.

3.2 WORK PERFORMED BY OTHERS

- A. [Electrical Contractor shall install 4" sq. sheet steel wall boxes, minimum 1" trade size conduit (or as indicated on drawings) stubbed 12" above ceiling with 6" radius (or as required by ANSI/TIA-569 C), with a 90 degree bend at top in the direction towards route destination, and plastic bushing for recessed locations.]
- B. [Electrical Contractor shall install 4" sq. cast boxes. Minimum 1" trade size conduit (or as indicated on Drawings) stubbed up to 10' AFF (or as indicated on Drawings), with 6" radius (or as required by ANSI/TIA-569 C) for surface mounted locations.]
- C. [The Owner will provide access point & network electronics equipment in all Communications Rooms as required.]

- D. The Owner will provide all voice & data cross-connect jumpers.

3.3 DEMOLITION WORK

- A. All demolition of existing telecommunications Cable, equipment and materials shall be specified by C&IT and done by this Contractor unless otherwise indicated. Include all items such as, but not limited to, cable, patch panels, devices, and wiring called out on the Drawings and as necessary whether such items are actually indicated on the Drawings or not in order to meet NFPA requirements.
- B. In general, demolition of old low voltage communications cabling work is indicated on the drawings, however, the contractor shall visit the job site to determine the full extent and character of this work. All existing voice & data jacks demolished need to be documented. A room number, Jack number (if still there), approximate location in the room & the communication room where it terminated need to be identified. This information must be returned to C&IT IT Customer Services Telecommunications department.
- C. None of the recovered material shall be reused in the new work.
- D. Where equipment or fixtures are removed, outlets shall be properly blanked off, and conduits capped. After alterations are done, the entire installation shall present a "finished" look, as approved by the Architect/Engineer. The original function of the present systems to be modified shall not be changed unless required by the specific revisions to the system as specified or as indicated.
- E. Reroute cable as required to maintain service. Where walls and ceilings are to be removed as shown on the Drawings, the conduit is to be cut off by the Electrical Trades so that the abandoned conduit in these walls and ceilings may be removed with the walls and ceilings by the Architectural Trades. All dead-end conduit runs shall be plugged at the remaining outlet boxes or at the panels.
- F. Where new walls and/or floors are installed which interfere with existing telecommunications outlets, devices, etc., this Contractor shall adjust, extend and reconnect such items as required to maintain continuity of same.
- G. All electrical work in altered and unaltered areas shall be run concealed wherever possible. Use of surface metal raceway or exposed conduits will be permitted only where approved by the Architect/Engineer and as specifically indicated on the Drawings.

3.4 WORK IN EXISTING BUILDINGS

- A. The Owner will provide access to existing buildings via a Project Coordinator. However, this Contractor, once work is started in the existing building, shall complete same without interruption so as to return work areas as soon as possible to Owner.

- B. Adequately protect and preserve all existing and newly installed work. Promptly repair any damage to same at this Contractor's expense.
- C. Consult with the Owner's Project Coordinator and C&IT Project Coordinator as to the methods of carrying on the work so as not to interfere with the Owner's operation any more than absolutely necessary. Accordingly, all telecommunications services shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the Owner's representative.

3.5 COORDINATION

- A. Install work to avoid interference with work of other trades including, but not limited to, architectural, mechanical and electrical trades. Remove and relocate any work that causes interference at this Contractor's expense. Disputes regarding the cause of interference will be resolved by the Owner's representative or Architect/Engineer.
- B. If there is a general contractor, The general contractor is responsible for the construction schedule. All work activities are to be coordinated with the general contractor.

3.6 CHASES AND RECESSES

- A. Chases and recesses shall be provided by the Architectural Trades, but this Contractor shall be responsible for coordinating their accurate location and size.

3.7 SLEEVES

- A. Provide and install Hilti Speed Sleeve model CP-630 or EZ path fire stop system wherever conduits or cabling pass through fire rated walls, floors or cables pass through openings in walls.
- B. Sleeves are used in standard walls & floors with no fire rating. All sleeves through the floor are to extend 4 inches above floor, unless otherwise noted. Provide escutcheons at each sleeve in finished areas and adequate spacing between sleeves to accommodate escutcheons.

3.8 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

- A. Refer to General Conditions for requirements.
- B. All cutting, patching and repair work shall be done by the Contractor.

3.9 EXCAVATION AND BACKFILLING

- A. Provide all excavation, trenching, tunneling, dewatering and backfilling required for the telecommunications work. Coordinate the work with other excavating and backfilling in the same area.
- B. Refer to electrical Drawings and the architectural Specifications for excavating and backfilling methods and materials.

3.10 ACCESS DOORS

- A. Provide access doors for installation by architectural trades. In the walls, provide Milcor No. "DW" or "M" as required to make all controls, electrical boxes and other equipment installed by the Contractor accessible. Minimum size 12 inches x 12 inches. In the ceiling, provide Milcor No. 3210, 3105 or 3206 for accessibility as mentioned above, 24 inches x 24 inches minimum size. The plaster or acoustical tile insert shall be by the architectural trades. Areas with accessible ceilings (ceilings where tiles are not fastened in place and can be individually removed without removal of adjacent tiles) will not require access doors.
- B. When access doors are in fire resistant wall or ceilings, they must bear the Underwriters Laboratories, Inc., Label, with time design rating equal to or exceeding that of the wall or ceiling unless they were a part of the tested assembly.

3.11 CLEANING

- A. All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.
- B. Final cleanup shall include, but not be limited to, cleaning all telecommunications equipment spaces, devices, cover plates, and removing all scrap cable and debris from pathways.

3.12 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

- A. Equipment and materials shall be protected from theft, injury or damage.
- B. Protect conduit openings with temporary plugs or caps.
- C. Provide adequate storage for all equipment and materials delivered to the job site. Location of the space will be designated by the Owner's Project Coordinator or Architect. Equipment set in place in unprotected areas must be provided with temporary protection.

3.13 EXTRA WORK

- A. For any extra telecommunications work that may be proposed, this Contractor shall furnish to the General Contractor, an itemized breakdown of the estimated cost of the materials and labor required to complete this work. This Contractor shall proceed only after receiving a written order from the General Contractor establishing the agreed price and describing the work to be done.

3.14 DRAWINGS AND MEASUREMENTS

- A. These Specifications and accompanying Drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either shall be as binding as if call for by both. The Contractor will understand that the work herein described shall be complete in every detail.
- B. The Drawings are not intended to be scaled for rough-in measurements or to serve as shop drawings. Field measurements, necessary for ordering materials and fitting the installation to the building construction and arrangement, shall be taken by this contractor.

3.15 Automation System Program Code

- A. All automation system uncompiled and compiled program codes, source codes, custom modules, graphical user interface screen shots and any other automation system programming data and material (Program Code) shall be provided to the UNIVERSITY in hard copy and on CD Rom in an unencrypted format acceptable to the UNIVERSITY.
- B. Copyright for the Program Code shall be assigned to the UNIVERSITY for purposes of system maintenance.
- C. Provision of and Copyright assignment of the Program Code to the UNIVERSITY by the Vendor shall be conditions of the Purchase Order and contract acceptance by the Vendor.
- D. Provision of and Copyright assignment of the Program Code to the UNIVERSITY by the Vendor shall be conditions of final System acceptance by the UNIVERSITY.

END OF SECTION 17010

SECTION 17110 - TELECOMMUNICATIONS INTERIOR PATHWAYS

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

- A. Related Sections include the following:
 - 1. Division 17 Section "Telecommunications General Requirements."

4.2 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NFPA-297 - Guide on Principles and Practices for Communication Systems.
- C. ANSI/TIA 568-C - Commercial Building Telecommunications Cabling Standard.
- D. ANSI/TIA 569-C - Commercial Building Standard for Telecommunications Pathways and Spaces.
- E. ANSI JSTD- 607 B - Commercial Building Grounding and Bonding Requirements for Telecommunications.
- F. ANSI/IEEE-110-1992 - Powering and Grounding Sensitive Electronic Equipment.
- G. BICSI – Building Industry Consulting Services International.

4.3 SUBMITTALS

- A. Submit all structured cabling system raceways and supports identified in this section under provisions of Section 17010.
- B. Product Data: Provide for products specified and required.
- C. Shop Drawings: Indicate project specific part numbers, dimensions, support points, fittings and finishes.

4.4 PROJECT RECORD DOCUMENTS

- A. Submit all structured cabling system raceways and supports identified in this section under provisions of Section 17010.

- B. Accurately record equipment layout and cable layouts in all telecommunication spaces.

4.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 17010.
- B. Protect products from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

4.6 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduits, and cable pathways prior to rough-in.

4.7 DESCRIPTION OF SYSTEMS

- A. Communications cabling systems pathways shall be installed in accordance with ANSI/TIA 569-C.
- B. Intra-building backbone cabling shall be installed in conduit, cable tray or J-hook support system.
- C. Horizontal cabling (cabling from the telecommunications room to the work area outlet) pathways shall consist of [conduit] [cable tray] [J-hooks] [under floor duct system] [raised access flooring system] [accessible ceiling space] [cellular flooring system] as indicated on Drawings and as required.
- D. Where the accessible ceiling systems [raised access flooring systems] are used as the primary pathway, cabling shall be installed [in main cable tray runs] as indicated on the Drawings, with individual work area cables routed exposed [in conduit] and supported as specified herein.

PART 5 - PRODUCTS

5.1 J-HOOKS

- A. Manufacturers:
 - 1. Erico-Caddy.
 - 2. B-Line.
- B. Horizontal cable routed exposed through ceiling space shall be supported from J-hooks.

- C. J-hooks shall be a minimum of 5/8" wide and shall have a bearing surface that complies with required bend radii of the specified cables to be supported.
- D. J-hooks shall have flared or folded edges to prevent damage when installing cables.

