

# **PROJECT MANUAL**

for

## **SMITH MIDDLE SCHOOL CHILLER REPLACEMENT**

**216 Addison Road  
GLASTONBURY, CONNECTICUT 06033**

**BID # GL-2014-21**

**Bemis Associates LLC  
185 Main Street  
Farmington, Connecticut 06032**

January 24, 2014

TOWN OF GLASTONBURY

INVITATION TO BID

<u>BID #</u>	<u>ITEM</u>	<u>DATE &amp; TIME REQUIRED</u>
GL-2014-21	Chiller Replacement Smith Middle School	February 11, 2014 @ 11:00 a.m.

The Town of Glastonbury is seeking bids for the replacement of chillers and associated equipment at the Smith Middle School, 216 Addison Road, Glastonbury, CT 06033

Bid packages may be obtained at The Print House LLC, 22 Krieger Lane, Unit 6, Glastonbury, CT 06033 for a nonrefundable deposit of \$30. Checks to be made payable to the Town of Glastonbury. Bidders are advised to call (860-652-0803) at least 30 minutes prior to pick up. Bid packages may also be obtained from the Town's website at [www.glastonbury-ct.gov](http://www.glastonbury-ct.gov) at no cost.

**A mandatory pre-bid meeting and site walk through will be held at the Smith Middle School, 216 Addison Road, Glastonbury, CT 06033 on January, 29 at 3:00 p.m.** All bidders must attend in order for their bid to be considered. Contractors shall comply with State Statutes concerning Employment, and Labor Practices, if applicable, and Section 31-53 of the Connecticut General Statutes as amended (Prevailing wages), including annual adjustments in Prevailing Wages. Certified payrolls will be required bi-weekly. Sealed bids must be accompanied with Bid Security. Bid Security shall be issued payable to the "Town of Glastonbury" in the form of a certified check or Bid Bond in an amount not less than 10% of the total amount of the base bid. The Bid Bond must be issued by a surety company licensed in the State of Connecticut. Cashier's checks will not be accepted.

The Town reserves the right to waive informalities or reject any part of, or the entire bid, when said action is deemed to be in the best interest of the Town. All Sealed Bids must be submitted to the Office of the Purchasing Agent no later than the time and date indicated. All bids will be publicly opened and read.

The Town of Glastonbury is an Affirmative Action/Equal Opportunity Employer. Minority / Women / Disadvantaged Business Enterprises are encouraged to bid.

Mary F. Visone  
Purchasing Agent

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1. General: Where the term "Town" or "Town of Glastonbury" is used this shall be assumed to apply, also, to the Glastonbury Board of Education.
2. Sealed bids (**one original and one copy**) on the attached Bid Forms will be received at the Office of the Purchasing Agent, Town Hall, 2155 Main Street, Glastonbury, Connecticut, 06033 (second level). At the designated time of opening, they will be publicly opened, read, recorded and placed on file.
3. Whenever it is deemed to be in the best interest of the Town, the Town Manager, Purchasing Agent or designated representative shall waive informalities in any and all bids. The right is reserved to reject any bid, or any part of any bid, when such action is deemed to be in the best interest of the Town of Glastonbury.
4. Bidders shall submit a Bid on a lump sum basis for the Base Bid. The basis of award will be based upon the sum of the Base Bid plus any alternates (if any) selected by the Town.
5. Bids will be carefully evaluated as to conformance with stated specifications.
6. The envelope enclosing your bid should be clearly marked by bid number, time of bid opening, and date.
7. Specifications must be submitted complete in every detail and, when requested, samples shall be provided. If a bid involves any exception from stated specifications, they must be clearly noted as exceptions, underlined, and attached to the bid.
8. The Bid Documents contain the provisions required for the requested item. Information obtained from an officer, agent, or employee of the Town or any other person shall not affect the risks or obligations assumed by the Bidder or relieve him/her from fulfilling any of the conditions of the bid.
9. Each Bidder is held responsible for the examination and/or to have acquainted themselves with any conditions at the job site which would affect their work before submitting a bid. Failure to meet these criteria shall not relieve the Bidder of the responsibility of completing the bid without extra cost to the Town of Glastonbury.
10. Any bid may be withdrawn prior to the above-scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and the date specified shall not be considered. No Bidder may withdraw a bid within sixty (60) days after the actual date of the opening thereof. Should there be reasons why a bid cannot be awarded within the specified period, the time may be extended by mutual agreement between the Town and the Bidder.
11. Each bid must be accompanied by a bid bond payable to the Town for ten percent (10%) of the total amount of the bid. The bid bond of the successful Bidder will be retained until the payment bond and performance bond have been executed and approved, after which it will be returned. A certified check may be used in lieu of a bid bond. The Town of Glastonbury will not be liable for the accrual of any interest on any certified check submitted. Cashier's checks will not be accepted.
12. A 100% Performance and Payment bond is required of the successful bidder. This bond shall cover all aspects of the specification and shall be delivered to the Purchasing Agent prior to the issuance of

a purchase order. The Performance and Payment Bond will be returned upon the delivery and acceptance of the bid items.

13. The Bidder agrees and warrants that in the submission of this sealed Bid, they will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religion, national origin, sex, or physical disability including, but not limited to blindness, unless it is shown by such Bidder that such disability prevents performance of that which must be done to successfully fulfill the terms of this sealed Bid or in any manner which is prohibited by the laws of the United States or the State of Connecticut: and further agrees to provide the Human Relations Commission with such information requested by the Commission concerning the employment practices and procedures of the Bidder. An Affirmative Action Statement will be required by the successful Bidder.
14. Bidder agrees to comply with all of the latest Federal and State Safety Standards and Regulations and certifies that all work required in this bid will conform to and comply with said standards and regulations. Bidder further agrees to indemnify and hold harmless the Town and Board of Education for all damages assessed against the Town or Board of Education as a result of Bidder's failure to comply with said standards and/or regulations.
15. All correspondence regarding any purchase made by the Town of Glastonbury or Glastonbury Board of Education shall reference the Town or Board of Education purchase order number. Each shipping container shall clearly indicate both purchase order number and item number.
16. Bidder is required to review the Town of Glastonbury Code of Ethics adopted July 8, 2003 and effective August 1, 2003. Bidder shall acknowledge that they have reviewed the document in the area provided on the bid/proposal response page (BP). The selected Bidder will also be required to complete and sign an Acknowledgement Form prior to award. The Code of Ethics and the Consultant Acknowledgement Form can be accessed at the Town of Glastonbury website at [www.glastonbury-ct.gov](http://www.glastonbury-ct.gov). Upon entering the website click **Bids & RFPs** which will bring you to the links for the Code of Ethics and the Consultant Acknowledgement Form. If the Bidder does not have access to the internet, a copy of these documents can be obtained through the Purchasing Department at the address listed within this bid/proposal.
17. Any bidder, in order to be considered, shall be engaged primarily in the business of construction with for minimum of five (5) years, prior experience with chiller replacements and have a valid contractor's license in the State of Connecticut.
18. Non-Resident Contractors:  
Upon award the Town is required to report names of nonresident (out of state) Contractors to the State of Connecticut, Department of Revenue Services (DRS) to ensure that Employment Taxes and other applicable taxes are being paid by Contractors. **A single surety bond for 5% of the entire contract price is required to be filed with DRS by any unverified nonresident prime or general contractor (if awarded) where the contract price for the project is \$250,000 or more.** The contractor will be required to promptly furnish to the Town a copy of the Form AU-968 - Certificate of Compliance issued by the State of Connecticut, DRS. See State of Connecticut Notice SN 2012 (2).
19. Bidder shall include on a sheet(s) attached to its proposal a complete disclosure of all past and pending mediation, arbitration and litigation cases that the bidder or its principals (regardless of their

place of employment) have been involved in for the most recent five years. Please include a statement of the issues in dispute and their resolution. Acceptability of Bidder based upon this disclosure shall lie solely with the Town.

