FRANKLIN COUNTY CONVENTION FACILITIES AUTHORITY

PROJECT MANUAL

for the

Greater Columbus Convention Center Air Handler Unit Variable Frequency Drive Installation Bid Package 2025-02

Technical Specifications Prepared By:

CMTA

April 22, 2025

NOTICE TO BIDDERS FRANKLIN COUNTY CONVENTION FACILITIES AUTHORITY Greater Columbus Convention Center Air Handler Unit Variable Frequency Drive Installation

Sealed proposals will be received by the Franklin County Convention Facilities Authority, hereinafter referred to as the "Owner" of the Greater Columbus Convention Center ("GCCC"), 400 N. High St., Columbus, Ohio 43215 until <u>May 6, 2025, at 3:00 PM</u> local time and will be publicly opened and read aloud immediately thereafter, for the furnishing of materials and performing the labor for the execution and construction of:

GCCC Air Handler Unit Variable Frequency Drive Installation

Owner's Estimate: \$1,400,000

in accordance with specifications prepared by CMTA. All information for bidders, including the Project Manual, Form of Proposal, Plans, Technical Specifications, Contract Bond and other Contract Documents (collectively, "Bid Documents") may be examined at:

Franklin County Convention Facilities Authority 400 N. High Street, 4th Floor Columbus, Ohio 43215

Requests for copies of Bid Documents as well as questions regarding plans and specifications should be addressed to Jordan Edmonds, In-House Counsel, Franklin County Convention Facilities Authority, email: jedmonds@fccfa.org. Bid Documents will also be available on the Authority's website: www.meetusincolumbus.com.

No bidder may withdraw their bid within 60 days after the actual date of the bid opening, except as provided for in the Bid Documents.

Each bid must be accompanied by a Bid Guaranty and Contract Bond in the exact form included in the Bid Documents and meeting the requirements of Section 153.54 of the Ohio Revised Code.

State of Ohio prevailing wage rates and Equal Employment Opportunity requirements are applicable to this bid invitation for all work performed pursuant to this contract.

The Franklin County Convention Facilities Authority reserves the right to waive any informalities or in its sole discretion, to reject any or all bids.

Bids shall be sealed and delivered on or before May 6, 2025, at 3:00 PM EST to:

Franklin County Convention Facilities Authority 400 North High Street, 4th Floor Columbus, Ohio 43215

INSTRUCTIONS TO BIDDERS

GENERAL REQUIREMENTS & INFORMATION

- a) Bidder shall inspect all plans and specifications and visit the site of the work to verify existing conditions and to become familiar with the conditions under which the work will be performed.
- b) The Form of Proposal, Bid Guaranty, Responsibility Analysis Form, Project Schedule, and all other required submittals, each fully executed, are to be submitted in sealed form and addressed to the Franklin County Convention Facilities Authority as provided for in the Notice to Bidders. **Interested bidders must provide one original and three hard copies of all required submittals.**
- c) Owner & Architect:

1) The Owner is:

Franklin County Convention Facilities Authority (FCCFA) 400 North High Street, 4th Floor Columbus, Ohio 43215-2096 Phone: 614-827-2800

2) The Architect is:

CMTA, Inc. 1650 Lake Shore Drive, Suite 380 Columbus, Ohio 43204 Phone: 614-992-1500

d) The project consist of mechanical, HVAC controls, plumbing, and electrical work required for the replacement of 32 air handling unit fan motos with new variable frequency drives serving the Greater Columbus Convention Center's North Facility, all as described within the Project Manual, technical specifications, and drawings.

The Project consists of providing all labor, materials, equipment, and services necessary for the timely and proper completion of installation of the variable frequency drives, all as described within the Project Manual, drawings, and technical specifications.

Bidders are responsible for visiting the site to determine existing conditions. No plea of ignorance of conditions that exist, or of conditions or difficulties that may be encountered in the execution of the work, as a result of the failure to make such examination and investigation, will be accepted as an excuse for any failure or omission on the part of the bidders to fulfill in every respect all the requirements of the contract, nor will the same be accepted as a basis for any claim whatsoever for extra compensation or for an extension of time.

ARTICLE 1. PROPOSALS

- a) For lump sum bids, separate bids will be received for any or all divisions of work shown on the Form of Proposal. If not bidding a given contract on the Form of Proposal mark it "N/A".
- b) In the case of unit price bids, the Bidder shall submit bids on all items listed, unless other instructions are noted in the Form of Proposal.

Unless otherwise expressly provided in the Project Manual and related bid documents, such unit prices shall be fully-loaded rates that include, but are not limited to, all overhead, profit, labor, materials, equipment, services, insurance and bonding costs necessary for the timely and proper installation of the item for which the unit prices are requested. The unit prices quoted in the proposal shall be the basis for any change orders entered into under the contract, unless the Owner determines that the use of such unit prices will cause substantial inequity to either the bidder or the Owner.

c) The Proposal shall contain the following documents:

- 1) The Form of Proposal (bid)
- 2) The Bid Guaranty
- 3) EEO Certification Clause
- 4) Non-Discrimination Policy Compliance
- 5) Contractor's Review Certificate
- 6) Manufacturer's Declaration and Subcontractor Declaration
- 7) Declaration of Insurance
- 8) Project Schedule
- 9) Responsibility Analysis Form
- d) The wording of the Form of Proposal shall be used without change, alteration, or addition (except as provided for in the Project Manual). Any other change in the wording may cause the bid to be rejected; however, the Owner reserves the right to waive any informalities not affecting the substance of the bid.
- e) The forms used in submitting the bid shall be those furnished by the Owner in the Project Manual.
- f) The bid shall contain the Bid Guaranty meeting the requirements of Section 153.54 of the Ohio Revised Code.
- g) Bidders shall take the following precautions in preparing bids:
 - 1) Sign the bid. Failure to do so shall result in rejection of the bid. Bids shall be signed with the name typed below the signature. A bidder that is a corporation shall sign its bid with the legal name of the corporation followed by the name

of the state of incorporation and the legal signature, including title, of an officer authorized to bind the corporation to a contract.

2) Alternates:

The Owner may request bids on alternates. If the Owner requests bids on alternates, the bidder should include the cost of the alternates requested on its Form of Proposal.

Where the Form of Proposal provides for quoting either an addition or deduction for an "Alternate," indicate whether the sum named is an addition or deduction by ruling out the words not applicable. Any alteration or erasure must be initiated by the bidder.

All requested alternates, if any, shall be bid by all bidders. If no change in the base bid is required enter "no change". Do not mark with any notation other than the cost change or "no change" (e.g., "N/A" or "No Bid", shall be taken as meaning "No Change" and a cost of \$0.00 shall be used in determining the lowest and best bidder and preparation of the contract). If a bidder does not accept a value of \$0.00 for any incorrectly marked alternates accepted by the Owner, the bid shall be considered non-responsive and be grounds for the rejection of the bid. At the time of awarding the contract, the Owner will select or reject alternates as it determines is in its best interest.

If, during the progress of the work, the Owner desires to reinstate any alternate not included in the contract, the Owner reserves the right to reinstate the alternate at the price bid by the bidder provided that such action is taken in sufficient time so as not to delay the progress of the work or cause the bidder additional expense.

- 3) Complete and sign the Equal Employment Opportunity Certification attached to the Form of Proposal.
- 4) Bidders shall acknowledge and note receipt of addenda on the Form of Proposal.
- 5) Bids shall not be submitted by facsimile transmission.
- 6) Bids shall be enclosed in a sealed opaque envelope with the bidder's name and the title of the project printed in the upper left-hand corner and addressed as follows: Offices of the Franklin County Convention Facilities Authority, 400 N. High St., Fourth Floor, Columbus, Ohio 43215.
- h) All bids are valid for a period of sixty (60) days after the date of opening bids. A bidder for a contract with the Owner may withdraw their bid from consideration if the price

bid was substantially lower than the other bids, providing the bid was submitted in good faith and the reason for the price bid being substantially lower was a clerical mistake as opposed to a judgment mistake and was actually due to an unintentional and substantial quantity of work, labor, or material made directly in the compilation of the bid. <u>Request to withdraw such bid must be made in writing and filed with the Owner within two (2) business days after the opening of bids.</u>

ARTICLE 2. METHOD OF AWARD

a) The Owner will receive bids for the contract as set forth on the Form of Proposal and as defined in the Project Manual.

Subject to the right of the Owner to reject any and all bids and as provided below, the Owner will award a single contract for each of the contracts/bid packages listed in the Project Manual or one or more combined contracts for combination(s) of the bid packages. Bidders must furnish all information requested on or accompanying the Form of Proposal. Failure to do so may result in disqualification of the bid.

b) Determination of Lowest and Best Bid (see Instructions to Bidder's Responsibility Analysis Form):

Subject to the right of the Owner to reject any or all bids, the Owner will award the contract for the work to the bidder submitting the lowest and best bid, taking into consideration accepted alternates. In determining which bid is the lowest and best bid, the Owner may take into consideration not only the amount of the bid but such of the following criteria as it, in its sole discretion, deems appropriate and may give such weight thereto as it deems appropriate:

- 1) The bidder's financial ability to complete the contract successfully and on time without resort to its Surety;
- 2) The bidder's prior experience with similar work on comparable or more complex projects;
- 3) The bidder's prior history of the successful and timely completion of similar projects;
- 4) The bidder's equipment and facilities;
- 5) The adequacy, in numbers and experience, of the bidder's work force to complete the contract successfully and on time;
- 6) The bidder's prior experience on other projects of the Owner, including the bidder's demonstrated ability to complete its work on these projects in accordance with the contract documents and on time, and its ability to work with the Owner.

- 7) The bidder's compliance with federal, state, and local laws, rules, and regulations, including but not limited to, the prevailing wage law and Occupational Safety and Health Act.
- 8) All of the foregoing with respect to each of the subcontractors which the bidder intends to use on the Project; and
- 9) Depending upon the type of work, other essential factors, as the Owner may determine.

Absent special circumstances, no bidder shall be deemed responsible unless the bidder has been in existence at least thirty-six months.

- c) Acceptance of the contract within the 60-day period following the opening of bids automatically assumes that if materials, labor or subcontract costs increase, they shall be absorbed by the successful bidder. Award of contracts beyond the 60-day period shall be reviewed for increased costs after award of the contract only if the cause for delay is no fault of the successful bidder.
- d) If, in the opinion of the Owner, the acceptance of the lowest bid is not in the best interest of the Owner, the Owner may accept at its discretion, another bid so opened, or reject all bids and advertise for other bids. Such advertisement will be for such time, in such form and in such newspapers as may be directed by the Owner.
- e) No contract shall be awarded if the low bidder is more than 20% below the median of all others bids received for projects where the estimate is \$100,000 or more, and no contract shall be awarded if the low bidder is more than 25% below the median of all other bids received for projects where the estimate is less than \$100,000, unless the following occurs and/or are reviewed.
 - 1) An interview with the bidder, the purpose of which is to determine what, if anything, has been overlooked in the bid in question, and to analyze the process envisioned by the bidder to complete the work in question.
 - 2) The financial status of the bidder and its Surety based upon certified financial statements submitted by each.
 - 3) Receipt of written confirmation by the Surety that it has reviewed the bid in question.
 - 4) The record of the bidder in performing other public works projects in the past.

If after review and consideration, the acceptance of the lowest and best bid is not in the best interest of the Owner, the Owner may accept another proposal so opened or reject all proposals and advertise for other bids.

- f) In accordance with Ohio Revised Code 153.12, no contract will be awarded if the price of the contract exceeds the published estimate by more than 20%.
- g) If individual and combined contract bids are included on the Form of Proposal and a bidder opts to submit multiple bids, a bidder shall not be permitted to be determined to be the low bidder for any individual contract bid if that bidder withdraws a lower combination contract bid for any reason (including omission of any work item or math/clerical errors).
- h) The Owner reserves the right to disqualify bids, before or after opening, upon evidence of collusion with intent to defraud or other illegal practices on the part of the bidder.
- i) After determination of the lowest and best bid, the selected contractor shall receive a Recommendation of Award, a copy of the full unexecuted contract and an unexecuted copy of the Notice of Authority to Proceed ("NTP") with construction. The successful bidder ("Contractor") shall then provide the required items for formal execution of the contract and NTP by the Owner all in accordance with Article 8. If the Project Schedule requires that the Contractor commence work (or make commitments and preparations to commence the work) prior to receipt of the fully executed contract and NTP, the Contractor, in order to meet the requirements of the Project Schedule, shall be solely responsible to notify the Owner in writing 10 business days before the date that such NTP is required. The Owner may direct the Contractor to proceed with the work with an executed NTP before the formal execution of the contract. If the Contractor has met all of the requirements for executing a contract and the Owner chooses not to execute the contract, the Contractor shall be reimbursed for all reasonable costs incurred as a result of starting work under the NTP and prior to receipt of a fully executed contract.
- j) No contract shall be entered into until:
 - 1) The Industrial Commission has certified that the corporation, partnership, or person so awarded the contract has complied with Sections 4123.01 to 4123.99 (Workers' Compensation), inclusive of the Ohio Revised Code;
 - 2) If the bidder so awarded the contract is a foreign corporation, the Secretary of State has certified that such corporation is authorized to do business in this state; and, if the bidder so awarded the contract is a non-Ohio person or partnership, then until the bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as its agent for the purpose of accepting service of summons in any action brought under Section 153.05 of the Revised Code or under Sections 4123.02 to 4123.99 inclusive, of the Ohio Revised Code.
 - 3) The successful bidder shall notify the Owner, within 3 calendar days after receipt of the Recommendation of Award, the provisions the bidder has made or reasonably can be expected to make in order to meet the provisions of the

Owner's Disadvantaged Business Participation Plan. Notification shall include a statement of the bidder's present intention concerning which portions of the contract will be awarded to disadvantaged business subcontractors and materialmen and the identity of the intended subcontractor or materialman, if any. Within such five (5) calendar day period, the successful bidder may request in writing a longer period of time to meet the provisions of the plan. Such request shall set forth the reasons additional time is required. The Owner shall notify the successful bidder in writing of its approval or disapproval of the request. If additional time is approved by the Owner or if formal execution of the contract is delayed due to any failure of the bidder to meet the requirements of the Owner's Disadvantaged Business Participation Plan, the bidder shall remain responsible for all the requirements and timelines of the Project.

- 4) The required certificates of insurance coverage (as set forth in the contract) and bond are submitted to the Owner.
- 5) A copy of the contract is forwarded to the successful bidder by the Owner, signed by the successful bidder and returned to the Owner.
- 6) All requirements of Article 8 herein have been satisfied.

The contract cannot be fully executed until this information is provided. If the bidder fails to provide the documents within the required time, the bidder is solely responsible to meet all Project Schedule requirements regardless of the date of the formal execution of the contract.

ARTICLE 3. BID GUARANTY

- a) All Bid Guaranties and Contract Bonds must be satisfactory to the Owner.
- b) The Bid Guaranty and Contract Bond meeting the requirements of Section 153.54(B) of the Ohio Revised Code, as furnished by the Owner, shall be used without change of wording.
- c) If the amount is left blank, the penal sum of the Bid Guaranty and Contract Bond will be the full amount of the bidder's base bid plus add alternates; alternatively, if completed, the amount must not be less than the full amount of the base bid plus add alternates, stated in dollars and cents. A percentage is not acceptable.
- d) The Bid Guaranty and Contract Bond must be signed by an Authorized Agent of an acceptable Surety Bonding Company and by the bidder. The bond must be issued by a surety company authorized by the Ohio Department of Insurance to transact business in the State of Ohio. It is essential that the bond be issued by a surety company which can adequately demonstrate a record of competent underwriting, efficient management, adequate reserves, and soundness of investments.

- e) Bid Guaranties and Contract Bonds must be supported by credentials showing the Power of Attorney of the Agent.
- f) In lieu of the Bid Guaranty referred to in Article 2(b) above, the bidder may submit the Bid Guaranty provided in Division (C) of Section 153.54 of the Ohio Revised Code, in the form of a Certified Check, Cashier's Check, or Letter of Credit pursuant to Chapter 1305 of the Ohio Revised Code. A Bid Bond is not acceptable for use as a Bid Guaranty.
- g) The amount of the Certified Check, Cashier's Check or Letter of Credit shall be equal to 10% of the base bid plus add alternates.
- h) The Bid Guaranty shall be payable to the Franklin County Convention Facilities Authority.
- i) Bid Guaranties shall be returned to all unsuccessful bidders immediately after the contract is executed.
- j) The Certified Check, Cashier's Check or Letter of Credit shall be returned to the successful bidder upon filing of the Bond required in Division (C), Section 153.54 of the Ohio Revised Code. The Performance Bond shall not be deemed "filed" until the Contract is fully executed.

ARTICLE 4. STANDARDS – SUBSTITUTIONS

- a) Those articles, devices, materials, forms of construction, fixtures, etc., named in the specifications to denote the kind and quality required shall be known as "Standards" and all bids shall be based on the same.
- b) Where two or more "Standards" are named together, the Contractor may furnish any one of the "Standards" named, but the Contractor shall make their selection known to the Owner within thirty (30) days following the award of the contract. Failure to comply with this requirement will automatically hold up payment requests from the Contractor in view of possible improper materials being used on the project. The first "Standard" listed shall be considered as the basis of design. If the Contractor opts to use a named "Standard" other than the basis of design and this results in any necessary modifications to any other element of the contract documents, the Contractor shall be responsible for all associated additional costs.
- c) Bidders desiring consideration for the use of material, equipment, etc., not named in the specifications may submit proposals for the substitution of same for "Standards" as specified, using the "Substitution Sheet" attached to the proposal form and listing, for each proposed change: (1) the "Standard" specified, (2) the substitution, and (3) the change in bid price, (or "no change"). Proposed substitutions must be included on the "Substitution Sheet" to be considered. Complete specifications and descriptions of any proposed substitutions being considered for acceptance shall be furnished to the Owner

promptly upon request. Acceptance of substitutes shall be at the sole discretion of the Owner.

- d) Any substitution accepted must be incorporated in the formal contract.
- e) Substitution shall not affect the determining of lowest and best bid.
- f) No substitution will be considered prior to receipt of bids unless written request for approval has been received by the Owner at least **10 days prior to the date for receipt of bids**. A statement setting forth changes in other materials, equipment, or other portions of the work, including changes in the work of other contractors that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Owner's decision of approval or disapproval of a proposed substitution shall be final. If the brand or product is acceptable, the Owner will approve it prior to bidding in an addendum issued by the Owner to all bidders on record.
- g) In proposing a substitution, the bidder represents and warrants that each proposed substitution will not result in any changes to the project, including changes to the work of other contractors, or any decrease in the performance of any equipment or systems to be installed in the project and agrees to pay any additional costs incurred by the Owner as a result of a substitution which is accepted.
- h) **Following the award of the contract, there shall be no substitutions**, except pursuant to a change order. The Owner in its sole discretion may decline to consider a substitution for a change order.
- i) If the specified materials and/or manufacturers are no longer available, it is the bidder's responsibility to notify the Owner during the bidding period. Substitutions made during the construction period resulting from these conditions (i.e., failure of the bidder to notify Owner) will be made solely at the Owner's discretion.

ARTICLE 5. EXAMINATION OF DOCUMENTS

- a) Each bidder shall examine all bid documents, including, but not limited to, the Project Manual, Project Schedule, Notice to Bidders, Form of Proposal, addenda, plans, specifications, form contract. etc., for all other divisions of the work as well as its own, noting particularly all requirements which will affect its work in any way. These Bid Documents shall become the Contract Documents, as defined in the contract that governs the relationship between the Contractor and the Owner when the contract is executed. Failure of a bidder to become fully acquainted with the amount and nature of work required to complete its division of the work in conformity with all requirements for the project as a whole will not be considered subsequently as a basis for extra compensation.
- b) Should any requirements in the plans and/or specifications for the project, as a whole, appear to a bidder to be in disagreement with those for the part of the work on which

the bidder proposes to bid or in the case of a discrepancy in the plans and specifications, a request for clarification, in writing should be addressed to the Owner at least 5 calendar days prior to the date set for opening bids. The Owner will reply to all such inquires through an addendum. Verbal interpretations will not be honored and are not legally binding. The Owner will forward a copy of same to all individuals holding plans and specifications. If, in examining the contract documents, the bidder discovers an apparent violation of the Ohio Basic Building Code, or other applicable statute or regulation, the bidder shall report such apparent violation to the Owner promptly. However, this provision shall not be construed as imposing responsibility on the bidder to ensure conformity of the plans and specifications.

- c) No allowance will be made subsequently for any omission, error, or negligence of the bidder.
- d) Unless specifically assigned to one contract for all aspects of the project, each bidder is responsible to include all requirements for all sections contained in the Project Manual, and Project Schedule, in the base bid amount. (Contract is not limited to only those specifications sections listed in the contract summary of work).

ARTICLE 6. OPENING OF BIDS

Bids shall be opened and read publicly at the time and place named in the Notice to Bidders. The time for opening bids shall be extended at the discretion of the Owner with no further advertising when an addendum to the plans or specifications is issued within 72 hours of the scheduled bid opening, excluding Saturdays, Sundays and Legal Holidays.

ARTICLE 7. ADDENDA

- a) Any explanation, interpretation, correction, or modification of the Project Manual or Bid Documents will be issued in the form of an addendum, which shall be the only means considered legally binding; explanations, interpretations, etc., made by any other means shall <u>not</u> be legally binding. All addenda shall become a part of the contract documents.
- b) Bidders shall submit questions to the Owner no later than close of business on April 30, 2025, to allow sufficient time for the Owner to respond. All addenda will be issued except as hereafter provided and mailed or otherwise furnished to persons who have obtained Bid Documents for the project on or before close of business on May 1, 2025. If any addendum is issued within 72-hours prior to the bid date, then the time for opening of bids shall be extended one week with no further advertising of bids required.
- c) Copies of each addendum will be sent only to the bidders to whom Bid Documents have been issued. Receipt of addenda shall be indicated by bidders in the space provided on the Form of Proposal.

- d) Each bidder shall carefully read and review the Bid Documents and immediately bring to the attention of the Owner any error, omission, inconsistency, or ambiguity therein.
- e) If a bidder fails to indicate receipt of all addenda through the last addendum issued by the Owner on its Form of Proposal, the bid of such bidder will be deemed to be responsive only if:
 - 1) The bid received clearly indicates that the bidder received the addendum, such as where the addendum added another item to be bid upon and the bidder submitted a bid on that item; or
 - 2) The addendum involves only a matter of form or is one which has either no effect or has merely a trivial or negligible effect on price, quantity, quality, or delivery of the item bid upon.

ARTICLE 8. ADDITIONAL SUBMITTAL REQUIREMENTS

- a) Upon receipt of the Notification of Recommendation of Award (NOA), the successful bidder will submit the following to the Owner:
 - 1) One copy of the Executed Contract;
 - 2) Contract Bond;
 - a) Including Certificate of Compliance issued by the Department of Insurance, showing the Bonding Company is Licensed to do business in the State of Ohio.
 - b) Including a Financial Statement of the Bonding Company.
 - 3) Certificate of Insurance;
 - 4) Completed W-9 Form;
 - 5) Workers' Compensation Certificate (Industrial Commission certification of O.R.C. requirements).

If the bidder fails to provide the documents within the required time, the bidder is solely responsible to meet all Project Schedule requirements regardless of the date of the formal execution of the contract. Failure of the bidder to provide these documents within 15 days of receipt of the NOA may result in rejection of the bid.

- b) The successful bidder shall notify the Owner, within three calendar days of receipt of the NOA, of the provisions the bidder has made or reasonably can be expected to make in order to meet the provisions of the Owner's Disadvantaged Business Participation Plan.
- c) Within fifteen calendar days of receipt of the NOA or such longer time as may be permitted in writing by the Owner, the apparent low bidder will submit the following to Owner:
 - 1) The list of all proposed subcontractors, suppliers, manufacturers, and vendors.

After approval by the Owner of the list submitted by the successful bidder, the list shall not be changed unless written approval of the change is authorized by the Owner.

- 2) Schedule of Values including a breakdown of labor and material for the project, and the sum thereof.
- 3) A current name of the person or persons proposed to represent the bidder as project manager(s) or superintendent(s).
- 4) A shop drawing and submittal schedule (includes every submittal requirement in the specifications).
- d) Within 15 calendar days of receipt of the NOA, the successful bidder is required to submit a Project Schedule to the Owner which shall, at a minimum, show detailed work operations and durations. The intent of this requirement is to allow the Owner an opportunity to more fully understand how the Contractor intends to complete the detail of the project. This detailed working schedule shall identify workforce requirements and be thoroughly coordinated with the Owner and all other subcontractors. The Contractor shall prosecute its work, at the direction of the Owner, furnishing at all times sufficient skilled workers, materials, and equipment to perform its work to meet the line-item progress required by the Project Schedule, so as not to delay the completion of the whole or any part of the work. <u>The Owner anticipates that work on the project will commence June 2025 and be completed by December 31, 2025.</u>

ARTICLE 9. TAXES

Materials purchased for use or consumption in connection with the proposed work will be exempt from the State of Ohio Sales Tax as provided for in Section 5739.02 of the Ohio Revised Code and also from the State of Ohio Use Tax, Section 5741.01.

ARTICLE 10. LIQUIDATED DAMAGES

Liquidated damages shall apply to the terms of the contract.

ARTICLE 11. PROJECT SCHEDULE

Each bidder is required to submit a proposed schedule with the bid which shall at a minimum, show work operations and duration.

ARTICLE 12. OWNER'S RIGHT TO WAIVE DEFECTS AND IRREGULARITIES

- a) The Owner reserves the right to waive any and all irregularities provided that the defects and irregularities do not affect the amount of the bid in any material respect or otherwise give the bidder a competitive advantage.
- b) By submitting a bid, the bidder agrees that (i) the Owner's determination of whether a defect or irregularity affects the amount of the bid in any material respect or otherwise

gives the bidder a competitive advantage will be final and conclusive, and (ii) the bidder will pay the Owner's attorneys' and consultants' fees related to any challenge to the bid procedure or process, brought directly or indirectly by the bidder and/or any of its affiliates, which is unsuccessful.

ARTICLE 13. PRE-BID MEETING

A pre-bid meeting and site tour will be held on <u>Thursday April 24, 2025 at 2:00 PM</u> <u>EST</u>. Potential bidders should plan to meet in the A110 Meeting Room located in the Greater Columbus Convention Center's North Facility at 400 N. High St., Columbus, OH 43215.

ARTICLE 14. CONTINUITY OF CONVENTION CENTER OPERATIONS

The Contractor shall plan and perform all work without creating any interruption or disruption to normal Greater Columbus Convention Center operations and functions. All necessary interruptions and disruptions must be minimized, planned, scheduled, and approved by the Owner. In preparation of the bid, bidders may not assume the use of any activity or operation that will result in the disruption of convention center activities without the prior approval of the Owner.

ARTICLE 15. PREVAILING OR MINIMUM WAGE RATES

- a) Each laborer, worker or mechanic employed by the bidder for the work herein specified or by the subcontractor or by other persons performing work for the project shall be paid not less than the prevailing wage rates as determined by the Department of Industrial Relations of the State of Ohio in accordance with Chapter 4115 of the Ohio Revised Code.
- b) In the event the wage rate for any labor classification is changed between the time the rates are published herein and the time the work required by the contract is performed, or in the event any class of labor employed is not included in the published schedule of prevailing wages, then the rate prevailing at the time the work is actually performed, as ascertained and determined by the Department of Industrial Relations of the State of Ohio or the US Department of Labor, shall govern the work under the contract. No increase in the contract sum will be allowed for any later increase in the prevailing rates or wages as they may apply to this work.

ARTICLE 16. PAYROLL SUBMITTAL

- a) All contractors and subcontractors shall keep full and accurate payroll records covering all disbursements of wages to their employees to whom they are required to pay not less than the prevailing rate of wages, as set forth in the contract documents. Such records shall be preserved for a period of three years from the date of completion of the contract.
- b) The Contractor and each subcontractor shall deliver to the Owner a certified copy of their payroll, with each month's payment application for the previous month's weekly

payrolls which shall show for each employee paid any wages, their name, current address, social security number, number of hours worked each day during the pay period and the total hours worked for each week, their hourly rate of pay, their job classification, fringe payments, and deductions from their wages. In addition, the Contractor, at the beginning of the performance under the contract, shall give to the Owner a schedule of the dates during the life of the contract with the Owner on which the Contractor is required to pay wages to employees and a complete list of all subcontractors. Upon completion of the contract and prior to final payment, the Contractor and each subcontractor shall file with the Owner an affidavit stating full compliance with Chapter 4115 of the Ohio Revised Code. The Owner will withhold payment of any monthly/partial and/or final payment until all requirements have been met in accordance with the terms of the contract.

ARTICLE 17. INSURANCE

Insurance requirements shall be defined in the contract.

DIVERSITY, EQUITY, AND INCLUSION (Non-Discrimination) POLICY

Through the adoption of this Diversity, Equity, and Inclusion Policy ("DEI Policy") the Franklin County Convention Facilities Authority ("FCCFA") affirms its commitment to equal opportunity and non-discrimination in all aspects of its operations including, but not limited to, contracting and procurement, employee recruitment and selection, compensation and benefits, professional development and training, promotions, transfers, layoffs, and terminations. Pursuant to this DEI Policy the FCCFA will not participate in either active or passive unlawful discrimination of any type and will strive to maintain an open, diverse, and inclusive workplace for all employees, officers, contractors, and subcontractors.

It is the position of the FCCFA that discrimination of any kind based upon age, sex, race, color, religion, disability, national origin, genetic information, ethnicity, ancestry, sexual orientation, gender identity or expression, family or marital status, military or veteran status, or any other basis prohibited by the laws of the United States, the State of Ohio, or the City of Columbus ("Protected Status") is prohibited. No person shall be unlawfully denied the benefit of, or otherwise be discriminated against in connection with their employment, the award or performance of any contract, or the modification of any contract or award.

The fundamental tenets of this DEI Policy are as follows:

- All Contractors shall have an equal opportunity to compete with respect to contracting and procurement activities of the FCCFA, regardless of age, sex, race, color, religion, disability, national origin, genetic information, ethnicity, ancestry, sexual orientation, gender identity or expression, family or marital status, military or veteran status, or any other Protected Status;
- No Contractor or FCCFA employee shall have engaged or shall engage in any kind of unlawful discrimination involving age, sex, race, color, religion, disability, national origin, ethnicity, ancestry, genetic information, sexual orientation, gender identity or expression, family or marital status, or any other Protected Status, whether or not such unlawful discrimination is related to the FCCFA or any contract with the FCCFA;
- The FCCFA and any Contractor seeking to do business with the FCCFA shall, whenever possible, craft bid specifications which enable MBE/WBE participation that is consistent with demographics for the City of Columbus;
- The FCCFA through its staff, facility management companies and other contractors will (i) monitor and provide periodic reports to the FCCFA Board of Directors regarding compliance by the FCCFA and its Contractors with this DEI Policy; (ii) collect and record information on the inclusion of minorities and women in their contracting, procurement, and workforce activities; and (iii) analyze data to evaluate the inclusion of minorities and women in the FCCFA's contracting, procurement, and workforce activities; shall include:

- Semi-annual diversity profile updates from all key service partners and facility management companies;
- Documentation of contractor compliance with this DEI Policy in any recommendation of award presented to the FCCFA Board of Directors;
- Monthly board reports describing MWBE participation rates for all ongoing construction projects.
- The FCCFA shall review this DEI Policy periodically to ensure that it effectively promotes and achieves diversity, equity, inclusion, non-discrimination and equal opportunity in connection with the FCCFA's operations, and all contracting and procurement activities; and
- All Contractors and employees shall comply with this DEI Policy. A Contractor's success or failure to comply with this DEI Policy will be a factor in any award of a contract to such Contractor. An employee's success or failure to comply with this DEI Policy will be a factor considered in connection with any disciplinary measures or continued employment with FCCFA.

The FCCFA through its staff, facility management companies and other contractors shall be responsible for implementing, monitoring and evaluating this DEI Policy.

If the FCCFA determines that the objectives of this DEI Policy are not being achieved, the FCCFA Board of Directors may, in their discretion, direct the Executive Director to conduct further investigations into the reasons for not achieving such objectives.

This DEI Policy applies to all contracting and procurement activities of the FCCFA, including contracting for construction, professional and non-professional services and procurement of goods and supplies.

This DEI Policy shall be referenced in each bid and Request for Proposal or Qualifications document issued by the FCCFA. A Contractor's failure to comply with this DEI Policy may result in (a) debarment from participation in future FCCFA contracting opportunities, (b) liability for breach of contract and (c) the enforcement of any other remedies available under the related contract or applicable law.

FORM OF PROPOSAL

Submitte	d By:			
on:				, 2025
To:	Fra 400 Co	nklin County Con) North High Stree lumbus, Ohio 432	nvention Facilities Authority et, 4th Floor 15-2096	
having re	ead the Project Man	nual, Specification	ns and examined the Drawings	s entitled:
Greater	Columbus Conve	ention Center Air	• Handler Unit Variable Fre	quency Drive Installation
as prepar and havin	ed by the Franklin ng also received, re	County Convention and included the	on Facilities Authority for the heir provisions in the bid all a	construction of said project ddenda thereto as follows:
Addendu	m No:	Dated:	Addendum No:	Dated:
Addendu	m No:	Dated:	Addendum No:	Dated:
and havin project, t shown, an sum:	ng also inspected th he undersigned pro nd required in the I	ne site of and the co oposes to furnish a Project Manual, Sp	onditions affecting and govern Il materials and perform all la pecifications and Drawings for	ing the construction of said bor as specified, described, the Work, for the indicated
(NOTE:	Fill in all spaces	of items being bid	and quote the sum in both wo	ords and figures.)

ESTIMATE FOR PROJECT (\$1,400,000)

Total material, labor and services for the project – Greater Columbus Convention Center Air Handler Unit Variable Frequency Drive Installation - for the lump sum amount of:

Dollars (\$ ______)

FORM OF PROPOSAL (continued)

EXECUTION OF PROPOSAL

NOTE A: TIME OF COMPLETION

- a) It is understood and agreed that the work embodied in this contract shall be completed no later than the completion date stated within the contract, unless an extension of time is granted by the Owner.
- b) Upon failure to have all work completed within the period of time above mentioned, the Contractor shall forfeit and pay, or cause to be paid, to the Owner for and as liquidated damages to be deducted from any payment due or to become due to the said contractor, the sum set forth in the following table for the size of contract, for each and every day thereafter that the said work remains in an unfinished condition.

DOLLAR AMOUNT OF CONTRACT DOLLARS PER DAY

\$0 to \$100,000.00	\$250.00
\$100,000.01 to \$500,000.00	\$500.00
\$500,000.01 to \$1,000,000.00	\$1,000.00
\$1,000,000.01 to \$10,000,000.00	\$2,500.00
\$10,000,000.01 and up	\$5,000.00

NOTE B: Failure to sign proposal may result in rejection of the Bid.

THIS PROPOSAL SUBMITTED BY:

	Name of Contractor	
D17		
ВҮ:	Signature of Contractor or Authorized Representative	
DATE:		
Contact Perso	on for contract processing:	
Mailing Addr	ress if different from above:	

FRANKLIN COUNTY CONVENTION FACILITIES AUTHORITY

Diversity, Equity & Inclusion (Non-Discrimination) Policy

(name of Contractor) hereby has reviewed the FCCFA's Diversity, Equity &

Inclusion Policy.

The contractor agrees to comply with all policy requirements and, directly or indirectly, (1) has not engaged, is not engaged, and will not engage in any kind of unlawful discrimination involving race, color, sex, sexual orientation or gender identity, disability, age, religion, veteran status or national origin, whether or not such discrimination is related to a contract or procurement activity with or for the FCCFA and (2) will not, for any purpose related to its engagement by the FCCFA, employ or contract with persons or businesses which the Contractor knows or has reason to know have engaged, are engaged, or will engage in any kind of unlawful discrimination involving race, color, sex, sexual orientation or gender identity, disability, age, religion, veteran status or national origin, whether or not such unlawful discrimination is related to a contract or procurement activity with or for the FCCFA. The contractor further agrees to incorporate these requirements in all subcontracts on this project regardless of tier.

Date: _____

Signature of Contractor or Authorized Representative

- () Submitted own Affirmative Action Plan.
- Contractor has been certified as a minority and/or female owned business.
 (Submit copy of certification as received from the federal government and/or any Ohio government unit or public authority).

Note: This certification must be filled and signed. Failure to comply may invalidate your bid.

DECLARATION OF INSURANCE TO THE FRANKLIN COUNTY CONVENTION FACILITIES AUTHORITY

THIS IS TO CERTIFY THAT THE FOLLOWING DESCRIBED POLICIES OF INSURANCE HAVE BEEN ISSUED AND ARE IN FULL FORCE AND EFFECT AT THIS TIME:

- 1. Name of Insured (Contractor):
- 2. Address:

3.	Title and Location: (Contract Job Site)	Franklin County Convention Facilities Authority - Greater Columbus Convention Center
4.	Project:	GCCC Air Handler Unit Variable Frequency Drive Installation

5. Policy Number(s), Carriers and Expiration Dates:

LIMITS OF LIABILITY IN \$1,000 AMOUNTS

TYPE OF INSURANCE		Each Occurrence	Aggregate
GENERAL LIABILITY			
Comprehensive Form	Bodily Injury	\$	\$
Premises-Operations			
Explosion and Collapse Hazard	Property Damage`	\$	\$
Underground Hazard	-		
Products/Completed Operations Hazard Contractual Hazard	Combined Single Limit	\$ \$	\$ \$
Broad Form Property Damage	C		
Independent Contractors Personal Injury	Personal Injury	\$	\$
AUTOMOBILE LIABILITY	Bodily Injury Each Person	\$	
Comprehensive Form			
Owned	Bodily Injury Each Accident	\$	

Hired Non-Owned **Property Damage** \$ **EXCESS LIABILITY** Combined \$ Single Limit \$ Umbrella Form Combined \$ Single Limit Self-Insured Following Form \$

List any manuscript or unusual exclusions for forms and attach copies.

Check those of the following operations which are excluded:

____Asbestos removal or abatement _____PCP Removal _____ Demolition

It is agreed that sixty (60) days written notice of cancellation or material change in the described policy(s) will be given to the holder of this certificate, known as the Franklin County Convention Facilities Authority, 400 North High Street, Columbus, OH 43215.

Insurance Agency:	
Address:	Telephone:
Contractor's Signature:	Agent's Signature:
Date:	Date:

ADDITIONAL INSURED WITH RESPECT TO THIS JOB ONLY; AS THEIR INTEREST MAY APPEAR:

- 1. Franklin County Convention Facilities Authority, its other contractors and own forces, if any, and the subcontractors, sub-subcontractors, consultants, agents, and employees of any of them, in their individual capacities as such:
- 2. The Franklin County Convention Facilities Authority Board, its members, consultants, agents, and employees of any of them, in their individual capacities as such;
- 3. The Architect/Engineer its consultants, agents, and employees of any of them, in their individual capacities as such;
- 4. The Construction Manager, its consultants, agents, and employees of any of them, in their individual capacities as such.
- 5. ASM Global, its consultants, agents, and employees of any of them, in their individual capacities as such.

FRANKLIN COUNTY CONVENTION FACILITIES AUTHORITY MANUFACTURER'S DECLARATION

Part A

Contractor's Name and Address:

Project Title and Location: GCCC Air Handler Unit Variable Frequency Drive Installation

Part B (Complete for all suppliers but do not include subcontractors.)			
Name:	Type/Brand Name of Supplie	s:	
Address:	Phone: Minority/Female Business:	_Yes _No	
Name:	Type/Brand Name of Supplie	s:	
Address:	Phone: Minority/Female Business:	_ Yes _ No	
Name:	Type/Brand Name of Supplie	s:	
Address:	Phone:		
	Minority/Female Business:	_ Yes _ No	
Name:	Type/Brand Name of Supplie	s:	
Address:	Phone:		
	Minority/Female Business:	_ Yes _ No	
(attach additional pages as needed)			

FRANKLIN COUNTY CONVENTION FACILITIES AUTHORITY SUBCONTRACTOR DECLARATION

Part A

Contractor's Name and Address:

Project Title and Location:	GCCC Air Handler Unit Variable Frequency Drive Installation	
Part B (Complete for all sub	bcontractors, specify brand name of their material)	
Name:	Type Work:	
FTID#: Address:	Brand Name(s):	
	Minority/Female Business: Yes	
Phone:		
Name:	Type Work:	
FTID#: Address:	Brand Name(s):	
	Minority/Female Business: Yes	
Phone:		
Name:	Type Work:	
FTID#: Address:	Brand Name(s):	
	Minority/Female Business: Yes	
Phone:		
(attach additional pages as nee	eded)	

FRANKLIN COUNTY CONVENTION FACILITIES AUTHORITY CONTRACTOR'S REVIEW CERTIFICATE

The undersigned acknowledges that:

- (1) the contractor's authorized agent has carefully read and understood all of the Bid Documents submitted for the GREATER COLUMBUS CONVENTION CENTER AIR HANDLER UNIT VARIABLE FREQUENCY DRIVE INSTALLATION, including, but not limited to, the Notice to Bidders, Instructions to Bidders, Form of Proposal, Substitution Sheet, Prevailing Wage Determination, Form of Bid Guaranty and Contract Bond, this Contractor's Review Certificate, Project Manuals, Specifications and Drawings; and
- (2) the Bid Documents are sufficient and adequate for the undersigned to perform the Work; and
- (3) the contractor's authorized agent has carefully reviewed the site and conditions under which the Work will be performed, or has been given ample opportunity to do so, and fully assumes the risk for any condition at the site that could have been discovered by a careful and diligent review of the site; and
- (4) the contractor's authorized agent has confirmed that the contractor's surety is authorized to do business in the State of Ohio.

Dated: _____

CONTRACTOR: _____

By: _____

SIGNATURE

TYPED OR PRINTED NAME

Its: _____

NOTE: The Bidder should review the Bid Documents and the site and conditions under which the Work will be performed so that the Bidder can give the acknowledgments contained in this Certificate.

BID GUARANTY AND CONTRACT BOND

KNOW ALL MEN BY THESE PRESENT, that we, the undersigned

(Name and Address)

as Principal and

(Name of Surety)

as Surety, are hereby held and firmly bound unto the Franklin County Convention Facilities Authority as Obligee in the penal sum of the dollar amount of the bid submitted by the Principal to the Obligee on this ________ day of _______, 2025 to undertake the project known as the Greater Columbus Convention Center Air Handler Unit Variable Frequency Drive Installation. The penal sum referred to herein shall be the dollar amount of the Principal's bid to the Obligee, incorporating any additive or deductive alternative proposals made by the Principal on the date referred to above to the Obligee, which are accepted by the Obligee. In no case shall the penal sum exceed the amount of ______ dollars (\$______).

(If the above line is left blank, the penal sum will be the full amount of the Principal's bid, including add alternates.) Alternatively, if completed, the amount stated must not be less than the full amount of the bid, including add alternates, in dollars and cents. A percentage is not acceptable. For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above-named Principal has submitted a bid on the above referred to Project;

NOW, THEREFORE, if the Obligee accepts the bid of the Principal and the Principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material; and in the event the Principal pays to the Obligee the difference, not to exceed ten percent of the penalty hereof, between the amount specified in the bid and such larger amount for which the Obligee may in good faith contract with the next lowest bidder to perform the Work covered by the bid; or in the event the Obligee does not award the Contract to the next lowest bidder and resubmits the Project for bidding, the Principal will pay the Obligee the difference, not to exceed ten percent of the penalty hereof, between the amount specified in the bid, or the costs, in connection with the resubmission, or printing new contract documents, required advertising and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect. If the Obligee accepts the bid of the Principal and the Principal, within ten days after the awarding of the Contract, enters into a proper contract in accordance with the bid, plans, details, specifications, and bills of material, which said Contract is made a part of this Bond the same as though set forth herein; and

IF THE SAID Principal shall well and faithfully perform each and every condition of such Contract; and indemnify the Obligee against all damage suffered by failure to perform such Contract according to the provisions thereof and in accordance with the plans, details, specifications, and bills of material therefor; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said Contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialman, subcontractor or laborer having a just claim, as well as for the Obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID Surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of said Contract or in or to the plans and specifications therefor shall in any way affect the obligations of said Surety on its Bond, and it does hereby waive notice of any such modifications, omissions or additions to the terms of the Contract or to the Work or to the specifications.

SIGNED AND SEALED This	day of		_, 2025.
PRINCIPAL:			
BY:			
TITLE:			
SURETY	SURETY COMPA	NY ADDRESS:	
	Street		
	City	State	Zip
pv.	Telephone:		
DI.			

Attorney-in-Fact

If the requirements of Section 3905.41 of the Ohio Revised Code are applicable or if Surety Agent's Address is other than Ohio, and the Ohio Department of Insurance's Certificate of Compliance is not attached, please complete Ohio Resident Agent Information as follows:

SURETY AGENT'S ADDRESS:

Agency Name:			Agency Name:		
Street			Street		
City	State	Zip	City	State	Zip
Telephone			Telephone		· · · · · · · · · · · · · · · · · · ·

NOTE Failure by any party to sign this Bid Guaranty and Contract Bond shall result in rejection of bid.

INSTRUCTIONS TO BIDDERS RESPONSIBILITY ANALYSIS FORM

FRANKLIN COUNTY CONVENTION FACILITIES AUTHORITY DETERMINATION OF LOWEST AND BEST BID

This form must be completed in its entirety and submitted with the Bid Form. Attach additional sheets if necessary to provide complete answers to the questions below. Do not include any misleading statements and make sure to include all facts necessary to make the statements made not misleading. The term "Project" means the project for which the attached bid is submitted. All references to "**Bidder**" should be answered with respect to the **actual legal entity** submitting the bid.

Subject to the right of the Owner to reject any or all bids, the Owner will award the Contract for the Work to the Bidder submitting the lowest and best bid, taking into consideration accepted alternates. In determining which bid is the lowest and best bid, the Owner may take into consideration not only the amount of the bid but such of the following criteria as the Owner, in its sole discretion, deems appropriate, and may give such weight thereto as it deems appropriate:

Bidder Name	

Bid Package No.: <u>2025-2</u>_____

Trade/Service	

Product (s) Supplied _____

- 1. Bidder shall provide all information listed below with its bid, unless otherwise noted. Failure to do so may, at the Owner's discretion, result in rejection of the bid.
- 2. The Owner reserves the right to reject all bids.
- 3. Will the Bidder employ supervisory personnel on this Project that have three (3) or more years in the specific trade and/or maintain the appropriate state license?

Yes No

- 4. On a separate sheet, provide information to demonstrate the following:
 - Bidder's previous performance to complete its work on projects of similar size and scope.
 - Bidder's previous ability to complete these same projects on time.
 - Bidder's previous ability to work with this Owner, Architect, Engineer and/or Construction Manager.
- 5. Bidder shall not have an EMR (Workers' Compensation Interstate/Intrastate Experience Modification Rate) greater than 1.5. If Bidder's EMR is above 1.0, Bidder shall provide a letter from Insurance Broker providing EMR for the most recent five (5) years, reasoning for EMR being above 1.0 and incident rates for that time period.

6. Has the Bidder been in existence at least 36 months?

____Yes ____No

7. Has the Bidder, or any principal, owner, officer, stockholder, affiliate or any person involved in the bidding, contracting or leasing process been cited in the last five (5) years for violations of or failure to comply with any laws including without limitation:

a.	Workers' compensation laws	Yes	No
b.	. Wage and hour laws YesYYS		No
c.	Unemployment laws	Yes	No
d.	Tax laws	Yes	No
e.	Fair Labor Standards Act	Yes	No
f.	Immigration laws	Yes	No
g.	Licensing requirements	Yes	No
h.	OSHA	Yes	No
i.	EPA	Yes	No
j.	Any items below:	Yes	No

- 1. A judgment or conviction for any business-related conduct constituting a crime under federal, state or local government law including, but not limited to, fraud, extortion, bribery, racketeering, price-fixing or bid collusion or any crime related to truthfulness and/or business conduct.
- 2. A criminal investigation or indictment for any business-related conduct constituting a crime under federal, state or local government law including, but not limited to, fraud, extortion, bribery, racketeering, price-fixing or bid collusion or any crime related to truthfulness and/or business conduct.
- 3. An unsatisfied judgment, injunction or lien for any business-related conduct obtained by any federal, state or local government agency including, but not limited to, judgments based on taxes owed and fines and penalties assessed by any federal, state, or local government agency.
- 4. An investigation for a civil or criminal violation for any business-related conduct by any federal, state or local agency.
- 5. A grant of immunity for any business-related conduct constituting a crime under federal, state or local governmental law including, but not limited to, fraud,

extortion, bribery, racketeering, price-fixing, bid collusion or any crime related to truthfulness and/or business conduct.

- 6. An administrative proceeding or civil action seeking specific performance or restitution in connection with any federal, state or local contract or lease.
- 7. A sanction imposed as a result of judicial or administrative proceedings relative to any business or professional license.
- 8. A consent order with the Ohio Environmental Protection Agency, or a federal, state or local government enforcement determination involving a violation of federal, state, or local environmental laws.

If yes, on a separate sheet, provide complete details including the date of each citation or violation; the nature of each violation; and the sanction for each violation. If the Bidder was fined, include the dollar amount.

For purposes of 7.a. above, a violation of the Workers' compensation laws is a determination by the Ohio Bureau of Workers Compensation that the contractor is not in compliance with Ohio Workers' Compensation laws and regulations.

For purposes of 7.b. above, a violation of the Ohio Prevailing Wage Act is a determination by the Ohio Department of Commerce, Division of Labor and Worker Safety, Wage and Hour Division, or successor that the contractor is not in compliance with the provisions, duties, obligations and is subject to the remedies and penalties of Chapter 4115 of the Ohio Revised Code.

8. Does Bidder have any outstanding liens? If yes, on a separate sheet identify each circumstance and Bidder's response.

Yes

No

9. Has Bidder been party to litigation or arbitration proceedings in connection with any work performed, services rendered, or products supplied in the last five years? If yes, on a separate sheet, provide complete details, including dates, parties, whether Bidder was a plaintiff/claimant or defendant/respondent, the nature of the dispute and the ultimate determination or other resolution (i.e. settlement).

Yes

_____ No

10. In the last five years, has Bidder had work rejected as defective (other than minor re-work accomplished without formal notice)? If yes, on a separate sheet identify each circumstance and Bidder's response.

Yes

_____ No

11. In the last five years, has Bidder's contract or employment been terminated prior to completion of a project for any reason other than convenience of the Owner? If yes, on a separate sheet identify each such circumstance and provide full details.

Yes

_____ No

12. Bidder shall secure any required bonds from a surety licensed to do business in the State of Ohio with an A.M. Best Company rating of at least A. Has Bidder met this requirement?

Yes

No

13. Has Bidder's construction license ever been revoked in any state?

Yes

_____ No

14. In the last five years, has Bidder had its own forces supplemented by an Owner, contractor or construction manager or had a claim made against it for defective, delayed or non-compliant work? If yes, on a separate sheet identify each such circumstance and provide full details.

Yes

No

- 15. Bidder for a skilled contract (i.e. plumbing, electrical, HVAC, or fire safety) shall certify that Bidder will not subcontract greater than 50% of its awarded contract.
- 16. Does Bidder provide a minimum healthcare medical plan for those employees working on the project? If yes, list the healthcare plan provider below.

_____Yes _____No

Healthcare Medical Plan Provider:

17. Does Bidder contribute to an employee pension or retirement plan for those employees working on the project? If yes, list the pension or retirement plan provider below.

_____Yes _____No

Pension Plan or Retirement Plan Provider:

The contractor may be asked to provide ERISA form 5500 for the retirement plan.

18. Has Bidder implemented an OSHA compliant Safety Program?

Yes

_____No

19. Does Bidder maintain a substance abuse policy that meets or exceeds requirements of the Ohio BWC and that its personnel are subject to on this Project?

Yes

_____No

20. Is the bidder a foreign corporation (i.e. not incorporated under the laws of Ohio) or an individual or partnership?

_____Yes _____No

- 21. If yes to Item 20 above, provide proof of a Certificate of Good Standing from the Secretary of State showing the right of the Bidder to do business in the State and/or proof of filing with the Secretary of State a Power of Attorney designating the Secretary of State as Bidder's agent.
- 22. Bidder shall certify that the Bidder's subcontractors / vendors shall meet all requirements contained herein.

- 23. The Owner reserves the right to request the following information within 48 hours of the bid date:
 - a. On a separate sheet, list all projects greater than \$1,000,000 completed by Bidder in the preceding five years and for each, provide Bidder's original contract amount, final contract amount and a reference name and phone number.
 - b. For the three largest projects listed from Item 3 above list your average manpower and peak manpower along with the original duration of the project and final duration of the project.
 - c. On a separate sheet, provide Bidder's current work load under contract. List each current project and its respective contract amount and scheduled duration.
 - d. On a separate sheet, provide information on Bidder's equipment and facilities.
 - e. Bidder shall provide sufficient financial information to demonstrate fiscal capability to perform the project. All financial information identified by the Bidder as a trade secret and contained herein shall be treated as a trade secret and exempt from Ohio's Public Records laws, but the Owner's sole duty shall be to notify Bidder of any requests for that information so that Bidder is afforded the opportunity, at Bidder's expense, to contest in court the disclosure of any such information. The Owner may, but shall not be obligated to, contest any request for the disclosure of such information.
 - f. On a separate sheet, identify, in numbers and experience, the Bidder's work force. Differentiate between hourly and salaried staff. Describe Bidder's workforce, focusing on worker experience and continuity.
 - g. Bidder for a skilled trade contract or fire safety contract shall certify and upon request, provide evidence that Bidder is a state licensed heating, ventilating, and air conditioning contractor, refrigeration contractor, electrical contractor, plumbing contractor, or hydronics contractor or licensed by the State Fire Marshall and uses skilled, trained personnel.
 - h. Identify the number of man hours and associated wages for each trade classification included in the Contractor's and Subtiers' Base Bid. Separately list the subtier's information. Provide additional sheet if more room is needed. DO NOT include payroll taxes, assessments or fringe benefits of any kind in the Wage amounts.

Man Hours	Wages (No fringes or OH&P)	
	Man Hours	

The Undersigned certifies under oath that the information provided herein and on all supplemental pages of explanation is true, complete and correct.

Company		
By		
Title		
(Signature must be notarized)		
Sworn to and subscribed in my presence this	day of	
By	, the	of
	, a	on
behalf of the	·	
Notary Public		
Commission Expires:		

Franklin County Convention Facilities Authority Bid Evaluation Process:

In determining the lowest and best bid for construction contracts, the Franklin County Convention Facilities Authority will take the following steps and consider the following items in making this determination. The Authority reserves its discretion to evaluate the price and quality of bids to ensure that the lowest and best bid is selected. The Authority reserves its discretion to modify this process at any time and for any reason without notice.