5.2 INNERDUCT

- A. Manufacturers:
 - 1. Carlon.
 - 2. Endot.
- B. Install inner duct through conduits and sleeves for optical fiber cabling installations.
- C. Description: UL listed, non-metallic, corrugated flexible conduit for use in plenum or riser installations as applicable. Provide each inner duct with one 1/4" W pull tape with a tensile rating of 900 lbs.

PART 6 - EXECUTION

6.1 GENERAL

- A. Where cables pass through fire rated walls, the Contractor shall provide and install Hilti Speed Sleeve model CP-630 or EZ path fire stop system. This penetration sleeve must match the fire rating of the wall. The penetration shall be sized per ANSI/TIA-569-C.
- B. Any other wall or floor penetrations that aren't fire rated, the Contractor shall fire-stop the penetrations, after final cable installation, using Engineer-approved materials. Fire-stopping materials shall be installed per manufacturer's recommendations and shall maintain partition rating and integrity. All fireproofing shall be applied in a neat manner with all excess material cleaned from all walls and surfaces. Contractor shall replace and re-install all fireproofing materials removed during cable installation.
- C. Contractor shall patch and repair any holes or other damage to walls or partitions and paint to match original, as applicable.
- D. The Communication Cabling Contractor shall provide plastic and/or grounding bushings, as applicable, on all conduit sleeves, stubs and conduit terminations that may have been missed by the Electrical Contractor.
- E. All cutting, patching and restoration to the original condition of walls, ceilings, floors, etc., shall be the responsibility of the Contractor.
- F. All ceiling removal and restoration required for the execution of this work shall be the responsibility of the Contractor.

- G. Any additional existing voice & data jacks demolished need to be documented. A room number, Jack number (if still there), approximate location in the room & the communication room where it terminated need to be identified. This information must be returned to C&IT IT Customer Services Telecommunications department.
- H. All cabling installed exposed in accessible ceiling systems shall be supported by cable tray or J-hooks.
- I. All J-hooks shall be supported directly from the structure above or wall mounted, as applicable, independent of ceiling framing, electrical conduit, mechanical piping and ductwork. Provide all-thread rod with ¼" diameter or equivalent supporting means with suitable fasteners when attaching to structure or structural members. Increase size of support as required when multiple J-hooks (stacked or tree configuration) are attached to single support based on maximum loading capacity of J-hooks.
- J. **J-Hooks shall be spaced 48" Minimum or 60" maximum on center.**
- K. Telecommunications cabling shall be routed in continuous conduit above hard ceilings or between floors in any kind of offset condition.
- L. Communications cable pathway routing shall be coordinated with above ceiling work of other Contractors to avoid conflicts and potential sources of EMI.
- M. Do not route exposed communications pathway within 12" of lighting fixtures and electrical power feeders.
- N. Route inner duct for all fiber optic backbone cabling, in cable tray, conduit, and sleeves. Coordinate routings and quantities with Drawings.

END OF SECTION 17110

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SECTION 17130 - COMMUNICATION EQUIPMENT SPACES SUPPORT
HARDWARE

PART 7 - GENERAL

7.1 RELATED DOCUMENTS

- A. Related Sections include the following:
 - 1. Division 17010 Section "Telecommunications General Requirements."

7.2 SECTION INCLUDES

- A. Equipment racks.
- B. Equipment cabinets.
- C. Equipment shelves.
- D. Cable management.
- E. Backboards.
- F. Telecommunications cable runway.

7.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NFPA-75 - Protection of Electronic Computer Data Processing Equipment.
- C. NFPA-297 - Guide on Principles and Practices for communication Systems.
- D. ANSI/TIA 568-C - Commercial Building Telecommunications Cabling Standard.
- E. ANSI/TIA 569-C - Commercial Building Standard for Telecommunications Pathways and Spaces.
- F. ANSI/TIA 607-B - Commercial Building Grounding and Bonding Requirements for Telecommunications.
- G. ANSI/IEEE-110-1992 - Powering and Grounding Sensitive Electronic Equipment.
- H. BICSI – Building Industry Consulting Services International.

7.4 SUBMITTALS

- A. Submit under provisions of Section 17010.
- B. Product Data: Provide for racks and all cable management hardware
- C. Shop Drawings: Indicate dimensions, support points, and finishes.
- D. Submit layout Drawings to scale of all communication rooms indicating routing of all cable runway, elevations of equipment racks indicating all equipment to be installed, and all wall penetrations.

7.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 17010.
- B. Accurately record equipment layout and cable layouts in all telecommunication spaces.

7.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 17010.
- B. Protect products from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

7.7 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduits, and cable pathways prior to rough-in.

PART 8 - PRODUCTS

8.1 EQUIPMENT RACKS

- A. Manufacturers:
 - 1. Chatsworth Products (CPI)
 - 2. Homaco.
 - 3. Hubbell.
- B. Description: Nominal 19" x 84"H equipment rack, with universal EIA hole spacing for mounting equipment and accessories.
- C. Material: 6061-T6 heavy-duty aluminum or equivalent.

- D. Provide all hardware for floor mounting and anchoring.
- E. Provide one (1) equipment shelf and all mounting hardware.
- F. Provide complete ground bar kit with all required hardware
- G. Provide power plug strip mounted to equipment rack, with a minimum of 6 surge-protected outlets and 10-foot cord.

8.2 WALL MOUNTED EQUIPMENT RACKS

- A. Manufacturers:
 - 1. Chatsworth Products (CPI)
 - 2. Homaco.
 - 3. Hubbell.
 - 4. Blackbox.
- B. Description: Wall mounted rack, nominal 19" x 48"H, or 19" x 84"H, as indicated on Drawings.
- C. Material: Equivalent construction as floor mounted rack, with steel hinge and mounting hardware.
- D. Finish: Telco black powder coat.
- E. Width: Nominal 22 inches.
- F. Depth: Nominal 32 inches projection from wall.
- G. Height: Nominal 48 inches.
- H. Provide complete ground bar kit with all required hardware.
- I. Provide power plug strip with a minimum of 6 surge-protected outlets in cabinet and 10 foot cord.

8.3 VERTICAL CABLE MANAGEMENT

- A. Manufacturers:
 - 1. Same as equipment rack.
- B. Description
 - 1. Duct style cable management panel for mounting on equipment racks with slotted construction to allow multiple cable exits, [double sided for front and rear management] and fluted to allow cables to pass from front to rear.
 - 2. Removable solid cover.
 - 3. Material: ASTM A569 steel or 5052-H32 aluminum.

4. Provide (2) 3"W cable management units between racks and one 6"W at ends. Cable management unit shall be [84"H] [96"H] by nominal 6"D
 5. Finish: Electrostatic powder coat, post-fab painted in black.
- C. Provide all hardware required for securely mounting panel to equipment rack.

8.4 HORIZONTAL CABLE MANAGEMENT

- A. Manufacturers:
1. Same as equipment [rack] [cabinet].
 2. Same as UTP connector.
- B. Description
- C. Cable management bar with split D-rings [with pass-through holes] [removable cover] for mounting on 19" rails.
- D. Material: [Steel] [High-strength plastic].
- E. Dimensions: Provide one (1) rack unit and two (2) rack unit sizes to coordinate with size of corresponding patch panel. D-rings shall be nominally 5"D.

8.5 EQUIPMENT CABINETS

- A. Manufacturers:
1. Chatsworth Products (CPI)
 2. Hubbell.
 3. Great Lakes Cabinets.
- B. Standard equipment cabinet, floor mounted, will be nominal 24"W x 30"D x 84"H, fully welded steel construction, lockable front and rear doors (roof fans) cable management, 19" EIA mounting racks and adjustable, fixed shelves as required.
- C. The cabinet frame shall be constructed of four cold rolled steel components – top, bottom, left and right welded to form a self supporting framework. The side members shall be fabricated from 16 gauge cold rolled steel. The top and bottom shall be fabricated from 14 gauge cold rolled steel. The vertical uprights shall have integral cable management channels with provisions for hook and loop or traditional cable ties. The frame shall be designed to be bolted side by side to other frames.
- D. The side covers shall be constructed of 19 gauge cold rolled steel with double bent flanges along the entire perimeter. The side covers shall lift off easily via grip handles assembled to the covers. The side cover shall have clusters of rectangular perforation to accommodate ventilation for equipment providing greater than 100 sq. in. of ventilation.
- E. The front door shall be a window door assembled to the frame via spring-loaded hinges at the top and bottom. The door shall be locking with a unique operator's

key. The operator's key shall operate the front door only. The latch shall be flush to the door. The window shall be a .125" acrylic panel secured to a reinforced steel frame.

- F. The rear door shall be a steel door assembled to the frame via spring-loaded hinges at the top and bottom. The door shall be locking with a unique service personnel key. The service personnel key shall operate both the rear and front doors. The latch shall be push button operated. The rear door shall be reinforced and have a cluster of rectangular perforations for ventilation.
- G. The top shall have a removable panel in the center, designed to be replaced with a cooling fan, and six 3" diameter cable entry knockouts; three along each side to route cables directly into vertical cable organizers minimizing the number of bends to the cables.
- H. The bottom panel shall be similarly configured with 6 knockout locations. The cabinet bottom shall also be provided with holes for securing the cabinet to the floor.
- I. The top cover shall accept the mounting of a 250 CFM cooling fan.
- J. The cabinet shall be pre-configured for 19" mounting with universal hole spacing per the EIA 310 standard requirements.
- K. The cabinet shall feature three sets of rails, front, center, and rear. The front set of rails shall be 20 rack positions high, from the bottom of the cabinet. The rear and center rails shall be the full internal height. The recess of all three sets of rails shall be adjustable forward and back. The rails shall be tapped for a #10-32 screw. The center rails shall be formed in a 'C' profile, 3" deep, tapped on both the front and rear flanges so as to provide the functionality of an open frame rack. The front and rear rails shall be of an L shape.
- L. The entire enclosure shall be finished with a durable polyurethane powder coat – medium texture, and shall be **black** in color.