20. Bidder or its principals, regardless of their place of employment, shall not have been convicted of, nor entered any plea of guilty, or nolo contendere, or otherwise have been found civilly liable or criminally responsible for any criminal offense or civil action. Bidder shall not be in violation of any State or local ethics standards or other offenses arising out of the submission of bids or proposals, or performance of work on public works projects or contracts.
21. Municipal construction projects are exempt from Federal Excise Taxes, as well as, State of Connecticut Sales, Use and Service Taxes and should not be include in the Bidder's proposal.
22. After award of Contract, Owner will require the Contractor's Schedule of Values, which shall be submitted at the preconstruction meeting. The Schedule of Values must accurately reflect job costs and include a complete breakdown of material and labor costs.
23. **Prevailing Wage Rates:**  
Wage Rate Determination for this Project from the State of Connecticut is included in the bid documents. Certified payrolls for site labor shall be filled out weekly and submitted monthly to the Town on the correct State form (See Project Manual). The Town reserves the right to, without prior notice, audit payroll checks given to works on site in order to ascertain that wages and fringe benefits are being paid as required by the State of Connecticut. Contractor to comply with Connecticut General Statutes Section 31-53, as amended. Please make special note of the State requirement to adjust wage and fringe benefit rates on each July 1st following the original published rates. These revised rates are available via the internet. See State material attached.

NOTE that bidder is to include in its bid proposal all costs required by such annual increases in the PREVAILING RATES. No Escalation Clauses are to be included in the bidder's proposal and no Escalation Clauses will be in the Contract Agreement. Bidder is to anticipate any future increases and include these costs in its quotation.

Contractor's invoices will not be paid if certified payrolls are incomplete, incorrect or not received in a timely manner.

All Apprentices must be registered with the State of Connecticut and their number shall not exceed the number allowed by law. Otherwise, all workers must be paid at least the Journeyman rate listed including benefits.

**OSHA SAFETY AND HEALTH CERTIFICATION:**

Effective July 1, 2009: Any Mechanic, Laborer, or Worker, who performs work in a classification listed on the prevailing wage rate schedule on any public works project covered under C.G.S. Section 31-53, both on site and on or in the public building, must have completed a federal OSHA Safety and Health course within the last 5 years.

The execution of the Contract by the Bidder binds it to all applicable State Labor Laws and Regulations. Note that these change annually on July 1 and all provisions for such changes in Prevailing Wage Rates are to be included in the Bidder's Lump Sum Proposal.

All other statutory laws, to the extent they are required to be incorporated into a contract by statute, are hereby deemed fully incorporated herein and in the Contract.

Violation of Prevailing Wage Law requirements may cause Contract to be terminated and the Owner reserves its rights if such termination is required.

24. Each Bidder shall submit a list of similar projects completed within the last three years. In order to be eligible for consideration, the Bidder must have successfully completed a minimum of five (5) similar projects within the last three (3) years. Please provide project name and contact information for project coordinator (name, title, address, phone number). Please also provide contract value.
25. Technical questions regarding this bid shall be made in writing and directed to David Sacchitella, Buildings Superintendent, [dave.sacchitella@glastonbury-ct.gov](mailto:dave.sacchitella@glastonbury-ct.gov). For administrative questions regarding this Bid, please contact Mary F. Visone, Purchasing Agent, at (860) 652-7588 or email the Purchasing Department at [purchasing@glastonbury-ct.gov](mailto:purchasing@glastonbury-ct.gov). All questions, answers, and/or addenda, as applicable will be posted on the Town's website at [www.glastonbury-ct.gov](http://www.glastonbury-ct.gov). (Upon entering the website click on Bids & RFP's). The request must be received at least three (3) business days prior to the advertised response deadline. **It is the respondent's responsibility to check the website for addenda prior to submission of any bid/proposal.**

**IMPORTANT:**

**Failure to comply with general rules may result in disqualification of the Bidder.**

**01.00 WORKMANSHIP, MATERIALS AND EMPLOYEES**

- 01.01 Wherever in this contract the word “Engineer” is used, it shall be understood as referring to the Director of Facilities of the Town of Glastonbury acting personally or through any assistants duly authorized.
- 01.02 The entire work described herein shall be completed in accordance with the plans and specifications to the full intent and meaning of the same. Unless otherwise specified, all materials incorporated in the permanent work shall be new, and both workmanship and material shall be of good quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.
- 01.03 The wording “furnish”, “install”, “construct”, “furnish and install”, or any similar terms, unless specifically noted to the contrary, shall include all labor, materials, water, tools, equipment, light, power, transportation, and any other services required for the completion of the work.
- 01.04 The Contractor shall at all times enforce strict discipline and good order among his employees, and shall seek to avoid employing on the work any unfit person or anyone not skilled in the work assigned to him.

**02.00 SUPERINTENDENT**

- 02.01 The Contractor shall keep on the work during its progress, in the absence of the Contractor, a competent Superintendent. The Superintendent shall be acceptable to the Engineer and shall fully represent the Contractor. All directions given to the Superintendent shall be binding as if given to the Contractor.

**03.00 PRECONSTRUCTION MEETING**

- 03.01 A Preconstruction Meeting will be held with the Engineer, Contractor, and any other interested parties prior to commencing any work. The Engineer shall arrange the meeting based on a mutually convenient time.

**04.00 PERMITS**

- 04.01 All permits, licenses, and fees required for the performance of the Contract work shall be secured and paid for by the Contractor. The local building permit fees will be waived.

**05.00 PROPERTY ACCESS**

- 05.01 The Contractor shall take all proper precautions to protect from injury or unnecessary interference, and provide proper means of access to abutting property where the existing access is cut off by the Contractor.
- 05.02 The Contractor shall take all proper precautions to protect persons from injury or unnecessary inconvenience and leave an unobstructed way along the public and private places for travelers, vehicles, and access to hydrants.



05.03 The Contractor shall make arrangements with the adjacent property owners for such trespass as he may reasonably anticipate in the performance of the work. All such arrangements shall be reported, in writing, to the Engineer.

**06.00 PROTECTION OF THE PUBLIC AND OF WORK AND PROPERTY**

06.01 The Contractor shall continuously maintain adequate protection of all work from damage, and shall take all reasonable precautions to protect the Town from injury or loss arising in connection with the Contract.