- 1. Select which alternates will be accepted.
- 2. Identify the apparent low bidder based on the accepted alternates.
 - 2.1 Is the apparent low bid responsive? Are all required bid submissions included?
 - 2.2 Has the bidder qualified their bid in a way that would disqualify the bid?
- 3. Meet with the bidder to determine that all project scope is clearly understood and included. Discuss project schedule, safety and all project requirements. Identify key project staff. Identify subcontractors. Identify long lead time equipment. Discuss submission, review and approval process. Identify and discuss other items pertinent to the job.
- 4. Is the bidder well qualified?
 - 4.1 Background Check: Check Dun and Bradstreet. Run Lexus/Nexus check. Check for prevailing wage and workers compensation compliance.
 - 4.2 Is the bidder qualified for a job of this scope? (Questions 4, 6, 15, 23.a, b,c,d,e)
 - 4.3 Has the bidder demonstrated that they will provide qualified, well trained staff? (Questions 3, 23.f, g)
 - 4.4 Does the bidder provide a minimum healthcare medical plan for those employees working on the project? (Question 16)

Does the bidder contribute to an employee pension or retirement plan for those employees working on the project? (Question 17)

- 4.5 Does the bidder have a history of providing quality construction services? (Questions 6, 9, 10, 11, 13, 14)
- 4.6 Does the bidder maintain a safe workplace? (Questions 5, 18, 19)
- 4.7 Does the bidder follow all applicable laws? (Question 7)
- 4.8 Is the bidder financially stable? (Questions 7.j.3, 8, 12, 23.e)
- 5. If it is determined that the apparent low bid is responsive, valid and the bidder is well qualified:

- 5.1 Assemble all necessary documentation and paperwork required in the bid documents.
- 5.2 Submit a resolution for board approval to enter into the contract.
- 5.3 Issue a notice to proceed.
- 5.4 Sign a contract with the successful bidder.
Exhibit A Prevailing Wage Schedules

Prevailing Wage Rate Skilled Crafts Name of Union: Labor Local 423

Change # : LCN01-2024ibLoc423

Craft : Laborer Effective Date : 06/12/2024 Last Posted : 06/12/2024

	BI	łR		Fri	inge Bene	fit Payme	ents		Irrevo Fu	cable nd	Total PWR	Overtime Rate
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Clas	sification											
Laborer Group 1	\$31	48	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$45.53	\$61.27
Group 2	\$31	79	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$45.84	\$61.74
Group 3	\$32	2.10	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$46.15	\$62.20
Group 4	\$32	2.41	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$46.46	\$62.66
Apprentice	Per	cent										
0-1000 hrs	70.00	\$22.04	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$36.09	\$47.10
1001-2000 hrs	80.00	\$25.18	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$39.23	\$51.83
2001-3000 hrs	90.00	\$28.33	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$42.38	\$56.55
3001-4000 hrs	95.00	\$29.91	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$43.96	\$58.91
More than 4000 hrs	100.00	\$31.48	\$8.40	\$4.15	\$0.40	\$0.00	\$1.00	\$0.00	\$0.10	\$0.00	\$45.53	\$61.27

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

1 Journeymen to 1 Apprentice

4 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note): FAIRFIELD, FAYETTE, FRANKLIN, HOCKING, LICKING, MADISON, PICKAWAY, UNION

Special Jurisdictional Note :

Details :

Group 1:

General Laborers, Carpenter Tender, Cathodic Protection, Cleaning Debris, Cleaning of all Material, General Clean-up including Vacuum Cleaning, Scraping and Cleaning of Walls and Floors, Landscape, Installation and Removal of Fencing, Sod Layers, All Portable Heaters, Flagman, Loading and Unloading of all Trucks, Handling and conveying all Materials, Washing of all Windows, Conveyer Belt, All Water Pumps up to and including three (3) inch intake, Watchman, Water Boy and Tool Room Attendant.

Group 1- Swimming Pools, Pool Decks, Surrounding Sidewalk and Parking Garages.

Group 2:

Skid Steer, Concrete Specialists, Brick Tender, Stone Mason Tender, Plaster Tender, Mortar Mixer and Operator, Cement Mason Tender, Construction Specialist, All Scaffold Builders (Swinging Scaffolds), Lagging, Bush Hammering, Jack Hammer Operator, Air or Electric Pneumatic Tool Operator, Power Driven Tools, Power Buggy Operators, Pouring and Placement of all concrete, Fork Lift Operators, Power Wheelbarrow Operators, Asphalt and Blacktop Rakers, Wrecker/Demolition, Sand Blasting and Chipping, Welders on Demolition, Grade Checkers, a person on a bucket pouring concrete, Gunite Nozzle man, Wagon and Churn Drill Operator, Concrete Saw Operator, Brush Feeders on pulverizers, Pipe Layers, Bottom Man, Laser Gun, Burners, Sand Blasting of concrete, Vibrator Man, Steward, Signal Man, Caisson, Caisson Bottom Man, Piledrivers, Asbestos and Lead Abatement Laborers.

Hazardous Waste (Level B): Any work requiring the following protective equipment must be paid at Group 2 rate, A protective suit and an Air Purifying Respirator (APR) with the appropriate filter canisters. The ensemble is used when contaminants are reliably known not to be hazardous to the skin and not IDLH (Immediately Dangerous To Life or Health) and correct filter protection is available. This ensemble offers adequate protection for many jobs. Heat stress may be a problem due to inherent restrictions to breathing in an APR. Also, normal job related injury risk will be nearly as high as for Level C Equipment.

Group 3 Hazardous (Level C:) Any work requiring the following protective equipment must be paid at Group 3 rate,

A chemically resistant splash suit and a (SCBA) or Airline Respirator. This ensemble is required when the situation is very hazardous, such as oxygen deficient atmospheres, IDLH atmospheres, or confined space entries, but the risk of skin exposure is not as great as in Level D situations. Then Level C ensemble gives the second highest level of protection, but also puts physical stress on the worker; primarily heat stress, reduced vision, dexterity and mobility directly attributable to wearing of the protective equipment. Therefore, in addition to the hazardous material, the hazard of the normal job related injuries is greatly increased.

Group 4 Hazardous Waste (Level D) requiring the following protective equipment must be paid at Group 4 rate,

Protective equipment is required when the area has been known to contain extremely toxic contaminants or contaminants unknown but may be expected to be extremely toxic and /or Immediately Dangerous to Life and Health (IDLH). This ensemble includes fully encapsulated chemical suit (moon suit), Self Contained Breathing Apparatus (SCBA), or Airline Fed Respirator, and various types and numbers of boots and gloves, cool vests and voice activated radios are optional equipment sometimes worn. Level D ensembles provide the highest level of protection from contaminants but places the greatest physical and mental stress on the worker. The claustrophobic environment of the moon suit causes anxiety in most people, which greatly increases the already inherent heat stress problems. Also, this ensemble reduces vision, mobility, dexterity, and communication capacity, all of which increases the risk of normal job related injuries, ie., slips ,falls, caught between, etc

Hazardous Pay of \$0.25 per hour shall be paid in addition to classifications shown above

Swing Scaffolds (suspended by rope or pulley), and swing scaffolds for grain storage tank or grain elevators, when the work is performed at a height of fifty (50) feet or more above the foundations or grade level, whichever is higher. Caisson work and tunnel work (depth being 15 feet or deeper)

Hazardous Waste Removal & Lead Abatement Workers: Exclusive or "Hot" area with toxic or hazardous materials, when one of the following personal protective equipment ensembles will be required for necessary protection against toxic contaminants. All of the ensembles increase the risks of certain types of worker-related injuries. When Laborers complement another craft receiving premium rate of pay Laborers will also receive premium pay for this "HOT" type of work.

Prevailing Wage Rate Skilled Crafts

Name of Union: Sheet Metal Local 24 (Columbus)

Change # : LCN02-2024ibLoc24Col

Craft : Sheet Metal Worker Effective Date : 11/13/2024 Last Posted : 11/13/2024

	BI	łR		Fri	inge Bene	fit Payme	ents		Irrevo Fu	cable nd	Total PWR	Overtime Rate
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Clas	sification											
Sheet Metal Worker	\$38	3.85	\$10.08	\$12.28	\$1.24	\$0.00	\$3.82	\$0.00	\$0.00	\$0.00	\$66.27	\$85.69
Apprentice	Per	cent										
1st Year	57.02	\$22.15	\$8.27	\$2.14	\$1.03	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$33.59	\$44.67
2nd Year	65.00	\$25.25	\$9.46	\$7.98	\$1.03	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.72	\$56.35
3rd Year	75.00	\$29.14	\$9.69	\$9.21	\$1.24	\$0.00	\$2.87	\$0.00	\$0.00	\$0.00	\$52.15	\$66.72
4th Year	85.00	\$33.02	\$9.84	\$10.44	\$1.24	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$57.79	\$74.30

Special Calculation Note : No special calculations for this skilled craft wage rate required at this time.

Ratio :

1 Journeyman to 1 Apprentice
2-8 Journeymen to 2 Apprentices
9-11 Journeymen to 3 Apprentices
12-14 Journeymen to 4 Apprentices
15-17 Journeymen to 5 Apprentices
18-20 Journeymen to 6 Apprentices
21-23 Journeyman to 7 Apprentices
24-26 Journeyman to 8 Apprentices
27-29 Journeymen to 9 Apprentices
30-32 Journeymen to 10 Apprentices

Jurisdiction (* denotes special jurisdictional note):

ADAMS, ATHÈNS, DELAWARE, FAIRFIELD, FAYETTÉ, FRANKLIN, GALLIA, GUERNSEY, HOCKING, JACKSON, KNOX, LAWRENCE, LICKING, MADISON, MARION, MEIGS, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, ROSS, SCIOTO, UNION, VINTON 4/11/25, 2:04 PM

33-35 Journeymen to 11 Apprentices 36-38 Journeymen to 12 Apprentices 39-41 Journeymen to 13 Apprentices 42-44 Journeymen to 14 Apprentices 45-47 Journeymen to 15 Apprentices 48-50 Journeymen to 16 Apprentices and so on

Special Jurisdictional Note :

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 683 Inside

Change # : LCR01-2025ibLoc683In

Craft : Electrical Effective Date : 02/12/2025 Last Posted : 02/12/2025

	BHR		Fri	inge Benei	fit Payme	ents		Irrevo Fu	cable nd	Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Clas	ssification										
Electrician	\$40.50	\$11.55	\$8.49	\$1.16	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$65.70	\$85.95
Welding	\$41.50	\$11.55	\$8.52	\$1.16	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$66.73	\$87.48
Medium Voltage Splicing	\$41.50	\$11.55	\$8.52	\$1.16	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$66.73	\$87.48
Over 100 feet	\$60.75	\$11.55	\$9.09	\$1.16	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$86.55	\$116.92
Level 1 CW 0 to 2000 hours	\$15.29	\$6.83	\$0.46	\$0.92	\$0.00	\$0.46	\$0.10	\$0.00	\$0.00	\$24.06	\$31.71
Level 2 CW 2001 to 4000 hours	\$16.25	\$6.83	\$0.49	\$0.92	\$0.00	\$0.49	\$0.10	\$0.00	\$0.00	\$25.08	\$33.21
Level 3 CW 4001 to 6000 hours	\$17.20	\$6.83	\$0.52	\$0.92	\$0.00	\$0.52	\$0.10	\$0.00	\$0.00	\$26.09	\$34.69
Level 4 CW 6001 to 8000 hours	\$19.12	\$6.83	\$0.57	\$0.92	\$0.00	\$0.57	\$0.10	\$0.00	\$0.00	\$28.11	\$37.67

PW Rate Skilled LCR01-2025ibLoc683In Page

Level 1 CE 8001 to 10000 hours	\$21	1.03	\$6.83	\$0.63	\$0.92	\$0.00	\$0.63	\$0.10	\$0.00	\$0.00	\$30.14	\$40.66
Level 2 CE 10,001 to 12,000 hours	\$22	2.94	\$6.83	\$0.69	\$0.92	\$0.00	\$0.69	\$0.10	\$0.00	\$0.00	\$32.17	\$43.64
Level 3 CE 12,001 to14,000 hours	\$28	3.67	\$6.83	\$0.86	\$0.92	\$0.00	\$0.86	\$0.10	\$0.00	\$0.00	\$38.24	\$52.58
Apprentice	Per	cent										
0-1000 hrs 1st Period	50.00	\$20.25	\$11.55	\$4.25	\$1.16	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.21	\$47.33
1001-2000 hrs 2nd Period	55.00	\$22.28	\$11.55	\$4.67	\$1.16	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.66	\$50.79
2001-3500 hrs 3rd Period	60.00	\$24.30	\$11.55	\$5.09	\$1.16	\$0.00	\$2.40	\$0.00	\$0.00	\$0.00	\$44.50	\$56.65
3501-5000 hrs 4th Period	65.02	\$26.33	\$11.55	\$5.52	\$1.16	\$0.00	\$2.60	\$0.00	\$0.00	\$0.00	\$47.16	\$60.33
5001-6500 hrs 5th Period	70.00	\$28.35	\$11.55	\$5.94	\$1.16	\$0.00	\$2.80	\$0.00	\$0.00	\$0.00	\$49.80	\$63.97
6501-8000 hrs 6th Period	80.00	\$32.40	\$11.55	\$6.79	\$1.16	\$0.00	\$3.20	\$0.00	\$0.00	\$0.00	\$55.10	\$71.30

Special Calculation Note : Other for CW/CE: Education Fund

Ratio :

1 to 3 Journeyman to 2 Apprentices 4 to 6 Journeyman to 4 Apprentices

Ratio

Construction Wireman and Construction Electrician 1 Journeyman to 2 Apprentices to 2 CW/CE With a MAXIMUM of 12 CW/CE an on any jobsite

Jurisdiction (* denotes special jurisdictional note) :

CHAMPAIGN, CLARK, DELAWARE, FAIRFIELD, FRANKLIN, MADISON, PICKAWAY*, UNION

Construction Wireman and Construction Electricians may work on residential projects without working under the supervision of a Journeyman Wireman. On ALL other job sites, Construction Wireman and Construction Electricians CAN only be employed after an APPRENTICE IS EMPLOYED on the job site.

Special Jurisdictional Note : In Pickaway County the following townships: Circleville,Darby,Harrison,Jackson,Madison,Monroe,Muhlenberg,Scioto,Walnut,Washington.

Details :

Exhibit B

Technical Specifications and Drawings

DRAWING INDEX

PRC	DJECT DRAWING INDEX
SHEET NUMBER	SHEET TITLE
G000	COVER SHEET
M001	GENERAL INFORMATION - HVAC
M100	OVERALL BUILDING PLAN
M701	HVAC SCHEDULES
E001	ELECTRICAL GENERAL INFORMATION
E301	OVERALL ELECTRICAL PLAN
E302	OVERALL ELECTRICAL PLAN - NORTH BUILDING MEZZANINE
E303	ENLARGED ELECTRICAL ROOM PLANS
E501	ELECTRICAL SINGLE LINE DEMOLITION
E502	ELECTRICAL SINGLE LINE NEW WORK



A. CONTRACTOR SHALL COORDINATE LAY DOWN AREAS WITH OWNER AND ENGINERR PRIOR TO MOBILIZATION.

B. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ANY AND ALL EQUIPMENT AND MISC. ITEMS TO BE DEMOLISHED DURING

CONSTRUCTION. C. ALL SHUTDOWNS NEEDED FOR MOTOR REPLACEMENTS ARE TO BE HEAVILY COORDINATED WITH GCCC'S SCHEDULED EVENTS AND FACILITY PERSONNEL.

Greater Columbus Convention Center North Building Air Handler Fan Upgrades

500 North High Street Columbus, OH 43215

PROJECT DESCRIPTION

THIS PROJECT CONSISTS OF MECHANICAL, HVAC CONTROLS, & ELECTRICAL WORK REQUIRED FOR THE REPLACEMENT OF 32 FAN MOTORS OF AIR HANDLING UNITS WITH NEW MOTORS AND NEW VARIABLE FREQUENCY DRIVES SERVING THE GREATER COLUMBUS CONVENTION CENTER'S NORTH FACILITY.



PROJECT LOCATION

VICINITY MAP: LOCAL / CAMPUS

PROJECT TEAM

PROJECT MANAGER - COLE PARKINSON MECHANICAL ENGINEER - PAUL COYNE **ELECTRICAL ENGINEER - JEFF EVERS**



BUILDING SCIENCE LEADERSHIP

GOVERNING REGULATIONS

OHIO BUILDING CODE	2024 (2021 IBC with Ohio amendments)
EXISTING BUILDING CODE	2024 (2021 IEBC with Ohio amendments)
OHIO MECHANICAL CODE	2024 (2021 IMC with Ohio amendments)
OHIO PLUMBING CODE	2024 (2021 IPC with Ohio amendments)
NATIONAL ELECTRICAL CODE NFPA 70	2023
OHIO ENERGY CODE	2021 (2021 IECC with Ohio amendments
INTERNATIONAL FIRE CODE	2021

GENERAL BUILDING INFORMATION

FLOOD ZONE: X (FEMA MAP 39049C0307K, EFFECTIVE OF 6/17/2008) OCCUPANCY: PRIMARY USE IS GROUP A-3, EXHIBITION HALL. THE BUILDING ALSO CONTAINS USE GROUP A-2 (FOOD SERVICE & CAFE), USE GROUP B (OFFICE USE), AND INCIDENTAL S-2 (STORAGE). TYPE OF CONSTRUCTION: I-A TOTAL BUILDING AREA: 1,212,940 SF 3,075 SF (0.25% TOTAL) PROJECT AREA:

BUILDING HEIGHT: NORTH: 2 STORIES, 68'-0"

SOUTH: 4 STORIES, 82'-0" HIGHEST OCCUPIED FLOOR ABOVE LOWEST POINT OF FIRE DEPARTMENT ACCESS: NORTH: 21'-6" SOUTH: 58'-0"

2024 EXISTING BUILDING CODE COMPLIANCE

OEBC 301.3.1 PERSCRIPTIVE COMPLIANCE: ALTERATIONS SHALL COMPLY WITH SECTIONS 302 THROUGH 309 AND CHAPTER 5.

<u>302 GENERAL PROVISIONS</u> COMPLIES - MATERIALS PERMITTED BY THE APPLICABLE CODE FOR NEW CONSTRUCTION SHALL BE USED.

<u>SECTION 303 STORM SHELTERS</u> **NOT APPLICABLE** - AREA OF WORK IS NOT A STORM SHELTER. SECTION 304 STRUCTURAL DESIGN LOADS AND EVALUATION AND DESIGN PROCEDURES NOT APPLICABLE - PROJECT DOES NOT ALTER STRUCTURAL LOAD.

SECTION 305 IN-SITU LOAD TESTS NOT APPLICABLE - IN-SITU LOAD TESTS NOT USED.

SECTION 306 ACCESSIBILITY FOR EXISTING BUILDINGS NOT APPLICABLE - PROJECT EXTENT DOES NOT ALTER ACCESSIBILITY OF EXISTING BUILDING.

SECTION 307 SMOKE ALARMS NOT APPLICABLE - PROJECT DOES NOT OCCUR TO SLEEPING ROOMS OR GROUP R OR I-1 OCCUPANCIES.

SECTION 308 CARBON MONOXIDE DETECTION COMPLIES - EXCEPTION #2 ALTERATION OF MECHANICAL SYSTEM OTHER THAN FUEL-BURNING APPLIANCES.

SECTION 309 ADDITIONS AND REPLACEMENTS OF EXTERIOR WALL COVERINGS AND EXTERIOR WALL ENVELOPES NOT APPLICABLE - NO EXTERIOR WALL COVERING OR EXTERIOR WALL ENVELOPE IS ADDED OR REPLACED.

CHAPTER 5 PERSCRIPTIVE COMPLIANCE METHOD

ECTION 501 GENERA **COMPLIES** - REFER TO SECTION 302 THROUGH 309 COMPLIANCE ABOVE. PROJECT IS NOT IN A GROUP I-2 AND 501.3 IS NOT APPLICABLE.

SECTION 502 ADDITIONS NOT APPLICABLE - PROJECT IS NOT AN ADDITION

SECTION 503 ALTERATIONS **COMPLIES** - ALTERATION TO SYSTEM COMPLIES WITH CODE FOR NEW CONSTRUCTION TO THE EXTENT OF THE PROPOSED ALTERATION. NO ALTERATION IS SUCH THAT THE EXISTING BUILDING, STRUCTURE, OR SYSTEM IS NO LESS COMPLYING WITH THE PROVISIONS OF THIS CODE THAN THE EXISTING BUILDING OR STRUCTURE WAS PRIOR TO THE ALTERATION.

<u>SECTION 504 FIRE ESCAPES</u> **NOT APPLICABLE** - PROJECT DOES NOT INCLUDE ANY FIRE ESCAPES.

SECTION 505 WINDOWS AND EMERGECY ESCAPE OPENINGS NOT APPLICABLE - PROJECT DOES NOT INCLUDE INSTALLATION OR REPLACEMENT OF WINDOWS.

SECTION 506 CHANGE OF OCCUPANCY NOT APPLICABLE - PROJECT DOES NOT INCLUDE ANY CHANGE OF OCCUPANCY.

<u>SECTION 507 HISTORIC BUILDINGS</u> **NOT APPLICABLE** - BUILDING IS NOT A HISTORIC BUILDING.

FRANKLIN COUNTY CONVENTION **FACILITIES AUTHORITY**

400 North High Street, 4th Floor Columbus, Ohio 43215





MECHA	NICAL SYMBOLS LIST
NOTE: NOT	ALL SYMBOLS MAY BE USED.
SYMBOL	DESCRIPTION
Ð	HUMIDISTAT WITH ADJUSTABLE CONTROL
	HUMIDITY SENSOR
H2	HYDROGEN SENSOR
	CARBON DIOXIDE SENSOR
	CARBON MONOXIDE SENSOR
NO2	NITROGEN DIOXIDE SENSOR
os	OCCUPANCY SENSOR
$\langle 1 \rangle$	KEYNOTE (SEE LEGEND ON SHEET)
	PIPE TEE DOWN
	PIPE TEE UP
	PIPE GUIDES OR SLEEVES
	PIPE ANCHOR
	FLEXIBLE PIPE CONNECTION
X	GENERAL SERVICE VALVE (SEE SPECIFICATIONS FOR VALVE TYPE PER APPLICATION)
<u>۲</u>	CHECK VALVE (ARROW INDICATES
	MANUAL BALANCING VALVE
≷	TWO-WAY CONTROL VALVE
X	THREE-WAY CONTROL VALVE
<u>مر</u> PICBV	TWO-WAY PRESSURE INDEPENDENT
	PRESSURE REDUCING VALVE
¥	STEAM PRESSURE REGULATING VALVE
<u> </u>	DRAIN VALVE WITH THREADED
	HOSE CONNECTION
	REDUCED FRESSORE BACKFLOW FREVENTER
<u>×</u>	PRESSURE GAUGE WITH STOPCOCK
	STRAINER WITH BLOW DOWN VALVE
<u>م</u>	TEMPERATURE/PRESSURE TEST PLUG
Ŷ	(PETE'S PLUG)
×	SIGHT FLOW INDICATOR
	FLOW METER
Π	THERMOMETER
	PITCH DOWN IN DIRECTION OF ARROW
WAL	L RATING LEGEND

FIRE RESISTIVE RATED WALLS, 1 HOUR
FIRE RESISTIVE RATED WALLS, 2 HOUR
FIRE RATED, SMOKE BARRIER WALLS, 1 HOUR
FIRE RATED, SMOKE BARRIER WALLS, 2 HOUR

IECHANIC	AL SYMBOLS LIST CONT.		MECHANICAL ABBREVIATIONS	MECHANICA	L CONTR
NOTE: NOT	ALL SYMBOLS MAY BE USED.		NOTE: NOT ALL ABBREVIATIONS MAY BE USED.	NOTE: N	OT ALL SYME
SYMBOL		ABBREVIATION	DESCRIPTION	SYMBOL	
п		(D) (E)	EXISTING TO BE DEMOLISHED EXISTING TO REMAIN	AF	AIR FLO
<u>گ</u>	VAV TERMINAL BOX (WITH REHEAT)	(F) AFF	FUTURE ABOVE FINISHED FLOOR	AS	AIR SW
┛	VAV TERMINAL BOX (NO REHEAT)	AMB		СТ	CONDL
	1. IF MIN COOLING CFM IS NOT SHOWN ON	AVG	AVERAGE OR AVERAGING	CS	CURRE
	PLANS, THEN MIN COOLING CFM IS EQUAL TO 65% OF MAX COOLING CFM.	BAS BFP	BUILDING AUTOMATION SYSTEM BACKFLOW PREVENTOR	DP	DIFFER
	2. HEATING CFM IS EQUAL TO MIN COOLING CFM.	BHP BLDG	BRAKE HORSEPOWER BUILDING	EPT	ELECTI
	DUCTWORK PLANS	BOB	BOTTOM OF BEAM	ES	END SV
	MAX COOLING CFM / MIN COOLING CFM	BOD	BOTTOM OF PIPE		ELOW
	PIPING PLANS	BOS BTUH	BOTTOM OF STRUCTURE BRITISH THERMAL UNITS PER HOUR		
	TAG	CFM CI	CUBIC FEET PER MINUTE CENTER LINE		HAND-0
	DUCTWORK PIPING PLANS PLANS		CLEAN OUT		LEVEL
	TAG EXAMPLES: TB1 TB1 500000 500 500	COMPR	COMPRESSOR COEFFICIENT OF PERFORMANCE	(M)	METER
•		CV DB	CONSTANT VOLUME DRY BULB	РНТ	PH TRA
	RECTANGULAR DUCT ELBOW UP	DDC	DIRECT DIGITAL CONTROLS	PS	PRESS
		EAT	ENTERING AIR TEMPERATURE	PT	PRESS
		ECM EER	ELECTRONICALLY COMMUTATED MOTORS ENERGY EFFICIENCY RATIO	l l l l l l l l l l l l l l l l l l l	SMOKE
Ţ <u> </u>		EFF	EFFICIENCY ETHYLENE GLYCOL		START
	RETURN, RELIEF, AND EXHAUST AIR RECTANGULAR DUCT ELBOW UP	ESP	EXTERNAL STATIC PRESSURE		темое
		FLA	FULL LOAD AMPS		IEMPE
		FPI FPM	FINS PER INCH FEET PER MINUTE		VARIAE
ţ	ROUND DUCT ELBOW UP	FPS FT	FEET PER SECOND		VIBRAT
	SUPPLY AND OUTDOOR AIR RECTANGULAR DUCT FLROW DOWN	GAL	GALLONS	FS	WATER
		GPM HD	GALLONS PER MINUTE HEAD		
	OVAL DUCT ELBOW DOWN	HP IN	HORSEPOWER INNER DIAMETER	MECI	HANICAL
	ROUND DUCT ELBOW DOWN	IPLV	INTEGRATED PART LOAD VALUE	SHEET NUMBER	
↓ [/]	RETURN, RELIEF, AND EXHAUST AIR	LAT	LEAVING AIR TEMPERATURE	M001 C	GENERAL INFORMA
	RECTANGULAR DUCT ELBOW DOWN	LWT MBH	LEAVING WATER TEMPERATURE THOUSAND BTUH	M701	IVAC SCHEDULES
	OVAL DUCT ELBOW DOWN	MCA MER	MINIMUM CIRCUIT AMPACITY	-	
	ROUND DUCT ELBOW DOWN	MOCP	MAXIMUM OVERCURRENT PROTECTION		
	NEW WORK DUCTWORK	N/A NC	NOT APPLICABLE NORMALLY CLOSED		
		NO NPLV	NORMALLY OPEN NON-STANDARD PART LOAD VALUE	-	
		NPSH	NET POSITIVE SUCTION HEAD	-	
	DEMOLITION DUCTWORK	OD	OUTSIDE DIAMETER		
	NEW WORK PIPING	PD PG	PRESSURE DROP PROPYLENE GLYCOL		
	EXISTING PIPING	PPH PPM	POUNDS PER HOUR		
	DEMOLISHED PIPING	PRV	PRESSURE REDUCING VALVE		
	SUPPLY DIFFUSER WITH FLEXIBLE DUCT	REFRIG	POUNDS PER SQUARE INCH REFRIGERANT		
	TAG - NECK SIZETAG EXAMPLE:S1-6øAIRELOW (CEM)100	RH RPM	RELATIVE HUMIDITY REVOLUTIONS PER MINUTE		
	SUPPLY DIFFUSER	SEER	SEASONAL ENERGY EFFICIENCY RATIO		
	TAG - NECK SIZE TAG EXAMPLE: S1-6ø	TSP	TOTAL STATIC PRESSURE		
	RETURN/EXHAUST GRILLE R1	TYP UNO	TYPICAL UNLESS NOTED OTHERWISE		
	TAG EXAMPLE: 500 E1	VAV	VARIABLE AIR VOLUME		
		VOC	VOLATILE ORGANIC COMPOUNDS		
│ ∕ - ►	TAG - NECK SIZE TAG EXAMPLE: S2-12x8	W VRF	VARIABLE REFRIGERANT FLOW WATTS		
•	AIRFLOW (CFM) 100	WB WG	WET BULB WATER GAUGE		
←^/	TAG TAG EVANDER TO TAG	WPD	WATER PRESSURE DROP]	
I '	AIRFLOW (CFM) I AG EXAMPLE: E2 100]	
<u>-</u>	DAMPERS/DUCT ACCESSORIES BDD: BACKDRAFT DAMPER				
	FSD: FIRE/SMOKE DAMPER FD: FIRE DAMPER				
┝╼╋╛┤	MD: MOTORIZED DAMPER SD: SMOKE DAMPER		CHILLED WATER RETURN		
	VD: VOLUME DAMPER SB: SECURITY BARS	CHS CWR	CHILLED WATER SUPPLY CONDENSER WATER RETURN		
 ¬		CWS	CONDENSER WATER SUPPLY		
		EA	EXHAUST AIR		
┡━━━╃╶╴┘	(WITH CLEARANCE SHOWN)	GR GS	GEOTHERMAL RETURN GEOTHERMAL SUPPLY	-	
		HR HS	HEAT PUMP RETURN HEAT PUMP SUPPLY		
		HWR	HEATING HOT WATER RETURN	-	
		HWS MW	MAKEUP WATER - GENERIC		
<u>۲ – ٦</u>		OA PC	OUTDOOR AIR PUMPED CONDENSATE	-	
	DEMOLISHED MECHANICAL EQUIPMENT	RA	RETURN AIR REFRIGERANT		
		REL	RELIEF AIR	4	
$\overline{\bigcirc}$		SA V	VENT		
\bigcirc	GENERIC PUMP	MECHANIC	AL STEAM SYSTEM TYPES AND ABBREVIATIONS		
۲ ^٦			NOTE: NOT ALL ABBREVIATIONS MAY BE USED.		
	ACCESS DOOR	ABBREVIATION	DESCRIPTION	1	
		BBD	STEAM BOILER BOTTOM BLOWDOWN STEAM BOILER BLOWDOWN		
		BFW	STEAM BOILER FEEDWATER		
		CBD CF	STEAM BUILER CONTINUOUS BLOWDOWN CHEMICAL FEED		
		CLPS(PSI) HPC	CLEAN LOW PRESSURE STEAM (PSI) HIGH PRESSURE STEAM CONDENSATE		
		HPS(PSI)	HIGH PRESSURE STEAM (PSI) = 60 PSI AND ABOVE		
		LPS(PSI)	LOW PRESSURE STEAM (PSI) = 15 PSI AND BELOW		
		MPC MPS(PSI)	MEDIUM PRESSURE STEAM CONDENSATE MEDIUM PRESSURE STEAM (PSI) = 16 PSI - 59 PSI		
		PSC	PUMPED STEAM CONDENSATE]	

SV STEAM VENT VSC VACUUM STEAM CONDENSATE

ROLS SYMBOLS LIST
IBOLS MAY BE USED.
DESCRIPTION

DESCRIPTION
AIR FLOW MEASURING DEVICE
AIR SWITCH
CONDUCTIVITY TRANSMITTER
CURRENT SENSOR
DIFFERENTIAL PRESSURE TRANSMITTER
ELECTRONIC PNEUMATIC TRANSDUCER
END SWITCH
FLOW METER
HAND-OFF-AUTO SWITCH
LEVEL TRANSMITTER
METER
PH TRANSMITTER
PRESSURE SWITCH
PRESSURE TRANSMITTER
SMOKE DETECTOR
STARTER
TEMPERATURE SWITCH

- VARIABLE FREQUENCY DRIVE
- VIBRATION TRANSMITTER

WATER FLOW SWITCH

NICAL SHEET INDEX

SHEET TITLE **RAL INFORMATION - HVAC** ALL BUILDING PLAN

MECHANICAL GENERAL NOTES

VISIT THE SITE OF THE WORK TO GAIN AN ACCEPTABLE KNOWLEDGE OF CONDITIONS AFFECTING THE EXECUTION OF THE WORK. AFTER VISITING THE SITE, REQUEST SUCH INFORMATION AND/OR CLARIFICATIONS AS NECESSARY TO FULLY UNDERSTAND THE WORK REQUIRED AND TO PROPERLY ESTIMATE COSTS.

- REVIEW ALL DRAWINGS TO VERIFY EXTENT AND SCHEDULING OF ALL DEMOLITION ACTIVITIES PRIOR TO COMMENCING DEMOLITION WORK. FIELD VERIFY ALL SIZES AND LOCATIONS OF EXISTING DUCTWORK AND PIPING TO REMAIN. NOTIFY ARCHITECT/ENGINEER OF DEVIATIONS WHICH AFFECT RENOVATION WORK PRIOR TO PROCEEDING WITH THE WORK. COORDINATE DISPOSAL/SALVAGE OF ALL FIXTURES, DEVICES, EQUIPMENT, ETC. (INDICATED FOR DEMOLITION) WITH THE OWNER.
- ITEMS NOTED TO BE DEMOLISHED INCLUDES BUT IS NOT LIMITED TO ALL ASSOCIATED COMPONENTS, CONTROL WIRING, PIPING, DUCTWORK, ELECTRICAL CONNECTIONS, SUPPORTS, INSULATION, ETC. COORDINATE WITH OTHER TRADES AS REQUIRED. ALL WORK IS TO BE PHASED AS INDICATED ON THE ARCHITECTURAL DRAWINGS. CONTRACTOR SHALL COORDINATE PHASING OF ALL DEMOLITION, RENOVATION, AND NEW WORK WITH OTHER TRADES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND PHASE ALL TIE-INS AND INTERRUPTIONS OF EXISTING SERVICES TO MINIMIZE OR ELIMINATE DOWNTIME. CLOSELY COORDINATE
- PHASING OF WORK WITHIN CORRIDORS WITH THE OWNER. CORRIDORS CANNOT BE COMPLETELY CLOSED OFF TO PEDESTRIAN TRAFFIC. TO ACCOMMODATE PHASING, CORRIDOR ACCESS WORK MAY NEED TO BE PERFORMED DURING OFF PEAK PERIODS. PRIOR TO MOVING ON TO THE NEXT PHASE, ALL WORK IN PREVIOUSLY PHASED AREAS MUST BE COMPLETE AND OPERATIONAL. THE CONTRACTOR SHALL INSTALL ALL NEW SERVICES AND EQUIPMENT AND HAVE THEM TESTED AND FULLY AND RELIABLY FUNCTIONAL PRIOR TO INTERRUPTING. RELOCATING OR REMOVING ANY EXISTING SERVICES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO BARE ANY AND ALL COSTS ASSOCIATED WITH THIS PHASING, INCLUDING TEMPORARY SERVICES, TEMPORARY RELOCATION, PREMIUM TIME WORK, ETC.
- ENSURE THAT THE WORK WILL NOT INTERFERE OR INTERRUPT SERVICES TO AREAS OUTSIDE OF THE DESIGNATED CONTRACT AREAS. SCHEDULE ALL WORK AS TO CAUSE MINIMAL SERVICE INTERRUPTIONS FOR THE OWNER. UNAVOIDABLE INTERRUPTIONS ARE TO BE SCHEDULED WITH THE OWNER NO LESS THAN TWO WEEKS PRIOR TO THEIR EXPECTED COMMENCEMENT. WORK SHALL BE PERFORMED AT SUCH TIMES AS DIRECTED BY THE OWNER AND, IF POSSIBLE, ARE TO OCCUR DURING OFF PEAK PERIODS.
- THE CONTRACTOR IS TO VERIFY THE EXACT SERVICE OF ANY EXISTING PIPING OR DUCTWORK PRIOR TO INSTALLING ANY NEW CONNECTIONS. ANY DISCREPANCIES BETWEEN THE CONSTRUCTION DOCUMENTS OR THE DESIGN INTENT AND ACTUAL CONDITIONS ARE TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY, PRIOR TO FABRICATION OR INSTALLATION.
- CONTRACTOR SHALL REMOVE AND REPLACE EXISTING LAY-IN CEILING GRID AND TILES AS NECESSARY TO COMPLETE ABOVE CEILING WORK. RETURN CEILING TO ORIGINAL CONDITION FOLLOWING COMPLETION OF CONSTRUCTION. EACH TRADE SHALL PAY THE GENERAL CONTRACTOR TO PATCH AND REPAIR FLOOR SLAB AND WALL PENETRATIONS TO MATCH
- EXISTING WHERE THEIR PIPING, DUCT OR EQUIPMENT IS BEING REMOVED OR INSTALLED. ALL ROOFING MODIFICATIONS SHALL BE DONE BY OWNER'S ROOFING VENDOR TO MAINTAIN ANY AND ALL WARRANTIES. COST TO BE INCLUDED IN THIS CONTRACT UNLESS SPECIFICALLY INCLUDED IN GENERAL TRADES CONTRACTOR'S SCOPE OF WORK.
- . INSULATE DUCTWORK AND PIPING WHERE EXISTING INSULATION HAS BEEN DAMAGED AND/OR REMOVED IN THE PERFORMANCE OF WORK FOR THIS PROJECT. . FOR RENOVATION WORK, IT IS PROHIBITED TO SUSPEND NEW WORK FROM THE EXISTING FLOOR SLAB OR ROOF DECK.
- 2. THE CONTRACTOR IS HEREBY ADVISED THAT IT IS POSSIBLE THAT ASBESTOS, AND/OR OTHER HAZARDOUS MATERIALS ARE OR WERE PRESENT IN THIS BUILDING(S). ANY WORKER, OCCUPANT, VISITOR, ETC., WHO ENCOUNTERS ANY MATERIAL OF WHOSE CONTENT THEY ARE NOT CERTAIN SHALL PROMPTLY REPORT THE EXISTENCE AND LOCATION OF THAT MATERIAL TO THE OWNER. FURTHERMORE, THE CONTRACTOR SHALL ENSURE THAT NO ONE COMES NEAR TO OR IN CONTACT WITH ANY SUCH MATERIAL OR FUMES THEREFROM UNTIL ITS CONTENT CAN BE ASCERTAINED TO BE NON-HAZARDOUS. CMTA, INC HAS NO EXPERTISE IN THE DETERMINATION OF THE PRESENCE OF ANY HAZARDOUS MATERIAL. THEREFORE, NO ATTEMPT HAS BEEN MADE BY CMTA TO IDENTIFY THE EXISTENCE OR LOCATION OF ANY SUCH HAZARDOUS MATERIAL. FURTHERMORE, CMTA NOR ANY AFFILIATE HEREOF WILL NOT OFFER OR MAKE ANY RECOMMENDATIONS RELATIVE TO THE REMOVAL, HANDLING OR DISPOSAL OF SUCH MATERIAL. IF THE WORK WHICH IS TO BE PERFORMED INTERFACES, CONNECTS OR RELATES IN ANY PHYSICAL WAY WITH OR TO EXISTING COMPONENTS WHICH CONTAIN OR BEAR ANY HAZARDOUS MATERIAL, ASBESTOS BEING ONE, THEN IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO CONTACT THE OWNER AND SO ADVISE THE OWNER IMMEDIATELY. THE CONTRACTOR BY EXECUTION OF THE CONTRACT FOR ANY WORK AND/OR BY THE ACCOMPLISHMENT OF ANY WORK THEREBY AGREE TO BRING NO CLAIM, RELATIVE TO OTHER SUCH ITEM AGAINST CMTA, ITS PRINCIPALS, EMPLOYEES, AGENTS OR CONSULTANTS. ALSO, THE CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD CMTA, ITS PRINCIPALS, EMPLOYEES, AGENTS AND CONSULTANTS HARMLESS FROM ANY SUCH RELATED CLAIMS WHICH MAY BE BROUGHT BY ANY SUBCONTRACTORS, SUPPLIERS OR ANY OTHER THIRD PARTIES.
- 13. INSTALL ALL WORK TO COMPLY WITH ALL LAWS, REGULATIONS, CODES, AND STANDARDS (FEDERAL, STATE, AND LOCAL), AS ADOPTED BY THE AGENCIES HAVING JURISDICTION, INCLUDING REASONABLY ANTICIPATED REVISIONS BASED ON EMERGING TRENDS IN BUILDING REGULATIONS. WHERE ANY OF THESE DIFFER, THE MOST STRINGENT SHALL APPLY. THE ENGINEER DOES NOT DEFINE THE SCOPE OF INDIVIDUAL TRADES, SUBCONTRACTORS, MATERIAL SUPPLIERS AND VENDORS. ANY
- SHEET NUMBERING OR SPECIFICATION NUMBERING SYSTEM USED WHICH IDENTIFIES DISCIPLINES IS SOLELY FOR THE ENGINEER'S CONVENIENCE AND IS NOT INTENDED TO DEFINE A SUBCONTRACTOR'S SCOPE OF WORK. INFORMATION REGARDING INDIVIDUAL TRADES, SUBCONTRACTORS, MATERIAL SUPPLIERS AND VENDORS MAY BE DETAILED, DESCRIBED AND INDICATED AT DIFFERENT LOCATIONS THROUGHOUT THE CONTRACT DOCUMENTS. NO CONSIDERATION WILL BE GIVEN TO REQUESTS FOR CHANGE ORDERS FOR FAILURE TO OBTAIN AND REVIEW THE COMPLETE OF CONTRACT DOCUMENTS WHEN PREPARING BIDS, PRICES AND QUOTATIONS. UNLESS STATED OTHERWISE, THE SUBDIVISION AND ASSIGNMENT OF WORK UNDER THE VARIOUS SECTIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR HOLDING THE PRIME CONTRACT.
- 5. CONTRACT DOCUMENTS FOR MECHANICAL WORK ARE SCHEMATIC IN NATURE AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY. ALL OFFSETS, TURNS, FITTINGS, TRIM, DETAIL, ETC., MAY NOT BE INDICATED, BUT SHALL BE PROVIDED AS REQUIRED. WORK SHALL BE INSTALLED FROM FULLY COORDINATED CONTRACTOR GENERATED DIMENSIONED DRAWINGS. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE SYSTEMS AS
- STATED, IMPLIED OR INTENDED IN THE DRAWINGS AND SPECIFICATIONS. INCLUDE IN THE BID AS PART OF THE CONTRACT, ALL NECESSARY AND APPLICABLE SUPPLIES, MATERIALS, AND APPURTENANCES, WHETHER INDICATED OR NOT. IN CASE OF CONFLICTS, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR CLARIFICATION AND FINAL DETERMINATION PRIOR TO THE BID.
- ANY DEVIATIONS FROM THE BASIS OF DESIGN THAT REQUIRE ADDITIONAL PROVISIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. COORDINATE THE EXACT REQUIREMENTS AND LOCATION OF WORK WITH THE WORK OF OTHER TRADES PRIOR TO FABRICATION AND INSTALLATION. PROVIDE ADDITIONAL OFFSETS AND SECTIONS IN DUCTWORK AND/OR PIPING REQUIRED TO MEET THE APPLICABLE JOB
- CONDITION REQUIREMENTS. VERIFY JOB SITE ELEVATIONS, DIMENSIONS, AND CONDITIONS, PRIOR TO FABRICATION OR INSTALLATION OF THE WORK. COORDINATE EXACT ROUTING OF DUCTWORK AND PIPING WITH OTHER TRADES SO THAT NO CONFLICTS OCCUR WITH DUCTWORK, PIPING, LIGHTS, STRUCTURE, ETC. PROVIDE ALL PERTINENT DATA CONCERNING THE LOCATION, DIMENSIONS, ETC., OF THE MECHANICAL EQUIPMENT THAT REQUIRES BASES. CURBS AND SUPPORTS TO THE APPROPRIATE TRADES. WORK NOT APPROPRIATELY COORDINATED SHALL BE REMOVED AND PROPERLY INSTALLED AT THE EXPENSE OF THE RESPONSIBLE CONTRACTOR(S).
-). PRIOR TO ORDERING ANY MATERIALS OR ROUGH-IN OF ANY KIND, THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR FINAL COORDINATION OF ALL ELECTRICAL REQUIREMENTS (I.E. VOLTAGE, PHASE, CIRCUIT BREAKER, WIRE SIZING, ETC.) WITH THE ELECTRICAL CONTRACTOR. THERE WILL BE NO CHANGE IN THE CONTRACT AMOUNT FOR ANY DISCREPANCIES. 20. WHERE CEILINGS ARE INDICATED, ALL DUCTS AND PIPES SHALL BE RAN ABOVE CEILING. IN EXPOSED CONDITIONS, INSTALL DUCTWORK
- AND PIPING TIGHT TO THE BOTTOM OF STRUCTURE. . ALL RATED WALL AND FLOOR PENETRATIONS ARE TO BE SEALED WATER TIGHT AND PACKED WITH FIRE STOP MATERIAL.
- 22. ALL ITEMS THAT REQUIRE MAINTENANCE OR ADJUSTMENT MUST BE INSTALLED IN ACCESSIBLE LOCATIONS. PROVIDE AN APPROPRIATELY SIZED ACCESS DOOR AS REQUIRED AT NO ADDITIONAL COST TO OTHERS WHETHER SHOWN OR NOT ON THE PLANS.
- . ALL SEALS, BEARINGS, PACKINGS, AND ACCESSORIES FOR ALL EQUIPMENT AND PIPING SPECIALTIES SHALL BE SUITABLE FOR THE CONTINUOUS OPERATIONAL TEMPERATURES, PRESSURES AND CHARACTERISTICS OF THE SYSTEM THEY SERVE. . PERFORM A COMPLETE AIR AND WATER SYSTEM FLOW BALANCE FOR ALL EQUIPMENT THAT IS SHOWN, SCHEDULED OR OTHERWISE IDENTIFIED, AT THE END OF CONSTRUCTION.
- INSTALL EQUIPMENT, MATERIALS, ETC. IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND DIRECTION. PROVIDE STRAIGHT INLET AND OUTLET DUCTS/PIPES BASED ON MANUFACTURER'S RECOMMENDATIONS. IF IN CONFLICT WITH THE DESIGN INDICATED HEREIN, ADVISE THE ENGINEERS PRIOR TO INSTALLATION FOR CLARIFICATION. 5. COORDINATE THE EXACT LOCATIONS OF DIFFUSERS, GRILLES AND REGISTERS WITH ARCHITECTURAL REFLECTED CEILING PLANS, AREA SMOKE DETECTORS, SPRINKLERS, LIGHTS AND ELECTRICAL DEVICES. AIR DEVICES SHALL NOT BE WITHIN 3 FEET OF AN AREA SMOKE
- DETECTOR. UNLESS NOTED OTHERWISE, PROVIDE BRANCH DUCT TO DIFFUSERS SAME SIZE AS DIFFUSER NECK. FLEXIBLE DUCT CONNECTION TO THE DIFFUSER SHALL BE NO MORE THAN FIVE FEET IN LENGTH. ALL BRANCH DUCT TAKEOFFS TO AIR DEVICES SHALL HAVE A MANUAL BALANCING DAMPER INSTALLED IN AN ACCESSIBLE LOCATION.
- 28. AIR DEVICES PROVIDED WITH INTEGRAL BALANCE DAMPERS SHALL NOT HAVE AN ADDITIONAL BALANCING DAMPER AT AIR DEVICE BRANCH TAKEOFF. 29. PROVIDE ROOM TEMPERATURE THERMOSTATS FOR ALL EQUIPMENT THAT MAINTAINS SPACE TEMPERATURE. PREFERRED LOCATIONS
- ARE SHOWN ON THE PLANS. THERMOSTATS SHALL BE MOUNTED AT 48 INCHES ABOVE FINISHED FLOOR, UNLESS NOTED OTHERWISE. COORDINATE THE EXACT LOCATIONS OF THERMOSTATS WITH MARKERBOARDS, SWITCHES, AND ANY OTHER WALL MOUNTED FIXTURES PRIOR TO ROUGH IN.
- 30. UNLESS NOTED OTHERWISE, MINIMUM PIPE SIZE TO TERMINAL EQUIPMENT SHALL BE 3/4 INCH AND MINIMUM FLOW SHALL BE 0.5 GPM. 1. PROVIDE SHUT-OFF VALVES WITHIN ALL SUPPLY PIPING BRANCH TAKEOFFS FROM MAINS. PROVIDE A MANUAL BALANCE VALVE AND A SEPARATE SHUT-OFF VALVE WITHIN ALL RETURN PIPING BRANCH TAKE-OFFS FROM MAINS. LOCATE VALVES IN ACCESSIBLE LOCATIONS.
- . INSTALL ALL PIPING IN LOCATIONS AND ELEVATIONS SUCH THAT COILS, TUBES, AND FILTERS CAN BE REMOVED AND REPLACED WITHOUT MAJOR PIPING REMOVAL. LOCATE VALVES IN APPROPRIATE PLACES TO ACCOMMODATE MAINTENANCE. FOR GRAVITY FLOW PIPING, ADEQUATE SLOPE SHALL BE PROVIDED.
- INSTALL TWO-WAY CONTROL VALVES ON ALL EQUIPMENT UNLESS NOTED OTHERWISE. 34. AT TIME OF ROUGH INSTALLATION, DURING STORAGE ON THE CONSTRUCTION SITE, AND UNTIL FINAL STARTUP OF THE HEATING AND COOLING EQUIPMENT, ALL DUCT AND OTHER RELATED AIR DISTRIBUTION COMPONENT OPENINGS SHALL BE COVERED WITH TAPE, PLASTIC, SHEET METAL OR OTHER METHODS ACCEPTABLE FOR PROTECTION TO THE ENFORCING AGENCY TO REDUCE THE AMOUNT OF DUST OR DEBRIS WHICH MAY COLLECT IN THE SYSTEM(S).
- 5. IN MECHANICALLY VENTILATED BUILDINGS, PROVIDE REGULARLY OCCUPIED AREAS OF THE BUILDING WITH AIR FILTRATION MEDIA FOR OUTSIDE AND RETURN AIR THAT PROVIDES AT LEAST A MINIMUM EFFICIENCY REPORTING VALUE (MERV) OF 8 PRIOR TO OCCUPANCY. FILTERS SHALL BE CHANGED PRIOR TO AIR BALANCE AND COMMISSIONING, AND AGAIN AT THE COMPLETION OF CONSTRUCTION JUST PRIOR TO OCCUPANCY OF THE BUILDING WITH FINAL FILTERS PER SPECIFICATIONS. MAINTENANCE RECOMMENDATIONS FOR FILTERS OF THE SAME VALUE SHALL BE INCLUDED IN THE OPERATION AND MAINTENANCE MANUAL.
- 36. INSTALLATION OF HVAC, REFRIGERATION, AND FIRE SUPPRESSION EQUIPMENT SHALL NOT CONTAIN ANY CFCS OR HALONS. 37. ALL SUPPORTS FOR EQUIPMENT, DUCTWORK AND PIPING SYSTEMS, AND DEVICES SHALL BE FROM THE BUILDING STRUCTURE. SUPPORT FROM STRUCTURAL BRIDGING IS UNACCEPTABLE.
- 38. DO NOT INSTALL PIPING, CONDUIT, DUCTWORK, ETC., IN A LOCATION OR IN A MANNER THAT WILL ALLOW FREEZING AND/OR THE COLLECTION OF CONDENSATION. 39. CONTRACTOR IS RESPONSIBLE FOR DRAINING, FLUSHING, PURGING, AND FILLING ALL PIPING SYSTEMS AS REQUIRED. THESE SYSTEMS
- INCLUDE (BUT MAY NOT BE LIMITED TO); HEATING HOT WATER SYSTEMS, CHILLED WATER SYSTEMS, BUILDING STEAM SYSTEMS, ALL REQUIRED CHEMICAL TREATMENT SYSTEMS, CONDENSER WATER SYSTEMS (AND COOLING TOWER SUMPS), WATER-SOURCE HEAT PUMP LOOP SYSTEMS, GROUND-SOURCE HEAT PUMP LOOP SYSTEMS, CONDENSATE SYSTEMS AND MAKE-UP WATER CONNECTIONS.







GENERAL NOTES

- A. AIR HANDLING UNITS AND RETURN FANS IDENTIFIED ON DRAWING TO HAVE MOTORS REPLACED AND BE PROVIDED WITH VARIABLE FREQUENCY DRIVES. REFER TO M701.
- B. PRIOR TO MOTOR REPLACEMENT, REFER TO SPEC SECTION 230593 FOR EXISTING AIRFLOW TEST REQUIREMENTS.
- C. ALL WORK SHALL BE COORDINATED WITH OWNERS SCHEDULE.

KEYNOTES

- 1 UNIT LOCATED APPROX. 35'0" AFF IN EXHIBIT HALL SPACE ACCESSIBLE BY LIFT.
- 2 UNIT LOCATED IN SECOND FLOOR MECHANICAL ROOM ACCESSIBLE BY STAIRS.
- 3 REMOVE INLET GUIDE VANES AND ACTUATORS DURING MOTOR REPLACEMENT.