8.6 EXTRA LARGE EQUIPMENT CABINETS

- A. Description: Extra large equipment cabinets, floor mounted, nominal 30"W x 36"D x 84"H, fully welded steel construction, lockable front and rear doors, roof fans, cable management, 19" or 23" EIA mounting racks as indicated and required, and adjustable, fixed shelves as required.
- B.

8.7 WALL MOUNTED EQUIPMENT CABINETS

- A. Manufacturers:
 - 1. Chatsworth Products (CPI)
 - 2. Hubbell.

3. Great Lakes Cabinets.

- B. Equipment cabinet, wall mounted will be nominal 24"W x 48"H x 24"D, with equivalent construction as standard floor mounted cabinet except with double hinged center section.
- C. The cabinet body shall consist of 16 gauge cold rolled steel formed and welded construction. The cabinet body sides shall have clusters of rectangular perforations to accommodate adequate ventilation for the enclosed equipment. The top and bottom of the cabinet body shall also have a circular cut with a removable cover plate for the mounting of an optional 250 cfm cooling fan. The cabinet shall be symmetrical in design to allow front and rear doors to open left or right.
- D. The rear door shall consist of 16 gauge cold rolled steel formed and welded construction with a double bent flange along the door's entire perimeter. There shall be two (2) pairs of wall mounting holes located at the upper and lower surface of the door, spaced 16" on center for mounting to studded wall construction. The top and bottom edge of the rear door shall each have three (3) through hole cut outs [3" in diameter] with removable plastic covers, along with two (2) double ring knock out holes for 1.12" or 0.88" through-hole openings. The rear door shall be symmetrical in design to allow for reverse mounting. The door shall be locking with a unique key to operate the rear door only.
- E. The front door shall be made of 16 gauge cold rolled steel formed and welded construction, with a double bent flange along the entire perimeter. The door should be available in both solid and a framed window. The window version shall have .125" thick acrylic panel secured to a reinforced steel frame. The door shall be locking with a unique operator's key, which operates the front door only.
- F. The wall mount cabinet shall be pre-configured for 19" mounting with #12-24 tapped holes 5/8", 5/8", 1/2" EIA standard hole pattern. The 19" mounting rails shall be constructed of 11 gauge cold rolled steel. Mounting rails shall also be fully adjustable from front to back of the cabinet.
- G. The entire cabinet shall be finished with a durable polyurethane powder coat, medium texture, and be available in black or office white.
- H. The wall mount cabinet shall be designed so that access to all internal components can be from the front or rear of the cabinet body by way of a dual hinge design.
- I. Weight: Load capacity of the cabinet shall be 150 lbs. Dedicated 120V cabinet installed in cabinet.
- J. Provide dedicated 120V circuit installed in cabinet.

8.8 BACKBOARDS

- A. Description: AC-grade fire rated or better plywood backboard in sheets measuring 4'W x 8'H x 3/4"D. Plywood sheets shall be free of all voids. Plywood shall have a minimum of two coats of fire-resistant, non-conducting paint applied to all sides of all sheets. Provide flush hardware and supports to mount plywood to wall. The provided hardware shall have sufficient strength to carry all anticipated loads including, but not limited to cabling, cable management, equipment and terminating hardware and electronics equipment.

8.9 TELECOMMUNICATIONS CABLE RUNWAY

- A. Manufacturers:
 - 1. Chatsworth Products (CPI)
 - 2. Homaco.
 - 3. Hubbell.
 - 4. Cablofil.
- B. Description: 16 gauge tubular steel stringer style, with rungs 9"-12" O.C.
- C. Material: 3/8" x 1-1/2" tubular steel with 1/2" x 1" steel channel rungs, or equivalent.
- D. Finish: Telco gray [black] powder coat.
- E. Width: 18 inches, or as indicated on Drawings.
- F. Provide manufacturer's standard hardware and accessories indicated and required to provide a complete system. Provide minimum 3/8" diameter threaded rod and mounting hardware for cable runway. Cable runway must be mounted from the sides. It is not permissible to support the cable runway from the center. No exception to this will be allowed.
- G. Provide 6" H side mount vertical retaining posts on each side at minimum 48" intervals to maintain cabling on runway, or vertical members integrally attached to rungs. Provide same finish color as runway.
- H. Provide cable drop-off, radius fittings as required for cable transitions from horizontal to vertical. Provide same finish color as runway.

PART 9 - EXECUTION

9.1 EQUIPMENT RACKS

- A. Contractor shall furnish and install wall mounted and floor-mounted equipment racks per manufacturer's recommendation.
- B. Provide equipment racks of same type, style and finish color as existing, where applicable.

- C. The racks shall be labeled according to the Drawings and in accordance with specification 17170 "Cable Plant Administration and Testing."
- D. Free standing equipment racks shall be bolted to the floor using anchors in concrete floor and toggle bolts through raised flooring.
- E. All racks, cabinets and cable transport hardware shall be bonded to the communications system ground riser.
- F. Mount the top of the equipment racks to the bottom of cable runway unless noted otherwise on Drawings for the cable runway to be higher.
- G. Dedicated power circuits for each equipment rack will be located at the bottom or the top of the equipment racks as indicated on the drawings.
- H. Each equipment rack will have separate ground wire to the ground buss bar.

9.2 EQUIPMENT CABINETS

A. Free Standing Cabinets

- 1. Cabinets shall be installed in a location that allows both the front and rear door to open a full 90 degrees.
- 2. Cabinets employing cooling fans shall be installed such that there is at least 6" of clear space above the top of the fan casing.
- 3. Each free standing equipment cabinet will have a separate ground wire to the ground buss bar.

B. Wall Mount Cabinets

- 1. Wall mount cabinets shall arrive on site fully assembled and ready to install.
- 2. When mounting the cabinets to studded wall construction, the cabinet must be secured to the wall studs to assure adequate support for the enclosure and its contents.
- 3. Cabinets shall be installed in such a way as to not interfere with the use of the front door or hinged body section.
- 4. Each wall mount cabinet will have a separate ground wire to the ground buss bar.

9.3 EQUIPMENT SHELVES

- A. Install per manufacturer's recommendations using all hardware required.

9.4 CABLE MANAGEMENT

- A. Install vertical and horizontal cable management panels per manufacturer's recommendations.

- B. Install vertical panels on each side of free-standing equipment racks.
- C. Install horizontal patch panels of equivalent quantity as patch panels and of equivalent size, i.e. one rms of cable management panels for one rms of patch panels.

9.5 BACKBOARDS

- A. A minimum of three walls (or as indicated on Drawings) shall be covered with plywood backboards to a minimum 8'-6" above finished floor in all Telecommunications spaces and as indicated on Drawings. Normally no plywood is needed on the wall where the door is.
- B. Securely fasten backboard to wall using appropriate hardware and mount at all four corners, minimum. Securely fasten backboard to wall-framing members (studs).
- C. Provide adequate backboard space to allow a clean and workable arrangement for telephone and data connections. Keep all non-voice data item to corners of shortest wall (doorwall).

9.6 TELECOMMUNICATIONS CABLE RUNWAY

- A. Provide tubular steel cable runway in communications closets around 3 sides of the room for proper cable management. Provide all mounting hardware to securely mount to equipment racks, wall, ceiling or structure above, as required. Provide supports recommended by manufacturers and no more than 10 ft O.C.
- B. As a minimum, mount runway at each end to wall using appropriate hardware. Where overall length is greater than 10 ft, provide supplemental support from structure above or from equipment racks and cabinets below. Provide additional supports as required to prevent runway from swaying.
- C. Mount runway directly to top of racks unless noted otherwise on drawings for the cable runway to be higher.
- D. Runway shall run around 3 sides of perimeter of room and an additional 4th section across the center of the room securing the top of the equipment racks to the cable runway. Normally no cable runway will be needed on the door side wall unless cable sleeves / cable tray entering the communication room are over the door header or noted otherwise on the drawings.
- E. Each section of the cable runway section will be grounded and bonded together.
- F. The cable runway will have a separate ground wire to the ground buss bar.

END OF SECTION 17130

SECTION 17150 - TELECOMMUNICATIONS CABLING

PART 10 - GENERAL

10.1 RELATED DOCUMENTS

- A. Related Sections include the following:
 - 1. Division 17010 Section "Telecommunications General Requirements."
 - 2. Telecommunications construction drawings.

10.2 REFERENCES

- A. ANSI/TIA-568-C - Commercial Building Telecommunications Cabling Standard.
- B. ANSI/NFPA 70 - National Electrical Code.
- C. FCC Part 68 - Connection of Terminal Equipment to the Telephone Network.
- D. FCC Part 15 - Radiation Limits.
- E. FCC Part 76 - Cable Television Service.
- F. BICSI TDMM - Telecommunications Distribution Methods Manual, Latest Edition.
- G. BICSI TCIM - Telecommunications Cabling Installation Manual, Latest Edition.

10.3 PROJECT CONDITIONS

- A. Verify field measurements are as shown on Drawings.
- B. Verify suitability of all pathways prior to cable installation.

10.4 CABLING SYSTEM PERFORMANCE

- A. General:
 - 1. Cabling system performance shall meet or exceed current industry standards and/or manufacturers' specifications as specified herein.
 - 2. The cable installed in the walls, connectors, jack, patch panels, & patch cords must be the same manufacture & model that forms the

complete cabling system channel. The total system shall meet the performance criteria described below.

3. The cable and connector devices shall be certified compatible by the manufacturer of each component to meet the performance criteria described below. Submit manufacturer's certification with submittals.
4. The referenced standards describing the performance below shall include all revisions, clarifications and bulletins to the original standard referenced as well as any standards cross-referenced.
5. The referenced standards describing the performance below shall apply to backbone cable, horizontal cabling and connecting hardware performance requirements as well as installation standards and techniques and field testing and verification of performance.