06.02 The Contractor shall adequately protect adjacent private and public property as provided by law and the Contract Documents.

06.03 The Contractor shall make good any damage, injury, or loss of work and to the property of the Town resulting from lack of reasonable protective precautions.

06.04 The School building involved will be occupied during the work except the period of the Spring Break, April 14-18, 2014. The Contractor may be required to adjust his work schedule should the work have an adverse impact on operations. There will be no modification of the bid price should a schedule adjustment be required.

**07.00 EXISTING IMPROVEMENTS**

07.01 The Contractor shall conduct his work so as to minimize damage to existing improvements designated to remain. Except where specifically stated otherwise in the specifications, drawings, or as directed by the Engineer, it will be the responsibility of the Contractor to restore to their original condition, as near as practical, all improvements on public or private property. This shall include:

- a. Property within and adjacent to the work area such as shrubs, walks, driveways, fences, etc.
- b. Utility mains, ducts, poles, and services. The Contractor is hereby notified that utilities, if/where shown on the plans, are at approximate locations. These locations are subject to possible errors in the source of information and errors in transcription. The Contractor shall make certain of the exact location of all mains, ducts, poles, and services prior to excavation.

**08.00 SEPARATE CONTRACTS**

08.01 The Engineer reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs. Wherever work being done by the Town of Glastonbury forces or by other contractors is contiguous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Engineer to secure the completion of the various portions of the work.

**09.00 INSPECTION OF WORK**

09.01 The Town shall provide sufficient personnel for the inspection of the work.

- 09.02 The Engineer shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection.
- 09.03 If the specifications or the Engineer's instructions require any work to be specially tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection and, if the inspection is by another authority other than the Engineer, of the date fixed for such inspection. Inspections by the Engineer shall be made promptly. If any work should be covered up without approval or consent of the Engineer, it must, if required by the Engineer, be uncovered for examination and properly restored at the Contractor's expense.
- 09.04 Re-inspection of any work may be ordered by the Engineer. If such work is found to be in accordance with the Contract Documents, the Town shall pay the cost of re-inspection and replacement. If such work is not in accordance with the Contract Documents, the Contractor shall pay such cost.

**10.00 RIGHT TO INCREASE OR DECREASE WORK**

- 10.01 The Town shall have the right to increase or decrease the amount of work herein specified as may be required.

**11.00 RIGHT OF ENGINEER TO STOP WORK FOR WEATHER CONDITIONS**

- 11.01 Should the work, in the opinion of the Engineer, be in danger by reason of inclemency of weather, or could not be finished in time to prevent such danger, the Contractor shall cease operations upon order of the Engineer, and shall not resume them until ordered to do so by the Engineer when the weather conditions are favorable. The Contractor shall, upon such orders, discontinue work, remove all materials or appliances for or in use upon the work, and place the premises in proper condition for use by the public during the time the work is suspended as herein provided, without cost to the Town.

**12.00 CONTRACTOR TO BE RESPONSIBLE FOR IMPERFECT WORK OR MATERIALS**

- 12.01 Any faithful work or imperfect material that may be discovered before the acceptance and the payment of the work shall be corrected upon the order of the Engineer. The acceptance and payment of the work does not in any manner relieve the Contractor of his obligation to construct work in the proper manner and the use of materials herein specified.

**13.00 TOWN MAY NOTIFY CONTRACTOR IF WORK IS NOT CARRIED ON SATISFACTORILY**

- 13.01 If, in the opinion of the Engineer, the Contractor is not proceeding with the work at a sufficient rate of progress so as to finish in the time specified, or has abandoned said work, or is not complying with the terms and stipulations or the Contract and specifications, the Engineer may serve notice on the Contractor to adopt such methods as will ensure the completion of the work in the time specified.
- 13.02 If, within five days after the Engineer has notified the Contractor that his work is not being carried on satisfactorily as before mentioned, the Engineer shall have the right to annul the

Contract and manage the work under the direction of the Engineer, or re-let, for the very best interest of the Town as a new contract, the work under said new Contract shall be considered the responsibility of the defaulting Contractor.

- 13.03 Additional costs incurred over and above the original Contract shall be borne by the Performance Bond.

**14.00 DEDUCTIONS FOR UNCORRECTED WORK**

- 14.01 If the Engineer deems it inexpedient to correct work that has been damaged or that was not done in accordance with the Contract, an equitable deduction from the Contract price shall be made there for.

- 14.02 The Contractor shall promptly remove from the premises all materials condemned by the Engineer as failing to meet Contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the Contract and without expense to the Town, and shall bear the expense of making good all work by other contractors destroyed or damaged by such removal or replacement.

- 14.03 If the Contractor does not remove such condemned work and materials as promptly as possible after written notice, the Engineer may remove them and store the materials at the expense of the Contractor.

**15.00 CLEANING UP**

- 15.01 The Contractor must remove all debris of every description as the work progresses and leave the surroundings in a neat and orderly condition to the satisfaction of the Engineer.

- 15.02 Upon completion, and before acceptance and final payment, the Contractor shall remove from the site all equipment, forms, surplus material, rubbish and miscellaneous debris and leave the site in a neat and presentable condition.

**16.00 ROYALTIES AND PATENTS**

- 16.01 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Town of Glastonbury harmless from loss on account hereof, except that the Town of Glastonbury shall be responsible for all such loss when a particular manufacturer, product, or process is specified by the Town of Glastonbury.

**17.00 ERRORS OR CONFLICT IN DRAWINGS AND SPECIFICATIONS**

- 17.01 The Contractor shall immediately notify the Owner/Engineer should he find any errors or conflicts in the contract documents. The Owner/Engineer shall render his interpretation or instruction in writing on the items as soon as possible.

- 17.02 Any work undertaken by the Contractor containing possible errors or conflicts will be done at his own risk unless he has received prior written approval from the Owner/Engineer.

17.03 The Contractor shall be responsible for estimating and supplying all quantities, and where clarification or additional information is required, a request in writing to the Owner/Engineer shall be made. No extra charge or compensation will be allowed the Contractor unless there is a change in scope or dimension of the project resulting in need for extra material, equipment and/or labor. Said differences are to be handled under Article 18.

**18.00 EXTRA WORK AND EXTRA COST**

18.01 The Owner, without invalidating the contract documents, may order extra work or make changes by altering, adding to or deducting from the work, the contract price being adjusted accordingly. All such work shall be executed under the conditions of the original contract except that any claim of extension of time caused thereby shall be adjusted at the time of ordering the change.

18.02 No extra work or change shall be performed unless in pursuance of a written order from the Owner/Engineer, with the agreed price prior to the commencement of the work, and no claim for an addition to the contract price shall be valid unless so ordered.

18.03 The value of any such work or change shall be determined, in one or more of the following ways:

- a) By estimate and acceptance on a lump sum.
- b) By unit prices named in the contract or subsequently agreed upon.
- c) By cost and percentage or by cost and a final fee.

**19.00 SUBSTITUTIONS**

19.01 The Contractor shall use materials as specified unless material list is of an open nature. Material other than specified will be permitted only after written application, including four (4) copies of specifications, is made by the Contractor and written approval received from the Engineer or Owner.

