Bidder's Name _____

Address _____

City & State _____

COUNTY OF ATLANTIC, NEW JERSEY
INVITATION TO BID, INSTRUCTIONS TO BIDDERS
SPECIFICATIONS AND BID PROPOSAL FORMS FOR

Replacement of chillers and associated hydronic pumps, piping, and mechanical and electrical appurtenances at the Atlantic County Stillwater Complex located in Northfield, New Jersey.

Special Instructions to Bidders:

THE FOLLOWING FORMS MUST BE COMPLETED, SIGNED AND SUBMITTED WITH THE BID OR BID WILL BE REJECTED.

1. Bid Security is required to be submitted with the bid. The Security may be a Certified Check, Cashier's Check or Bid Bond.

2. Do not fail to provide a CONSENT OF SURETY from a Authorized bonding/insurance company.

3. Do not fail to complete, sign and notarize DISCLOSURE STATEMENT.

4. Do not fail to sign the PROPOSAL FORM.

5. Copy of Certificate for Public Works Contractor Registration

General Instructions

1. Bidder's Name and address together with Proposal category and due date must appear on the outside of the BID ENVELOPE containing the bid.

2. Total price of each item bid on must be extended and the grand total of the bid must be shown above signature of Bidder. Should any discrepancy arise as to bid amount, Unit Price shall prevail.

3. Non-Collusion Affidavit must be signed and notarized.

4. BIDDERS SHOULD SUBMIT A COPY OF YOUR NJ BUSINESS REGISTRATION CERTIFICATE

5. Any questions pertaining to this specification must be directed to the Office of Budget & Purchasing, telephone (609) 343-2267 or fax (609) 343-2193

NOTICE TO BIDDERS

Public Notice is hereby given that **SEALED BIDS** will be received by the Purchasing Agent of the County of Atlantic, New Jersey at 11:00am prevailing time on **February 22, 2017** the Conference Center; 3rd Floor; 1333 Atlantic Avenue; Atlantic City, NJ for:

BID 201706.1 **Replacement of chillers and associated hydronic pumps, piping, and mechanical and electrical appurtenances at the Atlantic County Stillwater Complex located in Northfield, New Jersey.**
(Bid Security and Consent of Surety Required)

Specifications and blank Bid Forms may be obtained online at the following web address http://bids.aclink.org

A PRE-BID CONFERENCE SHALL BE HELD ON **FEBRUARY 6, 2017 AT 9:00 AM** AT THE STILLWATER BUILDING 201 SHORE ROAD NORTHFIELD, NJ 08225

A site visit will follow

It is highly recommended that all interested parties attend this pre-bid meeting. Atlantic County will not be held responsible for vendors not receiving general information due to their not attending any pre-bid meetings

PROSPECTIVE BIDDERS SHALL ENSURE THAT ANY QUESTIONS THEY HAVE CONCERNING THIS PROJECT BE BROUGHT UP AT THE PRE-BID CONFERENCE. QUESTIONS PERTAINING TO THE PLANS OR SPECIFICATIONS ASKED AFTER THE PRE-BID MAY OR MAY NOT BE ADDRESSED DEPENDING ON AVAILABLE TIME.

Any questions concerning this specification must be directed to the Office of Budget & Purchasing, telephone (609) 343-2268 or fax (609) 343-2193

Bidders are required to comply with requirements of NJSA 10:5-31 et seq. and N.J.A.C. 17:27

Every bidder must abide by the New Jersey Prevailing Wage Act, P.L. 1963, Chapter 150.

The County of Atlantic reserves the right to reject any or all bids

By order of the County Executive of the County of Atlantic

Palma Conover, QPA,
Division of Budget & Purchasing
County of Atlantic, New Jersey

BID SPECIFICATION TABLE OF CONTENTS

INVITATION TO BID, INSTRUCTIONS TO BIDDERS, SPECIFICATIONS AND BID FORMS

INVITATION TO BID

Sealed bids will be received by the Purchasing Agent of the County of Atlantic, New Jersey, in the Atlantic County Conference Center, 3rd floor, 1333 Atlantic Avenue, Atlantic City, NJ 08401, at the time and date as specified in the "Notice to Bidders" at which time and place the bids shall be publicly opened and read aloud for:

Replacement of chillers and associated hydronic pumps, piping, and mechanical and electrical appurtenances at the Atlantic County Stillwater Complex located in Northfield, New Jersey

(Bid Security and Consent of Surety Required)

INSTRUCTIONS TO BIDDERS

1. Bid shall be submitted in a clearly marked sealed envelope, plainly marked on the outside as follows: Bidder's Name and Address, Bid Category, and due date.

   Atlantic County will not be held responsible for any erroneous pages or pages missing from this bid document if it is obtained from a source other than the Division of Budget and Purchasing or the Atlantic County Bid Portal. Atlantic County will not be held responsible if bidders (vendors) fail to receive any updates or addenda to the specification, if they haven't contacted the Purchasing office

2. **Consent of Surety** by a company authorized to transact business in the State of New Jersey shall accompany each bidders bid. The Consent shall state that it will provide the contractor with a bond in a sum equal to the full amount of the bid submitted if the contract be awarded to such bidder, conditioned for the faithful performance of the contract, in strict accordance with the specifications. **Failure to submit consent of surety with the bid shall result in automatic rejection.**

3. **The Disclosure Statement** (Public Law 1977, Chapter 33) attached to the specifications must be filled in completely and sworn to before a Notary Public. **Failure to do so shall result in automatic rejection of bid.**

4. **The Non-Collusion Affidavit** attached to the specifications must be filled in completely and sworn to before a Notary public.

5. **The Atlantic County Recycling Program and Solid Waste Management Plan.** The Contractor shall be required to comply with the requirements of the Atlantic County Solid Waste Management Plan and Recycling Plan, adopted in accordance with N.J.S.A. 13:1E- 1, et seq., and Atlantic County Ordinances #10 of 2009 and #9 of 2014. The said plans and ordinances specify requirements concerning disposal of solid wastes, along with materials that are identified as either mandatory recyclables or recommended to be recycled.

6. **Affirmative Action**

The Contractor shall be required to comply with the requirements of N.J.S.A. 10:5-31at seq. and N.J.A.C. 17:27. Each successful contractor is required to submit one of the following documents **PRIOR TO EXECUTION OF A CONTRACT:**

1. A copy of the contractor's Letter of Federal Approval indicating the contractor has an existing Federally approved affirmative action program , or
2. A copy of the contractor's Certificate of Employee Information Report , or
3. Contractor's initial Affirmative Action Employee Information Report (Form AA 302)

7. This bid requires certain documents be provided to the County as required by law. Some of the documents shall **REQUIRE** original signatures at the time of the Vendor's submission of its bid proposal to the County, while other documents shall not. Below is a list of these documents:

A. ORIGINAL SIGNATURES **REQUIRED** AT THE TIME OF SUBMISSION OF THE VENDOR'S BID PROPOSAL. These documents shall **REQUIRE ORIGINAL SIGNATURES AT THE TIME OF THE BID SUBMISSION BY THE VENDOR TO THE COUNTY**. FACSIMILE, COPY OR RUBBER STAMP SIGNATURES **WILL NOT BE ACCEPTED AND SHALL BE CAUSE FOR AN AUTOMATIC REJECTION OF THE BIDDER'S PROPOSAL**. Any bid price showing any erasure or alteration must be initialed by the bidder in **INK**.

1. Proposal Page.

B. ORIGINAL SIGNATURES **NOT REQUIRED** AT THE TIME OF SUBMISSION OF THE VENDOR'S BID PROPOSAL. These documents shall **NOT** require original signatures **at the time of the bid submission** by the Vendor. However, THESE ORIGINAL DOCUMENTS WITH THE ORIGINAL SIGNATURES shall be required by the County. This requirement is explained more fully in Section C, below.

1. Disclosure Statement;
2. Non-Collusion Affidavit;
3. Plumbing Affidavit;
4. Subcontractor's Affidavit;
5. Bid bond;
6. Consent of Surety;
7. Employee Benefits Affidavit.

C. ORIGINAL SIGNATURES REQUIREMENTS CLARIFICATION. In order for the County to prepare and sign a contract with the Vendor who is being recommended for the award of the contract, the County must have the original signatures on **ALL** of the documents listed in Sections A and B above, but at various times. The Proposal Page listed in Section A must have the original signature at the time that the Vendor submits his proposal to the County.

At the time of the submission of the proposal to the County, the items listed in Section B may be copies and do not need to have the original signatures. However, the Vendor must submit the originals of all the items in Section B **WITHIN FIVE (5) BUSINESS DAYS** after the date of the written Notice of the Recommendation of the award by the County to the Vendor. **THERE ARE NO EXCEPTIONS TO THESE RULES; FAILURE TO COMPLY WITH THESE REQUIREMENTS SHALL RESULT IN AN AUTOMATIC DISQUALIFICATION OF THE VENDOR**, and the County shall have the right to award the contract to the next lowest responsible vendor. There will be no negotiation of this requirement.

8. Bids must be accompanied by a Certified Check, Cashier's Check or Bid Bond payable to the order of the "County Treasurer, County of Atlantic" in the sum of not less than ten (10%) percent of the total amount of the bid except that no security shall be in excess of $20,000.00.

9. Prices quoted in all proposals shall be delivered prices, F.O.B. destination, freight prepaid.

10. The County is exempt from all taxes including Federal Excise Tax, Transportation Taxes, State Excise and Sales Tax, and local taxes.

11. Bid prices are to remain firm for a period of not less than sixty (60) days to allow the County to determine the lowest bid that shall most economically serve the intentions of this bid.

12. No Bidder shall be allowed to offer more than one price on each item even though he/she may feel that he/she has two or more type or styles that will meet specifications. Bidders must determine for themselves which to offer. If said bidder should submit more than one price on any item, all prices for the item shall be rejected.

13. It is understood and agreed that all prices quoted are firm and not subject to any increase during the life of the contract. Should there be any reduction in successful bidder(s) prices as submitted, vendor agrees that all deliveries made on and after such date of price reduction will be invoiced on the basis of reduced prices.

14. It will be assumed that all bids are based upon the specification unless the bidder stipulates to the contrary in letter form to be attached to bid submission. **Bidder shall not type changes on bid specification forms.** The letter shall point out in detail any and all deviations from the specification. If and whenever in the proposal a brand name, make, name of any manufacturer, or trade name is mentioned, it is for the purpose of establishing a grade or quality of merchandise. The County of Atlantic does not wish to rule out other competition and equal brands or makes, and therefore, the phrase **or equivalent** is added. If merchandise other than that specified is bid, it is the bidder's responsibility to name such within the bid and to provide information to the County that may show said item/s is equivalent to that specified. The County shall be the sole judge concerning the merits of the bid submitted.

15. The County reserves the right to reject any or all items covered in the bid request, or any portion(s) thereof, waive informalities, re-advertise and/or take such other actions decreed necessary and in the best interest of the County of Atlantic. Where two or more bidders are tie on an item, the County reserves the right to make the award to either of the bidders.

16. All bidders, where required, shall clearly stipulate the guaranteed delivery date of all items. Successful bidder(s) failing to meet the delivery date specified incur the risk of cancellation of contract.

17. All bid corrections or erasures shall be initialed by the person signing the bid or an authorized representative.

18. All bids shall be typewritten or printed in ink on the form(s) prepared by the County. All bids must be signed by officials of the Corporation or Company duly authorized to sign bid proposals.

19. Bids may be submitted prior to bid date to the Division of Purchasing, 6th floor, 1333 Atlantic Avenue, Atlantic City, NJ 08401.

Bids delivered the day of the bid opening shall be delivered to the Division of Purchasing, 6th floor, if delivered before 10:30 A.M. If bids are delivered after 10:30 A.M., the bidder shall deliver the bid to the 4th floor Conference Center and wait until the time of the bid opening. Bidder is notified that no bid will be opened if received after the specified hour.

The County shall not be responsible for late postal or overnight delivery, nor shall postmark dates or overnight dates be considered in honoring of bids. The County shall not be responsible for bidders hand delivering bids who arrive late or to the wrong location.

20. The County of Atlantic shall award all contracts on a **LUMP SUM BASIS** to the lowest responsible and responsive bidder.

21. The award of the contract or the rejection of the bids shall be made within sixty (60) days of the date of receiving bids; unless written extensions are requested by the Purchasing Agent and accepted by the bidder(s). All bid securities shall be returned immediately if all bids are rejected. The successful bidder(s) to whom the award is to be made shall be notified by receipt of the contract or written "Notice to Proceed" from the County department for whom the work is being provided.

22. When award of contract is made in one fiscal year with an effective date in the next fiscal year, award shall be contingent upon the availability of appropriation of sufficient funds for that purpose for the year in which said contract takes effect. When a contract shall be awarded for a period in excess of one year, said contract shall be contingent upon the annual availability and appropriation of sufficient funds for that purpose for each year of the contract.

23. Simultaneously with the delivery of the executed Contract, the successful bidder shall be required to furnish the County with an executed Performance Bond of a Surety Company authorized to transact business in the State of New Jersey in the sum equal to the full amount of the contract. Said Bond is to be satisfactory to the County Counsel as to form and be conditioned for the faithful performance of the contract to be entered into hereunder.

24. All bid deposits shall be returned within three (3) days of award of contract except to the successful bidder(s) whose bid security shall be returned after execution of a formal contract and delivery of certificates of insurance as required.

    Should the successful bidder(s) fail to enter into said contract after acceptance of bid by the County then the check or security deposit shall at the option of the County be retained as liquidated damages, or if bid bond has been supplied, principal and surety shall be liable for the amount of the bid bond.

25. All items bid shall be inspected by a representative of the requisitioning department upon delivery to ascertain compliance with the specifications. Items not in compliance with the specification shall be rejected, and the bidder shall comply with the specification or the County shall take remedial measures to assure compliance.

26. Discounts, if any, shall be figures from the date of acceptance of the equipment/service by the County regardless of the date of delivery or invoice.

27. Successful bidder(s) shall indemnify and save and keep harmless the County of Atlantic against any and all claims for royalties, patent infringements or suits for information thereon which many be involved in the manufacture or use of the items to be furnished.

28. Successful bidder(s) specifically and explicitly agrees to indemnify and save and keep harmless and defend the County of Atlantic against any and all losses, cost damage, claim expense or liability whatsoever, because of accident or injury to person or property of others occurring in connection with the operations under the contract including but not limited to employees, agents, servants, contractors and subcontractors of the successful bidder, even if the losses, cost damage, claim expense, or liability stem from negligence of the County of Atlantic.

29. The bid is irrevocable by the subscriber, or his, their or its personal or legal representatives. Said bid and award thereunder is made to the subscriber by the County of Atlantic and shall bind the subscriber, his, their or its heirs, executors, administrators, successors or assigns.

30. Assignment to any third party of any moneys due or to grow due the bidder or any contract based on this bid is prohibited and will not be recognized by the County.

31. The contractor shall not transfer or sublet any portion of the work covered by these specifications without written consent of the County of Atlantic.

32. The parties to any County contract resulting from this bid do hereby agree that the provisions of N.J.S.A. 10:2-1 through 10:2-4, dealing with discrimination in employment on public contracts, and the Rules and Regulations promulgated pursuant thereunto, are hereby made a part of such contract and are binding upon them.

33. The New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 (P.L. 1963, Chapter 150), is hereby made a part of every contract entered into by the County of Atlantic, except those contracts which are not within the scope of the act. The successful bidder and any of its subcontractors shall be obligated to pay the prevailing wage, to submit certified payrolls as documentation of compliance if requested, and to permit on-site monitoring, including interviews with employees and review subcontracts, by County representatives. The bidder's signature on this proposal is his guarantee that neither he nor any subcontractors he might employ to perform the work covered by this bid are listed or are on record in the Office of the Commissioner of the New Jersey Department of Labor as one who has failed to pay prevailing wages in accordance with the provisions of this act.

Every contractor and subcontractor shall keep an accurate payroll record, showing the name, craft or trade, job title or classification, actual hourly rate or wages paid, hours worked and total wages paid to each workman employed by him/her in connection with a public work. Payroll records shall be preserved for a period of two year from the date of payment.

Public Works Contractor Registration Act

NJSA 34:11-56.48 The Public Works Contractor Registration Act specifies that no contractor or subcontractor shall bid on or engage in any contract (or part thereof) for public work which is subject to the provisions of the “New Jersey Prevailing Wage Act PL 1963 C. 150 (C: 34:11-56.25)” for the construction, reconstruction, demolition, alteration repair or maintenance of a Public Building regularly open to and used by the general public institution and includes any subcontractor or lower tier subcontractor unless they are registered with the Commissioner of Labor.

Bidders submitting a bid for a public works contract or performing public work **MUST** submit a **certificate of registration with your bid.** Failure to submit a copy of the certificate of registration will result in rejection of the bid. Copies of the bidder's subcontractors certificate of registration will be required after submission of the bid but prior to the award of the contract.

34. Only manufactured and farm products of the United States, wherever available, shall be used in connection with this undertaking, pursuant to 40A:11-18 of the Revised Statutes of the State of New Jersey.

35. The Contractor shall comply with all New Jersey State and Federal Laws as they pertain to the performance under the contract.

36. Should any difference arise between the contracting parties as to the meaning or intent of these instructions or specifications, the County Purchasing Agent's decision shall be final and conclusive.

37. A written request for the withdrawal of a bid, or any party thereof, will be granted if the request is received by the County Purchasing Agent prior to the specified time of the bid opening.

38. All equipment purchased by the County of Atlantic shall be nonproprietary.

39. Every successful contractor shall be required to sign the standard County form contract, a copy of which attached to this bid specification under page numbers CT1 and CT2. If bidder desires to make any modifications to the contract language, or if bidder has another contract form that he/she desires to sign in lieu of or in addition to the County contract form, **a sample copy of the bidder's proposed contract language or form must be submitted with bid proposal as a separate attachment.** If no attachment is given it will be presumed that the contract documents will consist exclusively of the County's form contract. Any proposed language or form changes which in any way modifies the contractor's responsibilities as set forth in the bid specifications will not be acceptable and will be deemed to constitute a bid exception.

40. **Safety**: The Contractor hereby covenants and agrees to take, use provide and make all proper, necessary and sufficient precautions, safeguards and protections against the occurrence of happenings, accidents, injuries, damages or hurt to any person or property during the progress of the work herein covered, and be responsible for any indemnity and save harmless the County of Atlantic, its officers, agent, servants and employees from payment of all sums of money by reason of all or any such happenings, accidents, injuries, damages, hurt to person or property that may happen or occur upon or about such work, and all fines, penalties and loss incurred for or by reason of violations or any Federal, State, City or Borough ordinance or regulations while said work is in progress.

41. As this is a Sealed Bid Submission pursuant to NJ.S.A. 52:34-12, Telephone, Telefacsimile (fax), Telegraph Bids or any other electronic mediums will not be accepted for publicly advertised bid requirements.

42. The successful bidder will be required to comply with all applicable provisions of the N.J. Public Employees Occupational Safety and Health Act, (N.J.A.C. 34:6A-25), when providing any materials, supplies or services as part of this contract.

43. **Oral Instructions** Neither the County of Atlantic or their authorized representatives will be responsible in any way for oral answers unconfirmed in writing to any inquires regarding the intent or meaning of these specifications

44. CONSTRUCTION CONTRACTS - Before digging, contact the Dig number for mark-out of underground utilities. It is the responsibility of the contractor to call the Dig number to ascertain the location of all underground construction in the area of the project.

45. The manufacturer or supplier of a substance or mixture shall supply the Chemicals Abstracts Service number of all the components of the mixture or substance and the chemical name to the County to insure that every container bears a proper label at a County facility. This complies with P.L. 1982, Chap. 315, "Worker and Community Right to Know Act" sub sect. b, sect. 14. Further, all applicable Material Safety Data sheets (MSDS) a/k/a hazardous substance facts sheets, must be furnished to the County.

46. TERMINATION FOR CONVENIENCE: The County may terminate a contract, in whole or in part, without showing cause upon giving written notice to the Contractor. The County shall pay all reasonable cost incurred by the Contractor up to the date of termination. The Contractor will not be reimbursed for any anticipatory profits which have not been earned up to the date of termination.

    TERMINATION FOR DEFAULT: When the Contractor has not performed or has unsatisfactory performed the Contract, payment shall be withheld at the discretion of the County. Failure on the part of a contractor to fulfill contractual obligations shall be considered just cause for termination of the contract and the Contractor is not entitled to any costs incurred by the Contractor up to the date of termination.

    Termination of either type shall be completed by giving five (5) days notice in writing to the other party of its intentions to do so with the terms and conditions of the agreement. In the event the County cancels the contract, the Contractor shall only be entitled to payments for work properly performed or completed.

47. AMERICANS WITH DISABILITIES ACT: To request a reasonable accommodation of a disABILITY, contact the ADA coordinator at PHONE: (609) 343-2389 ; TTD: (609) 343-5551; or FAX: (609) 345-4295 at least five (5) business days prior to the event

48. **MULTIPLE BIDS NOT ALLOWED -** No bidder shall be allowed to submit more than one bid from an individual, firm, partnership, corporation or association under the same or different name, this will be cause for automatic rejection of your bid

49. **NEW JERSEY BUSINESS REGISTRATION CERTIFICATE**

Section 1 of P.L. 2001, c.134 is amended to read as follows:

An act concerning business registration for providers of goods and services to the State, State colleges and universities , county colleges, local contracting units, boards of educations, water and wastewater contractors and casinos, supplementing Title 54 of the revised Statues and amending P.L.1977,c.110.

.No contract shall be entered into by any contracting agency unless the contractor provides a copy of its business registration

All non governmental entities SHOULD submit a copy of their Business Registration Certificate or a copy of their 501(c) designation with their Bid. Bidder must submit a copy of their NJ Business Registration or 501(c) designation prior to award of the contract.

All bids must comply with the provisions mandated by applicable Federal Law and New Jersey Statutes.

Any provision in the specification which may be in conflict with any New Jersey statute are amended to conform to the minimum requirement of such statute.

CONTRACTORS / VENDORS

The successful bidder must maintain and submit to Atlantic County a list of subcontractors and their addresses that may be updated from time to time during the course of contract performance. A complete and accurate list shall be submitted before final payment is made for goods provided or services rendered or for construction of a construction project under this contract

A subcontractor shall provide a copy of its business registration to any contractor who shall forward it to the County. No contract with a subcontractor shall be entered into by any contractor under any contract with Atlantic County unless the subcontractor first provides proof of valid business registration.

The successful bidder as well as their subcontractors and each of their affiliates shall collect and remit to the Director of the Division of Taxation in the Department of the Treasury the use tax due Pursuant to the "Sales and Use Tax Act" P.L.1966,c.30(C.54:32B-1et seq.) On all their sales of tangible personal property delivered into the state of New Jersey.

50. **Investment Activities in Iran** - Pursuant to N.J.S.A. 52, 32-55, et seq., any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete a certification with their bid, in the form provided, to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division of Purchase and Property's website at www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf

TECHNICAL SPECIFICATIONS

DOCUMENT 00001

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DIVISION 26

END OF DOCUMENT

SECTION 00010 - INSTRUCTIONS TO BIDDERS

PART 1-INSTRUCTIONS

1.1 PROPOSALS

A. The County of Atlantic, New Jersey invites bids for all work in connection with the following project:

1. Replacement of chillers and associated hydronic pumps, piping, and mechanical and electrical appurtenances at the Atlantic County Stillwater Complex located in Northfield, New Jersey.

B. Work for which Bids are invited shall consist of one (1) "Base Bid." A fixed amount "Owner's Allowance" as shown on the Proposal Form will be added to the "Base Bid" amount. Project shall be bid as a single prime contract for all work specified and required.

C. Bids will be received at the time and place stipulated in the Invitation for Bids.

D. Any proposal prepared and submitted in accordance with the provisions described herein may be considered informal by the County, who reserves the right to waive any informalities in the proposal or reject any and all proposals. Any proposal received after the time and date specified may not be considered. No bidder shall withdraw a proposal within a minimum of sixty (60) days after actual date of the opening thereof.

E. Proposals are requested on the items stated in the County's General Instructions and Conditions for Construction Contracts for the project. The prices shall cover all cost of any nature incidental to and growing out of the work. In explanation, but not in limitation thereof, these costs shall include the cost of all work, labor materials, equipment, transportation, and all else necessary to perform and complete the project in the manner and within the time required, all incidental expenses in connection therewith, all costs on account of loss by damage or destruction of the project, and any additional expenses for unforeseen difficulties encountered, for settlement of damages and for replacement of defective work and materials. Conditions, limitations or provisions attached to the proposal by the bidder may cause its rejection.

F. Before submitting their proposal, the bidder shall be familiar with the Technologies, Drawings, Specifications and other Documents that will form part of the Contract, shall have investigated in detail the project site and shall have made such examination thereof, as may be necessary to satisfy himself in regard to the character and amount of work involved. They shall have satisfied themselves also that they can secure the necessary labor, equipment and materials and that the equipment and materials they propose to use will comply with the requirements thereof and can be obtained by them in the quantities and at the time required.

G. Bidders are cautioned to carefully read and review the project's Specifications and Drawings and conduct site inspections to acquaint themselves with any requirements therein necessitating installation work by one Contractor of materials or equipment furnished by another Contractor or the County and required to complete the entire project.

H. Attention is directed to the fact that these Specifications do not include a complete set of Contract forms. Some forms are included for the convenience of Bidders and are to be attached to the Proposal, filled out,

and executed. Separate copies of Proposals are to be furnished, in triplicate, two to be submitted with the proposal and one to be retained by the Bidder for his records. NOTE: All forms or papers required to be submitted with the proposals shall be signed, witnessed, and/or sworn to in duplicate.

I. When the proposal is made by an individual, his/her post office address shall be stated, and he/she shall sign the proposal; when made by a corporation, its name and principal post office address shall be stated and the proposals shall be signed by an authorized official of the corporation. Before award is made to a Bidder not a resident of the State, such Bidder shall designate a proper agent in the State on whom service can be made in the event of litigation.

J. When the proposal is made by a corporation, the Bidder must submit a notarized affidavit setting forth all persons owning ten (10%) percent or more if the stock of the corporation submitting the proposal, complete with address.

1.2 PROPOSAL GUARANTEE:

A Each bid shall be accompanied by a Bid Bond, Certified Check, Treasurer's Check or Cashier's Check payable to the County of Atlantic in the amount of ten percent (10%) of the total amount of the bid (but not in excess of $20,000.00) per N.J.S.A. 40A:11-21. It shall be subject to forfeit and retention by the County of Atlantic in lieu of other legal remedies, should a successful Bidder fail to execute a contract and provide a performance bond within ten (10) days after the County has tendered the contract.

1.3 RETURN OF PROPOSAL GUARANTEE:

A. The bid security of all bidders except the three (3) apparent lowest responsible bidders shall be returned pursuant to N.J.S.A. 40A:11-24a. The bid security of the remaining unsuccessful bidders shall be returned within three (3) working days after the award of contract.

1.4 POWER OF ATTORNEY:

A. Attorneys-in-fact who sign proposal bonds or contract bonds must file with each bond a certified copy of their Power of Attorney to sign said bonds.

1.5 AWARD OF CONTRACT:

A. The County may reject all proposals or may award the Contract as dictated by the needs and requirements of the New Jersey State Law and the County of Atlantic.

1.6 EXAMINATION OF SITE, DRAWINGS, ETC:

A. Bidders shall thoroughly examine and be familiar with the plans and specifications. The failure or omission of any Bidder to receive or examine any form, instrument or document, shall in no way relieve any Bidder from obligation with respect to his proposal. By submitting a proposal the Bidder agrees and warrants that he has examined the site, drawings and where the Specifications require in any part of the work a given result to be produced, that the Specifications are adequate and the required result can be produced under the requirements. No claim for any extra will be allowed because of alleged impossibilities in the production of the results specified or because of unintentional errors or conflicts in the Specifications.

1.7 PLANS AND SPECIFICATIONS:

A. The project shall be performed in accordance with the requirements of the Plans and Specifications, subject to modification as provided in General Conditions.

B. Any work required by either of them and not by the other shall be performed as if denoted both ways. Should any work be required which is not also denoted in the Specifications because of an obvious omission, but which is, nevertheless, necessary for the proper performance of the project, such work shall be performed as fully as if it were described and delineated at no additional cost to the County of Atlantic.

1.8 CHANGES WHILE QUOTING:

A. Should a Bidder find during examination of the Proposal Drawings and Specifications, any discrepancies, omissions, ambiguities, or conflicts in or among the documents, or be in doubt as to their meaning, the Engineer shall be notified in writing not later than seven (7) calendar days before bid opening date, and where information sought is not clearly indicated or specified, he will issue a clarifying bulletin which will become part of the Construction Documents.

1.9 INTERPRETATION OF CONTRACT DOCUMENTS:

A. No oral interpretation of the contract documents will be made to any Bidder. Every interpretation requested shall be made in writing to the Engineer. No such request received within seven (7) calendar days of the date established for the opening of bids will be given consideration.

B. Every interpretation and any supplemental instructions will be made in the form of an addendum to the contract documents, which, if issued, will be sent to all persons to whom contract documents have been issued by the Engineer. All such addenda shall become a part of the contract documents.

1.10 SUBSTITUTIONS:

A. Whenever a material, article, or piece of equipment is identified on the Plans or in the Specifications by reference to manufacturer's or vendor's name, trade names, catalogue numbers, etc., it is intended merely to establish a standard; and, any material, article, or equipment of other manufacturers, or vendors, which will perform adequately the duties imposed by the general design, will be considered provided the material, article, or equipment so proposed is, in the opinion of the Engineer, of equal substance and function. It shall not be purchased or installed by the Contractor without the Engineer's written "Notice of Review".

B. The terms "General Contractor", "Mechanical Contractor", "HVAC Contractor", "Electrical Contractor", "Contractor", "Prime Contractor", "This Contractor" or "Site Contractor" as mentioned in the Division 1, and technical specifications, refers to the Contractor, who is responsible for all work on this project.

1.11 COLLUSIVE PROPOSALS:

A. More than one bid or one from an individual, a firm or partnership, corporation, or an association under the same or different names will not be considered. Reasonable ground for believing that the Bidder is interested in more than one proposal for the same work will cause rejection of all proposals in which there is no reason for believing that collusion exists among any of the Bidders. Participants in any collusion will not be considered in future proposals.

1.12 INDEMNIFICATION:

A. Bidders shall agree, if awarded a contract, that they will indemnify and save harmless the County from all suits and actions of every nature and description brought against it, growing out of that contract, or contracts, written or verbal, entered in between the County and the successful Bidder, and further that upon the awarding of the contract in accordance with these specifications, this agreement of indemnifications shall automatically become effective.

B.COMPLIANCE WITH LAWS:

1. General: Bidders are advised that they will comply with all Federal and State of New Jersey laws as they pertain to the performance under the Contract.
2. Prevailing Wages
3. Affirmative Action

1.13 PERFORMANCE & PAYMENT BOND, EXECUTION AND CONTRACT:

A. Subsequent of the award, the successful Bidder shall execute and deliver to the County a Contract in such number of counterparts as the County may require.

B. The successful Bidder shall furnish a Performance Bond in the total amount of the contract. Said bond shall be that of an approved company, authorized to transact business in the State of New Jersey. These bonds shall minimally conform to the requirements of NJSA 2A:44-143 and as stipulated in all bid documents.

C. Having satisfied all conditions of award as set forth, the successful Bidder shall furnish performance and payment bond in a penal sum of at least 100% of the amount of the Contract as awarded, as security for the faithful performance of the Contract, and for the payment of all persons, firms or corporation to whom the Contractor may become legally indebted for labor, materials, tools, equipment, or services of any nature, employed or used by him in performing the work. Such bond shall be in the form of bond included in the Specifications and shall bear the same date as, or a date subsequent to, the date of the Contract.

1.14 CONSTRUCTION PERMIT:

A. Bidders shall include in their proposal the cost of all licenses for the proper execution and completion of the work, if applicable. All permit and inspections fees shall be paid by the County.

B. The Prime Contractor or his subcontractors (as appropriate) shall be responsible for securing all required permits for all mechanical and electrical construction work for this project.

1.15 MISCELLANEOUS PROVISIONS:

A. A written request for the withdraw of a bid will be granted if received by the County before any bid has been opened.

B. The County of Atlantic is exempt from all Federal and State Taxes.

C. Questions concerning this bid invitation may be directed to Concord Engineering Group, Inc., 2311

Atlantic Avenue, Atlantic City, New Jersey, 08401 at telephone (609) 246-7255 or Fax at (609) 246-7413.

D. The successful Bidder shall not assign, transfer, convey, sublet or otherwise dispose of the contract or any part thereof to anyone without the written consent of the County of Atlantic.

E. Should any differences arise between the contracting parties as to the meaning or intent of these Instructions or Specifications, the Engineer or his designated Representative's decision is to be final and conclusive.

F. Non-performance by the successful Bidder, or his failure to execute the contract or meet the performance bond requirements within ten (10) days after the award, may result, at the option of the County, in his proposal security forfeited to the County as liquidated damages and not as a penalty.

G. The successful Bidder agrees that he/she will make no claim for additional payment or any other concession because of any misinterpretation or misunderstanding of the contract on his part, or of any failure to fully acquaint himself/herself with any conditions relating to the contract.

END OF SECTION 00010

SECTION 00011 - CONDITIONS AND INSTRUCTIONS

PART 1 -TERMS AND REQUIREMENTS FOR BIDS:

The Contractor shall provide:

A. Purchase, supply and install all specified equipment, devices, systems and appurtenances to be used as defined in the plans and specifications for this project.

NOTE: It is the Contractor's responsibility to verify existing conditions and dimensions in the field and notify any discrepancies to the Engineer in writing.

PART 2 - THE SELECTION PROCESS:

The contract award process will proceed in the following steps:

2.1 SELECTION COMMITTEE

A. A Selection Committee consisting of officials from County will evaluate the bids and rank them according to the selection criteria put forth in Section 2.2.

2.2 QUALIFICATIONS EVALUATION CRITERIA

A. County will evaluate the Bids based on the criteria set forth in the New Jersey State laws for public bidding.

PART 3 - PROCEDURES:

3.1 POINTS OF CONTACT

A. Direct questions concerning the construction documents and the Procedures for responding to the invitation to bid should be directed to:

Palma Conover, Director
Atlantic County Division of Budget & Purchasing
1333 Atlantic Avenue
6th Floor
Atlantic City, NJ 08401
Telephone Number: (609) 34-2268
Fax Number: (609) 343-2193

3.2 SUBMISSION OF BIDS

A. Refer to Section 00010, Part 1- "Instructions" and General Instructions and Conditions for Construction Contracts specifications.

3.3 RIGHT TO REJECT SUBMISSIONS

A. This invitation to bid does not commit County to award a contract, pay any costs incurred in the preparation of a proposal, or the procurement of contract for services. County intends to award a contract on the basis of the best interest and advantage to County and reserves the right to accept or reject any or

all Bids received as a result of this invitation for bids.

3.4 PROPOSAL INSTRUCTIONS ON FORMAT AND CONTENT

A. Interested parties must submit bids in the format outlined in Part 4 of this section. Complete each of the described forms and sections in full (except those sections described as optional). County will review each proposal to determine if it is complete prior to actual evaluation. County reserves the right to eliminate from further consideration any proposal deemed substantially or materially non-responsive to the requests for information contained herein.

3.5 CONTRACT SCOPE

A. Replacement of chillers and associated hydronic pumps, piping, and mechanical and electrical appurtenances at the Atlantic County Stillwater Complex located in Northfield, New Jersey, as specified on the Contract Drawings and within the Technical Specifications.

1 The Contractor work includes the demolition of two (2) existing natural gas fire outdoor chillers and associated indoor pump, indoor and outdoor piping, fittings, valves, heat trace, appurtenances, etc., serving the Stillwater Complex in Northfield, NJ, and replacing the chillers with one (1) new packaged outdoor scroll centrifugal chiller, two (2) new indoor chilled water pumps, new piping, fittings, valves, heat trace, pipe insulation, controls, etc., as indicated on the project's Contract Drawings and in the project's Technical Specifications.

2 Miscellaneous related work includes, but is not limited to, the installation of associated electrical work as indicated on the project's Contract Drawings and in the project's Technical Specifications.

3 Contractor shall perform all necessary trenching, excavation, backfilling, and restoration work for installing new electrical power feeders to new outdoor chiller, chiller heater, chilled water piping heat trace, outdoor receptacle, control wiring, etc., as indicated on the project's Contract Drawings and in the project's Technical Specifications.

4 Contractor shall perform the demolition and removal of all mechanical and electrical items shown on the project's Contract Drawings and Technical Specifications including, but not limited to the two (2) existing outdoor chillers, one (1) concrete pad, two (2) indoor chilled water inline pumps, chilled water and natural gas piping, pipe fittings, valves, heat trace, pipe insulation, electrical feeders, etc. Contractor shall coordinate with the County and turn over to County any item shown to be demolished and removed which the County may want to keep. Work includes the permanent capping of existing natural gas piping of which a portion is to be demolished and removed.

5 Contractor shall be responsible to modify as necessary, one (1) of the existing chiller concrete pads as necessary to properly support the new outdoor chiller as indicated on the project's Contract Drawings and in the project's Technical Specification.

6 Contractor shall be responsible to provide structural support systems for all new piping and hydronic pumps. All new metallic supports shall be stainless or galvanized steel construction. No painted steel supports, including hangers and shields, shall be painted steel.