B. A plenum category 5E (CAT5E) cabling in a 25 pair cable bundle is to be utilized for voice (telephone) building backbone riser only. Category 5E performance is defined by ANSI/TIA 568-C for 100 ohm UTP cables and associated connecting hardware whose transmission characteristics are specified up to 16 MHz.

C. Category 6 enhanced (CAT6E) cabling shall be utilized for all voice, data, wireless access points & security camera horizontal wiring. For WSU projects, any one of the following five cat6e structured cabling system products are acceptable:

1. Hubbell NEXTSPEED Cat 6 enhanced
2. Superior-Essex/BerkTek NextGain Cat6EX
3. Leviton-Ortronics Lanmark-2000
4. Beldon DataTwist 600e
5. CommScope Uniprise 7504 Cat6E

Category 6e performance is defined by the manufacturers of the above cabling products,

D. Fiber optic cabling shall be utilized for all data building backbone riser. Fiber optic performance is defined as follows:

1. Multimode:
 - a. **50/125µm** laser optimised fiber optic cable. The cable shall be dual rated for 850nm and 1300nm and meet all performance requirements of TIA/EIA 568-492aaac (om3) at each transmission wavelength.
 - b. Maximum attenuation:
3.5dB/km @ 850nm
1.5dB/km @ 1300nm
 - c. Bandwidth:
1500 MHz*km @ 850nm
500 MHz*km @ 1300nm
2. Singlemode:
 - a. Provide nominal 9/125µm core/cladding, singlemode dispersion unshifted fiber optic cable. The cable shall be rated for 1310nm and

1510nm and meet all performance requirements of ANSI/TIA 568-C

at each transmission wavelength.

- b. Maximum Attenuation: 0.5dB/km @ 1310nm
- c. 0.5dB/km @ 1550nm
- d. Bandwidth: 2GHz*km @ 1310nm
- e. 2GH*/km @ 1550nm

10.5 CONTRACTOR QUALIFICATIONS

- A. The installing Contractor shall be certified by the cabling and connector manufacturer of the structured cabling system product selected from 1.4.C (above). A letter of certification from the manufacturer shall be included in the bid submittal. No exception to this will be allowed.

10.6 SUBMITTALS

A. Product Data Sheets:

- 1. Submittals shall be complete and bound in 3-ring binders (or similar fashion) for Engineer's approval prior to ordering equipment.
- 2. The binders shall contain manufacturer's product data sheets for the specific items to be installed for this project.
- 3. Contractor shall highlight or otherwise identify each specific item to be installed, by catalog number, on each product data sheet. The Contractor shall indicate specific color, style, configuration, etc., and all accessories specified and required for a complete installation.

B. Samples (May Be Required)

- 1. Submit samples of all cabling to be provided in this section for Engineer's review prior to installation. Samples shall be 12" in length and shall be labeled.
- 2. Submit 2 sets of samples of all types of cable labels to be provided in this section. Attach one set to the cable samples, and submit together for Engineer's review.
- 3. Submit sample of labeling scheme proposed for the project. Include all labeling scenarios such as cables, outlets, patch panels, racks, etc. Submit proposed schemes for Engineer/Owner review prior to installation.

10.7 UNIT PRICING

A. Provide separate unit pricing included with bid for each of the following:

- 1. A complete workstation drop of each type of outlet indicated (e.g. A, B, C, etc.) of length 100 feet, including all cabling, connectors, faceplate, labeling, installation, termination and testing.

2. Complete schedule C of WSU's purchasing bid package.

10.8 UTP CABLING SYSTEM WARRANTY

A. General

1. The UTP voice and data cabling system shall be warranted by the manufacturer(s) of the components for a period of not less than 20 years from the time the installation is deemed complete.
2. It shall be the sole responsibility of the low voltage cabling Contractor to register the project with the manufacturer(s) and meet all manufacturers' warranty requirements.
3. It shall be the sole responsibility of the low voltage cabling Contractor shall provide Owner with test results, all manufacturers' warranty certificates with Record Documents including a site plan elevation with outside plant man holes, hand holes & conduit.

B. Warranty Coverage

1. Product - all passive components of the cabling system shall be warranted to be free from defects in material and workmanship.
2. Performance - all passive components, as installed, shall meet or exceed all published performance data.
3. This will exceed TIA and ISO performance specifications for Permanent Link and Channel, as required, at all frequencies specified.
4. Applications - the installed Permanent Link and Channel shall be warranted to support all current applications, as well as those introduced in the future, that require the specified cabling system per TIA, ISO & cabling manufacture specifications.

C. Warranty Requirements

1. Provide a Permanent Link warranty for all voice drops. Provide a Channel warranty for all data drops.
2. Warranty shall cover repair or replacement of all defective components free of charge, including all labor performed by a manufacturer-certified installer. All new or replacement components shall be furnished new. Never used, reused, reconditioned, or refurbished components shall be allowed.
3. The installing Contractor shall be certified by the cabling and connector manufacturers as an approved and trained installer of their equipment. Submit letter of certification from the manufacturer to the engineer at time of submittal. No exception to this will be allowed.

PART 11 - PRODUCTS

11.1 INTER-BUILDING FIBER OPTIC BACKBONE

A. Singlemode fiber optic cabling

1. Manufacturers:
 - a. Systimax
 - b. Corning
 - c. BerkTek
 - d. CommScope
2. Description: Nominal 9/125 μm , [6] [12] [18] [24] [36] [48] [96] strand or as indicated on Drawings, loose tube, all-dielectric cable, rated for outdoor use. Cable shall have water-blocking properties to prevent water penetration and fiber damage. Cable shall have maximum 12 stands per tube, and an overall Polyethylene jacket.
3. Description: Nominal 9/125 μm , [6] [12] [18] [24] [36] [48] [96] strand or as indicated on Drawings, loose tube, armored cable, rated for outdoor use. Cable shall have water-blocking properties to prevent water penetration and fiber damage. Cable shall have maximum 12 stands per tube, and an overall Polyethylene jacket.
4. Description: Nominal 9/125 μm , [6] [12] [18] [24] [36] [48] [96] strand or as indicated on Drawings, loose tube, OFNR rated for indoor/outdoor use. Cable shall have water-blocking properties to prevent water penetration and fiber damage. Cable shall have maximum 12 stands per tube, and an overall UV resistant, flame retardant jacket.

11.2 INTRA-BUILDING COPPER BACKBONE (VOICE ONLY)

A. Manufacturers:

1. Superior-Essex
2. BerkTek
3. Beldon
4. Hubbell
5. CommScope

B. Description:

1. Twisted pair copper conductors, 24 AWG, solid annealed copper. Provide [25] [50] [100] pair cable bundles, as indicated on Drawings.

2. Cable rated CAT 3 voice backbone cable, UL Listed CMR, CMP as required.
3. 25 pair binder groups color coded per industry standards.
4. Flame-retardant PVC insulation for riser rated applications, low-smoke PVC insulation for plenum applications, color-coded for each conductor per industry standards.
5. White, flame-retardant PVC outer jacket for riser rated applications, gray low-smoke PVC outer jacket for plenum applications.

11.3 INTRA-BUILDING FIBER OPTIC BACKBONE

A. Multimode fiber optic cabling

1. Manufacturers:
 - a. Systimax
 - b. Corning
 - c. BerkTek
 - d. CommScope
2. Description: 50]/125 μm , [6] [12] [18] [24] [36] [48] strand or as indicated on Drawings, tight buffered, OFNP. Cable shall be comprised of individually jacketed, and uniquely identified fibers with an overall orange sheath.
3. Horizontal & Vertical fiber cable shall be furnished with performance requirements for the system served (voice, video or data) as indicated on the drawings riser diagram.

B. Singlemode fiber optic cabling

1. Manufacturers:
 - a. Systimax
 - b. Corning
 - c. BerkTek
 - d. CommScope
2. Description: Nominal 9/125 μm , [6] [12] [18] [24] [36] [48] strand or as indicated on Drawings, tight buffered, OFNP. Cable shall be comprised of individually jacketed, and uniquely identified fibers with an overall yellow sheath.
3. Horizontal & Vertical fiber cable shall be furnished with performance requirements for the system served (voice, video or data) as indicated on the drawings riser diagram.

11.4 COPPER HORIZONTAL CABLING

A. Manufacturers:

1. CommScope
2. BerkTek
3. Superior-Essex
4. Hubbell
5. Beldon

B. Description:

1. Horizontal cable shall be furnished with performance requirements for the system served (voice, video or data) as indicated on the drawings riser diagram.
2. Category 6 enhanced: 23 AWG, 4-pair, 100 ohm, UTP, [CMR] [CMP], with green jacket for data & wireless access points, yellow jacket for voice cabling, purple jacket for security camera cabling. See exact products in section 10.4 C above.
3. Voice jacks will terminate in their own group of patch panels. Workstation, server, printer etc. data jacks will terminate in their own group of patch panels. Wireless access point & security camera data jacks will terminate in their own separate group of patch panels. All install in the equipment racks.

11.5 UTP JACKS AND CONNECTORS

A. Manufacturers:

1. CommScope UNJ600.
2. Ortronics
3. Leviton
4. Hubbell
5. Beldon

B. Modular jacks for UTP cables:

1. 8 position, 8 conductor, non-keyed, universal modular jack, snap-in type, terminated with a 110 style pc board connector, color coded for T568A & T568B wiring.
2. Designed to terminate 22-26 AWG solid on insulation-displacement 110-style connectors.
3. Contacts shall be minimum 50 micron gold-plated in the contact area.
4. Rated to match the performance of the cabling system they are installed on.
5. Color coded for system served as indicated on the Drawings.
6. Furnish keystones (icons) for jack identification. Keystones for voice jacks shall be **[White]** and keystones for data, wireless access points & security cameras jacks shall be **[orange]**.
7. When installing outdoor cameras, Aps, or any type of network device

You must use one of the following Hi-Impact jacks and patch cords.