	UNIT	DATA	SUPPLY FAN DATA										
TAG	INSTALLED LOCATION	AREA SERVED	TOTAL AIRFLOW (CFM)	MIN OA (CFM)	TSP (IN WG)	FAN TYPE	# OF FANS	HP (EACH)	VOLTS	PHASE			
AHU-1-1	EXHIBIT HALL B MEZZANINE	EXHIBIT HALL B	117,000	5,200	3.75	VARIAX	2	60.0	460	3			
AHU-1-1A	EXHIBIT HALL B MEZZANINE	EXHIBIT HALL B	117,000	5,200	3.75	VARIAX	2	75.0	460	3			
AHU-1-2	EXHIBIT HALL B MEZZANINE	EXHIBIT HALL B	96,600	4,250	3.75	VARIAX	2	60.0	460	3			
AHU-1-2A	EXHIBIT HALL B MEZZANINE	EXHIBIT HALL B	117,000	5,200	3.75	VARIAX	2	60.0	460	3			
AHU-2-1	EXHIBIT HALL A MEZZANINE	EXHIBIT HALL A	96,600	4,250	3.75	VARIAX	2	60.0	460	3			
AHU-2-2	EXHIBIT HALL A MEZZANINE	EXHIBIT HALL A	96,600	4,250	3.75	VARIAX	2	60.0	460	3			
AHU-5	EXHIBIT HALL A MEZZANINE	LOBBY AREA OUTSIDE UNION STATION	36,300	4,640	3.50	PLUG	1	40.0	460	3			
AHU-6	EXHIBIT HALL A MEZZANINE	A POD (A110-115, A210-216) & CONCOURSE A AREA	94,950	7,460	6.50	VARIAX	2	75.0	460	3			
AHU-7	EXHIBIT HALL A MEZZANINE	A POD (A120-125, A220-226) & CONCOURSE A AREA	89,350	6,285	6.50	VARIAX	2	75.0	460	3			
AHU-8	EXHIBIT HALL B MEZZANINE	DISCOVERY CAFE & CONCOURSE A AREA	53,360	3,675	5.30	VARIAX	1	75.0	460	3			
AHU-9	EXHIBIT HALL B MEZZANINE	B POD (B130-132, B230-235) & CONCOURSE B AREA	81,930	5,650	5.70	VARIAX	2	60.0	460	3			
AHU-10	EXHIBIT HALL B MEZZANINE	B POD (B140-145, B240-245) & CONCOURSE B AREA	87,600	4,100	5.50	VARIAX	2	75.0	460	3			
AHU-14	L2 MECH RM (NORTH OF HALL C)	EXHIBIT HALL C	39,000	7,800	4.80	PLUG	1	60.0	460	3			
AHU-15	L2 MECH RM (NORTH OF HALL C)	EXHIBIT HALL C	32,000	10,400	4.30	PLUG	1	40.0	460	3			
AHU-16	L2 MECH RM (NORTH OF HALL C)	EXHIBIT HALL C	32,000	10,400	4.30	PLUG	1	40.0	460	3			
AHU-17	L2 MECH RM (NORTH OF HALL C)	EXHIBIT HALL C	34,000	6,800	4.40	PLUG	1	50.0	460	3			
AHU-18	L2 MECH RM (NORTH OF HALL C)	EXHIBIT HALL C & D	40,800	8,160	4.80	PLUG	1	60.0	460	3			

	EXISTING RETURN FAN SCHEDULE												
		DATA			PERF	PERFORMANCE DATA					MOTOR DATA		
TAG	LOCATION		FUNC	ΓΙΟΝ	FAN TYPE	FLOW (CFM)	ESP (IN WG)	DRIVE TYPE	НР	VOLTS	PHASE		
RF-14	L2 MECH RM (NORTH OF HA	ALL C)	AHU-14 / EX	L HALL C	INLINE	35,000	1.25	DIRECT	25.0	460	3		
RF-15	L2 MECH RM (NORTH OF HA	ALL C)	AHU-15 / EX	. HALL C	INLINE	28,800	1.25	DIRECT	20.0	460	3		
RF-16	L2 MECH RM (NORTH OF HA	ALL C)	AHU-16 / EX	. HALL C	INLINE	28,800	1.25	DIRECT	20.0	460	3		
RF-17	L2 MECH RM (NORTH OF HA	ALL C)	AHU-17 / EX	. HALL C	INLINE	30,600	1.25	DIRECT	20.0	460	3		
RF-18	L2 MECH RM (NORTH OF HA	ALL C)	AHU-18 / EX.	HALL C&D	INLINE	36,700	1.25	DIRECT	25.0	460	3		
NOTE:	NOTE: EXISTING FANS TO REMAIN AND PERFORMANCE PROVIDED FOR REFERENCE. MOTORS TO BE REPLACED WITH INVERTER-DUTY MOTORS BASED ON CURRENT												
20 HP: 25 HP	US MOTORS #020R9C 46	30V-3PH	F INS. CLASS	NOM EFF 8	D.D 3 6								
40 HP:	US MOTORS #8DP40P2C 46	60V-3PH	F INS. CLASS	NOM EFF 94	4.1								
50 HP:	US MOTORS #8DP50P2C 46	60V-3PH	F INS. CLASS	NOM EFF 94	4.5								
60 HP:	US MOTORS #DP60P2E 46	60V-3PH	F INS. CLASS	NOM EFF 9	5.0								
75 HP:	US MOTORS #D75P2E 46	60V-3PH	F INS. CLASS	NOM EFF 9	5.0								

VARIABLE FREQUENCY DRIVE SCHEDULE												
				MOTOR	ELEC	TRICAL DA	ΑΤΑ	FUSED AND	BYPASS	REDUNDANT		
TAG	MANUFACTURER	MODEL	SERVICE	HP	VOLTAGE	PHASE	HZ	DISCONNECT	STARTER	DRIVE	ENCLOSURE	REMARKS
VFD-AHU-1-1 SF1	ABB	ACH580-3PCR-077A-4	AHU-1-1 SF1	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-1-1 SF2	ABB	ACH580-3PCR-077A-4	AHU-1-1 SF2	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-1-1A SF1	ABB	ACH580-3PCR-096A-4	AHU-1-1A SF1	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-1-1A SF2	ABB	ACH580-3PCR-096A-4	AHU-1-1A SF2	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-1-2 SF1	ABB	ACH580-3PCR-077A-4	AHU-1-2 SF1	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-1-2 SF2	ABB	ACH580-3PCR-077A-4	AHU-1-2 SF2	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-1-2A SF1	ABB	ACH580-3PCR-077A-4	AHU-1-2A SF1	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-1-2A SF2	ABB	ACH580-3PCR-077A-4	AHU-1-2A SF2	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-2-1 SF1	ABB	ACH580-3PCR-077A-4	AHU-2-1 SF1	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-2-1 SF2	ABB	ACH580-3PCR-077A-4	AHU-2-1 SF2	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-2-2 SF1	ABB	ACH580-3PCR-077A-4	AHU-2-2 SF1	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-2-2 SF2	ABB	ACH580-3PCR-077A-4	AHU-2-2 SF2	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-5 SF	ABB	ACH580-3PCR-052A-4	AHU-5 SF	40.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-6 SF1	ABB	ACH580-3PCR-096A-4	AHU-6 SF1	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-6 SF2	ABB	ACH580-3PCR-096A-4	AHU-6 SF2	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-7 SF1	ABB	ACH580-3PCR-096A-4	AHU-7 SF1	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-7 SF2	ABB	ACH580-3PCR-096A-4	AHU-7 SF2	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-8 SF	ABB	ACH580-3PCR-096A-4	AHU-8 SF	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-9 SF1	ABB	ACH580-3PCR-077A-4	AHU-9 SF1	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-9 SF2	ABB	ACH580-3PCR-077A-4	AHU-9 SF2	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-10 SF1	ABB	ACH580-3PCR-096A-4	AHU-10 SF1	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-10 SF2	ABB	ACH580-3PCR-096A-4	AHU-10 SF2	75.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-14 RF	ABB	ACH580-3PCR-034A-4	AHU-14 RF	25.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-14 SF	ABB	ACH580-3PCR-077A-4	AHU-14 SF	60.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-15 RF	ABB	ACH580-3PCR-027A-4	AHU-15 RF	20.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-15 SF	ABB	ACH580-3PCR-052A-4	AHU-15 SF	40.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-16 RF	ABB	ACH580-3PCR-027A-4	AHU-16 RF	20.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-16 SF	ABB	ACH580-3PCR-052A-4	AHU-16 SF	40.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-17 RF	ABB	ACH580-3PCR-027A-4	AHU-17 RF	20.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-17 SF	ABB	ACH580-3PCR-065A-4	AHU-17 SF	50.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-18 RF	ABB	ACH580-3PCR-034A-4	AHU-18 RF	25.0	460	3	60	Yes	No	No	NEMA 1	ALL
VFD-AHU-18 SF	ABB	ACH580-3PCR-077A-4	AHU-18 SF	60.0	460	3	60	Yes	No	No	NEMA 1	ALL

REMARKS: 1. PROVIDE VFDS WITH HARMONIC PACKAGE WITH THDI OF 3% OR LESS AT NOMINAL LOAD CONDITION. THE STATE WAS HERE COMMUNICATION PORT FOR BACINET COMPATIBLE PROTOCOL. 2. VFDS SHALL INCLUDE COMMUNICATION PORT FOR BACNET COMPATIBLE PROTOCOL.



IT HP:



2 SUPPLY/RETURN FAN VFD CONTROL



ELECTRICAL GENERAL NOTES:

- A. EACH CONTRACTOR, PROPOSER, SUPPLIER AND/OR MANUFACTURER SHALL REFER TO ALL DOCUMENTS PERTAINING TO THIS PROJECT AND COORDINATE ACCORDINGLY SO AS TO ENSURE ADEQUACY OF FIT.
- COMPLIANCE WITH SPECIFICATIONS, PROPER VOLTAGE AND CURRENT CHARACTERISTICS TO AVOID CONFLICT WITH ANY OTHER BUILDINGS SYSTEMS. VERIFY SAME WITH SHOP DRAWINGS. B. ADDITIONAL ELECTRICAL REQUIREMENTS MAY BE SHOWN ON PLANS FROM OTHER DISCIPLINES IN THIS SET.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL PLANS AND SPECIFICATIONS FOR A COMPLETE UNDERSTANDING OF THE PROJECT REQUIREMENTS. C. WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ALL LOCAL, STATE, AND NATIONAL CODES.
- INCLUDING BUT NOT LIMITED TO NFPA 70 (NEC), NFPA 72, INTERNATIONAL BUILDING CODES, ETC. D. CONTRACTOR SHALL FOLLOW SEISMIC RESTRAINT AND DESIGN REQUIREMENTS CONTAINED IN LATEST ADOPTED STATE AND INTERNATIONAL BUILDING CODES, WITH ALL AMENDMENTS AS ADOPTED BY THE CURRENT LEGISLATION. REFER TO ELECTRICAL AND STRUCTURAL SPECIFICATIONS FOR ADDITIONAL
- INFORMATION. E. ALL OFFSETS, TURNS, FITTINGS, TRIM, DETAIL, ETC. MAY NOT BE INDICATED, BUT SHALL BE PROVIDED AS REQUIRED. ADDITIONAL ALLOWANCES SHALL BE INCLUDED FOR SAME AT EACH PROPOSER'S DISCRETION. F. INSTALL NO PIPING, CONDUIT, DUCTWORK, ETC. IN A LOCATION OR IN A MANNER WHICH WILL ALLOW
- FREEZING OR THE COLLECTION OF CONDENSATION THEREON. IF IN DOUBT, CONTACT THE ENGINEER. G. ADVISE THE ENGINEER OF ANY CONFLICTS, ERRORS, OMISSIONS, ETC. AT LEAST TEN DAYS PRIOR TO BID DATE, TO ALLOW CLARIFICATION BY WRITTEN ADDENDUM. H. WHERE CONFLICTS ARE FOUND BETWEEN DRAWINGS, DETAILS, OR SPECIFICATIONS, THE MORE STRINGENT
- REQUIREMENT SHALL APPLY. NOTIFY ARCHITECT OF DISCREPANCY IN WRITING. I. DEVIATION FROM SPECIFICATIONS OR PLANS REQUIRES PRIOR WRITTEN APPROVAL FROM THE ENGINEERS AND MUST BE SUBMITTED IN WRITING NO LATER THAN TEN DAYS PRIOR TO THE BID DATE. J. OBSERVE ALL APPLICABLE CODES, RULES AND REGULATIONS THAT MAY APPLY TO THE WORK UNDER THIS CONTRACT. (CITY, COUNTY, LOCAL, STATE, FEDERAL, MUNICIPALITY, UTILITY COMPANY, OSHA, ETC.).
- K. MOUNTING HEIGHTS FOR WALL MOUNTED DEVICES INDICATED ABOVE FINISHED FLOOR ARE TO CENTER OF DEVICE UNO. MOUNTING HEIGHTS TO CEILING SUSPENDED DEVICES ARE TO BOTTOM OF DEVICE UNO. INSTALL EQUIPMENT, MATERIALS, ETC. IN STRICT ACCORDANCE WITH MANUFACTURER'S
- RECOMMENDATIONS AND DIRECTIONS. IF IN CONFLICT WITH THE DESIGN INDICATED IN CONTRACT DOCUMENTS, ADVISE THE ENGINEER PRIOR TO INSTALLATION FOR CLARIFICATION.
- M. DO NOT RECESS PANELBOARD TUBS OR OTHER FLUSH-MOUNTED EQUIPMENT IN WALLS THAT HAVE A FIRE RATING. NO INSTALLATION SHALL DIMINISH OR VOID FIRE RESISTIVE RATINGS IN ANYWAY. N. THE PURPOSE AND INTENT OF ALL OF THE DOCUMENTS PERTAINING TO THIS PROJECT IS TO PROVIDE A COMPLETE, FUNCTIONAL, SAFE, LIKE-NEW FACILITY, ANYTHING LESS SHALL BE UNACCEPTABLE.
- O. ALL SYSTEMS, EQUIPMENT AND MATERIALS ARE TO BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. WORK NOT MEETING THIS CRITERION SHALL BE REMOVED AND REINSTALLED SATISFACTORILY. FINAL DETERMINATION OF THE ACCEPTABILITY OF THE QUALITY OF WORK RESIDES WITH THE ENGINEER P. ALL WORK, MATERIALS, EQUIPMENT, ETC. SHALL BE FULLY GUARANTEED FOR ONE FULL CALENDAR YEAR
- FROM THE DATE OF SUBSTANTIAL COMPLETION AS DOCUMENTED BY THE ENGINEER, UNLESS LONGER WARRANTY PERIODS FOR EQUIPMENT ARE SPECIFIED. Q. THE CONTRACTOR IS RESPONSIBLE FOR ALL UTILITY COMPANY FEES, CASH CONTRIBUTIONS OR OTHER COSTS THAT THE UTILITY COMPANY MAY REQUIRE TO COMPLETE THEIR WORK. (ELECTRIC, TELEPHONE,
- TELEVISION, DATA, ETC.). R. ANY VIBRATING, OSCILLATING OR OTHER NOISE OR MOTION PRODUCING EQUIPMENT SHALL BE ISOLATED FROM SURROUNDING SYSTEMS IN AN APPROVED MANNER. NOISY OR STRUCTURALLY DAMAGING INSTALLATIONS SHALL BE SATISFACTORILY REPLACED OR REPAIRED AT THE INSTALLING CONTRACTORS' EXPENSE. THE FINAL DECISION ON THE SUITABILITY OF A PARTICULAR INSTALLATION'S ACCEPTABILITY SHALL BE THAT OF THE ENGINEER.
- S. CHECK ALL THREE PHASE MOTORS WITH A PHASE ROTATION METER, PRIOR TO PLACING IN SERVICE. PROVIDE DETAILED SHOP DRAWINGS TO ENGINEER PRIOR TO PURCHASING OR INSTALLING ANY EQUIPMENT U. DEVIATIONS IN SIZES, CAPACITIES, FIT, FINISH, ETC. FOR EQUIPMENT FROM THAT PRIME SPECIFIED SHALL BE THE RESPONSIBILITY OF THE PURCHASER OF THAT EQUIPMENT. ANY PROVISIONS REQUIRED TO ACCOMMODATE A DEVIATION, WHETHER APPROVED BY THE ENGINEER OR NOT, SHALL BE THE
- RESPONSIBILITY OF THE PURCHASER. V. THE CONSTRUCTION MANAGER, GENERAL CONTRACTOR, OR WHOMEVER HOLDS THE PRIME CONTRACT(S) FOR THIS CONSTRUCTION IS RESPONSIBLE FOR THE COORDINATION, APPEARANCE, SCHEDULING AND TIMELINESS OF THE WORK OF ALL TRADES, CONTRACTORS, SUPPLIERS, INSTALLERS, ETC. POOR OR UNTIMELY WORK ON THE PART OF ANY SUBCONTRACTOR SHALL BE RESOLVED BY THE PARTY WHO ENGAGED THEM ON THIS PROJECT.
- W. WHERE MOUNTING HEIGHTS ARE NOT INDICATED OR ARE IN CONFLICT WITH ANY OTHER BUILDING SYSTEM, CONTACT THE ENGINEER BEFORE AFFECTING INSTALLATION. REFER ALSO TO ARCHITECTURAL INTERIOR AND EXTERIOR ELEVATIONS, CEILING HEIGHTS AND OTHER DETAILS OF THESE DOCUMENTS, AS APPLICABLE. X. WHERE FIRE-RATED CEILING ASSEMBLIES ARE NOTED, PROVIDE UL-LISTED FIRE-RATED GYPSUM BOARD OR
- PRE-MANUFACTURED ENCLOSURES ABOVE LUMINAIRES, CEILING DEVICES, ETC. IN OR ON CEILING, AS REQUIRED TO MAINTAIN CEILING RATINGS. Y. COORDINATE THE LOCATION OF DRAINS. ELECTRICAL OUTLETS. GAS OUTLETS. ETC. WITH ALL CASEWORK. KITCHEN EQUIPMENT, MECHANICAL ROOM EQUIPMENT, ETC. PRIOR TO COMMENCING INSTALLATION. WORK
- NOT SO COORDINATED SHALL BE REMOVED AND PROPERLY INSTALLED AT THE EXPENSE OF THE RESPONSIBLE CONTRACTOR(S). Z. ALL ELECTRICAL COMPONENTS OR EQUIPMENT SHALL BE LISTED AND LABELED BY UNDERWRITER'S LABORATORIES OR OTHER APPROVED LISTING AGENCY, APPROVAL AND LABELING OF INDIVIDUAL
- COMPONENTS ON AN ASSEMBLY IS NOT ACCEPTABLE AS MEETING THIS REQUIREMENT, UNLESS WAIVED BY THE ENGINEER IN WRITING. AA. ALL WIRING SYSTEMS SHALL BE INSTALLED WITH A MINIMUM OF SPLICES. CONDUCTORS, WHETHER SINGLE OR MULTI-PAIR, SHALL BE INSTALLED CONTINUOUS INSOFAR AS POSSIBLE FROM TERMINAL POINT TO TERMINAL POINT.
- BB. NO CONDUIT, SUPPORTS, ETC. SHALL BE RUN THROUGH ACCESS CLEARANCES OF EQUIPMENT BY OTHER TRADES (I.E. VAV BOXES). COORDINATE WITH ALL TRADES PRIOR TO CONSTRUCTION. CC. ALL CONTRACTORS SHALL EXERCISE EXTREME CARE IN THE COURSE OF THEIR WORK SO AS TO ENSURE THAT THEY DO NOT INTERRUPT ANY EXISTING SERVICE OR SUB-SERVICE FOR SAFETY PURPOSES. PAY PARTICULAR ATTENTION TO THIS PRECAUTION RELATIVE TO NATURAL GAS AND ELECTRICAL LINES. VERIFY THE LOCATION, SIZE, TYPE, ETC. OF EACH UNDERGROUND OR OVERHEAD UTILITY. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL FEDERAL, STATE AND/OR LOCAL RULES, REGULATIONS, STANDARD AND SAFETY REQUIREMENTS. UTILITIES SHALL BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE MUNICIPALITY OR UTILITY COMPANY STANDARDS. IN ALL CASES, THE MOST STRINGENT REQUIREMENT SHALL
- ΔΡΡΙ Υ DD. ALL SUPPORTS FOR EQUIPMENT. DEVICES OR FIXTURES SHALL BE UNIQUE, DIRECTLY FROM THE BUILDING STRUCTURE. DO NOT SUPPORT WORK FROM OTHER TRADES EQUIPMENT OR SUPPORTS WITHOUT WRITTEN PERMISSION FROM THE ENGINEER AND CONSENT OF THE OTHER TRADE, IN WRITING. EE. WHERE INTERRUPTING AN EXISTING UTILITY OR SERVICE DELIBERATELY OR ACCIDENTALLY, THE
- RESPONSIBLE CONTRACTOR SHALL WORK CONTINUOUSLY AS NEEDED TO RESTORE SAME, PROVIDING PREMIUM TIME AS NEEDED. FF. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING REQUIRED FOR HIS WORK. ALL CUTTING AND PATCHING SHALL BE IN ACCORDANCE WITH THE ARCHITECT'S STANDARDS FOR SUCH
- WORK GG. ALL WORK SHALL BE CONCEALED UNLESS SPECIFICALLY INDICATED TO BE EXPOSED, OR REQUIRED TO BE EXPOSED. IF IN DOUBT, CONTACT THE ENGINEER FOR CLARIFICATIONS PRIOR TO INSTALLING ANY SUCH
- WORK. HH. INTERRUPTION OF ANY EXISTING SERVICES SHALL BE COORDINATED WITH THE OWNER, GENERAL CONTRACTOR, UTILITY COMPANY AS NECESSARY, AND THE ARCHITECT, AT LEAST TWO WEEKS IN ADVANCE OF ANTICIPATED INTERRUPTION. A SCHEDULE FOR THESE OUTAGES SHALL BE DEVELOPED AND AGREED UPON BETWEEN THE PARTIES MENTIONED TO AVOID UNNECESSARY INCONVENIENCE TO THE OWNER OR ANY AFFECTED PARTY. NOTIFY THE UTILITY COMPANY OF ANY ANTICIPATED SERVICES REQUIRED TWO WEEKS IN ADVANCE, IN WRITING. IF UTILITY COMPANY REQUIRES A LONGER NOTIFICATION PERIOD, SO
- PROVIDE. II. WHERE BACKBOXES ARE LOCATED IN THE SAME VERTICAL CHANNEL/STUD SPACE ON OPPOSITE SIDES OF THE SAME WALL, PROVIDE SOUND-INSULATING PUTTY AROUND BOXES AS REQUIRED TO ELIMINATE SOUND TRANSMISSION FROM ROOM TO ROOM.
- JJ. JUNCTION BOXES LOCATED ABOVE ACCESSIBLE CEILINGS SHALL BE LOCATED NO MORE THAN 36" ABOVE CEILING LEVEL. LABEL EACH BOX IN AREA OF WORK WITH A PERMANENT MARKER OR IN ACCORDANCE WITH
- KK. ALL MATERIALS FURNISHED AND ALL WORK INSTALLED SHALL COMPLY WITH THE CURRENT EDITION OF THE NATIONAL ELECTRICAL CODES, NATIONAL FIRE CODES OF THE NATIONAL FIRE PROTECTION ASSOCIATION, THE REQUIREMENTS OF LOCAL UTILITY COMPANIES, AND WITH THE REQUIREMENTS OF ALL GOVERNMENTAL AGENCIES OR DEPARTMENTS HAVING JURISDICTION. IF ANY CONFLICTS OR DISCREPANCIES OCCUR THE MOST STRINGENT SHALL APPLY.
- DIMENSIONED DRAWINGS, OR DIMENSIONS SUPPLIED TO THE CONTRACTOR. MM. NOISY WORK, WORK OUTSIDE CONSTRUCTION BARRIERS, WORK IN OCCUPIED AREAS, ETC, SHALL BE CONSTRUCTION.
- LL. DO NOT SCALE FROM DRAWINGS, AS PRINTING DISTORTS SCALE. WORK SHALL BE LAID OUT FROM
- SPECIFICATIONS, WHICHEVER IS MORE STRINGENT.
- PERFORMED AFTER HOURS OR ON WEEKENDS. COORDINATE EXACT SCHEDULING WITH FACILITY PRIOR TO NN. ALL ITEMS HAVING KEYED LOCKS/OPERATORS SHALL HAVE CORED LOCKS/OPERATORS. ALL KEYING SHALL MATCH THE OWNER'S EXISTING KEY-WAYS. COORDINATE EXACT REQUIREMENTS WITH OWNER PRIOR TO

ELECTRICAL DEMOLITION NOTES:

A. DOTTED LINES INDICATE ITEMS FOR REMOVAL (UON) AND THIN SOLID

- LINES INDICATE EXISTING ITEMS TO REMAIN. B. THE CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF EXISTING CIRCUITS THAT CONTAIN DEVICES OR EQUIPMENT THAT ARE TO REMAIN. WHEN DEMOLITION OF AN ELECTRICAL DEVICE (OR CIRCUIT) IS INDICATED ON THE DRAWINGS: THE CONTRACTOR SHALL ENSURE THAT OTHER DEVICES OR EQUIPMENT "UPSTREAM" OR "DOWNSTREAM" ON THE CIRCUITS SHALL REMAIN IN "PRE- DEMOLITION" WORKING ORDER. "LEFT-OVER" CIRCUIT BREAKERS SHALL REMAIN, BE SWITCHED TO OFF POSITION, AND BE LABELED AS SPARES IN THEIR PANELS. PROVIDE NEW
- C. LOCATIONS OF DEVICES, CONNECTIONS, ETC., INDICATED ON THIS DRAWING WERE TAKEN FROM VARIOUS SOURCES. THEY ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO VARIATION FROM EXISTING CONDITIONS, CERTAIN EXISTING ELEMENTS MAY NOT BE INDICATED AT ALL. THE CONTRACTOR PROPOSING TO DO ANY PART OF THE WORK
- INDICATED HEREON SHALL VISIT THIS SITE AND DETERMINE TO HIS SATISFACTION THAT THEY MAY COMPLETE ALL WORK REQUIRED FOR THE BID WHICH HE PROPOSES. D. REMOVE ALL ASSOCIATED BACKBOXES, CONDUIT AND CONDUCTORS FOR DEVICES / FIXTURES / ETC. BEING REMOVED (BACK TO SOURCE), WHETHER INDICATED OR NOT (UON). CONTRACTOR SHALL PATCH AND
- REPAIR ANY EXISTING WALLS, FLOORS OR CEILINGS WHERE DEVICES ARE SHOWN TO BE REMOVED (PATCH AND REPAIR TO RECEIVE NEW FINISHES - SEE ARCHITECTURAL PLANS). E. COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH OWNER. TURN OVER ITEMS REMOVED TO OWNER AT THEIR OPTION.
- F. COORDINATE WITH OTHER TRADES FOR THE REMOVAL AND/OR RELOCATION OF ELECTRICAL DEVICES AND CONNECTIONS ASSOCIATED WITH THEIR EQUIPMENT. G. PROVIDE TEMPORARY EMERGENCY EXIT LIGHTS AT CONSTRUCTION
- BARRIERS AS REQUIRED. H. CONTRACTOR SHALL PATCH AND REPAIR ALL EXISTING WALLS / CEILINGS AS REQUIRED WHERE DEVICES ARE BEING REMOVED OR INSTALLED. I. UNUSED/ABANDONED CONDUCTORS DISCOVERED ABOVE ACCESSIBLE
- CEILINGS SHALL BE REMOVED IN ACCORDANCE WITH NEC REQUIREMENTS. J. EXISTING ELECTRICAL SYSTEMS IN CONFLICT WITH CONSTRUCTION SHALL BE RELOCATED TO PERMIT INSTALLATION OF DEVICES AND
- EQUIPMENT SHOWN ON PLANS. K. CONTRACTOR SHALL SEAL ALL EXISTING AND NEW PENETRATIONS OF BUILDING ENVELOPE (EXTERIOR WALLS, ROOF, ETC.) WATER-TIGHT AND AS APPROVED BY ARCHITECT AND ENGINEER. ROOFING SHALL BE RESTORED BY A LICENSED ROOFING CONTRACTOR BASED ON WRITTEN INSTRUCTIONS AND DETAILS FROM ROOFING MANUFACTURER AS REQUIRED TO MAINTAIN ROOF WARRANTY. REFER TO ARCHITECTURAL
- AND ENGINEERING PLANS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS. L. DEVICES INDICATED WITH AN "R" SHALL BE RELOCATED. REMOVE. PROTECT, AND REINSTALL IN NEW LOCATION INDICATED ON NEW WORK PLANS, INTERCEPT AND EXTEND ALL EXISTING CABLING TO NEW LOCATION. CLEAN AND RE-LAMP RELOCATED LUMINAIRES. M. ALL EXISTING PANELS AFFECTED BY THIS CONTRACTOR'S WORK SHALL BE PROVIDED WITH NEW TYPE-WRITTEN PANEL DIRECTORIES AND INSERT SLEEVES. PANEL DIRECTORIES SHALL NOT USE ROOM NAMES
- OR NUMBERS FROM THESE DRAWINGS. DIRECTORIES SHALL BE DETAILED AND COORDINATED WITH OWNER'S SUITE NUMBERS, FINAL ROOM NUMBERS, IT RACK NAMES, WORKSTATION DESIGNATIONS, ETC. UNUSED BREAKERS SHALL BE IN OFF POSITION.

CONSTRUCTION.

TYPEWRITTEN DIRECTORIES FOR ALL PANELS AFFECTED.

	DESCRIPTION	MOUNTING HEIGHT (TO CENTER OF BO)	DRAWING SYMBOL
	SWITCHES		
	LIGHT SWITCH:GENERAL PURPOSE	46"	\$
		46"	\$D \$3
\vdash	KEYED SWITCH	40 46"	ф9 \$К
	OCCUPANCY OR VACANCY SENSOR SWITCH	46"	¢ \$os,\$vs
	LOW VOLTAGE SWITCH	46"	\$LV,\$LV#
	NON-REVERSING MOTOR STARTER SNAP SWITCH	AS NOTED	\$ M
		46"	\$⊺ බ (v)
\vdash	PHOTO-CELL AS NOTED	AS NOTED	
┢	EXAM LIGHT SWITCH	46"	\$X
	NIGHT LIGHT SWITCH WITH CONSTANTLY	46"	\$ N
	SURGICAL LIGHT INTENSITY CONTROL	46"	\$SL
	FOUR-WAY SWITCH	46"	\$4
		46"	\$U
	WHEN LOAD IS OFF)	46"	\$"∟
	PILOT LIGHT SWITCH (ILLUMINATED WHEN LOAD IS ON)	46"	\$PL
		46" 46"	\$ MC ¢ ноа
\vdash	EMERGENCY AUTOMATIC TRANSFER SWITCH	-0	φ ΠΟΛ En
	FOR LIGHTING CONTROLS (REFER TO DETAIL)		ER
\vdash		1'-6"	A
\vdash		1'-6"	⊖s
	TAMPER-RESISTANT	41.01	\sim
\vdash	SLASH THROUGH ANY DEVICE INDICATES MOUNTING	σ- ι	Ð
	ABOVE COUNTERTOP 2" ABOVE BACKSPLASH, OR AT 48" WHERE NO COUNTER IS PRESENT		₽,₽
\vdash	FILLED CENTER BAR INDICATES INTEGRAL GROUND	1'-6"	
\vdash	FAULT PROTECTION (GFCI) FILLED OUTER BARS INDICATES INTEGRAL INTEGRAL	11 6"	
\vdash			$\overline{}$
	QUADRUPLEX RECEPTACLE	1'-6"	\oplus
	JUNCTION BOX, CEILING OR WALL		Ŵ,Ю
	VOLTAGE/1PH RECEPTACLE, AS NOTED	AS NOTED	€
	VOLTAGE/3PH RECEPTACLE, AS NOTED	1'-6"	ŧ
	MEATHER-PROOF "WHILE IN USE" TYPE DIE-CAST	2'-2"	Here we
	ENCLOSURE AT OUTLET - SEE SPECIFICATIONS		
	REMOTE, READILY ACCESSIBLE GFI DEVICE AT 48"		\frown
	LOCATION WITH PLUMBING CONTRACTOR TO		EWC
	DEAD FRONT GFCI DEVICE, LABEL AND INSTALL IN		\ominus
	READILY ACCESSIBLE LOCATION GANG RECEPTACLE IN COMBINATION WITH SWITCH	46"	⊖ ⊖c/s
	(PROVIDE DIVIDER IF LIGHTING CIRCUIT IS 277V) "DOG-HOUSE" TYPE TWIN DUPLEX RECEPTACLE		
-	WITH ONE DUPLEX RECEPTACLE ON BOTH SIDES	ON ONTR.	\bigcirc DP \bigcirc SS
H	FIRE ALARM		— •••
	MAIN CONTROL PANEL CENTRAL PROCESSING	6'-6" TO	FACP
	UNIT (CPU)	TOP 46" TO	
	PULL STATION : DOUBLE ACTION	LEVER	
		WALL, CLG	
		WALL, CLG	
\vdash			
\vdash	PROJECTED BEAM SMOKE DETECTOR; EMITTER	010	
\vdash	(BE) AND RECEIVER (BR)	CIG	
	CARBON MONOXIDE DUCT DETECTOR	ABV CLG	
	DOOR HOLDER : WALL TYPE	WALL	DH
	DOOR HOLDER : CLOSURE TYPE	ABV DOOR	DH C
	DUCT SMOKE DETECTOR	ABV CLG	DD
	CONNECTION TO SPRINKLER TAMPER SWITCH WITH ADDRESSABLE MODULE		FS
	REMOTE L.C.D. FIRE ALARM ANNUNCIATOR	54"	FAA
	POWER SUPPLY/CONTROL FOR AUDIO/VISUAL DEVICES	46"	NAC
	TRANSPONDER CABINET	46"	TRAN
\vdash			
		WALL	
\vdash	H.V.A.C. SMOKE DAMPER CONNECTION		SM
	ADDRESSABLE RELAY MODULE		R
	INDICATES VANDAL-PROOF POLYCARBONATE COVER,		PC
	WITH THE SPECIFIC DEVICE THEY ARE PROTECTING		10
			CH
			EL
	RETED, LOCKED PULL STATION : DOUBLE ACTION. STATION SHALL ONLY BE OPERABLE VIA KEY IN DOSSESSION OF CTAFF	46" TO LEVER	FK
\vdash	BELL / LIGHT	80"	BL
\vdash	BELL ONLY	80"	В
\vdash		CLG	SD P
	CARBON MONOXIDE ALARM: SINGLE STATION	CLG	СМ
	CARBON MONOXIDE AUDIO/VISUAL NOTIFICATION	WALL	F
H	APPLIANCE POST INDICATOR VAI VF		└─┘ ^N CM □ PIV
	GRAPHICS DISPLAY TERMINAL		GDT
\vdash		7'-6"	RI
\vdash	FIREMAN'S PHONE JACK	4'-6"	FP
	FIREMAN'S KNOX BOX CONNECTION		КВ

DESCRIPTION	MOUNTII (TO CEN
LIGHTING	
REFER TO LUMINAIRE SCHEDULE FOR EXACT FIXTURE	
SPECIFICATIONS, MOUNTING HEIGHTS, ETC.	
NDICATES RECESSED)	
POLE MOUNTED AREA LIGHT	
-LOODLIGHT	
EXIT LIGHT (CEILING, END, WALL MOUNT)	
STRIP FIXTURE	
CROSS-HATCHING INDICATES LIGHT IS POWERED	
PARALLEL-HATCHING INDICATES LIGHT IS	
POWERED FROM THE EMERGENCY-LIFE SAFETY	
EMERGENCY BATTERY WALL-PACK	
CONDUIT CONCEALED IN WALLS OR IN CEILING	
SPACE: ARROW(S) INDICATE(S) HOME RUN & #	
OF CIRCUITS: HASHMARKS INDICATE # OF CONDUCTORS. DASHED LINE INDICATES	
CONDUIT BELOW FLOOR.	=1 01
DISCONNECT SWITCH	5'-0"
	5'-0"
	5'-0"
	5'-0"
ENCLOSED FLUSH MTD. CIRCUIT BREAKER	5'-0"
	46"
	6'-6" TO TOP
HATCHING INDICATES EMERGENCY	
TRANSFORMER	AS NOTED
EQUIPMENT TAG, REFER TO EQUIPMENT SCHEDULE	
TAGGED NOTE	
REVISION TAG	
WIRE BASKET CABLE TRAY, SIZE AS NOTED	AS SHOWN
LADDER CABLE TRAY, SIZE AS NOTED	AS SHOWN
SOLID BOTTOM CABLE TRAY, SIZE AS NOTED	AS SHOWN
LOW VOLTAGE CABLE PATH	
EQUIPMENT HARDWIRE CONNECTION (SEE DETAIL)	
MOTOR CONNECTION, REFER TO EQUIPMENT	
SPECIFIC GUARD FOR DEVICE NOTED	
WEATHERPROOF - NEMA-3R, WET LOCATION LISTED.	
OUTDOORS.	
NDICATES EMERGENCY POWER	
GENERATOR ANNUNCIATOR PANEL - SEE	46"
CONTRACTOR, ELECTRICAL CONTRACTOR SHALL	
MECHANICAL DRAWINGS FOR LOCATIONS	
CONDUIT UP	
CONDUIT DOWN	
GROUND BUS BAR ON INSULATED STANDOFFS	2'-0"
BOX ON ANY DEVICE INDICATES SURFACE MOUNTED	
CIRCLE ON ANY DEVICE INDICATES DEVICE FED FROM	
STUB UP CONDUIT	
	AS SHOWN
COMPLETE WITH TRANSFORMER (MOUNT ABOVE	
CEILING IN CORRIDOR NEAR PUSH-BUITON) AND ALL ACCESSORIES, POWER FROM NEAREST AVAILABLE	46"
120V NORMAL POWER GENERAL RECEPTACLE CIRCUIT,	
DOORBELL AUDIO/VISUAL STATION, PROVIDE PROVIDE	
CONNECTION TO PUSHBUTTON STATION IN AREA.	7'-6"
ETC.) DESIRED WITH OWNER/ARCHITECT, NUTONE OR	
KITCHEN EQUIPMENT OUTLET COUPLING	
CONNECTION (SEE DETAIL)	
NDICATES MOUNTING ABOVE COUNTER-TOP, 2" ABOVE BACKSPLASH, NO HIGHER THAN 48"	
EXPLOSION PROOF - PROVIDE WIRING METHODS,	
HAZARDOUS LOCATION.	
PLUMBING FIXTURE SOLENOID VALVE/ELECTRIC EYE	
CONNECTION REQUIREMENTS WITH MANUFACTURER.	
PLUMBING FIXTURE ELECTRIC EYE TRANSFORMER	
MOUNT ABOVE SUSPENDED ACCESSIBLE CEILING IN J-	
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED	
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE	VERIFY WITH
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS)	VERIFY WITH ARCHITECT
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE	VERIFY WITH ARCHITECT
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED	VERIFY WITH ARCHITECT AS SHOWN
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS	VERIFY WITH ARCHITECT AS SHOWN
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED	VERIFY WITH ARCHITECT AS SHOWN FLOOR
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED FLOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED FLOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED FLOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL FINISHES. DEVICES AS SCHEDULE FD	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR FLOOR
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED FLOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL FINISHES, DEVICES AS SCHEDULED AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR FLOOR
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED FLOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL FINISHES, DEVICES AS SCHEDULED AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR FLOOR 1'-6"
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED FLOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL FINISHES, DEVICES AS SCHEDULED AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION COMBINATION POWER AND DATA OUTLET I OCATION	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR FLOOR 1'-6"
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED FLOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL FINISHES, DEVICES AS SCHEDULED AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR FLOOR 1'-6" 1'-6"
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS "LOORBOX, POWER ONLY, AS SCHEDULED "LOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE "IRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL "INISHES, DEVICES AS SCHEDULED "AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL NFORMATION	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR FLOOR 1'-6" 1'-6"
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS LOORBOX, POWER ONLY, AS SCHEDULED LOORBOX, COMBINATION POWER AND LOW /OLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL FINISHES, DEVICES AS SCHEDULED AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL NFORMATION	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR FLOOR 1'-6" 1'-6" 1'-6"
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS LOORBOX, POWER ONLY, AS SCHEDULED LOORBOX, COMBINATION POWER AND LOW /OLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL INISHES, DEVICES AS SCHEDULED AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL NFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, SFCI DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR FLOOR 1'-6" 1'-6" 1'-6"
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS CLOORBOX, POWER ONLY, AS SCHEDULED CLOORBOX, COMBINATION POWER AND LOW (OLTAGE, REFER TO FLOORBOX SCHEDULE CORBOX, COMBINATION POWER AND LOW (OLTAGE, REFER TO FLOORBOX SCHEDULE CLOORBOX, COMBINATION POWER AND DATA OUTLET LOCATION, COMBINATION POWER AND DATA OUTLET C	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR 1'-6" 1'-6" 1'-6" 1'-6" CLG
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS LOORBOX, POWER ONLY, AS SCHEDULED LOORBOX, COMBINATION POWER AND LOW /OLTAGE, REFER TO FLOORBOX SCHEDULE IRE RATED POKE THOUGH FLOOR BOX, COORDINATE XACT COVER REQUIREMENTS WITH ARCHITECTURAL INISHES, DEVICES AS SCHEDULED AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL NFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, SFCI DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION DVERHEAD PROJECTOR: PROVIDE DUPLEX RECEPTACLE, ONE DATA, HDMI, 3.5mm AUDIO, ND VGA OUTLET ON (3) PLATES	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR fLOOR 1'-6" 1'-6" 1'-6" CLG
BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS) SURGE PROTECTION DEVICE BUS DUCT, AMPERAGES AS NOTED SPECIAL OUTLETS FLOORBOX, POWER ONLY, AS SCHEDULED FLOORBOX, COMBINATION POWER AND LOW VOLTAGE, REFER TO FLOORBOX SCHEDULE FIRE RATED POKE THOUGH FLOOR BOX, COORDINATE EXACT COVER REQUIREMENTS WITH ARCHITECTURAL FINISHES, DEVICES AS SCHEDULED AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION COMBINATION POWER AND DATA OUTLET LOCATION, GET DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION OVERHEAD PROJECTOR: PROVIDE DUPLEX RECEPTACLE, ONE DATA, HDMI, 3.5mm AUDIO, AND VGA OUTLET ON (3) PLATES SPECIAL VIDEO SYSTEM SIGNAL INPUT SURFACE PLUG-MOLD	VERIFY WITH ARCHITECT AS SHOWN FLOOR FLOOR 1'-6" 1'-6" 1'-6" CLG

PP

POWER POLE AS NOTED

								Sheet	List - Electrical	
HT KOX)				TH XOX)		-	SHEET #			
EIGH OF B						-	E001 E301		OVERALL ELECTRICAL PLAN	
G H ER	47			G H ER		-	E302	OVERALL E	LECTRICAL PLAN - NORTH BUILDING	MEZZANI
						-	E303 E501		ENLARGED ELECTRICAL ROOM PLANS	J
	RAW YMB				RAW YMB		E501		ELECTRICAL SINGLE LINE NEW WORK	•
ΣĿ	<u>م ص</u>	DESCRIPTION		ΣĿ	<u>0</u> 0					
	-									
	-	OWNER FURNISHED CONTRA	CTOR INSTALLED		OFCI					
	⊕ ,O,	OWNER FURNISHED OWNER	INSTALLED		OFOI					
		CONTRACTOR FURNISHED CO	NTRACTOR INSTALLED		CFCI					
	<u></u>	CONTRACTOR FURNISHED OV			CFOI					
	k⊈ , €		ER							
		DATA OUTLET : NUMBER BESI	DE OUTLET	1'-6"						
	⊖,♀,♀ ⊢- ○	INDICATES NUMBER OF DATA VOICE OUTLET : NUMBER BES	JACKS SIDE OUTLET	1'-6"	$-\frac{\vee}{\underline{\#}\underline{\vee}}$					
		INDICATES NUMBER OF VOICE COMBINATION OUTLET : NUME	E JACKS BER BESIDE OUTLET		#D/#V					
		INDICATES NUMBER OF DATA	VOICE JACKS	1'-6"						
		MAIN DISTRIBUTION FRAME - 1 SYSTEM SCHEMATICS AND DE REQUIREMENTS	ETAILS FOR ADDITIONAL		MDF					
	∑ ⊘ SL, XL	INTERMEDIATE DISTRIBUTION DATA SYSTEM SCHEMATICS A ADDITIONAL REQUIREMENTS	I FRAME - REFERENCE		IDF					
1		WIRELESS ACCESS POINT WI DATA OUTLET FOR ANTENNA.	TH PROVISIONS FOR (1 PROVIDE A COMPLETE							
		MOUNTED AT AN ACCESSIBLE 24" ABOVE CEILING, AT EACH	E HEIGHT NO MORE THAN OUTLET. PROVIDE A 20'							
		COIL OF CABLE AHEAD OF TH ADJUSTMENT OF FINAL OUTLI	E OUTLET FOR ET LOCATION. THE							
5'-0"		CONTRACTOR SHALL COORD WITH THE OWNER AND ADJUS	INATE EXACT LOCATIONS ST OUTLET LOCATIONS AT							
5'-0"	\boxtimes	SUBSTANTIAL COMPLETION T OWNER'S WAP LOCATIONS. W	O ACCOMMODATE /AP'S ARE OWNER-							
5'-0"		FURNISHED, OWNER-INSTALL	ED		_					
5'-0"					+					
46"										
6'-6" TO TOP	\sim	TELECOMMUNICATIONS SYST	EM BACKBOARD.	AS REQD.						
		PROVIDE 96"H x 3/4"D FIRE-RE BACKBOARD WITH TWO (2) CO	TARDENT PLYWOOD DATS OF NON-							
AGNOTED	EQUIP-1	C0NDUCTIVE, FIRE-RETARDAN 3/0 TO GROUND BAR AT MAIN	NT LIGHT GRAY PAINT, # SERVICE SWITCHBOARD,		TEL					
	\bigcirc	30-PT GROUND BAR AND A 6'- BACKBOARD. INSTALL BOARD	0", #3 AWG PIGTAIL AT 0 AT 2' AFF. (LENGTH OF							
		BOARD AS INDICATED ON FLC	OOR PLAN)							
AS SHOWN										
AS SHOWN										
	\mathbb{O}^{\sim}									
	\wedge									
	WG									
	WP		LAMACOID					LAMAC	COID	
	E.EM		NAME PLATE		-			NAME	PLATE	
46"	GEN-A	1/2" HIGH					1/2" HIGH			
		LETTERS		JMP	P-1		LETTERS		PANEL LXVV	
	(T)			08V/3PH	/4W				120/208V/3PH/4W	\Box
	0	1/4" HIGH LETTERS		ED: 600 /	AMPS	\sim	1/4" HIGH LETTERS		FEED: 200 AMPS	U
	•		FEI	ט דאטM: <u>האד # 4</u>	NULA 2				(4) #3/0, #6 GND, 2" C.	
2'-0"										
	Ē									
	$\overset{\frown}{\longleftrightarrow}$		<u>IYPICAL EQUIE</u> NO SCALE		NEPLATE			TYPICAL NO SCAL	<u>POWER PANEL NAMEPLATE DETA</u> E	<u>IL</u>
AS SHOWN										
AS SHOWN		GEN	ERAL NOTES:							
46"	DB	A. 1	NORMAL POWER LABE	LS SHALL I	BE BLACK WI	TH WHITE LETTERS.				
55		B. 1	EMERGENCY POWER L	ABELS SH	ALL BE RED V	WITH WHITE LETTERS.	LABEL SHOUL	D ALSO INCLU	JDE	
		C.	EMERGENCY POWER L	ABELS IN I	HEALTHCARE	E APPLICATIONS SHOU	LD INCLUDE SY	YSTEM SEVER	ED	
7'-6''	DB	D. 1	'LIFE SAFETY", "CRITIC UTILIZE SCREW-ON TY	AL" OR "EC PE LAMACO	UIPMENT" . OID PLATES.					
		E	THIS DETAILS APPLIES	TO ALL EL	ECTRICAL EC	QUIPMENT INCLUDING	PANELS, SWIT	CHGEAR, ES (VDE'S)		
	$\mathbb{Q}_{\mathcal{K}}^{K}$		SPECIAL DEVICE PLATI	ES, INVERT	ER, AND SIM	ILAR MATERIALS SHAL	L BE CLEARLY	MARKED AS 1	0	
	C			USE.						
	VD									
	۸ ۲									
	\oplus				CAL EC		JAMEPL	ATE		
	I		(2) SCALE	: NONE						
	\bigotimes		~							



SHEET NUMBER

SHEET TITLE ELECTRICAL GENERAL INFORMATION

PROJECT NUMBER OCCC23

1	04/22/2025	BID SET	
#	Date		Description

ISSUE / REVISION

KEYPLAN

REGISTRATION

CONSULANTS

CLIENT **FRANKLIN COUNTY CONVENTION FACILITIES** AUTHORITY 400 North High Street, 4th Floor Columbus, Ohio 43215

PROJECT **Greater Columbus Convention Center North Building Air Handler** Fan Upgrades 500 North High Street Columbus, Ohio 43215

5455 Rings Road, Suite 450

Dublin, OH 43204

T: 614.992.1500

INE









GENERAL NOTES (POWER):

- A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
 B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
 C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. MARK INSIDES OF ALL DEVICE BOXES WITH
- LADELS WITT BLACK LETTERING. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.
 D. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.

 AIR HANDLER FAN MOTORS TO BE REPLACED BY OTHERS. REFER TO DEMOLITION AND NEW WORK SINGLE LINE DIAGRAMS FOR MORE INFORMATION. REFER TO MECHANICAL DRAWINGS FOR MORE INFORMATION ON EQUIPMENT LOCATIONS.







GENERAL NOTES (POWER):

- A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES. B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED. C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES,
- SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER. D. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS

BY OTHER TRADES.





GENERAL NOTES (POWER): A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND

- CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
 B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
- C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.
 D. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC.
- NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.



NORTH BUILDING MEZZ - SE ELEC ROOM SCALE: 1/8" = 1'-0" 0 2' 4' 8' 16' 24' 32'













- GENERAL POWER RISER NOTES: A. PROVIDE ENGRAVED LAMACOID LABELS FOR ALL POWER DISTRIBUTION EQUIPMENT FURNISHED OR MODIFIED IN THIS PROJECT, LABELS PER DETAILS
- B. SERVICE EQUIPMENT SHALL BE MARKED WITH THE MAXIMUM AVAILABLE FAULT-CURRENT AT THE EQUIPMENT AND THE DATE THE CALCULATION WAS PERFORMED. APPLY A TYPE-WRITTEN ADHESIVE LABEL WITH WHITE
- C. CONTRACTOR SHALL INSTALL SEPARATE CONDUITS, PULL BOXES, ETC. FOR EACH EMERGENCY POWER BRANCH & NORMAL POWER PER NEC FOR COMPLETE
- D. ALL CIRCUIT BREAKERS AND/OR DISCONNECTS SERVING THE PRIMARY SIDE OF A TRANSFORMER WHICH ARE NOT WITHIN SITE OF THE TRANSFORMER SHALL BE PROVIDED WITH PERMANENTLY INSTALLED MEANS TO LOCK THE BREAKER IN THE OFF POSITION. SUCH TRANSFORMERS SHALL HAVE THE ROOM NAME AND NUMBER OF THE PRIMARY DISCONNECTING MEANS ENGRAVED ON THE
- E. ALL SPARE BREAKERS SHALL BE SO LABELED IN CIRCUIT DIRECTORIES AND
- F. MINIMUM PANEL MOUNTING SPACE IS NOTED ON DRAWINGS AND SCHEDULES. ALL MOUNTING SPACE SHALL BE PREPARED TO ACCEPT FUTURE BREAKERS.
- G. NO CONDUIT SHALL BE INSTALLED UNDERGROUND, EXCEPT FOR DISTRIBUTION EQUIPMENT FEEDERS, EXTERIOR CONDUITS, PARKING LOT ISLANDS, UNLESS REQUIRED FOR THE APPLICATION (FLOOR BOXES, ISLANDS, ETC,) OR SPECIFICALLY INDICATED AS SUCH IN CONSTRUCTION DOCUMENTS. NO CONDUIT SHALL BE INSTALLED WITHIN CONCRETE SLABS.
- J. E.C. SHALL VERIFY ALL EXISTING CONDUIT AND CONDUCTOR SIZES AND QUANTITIES OF EQUIPMENT IN THE SCOPE OF WORK PRIOR TO ROUGH-IN.
- 1. DISCONNECT AND REMOVE EQUIPMENT DISCONNECT, VFD/MOTOR STARTER, AND WIRING TO AIR HANDLER MOTORS. PULL CIRCUIT BACK TO NEW JUNCTION BOX TO
- 2. DISCONNECT AND REMOVE MOTOR STARTER BUCKET IN MOTOR CONTROL CENTER TO BE REPLACED IN NEW WORK. REFER TO NEW WORK ONE-LINE

A LEGENCE Company 5455 Rings Road, Suite 450 Dublin, OH 43204 T: 614.992.1500 PROJECT **Greater Columbus Convention** Center North Building Air Handler Fan Upgrades 500 North High Street Columbus, Ohio 43215 CLIENT FRANKLIN COUNTY **CONVENTION FACILITIES** AUTHORITY 400 North High Street, 4th Floor Columbus, Ohio 43215 CONSULANTS REGISTRATION KEYPLAN \bigcirc **ISSUE / REVISION** 1 04/22/2025 BID SET # Date Description PROJECT NUMBER OCCC23 SHEET TITLE ELECTRICAL SINGLE LINE DEMOLITION SHEET NUMBER E501



WIRE SIZE SCHEDULE						
Size	WireSize					
3CU-40A	(3) #8 CU & #10 CU GND. IN 3/4"C					
3CU-60A	(3) #6 CU & #10 CU GND. IN 1"C					
3CU-70A	(3) #4 CU & #8 CU GND. IN 1-1/4"C					
3CU-100A	(3) #2 CU & #6 CU GND IN 1-1/4"C					
3CU-150A	(3) #1/0 CU & #6 CU GND. IN 2"C					
3CU-250A	(3) #4/0 CU & #6 CU GND. IN 2-1/2"C					
3CU-300A	(3) #350 CU & #2 CU GND. IN 3"C					

- A. REFER TO SPECIFICATIONS FOR CONDUCTOR REQUIREMENTS. ALL FEEDERS
- B. CURRENT CARRYING CONDUCTORS ARE SIZED FROM NEC-2017 TABLE 310.15(B) (16) (75DEG C - FOR THHW/THW/THWN INSULATION). REFER TO PROJECT SPECIFICATIONS FOR ALLOWABLE CONDUIT AND WIRING METHODS.

- E. CONDUIT FILL RATES ARE BASED UPON TABLE C.10 (PVC-80 CONDUIT WITH THHN/THWN/THWN-2 WIRE). REFER TO PROJECT SPECIFICATIONS FOR ALLOWABLE CONDUIT AND WIRING METHODS.

A. PROVIDE ENGRAVED LAMACOID LABELS FOR ALL POWER DISTRIBUTION EQUIPMENT FURNISHED OR MODIFIED IN THIS PROJECT, LABELS PER DETAILS

- CURRENT AT THE EQUIPMENT AND THE DATE THE CALCULATION WAS PERFORMED. APPLY A TYPE-WRITTEN ADHESIVE LABEL WITH WHITE BACKGROUND, 1/2" HIGH BLACK LETTERING.
- C. CONTRACTOR SHALL INSTALL SEPARATE CONDUITS, PULL BOXES, ETC. FOR EACH EMERGENCY POWER BRANCH & NORMAL POWER PER NEC FOR COMPLETE
- TRANSFORMER WHICH ARE NOT WITHIN SITE OF THE TRANSFORMER SHALL BE PROVIDED WITH PERMANENTLY INSTALLED MEANS TO LOCK THE BREAKER IN THE OFF POSITION. SUCH TRANSFORMERS SHALL HAVE THE ROOM NAME AND NUMBER OF THE PRIMARY DISCONNECTING MEANS ENGRAVED ON THE
- E. ALL SPARE BREAKERS SHALL BE SO LABELED IN CIRCUIT DIRECTORIES AND
- F. MINIMUM PANEL MOUNTING SPACE IS NOTED ON DRAWINGS AND SCHEDULES. ALL MOUNTING SPACE SHALL BE PREPARED TO ACCEPT FUTURE BREAKERS.
- G. NO CONDUIT SHALL BE INSTALLED UNDERGROUND, EXCEPT FOR DISTRIBUTION EQUIPMENT FEEDERS, EXTERIOR CONDUITS, PARKING LOT ISLANDS, UNLESS REQUIRED FOR THE APPLICATION (FLOOR BOXES, ISLANDS, ETC,) OR SPECIFICALLY INDICATED AS SUCH IN CONSTRUCTION DOCUMENTS. NO CONDUIT SHALL BE INSTALLED WITHIN CONCRETE SLABS.
- H. SEE SPECIFICATIONS FOR POWER STUDY REQUIREMENTS.
- WHERE REQUIRED FOR SELECTIVE COORDINATION.
- QUANTITIES OF EQUIPMENT IN THE SCOPE OF WORK PRIOR TO ROUGH-IN.