7 Contractor shall be responsible to interface the new chiller and chilled water pumps into the facility's existing Johnson Controls building management system (BMS).

8 Contractor shall perform all electrical work required for the installation of the new chiller and chiller electric heater, new chilled water pumps, new electric heat trace, new control wiring, and all ancillary electrical work as indicated on the project's Contract Drawings and in the project's Technical Specifications.

9 Contractor shall be responsible to patch/seal and insulate all exterior wall and roof openings resulting from this project's demolition and new construction work, including the resealing of the existing 4" chilled water piping lines, conduits, cables, etc., penetrating the Stillwater building's ground floor exterior wall.

10 All patched and/or repaired wall, ceilings, floors roofs, etc., shall match building's existing finishes.

11 Contractors shall include in their base bid amount a full twelve (12) months of maintenance services that includes the following:

a. Provide maintenance service (which includes full labor and materials) on all new HVAC systems with a three (3) month interval as maximum time period between calls.
b. Provide 24 hour emergency service on breakdowns and malfunctions of new HVAC systems.
c. Include HVAC maintenance items as outlined in manufacturer's operating and maintenance data.
d. Submit copy of service call work order or report and include description of work performed.

3.6ADDITIONAL REQUIREMENTS

A. The technical services to be delivered by the Contractor will include the following:

1. Supervision and coordination of the work of all subcontractors.
2. Coordination and cooperation of the Contractor to support the County's schedule.
3. Testing and adjusting of all new mechanical, electrical and control systems shall be coordinated by the Contractor with the County and their vendors such as Johnson Controls for automatic temperature controls systems.
4. Field startup of all new mechanical equipment shall be performed by a manufacturer's certified technician working directly for the Contractor. Contractor shall notify County no less than two (2) weeks in advance of all equipment startups.
5. Testing and training of County employees by on-site technicians certified by the manufactures of the new HVAC and control systems.
6. Preparation and delivery of "as-built" drawings showing all new work performed as part of this project.

PART 4 - OUTLINE OF BIDS SUBMITTED TO COUNTY

A. The following Items 1 through 8 must be completed and signed or bid will be rejected:

1. Bid Security in the forms of a Certified Check, Cashier's Check or Bid Bond.
2. Certificate from a Surety Company stating that if bid is accepted, company will provide the required performance bond.
3. Disclosure Statement properly notarized listing stockholders or partners owning ten percent (10%) or more of the Corporation or partnership stock.
4. Properly complete and sign all Proposal Pages (PF).
5. Properly complete and sign the Subcontractors Affidavit Form.
6. Properly complete and sign Employee Benefits Affidavit.
7. Properly complete and sign the Plumbers Affidavit Form.
8. A copy of the Public Works Contractor Registration Certificate issued by the State of New Jersey Department of Labor.

B. The following items should also be submitted with the bid:

1. A copy of your New Jersey Business Registration Certificate issued by the New Jersey Department of Treasury.
2. Non-Collusion Affidavit properly signed and notarized.
3. Affirmative Action Page Properly signed and completed.
4. Affidavit of Compliance on Contractor's Recycling Program.
5. Deviations from Specifications, if applicable, to be attached in letter form.

C. Bid Package shall be returned intact (all pages).

D. Any Corrections, additions or deletions shall be initialed and dated.

END OF SECTION 00011

DOCUMENT 00015

LIST OF DRAWINGS

PART 1 CONTRACT DRAWINGS

1.1 The following Drawings form the graphic portion of the Contract Documents.

Number	Drawing Title	Date
	Cover Sheet	11/4/16
M-0	Mechanical General Notes, Legend and Symbols	11/4/16
M-1	Partial 1st Floor Mechanical Demolition and New Work Plans	11/4/16
M-2	Mechanical Schedules, details, Piping Schematic and Control Sequences	11/4/16
E-0	Electrical General Notes, Legend and Panel Schedules	11/4/16
E-1	Partial 1st Floor Electrical Demolition and New Work Plans	11/4/16

END OF DOCUMENT

SECTION 00030 - SUPPLEMENTARY GENERAL CONDITIONS

PART 1 - GENERAL

1.1 INSURANCE REQUIREMENTS

A. The Contractor shall provide and pay for insurance coverage of such types and in such amounts as will completely protect the Contractor and the County against any and all risks of loss or liability arising out of this contract.

B. The insurance must be furnished by insurance companies with an "A" or better rating, as published in the most recent edition of Bests Insurance Key Rating Guide and authorized to do business in the State of New Jersey.

C. The Contractor shall furnish the County with Certificates of Insurance naming the County as an additional insured, and providing further that the liability insurance coverage shall be considered as primary and not as excess insurance, describing the types and amounts of insurance, identifying the coverage to this contract by reference and providing for thirty (30) days written notice to the County by registered mail prior to any modification, cancellation, non-renewal or other change in coverage.

D. The Contractor and his Subcontractors, Comprehensive Liability Insurance shall be as specified in the General Instructions and Conditions for Construction Contracts.

1.2 PERFORMANCE AND PAYMENT BOND, EXECUTION OF CONTRACT

A. Subsequent to the award, the successful Bidder shall execute and deliver to the County a Contract in such number of counterparts as the County may require.

B. Having satisfied all conditions of award as set forth, the successful Bidder shall furnish a payment bond in a penal sum of at least 100% of the amount of the Contract as awarded, as security for the faithful performance of the Contract, and for the payment of all persons, firms or corporations to whom the Contractor may become legally indebted for labor, materials, tools, equipment, or services of any nature employed or used by him in performing the work. Such bond shall be in the form of bond included in the Specifications and shall bear the same dates as, or a date subsequent to, the date of the Contract.

C. On each such bond, the rate of premium shall be stated, together with the total amount of the premium charged. The current power of attorney for the person who signs for any surety company shall be attached to such bond.

D. The failure of any successful Bidder to execute such contract and to supply the required bond within ten days after the prescribed forms are presented for signature, or within such extended period as the County may grant based upon reasons determined adequate by the County, shall constitute a default, and the County may either award the contract to the next responsible Bidder or re-advertise for bids, and may charge against such Bidder the difference between the amount of the Bidder and the amount for which a contract for the work is subsequently executed.

1.3 ADDITIONAL OR SUBSTITUTE BOND

A. If at any time the County, for justifiable cause, shall be or become dissatisfied with the Surety of Sureties for the Performance and/or Payment Bonds, the Contractor shall within five (5) days after the notice from the County to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other Surety or Sureties as may be satisfactory to the County. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new Surety or Sureties shall have furnished such an acceptable bond to the County.

1.4 OBSERVANCES OF LAWS

A. The Contractor shall observe and comply with all Federal, State and local laws that affect those engaged or employed in this project, the materials and/or the conduct of the work.

B. All such laws and/or ordinances affecting this Contract in any way shall be part of the Contract as if included herein.

C. Specifications, instructions to bidders and all accompanying documents, including the awarded contract, shall be taken to be in accordance with the laws of the State of New Jersey.

1.5 PREVAILING WAGE RATES

A. In accordance with N.J.S.A. 34:11-56-25, "Prevailing Wage", the prevailing wage rates, as determined by the Commissioner of Labor and Industry of the State of New Jersey, for the locality of the work of each craft or trade or classification of all workmen shall be paid not less than these prevailing wage rates.

B. In the event it is found that any workmen employed by the Contractor, or any Subcontractor covered by this Contract is paid less than the required wage rates, the County may determine the Contractor's right to proceed with the work or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The Contractor and his sureties shall be liable to the County for any excess costs occasioned thereby.

C. The Contractor and each Subcontractor shall keep an accurate record showing the name, craft, or trade and actual hourly rate of wages paid to each workman employed by him in connection with the work. Records shall be preserved for three years from the date of payment.

D. The Contractor shall furnish and erect in a prominent and easily accessible place at the site of the work, a suitable bulletin board.

E. Each Contractor shall post upon this bulletin board, the prevailing wage rates for each craft and classification involved in the work as determined by the Commissioner of Labor and Industry of the State of New Jersey, including the effective date of any changes thereof. Each Contractor and Subcontractor shall post similar prevailing wage rates at such place or places as are used by them to pay workmen their wages.

F. Before Awarding Contract: A check will be made with the Commissioner of Labor and Industry for list of the Contractor's not paying prevailing wages. The Contract will not be awarded to such Contractor until three (3) years after date of such listing.

G. Certified Payroll: The Contractor and /or all Subcontractors are required to forward within ten (10) calendar days after completion of each pay period, a certified copy of their payroll.
This copy is to be forwarded to:

COUNTY OF ATLANTIC
DIVISION OF FACILITIES/CAPITAL PLANNING
AND PROPERTY MANAGEMENT
1227 DREXEL AVENUE
P.O. BOX 1107
ATLANTIC CITY, NEW JERSEY, 08404-1107

1.6 SPECIFICATIONS

A. The titles to the Divisions of these Specifications are introduced merely for convenience and are not necessarily correct segregation of labor or materials. Such separations shall not operate to make the Engineer an arbiter to establish limits between the Contractor and Subcontractor.

B. The Contractor shall classify and allocate the furnishing of materials and the performance of work to the various trades in accordance with local customs, jurisdictional awards, regulations and decisions insofar as they are applicable.

C. The Contractor, all separate Contractor's, and all Subcontractors shall conduct all their operations on this project in such a manner that no jurisdictional disputes arise regarding delivery, unloading, handling, installations, and connections of the various items in the several trades involved.

1.7 INTERPRETATIONS

A. Should the Specifications disagree in themselves or with each other, the better quality or quantity of work shall be provided.

B. Large scale details shall govern small scale drawings.

C. Where the work is indicated in detail on only a portion of the drawing, this work shall apply to other like portions of the building.

D. Should any work be necessary for the proper execution of the Specifications or Drawings, the Contractor shall perform all such work as if fully specified or indicated.

E. The Engineer shall be advised in writing of all discrepancies, errors, conflicts, and omissions in the Specifications and Drawings. The Engineer will promptly resolve the matter. Any work undertaken after the discrepancy has been discovered and prior to clarification by the Engineer will be done at the Contractor's risk.

F. The Engineer shall decide as to the meaning or intention of any portion of the Specifications and Drawings. His decision shall be final.

G. Throughout the Specifications and Drawings, references are made to nominal, not actual, sizes of commercial materials. In all such cases, Contractor shall supply materials in their commercial sizes in accordance with recognized and accepted standards as intended. Only if accurately dimensioned, or if particularly specified, will sizes other than usual commercial sizes be required.

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

1.8 USE OF DOMESTIC MATERIALS

A. The Contractor shall comply with the provisions of Chapter 33, Title 52 of the Revised Statutes (R.S. 52:33-1, et. seq.) and NJSA 18A:18A-20 requiring the preference be given to the use of domestic materials or as same be governed by Federal Law Regulation.

B. "Domestic Construction Material" means an un-manufactured construction material which has been mined or produced in the United States, or a manufactured construction material which has been manufactured in the United States if the cost of its components which are mined, produced, or manufactured in the United States exceed 50 percent of the cost of the components. The cost of components shall include transportation costs to the place of incorporation into the construction material and, in the case of components of foreign origin, whether or not a duty free entry certificate may be issued.

1.9 GUARANTEE

A. The Contractor shall guarantee all materials and workmanship installed and/or performed under this Contract to be free to defects which may impair the strength, durability or appearance of said work and/or may make it suitable for the intended purpose, for a minimum period of two (2) years from the date of final completion, unless otherwise noted in the other sections of this Specification.

B. The Contractor shall repair and/or replace any such work to the satisfaction of the County at no additional cost to the County.

C. The guarantee is in addition to and shall in no way limit any other warranty or guarantee required by the provisions of the Contract Documents.

1.10 PERMITS AND REGULATIONS

A. Permits necessary for the prosecution of the work shall be secured by the Contractor and paid for by the County. Licenses necessary for the prosecution of the work shall be secured and paid for by the Countractor.

B. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the Drawings and Specifications are at variance therewith, he shall promptly notify the Engineer in writing and any necessary changes shall be adjusted as provided in Section 1.8. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, he shall bear all costs arising there from.

1.11 REQUIRED PROVISIONS DEEMED INSERTED

A. Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

1.12 SUSPENSION OF WORK

A. Should the County be prevented or enjoined from proceeding with work or from authorizing its prosecution either before or after its prosecution, by reason of any litigation, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay, but time for completion of the work will be extended to such reasonable time as the County may determine will compensate for time lost by such delay with such determination to be set forth in writing.

1.13 ANTI-KICKBACK ACT

A. The parties to this contract agree to conform to the provisions of the Copeland “Anti-Kickback Act” (18 USC 374).

PART 5 - PRODUCTS

(Not Applicable).

PART 6 - EXECUTION

(Not Applicable)

END OF SECTION 00030

SECTION 01010 - SUMMARY OF WORK

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 specifications apply to this section.

1.2 PROJECT GENERAL DESCRIPTION

B. Replacement of existing chillers and associated chilled water pumps, piping, valves, fittings, electric heat trace and associated mechanical appurtenances at the Atlantic County Stillwater complex located in Northfield, New Jersey, as specified on the Contract Drawings and within the Technical Specifications.

1. The Contractor's work includes, but is not limited to, the demolition of two (2) existing natural gas fire outdoor chillers and associated indoor pump, indoor and outdoor piping, fittings, valves, heat trace, appurtenances, etc., serving the Stillwater Complex in Northfield, NJ, and replacing the chillers with one (1) new packaged outdoor scroll centrifugal chiller, two (2) new indoor chilled water pumps, new piping, fittings, valves, heat trace, pipe insulation, controls, etc., as indicated on the project's Contract Drawings and in the project's Technical Specifications.
2. Miscellaneous related work includes, but is not limited to, the installation of associated electrical work as indicated on the project's Contract Drawings and in the project's Technical Specifications.
3. Contractor shall perform all necessary trenching, excavation, backfilling, and restoration work for installing new electrical power feeders to new outdoor chiller, chiller heater, chilled water piping heat trace, outdoor receptacle, control wiring, etc., as indicated on the project's Contract Drawings and in the project's Technical Specifications.
4. Contractor shall perform the demolition and removal of all mechanical and electrical items shown on the project's Contract Drawings and Technical Specifications including, but not limited to the two (2) existing outdoor chillers, one (1) concrete pad, two (2) indoor chilled water inline pumps, chilled water and natural gas piping, pipe fittings, valves, heat trace, pipe insulation, electrical feeders, etc. Contractor shall coordinate with the County and turn over to County any item shown to be demolished and removed which the County may want to keep. Work includes the permanent capping of existing natural gas piping of which a portion is to be demolished and removed.
5. Contractor shall be responsible to modify as necessary, one (1) of the existing chiller concrete pads as necessary to properly support the new outdoor chiller as indicated on the project's Contract Drawings and in the project's Technical Specification.
6. Contractor shall be responsible to provide structural support systems for all new piping and hydronic pumps. All new metallic supports shall be stainless or galvanized steel construction. No painted steel supports, including hangers and shields, shall be painted steel.
7. Contractor shall be responsible to interface the new chiller and chilled water pumps into the facility's existing Johnson Controls building management system (BMS).
8. Contractor shall perform all electrical work required for the installation of the new chiller and chiller electric heater, new chilled water pumps, new electric heat trace, new control wiring, and all ancillary electrical work as indicated on the project's Contract Drawings and in the project's Technical Specifications.
9. Contractor shall be responsible to patch/seal and insulate all exterior wall and roof openings resulting from this project's demolition and new construction work, including the resealing of the existing 4" chilled water piping lines, conduits, cables, etc., penetrating the Stillwater building's ground floor exterior wall.
10. All patched and/or repaired wall, ceilings, floors roofs, etc., shall match building's existing finishes.
11. Contractors shall include in their base bid amount a full twelve (12) months of maintenance services.

B. If Contractor cannot have the new chiller and chiller pumps installed and fully operational by the start of the cooling season, (April 15, 2017), Contractor shall furnish, install and operate a temporary electric chiller serving the

Stillwater complex until the new chiller system installation is complete and the new chiller system is fully operational.

1.3 WORK SEQUENCE

A. The County shall continuously occupy and operate the Atlantic County Stillwater complex throughout the construction schedule for this project. Contractor shall be responsible to maintain unencumbered access to the facility and maintain continuous operation of all mechanical, electrical, plumbing and fire protection systems during all occupied periods of the complex.

B. The work shall be conducted to provide the least possible interference to the activities of the County's personnel and public, and to permit an orderly installation and activation of the new chiller and associated chilled water pumps, controllers, equipment, devices and appurtenances, with minimal interruption to the County's operations of the complex.

C. All contracted work shall start immediately upon written notification to proceed by the County of Atlantic.

D. The project's Work Sequence and Construction Schedule shall be as follows:

1. The preparation and submission for review and approval of equipment and systems' layout shop drawings shall begin immediately upon receipt of a Notice to Proceed from the County, and shall be completed and submitted to the Engineer within twenty eight (28) calendar days.
2. The preparation and submission for review and approval of the project's schedule of values and proposed construction schedule shall begin immediately upon receipt of a Notice to Proceed from the County, and shall be completed and submitted to the Engineer within fourteen (14) calendar days.
3. The installation of the new chiller system replacement work to the Atlantic County Stillwater complex may begin immediately upon written Notice to Proceed and performed in such a manner that the complex remains open and unencumbered for the County's employees' and public's use. All work shall be substantially complete by no later than one hundred fifty (150) calendar days after Contractor's receipt of a Notice to Proceed from the County.
4. All required work which may affect the public and non-public areas adjacent to the Stillwater complex must be scheduled with the County and the City of Northfiled a minimum of two (2) weeks in advance of when work is to be performed.
5. All miscellaneous electrical work shall be performed while the Stillwater complex is open and accessible to the County's employees and public. System testing, adjusting and "trouble-shooting" must be completed such that the Atlantic County Stillwater complex's operations are not interrupted.

E. All work of this Contract is to be substantially completed by no later than one hundred fifty (150) calendar days after Contractor's receipt of a Notice to Proceed from the County. Contractor shall include in their bid amount all necessary extra labor and material charges (including premium labor charges and quick-ship charges) that will be required to meet this schedule.

1.4 LIQUIDATED DAMAGES

A. If the said Contractor shall neglect, fail or refuse to complete all work in accordance with the requirements of Division 1, Section 01800, "Construction Schedules and Milestones", or any proper extension thereof granted by the County, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the County $250.00 per day, not as a penalty, but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated above in the contract for the delivery.

B. The said amount is fixed and agreed upon by and between the Contractor and the County because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the County would in such event sustain, and said amount is agreed upon to be the amount of damages which the County would sustain and said amount shall be retained from time to time by the County from current periodical estimates.

C. It is further agreed that time is of essence of each and every portion of this Contract and of the Specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract and additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the County determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the County; Provided further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of work is due:

1. To any preference, priority or allocation order duly issued by the Government.
2. To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, included, but not restricted to, acts of God, or of other public enemy, act of the County, acts of another Contractor in the performance of a contract with the County, fires, floods, epidemics, quarantine restriction, strikes, freight embargoes, and severe weather.
3. To any delays of Subcontractors or supplies occasioned by any of the causes specified in subsections 1 and 2 of this article; Provided further, that the Contractor shall, within ten (10) days from the beginning of such delay, unless that County shall grant a further period of time prior to the date of final settlement of the Contract, notify the County, in writing, if the cause of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

1.5 CONTRACTOR'S USE OF PREMISES

A. General: During the construction period the Contractor shall have limited use of the premises for construction operation, including use of the site. The Contractor's use of the premises is limited only by the County's right to perform normal operations and limited construction/maintenance operations with its own forces.

B. General: Limit use of the premises to construction activities in areas indicated; allow for continuous County occupancy and use by the Public.

1. Confine operations to areas where construction occurs. Portions of the site beyond areas in which construction operations occur are not to be disturbed.
2. Keep parking lot, streets, driveways and entrances serving the premises clear and available to the Public and the County's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

1.6 COUNTY OCCUPANCY

A. Full County Occupancy: The County will fully occupy the site and existing buildings during the entire construction period. Cooperate with the County during construction operations to minimize conflicts and facilitate County's unencumbered usage. Perform the work so as not to interfere with the County's operations including, but not limited to, the normal activities of the County's staff and of the public in the public and non-public areas adjacent to the existing building.

PART 2 - PRODUCTS

(Not Applicable).

PART 3 - EXECUTION

(Not Applicable).

END OF SECTION 01010

SECTION 01027 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

B.The Contractor's Construction Schedule and Submittal Schedule are included in Specification Section "Submittal".

1.3 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.

B.Contractor shall coordinate preparation of its Schedule of Values for its part of the work with preparation of the Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:

   a. Contractor's Construction Schedule.
   b. Application for Payment form.
   c. List of subcontractors.
   d. List of products.
   e. List of principal suppliers and fabricators.

2. Submit the Schedule of Values to the Engineer within fourteen (14) calendar days after issuance of Notice to Proceed by the County, but in no case later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.

C. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following Project identification on the Schedule of Values:

   a. Project name and location.
   b. Name of the Engineer.
   c. Project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

   a. Generic name.

b. Name of subcontractor.
c. Name of manufacturer or fabricator.
d. Name of supplier.
e. Change Orders (numbers) that have affected value.
f. Dollar value.
g. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the County.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment-Application Forms: Use County of Atlantic Standard Invoice, AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment.

C. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the County. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

D. Transmittal: Submit 3 signed and sealed, executed copies of each Application for Payment to the Engineer by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.

E. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics lien from every entity who may lawfully be entitled to file a mechanics lien arising out of the Contract, and related to the Work covered by the payment.

F. Retainage: For Contracts or agreements the total of which exceeds $100,000.00, the Owner shall retain two (2%) of the total amount due on each partial payment pending completion of the contract or agreement. For contracts or agreements the totals of which are less than $100,000.00, the Owner shall retain ten (10%) of the total amount due on each partial payment. The total retainage shall become due and payable to the Contractor as part of the Contractor's Final Payment upon final completion of all work to the satisfaction of the County and Engineer.

G.Initial Application for Payment: Contractor may submit for approval, up to 30% of contract value less contingency. Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment, include the following:

1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Contractor's Construction Schedule.
5. Copies of building permits.

6. Certificates of insurance and insurance policies.
7. Performance and payment bonds (if required).
8. Data needed to acquire the County's insurance.
9. Initial settlement survey and damage report (if required).

F.Application for Payment at Substantial Completion: Contractor may request up to 98% of contract value. Following issuance of the Certificate of Substantial Completion, Contractor may submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for County occupancy of designated portions of the work.

G. Administrative actions and submittal that shall proceed or coincide with the Application for Payment at Substantial Completion include:

1. Occupancy permits and similar approvals.
2. Warranties (guarantees) and maintenance agreements.
3. Test/adjust/balance records.
4. Maintenance instructions.
5. Start-up performance reports.
6. Change-over information related to County's occupancy, use operation and maintenance.
7. Final cleaning.
8. Application for reduction of retainage, and consent of surety.
9. Advice on shifting insurance coverage.
10. List of incomplete work, recognized as exceptions to Engineer's Certificate of Substantial Completion.

H.Final Payment Application: Administrative actions and submittal which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. Completion of Project's closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Assurance that unsettled claims will be settled.
4. Assurance that work not complete and accepted will be completed without undue delay.
5. Transmittal of required Project construction records to County.
6. Proof that taxes, fees and similar obligations have been paid.
7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish and similar elements.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 01027

SECTION 01035 - MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.3 MINOR CHANGES IN THE WORK

A. Supplemental instructions authorizing minor changes in the work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Engineer on AIA Form G710.

1.4 CHANGE ORDER PROPOSAL REQUESTS

A. County-Initiated Proposal Requests: Proposed changes in the work that will require adjustments to the Contract Sum or Contract Time will be issued by the Engineer, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.

1. Proposal requests issued by the Engineer are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
2. Unless otherwise indicated in the proposal request, within 10 days of receipt of the proposal request, submit to the Engineer for the County's review an estimate of cost necessary to execute the proposed change.

a. Include a list of quantities of products required and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include a statement indicating the effect the proposed change in the work will have on the Contract Time.

B. Contractor -Initiated Change Order Proposal Requests: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Engineer.

1. Include a statement outlining the reasons for the change and the effect of the change on the work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
2. Include a list of quantities of products required and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section "Product Substitutions" if the proposed change in the work requires the substitution of one product or system for a product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.

1.5 OWNER'S ALLOWANCES

A. Submit claims for increased costs because of a prior approved change in scope or nature of the Owner's Allowance described in the Contract Documents, whether for the purchase order amount or the Contractor's handling, labor, installation, overhead, and profit. Submit all claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The County will reject claims submitted later than 21 days.

1. Do not include the Contractor's or Subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
2. No change to the Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the County and the Contractor are not is total agreement on the terms of a Change Order Proposal Request, the Engineer may issue a Construction Change Directive on AIA Form G714 or a Request Against Allowance form, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive contains a complete description of the change in the work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CHANGE ORDER PROCEDURES

A. Upon the County's and Engineer's approval of a Change Order Proposal Request, the Engineer will issue a Change Order for signatures of the County and the Contractor on AIA Form G701, as provided in the Conditions of Contract.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

(Not Applicable)

END OF SECTION 01035

SECTION 01040 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

1. Coordination.
2. Administrative and supervisory personnel.
3. General installation provisions.
4. Cleaning and protection.

1.3 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different Sections of the Specifications that are dependent on each other for proper installation, connection, and operation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work.

D. Conservation: Coordinate construction operations to ensure that operations are carried out with consideration given to conservation of energy, water and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the work. Refer to other sections of disposition of salvage materials that are designated as County's property.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacture's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspection materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion.

E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Engineer for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Engineer for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.3 PROTECTION OF PERSONS AND PROPERTY

A. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

B. The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

1. All employees on the Work and all other persons who may be affected thereby.
2. All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor of any of his Subcontractors of Sub-subcontractors.
3. All other property at the site or adjacent thereto, including trees, shrubs, lawns, walk, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

C. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. He shall erect and maintain as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying Engineers and Users of adjacent utilities.

D. When the use of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care in compliance with State and Local regulations and shall carry on such activities under the supervision of properly qualified personnel.

E. All damage or loss to any property referred to herein caused in whole or in part by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them as be liable, shall be remedied by the Contractor.

F. The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's Superintendent unless otherwise designated in writing by the Contractor to the Engineer.

G. The Contractor shall comply in all respects with the state construction safety code and with applicable federal regulations, and shall see that all Subcontractors comply with the codes and regulations wherever and whenever they are applicable.

H. The Contractor is specifically directed to comply with Section 7 of the Construction Safety Code which requires among other things, first aid kits to be available and the name of the nearest physician and ambulance service to be posted.

I. The Contractor shall notify the Engineer immediately if any accident of injury occurring on the project.

J. Where electric or gas welding or cutting work is done above or within ten feet of combustible material or above space that may be occupied be persons; interposed shields of incombustible materials shall be used to protect against fire damage or injury due to sparks or hot metal.

K. Tanks supplying gases for gas welding or cutting shall be placed at no greater distance from the Work than is necessary for safety, securely fastened and maintained in an upright position where practicable. Such tanks, when stored for use, should be removed from any combustible material and free from exposures to the ray of the sun or to high temperatures. Remove all tanks from the building at the end of each day.

L. Suitable fire extinguisher equipment shall be maintained near all welding and cutting operations. When operations cease for the noon hour or at the end of the day, the surroundings adjacent to welding and cutting operations should be thoroughly wet down.

M. A workman equipped with suitable fire extinguishing equipment should be stationed near welding and cutting operations to see that sparks do not lodge in floor cracks, or pass through floor or wall openings or lodge in any combustible material. The workmen shall be kept at the source or work offering special hazards for 30 minutes after the job is completed, to make sure that no smoldering fires have been started.

N. In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss.

END OF SECTION 01040

SECTION 01045 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it will be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
4. Approval by the Engineer to proceed with cutting and patching does not waive the Engineer's right to later require complete removal and replacement of a part of the work found to be unsatisfactory.

1.3 QUALITY ASSURANCE

A. Requirements for Structural work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

a. Structural concrete.
b. Structural steel.
c. Timber and primary wood framing.
d. Miscellaneous structural metals.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Engineer's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Use materials identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect subject to the County's approval. Use materials whose installed performance will equal or surpass that of existing materials.

B. All materials use for cutting, patching of existing surfaces shall equal existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

D. Repair, patch and paint all disturbed existing walls, floor, ceilings, partitions, etc. to match existing surfaces and colors. All cutting and patching shall be done to the complete satisfaction of the County.

E. Patch roof openings in a manner and with such materials that are in full compliance with the existing roof's manufacturer's recommendations and warranty requirements.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty, and items similar in nature.

END OF SECTION 01045

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.

C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Engineer, requested by the Engineer, and similar phrases.

D. Approved: The term approved, when used in conjunction with the Engineer’s action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. Install: The term install describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

H. Provide: The term provide means to furnish and install, complete and ready for the intended use.

I. Installer: An installer is the Contractor or another entity engaged by the Contractor, either as an employee, Subcontractor, or Contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term experienced, when used with the term installer, means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
2. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

3.Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no choice or option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

J. Project Site is the space available to the Contractor for performing construction activities either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on Construction Specifications Institute's 17-Division format and MASTER FORMAT numbering system.

B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2.Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor and/or Seller. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

a. The words shall be are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified and where the standards establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Engineer for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Engineer for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1.Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

1.5 GOVERNING REGULATIONS AND AUTHORITIES

A. Copies of Regulations: Obtain copies of the following regulations and retain at the Project Site to be available for reference by parties who have a reasonable need.

1.6 SUBMITTALS

A. Permits, Licenses, and Certificates: For the County's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

Not Applicable)

END OF SECTION 01095

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including but not limited to the following:

1. Pre-Construction Conference.
2. Progress Meetings.

1.3 PRE-CONSTRUCTION CONFERENCE

A. County shall schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than seven (7) calendar days after issuance of Notice to Proceed and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B.Attendees: The County, Engineer and their consultants; the Contractor and its superintendent; major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda: Discuss items of significance that could affect progress, including such topics as:

1. Tentative construction schedule.
2. Designation of responsible personnel.
3. Procedures for processing field decisions and Change Orders.
4. Procedures for processing Applications for Payment.
5. Distribution of Contract Documents.
6. Submittal of Shop Drawings, Product Data, and Samples.
7. Preparation of record documents.
8. Use of the premises.

1.4 PROGRESS MEETINGS

A. **Prime Contractor** shall conduct periodic progress meetings at the Project site at regularly prescheduled intervals. Notify the County and the Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the County and Engineer, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda: **Prime Contractor** shall be responsible to review and correct minutes of the previous progress meeting. All parties involved shall review minutes and other items of significance that could affect progress and report any concerns or corrections to the Prime Contractor. Include topics for discussion as appropriate to the current status of the Project. **Prime Contractor** shall prepare agenda for each meeting and distribute to all parties no less than three (3) calendar days prior to the next meeting.

D. Reporting: No later than 3 days after each meeting, the **Prime Contractor** shall prepare and distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

(Not Applicable)

END OF SECTION 01200

SECTION 01210 - ALLOWANCES

2GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a This Section includes administrative and procedural requirements governing allowances.

1 Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

b Types of allowances include the following:

1 Lump-sum allowances.
2 Contingency allowances.

3. SELECTION AND PURCHASE

a At the earliest practical date after award of the Contract, advise Engineer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

b At Engineer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

c Purchase products and systems selected by Engineer or Owner from the designated supplier.

4. SUBMITTALS

a Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

b Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

c Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

5. COORDINATION

a Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

6. LUMP-SUM ALLOWANCES

a Allowance shall include cost to Contractor of specific products and materials selected by Engineer or Owner under allowance and shall include taxes, freight, and delivery to Project site.

b Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Engineer or Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

7. CONTINGENCY ALLOWANCES

a Use the contingency allowance only as directed by Engineer or Owner for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

b Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins as limited by State Public Bidding Laws.

c At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

8. UNUSED MATERIALS

a Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1 If requested by Engineer of Owner, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Engineer or Owner, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

3PRODUCTS (Not Used)

4EXECUTION

1. EXAMINATION

a Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

2. PREPARATION

a Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3. SCHEDULE OF ALLOWANCES

a See Contract Drawings for Allowance descriptions.

END OF SECTION 01210

SECTION 01300 - SUBMITTALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the work, including:

1. Contractor's construction schedule.
2. Submittal schedule.
3. Daily construction reports.
4. Shop Drawings.
5. Product Data.
6. Samples.

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.
2. Applications for Payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of Subcontractors.

C. The Schedule of Values submittal is included in Section “Applications for Payment”.

D. Inspection and test reports are included in Section “Quality Control Services”.

1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

1.4 CONTRACTOR CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type of Contractor’s construction schedule. Submit with initial application for payment.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, County, Subcontractors, and other parties required to comply with scheduled dates.

1.5 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2" by 11" but no larger than 36" by 48".
7. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves. Where Product Data must specially be prepared because standard printed data is not suitable for use, submit as “Shop Drawings.”

1.7 ENGINEER'S ACTION

A. Except for submittals for the record, information or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return promptly.

1.Compliance with specified characteristics is the Contractor’s responsibility.

B. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 01300

SECTION 01300 - SUBMITTALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the work, including:

1. Contractor's construction schedule.
2. Submittal schedule.
3. Daily construction reports.
4. Shop Drawings.
5. Product Data.
6. Samples.

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.
2. Applications for Payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of Subcontractors.

C. The Schedule of Values submittal is included in Section “Applications for Payment”.

D. Inspection and test reports are included in Section “Quality Control Services”.

1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

1.4 CONTRACTOR CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type of Contractor’s construction schedule. Submit with initial application for payment.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, County, Subcontractors, and other parties required to comply with scheduled dates.

1.5 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2" by 11" but no larger than 36" by 48".
7. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves. Where Product Data must specially be prepared because standard printed data is not suitable for use, submit as “Shop Drawings.”

1.7 ENGINEER'S ACTION

A. Except for submittals for the record, information or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return promptly.

1.Compliance with specified characteristics is the Contractor’s responsibility.

B. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 01300

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality control services.

B.Quality control services include inspections and tests and related actions including reports performed by testing agencies, governing authorities and the Contractor. They do not include Contract enforcement activities performed by the Engineer.

C.Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1.3 RESPONSIBILITIES

A.Contractor's Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Sections and required by governing authorities. Costs for these services shall be included by the Contractor in the Contract Sum.

1. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicated compliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

    a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

2. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel.

B.Duties of the Testing Agency: The testing agency engaged by the Contractor to perform inspections, sampling, and testing of materials and construction specified in individual Specification Sections shall cooperate with the Engineer and the Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

C.Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1.4 SUBMITTALS

A.The testing agency shall submit a certified written report of each inspection, test, or similar service to the Engineer, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.

1.5 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories and which specialize in the types of inspections and tests to be performed.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualifies of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C.Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

B. Temporary services include, but are not limited to, the following:

1. Temporary door opening enclosures.

C. Support facilities include, but are not limited to, the following:

1. Storage sheds.
2. Temporary enclosures.
3. Temporary project identification signs and bulletin boards.
5. Waste disposal services.
6. Construction aids and miscellaneous services and facilities.

1.3 SUBMITTALS

A. Implementation and Termination Schedule: Within fourteen (14) calendar days of the date established for commencement of the work, submit a schedule indicating implementation and termination of each temporary facility.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Local and State building code requirements.
2. Local zoning requirements.
3. Health and safety regulations.
4. Utility company regulations.
5. Police, fire department and rescue squad rules.
6. State and Federal environmental protection regulations.

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition".

C. Inspections: Arrange for authorities having jurisdiction to inspect the work. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Toilets: Contractor shall provide temporary toilet facilities for Contractor's use only.

3.2 SUPPORT FACILITIES INSTALLATION

A. Locate storage sheds, and other temporary construction and support facilities for easy access.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion.

B. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

1. If required, install tarpaulins securely with incombustible wood of metal framing. Close openings of 25 sq. ft. or less with fire treated plywood or similar materials.

C Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit unauthorized signs.

1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.

2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

D Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly.

Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.4 MECHANICAL, PLUMBING, ELECTRICAL AND FIRE SUPPRESSION SYSTEMS

A. The installation of replacement chillers, chilled water pumps and associated controllers, equipment, devices, etc., at the Stillwater complex shall be done in a manner which maintains continuous operation of the complex's mechanical, electrical, plumbing and fire suppression systems during all periods of occupancy. Contractors shall include in their bid amount all necessary temporary work (for all trades), throughout the entire project, necessary to maintain the continued, uninterrupted operation of the facility's existing mechanical, plumbing, electrical and fire suppression systems during periods when the complex is occupied.

3.5 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal.

C. Termination and Removal: Unless the County or Engineer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The County reserves the right to take possession of project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during the construction period.

END OF SECTION 01500

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories" and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
b. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

A. Product List: Prepare a list showing products specified in tabular form acceptable to the Engineer. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.

1.5 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Engineer to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the work:

1. No available domestic product complies with the Contract Documents.
2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
2. Semi-proprietary Specification Requirements: Where Specifications name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.

a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.

    a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.

6. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes, or regulations specified.
7. Visual Matching: Where Specifications require matching an established Sample, the Engineer's decision will be final on whether a proposed product matches satisfactorily.

    a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.

8. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Engineer will select the color, pattern, and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work.

    1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01631 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."