A. Manufacturers:

1. CommScope UMP610-24P or UMP610-48P.
2. Ortronics
3. Leviton
4. Hubbell HI6Coupler & Jack. HI603AE Patch Cord
5. Beldon

11.6 UTP PATCH PANELS

A. Manufacturers:

1. CommScope UMP610-24P or UMP610-48P.
2. Ortronics
3. Leviton
4. Hubbell
5. Beldon

B. UTP Patch Panel:

1. Patch panel shall serve as data jack, voice jack, security access point system horizontal cross connect.
2. Wireless access point & security camera data jacks will be terminated on their own patch panel separate from the workstation data jack patch panels.
3. Patch panel shall be configured for standard 19" rack mounting.
4. High density type with 24 modular jack ports for every standard rack mount unit (1.75" high).
5. Maximum 6 port groupings of replaceable modules.
6. Terminations for the "building side" cabling on 110-style insulation pc board connectors color-coded for T568B terminations.
7. Horizontal and vertical cable management hardware front and rear.
8. Performance shall meet the performance of the cabling system they are installed on.
9. Constructed of black anodized aluminum with adequate structural integrity so that panel will not deflect when center of panel is pushed with the hand.
10. Provisions for icons and labeling to comply with the labeling requirements in specification 17170, "Cable Plant Administration and Testing".

11.7 CROSS-CONNECT BLOCKS

A. Manufacturers:

1. CommScope.
2. Ortronics
3. Leviton

4. Hubbell
 5. Beldon
- B. Cross-connect blocks
1. Cross connect blocks shall be used for voice connectivity [backbone to] horizontal cross connects:
 2. Wall mount 110 type wiring blocks mounted in a modular frame design that includes the frame, blocks, vertical and horizontal wiring troughs, and designation strips.
 3. Provide wire management frames between adjacent vertical sections to allow management of cross connect wiring.
 4. The frames and horizontal wiring troughs shall be constructed of steel (painted white or ivory in color), the wiring blocks, connecting blocks and vertical frames shall be constructed of molded polycarbonate.
 5. Blocks shall be marked black every fifth pair.
 6. Locate backbone frames on the right and horizontal frames on the left.

11.8 FACE PLATES

- A. Manufacturers: Same as jacks and connectors, unless otherwise noted. In almost all cases in labs, stainless steel plates will be called out in lieu of plastic. Reference construction drawings.
- B. Face plates for wall mounted workstation outlets shall allow a minimum 2 and maximum of 6 positions and accept snap-in jacks, as specified.
- C. Face plates for recessed outlet boxes shall be high-strength nylon, [white] color, single-or double-gang as required and as applicable. Face plates shall be equipped with label slots, top and bottom, and clear polycarbonate covers for each label.
- D. Provide duplex mounting frames, as required, to mate and match jacks to face plates.
- E. Provide stainless steel faceplates with attachment hooks for hanging telephone device for outlets indicated as wall phone outlets.

11.9 UTP PATCH CORDS

- A. Manufacturers:
 1. Shall be the same manufacturer & type as the cable, jacks & patch panels installed in the building..
- B. Description:
 1. Provide two (2) patch cords, one of each length specified, for each data and voice port in patch panel outlet and one (2) patch cord for each data & voice port for the workstation, length as specified above.

2. For the workstation room side provide cords with stranded conductors and jacketing for greater flexibility, having compatible performance as copper UTP horizontal and fully warranted, as required.
3. Patch cords shall be **[10'-15']** in length, gray color for the workstation, **[3'-7']** in length, gray color for the communication room, **[3']** in length, green color for the access point & **[3']** in length, purple color for the security cameras. Coordinate possible different lengths with Owner.

11.10 FIBER OPTIC CONNECTORS FOR BOTH INTER – BUILDING & INTRA – BUILDING CABLES

A. Manufacturers:

1. Corning Cable Systems.

B. Multimode fiber optic connectors shall be:

1. Field installed **[SC]** type in 12/24 port panels for INTRA – BUILDING riser tie cabling between communication rooms. Provide **[black]** color connector.
2. Field installed **[SC]** type in 12/24 port panels for INTER – BUILDING tie cabling between buildings. Provide **[blue]** color connector.

C. Singlemode fiber optic connectors shall be:

1. Field installed **[SC]** type in 12/24 port panels for INTRA – BUILDING riser tie cabling between communication rooms. Provide **[black]** color connector.
2. Field installed **[SC]** type in 12/24 port panels for INTER – BUILDING tie cabling between buildings. Provide **[black]** color connector.

D. Singlemode fiber optic connectors for video shall be:

1. Field installed **[SC/APC]** type in 12/24 port panels for INTRA – BUILDING riser tie cabling between communication rooms. Provide **[green]** color connector.
2. Field installed **[SC]** type in 12/24 port panels for INTER – BUILDING tie cabling between buildings. Provide **[green]** color connector.
3. Connectors shall be epoxy polish **[SC/APC]** type with ceramic ferrule with tool kit.
4. Connectors shall be fusion type. Compression type connectors shall not be allowed.
5. All **[SC/APC]** connectors and ferrules shall be green in color.
6. Field Install A Minimum of 2 strands or Coordinated exact quantities and requirements for **[SC/APC]** terminated fiber optic strands with C&IT-IT Customer Services- Telecommunications department prior to installation.

11.11 FIBER OPTIC PATCH PANELS

A. Manufacturers

1. CommScope.
2. Corning
3. Leviton
4. Ortronics

B. Description:

1. Rack-mounted, minimum 24-port patch panel with modules or panels as indicated suitable for mounting connector types as specified and as required, complete with slide-out fiber management tray and management rings and clips to maintain minimum bend radius of fibers, and lockable front and rear doors, clear, tinted-polycarbonate front door (03U and 04U panels only).
2. Provisions for icons and labeling to comply with the labeling requirements in specification 17170, "Cable Plant Administration and Testing".

11.12 COPPER SPLICING PRODUCTS

A. Manufacturers:

1. 3M – Series 2-Type FR 510 Closure.

B. Description: Copper splice case, indoor, re-openable, sized for pair counts indicated on Drawings. Provide all hardware and accessories required to make the quantity and type of splices as indicated on the Drawings.

11.13 FIBER OPTIC SPLICE PANELS

A. Manufacturers:

1. CommScope.
2. Corning
3. Leviton
4. Ortronics

B. Description: Rack-mounted splice enclosure with splice trays, cable strain relief hardware, sliding shelf, locking front and rear doors, grommeted entry points, and open-side design for easy fiber egress.

C. Splice trays shall be for heat-shrink fusion splices and compatible with splice panel.

PART 12 - EXECUTION

12.1 GENERAL

- A. In addition to the notes contained on the Drawings, the following Contractor notes shall apply.

12.2 CABLE ROUTING

- A. Route all cables and cable raceways parallel to or perpendicular to building structure.
- B. All cables shall be installed as single continuous "home-run" pulls from connector block to connector block, or from patch panel in the telecommunications room to voice/data workstation outlet in the work area.
- C. Cable that is run above a suspended ceiling should be supported per manufacturer's recommendations, whether in approved cable tray, in conduit, or by j-hooks.
- D. All data/communication cables, not installed in conduits, shall be supported by j-hooks supported from the bar joists or trusses. No tie-raps or bundling allowed.
- E. The number of voice/data cables per hanger shall not exceed manufacture rating.
- F. The maximum spacing of cable hangers and supports shall be 60 inches or less. Level changes may require additional support. Contractor shall be responsible to replace all fire-proofing materials displaced during installation of hangers to maintain required fire rating of structure.
- G. Communication cable and infrastructure shall be independently supported.
- H. Do not support or tie-wrap any cables to ductwork, plumbing lines, fire suppression, electrical conduits, mechanical systems, or ceiling system.
- I. Do not directly lay or route voice/data cables on ductwork, piping and plumbing systems or on top of the lay-in ceiling tile.
- J. Minimum clearance distance requirements shall be observed:
 - 1. 5" (125 mm) from power lines of 2 KVA or less.
 - 2. 12" (305 mm) from high voltage lighting (including fluorescent).
 - 3. 39" (1 m) from power lines of 5 KVA or greater.
 - 4. 39" (1 m) from transformers and motors.
- K. All cable must be free of tension at both ends as well as over the length of the run.

- L. Only Velcro straps are permitted as cable bundle supports. Waterfalls from cable tray shall not pinch, bind, crimp or in anyway deform or cause physical damage to the cable jacket, or alter the electrical characteristics of the voice/data cables.
- M. Contractor shall take care to assure that during and upon completion of the installation, all cables are free of kinks, sharp bends, twists, gouges, cuts or any other physical damage which may cause physical or electrical characteristic alterations to the cables. The cables must also be installed at the proper room temperature. Any of these conditions will constitute a replacement of the installed cable.
- N. Contractor to observe all minimum bend radius and tension limitations, etc., as specified by the cable manufacturer when installing the cables.
- O. Contractor shall supply neatly bundled slack loops of length 10 feet for all cabling in telecommunications spaces. Provide neatly bundled slack loop 1 foot above the ceiling at workstation end.
- P. Provide Velcro cable ties periodically in all runs and within the telecommunications spaces provide slack loops per standards and to neatly bundle cables.
- Q. Route all optical fiber cabling in inner duct. Support inner duct with j-hooks a maximum five feet on center when not routed in conduit or cable tray.

12.3 CABLE TERMINATIONS

- A. The Contractor who installs the communications cabling shall terminate & test the finished link. It is not allowed to have a non-certified electrical contractor install the communications cable & have another certified contractor terminate, test & warranty it. No exceptions to this will be allowed. Terminate all wiring at both ends using the T568B convention. All voice and data cables shall be terminated in accordance with ANSI/TIA 568-C installation guidelines.
- B. Contractor to install all modular jack dust covers and 110 style module "stuffer" caps as per manufacturer's recommendations on all workstation outlets and patch panels.
- C. All voice (phone) cables shall terminate on rack mounted, high density, patch panels in their own patch panel separate from workstation data jack patch panels.
- D. All data cables shall be terminated on rack mounted, high density, patch panels.
- E. Wireless access point & security camera data jacks will be terminated on their own patch panel separate from the workstation data jack patch panels.
- F. All access point & camera jacks above ceiling must be orange, securely mounted and labeled. No double stick allowed.
- G. All cable terminations shall be free of stress or tension when complete.