The material installed in the job site shall be new and of the quality specified.

The manufacturer's recommendation shall be followed for the installation of all equipment.

**20.00 PRODUCT SUBMITTALS**

20.01 Prior to ordering materials, the Contractor shall submit submittals as specified in the detailed specification sections. Three (3) copies of the submittals shall be forwarded to the Engineer for review and approval.

20.02 Submittals shall indicate specification Section for each product. Submittals not containing all the required information shall be returned to the contractor for re-submittal.

**21.00 OWNER'S ACCEPTANCE**

21.01 Within seven (7) days of the Contractor's notification that the installation is substantially complete, the Owner's authorized representative shall inspect the installation. The Owner, with the Contractor, shall take necessary steps to inspect the installation. Upon completion of the inspection, the Owner or the Owner's authorized representative may either accept the work

outright or prepare a "Punch List" that upon completion by the Contractor and acceptance by the Owner will signify final acceptance provided that all other applicable terms and provisions of the Contract have been completed to the Owner's satisfaction.

**22.00 RESPONSIBILITY FOR MAINTENANCE**

22.01 It will be the Contractor's responsibility to maintain the work as specified in the detailed specifications during the warranty period.

**23.00 SERVICE BY THE CONTRACTOR**

23.01 The Contractor shall maintain the work as specified during the warranty period.

**24.00 WARRANTY**

24.01 The guarantee shall be as specified in the respective sections of the specification.

24.02 The Contractor shall be responsible for the repair and/or replacement of all defective work and materials. All repair work shall be completed in a timely fashion.

24.04 Should the Contractor not respond promptly, the Owner may take any action he deems necessary to repair the defect and prevent further damage to his property, including the hiring of another contractor, or the repairing of such a defect with material supplied by the Contractor. In this event, the Contractor shall be liable for expenses incurred and property damages suffered by the Owner.

## 01.00 NOTICE TO CONTRACTOR

- 01.01 Intent of Contract: The intent of the Contract is to prescribe a complete work or improvement which the Contractor undertakes to do, in full compliance with the specifications, plans, special provisions, proposal and Contract. The Contractor shall perform all work in close conformity with the plans or as modified by written orders, including the furnishing of all materials, supplies, transportation, labor, and all other things necessary to the satisfactory prosecution and completion of the project.

The scope of the work shall include all labor, materials and equipment needed to provide and install, and equip new chillers and associated equipment and materials, complete and ready for use, as described in the plans and specifications for Chiller Replacement at Smith Middle School in Glastonbury, CT.

## 02.00 COMMUNICATIONS

- 02.01 All notices, demands, requests, instructions, approvals, proposals, and claims must be in writing.
- 02.02 Any notice to, or demand upon, the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature page of the Agreement (or at such other office as the Contractor may, from time to time, designate) in a sealed, postage-prepaid envelope or delivered with charges prepaid to any overnight mail carrier in each case addressed to such office.
- 02.03 All papers required to be delivered to the Town shall, unless otherwise specified in writing to the Contractor, be delivered to the Building Superintendent, 2143 Main Street, Glastonbury, CT 06033, and any notice to, or demand upon, the Town shall be delivered at the above address in a sealed, postage-prepaid envelope or delivered with charges prepaid to any overnight mail carrier, in each case addressed to such office or to such other representatives of the Town, or to such other address as the Town may subsequently specify in writing to the Contractor for such purpose.
- 02.04 Any such notice shall be deemed to have been given as of the time of actual delivery or, in case of mailing, when the same should have been received in due course of post or, in the case of telegrams, at the time of actual receipt, as the case may be.

## 03.00 INSURANCE

The Bidder shall, at its own expense and cost, obtain and keep in force during the entire duration of the Project or Work the following insurance coverage covering the Bidder and all of its agents, employees and sub-contractors and other providers of services and shall name the **Town and Board of Education, its employees and agents as an Additional Insured** on a primary and non-contributory basis to the Bidders Commercial General Liability and Automobile Liability policies. These requirements shall be clearly stated in the remarks section on the Bidders Certificate of Insurance. Insurance shall be written with Carriers approved in the State of Connecticut and with a minimum Best's Rating of A-. In addition, all Carriers are subject to approval by the Town. Minimum Limits and requirements are stated below:

1) Worker's Compensation Insurance:

- Statutory Coverage
- Employer's Liability
- \$100,000 each accident/\$500,000 disease-policy limit/\$100,000 disease each employee

2) Commercial General Liability:

- Including Premises & Operations, Products and Completed Operations, Personal and Advertising Injury, Contractual Liability and Independent Contractors.
- Limits of Liability for Bodily Injury and Property Damage  
Each Occurrence \$1,000,000  
Aggregate \$2,000,000 (The Aggregate Limit shall apply separately to each job.)
- A Waiver of Subrogation shall be provided

3) Automobile Insurance:

- Including all owned, hired, borrowed and non-owned vehicles
- Limit of Liability for Bodily Injury and Property Damage:  
Per Accident \$1,000,000

The Bidder shall direct its Insurer to provide a Certificate of Insurance to the Town before any work is performed. The Contractor shall be responsible to notify the Town 30 days in advance with written notice of cancellation or non-renewal. The Certificate shall evidence all required coverage including the Additional Insured and Waiver of Subrogation. The Bidder shall provide the Town copies of any such policies upon request.

**INDEMNIFICATION**

To the fullest extent permitted by law, the Bidder shall indemnify and hold harmless the Town and Board of Education and its consultants, agents, and employees from and against all claims, damages, losses and expenses, direct, indirect or consequential (including but not limited to fees and charges of engineers, attorneys and other professionals and court and arbitration costs) arising out of or resulting from the performance of the Bidder's work, provided that such claim, damage, loss or expense is caused in whole or in part by any negligent act or omission by the Bidder, or breach of its obligations herein or by any person or organization directly or indirectly employed or engaged by the Bidder to perform or furnish either of the services, or anyone for whose acts the Bidder may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

**04.00 WORK BY OTHERS**

- 04.01 Private utilities, contractors, developers or other parties may be expected to be working within the Contract area during this Contract. It shall be the responsibility of the contractor to coordinate his work with the work being done by others in order that the construction shall proceed in an efficient and logical manner. The Contractor shall have no claim or claims whatever against the Town, the Engineer, or other parties due to delays or other reasons caused by the work by others or his failure to coordinate such work.

**05.00 CONTRACTOR'S WORK AND STORAGE AREA**

05.01 The Contractor shall contact the Town to determine if any specific locations will be designated, or gain its approval prior to using any area for storage of equipment, materials and trailers during the period of this Contract. The Contractor shall confine his work/storage area to the limits as designated or approved and shall be responsible for the security of the work/storage area. Upon completion of the Contract, the Contractor shall remove all equipment and materials, except as otherwise specified, and restore the site to its original condition as approved by the Engineer and at no cost to the Town.

**06.00 DISPOSAL AREA**

06.01 The Tryon Street Bulky Waste Facility will be available to the Contractor, at no charge, for disposal of materials that are accepted at that facility. No materials containing lead-based paint of any level shall be dumped at the Tryon Street facility. The Contractor is required to obtain a disposal area for all other unsuitable or surplus materials at no cost to the Town.