C. Standards: Refer to Section: "Definitions and Standards" for applicability of industry standards to products specified.

D. Procedural requirements governing the Contractor's selection of products and product options are included under Section "Materials and Equipment."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for "substitutions." The following are not considered to be requests for substitutions:

1. Substitutions requested during the Bidding period, and accepted prior to award of the Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to the Contract Documents requested by the County or Engineer.
3. Specified options of products and construction methods included in the Contract Documents.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: Requests received more than fifteen (15) days after Notification to Proceed shall be rejected. Requests for substitution if received within fifteen (15) days after Notification to Proceed shall meet the following requirements:

1. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and accordance to procedures required for Change Order proposals.
2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

   a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
   b. Samples, where applicable or requested.
   c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
   d. Coordination information, including a list of changes of modifications needed to other parts of the Work and to construction performed by the County and separate Contractor, that will become necessary to accommodate the proposed substitution.
   e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
   f. Cost information, including a proposal of the net change, if any in the Contract Sum.
   g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Document, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

3. Engineer's Action: Within one (1) week of receipt of the request for substitution, the Engineer will request additional information or documentation for evaluation of the request. Within two (2) weeks of receipt of the request, or one week of receipt of additional information or documentation, which ever is later the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of a Change Order.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A.Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented, and properly submitted.
4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
7. A substantial advantage is offered the County, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the County may be required to bear. Additional responsibilities for the County may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the County or separate Contractor, and similar considerations.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
11. Where a proposed substitution involves more than one Contractor and/or Subcontractor, each Contractor shall cooperate with the other Contractors involved to coordinate the work, provide uniformity and consistency, and assure compatibility of products.

B.The Contractor's submittal and the Engineer's acceptance of Shop Drawings, Product Data, or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION

(Not Applicable).

END OF SECTION 01631

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including, but not limited to:

1. Inspection procedures.
2. Project record document submittal. (As-built drawings)
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following and list exceptions in the request:

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum
2. Advise the County of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
4. Obtain and submit releases enabling the County unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Submit record as-built drawings, operation and maintenance manuals, final project photographs, damage or settlement survey, property survey and similar final record information.
6. Deliver tools, spare parts, extra stock, and similar items.
7. Make final changeover of permanent locks and transmit keys to the County. Advise the County's personnel of changeover in security provisions.
8. Complete startup testing of systems and instruction of the County's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mockups, and similar elements.

9. Complete final cleanup requirements, including touch up painting. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following and list exceptions in the request:

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit consent of surety to final payment.
4. Submit a final liquidated damages settlement statement.
5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Re-inspection Procedure: The Engineer will re-inspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed under circumstances acceptable to the Engineer.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistant location; provide access to record documents for the Engineer's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
2. Mark new information that is important to the County, but was not shown on Contract Drawings or Shop Drawings.
3. Note related change order numbers where applicable.

4. Organize record drawing sheets into manageable sets, bind sets with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up record drawings and Specifications.

D. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Engineer for the County's records.

E. Operation and Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Recommended maintenance procedures.
5. Inspection procedures.
6. Shop Drawings and Product Data.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the County's personnel to provide instruction in proper operation and maintenance. If installers are not certified by manufacturers of equipment, devices and systems installed, provide instruction by manufacturer’s certified representatives. Include a detailed review of the following items:

1. Operation and Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Control sequences.
6. Cleaning.
7. Warranties and bonds.

3.2 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and is included in Section "Temporary Facilities."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the County's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1.Where extra materials of value remaining after completion of associated work, have become the County's property, arrange for disposition of these materials as directed.

END OF SECTION 01700

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

1. Refer to the General Conditions and individual Specification Sections for terms of the Contractor's special warranty of workmanship and materials.
2. General closeout requirements are included in Section "Project Closeout."
3. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in the individual Specification Sections.
4. Certifications and other commitments and agreements for continuing services to County are specified elsewhere in the Contract Documents.

B.Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY AND MAINTENANCE BOND REQUIREMENTS

A. Related Damages and Losses: When correcting warranted work that has failed or maintenance work covered by a maintenance bond that is required to be performed, remove and replace other work that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted or maintenance work.

B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C.Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the County has benefited from use of the work through a portion of its anticipated useful service life.

D. County's Recourse: Expressed warranties made to the County, are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on the time in which the County can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The County reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. The County reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

A. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the Engineer.

B.When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the County through the Engineer for approval prior to final execution.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

(Not Applicable)

END OF SECTION 01740

SECTION 01800 - CONSTRUCTION SCHEDULES AND MILESTONES

PART 1 - GENERAL

4.2 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and other Division 1 specification sections, apply to this section.

4.3 SUMMARY

A. This section specifies the construction schedules and milestones governing the contractor's installation of a new chiller, chilled water pumps and associated mechanical and electrical work including, supplemental site, mechanical and electrical work, and all other specified and required miscellaneous work.

B. The Contractor shall be responsible to coordinate the work and construction activities of both his "direct" employees and his "sub-contractors" to assure an efficient and timely installation of each phase of the work in accordance with the construction schedule specified herein.

C. The Contractor shall furnish all required manpower to meet the construction schedule defined herein.

D. Upon written notification to proceed by the County of Atlantic, the Contractor shall perform the following:

1. All equipment, material and systems submittals shall be submitted to the Engineer for approval within twenty eight (28) calendar days of written notification to proceed by the County.
2. Contractor shall provide the County and Engineer with the projected "lead times" of all new equipment and material immediately after receipt of approved submittals.
3. A Construction Schedule and a Schedule of Values shall be prepared by the Contractor and submitted to the County and Engineer within fourteen (14) calendar days of written notification to proceed by the County. At that time, the County will review and coordinate with Contractor any dates required for limited systems shutdowns. The County reserves the right to alter the Contractor's proposed limited systems shutdown dates as may be necessary for the continued, uninterrupted operation of the Atlantic County Stillwater complex. The needs of the County will take precedence in determining the actual partial shutdown or disruption dates.
4. The Atlantic County Stillwater complex shall remain operational continuously through the completion of the project. The complex's existing mechanical, electrical, plumbing and fire suppression systems must remain fully operational during periods of complex's occupancy. Contractor shall furnish, install and operate a temporary chiller starting April 15, 2017, if the new chiller system installation is not completed and fully operational.
5. The Atlantic County Stillwater complex's new chiller replacement work may begin immediately upon written Notice to Proceed.
6. Contractor shall coordinate and officially notify the County of the dates of any required utility or systems shut-downs and transfer of services, a minimum of fourteen (14) calendar days in advance of the scheduled work.
7. All required work that may affect the public and non-public areas adjacent to the Atlantic County Stillwater complex, must be scheduled with the County and the City of Northfield a minimum of two (2) weeks in advance of when the work is to be performed.
8. All work required in non-public or non-public areas shall be performed while the Atlantic County Stillwater complex is open and accessible to the County's employees and the public. System

testing, adjusting and "trouble-shooting" must be completed such that the Atlantic County Stillwater complex's normal operations are not interrupted.

9. All work of the project shall be substantially complete by no later than one hundred fifty (150) calendar days after written notification to proceed by the County.

E. Refer to Section 01010, 1.3, "Work Sequence" for additional limited system's shutdown requirements and completion dates.

F. Unless otherwise determined, Work under this Contract, other than maintenance work of a non-offensive nature, shall not be performed on Saturdays, Sundays and/or County and State Holidays, except in time of emergency, and then only under written permission from the County or the Engineer, who shall be the sole judge of the urgency of the emergency. On weekdays, that is Monday to Friday, the work shall consist of eight (8) hours maximum, beginning not before 7 A.M. and ending not after 6 P.M., except for any pile driving or other "noise nuisance" tasks, which will not commence before 8 A.M. nor extend beyond 6 P.M. Contractor shall take note that the construction site is located adjacent to a school and a residential neighborhood and the Contractor shall be responsible to take all due care to not create any "nuisance noise".

G. County shall hold a pre-construction meeting within seven (7) days from the County's written Notice to Proceed.

END OF SECTION 01800

SECTION 230010 - BASIC MECHANICAL GENERAL REQUIREMENTS

1GENERAL

1. RELATED DOCUMENTS

a Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

b The General Conditions, Special Conditions, Supplementary Conditions, Division 1 Specification Sections, Conditions of Contract and other similar Contract Documents apply to and form a part of this Division.

c The applicable portions of the requirements described in this Sub-division 26 shall apply to all work included in the Heating, Ventilating and Air Conditioning (HVAC) and Electrical Documents.

2. SCOPE OF WORK

a The work shall include all Heating, Ventilating and Air Conditioning (HVAC) work and incidental electrical construction as shown on the Contract Drawings and as mentioned in this Division of the Specifications.

b Work includes, but is not limited to, the following:

1 The Contractor work includes the demolition of two (2) existing natural gas fire outdoor chillers and associated indoor pump, indoor and outdoor piping, fittings, valves, heat trace, appurtenances, etc., serving the Stillwater Complex in Northfield, NJ, and replacing the chillers with one (1) new packaged outdoor scroll centrifugal chiller, two (2) new indoor chilled water pumps, new piping, fittings, valves, heat trace, pipe insulation, controls, etc., as indicated on the project's Contract Drawings and in the project's Technical Specifications.

2 Miscellaneous related work includes, but is not limited to, the installation of associated electrical work as indicated on the project's Contract Drawings and in the project's Technical Specifications.

3 Contractor shall perform all necessary trenching, excavation, backfilling, and restoration work for installing new electrical power feeders to new outdoor chiller, chiller heater, chilled water piping heat trace, outdoor receptacle, control wiring, etc., as indicated on the project's Contract Drawings and in the project's Technical Specifications.

4 Contractor shall perform the demolition and removal of all mechanical and electrical items shown on the project's Contract Drawings and Technical Specifications including, but not limited to the two (2) existing outdoor chillers, one (1) concrete pad, two (2) indoor chilled water inline pumps, chilled water and natural gas piping, pipe fittings, valves, heat trace, pipe insulation, electrical feeders, etc. Contractor shall coordinate with the County and turn over to County any item shown to be demolished and removed which the County may want to keep. Work includes the permanent capping of existing natural gas piping of which a portion is to be demolished and removed.

5 Contractor shall be responsible to modify as necessary, one (1) of the existing chiller concrete pads as necessary to properly support the new outdoor chiller as indicated on the project's Contract Drawings and in the project's Technical Specification.

6 Contractor shall be responsible to provide structural support systems for all new piping and hydronic pumps. All new metallic supports shall be stainless or galvanized steel construction. No painted steel supports, including hangers and shields, shall be painted steel.

7 Contractor shall be responsible to interface the new chiller and chilled water pumps into the facility's existing Johnson Controls building management system (BMS).

8 Contractor shall perform all electrical work required for the installation of the new chiller and chiller electric heater, new chilled water pumps, new electric heat trace, new control wiring, and all ancillary electrical work as indicated on the project's Contract Drawings and in the project's Technical Specifications.

9 Contractor shall be responsible to patch/seal and insulate all exterior wall and roof openings resulting from this project's demolition and new construction work, including the resealing of the existing 4" chilled water piping lines, conduits, cables, etc., penetrating the Stillwater building's ground floor exterior wall.

10 All patched and/or repaired wall, ceilings, floors roofs, etc., shall match building's existing finishes.
11 Contractors shall include in their base bid amount a full twelve (12) months of maintenance services that includes the following:

i Provide maintenance service (which includes full labor and materials) on all new HVAC systems with a three (3) month interval as maximum time period between calls.
ii Provide 24 hour emergency service on breakdowns and malfunctions of new HVAC systems.
iii Include HVAC maintenance items as outlined in manufacturer's operating and maintenance data.
iv Submit copy of service call work order or report and include description of work performed.

c If Contractor cannot have the new chiller and chiller pumps installed and fully operational by the start of the cooling season, (April 15, 2017), Contractor shall furnish, install and operate a temporary electric chiller serving the Stillwater complex until the new chiller system installation is complete and the new chiller system is fully operational.

d Coordinate all work in this Division with all related trades.

3. ADDITIONAL REQUIREMENTS

a The technical services to be delivered by the Contractor will include the following:

1 Supervision and coordination of the work of all subcontractors.
2 Coordination and cooperation of the Contractor to support the County's schedule.
3 Testing and adjusting of all new mechanical, electrical and control systems shall be coordinated by the Contractor with the County and their vendors such as Johnson Controls for automatic temperature controls systems.
4 Field startup of all new mechanical equipment shall be performed by a manufacturer's certified technician working directly for the Contractor. Contractor shall notify County no less than two (2) weeks in advance of all equipment startups.
5 Testing and training of County employees by on-site technicians certified by the manufactures of the new HVAC and control systems.
6 Preparation and delivery of "as-built" drawings showing all new work performed as part of this project.

4. FACTORY TESTING

a The new factory assembled packaged chiller shall be factory tested including helium leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit, prior to shipping. A certified factory Run test report shall be provided for the new chiller. **The "Run Test Report" shall be submitted to Owner for approval, prior to acceptance of unit for payment.**

5. INTENT

a It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.

b Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation shall be furnished, delivered and installed by the Contractor without additional expense to the Owner.

6. DEFINITIONS

a The term “Mechanical Contractor”, “HVAC Contractor”, “Prime Contractor” or “Contractor” when used in this Division refers to the Contractor responsible for all HVAC systems work under this Division.

b The term “provide” shall mean to furnish and install.

c The term “furnish” when used separately shall mean to obtain and deliver the item to job site for installation by Other Trades.

7. SINGULAR NUMBER

a A reference made to any item in the singular number shall apply equally to as many identical items as the work requires.

8. GUARANTEE

a General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. Submit a written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, for the following:

1 Base Bid: Manufacturer’s full parts and labor warranty for all new HVAC and associated electrical components including, but not limited to equipment, devices, controls, appurtenances, etc., for not less than two (2) years, from date of Substantial Completion.

b Contractor shall arrange for a Manufacturer factory-trained and certified representative, without charge, to supervise startup of new outdoor packaged chiller and instruct the Owner’s personnel on operation and maintenance of new chiller unit and its associated controls. Provide a minimum of one day for instruction of Owner’s personnel. Manufacturer shall provide a minimum of three (3) copies of their operation and maintenance instructions in booklet form. Manufacturer shall certify in writing, installation and performance of all HVAC units is in compliance with design intent and manufacturers’ listed and submitted data.

9. MAINTENANCE SERVICES

a Contractors shall include in their base bid amount a full twelve (12) months of maintenance services that includes the following:

1 Provide maintenance service (which includes full labor and materials) on all new HVAC systems with a three (3) month interval as maximum time period between calls.
2 Provide 24 hour emergency service on breakdowns and malfunctions of new HVAC systems.
3 Include HVAC maintenance items as outlined in manufacturer's operating and maintenance data.
4 Submit copy of service call work order or report and include description of work performed.

10. VISIT TO SITE

a Prior to submission of bid, Contractor shall visit Site and become familiar with existing conditions. Bids as submitted, will be interpreted to include all costs and charges made necessary by existing conditions such as installation space requirements and interferences.

b Contractor shall verify, in field, the location and elevation of all underground services affected by this work before proceeding with construction. Notify Engineer immediately in the event the location of existing site utilities vary appreciable from those shown on drawings.

11. COMMISSIONING

a Mechanical Contractor shall provide full mechanical commissioning services for this project. Commissioning services shall include actual field commissioning of all new and modified mechanical systems, balancing and testing services for all new and modified mechanical equipment and systems of the project.

b The Contractor's Commissioning Agent shall be responsible to perform the following work:

1 Prepare an overall commissioning plan, including all functional tests to be performed for equipment and systems. The Contractor shall coordinate and assist the Commissioning Agent in the development of the commissioning plan. The Commissioning Plan will be reviewed by the Engineer and Owner.
2 Review equipment submittals and manufacturer’s startup requirements and procedures for information affecting the commissioning and balancing process.
3 Review manufacturer’s startup reports.
4 Develop functional test procedures for all equipment and systems. Procedures shall include forms to be completed by the Mechanical Contractor in order to document functional performance tests.
5 Review functional performance test records.
6 Provide final commissioning report, incorporating functional performance test records, inspection reports, etc.
7 Prepare and submit to Engineer for approval, Testing and Balancing Report for all new or modified hydronic systems.
8 Review Operations and Maintenance Manuals prepared and submitted by Mechanical Contractor.
9 Review Training syllabus prepared and submitted by Mechanical Contractor.
10 Oversee all commissioning activities, and facilitate communication between team members (Mechanical Contractor, Electrical Contractor, Fire Alarm Contractor, Design Professionals, Owner’s Construction Manager, Owner, etc.) regarding commissioning activities. Commissioning Agent shall advise the Owner’s Construction Manager of any concerns regarding work practices or installation of equipment which may negatively affect commissioning, testing and balancing, and work actively with the Owner’s team to resolve issues regarding commissioning testing and balancing.
11 Set up, conduct and document a pre-commissioning meeting with the Owner, Mechanical Contractor, Electrical Contractor and Design Professionals. Pre-commissioning meeting will involve a review of the Commissioning Plan and functional test procedures.
12 Set up, conduct and document commissioning meetings with the Owner, Mechanical Contractor, Design Professionals and all other Contractors as deemed necessary by the Commissioning Agent. Meetings shall be conducted during the period(s) of time when functional performance testing is underway, and shall be conducted on a bi-weekly basis.
13 Perform monthly inspections of mechanical work on site (once Mechanical Contractor has mobilized). Consultant shall provide written report for each inspection, listing any deficiencies in work and corrective action required.
14 Witness all manufacturer’s startups (pre-commissioning start up) of equipment and systems, where applicable.
15 Witness functional performance tests for equipment and systems, where applicable. Assist Mechanical Contractor and Design Professionals in resolving problems encountered during functional performance testing.
16 Perform full Testing and Balancing (hydronic and air) of new and modified HVAC systems.

c The Mechanical Contractor shall be responsible to perform the following:

1 Provide all submittals as required in Division 23 specification sections and indicated on project’s Contract Drawings.
2 Provide (as submittals) manufacturers startup requirements and procedures for all mechanical equipment.

3 Work cooperatively with the Commissioning Agent to develop a commissioning plan. The Commissioning Agent has primary responsibility for the Commissioning Plan.
4 Develop schedules for all testing based upon the commissioning plan. This schedule must be integrated into the master construction activity schedule.
5 Document manufacturer's field startups for all mechanical equipment. Submit completed and manufacturer's certified start-up reports to the Design Professional and Commissioning Agent for review.
6 Document Functional Tests (using forms developed by the Commissioning Agent). Submit completed and manufacturer's certified functional performance test reports to the Owner, Engineer and Commissioning Agent for review.
7 Submit Operations and Maintenance Manuals in accordance with Division 23 and project's Contract Drawings.
8 Provide syllabus for training, in accordance with requirements of Division 23 and project's Contract Drawings.
9 Coordinate all commissioning activities with their work.
10 Attend all Commissioning Meetings.
11 Provide manufacturer certified technician to perform manufacturer's startup procedures for all mechanical equipment.
12 Perform and document functional performance of all mechanical equipment and systems, in accordance with procedures developed by the Commissioning Agent.
13 In the event that a functional performance test fails, the cause of failure shall be determined and rectified as soon as possible, and then retested. If more than two functional performance test, involving witnessing by the Design Professional and/ or Commissioning Agent of the same system(s) or equipment are required, the contractor shall reimburse all associated costs for the extraordinary participation of the Engineer and Owner's staff, as required by the particular test being performed;
14 Assist the Commissioning Agent in performing all Testing and Balancing. Mechanical Contractor shall make equipment available and accessible, and shall coordinate their activities with those of the Commissioning Agent.
15 Make all corrections and adjustments to equipment and systems in order to achieve TAB performance in accordance with the Contract Documents.
16 Oversee and/or provide training for the systems specified in Division 23 and project's Contract Drawings.

12. REGULATIONS

a Entire installation including materials, equipment and workmanship shall conform to all applicable laws, codes and regulations of local municipal, county, state and federal authorities, also National Fire Protection Association, Factory Mutual, Underwriters Laboratories, National Electrical Code and other regulatory bodies having jurisdiction over this class of work. Where applicable by local building codes, materials and equipment shall bear stamps or seals of Nationally Recognized Testing Laboratories or construction standards from ARI, ASME, AGA, FM, IEEE, NFPA, NEMA, NSF, UL, ETL and other similar industry regulating groups.

b Minimum requirements of Codes and Regulations do not relieve the Contractor from providing higher grade of materials and workmanship as may herein be specified or shown on drawings.

c All work shall be inspected, tested and approved by the proper authorities. Contractor shall obtain all permits, certificates and inspections and determine all required service connection charges. Owner shall pay all connection charges, permits, certificates and inspection fees. Contractor shall prepare and obtain approval of specific drawings that may be required by the proper authorities. Deliver certificates of approval to Engineer before request for final payment.

d Pressure vessels shall conform to the latest applicable State and Local Codes and Regulations.

e All safety relief devices protecting pressure vessels shall conform to the latest applicable state, local and ASA-B9 codes.

f Energy Conservation Codes: It is the intent of this specification that all equipment and materials furnished meet the State Uniform Construction Code, International Mechanical Code, International Energy Conservation Code and ASHRAE 90.1 - 2007 as adopted in the State of New Jersey.

g Construction Safety: All work shall be done in accordance with the following Federal regulations:

1 Williams-Steiger Occupational Safety and health Act of 1970, Public Law 91-596.
2 Part 1910 – Occupation Safety and Health Standards, Chapter XVII of Title 29, Codes of Federal Regulations.
3 Part 1518 – Safety and Health Regulations for Construction, Chapter XIII of Title 29, Codes of Federal Regulations.

h Fire Ratings:

1 All material used anywhere in the work must have NFPA ratings as follows:

i Flame Spread – Not over 25.
ii Smoke Developed – Not over 50.
iii Fuel Contributed – Not over 25.

2 All materials shall be "Self Extinguishing".

i The requirements of authorities shall be the minimum acceptable requirements for the work and nothing described in these specifications or indicated on the drawings shall be construed to permit work not conforming to the most stringent of the applicable codes and regulations.

j When drawings or specifications call for materials or construction of better quality or larger size than required by codes, laws, rules and regulations, the drawings and specifications shall take precedence.

k Should any changes to the work indicated on the drawings or described in the specifications be necessary so as to comply with the above requirements, immediately notify the Engineer.

13. PROTECTION

a Effectively protect all material and equipment from dust, dirt, weather and damage until final acceptance as installed. Close all pipe, duct and equipment openings, during construction, with suitable temporary closures. Provide suitable protective covering for equipment, fixtures, devices and material before, during and following installation. Provide new materials and equipment to replace similar damaged items without additional cost to the Owner.

14. COORDINATION

a Prior to bid, Contractor shall examine HVAC and Electrical Drawings for proper coordination of all trades and include in bid price all necessary work required for proper field coordination of all trades.

b Prior to any construction work, Contractor shall reexamine all HVAC and Electrical Drawings. The work of all other Sub-Contractors shall be carefully considered and the work of this Contractor and each his Sub-Contractors coordinated so that all parts of their work will be compatible with, and not interfere with the other trades.

c Review with the General Contractor and all other trades, locations of all equipment and materials so that all work may be installed in the most direct manner, and interferences are avoided between pipes, ducts, conduits, equipment, fixtures, devices, associated appurtenances and architectural and structural features.

d Contractor shall jointly prepare with all of the project's Subcontractors, Coordination Drawings which shall include all HVAC and structural systems, and Electrical installation layouts overlaid onto the architectural and structural plans which are to then be submitted to all other Trades for mark-up, comment and coordination. All Sub-Contractors shall submit, to the all other trades, all setting plans,

templates, approved shop drawings, approved equipment layouts, approved electrical wiring and control diagrams, etc., to insure proper space and functional relationship to all other equipment and services. Upon completion of coordination drawings, Contractor shall submit these coordination drawings to the Engineer for review and approval.

e Contractor shall jointly prepare with all of the project's Sub-Contractors site coordination drawings which include all underground site utilities including, but not limited to underground utility domestic water mains, utility sanitary sewer lines, utility electric, telephone and cable lines, electric site lighting wiring, irrigation piping and sprinklers, wells and manholes, surveillance camera electric cabling, etc. Upon completion of coordination drawings, Contractor shall submit these coordination drawings to the Engineer for review and approval.

f Contractor shall prepare dimensioned mechanical and electrical, piping, conduit, equipment and devices "Layout Drawings" in ¼" scale showing all inserts, sleeves in floors, walls, roofs, beams and columns as part of Contractor's coordination drawings. Drawings shall provide for proper alignment. Upon completion of coordination drawings, Contractor shall submit these coordination drawings to the Engineer for review and approval.

g Coordinate with all trades, clear passages and code required clearances necessary to deliver, relocate, remove, install and erect equipment and materials.

h Where there will not be sufficient clearance for passage following erection of confining enclosures, deliver, set and protect equipment and materials before erection of confining enclosures. All equipment and materials so confined shall be inspected and tested prior to delivery. Should equipment or materials fail to meet the requirements of the Specifications, replace equipment or materials and pay all costs, including costs for modifications of completed areas that are required to provide clear passage.

i When interferences occur, prepare installation drawings in ¼" scale of equipment and material in areas of interferences. Submit drawings to all other trades for their examination, comment, coordination and signed approval. Submit fully coordinated installation drawings to the Engineer for review before beginning any construction work. Meet as necessary with all other trades affected, coordinate work and correct interferences. Where interferences occur during construction because failure to coordinate work, rearrange work at no additional cost to the Owner.

j Upon completion and final coordination of Contractor's Coordination Drawings, Contractor shall submit final Coordination Drawings with all associated Layout Drawings to the Engineer for final approval. If the Contractor cannot resolve coordination conflicts with his/her Sub-Contractors, Contractor shall request a coordination meeting with Engineer.

k All modifications to the building, removal and relocation of equipment and materials that are required for clear passage and code required clearance of equipment shall be provided by the Contractor at no additional cost to the Owner. Contractor shall restore all disturbed building structures and surfaces, and reinstall and reconnect all equipment modified or disturbed by the work of this project.

l Coordinate the procurement of specified materials and equipment being supplied by Sub-Contractors, manufacturers and vendors. Items when provided as part of the equipment, shall meet the requirements of these specifications.

15. DRAWINGS

a Accompanying HVAC and electrical drawings are a part of the Contract Documents and are intended to show approximate and relative locations of materials and equipment. Drawings shall not be scaled to determine exact positions and clearances. Ascertain all dimensions in the field.

b Because of diagrammatic layout and small scale of drawings, not all rises, drops, offsets, vents, traps and related specialties are indicated. Provide all such piping, ductwork, fittings, valves and specialties required in such cases to insure a complete and properly operating installation in accordance with Codes and without extra cost to Owner.

c Examine all drawings and specifications pertaining to the work of all Other Trades. Contractor shall be responsible for installation and fitting into the building, without interference to the work of Other Trades, all materials and equipment provided under this Contract.

d When directed by the Owner or Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed, to prevent conflict with the work of other trades or for proper execution of the work.

e Where variances occur between the drawings and the specifications or within either document itself, the item or arrangement of better quality and greater quantity shall be included in the Contract price. The Engineer will decide on the item and the manner in which work shall be installed.

16. SUBMITTALS

a The Contractor shall carefully prepare and review his schedule of submissions, determine the necessary lead time for preparing, submitting, checking, ordering and delivery of all materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.

b Submittals will be checked for general compliance with specifications only. The Contractor shall be responsible for deviations from the drawings or specifications, and for errors or omissions of any sort in submittals.

c Submit a complete list of material and equipment proposed for the job, including manufacturer's names.

d Reference all listings to the specifications' article to which each is applicable.

e Submit on all materials and equipment, even if same is as specified or shown on the drawings.

f Include complete catalog information such as construction, ratings, insulation systems, etc., as applicable.

g Submit shop drawings in accordance with Division 1 of the project's Technical Specifications.

h Include with each submission and for each item the following information:

1 Project name.
2 Name of Contractor and/of Sub-Contractor making submission.
3 Name of equipment being submitted. Identify by equipment number shown on drawing.
4 The manufacturer's name for each piece of equipment.
5 Complete performance data.
6 Dimensions and operating weight of equipment.
7 Materials and features of construction.

i As a minimum, submit shop drawings for the following:

1 Packaged Air-Cooled Outdoor Scroll Centrifugal Chiller.
2 Hydronic Pumps.
3 Piping, Fittings and Joining Materials.
4 Valves and Specialties.
5 Piping Layouts (3/8" scale).
6 Piping Insulation.
7 Electric Heat Trace.
8 Automatic Temperature Controls.
9 Foundations and Supports.

j Refer to Specification Section 01300 - Submittals for additional information.

17. SHOP DRAWINGS

a Before starting installation, submit for review all information, including manufacturer's drawings and literature in required numbers of copies showing complete physical and performance data for all materials and equipment.

b Prepare and submit for review "Layout Drawings" (minimum of 3/8" scale) of piping and equipment prior to installation.

c Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly made in red ink. Each component, and all optional equipment required for the project, shall be indicated. Data of a general nature will not be accepted. Drawings shall be corrected in red ink.

d Prior to submitting for approval, Contractor shall "mark-up" each copy of each shop drawing or data so as to "cross-reference" each item with its respective drawing item number and specification section number. Shop drawings or data submitted that are not adequately "marked-up" will be returned without review.

e Shop drawings of systems containing closely related items and components must be submitted as a single submission showing the interrelation of the components required for that system, for example: the grilles and registers with sheet metal drawings.

f Engineer's review of shop drawings, and their corrections and comments made thereon, does not relieve the Contractor from compliance with drawings and specifications. Contractor shall be responsible for confirming and correlating all quantities and dimensions, selecting fabrication procedures and techniques of construction.

g Specification Section 01300 - Submittals for additional information.

18. AS-BUILT DRAWINGS

a Prior to final payment, the Contractor shall submit "As-Built" drawings as herein described.

b Maintain during construction a "clean" record set of installation prints. Record in colored ink on these prints all deviations from the contract drawings in sizing, location and details of underground utilities, piping, ductwork, equipment, etc. Submit as-built drawings to Engineer for review as part of project's close-out. Make correction following review and submit a complete set of "as-built" drawings, (1) set hard copy reproducible (1/8" =1'-0" scale minimum), and (1) set electronic files produced in PDF format to the Owner and Engineer upon project completion.

c Specification Section 01300 - Submittals for additional information.

19. SAMPLES

a The Engineer may direct the Contractor to submit samples of items called for in the specifications such as control valves, louvers, etc. Samples of materials which the manufacturer will actually ship shall be properly labeled or identified. Samples shall be left at the construction site for review by the Engineer.

b Each sample must be labeled or securely tagged with the following minimum information:

1 Identification of sample (i.e.: material, color, number, etc.).
2 Reference to contract documents.
3 Name of manufacturer.
4 Name of project.
5 Name of Contractor
6 Date of submission

c A transmittal letter shall be sent to the Engineer and Owner indicating when, where and how the samples were submitted.

d Refer to Specification Section 01300 – Submittals for additional information.

20. WORK RESPONSIBILITIES

a Examine the site and all HVAC, electrical, and all other project documents and accept such conditions and make allowance for them in preparing the bid. No extra charges will be considered for costs resulting from failure to comply with the above.

b The drawings indicate diagrammatically the desired locations or arrangement of ductwork and piping runs, grilles and diffusers, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions. The Contractor is responsible for the correct placing of his work and the proper location and connection of his work in relation to the work of other trades.

c Locations shown on architectural and ceiling plans and/or wall elevations shall take precedence over HVAC plan locations, but where a major conflict is evident, notify the Engineer for instructions prior to commencing work on the same.

d In the event changes in the indicted locations or arrangements are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra costs, providing the change is ordered before the piping and ductwork runs, etc. and the work directly connected to same is installed and no extra materials are required.

e All scaled and figured dimensions are approximate of typical equipment of the type and capacity indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, weights, etc. with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.

f Where equipment is furnished by others, verify voltage characteristics, piping and ductwork connections, dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

g Should changes be necessary to the work indicated on the drawings or described in the specifications so as to comply with the above requirements, immediately notify the Engineer.

h Perform all work competent and skilled personnel. All work shall be of the highest quality consistent with the best practices of the trade.

i Replace or repair, without additional compensation, any work which, in the opinion of the Engineer, does not comply with these requirements.

j The Contractor shall be responsible for the safety and good condition of all materials and equipment until final acceptance by the Owner; for providing adequate and proper storage facilities during the progress of the work; for replacing all damaged and defective work before applying for final acceptance; for erecting and maintaining suitable barriers, protective devices, light and warning signs for the protection of the public and employees; and for all loss, damage or injury to persons or property resulting from any neglect of these responsibilities.

k The Contractor shall be responsible for all faults and deficiencies in his work during the guarantee period and shall repair, at no cost to the Owner, all such deficiencies that occur immediately upon notification by the Owner. All damage to other work there from, which may occur during the construction and guarantee period, shall be repaired at once, at no cost to the Owner.

21. MATERIALS, STANDARDS OF QUALITY AND SUBSTITUTIONS

a All materials and equipment shall be new and of standards specified herein.

b Equipment shall be standard catalog products of an established manufacturer, regularly produced and recommended for service required, in accordance with engineering data or other comprehensive literature made available to the public, and in effect at the time of the bids. Where two or more units of same class equipment are required, these units shall be products of a single manufacturer.

c All equipment shall be installed in strict accordance with manufacturer's instructions for type and capacity of each piece of equipment used. Each Contractor shall obtain these instructions which shall be considered part of these specifications. Type, capacity and application of equipment shall be suitable and must operate satisfactorily for the purpose intended and be so guaranteed by the manufacturer through the Contractor.

d Coordinate the procurement of specified materials, devices and equipment being supplied by Sub-Contractors, manufacturers and vendors. Such items as thermometers, gages, motor starting equipment, vibration isolation devices and valves, when provided as part of the equipment, shall meet these specifications. Direct Sub-Contractors, manufacturers and venders to provide such items.

e Equipment, devices and systems of same type, such as starters, valves, pipe, pipe fittings, fans, pumps, controls, etc., shall be the product of one manufacturer unless they are part of a factory assembled equipment package.

f HVAC equipment shall be provided from a single source manufacturer. Rooftop heat recovery units and associated VAV terminal units shall be by the same manufacturer.

g The manufacturer or figure number named in the specifications and/or listed in equipment schedules on the drawings, are the items that have been used as the basis for design. Systems have been designed on the basis of the equipment specified. When manufacturer's names and figure numbers are used, they shall be considered as the standard of grade and quality required. Materials and equipment of other manufacturers' may be used, if accepted, but they must be equal in all respects, capacity, quality, design and type. **Should equivalent items of other manufacturers be submitted by the Contractor, it shall be the Contractor's responsibility to provide and bear at no extra cost to Owner, all changes to the designed general construction, structural, heating, ventilating and air conditioning and electrical systems, that are required by the use of the substituted items, including cost of Engineer's redesign efforts.**

h When one manufacturer or figure number is used or words such as "or equal" and/or "equal to" are used with a manufacturer's name or figure number, the Contractor may submit an equivalent substitute product for approval, and shall show the prices of both the specified item and the substitute item. **Should equivalent items of other manufacturers be submitted by the Contractor, it shall be the Contractor's responsibility to provide and bear at no extra cost to Owner, all changes to the designed general construction, structural, heating, ventilating and air conditioning and electrical systems, that are required by the use of the substituted items, including cost of Engineer's redesign efforts.** Engineer's approval shall be final.

i When two or more manufacturers or figure numbers are used for a given material or equipment, select the manufacturer from the manufacturers named.

j Refer to Specification Section 01300 - Submittals for additional information.

22. PERFORMANCE OF EQUIPMENT, DEVICES AND SYSTEMS

a Equipment, devices and systems shall perform properly and in accordance with the intent of the Contract Documents.

b Equipment, devices and systems shall be installed and tested in accordance with manufacturer's instructions for type and capacity, also in accordance with requirements of these specifications. Manufacturer's instructions shall be considered a part of these specifications.

c Shop drawing submittals shall include manufacturer's complete physical and performance data. Performance shall be demonstrated "in-the-field" by the manufacturer.

d Refer to Specification Section 01300 - Submittals for additional information.

23. SEQUENCE OF WORK

a The sequence in which work will be performed shall be prepared as a schedule by the Contractor and reviewed and approved by the Owner. Contractor shall submit a complete project construction schedule for approval fourteen (14) days after notification to proceed. Schedule shall show delivery of equipment to the site, erection of equipment and pertinent work related to installation and when the equipment will be placed in operation.

b Refer to Specification Section 01300 - Submittals for additional information.

24. WORK FORCE AND SUPERINTENDENCE

a Contractor shall, upon initiation of construction, keep a suitable force of men on the site at all times in order to provide all sleeves, inserts and provide all other materials as required for the satisfactory installation of the entire system.

b Contractor shall give his personal superintendence to the work or have a competent superintendent, satisfactory to the Engineer and Owner, on the work at all times during construction with authority to act for him. He shall provide an adequate organization for proper coordination and expediting of this work.

25. RUBBISH

a During the course of construction, all Contractors shall be responsible to remove from the premises all rubbish resulting from the work of the project. Contractors shall coordinate the continual cleanup of the project site with the Prime Contractor.

b At all times, keep the premises free from accumulations of waste materials and rubbish caused by agents and employees of the Contractor.

c At the completion of the work, remove from the site all rubbish in or about the building, in addition to tools, scaffolding and other specialties that were utilized or a result of Contractor's work.

d In the event of dispute of refusal to comply with the requirements of the above paragraphs, the Owner shall have the option of removing such rubbish from the premises, and back-charge the Contractor for doing such work.

e The Contractor shall, on a daily basis, remove from the site all rubbish, debris and discarded materials resulting from Contractor's work.