12.4 OUTLETS

- A. Contractor shall coordinate the location of all outlets with the architectural furniture layouts and the Engineer and WSU C&IT.
- B. Contractor to furnish and install voice, data, and video jacks in face plates for flush and surface-mounted workstation outlets.
- C. Mount surface outlets securely in place in consistent locations on systems furniture. Coordinate with furniture installer.

12.5 FACE PLATES

- A. Contractor shall furnish and install faceplates on wall boxes and raceway as required and as indicated on the Drawings.
- B. Contractor shall provide standard faceplate with blank inserts for all outlets indicated as "future".

12.6 PATCH PANELS

- A. The Contractor shall provide patch panels and cable management panels in equipment racks, as required.
- B. Mount patch panel according to equipment rack elevations.

12.7 VOICE RISER CONNECTING BLOCKS

- A. Contractor shall mount 110 style-connecting blocks on plywood backboard. Provide "D rings" & cable management between blocks.

END OF SECTION 17150

SECTION 17170 - CABLE PLANT ADMINISTRATION AND TESTING

PART 13 - GENERAL

13.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
- B. Related Sections include the following:
 - 1. Division 17010 Section "Telecommunications General Requirements."

13.2 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NFPA-297 - Guide on Principles and Practices for Communication Systems.
- C. ANSI/TIA 568-C - Commercial Building Telecommunications Cabling Standard.
- D. ANSI/TIA 569-C - Commercial Building Standard for Telecommunications Pathways and Spaces.
- E. ANSI/ JSTD 607-B - Commercial Building Grounding and Bonding Requirements for Telecommunications.
- F. ANSI/IEEE-110-1992 - Powering and Grounding Sensitive Electronic Equipment.
- G. BICSI – Building Industry Consulting Services International.

13.3 SUBMITTALS

- A. Submit under provisions of Section 17010.
- B. Product Data: Provide for all cable and device labeling apparatus.
- C. Reports: Submit final, certified test reports in bound booklet and electronic media. Include signed and dated reports certifying the test results.

13.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 17010.
- B. Accurately record equipment layout and cable layouts in all telecommunication spaces.

13.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site under provisions of Section 16010.
- B. Protect products from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

13.6 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduits, and cable pathways prior to rough-in.

PART 14 - PRODUCTS

14.1 LABELS

- A. Manufacturers:
 - 1. Brady.
 - 2. Brother P-Touch.
 - 3. Equivalent by Tester manufacturer.
 - 4. Equivalent by UTP connectivity manufacturer.
- B. Description
 - 1. Machine-printed permanent glossy polyester labels for racks, cabinets, faceplates, and panels. (Brady B-422).
- C. Machine-printed, self-laminating vinyl for cabling and patch cords. (Brady B-427)

PART 15 - EXECUTION

15.1 LABELING

- A. Contractor to install all faceplate and equipment labels in accordance with manufacturer's recommendations and the specifications. All labels shall be

neatly installed and shall be level with the floor and properly aligned on the faceplate.

- B. All pieces of voice and data equipment, including wires, cables, fibers and their respective terminations shall be labeled and identified in accordance with ANSI/TIA 606-B.
- C. Labels shall meet the requirements of UL 969 as outlined in the ANSI/TIA 606-B.
- D. All horizontal and backbone subsystem copper and fiber cables shall be labeled at each end. Labeling is required at intermediate points such as pullboxes and consolidation points (where appropriate).
- E. Do not install labels closer than 3" to the termination point.
- F. Patch panel labels shall be printed with the associated user data jack number. Contractor shall submit a sample of patch panel label strips to the Engineer for approval prior to installation.
- G. Numbering schemes for fiber panels, copper patch panels & voice wall 110 punch blocks will go in ascending order.
- H. Intra-building fiber riser cable labeling scheme is for building riser cables between communication rooms, [cable type]-[WSU Building Number]-[floor number]-[communication room number]. Example: BRC-027.03.315
- I. Voice & data jack labeling scheme is [Room Number] – [jack number + function].
Ex: 222-V01, 222-D01, 222-V02, 222-D02, 223-V01, 223-D01, etc labeling shall be consistent at each end of cabling and at workstation outlet and patch panel or connecting block. Data jacks shall be orange located in the outlet bottom position (vertical) or the outlet right position (horizontal). Voice jacks shall be White located in the outlet top position (vertical) or the outlet left position (horizontal). All voice terminates in their own patch panel.
- J. Wireless access point jacks labeling scheme is [WAP] - [Room Number]. If the access point is in a corridor, use the closest room number. Labeling shall be consistent at each end of cabling and at WAP outlet and patch panel or connecting block. When a wireless access point is located above the ceiling a label must be placed on the ceiling grid which contains a small red dot & the wireless access point jack number.
- K. Security camera jacks labeling scheme is [CAM] - [Room Number]. If the security camera is in a corridor, use the closest room number. Labeling shall be consistent at each end of cabling and at WAP outlet and patch panel or connecting block.
- L. All access point & security camera jacks will be terminated together on their own patch panel separate from the workstation data patch panels.
- M. All labels must be based on the final room numbers. Verify room numbering with Owner prior to installation of labels. Do not use room numbers that appear on construction drawings.

15.2 UTP SYSTEM TESTING

- A. Upon completion of the cable installation, the Contractor shall perform complete copper cable certification tests, according to all manufacturer's requirements for warranty and all testing required by TIA/EIA, including, but not limited to:
 - 1. Continuity checks on each cable, checking for opens and shorts.
 - 2. Cable length (Channel and Permanent Link).
 - 3. Correct pair polarity.
 - 4. Correct cable labeling at both ends.
- B. Tests shall be performed with connectors installed.
- C. Any outlet, cable or component not satisfactorily passing tests or failing to meet quality installation standards as described in the specification, shall be repaired and/or replaced as directed by the Engineer at the Contractor's expense.
- D. The Contractor shall prepare complete cable test reports for all installed cables for review and acceptance by the Engineer WSU C&IT prior to acceptance of the cabling system.
- E. Category 6E UTP cable and patch cord installations shall be fully tested and verified in accordance with TIA/EIA-568-C specifications.
- F. All cable testing shall be conducted by an experienced technician using a Level III minimum Fluke Networks DTX 1800, Versiv or Engineer-approved equal for certification testing.
- G. The cable tester shall be calibrated to the type of cable being tested prior to beginning the cable certifications. It should identify each cable or jack number on the test results.
- H. Descriptions of the proposed calibration procedure shall be submitted to the Engineer for approval prior to beginning any testing.
- I. The Category 6E Horizontal Cable Certification reports shall have complete testing of Permanent Link for voice drops and Channel for data drops, at frequency increments up to 250MHz as indicated in ANSI/TIA-568-C and shall include the following:
 - 1. Cable/Faceplate Number -- matching faceplate numbers on patch panels
 - 2. Test Date
 - 3. Cable Length
 - 4. Wire-Map
 - 5. Network Tests for 100BASE-TX and 1000BASE-T
 - 6. Attenuation
 - 7. Near End CrossTalk (NEXT)
 - 8. Power-sum NEXT (PS-NEXT)
 - 9. Attenuation to Cross Talk Ratio (ACR)
 - 10. Power-sum Attenuation to Cross Talk Ratio (PS-ACR)

11. Equal Level Far End CrossTalk (ELFEXT)
12. Power-sum Equal Level Far End CrossTalk (PS-ELFEXT)
13. Return Loss
14. Propagation Delay
15. Delay Skew
16. Signal to Noise Ratio

- J. Upon completion, before final payment the following must be provided:
1. Provide (1) electronic copy of test results in PDF file format.
 2. Provide the manufacture warranty certificate upon completion.
 3. Test date.
 4. Tester make and model no.
 5. No exception to this will be allowed.
- K. After the horizontal cable tests have been performed, the Contractor shall install the faceplate labels and modular jack dust covers.

15.3 OPTICAL FIBER SYSTEM TESTING

- A. Upon completion of the fiber cable installation, the Contractor shall perform complete fiber cable certification tests, according to all manufacturer's requirements for warranty and all testing required by ANSI/TIA 568-C.
- B. Test all fiber (100%) using a power meter using the encircled flux testing criteria as stated in the TIA TSB-4979 specification or TIA 526-14-B standard, testing all cables in both directions.
- C. Provide test report and include as a minimum the following information for all cables:
1. Fiber cable number
 2. Fiber length.
 3. Attenuation (loss in dB).
 4. Test date
 5. Tester make and model no.
 6. Tester calibration date.
- D. All cable testing shall be conducted by an experienced technician using a Microtest Simplifiber meter or equivalent tester.