A LEGENCE Company 5455 Rings Road, Suite 450 Dublin, OH 43204 T: 614.992.1500 PROJECT **Greater Columbus Convention Center North Building Air Handler** Fan Upgrades 500 North High Street Columbus, Ohio 43215 CLIENT FRANKLIN COUNTY **CONVENTION FACILITIES** AUTHORITY 400 North High Street, 4th Floor Columbus, Ohio 43215 CONSULANTS REGISTRATION KEYPLAN **ISSUE / REVISION** 04/22/2025 BID SET # Date Description PROJECT NUMBER OCCC23 SHEET TITLE ELECTRICAL SINGLE LINE NEW WORK SHEET NUMBER E502

<u>INDEX</u>

DIVISION 23 & 25 – HVAC

230500- General Mechanical Requirements	230500-1 thru	17
230510- Mechanical Demolition and Salvage	230510-1 thru	3
230514- Variable Frequency Drives	230514-1 thru	4
230593- Mechanical Systems Testing, Adjusting & Balancing	230593-1 thru	3
250100- Elec. Motors and Other Elec. Requirements for Mech. Equipment.	250100-1 thru	3
250400- Control – Direct Digital	250400-1 thru	8

SECTION 23 0500

GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The Work under this Section includes, but is not limited to, providing all labor, material, equipment, and services necessary for completion of all mechanical systems in a serviceable fully operational manner.
- B. All items of Work and systems shall be furnished and installed ready for satisfactory operation and all required apparatus and service shall be provided even though not specifically mentioned herein.
- C. The Contract Specifications and Contract Drawing Equipment Schedules list the equipment manufacturers selected for the basis of the Specifications and for the various individual equipment layouts on the Contract Drawings. Substitutions shall be made in accordance with General Conditions and as otherwise provided in the Contract Documents.
- D. The Drawings showing the layout, arrangements, sizes and principal connections to the equipment and apparatus are based on one particular type of equipment of an acceptable manufacturer. If equipment other than the particular type shown on the layout Drawings is used, it is the Contractor's sole responsibility to make all necessary modifications to related piping, ductwork, electrical and utility connections, apparatus and miscellaneous items to complete the Mechanical Work, ready for satisfactory operation required under these Specifications. The cost of making all the modifications shall be borne by this Contractor without extra cost to the Owner, Architect or Engineer. In using such equipment, it is imperative that the equipment must fit the space and the access allotted, with the final layout to be approved by the Architect/Engineer (A/E). Follow the Drawings as closely as actual building construction permits.
- E. The Drawings show the principal engineering design elements of the mechanical installation. They are not intended as detailed construction installation drawings for the Mechanical Work but as a complement to the Specifications to clarify the principal features of the mechanical systems. It is the intent of this Section that all equipment and devices, furnished and installed under this and other Sections, be properly connected and interconnected with other equipment so as to render the installation complete for successful operation, regardless of whether all the connections and interconnections are specifically mentioned in the Contract Specifications or shown on the Contract Drawings.
- F. Check the layout of the Work of this Division, as indicated on the Drawings. Determine exact locations by the dimensions of the equipment approved. Obtain written approval from the Engineer for any revised layout before equipment or material involved is installed. Consult the Architectural and Structural Drawings for all dimensions, locations of partitions, locations and sizes of structural supports, foundations, swings of door, and other detail information required for a correct installation of this Work.

- G. Examine all other Divisions of the Contract Documents for Work related to the Work of this Division. Cooperate to provide continuity of Work, to eliminate duplications, and to provide Mechanical Work in support of such related Work. Furnish to other trades and on schedule all information required for the execution of Mechanical Work.
- H. Any additional Work such as cutting, drilling, patching, excavating, moving of another trade's work because of delay in Mechanical Work or lack of information is a part of this Division and shall be performed without increase in Contract Price.
- I. Install and connect devices and equipment in accordance with the best engineering practice and the manufacturer's instructions and recommendations. Provide all incidental ductwork, piping, valves, connections, and all similar material recommended by the manufacturer, or required for proper operation and maintenance, complete without additional costs.
- J. Provide all necessary rigging, scaffolding, tools, tackle, labor and other materials or equipment which may be necessary for the completion of the Work.
- K. Furnish and install motor on proper frame designed by the equipment manufacturer.
- L. All control wiring associated with the mechanical systems shall be provided under Division 23. All wiring shall comply with Division 26 Standards.

1.2 SPECIFIED ELSEWHERE

- A. The following will be provided under other sections of the Specifications:
 - 1. All power wiring associated with equipment provided under this Division shall be furnished, installed, and wired in accordance with Division 26. Under Division 23, provide installation instructions, locating dimensions, and wiring diagrams for the other trades. Supervise the installation and start-up and test the equipment.

1.3 RELATED WORK

A. The Drawings, General Provisions of the Contract, General Conditions, General Requirements, Supplemental General Conditions and Division 01 through 26 all apply to the work in this Section.

1.4 DEFINITIONS

- A. Provide: Furnish, install and connect up complete and ready for operation of particular work referred to, unless specifically otherwise noted.
- B. Furnish: To purchase, procure, acquire and deliver complete with related accessories.
- C. Install: To erect, mount and connect for use complete with related accessories.
- D. Work: Labor, materials, equipment, apparatus, controls, accessories and other items required for proper and complete installation.
- E. Concealed: Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.
- F. Exposed: Not installed underground or concealed as defined above.

- G. Accessible: Capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, ductwork or going through doors or false ceilings.
- H. Words: Words used in the singular number shall include the plural sense and vice versa.
- I. Wiring: Wire or cable installed in conduit, with all required boxes, fittings, supports, connections, etc.
- J. Power Wiring: That wiring between the source of power and the current consuming device such as motors, equipment, heaters, etc. It includes the installation of such control devices in the power circuit such as pushbuttons, thermostats, key switches, timers, etc., which control loads for which no magnetic starter or contactor is provided for controls.
- K. Control Wiring: That wiring between control devices that does not provide the power circuit, regardless of voltage, when a magnetic starter or contactor is provided for control.

1.5 INTENT

- A. Furnish, erect, install, connect, clean, adjust, test and place in service all materials, equipment and systems in accordance with applicable codes, manufacturer's directions and recommendations for all work shown on the drawings and called for in the Specifications.
- B. Carefully examine the contract documents, visit the site, and thoroughly become familiar with the local conditions relating to the work. Failure to do so will not relieve the contractor from any obligations of the Contract.
- C. Should there be any discrepancies of a question of intent, refer the matter to the Architect/Engineer for a final decision before ordering any equipment/materials or before starting any related work.
- D. In case of conflict between project specifications and drawings, drawings govern unless the Architect/Engineer rules otherwise.
- E. Apparatus, devices, materials of work not specifically shown on drawings, but mentioned in the project specifications, or vice versa, or any incidental accessories and appurtenances necessary to make the work complete and ready for operation, even though not specified or shown on the drawings, shall be furnished and installed without additional expense to the Owner.
- F. It is the contractor's responsibility prior to bids to review all project documents.
- G. Project documents include architectural, structural, mechanical, control, plumbing, fire protection and electrical disciplines.

1.6 CODES AND STANDARDS

A. Applicable Publications: Reference made herein to standards, Specifications, or codes, refer to the latest edition including all addenda, errata, or other revisions thereto, existing on the date of execution of the Contract.

- B. Local Codes and Ordinances: Install all Work in conformance with all applicable local Codes and state ordinances and statues. Nothing in the Specifications or Drawings shall be construed to permit deviation from the governing codes. In case of conflict with local ordinances and statues, the more stringent shall apply.
- C. Abbreviations: Abbreviations and Symbols under Mechanical Sections make use of the following abbreviations in adopting applicable standards and codes as a part of Division 23:
 - 1. ADC Air Diffusion Council Test Code
 - 2. AGA American Gas Association
 - 3. AIA American Institute of Architects
 - 4. AMCA Air Moving and Conditioning Association
 - 5. ANSI American National Standards Institute
 - 6. API American Petroleum Institute
 - 7. ARI Air Conditioning and Refrigeration Institute
 - 8. AGA American Gas Association
 - 9. ASHRAE-American Society of Heating, Refrigeration and Air Conditioning Engineers
 - 10. ASME American Society of Mechanical Engineers
 - 11. ASTM American Society for Testing and Materials
 - 12. AWS American Welding Society
 - 13. AWWA American Water Works Association
 - 14. EPA Environmental Protection Agency
 - 15. FM Factory Mutual System
 - 16. IMC International Mechanical Code
 - 17. IPC International Plumbing Code
 - 18. IRI Industrial Risk Insurers
 - 19. MSS Manufacturers Standardization Society
 - 20. NACE National Association of Corrosion Engineers
 - 21. NEC National Electric Code
 - 22. NEMA National Electrical Manufacturers Association
 - 23. NFC National Fire Code
 - 24. NFPA National Fire Protection Association
 - 25. NPC National Plumbing Code
 - 26. NSF National Sanitation Foundation
 - 27. OSHA Occupational Safety and Health Standards
 - 28. PDI Plumbing and Drainage Institute
 - 29. SMACNA Sheet Metal and Air Conditioning Contractor's National Association
 - 30. UL Underwriters Laboratories, Inc.
 - 31. State and Local Fire Marshall
 - 32. State and Local Inspection Authorities
 - 33. Owner District's Fire Insurance Agency requirements
 - 34. The Division 01 Sections "Regulatory Requirements" and Reference Standards of the Project Specifications
- D. Permits and Inspections
 - 1. Obtain and pay for all permits, bonds, licenses, etc. required by the Local, State or other authority having jurisdiction over the work.
 - 2. Arrange and pay for inspections required by the above when they become due as a part of the work of the Sections affected. Conceal no work until approved by these governing authorities. Present the Owner with properly signed certificates of final inspection before the Owner's acceptance of the Work.

3. Obtain and pay for all meters, gauges, instruments, and devices required by the governing authorities except as otherwise noted as part of the Work of the Sections affected.

1.7 QUALITY ASSURANCE

- A. All materials furnished shall be new and shall comply with all applicable standards listed below.
- B. All materials or work found to be defective or not in strict conformity with the Contract Documents, or defaced or injured through any cause, shall be rejected, and shall be removed by Contractor and satisfactory material and Work substituted without delay.
- C. Contractor shall protect his/her Work by keeping all piping, equipment, etc., capped or plugged, drained, or otherwise protected from injury by freezing, water damage, or stoppage from material, concrete, sand, or dirt and shall repair any such injury without additional charge to the User. Injury shall be interpreted to include scratches, discoloring and denting.
- D. Contractor will be held responsible for any damage caused by him/her to other Contractors' Work.
- E. Submit shop drawings and product data for all equipment as specified or scheduled. Update all drawings to "as-built" status and submit to Architect/Engineer digitally or on flash drive.

1.8 SUBMITTALS

- A. Submit under provisions of Division 01 and as specified herein. The most stringent requirements shall apply.
- B. General: Within 15 calendar days after date of Contract Agreement, submit to the Engineer a typewritten list of all items of equipment and material proposed for installation on this project. Provide the specification page number, manufacturer's name, model number, size non-standard accessories specified or required, and any other information required to identify each item.
 - 1. Within 30 days after the Contractor has been given notice of approval of manufacturers, submit shop drawings of equipment and material proposed for this installation.
 - 2. If substitutions have been offered in lieu of specified materials and/or equipment they shall be in accordance with AIA Document A201.
- C. Shop Drawings: Submit shop drawings for all Work to be done under each of the Mechanical Sections and for all items and assemblies which are to be specifically fabricated for this Contract.
- D. The Engineer's review of Manufacturer's Drawings or Schedules shall not relieve the Contractor from responsibility for errors or omissions in Manufacturer's Drawing and deviations from the Contract Drawings or Specifications.
- E. Coordination and Fabrication Drawings: Prepare layout drawings of all system assemblies of this Contract including plumbing, heating, sprinkler piping, electrical and technology, mechanical and electrical room layouts with equipment and piping, ductwork installations, and control systems. Include completely dimensioned plans drawn to scale. Show elevations and sections indicating locations of all equipment, piping, ductwork, drains, controls, and other items with reference to columns, walls, slabs, beams, and to components of other systems and work of other trades. Floor plans shall be drawn at not less than 1/4-inch scale with a sign-off

block including all disciplines and date. Tracing or reproduction of Construction Documents is not acceptable. Provide a minimum of one reproducible drawing and five prints of each drawing.

- F. Electronic files containing AutoCAD Floor Plans or Revit models are available through the Engineer. Cad drawing format shall be <u>AutoCAD 2017</u> unless requested otherwise. Revit models shall be in the version in which they are created. The Contractor shall complete, sign, and submit a "Model Sharing Agreement" form which is available from the Architect/Engineer by request. Fees may apply for these electronic files.
- G. Catalog Cuts: Submit manufacturer's data sheets and pictures of all standard manufactured items proposed for installation in this project. Clearly identify each item proposed, together with all required accessories and fittings, with tag numbers and specification page and line numbers. Include graphs, curves, or charts, as applicable, with the specified operating point clearly marked.
- H. Installation and Bolt Setting Diagrams: Submit complete installation instructions and bolt setting information for items of equipment furnished under Division 23 such as pumps, fans, compressors, tanks, filters, pressure vessels, etc.
- I. Wiring Diagrams: Provide specific wiring diagrams and instructions for all equipment, controls or devices which are furnished under Division 23 and are to be wired and connected by other trades. The diagrams and instructions shall not be of a general or typical nature but shall be applicable and specific to this Contract.
- J. Samples: Where a Contractor proposes a manufacturer, material, or method differing from that specified, the Engineer may require illustrative samples of the manufacturer, material or method. Submit such samples as part of the shop drawing requirements, and shall include samples of insulation, special finishes, etc.
- K. Submittals shall be made in accordance with the General Conditions of the Contract and as otherwise required in the Contract Documents. In submitting shop drawings, illustrations and descriptive material for approval of the Engineer, the Contractor must clearly mark each shop drawing, catalog cut, pamphlet or specification sheet as follows, for purposes of identification and record:
 - 1. Date: (as submitted)
 - 2. Project Title:
 - 3. Location of Project:
 - 4. Branch of Work: (HVAC, Plumbing, Fire Protection, etc.)
 - 5. Specification Paragraph & Page:
 - 6. Submitted by: (Contractor Name)
 - 7. Contract No.:

1.9 SUBSTITUTIONS

- A. Product substitutions shall be in accordance with the General Conditions, Supplemental General Conditions, Division 01 and as specified.
- B. The products, equipment, etc. scheduled on the Drawings or specified are the basis of design. Where more than one manufacturer is listed, the Contractor may use any of the acceptable manufacturers as the basis of their bids unless otherwise specified. However, the Contractor

assumes all responsibility for changes to the design, installation, etc. as a result of the change, i.e.: power characteristics, physical size, etc.

- C. Any request for substitution to other than the specified acceptable manufacturers must be submitted to the Engineer in writing and shall include an adequate description of proposed change, reason(s) for requesting change and cost adjustment information. Substitutions not submitted in this manner will be rejected automatically. Substitution requests will only be considered for the following reasons:
 - 1. Specified manufacturer(s) is no longer in business.
 - 2. Specified product(s) cannot be delivered within the required project schedule.
 - 3. Alternate product(s) is of equal quality, but better value with savings offered to the Owner.

1.10 PROJECT RECORD DOCUMENTS

- A. Maintain Project Record Drawings during construction in accordance with General Conditions and as specified.
- B. Provide Project Record Drawings at completion of project. Shop drawings are not acceptable as record drawings unless they have been revised to reflect all field changes. Tracing or reproduction of the Contract Documents shall not be acceptable.
- C. Show the following information on the Project Record Drawings:
 - 1. All significant changes in plan, sections, elevations, and details, such as all relocation, or changes in ductwork and piping.
 - 2. All final locations of controls and final arrangement of electric circuits and any significant changes made in design as a result of change order or job conditions.
 - 3. Final location and arrangement of all mechanical equipment.
- D. Provide AutoCAD Version 2017 or later files, or Revit models digitally or on flash drive of all Project Record Drawings.

1.11 OPERATING AND MAINTENANCE MANUALS

- A. Submittals of operation and maintenance manuals shall be in accordance with General Conditions and as herein specified.
- B. Prepare and deliver to the Engineer, 3 complete sets of operating and maintenance manuals for all equipment listed in the Equipment Schedules and when specified by the Section in which the equipment is furnished. Provide all information pertinent to the equipment for preventive maintenance and for replacement of all expendable components. Manuals shall refer only to the actual equipment provided. All reference to alternative equipment shall be deleted. All such literature shall be bound in 3 new standard 3-ring binders and shall be submitted to the Engineer, along with an electronic (PDF) version.
- C. Include the items listed below and features as may be recommended by the manufacturers.
 - 1. Catalog information of the unit installed.
 - 2. Capacity and installation details.
 - 3. Wiring diagrams of electrical components.
 - 4. Special valves and control devices.
 - 5. Complete list of parts with reordering numbers.

- 6. All points requiring lubrication, lubrication frequency and type of lubricant.
- 7. Operating pressure and temperatures.
- 8. Design pressures and temperatures.
- 9. Relief devices and settings.
- 10. Electrical characteristics of all motors.
- 11. Operating curves of pumps and fans.
- 12. Recommended spare parts list.
- 13. Warranty Information.
- D. Prepare operating instructions, complete and explicit, including instructions for start-up, operating, and stopping. Underscore and emphasize critical points of operations and hazardous limit.
- E. Items which also must be included are make-up air units, coils, filters, unit heaters, heating and HVAC components, fans, motors, pumps, temperature control systems with a description of the sequence control, vibration isolation, etc.
- F. Include flow charts and wiring programs in the manuals indicating valve locations and control devices. Also include parts lists to be used for ordering replacement and repair parts.
- G. Arrange information in an orderly manner in accordance with the numbering system used for the project specification. Include a table of contents for each manual.
- H. Manual covers shall include the name of the project.

1.12 DELIVERY, STORAGE AND HANDLING

A. Refer to the General Conditions, Standard Specifications and as specified in each individual section.

1.13 WARRANTY

- A. Except where otherwise specifically included in individual Sections, all mechanical systems shall be provided with the guarantees as follows.
- B. Guarantee all mechanical systems, equipment, materials, and workmanship to be free from defect for a period of 1 year from the date of final acceptance of the Work. Replace or repair in an approved manner any Work which may prove defective or not in compliance with the Contract Documents without additional cost to the Owner and without interference with the Owner's operation. There shall be a mandatory walk thru at 10 months to ensure all equipment/materials are performing as required.
- C. Deliver to the Architect/Engineer 3 copies of all manufacturer's or equipment suppliers' warranties as part of the O&M manuals.
- D. Make all adjustments required to ensure operation of the various systems in accordance with the intent of the Drawings and Specifications.
- E. It is specifically understood that all adjustments to ensure the proper operation of the systems shall cover a period of 12 months following acceptance of the Work, and the Contractors and/or

their suppliers shall make all such adjustments required during this period without delay and without additional cost to the Owner.

- 1.14 TESTING, ADJUSTING AND BALANCING
 - A. This contractor shall employ the services of an independent firm to perform testing, adjusting and balancing.
 - B. The independent firm will perform services specified in related section.
 - C. Reports will be submitted by the independent firm to the Engineer indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.
 - D. Test Pressures: Lines shall be tested according to the following schedule:

Line	Test Medium	Minimum Pressure	Minimum Time	Remarks
Heating Water	Water	125 lb.	24 Hours	No Drop
Condensate	Water	125 lb.	24 Hours	No Drop
Chilled Water	Water	125 lb.	24 Hours	No Drop

1.15 OPERATING INSTRUCTIONS TO OWNER

A. Contractor shall furnish Architect/Engineer with a written statement from the Owner certifying acceptance of all the equipment, data and instructions of operation. Architect/Engineer will not approve the request for final payment until this certificate has been submitted.

PART 2 - PRODUCTS

2.1 EQUIPMENT SUPPLIED BY CONTRACTOR

- A. Contractor furnishing an item of equipment is responsible for the proper handling, setting, installation, startup and initial operation.
- B. If Contractor is unfamiliar with the proper start-up and adjustment procedure of any equipment or system furnished by him/her, he/she shall include the services of a qualified representative of the manufacturer or vendor to provide start-up assistance and for instruction of the Owner's personnel.
- C. Contractor shall include all necessary allowances to ensure that all equipment and systems furnished will be serviced as required during the guarantee period.
- D. When a manufacturer offers an extended warranty at additional cost, such extended warranty shall be included as alternate.

2.2 NOISE AND VIBRATION CONTROL

A. Contractor shall make provisions in the installation of the Work that noises or vibrations will not be transmitted through foundations, floors, walls, columns, ducts and piping, so as to be objectionable in any manner. All equipment provided shall be selected and installed with this in view. If any equipment exceeds reasonable requirements as to quietness of operation and

freedom from vibration when operating under continuous maximum demands, it shall be altered or replaced.

- B. Furnish and install vibration eliminators and isolation equipment for equipment, motors, and pumps, as indicated on the Drawings, and as specified in related section.
- C. The isolation and vibration eliminator manufacturer and Contractor shall be responsible for the selection of the proper units for their loadings, quantities, and each shall guarantee that each and every installation and their application shall have a vibration efficiency of 95% or greater. As a minimum, provide types of vibration eliminators as indicated on the Drawings and specified in related section.
- D. Submit shop drawings to the Architect/Engineer for review of all isolation equipment with dimensions and other data as recommended and prepared by the isolation equipment manufacturer.

2.3 GUARDS

- A. All belts, pulleys, chains, gears, couplings, projecting set screws, key and other rotating parts shall be fully enclosed and properly guarded.
- B. Guards shall be constructed of not less than 1-inch x 1-inch x 1/8-inch structural steel angles and 1/2-inch diamond mesh enclosure or equally suitable enclosure, all of hot-dipped galvanized fabrication.
- C. Guards shall be secured to the driven machines or to foundations of floors by heavy galvanized structural angle supports and anchor bolts. Braces or supports secured to motors will not be permitted and braces and/or supports must not "bridge" the sound and vibration isolators.
- D. Guards shall be designed with adequate provision for movement of motor required to adjust belt tension. Means shall also be provided to permit lubrication, use of speed counters and other maintenance and testing operation with guard in place.

2.4 MAINTENANCE MATERIALS, SERVICE AND SPARE PARTS

- A. This contractor shall be responsible for continued maintenance of all equipment furnished under this contract. This contractor shall, at the time of Owner acceptance, provide the Facilities planning Office with a report detailing the following information:
 - 1. Dates equipment arrived at the job site.
 - 2. Installation date.
 - 3. Dates of maintenance at start-up and at periodic maintenance.
 - 4. Dates of lubrication changes as applicable and specific name, manufacturer and type of lubrication.
- B. Refer to the General Conditions and to the individual Sections for additional requirements.

PART 3 - EXECUTION

3.1 SAFETY PRECAUTIONS DURING INSTALLATION

- A. Contractor shall take all measures to ensure safe installation of all Work and to prevent injury to persons or damage to property in compliance with OSHA and all applicable regulations.
- B. Contractor shall erect whatever scaffolds, platforms, supports, or other required construction to safely protect his/her own workers and other persons at the site.
- C. Such scaffolds, platforms, etc., shall be designed and constructed by Contractor who shall be solely responsible for their adequacy and safety. Engineer, Architect, the Owner, or User is not responsible for ascertaining the adequacy of any temporary structures used or erected by the Contractor.

3.2 INTERRUPTIONS AND TIE-INS

A. Any interruptions and tie-ins to existing systems that are necessary for installation of the new Work shall be performed and completed in coordination with the Owner's representatives. Provide 2 days written notice prior to any tie-in or connection to existing active systems. Any work requiring shut down of systems serving occupied areas shall occur during off hours, unless otherwise scheduled by mutual agreement.

3.3 MODIFICATIONS AND INTERFERENCES

- A. Contractor shall carefully check and become familiar with the Architectural, Structural, Electrical and all Mechanical Drawings and Details and make note of all locations where walls, partitions, ceilings, and structural members are called for to be furred or closed-in.
- B. Modifications to the arrangement of the piping and ductwork systems may be required to suit structural conditions, or to avoid interference with the Work of other trades. Contractor shall furnish all offsets, additional fittings, etc., as required to meet installation conditions whether detailed on the Drawings or not.
- C. Any conflicting information in the Specifications or on the Drawings shall be called to the attention of the Architect/Engineer for clarification before proceeding with fabrication or erection of the parts affected.

3.4 COOPERATION OF CONTRACTORS

A. Each Contractor, in the event of separate contracts in laying out his/her work, shall cooperate with other Contractors on the work so as to avoid any interference with their work. If this is not done, the Architect/Engineer reserves the right to make such changes in the work as are necessary to avoid interferences and such changes will not be considered as cause for additional compensation or extension of time for the Contractor.

3.5 WORK PRIORITY OVER OTHER TRADES

- A. Work in cooperation with one another to fit piping and ductwork into structure as job conditions may demand. All final decisions as to right of way and run of pipe, ducts, to be made by the Architect/Engineer. In general, priority is to be arranged as follows:
 - 1. Recessed lighting fixtures.
 - 2. Sheet metal ductwork.
 - 3. Sprinkler heads and sprinkler water lines.
 - 4. Plumbing waste lines, downspouts and vents.

- 5. Refrigeration lines.
- 6. Plumbing water lines.
- 7. Electrical conduit.

3.6 EQUIPMENT PADS

A. Provide four-inch minimum concrete housekeeping pads for all floor mounted equipment.

3.7 ARRANGEMENT AND ALIGNMENT

- A. All equipment, ductwork, piping, etc. shall be arranged and aligned in accordance with the Drawings. Elevations, where given, must be held. Floor elevations, where given, are to high points of floor. Dimensions must be held as closely as possible. All dimensions are to be field-checked for accuracy before fabrication.
- B. Install all equipment, ductwork, piping, etc. straight and direct as possible, generally forming right angles with, or running parallel with, walls or adjacent ductwork, piping, etc. All ductwork, piping, etc. shall be neatly spaced with risers and drops running plumb and true.
- C. Run ductwork, piping, etc. in wall chases, shafts, hung ceilings, recesses, etc., where same are provided. Do not run in floor slab fill unless specifically so noted on Drawings. Ductwork, piping, etc. shall not be covered or closed until testing is completed.
- D. Drawings, in general, are made to scale. All dimensions shall be checked in the field by the Contractor before final connections are fabricated.
- E. Drawings are, in general, diagrammatic and the exact locations shall be determined by the Contractor from field measurements. The actual arrangement, when erected, shall follow the general locations shown on the Drawings as far as practicable. The installation shall be neat in appearance and convenient to operate.
- F. Installations shall be coordinated with other Work to avoid blocking building openings, light fixtures, etc. and shall not interfere with access to valves or equipment. Equipment, ductwork, piping, etc. shall be installed to provide working clearance for operation and maintenance.

3.8 ALIGNMENT OF ROTATING EQUIPMENT

- A. All pumps, fans, etc. or similar equipment directly connected to motors by means of flexible couplings must be perfectly aligned after installation by the use of a dial indicator and the Work of alignment must be performed by a craftsman skilled in the Work.
- B. Belted equipment shall be aligned so that the grooves of the driver pulley are truly aligned with those of the driven sheave, and the belts must be in the proper tension, free from flutter. In multi-belt drives, all belts must be operated at the same plane. Flutter in any 1 belt will be cause to reject the entire set, as the original installation of belts must be in matched sets.
- C. All equipment provided with high-capacity belt drives must be conveniently tagged and so identified for future servicing and replacement of belts.

D. Before any rotating equipment is put in operation for testing purposes, it shall be properly lubricated with lubricants recommended by the manufacturer, and they shall be further lubricated before the equipment is turned over to the Owner.

3.9 CLEARANCES

A. Install ductwork, piping, etc. to provide minimum clearance of at least one (1) inch between extreme projections of piping, flanges, fittings, valves, allowing for insulation, expansion, etc.

3.10 EXPANSION

- A. Special attention shall be given to the installation of ductwork, piping, etc. which have an appreciable movement so that they will not hit other ducts, pipes, structural members, etc. under actual operating conditions.
- B. Provide flexible connections or expansion compensators where ducts, pipes, etc. cross building expansion joints.

3.11 LOCATION OF VALVES AND PIPING COMPONENTS

- A. System components which require observation, operation, or maintenance such as valves, gages, controls, strainers, dirt pockets, cleanouts, unions and flanges, etc., shall be located, whenever possible, so as to be readily accessible. They shall not be concealed in chases or above ceilings without provision for access. Valves which require frequent operation, or which may require emergency operation, and which are 10'-0" from normal working level, should be installed with appropriate provisions such as chain wheels or extension stems.
- B. Install all valves with stems in either an upright (preferred) or horizontal position. Control valves shall be installed with top works upward unless specifically shown otherwise.
- C. Globe valves should be installed to seat against the direction of flow.
- D. Make provisions for draining all low points of all piping systems, whether indicated on the Drawings or not, using a globe or ball valve and iron pipe thread to hose thread adapter with cap. Drains shall not be less than 3/4 inch, subject to sizes indicated on Drawings.

3.12 DRAINAGE AND VENTING

- A. Where ducts, pipes, etc. are purposely pitched for drainage or venting, an accurate grade shall be maintained. Lines shall be supported in such a manner as to prevent deflection sufficient to pocket the lines.
- 3.13 PIPE SIZE DESIGNATIONS
 - A. All pipe sizes referred to in these Sections should be interpreted as IPS (iron pipe size) unless specifically designated otherwise, such as "O.D." for tubing.

3.14 CUTTING AND PATCHING

A. All cutting, repairing, fitting, and refinishing of in-place construction required for the installation of the Work of a Section, shall be included as part of the Work of that section except as specifically shown on Drawings or hereinafter specified.

- B. Work shall be performed by craftsmen skilled in their respective trades.
- C. Match existing conditions in color, materials, and texture.

3.15 DUCTWORK PIPE AND EQUIPMENT IDENTIFICATION

A. Piping identification shall be as specified in related section. Equipment identification consistent with the markings on the equipment schedule shall be made following finished painting with paint or stencil letters or numerals as approved by the Architect/Engineer.

3.16 CLEANING - GENERAL AREA

- A. Contractor shall assist in maintaining the premises in an orderly fashion at all times, providing continuous clean-up during the construction period. Contractor shall remove all cartons, containers, and crates as soon as the contents have been removed and shall also remove all debris caused by Work as soon as possible. Deposit all discarded materials in a suitable refuse container and prevent these materials from being scattered by the elements. All cartons and debris shall be removed from the premises and site at the sole expense of Contractor.
- B. Contractor shall stack all construction materials associated with his/her Work in areas so as to avoid congestion and interference.
- C. At the completion of the work, the Contractor shall clean all of his/her work and equipment free from dust and other foreign matter and shall leave the work in good housekeeping condition, in a manner acceptable to the Architect/Engineer.

3.17 WIRING DIAGRAMS

A. Contractors shall provide each piece of electrically connected, controlled, or operated equipment with specific wiring diagrams and instructions. Diagrams and instructions shall not be of a general or typical nature but applicable only to the specific job. The diagrams and instructions used to install the equipment shall be identical to that included in the "Operations and Maintenance Manuals".

3.18 SYSTEM START UP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify the Architect/Engineer 7 working days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions which may cause damage.
- D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer. Check ratings of overload relays for each starter.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.

- G. When called for in individual Specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.19 DEMONSTRATION AND INSTRUCTIONS

- A. Provide the services of a competent supervisor or technician to instruct the Owner's personnel in the operation of each piece of equipment/systems installed as specified in the individual sections. Include not less than the time listed for each of the systems. Where required by the individual section of the specifications, provide the services of factory trained specialists to instruct the Owner's personnel in the operation of the equipment/system so specified.
- B. Demonstrate operation and maintenance of products to Owner's personnel, 2 weeks prior to date of completion. Provide an over/outline of the purpose and operation of all equipment installed under this contract.
- C. Demonstrate Project equipment and instruct in a classroom environment for up to 10 people, located at the project site and instructed by a qualified manufacturer's representative who is knowledgeable about the Project. Provide documents for all attendees.
- D. For equipment or systems requiring seasonal operation, perform demonstration for other season within 6 months.
- E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual in detail with the Owner's personnel in detail to explain all aspects of operation and maintenance. Training shall include review of temperature control drawings and schematics.
- F. Demonstrate start-up, operation, control, adjustment, normal & unoccupied operations, system troubleshooting, step by step procedure for determining the source of problems on the system level, component trouble-shooting description of diagnostic procedures for determining the source of the problems on the component level, servicing & maintenance instructions of required procedures for weekly, monthly, and annual preventive checks and timely repairs, sources of spare parts and special tools, and shut-down of each item of equipment at agreed time at designated location.
- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- H. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.
- I. Training shall include a question and answer period.
- J. Training shall include special requirements of tenants for equipment's function.
- K. Training shall include any special issues to maintain warranties.
- L. Training shall include relevant health and safety issues and concerns, and special safety features.
- M. Training shall include Integral Controls Programming, trouble shooting, alarms, manual operation, and interface with Integral Controls.
- N. Training shall include Building Automation Controls Programming, trouble shooting, alarms, manual operation, and interface with Integral Controls.
- O. Training shall include interaction with other systems, and operation during power outage and fire.
- P. Training shall include common trouble shooting issues and methods, control system warnings and error messages including using the control system for diagnosis.
- Q. Digitally record all instructional sessions and demonstrations. Provide two flash drives, labeled with all pertinent information to identify specific equipment or systems, and include in the O & M's.

3.20 LUBRICATION

- A. During the commissioning process and prior to testing, all equipment shall be properly lubricated in accordance with the manufacturer's instructions. One set of tools necessary for lubrication shall be provided by this Contractor.
- B. Except for small electrical motors which, under NEMA Standards, are equipped with lifetime lubrication, all bearings on large motors and mechanical equipment shall be equipped with lubrication fittings at all service points, accessibly located. Oil fill and drain line extensions shall be provided where necessary for convenient servicing of equipment.

3.21 TESTING

- A. Testing all equipment/systems installed shall be the responsibility of the trade installing the Work under the supervision of an Engineer employed by the Contractor except as specified. The Owner shall employ services of an independent firm to perform testing, adjusting and balancing:
 - 1. The independent firm will perform services specified in related section.
 - 2. Reports will be submitted by the independent firm to the Engineer indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.
- B. Furnish all gauges, instruments, test equipment and personnel required for the tests. Adjust all equipment to perform with the least possible noise and vibration consistent with its duty. Quietness of operation of all equipment is a requirement. Any equipment producing noise that is abnormal, in the opinion of the Architect/Engineer, shall be repaired or removed and replaced with satisfactory equipment at no additional expense.
- C. Operate the system and make all adjustments in control and equipment and complete necessary balancing to deliver not less than the air or fluid quantities shown on the Drawings for each equipment item.

3.22 TOOLS

A. On completion of the Work, the Contractor shall furnish and deliver to the Owner any special tools and instrumentation that may be required for the proper servicing or routine testing of any equipment furnished under this Contract.

END OF SECTION 23 0500

SECTION 23 0510

MECHANICAL DEMOLITION & SALVAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Removal of designated construction, equipment and fixtures as indicated on Drawings.
- B. Provide demolition for all areas necessary to receive new work.
- C. Refer to items as scheduled at end of Section.

1.2 RELATED SECTIONS

A. Division 01.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable code for demolition work, safety of structure, and dust control.
- B. Obtain any required permits from the proper authorities.
- C. Do not close or obstruct egress width to exits.
- D. Do not disable or disrupt building fire or life safety systems without 3 day prior written notice to the Owner.
- E. Notify the Owner, architect and engineer if any hazardous or contaminated materials are discovered.
- 1.4 SEQUENCING
 - A. Sequence work so that building services to occupied areas remain in operation with only brief outages.

1.5 SCHEDULING

A. Schedule work to the mutual satisfaction of all parties involved.

1.6 PRE-DEMOLITION CONFERENCE

- A. Convene one week prior to commencing work under this section.
- B. Review demolition procedures and coordination required with related work.
- 1.7 QUALITY ASSURANCE
 - A. Contractor with minimum 5 years documented experience.

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide, erect, and maintain temporary barriers as necessary to protect work to remain in place.
- B. Protect existing materials that are not to be demolished.
- C. Prevent movement of structure; provide required bracing and shoring.
- D. Mark location of utilities.

3.2 DEMOLITION REQUIREMENTS

- A. Conduct demolition necessary to receive new Work.
- B. Conduct demolition to minimize interference with adjacent occupied building areas.
- C. This Contractor to furnish new Work at no extra cost if items scheduled to be re-used after demolition is ruined by the process of demolition.
- D. Cease operations immediately if structure appears to be in danger. Notify A/E. Do not resume operations until directed.
- E. Maintain protected egress and access to the Work.
- F. Unless otherwise noted, this Contractor is responsible for and is to include in his/her proposal the cost for any and all demolition necessary to receive the intended new Work. The Owner shall not be responsible after bidding for any extra costs for demolition of existing materials that must be removed in order that the new scope of work is properly installed.

3.3 DEMOLITION

- A. Demolish in an orderly and careful manner. Protect existing supporting structural members and work to remain in place.
- B. Coordinate demolition with existing mechanical and electrical utilities.
- C. Except where noted otherwise, remove demolished materials from site to an acceptable recycler. Do not burn or bury materials on site.
- D. Remove demolished materials from site as work progresses. Upon completion of work, leave areas in clean condition.
- E. Remove temporary Work.

F. Demolish existing work to receive new Work.

3.4 SALVAGE

- A. Where existing equipment, controllers, control devices, monitoring instruments, specialty insulations or other existing Mechanical or Controls items are indicated to be removed that may still hold value for the Owner, coordinate Owner's salvage requirement prior to demolition.
- B. Where certain existing equipment is known to be desired by the Owner ahead of construction demolition activities, an attempt has been made to indicate this on the Construction Documents. However, not all equipment or control devices may be indicated and it is the Contractor's responsibility to hold a Pre-Demolition Conference with the Owner to determine what items are to be saved and what can be disposed of.

END OF SECTION 23 0510

SECTION 23 0514

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 REFERENCE

- A. All applicable requirements of other portions of the Contract Documents apply to the work of this Section including, but not limited to, General Requirements; and Division 23 Section "General Mechanical Requirements."
- 1.2 DESCRIPTION OF WORK
 - A. Provide variable frequency drives (VFDs) as specified herein.
 - B. The VFD shall consist of a pulse-width-modulating (PWM) inverter for positive speed control for standard NEMA design B induction motors used in HVAC applications. The VFDs will be manufactured by ABB, Danfoss, Yaskawa, or Square D and shall be UL-listed.

1.3 SUBMITTALS

- A. Shop Drawings: Fabrication drawings indicating materials of construction, unit configurations, dimensions, field connection details, support details and installation details.
- B. Product Data
 - 1. All product items specified.
 - 2. Manufacturer's literature and cut sheets.
 - 3. Wiring diagrams.
 - 4. Weights.
 - 5. Temperature/ambient requirements.
 - 6. Noise and sound data.
- C. Samples: Not required for A/E review.
- D. Contract Close-Out Information
 - 1. Operating and maintenance data.
 - 2. Training video.
 - 3. Warranties.

1.4 WARRANTY

- A. The manufacturer shall provide start-up commissioning of the VFD and its optional circuits by a factory-certified service technician. Start-up services shall include checking for verification of proper operation and installation for the VFD, its option, its interface wiring to the building automation system, and programming of any critical frequency rejection points.
- B. The VFD shall be warranted by the manufacturer for a period of 36 months from the date of shipment. The warranty shall include parts and labor.

PART 2 - PRODUCTS

2.1 VARIABLE FREQUENCY DRIVES

- A. VFD systems shall be microprocessor-based and fully transistorized with a conservatively rated 3phase, full-wave diode bridge input and a pwm sine-coded output waveform. Harmonic mitigation hardware shall be provided to limit the current distortion to 3% total harmonic current distortion, when measured at the lugs of the drive. The harmonic mitigation hardware shall be internal to the drive package. The output transistors must be of the insulated gate bipolar transistor (IGBT) type to facilitate noiseless motor operation. The VFDs shall be tested and rated for a minimum of a 20year mean time between failure (MTBF). Provide manufacturer's typical test results or calculations with submittal to verify MTBF.
- B. To minimize electrical and acoustical noise, and to eliminate low-speed cogging, a minimum switching frequency of 15 khz shall be used. The VFD shall not "cog" at frequencies above 1.5 hz. There shall be no sudden frequency shifts as the output frequency is varied between 1.5 and 60hz.
- C. The VFDs input displacement power factor shall be 0.98 or better over the entire operating frequency and load range. Efficiency shall be measured at 96% minimum at rated load. Provide manufacturer's typical test results or calculations with submittal to verify efficiency and power factor.
- D. All VFDs shall have, but shall not be limited to, the following protective features:
 - 1. Solid state output ground fault protection shall be provided.
 - 2. Adaptive electronics motor overload protection shall be provided which shall protect both the motor and the VFD at all frequencies. Electronic thermal overload circuits which only properly protect the motor at full speed shall not be acceptable. The VFD shall sense the load and speed and shall recalibrate the thermal trip curve to ensure low-speed motor protection. The initial trip point shall be adjustable from at least 40% of the VFD continuous rating to account for motor magnetizing current.
 - 3. Input surge protection shall be performed by MOVs (metal oxide varistors) in accordance with ANSI Specification C62.41.1 and C62.41.2.
- E. Opto-coupled isolated control inputs shall be provided. The motor speed shall be directly proportional, or inversely proportional to 0-10 VDC, 4-20 ma, and variable resistance signals. In addition, the VFD shall have independent settings adjustable on the fly for input reference offset (positive and negative) and gain to facilitate signal setting/matching.
- F. VFD operation options shall be programmable, and shall include, at a minimum, the following functions:
 - 1. User-definable speed upon lost reference signal. Drive to indicate fault upon lost signal.
 - 2. The standard protocol shall be BACnet. Each individual drive shall have the protocol in the base VFD. The use of third-party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority. Use of non-certified protocols is not allowed.
 - 3. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed/frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all

analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible. The following additional status indications and settings shall be transmitted over the serial communications bus – keypad "Hand" or "Auto" selected the ability to change the PID set point. The DDC system shall also be able to monitor if the motor is running in the VFD mode over serial communications. A minimum of 15 field parameters shall be capable of being monitored.

- 4. The VFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. This control shall be independent of any VFD function. For example, the analog outputs may be used for modulating chilled water valves or cooling tower bypass valves. The drive's digital (relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. In addition, all of the drive's digital and analog inputs shall be capable of being monitored by the DDC system.
- G. The VFD shall provide the following operational features:
 - 1. "Speed search" transfer. The VFD shall have the ability to start from bypass or fault trip into a spinning load from 100% forward to 100% reverse rotation without stopping the motor or creating a fault condition. The VFD shall match the motor's speed and then drive the motor to its proper speed reference.
 - 2. Programmable current limit.
 - 3. Programmable, "intelligent" auto-restart function. Intelligent auto-restart precludes any attempt to restart in the event of trips typically indicative of component failure.
 - 4. Drive must have power loss ride-through capability, for units 5 HP and larger. In the event of a loss of three-phase power lasting 2 seconds or less, the VFD must have the ability to regain operation without nuisance trips.
 - 5. Critical Frequency Rejection Points: Drives shall be capable of programming up to 3 frequency rejection points to protect the driven equipment from continuous operation at harmful resonance frequencies.
 - 6. The following fault conditions shall cause the VFD to shut down without damage and shall be annunciated via alpha-numeric fault diagnostic (remote annunciation shall be available with a form 'c' fault contact):
 - a. Overload (blow fuse any or all legs/loss of phase)
 - b. Instantaneous over current trip (short circuit)
 - c. DC bus overvoltage
 - d. DC bus under voltage, phase loss protection
 - e. Excessive ambient, VFD heat sink over temperature
 - f. Ground fault input
 - g. Internally diagnosed, control failure
 - h. Motor thermal overload
 - i. VFD thermal overload
 - j. Programmable "shear pin" current trip

2.2 PROGRAMMING/OPERATOR STATION

- A. Include alpha-numeric display of frequency reference, output frequency, output current (accurate +/-3%, regardless of output frequency), output voltage, DC bus voltage, output power (kW), input terminal status, output thermal status, LED lamp check, and EEPROM number.
- B. Alpha-numeric display of faults. Up to 4 sequential faults shall be retained in non-volatile memory (maintained even after removal of input power). All system information (voltage

levels, current levels, etc.) shall be stored for the previous 3 seconds before the last fault in 160 nsec intervals to aid in diagnostics.

- C. VFD systems located outdoors shall be mounted in a NEMA or UL Type 3R enclosure. VFD systems located in indoor wet/damp rooms or indoor rooms with water systems such as chiller or boiler rooms shall be mounted in a NEMA or UL Type 12 enclosure. VFD systems mounted in indoor dry rooms without water systems shall be mounted in a NEMA 1 enclosure. All enclosures shall be provided with the following additional equipment requirements:
 - 1. Door-mounted digital operator control station.
 - 2. Door-interlocked input circuit breaker with flange-mounted pad-lockable operating handle.
 - 3. Three (3) contactor bypass to fully isolate the VFD. The VFD must be able to be removed for testing purposes while the motor is operating in the bypass mode. Bypass systems shall included electronic bypass board with Bacnet integration, manual bypass systems are not acceptable.
 - 4. Output 3-phase current sensing overload relay to provide motor protection in either the VFD or bypass mode.
- D. VFD systems shall be full load tested prior to shipment.
- E. DV/DT All VFDs operating a single motor with a wire distance of more than 300 feet are required to have a DV/DT filter. The DV/DT filter will limit the rated voltage rise over time to prevent the breakdown of motor winding insulation and reduce the motor operating temperature. The DV/DT filter can be mounted internally to the VFD enclosure or supplied externally in close proximity to the VFD. If supplied externally, the DV/DT filter shall be mounted in a NEMA enclosure matching the VFD NEMA enclosure type. The DV/DT filter shall be UL listed.
- F. VFDs operating multiple motors shall be sized based on NEC values for connected FLA of all motors, not based on nominal VFD/motor horsepower.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All equipment shall be installed per manufacturer's recommendations.
- B. Label all control components to match the control and wiring diagrams.
- C. All motors controlled with VFDs shall be provided with a shaft grounding system to electrically insulate bearings to prevent damage due to stay shaft currents.

END OF SECTION 23 0514

SECTION 23 0593

MECHANICAL SYSTEMS TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 REFERENCE

A. All applicable requirements of other portions of the Contract Documents apply to the work of this Section including, but not limited to, Division 01 General Requirements.

1.2 DESCRIPTION OF WORK

A. Work Includes

- 1. Furnishing all labor, materials, tools, equipment, and services to test, balance and adjust all mechanical systems as indicated, in accord with provisions of Contract Documents.
- 2. Complete coordination with work of all other trades.
- B. Test, balance, and adjust following mechanical systems:
 - 1. Fans
 - 2. Instrumentation and control system

1.3 QUALITY ASSURANCE

- A. Agency Qualifications: Independent balance and testing agency, member of the Associated Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).
- B. Balancing Standards: AABC requirements and recommendations.
- 1.4 RESPONSIBILITIES OF TESTING AND BALANCING AGENCY WORK
 - A. Schedule work with trades involved.
 - B. Check, adjust, and balance system components to obtain optimum conditions for function and operation of system.
 - C. Evaluate operation of systems and advise installer of necessary adjustments and corrective measures.
 - D. Prepare and submit test reports.

1.5 RESPONSIBILITIES OF HEATING CONTRACTOR'S WORK

- A. Startup systems and keep in correct operation during balancing operations.
- B. Make personnel accessible to provide necessary adjustments and corrections to systems as directed by balancing agency.
- C. Maintain accessibility to test locations and devices requiring adjustment.
- D. Add dampers required for correct air balance as recommended by the Air Balance Agency.

- E. Provide additional sets of pulleys and belts as recommended by the Air Balance Agency.
- F. Provide to the Test and Balance Agency a complete set of approved Shop Drawings and submittals and a posted set of Mechanical Drawings, indicating any and all changes to the Contract Documents.

1.6 JOB CONDITIONS

- A. Balance at time directed by the Owner.
 - 1. If balancing is not preformed during peak cooling season, demonstrate satisfactory balancing during next peak cooling season.
 - 2. If balancing is not preformed during peak heating season, demonstrate satisfactory balancing during next peak heating season.

1.7 GUARANTEE

- A. Provide extended warranty of 90 days, after completion of test and balance work, during which time the Owner may, at their discretion, request recheck or resetting of any equipment or system which is not performing satisfactorily. Provide technicians to assist as required in making such tests.
- 1.8 SUBMITTALS
 - A. Shop Drawings: Not required for review.
 - B. Product Data: Not required for review.
 - C. Samples: Not required for review.
 - D. Reference Submittals: Qualifications of balancing agency and sample report forms.
 - E. Contract Closeout Information
 - 1. Balancing Reports
 - a. Use forms similar to AABC latest edition.
 - b. Report to include the following:
 - 1) All specified data.
 - 2) All equipment nameplate information.
 - 3) All traverse readings.
 - 4) Line sketch/diagram indicating location of traverses.
 - 5) Static pressure profiles.
 - 6) AABC equipment data sheets.
 - 7) Fan and pump curves.
 - 8) Temperature readings (all air and water streams)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Accurately calibrate and maintain all test instruments in good working order.

- 1. If requested, conduct tests of instruments in the presence of the Owner.
- B. If requested, conduct balancing tests in the presence of the Owner.
- C. Do not begin balancing until the system(s) have been completed and are in good working order.
- D. Record all inspections, tests, and adjustments.

3.2 EXISTING AIRFLOW TEST

- A. Prior to demolition and replacement of fan motors, perform airflow tests on existing units to verify current airflow and report results back to Engineer.
 - 1. Intent is to verify existing airflows to be matched after replacement. Previous fan performance data provided on schedules for reference.

3.3 AIR BALANCE TESTING PROCEDURE

- A. Perform tests and balance system in accord with the following.
- B. Test and adjust equipment capacity to design requirements and record RPM.
- C. Test motor load amperes and fan rotations.
- D. Make pitot tube traverse of main supply ducts and obtain CFM at fans. Provide fan curves and plots.
- E. Test system static pressure, suction and discharge.
- F. Test and adjust system for design CFM outside and return air:
 - 1. Maximum outside air setting.
 - 2. Minimum outside air setting.
- G. Test and adjust system for design CFM outside air.
- H. In cooperation with control manufacturer's representative, set automatically operated dampers to operate as indicated.
 - 1. Check all controls for proper calibration and list all controls requiring adjustment by control installers.
- I. Make any changes in pulleys, belts, and dampers, to achieve capacity.
- J. List all mechanical nameplate and specifications of fans.
- 3.4 OPERATING TEST
 - A. After systems are balanced, conduct operating test of not less than 8 hours' duration each for heating and cooling systems to demonstrate to satisfaction of the Owner that systems comply with requirements of plans and specifications, and that all equipment and controls are functioning properly.

END OF SECTION 23 0593

SECTION 250100

ELECTRIC MOTORS AND OTHER ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

PART 1 – GENERAL

- 1.1 The Contractor's attention is directed to the GENERAL MECHANICAL REQUIREMENTS and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- 1.2 Through coordination with other Contractors, Vendors and Suppliers associated with this Project, this Contractor shall ensure a complete, 100% functional, tested, inspected, and approved systems. Claims for additional cost or change orders will immediately be rejected. All equipment shall be furnished for a single point electrical connection unless specifically excluded as a requirement.
- 1.3 Review the Specification Section CONTROLS to determine controls, including variable frequency drives, to be furnished.
- 1.4 Prior to ordering any materials or rough-in of any kind, the Mechanical Contractor shall be responsible for final coordination of all electrical requirements (i.e., voltage, phase, circuit breaker, wire sizing, etc.) with the Electrical Contractor. There will be no change in the Contract Amount for any discrepancies. A final coordination meeting shall be held with the Architect, Owner, Engineer, General Contractor, Mechanical Contractor, Electrical Contractor, and their sub-contractors.

PART 2 - MOTORS:

- 2.1 The following are basic requirements for simple or common motors.
- 2.2 Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
- 2.3 Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
- 2.4 Motors shall be capable of frequency of starts not less than five (5) evenly time spaced starts per hour for manually controlled motors.
- 2.5 Motors shall have a 1.15 service factor for poly-phase motors.
- 2.6 Provide inverter rated motors where variable frequency drives are utilized. Motor shall be premium efficiency type with Class F insulation and shall conform to NEMA MG 1 parts 30 and 31. Inverter duty rated motors shall have a temperature rating for 40 deg C ambient environment with maximum of 105 deg C temperature rise.
- 2.7 Motor bearings shall be ball or roller bearings with inner and outer shaft seals. Bearings shall be re-greasable, except permanently sealed where motor is normally inaccessible for regular

maintenance. Bearings shall be designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

- 2.8 Motor enclosure type shall be open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation. Enclosures shall be guarded drip-proof type motors where exposed to contact by employees or building occupants. Enclosure shall be weather protected Type I for outdoor use or Type II where not housed.
- 2.9 Provide built-in thermal overload protection and, where required, internal sensing device suitable for signaling and stopping motor at starter.
- 2.10 Provide premium efficient motors with a minimum EPACT efficiency in accordance with NEMA MG 1, Table 12-11 and 12-12 for 1800 rpm, enclosed motors. If efficiency not specified, motors shall have a minimum efficiency as listed below:

1 hp - 85.5%	7.5 hp – 91.7%	30 hp - 93.6%
1.5 hp – 86.5%	10 hp – 91.7%	40 hp – 94.1%
2 hp - 86.5%	15 hp – 92.4%	50 hp – 94.5%
3 hp - 89.5%	20 hp – 93.0%	60 hp – 95.0%
5 hp - 89.5%	25 hp – 93.6%	75 hp – 95.4%

2.11 On the motor nameplate, indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

PART 3 – <u>MOTOR VFDS</u>:

3.1 Refer to Section 230514

PART 4 – <u>ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT:</u>

- 4.1 All mechanical equipment shall be provided for single point electrical connection unless noted otherwise.
- 4.2 The equipment manufacturer shall provide internally mounted fuses with the equipment, as required, to comply with the U.L. listing on the equipment name plate. (i.e., hermetically sealed compressors or equipment with name plate data that recommends or requires fuse protection.) See also, National Electrical Code, Article 440, Part C, and other applicable sections of the N.E.C.
- 4.3 It shall be the Contractor's responsibility to assure that all mechanical equipment requiring electrical connections be provided with all required proper wiring, electrical protective devices, disconnecting means and electro-mechanical starting units to properly match the mechanical equipment requirement.
- 4.4 Each separate contractor engaged for the project shall coordinate with all other trades to ensure all necessary equipment and labor is included for fully functioning mechanical systems, installed per Code and Project requirements.
- 4.5 Refrigeration condensing units with internal compressors shall be furnished with integral starter.
- 4.6 All interlock or other control wiring, unless specifically noted otherwise, is the responsibility of this Contractor.

- 4.7 All equipment shall be suitably enclosed. All enclosures for equipment shall be rated and approved for the environment in which it operates. (i.e., NEMA 1, NEMA 3R, NEMA 7, NEMA 12, etc.) Verify the requirement with the installation condition if not indicated on the plans.
- 4.8 Observe the following standards for manufacture of equipment and in selection of components: (1) Starters, control devices and assemblies - NEMA (I.E.C. style not acceptable), (2) Enclosures for electrical equipment – NEMA, (3) Enclosed switches – NEMA, (4) All electrical work, generally NFPA 70, (5) All electrical work in industrial occupancies - J.I.C. standards, (6) All electrical components and materials - U.L. listing required.
- 4.9 Where scheduled on the drawings, provide disconnect switches and contactors. Disconnect switches shall be fusible type or circuit breaker type.