**07.00 DUST CONTROL**

07.01 During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities so as to minimize the creation and dispersion of dust. If the Engineer decides that it is necessary to use water or calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed, without additional compensation.

**08.00 PROTECTION OF EXISTING UTILITIES**

08.01 Before starting any excavation, the Contractor shall submit to the Engineer plans or details showing the proposed method the Contractor will use to support and protect all existing utilities during construction. The furnishing of such plans and details shall not serve to relieve the Contractor of any responsibility for the proper conduct of the work.

08.02 There will be no extra payment for submitting plans or details for supporting and protecting all existing utilities during construction.

**09.00 TIME FOR COMPLETION/NOTICE TO PROCEED**

09.01 Within ten (10) calendar days after the date of the Notice of Award, the Contractor must provide the appropriate insurance certificates to the Town Purchasing Agent and shall be issued a Notice to Proceed and a Purchase Order prior to initiating any work on the project.

09.02 Work shall commence within thirty (30) days of the date of the Notice to Proceed/Purchase Order.

09.03 After the work has begun, it will continue in an orderly fashion and shall be fully completed within 120 consecutive calendar days from the date of commencement. The Engineer reserves the right to extend the contract an additional thirty (30) days by mutual written agreement.



09.04 Weather permitting, it is the intention of the Town to have all work required under this Contract completed no later than May 2, 2014. In no case, however, shall the work be completed any later than May 16, 2014.

09.05 Because the facilities may remain open during the installation period, the Contractor shall make every reasonable effort to complete the installation as expeditiously as possible.

**10.00 MEASUREMENT AND PAYMENT**

10.01 All direct, indirect, or incidental costs of work and/or services required by these specifications shall be included in the Lump Sum price.

10.02 Monthly progress payments will be made, based on the approved Schedule of Values, for work that has progressed in accordance with the contract documents, subject to a deduction of five percent (5%) of the amount of the application for payment to be retained by the Owner until completion of the entire contract in an acceptable manner and two and one half percent (2.5%) until the applicable one year warranty period has expired and all required inspections have been completed and results have been submitted and approved by the Engineer.

**11.00 COMPLIANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL REQUIREMENTS**

11.01 This award of bid is subject to the conformance of the Contractor to all Federal, State, and Local laws, statutes, regulations, ordinances or other requirements that are applicable to the type of work contained in these specifications.

**12.00 CONTRACTOR COMPLIANCE FORM**

12.01 All contractors performing work on school property will be required to complete and submit, for approval, the "Contractor Compliance Form" issued by the Glastonbury Public Schools. A copy is provided as part of this document (see pages CC 1-2)

# ATTENTION CONTRACTOR

- APPROVED FORM FOR YOUR FILES-NOTE ANY COMMENTS BOTTOM OF PAGE 2 - APPROVAL REQUIREMENTS
- APPLICATION DENIED-SEE BOTTOM PAGE 2

## GLASTONBURY PUBLIC SCHOOLS

### OFFICE OF DISTRICT SAFETY OFFICER

Dr. Kenneth R. Roy  
Director of Environmental Health & Safety  
330 Hubbard St.  
Glastonbury, CT 06033-3099

Telephone: (860) 652-7200 Ext. 2002  
Fax: (860) 652-7275  
E-mail: royk@glastonburyus.org

### CONTRACTOR COMPLIANCE FORM

#### Notice to Contractors:

In concert with, but not limited to, all OSHA General Industry and Construction standards, EPA, NFPA, AHERA, and building codes, contractors conducting work activities at/on any Glastonbury Public School District property are required to provide the following information:

**NOTICE: THIS FORM MUST BE COMPLETED AND APPROVED  
3 DAYS PRIOR TO COMMENCING ANY OPERATIONS**

Once approved, the form will be returned to the originator. Approval is conditional relative to noted specifications by GPS Safety Officer/Director of Environmental Health and Safety.

#### 1. Project Information:

<b>Project Description:</b>		
<b>Location:</b>		
<b>Start Date:</b>	<b>Completion Date:</b>	
<b>Contractor Safety Officer</b>	<b>Phone:</b>	<b>Fax:</b> <b>Email:</b>

Permit Prepared By:

Date Prepared:

Project Scope	Yes	No	Comments
Confined Spaces*	<input type="checkbox"/>	<input type="checkbox"/>	
Electrical Work**	<input type="checkbox"/>	<input type="checkbox"/>	
Forklift	<input type="checkbox"/>	<input type="checkbox"/>	
Hazardous Materials	<input type="checkbox"/>	<input type="checkbox"/>	
Ladders/Scaffolds	<input type="checkbox"/>	<input type="checkbox"/>	
Respirators	<input type="checkbox"/>	<input type="checkbox"/>	
Rigging/Lifting	<input type="checkbox"/>	<input type="checkbox"/>	
Welding***	<input type="checkbox"/>	<input type="checkbox"/>	
Asbestos Management****	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	

\* Contractors need to secure, complete and submit a "Confined Space Permit" from the Director of Environmental Health and Safety for approval 3 days PRIOR to doing any work in a Permit Required Confined Space Area.

\*\* Contractors need to secure, complete and submit an "energized Electrical Work Permit" from the Director of Environmental Health and Safety for approval 3 days PRIOR to doing any energized electrical work.

\*\*\* Contractors are required to secure, complete and submit a "Hot Work Permit" from the Director of Environmental Health and Safety for approval 3 days PRIOR to doing any hot work (e.g. welding, etc.)

\*\*\*\* Contractors need to secure the Asbestos Management Plan form the Director of Facilities prior to all construction/demolition work.

2. Provide district safety officer with Material Safety Data Sheets (MSDS) for all materials used on-site.

LIST EITHER CHEMICAL OR TRADE NAME OF EACH ATTACHED MSD SHEET BELOW


3. In cases of hazardous waste production, a written disposal plan must be provided to and approved by the District Safety Director, 5 days prior to initiation of work for those materials disposed of on site.
4. All contractors and/or their personnel are required **to be in compliance with all EPA, NFPA, AHERA and OSHA and other appropriate safety standards** when working on site (under the direction of a contractor's project supervisor).
5. All on-site activities carried out by contractors, and/or their employees, must be done in such a manner as to **maintain a safe working environment** for all Glastonbury Public Schools' employees, students and visitors.
6. Contractor employees found to be in non-compliance **may be removed from the District worksite** by the District Safety Officer.
7. Contractors found to be in non-compliance will be subject to **forfeiture of payment and/or contract termination**.
8. The district reserves the right to inspect the worksite **at any time** for safety compliance.
9. The district may require review of a contractors OSHA 200/300 log for a period of three (3) previous years.

**Please type company name and address below**

	<b>RETURN TO:</b> <b>Dr. Kenneth Roy, Safety Compliance Officer</b> <b>E-mail:       royk@glastonburyus.org</b>
--	---

By signature, the contractor agrees to adhere to all components and the spirit of this document.