26. CLEANING OF PIPING, EQUIPMENT AND DUCTWORK

a Thoroughly clean all piping, ductwork and equipment of dirt, scale, plaster, concrete, paint and other foreign matter.

b Clean pumps, motors, fans, tanks, grilles, registers, diffusers, louvers and all other equipment, remove labels and protective coverings, and clean all grease and cuttings from stainless steel plated and polished piping and trim.

c Wipe all ductwork surfaces to be painted, lined or covered.

d Clean all strainers and other accessories that may collect foreign matter. Flush or blow-out all equipment and piping systems prior to charging piping and equipment..

e Replace all filters in air handling equipment that has been operated, for any reason, during construction. This replacement is in addition to "spare" filters.

27. TEMPORARY SERVICES FOR CONSTRUCTION

a Refer to General Conditions, Divisions 1 and 23 of the Technical Specification Sections and Conditions of the Contract.

28. CUTTING AND PATCHING

a Sub-Contractors shall furnish General Contractor information such as size, position and arrangement of materials and equipment, so that new openings in floors, walls, roofs, beams, ceilings can be properly provided and coordinated as construction progresses.

b Cutting and patching for new equipment and materials will be provided by Contractor.

c Cutting shall be coordinated with Other Trades, done neatly and to minimize damage to all construction. Provide lintels where required.

d Cutting and patching shall be done by Trades normally specializing in installation of materials being patched. Paint all patched surfaces.

e Review all cutting and patching with Engineer before beginning work.

f Cutting openings in concrete slabs and walls shall be done neatly using core boring machines.

29. FOUNDATIONS AND SUPPORTS

a Unless indicated otherwise, provide all concrete foundations and pads, structural steel and concrete supports required for equipment and materials provided under this Division. Provide isolation mountings for noisy or vibrating equipment. Submit shop drawings of foundation and pads for approval.

b All floor and grade mounted equipment shall be erected on minimum 4" high concrete pads over the complete floor area of the equipment, unless noted otherwise. All mechanical and electrical equipment, devices and ductwork must be installed at minimum at or above the New Jersey adopted flood plain elevation for the project site.

c Concrete work, foundations, pads, shall include anchor bolts, and shall have sufficient size and mass to suit supported equipment. Foundations and pads shall be properly dwelled in with the floor construction, and shall have sloped bevels on all horizontal and vertical edges. Concrete shall be lightweight mix having a comprehensive strength of 5,000 PSI minimum at twenty-eight days. Placing of reinforcing steel and concrete shall be done according to recommendations of the American Concrete Institute and Concrete Reinforcing Steel Institute, and all materials shall conform to American Society for Testing and Materials Specifications (ASTM) applicable to this work.

d Structural steel supports shall include all beams, plates, angles, bearing plates and structural shapes of every description required to complete the steel work. Manual of construction by American Institute of Steel construction (AISC) shall be followed in design and construction. All structural steel shall conform to ASTM Specification A-36. All structural steel members shall have a shop coat of rust inhibitive paint.

30. STEEL SUPPORTS

a Unless indicated otherwise, provide all structural steel supports required for equipment, ductwork, piping and materials provided. Provide isolation mountings for noisy of vibrating equipment. Submit shop drawings for approval.

b All structural steel supports shall be stainless or galvanized steel construction.

c Structural steel supports shall include all beams, plates, angles, bearing plates and structural shapes of every description required to complete the steel work. Manual of construction by American Institute of Steal Construction shall be followed in design and construction. All structural steel shall conform to American Society for Testing Materials Specification A-36. All structural steel members shall have a shop coat of rust inhibitive paint.

31. CONCRETE WORK

a Unless noted otherwise, provide all concrete work for foundations, pads, supports, required for equipment and materials provided under this Division. Provide isolation mountings for all equipment that is either noisy or has rotating or vibrating components. Submit shop drawings for approval.

b Concrete work, foundations, pads, shall include anchor bolts, and shall have sufficient size and mass to suit supported equipment. Foundations and pads shall be properly dowelled in with floor construction, and shall have sloped bevels on all horizontal and vertical edges. Concrete shall be a lightweight mix having a compressive strength of 5,000 PSI minimum at twenty-eight days. Placing of reinforcing steel and concrete shall be done according to recommendations of the American Concrete Institute and Concrete Reinforcing Steel Institute, and all materials shall conform to American Society for Testing Materials Specifications, applicable to this work.

c Form work shall be of sufficient strength to maintain desired shape during pouring of concrete and tight enough to prevent leakage of the grout through joints.

32. SCAFFOLDING

a Provide temporary scaffolding, ladders and other equipment required for installation of equipment and materials including protection features as required by codes and trade associations' recommendations.

33. FLASHING AND ROOF REPAIRS

a All flashing methods and materials shall attain a complete watertight installation.

b Provide counter flashing for items placed upon roof and piercing roof. General Contractor will provide base flashing.

c For all pipes, vents and conduits passing through roof provide counter-flashing fitting up to 6 inch size. For pipes over 6 inch size clamp counter-flashing to pipe and apply a heavy coating of roofing cement. For pipe or conduit smaller than 1 ½" size, provide pitch pockets on roof.

d Riser sleeves for piping and conduits in membrane waterproofed floors shall have flashing clamps attached to membrane. Where possible, sleeves shall be provided with top and bottom steel pipe sleeves. Large sleeves shall be shop fabricated. Sleeves shall extend 2 inches above finished door. At each field fabricated mop receptor, where applicable, provide a four pound lead pan, turned up 6 inches on all sides and soldered watertight. Attach drain flashing clamp.

e Floor sinks, drains and clean-outs in membrane waterproofed floors shall have flashing clamps attached to the membrane.

f Ducts and flues passing through roof shall be counter-flashed with sheet metal, soldered to duct riser and extending down over roof curbs, which shall be properly flashed. Apply heavy coating of roofing cement at junction of duct and counter-flashing collar.

g Include all necessary flashing for roofs. Methods, materials and workmanship shall be in accordance with requirements of the roofing "warranties".

34. ACCESS PANELS

a Furnish access panels required for access to valves, traps, controls, dampers and other specialties requiring maintenance and service in ceilings.

b Panels shall have 16 gauge steel frame and 14 gauge flush steel door having concealed hinge and screwdriver operated cam locks, all with factory prime finish.

c Access panels shall be of sizes required for easy access to specialties, but in no case shall they be less than 18" x 18".

d Coordinate panel locations and sizes with Other Trades. Prior to installation, submit and review panel locations and sizes with Engineer.

e Panels shall be furnished to suit the surface into which installed.

35. MACHINERY GUARDS

a Provide metal guards over all belt drives, couplings and other moving parts of equipment to protect personnel from injury. Protection facilities shall comply with government and state regulations.

b Guards shall be easily removable and replaceable. Arrange guards to include protected openings for inspection, lubrication and obtaining RPM and motor readings.

36. WELDING

a All welding shall be done by qualified and certified welders in accordance with ASME Boiler Code - Section 9 or American Welding Society Code for Welding in Building Construction (AWS D1.0).

b Contractor shall secure all hot work permits as required for this project.

c The Contractor shall submit certified test records of each welder.

d Welding may be done by either the metal-arc or gas welding processes.

e The filler metal for welding steel piping shall conform to AWSW 6010 for metal arc welding and to specification GR 60 for gas welding. Filler metal shall be suitable for the metal welded.

f Welding shall not be done when the atmospheric temperature is less than 0 degrees F. when surfaces are wet, or during periods of high wind.

g Welds shall show a bright metallic luster after cleaning and shall have uniform contour. Except as necessary to correct defects, the surfaces shall not be dressed, smoothed, or finished for improving their appearance, unless so specified. Welds generally shall be free from gas pockets, oxides, slag inclusions, and surface porosity, except to the extent produced in passing qualification tests. The inside of the pipe shall be relatively free from globules of weld metal.

37. PAINTING

a All materials and equipment shall be protected from rust, corrosion and similar damage by either factory applied or field applied protective coatings. Clean and touch-up such protected surfaces that become scratched, marred or otherwise damaged and make surfaces ready for final painting.

b Finish painting of materials and equipment provided under this Division shall be the responsibility of this Division's Contractor.

c In unfinished-occupied areas, such as Mechanical and Electrical Rooms, on the roof and wherever exposed to the weather, all ferrous metal pipe, hangers and equipment shall be rust-protected with the manufacturer's prime

coat and a extreme seacoast final coating. All exposed ferrous metal and canvas jackets shall receive two coats of paint in addition to prime coat, using heat resistant paint for high temperature pipe. Aluminum, galvanized and cuprous metals and plastic coated insulation shall not be painted.

d In unfinished unoccupied areas such as duct shafts, chases all ferrous metal, pipe, hangers and equipment except cast-iron pipe shall be rust protected with the manufacturer's coating or a prime coat. Aluminum, galvanized and cuprous metals and insulation shall not be painted.

e Do not paint over nameplates of equipment.

38. IDENTIFICATION

a Identify all concealed and exposed equipment, devices,

b piping and associated appurtenances with legibly stenciled lettering, applied, after finish painting where applicable, in color to contrast with basic color.

c Identify piping adjacent to valves and then at maximum 20-foot intervals. Indicate flow direction with arrows. Lettering shall be minimum 1/3 pipe diameter, but not less than ½-inch high.

d All major equipment, including air handling units, condensing units, VAV terminal units, duct heaters, fans, pumps, etc., shall be identified by the equipment numbers shown on drawings, or by the Owner's numbering system, if so directed. Include the type of service, or the name of area served. Lettering shall be minimum 1-inch high. Do not stencil surfaces exposed in public areas.

e Identify each piece of motor control equipment, remote pushbuttons, and switches and other electrical equipment with laminated, engraved, white core, black finished plastic nameplates having minimum ¼-inch size lettering. Laminated nameplates shall consist of two black plastic sheets with one white plastic sheet bonded to and in-between the black. Engrave letters in black sheet, down to depth of white sheet.

f Identify all remote controllers, such as on-off, high-low, occupied-unoccupied switches and other devices regularly operated by Owner's personnel with nameplates as specified above.

g Provide for each valve, except those immediately adjacent to apparatus where use of valve is obvious, a 2-inch diameter non-ferrous metal or color coded plastic tag with figures and pipe identification stamped or engraved into tag. Tags shall be fastened with non-ferrous "S" hooks. Number each valve and provide two valve charts, framed behind glass, listing each valve, its location and data on what it controls.

h Submit list of titles and data for Engineer's review before beginning work.

39. OPERATING AND MAINTENANCE MANUALS

a At the completion of the project, deliver to the Engineer for transmittal to the Owner, three (3) complete sets of instruction manuals, for each piece of HVAC, and incidental electrical equipment, device, controls, valves and all specialty items

b Each instruction manual shall consist of data supplied by the manufacturer giving complete information on the following:

1 Installation procedure.
2 Operating instructions.

3 Maintenance instructions.
4 Detailed parts lists.
5 Recommended spare parts.
6 Address and telephone numbers of nearest supply house.
7 Address and telephone number of manufacturer's representative.

c Each set of instruction manuals shall be bound in an 8 ½" x 11" hard cover, 3-ring binder. The binders shall be assembled using tabs to separate each equipment item. An index sheet shall be inserted in the front of the binder, listing every item included with the manual.

40. OPERATING AND MAINTENANCE INSTRUCTION

a After all tests, startup, balancing and adjustments have been successfully made, instruct the representatives of the Owner in all details of operation of all HVAC equipment, devices and systems. Provide competent instruction for a minimum of one (1) day, which shall not include time required for testing, adjusting, startup and balancing.

b Instruction in all details of operation of all equipment shall be recorded by means of videotaping.

41. ELECTRICAL EQUIPMENT

a Contractor shall furnish all his equipment complete with motor, controllers, capacitor, starting equipment and control transformers, except where specifically listed differently on the Contract Drawings.

b Unless otherwise noted, electric motors shall be open, drip proof, induction type rated for continuous duty at 15% overload with 40 degrees C. rise. Single phase motors shall be capacitor start, induction run.

c Manufacturer's certified technician shall check the equipment for its conformance to the specifications, for proper installation and shall run the system in all modes of operation to ascertain that the unit will function properly. All necessary adjustment shall be made to insure trouble-free service.

d After completion of the startup procedure, Manufacturer shall certify, in writing, that the equipment is installed in accordance with his requirements and is operating in accordance with the intent of the specifications. Final payment will not be made until this requirement is completed.

2PRODUCTS

(Not Used)

3EXECUTION

(Not Used)

END OF SECTION 230010

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

4 GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

3. COORDINATION

a Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1 Motor controllers.
2 Torque, speed, and horsepower requirements of the load.
3 Ratings and characteristics of supply circuit and required control sequence.
4 Ambient and environmental conditions of installation location.

5 PRODUCTS

1. GENERAL MOTOR REQUIREMENTS

a Comply with NEMA MG 1 unless otherwise indicated.

b Comply with IEEE 841 for severe-duty motors.

2. MOTOR CHARACTERISTICS

a Duty: Continuous duty at ambient temperature of 40°C and at altitude of 3300 feet above sea level.

b Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

3. POLYPHASE MOTORS

a Description: NEMA MG 1, Design B, medium induction motor.

b Efficiency: Energy efficient, as defined in NEMA MG 1.

c Service Factor: 1.15.

d Multispeed Motors: Variable torque.

1 For motors with 2:1 speed ratio, consequent pole, single winding.
2 For motors with other than 2:1 speed ratio, separate winding for each speed.

e Multispeed Motors: Separate winding for each speed.

f Rotor: Random-wound, squirrel cage.

g Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

h Temperature Rise: Match insulation rating.

i Insulation: Class F.

j Code Letter Designation:

1 Motors 15 HP and Larger: NEMA starting Code F or Code G.
2 Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

k Enclosure Material: Cast iron for motor frame sizes 234T and larger; rolled steel for motor frame sizes smaller than 324T.

4. POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

a Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

b Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1 Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2 Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3 Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4 Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

c Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

5. SINGLE-PHASE MOTORS

a Motors larger than 1/20 HP shall be one of the following, to suit starting torque and requirements of specific motor application:

1 Permanent-split capacitor.
2 Split phase.
3 Capacitor start, inductor run.

4 Capacitor start, capacitor run.

b Multispeed Motors: Variable-torque, permanent-split-capacitor type.

c Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

d Motors 1/20 HP and Smaller: Shaded-pole type.

e Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

6 EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

7 GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Sleeves.
2 Sleeve-seal systems.
3 Sleeve-seal fittings.
4 Grout.

3. SUBMITTALS

a Product Data: For each type of product indicated.

8 PRODUCTS

1. SLEEVES

a Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

b Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

c Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

d Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2. SLEEVE-SEAL SYSTEMS

a Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1 Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2 Pressure Plates: Stainless steel.

3 Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

3. SLEEVE-SEAL FITTINGS

a Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

4. GROUT

a Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

b Characteristics: Nonshrink; recommended for interior and exterior applications.

c Design Mix: 5000-psi, 28-day compressive strength.

d Packaging: Premixed and factory packaged.

9 EXECUTION

1. SLEEVE INSTALLATION

a Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

b For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide[1-inch annular clear space between piping and concrete slabs and walls.

1 Sleeves are not required for core-drilled holes.

c Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1 Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2 Cut sleeves to length for mounting flush with both surfaces.

i Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3 Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

d Install sleeves for pipes passing through interior partitions.

1 Cut sleeves to length for mounting flush with both surfaces.
2 Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3 Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

e Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

2. SLEEVE-SEAL-SYSTEM INSTALLATION

a Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

b Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3. SLEEVE-SEAL-FITTING INSTALLATION

a Install sleeve-seal fittings in new walls and slabs as they are constructed.

b Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

c Secure nailing flanges to concrete forms.

d Using grout, seal the space around outside of sleeve-seal fittings.

4. SLEEVE AND SLEEVE-SEAL SCHEDULE

a Use sleeves and sleeve seals for the following piping-penetration applications:

1 Exterior Concrete Walls above Grade:

i Piping Smaller Than NPS 6 Cast-iron wall sleeves.
ii Piping NPS and Larger: Cast-iron wall sleeves.

2 Exterior Concrete Walls below Grade:

i Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

a Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

ii Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

a Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3 Concrete Slabs-on-Grade:

i Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

a Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

ii Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

a Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4 Concrete Slabs above Grade:

i Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
ii Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

5 Interior Partitions:

i Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
ii Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 230517

SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

10 GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Liquid-in-glass thermometers.
2 Thermowells.
3 Dial-type pressure gages.
4 Gage attachments.
5 Test plugs.

3. SUBMITTALS

a Product Data: For each type of product.

b Shop Drawings:

1 Include diagrams for power, signal, and control wiring.

c Product Certificates: For each type of meter and gage.

d Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

11 PRODUCTS

1. LIQUID-IN-GLASS THERMOMETERS

a Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1 Standard: ASME B40.200.
2 Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
3 Case Form: Adjustable angle unless otherwise indicated.
4 Tube: Glass with magnifying lens and blue organic liquid.
5 Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F].
6 Window: Glass.
7 Stem: Aluminum and of length to suit installation.

i Design for Thermowell Installation: Bare stem.

8 Connector: 1-1/4 inches, with ASME B1.1 screw threads.
9 Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2. THERMOWELLS

a Thermowells:

1 Standard: ASME B40.200.
2 Description: Pressure-tight, socket-type fitting made for insertion in piping tee fitting.
3 Material for Use with Copper Tubing: CNR or CUNI.
4 Material for Use with Steel Piping: CRES or CSA.
5 Type: Stepped shank unless straight or tapered shank is indicated.
6 External Threads: NPS 1/2, ASME B1.20.1 pipe threads.
7 Internal Threads: 1/2, with ASME B1.1 screw threads.
8 Bore: Diameter required to match thermometer bulb or stem.
9 Insertion Length: Length required to match thermometer bulb or stem.
10 Lagging Extension: Include on thermowells for insulated piping and tubing.
11 Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

b Heat-Transfer Medium: Mixture of graphite and glycerin.

3. DIAL-TYPE PRESSURE GAGES

a Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1 Standard: ASME B40.100.
2 Case: Sealed cast aluminum; 6-inch nominal diameter.
3 Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4 Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5 Movement: Mechanical, with link to pressure element and connection to pointer.
6 Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7 Pointer: Dark-colored metal.
8 Window: Glass.
9 Ring: Stainless steel.
10 Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

4. GAGE ATTACHMENTS

a Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

b Siphons: Loop-shaped section of stainless-steel pipe with NPS 1/4 or NPS 1/2 pipe threads.

c Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

5. TEST PLUGS

a Description: Test-station fitting made for insertion in piping tee fitting.

b Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

c Thread Size: ¼ NPS, ASME B1.20.1 pipe thread.

d Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

e Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

12 EXECUTION

1. INSTALLATION

a Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

b Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

c Install thermowells with extension on insulated piping.

d Fill thermowells with heat-transfer medium.

e Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

f Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

g Install valve and snubber in piping for each pressure gage for fluids (except steam).

h Install test plugs in piping tees.

i Install flow indicators in piping systems in accessible positions for easy viewing.

j Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

k Install connection fittings in accessible locations for attachment to portable indicators.

l Install thermometers in the following locations:

1 Two inlets and two outlets of each chiller.

m Install pressure gages in the following locations:

1 Inlet and outlet of each chiller chilled-water connection.
2 Suction and discharge of each pump.

2. CONNECTIONS

a Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

3. ADJUSTING

a After installation, calibrate meters according to manufacturer's written instructions.

b Adjust faces of meters and gages to proper angle for best visibility.

4. THERMOMETER SCHEDULE

a Thermometers at inlets and outlets of each chiller shall be one of the following:

1 Industrial-style, liquid-in-glass type.
2 Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

b Thermometer stems shall be of length to match thermowell insertion length.

5. THERMOMETER SCALE-RANGE SCHEDULE

a Scale Range for Chilled-Water Piping: Minus 4 to plus 100 deg F.

6. PRESSURE-GAGE SCHEDULE

a Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be one of the following:

1 Sealed, direct-mounted, stainless steel case.
2 Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

b Pressure gages at suction and discharge of each pump shall be one of the following:

1 Sealed, direct-mounted, stainless steel case.
2 Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

7. PRESSURE-GAGE SCALE-RANGE SCHEDULE

a Scale Range for Chilled-Water Piping: 0 to 100 psi.

END OF SECTION 230519

SECTION 230523 - GATE VALVES FOR HVAC PIPING

13 GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Bronze gate valves.
2 Iron gate valves.

3. DEFINITIONS

a CWP: Cold working pressure.

b NRS: Nonrising stem.

c OS&Y: Outside screw and yoke.

d RS: Rising stem.

4. SUBMITTALS

a Product Data: For each type of valve.

5. DELIVERY, STORAGE, AND HANDLING

a Prepare valves for shipping as follows:

1 Protect internal parts against rust and corrosion.
2 Protect threads, flange faces, grooves, and weld ends.
3 Set gate valves closed to prevent rattling.

b Use the following precautions during storage:

1 Maintain valve end protection.
2 Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

c Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

14 PRODUCTS

1. GENERAL REQUIREMENTS FOR VALVES

a Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

b ASME Compliance:

1 ASME B1.20.1 for threads for threaded-end valves.
2 ASME B16.1 for flanges on iron valves.
3 ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4 ASME B16.18 for solder joint.

c AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

d Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

e Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

f Valve Sizes: Same as upstream piping unless otherwise indicated.

g RS Valves in Insulated Piping: With 2-inch stem extensions.

h Valve Bypass and Drain Connections: MSS SP-45.

2. BRONZE GATE VALVES

a Bronze Gate Valves, NRS, Class 125:

1 Description:

i Standard: MSS SP-80.
ii CWP Rating: 200 psig.
iii Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
iv Ends: Threaded or solder joint.
v Stem: Bronze.
vi Disc: Solid wedge; bronze.
vii Packing: Asbestos free.
viii Handwheel: Malleable iron.

3. IRON GATE VALVES

a Iron Gate Valves, NRS, Class 125:

1 Description:

i Standard: MSS SP-70.
ii NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.

iii NPS 14 to NPS 24, CWP Rating: 150 psig.
iv Body Material: ASTM A 126, gray iron with bolted bonnet.
v Ends: Flanged.
vi Trim: Bronze.
vii Disc: Solid wedge.
viii Packing and Gasket: Asbestos free.

15 EXECUTION

1. EXAMINATION

a Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

b Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

c Examine threads on valve and mating pipe for form and cleanliness.

d Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

e Do not attempt to repair defective valves; replace with new valves.

2. VALVE INSTALLATION

a Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

b Locate valves for easy access and provide separate support where necessary.

c Install valves in horizontal piping with stem at or above center of pipe.

d Install valves in position to allow full stem movement.

e Install valve tags.

3. ADJUSTING

a Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

4. GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

a If valve applications are not indicated, use the following:

1 Gate valves.

b If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

c Select valves, except wafer types, with the following end connections:

1 For Copper Tubing, NPS 2) and Smaller: Threaded ends, except where solder-joint valve-end option is indicated in valve schedules below.
2 For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends.
3 For Steel Piping, NPS 2 and Smaller: Threaded ends.
4 For Steel Piping, NPS 2-1/2 and Larger: Flanged end.
5 For Grooved-End Steel Piping, except for Steam and Steam Condensate Piping: Valve ends may be grooved.

5. CHILLED-WATER VALVE SCHEDULE

a Pipe NPS 2 and Smaller: Bronze valves, Class 125, with soldered or threaded ends.

b Pipe NPS 2-1/2 and Larger: Iron gate valves, OS&Y, Class 125.

END OF SECTION 230523

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

16GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Metal pipe hangers and supports.
2 Trapeze pipe hangers.
3 Metal framing systems.
4 Thermal-hanger shield inserts.
5 Fastener systems.
6 Equipment supports.

3. DEFINITIONS

a MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

4. PERFORMANCE REQUIREMENTS

a Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

b Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1 Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2 Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3 Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

5. SUBMITTALS

a Product Data: For each type of product indicated.

b Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1 Trapeze pipe hangers.
2 Metal framing systems.
3 Pipe stands.
4 Equipment supports.

c Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1 Detail fabrication and assembly of trapeze hangers.
2 Design Calculations: Calculate requirements for designing trapeze hangers.

d Welding certificates.

6. QUALITY ASSURANCE

a Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

b Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

17PRODUCTS

1. METAL PIPE HANGERS AND SUPPORTS

a Carbon-Steel Pipe Hangers and Supports:

1 Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2 Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3 Nonmetallic Coatings: Plastic coating, jacket, or liner.
4 Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5 Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

b Stainless-Steel Pipe Hangers and Supports:

1 Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2 Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3 Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

c Copper Pipe Hangers:

1 Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2 Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2. TRAPEZE PIPE HANGERS

a Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

3. METAL FRAMING SYSTEMS

a MFMA Manufacturer Metal Framing Systems:

1 Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
2 Standard: MFMA-4.
3 Channels: Continuous slotted steel channel with inturned lips.
4 Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
5 Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
6 Metallic Coating: Hot-dipped galvanized.

b Non-MFMA Manufacturer Metal Framing Systems:

1 Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2 Standard: Comply with MFMA-4.
3 Channels: Continuous slotted steel channel with inturned lips.
4 Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
5 Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
6 Coating: Zinc.

4. THERMAL-HANGER SHIELD INSERTS

a Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

b For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

c For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

d Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

5. FASTENER SYSTEMS

a Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

b Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

6. EQUIPMENT SUPPORTS

a Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

7. MISCELLANEOUS MATERIALS

a Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

b Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1 Properties: Nonstaining, noncorrosive, and nongaseous.
2 Design Mix: 5000-psi, 28-day compressive strength.

18EXECUTION

1. HANGER AND SUPPORT INSTALLATION

a Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

b Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1 Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2 Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

c Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

d Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

e Fastener System Installation:

1 Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2 Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

f Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

g Equipment Support Installation: Fabricate from welded-structural-steel shapes.

h Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

i Install lateral bracing with pipe hangers and supports to prevent swaying.

j Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

k Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

l Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

m Insulated Piping:

1 Attach clamps and spacers to piping.

i Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

2 Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

i Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3 Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

i Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4 Shield Dimensions for Pipe: Not less than the following:

i NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
ii NPS 4: 12 inches long and 0.06 inch thick.
iii NPS 5 and NPS: 18 inches long and 0.06 inch thick.
iv NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
v NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5 Pipes NPS 8 and Larger: Include reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6 Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

2. EQUIPMENT SUPPORTS

a Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

b Grouting: Place grout under supports for equipment and make bearing surface smooth.

c Provide lateral bracing, to prevent swaying, for equipment supports.

3. METAL FABRICATIONS

a Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

b Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

c Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2 Obtain fusion without undercut or overlap.
3 Remove welding flux immediately.
4 Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

4. ADJUSTING

a Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

b Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

5. HANGER AND SUPPORT SCHEDULE

a Specific hanger and support requirements are in Sections specifying piping systems and equipment.

b Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

c Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

d Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

e Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

f Use stainless-steel pipe hangers and stainless-steel attachments for hostile (outdoor) environment applications.

g Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

h Use padded hangers for piping that is subject to scratching.

i Use thermal-hanger shield inserts for insulated piping and tubing.

j Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1 Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2 Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
3 Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
4 Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
5 Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
6 Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
7 Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
8 Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

k Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1 Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

l Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1 Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2 Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3 Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4 Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5 Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

m Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1 Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2 Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3 Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4 Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5 Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6 C-Clamps (MSS Type 23): For structural shapes.
7 Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8 Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9 Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10 Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11 Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12 Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

i Light (MSS Type 31): 750 lb.
ii Medium (MSS Type 32): 1500 lb.
iii Heavy (MSS Type 33): 3000 lb.

13 Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14 Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15 Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

n Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1 Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2 Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3 Thermal-Hanger Shield Inserts: For supporting insulated pipe.

o Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

p Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

END OF SECTION 230529

SECTION 230533 - HEAT TRACING FOR HVAC PIPING

19GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section includes heat tracing for HVAC piping with the following electric heating cables:

1 Self-regulating, parallel resistance.

3. SUBMITTALS

a Product Data: For each type of product.

1 Include rated capacities, operating characteristics, and furnished specialties and accessories.
2 Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

b Shop Drawings: For electric heating cable.

1 Include plans, elevations, sections, and attachment details.
2 Include diagrams for power, signal, and control wiring.

c Field quality-control reports.

d Sample Warranty: For special warranty.

e Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

4. WARRANTY

a Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1 Warranty Period: Five (5) years from date of Substantial Completion.

20PRODUCTS

1. SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

a Comply with IEEE 515.1.

b Heating Element: Pair of parallel No. 16 AWG, tinned or nickle coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

c Electrical Insulating Jacket: Flame-retardant polyolefin.

d Cable Cover: Stainless-steel braid.

e Maximum Operating Temperature (Power On): 150 deg F.

f Maximum Exposure Temperature (Power Off): 185 deg F.

g 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.

h Capacities and Characteristics:

1 Maximum Heat Output: 7W/ft.
2 Piping Diameter: 4”.
3 Electrical Characteristics for Single-Circuit Connection:

i Volts: 120.
ii Phase: 1.
iii Hertz: 60.
iv Full-Load Amperes: 15A.
v Minimum Circuit Ampacity: 15A.
vi Maximum Overcurrent Protection: 20A.

2. CONTROLS

a Remote bulb unit with adjustable temperature range from 30 to 50 deg F.

b Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.

c Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.

d Corrosion-resistant, waterproof control enclosure.

3. ACCESSORIES

a Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

b Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1 Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
2 Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

21EXECUTION

1. EXAMINATION

a Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1 Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.

b Proceed with installation only after unsatisfactory conditions have been corrected.

2. INSTALLATION

a Install electric heating cable across expansion joints according to manufacturer's written instructions; use slack cable to allow movement without damage to cable.

b Install electric heating cables after piping has been tested and before insulation is installed.

c Install electric heating cables according to IEEE 515.1.

d Install insulation over piping with electric cables.

e Install warning tape on piping insulation where piping is equipped with electric heating cables.

f Set field-adjustable switches and circuit-breaker trip ranges.

3. CONNECTIONS

a Ground equipment according to NEC requirements.

b Connect wiring according to NEC requirements.

4. FIELD QUALITY CONTROL

a Perform the following tests and inspections:

1 Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
2 Test cables for electrical continuity and insulation integrity before energizing.
3 Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

b Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.

c Cables will be considered defective if they do not pass tests and inspections.

d Prepare test and inspection reports.

5. PROTECTION

a Protect installed heating cables, including nonheating leads, from damage during construction.

b Remove and replace damaged heat-tracing cables.

END OF SECTION 230533

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

22GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Equipment labels.
2 Warning signs and labels.
3 Pipe labels.
4 Stencils.
5 Valve tags.

3. SUBMITTALS

a Product Data: For each type of product.

b Samples: For color, letter style, and graphic representation required for each identification material and device.

c Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

d Valve numbering scheme.

e Valve Schedules: For each piping system to include in maintenance manuals.

23PRODUCTS

1. EQUIPMENT LABELS

a Metal Labels for Equipment:

1 Material and Thickness: stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2 Letter Color: By Owner.
3 Background Color: By Owner..

4 Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5 Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6 Fasteners: Stainless-steel self-tapping screws.
7 Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

2. WARNING SIGNS AND LABELS

a Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

b Letter Color: By Owner.

c Background Color: By Owner.

d Maximum Temperature: Able to withstand temperatures up to 160 deg F.

e Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

f Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

g Fasteners: Stainless-steel self-tapping screws.

h Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

i Label Content: Include caution and warning information plus emergency notification instructions.

3. PIPE LABELS

a General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

b Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover fully circumference of pipe and to attach to pipe without fasteners or adhesive.

c Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

d Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1 Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2 Lettering Size: Size letters according to ASME A13.1 for.

4. STENCILS

a Stencils for Piping:

1 Lettering Size: Size letters according to ASME A13.1 for piping.
2 Stencil Material: Brass.
3 Stencil Paint: Exterior, gloss, alkyd enamel or acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
4 Identification Paint: Exterior, alkyd enamel or acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

b Stencils for Access Panels and Door Labels, Equipment Labels, and Similar Operational Instructions:

1 Lettering Size: Minimum letter height of 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
2 Stencil Material: Brass.
3 Stencil Paint: Exterior, gloss, alkyd enamel or acrylic enamel. Paint may be in pressurized spray-can form.
4 Identification Paint: Exterior, alkyd enamel or acrylic enamel. Paint may be in pressurized spray-can form.

5. VALVE TAGS

a Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1 Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2 Fasteners: Brass S-hook.

b Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1 Valve-tag schedule shall be included in operation and maintenance data.

24EXECUTION

1. PREPARATION

a Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

2. GENERAL INSTALLATION REQUIREMENTS

a Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

b Coordinate installation of identifying devices with locations of access panels and doors.

c Install identifying devices before installing acoustical ceilings and similar concealment.

3. EQUIPMENT LABEL INSTALLATION

a Install or permanently fasten labels on each major item of mechanical equipment.

b Locate equipment labels where accessible and visible.

4. PIPE LABEL INSTALLATION

a Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option.

1 Identification Paint: Use for contrasting background.
2 Stencil Paint: Use for pipe marking.

b Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1 Near each valve and control device.
2 Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3 Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4 At access doors, manholes, and similar access points that permit view of concealed piping.
5 Near major equipment items and other points of origination and termination.
6 Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7 On piping above removable acoustical ceilings. Omit intermediately spaced labels.

c Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

d Pipe Label Color Schedule:

1 Chilled-Water Piping: White letters on a safety-green background.

5. VALVE-TAG INSTALLATION

a Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

b Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1 Valve-Tag Size and Shape:

i Chilled Water: 2 inches round.

2 Valve-Tag Colors:

i Potable and Other Water: White letters on a safety-green background.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

25GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Balancing Hydronic Piping Systems:

i Constant-flow hydronic systems.
ii Variable-flow hydronic systems.
iii Primary-secondary hydronic systems.

2 Testing, Adjusting, and Balancing Equipment:

i Chillers.

3 Control system verification.

3. DEFINITIONS

a AABC: Associated Air Balance Council.

b BAS: Building automation systems.

c NEBB: National Environmental Balancing Bureau.

d TAB: Testing, adjusting, and balancing.

e TABB: Testing, Adjusting, and Balancing Bureau.

f TAB Specialist: An independent entity meeting qualifications to perform TAB work.

g TDH: Total dynamic head.

4. PREINSTALLATION MEETINGS

a TAB Conference: If requested by the Owner, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.

1 Minimum Agenda Items:

i The Contract Documents examination report.
ii The TAB plan.
iii Needs for coordination and cooperation of trades and subcontractors.
iv Proposed procedures for documentation and communication flow.

5. SUBMITTALS

a Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

b Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

c Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

d System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

e Examination Report: Submit a summary report of the examination review required in "Examination" Article.

f Certified TAB reports.

g Sample report forms.

h Instrument calibration reports, to include the following:

1 Instrument type and make.
2 Serial number.
3 Application.
4 Dates of use.
5 Dates of calibration.

6. QUALITY ASSURANCE

a TAB Specialists Qualifications: Certified by AABC, NEBB or TABB.

1 TAB Field Supervisor: Employee of the TAB specialist and certified by AABC, NEBB or TABB.
2 TAB Technician: Employee of the TAB specialist and certified by AABC, NEBB or TABB as a TAB technician.

b Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

c ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

d ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

7. FIELD CONDITIONS

a Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

26PRODUCTS (Not Applicable)

27EXECUTION

1. EXAMINATION

a Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

b Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

c Examine the approved submittals for HVAC systems and equipment.

d Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

e Examine equipment performance data including fan and pump curves.

1 Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2 Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance.

f Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

g Examine test reports specified in individual system and equipment Sections.

h Examine HVAC equipment with functioning controls are ready for operation.

i Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

j Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

k Examine system pumps to ensure absence of entrained air in the suction piping.

l Examine operating safety interlocks and controls on HVAC equipment.

m Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

2. PREPARATION

a Prepare a TAB plan that includes the following:

1 Equipment and systems to be tested.
2 Strategies and step-by-step procedures for balancing the systems.
3 Instrumentation to be used.
4 Sample forms with specific identification for all equipment.

b Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1 Hydronics:

i Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
ii Piping is complete with terminals installed.
iii Water treatment is complete.
iv Systems are flushed, filled, and air purged.
v Strainers are pulled and cleaned.
vi Control valves are functioning per the sequence of operation.
vii Shutoff and balance valves have been verified to be 100 percent open.
viii Pumps are started and proper rotation is verified.
ix Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
x Suitable access to balancing devices and equipment is provided.

3. GENERAL PROCEDURES FOR TESTING AND BALANCING

a Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

b Cut insulation, pipes and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1 After testing and balancing, install test ports.
2 Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finishes.

c Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

d Take and report testing and balancing measurements in inch-pound (IP) units.

4. GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

a Prepare test reports for pumps and chiller. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

b Prepare schematic diagrams of systems' "as-built" piping layouts.

c In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1 Check liquid level in expansion tank.
2 Check highest vent for adequate pressure.
3 Check flow-control valves for proper position.
4 Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5 Verify that motor starters are equipped with properly sized thermal protection.
6 Check that air has been purged from the system.

5. PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

a Adjust pumps to deliver total design gpm.

1 Measure total water flow.

i Position valves for full flow through coils.
ii Measure flow by main flow meter, if installed.
iii If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

2 Measure pump TDH as follows:

i Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
ii Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
iii Convert pressure to head and correct for differences in gage heights.
iv Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.

v With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

3 Monitor motor performance during procedures and do not operate motor in an overloaded condition.

b Adjust flow-measuring devices installed in mains and branches to design water flows.