END OF SECTION 25 0100

SECTION 250400

CONTROL - DIRECT DIGITAL

PART 1 – <u>GENERAL</u>:

- 1.1 The Trane Tracer SC building automation system front end for the air handlers and return fans is existing to remain. All control interface hardware, services, installation, warranty, training, etc., shall be included as hereinafter specified including such minor details not specifically mentioned or shown as may be necessary for the complete integration and operation of the system.
- 1.2 The Temperature Control Contractor (TCC) shall furnish all labor, materials, equipment, and service necessary for integration utilizing Direct Digital Controls. All labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned shall be included for the complete, fully functional and commissioned integration.
- 1.3 The TCC shall provide all items, articles, materials, devices, operations or methods listed, mentioned or scheduled on the drawings including all labor, materials, equipment and incidentals necessary and required for their completion. This will include connecting to any mechanical equipment furnished with a control interface device and contacting the equipment suppliers and/or manufacturers for information for the proper interface to the equipment being furnished.
- 1.4 These apparatuses shall consist of the necessary accessories for the complete control of all equipment hereinafter specified. Updated control sequences are noted on the drawings. Provide all control equipment required to perform the sequences described.
- 1.5 Include all power wiring and cabling for the operation of the controls system. Refer to Electrical Division Specifications for additional requirements.
- 1.6 A mandatory pre-installation meeting shall occur prior to the TCC beginning any work on site. This meeting shall be attended by the Mechanical Contractor Superintendent, TCC Superintendent, Engineer, and Owner. The purpose of the meeting is to have the controls installer communicate their understanding of the system design and how the system is intended operate to the Engineer and get the Engineer's input and agreement. The agreement between the TCC and the Mechanical Engineer is to be thoroughly documented by the TCC for later reference.
- 1.7 The installation shall comply with the Local Authorities and State Fire Marshal code requirements, including normal operating and smoke mode functions (where applicable). The installation shall comply with the requirements of the NEC, NFPA, UL and the Building Codes, including referenced mechanical, electrical, energy codes, etc.
- 1.8 Abbreviations
 - TCC Temperature Control Contractor

- 1.9 The TCC shall list the following cost breakdowns, material and labor, on the official project schedule of values.
 - Controls Front End Interface
 - Controls Commissioning Plan
 - Controls Shop Drawings
 - Controls Graphics
 - Controls Materials and Labor
 - Controls Startup, Commissioning, Testing, Documentation
 - Controls Training and Owner Acceptance
 - Controls Record Drawings

PART 2 – GENERAL SYSTEM REQUIREMENTS:

- 2.1 All labeling for this system shall utilize existing names and numbers. Coordinate with the Owner to ensure compliance.
- 2.2 Include in the bid for the Controls Contractor to perform 16 additional on-site hours of on-site programming, adjustments, modifications, etc. as requested by the Engineer during the warranty period after the date of substantial completion for the project.
- 2.3 All points of user interface shall be on standard PCs that do not require the purchase of any special software from the control's manufacturer for use as a building operations terminal.
- 2.4 The TCC shall connect to any mechanical and electrical equipment furnished with a control interface device. The TCC shall contact the equipment suppliers and/or manufacturers for information for the proper interface to the equipment being furnished. All points not provided with the equipment control interface are the responsibility of the TCC.
- 2.5 The TCC shall all have access to Direct Digital Control (DDC) system via the Owner's Wide Area Network (WAN) and/or Local Area Network (LAN).
- 2.6 The TCC shall be responsible for coordination with the Owner's IT staff to ensure that their system will perform in the Owner's environment without disruption to any of the other activities taking place on that WAN/LAN.

PART 3 – SUBMITTALS:

- 3.1 The TCC shall not start the project installation until the shop drawing submittals have been reviewed by the Engineer.
- 3.2 Submittals shall include hardware, end devices, ancillary control components, a written operating sequence, unitary control wiring, building floor plans showing communication cabling and labels as well as logic flow diagrams. All submittals shall be provided on paper and electronically in PDF format.
- 3.3 Submittals shall contain one control drawing per specified system and equipment. Drawing shall include point descriptors (DI, DO, AI, AO), addressing, and point names. Each point name shall be unique (within a system and between systems). For example, the point named for the mixed air temperature for AHU #1 and AHU #2 shall not be MAT but should be named AHU#1MAT, and AHU#2MAT. The point names should be logical and consistent between systems and AHU's. The

abbreviation or shorthand notation (e.g., MAT) shall be clearly defined in writing by the TCC.

- 3.4 Control diagrams shall identify: System being controlled (attach abbreviated control logic text, all digital points, analog points, virtual points, all functions logic, math, and control) within control loop, legend for graphical icons or symbols, definition of variables or point names and detailed electric connections to all control devices and sensors.
- 3.5 Points list shall include all physical input/output. Points list shall be provided in both hard copy and in electronic format and shall include: Name, address, engineering units, high and low alarm values and alarm differentials for return to normal condition, default value to be used when the normal controlling value is not reporting, message and alarm reporting as specified, identification of all adjustable points and description of all points.
- 3.6 Submittals shall contain floor plans depicting applicable DDC control devices (control units, network devices, LAN interface devices, and power transformers as well as static pressure sensor in duct and temperature sensors in rooms) in relation to mechanical rooms, HVAC equipment, and building footprint.
- 3.7 Submittals shall contain DDC system architecture diagram indicating schematic location of all applicable control units, workstations, LAN Interface devices, gateways, etc. Indicate address and type for each control unit, Indicate protocol, baud rate, and type of LAN per control unit.
- 3.8 Electrical wiring diagrams shall include motor start, control, and safety circuits and detailed digital interface panel control point termination diagrams with all wire numbers and terminal block numbers identified. Indicate all required electrical wiring. Provide panel termination drawings on separate drawings. Clearly differentiate between portions of wiring that are existing, factory-installed and portions to be field-installed.
- 3.9 Show all electric connections of the controls system to equipment furnished by others complete to terminal points identified with manufacturer's terminal recommendations.
- 3.10 TCC shall provide one complete drawing that shows the control-wiring interface with equipment provided by others.
- 3.11 Submittals shall include project specific graphic screens for each existing system including a picture of the screen with a list of the variables to be placed on the screen.
- 3.12 Submittals shall include TCC's hardware checkout sheets and test reports.
- 3.13 Submittals shall include the agenda for approval by the engineer and owner of the specified training periods. See training section for requirements.

PART 4 – O&M MANUALS AND CLOSEOUT DOCUMENTS:

4.1 Operating instructions, maintenance procedures, parts and repair manuals shall be supplied. Repair manuals shall include detailed instructions in the set-up, calibration, repair and maintenance of all equipment furnished. Also supplied with these manuals will be a complete parts listing of all devices supplied which is to include part numbers and model numbers of all parts and component parts along with exploded views of devices.

- 4.2 All as built drawings (wiring diagrams, flowcharts, floor plans, etc.) shall also be supplied to the owner electronically in PDF format.
- 4.3 System specific wiring, control diagrams, sequence of operation and points lists shall be as installed in each control panel. This means as-built drawings, not design (submittal) drawings.
- 4.4 Supply one copy of the software programming manual (hard copy and PDF format). The manual shall describe all furnished software. The manual shall be oriented to programmers and shall describe calling requirements, data exchange requirements, data file requirements, and other information necessary to enable proper integration, loading, testing, and program execution.
- 4.5 Provide a Bill of Materials with each schematic drawing. List all devices/equipment and match to schematic and actual field labeling. Provide quantity, manufacturer, actual product ordering number, description, size, accuracy, operating ranges (voltage, temperature, pressure, etc.), input/output parameters, etc.
- 4.6 Maintenance manual shall include copies of signed-off acceptance test forms, commissioning reports, start-up reports, etc.
- 4.7 The TCC shall turn over to owner two (2) sets of computerized back-ups of the complete temperature control system.

PART 5 – <u>WARRANTY</u>:

- 5.1 Labor and materials for the specified control system integration shall be warranted free from defects for a period of <u>24 months</u> after substantial completion <u>and</u> acceptance. Failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner.
- 5.2 The TCC shall respond to the Owner's request for warranty service within 24 hours during normal business hours. The TCC shall respond to the Owner's request for Emergency service (defined as life-threatening or creating the potential to cause property damage) during the warranty period within 4 hours.
- 5.3 The TCC shall provide technical phone support to the owner during the warranty period for warranty related issues and for two years after the warranty period. If the technical support location of the TCC is outside of the toll-free calling area for the customer, the TCC shall have a toll-free number or accept collect calls for the purpose of providing technical support.
- 5.4 During the warranty period, standard parts for the DDC system shall arrive at the facility within 48 hours of placing an order. Non-standard parts (requiring re-manufacturing or ordering from another supplier) shall be shipped within 96 hours.

PART 6 – <u>TRAINING</u>:

6.1 A formal on-site "Hands On" training session shall be conducted for the owner's maintenance personnel. This session shall be a minimum of one (1) eight (8) hour day to train the staff on setup, operation, and maintenance of newly integrated system(s) and/or devices. This will be at a time and location selected by the owner. One (1) additional eight (8) hour session shall be provided as "opposite season" training – generally 6 months into the warranty period. Two (2) additional eight (8) hour sessions shall be provided at a later date. (This may be requested any time during the

warranty period.) All training materials and books shall be provided. Both sessions shall be given by the manufacturer's "factory" technical representative. (This is defined as someone other than the installing contractor's representative.) All expenses are to be provided by the TCC. All training sessions shall be scheduled at the owner's request.

- 6.2 TCC shall conduct training courses for designated personnel in operation and maintenance of system. Training shall be oriented to specific system being installed under his contract and shall be digitally recorded and submitted on DVD by the TCC.
- 6.3 Training shall be a mix of test exercises and actual keyboard entry and screen viewing at the operator's terminal. A curriculum shall be discussed and implemented based on the level of expertise of the employees. Hands-on experience and problem solving shall be emphasized.
- 6.4 If during any training session, the trainer/owner finds more than three (3) items that need repair, the training session will be immediately terminated. The session will be rescheduled for another date. The re-scheduled training session will be carried out at no additional cost to the Owner.
- 6.5 The training shall be oriented to making the owner self sufficient in the day-to-day use and operation of the DDC system.
- 6.6 Additionally, the training shall include:
 - System start-up, shutdowns, power outage and restart routines, alarms, security levels, changing setpoints, changing schedules and other parameters, overrides, freeze protection, manual operation, return to automatic operation, and resetting equipment.
 - All screen modifications shall be discussed, allowing time for questions.
 - Information specifically focused on showing the owner methods of troubleshooting the mechanical systems using the DDC.
 - Creating, modifying, viewing, downloading, and reloading, trend logs.
 - The trainer must be well grounded in both DDC system operation and in mechanical systems service and shall be the programmer.

PART 7 – <u>COMMISSIONING & VERIFICATION, FUNCTIONAL PERFORMANCE TESTING &</u> <u>CHECKLISTS:</u>

- 7.1 100% compliance with the requirements of this section is a condition of the Owner's acceptance and start of the warranty period.
- 7.2 The TCC shall be responsible for completion of (1) their hardware checkout sheets and test reports,
 (2) Point-by-point confirmations of ALL points this includes visual inspection of installed components, and (3) sequence of operation confirmation.
- 7.3 This documentation and process shall be complete, approved and accepted by Engineer and Owner prior to acceptance. This information shall be documented as completed. A copy shall be delivered to the Engineer and Owner and included in the O&M manuals. Each subcontractor shall be responsible for the completion of their own System Verification Checklists/Manufacturer's Checklists. Sample checklists shall be submitted to the Engineer and Testing Agent for approval.
- 7.4 Refer to Mechanical Specification Section GENERAL PROVISIONS for additional information and requirements.

PART 8 - WIRE MANAGEMENT, ELECTRICAL POWER, ETC:

- 8.1 Refer to CABLING section of this specification for additional requirements.
- 8.2 Electrical work required for system interlock and installation of the temperature control integration shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.
- 8.3 The TCC shall be responsible for the power source to any control panels, unitary controllers, etc. on any controlled equipment and all other control power requirements. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.
- 8.4 PRIOR TO INSTALLATION, ENSURE THROUGH COORDINATION WITH ALL TRADES, THAT APPROPRIATE CLEARANCES (36" MINIMUM) AS REQUIRED BY THE N.E.C. ARE MAINTAINED AT ALL CONTROL PANELS, INCLUDING UNITARY CONTROLLERS.
- 8.5 All control circuits within the electrical panels shall be marked to indicate equipment served.
- 8.6 The TCC shall perform all temperature control interlock wiring. This shall include control valves, dampers, thermostats, indoor/outdoor HVAC systems, etc. Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.
- 8.7 The TCC shall be responsible for any power required for the unitary controls or control panels. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.
- 8.8 All wiring shall be continuous runs. Any junctions must be made in metal enclosure.
- 8.9 Grounding terminals shall be color coded green and yellow and shall be compatible with the other specialty terminals specified above and shall mount on the same DIN rail system. Units shall be arranged so that the wiring connected to them is grounded to the enclosure via the mounting rail. These terminals shall be provided for grounding cable shields at the points where the cables enter a control panel and terminate on the control panel terminal strip. Terminals shall be Entrelec M 4/5.3A.PI or equivalent by Weidmuller, Phoenix, or Allen Bradley.
- 8.10 Any new conventional HVAC control panels shall be certified as being constructed and wired in accordance with NFPA 70 110.3 (a) (1) and article 409.
- 8.11 Contractor shall insure control panels have an identification label stating the "Certification Agency" such as UL, CSA, CE, etc. or a label of certification for each control panel by a Professional Engineer (P.E.) registered in the State the project is taking place, stating that the design of the control panel was under their direct supervisory control. Include with shop drawings.
- 8.12 Only a licensed electrical contractor with a licensed Master Electrician and a licensed on-site electrician can install the electrical wiring for lighting controls systems or Building Automation Systems (BAS).

PART 9 – <u>CABLING</u>:

- 9.1 Refer to WIRE MANAGEMENT section of this specification for additional requirements.
- 9.2 Acceptable cable manufacturers are Belden, West Penn or Alpha.
- 9.3 A complete cabling system shall be furnished and installed, which shall adhere to the highest workmanlike standard of quality and appearance. Cabling shall be installed square with building lines and contained within a wire management system.
- 9.4 All sizing of cabling shall be according to manufacturer's recommendations.
- 9.5 Furnish a floor plan of the building indicating communication cable labeling and routing as well as addresses and branch wiring from the unitary devices. All cabling shall be labeled on both ends. The type, size and label of all cabling shall be indicated on submittal floor plan drawings.
- 9.6 All cabling shall be stranded. "NO" solid conductors will be accepted. All cabling shall be 100% shielded with appropriate drain wire and insulation.
- 9.7 All cable connections shall be continuous run (including shield). Any junctions must be made in a metal enclosure, connections must be soldered or wire nuts, taped and the metal enclosure must be mechanically attached to the nearest ground. No crimped connections will be accepted. Note location of junction boxes on the as built floor plans. All cabling networking unitary controllers, and other networked equipment, shall be in soldered.
- 9.8 All shields must be terminated as per manufacturer's recommendation. Shield termination requirements by the manufacturer must be provided with submittals.

PART 10 - VARIABLE FREQUENCY DRIVES (VFDs):

- 10.1 The work includes all labor, materials, and related items to completely furnish and install, start up and test, and place into service the Variable Frequency Drives (VFDs) indicated and scheduled on the Drawings and described in the Specifications.
- 10.2 Refer to section 230514 for Variable Frequency Drive specification.
- 10.3 The VFD shall include (2) Analog inputs either 4–20 made or 0-10 vdc, (6) programmable Digital Inputs, (2) Programmable analog Outputs, (3) Form C Relay output rated 2 amps continuous minimum, and (2) PID Process controllers.
- 10.4 The drive shall have embedded serial communication capabilities that allow direct connection to Trane Tracer SC automation system as part of the drives software suite without the need for extra hardware cards or gateways. The drive shall be capable of interfacing with BACnet.
- 10.5 All VFDs shall be provided and installed in strict accordance with the manufacturer's recommendations.
- 10.6 Factory-authorized startup for each drive is mandatory. Provide a written record of the startup of each unit. Start up and programming by a factory-authorized technician. At startup, lockout any speed with the VFD that does not meet the vibration allowanced of the equipment manufacturers.

PART 11 – <u>GRAPHICS SCREENS AND TRENDS:</u>

- 11.1 Existing graphics screens to remain and VFDs added. All new graphics shall match the existing system graphics.
- 11.2 Current VFD status and operating conditions shall be monitored through its communications interface port. The following points shall be monitored and trended through the VFD interface as follows:

	Hardware Points			Software Points						
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Motor Speed RPM					×			×		×
Motor Frequency Hertz					×			×		×
Motor Current Amps					×			×		×
Motor Runtime					×					×
VFD Status						×		×		×
In Fault Condition						×		×	×	×
In Bypass						×		×	×	×
Totals	0	0	0	0	4	3	0	6	2	7

Total Hardware (0)

Total Software (15)

PART 12 - TIME SCHEDULES (ALL TIMES SHALL BE USER ADJUSTABLE):

- 12.1 During construction, the time schedule will be coordinated with the Owner for all times seven (7) days a week.
- 12.2 When the system is fully tested and operational and after the Owner's staff have been fully instructed as to the operation of the system the schedule shall be as follows unless otherwise instructed:
- 12.3 Each piece of equipment shall have its own adjustable time schedule.
- 12.4 All schedules shall be coordinated and confirmed with the Owner prior to final implementation.

END OF SECTION 25 0400

INDEX

DIVISION 26 – ELECTRICAL

260501- General Provisions - Electrical	. 260501-1	thru	23
260502- Scope of the Electrical Work	260502-1	thru	2
260503- Shop Drawings, Etc.	260503-1	thru	3
260504- Sleeving, Cutting, Patching & Repairing for Electrical Systems	260504-1	thru	4
260508- Coordination Among Trades, Systems Interfacing and Connection of			
Equipment Furnished by Others	260508-1	thru	3
260519- Low-Voltage Electrical Power, Conductors, Cables, Splicing Devices			
and Connectors	. 260519-1	thru	7
260526- Grounding and Bonding	260526-1	thru	7
260529- Hangers and Supports for Electrical Systems	260529-1	thru	7
260533- Raceways & Fittings for Electrical Systems	. 260533-1	thru	13
260535- Cabinets, Outlet Boxes & Pull Boxes for Electrical Systems	. 260535-1	thru	4
260553- Identifications for Electrical Systems	. 260553-1	thru	6
262813- Fuses	. 262813-1	thru	4
262816- Enclosed Switches and Circuit Breakers	. 262816-1	thru	5

DIVISION 26 – ELECTRICAL

SECTION 260501 - GENERAL PROVISIONS - ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special, and Supplementary Conditions, and Divisions 00 and 01 Specification Sections, apply to this Section.
- B. The Instructions to Bidders, General and Special Conditions, and all other contract documents shall apply to the Contractor's work as well as to each of his Sub Contractor's work. Each Contractor is directed to familiarize himself in detail with all documents pertinent to this Contract. In case of conflict between these General Provisions and the General and/or Special Conditions, the affected Contractor shall contact the Engineer for clarification and final determination.
- C. Each Contractor shall be governed by any alternates, unit prices and Addenda or other contract documents insofar as they may affect his part of the work.

1.2 SUMMARY

- A. The work included in this division consists of the furnishing of all labor, equipment, transportation, supplies, material and appurtenances and performing all operations necessary for the satisfactory installation of complete and operating Electrical Systems indicated on the drawings and/or specified herein.
- B. Any materials, labor, equipment or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Electrical Systems in a substantial manner, in compliance with the requirements stated, implied, or intended in the drawings and specifications, shall be included as part of this Contract. The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten days prior to bid. In the absence of such written notice and by the act of submitting his bid, it shall be understood that the Contractor has included the cost of all required items in his bid, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensations.
- C. It is not the intent of this Section of the Specifications to make any Contractor, other than the General Contractor, Prime Contractor, Construction Manager responsible to the Owner. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be routed through the Construction Manager to the to the Engineer. Also, this Section of the Specifications shall not be construed as an attempt to arbitrarily assign responsibility of work, material, equipment or services to a particular trade or Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be optional.
- D. This section of the Specifications or the arrangement of the Contract Documents shall not be construed as an attempt to arbitrarily assign responsibility for work, material, equipment or services to a particular trade Contractor or Sub-Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be the responsibility of the Contractor holding the Prime Contract.
- E. It is the intent of this Contract to deliver to the Owners a "like new" project once work is complete. Although plans and specifications are complete to the extent possible, it shall be responsibility of the Contractors involved to remove and/or relocate or re-attach any existing or new systems which interfere with new equipment or materials to be installed by other trades without additional cost to the Owner.
- F. In general, and to the extent possible, all work shall be accomplished without interruption of the existing facilities' operations. Each Contractor shall advise the Owner and Engineer in writing at least one week prior to the deliberate interruption of any services. The Owners shall be advised of the exact time that interruption will occur and the length of time the interruption will occur. Failure to comply with this requirement may result in complete work stoppage by the Contractors involved until a complete schedule

of interruptions can be developed. Contractor will not be entitled to additional compensation due to work stoppage mandated by unscheduled interruption.

- G. Whenever utilities are interrupted, either deliberately or accidentally, the Contractor shall work continuously to restore said service. The Contractor shall provide tools, materials, skilled journeymen of his own and other trades as necessary, premium time as needed and coordination with all applicable utilities, including payment of utility company charges (if any), all without requests for extra compensation to the Owner, except where otherwise provided for in the contract for the work. The Contractor shall abide by the requirements of the Special Conditions and the Owner's outage request program.
- H. Required Notices: Ten days prior to the submission of a proposal, each proposer shall give written notice to the Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, Proposers signify that they have included the cost of all required items in the proposal and that the Proposer will be responsible for the safe and satisfactory operation of the entire system.
- I. Any reference within these specifications to a specific entity, i.e., "Electrical Contractor" is not to be construed as an attempt to limit or define the scope of work for that entity or assign work to a specific trade or contracting entity. Such assignments of responsibility are the responsibility of the Contractor or Construction Manager holding the prime contract, unless otherwise provided herein.
- J. In each of the specifications and drawings referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.3 DEFINITIONS AND ABBREVIATIONS

- A. Prime Contractor The Contractor who has been engaged by the Owner in a contractual relationship to accomplish the work.
- B. Contractor Any Contractor whether bidding, proposing or working independently or under the supervision of a General Contractor, Prime Contractor, Construction Manager and who installs any type of Electrical Work as specified in the Contract Documents.
- C. Electrical Contractor Any Contractor whether bidding or working independently or under the supervision of a General Contractor, that is: the one holding the Prime Contract and who installs any type of Electrical work, such as: power, lighting, television, telecommunications, data, fiber optic, intercom, fire detection and alarm, security, video, underground or overhead electrical, etc.
- D. Electrical Sub-Contractor Each or any Contractor contracted to, or employed by, the Electrical Contractor for any work required by the Electrical Contractor.
- E. Engineer The Consulting Mechanical-Electrical Engineer either consulting to the Owner, or Other, etc. In this case: CMTA, Inc., Consulting Engineers.
- F. Contract Documents All documents pertinent to the quality and quantity of work to be performed on this project. Includes, but not limited to: Plans, Specifications, Instructions to Bidders, General and Special Conditions, Addenda, Alternates, Lists of Materials, Lists of Sub-Contractors, Unit Prices, Shop Drawings, Field Orders, Change Orders, Cost Breakdowns, Schedules of Value, Periodical Payment Requests, Construction Manager's Assignments, Construction Contract with Owner, etc.
- G. Bidder/Proposer Any person, agency or entity submitting a proposal to any person, agency or entity for any part of the work required under this contract.
- H. The Project All of the work required under this Contract.
- I. Furnish Deliver to the site in good condition and turn over to the Contractor who is to install.
- J. Provide Furnish and install complete, tested and ready for operation.
- K. Install Install equipment furnished by others in complete working order.

- L. Indicated Listed in the Specifications, shown on the Plans or Addenda thereto.
- M. Basis of Design (BOD): Documentation of primary thought processes and assumptions behind design decisions made to meet design intent. Describes systems, components, conditions and methods chosen to meet intent.
- N. Monitoring: Recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or trending capabilities of control systems.
- O. Start-up: The activities where systems or equipment are initially tested and operated. Start-up is completed prior to functional testing.
- P. Vendor: Supplier of equipment.
- Q. Typical or Typ- Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.
- R. Abbreviations:
 - 1. ADA Americans with Disabilities Act.
 - 2. AFF Above Finished Floor
 - 3. AFG Above Finished Grade
 - 4. AIC Amps Interrupting Capacity
 - 5. ANSI American National Standards Institute.
 - 6. ASA American Standards Association.
 - 7. ASTM American Society for Testing Materials.
 - 8. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers.
 - 9. BAS Building Automation System.
 - 10. BICSI Building Industry Consulting Services International
 - 11. CM Construction Manager
 - 12. EC Electrical Contractor
 - 13. EM Emergency
 - 14. FCC United States Federal Communications Commission
 - 15. FLA Full Load Amps
 - 16. GC General Contractor
 - 17. IECC International Energy Conservation Code
 - 18. IEEE Institute of Electrical and Electronics Engineers.
 - 19. IESNA Illuminating Engineering Society of North America
 - 20. ISO International Standards Organization.
 - 21. LRA Locked Rotor Amps
 - 22. MC Mechanical Contractor
 - 23. MCA Minimum Circuit Ampacity
 - 24. MOCP Maximum Overcurrent Protection
 - 25. NEC National Electrical Code (NFPA 70).
 - 26. NECA Standards for Installation.
 - 27. NEMA National Electrical Manufacturers Association.
 - 28. NESC National Electrical Safety Code.
 - 29. NFPA National Fire Protection Association.
 - 30. NRTL: Nationally Recognized Testing Laboratory
 - 31. N/A Not Applicable
 - 32. OBC Ohio Building Code
 - 33. OSHA Office of Safety and Health Administration.
 - 34. PC Plumbing Contractor
 - 35. SPD: Surge Protection Device
 - 36. TIA Telecommunications Industry Association
 - 37. RFI Request for Information
 - 38. RIO Rough-in Only
 - 39. UL Underwriters Laboratories, Inc.
 - 40. UON Unless otherwise noted.

1.4 SYSTEM COMMISSIONING

- A. Section 019113 requires the engagement of a Commissioning Authority to document the completion of the Mechanical, Fire Protection, Plumbing, Electrical, Electronic Safety and Security, and associated Control Systems for the project. Section 019113 defines the roles and responsibilities of each member of the commissioning team.
- B. Comply with the requirements of Section 019113 for the commissioning of the various building systems.

1.5 INTENT AND INTERPRETATION

- A. It is the intent of these specifications and all associated drawings that the Contractor provide finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete, tested and ready for operation."
- B. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.
- C. It is the intention of the Contract Documents to call for a complete and operational system, including all components, accessories, finish work, etc. as necessary for trouble free operation; tested and ready for operation. Anything that may be required, implied, or inferred by the Contract Documents shall be provided and included as part of the Bid.
- D. All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the proposed equipment and materials with specific manufacturer's installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer's installation requirements whether specifically detailed or not within the Plans and Specifications.
- E. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.
- F. The Bidder/Proposer shall completely review the Contract Documents. Any interpretation as to design intent or scope shall be provided by the Engineer. Should an interpretation be required, the Bidder/Proposer shall request a clarification not less than ten (10) days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event of any conflict, discrepancy, or inconsistency develops; the interpretation of the Engineer shall be final.
- G. The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten (10) days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost of all required items in the bid, and that will be responsible for the approved satisfactory functioning of the entire system without extra compensations.

1.6 ELECTRICAL DRAWINGS AND SPECIFICATIONS

- A. The drawings are diagrammatic only and indicate the general arrangement of the systems and are to be followed insofar as possible. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted in writing to the Engineer for approval before proceeding with the work. The Contract Drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Contractors shall, however, anticipate that additional offsets may be required and submit their bid accordingly.
- B. The drawings and specifications are intended to supplement each other. No Contractor, bidder, proposer or supplier shall take advantage of conflict between them, or between parts of either, but should this condition exist, the Contractor or supplier shall request a clarification of the condition at least ten days prior to the submission of bids so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be the determining factor. In all

instances, unless modified in writing and agreed upon by all parties thereto, the Contract to accomplish the work shall be binding on the affected Contractor.

- C. The drawings and specifications shall be considered to be cooperative and complimentary and anything appearing in the specifications which may not be indicated on the drawings or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.
- D. This Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.
- E. The Engineer shall reserve the right to make minor adjustments in location of conduit, fixtures, outlets, switches, etc., where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance.
- F. Where the location of Electrical equipment may interfere with ceiling heights, the Contractor shall call this to the attention of the Engineer in writing prior to making the installation. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work on the part of the Contractor or unduly delay the work.
- G. Should overlap of work between the various trades become evident, this shall be called to the attention of the Engineer. In such an event, neither trade shall assume that he is to be relieved of the work which is specified under his branch until instructions in writing are received from the Engineer.
- H. The Electrical drawings are intended to show the approximate location of equipment, materials, etc. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions whether given in figures or scaled shall be verified in the field. In case of conflict between small and large scale drawings, the larger scale drawings shall take precedence.
- I. The Electrical Contractor and his Sub-Contractors shall review all drawings in detail as they may relate to his work (structural, site survey, mechanical, etc.). Review all drawings for general coordination of work, responsibilities, ceiling clearances, wall penetration points, chase access, fixture elevations, etc. Make any pertinent coordination or apparent conflict comments to the Engineers at least ten (10) days prior to bids, for issuance of clarification by written addendum.
- J. Where on any of the drawings a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornament or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.
- K. Special Note: Always check ceiling heights indicated on Drawings and Schedules and insure that these heights may be maintained after all mechanical and electrical equipment is installed. If a conflict is apparent, notify the Engineer in writing for instructions.

1.7 EXAMINATION OF SITE AND CONDITIONS

- A. Each Contractor shall inform himself of all of the conditions under which the work is to be performed, the site of the work, the structure of the ground, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work. All Contractors shall carefully examine all Drawings and Specifications and inform themselves of the kind and type of materials to be used throughout the project and which may, in any way, affect the execution of his work.
- B. Each Contractor shall fully acquaint himself with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of temporary or permanent utilities, etc. The Contractor shall include in his work all expenses or disbursements in connection with such matters and conditions. Each Contractor shall verify all work shown on the drawings and conditions at the site, and shall report in writing to the Engineer ten (10) days prior to bid, any apparent omissions or discrepancies in order that clarifications may be issued by written addendum. No allowance is to be made for lack of knowledge concerning such conditions after bids are accepted.

C. The Electrical Contractor is required to provide coordination drawings, data and collaboration for all aspects of his work in accordance with the general and special conditions – Divisions 20, 21, 22, 23, 25, 26, 27 and 28 and the Construction Manager's procedures.

1.8 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

- A. When any Contractor requests review of substitute materials and/or equipment, and when under an approved formal alternate proposal, it shall be understood and agreed that such substitution, if approved, will be made without additional cost regardless of changes in connections, spacing, service, mounting, etc. In all cases where substitutions affect other trades, the Contractor offering such substitutions shall advise all such Contractors of the change and shall reimburse them for all necessary changes in their work. Any drawings, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Special Note: Review of Shop Drawings by the Engineer does not absolve the Contractor of this responsibility.
- B. References in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Each Contractor, in such cases, may, at his option, use any article, device, product, material, fixture, form, or type of construction which in the judgment of the Engineer is equivalent to that specified, provided the provisions of Paragraph 5.1 immediately preceding are met. Substitutions shall be submitted to the Engineer a minimum of ten (10) days prior to bid date for approval to bid in written form through addenda or other method selected by the Engineer. If prevailing laws of cities, towns, states or countries are more stringent than these specifications regarding such substitutions, then those laws shall prevail over these requirements.
- C. Wherever any equipment and material is specified exclusively only such items shall be used unless substitution is accepted in writing by the engineers.
- D. Each Contractor shall furnish along with his proposal a list of specified equipment and materials which he proposes to provide. Where several makes are mentioned in the Specifications and the Contractor fails to state which he proposes to furnish, the Engineer shall have the right to choose any of the makes mentioned without change in price.

1.9 SINGLE SOURCE RESPONSIBILITY AND OBSOLETE EQUIPMENT

A. Except where specifically noted otherwise, all equipment supplied by the Contractor shall be the standard products of a single manufacturer of known reputation and experience in the industry. Only equipment, components and accessories in current production for at least five (5) years beyond the completion date of this system shall be used and installed. Any equipment found to be obsolete or not in future production will be removed and replaced at Contractor's expense. This includes all equipment, materials and labor.

1.10 CODES, RULES, PERMITS, FEES, REGULATIONS, ETC.

- A. The Contractor shall give all necessary notices, obtain and pay for all permits, government sales taxes, fees, and other costs including utility connections or extensions, in connection with his work. As necessary, he shall file all required plans, utility easement requests and drawings, survey information on line locations, load calculations, etc., prepare all documents and obtain all necessary approvals of all utility and governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.
- B. Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve Contractor's responsibilities to provide and complete all work in compliance with such.
- C. The Contractor shall include in the work, without extra cost, any labor, materials, services, apparatus or drawings required in order to comply with all applicable laws, ordinances rules and regulations, whether or not shown on drawings and/or specified.
- D. All materials furnished and all work installed shall comply with the current edition of the National Electrical Codes, National Fire Codes of the National Fire Protection Association, the requirements of local utility companies, and with the requirements of all governmental agencies or departments having jurisdiction.

- E. All material and equipment for the electrical systems shall bear the approval label, or shall be listed by the Underwriters' Laboratories, Incorporated. Listings by other testing agencies may be acceptable with written approval by the Engineer.
- F. All electrical work is to be constructed and installed in accordance with plans and specifications which have been approved in their entirety and/or reflect any changes requested by the State Fire Marshal, as applicable or required. Electrical work shall not commence until such plans are in the hands of the Electrical Contractor.
- G. The Contractor shall insure that his work is accomplished in accord with OSHA Standards and any other applicable government requirements.
- H. Where conflict arises between any code and the plans and/or specifications, the code shall apply except in the instance where the plans and specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten working days prior to bid date, otherwise the Contractor shall make the required changes at his own expense. The provisions of the codes constitute minimum standards for wiring methods, materials, equipment and construction and compliance therewith will be required for all electrical work, except where the drawings and specifications require better materials, equipment, and construction than these minimum standards, in which case the drawings and specifications shall be the minimum standards.

1.11 SUPERVISION OF WORK

A. Each Contractor and Sub-Contractors shall personally supervise the work or have a competent superintendent on the project site at all times during progress of the work, with full authority to act for him in matters related to the project.

1.12 COST BREAKDOWNS AND PAY APPLICATION

- A. Within thirty days after acceptance of the Contract, each Contractor is required to furnish to the Engineer one copy of a detailed cost breakdown on each respective area of work. These cost breakdowns shall be made on forms provided or approved by the Engineer. Payments will not be made until satisfactory cost breakdowns are submitted. Refer to Division 0 and 1 specification sections for additional requirements.
- B. In addition to cost breakdowns by specification section, the following shall also be provided: Material and labor shall be listed separately. These items are in addition to items listed in front-end specifications. Pay special attention to required withholding percentages for startup, testing, documentation, acceptance, owner training, etc. The breakdown shall be minimally as follows:
 - 1. Permitting
 - 2. Mobilization
 - 3. Electrical Shop Drawings/Submittals
 - 4. Electrical Coordination Drawings
 - 5. Temporary Power
 - 6. Interior Lighting Materials & Labor
 - 7. Lighting Controls Materials & Labor
 - 8. Electrical Distribution (Switchgear) Materials & Labor
 - 9. Feeders Materials & Labor
 - 10. Branch Circuiting Materials & Labor
 - 11. Electrical Devices Materials & Labor
 - 12. Low-Voltage Data/Voice Cabling Materials & Labor
 - 13. Low-voltage Data/Voice Equipment Materials & Labor
 - 14. Spare lamps and ballasts
 - 15. Electrical Distribution Equipment Startup, Testing, & Verification (shall equal 2.5% of Equipment Value)
 - 16. Lighting and Lighting Controls Startup, Testing, & Verification (shall equal 2.5% of Equipment Value)
 - 17. Low Voltage Systems Startup, Testing, & Verification (shall equal 5% of Equipment Value)
 - 18. Owner Training & Acceptance
 - 19. Punchlist

- 20. As-Built/Record Drawings & Acceptance
- 21. O&M Manuals & Acceptance
- 22. Warranty
- 23. Demobilization

1.13 GUARANTEES AND WARRANTIES

- A. Each Contractor shall unconditionally guarantee all equipment, apparatus, materials, and workmanship entering into this Contract to be the best of its respective kind and shall replace all parts at his own expense, which fail or are deemed defective within one year from final acceptance of the work by the Engineer. The effective date of completion of the work shall be the date each or any portion of the work is accepted by the Engineer and Owner's Statement of Substantial Completion.
- B. Items of equipment which have longer guarantees, as called for in these specifications or as otherwise offered by the manufacturer, such as generators, engines, batteries, transformers, etc., shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Owner reserves the right to use equipment installed by the Contractor prior to date of final acceptance. Such use of equipment shall in no way invalidate the guarantee except that the Owner shall be liable for any damage to equipment during this period due to negligence of his operator or other employee.
- C. The Warranties specified in this and other Articles shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to, and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.
- D. All light fixtures shall have a five (5) year unconditional warranty (Parts, Labor and Travel)
- E. All generators shall have a five (5) year unconditional warranty (Parts, Labor and Travel)
- F. Provide all warranty certificates to Owner. All warranties begin starting at the substantial completion date, submit warranty certificates accordingly.

1.14 INSPECTION, APPROVALS AND TESTS

- A. Before requesting a final review of the installation from the Engineer, the Contractor shall thoroughly inspect his installation to assure that the work is complete in every detail and that all requirements of the Contract Documents have been fulfilled. Failure to accomplish this may result in charges from the Engineers for unnecessary and undue work on their part.
- B. Owner's and Engineer's inspections: Two (2) inspections will be held to generate and then review punchlist items. All site inspections and visits thereafter shall be billed to the Contractor at the Engineer's standard hourly rates.
- C. The Contractor shall provide as a part of this contract electrical inspection by a competent Electrical Inspection Agency, licensed to provide such services. The name of this agency shall be included in the list of materials of the Form of Proposal by the Contractor. All costs incidental to the provision of electrical inspections shall be borne by the Electrical Contractor.
- D. The Contractor shall advise each Inspection Agency in writing (with an information copy of the correspondence to the Engineer) when he anticipates commencing work. Failure of the Inspection Agency to inspect the work in the stage following and submit the related reports may result in the Contractor's having to expose concealed work not so inspected. Such exposure will be at the expense of the responsible Contractor.
- E. Inspections shall be scheduled for rough as well as finished work. The rough inspections shall be divided into as many inspections as may be necessary to cover all roughing-in without fail. Report of each such inspection visit shall be submitted to the Engineer and the Contractor within three days of the inspection.
- F. Approval by an Inspector does not relieve the Contractor from the responsibilities of furnishing equipment having a quality of performance equivalent to the requirements set forth in these plans and specifications. All work under this contract is subject to the review of the Engineer, whose decision is binding.

- G. Before final acceptance, the Contractor shall furnish three (3) copies of the certificates of final approval by the Electrical Inspector (as well as all other inspection certificates) to the Engineer with one (1) copy of each to the appropriate government agencies, as applicable. Final payment for the work shall be contingent upon completion of this requirement.
- H. The Contractor shall test all wiring and connections for continuity and grounds before equipment and fixtures are connected, and when indicated or required, demonstrate by Megger Test the insulation resistance of any circuit or group of circuits. Where such tests indicate the possibility of faulty insulation, locate the point of such fault, pull out the defective conductor, replacing same with new and demonstrate by further test the elimination of such defect.
- 1.15 CHANGES IN ELECTRICAL WORK
 - A. REFER TO GENERAL AND SPECIAL CONDITIONS.

1.16 CLAIMS FOR EXTRA COST

A. REFER TO GENERAL AND SPECIAL CONDITIONS.

1.17 COORDINATION DRAWINGS

- A. Detailed electronic coordination drawings shall be required for this project. A specific line-item shall be included on the schedule of values by each Trade for "preparation of coordination drawings". This line-item value shall be approved by the Engineer. The Engineer and the Engineer's Field Inspector shall closely monitor progress and quality of the preparation of the electronic coordination drawings and may withhold pay requests as deemed appropriate.
- B. Coordination Drawings shall be provided on this project by each Trade (Mechanical, Fire Protection, Electrical). Drawings shall be 30x42 sheet size and shall be at ¼" scale. Drawings shall be prepared in electronic format utilizing AutoCad software. The Engineer will supply electronic drawings files of the Contract Documents upon the Contractor's request and release.
- C. The basis for the Coordination Drawings shall be the sheet metal ductwork fabrication shop drawings, all electrical feeder conduits and other conduits 2" and larger, and pneumatic tube system piping and components in ceiling spaces. The Coordination Drawings shall be prepared by the Mechanical Contractor. The Coordination Drawings shall indicate (1) systems above ceilings in finished areas, (2) systems supported from the structure in finished areas without ceilings, (3) systems in the mechanical rooms, and (4) all wall, roof, floor penetrations. These drawings shall indicate all ductwork as double lined with bottom elevations noted.
- D. The sheet metal fabrication shop drawings shall be completed in a timely manner so as not to conflict with construction schedule and phasing plan. At the Construction Manager's discretion, these drawings shall be completed in phases to correspond with the project construction work sequencing. The Mechanical Contractor shall furnish an electronic copy of these ductwork shop drawings to all other Trades, specifically the Fire Protection and Electrical and other Contractors as requested by the Construction Manager for the purpose of including other trades work on the Coordination Drawings.
- E. Pre-Coordination Meetings with all necessary trades shall occur. During these meetings, the Contractors shall discuss locations/elevations where piping, conduits, cable path, etc. will be installed with respect to the sheet metal fabrication drawings and other trades. The sheet metal ductwork and gravity piping systems shall be given the first priority. Within 30 days of the meeting, each Trade shall provide the Mechanical Contractor electronic drawings of all of their systems (with elevation noted), coordinated with the ductwork and other trades for them to incorporate into the Coordination Drawings. Coordination Meetings shall then occur so that all conflicts can be resolved between Trades. All conflicts shall be resolved between all Trades at these Coordination Meetings and the Mechanical Contractor shall then amend the Drawings to include the Final Coordinated Work.
- F. It is realized that not all systems can be completely detailed. The coordination drawings shall include the following at a minimum:
 - 1. All supply/return/exhaust ductwork.
 - 2. All above slab sanitary and roof drainage piping.

- 3. HVAC, fire protection and domestic water piping which are 2" in size and greater, excluding insulation.
- 4. Medical gas mains.
- 5. Electrical conduits which are 1.5" in size and greater.
- 6. J-hook and cable tray cabling paths
- 7. Multiple smaller piping/conduits hung on a common hanger.
- 8. All wall, roof, floor penetrations.
- 9. Light fixtures.
- G. After completion of the Final Coordination Drawings, a Final Review with the all Trades shall occur to provide any final comments and approval by all Trades. Other interim coordination meeting will be required to ensure successful coordination drawings. Any additional coordination items will be updated by the Mechanical Contractor. The Final Approved Coordination Drawings shall be distributed electronically (on CD) to each Trade by the Mechanical Contractor. The Mechanical Contractor shall also furnish a complete 30x42 paper set of drawings to the jobsite main office and shall utilize them for updates of field conditions/deviations that occur during construction. Final Approved Coordination Drawings shall also be distributed to the Construction Manager, Owner, and Engineer for their Records. This process shall be completed prior to starting any work.
- H. Each Contractor shall ensure that any deviations from the Coordination Drawings are recorded as they occur, in red erasable pencil on record drawings kept at the jobsite. Upon completion of a particular phase, the Mechanical Contractor shall incorporate all field deviations into the Coordination Drawings to be utilized as Record Drawings. The Engineer shall review the Record Documents from time to time to ensure compliance with this specification. Compliance shall be a contingency of final payment. Also, pay particular attention to Deviations in the Control Systems and all exterior utilities. Keep information in a set of drawings set aside at the job site especially for this purpose. The Record Drawings shall be distributed electronically (on CD) to the Construction Manager, Owner, and Engineer for their Records.
- I. The Mechanical Contractor is responsible to the General Contractor for the shop drawing layout of the following rooms and details:
 - 1. Concrete pads and foundations
 - 2. Equipment room layouts with actual equipment
 - 3. Roof layouts
 - 4. Trench locations and sizes
 - 5. Dimensioned floor drain locations
 - 6. Congested areas above ceilings adjacent to mechanical and electrical rooms
 - 7. Dimensioned ductwork shop drawings
 - 8. Refer to Part 43 for additional requirements.
- J. The Electrical Contractor is responsible to the General Contractor for the shop drawing layout of the following rooms and details:
 - 1. Concrete pads and foundations
 - 2. Equipment room layouts with actual equipment
 - 3. Routes of feeder conduits and all other conduits 1.5" and larger
 - 4. J-hook and cable tray cabling paths
 - 5. Trench locations and sizes
 - 6. Congested areas above ceilings adjacent to mechanical and electrical rooms
 - 7. Refer to Part 41 for additional requirements.
 - 8. Light fixture locations
 - 9. Exact layouts of all work in open ceiling areas
- 1.18 SURVEYS, MEASUREMENTS AND GRADES
 - A. The Contractor shall lay out his work and be responsible for all necessary lines, levels, elevations and measurements. He must verify the figures shown on the drawings before laying out the work and will be held responsible for any error resulting from his failure to do so.

- B. The Contractor shall base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.
- C. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Engineer thru normal channels of job communication and shall not proceed with his work until he has received instructions from the Engineer.

1.19 TEMPORARY SERVICES

- A. The Contractor shall arrange for temporary electrical and other services which he may require to accomplish his work. In the absence of other provisions in the contract, the Contractor shall provide for his own temporary services of all types, including the cost of connections, utility company fees, construction, removal, etc., in his bid.
- B. All temporary services shall be removed by Contractor prior to acceptance of work.

1.20 TEMPORARY USE OF EQUIPMENT

- A. The permanent electrical equipment, (except lighting), when installed, may be used for temporary services, subject to an agreement among the Contractors involved, the Owner, and with the consent of the Engineer. Should the permanent systems be used for this purpose, each Contractor shall pay for all temporary connections required and any replacements required due to damage without cost, leaving the equipment and installation in "as new" condition. The Contractor may be required to bear utility costs, user fees, etc.
- B. Permission to use the permanent equipment does not relieve the Contractors who utilize this equipment from the responsibility for any damages to the building construction and/or equipment which might result because of its use.

1.21 MATERIALS AND WORKMANSHIP

- A. All electrical equipment, materials and articles incorporated in the work shall be new and of comparable quality to that specified. All workmanship shall be first-class and shall be performed by electricians skilled and regularly employed in their respective trades. The Contractor shall determine that the equipment he proposes to furnish can be brought into the building(s) and installed within the space available. All equipment shall be installed so that all parts are readily accessible for inspection, maintenance, replacement, etc. Extra compensation will not be allowed for relocation of equipment for accessibility or for dismantling equipment to obtain entrance into the building(s).
- B. All conduit and/or conductors shall be concealed in or below walls, below floors or above ceilings, unless otherwise noted. All fixtures, devices and wiring required shall be installed to make up complete systems as indicated on the drawings and specified herein. Raceways shall not be placed within foundation walls and footings.
- C. All materials, where applicable, shall bear Underwriters' Laboratories label or that of another Engineer approved testing agency, where such a standard has been established.
- D. Each length of conduit, wireway, duct, conductor, cable, fitting, fixture and device used in the electrical systems shall be stamped or indelibly marked with the maker's mark or name.
- E. All electrical equipment shall bear the manufacturer's name and address and shall indicate its electrical capacity and characteristics.
- F. All electrical materials, equipment and appliances shall conform to the latest standards of the National Electric Manufacturers Association (NEMA) and the National Board of Fire Underwriters (NBFU) and shall be approved by the Owner's insuring agency if so required.
- G. Comply with National Electrical Contractors Association (NECA) performance standards that are published as National Electrical Installation Standards (NEIS).
- H. All applicable equipment and devices provided shall meet all FCC requirements and restrictions.
- 1.22 QUALIFICATIONS OF WORKMEN

- A. All Electrical Contractors bidding this project must have been a licensed company for a minimum of three (3) years to qualify to bid this project. Individual employee experience does not supersede this requirement.
- B. All subcontractors bidding the electrical work must have completed one project of 70% this subcontract cost size and two projects of 50% this subcontract cost size.
- C. All electrical work shall be accomplished by qualified workmen competent in the area of work for which they are responsible. Untrained and incompetent workmen as evidenced by their workmanship shall be relieved of their responsibilities in those areas. The Engineer shall reserve the right to determine the quality of workmanship of any workman and unqualified or incompetent workmen shall refrain from work in areas not satisfactory to him. Requests for relief of a workman shall be made through the normal channels of responsibility established by the contract document provisions.
- D. All electrical work shall be accomplished by Journeymen electricians under the direct supervision of a licensed Electrician. All applicable codes, utility company regulations, laws and permitting authority of the locality shall be fully complied with by the Contractor.
- E. Special electrical systems, such as Fire Detection and Alarm Systems, Telecommunications or Data Systems, Video Systems, Special Electronic Systems, Control Systems, etc., shall be installed by workmen normally engaged or employed in these respective trades.

1.23 CONDUCT OF WORKMEN

A. The Contractor shall be responsible for the conduct of all workmen under his supervision. Misconduct on the part of any workmen to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt relief of that workman. The consumption or influence of alcoholic beverages, narcotics or illegally used controlled substances on the jobsite is strictly forbidden.

1.24 COOPERATION AND COORDINATION BETWEEN TRADES

- A. The Contractor is expressly directed to read the General Conditions and all detailed sections of these specifications for all other trades and to study all drawings applicable to his work, including Mechanical, Structural and other pertinent Drawings, to the end that complete coordination between trades will be effected.
- B. Refer to Coordination Among Trades, Systems Interfacing and Connection of Equipment Furnished by Others section of these Specifications for further coordination requirements. The Contractor is responsible for the correct location of all rough-in and connections at every piece of equipment. Work not correctly located shall be relocated at the Contractor's expense.
- C. Where any work is to be installed in close proximity to, or will interfere with work of other trades, each shall cooperate in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 1/4" = 1'-0", clearly indicating how his work is to be installed in relation to the work of other trades, or so as not to cause any interference with work of other trades. He shall make the necessary changes in his work to correct the condition without extra charge.
- D. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.25 PROTECTION OF EQUIPMENT

- A. The Contractor shall be entirely responsible for all material and equipment furnished by him in connection with his work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. All rough-in conduit shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged while stored on site either before or after installation shall be repaired or replaced (as determined by the Engineer) by the responsible Contractor. Electrical equipment exposed to the weather shall be replaced by the Contractor at his expense.
- 1.26 SCAFFOLDING, RIGGING AND HOISTING
A. The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. All such temporary appurtenances shall be set up in strict accord with OSHA Standards and Requirements. Remove same from premises when no longer required.

1.27 CONCRETE WORK

- A. The Contractor shall be responsible for the provision of all concrete work required for the installation of any of his systems or equipment. If this work is provided by another trade, it will not relieve the Electrical Contractor of his responsibilities relative to dimensions, quality of workmanship, locations, etc. In the absence of other concrete specifications, all concrete related to Electrical work shall be 3000 PSI minimum compression strength at 28 days curing and shall conform to the standards of the American Concrete Institute Publication ACI-318. Heavy equipment shall not be set on pads for at least seven days after pour.
- B. All concrete pads shall be complete with all pipe sleeves, embeds, anchor bolts, reinforcing steel, concrete, etc., as required. Pads larger than 18" in width shall be reinforced with minimum #4 round bars on 6" centers both ways. All reinforcing steel shall be per ASTM requirements, tied properly, lapped 18 bar diameters and supported appropriately up off form, slab or underlayment. Bars shall be approximately 3" above the bottom of the pad with a minimum 2" cover. All parts of pads and foundations shall be properly rodded or vibrated. If exposed parts of the pads and foundations are rough or show honeycomb after removing forms properly adhered repairs shall be made. If structural integrity is violated, the concrete shall be replaced. All surfaces shall be rubbed to a smooth finish.
- C. Special Note: All pads and concrete lighting standard bases shall be crowned slightly so as to avoid water ponding beneath equipment.
- D. In general, concrete pads for small equipment shall extend 6" beyond the equipment's base dimensions. For large equipment with service access panels, extend pads 18" beyond base or overall dimensions to allow walking and servicing space at locations requiring service access.
- E. Exterior concrete pads shall be 4" minimum above grade and 4" below grade on a tamped 4" dense grade rock base unless otherwise noted or required by utility company. Surfaces of all foundations and bases shall have a smooth finish with three-quarter inch radius or chamfer on exposed edges, troweled or rubbed smooth. All exterior pads shall be crowned approximately 1/8" per foot, sloping from center for drainage.

1.28 SMOKE AND FIRE PROOFING

- A. The Contractor shall not penetrate rated fire walls, ceilings or floors with conduit, cable, bus duct, wireway or other raceway system unless all penetrations are protected in a code compliant manner which maintains the rating of the assembly. Smoke and fire stop all openings made in walls, chases, ceiling and floors. Patch all openings around conduit, wireway, bus duct, etc., with appropriate type material to smoke stop walls and provide needed fire rating at fire walls, ceilings and floors. Smoke and fire proofing materials and method of application shall be approved by the local authority having jurisdiction.
- B. Contractor to provide heat detectors in the area of construction with complete fire detection until fire alarm system is operational and construction is complete.
- C. Fire-stopping materials and installation shall be by a single source through-out the project, by all trades.
- D. All fire-stopping assemblies must be UL listed. Provide shop drawings indicating penetration detail for each type of wall and floor construction. Shop drawings must be specific for each individual type (i.e., one-hour fire rated gypsum wall board with insulated metal pipe penetration.) and must indicate a UL listing for the complete fire-stopping assembly.
- E. 3M fire protection products are listed below. Equivalent products may be submitted if they are UL listed.
- F. All of the fire-stopping shall be applied by a Contractor who is certified by the manufacturer of the firestopping product for installation of the product.
- G. Fire-stopping materials to include but not limited to the following:
 - 1. 3M fire barrier FS-195 wrap/strip.
 - 2. 3M fire barrier CP 25 caulk.

- 3. 3M fire barrier MP moldable putty.
- 4. 3M fire barrier RC-1 restricting collar with steel hose clamp.
- 5. 3M fire barrier damming materials.
- 6. 3M fire barrier CS-195 composite sheet.
- 7. 3M fire barrier fire dam 150 caulk.
- 8. Steel sleeves.
- 9. Hilti Speed Sleeves.