Signature of Contractor	Title	Date

<p><b>INTERNAL USE ONLY</b></p> <p>APPROVAL STATUS: <input type="checkbox"/> YES  <input type="checkbox"/> NO</p> <p><b>GPS Safety Officer:</b> _____ <b>Date:</b> _____</p> <p>c: <input type="checkbox"/> Maintenance Office File  <input type="checkbox"/> Contractor  <input type="checkbox"/> Safety Officer Roy  <input type="checkbox"/> Building Principal/Supervisor  <input type="checkbox"/> (Other)  <input type="checkbox"/> (Other)</p>	<p><b>NOTE TO CONTRACTOR: APPROVAL CONTINGENT ON THE FOLLOWING ITEMS:</b></p>
---	---

(revised 8/11)

- S 1.1 STRUCTURAL – EQUIPMENT SUPPORT PLANS AND DETAILS
- M 1.1 MECHANICAL – ROOF PLANS, DETAILS AND SCHEDULE
- E 1.1 ELECTRICAL – ROOF PLANS, SPECIFICATIONS, DRAWING  
LEDGEND AND SCHEDULES

Proposal of \_\_\_\_\_  
(hereinafter called "Bidder"), organized and existing under the laws of the State of \_\_\_\_\_  
\_\_\_\_\_, doing business as \_\_\_\_\_  
\_\_\_\_\_.

To the Town of Glastonbury (hereinafter called "Town").

In compliance with your Invitation to Bid, the Bidder hereby proposes to furnish and/or services as per Bid Number GL-2014-21 in strict accordance with the Bid Documents, within the time set forth therein, and at the prices stated below.

By submission of this bid, the Bidder certifies, and in the case of a joint bid each party thereto certifies as to their own organization that this bid has been arrived at independently without consultation, communication, or agreement as to any matter relating to this bid with any other Bidder or with any competitor.

The Bidder acknowledges receipt of the following Addendum:

Addendum #1 \_\_\_\_\_

Addendum #2 \_\_\_\_\_

Addendum #3 \_\_\_\_\_

**It is the responsibility of the bidder to check the Town's website for any Addendum before submitting the bid.**

<b>BASE BID</b>	Furnish and install new chillers and associated equipment at Smith Middle School as specified in the Plans and Specifications for Bid GL-2014-21.	<b>BID AMOUNT</b>
		\$
\$	_____	_____
WRITTEN AMOUNT		NUMERIC AMOUNT
<b>ALTERNATE #1</b>	Extend Labor, Materials and Equipment Warranty to 10 years	
		\$
\$	_____	_____
WRITTEN AMOUNT		NUMERIC AMOUNT
<b>ALTERNATE #2</b>	Extend monitoring, Fall shut down and Spring start up services to 10 years	
		\$
\$	_____	_____
WRITTEN AMOUNT		NUMERIC AMOUNT

**Other Items Required with Submission of Bid Proposal**

The following bid checklist describes items required for inclusion with the above-referenced bid proposal package. It is provided for the convenience of the bidders and, therefore, should not be assumed to be a complete list.

- \_\_\_\_\_ Bid Bond (10% of total bid amount).
- \_\_\_\_\_ List of five (5) similar projects completed within last three (3) years.
- \_\_\_\_\_ Acknowledgement of Addendums in Bid Proposal (as applicable).
- \_\_\_\_\_ Acknowledgement of Code of Ethics in Bid Proposal.
- \_\_\_\_\_ Sealed bids, one original and one copy.
- \_\_\_\_\_ Disclosure of past and pending mediation, arbitration and litigation cases that the Bidder or its principals have been involved in for the most recent five years (if applicable).
- \_\_\_\_\_ Copy of Bidder's Contractor's License (State of Connecticut).

**It is the responsibility of the Respondent to clearly mark the outside of the bid envelope with the Bid Number, Date and Time of Bid Opening, and it also THE RESPONSIBILITY OF THE BIDDER TO CHECK THE TOWN'S WEBSITE BEFORE SUBMITTING BID FOR ADDENDUMS POSTED PRIOR TO BID OPENING.**

Name of Bidder: \_\_\_\_\_

**CODE OF ETHICS**

I/We have reviewed a copy of the Town of Glastonbury's Code of Ethics and agree to submit a Consultant Acknowledgement Form if I/We are selected. Yes \_\_\_\_\_ No \_\_\_\_\_ \*

\*Bidder is advised that effective August 1, 2003, the Town of Glastonbury cannot consider any bid or proposal where the Bidder has not agreed to the above statement.

Respectfully submitted:

\_\_\_\_\_  
Type or Print Name of Individual

\_\_\_\_\_  
Doing Business as (Trade Name)

\_\_\_\_\_  
Signature of Individual

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
Title

\_\_\_\_\_  
City, State, Zip Code

\_\_\_\_\_  
Date

\_\_\_\_\_  
Telephone Number/Fax Number

\_\_\_\_\_  
E-Mail Address

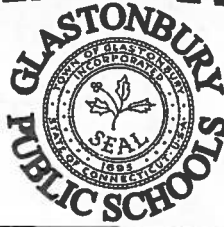
\_\_\_\_\_  
SS# or TIN#

(Seal – If bid is by a Corporation)

Attest

# SCHOOL YEAR AT A GLANCE

2013



2014

SCHOOL BEGINS: AUG 28 Grs. 7-12  
SCHOOL BEGINS: AUG 29 Grs. K-6

\*SCHOOL ENDS: JUNE 9

M	T	W	TH	F
<b>AUGUST 2013</b> Gr. 7-12 3 days Gr. K-6 2 days				
		1	2	
5	6	7	8	9
12	13	14	15	16
19	20	21	22	23
26	27	28	29	30

M	T	W	TH	F
<b>SEPTEMBER 2013</b> 19 DAYS				
2	3	4	5	6
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30				

M	T	W	TH	F
<b>OCTOBER 2013</b> 22 DAYS				
	1	2	3	4
7	8	9	10	11
14	15	16	17	18
21	22	23	24	25
28	29	30	31	

M	T	W	TH	F
<b>NOVEMBER 2013</b> 18 DAYS				
				1
4	5	6	7	8
11	12	13	14	15
18	19	20	21	22
25	26	27	28	29

M	T	W	TH	F
<b>DECEMBER 2013</b> 15 DAYS				
2	3	4	5	6
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30	31			

M	T	W	TH	F
<b>JANUARY 2014</b> Gr. 7-12 20 DAYS Gr. K-6 21 DAYS				
		1	2	3
6	7	8	9	10
13	14	15	16	17
20	21	22	23	24
27	28	29	30	31

Approved: Approved 12.12.2011  
REVISED: 01.30.2012

- AUG 26 Teacher Work Day-Convocation
- AUG 27 Teacher Professional Development
- ◇ AUG 28 FIRST DAY OF SCHOOL, GRADES 7-12  
Teacher Work Day, Grades K-6
- ◇ AUG 29 FIRST DAY OF SCHOOL, GRADES K-6  
FULL DAY
- SEP 2 Labor Day
- SEP 5 Rosh Hashanah
- OCT 14 Columbus Day
- NOV 5 Election Day - No School for Students
- NOV 27 Early Dismissal
- NOV 28-29 Thanksgiving Recess
- DEC 23-24 Holiday Recess
- JAN 1 (Includes New Year's Day)
- JAN 20 Martin Luther King Day
- JAN 16-22 Grades 7-12: Mid-Term Exams  
(Early Dismissal Grades 9-12 only)
- △ JAN 23 Gr. 7-12 No School for Students  
Teacher Work Day, Grades 7-12
- FEB 17-18 Winter Recess (Includes Presidents' Day)
- APR 14-18 Spring Recess (Includes Good Friday)
- MAY 26 Memorial Day
- Last 4 Days Final Exams, Grades 7-12  
(Early Dismissal Grades 7-12)
- Last Day Projected Last Day - June 9  
Early Dismissal Grades K-12
- Projected Teacher Work Day - June 10  
Teacher Work Day will be the first work day  
following the last day for students.