1 Measure flow in main and branch pipes.
2 Adjust main and branch balance valves for design flow.
3 Re-measure each main and branch after all have been adjusted.

c For systems with pressure-independent valves at terminals:

1 Measure differential pressure and verify that it is within manufacturer's specified range.
2 Perform temperature tests after flows have been verified.

d Verify final system conditions as follows:

1 Re-measure and confirm that total water flow is within design.
2 Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3 Mark final settings.

e Verify that memory stops have been set.

6. PROCEDURES FOR MOTORS

a Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1 Manufacturer's name, model number, and serial number.
2 Motor horsepower rating.
3 Motor rpm.
4 Phase and hertz.
5 Nameplate and measured voltage, each phase.
6 Nameplate and measured amperage, each phase.
7 Starter size and thermal-protection-element rating.
8 Service factor and frame size.

7. PROCEDURES FOR CHILLERS

a Balance water flow through each evaporator to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1 Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2 Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
3 Power factor if factory-installed instrumentation is furnished for measuring kilowatts.

4 Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
5 Capacity: Calculate in tons of cooling.
6 For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

8. CONTROLS VERIFICATION

a In conjunction with system balancing, perform the following:

1 Verify temperature control system is operating within the design limitations.
2 Confirm that the sequences of operation are in compliance with Contract Documents.
3 Verify that controllers are calibrated and function as intended.
4 Verify that controller set points are as indicated.
5 Verify the operation of lockout or interlock systems.
6 Verify the operation of valve and damper actuators.
7 Verify that controlled devices are properly installed and connected to correct controller.
8 Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9 Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

b Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

9. TOLERANCES

a Set HVAC system's airflow rates and water flow rates within the following tolerances:

1 Cooling-Water Flow Rate: Plus or minus 5 percent.

b Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

10. PROGRESS REPORTING

a Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

b Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

11. FINAL REPORT

a General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1 Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2 Include a list of instruments used for procedures, along with proof of calibration.
3 Certify validity and accuracy of field data.

b Final Report Contents: In addition to certified field-report data, include the following:

1 Pump curves.
2 Manufacturers' test data.
3 Field test reports prepared by system and equipment installers.
4 Other information relative to equipment performance; do not include Shop Drawings and Product Data.

c General Report Data: In addition to form titles and entries, include the following data:

1 Title page.
2 Name and address of the TAB specialist.
3 Project name.
4 Project location.
5 Engineer's name and address.
6 Contractor's name and address.
7 Report date.
8 Signature of TAB supervisor who certifies the report.
9 Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
10 Summary of contents including the following:

i Indicated versus final performance.
ii Notable characteristics of systems.
iii Description of system operation sequence if it varies from the Contract Documents.

11 Nomenclature sheets for each item of equipment.
12 Data for terminal units, including manufacturer's name, type, size, and fittings.
13 Notes to explain why certain final data in the body of reports vary from indicated values.
14 Test conditions for pump performance forms including the following:

i Conditions of strainers.
ii Other system operating conditions that affect performance.

d System Diagrams: Include schematic layouts of hydronic distribution systems. Present each system with single-line diagram and include the following:

1 Water flow rates.
2 Pipe and valve sizes and locations.
3 Balancing stations.
4 Position of balancing devices.

e Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1 Unit Data:

i Unit identification.
ii Location.
iii Service.
iv Make and size.
v Model number and serial number.
vi Water flow rate in gpm.
vii Water pressure differential in feet of head or psig.
viii Required net positive suction head in feet of head or psig.
ix Pump rpm.
x Impeller diameter in inches.
xi Motor make and frame size.
xii Motor horsepower and rpm.
xiii Voltage at each connection.
xiv Amperage for each phase.
xv Full-load amperage and service factor.
xvi Seal type.

2 Test Data (Indicated and Actual Values):

i Static head in feet of head or psig.
ii Pump shutoff pressure in feet of head or psig.
iii Actual impeller size in inches.
iv Full-open flow rate in gpm.
v Full-open pressure in feet of head or psig.
vi Final discharge pressure in feet of head or psig.
vii Final suction pressure in feet of head or psig.
viii Final total pressure in feet of head or psig.
ix Final water flow rate in gpm.
x Voltage at each connection.
xi Amperage for each phase.

f Instrument Calibration Reports:

1 Report Data:

i Instrument type and make.
ii Serial number.
iii Application.
iv Dates of use.
v Dates of calibration.

12. VERIFICATION OF TAB REPORT

a The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Owner.

b Engineer and Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

c If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

d If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

e If TAB work fails, proceed as follows:

1 TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2 If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3 If the second verification also fails, Owner and/or design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.

f Prepare test and inspection reports.

13. ADDITIONAL TESTS

a Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

b Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230719 - HVAC PIPING INSULATION

28GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section includes insulating the following HVAC piping systems:

1 Chilled-water piping, indoors and outdoors.

3. SUBMITTALS

a Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

b Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1 Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2 Detail attachment and covering of heat tracing inside insulation.
3 Detail insulation application at pipe expansion joints for each type of insulation.
4 Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5 Detail removable insulation at piping specialties.
6 Detail application of field-applied jackets.
7 Detail application at linkages of control devices.

c Qualification Data: For qualified Installer.

d Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

e Field quality-control reports.

4. QUALITY ASSURANCE

a Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

b Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1 Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2 Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

5. DELIVERY, STORAGE, AND HANDLING

a Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

6. COORDINATION

a Coordinate sizes and locations of supports, hangers, and insulation shields.

b Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

c Coordinate installation and testing of heat tracing.

7. SCHEDULING

a Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

b Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

29PRODUCTS

1. INSULATION MATERIALS

a Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

b Products shall not contain asbestos, lead, mercury, or mercury compounds.

c Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

d Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

e Mineral-Fiber, Preformed Pipe Insulation:

1 Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, [without factory-applied jacket] [with factory-applied ASJ] [with factory-applied ASJ-SSL]. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2. INSULATING CEMENTS

a Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

b Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

3. ADHESIVES

a Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
1 <Double click to insert sustainable design text for low emitting adhesives.>

b Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

c ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

d PVC Jacket Adhesive: Compatible with PVC jacket.

4. MASTICS

a Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

b Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1 Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2 Service Temperature Range: Minus 20 to plus 180 deg F.
3 Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4 Color: White.

c Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1 Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
2 Service Temperature Range: 0 to 180 deg F.
3 Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4 Color: White.

d Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1 Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
2 Service Temperature Range: Minus 50 to plus 220 deg F.
3 Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4 Color: White.

5. LAGGING ADHESIVES

a Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1 Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
2 Service Temperature Range: 0 to plus 180 deg F.
3 Color: White.

6. SEALANTS

a FSK and Metal Jacket Flashing Sealants:

1 Materials shall be compatible with insulation materials, jackets, and substrates.
2 Fire- and water-resistant, flexible, elastomeric sealant.
3 Service Temperature Range: Minus 40 to plus 250 deg F.
4 Color: Aluminum.

b ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1 Materials shall be compatible with insulation materials, jackets, and substrates.
2 Fire- and water-resistant, flexible, elastomeric sealant.
3 Service Temperature Range: Minus 40 to plus 250 deg F.
4 Color: White.

7. FACTORY-APPLIED JACKETS

a Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1 ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2 ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3 FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4 FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5 PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

8. FIELD-APPLIED JACKETS

a Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

b Metal Jacket:

1 Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

i Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
ii Finish and thickness are indicated in field-applied jacket schedules.
iii Moisture Barrier for Indoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.
iv Moisture Barrier for Outdoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.
v Factory-Fabricated Fitting Covers:

a Same material, finish, and thickness as jacket.
b Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
c Tee covers.
d Flange and union covers.
e End caps.
f Beveled collars.
g Valve covers.
h Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2 Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

i Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
ii Material, finish, and thickness are indicated in field-applied jacket schedules.

iii Moisture Barrier for Indoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.
iv Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
v Factory-Fabricated Fitting Covers:

a Same material, finish, and thickness as jacket.
b Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
c Tee covers.
d Flange and union covers.
e End caps.
f Beveled collars.
g Valve covers.
h Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

c Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

9. TAPES

a ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1 Width: 3 inches.
2 Thickness: 11.5 mils.
3 Adhesion: 90 ounces force/inch in width.
4 Elongation: 2 percent.
5 Tensile Strength: 40 lbf/inch in width.
6 ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

b FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1 Width: 3 inches.
2 Thickness: 6.5 mils.
3 Adhesion: 90 ounces force/inch in width.
4 Elongation: 2 percent.
5 Tensile Strength: 40 lbf/inch in width.
6 FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

c Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1 Width: 2 inches.
2 Thickness: 3.7 mils.
3 Adhesion: 100 ounces force/inch in width.
4 Elongation: 5 percent.
5 Tensile Strength: 34 lbf/inch in width.

10. SECUREMENTS

a Bands:

1 Wing seals are primarily used for fastening bands together. Closed seals are occasionally used for large, 84-inch- (2130-mm-) diameter applications and where fastening bands are used with springs. Wing seals are reusable; closed seals are not.
2 Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, ¾ inch wide.
3 Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide.
4 Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

b Wire: 0.062-inch soft-annealed, stainless steel.

30EXECUTION

1. EXAMINATION

a Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1 Verify that systems to be insulated have been tested and are free of defects.
2 Verify that surfaces to be insulated are clean and dry.
3 Proceed with installation only after unsatisfactory conditions have been corrected.

2. PREPARATION

a Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

b Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1 Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2 Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

c Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

d Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3. GENERAL INSTALLATION REQUIREMENTS

a Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

b Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

c Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

d Install insulation with longitudinal seams at top and bottom of horizontal runs.

e Install multiple layers of insulation with longitudinal and end seams staggered.

f Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

g Keep insulation materials dry during application and finishing.

h Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

i Install insulation with least number of joints practical.

j Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1 Install insulation continuously through hangers and around anchor attachments.
2 For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3 Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4 Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

k Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

l Install insulation with factory-applied jackets as follows:

1 Draw jacket tight and smooth.
2 Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3 Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.

i For below-ambient services, apply vapor-barrier mastic over staples.

4 Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5 Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

m Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

n Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

o Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

p For above-ambient services, do not install insulation to the following:

1 Vibration-control devices.
2 Testing agency labels and stamps.
3 Nameplates and data plates.
4 Manholes.
5 Handholes.
6 Cleanouts.

4. PENETRATIONS

a Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

b Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1 Seal penetrations with flashing sealant.
2 For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3 Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4 Seal jacket to wall flashing with flashing sealant.

c Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Provide required firestopping and fire-resistive joint sealers at penetrations.

5. GENERAL PIPE INSULATION INSTALLATION

a Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

b Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1 Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2 Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3 Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4 Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5 Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6 Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7 Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8 Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

c Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

d Install removable insulation covers at locations indicated. Installation shall conform to the following:

1 Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2 When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3 Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4 When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5 Finish exposed surfaces with a metal jacket.

6. INSTALLATION OF MINERAL-FIBER INSULATION

a Insulation Installation on Straight Pipes and Tubes:

1 Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2 Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3 For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4 For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

b Insulation Installation on Pipe Flanges:

1 Install preformed pipe insulation to outer diameter of pipe flange.
2 Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3 Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4 Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

c Insulation Installation on Pipe Fittings and Elbows:

1 Install preformed sections of same material as straight segments of pipe insulation when available.
2 When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

d Insulation Installation on Valves and Pipe Specialties:

1 Install preformed sections of same material as straight segments of pipe insulation when available.

2 When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3 Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4 Install insulation to flanges as specified for flange insulation application.

7. FIELD-APPLIED JACKET INSTALLATION

a Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1 Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2 Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3 Completely encapsulate insulation with coating, leaving no exposed insulation.

b Where FSK jackets are indicated, install as follows:

1 Draw jacket material smooth and tight.
2 Install lap or joint strips with same material as jacket.
3 Secure jacket to insulation with manufacturer's recommended adhesive.
4 Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5 Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

c Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

8. FINISHES

a Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below:

1 Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

i Finish Coat Material: Interior, flat, latex-emulsion size.

b Color: Final color as selected by Owner. Vary first and second coats to allow visual inspection of the completed Work.

c Do not field paint aluminum or stainless-steel jackets.

9. FIELD QUALITY CONTROL

a Perform tests and inspections.

b Tests and Inspections:

1 Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three (3) locations of straight pipe, three (3) locations of threaded fittings, three (3) locations of welded fittings, one (1) location of strainer, and three (3) locations of valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

c All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

10. PIPING INSULATION SCHEDULE, GENERAL

a Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

11. PIPING INSULATION SCHEDULE

a See Mechanical Construction Drawings for chilled water piping insulation specification.

b Provide new electric heat trace for all new and existing outdoor chilled water piping.

END OF SECTION 230719

SECTION 232113 - HYDRONIC PIPING

31GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section includes pipe and fitting materials and joining methods for the following:

1 Copper tube and fittings.
2 Steel pipe and fittings.
3 Joining materials.
4 Dielectric fittings.

3. SUBMITTALS

a Product Data: For each type of the following:

1 Pipe.
2 Fittings.
3 Joining materials.
4 Bypass chemical feeder.

b Delegated-Design Submittal:

1 Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
2 Locations of pipe anchors and alignment guides and expansion joints and loops.
3 Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
4 Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

c Coordination Drawings: Piping layout, 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 Other building services.
3 Structural members.

d Qualification Data: For Installer.

e Welding certificates.

f Field quality-control reports.

g Preconstruction Test Reports:

1 Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

4. QUALITY ASSURANCE

a Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

b Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1 Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
2 Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

32PRODUCTS

1. PERFORMANCE REQUIREMENTS

a Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1 Chilled-Water Piping: 150 at 73 deg F.

2. COPPER TUBE AND FITTINGS

a Drawn-Temper Copper Tubing: ASTM B 88, Type L.

b Wrought-Copper Unions: ASME B16.22.

3. STEEL PIPE AND FITTINGS

a Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

b Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.

c Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.

d Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.

e Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.

f Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

g Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1 Material Group: 1.1.
2 End Connections: Butt welding.
3 Facings: Raised face.

h Grooved Mechanical-Joint Fittings and Couplings:

1 Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
2 Couplings: Ductile- or malleable-iron housing and EPDM or nitrile gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

i Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

4. JOINING MATERIALS

a Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1 ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

i Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
ii Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

b Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

c Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

d Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

e Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

5. DIELECTRIC FITTINGS

a General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

b Dielectric Unions:

1 Description:

i Standard: ASSE 1079.
ii Pressure Rating: 125 psig minimum at 180 deg F.
iii End Connections: Solder-joint copper alloy and threaded ferrous.

c Dielectric Flanges:

1 Description:

i Standard: ASSE 1079.
ii Factory-fabricated, bolted, companion-flange assembly.
iii Pressure Rating: 125 psig minimum at 180 deg F.
iv End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

d Dielectric-Flange Insulating Kits:

1 Description:

i Nonconducting materials for field assembly of companion flanges.
ii Pressure Rating: 150 psig.
iii Gasket: Neoprene or phenolic.
iv Bolt Sleeves: Phenolic or polyethylene.
v Washers: Phenolic with steel backing washers.

e Dielectric Nipples:

1 Description:

i Standard: IAPMO PS 66.
ii Electroplated steel nipple, complying with ASTM F 1545.
iii Pressure Rating: 300 psig at 225 deg F.
iv End Connections: Male threaded or grooved.
v Lining: Inert and noncorrosive, propylene.

33EXECUTION

1. PIPING APPLICATIONS

a Chilled-water piping, aboveground, NPS 2-1/2 and smaller, shall be the following:

1 Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

b Chilled-water piping, aboveground, NPS 3 and larger, shall be the following:

1 Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints or Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

c Makeup-water piping installed aboveground shall be the following:

1 Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

2. PIPING INSTALLATIONS

a Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

b Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

c Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

d Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

e Install piping to permit valve servicing.

f Install piping at indicated slopes.

g Install piping free of sags and bends.

h Install fittings for changes in direction and branch connections.

i Install piping to allow application of insulation.

j Select system components with pressure rating equal to or greater than system operating pressure.

k Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

l Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

m Install piping at a uniform grade of 0.2 percent upward in direction of flow.

n Reduce pipe sizes using eccentric reducer fitting installed with level side up.

o Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

p Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

q Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

r Install shutoff valve immediately upstream of each dielectric fitting.

s Install all required expansion loops, expansion joints, anchors, and pipe alignment guides.

t Label all piping.

u Install sleeves for piping penetrations of walls, ceilings, and floors.

v Install sleeve seals for piping penetrations of concrete walls and slabs.

w Install escutcheons for piping penetrations of walls, ceilings, and floors.

3. DIELECTRIC FITTING INSTALLATION

a Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

b Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.

c Dielectric Fittings for NPS 2-1/2 and Larger: Use dielectric flange kits.

4. HANGERS AND SUPPORTS

a Comply with the following requirements for maximum spacing of supports.

b Provide all IBC required seismic restraints.

c Install the following pipe attachments:

1 Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2 Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3 Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

4 Spring hangers to support vertical runs.
5 Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6 On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

d Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1 NPS ¾: Maximum span, 7 feet.
2 NPS 1: Maximum span, 7 feet.
3 NPS 1-1/2: Maximum span, 9 feet.
4 NPS 2: Maximum span, 10 feet.
5 NPS 2-1/2: Maximum span, 11 feet.
6 NPS 3 and Larger: Maximum span, 12 feet.

e Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1 NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2 NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3 NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4 NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5 NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6 NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch
7 NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

f Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

5. PIPE JOINT CONSTRUCTION

a Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

b Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

c Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

d Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1 Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2 Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

e Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

f Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

g Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

6. CHEMICAL TREATMENT

a Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain the water characteristics specified on the Mechanical Contract Drawings.

7. FIELD QUALITY CONTROL

a Prepare hydronic piping according to ASME B31.9 and as follows:

1 Leave joints, including welds, uninsulated and exposed for examination during test.
2 Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3 Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4 Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5 Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

b Perform the following tests on hydronic piping:

1 Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2 While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3 Isolate expansion tanks and determine that hydronic system is full of water.
4 Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5 After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6 Prepare written report of testing.

c Perform the following before operating the system:

1 Open manual valves fully.
2 Inspect pumps for proper rotation.

3 Set makeup pressure-reducing valves for required system pressure.
4 Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5 Set temperature controls so all coils are calling for full flow.
6 Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7 Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232116 - HYDRONIC PIPING SPECIALTIES

34GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section includes special-duty valves and specialties for the following:

1 Hydronic specialty valves.
2 Air-control devices.
3 Strainers.
4 Connectors.

3. SUBMITTALS

a Product Data: For each type of the following:

1 Hydronic Specialty Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2 Air-control devices.
3 Strainers.
4 Connectors.

b Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

c Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

4. QUALITY ASSURANCE

a Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1 Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

35PRODUCTS

1. HYDRONIC SPECIALTY VALVES

a Bronze, Calibrated-Orifice, Balancing Valves:

1 Body: Bronze, ball or plug type with calibrated orifice or venturi.
2 Ball: Brass or stainless steel.
3 Plug: Resin.
4 Seat: PTFE.
5 End Connections: Threaded or socket.
6 Pressure Gage Connections: Integral seals for portable differential pressure meter.
7 Handle Style: Lever, with memory stop to retain set position.
8 CWP Rating: Minimum 125 psig.
9 Maximum Operating Temperature: 250 deg F.

b Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1 Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
2 Ball: Brass or stainless steel.
3 Stem Seals: EPDM O-rings.
4 Disc: Glass and carbon-filled PTFE.
5 Seat: PTFE.
6 End Connections: Flanged or grooved.
7 Pressure Gage Connections: Integral seals for portable differential pressure meter.
8 Handle Style: Lever, with memory stop to retain set position.
9 CWP Rating: Minimum 125 psig.
10 Maximum Operating Temperature: 250 deg F.

c Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.

1 Body: Bronze or brass.
2 Disc: Glass and carbon-filled PTFE.
3 Seat: Brass.
4 Stem Seals: EPDM O-rings.
5 Diaphragm: EPT.
6 Low inlet-pressure check valve.
7 Inlet Strainer: Stainless stee, removable without system shutdown.
8 Valve Seat and Stem: Noncorrosive.
9 Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

d Diaphragm-Operated Safety Valves: ASME labeled.

1 Body: Bronze or brass.
2 Disc: Glass and carbon-filled PTFE.
3 Seat: Brass.
4 Stem Seals: EPDM O-rings.
5 Diaphragm: EPT.
6 Wetted, Internal Work Parts: Brass and rubber.

7 Inlet Strainer: Stainless steel, removable without system shutdown.
8 Valve Seat and Stem: Noncorrosive.
9 Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

e Automatic Flow-Control Valves:

1 Body: Brass or ferrous metal.
2 Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
3 Combination Assemblies: Include bronze or brass-alloy ball valve.
4 Identification Tag: Marked with zone identification, valve number, and flow rate.
5 Size: Same as pipe in which installed.
6 Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
7 Minimum CWP Rating: 175 psig.
8 Maximum Operating Temperature: 250 deg.

2. AIR-CONTROL DEVICES

a Manual Air Vents:

1 Body: Bronze.
2 Internal Parts: Nonferrous.
3 Operator: Screwdriver or thumbscrew.
4 Inlet Connection: NPS 1/2.
5 Discharge Connection: NPS 1/8.
6 CWP Rating: 150 psig.
7 Maximum Operating Temperature: 225 deg F.

b Automatic Air Vents:

1 Body: Bronze or cast iron.
2 Internal Parts: Nonferrous.
3 Operator: Noncorrosive metal float.
4 Inlet Connection: NPS 1/2.
5 Discharge Connection: NPS 1/4.
6 CWP Rating: 150 psig.
7 Maximum Operating Temperature: 240 deg F.

3. STRAINERS

a Y-Pattern Strainers:

1 Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2 End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3 Strainer Screen: Stainless-steel, 60-mesh strainer, or perforated stainless-steel basket.
4 CWP Rating: 125 psig.

b Basket Strainers:

1 Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2 End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3 Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4 CWP Rating: 125 psig.

c T-Pattern Strainers:

1 Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2 End Connections: Grooved ends.
3 Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4 CWP Rating: 750 psig.

4. CONNECTORS

a Stainless-Steel Bellow, Flexible Connectors:

1 Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2 End Connections: Threaded or flanged to match equipment connected.
3 Performance: Capable of 3/4-inch misalignment.
4 CWP Rating: 150 psig.
5 Maximum Operating Temperature: 250 deg F.

36EXECUTION

1. VALVE APPLICATIONS

a Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

b Install calibrated-orifice, balancing valves at each branch connection to return main.

c Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

d Install check valves at each pump discharge and elsewhere as required to control flow direction.

e Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

f Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

2. HYDRONIC SPECIALTIES INSTALLATION

a Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

b Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

END OF SECTION 232116

SECTION 232123 - HYDRONIC PUMPS

37GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Split-coupled, horizontally mounted, in-line centrifugal pumps.

3. DEFINITIONS

a Buna-N: Nitrile rubber.

b EPT: Ethylene propylene terpolymer.

4. SUBMITTALS

a Product Data: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

b Shop Drawings: For each pump.

1 Show pump layout and connections.
2 Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
3 Include diagrams for power, signal, and control wiring.

c Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

5. MAINTENANCE MATERIAL SUBMITTALS

a Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1 Mechanical Seals: One (1) spare mechanical seal for each pump.

38PRODUCTS

1. SPLIT COUPLED, HORIZONTALLY MOUNTED, IN-LINE CENTRIFUGAL PUMPS

a Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally.

b Pump Construction:

1 Pump volute or casings shall be constructed of class 30 cast iron. The pump casing shall have equal suction and discharge ports. The pump casing shall be drilled and tapped for gauge ports at both the suction and discharge flanges and for drain port at the bottom of the casing.
2 Provide manufacturer's optional bronze wear ring fitted to the casing.
3 The pump shall be capable of being serviced without disturbing system piping.
4 The impeller shall be bronze and hydraulically balanced by either back vanes or balancing holes. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key.
5 The pump cover shall be machined to provide a balance chamber from the close tolerance between the back impeller hub and the cover. The cover shall be fitted with a bronze throttle bushing as standard. The cover shall be designed to provide maximum flexibility of mechanical shaft seals and flush glands.
6 The pump seal shall be EPT Ceramic rated to 250 degrees °F
7 The pump shall have a factory installed vent/flush line to insure removal of trapped air and mechanical seal cooling. The vent/flush line shall run from the seal chamber to the pump discharge.
8 For extended seal life, provide manufacturer's optional filter or sediment separator, which is incorporated in the vent/flush line.

c Motor: Single speed and rigidly mounted to pump casing.

1 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.
2 The pump shall be coupled to a high-efficiency NEMA rated motor designed for continuous operation and readily removable for servicing.
3 The pump shaft shall be of stainless steel and incorporate a suitable internal or external seal. The pump and motor shaft must be connected with circular keys capable of transmitting axial loads to the motor bearings.
4 The motor shall be connected to the pump shaft through a high tensile aluminum split style coupling.
5 Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

2. PUMP SPECIALTY FITTINGS

a Triple-Duty Valve:

1 Equal to Bell & Gossett Model 3DS-4B.
2 Straight pattern.
3 175 psig pressure rating.
4 Body: Cast-iron with brass seat.
5 Disc: Brass with EPDM Seat Insert
6 Stem: Stainless Steel
7 Spring: Stainless Steel
8 Packing: Teflon-Graphite (Asbestos-free)
9 Gasket: Non-Asbestos
10 Readout Valve: Brass with EPT insert, check valve & gasket
11 Drain plug and bronze-fitted shutoff, balancing, and check valve features.
12 Brass gage ports with integral check valve and orifice for flow measurement.
13 Flanged connections.

39EXECUTION

1. EXAMINATION

a Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

b Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

c Examine foundations and supports for suitable conditions where pumps are to be installed.

d Proceed with installation only after unsatisfactory conditions have been corrected.

2. PUMP INSTALLATION

a Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

b Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

c Equipment Mounting: Install in-line pumps with floor mounted pipe and pump supports of size required to support weight of in-line pumps.

3. CONNECTIONS

a Drawings indicate general arrangement of piping, fittings, and specialties.

b Where installing piping adjacent to pump, allow space for service and maintenance.

c Connect piping to pumps. Install valves that are same size as piping connected to pumps.

d Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

e Install triple-duty valve on discharge side of pumps.

f Install shutoff valve on suction side of pumps.

g Install pressure gages on pump suction and discharge or at integral pressure-gage tapping in configuration shown on Mechanical Drawings.

h Ground pump in accordance with NEC requirements and according to Section 260526 "Grounding and Bonding for Electrical Systems."

i Connect wiring in accordance with NEC requirements and according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

4. STARTUP SERVICE

a Perform startup service.

1 Complete installation and startup checks according to manufacturer's written instructions.
2 Check piping connections for tightness.
3 Clean strainers in chilled water piping system.
4 Perform the following startup checks for each pump before starting:

i Verify bearing lubrication.
ii Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
iii Verify that pump is rotating in the correct direction.

5 Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6 Start motor.
7 Open discharge valve slowly.

5. DEMONSTRATION

a Train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123

SECTION 236423 - AIR-COOLED SCROLL WATER CHILLERS

40GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section includes packaged, air-cooled, electric-motor-driven, scroll water chillers.

3. DEFINITIONS

a BAS: Building automation system.

b COP: Coefficient of performance. The ratio of the rate of heat removal to the rate of energy input using consistent units for any given set of rating conditions.

c DDC: Direct digital control.

d EER: Energy-efficiency ratio. The ratio of the cooling capacity given in Btu/h to the total power input given in watts at any given set of rating conditions.

e GFI: Ground fault interrupt.

f IPLV: Integrated part-load value. A single-number part-load efficiency figure of merit for a single chiller calculated per the method defined by AHRI 550/590 and referenced to AHRI standard rating conditions.

g I/O: Input/output.

h kW/Ton: The ratio of total power input of the chiller in kilowatts to the net refrigerating capacity in tons at any given set of rating conditions.

i NPLV: Nonstandard part-load value. A single number part-load efficiency figure of merit for a single chiller calculated per the method defined by AHRI 550/590 and intended for operating conditions other than the AHRI standard rating conditions.

j SCCR: Short-circuit current rating.

k TEAO: Totally enclosed air over.

l TENV: Totally enclosed nonventilating.

4. SUBMITTALS

a Product Data: For each type of product.

1 Include refrigerant, rated capacities, operating characteristics, and furnished specialties and accessories.
2 Performance at ARI standard conditions and at conditions indicated.
3 Performance at ARI standard unloading conditions.
4 Minimum evaporator flow rate.
5 Refrigerant capacity of water chiller.
6 Oil capacity of water chiller.
7 Fluid capacity of evaporator.
8 Characteristics of safety relief valves.
9 Force and moment capacity of each piping connection.

b Shop Drawings: Complete set of manufacturer's prints of water chiller assemblies, control panels, sections and elevations, and unit isolation. Include the following:

1 Assembled unit dimensions.
2 Weight and load distribution.
3 Required clearances for maintenance and operation.
4 Size and location of piping and wiring connections.
5 Diagrams for power, signal, and control wiring.

c Coordination Drawings:

1 Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

i Structural supports.
ii Piping roughing-in requirements.
iii Wiring roughing-in requirements, including spaces reserved for electrical equipment.
iv Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

2 Coordination drawings showing plan, section and elevation views, drawn to ¼” scale or greater.
3 Each view to show screened background with the following:

i Column grids, beams, columns, and concrete housekeeping pads.
ii Layout with walls, floors, and roofs, including each room name and number.
iii Equipment and products of other trades that are located in vicinity of chillers and part of final installation, such as plumbing systems.

d Certificates: For certification required in "Quality Assurance" Article.

e Seismic Qualification Certificates: For water chillers, accessories, and components, from manufacturers.

1 Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2 Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3 Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

f Installation instructions.

g Source quality-control reports.

h Startup service reports.

i Sample Warranty: For special warranty.

j Operation and Maintenance Data: For each water chiller to include in emergency, operation, and maintenance manuals.

k Spare Parts List: Recommended spare parts list with quantity for each.

l Touchup Paint Description: Detailed description of paint used in application of finish coat to allow for procurement of a matching paint.

m Instructional Videos: Including those that are prerecorded and those that are recorded during training.

5. QUALITY ASSURANCE

a ARI Compliance: Rate chiller according to ARI 550.

b ASHRAE Compliance: Conform to ASHRAE 15 for chiller design, construction, leak testing, and installation.

c ASME Compliance: Comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, for construction and testing of evaporator and condenser pressure vessels. Label evaporator and condenser with ASME mark.

d NEC Compliance: Comply with applicable NEC requirements for electrical power and control wiring.

e UL 1995 -- Standard for Heating and Cooling Equipment.

f Manufactured facility to be ISO 9001.

g Factory Functional Test: The chiller shall be pressure tested, evacuated and fully charged with HFC-410A refrigerant and oil. In addition, a factory functional test to verify correct operation by cycling condenser fans, closing compressor contacts and reading data points from temperature and pressure sensors.

h Chiller manufacturer shall have a factory trained and supported service organization that is within a 75 mile radius of the site.

6. DELIVERY, STORAGE, AND HANDLING

a Ship water chiller from the factory fully charged with refrigerant and filled with oil.

b Package water chiller for export shipping.

7. WARRANTY

a Warranty: Manufacturer agrees to repair or replace any component of water chiller that fails in materials or workmanship within two (2) years beginning from date of project's substantial completion. Warranty covers full parts and labor costs.

b Special Warranty: Manufacturer agrees to repair or replace components of water chiller that fails in materials or workmanship within specified warranty period.

1 Extended warranties include, but are not limited to, the following:

i Complete chiller including refrigerant and oil charge.
ii Complete compressor and drive assembly including refrigerant and oil charge.
iii Refrigerant and oil charge.

a Loss of refrigerant charge for any reason due to manufacturer's product defect and product installation.

iv Parts and labor.

2 Warranty Period: Five (5) years from date of Substantial Completion.

41PRODUCTS

1. PERFORMANCE REQUIREMENTS

a Seismic Performance: Scroll water chillers shall withstand the effects of earthquake motions determined according to 2015 IBC as adopted by New Jersey.

1 The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

b Site Altitude: Chiller shall be suitable for altitude at which installed without affecting performance indicated. Make adjustments to affected chiller components to account for site altitude.

c Performance Tolerance: Comply with the following in lieu of AHRI 550/590:

1 Allowable Capacity Tolerance: Zero (0) percent.
2 Allowable Full-Load Energy Efficiency Tolerance: Zero (0) percent.
3 Allowable Part-Load Energy Efficiency Tolerance: Zero (0) percent.

d AHRI Rating: Rate water chiller performance according to requirements in AHRI 550/590.

e ASHRAE Compliance: ASHRAE 15 for safety code for mechanical refrigeration.

f ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

g ASME Compliance: Fabricate and stamp water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.

h Comply with NFPA 70.

i Comply with requirements of UL 1995, "Heating and Cooling Equipment," and include label by a qualified testing agency showing compliance.

j Operation Following Loss of Normal Power:

1 Equipment, associated factory- and field-installed controls, and associated electrical equipment and power supply connected to backup power system shall automatically return equipment and associated controls to the operating state occurring immediately before loss of normal power without need for manual intervention by an operator when power is restored either through a backup power source, or through normal power if restored before backup power is brought on-line.
2 See drawings for equipment served by backup power systems.
3 Provide means and methods required to satisfy requirement even if not explicitly indicated.

k Outdoor Installations:

1 Chiller shall be suitable for outdoor installation indicated. Provide adequate weather protection to ensure reliable service life over a twenty five (25) year period with minimal degradation due to exposure to outdoor ambient conditions.
2 Chillers equipped to provide safe and stable operation while achieving performance indicated when operating at extreme outdoor temperatures encountered by the installation. Review historical weather database and provide equipment that can operate at extreme outdoor temperatures recorded over past thirty (30) year period.

2. MANUFACTURED UNIT

a Description: Factory-assembled, single piece chassis, air-cooled liquid chiller. Packaged chiller consists of four scroll compressors, an evaporator or cooler, an air cooled condenser, safety controls, and operational controls. Contained within the package shall be all factory wiring, piping, controls, pumping packages, piping, piping specialties and HFC-410A refrigerant charge.

3. REFRIGERANT

a Material: HFC-410A; provide full operating charge of refrigerant and oil.

1 Refrigerant Circuit: Provide refrigerant charging port.

b Units shall be provided with two (2) independent refrigerant circuits.

4. COMPRESSORS

a Fully hermetic scroll type compressors with R410A optimized and dedicated scroll profile.

b Statically and dynamically balance rotating parts.

c Provide oil lubrication system with oil charging valve and oil filter to ensure adequate lubrication during starting, stopping, and normal operation.

d Direct drive motor cooled by suction gas with only three major moving parts and a completely enclosed compression chamber which leads to increased efficiency.

e Each compressor will have crankcase heaters installed and properly sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles.

5. STARTING

a Furnish with unit-mounted starter. Compressor motor power factor shall be .90 or greater. If the compressor motor power factor is less than .90, power factor correction capacitors must be installed.

6. MOTOR

a Refrigerant-cooled, semihermetic motor with the following features:

1 Three-phase motor overload protection.
2 Current overload protection.

7. EVAPORATOR

a The evaporator shall be a high efficiency, brazed plate-to-plate type heat exchanger consisting of parallel plates. Braze plates shall be stainless steel with copper braze material.

b The evaporator shall be protected with an etched foil heater and insulated with 3/4 inch insulation. . Insulate evaporator, suction lines, and other surfaces where condensation might occur. This combination shall provide freeze protection down to -20F ambient temperatures while the heater is powered. Contractor shall provide separate power to energize heater and protect evaporator while chiller is disconnected.

c The water side working pressure shall be rated at 150 psig and tested at 1.5 times maximum allowable water side working pressure.

d The refrigerant side working presure shall be rated at 460 psig (29.6 bars) and tested at 1.1 maximum allowable refrigerant side working pressure.

e Provide water drain connection, vent and fittings for factory installed leaving water temperature control and low temperature cutout sensors.

8. AIR-COOLED CONDENSER

a Description: Factory assembled, wired, and tested; and consisting of casing, air-cooled condenser coils, fans, and controls integrated with compressor operation.

b Casing: Weatherproof, constructed of hot-dip galvanized steel with factory-painted finish.

c Fans: Low sound fans, propeller type, statically and dynamically balanced. Fan assembly shall be either painted or zinc coated steel. Fan guard shall be either PVC, chrome or zinc coated.

d Fan Discharge Arrangement: Vertical.

e Fan Motor: Direct drive, TEFC, with bearings permanently lubricated, and having built-in current- and thermal-overload protection. Low speed fan motors shall be three-phase with permanently lubricated ball bearings and individually protected by circuit breakers

Condenser Coil: The condenser coils shall consist of copper tubes mechanically bonded into plate-type aluminum fins. A subcooling coil shall be an integral part of the main condenser coil. Coils shall be provided manufacturer’s optional "Complete Coat" corrosion protection finish providing condensing coils’ aluminum fins with a seashore grade coating.

f The maximum allowable working pressure of the condenser shall be 650 psig. The condensers shall be factory proof and leak tested at 715 psig.

g Provide coil protection for shipping. Entire condenser coil shall be covered with heavy plastic to prevent inadvertent damage to the coil prior to operation.

h Unit shall be capable of starting and running at outdoor ambient temperatures from 0°F to 125F for all sizes.