1.29 QUIET OPERATION, SUPPORTS, VIBRATION AND OSCILLATION

- A. All work shall operate under all conditions of load without any objectionable sound or vibration, the performance of which shall be determined by the Engineer. Noise from moving machinery or vibration noticeable outside of room in which it is installed, or annoyingly noticeable noise or vibration inside such room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer shall be corrected in an approved manner by the Contractor (or Contractors responsible) at his expense.
- B. All equipment subject to vibration and/or oscillation shall be mounted on vibration supports suitable for the purpose of minimizing noise and vibration transmission, and shall be isolated from external connections such as piping, ducts, etc., by means of flexible connectors, vibration absorbers or other approved means. Surface mounted equipment such as panels, switches, etc., shall be affixed tightly to their mounting surface.
- C. The Contractor shall provide supports for all equipment furnished by him using an approved vibration isolating type as needed. Supports shall be liberally sized and adequate to carry the load of the equipment and the loads of attached equipment, piping, etc. All equipment shall be securely fastened to the structure either directly or indirectly through supporting members by means of bolts or equally effective means. No work shall depend on the supports or work of unrelated trades unless specifically authorized in writing by the Engineer.

1.30 WELDING

A. The Contractor shall be responsible for quality of welding done by his organization and shall repair or replace any work not done in accordance with the structural Engineer's specifications for such work. If required by the Engineer, the responsible Contractor shall cut at least three welds during the job for X-raying and testing. These welds are to be selected at random and shall be tested as a part of the responsible Contractor's work. Certification of these tests and X-rays shall be submitted, in triplicate, to the Engineer. In case a faulty weld is discovered, the Contractor shall be required to furnish additional tests and corrective measures until satisfactory results are obtained.

1.31 ACCESSIBILITY

- A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in partitions and above suspended ceilings for the proper installation of his work. He shall cooperate with the General Contractor (or Construction Manager) and all other Contractors whose work is in the same space, and shall advise each Contractor of his requirements. Such spaces and clearances shall be kept to the minimum size required to ensure adequate clearance and access.
- B. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to junction boxes, pull boxes, contactors, panels, disconnects, controllers, switchgear, etc. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved where the equipment is concealed.
- C. Each Contractor shall provide (or arrange for the provision by other trades) the access panels for each concealed junction box, pull box, fixtures or electrical device requiring access or service as shown on Engineer's plans or as required. Locations of these panels shall be identified in sufficient time to be installed in the normal course of work. All access panels shall be installed in accord with the Engineer's standards for such work. In the absence of such specifications, at a minimum such work shall comply with the specifications below.
- D. Access Doors; in Ceilings or Walls:
 - 1. In mechanical, electrical and service spaces: 14-gauge aluminum brushed satin finish, 1" border.

- 2. In finished areas: 14-gauge primed steel with 1" border to accept the architectural finishes specified for the space.
- 3. In fire or smoke rated partitions, access doors shall be provided that equal or exceed the required rating of the construction they are mounted in.

1.32 MANUFACTURER'S NAMEPLATE

A. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.33 ELECTRICAL CONNECTIONS

- A. The Contractor shall furnish and install all power wiring complete from power source to motor or equipment junction box, including power wiring through starters. The Contractor shall install all starters not factory mounted on equipment. Unless otherwise noted, the supplier of equipment shall furnish starters with the equipment. Also, refer to Division 20, 21, 22, 23, 24, 25, 26, 27, and 28 of Specifications, shop drawings and equipment schedules for additional information and requirements.
- B. All control, interlock, sensor, thermocouple and other wiring required for equipment operation shall be provided by the Contractor. All such installations shall be fully compliant with all requirements of Division 26, 27 and 28 regardless of which trade actually installs such wiring. Motors and equipment shall be provided for current and voltage characteristics as indicated or required. All wiring shall be enclosed in raceways unless otherwise noted.
- C. Each Contractor or Sub-Contractor, prior to bidding the work, shall coordinate power, control, sensor, interlock and all other wiring requirements for equipment or motors with all other contractors or subcontractors, to ensure all needed wiring is provided in the Contract. Failure to make such coordination shall not be justification for claims of extra cost or a time extension to the Contract.

1.34 FINAL CONNECTIONS TO EQUIPMENT

A. The roughing-in and final connections to all electrically operated equipment furnished under this and all other sections of the contract documents or by others, shall be included in the Contract and shall consist of furnishing all labor and materials for connection. The Contractor shall carefully coordinate with equipment suppliers, manufacturer's representatives, the vendor or other trades to provide complete electrical and dimensional interface to all such equipment (kitchen, hoods, mechanical equipment, panels, refrigeration equipment, etc.).

1.35 ENERGIZED EQUIPMENT

A. At no time shall the contractor work on energized electrical equipment. Contractor shall comply with NFPA 70E requirements at all times throughout construction.

1.36 MOTORS

- A. Each motor shall be provided by the equipment supplier, installer or manufacturer with conduit terminal box and NEC required disconnecting means as indicated or required. Three-phase motors shall be provided with external thermal overload protection in their starter units. Single-phase motors shall be provided with thermal overload protection, integral to their windings or external, in control unit. All motors shall be installed with NEMA-rated starters as specified and shall be connected per the National Electrical Code.
- B. The capacity of each motor shall be sufficient to operate associated driven devices under all conditions of operation and load and without overload, and at least of the horsepower indicated or specified. Each motor shall be selected for quiet operation, maximum efficiency and lowest starting KVA per horsepower as applicable. Motors producing excessive noise or vibration shall be replaced by the responsible contractor. Refer to Division 20, 21, 22, 23 and 25 of the Specifications for further requirements and scheduled sizes.
- C. All three-phase motors shall be tested for proper rotation. Correct wiring if needed and retest. Document testing and corrective action in operations and maintenance manual.

1.37 CUTTING AND PATCHING

- A. Unless otherwise indicated or specified, the Contractor shall provide cutting and patching necessary to install the work specified in this Division. Patching shall match adjacent surfaces to the satisfaction of the Engineer.
- B. No structural members shall be cut without the approval of the Structural Engineer and all such cutting shall be done in a manner directed by him.

1.38 SLEEVES AND PLATES

- A. Each Contractor shall provide and locate all sleeves and inserts required for his work before the floors and walls are built, or shall be responsible for the cost of cutting and patching required where sleeves and inserts were not installed, or where incorrectly located. Each Contractor shall do all drilling required for the installation of his hangers. Drilling of anchor holes may be prohibited in post-tensioned concrete construction, in which case the Contractor shall request approved methods from the Engineer and shall carefully coordinate setting of inserts, etc., with the Structural Engineer.
- B. Sleeves shall be provided for all electrical conduit passing thru concrete floor slabs and concrete, masonry, tile and gypsum wall construction. Sleeves shall not be provided for piping running embedded in concrete or insulating concrete slabs on grade, unless otherwise noted.
- C. Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be packed with oakum and lead, mechanical water stop or other approved material and made completely water tight by a method approved by the Engineer.
- D. Where conduit motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:
 - 1. Terminate sleeves flush with walls, partitions and ceiling.
 - 2. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor.
 - 3. In all areas where pipes are exposed, extend sleeves 1/2 inch above finished floor, except in rooms having floor drains, where sleeves shall be extended 3/4 inches above floor.
- E. Sleeves shall be constructed of 24-gauge galvanized sheet steel with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of galvanized steel pipe unless otherwise indicated on the drawings.
- F. Fasten sleeves securely in floors, walls, so that they will not become displaced when concrete is poured or when other construction occurs around them. Take precautions to prevent concrete, plaster or other materials being forced into the space between pipe and sleeve during construction. Fire and smoke stop all sleeves in a manner approved by the local authority having jurisdiction or per prevailing codes.

1.39 ANCHORS

A. Each Contractor shall provide and locate all inserts required for his work before the floors and walls are built, or shall be responsible for the cost of cutting and patching required where inserts were not installed, or where incorrectly located. Each Contractor shall do all drilling required for the installation of his hangers. Drilling of anchor holes may be prohibited in post-tensioned concrete construction, in which case the Contractor shall request approved methods from the Engineer and shall carefully coordinate setting of inserts, etc., with the Structural Engineer.

1.40 CONDUIT MOUNTING HEIGHTS

A. All exposed or concealed conduit, raceways, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed conduit shall, insofar as possible, run perpendicular or parallel to the building structure.

1.41 PAINTING

A. Each fixture device, panel, junction box, etc., that is located in a finished area shall be provided with finish of color and type as selected or approved by the Engineer. If custom color is required, it shall be provided at no additional cost to the Owner. All other equipment, fixtures or devices located in finished or unfinished areas, that are not required to have or are provided with finish color or coating shall be provided in a prime

painted condition, ready to receive finish paint or coating. All galvanized metal in finished areas shall be properly prepared with special processes to receive finish paint.

1.42 WEATHERPROOFING

- A. Where any work pierces waterproofing, including waterproof concrete, the method of installation shall be as approved by the Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.
- B. Wherever work penetrates roofing, it shall be done in a manner that will not diminish or void the roofing guarantee or warranty in any way. Coordinate all such work with the roofing installer.

1.43 EQUIPMENT/CONTROLS STARTUP & VERIFICATION

- A. A pre-start-up conference shall be held with the Engineer, Owner, Construction Manager, General Contractor, Mechanical Contractor, Electrical Contractor, Controls Contractor, Test and Balance Contractor, and any manufacturer's providing startup services. The purpose of this meeting will be to discuss the goals, procedures, etc. for start-up
- B. Equipment and controls startup and verification shall be required for this project. A specific line-item shall be included on the schedule of values by each Trade for "equipment and controls startup". This line-item value shall be approved by the Engineer. The Engineer, Owner and the Engineer's Field Inspectors shall closely monitor progress and quality of the equipment and controls startup and may withhold pay requests as deemed appropriate.
- C. The Contractor shall include in the bid to provide equipment and controls startup and verification for ALL Electrical systems specified for this project. Specific startup/verification specifications are included throughout the Electrical specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians (not third party contractors) and shall complete and submit start-up reports/checklists. Submit factory start-up reports to the Engineer. The contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner.
- D. Many pieces of equipment and systems are specified with "manufacturer" startup. In general, the manufacturer's recommended startup procedures and checklists will be acceptable for use in the project. Where "manufacturer" startup is not specified, then this Contractor shall perform startup services in strict accordance with manufacturer's instructions. All startup/verification process shall be thoroughly documented by the Contractor and shall include the time and date when performed.
- E. The Contractor shall be responsible for completion of their own System Verification Checklist (SVC) / Manufacturer's Checklists. Furnish to the Testing Agent and Engineer. Sample checklists shall be submitted to the Engineer, Owner, and Testing Agent for approval.

1.44 OPERATING INSTRUCTIONS

- A. Upon completion of all work and all tests, each Contractor shall furnish the necessary skilled labor and helpers for operating his systems and equipment for a period of three days of eight hours each, or as otherwise specified. During this period, instruct the Owner or his representative fully in the operations, adjustment, and maintenance of all equipment furnished. Give at least one week's written notice to the Owner, and Engineer in advance of this period. The Engineer may attend any such training sessions or operational demonstrations. The Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representative that were present.
- B. Unless specified otherwise in Division 1, each Contractor shall furnish three (3) complete bound sets for approval to the Engineer of typewritten and/or blueprinted instructions for operating and maintaining all systems and equipment included in this contract. All instructions shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.

C. Unless specified otherwise in Division 1, each Contractor, in the above mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this contract and a detailed, easy to read parts list and the name and address of the nearest source of supply.

1.45 CLEANING

- A. The Contractor shall, at all times, keep the area of his work presentable to the public and clean of rubbish caused by his operations; and at the completion of the work, shall remove all 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 Engineer may cause cleaning to be done by others and charge the cost of same to the responsible Contractor. Each Contractor shall be responsible for all damage from fire which originates in, or is propagated by, accumulations of his rubbish or debris.
- B. After completion of all work and before final acceptance of the work, each Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of materials, equipment and all associated fabrication. Pay particular attention to finished area surfaces such as lighting fixture lenses, lamps, reflectors, panels, etc.

1.46 INDEMNIFICATION

A. The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

1.47 HAZARDOUS MATERIALS

- A. The Contractor is hereby advised that it is possible that asbestos and/or other hazardous materials are or were present in this building(s). Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of his work, insure that his workers are aware of this potential and what they are to do in the event of suspicion. He shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall insure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.
- B. Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of their work, insure that their workers are aware of this potential and what they are to do in the event of suspicion. The Contractor shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall insure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.
- C. CMTA, Inc., Consulting Engineers, have no expertise in the determination of the presence of hazardous materials. Therefore, no attempt has been made by them to identify the existence or location of any such material. Furthermore, CMTA nor any affiliate thereof will neither offer nor make any recommendations relative to the removal, handling or disposal of such material.
- D. If the work interfaces, connects or relates in any way with or to existing components which contain or bear any hazardous material, asbestos being one, then, it shall be the Contractor's sole responsibility to contact the Owner and so advise him immediately.
- E. The Contractor by execution of the contract for any work and/or by the accomplishment of any work thereby agrees to bring no claim relative to hazardous materials for negligence, breach of contract, indemnity, or any other such item against CMTA, its principals, employees, agents or consultants. Also, the Contractor further agrees to defend, indemnify and hold CMTA, its principals, employees, agents and consultants, harmless from any such related claims which may be brought by any subcontractors, suppliers or any other third parties.

1.48 ABOVE-CEILING AND FINAL PUNCH LISTS

- A. The Contractor shall review each area and prepare a punch list for each of the subcontractors, as applicable, for at least two stages of the project.
 - 1. For review of in-wall work that will be concealed by drywall or other materials well before substantial completion.
 - 2. For review of the above-ceiling work that will be concealed by tile or other materials well before substantial completion.
 - 3. For review of all other work as the project nears substantial completion.
- B. When all work from the Contractor's punch list is complete at each of these stages and prior to completing ceiling installations (or at the final punch list stage), the Contractor shall request that the Engineer develop a punch list. This request is to be made in writing two weeks prior to the proposed date. After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list and all work prior to the ceilings being installed and at the final punch list review.
- C. After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list shall be submitted to the Engineer. The Engineer shall return to the site once to review each punch list and all work prior to the ceilings being installed and at the final punch list review.
- D. At the engineer's option, the contractor shall supply digital photographs via email or file-share of any installed work.
- E. If additional visits are required by the Engineer to review work not completed by this review, the Engineer shall be reimbursed directly by the Contractor by check or money order (due 10 days from date of each additional visit) at a rate of \$125.00 per hour for extra trips required to complete either of the above-ceiling or final punch lists.
- F. All panelboard fronts shall be omitted until final punch list inspection is made. Directories for each panelboard shall be completed and available for review by the Engineer at that time.

1.49 POSTED OPERATING INSTRUCTIONS

- A. Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:
 - 1. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - 2. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - 3. Safety precautions.
 - 4. The procedure in the event of equipment failure.
 - 5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.
- B. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.50 TRAINING AND RELATED SUBMITTALS

A. Upon completion of all work and all tests, Contractor shall provide classroom and in the field training for each type and/or model of equipment installed. Training shall be led by qualified factory certified technician. Contractor shall submit a request to schedule training sessions a minimum of two weeks in advance. Submission shall include qualifications of instructor as well as a syllabus that the Owner will add/deduct to as they see fit. Each individual listed as an "Attendee" on the roster submitted by the Owner shall receive a copy of the maintenance manual to review during training. All training sessions shall be recorded and a DVD with proper labels identifying the date, equipment, and project shall be delivered prior to Completion of the project. If the audio from the recording is unclear, narration shall be added. The

Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representative that were present.

- B. The training phase shall be accompanied by complete as-built documentation and the technical systems operation manual.
- C. These training sessions shall be videotaped by the Installer and copies provided to the Owner within one (1) week of training
- D. Brochures: Furnish Owner a complete set of operating instructions and diagrams.
- E. Instruction Program: Submit outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- F. At completion of training, submit two complete training manual(s) for Owner's use.
- G. Qualification Data: For facilitator, instructor and photographer.
- H. Attendance Record: For each training module, submit list of participants and length of instruction time.
- I. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
- J. Demonstration and Training DVDs: Submit two copies within seven days of end of each training module.
- K. Identification: On each copy, provide an applied label with the following information:
 - 1. Name of Project.
 - 2. Name and address of photographer.
 - 3. Name of Construction Manager.
 - 4. Name of Contractor.
 - 5. Date video was recorded.
 - 6. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- L. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video. Include name of Project and date of video on each page.

1.51 EQUIPMENT/SYSTEMS TESTING, VERIFICATION & START-UP

- A. The Contractor (and Sub-Contractors) shall be responsible for commissioning, starting-up, testing, checking, examining, inspecting, etc. their own systems.
- B. The Electrical Contractor shall designate an individual under his employment to lead the start-up, testing and verification process. This person should not be the project manager or job site superintendent, but a person dedicated to making this critical task successful and completed in a timely manner.
- C. This individual shall also be responsible for the following items:
 - 1. All identification and labeling requirements per plans and specifications.
 - 2. Submission of switchgear coordination study, fault current study, and arc flash hazard analysis.
- D. A pre-start-up conference shall be held with the Owner, Construction Manager, Electrical Contractor, and the Manufacturers providing startup services. The purpose of this meeting will be discuss the goals, procedures, etc. for start-up.
- E. A specific line-item shall be included on the schedule of values for testing and verification of all systems indicated in this section. This line-item value shall be approved by the Engineer. The Engineer, Owner and the Engineer's Field Inspector(s) shall closely monitor progress and quality of the testing, verification, and startup and may withhold pay requests as deemed appropriate.
- F. The Contractor shall test all wiring and connections for continuity and grounds before equipment and fixtures are connected, and when indicated or required, demonstrate by Megger Test the insulation

resistance of any circuit or group of circuits. Where such tests indicate the possibility of faulty insulation, locate the point of such fault, pull out the defective conductor, replacing same with new and demonstrate by further test the elimination of such defect.

- G. Systems Requiring Testing & Verification:
 - 1. Electrical Distribution Equipment
 - 2. Lighting and Lighting Controls
 - 3. All Low Voltage Systems
 - 4. Grounding Systems
 - 5. Wiring and Terminations
- H. The Contractor shall include in the bid to provide systems startup and verification for ALL electrical systems specified for this project. Specific startup, testing, and verification specifications are included throughout the Electrical specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians (not third party Contractors) and shall complete and submit start-up reports/checklists. Submit start-up reports to the Engineer. The Contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner. Where factory start-up is not specified for a particular piece of equipment or system, the Contractor shall be responsible to perform start-up.
- I. The Contractor shall be responsible for completion of System Verification Checklist (SVC) / Manufacturer's Checklists. Furnish to the Testing Agent and Engineer. Sample checklists shall be submitted to the Engineer, Owner, and Testing Agent for approval.
- J. The completed reports shall be organized and bound together in a tabbed binder and submitted for review and approval.
- 1.52 SPECIAL WRENCHES, TOOLS AND KEYS
 - A. Each Contractor shall provide, along with the equipment provided, any special wrenches or tools necessary to dismantle or service equipment or appliances installed by him. Wrenches shall include necessary keys, handles and operators for valves, switches, breakers, etc. and keys to electrical panels, emergency generators, alarm pull boxes and panels, etc. At least two (2) of any such special wrench, keys, etc. shall be turned over to the Engineer prior to completion of the project. Obtain a receipt that this has been accomplished and forward a copy to the Engineer.

1.53 CLOSEOUT DOCUMENTS

- A. All items listed in this section shall be provided to the engineer upon substantial completion. Provide three bound copies with complete index and tabs to locate each item.
- B. As-Built Record Drawings:
 - 1. The Contractor shall insure that any deviations from the design are being recorded daily, as necessary, on record drawings being maintained by the Contractor. Dimensions from fixed, visible permanent lines or landmarks shown in vertical and horizontal ways shall be utilized. Compliance shall be a requirement for final payment. Pay particular attention to the location of underfloor or underground exterior in-contract or utility-owned or leased service lines, main switches and other appurtenances important to the maintenance and safety of the Electrical System. Deliver these record drawings to the Engineer as a system is completed, within ten days of the mark-up and/or while the accuracy of the mark-ups can be verified visually. Monthly payment may be withheld if the requirement is not complied with.
 - 2. All underground utilities/piping installed as part of this project shall be surveyed by a land surveyor licensed in the State of Ohio. This shall include underground electrical primary, communications, vaults. The survey shall include actual duct bank depths to top of conduit every 100 feet in length. The survey shall also include benchmarks dimensions relative to above grade, fixed structures. The survey shall be furnished on a compact disc in AutoCad ".dwg" format and ".pdf" format. Provide a GPS coordinate of each geothermal well and indicate on the as-built drawing. The survey information shall be included in the closeout documentation.

- 3. Refer to additional record drawing requirements within the general conditions and other sections of these specifications.
- C. Start-up and System Testing Certifications and Reports:
 - 1. Provide reports from all required testing to indicate procedures followed and complete results of all tests. Provide reports on manufacturer's standard forms for all equipment and system tests. Testing shall be per applicable NEC, NFPA, UL, NETA, and/or ANSI standards.
- D. Operation and Maintenance Manuals
 - 1. Upon substantial completion of the project, the Contractor shall deliver to the Engineers (in addition to the required Shop Drawings) three (3) complete bound hard copies and a digital copy of operation and maintenance instructions and parts lists for all equipment provided in this contract. Formatting and content shall follow the guidelines outlined in the latest version of ASHRAE Application Handbook, Guideline 4. As a minimum, the following shall be included:
 - 2. All instructions shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.
 - 3. Each Contractor, in the above mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this contract and a detailed, easy to read parts list and the name and address of the nearest source of supply.
 - 4. The operation and maintenance document directory should provide easy access and be well organized and clearly identified.
 - 5. The operation and maintenance manuals shall contain the following information:
 - a. Emergency information should be immediately available during emergencies and should include emergency and staff and/or agency notification procedures.
 - b. Provide contacts (company name, address, phone number, email) where parts may be purchased for all equipment.
 - c. Provide detailed maintenance instructions, including recommended preventative maintenance schedules for all equipment requiring maintenance. For lighting and lighting controls, provide recommended re-lamping program, provide a schedule for inspecting and recalibrating lighting controls, and provide a recommended settings list for all components with adjustable settings.
 - d. General Information. Provide the following:
 - 1) Building function
 - 2) Building description
 - 3) Operating standards and logs
 - e. Technical Information. Provide the following:
 - 1) System description
 - 2) Operating routines and procedures
 - 3) Seasonal start-up and shutdown
 - 4) Special procedures
 - 5) Basic troubleshooting
 - f. The maintenance manual should contain the following information:
 - 1) Equipment data sheets. Provide the following:
 - a) Vendor and local representative's contact information
 - b) Operating and nameplate data
 - c) Warranty
 - d) Detailed operating instructions.
 - e) Tools required
 - f) Types of cleaners to use
 - 2) Maintenance program information. Provide the following:
 - a) Manufacturer's installation, operation, and maintenance instructions
 - b) Spare parts information

- c) Preventive maintenance actions
- d) Schedule of actions
- e) Action description
- f) History
- Test reports document observed performance during start-up and commissioning.
- h. Reference Division 1 specifications for additional requirements.
- E. Shop drawings will not be accepted as satisfying the requirement for Operation and Maintenance Manuals.
- F. Shop Drawings: Provide complete copies of all approved shop drawings. Where shop drawings were returned "Furnish as Corrected", the contractor shall make the corrections noted by the engineer and submit final corrected shop drawings with close-out documentation.
- G. Parts Lists: Provide an inventory of all spare parts, special tools, attic stock, etc. that have been provided to the owner.
- H. Warranties: Contractor's one-year warranty and all other specific warranties indicated in the construction documents.
- I. Training Verification: Provide certification that all specified training has been completed. List training session dates, times, and types.
- J. Inspection Certificates: Provide certificates of inspection from electrical inspector, fire marshal, and any other required special inspections.
- K. Panel Schedules: Provide hard copies and digital copies of Excel files for all panel-board schedules.
- L. Final Power System Study Reports.
- M. Power Riser Diagram: Provide a framed full-size copy of the overall power riser diagram (under glass) to the Owner. Also, provide three (3) vinyl-coated copies of same. Where an existing power riser diagram is present, the Contractor shall obtain the document from the Owner, and update in digital format with the scope of this project. Edits shall be in digital format and this work shall be closely coordinated with the Owner.

PART 2 - PRODUCTS (Not Used)

g.

PART 3 - EXECUTION (Not Used)

END OF SECTION (260501)

DIVISION 26 - ELECTRICAL

SECTION 260502 - SCOPE OF THE ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SCOPE OF THE ELECTRICAL WORK

The Electrical work for this project includes all labor, materials, equipment, fixtures, excavation, backfill and related items required to completely install, test, verify place in service and deliver to the Owner complete electrical systems in accordance with the accompanying plans and all provisions of these specifications. This work shall primarily include, but is not limited to the following:

- 1. All raceways, conduits, cable management systems, cable trays, J-hooks, conductors, outlet boxes, fittings, pull boxes, manholes, etc.
- 2. All low-voltage distribution equipment, switchboards, panelboards, disconnect switches, fuses, , contactors, starters, service pedestals, etc.
- 3. Electrical Studies including Fault Current, Arc Flash, and Coordination Studies. All studies to be performed by manufacturer of electrical distribution equipment.
- 4. Electrical Contractor shall install, mount and wire VFD's which shall be furnished by the Mechanical Contractor, unless otherwise noted.
- 5. All wiring devices and device plates.
- 6. Cable splicing, terminations, supports, etc.
- 7. All light fixtures, drivers, ballasts and lamps.
- 8. Grounding, per NEC and specified requirements.
- 9. Identification of electrical systems and equipment labeling.
- 10. All low-voltage systems as listed in System Responsibilities Matrix on Electrical Legend.
- 11. Cabling, testing and devices for data/voice network.
- 12. All necessary coordination with the Owner ensure that work, connections, etc., that they are to provide is accomplished and that service to this facility is delivered complete prior to occupancy.
- 13. Paying all necessary fees and costs for inspections of all Division 26 systems by a Licensed Electrical Inspector.
- 14. Paying all necessary fees and cost for permits, electrical inspections, work by utility companies (power, telephone, cable television company, etc.). The Contractor shall contact the utility companies prior to submitting a bid to determine exactly these charges will be.
- 15. Prior to submitting a bid, the Contractor shall contact all serving utility companies and municipal services to determine exactly what each utility company will provide and exactly what is required of the Contractor and the Contractor shall include all such requirements in his base bid. This shall include relocation fees and construction cost recovery due to Power Utility Company and Cable Company or their successors.
- 16. All general and special conditions required to accomplish the work.

1.3 SYSTEM COMMISSIONING

- A. Section 019113 requires the engagement of a Commissioning Authority to document the completion of the Mechanical, Fire Protection, Plumbing, Electrical, Electronic Safety and Security, and associated Control Systems for the project. Section 019113 defines the roles and responsibilities of each member of the commissioning team.
- B. Comply with the requirements of Section 019113 for the commissioning of the various building systems.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 260503 - SHOP DRAWINGS, SUBMITTALS, LITERATURE, MANUALS, PARTS LISTS, AND SPECIAL TOOLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

- A. Each Contractor shall submit to the Engineer, within thirty days after the date of the Contract, one (1) electronic set of shop drawings and/or manufacturer's descriptive literature on all equipment required for the fulfillment of his contract. Each shop drawing and/or manufacturer's descriptive literature shall have proper notation indicated on it and shall be clearly referenced so the specifications, schedules, light fixture numbers, panel names and numbers, etc., so that the may readily determine the particular item the Contractor proposes to furnish. All data and information scheduled, noted or specified by hand shall be noted in color red on the submittals. The Contractor shall make any corrections or changes required and shall resubmit for final review as requested. Review of such drawings, descriptive literature and/or schedules shall not relieve the Contractor from responsibility for deviation from drawings or specifications unless they have, in writing, directed the reviewer's attention to such deviations at the time of submission of drawings, literature and manuals; nor shall it relieve them from responsibility for errors or omissions of any nature in shop drawings, literature and manuals. The term "as specified" will not be accepted.
- B. If the Contractor fails to comply with the requirements set forth above, the Engineer shall have the option of selecting any or all items listed in the specifications or on the drawings, and the Contractor will be required to provide all materials in accordance with this list.
- C. Review of shop drawings by the Engineer applies only to conformance with the design concept of the project and general compliance with the information given in the contract documents. In all cases, the installing Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located.
- D. The Engineer's review of shop drawings, schedules or other required submittal data shall not relieve the Contractor from responsibility for the adaptability of the equipment or materials to the project, compliance with applicable codes, rules, regulations, information that pertains to fabrication and installation, dimensions and quantities, electrical characteristics, and coordination of the work with all other trades involved in this project.
- E. No cutting, fitting, rough-in, connections, etc., shall be accomplished until reviewed equipment shop drawings are in the hands of the Contractors concerned. It shall be each Contractor's responsibility to obtain reviewed shop drawings and to make all connections, etc. in the neatest and most workmanlike manner possible. Each Contractor shall coordinate with all the other Contractors having any connections, roughing-in, etc., to the equipment, to make certain proper fit, space coordination, voltage and phase relationships are accomplished.

- F. Shop Drawings: Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
- G. Product Data: Submittal shall include performance and characteristic curves.

1.3 SUBMITTALS AND SHOP DRAWING

- A. In accord with the provisions specified hereinbefore, shop drawings, descriptive literature and schedules shall be submitted on each of the following indicated items as well as any equipment or systems deemed necessary by the Engineer:
 - 1. Power Equipment
 - a. Fault Current, Arc Flash and Coordination studies (submit along with switchgear & panelboards).
 - b. Switchgear, switchboards, distribution panelboards and panelboards.
 - c. Circuit breakers and fusible switches, per each type.
 - d. Disconnect switches.
 - e. Fuses, per each type required.
 - f. Control components (relays, timers, selector switches, pilots, etc.)
 - g. Motor starters, if not submitted with unit equipment by supplier.
 - 2. Raceways
 - a. Conduits and each type of conduit fittings.
 - b. Cable trays and each type of cable tray fitting.
 - c. Ladder trays and each type of ladder tray fitting.
 - d. Surface-mounted metal or plastic raceways, with each type of fitting.
 - e. Wireways and each type of wireway fitting.
 - f. J-hook assembly.
 - g. Floor trough and each type of floor trough fitting.
 - h. Composite pullboxes.
 - 3. Conductors
 - a. Conductors, splicing devices, and connectors, each by type.
 - b. Splice or tap blocks.
 - c. Primary cable (over 600 volts) and each style of termination fitting for primary cable.
 - 4. Devices
 - a. Each type of wiring device and their coverplates.
 - b. Floor boxes and poke-thrus, each by type, with required accessories.
 - c. Data/voice/video wallplates, each by type.
 - d. Any special items not listed above.
 - 5. Grounding
 - a. Electrodes, bonding devices, terminals, etc.
 - b. Building service grounding electrode components.
 - 6. Electronic 3D Coordination Drawings per Electrical General Provisions
 - 7. Dimensioned electrical room plans/equipment layouts
 - 8. Fire-stopping materials including wrap, caulk, putty, sleeves, etc.
 - 9. Seismic Restraints

- 10. Miscellaneous
 - a. Control panel assemblies.
 - b. Non-standard junction/pullboxes.
- 11. Special wrenches, tools and keys

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 260504 - SLEEVING, CUTTING, PATCHING AND REPAIRING FOR ELECTRICAL SYSTEMS

PART 1 - <u>GENERAL</u>

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 SUMMARY

- A. The Contractor shall be responsible for all openings, sleeves, trenches, etc. that he may require in floors, roofs, ceilings, walls, etc. and shall coordinate all such work with the Construction Manager, General Contractor and all other trades. He shall determine and coordinate any openings which he is to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the responsible Contractor.
- B. The Contractor shall plan his work ahead and shall place sleeves, frames or forms through all walls, floors and ceilings during the initial construction, where it is necessary for conduit, conductors, wireways, etc. to go through; however, when this is not done, this Contractor shall do all cutting and patching required for the installation of his work, or he shall pay other trades for doing this work when so directed by the Engineer. Any damage caused to the buildings by the workmen of the responsible Contractor must be corrected or rectified by him at his own expense.
- C. The Contractor shall cut holes in casework, equipment panels, etc. (if any), as required to pass pipes in and out.
- D. The Contractor shall notify other trades in due time where he will require openings of chases in new concrete or masonry. He shall set all concrete inserts and sleeves for his work. Failing to do this, he shall cut openings for his work and patch same as required at his own expense.
- E. Openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.
- F. Where any cutting, coring, etc. of reinforced concrete is required, such structures shall be x-rayed to avoid damaging existing reinforcing steel.
- G. Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be made completely water tight. Provide Crouse-Hinds Link-Seal Environmental Conduit Seal with stainless steel hardware. Alternative methods shall be approved by the Engineer during shop drawing review.
- H. In all cases, sleeves shall be at least two pipe sizes larger than nominal pipe diameter.
- I. All roof penetrations shall be made inside mechanical equipment curbs, UON.
- J. Sleeves passing through roof or exterior wall or where there is a possibility of water leakage and damage shall be caulked water tight for horizontal sleeves and flashed and counter-flashed with lead (4 lb.) or copper and soldered to the piping, lapped over sleeve and properly weather sealed.

- K. All rectangular or special shaped openings in plaster, stucco or similar materials including gypsum board shall be framed by means of plaster frames, casing beads, wood or metal angle members as required. The intent of this requirements is to provide smooth even termination of wall, floor and ceiling finishes as well as to provide a fastening means for lighting fixtures, panels, etc. Lintels shall be provided where indicated over all openings in bearing walls, etc.
- L. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the Structural Engineer.
- M. The Contractor shall be responsible for properly shoring, bracing, supporting, etc. any existing and/or new construction to guard against cracking, settling, collapsing, displacing or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements, shall be promptly and properly made good to the satisfaction of the Engineer.
- N. All work improperly done or not done at all as required by the Electrical trades in this section will be performed by the Contractor at the direction of the trade whose work is affected. The cost of this work shall be paid for by the Contractor who is in non-compliance with the Contract.
- O. All penetrations shall be patched with materials matching that which has been disturbed.

PART 2 - PRODUCTS

- 2.1 SLEEVES
- 2.2 SLEEVES
 - A. Sleeves for Raceways:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, hot-dipped galvanized, plain ends.
 - a. Sleeves for exterior walls: Anchor flange welded to perimeter.
 - B. Sleeves for Raceways Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
 - C. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel of length to suit application.
 - 2. Minimum Metal Thickness: Shall be 0.138 inch (10 gauge).
 - D. Coordinate sleeve selection and application with selection and application of firestopping.

2.3 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annual space between sleeve and conduit.
 - 1. Sealing elements: EPDM or NBR 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 plates to sealing elements. Include one for each sealing element.

2.4 GROUT

- A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydrauliccement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. The Contractor shall provide and locate all sleeves and inserts required for his work before the floors and surface being penetrated are built, otherwise the Contractor shall core drill for conduits where sleeves and inserts were not installed, or where incorrectly located. Core drilling is the only acceptable alternative to sleeves. Do not chisel openings. Where sleeves are placed in exterior walls or in slabs on grade, the space between the conduit and the sleeves shall be made completely and permanently water tight.
- D. Conduits that penetrate fire and/or smoke rated assemblies shall have sleeves installed as required by the manufacturer of the rating seal used.
- E. Fasten sleeves securely in floors, walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster or other materials being forced into the space between pipe and sleeve during construction.
- F. Sleeves in floors shall extend 4" above finished floor level.
- G. Escutcheon plates shall be provided for all conduits passing thru walls, floors and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the conduit. Where plates are provided for conduits passing thru sleeves which extend above the floor surface, provide deep recessed plates to conceal the conduit sleeves.
- H. In all areas where busducts are exposed and pass thru floors, the opening shall be surrounded by a 4-inchhigh by 3-inch-wide concrete curb.
- I. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

3.2 CUTTING

- A. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the Engineer.
- B. Conduit openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.
- C. X-ray concrete slabs and walls prior to core drilling. Do not core drill through rebar, steel or or reinforcing material without written permission from the Structural Engineer.
- D. Openings in metal building walls shall be made in strict accord with building suppliers recommendations.

3.3 PATCHING AND REPAIRING

- A. Patching and repairing made necessary by work performed under this division shall be included as a part of the work and shall be done by skilled mechanics of the trade or trades for work cut or damaged, in strict accordance with the provisions herein before specified for work of like type to match adjacent surfaces and in a manner acceptable to the Engineer.
- B. Where portions of existing lawns, shrubs, paving, etc. are disturbed for installation of work of this Division, such items shall be repaired and/or replaced to the satisfaction of the Engineer.
- C. Where the installation of conduit, raceways, etc. requires the penetration of fire or smoke rated walls, ceilings or floors, the space around such conduit, raceways, etc., shall be tightly filled with an approved non-combustible fire insulating material satisfactory to maintain the rating integrity of the wall, floor or ceilings affected.

- D. Conduits passing through floors, ceilings and walls in finished areas, unless otherwise specified, shall be fitted with chrome plated brass escutcheons of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the conduit around which it is installed.
- E. Stainless steel collars shall be provided around all conduits, raceways, etc., at all wall penetrations; both sides where exposed.
- F. Where conduits pass through interior or exterior walls, the wall openings shall be sealed air tight. This shall include sealing on both sides of the wall to insure air does not enter or exit the wall cavity. This is especially critical on exterior walls where the wall cavity may be vented to the exterior.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 260508 - COORDINATION AMONG TRADES, SYSTEMS INTERFACING AND CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 COORDINATION

- A. The Contractor is expressly directed to read the General Conditions and all sections of these specifications for all other trades and to study all drawings applicable to his work, including Architectural, Plumbing Fire Protection, Mechanical and Structural drawings, to the end that complete coordination between trades will be affected. Each Contractor shall make known to all other Contractors the intended positioning of materials, raceways, supports, equipment and the intended order of his work. Coordinate all work with other trades and proceed with the installation in a manner that will not create delays for other trades or affect the Owner's operations.
- B. Special attention to coordination shall be given to points where raceways, fixtures, etc., must cross other ducts or conduit, where lighting fixtures must be recessed in ceilings, and where fixtures, conduit and devices must recess into walls, soffits, columns, etc. It shall be the responsibility of each Contractor to leave the necessary room for other trades. No extra compensation or time will be allowed to cover the cost of removing fixtures, devices, conduit, ducts, etc. or equipment found encroaching on space required by others.
- C. The Contractor shall be responsible for coordination with all trades to ensure that they have made provision for connections, operational switches, disconnect switches, fused disconnects, etc., for electrically operated equipment provided under this or any other division of the specifications, or as called for on the drawings. Any connection, circuiting, disconnects, fuses, etc. that are required for equipment operation shall be provided as a part of this contract.
- D. Review and coordinate connections to electrically operated equipment furnished by other trades with project contract documents, shop drawings, submittals, and installation instructions. Notify Engineer in writing of discrepancies prior to proceeding with work. No extra payment will be allowed for relocation of fixtures, devices, conduit, and equipment not installed or connected in accordance with the above instructions.
- E. If any discrepancies occur between accompanying drawings and these specifications and drawings and specifications covering other trade's work, each trade shall report such discrepancies to the Engineer far enough in advance so that a workable solution can be presented. No extra payment will be allowed for relocation of fixtures, devices, conduit, and equipment not installed or connected in accordance with the above instructions.
- F. In all areas where air diffusers, devices, lighting fixtures and other ceiling-mounted devices are to be installed, the Mechanical Trade(s), the Electrical Trade and the General Trades shall coordinate their respective construction and installations so as to provide a combined symmetrical arrangement that is acceptable to the Engineer. Where applicable, refer to reflected ceiling plans. Request layouts from the Engineer where in doubt about the potential acceptability of an installation.

- G. Refer to equipment schedules and details on all contract documents for additional information for mechanical and plumbing connections. Provide labor and materials for a complete and operable system.
- H. Provide equipment overcurrent protection and feeder sizes for equipment furnished by this or other trades or by Owner per actual equipment nameplates and installation instructions.
- I. Provide weather-proof/weather-resistant maintenance receptacles within 25 feet of all mechanical and plumbing units/equipment. Coordinate installation locations with final equipment layout provided by Mechanical Contractor. Provide GFI branch circuit for each maintenance receptacle to nearest panelboard unless circuit is otherwise noted on drawings.
- J. Verify exact mounting locations and connection requirements of all mechanical equipment with the Mechanical Contractor prior to rough-in.
- K. Verify exact mounting locations and connection requirements of all plumbing equipment with the Plumbing Contractor prior to rough-in.
- L. Verify elevator mounting locations and connection requirements with manufacture prior to rough-in. Provide overcurrent protection as required per the final vendor shop drawings.

1.3 INTERFACING

- A. Each Electrical Trade, Specialty Controls Trade, Mechanical Trade, Plumbing Trade, Fire Protection Trade and the General Trades, etc., shall insure that coordination is affected relative to interfacing of all systems. Some typical interface points are (but not necessarily all):
 - 1. Connection of all controls to equipment.
 - 2. Electrical power connections to electrically operated (or controlled) equipment.
 - 3. Electrical provisions for all equipment provided by other trades or suppliers within this contract.
 - 4. Contractor is to provide conduit whips and back boxes, as needed, to power systems furniture.
 - 5. Coordination of connection of Telecommunications (voice, data, video) lines to Owner's existing or new service.
 - 6. Connection of utility electrical service to Owner's existing or new services.

1.4 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

- A. Each Contractor shall make all connections to equipment furnished by others, whenever such equipment is shown on any part of the drawings or mentioned in any part of the Specifications, unless otherwise specifically specified hereinafter.
- B. All drawings are complementary, one trade of the other. It is the Contractor's responsibility to examine all drawings and specifications to determine the full scope of his work. The project Engineers have arranged the specifications and drawings in their given order solely as a convenience in organizing the project, and in no way shall they imply the assignment of work to specific trades, contractors, subcontractors or suppliers.
- C. Supervision to assure proper installation, functioning and operation shall be provided by the Contractor furnishing the equipment or apparatus to be connected.
- D. Items indicated on the drawings as rough-in only (RIO) will be connected by the equipment supplier or Owner, as indicated. The Contractor shall be responsible for rough-in provisions only as indicated. These rough-ins shall be in accord with the manufacturer's or supplier's requirements.
- E. For items furnished by others, relocated, or RIO, the Contractor shall obtain from the supplier or shall field determine as appropriate, the exact rough-in locations and connection sizes for the referenced equipment.
- F. The Contractor shall be responsible for coordinating with the General and all other trades, as necessary, to determine any and all final connections that he is to make to equipment furnished by others.
- G. Sides of cable, basket and ladder trays shall not be obstructed with special attention to pipes, ductwork, raceways, equipment, cables, etc.

PART 2 - <u>PRODUCTS</u> – Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide power wiring from the motor starters to each motor and its manual controlling device.
 - 1. Make flexible or liquid tight connections as specified in Section 260533, Raceways
- B. Except where provided with equipment, furnish and install manual pushbutton stations and pilot lights, with wiring. Where stations and pilot lights are grouped at central locations, mount them under a common faceplate.
- C. Certain equipment, as indicated, will be furnished with control panels and auxiliary control components. Mount the panels, furnish and install source wiring and disconnects, and completely connect controls and motors.
- D. Where a specification sections require installation of equipment under supervision of equipment manufacturer's representative, coordinate electrical installation to cooperate with representative's requirements.
- E. Provide power sources for Owner-furnished equipment.

END OF SECTION 260508

DIVISION 26 – ELECTRICAL

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER, CONDUCTORS, CABLES, SPLICING DEVICES AND CONNECTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
- B. This section of the Specifications covers all of the electrical power, lighting, and control power (line voltage) conductors, but does not include communications, data or signal system conductors, which are specified separately in these specifications.
- C. All conduits installed without conductors shall have a 200 lb. test nylon string installed for future use, tied off securely at each end.
- D. No more than 40% conduit fill permitted for any conduit system, including video, intercom, data, voice, power or other signal circuits unless specifically indicated otherwise on the plans.
- E. No more than seven conductors (six current-carrying and one ground) shall be installed in a conduit except for switch legs and travelers in multi-point switching arrangements. Multi-wire branch circuits with a shared neutral are not allowed.
- F. If multiple circuits are pulled in a single homerun, a dedicated neutral shall be provided for each phase conductor. In these cases, a maximum of seven conductors (six current carrying and one ground) are permitted in a single conduit. Conductors shall be derated per NEC.
- G. Intentional or unintentional painting of exposed low-voltage and/or line-voltage cabling is prohibited. The contractor shall ensure that exposed cabling is adequately protected from direct painting or overspray whether painting is required within the electrical specifications or required by other disciplines/trades. The contractor shall review the painting requirements for all disciplines and shall provide cabling protection as required. Where exposed cabling is being installed in exposed ceiling or wall spaces that are required to be painted, the contractor shall provide alternate options for cable colors and shall provide submittals for such cabling to engineer for approval.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordinate paragraph below with qualification requirements in Division 01 Section "Quality Requirements" and as supplemented in "Quality Assurance" Article.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- 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.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- 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. Alcan Products Corporation; Alcan Cable Division.
 - 2. Alpha Wire Company.
 - 3. American Insulated Wire Corp.; a Leviton Company.
 - 4. Belden Inc.
 - 5. Cerro Wire LLC.
 - 6. Encore Wire Corporation.
 - 7. General Cable Technologies Corporation.
 - 8. General Cable Corporation.
 - 9. Senator Wire & Cable Company.
 - 10. Southwire Company.
- B. All conductors shall be 98% conductive annealed copper unless otherwise noted, UL listed and labeled. Comply with ANSI/NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation:
 - 1. Comply with ANSI/NEMA WC 70/ICEA S-95-658.
 - 2. Lighting and receptacle branch circuits shall be Type THW, THHN or THWN insulation.
 - 3. All feeders shall be Type THW or THWN of the size as shown on the Contract Drawings.
 - 4. THHN wiring shall only be installed in overhead, dry or damp locations.
 - 5. THWN OR THW wiring shall be used for all circuits pulled in underground or other wet locations.
- D. Conductor sizes indicated on drawings are based upon 75 degree C rating.
- E. Minimum branch circuit or feeder size shall be not less than #12 AWG copper wire or of the sizes shown on the drawings.
- F. Conductors #10 AWG and smaller shall be solid. Conductors #8 AWG and larger sizes shall be stranded.

- G. Conductors for fire alarm wiring shall be stranded and in full compliance with NEC 760. Exposed cabling in air plenums shall be rated for plenum installation.
- H. All wire on the project shall be new, in good condition, and shall be delivered in standard coils or reels.
- I. The color of the wire shall be selected to conform to Section 210-5 of the latest edition of the National Electrical Code. Power conductors of all sizes shall follow the color coding scheme listed under PART 3, IDENTIFICATION below.
- J. Conductors used for motor connections and connections to vibrating or oscillating equipment shall be extra flexible.
- K. Conductors for main ground from neutral bus, equipment grounding bus, building steel, grounding grid and main cold water pipe connection shall be bare copper.
- L. All conductors shall be identified by color code and by means of labels placed on conductors in all junction boxes and at each terminal point with Brady, Ideal, T & B or approved equivalent labels indicating source, circuit number or terminal number.
- M. All feeders and branch circuits shall be installed and sized for a maximum 2% voltage drop. As calculated using 80% of the supply breaker rating as the load. Adjust conductors and conduit size accordingly for actual field installed conditions.
- N. For 120VAC, 20AMP branch circuits:
 - 1. #12 AWG when run is 50 feet or less;
 - 2. #10 AWG when run is between 50 feet and 100 feet;
 - 3. #8 AWG when run is more than 100 feet.
- O. No aluminum conductors shall be used.
- P. MC cable may be used for normal power branch circuits, #10 and smaller, where concealed in walls, above ceilings, etc. MC cable shall not be used for emergency power circuits, any feeders, any exposed locations, or any wiring larger than #10. Supports shall be per NEC and all runs shall be parallel or perpendicular to building lines with right angle turns. Cables shall be bundled where run in groups using listed supports. Do not route through structure or on work of other trades. Provide independent supports directly from structure.
- Q. MC cable is acceptable for the following applications:
 - 1. Feeders for lighting fixture whips and for branch circuits concealed in walls and partitions only. Locate junction box and convert to single conductors in rigid raceway within the same room as where the cable enters/exits the wall.
 - 2. Use only for single-circuit cable (i.e. two wire plus ground). For devices in the same wall connected to different circuits, install separate single circuit cable for each circuit.
 - 3. The MC cable length for power circuits shall be limited to 30' from the junction box to the wiring device located in the wall. If the circuit continues outside the wall, the circuit must immediately transition to conduit.
 - 4. The MC cable length for lighting circuits shall be limited to 30' from the junction box to the first fixture and from that point only those fixtures above the enclosed space/room shall be served by this HCF circuit.
- R. MC cable is not acceptable for the following applications:
 - 1. Homeruns to Panelboards.
 - 2. Branch circuits serving Essential Electrical System (Emergency & Standby) loads; including Life Safety branch, Critical branch and equipment emergency system.
 - 3. Branch circuits serving HVAC, elevator/escalator, medical and kitchen equipment loads.
 - 4. Within mechanical, electrical or telecommunication equipment rooms.
 - 5. Exposed Branch Circuits within areas that do not have a ceiling (i.e. open to structure).
 - 6. Wet locations.

2.2 SPLICING DEVICES & CONNECTORS

- 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. 3M; Electrical Products Division.
 - 2. AFC Cable Systems, Inc.
 - 3. Burndy
 - 4. Gardner Bender.
 - 5. Hubbell Power Systems, Inc.
 - 6. Ideal Industries, Inc.
 - 7. ILSCO.
 - 8. NSi Industries LLC.
 - 9. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
 - 10. Reliable
 - 11. T&B
 - 12. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
- C. Splicing devices for use on #10 AWG and smaller conductors shall be pressure type such as T&B "Sta-Kon".
- D. Wire nuts shall be spring pressure type, insulation 600V, 105°C insulation, up to #8 AWG. Greater than #6 AWG shall be a compression type connection, 600V insulation, cold shrink tubing, taped to restore full insulation value of the wire being spliced.
- E. Pressure crimp-applied ring type (or fork with upturned ends) terminations shall be employed on motor and equipment terminals where such terminals are provided on motor and equipment leads or on all stranded wire terminations using #10 AWG or smaller conductors.
- F. Splices, where necessary, shall be made with hydraulically-set "Hy-press" or equivalent crimped connectors. All splices shall be insulated to the full value of the wiring insulation using a cold-shrink kit or the equivalent in built-up materials.
- G. Large connectors (lugs) at terminals shall be mechanical type, hex-head socket or crimp-on style, installed per the manufacturer's recommendations.
- H. Underground connections made between bare ground wires or to ground rods shall be exothermically welded, "Cadweld" or equivalent.
- I. No aluminum splicing devices or connectors shall be used.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION MATERIAL APPLICATIONS

- A. Feeders and Branch Circuits: Copper. Solid for #10 AWG and smaller; stranded for # 8 AWG and larger.
- B. Conductors used for motor connections and connections to vibrating or oscillating equipment shall be extra flexible stranded.
- C. Conductors used for theatrical lighting branch cables shall be extra flexible stranded.
- D. Lighting and receptacle branch circuits shall be Type THW, THHN or THWN insulation.
- E. All feeders shall be Type THW or THWN of the size as shown on the Contract Drawings.
- F. THHN wiring shall only be installed in overhead, dry or damp locations.
- G. THWN or THW wiring shall be used for all circuits pulled in underground or other wet locations.
- H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

- I. Motor Connections shall use connection lugs with motor stub splice insulators.
- J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wiremesh, strain relief device at terminations to suit application.

3.2 INSTALLATION

- A. Clean out raceway system before pulling conductors.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. The pulling of all wires and cable on this project shall be performed in strict compliance with applicable sections of the National Electrical Code. No conductor entering or leaving a cabinet or box shall be deflected in such a manner as to cause excess pressure on the conductor insulation. Conductors shall only be installed after insulating bushings are in place.
- E. The radius of bending of conductors shall be not less than eighteen times the outside diameter of the conductor insulation or more, if recommended by the manufacturer.
- F. Conductors installed within environmental air plenums shall be per NEC. Article 800 and other applicable codes, with FEP-type insulation or an approved equivalent. Also provide plenum-rated tie-wraps where plastic straps or other supports, etc., are installed in plenum areas.
- G. Where indicated, systems and control conductors that are installed exposed shall not be routed across ceilings or ductwork. They shall be held up against building structure or against permanent support members. They shall be installed in such a manner that they do not interfere with the access to or operation of equipment or removal of ceiling tiles. Nylon tie-wraps shall be installed in such a manner so as to bundle conductors neatly, allowing runouts of single conductors or groups to drop down to equipment served. Install grommeting where dropping out of trays or into panels or service columns. Install sleeves with bushings where penetrating partitions. Firestop sleeves with approved material. Do not penetrate firewalls if so indicated on plans. Refer to the drawings for support requirements and details on routing exposed communications conductors.
- H. Conductors for isolated power systems shall be installed in as short a run of conduit as practicable. No pulling soap shall be used on conductors in isolated power systems.
- I. Where conductors are installed in industrial facilities, they shall be per JIC standards.
- J. Maximum permissible pulling tensions, as recommended by the manufacturer for any given type of cable or wire installed shall not be exceeded. Utilize special remote readout equipment to ensure compliance. Use particular caution when installing twisted pair data cable or fiber optic cables -- forces permitted for pulling in are typically very low for these cable types.
- K. All cables and wiring, regardless of voltage, installed in manholes or cable vaults shall be routed in such a manner to provide a minimum of 6 feet of slack cable for future splicing. Install cables along walls by utilizing the longer route from entry to exit. If both routes are symmetrical, provide a loop of cable secured to wall. All cables shall be tied to insulated cable supports on wall-mounted racks, spaced a maximum of three feet apart.
- L. Where multi-wire branch circuits are allowed on the drawings, the phases and neutral shall be wire-tied together in the panelboard and in all pull boxes.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- C. Wiring at Outlets: Install conductors at each outlet with at least 12 inches of slack.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform tests and inspections and prepare test reports.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Perform insulation resistance (megger) testing for all bus duct and feeders in accordance with NETA ATS. Testing may be witnessed by the Engineer and/or Commissioning agent. Schedule all tests with Engineer with ample notice.
 - 3. Megger tests shall be performed at a DC voltage of 1,000 volts for 600 volt rated equipment, and at a DC voltage of 500 volts for 120-300 volt rated equipment. Minimum acceptable (temperature corrected) resistance is 25 megaohms for 120-300 volt rated equipment and 100 megaohms for 600 volt rated equipment and wiring.
 - 4. Test instruments shall be calibrated to national standards within the last 12 months.
- D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors #3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- E. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- F. Cables will be considered defective if they do not pass tests and inspections. Remove and replace malfunctioning units and retest as specified above.
- G. Submit test results to Engineer for approval.