END OF SECTION 17170

SECTION 17500 – C&IT CATV SPECIFICATIONS AND TESTING

PART 16 - GENERAL

16.1 CONDITIONS AND RELATED DOCUMENTS

- A. All work shall conform to the most current revision of WSU Standards for Communications Infrastructure, which is available online at:

<http://ucomm.wayne.edu/WSU-Communications-Standards.pdf>

- B. The System shall allow the building Owner the capability of providing and regulating the distribution of digital and analog Standard Definition Television (SDTV) and High Definition Television (HDTV) channels and media to each individual jack or outlet.
- C. Prior to start of work, the Contractor's design and plan shall be reviewed and approved in advance by WSU C&IT Computing & Network Services. The representatives from WSU C&IT Computing & Network Services shall be David Fleig, 313-577-0845 and Pete Garabedian 313-577-1955.
- D. For requirements of work in existing buildings refer to Section 17010 and as otherwise noted herein. Coordinate all work with WSU C&IT Computing & Network Services and WSU FP&M for access to buildings and telecommunications spaces, and building occupancy schedules.
- E. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including labor, materials, equipment and incidentals necessary and required for their completion.
- F. All work shall be in compliance with the most current NEC, NFPA, state and local codes, ordinances and regulations of any other governing body having jurisdiction.
- G. The Contractor shall provide references and shall show evidence of having successfully completed at least three similar projects. Site visits may be required at the discretion of WSU C&IT Computing & Network Services.
- H. The Contractor shall provide a list of all its subcontractors. The Contractor shall provide references for each subcontractor showing evidence of their having successfully completed at least three similar projects. Site visits may be required at the discretion of WSU C&IT Computing & Network Services.
- I. The Contractor shall show evidence upon request that he maintains a fully equipped service organization capable of furnishing adequate certification, testing, inspection and service to the System, including replacement parts. Site

visits may be required at the discretion of WSU C&IT Computing & Network Services.

- J. After completion of the contract, the Contractor shall furnish two complete sets of operating instructions and other information necessary for proper installation and maintenance of System components.
- K. As-built drawings and documentation of the System performance shall be provided in three ring binders and supplied in both CD and hardcopy formats.
- L. AutoCad shall be used for all drawings supplied on CD. Microsoft Word or Adobe PDF shall be used for all word-processed files and related documentation supplied on CD.
- M. All electronic equipment and cable shall be new and shall be products of a manufacturer of established reputation and experience. The manufacturer shall have supplied similar apparatus to comparable installations rendering satisfactory service for at least three years.
- N. The Contractor shall furnish all necessary equipment, labor and installation materials whether specified or not to provide a complete turnkey, operating System.
- O. All equipment and cables shall be installed according to accepted construction regulations and practices and shall comply with manufacturers' recommendations.
- P. Pull strings shall be installed in all pathways.
- Q. All pathways and cores shall be firestopped as required per the attached Section 17110 document.

16.2 DRAWINGS

- A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as possible as the construction will permit.
- B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly; provide such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
- C. Deviations from the drawings, with the exception of routing and other such incidental changes that do not affect the serviceability of the System, shall not be made without the written approval of WSU C&IT Computing & Network Services.
- D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the

various trades, report such conflicts or differences to WSU C&IT Computing & Network Services for resolution. The Architect/Engineer does not have authority to approve any changes due to conflicts in documents. Approval must come from WSU C&IT Computing & Network Services Department. Primary contact is Pete Garabedian (313) 577-1955 backup contact is Dave Fleig (313) 577-0845.

16.3 STANDARDS, CODES AND REFERENCES

- A. ANSI/TIA-568-C Standard Commercial Building Telecommunications
- B. ANSI/NFPA 70 National Electrical Code, Latest Edition
- C. FCC Part 15 Radiation Limits
- D. FCC Part 76 Cable Television Service
- E. BICSI TDMM Edition Telecommunications Distribution Methods Manual, Latest Edition
- F. DOCSIS 3.0 or later Cable Television Standards
- G. ANSI/TIA 568-C.4 Standard Broadband and Coaxial Cabling Components

16.4 PROJECT CONDITIONS

- A. Verify field measurements are as shown on Drawings.
- B. Verify suitability of all pathways prior to cable installation.

16.5 SUBMITTALS

- A. Product Data Sheets
 - 1. Submittals shall be complete and bound in 3-ring binders or similar fashion for WSU C&IT Computing & Network Services approval prior to ordering equipment.
 - 2. The binders shall contain manufacturer's product data sheets for the specific items to be installed for this Project.
 - 3. Contractor shall highlight or identify each specific item to be installed, by catalog number, on each product data sheet. The Contractor shall indicate specific color, style, configuration, etc., and all accessories specified for a complete, turnkey installation.
 - 4. Contractor shall provide detailed line item pricing and a bill of materials for all aspects of the System.
 - 5. Provide product data sheets for all specified and required products

prior to purchase of any materials.

B. Layout Drawings

1. Submit layout drawings to scale for all cable television systems indicating all active and passive equipment, taps, splitters, jacks, and cable routing.
2. Submit summary of results based on calculations required to layout each trunk, branch, system or subsystem including dB loss budgets and bandwidth. Identify dB loss and bandwidth of every component.
3. Provide layout drawings prior to installation of any materials.

16.6 CATV BROADBAND SYSTEM DESCRIPTION

- A. The System shall utilize trunk and branch topology.
- B. The System shall utilize 0.500 inch diameter hard-line trunk with RG-6U branches. The System may utilize RG-11U Quad Shield, Double-braided coaxial trunk cable with RG-6U branches in special cases. Use of RG-11U trunk cable shall be determined and permitted solely by the representatives of WSU C&IT Computing & Network Services.
- C. The System shall allow the building Owner the capability of providing and regulating the distribution of digital and analog Standard Definition Television (SDTV) and High Definition Television (HDTV) channels and media to each individual jack or outlet.
- D. Branch circuits shall be tapped directly into the trunk and shall be home runs from the nearest trunk tap.
- E. No taps, couplers, splitters, amplifiers or splices shall be allowed between the trunk taps and wall jacks/drops.
- F. All in-line amplifiers shall be remote-powered from the first floor building communications MDF.
- G. Each residence room shall be furnished with two wall jacks/drops and shall be located per System drawings and field conditions.
- H. Designated common areas and offices shall be provided with one or more wall jacks/drops and shall be located per System drawings and field conditions.
- I. System input shall be a single point within the building MDF at which signals from various sources shall be injected.
- J. Accessibility for the addition of individual channel filter/traps shall be provided.
- K. Each hard line trunk shall be served by its own amplifier.
- L. System input shall be buffered with its own amplifier.

PART 17 - BROADBAND NETWORK SPECIFICATION

17.1 BANDPASS AND SPECTRUM ALLOCATION

A. Bandpass: 5MHz to 1000 MHz

1. Bandpass of passive devices and equipment shall be 5 MHz to 1000 MHz.
2. Bandpass of active amplifiers shall be 5 MHz to 870 MHz minimum.

B. Spectrum Allocation:

1. Forward: 54 MHz to 1000 MHz
2. Return: 5 MHz to 42 MHz

C. Reference Level

1. All levels of head end equipment shall be referenced to a 56 dBmV visual carrier of a television channel, forward and return.

D. Outbound Carrier To Composite Triple Beat

1. The ratio of any visual referenced carrier level to the peak distortion density level of all triple beat products within carrier bandpass shall be greater than 51 dB for the last amplifier in the trunk cascade.

E. Outbound Carrier To Noise

1. The ratio of any visual referenced carrier level to RMS noise across a 4.2 MHz bandwidth shall be 46 dB or greater.

F. Forward Carrier To Noise Ratio

1. The ratio of any forward originated visual referenced carrier's peak level to RMS noise level shall vary with the number of amplifiers in cascade (N) as follows:

N	C/N Not Less Than	N	C/N Not Less Than
1	57 dB	5-8	48 dB
2	54 dB	9-15	45 dB
3-4	51 dB	16-20	43 dB

G. Return Carrier To Noise Ratio

1. The ratio of any return visual referenced carrier's peak level to RMS noise level shall vary with the total number of amplifiers (N) in the return network as follows:

N	C/N Not Less Than	N	C/N Not Less Than
1	57 dB	9-15	45 dB
2	54 dB	16-30	42 dB
3-4	51 dB	31-50	40 dB
5-8	48 dB	51-100	37 dB

H. Carrier To Hum

1. The percentages of any visual referenced carrier level to hum (100% modulation) shall be less than 3%.

I. Gain versus frequency response

1. The frequency response across any 1 MHz shall be flat within +/- 2 dB as measured at any amplifier test point or outlet in the System.
2. Peak to valley.
3. The network peak to valley frequency response across any 18 MHz shall be less than 3 dB between adjacent carriers.

J. Carrier to second order intermodulation

1. The ratio of any visual referenced carrier level to any second order intermodulation products within the carrier bandpass shall be 51 dB or greater.

K. Outlet signal level

1. Forward visual referenced carrier level at any user point in the System shall be between +3.0 dBmV (minimum) and +15.0 dBmV (maximum) across the forward bandpass.

L. Return Level

1. Return visual referenced carrier level at the output of the return combiner shall be +10 dBmV +/- 5 dB across the return bandpass.

M. System or network radiation

1. System or network RF radiation shall conform to FCC Section 76.605 (a) (12). As measured by tuned dipole antenna, System radiation shall not exceed the following limits:

- a. 54 MHz to 216 MHz 15 μ V/meter at 30 meters
- b. Greater than 216 MHz 20 μ V/meter at 3 meters & 15 μ V/meter at 30 meters

PART 18 - EXECUTION

18.1 GENERAL

- A. All equipment shall be held firmly in place and supported by fastenings, brackets, etc. capable of supporting the load.
- B. Boxes, equipment cabling, racks, etc. shall be installed and secured plumb and square with building lines.
- C. In the installation of equipment and cable, consideration shall be given to operational efficiency, serviceability and overall aesthetics shall be determined by WSU C&IT Computing & Network Services.
- D. All cable, regardless of length, shall be marked with machine-generated, wrap-around numbered or lettered markers at both ends, and sealed with clear heat-shrink covers. There shall be no unmarked cables in the System. Marking codes shall be keyed to the floor and room number and shall be shown on the drawings. Marking nomenclature shall be approved prior to cable installation by WSU C&IT Computing & Network Services. Submit proposed nomenclature scheme with shop drawings and product data for approval by engineer and owner. Refer to Section 17010 for requirements.
- E. Terminal blocks, boards, strips or connectors shall be furnished for all cables that interface with racks, cabinets, consoles or equipment modules.
- F. All cables associated with the cable television System shall be grouped according to signals being carried in order to reduce signal contamination or interference. Grouping of cables shall adhere to the WSU Standards for Communications Infrastructure. Separate groups shall be formed for the following:
 - 1. Power cables.
 - 2. Control cables
 - 3. Cable television/RF cables.
- G. All branch cables shall be cut to the length dictated by the run and shall include a minimum 3 foot service loop at the trunk end, for repair purposes or future uses.