9. ENCLOSURES

a House components in 12 gauge galvanized steel frame and mounted on welded structural steel base. Hot-dip galvanized steel frame coating shall be Underwriters Laboratories Inc. (UL) recognized as G90-U, UL guide number DTHW2.

b Unit panels and control panels shall be finished with a baked on powder paint. Control panel doors shall have door stays. Paint system shall meet the requirements for outdoor equipment of Federal Government Agencies.

c Panel shall provide single point of electrical connection for chiller with circuit breaker disconnecting means. Mount starters and TB's in weatherproof panel provided with full

opening access doors. Provide lockable through-the-door disconnect operating handle or circuit breaker switch external to panel and clearly visible from outside of unit indicating if power is on or off. Provide 10,000 Amp Short Circuit Current Rating.

d Casings fabricated from steel that do not have a Zinc coating conforming to ASTM A 123 or ASTM A525 shall be treated for the prevention of corrosion with a factory coating or paint system. The coating or paint system shall withstand 500 hours in a salt-spray fog test in accordance with ASTM B 117. Each specimen shall have a standard scribe mark as defined in ASTM D 1654. Upon completion of exposure, the coating or paint system shall be evaluated and rated in accordance with procedures A and B of ASTM D 1654. The rating of failure at the scribe mark shall be not less than six (average creepage not greater than 1/8 inch). The rating of the unscribed area shall not be less than ten (no failure). Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimens with respect to materials, conditions of application, and dry-film thickness.

10. REFRIGERANT CIRCUIT

a All units shall have 2 refrigeration circuits to provide redundancy, each with two manifolded compressors on each circuit. Single refrigerant circuit chillers are not acceptable.

b Each refrigerant circuit shall include a filter drier, electronic expansion valve with site glass, liquid line service valves and a complete operating charge of both refrigerant HFC-410A and compressor oil.

c Each refrigerant circuit shall include a discharge line service valve to allow the refrigerant to be isolated in the condenser.

d Capacity Modulation: Capacity modulation shall be achieved by turning compressors on and off. The unit shall have a minimum of four capacity stages.

e Provide for each refrigerant circuit:

1 Liquid line shutoff valve.
2 Filter (replaceable core type).
3 Liquid line sight glass.
4 Electronic or thermal expansion valve sized for maximum operating pressure.
5 Charging valve.
6 Discharge and oil line check valves.
7 Compressor suction and discharge service valves.
8 High side pressure relief valve.
9 Full operating charge of HFC-410A and oil.

11. CHILLED WATER CIRCUIT

a Chilled fluid circuit shall be rated for 150 psig working pressure.

b Proof of flow switch shall be provided by the equipment manufacturer and installed the correct number of pipe diameters from any elbow and in the correct orientation.

c Units with brazed plate evaporators shall have a water strainer that is factory provided. It shall be installed with a blowdown valve to facilitate periodic cleaning of the strainer to prevent it from becoming clogged.

12. CHILLER OPTIONS

a Furnish chillers with the following features:

1 Control transformer.
2 Microprocessor based control system.
3 Weatherproof, NEMA 3R control panel enclosure.
4 Circuit Breaker.
5 Unit-mounted GFCI receptacle.
6 Water flow switch, factory provided, field installed.
7 Permanent guards and screens are to be provided to protect the condenser coils from a hail storm.
8 4” inline strainer for chilled water inlet.
9 High humidity insulation.
10 Sound attenuation package.
11 See Mechanical Drawings for additional specified chiller items.

13. ELECTRICAL

a Factory installed and wired, and functionally tested at factory before shipment.

b Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to water chiller.

c House in a unit-mounted, NEMA 250, Type 3R enclosure with hinged access door with lock and key or padlock and key.

d Wiring shall be numbered and color-coded to match wiring diagram.

e Factory wiring shall be located outside of an enclosure in a PVC raceway. Terminal connections shall be made with not more than a 24-inch length of liquidtight or PVC coated flexible metallic conduit.

f Field power interface shall be to circuit breaker. Minimum SCCR according to UL 508 shall be as required by electrical power distribution system, but not less than 10,000A.

g Each motor shall have branch power circuit and controls with one of the following disconnecting means having SCCR to match main disconnecting means:

1 UL 489, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

h Each motor shall have overcurrent protection.

i Overload relay sized according to UL 1995, or an integral component of water chiller control microprocessor.

j Phase-Failure and Undervoltage: Solid-state sensing with adjustable settings.

k Power Factor Correction: Capacitors to correct power factor to .90 at full load.

l Controls Transformer: Unit-mounted transformer with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.

m Control Relays: Auxiliary and adjustable time-delay relays, or an integral to water chiller microprocessor.

n Service Receptacle:

1 Unit-mounted, 120-V GFI duplex receptacle.
2 Power receptacle from chiller internal electrical power wiring.

o Indicate the following for water chiller electrical power supply:

1 Current, phase to phase, for all three phases.
2 Voltage, phase to phase and phase to neutral for all three phases.
3 Three-phase real power (kilowatts).
4 Three-phase reactive power (kilovolt amperes reactive).
5 Power factor.
6 Running log of total power versus time (kilowatt hours).
7 Fault log, with time and date of each.

14. CONTROLS, GENERAL

a The microprocessor-based unit controller shall be factory-installed and functionally tested at factory before shipment.

b Standalone, microprocessor based, with all memory stored in nonvolatile memory so that reprogramming is not required on loss of electrical power.

c Enclosure: Share enclosure with electrical power devices.

d The unit display shall provide the following data:

1 Water and air temperatures
2 Refrigerant levels and temperatures
3 Flow switch status
4 Compressor starts and run times
5 Date and time.
6 Operating or alarm status.
7 Operating hours.
8 Outside-air temperature.
9 Temperature and pressure of operating set points.
10 Chilled-water entering and leaving temperatures.

11 Refrigerant pressures in evaporator and condenser.
12 Saturation temperature in evaporator and condenser.
13 No cooling load condition.
14 Elapsed time meter (compressor run status).
15 Pump status.
16 Anti-recycling timer status.
17 Percent of maximum motor amperage.
18 Current-limit set point.
19 Number of compressor starts.
20 Alarm history with retention of operational data before unit shutdown.

e The unit controller shall provide chilled water reset based on return water as an energy saving option.

f Control Functions:

1 Manual or automatic startup and shutdown time schedule.
2 Capacity control based on evaporator leaving-fluid temperature.
3 Capacity control compensated by rate of change of evaporator entering-fluid temperature.
4 Chilled-water entering and leaving temperatures, control set points, and motor load limit.
5 Current limit and demand limit.
6 External water chiller emergency stop.
7 Anti-recycling timer.
8 Automatic lead-lag pump switching.

g Manual-Reset Safety Controls: The following conditions shall shut down water chiller and require manual reset if one or more of the following safeties has been breached:

1 Low evaporator refrigerant temperature and/or pressure.
2 Low chilled-water temperature.
3 High condenser refrigerant pressure.
4 High or low oil pressure.
5 High oil temperature.
6 Loss of chilled-water flow.
7 Motor current overload.
8 High compressor discharge temperature.
9 Electronic distribution faults: phase loss, phase imbalance, or phase reversal.
10 Control device failure.

h Unit shall be shipped with factory control and power wiring installed.

15. TEMPERATURE CONTROLS

a HVAC Controls: Furnish appurtenances to monitor and control chilled water set point and to monitor chiller alarms from building's BMS. Chiller control panel shall be provided with all necessary devices such that chiller is able to send and receive signals from the building's existing BMS.

b BMS System Interface: Chiller's DDC control panel shall be interfaced into the Stillwater Complex's existing Johnson Controls Building Management System (BMS). Provide factory-

install hardware and software to enable system to monitor, control, and display chiller status and alarms.

1 Hardwired I/O Points:

i Monitoring: On/off status, common trouble alarm, electrical power demand (kilowatts), electrical power consumption (kilowatt hours).
ii Control: On/off operation, Chilled-water discharge temperature set-point adjustment, electrical power demand limit.

2 Communication Interface: ASHRAE 135 (BACnet), or Johnson Controls-accepted open-protocol communication interface shall enable control system operator to remotely control and monitor the water chiller from an operator workstation. Control features and monitoring points displayed locally at water chiller control panel shall be available through DDC system for HVAC.

c Factory-installed wiring outside of enclosures shall be in NFPA 70-complaint raceway. Make terminal connections with liquidtight or flexible metallic conduit.

16. SAFETY CONTROLS

a Automatically reset controls to perform the following functions:

1 High discharge pressure
2 Loss of refrigerant.
3 Freeze protection controls.
4 Low refrigerant pressure.
5 Water-Flow Interlock: Vapor proof water-flow switch to prevent starting of compressor without chilled and condenser water flow.

17. POWER CONTROLS

a Control Panel: Mount starters in a UL1995 rated panel for outdoor use, unit mounted, factory wired with a single-point connection, with the following power-control options:

1 External-overload protection.
2 Control circuit fuse.
3 Power terminal block.
4 Lockout restart timer.

b Circuit Breaker.

c The starter shall be across-the-line configuration, factory-mounted and fully pre-wired to the compressor motor(s) and control panel.

d A control power transformer shall be factory-installed and factory-wired to provide unit control power.

e Control panel shall be dead front construction for enhanced service technician safety.

18. SOURCE QUALITY CONTROL

a Verification of Performance: Test chiller before shipment. Rate chiller according to ARI 550, "Standard for Centrifugal or Rotary Water-Chilling Packages." Provide a written report indicating Integrated Part-Load Value (IPLV) at ARI standard conditions or Application Part-Load Value (APLV) and test conditions.

19. CAPACITIES AND CHARACTERISTICS

a Capacity: As scheduled on project's Mechanical Drawings.

20. SOURCE QUALITY CONTROL

a Perform functional test of water chillers before shipping.

b Verification of Performance: Test each chiller before shipment. Rate each chiller according to ARI 550, "Standard for Centrifugal or Rotary Water-Chilling Packages." Provide a written report indicating Integrated Part-Load Value (IPLV) at ARI standard conditions or Application Part-Load Value (APLV) and test conditions.

1 Test the following conditions:

i Design conditions indicated.
ii AHRI 550/590 part-load points.

c Factory test and inspect evaporator according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Stamp with ASME label.

d For water chillers located outdoors, rate sound power level according to AHRI 370 procedure.

42EXECUTION

1. EXAMINATION

a Examine areas to receive chillers for compliance with installation tolerances and other conditions affecting performance and maintenance of chillers.

b Examine proposed route of moving chillers into place and verify that it is free of interferences.

c Verify piping roughing-in locations.

d Verify branch circuit wiring suitability. Do not proceed with installation until unsatisfactory conditions have been corrected.

2. INSTALLATION

a Install chiller according to manufacturer's written instructions.

b Coordinate sizes and locations of base with actual equipment provided. Cast anchor-bolt inserts into concrete base.

c Install water chiller on support structure indicated.

d Equipment Mounting:

1 Install water chiller on cast-in-place concrete equipment bases.

e Install chiller plumb and level, and anchor.

f Maintain manufacturer's recommended clearances for service and maintenance.

g Install piping connections maintaining clearances for service and maintenance of chiller.

h Install flange connections at chiller.

i Install flexible pipe connections for chiller.

j Install shutoff valves at chiller inlet and outlet connections.

k Maintain manufacturer's recommended clearances for service and maintenance and as required by governing code.

l Install separate devices furnished by manufacturer and not factory installed.

3. ELECTRICAL CONNECTIONS

a Refer to Division 26 Sections for wiring devices, wires and cables, and electrical installation requirements.

b Install and connect remote flow switches and remote chiller control panel.

c Ground equipment.

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

4. CONTROLS CONNECTIONS

a Install control and electrical power wiring to field-mounted control devices.

b Connect control wiring between chiller and the chilled water pumps' starters to interlock operation as required to provide a complete and functioning system.

c Connect control wiring between chiller control interface and building's BMS for remote monitoring and control of chillers.

d Provide nameplate on face of chiller control panel indicating control equipment designation serving chiller and the I/O point designation for each control connection. Nameplate shall be laminated phenolic layers of black with engraved white letters at least 1/2 inch high.

5. FIELD QUALITY CONTROL

a Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise field assembly of components and installation of chiller, including piping and electrical connections, and to report results in writing.

1 Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

6. CLEANING

1 Clean finishes to remove dust and dirt.
2 Touch up scratches in unfinished surfaces to restore corrosion resistance.
3 Touch up scratches in finished surfaces to restore finish.

7. STARTUP AND DEMONSTRATION SERVICES

a Startup Services: Engage the Scroll Chiller Manufacturer’s Factory-Authorized Service Representative to provide startup services and to demonstrate and train Owner's maintenance personnel as specified below. Submit qualifications (curriculum vitae) for proposed training personnel to the Engineer for review and approval.

1 Provide twenty four (24) total hours of training to Owner's maintenance personnel on procedures and schedules related to startup, shutdown, troubleshooting, servicing, and preventive maintenance. Provide training manual including all necessary literature and instructions for operation of the chiller, pumping skid and control system. A portion of the training to be in a classroom setting and the balance to be hands-on with the equipment. Video record the training sessions and provide electronic copy to Owner.
2 Review data in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
3 Schedule training with Owner, through Engineer, with at least 7 days' advance notice.

b Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.

c Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1 Verify that refrigerant charge is sufficient and water chiller has been leak tested.
2 Verify that pumps are installed and functional.
3 Verify that thermometers and gages are installed.
4 Operate water chiller for run-in period.
5 Check bearing lubrication and oil levels.
6 Verify proper motor rotation.

7 Verify and record performance of chilled water flow and low-temperature interlocks.
8 Verify and record performance of water chiller protection devices.
9 Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

d Visually inspect chiller for damage before starting. Repair or replace damaged components, including insulation. Do not start chiller until damage that is detrimental to operation has been corrected.

e Prepare a written startup report that records results of tests and inspections.

END OF SECTION 236423

SECTION 260010 - ELECTRICAL GENERAL REQUIREMENTS

43GENERAL

1. RELATED DOCUMENTS

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

2. SCOPE OF WORK

a Coordinate all work in this Division with all related trades.

b Furnish all materials, equipment, devices, supplies, transportation and labor, and perform all work necessary in the installation of all electrical work, complete and in operating condition.

c Examine all drawings and specifications and determine work to be performed by the Electrical Contractor and other trades. Provide the type and quantity of electrical materials, devices and equipment necessary to complete this work and place all systems in proper operation, tested and ready for use.

d Work Included: In general, the electrical work shall consist of, but not be limited to, the following:

1 All electrical work identified on project's electrical bid drawings and in project's technical specifications.
2 Incidental items not indicated on the bid drawings, not mentioned in the bid technical specifications, which belong to the work described, or are required to provide a complete system, shall be provided as though called out here in every detail.
3 Contractor shall acquire all permits and Owner shall pay all fees as may be necessary to perform the specified work.

e Line voltage electrical work related to the HVAC and Plumbing Trades shall be included under the Electrical Section of the Work. Coordinate all required line voltage work with the Mechanical and Plumbing Contractors.

f All low voltage electrical work shall be performed by a licensed Electrician. Electrical Contractor shall be responsible for all low-voltage work required for this project with the exception of only low-voltage automatic controls of HVAC systems. Electrical Contractor shall be responsible to coordinate with all other Contractors the low-voltage system requirements of the project.

g Work Related to other Electrically Operated Equipment.

1 Provide all electrical line voltage work required to provide electrical service and connection of electrically operated and/or controlled equipment, devices and systems furnished by other trades and specified in other trade sections of work. Examine all drawings and specifications and manufacturer's wiring diagrams and recommendations of other trades, particularly, but not limited to, equipment provided in the general construction, mechanical and plumbing contracts.

h Work includes, but is not limited to, the following scope:

1 The Contractor work includes the demolition of two (2) existing natural gas fire outdoor chillers and associated indoor pump, indoor and outdoor piping, fittings, valves, heat trace, appurtenances, etc., serving the Stillwater Complex in

Northfield, NJ, and replacing the chillers with one (1) new packaged outdoor scroll centrifugal chiller, two (2) new indoor chilled water pumps, new piping, fittings, valves, heat trace, pipe insulation, controls, etc., as indicated on the project's Contract Drawings and in the project's Technical Specifications.

2 Miscellaneous related work includes, but is not limited to, the installation of associated electrical work as indicated on the project's Contract Drawings and in the project's Technical Specifications.

3 Contractor shall perform all necessary trenching, excavation, backfilling, and restoration work for installing new electrical power feeders to new outdoor chiller, chiller heater, chilled water piping heat trace, outdoor receptacle, control wiring, etc., as indicated on the project's Contract Drawings and in the project's Technical Specifications.

4 Contractor shall perform the demolition and removal of all mechanical and electrical items shown on the project's Contract Drawings and Technical Specifications including, but not limited to the two (2) existing outdoor chillers, one (1) concrete pad, two (2) indoor chilled water inline pumps, chilled water and natural gas piping, pipe fittings, valves, heat trace, pipe insulation, electrical feeders, etc. Contractor shall coordinate with the County and turn over to County any item shown to be demolished and removed which the County may want to keep. Work includes the permanent capping of existing natural gas piping of which a portion is to be demolished and removed.

5 Contractor shall be responsible to modify as necessary, one (1) of the existing chiller concrete pads as necessary to properly support the new outdoor chiller as indicated on the project's Contract Drawings and in the project's Technical Specification.

6 Contractor shall be responsible to provide structural support systems for all new piping and hydronic pumps. All new metallic supports shall be stainless or galvanized steel construction. No painted steel supports, including hangers and shields, shall be painted steel.

7 Contractor shall be responsible to interface the new chiller and chilled water pumps into the facility's existing Johnson Controls building management system (BMS).

8 Contractor shall perform all electrical work required for the installation of the new chiller and chiller electric heater, new chilled water pumps, new electric heat trace, new control wiring, and all ancillary electrical work as indicated on the project's Contract Drawings and in the project's Technical Specifications.

9 Contractor shall be responsible to patch/seal and insulate all exterior wall and roof openings resulting from this project's demolition and new construction work, including the resealing of the existing 4" chilled water piping lines, conduits, cables, etc., penetrating the Stillwater building's ground floor exterior wall.

10 All patched and/or repaired wall, ceilings, floors roofs, etc., shall match building's existing finishes.

i If Contractor cannot have the new chiller and chiller pumps installed and fully operational by the start of the cooling season, (April 15, 2017), Contractor shall furnish, install and operate a temporary electric chiller serving the Stillwater complex until the new chiller system installation is complete and the new chiller system is fully operational.

j Coordinate all work in this Division with all related trades.

3. WARRANTY

a General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. Submit a written warranty, executed by the manufacturer for the following:

1 Manufacturer's warranty (full parts and labor) for not less than two (2) years from date of Substantial Completion as determined by Owner.

b Standard warranty of manufacturer shall apply for replacement of parts after expiration of above period. Provide manufacturer's replacement parts to the Owner, or his service agency as directed. Furnish to the Owner printed manufacturer's warranties, upon completion of project.

c Contractor shall be responsible to instruct the Owner's personnel on operation and maintenance of each electrical system. Provide a minimum of one day for instruction of Owner's personnel. Manufacturer shall

provide a minimum of three (3) copies of their operation and maintenance instructions in booklet form. Manufacturer shall certify in writing, installation and performance of all electrical equipment, devices and systems is in compliance with design intent and manufacturers' listed and submitted data.

4. ADDITIONAL REQUIREMENTS

a The technical services to be delivered by the Contractor will include the following:

1 Coordination and cooperation of the Contractor to support the County's schedule.
2 Testing and adjusting of all new and modified electrical systems shall be coordinated by the Contractor with the County and their vendors such as Johnson Controls for automatic temperature controls systems.
3 Field startup of all new mechanical equipment shall be performed by a manufacturer's certified technician working directly for the Contractor. Electrical Contractor shall be available as necessary to assist startup work. Contractor shall notify County no less than two (2) weeks in advance of all equipment startups.
4 Testing and training of County employees by on-site technicians certified by the manufactures of the new equipment, fixtures, fire alarm and control systems.
5 Preparation and delivery of "as-built" drawings showing all new work performed as part of this project.

5. INTENT

a It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.

b Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation shall be furnished, delivered and installed by the Contractor without additional expense to the Owner.

6. VISIT TO SITE

a Prior to submission of bid, visit Site and become familiar with existing conditions. Bids as submitted, will be interpreted to include all costs and charges made necessary by existing conditions such as installation space requirements and interferences.

b Contractor shall verify, in the field, the location and elevation of all underground services affected by this work before proceeding with construction. Notify Owner and Engineer immediately in the event the location of existing utilities vary appreciable from those shown on drawings.

7. LEGAL REQUIREMENTS AND STANDARDS

a In addition to the Division 1 Specification Sections and Drawings, comply with the latest adopted rules of the following:

1 National Fire Protection Association Codes as adopted by New Jersey.
2 National Electric Code as adopted by New Jersey.
3 New Jersey State Uniform Construction Code.
4 Local codes, laws, ordinances, rules and regulations of authorities having jurisdictions.
5 OSHA.
6 International Building Code as adopted by New Jersey.

b The requirements of authorities shall be the minimum acceptable requirements for the work and nothing described in these specifications or indicated on the drawings shall be construed to permit work not conforming to the most stringent of the applicable codes and regulations.

c When the drawings or specifications call for materials or construction of better quality or larger size than required by codes, laws, rules and regulations, the drawings and specifications shall take precedence.

d Should any changes to work indicated on the drawings or described in the specifications be necessary so as to comply with the above requirements, immediately notify the Owner and Engineer.

8. PERMITS AND INSPECTIONS

a Obtain and pay for all permits and inspections required by all legal authorities and agencies having jurisdiction for the work. This shall be a part of the work of the Contractor performing the work requiring the permit. The certificates of all such permits and inspections shall be delivered to the Engineer.

9. COORDINATION

a Prior to bid, Contractor shall examine all available HVAC and Electrical Drawings for proper coordination of all trades and include in bid price all necessary work required for proper field coordination of all trades.

b Prior to any construction work, Contractor shall reexamine all available HVAC and Electrical Drawings. The work of all other Sub-Contractors shall be carefully considered, and the work of this Contractor and each of his Sub-Contractors coordinated so that all parts of their work will be compatible with and not interfere with the other trades.

c Review with the General Contractor and all other trades, locations of all equipment and materials so that all work may be installed in the most direct manner and interferences are avoided between pipes, ducts, conduits, equipment, fixtures, devices, associated appurtenances and architectural and structural features.

d Contractors shall jointly prepare Coordination Drawings which include all HVAC and structural systems and electrical installation layouts to be submitted to Engineer and all other Trades for mark-up, comment and coordination. Contractors shall submit, to the Engineer and all other trades, all setting plans, templates, approved shop drawings, approved equipment layouts, approved electrical and control wiring diagrams, etc., to insure proper space and functional relationship to all other equipment and services. Upon completion of coordination drawings, Contractor shall submit these coordination drawings to the Engineer for review and approval.

e Prepare dimensioned conduit and equipment "Layout Drawings" in ¼" scale showing all inserts, sleeves in floors, walls, roofs, beams and columns as part of Contractor's coordination drawings. Drawings shall provide for proper alignment.

f Coordinate with all trades, clear passages and code required clearances necessary to deliver, relocate, remove, install and erect equipment and materials.

g Where there will not be sufficient clearance for passage following erection of confining enclosures, deliver, set and protect equipment and materials before erection of confining enclosures. All equipment and materials so confined shall be inspected and tested prior to delivery. Should equipment or materials fail to meet the requirements of the Specifications, replace equipment or materials and pay all costs, including costs for modifications of completed areas that are required to provide clear passage.

h When interferences occur, prepare installation drawings in ¼" scale of equipment and material in areas of interferences. Submit drawings to all other trades for their examination, comment, coordination and signed approval. Submit fully coordinated installation drawings to the Engineer for review before beginning any construction work. Meet as necessary with all other trades affected, coordinate work and correct interferences. Where interferences occur during construction because failure to coordinate work, rearrange work at no additional cost to the Owner.

i All modifications to the building, removal and relocation of equipment and materials that are required for clear passage and code required clearance of equipment shall be provided in accordance with Subparagraph G above. Restoration of disturbed building structures and surfaces, and reinstallation and reconnection of equipment shall be provided in accordance with Subparagraph G above.

j Coordinate the procurement of specified materials and equipment being supplied by Sub-Contractors, manufacturers and vendors. Such items as controls, thermometers, gages, motor starting equipment, vibration isolation devices, valves, etc., when provided as part of the equipment, shall meet the requirements of these specifications.

k Upon completion and final coordination of Contractor's Coordination Drawings, Contractor shall submit final Coordination Drawings with all associated Layout Drawings to the Engineer for final approval. If the Contractor cannot resolve coordination conflicts with his/her Sub-Contractors, Contractor shall request a coordination meeting with Owner and Engineer.

10. PROTECTION

a Effectively protect all material and equipment from dust, dirt, weather and damage until final acceptance as installed. Close all conduit, device, lighting and equipment openings, during construction, with suitable temporary closures. Provide suitable protective covering for equipment and material before, during and following installation. Provide new materials and equipment to replace similar damaged items without additional cost to the Owner.

11. DRAWINGS

a Accompanying electrical drawings are a part of the Contract Documents and are intended to show approximate and relative locations of materials, devices and equipment. Drawings shall not be scaled to determine exact positions and clearances. Ascertain all dimensions in the field.

b Because of diagrammatic layout and small scale of drawings, not all conduit and cable rises, drops, offsets and related specialties are indicated. Provide all such conduit, cables, fittings and specialties required in such cases to insure a complete and properly operating installation in accordance with Codes and without extra cost to Owner.

c Examine all drawings and specifications pertaining to the work of all Other Trades. Be responsible for installation and fitting into the building, without interference to the work of Other Trades, all materials and equipment provided under this Contract.

d When directed by the Owner or Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed, to prevent conflict with the work of other trades or for proper execution of the work.

e Where variances occur between the drawings and the specifications or within either document itself, the item or arrangement of better quality and greater quantity shall be included in the Contract price. The Owner and Engineer will decide on the item and the manner in which work shall be installed.

12. SUBMITTALS

a The Contractor shall carefully prepare and review his schedule of submissions, determine the necessary lead time for preparing, submitting, checking, ordering and delivery of all materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.

b Submittals will be checked for general compliance with specifications only. The Contractor shall be responsible for deviations from the drawings or specifications, and for errors or omissions of any sort in submittals.

c Submit a complete list of material and equipment proposed for the job, including manufacturer's names.

d Reference all listings to the specifications' article to which each is applicable.

e Submit on all materials and equipment, even if same is as specified or shown on the drawings.

f Include complete catalog information such as construction, ratings, insulation systems, etc.

g Submit shop drawings in accordance with Division 1 of the project's Technical Specifications.

h Include with each submission and for each item the following information:

1 Project name.
2 Name of Contractor and/of Sub-Contractor making submission.
3 Name of equipment, fixture, device, etc., being submitted. Identify by identification number shown on drawing.
4 The manufacturer's name for each piece of equipment, fixture, device, etc.
5 Complete performance data including voltage.
6 Materials and features of construction.

i As a minimum, submit shop drawings for the following:

1 Receptacles and Covers.
2 Switches and Covers.
3 Electrical Circuit Breakers, etc.
4 Line & Low Voltage Wiring and Conduit.
5 Starters and Disconnect Switches.

j Refer to Specification Section 01300 - Submittals for additional information.

13. AS-BUILT DRAWINGS

a Prior to final payment, the Contractor shall submit "As-Built" drawings as herein described.

b Maintain during construction a "clean" record set of installation prints. Record in colored ink on these prints all deviations from the contract drawings in sizing, location and details of underground utilities, conduit, lighting fixtures and equipment, etc. Submit as-built drawings to Engineer for review as part of the project close-out.

Make correction following review and submit a complete set of "as-built" drawings, (1) set hard copy reproducible (1/8" =1'-0" scale minimum), and (1) set electronic files produced in PDF format to the Owner and Engineer upon project completion.

c Refer to Specification Section 01300 - Submittals for additional information.

14. SAMPLES

a The Owner or Engineer may direct the Contractor to submit samples of items called for in the specifications. Samples of materials which the manufacturer will actually ship shall be properly labeled or identified. Samples shall be left at the construction site for review by the Owner and Engineer.

b Each sample must be labeled or securely tagged with the following minimum information:

1 Identification of sample (i.e.: material, color, number, etc.).
2 Reference to contract documents.
3 Name of manufacturer.
4 Name of project.
5 Name of Contractor
6 Date of submission

c A transmittal letter shall be sent to the Engineer and Owner indicating when, where and how the samples were submitted.

15. WORK RESPONSIBILITIES

a Examine the site and review all electrical, mechanical, architectural and structural and all other project drawings and accept such conditions and make allowance for them in preparing the bid. No extra charges will be considered for costs resulting from failure to comply with the above.

b The drawings indicate diagrammatically the desired locations or arrangement of conduit runs, outlets, equipment, devices, panels, etc. and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions. The Contractor is responsible for the correct placing of his work and the proper location and connection of his work in relation to the work of other trades.

c Locations shown on architectural and ceiling plans and/or wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify the Engineer for instructions prior to commencing work on the same.

d In the event changes in the indicted locations or arrangements are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra costs, providing the change is ordered before the conduit runs, etc., and the work directly connected to same is installed.

e All scaled and figured dimensions are approximate of typical equipment of the type, class and capacity indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.

f Where equipment is furnished by others, verify voltage characteristics and dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

g Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Owner and Engineer immediately and cease work on all parts of the Contract which are affected until approval for any required modifications to the construction has been obtained from the Owner and Engineer.

h Perform all work competent and skilled personnel.

i All work shall be of the highest quality consistent with the best practices of the trade.

j Replace or repair, without additional compensation, any work which, in the opinion of the Owner or Engineer, does not comply with these requirements.

k The Contractor shall be responsible for the safety and good condition of all materials and equipment until final acceptance by the Owner; for providing adequate and proper storage facilities during the progress of the work; for replacing all damaged and defective work before applying for final acceptance; for erecting and maintaining suitable barriers, protective devices, light and warning signs for the protection of the public and employees; and for all loss, damage or injury to persons or property resulting from any neglect of these responsibilities.

l The Contractor shall be responsible for all faults and deficiencies in his work during the guarantee period and shall repair, at no cost to the Owner, all such deficiencies that occur immediately upon notification by the Owner. All damage to other work there from, which may occur during the construction and guarantee period, shall be repaired at once, at no cost to the Owner.

16. INTERPRETATION

a All requests for interpretation of plans and specifications must be made by the Contractor through the Engineer. Any such requests made by equipment manufacturer or suppliers will be referred to the Contractor.

17. INSPECTION AND ACCEPTANCE PROCEDURE

a The Owner and Engineer will submit inspection reports periodically during the construction phase detailing contract deficiencies. The Contractor is responsible for making all corrections immediately to avoid delaying other trades. Final acceptances of the project will not be made until all items have been corrected and a final certificate of approval has been issued from the local authorities having jurisdiction.

18. WORK FORCE AND SUPERINTENDENCE

a Contractor shall, upon initiation of construction, keep a suitable force of men on the site at all times in order to provide all sleeves, inserts and provide all other materials as required for the satisfactory installation of the entire system.

b Contractor shall give his personal superintendence to the work or have a competent superintendent, satisfactory to the Engineer and the Owner, on the work at all times during construction with authority to act for him. He shall provide an adequate organization for proper coordination and expediting of this work.

19. RUBBISH

a During the course of construction, all Contractors shall be responsible to remove from the premises all rubbish resulting from the work of the project. Contractors shall coordinate the continual cleanup of the project site with the Prime Contractor.

b At all times, keep the premises free from accumulations of waste materials and rubbish caused by agents and employees of the Contractor.

c At the completion of the work, remove from the site all rubbish in or about the building, in addition to tools, scaffolding and other specialties that were utilized or a result of Contractor's work.

d In the event of dispute of refusal to comply with the requirements of the above paragraphs, the Owner shall have the option of removing such rubbish from the premises, and back-charge the Contractor for doing such work.

e The Contractor shall, on a daily basis, remove from the site all rubbish, debris and discarded materials resulting from Contractor's work.

20. TEMPORARY SERVICES FOR CONSTRUCTION

a Refer to General Conditions, Divisions 1 and 16 of the Technical Specification Sections and Conditions of the Contract.

b Contractor shall at minimum provide a temporary electric service at the site until the new building's electrical service has been installed and energized.

21. ACCESS PANELS

a Furnish access panels required for access to junction boxes and any other electrical specialties requiring maintenance and service in ceilings, walls or floors.

b Panels shall have 16 gauge steel frame and 14 gage flush steel door having concealed hinge and screwdriver operated cam locks, all with factory prime finish.

c Panels shall be of sizes required for access to specialties, but in no case shall they be less than 18" x 18".

d Coordinate panel locations and sizes with Other Trades. Prior to installation, submit and review panel locations and sizes with Owner and Engineer.

e Panels shall be furnished to suit the surface into which installed.

22. IDENTIFICATION

a Identify all concealed and exposed equipment, conduit and wiring with legibly stenciled lettering, applied, after finish painting where applicable, in color to contrast with basic color.

b All major electrical equipment, including switchboards, panels, disconnect switches, etc., shall be identified by the identification numbers shown on drawings, or by the Owner's numbering system, if so directed. Lettering shall be minimum 1-inch high. Do not stencil surfaces exposed in public areas.

c Label associated circuit number and panel number on covers of all electrical disconnect switches, receptacles and junction boxes.

d Submit list of titles and data for Engineer's review before beginning work.

23. OPERATING AND MAINTENANCE MANUALS

a At the completion of the project, deliver to the Engineer for transmittal to the Owner, three (3) complete sets of instruction manuals, for each piece of electrical equipment, device, panels, switchboard, fixture, device, etc., and all specialty items.

b Each instruction manual shall consist of data supplied by the manufacturer giving complete information on the following:

1 Installation procedure.
2 Operating instructions.
3 Maintenance instructions.
4 Detailed parts lists.
5 Recommended spare parts.
6 Address and telephone numbers of nearest supply house.
7 Address and telephone number of manufacturer's representative.

c Each set of instruction manuals shall be bound in an 8 ½" x 11" hard cover, 3-ring binder. The binders shall be assembled using tabs to separate each equipment item. An index sheet shall be inserted in the front of the binder, listing every item included with the manual.

24. OPERATING AND MAINTENANCE INSTRUCTION

a After all tests, startups, adjustments and certifications have been successfully made, instruct the representatives of the Owner in all details of the operations of all electrical equipment, devices, systems and appurtenances. Provide competent instruction for a minimum of one (1) day, which shall not include time required for testing, adjusting, startup and certification.

b Instruction in all details of operation of all equipment shall be recorded by means of videotaping.

25. ELECTRICAL EQUIPMENT

a Contractor shall furnish all equipment complete with motor, controllers, capacitor, starting equipment and control transformers, except where specifically listed otherwise on the Contract Drawings.

b Unless otherwise noted, electric motors shall be high efficiency, open, drip proof, induction type rated for continuous duty at 15% overload with 40 degrees C. rise. Single phase motors shall be capacitor start, induction run.

c Manufacturer's certified technician shall check the electrical equipment and systems for their conformance to the specifications, for proper installation and shall run the system in all modes of operation to ascertain that they will function properly. All necessary adjustment shall be made to insure trouble-free service.

d After completion of startup procedure, Manufacturer shall certify, in writing, that the electrical equipment and systems is installed in accordance with his requirements and is operating in accordance with the intent of the specifications. Final payment will not be made until this requirement is completed.

44 PRODUCTS

1. SELECTION OF MATERIALS AND EQUIPMENT

a Specified materials, equipment, devices, systems, etc., shall be selected within the operating capacities indicated on contract documents. In the absence of specific criteria, conservative commercial practice, in the opinion of the Engineer, will apply.

b All materials and equipment shall comply with all applicable standards and requirements of:

1 National Electrical Manufacturers Association (NEMA).
2 American National Standards Institution (ANSI).
3 Underwriters laboratories, Inc. (UL).
4 Institute of Electrical and Electronics Engineers (IEEE).

c Items of a similar application shall be of the same manufacturer.

d The label of listing by Underwriters Laboratories, Inc. shall appear on all materials and equipment for which standards have been established by that agency.

e Where local or other authorities have jurisdiction, have established label or approval requirements, furnish all materials and equipment with either the required labels affixed, or the necessary written approval.

f The equipment plans are designed around standard products of one or more of the manufacture's listed as being acceptable for the product involved. Where one or more manufacturer is listed as being acceptable for a product, each manufacturer listed for that product shall be considered as "equal" and acceptable.

g All materials to be free of asbestos and urea formaldehyde.

45 EXECUTION

1. SLEEVES AND ELECTRICAL PENETRATIONS

a Locate all openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required due to improperly located or omitted openings without cost to the Owner, and with the approval of the Engineer or Owner.

b Cutting or drilling in any structural member is prohibited without written approval of the Owner and Engineer.

c Location of Sleeves: Wherever conduits pass through concrete walls or suspended slabs, furnish and install sleeves of ample size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend two (2") inches above floor surfaces. Verify location with the Engineer.

d Where sleeves pierce unrated slabs or walls separating machine room areas from or other quiet areas, the sleeves shall be packed with fiberglass insulation to prevent noise transfer.

e Where raceways for electrical power, telephone or signal cables penetrate FIRE RATED walls, floors, partitions or slabs, fill and seal all such penetrations with a one-part intumescent caulk/putty sealant creating a fire stop equal to or exceeding fire rating of partition being penetrated. Fire sealant shall have ability to prevent spread of flame, smoke and water throughout the penetration and shall pass three (3) hour test, UL Test ASTM E814 and UL 1479. Fire sealant shall be 3M CP25 caulk and putty 303, installed in accordance with manufacturer's written instructions. Avoid all voids when arranging cables in penetration by using non-flammable fiber damming material wedged between cables.

f Type of sleeves: Steel pipe or galvanized sheet metal is acceptable.

g Finish Around Sleeves: Rough edges shall be finished smooth. Space between conduit and sleeves, where conduit passes through exterior walls and walls shall be sealed to permit movement of conduit, but prevent entrance of water.

h Space between conduit and sleeves, where conduit passes through interior walls and slabs, shall be sealed with an approved sealing compound that is fireproof and will remain pliable.

i Where faulty installation of sleeves, etc. occurs, the Electrical Contractor shall make all necessary changes and repairs, at no cost to the Owner, to the satisfaction of the Owner and Engineer.

j Where openings requested by the Electrical Contractor are left in floors or walls under other contracts, and are not used, such openings shall be filled in to match the adjoining work the Electrical Contractor.

k All additional openings required and not requested while the work proceeds shall be cut as a part of the work of the appropriate trade and be paid for by the Electrical Contractor.