3.5 IDENTIFICATION

- A. Color coding distribution voltage conductors, 600 volts or less
- B. Conductors, in all sizes of cable, shall have continuous solid insulation color(s) from the manufacturer. Taped ends shall not be acceptable.
 - 1. Conductors shall be color coded as follows:
 - a. 120/208 Volt Conductors
 - 1) Phase A: Black
 - 2) Phase B: Red
 - 3) Phase C: Blue

- 4) Neutral: White
- 5) Ground: Green
- 6) Isolated Ground: Green/Yellow
- b. Isolated Power Conductors (Type XLP or XHHN)
 - 1) Phase A Brown
 - 2) Phase B Orange
 - 3) Phase C Yellow
 - 4) Neutral White with brown tracer stripe
 - 5) Note: Provide each phase with tracer color other than white, green, or gray.
- c. Note: Further identify isolated power conductors with 1/2" wide purple tape at all terminations and junctions.
- 2. Fire Alarm Wiring: Red
- 3. Signal voltage wiring color coding shall be consistent throughout the project and shall match existing equipment and standards where applicable. Color coding for each system shall be unique.
- 4. Conductors within enclosures that may be energized when enclosure disconnect is off yellow, or taped with 1/2" yellow tape every 6" of length, inside enclosure. Provide lamacoid plate warning sign on front of enclosure where this condition occurs.
- 5. DC Wiring: Positive: Light Blue
 - Negative: Dark Blue
- C. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems.
- B. All metallic conduit, raceways, cable trays, wireways, supports, cabinets and equipment shall be grounded in accordance with the latest National Electrical Code, as shown on the Contract Drawings and in accord with the requirements of the local authority having jurisdiction, as applicable.
- C. The size of the equipment grounding conductors, grounding electrode conductors and service grounding conductors shall be not less than that given in Article No. 250 of the National Electrical Code, and/or as shown on the Contract Drawings. Where ungrounded conductor sizes are increased to minimize voltage drop, grounded conductor sizes shall be increased in the proper proportion.
- D. Grounding bus and non-current carrying metallic parts of all equipment and raceway systems shall be securely grounded by connection to common ground.
- E. The service entrance main ground bus shall also be connected to the main cold metallic water pipe within three feet of where it enters the building, on both the house and street sides of the main shut-off valve with a properly sized bonding jumper. A properly sized bonding jumper shall also be provided to the frame of any steel structure utilized in the construction. The steel frame of the building (if any) shall be made electrically continuous.
- F. All ground electrode systems shall be installed in accordance with manufacturer's recommendations, UL listings, ANSI standards, National Electrical Code and National Electrical Safety Code.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including the following:
 - 1. Grounding Systems
 - 2. Ground Rods
 - 3. Ground Wires
 - 4. Connectors and Fasteners
 - 5. Bonding Materials

1.4 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.

Greater Columbus Convention Center North Facility Air Handling Unit Fan Replacement Bid Package

- 3. Ground rings.
- 4. Grounding arrangements and connections for separately derived systems.
- 5. Grounding for sensitive electronic equipment.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports. Provide the following test reports:
 - 1. Bond resistance test
 - 2. Ground resistance tests
 - 3. Ground isolation test
 - 4. Continuity isolation test

1.5 CLOSEOUT DOCUMENTS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
- B. In addition to items specified in Section 260501 "CLOSEOUT DOCUMENTS," include the following:
 - 1. Instructions for periodic testing and inspection of grounding features at building master ground bus and electrodes based on NFPA 70B.
 - 2. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - 3. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.
- C. Listing and labeling: Provide products specified in this Section that are listed and labeled.
- D. Comply with NECA's "Standard of Installation."
- 1.7 SYSTEM COMMISSIONING
 - A. Section 019113 requires the engagement of a Commissioning Authority to document the completion of the Mechanical, Fire Protection, Plumbing, Electrical, Electronic Safety and Security, and associated Control Systems for the project. Section 019113 defines the roles and responsibilities of each member of the commissioning team.
 - B. Comply with the requirements of Section 019113 for the commissioning of the various building systems.

PART 2 - <u>PRODUCTS</u>

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS:

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Erico
 - 2. ILSCO
 - 3. Cadweld
 - 4. Burndy
 - 5. Therm-O-Weld
 - 6. T&B

- 7. O.A. Co.
- 8. Lyncole XIT Grounding
- 9. Superior Grounding Systems
- 10. LEC Inc

2.3 CONDUCTORS

- A. Comply with Specification Section 260519, LOW-VOLTAGE ELECTRICAL POWER, CONDUCTORS, CABLES, SPLICING DEVICES AND CONNECTORS.
- B. Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.
- C. Ground wires and cables shall be of the AWG sizes shown on the Contract Drawings or shall be sized in accordance with the prevailing codes. All ground wires and cables shall be copper.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar per EIA/TIA standards.
- E. All grounding fittings shall be heavy cast bronze or copper of the mechanical type except for underground installations or interconnection of grounding grid to cable, columns and ground electrodes, which shall be thermically welded type as manufactured by Cadweld, Burndy Co., Therm-O-Weld, or approved equivalent.

PART 3 - EXECUTION

3.1 GENERAL

- A. All metallic conduit, raceways, wireways, supports, cabinets and equipment shall be grounded in accordance with the latest issue of the National Electrical Code, as shown on the Contract Drawings and in accord with the requirements of the local authority having jurisdiction, as applicable.
- B. The size of the equipment shall be not less than that given in Article No. 250 of the National Electrical Code, and/or as shown on the Contract Drawings.
- C. Grounding bus and non-current carrying metallic parts of all equipment and raceway systems shall be securely grounded by connection to common ground.
- D. All outlet, junction and pull boxes shall be grounded with pigtail to the equipment grounding conductor.

3.2 APPLICATIONS

- A. Conductors: Install solid conductor for #10 AWG and smaller, and stranded conductors for #8 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, #3/0 AWG minimum or as indicated on drawings, whichever is larger.
 - 1. Bury at least 24 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of ductbank installation.

- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe.
- D. Grounding Bus: Install in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 18 inches above finished floor unless otherwise indicated.
 - 2. 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.
- E. 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.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Busway Supply Circuits
 - 8. Computer and Rack-Mounted Electronic Equipment Circuits.
- B. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- C. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
 - 1. For telephone, alarm, voice and data, and other communication equipment, provide #4/0 minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-18-inch grounding bus.
 - 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. All grounding conductors shall be protected from mechanical injury and shall be rigidly supported. Where ground conductors are run through flexible conduit and through panelboard switchboard or motor control center feeders, they shall be securely bonded to such conduit thru the use of grounding bushings at the entrance and exit. All connection of equipment shall be made with an approved type of solderless connection and same shall be bolted or clamped to equipment or conduit.
- C. Equipment ground connections to GFI circuit breakers shall be carried and bonded to each outlet on the circuit. Provide a separate equipment grounding conductor with green color insulation.
- D. Equipment grounding conductors shall be routed to lighting fixtures, devices, receptacles, electric heaters, furnace and other equipment. Equipment grounding conductors shall be green.
- E. Resistance to the grounding at the service entrance equipment shall be in accordance with the NEC for style of construction and shall not exceed five ohms as measured by the described testing method.

- F. All circuits shall have a grounding conductor.
- G. When grounding systems are completely installed and all grading in the area of the service grounding electrode has been completed up to finish elevations, perform a fall-of potential or other approved test to determine actual system resistance to earth. Report results to the Engineer in writing. Refer to testing provisions in this section of specifications.
- H. The Contractor shall ensure that the ground return path thru building structural steel or other means is electrically continuous back to the service grounding electrode and is of adequate capacity and impedance to carry the maximum expected fault or other current. Where no electrically continuous steel building frame is available, the Contractor shall provide a properly sized ground bar and ground conductor routed back to the main facility ground bus.
- I. Where a building's steel frame is made electrically discontinuous by masonry breaks (as at firewalls, etc.), the Contractor shall provide an accessible thermically welded bonding jumper of #500Kcmil copper to bond the building steel frame sections together, making the entire steel frame electrically continuous. The installation of these bonding jumpers shall be reviewed by the Engineer prior to their being covered by construction.
- J. Grounding connections shall never be made to fire protection, natural gas, flammable gas or liquid fuel piping, except where specifically indicated on the plans.
- K. Where dielectric fittings are utilized in piping systems, the piping system shall not be utilized as a ground path. Bonding jumpers shall not be utilized to bridge over such fittings. Piping systems shall not be utilized as ground paths except where specifically required by codes in the case of water piping.
- L. At all metallic outlet, junction and pull boxes, bond the equipment grounding conductor to the box.
- M. Ground Rods: Drive rods until tops are 12 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
 - 3. Provide well access for testing at one (1) rod.
- N. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- O. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- P. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange.

Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

- 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
- 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- Q. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- R. Grounding for Steel Building Structure: Provide a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- S. Concrete-Encased Grounding Electrode (Ufer Ground): Provide and fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than #4 AWG.
 - 1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- T. Perform ground testing, log results, and provide reports of test points, test values, and procedure as required by engineer and/or local authority having jurisdiction. All systems shall be grounded to maintain leakage current below levels required by applicable codes and standards.
- U. Grounding Busbars:
 - 1. Install busbars horizontally, on insulated spacers 4 inches minimum from wall, 72 inches above finished floor unless otherwise indicated.
 - 2. 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.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by four point fall-of-potential method according to IEEE 81.
 - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
- 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
- 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
- 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm.
- 5. Substations and Pad-Mounted Equipment shall be 5 ohms or less.
- 6. Manhole Grounds shall be 10 ohms or less.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

3.6 FUNCTIONAL PERFORMANCE TESTS

A. System functional performance testing is part of the Commissioning Process as specified in Section 019113. Functional performance testing shall be performed by the contractor and witnessed and documented by the Commissioning Authority.

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - <u>GENERAL</u>

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

- A. Section Includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
 - 3. Isolation pads.
- B. Related Sections include the following:
 - 1. Division 26 Section "Vibration Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit
- C. LFMC: Liquid-tight flexible metal conduit
- D. GRS: Galvanized rigid steel conduit.
- 1.4 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.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. 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.
- 5. Concrete Based for Equipment.
- 6. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- 7. Delegated-Design Submittal: For hangers and supports for electrical systems.
- 8. Include design calculations and details of trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which hangers and supports will be attached.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Items penetrating finished ceiling, including the following:
 - 5. Lighting fixtures.
 - 6. Air outlets and inlets.
 - 7. Speakers.
 - 8. Sprinklers.
 - 9. Access panels.
 - 10. Projectors.

1.7 QUALITY ASSURANCE

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

1.8 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.9 SYSTEM COMMISSIONING

- A. Section 019113 requires the engagement of a Commissioning Authority to document the completion of the Mechanical, Fire Protection, Plumbing, Electrical, Electronic Safety and Security, and associated Control Systems for the project. Section 019113 defines the roles and responsibilities of each member of the commissioning team.
- B. Comply with the requirements of Section 019113 for the commissioning of the various building systems.

PART 2 - PRODUCTS

2.1 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:
 - a. Allied Tube & Conduit

- b. Cooper B-Line, Inc.; a division of Cooper Industries.
- c. ERICO International Corporation.
- d. Thomas & Betts Corporation.
- e. Unistrut; Tyco International, Ltd.
- 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. 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.
- E. Device Box Mounting Brackets: Factory-fabricated sheet steel brackets for support of device boxes adjacent to or between studs.
 - 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. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
- F. Through-Stud Cable and Raceway Support Clips: Factory-fabricated spring steel clip for cables or raceways where run horizontally through metal studs.
 - 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. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
- G. Roof-mounted Raceway Support Blocking: Factory-fabricated support blocking for use under roofmounted raceways. Wedge-shaped blocking constructed of 100% recycled UV-resistant Rubber with integral galvanized steel strut to accept raceway support clips.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Cooper B-Line C-Port series components or a comparable product by one of the following:
 - a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
- H. Tee Bar Grid Box Hanger: Factory-fabricated metal electrical box hanger for supporting boxes at locations between ceiling system t-grid components. Height adjustable for various electrical box depths. Attached to ceiling tee bar with screws or integral clamp for stability. Includes tab for independent support wire attachment.
 - 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. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
- I. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- J. 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, or steel 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:
 - 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.
- 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or 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:
 - 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: Solid, threaded steel.

2.2 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 05 Section "Metal Fabrications" for steel shapes and plates.

2.3 VIBRATION ISOLATION PADS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Korfund Maxi-Flex Pads or a comparable product by one of the following:
 - 1. Ace Mountings Co., Inc.
 - 2. Amber/Booth Company, Inc.
 - 3. California Dynamics Corporation.
 - 4. Isolation Technology, Inc.
 - 5. Kinetics Noise Control.
 - 6. Mason Industries.
 - 7. Vibration Eliminator Co., Inc.
 - 8. Vibration Isolation.
 - 9. Vibration Mountings & Controls, Inc.
- B. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NFPA 70, NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except where requirements of this Section are more stringent.
- B. Maximum Horizontal and Vertical Support Spacing for Raceway(s): Space supports for EMT and GRS as required by NFPA 70.
- C. Minimum Hanger Rod Size for Raceway Supports: Minimum rod size shall be 1/4 inch in diameter.
- D. Single Raceways:
 - 1. For Raceways 1-1/4-inch and smaller: Install adjustable steel band hanger suspended on threaded rod.
 - 2. For Raceways larger than 1-1/4-inch: Install trapeze-type supports fabricated with steel slotted support system suspended on threaded rods. Size trapeze members, including the suspension rods, based on the support required for the size, and loaded weight of the conduits.
 - a. Secure raceway or cable to support with two-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.
- E. Multiple Raceways: Install trapeze-type supports fabricated with steel slotted support system suspended on threaded rods, where multiple raceways are run vertically or horizontally at the same elevations. Size trapeze members, including the suspension rods, based on the support required for the number, size, and loaded weight of the conduits. Space them as required for the smallest conduit to be supported. Size 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 or single-bolt conduit clamps using spring friction action for retention in support channel.
- F. 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.

3.2 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SUPPORT INSTALLATION

- A. Comply with NFPA 70, NECA 1 and NECA 101 for installation requirements except where requirements of this Article are more stringent.
- B. Fasten junction, pull and devices boxes securely to the building construction, independent of raceway system.
- C. Install Device Box Mounting Brackets supported between two studs. All device boxes shall attached to two studs, device box stabilizers shall not be acceptable.
- D. Install Through-Stud Cable and Raceway Support Clips where cables or raceways run horizontally through metal studs.

- E. Install Tee Bar Grid Box Hanger supported between two ceiling grid tee bars where devices boxes are located flush in recessed suspended ceilings.
 - 1. Install at least one independent support rod from box hanger to structure.
- F. Install Roof-mounted Raceway Support Blocking where raceways run on across roofing.
 - 1. Coordinate installation of roof supports with items specified in Division 07 Section "Roof Accessories." Provide products compatible with rooftop materials included in the Work.
- G. Provide minimum of two lock nuts per threaded support rod except where lock nut tightens against a threaded socket, one locknut may be used.
- H. Support raceways at a distance above suspended ceilings to permit removal of ceiling panels and luminaires.
- I. Locate raceways so as not to hinder access to mechanical equipment.
- J. Do not secure conductors, raceways, or supports to suspended ceiling hanger rods or wires.
- K. 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 (90 kg).
- L. Mounting and Anchorage of Surface-Mounted or Recessed-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. Where support anchors are required, establish their type and locate in concrete construction before concrete is poured, if possible. Fit each hanger rod with a nut at its upper end, and set nut in a universal concrete insert in the form. Where supported weight exceeds holding strength of a single insert, pass rods through top slot of inserts and interlock with reinforcing steel. Also, where particularly heavy loads are to be supported, suspend hanger rod or rods from a structural angle spanning two or more inserts and securely bolted thereto to distribute the weight.
 - 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. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Springtension clamps.
 - 6. To Light Steel: Sheet metal screws.
 - 7. For Surface-Mounted Items 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 structure by means that meet seismic-restraint strength and anchorage requirements. Attachment to gypsum wall board is not acceptable as sole support means; slotted-channel rack solidly attached to structure or light-gauge metal framing at both ends is required.
 - 8. For Recessed-Mounted Items in Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices to intermediate light-gauge metal framing members on each side of device or provide slotted-channel racks within hollow wall attached to structure by means that meet seismic-restraint strength and anchorage requirements. Attachment to gypsum wall board is not acceptable as sole support means.
- M. Do not support any items (equipment, piping, conduit, etc.) exceeding 2 inches in diameter from the bottom of slabs. Where intermediate supports are required between structural members, use slotted steel channels support systems attached to beams or joists in order to avoid attachment to slabs.
- N. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars. Verify reinforcing locations with Structural Engineer. X-Ray existing concrete structures as required.

3.4 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 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.
- 3.5 CONCRETE BASES
 - A. Construct concrete bases of dimensions indicated but not less than 3 inches larger in all directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
 - B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."
 - C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.6 PAINTING

- A. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

SECTION 260533 - RACEWAYS AND FITTINGS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

- A. This section is intended to specify the raceways, conduit, conduit fittings, hangers, junction boxes, splice boxes, specialties and related items necessary to complete the work as shown on the drawings and specified herein.
- B. This section specifies basic materials and methods and is a part of each Division 26, 27 and 28 Sections that implies or refers to electrical raceways specified therein.
- C. The types of raceways specified in this section include the following:
 - 1. Steel electrical metallic tubing (EMT)
 - 2. Galvanized rigid steel conduit (GRS or RMC)
 - 3. Intermediate metal conduit (IMC)
 - 4. Rigid aluminum conduit (RAC)
 - 5. Flexible metal conduit (FMC)
 - 6. Liquid-tight flexible metal conduit (LFMC)
 - 7. Rigid nonmetallic conduit (RNC)
 - 8. Surface metal raceway (SMR)
 - 9. Metal wireways and auxiliary gutters.
 - 10. Wall ducts and trench ducts.
 - 11. Cable tray or cable trough.
 - 12. Duct banks, and their construction.
- D. All raceways, as listed above and otherwise specified herein shall be provided in compliance with latest editions of all applicable UL, NEMA, NEC and ANSI standards. All conduit, raceways and fittings shall be Underwriters Laboratories listed and labeled, or bear the listing of an agency acceptable to the local authority having jurisdiction.
- E. Conduit and raceways, as well as supporting inserts in contact with or enclosed in concrete shall comply with the latest edition of all ACI standards and the equipment manufacturer's recommendations for such work.
- F. The decision of the Engineer shall be final and binding in any case where a question or inquiry arises regarding the suitability of a particular installation or application of raceways, supports or materials, if other than outlined herein.
- G. Minimum size of conduit shall be 3/4" trade size for power and 1-1/4" trade size for voice/data/TV unless otherwise noted on the drawings. All conduit and raceways shall be sized for the number of conductors contained, in accord with the latest edition of the National Electrical Code or any other applicable standards.

- H. The installer of raceway systems shall avoid the use of dissimilar metals within raceway installations that would result in galvanic-action corrosion.
- I. PVC or other non-metallic conduit shall be rated for the maximum operating temperature that could be developed by the conductors it encloses, while in normal operation.
- J. All empty conduit installed anywhere shall have pull-strings installed for future cabling installation. Coordinate with vendors and provide extra pull-strings as required to ensure that when cabling is pulled, conduit will still have pull-strings installed for future use.
- K. ¹/₂" conduit may be used for no more than (5) #12 AWG or (3) #10 AWG wires. Light fixture whips may be 3/8" flexible metal conduit.
- L. Fire Alarm Cabling (open): All wiring which is exposed, concealed in walls, concealed above inaccessible ceilings, or otherwise inaccessible shall be installed within conduit and enclosed junction boxes. Provide a completely separate conduit system from power wiring or other raceway systems. All concealed conduit shall be manufactured red no field painting will be accepted and exposed conduit in finished spaces shall be painted to match adjacent finishes. Concealed cabling above accessible ceilings shall be an open cabling system ran in dedicated 2'' J-hooks. Provide J-hooks above or below primary cabling paths used for other systems. Conduit stub-outs shall be run to these paths. Cabling shall be listed by the fire alarm system manufacturer for use with their system. Cabling shall be air-plenum-rated.

1.3 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.
- 1.4 ACTION SUBMITTALS
 - A. Product Data: Submit manufacturer's product data for raceways, conduits, outlet boxes, and wireways.
 - B. Shop Drawings:
 - 1. Submit Shop Drawings of the complete metal surface raceway system.
 - 2. Shop Drawings shall include sizes and lengths of raceways, inside corners, outside corners, end caps, raceway cover spacing, grounding, branch circuiting and wiring including locations of service entrances, receptacle types and manufacturers, receptacle spacing, and receptacle labeling with proper voltage, phase, circuit and panelboard designations as indicated on the Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit; a Tyco International Ltd. Co.

- 3. Anamet Electrical, Inc.
- 4. Electri-Flex Company.
- 5. O-Z/Gedney; a brand of EGS Electrical Group.
- 6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
- 7. Republic Conduit.
- 8. Robroy Industries.
- 9. Southwire Company.
- 10. Thomas & Betts Corporation.
- 11. Western Tube and Conduit Corporation.
- 12. Wheatland Tube Company; a division of John Maneely Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. STEEL ELECTRICAL METALLIC TUBING

- 1. Electrical metallic tubing (EMT), of corrosion-resistant zinc coated cold rolled steel tubing shall be permitted for concealed installation in dry interior locations.
- 2. EMT shall not be installed underground, in concrete slabs or where exposed to physical damage. EMT shall be permitted for exposed work in mechanical and electrical rooms and other exposed structure areas where not subjected to physical damage, as determined by the Engineer. All exposed conduit and fittings located within 8'-0" of finished floor shall be rigid steel with threaded connectors.
- 3. Comply with ANSI C80.3 and UL 797.
- 4. Connectors and couplings for EMT: Concrete- or rain-tight, compression type, made of zinc- or chromium-plated steel. Connectors shall have nylon insulating throats.

D. GALVANIZED RIGID STEEL CONDUIT

- 1. Galvanized rigid steel conduit (GRS or RMC) shall have a zinc coating inside and outside by means of hot-dip galvanizing. Use only threaded fittings for GRS.
- 2. Use GRS where subject to physical damage for exposed work in mechanical spaces, within factory or other industrial work areas, for exposed fit-up work on machinery, for exposed exterior damp or wet location work, in hazardous atmospheres, in exterior underground locations where installed beneath roadways, where ells occur in underground PVC conduits, or where turning out of concrete encased duct banks, and at other locations as specifically called out on the drawings.
- 3. GRS shall be used for all building interior power wiring or cables of over 600 Volts.
- 4. GRS shall be delivered with plastic protectors on the threads.
- 5. GRS threads shall not have any coating which will reduce conductivity of the joint.
- 6. Couplings, bends, elbows and fittings shall be subject to the same requirements as for the straight lengths.
- 7. Comply with ANSI C80.1 and UL 6.
- 8. "Kwik-Couple" type fittings are not acceptable.
- 9. Use polyvinylchloride (PVC) coated rigid steel conduit in accordance with NEMA RN 1, Type 40 (40 mils thick) where underground and in corrosive areas.

E. INTERMEDIATE METAL CONDUIT

- 1. Unless otherwise indicated on the drawings, intermediate metal conduit (IMC) may be used in any location in place of rigid galvanized steel conduit, as permitted by codes, and as approved by the Engineer.
- 2. Manufactured in conformance with UL standards.
- 3. Comply with ANSI C80.6 and UL 1242.

F. RIGID ALUMINUM CONDUIT

- 1. Rigid aluminum conduit shall be permitted for installation indoors in dry locations only. Under no conditions shall it be cast into concrete slabs or pass thru construction where prolonged contact will degrade the aluminum.
- 2. All ells used in rigid aluminum conduit systems shall be rigid galvanized steel.

- 3. Manufactured in conformance with UL standards.
- 4. Comply with ANSI C80.5 and UL 6A.

G. FLEXIBLE METAL CONDUIT

- 1. Flexible metal conduit may be used only where required for connection to light fixtures, motors and other equipment subject to vibration. It shall be constructed of galvanized steel. It shall be installed with connectors designed for the purpose. All flexible metal conduit shall be installed as a single piece. No joints shall be installed. Flexible conduit shall not be used in wet or dusty locations or where exposed to oil, water or other damaging environments. An equipment grounding conductor or bonding jumper shall be used at all flexible conduit installations. Flexible metal conduit shall not be used in lengths over six feet for light fixture and three feet for other connections. Flexible metal conduit shall not be used in telephone, fire alarm, intercom, security, and other communication systems.
- 2. Comply with UL 1.

H. LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- 1. Weatherproof flexible metal conduit shall be wound from a single strip of steel, neoprene covered, equivalent to "Liquatite" or "Sealtite" Type "UA". It shall be installed in such a manner that it will not tend to pull away from the connectors. Provide strain relief fittings equivalent to "Kellems" as required where subject to vibration. Flexible connections to motors in dusty areas shall be dust-tight, in areas exposed to the weather weatherproof. Length shall not exceed 3' unless permitted by the Engineer.
- 2. Comply with UL 360.
- 3. Liquidtight type connectors: UL 14814A. Fittings: With nylon insulated throat.

I. RIGID NON-METALLIC CONDUIT

- 1. Polyvinylchloride (PVC) Conduit:
 - a. PVC conduit shall be Type II, in conformance with NEMA TC2 and the following:
 - 1) Schedule 40 and 80, high impact.
 - 2) Suitable for use with 90°C rated wire.
 - 3) Conform to UL Standard 651 and carry appropriate UL listing for above and below ground use.
- 2. Rigid non-metallic conduit shall be constructed of PVC, nominally schedule 40 weight. If installation will enclose utility company provided conductors, verify exact type required and install in accordance with their standards, where more stringent than this specification in normal building conditions.
- 3. Rigid non-metallic conduit may be used in exterior wet or damp locations where installed underslab or underground. It shall not be run in interior locations, except with special permission from the Engineer for use in corrosive environments, and then only if protected from physical damage. No rigid non-metallic conduit may be installed in environmental air plenums or cast into above-grade concrete slabs. No rigid nonmetallic conduit may be installed in locations where the ambient temperature might exceed the rating of the raceway.
- 4. Where rigid non-metallic conduit is placed underground, as for feeder circuits, secondaries or branch circuit runs and where ell is made upward thru a slab on grade, transition the turning ell and the riser to rigid steel conduit to a height of 6" above the concrete slab.
- 5. Flexible non-metallic conduit shall not be used, except by special permission, obtained in writing from the Engineer.
- 6. Provide equipment grounding conductors of copper, sized as required by codes, in all circuits installed in rigid nonmetallic raceways.
- 7. Manufactured in conformance with UL standards.
- 8. Comply with NEMA TC 2 and NEMA TC 3.
- J. RACEWAY FITTINGS

- 1. Fixture whips shall be 1/2" flexible, with clamp-on steel fittings at each end, six foot maximum length, with insulated throat bushings at each end and bonding locknuts. Wiring thru fixture whips shall be #12 AWG, with #12 AWG ground bonded to outlet at source end.
- 2. Raceway fittings (or condulets) shall be of gray iron, malleable iron or heavy copper-free cast aluminum. They shall be furnished in proper configurations, avoiding excessive plugged openings. Any openings that are left shall be properly plugged. All coverplates shall be gasketed with neoprene or similar approved materials, rated for the environment. Wiring splices within are not permitted.
- 3. Where required, raceway fittings shall be provided in explosion-proof configurations rated for the atmosphere. Place conduit seal off fittings at each device in accord with applicable codes. Seal off fittings shall be packed with wadding, and poured with an approved non-shrink sealing compound.
- 4. Where conduit transitions in a run from a cold to a warm environment, (such as at a freezer, refrigerator or exterior wall) sealoff fittings shall be placed on the warm side immediately at the boundary to prevent migration of condensation within raceway systems.
- 5. Conduit bodies, junction boxes and fittings shall be dust tight and threaded for dusty areas, weatherproof for exterior locations and vapor tight for damp areas. Conduit fittings shall be as manufactured by Crouse Hinds, Appleton, Killark or approved equivalent. All surface mounted conduit fittings as with "FS", "FD", "GUB" Types etc., shall be provided with mounting hubs.
- 6. Where lighting fixtures, appliances or wiring devices are to be suspended from ceiling outlet boxes, they shall be provided with 3/4" rigid conduit pendants. Outlet boxes shall be malleable iron, provided with self-aligning covers with swivel ball joint and #14 gauge steel locking ring. Provide safety chain between building structure and ballast housing of light fixtures for all fixtures, appliances or devices greater than 10 lbs weight. Fixtures shall be installed plumb and level. Cover pendants shall be finished to match fixtures.
- 7. UL listed expansion/deflection fitting shall be provided at all locations where a raceway/conduit crosses a structural joint intended for expansion, contraction or deflection. Other approved means may be acceptable with permission of the Engineer. Provide copper ground bonding jumpers across expansion fittings.
- 8. Fittings for threaded raceways shall be tapered thread with all burrs removed, reamed ends and cutting oil wiped clean.
- 9. Fittings for EMT conduits 2-1/2" and smaller shall be of steel, compression type. Fittings for sizes larger than 2-1/2" shall be setscrew, with two setscrews each side. Conduit stops shall be formed in center of couplings. All EMT connectors and couplings shall be of formed steel construction. All connectors shall be insulated throat type.
- 10. Indentation or die-cast fittings shall not be permitted in any raceway system.
- 11. Compression type fittings shall be utilized for EMT conduit installed in damp or dusty locations, or where otherwise indicated.
- 12. All conduit fittings shall be securely tightened. All threaded fittings shall engage seven full threads. Fasteners shall be properly torqued to manufacturer's recommendations.
- 13. Comply with NEMA FB1 and UL 514B.

2.2 SURFACE MOUNTED METAL RACEWAY

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Wiremold
 - 2. Istrol
 - 3. Hubbell
- B. Surface metal raceways shall only be provided where indicated on the drawings.
- C. System: Provide surface raceway systems for branch circuit and data network voice, video and other low-voltage wiring. Surface raceway system shall consist of raceway bases, covers, pre-divided raceway bases, dual covers, appropriate fittings and device mounting plates necessary for a complete installation.
- D. Surface metal raceways shall be constructed of code gauge corrosion-resistant galvanized steel or aluminum extrusions, and finished in an ivory, buff or grey color as selected by the Engineer. Finishes shall be suitable for field painting, prepared by the installing Contractor as necessary.

- E. Surface metal raceways, where used as raceways only, shall be sized for the conductors indicated. Nominal minimum size of such raceways shall be equivalent to Wiremold Co. Series #700, or equivalent by Walkerduct, Isotrol or other approved manufacturer.
- F. Surface metal raceways to be furnished with integral receptacles shall have Simplex Nema 5-20R outlets spaced on centers as indicated on plans. These shall be Wiremold Co. #2200 Series or equivalent Walkerduct, Isotrol or other approved manufacturer.
- G. Surface Mounted Aluminum Raceways: ALDS4000 Dual Channel Aluminum Surface Raceway by The Wiremold Company.
 - 1. Material: Alloy 6063-T5 extruded aluminum; minimum thickness 0.050-inches.
 - 2. Finish: Satin, No. 204 clear anodized, 0.004-inch thick, Class R1 Mil-Spec.
 - 3. Device Cover Plates: Suitable to mount commercially available duplex devices, single 1.40" and 1.59" diameter receptacles. GFCI, surge receptacles and other rectangular faced devices, and voice and data jacks. Cover plates shall be removable using standard screwdriver without marring the finish.
- H. Surface metal raceways and all components and fittings shall be furnished by a single manufacturer, wherever practical. All trim and cover fittings, flush feed boxes, splices, outlet fittings, etc, necessary for a complete installation shall be provided by the installing contractor. These raceways shall be rigidly mounted with approved fasteners on not to exceed 24" centers in a run, or 6" from ends and on either side of a corner. Refer to plans for notations on exact types of these raceways and outlet configurations.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, available 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; a Pentair company.
 - 3. Mono-Systems, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70. Minimum of 14 guage steel before finishes are applied.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireways of painted steel construction shall be corrosion-resistant, moisture and oil resistant where indicated or necessary. Wireways shall be furnished in nominal sizes of 2 ¹/₂ " X 2 ¹/₂ ", 4" X 4", 6"" X 6", 8" X 8" or 12" X 12", as indicated on plans. Furnish with hinged covers on all runs and removable covers on all fittings, to allow a continuous unobstructed path for conductor installation. Provide knockouts on all runs, unless otherwise indicated or prohibited by codes.
- E. Provide wireways with hangers of same manufacturer, installed so as to allow unobstructed access to wireway interior. Install at not to exceed 8'-0" centers, closer as needed at fittings and turns. Use ¼ " rod hangers minimum for up to 4"X 4", 3/8 " rod minimum up to 8"X 8", ½ " rod minimum for 12" X 12".
- F. Wireway Covers: Furnish with continuous hinged covers on all runs and removable covers on all fittings, to allow a continuous unobstructed path for conductor installation.
- G. Finish: Manufacturer's standard enamel finish.
- 2.4 SUPPORTS AND HANGERS
 - A. Supports and hangers shall be installed in accord with all applicable codes and standards. They shall be corrosion resistant, galvanized or furnished with an equivalent protective coating. All electrical

raceways shall be hung independently from the building structure with UL listed and approved materials. Hangers and supports depending from the support systems of other trades work shall not be permitted, except with specific approval in writing from the Engineer. The use of tie wire for support or fastening of any raceway system is prohibited. Perforated metal tape shall not be used for raceway support.

- B. No raceway shall be installed on acoustic tile ceiling tees, or in any location that will impair the functioning, access or code-required clearances for any equipment or system.
- C. Supports for raceways shall be of materials compatible with the raceway, of malleable iron, spring steel, stamped steel or other approved material. Die-cast fittings are not permitted for supports.
- D. The installing contractor shall provide all necessary supports and braces for raceways, in a rigid and safe installation, complying with all applicable codes.
- E. Individual conduits routed on building walls, ceilings or equipment shall be secured by two- hole galvanized malleable iron or stamped steel pipe strap or "minerallac" 2-piece straps. The straps are to be anchored by an approved means such as expansion anchors, toggle bolts, through bolts, etc. Where required by codes or other standards, provide spacers behind mounting clamps to space conduits off walls.
- F. Supports may not be fastened to roof decking on drive pins.
- G. Individual conduits run on building steel shall be secured by means of clamp supports similar and equal to those manufactured by the C.C. Korn Company, Elcen Co., B-Line or approved equivalent. Provide korn clamps, bulb-tee, flange clamps, beam clamps, "minerallacs", etc.
- H. Where feasible, vertical and/or horizontal runs of conduit shall be grouped in common hangers on "trapezes" of channel stock as manufactured by "Unistrut" or equivalent, 1-5/8" minimum depth. Utilize conduit clamps appropriate to the channel.
- I. Channel strut systems for supporting electrical equipment or raceways shall be constructed of 16 gauge minimum hot dip galvanized steel with 9/16" diameter holes on 8" centers, with finish coat of paint as manufactured by Unistrut, B-Line, Kindorf, or approved equivalent.
- J. The minimum diameter of round all-thread steel rods used for hangers and supports shall be 1/4", 20 threads per inch. All-thread rod shall be furnished with a corrosion-resistant finish.
- K. Welding directly on conduit or fittings is not permitted.
- L. Provide riser support clamps for vertical conduit runs. Riser support clamps shall be of heavy gauge steel construction. Install riser support clamps at each floor level penetration, or as otherwise required.
- M. Provide conduit cable support clamps for vertical conductor runs as required or indicated on plans. Clamps to be insulating wedging plug, with malleable iron support ring. Install within properly sized and anchored junction box.
- N. Spring steel clips and fittings such as those manufactured by HITT-Thomas, Caddy-Erico, or approved equivalent, with black oxide finish are permitted in any indoor dry location for concealed work, where acceptable to the local authority having jurisdiction.
- O. Raceways shall be securely and rigidly fastened in place at intervals specified here-in-before with wall brackets, conduit clamps, approved conduit hangers, or beam clamps. Fastenings shall be made by wood screws or screw type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat treated or spring steel tension clamps on steel work. Bolts, screws, etc. used in securing the work shall be galvanized and of ample size for the service. Assembly bolts, nuts, washers, etc., shall be zinc or cadmium coated. Raceways shall not be welded to steel structures. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than 3/4 inch in concrete joists shall avoid cutting the main reinforcing bars.
- P. The use of perforated iron straps or wire for supporting conduits will not be permitted.
- Q. Where conduits are installed in groups on a common steel channel type support, each conduit shall be secured by Korns, Unistrut, Kindorf clamps or equal.

R. Rigid conduits, where they enter panelboards, cabinets or pull boxes shall be secured in place by galvanized, double locknuts (one inside and one outside) and non-metallic bushings. All bushings shall have insulating material which has been permanently fastened to the fittings. Bushings for conduit 1-1/2 inches trade size and larger, which are used for power distribution, shall be complete with grounding lug and shall be bonded to the box by means of bare copper wire.

2.5 FIRESTOPPING MATERIALS

- A. All conduits and cables penetrating fire or smoke rated floors, walls and ceilings shall be firestopped. Firestopping assembly must be UL listed. All corridor walls, storage room walls and mechanical room walls are to be considered minimum one-hour fire rated. Elevated slabs and floors shall also be considered minimum one-hour rated. Refer to Architectural drawings for additional rating requirements.
- B. Provide shop drawings indicating penetration detail for each type of wall and floor construction. Shop drawings must be specific for each individual type. (i.e., one-hour fire rated gypsum wall board with insulated metal pipe penetration.)
- C. 3M fire protection products are listed below. Equivalent products may be submitted if they are UL listed.
- D. The manufacturer of the firestopping materials must provide on site training for the contractor. The training session shall demonstrate to the contractors the proper installation techniques for all the firestopping materials. The training session shall be four hours minimum. Contact the Engineer prior to conducting this training session.
- E. Firestopping materials to include but not limed to the following:
 - 1. 3M fire barrier FS-195 wrap/strip.
 - 2. 3M fire barrier CP 25 caulk.
 - 3. 3M fire barrier MP moldable putty.
 - 4. 3M fire barrier RC-1 restricting collar with steel hose clamp.
 - 5. 3M fire barrier damming materials.
 - 6. 3M fire barrier CS-195 composite sheet.
 - 7. 3M fire barrier fire dam 150 caulk.
 - 8. Steel sleeves.

2.6 SPECIALTIES

- A. All EMT terminations at junction boxes, panels, etc. shall be made with case hardened locknuts and appropriate fittings, with insulated throat liners. Insulating terminations shall be manufactured as a single unit. The use of split sleeve insulators is not permitted.
- B. All rigid conduit, except main and branch feeders, shall have heavy fiber insulating bushings reinforced with double locknuts. All branch and main feeders shall have insulated bushings with grounding lugs and shall be bonded to enclosures with appropriately sized copper jumpers, except at pad mounted transformers. Bonding jumpers shall be installed as required by the NEC and other applicable codes.
- C. All conduit stubbed through floor during construction shall have openings protected with plastic caps approved for this purpose. Connections on both ends of all flexible conduit shall be equivalent to Thomas and Betts, Ideal, Appleton, Efcor, or approved equivalent, rated for the environment.
- D. Nylon pull strings shall be provided in all empty conduit and in all conduit installed for other trades. Pull strings shall be left securely tied off at each end.
- E. Where spare raceways terminate in switchboards or motor control centers a fishtape barrier shall be provided.
- F. All outlet, junction and pull boxes shall be grounded with pigtail to the equipment grounding conductor.
- G. All fire alarm raceways in concealed areas, data/mechanical/electrical rooms and above ceilings shall be red. Exposed fire alarm raceways shall match adjacent finishes.

H. All junction, outlet and pull boxes in data/mechanical/electrical rooms and above ceilings shall be identified with panel and circuit designation on outside of covers. All junction, outlet and pull boxes in exposed areas shall be identified with panel and circuit designation on inside of covers.

2.7 COMMUNICATIONS OUTLETS

- A. Outlet boxes shall be 5" square by 2-7/8" deep with single or double-gang with raised extension ring.
- B. All communications outlets shall be fed with at least (1) 1-1/4" inch EMT conduits, with an absolute minimum number of bends from the outlet to the cable tray, wire way or homerun directly to the Telecommunications room. Pull boxes must be installed after every 270 degrees of bend (including offsets) or 100 feet of the conduit run.
- C. When mounting the outlet box in a steel studded wall, use a back brace.
- D. Use only compression fittings at joints. No more than one offset in a conduit run, unless additional pull boxes are provided after each offset.

PART 3 - <u>EXECUTION</u>

3.1 RACEWAY APPLICATION

- A. Indoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Concealed in Ceilings and Interior Walls and Partitions: EMT, IMC or GRC
 - 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 3. Damp or Wet Locations: GRC
 - 4. Exposed, Not Subject to Physical Damage: GRC, IMC or EMT. Raceway locations include the following:
 - a. Electrical Rooms
 - 5. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms (below 8'-0").
 - d. Gymnasiums.
- B. 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. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- C. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.
- F. PVC conduit and plastic molding are not acceptable except in caustic environments.
- G. Aluminum is not acceptable in caustic environments.
- 3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. This Contractor shall lay-out and install all conduit systems so as to avoid any other service or systems, the proximity of which may prove injurious to the conduit, or conductors which it confines. All conduit systems, except those otherwise specifically shown to the contrary, shall be concealed in the building construction or run above ceilings. Size of all conduit shall conform to Annex C, of the National Electrical Code, unless otherwise shown on the Contract Drawings.
- C. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- D. Support conduit within 12 inches of enclosures to which attached.
- E. No conduit shall be installed in or below poured concrete slabs except with permission of the architect or engineer. Conduit shall be held at least 12" from flues, steam or hot water pipes.
- F. All conduits in slab, under slab and in areas subject to abuse shall be shall be galvanized rigid steel with threaded fittings or rigid PVC Conduit encased in 3" (minimum) and steel reinforced concrete with dye identification.
- G. Intermediate grade conduit will not be acceptable in place of galvanized rigid steel conduit.
- H. All exposed conduit shall be installed with runs parallel or perpendicular to walls, structural members or intersections of vertical planes and ceilings, with right angle turns consisting of cast metal fittings or symmetrical bends unless otherwise shown. All conduit shall have supports spaced not more than eight feet apart. Randomly routed conduits will not be acceptable.
- I. Conduit shall be installed in such a manner so as to insure against collection of trapped condensation. All runs of conduit shall be arranged so as to be devoid of traps. Trapped conduit runs shall be provided with explosion proof drains at low points. Runs of conduit between junctions shall not have more than the equivalent of three 90° bends.
- J. Junction boxes shall be installed so that conduit runs will not exceed 50', or as shown on the Contract Drawings. Junction boxes shall be sized per NEC, Article 370.
- K. Install electrical raceways in accordance with manufacturer's written instructions, applicable requirements of latest edition of the NEC, and NECA "Standard of Installation", complying with recognized industry practices.
- L. Coordinate with other trades, including metal and concrete deck trades, as necessary to interface installation of electrical raceways and components.
- M. Level and square raceway runs, and install at proper elevations and required heights. Hold tight to structure wherever possible, to maximize available space and not restrict other trades.
- N. Complete installation of electrical raceways before starting installation of cables or wires within raceways.
- O. Bushings shall be provided on conduits to protect cables transitioning from conduits to cable tray pathway.
- P. Provide plastic bushings on the end of all conduit stub-ups.
- Q. Install electrical raceways in accordance with manufacturer's written instructions, applicable requirements of latest edition of the NEC, and NECA "Standard of Installation", complying with recognized industry practices.
- R. Coordinate with other trades, including metal and concrete deck trades, as necessary to interface installation of electrical raceways and components.
- S. Level and square raceway runs, and install at proper elevations and required heights. Hold tight to structure wherever possible, to maximize available space and not restrict other trades.

- T. Raceways installed in exterior locations shall receive one coat of primer, two coats finish paint after preparation of galvanizing, color selected by Architect. Exposed raceways in painted interior areas shall be similarly painted.
- U. Conduits, cables, raceways, and enclosures under metal-corrugated sheet roof decking shall not be located within 1-1/2" of the roof decking, measured from the lowest surface of the roof decking to the top of the conduit, cable, raceway, or box. GRS is acceptable to route tight to bottom of roof deck.
- V. Conduits, cables, raceways, and enclosures are not permitted in concealed locations of metal-corrugated sheet decking type roofing.
- W. All conduit, tubing, raceways, ducts and duct banks shall be installed in such manner as to insure against collection of trapped condensation and raceway runs shall be arranged so as to be devoid of traps.
- X. Where conduits pass through exterior concrete walls of facilities, the entrance shall be made watertight. This shall be done by providing pipe sleeves in the concrete with 1/2" minimum entrance seal.
- Y. All necessary precautions to prevent the lodgment of dirt, plaster, or trash in all conduit or tubing, fittings and boxes during construction shall be taken. All conduit in floors, concrete or below grade shall be swabbed free of debris or moisture before wires are pulled.
- Z. Liquid-tight flexible steel conduit shall be used for connections to all vibrating equipment, including motors and transformers, with a minimum of 18-inches of flex looped to avoid restraining equipment vibrating.
- AA. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- BB. Grounding bushings and bonding jumpers shall be used on conduit terminations at all junction boxes, pull boxes and cabinets to maintain grounding integrity of conduit system.
- CC. Do not install conduits or raceways on exterior facades or within wall cavities.
- DD. All conduit and PVC conduits installed below grade or below slabs (where indicated) shall be concrete encased.
- EE. Do not drill into bar joists to support raceways or cables.
- FF. All utilities and underground conduits shall be surveyed and recorded on as-built drawings.
- GG. All exterior conduits and raceways shall be painted.
- HH. All floor slabs and concrete walls shall be x-rayed before cutting.
- II. Contractor must maintain a minimum 12" clear space above, 6" below and a minimum 26" clear on one side of all cable trays and wireways (both new and existing).
- JJ. Absolutely no "LB's" are allowed in any communications conduit installation.
- KK. Conduit ends at a wireway will be mechanically fastened, have plastic bushings, and be wire bonded to the wireway.
- LL. Underground electric, cable TV, telephone service or other rigid steel conduit and underfloor rigid steel conduit below the concrete floor slab shall be painted with two coats of bitumastic paint, such as "Asphaltum".
- MM. All underground or underfloor conduits shall be swabbed free of all moisture and debris before conductors are pulled.
- NN. At least two (2) 1" and three (3) 3/4" conduits shall be stubbed from all flush-mounted panelboards into the nearest accessible area for future use. Provide suitable closures for these stubs. Identify each stub with a suitable hang tag.

- OO. Coordinate with other trades, including metal and concrete deck trades, as necessary to interface installation of electrical raceways and components.
- PP. All underground conduits shall be buried to minimum depth of 24" from the top of the concrete encasement or raceway to finished grade, unless otherwise noted on plans. Observe minimum burial requirements of local utility company where their standards or regulations apply. Conduits containing primary power conductors, (higher than 600 volts to ground) shall be 48" to top below finished grade, unless otherwise noted on plans. Conduits containing secondary power conductors, (600 volts and less to ground) shall be 36" to top below finished grade, unless otherwise noted on plans.
- QQ. Provide uni-strut racks where multiple conduits are supported at one location.
- RR. Provide separate a completely separate raceway system of conduits, pull-boxes, etc. for each emergency power branch and for normal power for complete separation per NEC.
- SS. Where existing panels are flush-mounted in walls, contractor shall cut, patch, and repair existing construction as required for concealed conduit entry for new connections to those panels.
- TT. Expansion-Joint Fittings:
 - 1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- UU. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- 3.3 PROTECTION
 - A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.4 SPECIALTIES

- A. All EMT terminations at junction boxes, panels, etc. shall be made with case hardened locknuts and appropriate fittings, with insulated throat liners. Insulating terminations shall be manufactured as a single unit. The use of split sleeve insulators is not permitted.
- B. All rigid conduit, except main and branch feeders, shall have heavy fiber insulating bushings reinforced with double locknuts. All branch and main feeders shall have insulated bushings with grounding lugs and shall be bonded to enclosures with appropriately sized copper jumpers, except at pad mounted transformers. Bonding jumpers shall be installed as required by the NEC and other applicable codes.
- C. All conduit stubbed through floor during construction shall have openings protected with plastic caps approved for this purpose. Connections on both ends of all flexible conduit shall be equivalent to Thomas and Betts, Ideal, Appleton, Efcor, or approved equivalent, rated for the environment.
- D. Pulling lines shall be left in all open conduit systems and shall be non-metallic, left securely tied off at each end cap any unused conduits.
- E. Where spare raceways terminate in switchboards or motor control centers a fishtape barrier shall be provided.

- F. All metal boxes, junction boxes and pull boxes shall be grounded with pigtails to the equipment grounding conductor.
- G. All empty raceways inside switchgear and open spaces shall be capped.
- H. All fire alarm raceways shall be red. Painted red conduit will not be accepted. Junction and pull boxes shall be identified with panel and circuit number on covers.
- I. All emergency power raceways shall be blue. Painted conduit will not be accepted. Junction and pull boxes shall be identified with panel and circuit number on covers.
- J. All conduits in theaters shall be black. Painted conduit will not be accepted. Junction and pull boxes shall be black and identified with panel and circuit number on inside of covers.

SECTION 260535 - CABINETS, OUTLET BOXES AND PULL BOXES FOR ELECTRICAL SYSTEMS

PART 1 - <u>GENERAL</u>

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes: Boxes, enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 CABINETS, OUTLETS AND PULL BOXES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Adalet.
 - 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman; a Pentair company.
 - 7. Hubbell Incorporated; Killark Division.
 - 8. Kraloy.
 - 9. Milbank Manufacturing Co.
 - 10. Mono-Systems, Inc.
 - 11. O-Z/Gedney; a brand of EGS Electrical Group.
 - 12. RACO; a Hubbell Company.
 - 13. Robroy Industries.
 - 14. Spring City Electrical Manufacturing Company.
 - 15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
 - 16. Thomas & Betts Corporation.
 - 17. Wiremold / Legrand.
- B. Cabinets for lighting and power, telephone, pull boxes, outlet boxes, or any other purposes specified or shown on the Contract Drawings, shall be constructed of code gauge, galvanized steel with sides formed and corner seams riveted or welded before galvanizing. Boxes assembled with sheet metal screws will not be accepted. Pull boxes shall include all boxes used to reduce the run of conduit to the required number of feet or bends, supports, taps, troughs, and similar applications and shall also be constructed as specified above.
- C. All cabinets and boxes for NEMA 1 and 1A application shall be provided with knockouts, as necessary, or shall be cut in the field by approved cutting tools which will provide a clean, symmetrically cut opening. All boxes, except panelboards, shall be provided with code gauge fronts with hex head or pan head screw fasteners. Fronts for panelboards shall be as specified for panelboards.

- D. Ceiling outlet boxes shall be galvanized steel, 4" octagonal, not less than 2 1/8" deep, with lugs or ears to secure covers, and those for use with ceiling lighting fixtures shall be fitted with 3/8" fixture studs fastened to the back of the boxes, where applicable. Provide adequate support with at least a 2 x safety factor for the anticipated fixture weight.
- E. Special size concealed outlet boxes for clocks, speakers, alarms, TV, etc., shall be provided by the manufacturer of the equipment.
- F. The location of outlets, as shown on the drawings, shall be considered as approximate only. It shall be incumbent upon this Contractor to study the general building drawings, with relation to spaces surrounding each outlet, in order to make his work fit the work of others and in order that when the devices or fixtures are installed, they will be symmetrically located and will not interfere with any other work or equipment. Any change in fixture or layout shall be coordinated with and approved by the Engineer before this change is made. Regardless of the orientation shown on the drawings, all devices shall be easily accessible when installed.
- G. All outlets, pull boxes, junction boxes, cabinets, etc., shall be sized per the current edition of the National Electrical Code.
- H. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- I. Outlet boxes and junction or pull boxes shall be threaded for rigid-threaded conduit, dust-tight vapor-tight or weatherproof as required for areas other than for NEMA 1 or 1A application. These shall be as manufactured by Crouse-Hinds, Appleton, Killark, or approved as equivalent.
- J. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- K. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
- L. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- M. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
 - 1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- N. NEMA 1 or 1A outlet boxes or pull or junction boxes shall be as manufactured by Appleton, Steel City, T & B, or approved equivalent.
 - 1. Outlet boxes for switches, receptacles, etc., concealed in walls shall be galvanized steel, 4" x 4" x 2 1/8" deep with plaster cover for the number of devices as required and to be flush with finished wall. Where outlet boxes are installed in walls of glazed tile, brick, concrete block, or other masonry which will not be covered with plaster or in walls covered by wood wainscot or paneling, deep sectional masonry boxes shall be used and they shall be completely covered with the plates or lighting fixtures. This Contractor shall cooperate with the brick layers, block layers and carpenters to insure that the outlet boxes are installed straight and snugly in the walls. Receptacles shall be set vertically in walls.
 - 2. Outlet boxes for data/voice locations shall be as specified in Division 27.
- O. Unless otherwise noted on the drawings or in the specifications, outlet boxes shall be installed at the following heights to centerline of box:

Wall Switches, Control Stations	
Convenience Outlets	
Above Counter, Convenience Outlets	Bottom at 2" above top of backsplash
TV Outlets	
TV Outlets - At Wall Brackets	
Desk Telephones	

Wall-Mounted Telephone	3'-10"
Weatherproof Outlets	2'-2"
Disconnects, Branch Panelboards 5'-0" max. to centerline and no more than	6'-6" to top
Fire Alarm Manual Stations	
Fire Alarm Audio and/or Visual Unit	5" below ceiling,
whichever is lower	•

Note: Contractor is to refer to Architectural elevations and coordinate device mounting heights, quantities, and locations.

- P. Outlet boxes mounted in glazed tile, brick, concrete block or other types of masonry walls shall be mounted above or below the mortar joint. Do Not Split The Mortar Joint.
- Q. Boxes for more than two (2) devices shall be for number of devices required and shall be one piece. No ganging of single switch boxes will be allowed.
- R. Outlets provided shall have only the holes necessary to accommodate the conduit at the point of insulation and shall be rigidly secure in position. Boxes with knockout removed and openings not used shall be replaced or provided with a listed knockout closure.
- S. Exterior outlets shall be die-cast aluminum, weather-proof with gasketed covers and baked on grey enamel finish, per ANSI 61.
- T. Boxes up to 4-11/16 square size shall be fastened to their mounting surface with two fasteners of proper size. Larger sizes shall be fastened with four fasteners, minimum.
- U. Openings for conduit entrance in cabinets and boxes shall be prefabricated, punched, drilled and/or reamed. The use of a cutting torch for this purpose is prohibited.
- V. Aluminum is not acceptable in caustic environments.

2.2 COMMUNICATIONS OUTLETS

- A. Outlet boxes shall be 5" square by 2-7/8" deep with single or double-gang with raised extension ring.
- B. All communications outlets shall be fed with at least (1) 1-1/4" inch EMT conduits, with an absolute minimum number of bends from the outlet to the cable tray, wire way or homerun directly to the Telecommunications room. Pull boxes must be installed after every 270 degrees of bend (including offsets) or 100 feet of the conduit run.
- C. When mounting the outlet box in a steel studded wall, use a back brace.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Install electrical boxes as required for splices, taps, wire pulling, equipment connections.
- D. Do not install flush mounting boxes back-to-back in walls; install with minimum 6-inches separation. Install with 24-inches separation in acoustic rated walls.
- E. Do not fasten boxes to ceiling support wires or other piping systems.
- F. Support all boxes independently of conduit.
- G. Grounding bushings and bonding jumpers shall be used on conduit terminations at all junction boxes, pull boxes and cabinets to maintain grounding integrity of conduit system.

3.2 **PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

SECTION 260553 - IDENTIFICATIONS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Warning labels and signs.
 - 5. Instruction signs.
 - 6. Equipment identification labels.
 - 7. Miscellaneous identification products.

1.3 DEFINITIONS AND ABBREVIATIONS

- A. SWBD Switchboard.
- B. MCC Motor Control Center.
- C. DP Distribution Panel. Electrical distribution panel which is an integral part of a switchboard or switchgear but has its own isolation circuit breaker.
- D. P Panel. Electrical distribution panels with manually operated circuit breakers which feed other distribution panels or directly to loads. These are generally the last distribution panel before the load.
- E. N Normal power system. Annotates that the associated component is part of the Normal Power distribution system and receives no backup power from the Emergency Power distribution system.
- F. E Emergency power system. Annotates that the associated component is part of the Normal Power and Emergency Power distribution systems. In the event of a loss of the supply from the normal power system, the component will receive power from the emergency power system.
- G. BKR Breaker. Switch which interrupts or establishes power flow to its associated load.
- H. DISC Disconnect Switch. Manually operated knife switch which interrupts or establishes power flow to its associated load.