□ SCHOOL CLOSED

M	T	W	TH	F
<b>18 DAYS FEBRUARY 2014</b>				
	3	4	5	6
10	11	12	13	14
17	18	19	20	21
24	25	26	27	28

M	T	W	TH	F
<b>21 DAYS MARCH 2014</b>				
	3	4	5	6
10	11	12	13	14
17	18	19	20	21
24	25	26	27	28
31				

M	T	W	TH	F
<b>17 DAYS APRIL 2014</b>				
	1	2	3	4
7	8	9	10	11
14	15	16	17	18
21	22	23	24	25
28	29	30		

M	T	W	TH	F
<b>21 DAYS MAY 2014</b>				
			1	2
5	6	7	8	9
12	13	14	15	16
19	20	21	22	23
26	27	28	29	30

M	T	W	TH	F
<b>6 DAYS JUNE 2014</b>				
	2	3	4	5
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30				

\*SCHOOL ENDS JUNE 9

\*If weather or other emergencies require the closing of school, the lost days will be made up by extending the school year in June up to 9 days.  
If additional days are needed, they will be taken from the Spring Recess, beginning April 14.





Project: Smith Middle School Chiller Replacement

**Minimum Rates and Classifications  
for Building Construction**

ID# : B 18673

**Connecticut Department of Labor  
Wage and Workplace Standards Division**

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number: GL-2014-21  
State#:

Project Town: Glastonbury  
FAP#:

Project: Smith Middle School Chiller Replacement

**CLASSIFICATION**

**Hourly Rate                      Benefits**

1a) Asbestos Worker/Insulator (Includes application of insulating materials, protective coverings, coatings, & finishes to all types of mechanical systems; application of firestopping material for wall openings & penetrations in walls, floors, ceilings

35.00                      27.41

1b) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters.\*\*See Laborers Group 7\*\*

2) Boilermaker

35.24                      25.01

*As of:* Thursday, January 23, 2014

**Project: Smith Middle School Chiller Replacement**

<b>3a) Bricklayer, Cement Mason, Concrete Finisher (including caulking), Stone Masons</b>	<b>32.50</b>	<b>26.21 + a</b>
<b>3b) Tile Setter</b>	<b>32.94</b>	<b>22.42</b>
<b>3c) Terrazzo Mechanics and Marble Setters</b>	<b>31.69</b>	<b>22.35</b>
<b>3d) Tile, Marble &amp; Terrazzo Finishers</b>	<b>26.25</b>	<b>19.20</b>
<b>3e) Plasterer</b>	<b>32.50</b>	<b>26.21</b>

**-----LABORERS-----**

**As of: Thursday, January 23, 2014**

Project: Smith Middle School Chiller Replacement

4) Group 1: Laborers (common or general), acetylene burners, carpenter tenders, concrete specialists, wrecking laborers, fire watchers.	26.40	17.15
4a) Group 2: Mortar mixers, plaster tender, power buggy operators, powdermen, fireproofers/mixer/nozzleman, fence erector.	26.65	17.15
4b) Group 3: Jackhammer Operators/Pavement Breaker, mason tender (brick) and mason tender (cement/concrete)	26.90	17.15
4c) **Group 4: Pipelayers (Installation of water, storm drainage or sewage lines outside of the building line with P6, P7 license) (the pipelayer rate shall apply only to one or two employees of the total crew who primary task is to actually perform the mating of pipe sections) P6 and P7 rate is \$26.80	26.65	17.15
4d) Group 5: Air track operators, Sand blasters	27.15	17.15
4e) Group 6: Nuclear toxic waste removers, blasters	29.40	17.15

As of: Thursday, January 23, 2014

**Project: Smith Middle School Chiller Replacement**

4f) Group 7: Asbestos/lead removal and encapsulation (except it's removal from mechanical systems which are not to be scrapped)	27.40	17.15
4g) Group 8: Bottom men on open air caisson, cylindrical work and boring crew	26.90	17.15
4h) Group 9: Top men on open air caisson, cylindrical work and boring crew	26.40	17.15
4i) Group 10: Traffic Control Signalman	16.00	17.15
5) Carpenter, Acoustical Ceiling Installation, Soft Floor/Carpet Laying, Metal Stud Installation, Form Work and Scaffold Building, Drywall Hanging, Modular-Furniture Systems Installers, Lathers, Piledrivers, Resilient Floor Layers.	30.45	21.65
5a) Millwrights	30.78	22.15

**As of: Thursday, January 23, 2014**

Project: Smith Middle School Chiller Replacement

6) Electrical Worker (including low voltage wiring) (Trade License required: E1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	37.60	22.22+3% of gross wage
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7a) Elevator Mechanic (Trade License required: R-1,2,5,6)	46.41	25.185+a+b
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-----LINE CONSTRUCTION-----

Groundman	24.99	6.5% + 9.75
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Linemen/Cable Splicer	45.43	6.5% + 16.20
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8) Glazier (Trade License required: FG-1,2)	34.18	17.75
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As of: Thursday, January 23, 2014

Project: Smith Middle School Chiller Replacement

9) Ironworker, Ornamental, Reinforcing, Structural, and Precast Concrete Erection	33.50	28.98
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----OPERATORS----

Group 1: Crane handling or erecting structural steel or stone, hoisting engineer 2 drums or over, front end loader (7 cubic yards or over); work boat 26 ft. and over. (Trade License Required)	36.05	21.55 + a
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Group 2: Cranes (100 ton rate capacity and over); Backhoe/Excavator over 2 cubic yards; Piledriver (\$3.00 premium when operator controls hammer). (Trade License Required)	35.73	21.55 + a
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Group 3: Excavator; Backhoe/Excavator under 2 cubic yards; Cranes (under 100 ton rated capacity), Grader/Blade; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Fine Grade. (slopes, shaping, laser or GPS, etc.). (Trade License Required)	34.99	21.55 + a
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Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper).	34.60	21.55 + a
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As of: Thursday, January 23, 2014