2. FLASHING AND ROOF REPAIRS

a All flashing methods and materials shall attain a complete watertight installation.

b For all conduits passing through a roof, provide counter-flashing fitting up to 6 inch size. For conduit smaller than 1 ½" size, provide pitch pockets on roof.

c Riser sleeves for conduits in membrane waterproofed floors shall have flashing clamps attached to membrane. Where possible, sleeves shall be provided with top and bottom steel pipe sleeves. Large sleeves shall be shop fabricated. Sleeves shall extend 2 inches above finished door.

3. CUTTING AND PATCHING

a The Electrical Contractor shall at a time in advance of the work, verify all openings indicated on the drawings. Should the work of this Division require it, Contractor shall furnish new instructions as to his requirements for these openings, subject to the Owner's and Engineer's approval. All additional cutting, patching and reinforcement of the construction of the building (subject to the Owner's and Engineer's approval) shall be performed under the section of the specifications covering the particular materials, but the cost shall be an obligation of this section of the work.

b The Contractor shall provide and pay for the addition of all structural steel required for the support or bracing of all work furnished and installed.

c Sub-Contractors shall furnish Prime Contractor information such as size, position and arrangement of materials and equipment, so that new openings in floors, walls, roofs, beams, ceilings can be properly provided and coordinated as construction progresses.

d Cutting and patching for new equipment and materials in new construction will be provided by Contractor.

e Cutting shall be coordinated with Other Trades, done neatly and to minimize damage to all construction. Provide lintels where required.

f Cutting and patching shall be done by Trades normally specializing in installation of materials being patched. Paint all patched surfaces to match new finishes.

g Review all cutting and patching with Owner and Engineer before beginning work.

h Cutting openings in new concrete slabs and walls shall be done neatly using core boring machines.

4. CLEANING AND PAINTING

a Conduit and equipment to be Installed: Clean conduit and equipment thoroughly to remove plaster, splattered paint, cement and dirt, on both exterior and interior.

b Conduit and Equipment to be Painted: Clean all conduit and equipment exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.

c All items with Factory Finish: Remove cement, plaster, grease and oil, and leave all surfaces, including cracks and corners, clean and polished. Touch up any scratched or bare spots to match finish.

d All electrical apparatus and equipment in equipment rooms shall be provided with a factory finish cost. All panels in public spaces, corridors, etc., shall be provided with a factory prime coat.

e Site Cleaning: Remove from site all packing cartons, scrap materials, and other rubbish relating to electrical installation.

5. TESTS

a Prior to energizing any motors, measure the service voltage for phase balance, and report immediately to the Engineer if unbalance exceeds one (1%) percent from mean.

b Upon completion of the work and adjustment of all equipment, conduct an operating test for approval at such time as the Owner or Engineer directs. Conduct the test in the presence of an authorized representative of the Owner or Engineer. Demonstrate all systems and equipment to operate, in accordance with all requirements of the contract documents, and to be free from all electrical and mechanical defects.

c All systems shall be free from short circuits and grounds, and shall show insulation between phase conductors and ground not less than the requirements of the National Electrical Code. Test all circuits for proper neutral connections.

d Complete all tests prior to final inspection of the project.

6. PRELIMINARY OPERATIONS:

a Should the Owner require that any portion of the systems or equipment be operated prior to the final schedule dates for completion and acceptance of the work, the Contractor shall consent. Such operation shall be under the direct supervision of, and at the expense of the Contractor, and shall not be construed as an acceptance of any of the work by the Owner.

END OF SECTION 260010

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

46GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Copper building wire rated 600 V or less.
2 Metal-clad cable, Type MC, rated 600 V or less.
3 Connectors, splices, and terminations rated 600 V and less.

3. DEFINITIONS

a PV: Photovoltaic.

b RoHS: Restriction of Hazardous Substances.

c VFC: Variable-frequency controller.

4. SUBMITTALS

a Product Data: For each type of product.

b Product Schedule: Indicate type, use, location, and termination locations.

c Qualification Data: For manufacturer's authorized service representative.

d Field quality-control reports.

47 PRODUCTS

1. COPPER BUILDING WIRE

a Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

b Standards:

1 Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2 RoHS compliant.
3 Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

c Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

d Conductor Insulation:

1 Type Type THHN and Type THWN-2: Comply with UL 83.
2 Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

2. METAL-CLAD CABLE, TYPE MC

a Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

b Standards:

1 Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2 Comply with UL 1569.
3 RoHS compliant.
4 Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

c Circuits:

1 Single circuit.

d Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

e Ground Conductor: Insulated.

f Conductor Insulation:

1 Type TFN/THHN/THWN-2: Comply with UL 83.

g Armor: PVC coated steel for exterior use and galvanized steel for indoor use, interlocked.

h Jacket: PVC applied over armor for exterior use.

3. CONNECTORS AND SPLICES

a Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

b Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

c Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1 Material: Copper.
2 Type: Two]hole with standard barrels.
3 Termination: Compression.

48 EXECUTION

1. CONDUCTOR MATERIAL APPLICATIONS

a Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

b Feeders: Copper for feeders smaller than No. 4 AWG; copper for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

c Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

d Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

2. CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

a Service Entrance: Type THHN/THWN-2, single conductors in raceway.

b Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

c Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

d Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in PVC raceway.

e Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

f Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in PVC raceway.

g Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

h Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in PVC raceway.

i Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

3. INSTALLATION OF CONDUCTORS AND CABLES

a Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

b Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

c 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.

d Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

e Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

f Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

g Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

4. 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-486B.

b Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1 Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

c Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

5. IDENTIFICATION

a Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

b Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

6. SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

a Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

7. FIRESTOPPING

a Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

8. FIELD QUALITY CONTROL

a Perform tests and inspections.

1 After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.
2 After installing conductors and cables and before electrical circuitry has been energized, test conductors feeding the following critical equipment and services for compliance with requirements:

i Chiller.
ii Hydronic pumps.
iii Electric heater for chiller, heat trace and receptacles..

3 Perform each of the following visual and electrical tests:

i Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
ii Test bolted connections for high resistance using one of the following:

a A low-resistance ohmmeter.
b Calibrated torque wrench.

iii Inspect compression-applied connectors for correct cable match and indentation.
iv Inspect for correct identification.
v Inspect cable jacket and condition.
vi Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one (1) minute duration.
vii Continuity test on each conductor and cable.
viii Uniform resistance of parallel conductors.

b Cables will be considered defective if they do not pass tests and inspections.

c Prepare test and inspection reports to record the following:

1 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.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

49GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Low-voltage control cabling.
2 Control-circuit conductors.
3 Identification products.

3. DEFINITIONS

a EMI: Electromagnetic interference.

b Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

c Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

d RCDD: Registered Communications Distribution Designer.

4. SUBMITTALS

a Product Data: For each type of product.

b Qualification Data: For testing agency, RCDD, layout technician, installation supervisor, and field inspector.

c Source quality-control reports.

d Field quality-control reports.

50 PRODUCTS

1. PERFORMANCE REQUIREMENTS

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 Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.

1 Flame Travel Distance: 60 inches or less.
2 Peak Optical Smoke Density: 0.5 or less.
3 Average Optical Smoke Density: 0.15 or less.

c Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

d Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

e RoHS compliant.

2. LOW-VOLTAGE CONTROL CABLE

a Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1 No. 16 AWG, stranded tinned-copper conductors.
2 PVC insulation.
3 Unshielded.
4 PVC jacket.
5 Flame Resistance: Comply with NFPA 262.

3. CONTROL-CIRCUIT CONDUCTORS

a Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

b Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

c Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

51 EXECUTION

1. EXAMINATION

a Test cables on receipt at Project site.

1 Test each cable for open and short circuits.

2. INSTALLATION OF RACEWAYS AND BOXES

a Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.

1 Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
2 Outlet boxes for cables shall be no smaller than 4 inches square by 2-1/8 inches deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
3 Flexible metal conduit shall not be used.

b Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

c Install manufactured conduit sweeps and long-radius elbows if possible.

d Raceway Installation in Equipment Rooms:

1 Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
2 Install cable trays to route cables if conduits cannot be located in these positions.
3 Secure conduits to backboard if entering the room from overhead.
4 Extend conduits 3 inches above finished floor.
5 Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

e Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3. INSTALLATION OF CONDUCTORS AND CABLES

a Comply with NECA 1.

b General Requirements for Cabling:

1 Comply with TIA-568-C Series of standards.
2 Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
3 Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4 Cables may not be spliced.
5 Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6 Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
7 Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8 Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
9 Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.

10 Support: Do not allow cables to lie on removable ceiling tiles.
11 Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.

c Installation of Control-Circuit Conductors:

1 Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."

d Open-Cable Installation:

1 Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2 Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
3 Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

e Installation of Cable Routed Exposed under Raised Floors:

1 Install plenum-rated cable only.
2 Install cabling after the flooring system has been installed in raised floor areas.
3 Below each feed point, neatly coil a minimum of 72 inches of cable in a coil not less than 12 inches in diameter.

f Separation from EMI Sources:

1 Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2 Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

i Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches.
ii Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches.
iii Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches.

3 Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

i Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
ii Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches.
iii Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches.

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

i Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
ii Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches.
iii Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches.

5 Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.
6 Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

4. REMOVAL OF CONDUCTORS AND CABLES

a Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

5. CONTROL-CIRCUIT CONDUCTORS

a Minimum Conductor Sizes:

1 Class 1 remote-control and signal circuits; No 14 AWG.
2 Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3 Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

6. FIRESTOPPING

a Comply with TIA-569-D, Annex A, "Firestopping."

b Comply with BICSI TDMM, "Firestopping" Chapter.

7. GROUNDING

a For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

b For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

8. IDENTIFICATION

a Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

b Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

9. FIELD QUALITY CONTROL

a Perform tests and inspections.

b Tests and Inspections:

1 Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2 Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3 Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.

i Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

c Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

d End-to-end cabling will be considered defective if it does not pass tests and inspections.

e Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

52 GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section includes grounding and bonding systems and equipment.

b Section includes grounding and bonding systems and equipment.

3. SUBMITTALS

a Product Data: For each type of product indicated.

b Field quality-control reports.

4. QUALITY ASSURANCE

a Testing Agency Qualifications: Certified by NETA.

53 PRODUCTS

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. CONDUCTORS

a Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

b Bare Copper Conductors:

1 Solid Conductors: ASTM B 3.
2 Stranded Conductors: ASTM B 8.
3 Tinned Conductors: ASTM B 33.
4 Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.

5 Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6 Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7 Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

3. 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 Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

c Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

d Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

e Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

f Cable-to-Cable Connectors: Compression type, copper or copper alloy.

g Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

h Conduit Hubs: Mechanical type, terminal with threaded hub.

i Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt or socket set screw.

j Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

k Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

l Straps: Solid copper, cast-bronze clamp or copper lugs. Rated for 600 A.

m Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one-piece clamp.

n U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

o Water Pipe Clamps:

1 Mechanical type, two pieces with stainless-steel bolts.

i Material: Tin-plated aluminum.
ii Listed for direct burial.

2 U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

4. GROUNDING ELECTRODES

a Ground Rods: Copper-clad, sectional type, 5/8 by 96 inches.

b Ground Plates: 1/4 inch thick, hot-dip galvanized.

54 EXECUTION

1. APPLICATIONS

a Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

b 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.

2. EQUIPMENT GROUNDING

a Install insulated equipment grounding conductors with all feeders and branch circuits.

b 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 Metal-clad cable runs.

c Heat-Tracing Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3. 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 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.

c Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1 Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2 Make connections with clean, bare metal at points of contact.
3 Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4 Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5 Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

4. FIELD QUALITY CONTROL

a assemblies, and equipment installations, including connections.

b Perform tests and inspections.

c 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 building’s existing grounding system at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.

i 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.
ii Perform tests by fall-of-potential method according to IEEE 81.

d Grounding system will be considered defective if it does not pass tests and inspections.

e Prepare test and inspection reports.

f Report measured ground resistances that exceed the following values:

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 Panelboards: 3 ohms.

g Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

55GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Galvanized steel slotted support systems.
2 Conduit and cable support devices.
3 Support for conductors in vertical conduit.
4 Structural steel for fabricated supports and restraints.
5 Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6 Fabricated metal equipment support assemblies.

3. SUBMITTALS

a Product Data: For each type of product.

1 Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

i Slotted support systems, hardware, and accessories.
ii Clamps.
iii Hangers.
iv Sockets.
v Eye nuts.
vi Fasteners.
vii Anchors.
viii Saddles.
ix Brackets.

2 Include rated capacities and furnished specialties and accessories.

b Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

1 Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2 Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

c Welding certificates.

4. QUALITY ASSURANCE

a Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M or AWS D1.2/D1.2M.

b Welding Qualifications: Qualify procedures and personnel according to the following:

1 AWS D1.1/D1.1M.
2 AWS D1.2/D1.2M.

56PRODUCTS

1. PERFORMANCE REQUIREMENTS

a Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

b Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to IBC as adopted by New Jersey.

1 The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event**.**

c Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1 Flame Rating: Class 1.
2 Self-extinguishing according to ASTM D 635.

2. SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

a Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches on center in at least one surface.

1 Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2 Material for Channel, Fittings, and Accessories: Galvanized steel.
3 Channel Width: Selected for applicable load criteria.
4 Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5 Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

b Conduit and Cable Support Devices: Galvanized steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

c 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 made of malleable iron.

d Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

e Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1 Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2 Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
3 Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4 Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5 Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6 Toggle Bolts: Stainless-steel springhead type.
7 Hanger Rods: Threaded steel.

3. FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

a Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

57EXECUTION

1. APPLICATION

a Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1 NECA 1.

b Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

c Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

d Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1 Secure raceways and cables to these supports with two-bolt conduit clamps.

e 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.

2. SUPPORT INSTALLATION

a Comply with NECA 1 for installation requirements except as specified in this article.

b Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.

c Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

d Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1 To Wood: Fasten with lag screws or through bolts.
2 To New Concrete: Bolt to concrete inserts.
3 To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4 To Existing Concrete: Expansion anchor fasteners.
5 Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6 To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
7 To Light Steel: Sheet metal screws.
8 Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

e Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3. INSTALLATION OF FABRICATED METAL SUPPORTS

a Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

b Field Welding: Comply with AWS D1.1/D1.1M.

4. CONCRETE BASES

a Construct concrete bases of dimensions indicated, but not less than 6 inches larger in both 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.

c Anchor equipment to concrete base as follows:

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.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

58GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Metal conduits and fittings.
2 Nonmetallic conduits and fittings.
3 Metal wireways and auxiliary gutters.
4 Nonmetal wireways.
5 Surface raceways.
6 Boxes, enclosures, and cabinets.
7 Handholes and boxes for exterior underground cabling.

3. DEFINITIONS

a GRC: Galvanized rigid steel conduit.

b IMC: Intermediate metal conduit.

4. SUBMITTALS

a Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

b Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

c 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.

d Qualification Data: For professional engineer.

e Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1 Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2 Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3 Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4 Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

f Source quality-control reports.

59PRODUCTS

1. METAL CONDUITS AND FITTINGS

a Metal Conduit:

1 Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2 GRC: Comply with ANSI C80.1 and UL 6.
3 IMC: Comply with ANSI C80.6 and UL 1242.
4 PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

i Comply with NEMA RN 1.
ii Coating Thickness: 0.040 inch, minimum.

5 EMT: Comply with ANSI C80.3 and UL 797.
6 FMC: Comply with UL 1; zinc-coated steel.
7 LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

b Metal Fittings:

1 Comply with NEMA FB 1 and UL 514B.
2 Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3 Fittings, General: Listed and labeled for type of conduit, location, and use.
4 Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5 Fittings for EMT:

i Material: Steel or die cast.
ii Type: Compression.

6 Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7 Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

c Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2. NONMETALLIC CONDUITS AND FITTINGS

a Nonmetallic Conduit:

1 Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2 RNC: Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3 LFNC: Comply with UL 1660.

b Nonmetallic Fittings:

1 Fittings, General: Listed and labeled for type of conduit, location, and use.
2 Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

i Fittings for LFNC: Comply with UL 514B.

3 Solvents and Adhesives: As recommended by conduit manufacturer.

3. METAL WIREWAYS AND AUXILIARY GUTTERS

a Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.

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.

b Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

c Wireway Covers: Flanged-and-gasketed type unless otherwise indicated.

d Finish: Manufacturer's standard enamel finish.

4. NONMETALLIC WIREWAYS

a Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

b Description: Schedule 80 PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

c Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

d Solvents and Adhesives: As recommended by conduit manufacturer.

5. BOXES, ENCLOSURES, AND CABINETS

a General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

b Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

c Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

d Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

e Metal Floor Boxes:

1 Material: Cast metal.
2 Type: Fully adjustable.
3 Shape: Rectangular.
4 Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

f Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

g Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast iron with gasketed cover.

h Box extensions used to accommodate new building finishes shall be of same material as recessed box.

i Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

j Gangable boxes are prohibited.

k Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.

1 Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2 Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

l Cabinets:

1 NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2 Hinged door in front cover with flush latch and concealed hinge.
3 Key latch to match panelboards.
4 Metal barriers to separate wiring of different systems and voltage.
5 Accessory feet where required for freestanding equipment.
6 Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

6. HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

a General Requirements for Handholes and Boxes:

1 Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2 Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

b Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1 Standard: Comply with SCTE 77.
2 Configuration: Designed for flush burial with open bottom unless otherwise indicated.
3 Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4 Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5 Cover Legend: Molded lettering, "ELECTRIC."
6 Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7 Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

60EXECUTION

1. RACEWAY APPLICATION

a Outdoors: Apply raceway products as specified below unless otherwise indicated:

1 Exposed Conduit: RNC, Type EPC-80-PVC.
2 Concealed Conduit, Aboveground: RNC, Type EPC-80-PVC.
3 Underground Conduit: Type EPC-80-PVC.
4 Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5 Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

b Indoors: Apply raceway products as specified below unless otherwise indicated:

1 Exposed, Not Subject to Physical Damage: EMT.
2 Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

i Mechanical and Electrical rooms.

3 Concealed in Ceilings and Interior Walls and Partitions: EMT.
4 Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5 Damp or Wet Locations: GRC.

c Minimum Raceway Size: 3/4-inch trade size.

d Raceway Fittings: Compatible with raceways and suitable for use and location.

1 Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. 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, cast-metal]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.

e Install nonferrous conduit or tubing for circuits operating above 60 Hz.

f Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

g Install surface raceways only where indicated on Drawings.

h Do not install nonmetallic conduit where ambient temperature exceeds 120°F.

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 Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

c Complete raceway installation before starting conductor installation.

d Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

e Arrange stub-ups so curved portions of bends are not visible above finished slab.

f Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

g Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

h Support conduit within 12 inches of enclosures to which attached.

i Raceways Embedded in Slabs:

1 Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2 Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3 Arrange raceways to keep a minimum of 2-inches of concrete cover in all directions.
4 Do not embed threadless fittings in concrete unless specifically approved by Engineer for each specific location.
5 Change from ENT to Type EPC-80-PVC before rising above floor.

j Stub-ups to Above Recessed Ceilings:

1 Use EMT or RMC for raceways.
2 Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

k Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

l Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

m Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

n Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

o Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

p Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

q Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

r Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

s 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.

t Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

u Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1 Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2 Where an underground service raceway enters a building or structure.
3 Where otherwise required by NFPA 70.

v Comply with manufacturer's written instructions for solvent welding RNC and fittings.

w Expansion-Joint Fittings:

1 Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2 Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

i Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.

ii Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
iii Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3 Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4 Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5 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.

x Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

y Locate boxes so that cover or plate will not span different building finishes.

z Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

aa Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3. INSTALLATION OF UNDERGROUND CONDUIT

a Direct-Buried Conduit:

1 Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2 After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
3 Install manufactured Schedule 80 PVC conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

i For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend Schedule 80 PVC conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4 Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
5 Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

4. SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

a Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

5. FIRESTOPPING

a Install firestopping at penetrations of fire-rated floor and wall assemblies.

6. 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.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

61GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2 Sleeve-seal systems.
3 Sleeve-seal fittings.
4 Grout.
5 Silicone sealants.

3. SUBMITTALS

a Product Data: For each type of product.

62PRODUCTS

1. SLEEVES

a Wall Sleeves:

1 Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2 Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

b Sleeves for Conduits 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 PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

d Sleeves for Rectangular Openings:

1 Material: Galvanized sheet steel.
2 Minimum Metal Thickness:

i For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
ii For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2. SLEEVE-SEAL SYSTEMS

a Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1 Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2 Pressure Plates: Plastic.
3 Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

3. SLEEVE-SEAL FITTINGS

a Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

4. GROUT

a Description: Nonshrink; 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, hydraulic-cement grout.

c Design Mix: 5000-psi, 28-day compressive strength.

d Packaging: Premixed and factory packaged.

5. SILICONE SEALANTS

a Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1 Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

b Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

63EXECUTION

1. SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

a Comply with NECA 1.

b Comply with NEMA VE 2 for cable tray and cable penetrations.

c Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1 Interior Penetrations of Non-Fire-Rated Walls and Floors:

i Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
ii Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2 Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3 Size pipe sleeves to provide ¼-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4 Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5 Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

d Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1 Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2 Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

e Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

f Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

g Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

2. SLEEVE-SEAL-SYSTEM INSTALLATION

a Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

b Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3. SLEEVE-SEAL-FITTING INSTALLATION

a Install sleeve-seal fittings in new walls and slabs as they are constructed.

b Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

c Secure nailing flanges to concrete forms.

d Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

64GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Color and legend requirements for raceways, conductors, and warning labels and signs.
2 Labels.
3 Bands and tubes.
4 Tapes and stencils.
5 Tags.
6 Signs.
7 Cable ties.
8 Paint for identification.
9 Fasteners for labels and signs.

3. SUBMITTALS

a Product Data: For each type of product.

1 Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

b Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

c Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

d Delegated-Design Submittal: For arc-flash hazard study.

65PRODUCTS

1. PERFORMANCE REQUIREMENTS

a Comply with ASME A13.1 and IEEE C2.

b Comply with NFPA 70.

c Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

d Comply with ANSI Z535.4 for safety signs and labels.

e Comply with NFPA 70E requirements for arc-flash warning labels.

f Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

g Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1 Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2. COLOR AND LEGEND REQUIREMENTS

a Raceways and Cables Carrying Circuits at 600 V or Less:

1 Black letters on an orange field.
2 Legend: Indicate voltage and system or service type].

b Color-Coding for Phase-and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

1 Color shall be factory applied.
2 Colors for 208/120-V Circuits:

i Phase A: Black.
ii Phase B: Red.
iii Phase C: Blue.

3 Colors for 240-V Circuits:

i Phase A: Black.
ii Phase B: Red.

4 Colors for 480/277-V Circuits:

i Phase A: Brown.
ii Phase B: Orange.
iii Phase C: Yellow.

5 Color for Neutral: White.
6 Color for Equipment Grounds: Green.
7 Colors for Isolated Grounds: Green with white stripe.

c Raceways and Cables Carrying Circuits at More Than 600 V:

1 Black letters on an orange field.
2 Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

d Warning Label Colors:

1 Identify system voltage with black letters on an orange background.

e Warning labels and signs shall include, but are not limited to, the following legends:

1 Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 42 INCHES."

f Equipment Identification Labels:

1 Black letters on a white field.

3. LABELS

a Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

b Snap-around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

c Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1 Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2 Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3 Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

d Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1 Minimum Nominal Size:

i 1-1/2 by 6 inches for raceway and conductors.
ii 3-1/2 by 5 inches for equipment.

4. BANDS AND TUBES

a Snap-around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.

b Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

5. TAPES AND STENCILS

a Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

b Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

c Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.

d Floor Marking Tape: 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

e Underground-Line Warning Tape:

1 Tape:

i Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
ii Printing on tape shall be permanent and shall not be damaged by burial operations.
iii Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2 Color and Printing:

i Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
ii Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE" .
iii Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

f Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

6. TAGS

a Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

b Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

c Write-on Tags:

1 Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
2 Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3 Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

7. SIGNS

a Baked-Enamel Signs:

1 Preprinted aluminum signs, high-intensity reflective, 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.

b Metal-Backed Butyrate Signs:

1 Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, 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.

c Laminated Acrylic or Melamine Plastic Signs:

1 Engraved legend.
2 Thickness:

i For signs up to 20 sq. in., minimum 1/16 inch thick.
ii For signs larger than 20 sq. in., 1/8 inch thick.
iii Engraved legend with black letters on white face, Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
iv Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

8. CABLE TIES

a General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1 Minimum Width: 3/16 inch.
2 Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3 Temperature Range: Minus 40 to plus 185 deg F.
4 Color: Black, except where used for color-coding.

b UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1 Minimum Width: 3/16 inch.
2 Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3 Temperature Range: Minus 40 to plus 185 deg F.
4 Color: Black.

c Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1 Minimum Width: 3/16 inch.
2 Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
3 UL 94 Flame Rating: 94V-0.
4 Temperature Range: Minus 50 to plus 284 deg F
5 Color: Black.

9. MISCELLANEOUS IDENTIFICATION PRODUCTS

a Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain 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.

66EXECUTION

1. PREPARATION

a Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

2. INSTALLATION

a Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

b Install identifying devices before installing acoustical ceilings and similar concealment.

c Verify identity of each item before installing identification products.

d Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

e Apply identification devices to surfaces that require finish after completing finish work.

f Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

g System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1 Secure tight to surface of conductor, cable, or raceway.

h System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1 Secure tight to surface of conductor, cable, or raceway.

i Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

j 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.

k Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

l Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1 "EMERGENCY POWER."
2 "POWER."
3 "UPS."

m Vinyl Wraparound Labels:

1 Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2 Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

n Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

o Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

p Self-Adhesive Labels:

1 On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2 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.

q Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

r Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

s Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

t Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1 Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

u Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

v Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

w Underground Line Warning Tape:

1 During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway 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.
2 Limit use of underground-line warning tape to direct-buried cables.
3 Install underground-line warning tape for direct-buried cables and cables in raceways.

x Metal Tags:

1 Place in a location with high visibility and accessibility.
2 Secure using UV-stabilized cable ties.

y Nonmetallic Preprinted Tags:

1 Place in a location with high visibility and accessibility.
2 Secure using UV-stabilized cable ties.

z Write-on Tags:

1 Place in a location with high visibility and accessibility.
2 Secure using UV-stabilized cable ties.

aa Baked-Enamel Signs:

1 Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2 Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

bb Cable Ties: General purpose, for attaching tags, except as listed below:

1 Outdoors: UV-stabilized nylon.
2 In Spaces Handling Environmental Air: Plenum rated.

3. IDENTIFICATION SCHEDULE

a Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

b Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

c Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3-inch-high, black letters on 20-inch centers.

1 Locate identification at changes in direction, at penetrations of walls and floors, and at 10-foot maximum intervals.

d Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Vinyl wraparound labels.

1 Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

e Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30A and 120V to Ground: Identify with self-adhesive raceway labels.

1 Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

f Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1 "EMERGENCY POWER."
2 "POWER."
3 "UPS."

g Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.

1 Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

h Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.

i Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

j Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.

k Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

l Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1 Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

m Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

n Concealed Raceways and Duct Banks, More Than 600 V, within Buildings: Apply floor marking tape to the following finished surfaces:

1 Floor surface directly above conduits running beneath and within 12 inches 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.

o Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

p Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

q Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1 Apply to exterior of door, cover, or other access.
2 For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

i Power-transfer switches.
ii Controls with external control power connections.

r Arc Flash Warning Labeling: Self-adhesive labels.

s Operating Instruction Signs: Baked-enamel warning signs.

t Emergency Operating Instruction Signs: Baked-enamel warning signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment.

u Equipment Identification Labels:

1 Indoor Equipment: Baked-enamel signs.
2 Outdoor Equipment: Laminated acrylic or melamine sign 4 inches high.
3 Equipment to Be Labeled:

i Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
ii Enclosures and electrical cabinets.
iii Access doors and panels for concealed electrical items.
iv Emergency system boxes and enclosures.
v Enclosed switches.
vi Enclosed circuit breakers.
vii Enclosed controllers.
viii Variable-speed controllers.
ix Push-button stations.
x Contactors.
xi Remote-controlled switches, dimmer modules, and control devices.
xii Monitoring and control equipment.

END OF SECTION 260553

SECTION 262726 - WIRING DEVICES

67GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 GFCI receptacles.
2 Toggle switches.
3 Wall plates.

3. DEFINITIONS

a BAS: Building automation system.

b EMI: Electromagnetic interference.

c GFCI: Ground-fault circuit interrupter.

d Pigtail: Short lead used to connect a device to a branch-circuit conductor.

e RFI: Radio-frequency interference.

f SPD: Surge protective device.

g UTP: Unshielded twisted pair.

4. SUBMITTALS

a Product Data: For each type of product.

b Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

c Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

68 PRODUCTS

1. GENERAL WIRING-DEVICE REQUIREMENTS

a Wiring Devices, Components, 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 NFPA 70.

c Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1 Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2 Devices shall comply with the requirements in this Section.

d Devices for Owner-Furnished Equipment:

1 Receptacles: Match plug configurations.
2 Cord and Plug Sets: Match equipment requirements.

e Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2. GFCI RECEPTACLES

a General Description:

1 125 V, 20 A, straight blade, non-feed-through type.
2 Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3 Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
4 Provide weatherproof, in-use cover.

b Duplex GFCI Convenience Receptacles:

3. TOGGLE SWITCHES

a Comply with NEMA WD 1, UL 20, and FS W-S-896.

b Switches, 120/277 V, 20 A:

4. WALL PLATES

a Single and combination types shall match corresponding wiring devices.

1 Plate-Securing Screws: Metal with head color to match plate finish.
2 Material for Finished Spaces: Type 302 stainless steel 0.04-inch-thick, brushed brass with factory polymer finish.

3 Material for Unfinished Spaces: Galvanized steel.
4 Material for Damp Outdoor Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for in-use, in wet and damp locations.

b Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, in-use, die-cast aluminum with lockable cover.

5. FINISHES

a Device Color: By Owner.

b Wall Plate Color: For plastic covers, match device color.

69 EXECUTION

1. INSTALLATION

a Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

b Coordination with Other Trades:

1 Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2 Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3 Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4 Install wiring devices after all wall preparation, including painting, is complete.

c Conductors:

1 Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2 Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3 The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4 Existing Conductors:

i Cut back and pigtail, or replace all damaged conductors.
ii Straighten conductors that remain and remove corrosion and foreign matter.
iii Pigtailing existing conductors is permitted, provided the outlet box is large enough.

d Device Installation:

1 Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2 Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3 Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4 Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5 When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6 Use a torque screwdriver when a torque is recommended or required by manufacturer.
7 When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8 Tighten unused terminal screws on the device.
9 When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

e Receptacle Orientation:

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

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

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

h Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

2. GFCI RECEPTACLES

a Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3. IDENTIFICATION

a Comply with Section 260553 "Identification for Electrical Systems."

b Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

4. FIELD QUALITY CONTROL

a Test Instruments: Use instruments that comply with UL 1436.

b Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

c Tests for Convenience Receptacles:

1 Line Voltage: Acceptable range is 105 to 132 V.
2 Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3 Ground Impedance: Values of up to 2 ohms are acceptable.
4 GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5 Using the test plug, verify that the device and its outlet box are securely mounted.
6 Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

d Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

70 GENERAL

1. RELATED DOCUMENTS

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

2. SUMMARY

a Section Includes:

1 Fusible switches.
2 Nonfusible switches.
3 Molded-case circuit breakers (MCCBs).
4 Enclosures.

3. DEFINITIONS

a NC: Normally closed.

b NO: Normally open.

c SPDT: Single pole, double throw.

4. SUBMITTALS

a Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, 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 Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
5 Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6 Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

b Shop Drawings: For enclosed switches and circuit breakers.

1 Include plans, elevations, sections, details, and attachments to other work.
2 Include wiring diagrams for power, signal, and control wiring.

c Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1 Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2 Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3 Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

d Field quality-control reports.

e Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1 In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

i Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
ii Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

f Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1 Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three (3) of each size and type.

5. FIELD CONDITIONS

a Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1 Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2 Altitude: Not exceeding 6600 feet.

6. WARRANTY

a Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1 Warranty Period: Three (3) years from date of Substantial Completion.

71 PRODUCTS

1. PERFORMANCE REQUIREMENTS

a Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to IBC as adopted by New Jersey.

1 The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. GENERAL REQUIREMENTS

a Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

b Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

c Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

d Comply with NFPA 70.

3. FUSIBLE SWITCHES

a Type HD, Heavy Duty:

1 Single throw.
2 Three pole.
3 600-V ac.
4 200 A and smaller.
5 UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
6 Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

b 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 Hookstick Handle: Allows use of a hookstick to operate the handle.
4 Lugs: Mechanical type, suitable for number, size, and conductor material.

4. NONFUSIBLE SWITCHES

a Type HD, Heavy Duty, Three Pole, Double 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 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 Hookstick Handle: Allows use of a hookstick to operate the handle.
4 Lugs: Mechanical type, suitable for number, size, and conductor material.
5 service equipment.

5. MOLDED-CASE CIRCUIT BREAKERS

a Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

b Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

c The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. Circuit breaker/circuit breaker and Fuse/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."

d Lugs shall be suitable for 90 deg C)rated wire, sized according to the 75 deg C temperature rating in NFPA 70.

e Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

f Thermal-Magnetic Circuit Breakers: Inverse time-current thermal 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.

g Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

h Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1 Instantaneous trip.
2 Long- and short-time pickup levels.
3 Long- and short-time time adjustments.
4 Ground-fault pickup level, time delay, and I-squared t response.

i Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

j Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

k Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

l 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 Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

4 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.
5 Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

6. ENCLOSURES

a Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

b Enclosure Finish: The enclosure shall be gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12).

c Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

d Operating Mechanism: The circuit-breaker operating handle shall be directly operable through the dead front trim of the enclosure (NEMA 250 Type 3R). The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

e Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

f NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

72 EXECUTION

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.

1 Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

2. PREPARATION

a Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1 Notify Engineer and Owner no fewer than fourteen (14) days in advance of proposed interruption of electric service.
2 Indicate method of providing temporary electric service.
3 Do not proceed with interruption of electric service without Owner’s written permission.

4 Comply with NFPA 70E.

3. ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

a Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1 Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2 Outdoor Locations: NEMA 250, Type 3R.
3 Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

4. INSTALLATION

a Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

b Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

c Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

d Install fuses in fusible devices.

e Comply with NFPA 70 and NECA 1.

5. IDENTIFICATION

a Comply with requirements in Section 260553 "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.

6. FIELD QUALITY CONTROL

a Perform tests and inspections.

b Tests and Inspections for Switches:

1 Visual and Mechanical Inspection:

i Inspect physical and mechanical condition.
ii Inspect anchorage, alignment, grounding, and clearances.
iii Verify that the unit is clean.
iv Verify blade alignment, blade penetration, travel stops, and mechanical operation.
v Verify that fuse sizes and types match the Specifications and Drawings.
vi Verify that each fuse has adequate mechanical support and contact integrity.
vii Inspect bolted electrical connections for high resistance using one of the two following methods:

a Use a low-resistance ohmmeter.

Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

viii Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
ix Verify correct phase barrier installation.
x Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2 Electrical Tests:

i Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
ii Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
iii Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
iv Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
v Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

c Tests and Inspections for Molded Case Circuit Breakers:

1 Visual and Mechanical Inspection:

i Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
ii Inspect physical and mechanical condition.
iii Inspect anchorage, alignment, grounding, and clearances.
iv Verify that the unit is clean.
v Operate the circuit breaker to ensure smooth operation.
vi Inspect bolted electrical connections for high resistance using one of the two following methods:

a Use a low-resistance ohmmeter.

Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

vii Inspect operating mechanism, contacts, and chutes in unsealed units.
viii Perform adjustments for final protective device settings in accordance with the coordination study.

2 Electrical Tests:

i Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
ii Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
iii Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
iv Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
v Determine the following by primary current injection:

a Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
b Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
c Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
d Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

vi Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
vii Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
viii Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
ix Verify operation of charging mechanism. Investigate units that do not function as designed.

3 Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4 Perform the following infrared scan tests and inspections and prepare reports:

i Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.

ii Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.

iii Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

5 Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

d Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

7. 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 to values indicated on the Drawings.

END OF SECTION 262816

CONTRACT

CONTRACTORS INSURANCE REQUIREMENTS

A/. GENERAL REQUIREMENTS

1/ The Contractor(s) shall provide and pay for insurance coverage of such type and in such amounts as will completely protect the Contractor and the County, its elected officials, officers, agents, servants employees and assigns against any and all risks of loss (including costs of defense) or liability arising out of this contract.

2/ The insurance should be furnished by insurance companies with and "A- (Excellent) VII" or better or better rating as published in the most recent editions of Best Insurance Key Rating and shall be authorized to conduct business in the State of New Jersey.

3/ It is recognized that in some instances that insurance may be acceptable which is underwritten by an insurance company that is not reported in the BEST GUIDE , or the coverage is extended under a self insured program. This insurance, or self insurance, must be in conformity with the rules and regulations of the Commissioner of Insurance of the State of New Jersey. Any insurance or self insurance of this type is subject to the review and acceptance by the County Risk Manager or the County Counsel. Furthermore written proof of acceptability by the Office of the Commissioner of Insurance may be necessary.