1.4 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

- 2.1 FLOOR MARKING TAPE
 - A. 2-inch wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.
- 2.2 WARNING LABELS AND SIGNS
 - A. Comply with NFPA 70 and 29 CFR 1910.145.
 - B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
 - C. Baked-Enamel Warning Signs:
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 7 by 10 inches.
 - D. Metal-Backed, Butyrate Warning Signs:
 - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 10 by 14 inches.
 - E. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES"
 - F. Provide warning signs for the enclosures of electrical equipment including pad-mounted transformers, pad-mounted switches, and switchgear having a nominal rating exceeding 600 volts.
 - 1. When the enclosure integrity of such equipment is specified to be in accordance with IEEE C57.12.28 or IEEE C57.12.29, such as for pad-mounted transformers, provide self-adhesive warning signs on the outside of the high voltage compartment door(s). Sign shall be a decal and shall have nominal dimensions of 7 by 10 inches with the legend "DANGER HIGH VOLTAGE" printed in two lines of nominal 2 inch high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background. Decal shall be Panduit No. PPSO710D72 or approved equal.
 - 2. When such equipment is guarded by a fence, mount signs on the fence. Provide metal signs having nominal dimensions of 14 by 10 inches with the legend "DANGER HIGH VOLTAGE KEEP OUT" printed in three lines of nominal 3 inch high white letters on a red and black field. Sign shall be Panduit No. PASO710D72 or approved equal.

2.3 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- C. 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.

2.4 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- C. Retain paragraph below to specify type of label for identifying outdoor equipment if specified in "Identification Schedule" Article.
- D. Stenciled Legend: In non-fading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.5 CABLE TIES

- A. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Clear
- B. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 - 5. Color: Clear

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

- 3.1 INSTALLATION
 - A. Verify identity of each item before installing identification products.
 - B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
 - C. Apply identification devices to surfaces that require finish after completing finish work.

- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Cable Ties: For attaching tags.
 - 1. Indoors: Plenum rated.
 - 2. Outdoors: UV-stabilized nylon.
- G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.
- H. Equipment, disconnect switches, switchgear, switchboards, panelboards, transformers, motor starters, variable frequency drives, special device plates, and similar materials shall be clearly marked as to their function and use. Markings shall be applied neatly and conspicuously to the front of each item of equipment with 1/2" black lamacoid plate (or equivalent) with white letters 1/4" high unless otherwise specified.
- I. PANELBOARD DIRECTORIES
 - 1. The Contractor shall provide clearly legible typewritten directories in each electrical panel indicating the area, item of equipment, etc. controlled by each switch, breaker, fuse, etc. These directories are to be inserted into plastic cardholders on back door in each panel. Descriptions shall be approved by the Owner.
 - a. EXAMPLES: LIGHTS, ROOM 100 RECEPTION, ROOM 200
 - 2. Provide electronic Excel files of all directories to owner as part of Close-out Documentation.
 - 3. Panel Schedules and circuit numbers on Record Drawings shall match.
- J. All electrical distribution equipment shall be provided with a black lamacoid plastic plate with 1/2" white letters for panel designation and 1/4" white letters showing voltage and feeder information. This includes branch circuit panelboards, switchboards, switchgear, disconnect switches, transformers, motor starters, variable frequency drives and lighting control panels, Branch circuit switches shall be designated as to function. Electrical distribution equipment labels shall indicate the source they are fed from, and the circuit number at that source. Clearly indicate the exact label legend to be furnished with each panelboard and switchgear on the shop drawings for each item of equipment prior to submission of shop drawings. Refer to drawings for further details.
- K. Where electrical distribution equipment, including branch circuit panelboards, switchboards and switchgear, are connected to an emergency source, the lamacoid plate shall be red, and the word "EMERGENCY" shall be incorporated into the legend. Also, provide similar plates and legends for automatic transfer switches, as appropriate. Refer to drawings for further details.
- L. Lamacoid plates shall be located at center of top of trim for branch circuit panels, switch gear, and centered at side for branch circuit switches. Fasten with self-tapping stainless steel screws or other approved method.
- M. All junction boxes utilized for life-safety branch emergency power circuits, connections, devices, etc. shall have the cover painted blue. Mark over paint with panel and circuit number.
- N. All concealed junction boxes utilized for fire alarm circuits, connections, devices, etc. shall have the cover painted red. Mark over paint with stenciled letters "FA".
- O. All new receptacle cover plates shall be marked with their panel and circuit number(s) with clear, machine printed adhesive labels with black lettering. Circuit number shall also be hand written inside outlet box with black permanent marker.

- P. All systems requiring room names and/or numbers for labeling or programming shall use the Owner's actual room name and numbering scheme, not floor plans. All reprogramming shall be included as required to accommodate construction phasing.
- Q. All junction, outlet and pull boxes in data/mechanical/electrical rooms and above ceilings shall be identified with panel and circuit designation on outside of covers. All junction, outlet and pull boxes in exposed areas shall be identified with panel and circuit designation on inside of covers.
- R. The inside of all junction and backboxes shall be marked with panel and circuit number in permanent marker.
- S. All identifications shall be consistent with the owner's standard practices, especially within existing facilities. Where the requirements here-in are in conflict with such standard practices, the contractor shall notify the engineer in writing prior to ordering any material for clarification.
- T. Identification shall consist of all UPPER CASE LETTERS.
- U. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- V. Apply identification devices to surfaces that require finish after completing finish work.
- W. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification devices.
- X. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- Y. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- Z. Fire alarm system: Install a nameplate on the fire alarm panel to indicate the panelboard and circuit number supplying the fire alarm system.
- AA. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- BB. Accessible Raceways, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot maximum intervals.
- CC. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- DD. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- EE. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

- FF. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- GG. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- HH. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer and load shedding.
- II. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
- JJ. Labeling Instructions:
 - 1. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
 - 2. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - 3. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - 4. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers and motor-control centers.
 - 2. Spare fuse cabinet.

1.3 SUBMITTALS

- A. Product Data: Include the following for each fuse type indicated:
 - 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 2. Let-through current curves for fuses with current-limiting characteristics.
 - 3. Time-current curves, coordination charts and tables, and related data.
 - 4. Fuse size for elevator feeders and elevator disconnect switches.
- B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - 1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - 2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
- C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:
 - a. Let-through current curves for fuses with current-limiting characteristics.
 - b. Time-current curves, coordination charts and tables, and related data.
 - c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- 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:

- 1. NEMA FU 1 Low Voltage Cartridge Fuses.
- 2. NFPA 70 National Electrical Code.
- 3. UL 198C High-Interrupting-Capacity Fuses, Current-Limiting Types.
- 4. UL 198E Class R Fuses.
- 5. UL 512 Fuseholders.

1.5 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.6 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Fuses: Equal to ten (10) percent of quantity installed for each size and type, but no fewer than three of each size and type.
- C. Fuse Pullers: Two (2) for each size and type.

1.7 WARRANTY

- A. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to, and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace fuses that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Owner's acceptance.

1.8 PROJECT CONDITIONS

A. A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Ferraz Shawmut, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.3 FUSE APPICATIONS

A. Circuits 601 to 6000 amperes shall be protected by current limiting BUSSMANN HI-CAP TIME DELAY FUSES KRP-C. Fuses shall employ "O" rings as positive seals between the end bells and the fuse barrel. Fuses shall be a time-delay type and must hold 500% of rated current for a minimum of 5 seconds, clear 20 times rated current in .01 seconds or less and be listed by Underwriter's Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class L.

- B. Circuits 0 to 600 amperes shall be protected by current limiting BUSSMANN LOW-PEAK Dual Element Fuses, LPN-RK (250 volts) or LPS-RK (600 volts). All dual element fuses shall have separate overload and short circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284NF melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse shall hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriters Laboratories, Inc. with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class RK1.
- C. Motor Circuits All individual motor circuits rated 480 amperes or less shall be protected by BUSSMANN LOW PEAK DUAL-ELEMENT FUSES LPN-RK (250 volts) or LPS-RK (600 volts). The fuses for 1.15 service factor motors shall be installed in rating approximately 125% of motor full load current except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuse should be 150% to 200% of the Type KRP-C HI-CAP Time Delay Fuses of the rating shown on the drawings. 1.0 service factor motors shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN RK (250 volts) or LPS-RK (600 volts) installed in rating approximately 115% of the motor full load current except as noted above. The fuses shall be UL Class RK1 or L.
- D. Circuit breaker panels shall be protected by BUSSMANN LOW-PEAK Dual Element fuses LPN-RK (250 volts) or LPS-RK (600 volts) as shown on the drawings. The fuses shall be UL Class RK1.

2.4 SPARE-FUSE CABINET

- A. Manufacturer: Bussmann #SFC-FUSE-CAB spare fuse cabinet or equal.
- B. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
- C. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
- D. Finish: Gray, baked enamel.
- E. Identification: "SPARE FUSES" in 1-1/2 inch high white letters on black lamicoid plate. Mount plate on exterior of door.
- F. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Fuses shall be installed when equipment is ready to be energized, including thorough cleaning and tightening of all electrical connections.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fuses shall be shipped separately. Any fuses shipped installed in equipment, shall be replaced by the Electrical Contractor with new fuses as specified above prior to energizing at no additional expense to Owner. All fuses shall be stored in moisture free packaging at job site and shall be installed immediately prior to energizing of the circuit in which it is applied.

- B. No fuses shall be installed in the equipment until the installation is complete, including tests and inspections required prior to being energized. All fuses shall be of the same manufacturer to insure retention of selective coordination, as designed.
- C. Provide a complete set of fuses for all fusible devices. Arrange fuses so rating information is readable without removing fuse.
- D. Install spare-fuse cabinet(s). Locate in Main Electrical Room.
- E. Upon completion of the building, the Contractor shall provide the Owner with spare fuses in Spare-Fuse Cabinet.

3.3 IDENTIFICATION

A. Install as part of the lamicoid identification labels indicating fuse rating and type on outside of the door on each fused switch.

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.
- C. Each Electrical Contractor's attention is directed to Section 260501 General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

- A. Section includes:
 - 1. Fusible Switches
 - 2. Non-Fusible Switches
 - 3. Individually Mounted Circuit Breakers
 - 4. Combination Starter/Disconnect Switches
 - 5. Enclosures.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter
- B. HD: Heavy Duty
- 1.4 ACTION SUBMITTALS
 - A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - B. Shop Drawings: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
B. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches, circuit breakeres, accessory, and component indicated from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate space available for enclosed switches including clearances between enclosed switches and adjacent surfaces and other items. Furnish and install equipment to comply with NEC clearances.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 WARRANTY

- A. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
- B. All enclosed switches and circuit breakers, finishes, and all of its component parts, and controls shall have an unconditional one (1) year warranty. Warranty shall include finishes and all components to be free from defects in materials and workmanship for a period of one (1) year from date of Owner's acceptance. Replacement of enclosed switches and circuit breakers, faulty materials and the cost of labor to make the replacement shall be the responsibility of the Contractor.
- C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to, and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.
- D. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace surge suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

1.8 SYSTEM COMMISSIONING

- A. Section 019113 requires the engagement of a Commissioning Authority to document the completion of the Mechanical, Fire Protection, Plumbing, Electrical, Electronic Safety and Security, and associated Control Systems for the project. Section 019113 defines the roles and responsibilities of each member of the commissioning team.
- B. Comply with the requirements of Section 019113 for the commissioning of the various building systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Square D; a brand of Schneider Electric.
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 3. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 4. Siemens.

2.2 NON-FUSIBLE SWITCHES

- A. All non-fusible safety switches shall be Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- B. All safety switches shall have switch blades that are fully visible in the "OFF" (open) position with the door open.

- C. All safety switches shall have a factory installed ground lug.
- D. All safety switches shall have a factory installed neutral lug, when a neutral is necessary.
- E. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.
- F. Switch mechanism shall be quick-make, quick-break, load break rated, such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing and opening action of the contacts has started. The handle and mechanism shall be an integral part of the box (not cover) with facilities for pad locking in the open or closed position with up to three padlocks. Switch doors shall be interlocked with switch handle so that the door can only be opened when the switch is in the "OFF" (open) position.
- G. Provide the following Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 FUSIBLE SWITCHES

- A. All fusible safety switches shall be Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- B. All safety switches shall have switch blades that are fully visible in the "OFF" (open) position with the door open.
- C. All safety switches shall have a factory installed ground lug.
- D. All safety switches shall have a factory installed neutral lug, when a neutral is required.
- E. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.
- F. Switch mechanism shall be quick-make, quick-break, load break rated, such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing and opening action of the contacts has started. The handle and mechanism shall be an integral part of the box (not cover) with facilities for pad locking in the open or closed position with up to three padlocks. Switch doors shall be interlocked with switch handle so that the door can only be opened when the switch is in the "OFF" (open) position.
- G. Provide the following Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 INDIVIDUALLY MOUNTED MOLDED-CASE CIRCUIT BREAKERS

- A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

- C. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following fieldadjustable settings:
 - 1. Instantaneous trip.
- D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- E. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- F. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

2.5 COMBINATION STARTER/DISCONNECT SWITCHES

- A. All combination starter/disconnect switches shall be full-voltage, non-reversing type.
- B. All combination starter/disconnect switches shall have low-voltage protection, solid state overloads, Hands-Off-Auto selector switch and Red and Green pilot lights.
- C. All combination starter/disconnect switches shall be Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Combination motor starters shall be rated in accordance with NEMA sizes and horsepower ratings. No starter shall be listed as a fractional size.
- E. Contactor contacts shall be silver alloy, double break, and shall allow for inspection on NEMA Sizes 00 through 4 without the use of tools. Size 5 and larger shall allow for inspection utilizing standard tools. They shall be replaceable without removing the line, load, or control wiring from the starter, and replaceable without removing the starter from the enclosure.
- F. Contactor coils shall be the encapsulated type, and shall be replaceable on NEMA Sizes 00 through 4 without the use of tools. Size 5 and larger shall be replaceable with standard tools. They shall be replaceable without removing the line, load, or control wiring from the starter, and replaceable without removing the starter from the enclosure.
- G. Overload protection shall be provided by solid state electronic overload relay. Single-phase starters shall provide one- or two-leg overload protection; three-phase starters shall provide three-leg overload protection.
- H. Combination starter shall be suitable for straight through wiring.
- I. Switch mechanism shall be quick-make, quick-break, load break rated, such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing and opening action of the contacts has started. The handle and mechanism shall be an integral part of the box (not cover) with facilities for pad locking in the open or closed position with up to three padlocks. Switch doors shall be interlocked with switch handle so that the door can only be opened when the switch is in the "OFF" (open) position.
- J. All safety switches shall have a factory installed ground lug.
- K. All safety switches shall have a factory installed neutral lug, when a neutral is necessary.
- L. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.
- M. Provide the following Accessories:

- 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
- 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
- 3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.6 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Securely fasten each switch, circuit breaker and combination starter to the supporting structure or wall, utilizing a minimum of four (4) 1/4 inch bolts. Do not mount in an inaccessible location or where the passageway to the switch may become obstructed.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Electrical Studies".

END OF SECTION

Exhibit C Draft Contract

DRAFT AIA Document A105[™] - 2017

Standard Short Form of Agreement Between Owner and Contractor

I

I

AGREEMENT made as of the « » day of «- » in the year «2025 » (In words, indicate day, month and year.)	
BETWEEN the Owner: (<i>Name, legal status, address and other information</i>)	ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion.
«Franklin County Convention Facilities Authority- »« » «400 North High Street, 4 th Floor »	The author may also have revised the text of the original AIA standard form.
« <u>Columbus, Ohio 43215</u> » « <u>kpaul@fccfa.org</u> »	An Additions and Deletions Report that notes added information as well as
and the Contractor: (Name, legal status, address and other information)	revisions to the standard form text is available from the author and should be reviewed.
« »	This document has important legal consequences. Consultation with an
for the following Project: (Name, location and detailed description)	attorney is encouraged with respect to its completion or modification.
Air Handler Unit Variable Frequency Drive Installation » «400 & 500 N. High Street <u>Columbus, Ohio 43215</u> » « »	
The Architect: (Name, legal status, address and other information)	
CMTA, Inc. «1650 Lake Shore Drive, Suite 380–» «Columbus, Ohio 43204–» «pcoyne@cmta.com »	
The Owner and Contractor agree as follows.	

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

1

AIA Document A105[™] - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum wattent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (389ADA2D)

r its completion. r may also have he text of the AIA standard form ons and Deletions at notes added ion as well as s to the standard t is available from or and should be ment has important sequences. ion with an is encouraged with o its completion cation.

Formatted: Superscript

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 3 CONTRACT SUM
- 4 PAYMENTS
- 5 INSURANCE
- 6 GENERAL PROVISIONS
- 7 OWNER
- 8 CONTRACTOR
- 9 ARCHITECT
- 10 CHANGES IN THE WORK
- 11 TIME

AIA Docume

- 12 PAYMENTS AND COMPLETION
- 13 PROTECTION OF PERSONS AND PROPERTY
- 14 CORRECTION OF WORK
- 15 MISCELLANEOUS PROVISIONS
- 16 TERMINATION OF THE CONTRACT
- 17 OTHER TERMS AND CONDITIONS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contractor shall complete the Work described in the Contract Documents for the Project. The Contract Documents consist of

- .1 this Agreement signed by the Owner and Contractor;
- .2 the drawings and specifications prepared by the Architect, dated <u>*x* DATE</u> », and enumerated as follows:

Number	Title	Date	

Document is protected by U.S. Copyright Law and International Treaties Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (389ADA2D)

Formatted: Highlight

	Specifications:	T :41-	.
	« »	litle	Pages
.3	addenda prepared by the A	rchitect as follows:	
	Number «»	Date	Pages
.4	written orders for changes i Agreement; and	n the Work, pursuant to Article	e 10, issued after execution of this
.5	other documents, if any, ide	entified as follows:	
	«The Request for Bids, in 2025–».»	cluding the Technical Specific	cations, issued by the Owner on April 22,
ARTICLE 2 § 2.1 The C Work.	DATE OF COMMENCEMENT ontract Time is the number o	AND SUBSTANTIAL COMPLETI f calendar days available to the	ON Contractor to substantially complete the
§ 2.2 Date o Unless othe (Insert the o	f Commencement: erwise set forth below, the dat date of commencement if othe	e of commencement shall be the formula of the state of this Agreement of the state	he date of this Agreement.
« »« <u>The Co</u>	ontractor shall not commence	any Work until after receipt of	f the Notice to Proceed.»
§ 2.3 Substa Subject to a Substantial (Check the	antial Completion: adjustments of the Contract T Completion, as defined in Se appropriate box and complet	ime as provided in the Contract action 12.5, of the entire Work: <i>e the necessary information.)</i>	et Documents, the Contractor shall achieve
[«»] N	ot later than « » (« ») calen	dar days from the date of com	mencement.
[« <mark>X</mark> »] H	By the following date: « Dece	mber 31, 2025–»	
ARTICLE 3 § 3.1 The C Work. Subj	CONTRACT SUM ontract Sum shall include all ject to additions and deductio	items and services necessary for ns in accordance with Article 1	for the proper execution and completion of the formation of the contract Sum is:
«», <mark>BID AN</mark>	<u>MOUNT ((</u> \$ «-» <u>)</u>)		
§ 3.2 For pu (Itemize the	proses of payment, the Contract Sum among the ma	ract Sum includes the following <i>ajor portions of the Work.)</i>	g values related to portions of the Work:
P	Portion of the Work	Value	
§ 3.3 The C Documents (Identify the subsequent each and the	contract Sum is based upon the and hereby accepted by the G e accepted alternates. If the b to the execution of this Agree the date when that amount exp	e following alternates, if any, w Dwner: idding or proposal documents ement, attach a schedule of suc ires.)	which are described in the Contract permit the Owner to accept other alternates th other alternates showing the amount for
AIA Document Document is p or any portio law. This dra for resale. User Notes:	A105 ^m - 2017. Copyright © 1993, protected by U.S. Copyright Law a on of it, may result in severe ci ift was produced by AIA software	2007 and 2017 by The American Inst nd International Treaties. Unautho vil and criminal penalties, and wi at 13:33:59 on 04/19/2018 under Or	itute of Architects. All rights reserved. WARNIN prized reproduction or distribution of this ATA [®] 11 be prosecuted to the maximum extent possible u der No. 4868632430 which expires on 02/07/2019, a (3)

I

1

1

I

<u>N/A</u> »		
34 Allowances if any included in the	Contract Sum are as follows:	
<i>Identify each allowance.</i>)	Contract Sum are as follows.	
Item	Price	
~~ >>		
3.5 Unit prices, if any, are as follows:	d	
identify the tiem and state the unit price	e and quantity limitations, if any, to which the	e unit price witt be applicable.)
ltem	Units and Limitations	Price per Unit (\$0.00)
« »		
RTICLE 4 PAYMENTS		
4.1 Based on Contractor's Applications	s for Payment certified by the Architect, the O	Owner shall pay the Contractor,
n accordance with Article 12, as follows	s:	
Insert below timing for payments and pa	rovisions for withholding retainage, if any.)	
	and the theory of the second second	
Provided that an Application for Payme	and is received by the Architect not later than the	the wast way of a month, the
a following month If an Application	n for Payment is received by the Owner after	the date fixed above payment
hall be made by the Owner not later that	in «forty-five (45)» days after the Owner reco	eives the Application for
ayment.		
Retainage shall be withheld from each pa	ayment in the amount of 8% of the Application	on for Payment until the Work
s 50% complete, after which no further	retainage will be withheld.	
4.2 Payments due and unpaid (except d	lisputed payments) under the Contract Docum	nents shall bear interest from
he date payment is due at the rate below	<i>i</i> , or in the absence thereof, at the legal rate p	revailing at the place of the
Project.		
inseri rale of interest agreea upon, if an	<i>ly.)</i>	\sim /
4 » % «per annum »		
<u>, , , , , , , , , , , , , , , , , , , </u>		$ \langle \rangle \vee \langle \rangle$
ARTICLE 5 INSURANCE		
5.1 The Contractor shall maintain the f	ollowing types and limits of insurance until t	he expiration of the period for
orrection of Work as set forth in Section	n 14.2, subject to the terms and conditions se	t forth in this Section 5.1:
5.1.1 Commercial General Liability ins	urance for the Project, written on an occurrent	nce form, with policy limits of
not less than « » ($ \frac{1,000,000}{2} $ ») each	occurrence, « » ($\$ \ll 2,000,000$ ») general ag	ggregate, and « » (\$
(1,000,000)») aggregate for products-co	ompleted operations hazard.	
512 Automobile Liebility severing ve	hisles around and non-around vehicles used	by the Contractor with policy
3.1.2 Automobile Liability covering version in $($, 41, 000, 000)$) per accident, for bodily injury death of a	by the Contractor, with policy
lamage arising out of the ownership ma	intenance and use of those motor vehicles a	long with any other statutorily
equired automobile coverage.	intenance, and use of mose motor venicles a	iong with any outer statutority
-1		11 11
5.1.3 The Contractor may achieve the r	equired limits and coverage for Commercial	General Liability and
Automobile Liability through a combina	tion of primary and excess or umbrella liabil	ity insurance, provided that
uch primary and excess or umbrella ins	urance policies result in the same or greater of	coverage as those required
inder Section 5.1.1 and 5.1.2, and in no	event shall any excess or umbrella liability in	nsurance provide narrower
coverage than the primary policy. The ex-	xcess policy shall not require exhaustion of th	he underlying limits only
hrough the actual payment by the under	lying insurers.	-
IA Document A105 [™] - 2017. Copyright © 1993,	2007 and 2017 by The American Institute of Archite	ects. All rights reserved. WARNING: Thi
ocument is protected by U.S. Copyright Law a or any portion of it, may result in severe ci	nd International Treaties. Unauthorized reproducti vil and criminal penalties, and will be prosecuted	ion or distribution of this AIA [®] Document I to the maximum extent possible under
aw. This draft was produced by AIA software or resale.	at 13:33:59 on 04/19/2018 under Order No. 48686324	130 which expires on $02/\overline{07}/2019$, and is
ser Notes:		(3B9ADA

4

1

§ 5.1.4 Workers' Compensation at statutory limits.

§ 5.1.5 Employers' Liability with policy limits not less than « » (\$ «1,000,000 ») each accident, « » (\$ «1,000,000 ») each employee, and « » (\$ «1,000,000 ») policy limit.

§ 5.1.6 The Contractor shall provide builder's risk insurance to cover the total value of the entire Project on a replacement cost basis.

§ 5.1.7 Other Insurance Provided by the Contractor

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits	
« »		

§ 5.2 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance and shall provide property insurance to cover the value of the Owner's property. The Contractor is may be entitled to receive an increase in the Contract Sum equal to the insurance proceeds related to a loss for damage to the Work covered by the Owner's property insurance.

§ 5.3 The Contractor shall obtain an endorsement to its Commercial General Liability insurance policy to provide coverage for the Contractor's obligations under Section 8.12.

§ 5.4 Prior to commencement of the Work, each party shall provide certificates of insurance showing their respective coverages.

§ 5.5 Unless specifically precluded by the Owner's property insurance policy, the Owner and Contractor waive all rights against (1) each other and any of their subcontractors, suppliers, agents, and employees, each of the other; and (2) the Architect, Architect's consultants, and any of their agents and employees, for damages caused by fire or other causes of loss to the extent payment is received for such damage or loss from those losses are covered by property insurance or other insurance applicable to the Project, except such rights as they have to the proceeds of such insurance.

ARTICLE 6 GENERAL PROVISIONS

§ 6.1 The Contract

The Contract represents the entire and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a written modification in accordance with Article 10.

§ 6.2 The Work

The term "Work" means the construction and services required by the Contract Documents, and includes all other labor, materials, equipment, and services provided, or to be provided, by the Contractor to fulfill the Contractor's obligations.

§ 6.3 Intent

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. <u>If inconsistencies exist within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes, or ordinances, the Contract or shall, in accordance with the Architect's interpretation, either (i) provide the better quality or greater quantity of Work, or (ii) comply with the more stringent requirement.</u>

§ 6.4 Ownership and Use of Architect's Drawings, Specifications and Other Documents

Documents prepared by the Architect are instruments of the Architect's service for use solely with respect to this Project. The Architect shall retain all common law, statutory, and other reserved rights, including the copyright. The Contractor, subcontractors, sub-subcontractors, and suppliers are authorized to use and reproduce the instruments of service solely and exclusively for execution of the Work. The instruments of service may not be used for other

ATA Document A105^M - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximm extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3E9ADA2D)

Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Architect.

§ 6.5 Electronic Notice

Written notice under this Agreement may be given by one party to the other by email as set forth below. (Insert requirements for delivering written notice by email such as name, title, and email address of the recipient, and whether and how the system will be required to generate a read receipt for the transmission.)

«Notices shall be sent to the email addresses provided for each party in this Agreement. »

ARTICLE 7 OWNER

§ 7.1 Information and Services Required of the Owner

§ 7.1.1 If requested in writing by the Contractor, the Owner shall furnish all necessary surveys and a legal description of the site.

§ 7.1.2 Except for permits and fees under Section 8.7.1 that are the responsibility of the Contractor, the Owner shall obtain and pay for other necessary approvals, easements, assessments, and charges.

§ 7.1.3 The Owner shall prepare and provide to the Contractor a Notice of Commencement pursuant to Ohio Revised Code Section 1311.252. Prior to commencement of the Work, at the written request of the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence.

§ 7.2 Owner's Right to Stop the Work

If the Contractor fails to correct Work which is not in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work until the correction is made. If the Owner's exercise of its rights pursuant to this Section 7.2 is determined by a court or arbitrator to have been unjustified, such exercise shall be deemed to have been a suspension of the Work pursuant to Section 16.4.

§ 7.3 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies, correct such deficiencies. In such case, the <u>Architect-Owner</u> may withhold or nullify <u>payment approval a Certificate for</u> <u>Payment</u> in whole or in part, to the extent reasonably necessary to reimburse the Owner for the cost of correction, <u>as</u> <u>well as charges of engineers, attorneys, and other professionals, provided the actions of the Owner and amounts</u> <u>eharged to the Contractor were approved by the Architect</u>.

§ 7.4 Owner's Right to Perform Construction and to Award Separate Contracts

§7.4.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project.

§ 7.4.2 The Contractor shall coordinate and cooperate with the Owner's own forces and separate contractors employed by the Owner.

ARTICLE 8 CONTRACTOR

§ 8.1 Review of Contract Documents and Field Conditions by Contractor

§ 8.1.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. Before executing the Agreement, the Contractor and each Subcontractor and Sub-subcontractor have evaluated and satisfied themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site.

AIA Document A105^M - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3B9ADA2D)

§ 8.1.2 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner. Before commencing activities, the Contractor shall (1) take field measurements and verify field conditions; (2) carefully compare this and other information known to the Contractor with the Contract Documents; and (3) promptly report errors, inconsistencies, or omissions discovered to the Architect and Owner.

§ 8.2 Contractor's Construction Schedule

§ 8.2.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit Contract and throughout the Work, shall prepare, keep current, and submit each time it is updated for the Owner's and Architect's information a Contractor's construction schedule for the Work.

§ 8.2.2 The Contractor shall coordinate its Work with the work of other contractors and consultants working on the Project. Contractor, Architect and other contractors shall keep schedules up to date and promptly notify each other- and Owner in writing if such schedules are impacted. Contractor shall use its best efforts to accommodate the schedules of other contractors and consultants.

§ 8.2.3 In developing the construction schedule for the Work Contractor shall take into consideration the schedule of events and daily operations of the Greater Columbus Convention Center. Contractor shall schedule work at the site so as to minimize the impact of the Work on the daily operations of the Greater Columbus Convention Center.

§ 8.3 Supervision and Construction Procedures

§ 8.3.1 The Contractor shall supervise and direct the Work Work, consistent with the standard of care exercised by other professional contractors in the Contractor's trade in the region where the Project is located, and using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work.

§ 8.3.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner, through the Architect, the names of subcontractors or suppliers for each portion of the Work. The Contractor shall not contract with any subcontractor or supplier to whom the Owner or Architect have made a timely and reasonable objection.

§ 8.4 Labor and Materials

§ 8.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work.

§ 8.4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

§ 8.4.3 Except in the case of minor changes in the Work authorized by the Owner or Architect, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order.

§ 8.4.4 This Project is a public improvement and, therefore, is subject to "prevailing wage" requirements. The Contractor shall pay the required prevailing wages applicable to the Project and shall comply with all restrictions, requirements, and agreements with respect to the laborers and mechanics employed by it for the performance of the Work. The Contractor shall require all of its Subcontractors to (1) pay prevailing wages, (2) comply with all restrictions, requirements, and agreements with respect to their laborers and mechanics employed for the performance of their work, and (3) include in any sub-subcontract the same requirements set forth in this Section 8.4.4.

§ 8.4.5 DISCRIMINATION AND INTIMIDATION

§8.4.5.1 In the hiring of employees for the performance of the Work, including without limitation Work to be performed by a Subcontractor, thene Contractor or Subcontractor, and anyne person acting on behalf of thea Contractor or Subcontractor, shall not discriminate against or intimidate any person by reason of race, color, creed, religion, national origin, ancestry, sex, disability, sexual orientation, military status, or any other basis prohibited by law.

ATA Document A105^W - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This ATA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this ATA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3B9ADA2D)

Formatted: Font: Not Bold Formatted: Font: (Default) Times New Roman, Not Bold Formatted: Font: (Default) Times New Roman Formatted: Font: (Default) Times New Roman

Formatted: Font: (Default) Times New Roman

§8.4.5.2 Neither the Contractor nor any of its Subcontractors, nor any person acting on behalf of the Contractor or any of its Subcontractors, shall, in any manner, discriminate against or intimidate any employee hired for the performance of the Work on account of race, color, creed, religion, national origin, ancestry, sex, disability, sexual orientation, military status, or any other basis prohibited by law.

§ 8.4.5.3 The Contractor and its Subcontractors shall, throughout the Project, comply with Ohio Revised Code Sections 153.59 and 153.591, and with the Owner's Non-Discrimination Policy. For any violation of this Section 8.4.5 or Ohio law, the Contractor shall suffer such penalties as provided for in Ohio Revised Code Section 153.60 and the Owner's Non-Discrimination Policy. In addition to any remedies the Owner has under Ohio law for a violation of this Section 8.4.5, the Owner may also exercise any of the remedies set forth in the Contract Documents.

§8.4.5.4 The Contractor and its Subcontractors shall fully cooperate with any official or agency of the Owner, the city, state, or federal government seeking to eliminate unlawful employment discrimination, and with all other Owner, city, state, and federal efforts to assure equal employment practices under this Contract.

§ 8.4.5.5 The Contractor shall comply with the State of Ohio's Equal Employment Opportunity in the Construction Industry rules set forth in Ohio Administrative Code Chapters 123:2-3 through 123:2-9. The Contractor also shall provide monthly reporting of its workforce by the tenth Day of each month for the preceding month to the Equal Opportunity Division of the Department of Administrative Services, using Input Form 29 (available at http://das.ohio.gov/Divisions/EqualOpportunity/InputForm29.aspx).

§ 8.4.6 MINORITY, FEMALE, AND DISADVANTAGED BUSINESS PARTICIPATION

§ 8.4.6.1 The Owner to-intends to have minority, female, and disadvantaged businesses used throughout the Project. To this end, the Contractor is encouraged to include participation in the Project by certified minority, female, and disadvantaged business enterprise Subcontractors that have received appropriate certification from the federal or Ohio government.

§ 8.5 Warranty

The Contractor warrants to the Owner and Architect that: (1) materials and equipment furnished under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents; (2) the Work will be free from defects not inherent in the quality required or permitted; and (3) the Work will conform to the requirements of the Contract Documents. Any material or equipment warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 12.5.

§ 8.6 Taxes

§ 8.6.1 The Contractor shall pay sales, consumer, use, and similar taxes that are legally required when the Contract is executed.

§ 8.6.2 Materials purchased for use or consumption in connection with the Work may be exempt from the State of Ohio Sales Tax as provided in Ohio Revised Code Section 5739.02, and from the State of Ohio Use Tax as provided in Ohio Revised Code Section 5741.01. Purchases by the Contractor of expendable items such as form lumber, tools, oils, greases, fuel, and equipment rentals are subject to the application of the Ohio Sales or Use Tax.

§ 8.7 Permits, Fees and Notices

§ 8.7.1 The Contractor shall obtain and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work.

§ 8.7.2 The Contractor shall comply with and give notices required by agencies having jurisdiction over the Work. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs. The Contractor shall promptly notify the Architect- and Owner in writing of any known inconsistencies in the Contract Documents with such governmental laws, rules, and regulations,

§ 8.8 Submittals

The Contractor shall promptly review, approve in writing, and submit to the Architect shop drawings, product data, samples, and similar submittals required by the Contract Documents. Shop drawings, product data, samples, and

ATA Document A105^w - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3E9ADA2D)

similar submittals are not Contract Documents. Documents, but the Work shall be in accordance with approved submittals.

§ 8.9 Use of Site

The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, the Contract Documents, and the Owner. The Contractor shall use best efforts to minimize any interference with the occupancy or beneficial use of (i) any areas and buildings adjacent to the site of the Work and (ii) the building on which the Work is being performed. Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, entrances, and parking areas other than those designated by the Owner.

§ 8.10 Cutting and Patching

The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

§ 8.11 Cleaning Up

The Contractor shall keep the premises and surrounding area free from accumulation of debris and trash related to the Work. At the completion of the Work, the Contractor shall remove its tools, construction equipment, machinery, and surplus material; and shall properly dispose of waste materials.

§ 8.12 Indemnification

§ 8.12.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, <u>officers, trustee</u>, and agents and employees of any of them, from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out <u>of or resulting</u> from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the <u>negligent_negligent</u>, <u>intentional</u>, <u>or other wrongful</u> acts or omissions of the Contractor, a subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder.

§ 8.12.2 If the Project is located in close proximity of other buildings and property, then the Contractor must use all care and diligence to avoid damage to any such buildings and property. As a result and consistent with that obligation, in addition to the indemnification required by Section 8.12.1, the Contractor shall indemnify and hold harmless the Owner and the Owner's agents and employees from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work that impacts, injures or destroys any building or property beyond the Project's physical limits.

ARTICLE 9 ARCHITECT

§ 9.1 The Architect will provide administration of the Contract as described in the Contract Documents. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 9.2 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the Work.

§ 9.3 The Architect will not have control over or charge of, and will not be responsible for, construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Architect will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

§ 9.4 Based on the Architect's observations and evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor.

§ 9.5 The Architect has and Owner each have authority to reject Work that does not conform to the Contract Documents. If the Architect does not reject non-conforming Work that it has discovered, the Architect may demand in writing that the Contractor bring the non-conforming Work into compliance with the Contract Documents.

§ 9.6 The Architect will promptly review and approve or take appropriate action upon Contractor's submittals, but only for the limited purpose of checking for conformance with information given and the design concept expressed

ATA Document A105^W - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (389ADA2D)

in-the Contract Documents. Review of such submittals is not for the purpose of determining the accuracy and completeness of other information such as dimensions, quantities, and installation or performance of equipment or systems, which are the Contractor's responsibility. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures.

§ 9.7 On written request from either the Owner or Contractor, the Architect will promptly interpret and decide matters concerning performance under, and requirements of, the Contract Documents. <u>The Architect's response to</u> such requests shall be made in writing and delivered to both the Owner and Contractor within any time limits agreed upon or otherwise with reasonable promptness.

§ 9.8 <u>Such Interpretations interpretations and decisions</u> of the Architect <u>will shall</u> be consistent with the <u>requirements</u> <u>indicated inintent of</u>, <u>and or</u> reasonably inferable from, the Contract Documents, and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 9.9 The Architect's duties, responsibilities, and limits of authority as described in the Contract Documents shall not be changed without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

ARTICLE 10 CHANGES IN THE WORK

§ 10.1 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract, consisting of additions, deletions or other revisions, and the Contract Sum and Contract Time or Contract Time, or both, shall be adjusted accordingly, in writing. If the Owner and Contractor cannot agree to a change in the Contract Sum, the Owner shall pay the Contractor its actual cost plus reasonable overhead and profit, <u>The Contractor shall not be entitled to an increase in the Contract Sum or to an extension of the Contract Time, or both, on account of any change in the Work that is not the subject of a Change Order prior to the commencement of such Work.</u>

§ 10.2 <u>Subject to the approval of the Owner, t</u>The Architect may authorize or order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. Such authorization or order shall be in writing and shall be binding on the Owner and Contractor. The Contractor shall proceed with such minor changes promptly.

§ 10.3 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be subject to equitable adjustment.may be equitably adjusted.

ARTICLE 11 TIME

§ 11.1 Time limits stated in the Contract Documents are of the essence of the Contract.

§ 11.2 If the Contractor is delayed at any time in progress of the Work by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, or other causes beyond the Contractor's control, the Contract Time shall be subject to equitable adjustment. <u>The Contractor, however, will not be entitled to an extension of the Contract Time to the extent that such delay occurs concurrently with a delay or delays attributable to the Contractor.</u>

§ 11.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the responsible party.

ARTICLE 12 PAYMENTS AND COMPLETION

§ 12.1 Contract Sum

The Contract Sum stated in this Agreement, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

AIA Document A105^M - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosenuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3B9ADa2D)

§ 12.2 Applications for Payment

§ 12.2.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for Work completed in accordance with the values stated in this Agreement. The Application shall be supported by data substantiating the Contractor's right to payment as the Owner or Architect may reasonably require, such as evidence of payments made to, and waivers of liens from, subcontractors and suppliers. Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

§ 12.2. The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment, all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or other encumbrances adverse to the Owner's interests.

§ 12.2.3 As a condition precedent to the Contractor's entitlement to payment on account of an Application for Payment, the Contractor shall submit with each Application for Payment:

- .1 a partial conditional lien waiver from the Contractor for the total payment requested in the Application for Payment;
- .2 a partial conditional lien waiver from all Subcontractors and Sub-subcontractors on whose account the Contractor is seeking payment in the Application for Payment for the total amount of such payment requested;
- .3 a partial unconditional lien waiver from the Contractor for the sum of all previously paid progress payments (not applicable to the Contractor's first Application for Payment) and not applicable to retainage;
- 4 unless previously provided, a partial or final unconditional lien waiver from each Subcontractor and Sub-subcontractor on whose account the Contractor previously sought and received payment for the sum of all such previously paid payments;
- .5 a notarized statement from the Contractor certifying that: -(1) the Application for Payment is correct;
 (2) the Contractor is entitled to payment of the amounts requested; and (3) all due and payable bills with respect to the Work have been paid in full or will be paid in full from the proceeds of the Application for Payment;
- .6 an application for payment on AIA Document G702/G703 to the Contractor from every Subcontractor on whose account the Contractor is seeking payment in the Application for Payment;
- .7 any other information required by the Contract Documents to be submitted with an Application for Payment; and
- .8 such other information substantiating the Contractor's right to payment as the Owner, or Architect or Owner's lender may reasonably require.

§ 12.3 Certificates for Payment

The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in part; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole. If certification or notification is not made within such seven day period, the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time and the Contract Sum shall be equitably adjusted due to the delay.

§ 12.4 Progress Payments

§ 12.4.1 After the Architect has issued a Certificate for Payment, but subject to the Owner's decision to approve payment in whole or in part, or if the Owner approves payment in the absence of a Certificate for Payment, the Owner shall make payment in the manner provided in the Contract Documents, and shall so notify the Architect. The Owner may decline to approve payment in whole or in part to such extent as may be necessary in the Owner's opinion to protect the Owner from loss for which the

ATA Document A105^W - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This All Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this All[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIR software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3B9AD22D) Contractor is or may be responsible, including loss resulting from acts and omissions of the Contractor's employees or Subcontractors or their respective agents, because of, among other things:

- defective Work not remedied;
- .2 liens or third-party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- failure of the Contractor to make payments properly to Subcontractors or for labor, materials or .3 equipment;
- reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- .7 repeated failure to carry out the Work in accordance with the Contract Documents; or
- representations made by the Contractor that are not true. .8

§ 12.4.2 The Contractor shall promptly pay each subcontractor and supplier, upon receipt of payment from the Owner, an amount determined in accordance with the terms of the applicable subcontracts and purchase orders.

§ 12.4.3 Neither the Owner nor the Architect shall have responsibility for payments to a subcontractor or supplier.

§ 12.4.4 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the requirements of the Contract Documents.

§ 12.4.5 Notwithstanding any other provision of the Contract Documents to the contrary, if any claim or lien for which the Contractor is responsible is filed or asserted or there is any reason to believe that such a claim or lien may be filed or asserted at any time during the performance of the Work or the duration of the Contract, the Owner may withhold from any payment otherwise due to the Contractor a sum sufficient, in the Owner's reasonable opinion or as required by law, to pay all obligations and expenses necessary to satisfy such claim or lien until the Contractor furnishes such evidence satisfactory to the Owner that the indebtedness and the claim or lien in respect thereof, if any, has been satisfied, discharged, and released of record if and as provided by law pending the resolution of any such dispute between the Contractor and the entity asserting the claim or lien. The Owner may withhold final payment from the Contractor until the Work and the site are free and clear of any and all claims, liens, or rights thereto arising out of Work performed or materials furnished in furtherance of the Work. In the event that the unpaid balance of the Contract Sum is insufficient to cover such losses, costs, damages, and fees, or it the lien claim arises from Contractor's failure to properly pass through any payment received from the Owner, the Contractor shall immediately pay the difference to the Owner. The Contractor shall have no responsibility under this Section for any lien or claim caused by Owner's failure to make payment to Contractor when due.

§ 12.5 Substantial Completion

§ 12.5.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents and when all government inspections have been successfully completed, and all required permits and authorizations have been issued- so the Owner can occupy or utilize the Work for its intended use.

§ 12.5.2 When the Contractor believes that the Work or designated portion thereof is substantially complete, it will notify the ArchitectArchitect, and the Architect will make an inspection to determine whether the Work is substantially complete. When the Architect determines that the Work is substantially complete, the Architect shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, establish the responsibilities of the Owner and Contractor, and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 12.6 Final Completion and Final Payment

§ 12.6.1 Upon receipt of a final Application for Payment, the Architect and Owner will inspect the Work. When the Architect and Owner finds the Work acceptable and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment.

ATA Document A105^W - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not resale (3B9ADA2D) User Notes:

Formatted: Indent: Left: 0.5", Hanging: 0.31"

§ 12.6.2 Final payment shall not become due until the Contractor submits to the Architect and Owner releases and waivers of liens, and data establishing payment or satisfaction of obligations, such as receipts, claims, security interests, or encumbrances arising out of the Contract.

§ 12.6.3 Acceptance of final payment by the Contractor, a subcontractor or supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 12.6.4 Notwithstanding any other provision of the Contract Documents to the contrary, the date of final completion of the Work is the date determined by the Owner when all Work is complete, accessible, operable, and usable by the Owner and all parts and systems are 100% complete and cleaned for the Owner's full use and all drawings, certificates, bonds, guarantees, and documents required by the Contract Documents have been provided to the Owner by the Contractor.

§ 12.6.5 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect and Owner (1) an affidavit in form and substance reasonably acceptable to the Owner that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied and that all Work is complete in accordance with the requirements of the Contract Documents, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and, (5), a final lien waiver from the Contractor and each Subcontractor; (6) all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, record documents, as-built copies of the Contract Documents, and other documents required by the Contract Documents; and (7) all of the documents and information required under Article 12 to be included with Applications for Payment. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor shall furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall immediately refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

ARTICLE 13 PROTECTION OF PERSONS AND PROPERTY

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs, including all those required by law in connection with performance of the Contract. The Contractor shall take reasonable precautions to prevent damage, injury, or loss to employees on the Work and other persons who may be affected thereby, the Work and materials and equipment to be incorporated therein, and other property at the site or adjacent thereto. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, or by anyone for whose acts the Contractor may be liable.

ARTICLE 14 CORRECTION OF WORK

I

§ 14.1 The Contractor shall promptly correct Work rejected by the Architect or <u>Owner</u> as failing to conform to the requirements of the Contract Documents. The Contractor shall bear the cost of correcting such rejected Work, including the costs of uncovering, replacement, and additional testing.

§ 14.2 In addition to the Contractor's other obligations including warranties under the Contract, the Contractor shall, for a period of one year after Substantial Completion, correct work not conforming to the requirements of the Contract Documents. <u>The Contractor will work together with the Architect and the Owner to see that the corrective</u> Work is completed.

§ 14.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 7.3.

ARTICLE 15 MISCELLANEOUS PROVISIONS

§ 15.1 Assignment of Contract

Neither party to the Contract shall assign the Contract as a whole without written consent of the other.

AIA Document A105^W - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosenuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3B9ADa2D)

§ 15.2 Tests and Inspections

§ 15.2.1 At the appropriate times, the Contractor shall arrange and bear cost of tests, inspections, and approvals of portions of the Work required by the Contract Documents or by laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.

§ 15.2.2 If the Architect or Owner requires additional testing, the Contractor shall perform those tests.

§ 15.2.3 The Owner shall bear cost of tests, inspections, or approvals that do not become requirements until after the Contract is executed. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 15.3 Governing Law

1

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules.

ARTICLE 16 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 16.1 Termination by the Contractor

If the Work is stopped under Section 12.3 for a period of 14 days through no fault of the Contractor, the Contractor may, upon seven additional days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, and costs incurred by reason of such terminationprofit.

§ 16.2 Termination by the Owner for Cause

- § 16.2.1 The Owner may terminate the Contract if the Contractor
 - .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
 - 2 fails to make payment to subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the subcontractors;
 - .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
 - 4 is otherwise guilty of substantial breach of otherwise fails to perform any of its duties or obligations under a provision of the Contract Documents.

§ 16.2.2 When any of the above reasons exist, the Owner_, after consultation with the Architect, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may

- .1 take possession of the site and of all materials thereon owned by the Contractor, and
- .2 finish the Work by whatever reasonable method the Owner may deem expedient.

§ 16.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 16.2/1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 16.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. This obligation for payment shall survive termination of the Contract.

§ 16.3 Termination by the Owner for Convenience

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Contractor shall be entitled to receive payment for Work executed, executed. However, if the Owner terminates the Contract pursuant to this Section 16.3, but the Contractor is in default, the Contractor will be entitled to receive only such sums as it would be entitled to receive following the occurrence of an event of default as provided in Section 16.2.

§ 16.4 SUSPENSION BY THE OWNER FOR CONVENIENCE

and costs incurred § 16.4.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine. The Contract Sum or Contract Time, or both, may be adjusted for increases in the cost and time caused by suspension, delay, or interruption, but no such adjustment will be made to the extent

AIA Document A105^W - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosenuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3B9ADa2D)

Formatted: Font: Arial Narrow, Bold

- by reason.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible, in which case the Contractor will only be entitled to an extension of the Contract Time but not the Contract Sum; or
- of such termination, along with reasonable overhead and profit on the Work not executed. 2 that an equitable adjustment is made or denied under another provision of the Contract.

ARTICLE 17 OTHER TERMS AND CONDITIONS

(Insert any other terms or conditions below.)

§ 17.1 CLAIMS

§ 17.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 17.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the Architect with a copy to the other party. Claims by either party must be initiated within 10 days after occurrence of the event giving rise to such Claim or within 10 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. The Contractor's failure to initiate and substantiate a Claim shall constitute an irrevocable waiver of the Claim.

§ 17.1.2.1 Unless otherwise agreed in writing by the Owner, within 45 days after the initiation of a Claim, the Contractor shall submit in writing to the Owner and Architect all information that the Contractor believes substantiates the Claim and all information and statements required to substantiate a Claim as provided in this Section 17.1. The failure to comply with the requirements of this Section 17.1.2.1 shall constitute an irrevocable waiver of any related Claim.

§ 17.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 17.1.4 CLAIMS FOR ADDITIONAL COST

§ 17.1.4.1 Except in the event of a Claim relating to an emergency endangering life or property, the Contractor shall obtain the Owner's specific written authorization prior to proceeding with any change in the Work that may entitle the Contractor to an increase in the Contract Sum. The Contractor's failure to obtain such prior written authorization shall constitute an irrevocable waiver of any related Claim. If the Contractor wishes to make a Claim for an increase in the Contract Sum for any reason other than a change in the Work ordered by the Owner, written notice as provided in this Article shall be given before proceeding to execute the affected Work.

§ 17.1.4.2 The Contractor shall substantiate each Claim for an increase in the Contract Sum with (1) written documentation of the actual additional direct costs to the Contractor due to the event giving rise to the Claim; and (2) a written statement from the Contractor that the increase requested is the entire increase in the Contract Sum associated with the Claim.

§ 17.1.5 CLAIMS FOR ADDITIONAL TIME

§ 17.1.5.1 Except in the event of a Claim relating to an emergency endangering life or property, the Contractor shall obtain the Owner's specific written authorization prior to proceeding with any change in the Work that may entitle the Contractor to an increase in the Contract Time. The Contractor's failure to obtain such prior written authorization shall constitute an irrevocable waiver of any related Claim. If the Contractor wishes to make a Claim for an increase in the Contract Time for any reason other than a change in the Work ordered by the Owner, written notice as provided in this Article shall be given before proceeding to execute the affected Work.

§ 17.1.5.24 The Contractor shall substantiate each Claim for an extension of the Contract Time with (1) a written description of the effect of the delay on the progress of the Work; (2) a detailed schedule which identifies the critical portions of the Work impacted by the delaying event and the dates of such impact; (3) a detailed written

ATA Document A105^W - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This All Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this All[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIR software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3B9AD22D)

Formatted: AIA Agreement Body Text

proposal for an increase in the Contract Sum which would fully compensate the Contractor for all costs of acceleration of the Work needed to completely overcome the associated delay together with a statement consistent with Section 17.1.4.2; and (4) a written statement from the Contractor that the extension requested is the entire extension of the Contract Time associated with the Claim.

.1 In the case of a continuing delay occurring on consecutive days, only one Claim is necessary. However, within ten days after the cessation of the cause of the continuing delay, the Contractor shall notify the Owner and Architect in writing that the cause of the delay has ceased. The failure to give timely notice of the cessation of the cause of the continuing delay will constitute an irrevocable waiver of any Claim based on the continuing delay.

§ 17.1.5.32 In addition to the requirements of Section 17.1.5.1, if adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on a critical element of the scheduled construction. Notwithstanding any other provision of the Contract Documents to the contrary, the Contract Time will not be adjusted on account of the impact of any normal adverse weather on any of the Work or on account of the impact of any abnormal adverse weather on non-critical elements of the Work. The support for and evaluation of all adverse-weather Claims shall be based upon average weather conditions during the 10 years immediately preceding the dates at issue in the Claim as such weather conditions were recorded at the governmentcontrolled weather-recording facility nearest to the site.

§ 17.1.5.43 Notwithstanding any other provision of the Contract Documents to the contrary, an extension of the Contract Time will be the Contractor's exclusive remedy in the event of any delay not the proximate result of the act or failure to act of the Owner or anyone for whom the Owner is directly responsible. The Contractor specifically waives any right it may otherwise have to an increase in the Contract Sum or to any type of damages because of such delay or disruption to all or any part of the Work, whether such delay was foreseen or unforeseen and whether caused by the active interference of any party for whom the Owner is not directly responsible.

.1 Notwithstanding the provisions of Section 17.1.5.43 to the contrary, the Contractor will not be entitled to an extension of the Contract Time to the extent that such delay occurs concurrently with a delay attributable to the Contractor.

§ 17.1.5.54 Notwithstanding any other provision of the Contract Documents to the contrary, in no event shall the Contractor be entitled to an increase in the Contract Time on account of any delaying impact on a non-critical element of the Work.

§ 17.1.67 MEDIATION

§ 17.1.67.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 12.6.3, 17.1.2, 17.1.4, and 17.1.5 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 17.1.7.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 17.1.7, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 17.1.67.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 17.1.78 LITIGATION

ATA Document A105^W - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not resale (3B9ADA2D) User Notes:

<u>Howingatter initiation of the Claim, be subj</u> lieve the parties of their obligation to media	ect to litigation. The filing of a lawsuit under this Section does not the their disputes pursuant to Section 17.1.67.
17.1.78.2 All litigation arising or allegedly a ly in the state or federal court where the Provident of the state of federal court where the Provident of the state of federal court where the Provident of the state of the sta	arising out of or resulting from the Project shall be held and brought piect is located. The parties consent to the exclusive jurisdiction of an
nue in that court.	oject is located. The parties consent to the exclusive jurisdiction of an
»	
is Agreement entered into as of the day and	d year first written above.
required by law, insert cancellation period	l, disclosures or other warning statements above the signatures.)
w	
"	
www.ep (Signatura)	CONTRACTOR (Signature)
(Signature)	
 Printed name and title)	(Printed name and title)
<u>r mica name una mic j</u>	
-	//
DWNER (Signature)	CONTRACTOR (Signature)
_	
Printed name and title)	(Printed name and title)
	JURISDICTION:
	\frown

AIA Document A105^m - 2017. Copyright © 1993, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA* Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA* Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:33:59 on 04/19/2018 under Order No. 4868632430 which expires on 02/07/2019, and is not for resale. User Notes: (3B9ADA2D)