- H. All trunk cables shall be cut to the length dictated by the run and shall include a minimum 25 foot service loop at the head end/MDF end, for repair purposes or future uses.
- I. For equipment mounted in drawers or slides, the interconnecting cables shall be provided with a service loop of appropriate length.
- J. All cables run in plenum areas shall be installed in cable trays provided by the Electrical Contractor or securely and independently supported using J-Hooks from the building structure at a maximum 4 feet on center. Bridal rings shall not be allowed.
- K. Cable shall not be laid on ceiling grid, light fixtures, plumbing, conduit, piping, ducts, etc. Cable shall not be attached to ceiling grid supports or tied to existing electrical conduit, conduit hangers, light fixtures, plumbing, plumbing hangers, piping, ducts, duct hangers, etc.
- L. All cables in vertical riser shall be strain-relieved at each floor.
- M. Cables installed in air return spaces or plenum spaces shall be plenum-rated per NFPA codes.

18.2 PRODUCTS

A. Trunk Cables

1. Cable shall be 0.500 inch diameter hard-line.
2. Cable shall be plenum-rated.
3. Cable shall be Commscope 2312K. Substitutions must be approved in advance by WSU C&IT Computing & Network Services.
4. In the special-use case of RG-11U coaxial trunk cable, all cable shall be Commscope 2287K plenum-rated. Use of RG-11U cable must be approved in advance by WSU C&IT Computing & Network Services.
5. Cable shall have a nominal impedance of 75 Ohms.
6. Cable shall be sweep-tested by its manufacturer, passed and certified as such by its manufacturer and shall be certified as its best grade over its entire rated bandwidth. A written copy of the certification shall be provided to WSU C&IT Computing & Network Services and shall be included with the Submittals and As-built documentation.

B. Coaxial branch/drop cable

1. Cable shall be RG-6U, 98% or higher RFI shield rating, quadshielded, doublebraided.
2. Cable shall be plenum-rated.

3. Cable shall be Commscope 2227V. Substitutions must be approved in advance by WSU C&IT Computing & Network Services.
4. Cable shall have a nominal impedance of 75 Ohms.
5. Cable shall be sweep-tested by its manufacturer, passed and certified as such by its manufacturer and shall be certified as its best grade over its entire rated bandwidth. A written copy of the certification shall be provided to WSU C&IT Computing & Network Services and shall be included with the Submittals and As-built documentation.

C. Trunk cable taps, Directional couplers, Splitters, Equalizers

1. Taps, couplers, splitters and equalizers shall be manufactured by C-Cor, Philips or equal. Substitutions must be approved in advance by WSU C&IT Computing & Network Services.
2. Taps, couplers, splitters and equalizers shall be trunk power-bypass and RF-bypass type.
3. Removal of a tap, coupler, splitter or equalizer cover shall not interrupt or disable the trunk power bypass or the RF bypass.
4. Taps shall not pass trunk power to the individual branch circuits, drops and wall jacks. Branch circuit taps shall be passive and shall not be powered by trunk power.
5. Taps, couplers, splitters and equalizers shall be of a type and size specifically designed for 0.500 inch diameter hard-line cable and connectors.

D. Trunk connectors

1. Connectors shall be Pyramid, LRC, Gilbert, Commscope or equal. Substitutions must be approved in advance by WSU C&IT Computing & Network Services.
2. Trunk connectors shall be of a two-piece design. Three piece connectors shall not be allowed.
3. Connectors shall be Cable Television Service, FCC Part 76 certified.
4. Connectors shall be of a type and size specifically designed for 0.500 inch diameter hard-line cable or RG-11U coaxial cable, as required.
5. If RG-11U coaxial cable is used, connectors shall be Thomas & Betts "Snap-n-Seal".
6. Connectors shall have a nominal impedance of 75 Ohms.

E. Branch cable connectors

1. Connectors shall be Thomas & Betts "Snap-n-Seal". Substitutions must be approved in advance by WSU C&IT Computing & Network Services.
2. Connectors shall be Cable Television Service, FCC Part 76 certified.
3. Connectors shall be of a size and type specifically designed for RG-6U Commscope 2227V plenum-rated cable, the trunk taps and the wall jacks. Computing & Network Services representatives shall approve these connectors in advance prior to the start of work.
4. Connectors shall be of a one-piece design. Two-piece connectors shall not be allowed.
5. Connectors shall have a nominal impedance of 75 Ohms.

F. Trunk amplifiers, line extenders

1. Amplifiers and extenders shall be C-Cor Flexnet NL Series or equal. Substitutions must be approved in advance by WSU C&IT Computing & Network Services.
2. Amplifiers and extenders shall be subsplit capable.
3. Amplifiers and extenders shall be designed to allow for remote trunk power and trunk power bypass.
4. Amplifiers and extenders shall be of a type and size specifically designed for 0.500 inch diameter hard-line cable and connectors.
5. Amplifiers shall be gain adjustable and equalizable.
6. Amplifiers and extenders shall be backboard mounted in the MDF.
7. Amplifiers shall have a minimum bandwidth of 862 MHz.

G. Line power inserters

1. Line power inserters shall be Philips 9-LPI or equal. Substitutions must be approved in advance by WSU C&IT Computing & Network Services.
2. Inserters shall be of a type and size specifically designed for 0.500 inch diameter hard-line cable and connectors.

H. Power supplies

1. Power supplies shall be Exide or Lectro "Broadband" series or equal and shall be compatible with the 0.500 hardline-equipped amplifier and line extender array.
2. Power supplies shall be fed from 120 volts AC.

3. Power supplies shall be hardwired to a dedicated, separate 120 VAC branch circuit. Coordinate installation with electrical trades as required.
 4. Power supplies shall be backboard mounted in the MDF.
- I. Coax jacks and wall plates, wall connectors
1. Wall jacks/connectors shall be "Grayfox Gold #7530." NO SUBSTITUTIONS ALLOWED.
 2. Wall jack connectors shall be type F.
 3. Wall jacks shall be 75 Ohm, SELF-TERMINATING.
 4. Wall jacks and connectors shall have a nominal impedance of 75 Ohms.
 5. Wall plates shall be satin finish, stainless steel, square corner, sized to match junction boxes.
- J. Jumper cables
1. Provide a sufficient number of twelve foot, black, 75 Ohm, type F coaxial jumper cables for use to connect television sets and VCR's to CATV outlets.
 2. Coaxial jumper cables are not required to be plenum-rated.
 3. Coaxial jumper cables shall be press-on/friction fit type. Screw-on connectors shall not be allowed.
 4. Coaxial jumper cables shall be compatible with the building CATV outlet connectors.
- K. Security at trunk line taps (IF required)
1. All connectors shall be equipped and installed with security shields.
- L. Unused taps
1. At any point in the system, all unused taps shall be terminated into precision, passive 75-Ohm terminators of appropriate size and wattage. Security provisions at trunk line taps shall apply.

18.3 SYSTEM PERFORMANCE AND TESTING

- A. All aspects of Section 1.8 BROADBAND NETWORK SPECIFICATIONS shall be tested and documented.

- B. Three sets of written test results shall be provided to WSU Computing & Network Services (C&IT) in 3-ring binders and on CD-ROM.
- C. System testing shall be performed by an independent testing company not affiliated with the System Contractor.
- D. System testing and methods shall be approved in advance by WSU Computing & Network Services (C&IT).
- E. All system testing shall be supervised by WSU Computing & Network Services (C&IT)
- F. System acceptance testing shall be subject to WSU Computing & Network Services (C&IT) inspection and approval of installation, workmanship, products, performance testing and documentation.

18.4 RELATED SYSTEMS AND FACILITIES (IF REQUIRED)

- A. Inter/Intra building signal transport system
 1. Provide a fiber optic CATV transport system to deliver all channels, whether active or not, across the specified bandwidth from the existing MDF. System shall be compatible and shall match the existing WSU transmit and receive systems. Substitutions shall not be allowed.
 2. The transport system shall feed the existing CATV programming to the new CATV broadband system for distribution to all CATV outlets.
 3. Signals shall be transported between buildings via the WSU single mode fiber optic backbone network.
 4. Signals shall be interfaced to the WSU fiber optic backbone network via WSU fiber optic patch panels located in each building's MDF.
 5. The transmitting end of the system shall have a minimum six fiber optic outputs for use with the inter-building transport system, monitoring systems and for future expansion.
 6. The system shall have an auxiliary input to allow delivery of programming from remote locations elsewhere on campus via the WSU single mode fiber optic backbone network.
 7. Fiber optic patch panels and patch cords shall be provided to interface all system inputs and outputs to the WSU fiber optic patch panels.
 8. Performance of the transport system shall meet or exceed the specifications of the CATV system specified within Section 17500 and

shall not impair, limit, change or reduce the quality or specifications of the existing CATV systems.

9. All fiber optic equipment shall be rack-mounted or backboard mounted. Mounting methods shall be approved in advance by WSU C&IT Network Services.
10. Fiber optic transmitter power levels shall be designed with sufficient headroom to compensate for practical and theoretical losses within the WSU fiber optic network and any passive optical splitters.
11. All singlemode fiber-optic connectors and ferrules shall be SC/APC. Color shall be green.

B. Local monitoring system

1. Provide a CATV monitoring television set within the MDF similar to the existing set in the WSU Headend.
2. The monitoring television set shall be rack mounted and shall be capable of viewing all CATV channels, whether active or not.
3. The CATV monitoring television shall be rack-mounted in the building MDF or its CATV distribution point.

END OF SECTION 1750