4/ The Contractor(s) shall furnish the County with Certificates of Insurance, as shown under "B" Specific Coverage Requirements, policies for General Liability must be endorsed to include the County of Atlantic as an **Additional Insured, a copy of ISO Endorsements CG 20 10 is required along with the certificate.** The Certificates of Insurance shall set out the types of coverage, the limits of liability, describe the operation by reference to this contract and provide for (30 days) written notice to the County of cancellation and/or non-renewal. All of the Contractors. Deductibles or Retention's shall be the sole responsibility of the contractor, those in excess of $10,000 are to be disclosed and are subject to approval by the County. If requested actual policy copies or incurred loss information may be required.

5/ The policies and specified limits of coverage must be effective prior to the commencement of work and must remain in force until final acceptance of the work under the contract. **Contracts that involve construction**, **installation, or maintenance repair must maintain completed operations insurance, endorsing the County as an additional insured for a term of two (2) years beginning on the date of the final acceptance**. **They also must include a copy of I.S O. Endorsement CG 2011 CG 2037 , or their equivalent.**

6/ The Contractor(s) shall obtain, and furnish the County, certificates of insurance from their subcontractor(s) or sub sub contractor(s) showing polices in force with coverage and limits as described under these insurance requirements.

7/ The Certificate of Insurance with a **A COPY OF THE ADDITIONAL INSURED ENDORSEMENTS** , are to be signed by a person authorized by the insuring company(s) to bind

coverage on it's behalf. Neither approval by the County nor failure to disapprove Certificates of Insurance/ furnished by the Contractor shall release the Contractor from full responsibility for all liability including costs of defense. Insurance is required as a measure of protection and the Contractor's liability is not limited thereby.

8/ The Certificates of Insurance, must be submitted to the County and shall be subject to the review and approval of the County Counsel or Risk Manager.

9/ If at any time during the term of this contract or any extension thereof, if any of the required policies of insurance should expire, change or be canceled, it will be the responsibility of the Contractor, prior to the expiration, change or cancellation, to furnish to the County a Certificate of Insurance indicating renewal or an acceptable replacement of the policy so that there will be no lapse in any coverage. In the event of interruption of any coverage for any reason, all payments and work under the contract shall cease and not be resumed until coverage has been restored and a current Certificate of Insurance received and approved.

10/ Any policy of insurance that is written on a claims made basis shall, under the terms of this contract, be renewed or the coverage extended for a period of not less than three years and shall provide coverage for the period operations were performed by the contractor. Proof of such extension shall annually be presented to the Risk Manager for the County of Atlantic and indicate the retroactive date of coverage or indicate that all prior acts coverage is provided.

11/ Insurance or Risk Funding maintained by the County shall be considered as Excess over Contractors Insurance. Insurance or Risk Funding Maintained by the County of Atlantic does not provide protection for Contractors liability.

12/ Certificates of Insurance and Evidence of Property Forms shall show the Certificate Holder as follows:

COUNTY OF ATLANTIC
COUNTY OFFICE BUILDING
1333 ATLANTIC AVENUE
ATLANTIC CITY, NEW JERSEY 08401
ATTN.: RISK MANAGER

Certificates of Insurance not reading as above will not be acceptable and will delay contract signature and/or payment.

13/ Questions regarding these insurance requirements may be directed to (609)-345-6700 Ext. 2495. Certificates for approval may be preliminarily submitted via fax to (609)-343-2164, or to (609)-343-2373.

B./ SPECIFIC COVERAGE REQUIREMENTS

1/ The following **checked** items are the minimum mandatory types of insurance coverage to be carried under the preceding requirements:

------X--------(a) Workers Compensation-Statutory Limits , Employers Liability - with minimum limits of - $1,000,000,/1,000,000,/1,000,000.

-----X----------(b) General Liability in a comprehensive form, with minimum limits as follows:

1/ Each Occurrence	$1,000,000
2/ Damage to Rented or Leased Properties	$ 100,000
3/ Medical Expense	$ 5,000
4/ Personal & Adv. Injury	$1,000,000
5/ General Aggregate	$2,000,000
6/ Products-Completed Operations Aggregate	$2,000,000

-----X---------(c) Motor Vehicle Liability Insurance in a comprehensive form, endorsed to include pollution coverage, with minimum limits of $1,000,0000 CSL

1/ Owned Vehicles
2/ Hired/Leased Vehicles
3/ Non-Owned Vehicles

------X------- - (d) Umbrella /Excess Liability over General / Automobile liability , with minimum limits of $1,000,000

January , 2011

CONTRACT

THIS AGREEMENT made this day of , 20XX, between the COUNTY OF ATLANTIC a body corporate and politic of the State of New Jersey with offices located at 1333 Atlantic Avenue, Atlantic City, NJ 08401 (the "County" hereinafter), and (contractor name), with offices located at (contractor address), hereinafter referred to as "Contractor".

WITNESSETH:

WHEREAS, the County desires to engage the services of the Contractor to provide all goods and services necessary to perform a Project concerning (describe or name project) specifically described in the County Bid documents, attached herewith as Exhibit A; and

WHEREAS, the Contractor has represented that it is qualified by training and experience to perform the required services in the manner and on the terms and conditions set forth herein.

WHEREAS, execution of this contract has been authorized by the Board of Chosen Freeholders of Atlantic County pursuant to Atlantic County Resolution # (number) adopted on (date).

NOW, THEREFORE, in consideration of the mutual covenants and promises contained herein, the parties hereto agree as follows:

1. SCOPE OF SERVICES AND CONTRACT DOCUMENTS.

The Contractor shall provide to the County the following: All work and services necessary to accomplish the Work, as set forth in the County's Bid Documents (Exhibit A) and Contractor's Proposal (Exhibit B) in accordance with all of the terms, conditions, specifications and requirements incorporated herein (referred to collectively as the "Work") for (add description of project from the bid specs).

2. CONSIDERATION.

A. In accordance with the authorization for this Contract granted by Atlantic County Board of Chosen Freeholders Resolution No. (number) adopted on (date), the Contractor shall be compensated in an amount not to exceed $ (amount) in full consideration for performance of the Project, in accordance with the requirements of the Contract Documents.

B. The time and rate of compensation shall be as set forth in the County Bid Documents (Exhibit A) and the Contractor's Proposal, Exhibit B, attached herewith, for all goods, materials, labor and services satisfactorily provided hereunder. The Price stated in the Contract Documents constitutes the total compensation (subject to adjustments explicitly authorized by the Contract Documents) payable to Contractor for performing all of the duties, responsibilities and obligations assigned to or undertaken by Contractor and shall be performed at the Contractor's expense, without change in the Contract Price.

C. Even if the Agreement calls for the provision of services on an hourly rate or other unit price basis or if the Agreement allows for payment of specified reimbursable expenses, Contractor understands that Contractor shall not be entitled to payment for any goods, materials, labor or other level of services rendered in excess of the maximum compensation specified in 2.A unless additional compensation is expressly authorized by the County.

D. Any changes to the maximum compensation or scope of work specified or otherwise required by the Contract Documents shall only be effective if such additional compensation or modification is expressly authorized by an amendatory resolution duly adopted by the Atlantic County Board of Chosen Freeholders.

E. Any claim by Contractor for an adjustment in the Contract Price shall be subject to the specific requirements of the Technical Specifications and County Special Conditions, In addition, any adjustment shall additionally be based on written notice delivered by Contractor promptly (but in no event later than seven days) after the start of the occurrence or event giving rise to the claim and stating the general nature of the claim. Contractor shall provide complete supporting data with respect to the claim, including all claims for equitable adjustment, not later than thirty (30) days after the start of such occurrence. All claims for adjustment in the Contract Price shall be determined by the County, in the event that the County and Contractor cannot otherwise agree on the amount involved. No claim of any kind for an adjustment in the Contract Price will be valid if it is not submitted in accordance with the procedures and requirements set forth in the Contract Documents, and Contractor waives all rights to recovery for any claim as to which this procedure is not followed.

F. It is the exclusive right of the County to determine that services have been performed in a proper and satisfactory manner in accordance with the terms and conditions set forth herein prior to approval and payment of invoice submitted by Contractor.

G. Payment shall be made only upon submission by the Contractor of the required executed standard County invoice, a bill on Contractor's letterhead and any other documents deemed necessary by the County.

H.Contractor agrees to maintain financial records, books and documents plus any evidence necessary to reflect all direct and indirect costs incurred during this Agreement in an auditable format. Contractor agrees to keep complete and accurate records with respect to the computation of all billing, including receipts for any reimbursable expenses and time records for all persons billed on an hourly rate basis. The Contractor also agrees to submit all documents and records necessary to assure compliance and completion of this Agreement. Contractor agrees that all financial records required to be kept be made available for inspection during normal business hours by representatives of the County. Said records shall be kept for a minimum of three (3) years after expiration of the Contract Term.

3. TERM.

A. Upon its authorization and execution this Agreement shall be effective for the term commencing on (date) and expiring on (date) .

B. The Contractor acknowledges it shall complete the performance of the Work in accordance with the time limits as specified in the Contract Documents. (Add the following where needed) together with a maintenance period of one (1) year from the date of the Certificate of Final Completion.

C. The County Executive or his designee may extend the time for completion specified by Article 3 B. Such extensions shall only be effective if in writing, and shall not extend the Agreement term beyond the term specified in the authorizing resolution. In the event that the time for completion is extended, all of the original terms and conditions will remain in effect for the extended period.

4. TIME OF THE ESSENCE. (May be reserved)

All time limits for the performance and completion of Work, as stated in the Contract Documents, are of the essence of this Contract. Expeditious performance and completion of this Contract are essential for the express purpose of enabling the County to maintain in public service an important transportation facility, in accordance with a predetermined program of funding and construction. The Contractor shall begin the Work promptly on the date of commencement and he shall carry the Work forward expeditiously with adequate forces and shall achieve completion at the earliest possible date within the Contract Time.

5. CONTRACT DOCUMENTS.

The Contract Documents consist of: A. the County Bid Documents, including the Bid Instructions, General Conditions, the technical specifications and the materials incorporated therein (Exhibit A) and the Contractor's Bid (Exhibit B) along with all attachments herewith, all of which are incorporated by reference and comprise the "Contract Documents". In the event of any dispute or inconsistency, the documents shall have the following priority:

A. The terms and provisions of this Agreement;

B. The requirements, terms and conditions set forth in the County Bid Documents which include all addendums and clarifications (Exhibit A);

C. The approved Project Schedule;

D. The Contractor's Bid (Exhibit B).

In addition to the Exhibits and submissions listed above, the Appendices to the Contract Documents shall additionally constitute integral parts of this Agreement and are hereby incorporated herein in their entirety:

6. PERFORMANCE BOND.

Upon execution of this agreement, and in no event later than 20 days after award of a contract by the County, the Contractor shall provide a Performance Bond in an amount equal to the proposed costs of all materials and installation work required to provide the Services, as set forth in the Contract Documents, in a form acceptable to the County, by company that is duly authorized to issue such obligations in New Jersey. The obligations imposed upon the Contractor by this contract shall be obligations in addition to all other terms, covenants and conditions of said Bond to the same effect as though they had been incorporated in said Bond.

This Bond shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations. All Bonds signed by an agent must be accompanied by appropriate power of attorney and surety disclosure statements

If the surety on any Bond furnished by Contractor is declared a bankrupt or becomes insolvent or its right to do business is terminated or suspended in the State of New Jersey or otherwise ceases to meet the requirements of the Contract Documents, Contractor shall within ten days thereafter substitute another Bond and surety, both of which must be acceptable to the County.

7. WARRANTIES.

Without limitation upon any other warranty, representation warranty or duty imposed upon or made by the Contractor in the Contract Documents, the Contract hereby warrants:

A. that this Contractor has not been solicited or secured, directly or indirectly, in a manner contrary to the laws of the State of New Jersey and that said laws have not been violated and shall not be violated as they relate to the procurement or the performance of this Contract by any conduct, including the paying or giving of any fee, commission, compensation, gift, gratuity or consideration of any kind, directly or indirectly, to any County, employee, officer or officials.

B. that the Contractor, for itself and its subcontractors, is qualified by training and experience to perform the services in accordance with all of the terms, conditions and requirements of the Contract Documents .

C. that the Contractor is ready, willing and able to perform all services in the timeframe and as required by this Contract, and that he and/or his subcontractors performing the work presently hold in good standing any and all necessary licenses for the lawful performance of the Project within the State of New Jersey.

8. WARRANTY AGAINST DEFECTS.

In addition to any other warranty, the Contractor further agrees to extend to the County a one year warranty against defects in material and workmanship of the materials and equipment herein provided to the County, which shall commence upon final Acceptance of the Work by the County

9. DEFAULT.

Without limitation upon any duty or obligation imposed upon the Contractor by the Contract Documents, a Default by the Contractor shall include the following:

A. Failure by the Contractor to begin work under the Contract within the time specified in the Notice to Proceed, or otherwise according to the Contract;
B. Failure by the contractor to perform the Work with sufficient workmen, equipment or materials to insure completion of the Work in accordance with the Contract;
C. Violation by the Contractor of any of the conditions or covenants of the Contract, the Documents, or any order of the County authorized therein, and failure to execute the same in good faith or in accordance with the terms thereof;
D. Unnecessary, unreasonable or negligent delay by the Contractor in performance of the Contract;
E. Abandonment or discontinuation by the Contractor of performance of the Work without approval of the County, or failure to resume Work which has been discontinued within a reasonable time after notice to do so;
F. Failure or refusal by the Contractor to remove materials or perform anew any Work rejected as defective or unsatisfactory;
G. Failure by the Contractor to complete the Work within the time specified in the Contract, or within the extended time as otherwise provided according to the Contract;
H. Insolvency or bankruptcy of the Contractor, or commission by him of any act of insolvency or bankruptcy;

I. Failure by the Contractor to protect, repair or make good any damage or injury to property;
J. Failure by the Contractor, for any cause whatsoever, to carry on the Work in an acceptable manner;
K. Conviction of any principal of Contractor of any crime under the laws of the State of New Jersey which, if committed by a public official, would disqualify that person from public employment;
L. Failure of Contractor to pay its subcontractors and/or suppliers, or any governmental authority any sums that are legally due and owing that are related to provision of goods or services related to this project.
M. Assignment or subcontracting of the work or any part thereof or any monies due hereunder that is not authorized as set forth in this Contract.

If the Contractor becomes in Default and fails, refuses or is otherwise unable to cure such default within a time frame that ensures continuous and uninterrupted provisions of all required Work to the County as set forth in the Contract Documents , or shall otherwise fail to comply with any of the terms, conditions, provisions or stipulations of this Contract , according to the intent and meaning thereof, then the COUNTY shall be permitted to pursue any or all remedies that may be available under the Contract Documents, or at law or in equity, including but not limited to an action for specific performance, termination of the contract, or any action for damages arising from the Contractor's default.

Notwithstanding the foregoing, the County and Contractor shall seek to mediate claims and disputes, when resort to litigation is not authorized, as set forth in the Contract Documents.

The commencement of one or more remedy shall not preclude the County from pursuit of any other available remedy.

Should the County fail to make any payment when such payment is due in accordance with the Contract Documents, or otherwise fail to perform any material duty or obligation imposed upon the County by the Contract Documents. the Contractor shall be permitted to proceed with all remedies that may be available at law or in equity, provided that Contractor shall first provide the County with written notice of the circumstances that are alleged to constitute a default and a 30 day opportunity to cure.

10. CONTINUING THE WORK.

During the pendency of any dispute or disagreement, the Contractor shall carry on the Work and adhere to the progress schedule, and shall not abandon, slow down or terminate its work, and no Work shall be delayed or postponed pending resolution of any disputes or disagreements, unless this Agreement is Terminated or such deviation from the Work or Work Schedule is directed by the County.

11. LIQUIDATED DAMAGES.

Without limitation upon any other provision regarding liquidated damages in the Contract Documents, all amounts set forth in the Contract Documents as liquidated damages shall be a per day charge for every calendar day that the Contractor is in default in completing the Work or any designated portion thereof in excess of the number of days prescribed. The daily sums herein contracted to be paid by the Contractor to the County for any default or delay in the completion of this Work or portions of Services are stipulated to be not a penalty, but rather, liquidated compensation for damages which the County will suffer by reason of such default, loss of use of property, interest on monies borrowed, increased administrative and engineering costs, and other tangible and intangible losses.

The County may deduct the sum of liquidated damages from any monies due or that become due the Contractor under the Contract. If such monies are insufficient, the Contractor or his surety or sureties shall pay to the County any deficiency in such monies within thirty (30) calendar days. Assessment of Liquidated Damages are not intended and shall not be an exclusive, and are in addition to any other rights and remedies provided by law or under this Contract.

12. ADDRESS FOR NOTICE.

The address given below shall be the address of the representatives parties to which all notices and reports required by this Agreement shall be sent by mail:

To the County of Atlantic:

County Executive
1333 Atlantic Avenue
County Office Building
Atlantic City, NJ 08401

Copy to County Counsel
1333 Atlantic Avenue
County Office Building
Atlantic City, NJ 08401

To the Contractor:

Contractor name and address

Any notice or statement by any party shall be deemed to be sufficiently given when sent by prepaid certified mail return receipt requested, to any party at its address set forth hereinabove. This address shall remain in effect unless another address is substituted by written notice.

IN WITNESS WHREOF, the parties have set their hand and seal effective as of the date forth above.

ATTEST

SONYA G. HARRIS, Clerk
Board of Chosen Freeholders

COUNTY OF ATLANTIC

DENNIS LEVINSON
County Executive

Approved as to form on behalf of
Atlantic County

JAMES F. FERGUSON
County Counsel

ATTEST

CONTRACTOR:

Affix Corporate Seal, if
applicable

kGeneral Construction Short Form 2013.doc

EXHIBIT A

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L. 1975, C. 127)
N.J.A.C. 17:27

GOODS, PROFESSIONAL SERVICE AND GENERAL SERVICE CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union of the contractor's commitments under this chapter and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

The contractor or subcontractor agrees to make good faith efforts to meet targeted county employment goals established in accordance with N.J.A.C. l7:27-5.2.

The contractor or subcontractor agrees to inform in writing its appropriate recruitment agencies including, but not limited to, employment agencies, placement bureaus, colleges, universities, and labor

unions, that it does not discriminate on the basis of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, and that it will discontinue the use of any recruitment agency which engages in direct or indirect discriminatory practices.

The contractor or subcontractor agrees to revise any of its testing procedures, if necessary, to assure that all personnel testing conforms with the principles of job-related testing, as established by the statutes and court decisions of the State of New Jersey and as established by applicable Federal law and applicable Federal court decisions.

In conforming with the targeted employment goals, the contractor or subcontractor agrees to review all procedures relating to transfer, upgrading, downgrading and layoff to ensure that all such actions are taken without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, consistent with the statutes and court decisions of the State of New Jersey, and applicable Federal law and applicable Federal court decisions.

The contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

Letter of Federal Affirmative Action Plan Approval

Certificate of Employee Information Report

Employee Information Report Form AA302 (electronically provided by the Division and distributed to the public agency through the Division's website at www.state.nj.us/treasury/contract_compliance)

The contractor and its subcontractors shall furnish such reports or other documents to the Division of Public Contracts Equal Employment Opportunity Compliance as may be requested by the office from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Division of Public Contracts Equal Employment Opportunity Compliance for conducting a compliance investigation pursuant to **Subchapter 10 of the Administrative Code at N.J.A.C. 17:27**.

BID CHECK LIST

Checked
Items required with bid

(Bidder's **INITIALS**)
Items submitted with bid

A FAILURE TO SUBMIT ANY OF THESE ITEMS IS MANDATORY CAUSE FOR REJECTION OF BID

X	Complete and sign Proposal page(s) ***ORIGINAL SIGNATURES***	
X	Corporate Disclosure Statement, Pursuant to N.J.S.A.40A:11-16	
X	Bid guarantee (bid bond or certified /cashier's check)	
X	Certificate from a Surety Company (Consent of Surety)	
	Acknowledgment of receipt of addenda or revisions (if any)	
	Employee Benefit Affidavit (Executive order # 2000-4)	
X	Copy of Certificate for Public Works Contractor Registration	
	Subcontractors Affidavit (N.J.S.A. 40A:11-16), includes Plumbing, HVAC, Electrical and Structural Steel	
	Plumbers Affidavit	

B MANDATORY ITEM(S) REQUIRED PRIOR TO AWARD OF CONTRACT

X	Copy of New Jersey Business Registration Certificate for bidder and designated subcontractors	

C FAILURE TO SUBMIT ANY OF THESE ITEMS AT TIME OF BID MAY BE CAUSE FOR REJECTION

X	**N**on–Collusion Affidavit	
X	Affirmative Action Page (AA 201 Completed & Submitted)	
X	References (if required)	
X	Deviations from Specifications, if applicable, attached in letter form	
	Other :	

Print Name of Bidder :_____ Date:_____

Signed By: _____

Print Name & Title: _____

THIS CHECKLIST SHOULD BE INITIALED AND SIGNED WHERE INDICATED AND RETURNED WITH ALL ITEMS

ATLANTIC COUNTY STILLWATER BUILDING

CHILLER REPLACEMENT

_____
Authorized Signature

_____
Company Name

The undersigned, having read the Notice to Bidders, Invitation to Bid, Instruction to Bidders, and specifications attached hereto, hereby agrees to the work which consists of **Performing Chiller Replacement work to the Atlantic County Stillwater Building, Northfield, New Jersey,** as described in and in strict accordance with this specification, as follows:

1. Base Bid	$ _____
2. 5% Allowance	$ _____
3. Total Bid (1 + 2)	$ _____

Award of contract shall be based on the lowest most responsive <u>Base Bid.</u>

<u>PARTIAL AWARD OF BASE BID</u>
Should the County of Atlantic, due to budget constraints, only have enough funding to award <u>less</u> than Base Bid, the County of Atlantic shall elect to award whichever part of the project that it can.

BIDDERS MUST COMPLETE AND SIGN ALL PF PAGES OR BID SHALL BE REJECTED

Authorized Signature

Company Name

ALLOWANCE CONTINGENCY :

The County of Atlantic will determine an allowance (contingency) amount, equal to five (5%) percent of the lowest qualified base bid, that will be added to and awarded with the base bid. This allowance shall be set aside to pay for items that are unforeseen or additional work not in the specifications or shown on the drawings. Before any work is performed under this Allowance Contingency category, it has to be approved by the Director of Facilities/Capital Planning & Property Management, or his designee. Any work performed without this written approval will not be paid.

IMPORTANT NOTES:

1) All work time-lines are weather permitting & exclusive of Weekends and Holidays.
2) All work is to begin within ten (10) working days from Notice to Proceed.
3) This project must be completed ASAP and within the projected one-hundred & fifty (150) consecutive calendar day construction schedule, including mobilization & closeout.
4) Liquidated damages for work not completed within the approved schedule will be in the amount of $250.00 (Two Hundred Fifty Dollars) per consecutive calendar day thereof.
5) Allowance funds **may only** be used with the prior approval of the Director of Facilities Management or his designee.
6) Any Allowance work done without prior approval will not be paid.

NOTE: Certified Check, Cashier's Check or Bid Bond must be not less than ten percent (10%) of the total amount of the Bid, except that no check or bid bond shall be for more than $20,000 and made payable to the Atlantic County Treasurer which the undersigned agrees is to be forfeited as liquidated damages and not a penalty if the Contract is awarded to the undersigned and the undersigned shall fail to execute the Contract for the project or furnish the required bond. Otherwise, said deposit shall be returned to the undersigned.

AWARD WILL BE BASED ON BASE BID ONLY TO THE LOWEST RESPONSIBLE AND RESPONSIVE BIDDER. THE COUNTY RESERVES THE RIGHT TO NOT AWARD THE BASE BID.

BIDDERS MUST COMPLETE AND SIGN ALL PF PAGES OR BID SHALL BE REJECTED

_____
Authorized Signature

_____
Company Name

NAME OF BIDDER

_____

Person Firm or Corporation

By:_____
Signature

Partnership
The undersigned is a Corporation under the laws of the State of _____
Individual

having principal Offices at: _____,
and is authorized to conduct business in the State of New Jersey.

_____
Street Address City/State Zip Code

Telephone _____ Fax Number _____

BIDDERS MUST COMPLETE AND SIGN ALL PF PAGES OR BID SHALL BE REJECTED

COUNTY OF ATLANTIC

ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

VENDOR REQUIRED TO COMPLETE AND RETURN FORM WITH PROPOSAL
REGARDLESS OF WHETHER ADDENDA WAS ISSUED.
FAILURE TO COMPLETE AND RETURN FROM IS A FATAL DEFECT
WHICH CANNOT BE CURED AND PROPOSAL WILL BE REJECTED

The undersigned vendor hereby acknowledges receipt of the following Addenda:

Addendum Number	Dated	Initial
_____		_____
_____		_____
_____		_____
_____		_____

OR:

Vendor acknowledges to the best of this /her knowledge no addendum has been issued by the County

Dated _____ Initial _____

Vendor is required to complete, sign and submit form with bid regardless of whether addenda was issued. Failure to complete and return form is a fatal defect which cannot be cured and bid will be rejected .
See: N.J.S.A. 40 A:11-23.2

BY: _____
(Print or Type Name of Authorized Individual)

Title: _____

BIDDERS MUST COMPLETE AND SIGN ALL PF PAGES OR BID SHALL BE REJECTED

ATLANTIC COUNTY HAS PROVIDED THIS SAMPLE BID BOND FOR SUBMISSION TO A BIDDER'S INSURANCE/BONDING COMPANY. LANGUAGE SUCH AS THIS WILL BE ACCEPTED; HOWEVER,

LANGUAGE THAT LIMITS THE BID BOND TO THE "DIFFERENCE" BETWEEN BID AMOUNT AND SUCH LARGER AMOUNT FOR WHICH THE COUNTY COULD CONTRACT, SHALL NOT BE ACCEPTABLE.

THIS BOND, made this _____ day of _____, 20____.

WITNESSETH:

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____, as Principal and _____ as Surety, are held firmly bound unto the County of Atlantic, as Owner, in the sum of Ten Percent (10%) of Amount of Bid, for the payment of which we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above is such that whereas the Principal has submitted to the County of Atlantic a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing for _____.

NOW, THEREFORE,

(a) If said Bid be rejected, or in the alternate,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Agreement attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for the faithful performance of said Agreement and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid,

Then this obligation shall be null and 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 amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its bond shall in no way be impaired or affected by an extension of the time within which the Owner may accept such bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and in such of them as are corporations have caused their corporate seals to be hereto affixed and those present to be signed by their proper officers, the day and year first set forth above.

by Principal: _____

by Surety: _____

ATLANTIC COUNTY HAS PROVIDED THIS SAMPLE CONSENT OF SURETY FORM FOR SUBMISSION TO A BIDDER'S INSURANCE/BONDING COMPANY. LANGUAGE SUCH AS THIS WILL BE ACCEPTED; HOWEVER, LANGUAGE THAT LIMITS THE TIME FRAME IN WHICH THE COUNTY CAN PROCESS CLAIMS AGAINST A PERFORMANCE BOND, OR LANGUAGE THAT STATES THE SURETY IS CONDITIONAL DEPENDING ON CONTRACT TERMS, WILL NOT BE ACCEPTED. (CONTRACT TERMS WILL BE AS OUTLINED IN THE BID SPECIFICATION)

County of Atlantic
1333 Atlantic Avenue
Atlantic City, NJ 08401

_____
NAME OF INSURANCE/BONDING COMPANY

being duly qualified to transact business in the State of New Jersey, hereby certifies that if

_____
CONTRACTOR NAME

is the successful bidder for _____

_____ it as surety will provide the bidder with a bonds as are called for in the bid specifications.

Signed and Sealed _____, 20_____.

_____
NAME OF INSURANCE/BONDING COMPANY

by: _____
ATTORNEY-IN-FACT

POWER OF ATTORNEY MUST BE ATTACHED TO CONSENT OF SURETY

YOU MUST PROVIDE BELOW THE NAME, ADDRESS AND PHONE NUMBER OF A PERSON TO BE CONTACTED IN THE EVENT ANY QUESTIONS OR CLAIMS ARISE REGARDING THE BID AND / OR PERFORMANCE BOND.

NAME_____ TITLE_____

ADDRESS_____

PHONE #_____

C.S.

LIST OF SUBCONTRACTORS

IF APPLICABLE

N.J.S.A. 40A:11-16 REQUIRES THE LISTING OF ALL SUBCONTRACTORS TO WHOM THE BIDDER WILL SUBCONTRACT THE FURNISHING OF:

1) Plumbing and gas fitting and all kindred work.
2) Steam power plants, steam and hot water heating and ventilating apparatus and all kindred work.
3) Electrical work
4) Structural steel and ornamental iron work

All bidders seeking to perform plumbing work on a publicly bid contract are required to comply with N.J.S.A. 45:14C.1-4 See Plumbing Affidavit page P.A. (when applicable)

In accordance with N.J.S.A. 40A:11-16 the following is a list of names of subcontractors to whom the bidder will subcontract the furnishing of the above referenced work required for the completion of the project. If more than one subcontractor is listed for an above referenced trade, the bidder must submit a list of names and addresses and the scope of work, goods and services for which the subcontractor has submitted a price quote and which the bidder has agreed to award each subcontractor should the bidder be awarded the contract.

Trade Company Address/Telephone #

_____

_____

_____

_____

_____

_____

_____

I certify that the foregoing statement(s) made by me are true. I am aware that if any of the foregoing statement(s) made by me are willfully false, I am subject to punishment.

Signature _____

AFFIDAVIT OF COMPLIANCE
PLUMBING CONTRACTOR

Public Law 1988, Chapter 442 (NJSA 45:14C-1 through 4) defines Plumbing Contractor as a licensed master plumber that shall be the holder of not less than 10% of the issued and outstanding shares of stock in the corporation, or not less than 10% of the capital of the partnership, or not less than 10% of the ownership of any other firm or legal entity engaging in the business of plumbing contracting in the State and shall employ either journeyman, plumbers or apprentice plumber or both.

Due to the enactment of Public Law 1988, Chapter 442, you must certify the following:

I certify that I own not less than (____) 10% of the issued and outstanding shares of stock in the corporation, or not less than (____) 10% of the capital of the partnership, or not less than (____) 10% of the ownership of any other firm or legal entity.

I certify that the foregoing statement made by me are true. I am aware that if any of the foregoing statement made by me is willfully false, I am subject to punishment.

SWORN AND SUBSCRIBED TO _____
SIGNATURE

BEFORE ME THE _____ DAY _____
NAME OF PERSON SIGNING
OF_____ 20___ (type or print)

_____ _____
Signature of Notary Public TITLE OF PERSON SIGNING

My Commission Expires: _____

Rev. Dec 16

STOCKHOLDER DISCLOSURE CERTIFICATION
This Statement Shall Be Included with Bid Submission

Name of Business:_____

Principle Place of Business: _____

Check the box that represents the type of business organization:

☐ Partnership ☐ Corporation ☐ Limited Liability Corporation

☐ I certify that no one stockholder, partner or member owns a 10% or greater interest in the respective Corporation, Partnership or Limited Liability Company.

OR

☐ I certify that the list below contains the names and addresses of all:

(1) stockholders in the corporation who own a 10% or more of its stock, of any class,

(2) individual partners in the partnership who own a 10% or greater interest therein, or

(3) members of the limited liability company who own a 10% or greater interest therein.

Further, that if one or more such stockholder, member or partner is itself a corporation, partnership or limited liability company, any stockholder, member or partner holding 10% or more therein, is also listed below, and

Further, if the bidder is publicly traded, the name and address of each person that holds a 10% or greater beneficial interest therein as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, below is listed links to the websites containing the last annual filings and the relevant page numbers of the filings that contain the information on each person that holds a 10% or greater beneficial interest.

Name	**Home Address**

Subscribed and sworn before me this ___ day of _____ , 2 __.

_____
(Affiant)

(Notary Public)

_____
(Print name & title of affiant)

My Commission expires:

(Corporate Seal)

AFFIDAVIT OF COMPLIANCE ON CONTRACTOR'S EMPLOYEE BENEFITS

(CONTRACTOR MUST COMPLETE, SIGN AND NOTARIZE THIS FORM AND SUBMIT WITH BID PACKAGE OR BID SHALL BE REJECTED).

The County of Atlantic has issued an Executive Order, #2000-4, dated May 17, 2000, which designates contractor's doing business with the County shall provide for

a. an approved health and hospital insurance plan, licensed by the New Jersey Department of Banking and Insurance,

b. an approved pension plan, and

c. an approved apprentice training program pursuant to the Department of Labor and Industry Act of 1948 (N.J.S.A. 34:1A-34, et. seq.).

I. a. I hereby acknowledge that compliance with this Executive Order is a material term and condition of my contract with the County of Atlantic.

I. b. I hereby certify that _____
Name of Company

currently provides a health plan, _____,
name of plan and group #

currently provides a pension plan, _____,and
name of plan

currently provides an apprenticeship program.

II. I hereby certify that any subcontractors that perform work for my company under the terms of this contract also provide the above items for their employees.

Signed and sealed
before me on

_____
SIGNATURE

_____, 20_____

_____ NAME
OF PERSON SIGNING (TYPE OR PRINT)

_____
NOTARY

_____
DATE

NON-COLLUSION AFFIDAVIT

State of New Jersey)
) ss
County of _____

I, _____ of _____ in the County of

_____ and the State of _____, of full age, being duly sworn according to law on my oath, depose and say, that:

I am _____ of the Firm of _____,
the bidder making the Proposal for the herein project, and that I executed the said Proposal with full authority to do so, that said bidder has not directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project, and that all statements contained in said Proposal and in this affidavit are true and correct, and made with full knowledge that the County of Atlantic relies upon the truth of the statements contained in said Proposal and in the statements contained in this affidavit in awarding the contract for the said project.

I warrant that no requirement or commitment was made in reference to any political contribution to any party, person, or elected official and that no undisclosed benefits of any kind were promised to any one connected with County government or any political party in reference hereto.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by

_____
NAME OF CONTRACTOR

I further warrant and represent that I have never been convicted of or acknowledge nor admitted to any payment of kickbacks or unlawful gifts to any government official or employee for which conduct the County of Atlantic deems me disqualified from doing business with County of Atlantic under such circumstances.

I also understand that the above disqualification does not apply to any vendor who cooperates with the prosecution and gives supporting testimony on behalf of the prosecution in the course of a judicial inquiry.

SWORN AND SUBSCRIBED TO
BEFORE ME THE _____ DAY
OF _____ 20____

_____
Signature of Notary Public

Notary Public of _____

My Commission Expires _____

_____
SIGNATURE OF AFFIANT

_____
PRINT OR TYPE NAME OF AFFIANT

AFFIRMATIVE ACTION INFORMATION

Please complete the following:

Company Name _____

1.Our Company has a Federal Affirmative Action Plan Approval:

YES _____NO _____

a. If yes, submit a photographic copy of the Approval

2.Our Company has a New Jersey Certificate of Employee Information Report:

YES _____NO _____

a. If yes, submit a Photographic copy of the Certificate

3.Our Company has neither of the above, therefore send us Form AA-302 (Affirmative Action Employee Information Report)

SEND AA-302 _____
(check if applicable)

I certify that the above information is correct to the best of my knowledge.

NAME: _____

SIGNATURE: _____

TITLE: _____

DATE: _____

DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

PART 1: CERTIFICATION

BIDDERS MUST COMPLETE PART 1 BY CHECKING EITHER BOX.
FAILURE TO CHECK ONE OF THE BOXES WILL RENDER THE PROPOSAL NON-RESPONSIVE.

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the State of New Jersey, Department of Treasury, Division of Purchase and Property website at http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf. Bidders must review this list prior to completing the below certification. **Failure to complete the certification may render a bidder's bid proposal non-responsive**. If the County of Atlantic determines that a person or entity has submitted a false certification concerning its engagement in investment activities in Iran pursuant to section 4 of P.L. 2012, c.25 (C.52:32-58), the local contracting unit shall report to the New Jersey Attorney General the name of that person or entity, and the Attorney General shall determine whether to bring a civil action against the person to collect the penalty prescribed in paragraph (1) of subsection a. of section 5 of P.L. 2012, c.25 (C.52:32-59). The County of Atlantic may also report to the county counsel the name of that person, together with its information as to the false certification, and the county counsel may determine to bring such civil action against the person to collect such penalty.

PLEASE CHECK THE APPROPRIATE BOX:

☐ I certify, pursuant to Public Law 2012, c. 25, that neither the bidder listed above nor any of the bidder's parents, subsidiaries, or affiliates is listed on the N.J. Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and I am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below.

OR

☐ I am unable to certify as above because the bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the Department's Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as nonresponsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

PART 2: PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN

You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes below.

PROVIDE INFORMATION RELATIVE TO THE ABOVE QUESTIONS. PLEASE PROVIDE THOROUGH ANSWERS TO EACH QUESTION. IF YOU NEED TO MAKE ADDITIONAL ENTRIES, ATTACH ADDITIONAL PAGES.

Name _____Relationship to Bidder/Offeror_____

Description of Activities_____

_____

Duration of Engagement_____ Anticipated Cessation Date_____

Bidder/Offeror Contact Name_____ Contact Phone Number_____

DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

Certification:

I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity. I acknowledge that the County of Atlantic is relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the County of Atlantic to notify the County of Atlantic in writing of any changes to the answers of information contained herein. I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the County of Atlantic and that the County of Atlantic at its option may declare any contract(s) resulting from this certification void and unenforceable.

I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity.

Bidder:_____

Signature:_____

Print Name:_____

Title:_____

Date:_____