**Project: Smith Middle School Chiller Replacement**

Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24" Mandrell)	34.01	21.55 + a
Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller; Pile Testing Machine.	34.01	21.55 + a
Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	33.70	21.55 + a
Group 7: Asphalt roller, concrete saws and cutters (ride on types), vermeer concrete cutter, Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and under Mandrell).	33.36	21.55 + a
Group 8: Mechanic, grease truck operator, hydroblaster; barrier mover; power stone spreader; welding; work boat under 26 ft.; transfer machine.	32.96	21.55 + a
Group 9: Front end loader (under 3 cubic yards), skid steer loader regardless of attachments, (Bobcat or Similar): forklift, power chipper; landscape equipment (including Hydroseeder).	32.53	21.55 + a

**As of: Thursday, January 23, 2014**



**Project: Smith Middle School Chiller Replacement**

<b>Group 10: Vibratory hammer; ice machine; diesel and air, hammer, etc.</b>	<b>30.49</b>	<b>21.55 + a</b>
<b>Group 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.</b>	<b>30.49</b>	<b>21.55 + a</b>
<b>Group 12: Wellpoint operator.</b>	<b>30.43</b>	<b>21.55 + a</b>
<b>Group 13: Compressor battery operator.</b>	<b>29.85</b>	<b>21.55 + a</b>
<b>Group 14: Elevator operator; tow motor operator (solid tire no rough terrain).</b>	<b>28.71</b>	<b>21.55 + a</b>
<b>Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.</b>	<b>28.30</b>	<b>21.55 + a</b>

**As of: Thursday, January 23, 2014**

**Project: Smith Middle School Chiller Replacement**

Group 16: Maintenance Engineer/Oiler.	27.65	21.55 + a
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Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator.	31.96	21.55 + a
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Group 18: Power safety boat; vacuum truck; zim mixer; sweeper; (Minimum for any job requiring a CDL license).	29.54	21.55 + a
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**-----PAINTERS (Including Drywall Finishing)-----**

10a) Brush and Roller	30.62	17.75
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10b) Taping Only/Drywall Finishing	31.37	17.75
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**As of: Thursday, January 23, 2014**

**Project: Smith Middle School Chiller Replacement**

10c) Paperhanger and Red Label	31.12	17.75
10e) Blast and Spray	33.62	17.75
11) Plumber (excluding HVAC pipe installation) (Trade License required: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2)	39.31	26.27
12) Well Digger, Pile Testing Machine	33.01	19.40 + a
13) Roofer (composition)	31.70	17.36
14) Roofer (slate & tile)	32.20	17.36

**As of: Thursday, January 23, 2014**

Project: Smith Middle School Chiller Replacement

15) Sheetmetal Worker (Trade License required for HVAC and Ductwork: SM-1,SM-2,SM-3,SM-4,SM-5,SM-6)	33.84	31.18
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16) Pipefitter (Including HVAC work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4, G-1, G-2, G-8 & G-9)	39.31	26.27
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-----TRUCK DRIVERS-----

17a) 2 Axle	27.88	18.27 + a
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17b) 3 Axle, 2 Axle Ready Mix	27.98	18.27 + a
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17c) 3 Axle Ready Mix	28.03	18.27 + a
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As of: Thursday, January 23, 2014

**Project: Smith Middle School Chiller Replacement**

17d) 4 Axle, Heavy Duty Trailer up to 40 tons	28.08	18.27 + a
17e) 4 Axle Ready Mix	28.13	18.27 + a
17f) Heavy Duty Trailer (40 Tons and Over)	28.33	18.27 + a
17g) Specialized Earth Moving Equipment (Other Than Conventional Type on-the-Road Trucks and Semi-Trailers, Including Euclids)	28.13	18.27 + a
18) Sprinkler Fitter (Trade License required: F-1,2,3,4)	39.76	19.87 + a
19) Theatrical Stage Journeyman	22.22	6.53

**As of: Thursday, January 23, 2014**

**Project: Smith Middle School Chiller Replacement**

*Welders: Rate for craft to which welding is incidental.*

*\*Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.*

*\*\*Note: Hazardous waste premium \$3.00 per hour over classified rate*

- Crane with 150 ft. boom (including jib) - \$1.50 extra
- Crane with 200 ft. boom (including jib) - \$2.50 extra
- Crane with 250 ft. boom (including jib) - \$5.00 extra
- Crane with 300 ft. boom (including jib) - \$7.00 extra
- Crane with 400 ft. boom (including jib) - \$10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

*The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.*

*Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.*

*It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.*

*The annual adjustments will be posted on the Department of Labor's Web page: [www.ct.gov/dol](http://www.ct.gov/dol). For those without internet access, please contact the division listed below.*

*The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.*

*All subsequent annual adjustments will be posted on our Web Site for contractor access.*

*Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.*

**As of: Thursday, January 23, 2014**

Project: Smith Middle School Chiller Replacement

*Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage*

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

**~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).**

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

**As of: Thursday, January 23, 2014**

SECTION 15010 - GENERAL CONDITIONS FOR MECHANICAL AND ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The General provisions of the Contract, including General and Supplementary Conditions, and Division 1, General Requirements apply to the work specified in this Section.
- B. Scope of Work: This Section contains special provisions for Divisions 15 and 16.

1.2 EXAMINATION OF SITE AND DRAWINGS:

- A. Before submitting his bid, Contractor shall visit site with plans and specifications in hand, shall consult with the Engineer and shall become thoroughly familiar with all conditions under which his work will be done since he will be held responsible for any assumptions he may make in regard thereto.
- B. The Contractor shall verify and obtain all necessary dimensions at the building.
- C. Certain present building clearances are available for handling equipment.

1.3 INTENT:

- A. Finished Work: The intent of the specifications and drawings is to call for finished work, completed, tested and ready for operation.
- B. Good Practice: It is not intended that the drawings show every pipe, fitting or minor detail and it is understood that while the drawings must be followed as closely as circumstances will permit, the systems shall be installed according to the intent and meaning of the Contract Documents and in accordance with good practice.
- C. Work under each Section shall include giving written notice to the Town within 15 days after the Award of the Contract of any materials of apparatus believed inadequate or unsuitable or in violation of any laws or codes, or items of work omitted. In the absence of such written notice, it is mutually agreed that work under each Section has included the cost of all required items and labor for the satisfactory functioning of the entire system without extra compensation.
- D. Any apparatus, appliance, material or work not shown on drawings but mentioned in specifications or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished and installed by Contractor at no additional cost to the Town.
- E. Prior to receipt of bids, Contractors shall give written notice to Engineer of any materials or apparatus believed inadequate, unsuitable or in violation of laws, ordinances, rules or regulations of authorities having jurisdiction and any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that Contractor has included the



cost of all required items in his proposal and that he will be responsible for approved satisfactory functioning of systems without further compensation.

- F. In all cases where apparatus is herein referred to in singular number, it is intended that such reference include as many such items as are required to complete work.
- G. If not otherwise specified or shown on plans, apparatus and materials shall be installed in accordance with manufacturer's published recommendations and instructions and to the complete satisfaction of the Engineer.
- H. It is the intent of these specifications for Mechanical and Electrical Contractors and/or their subcontractors or equipment suppliers to furnish all equipment complete with all accessories.

#### 1.4 REGULATIONS:

- A. Codes: All work shall be done in strict accordance with the 2005 Connecticut State Building Code Supplement with the 2009 Amendment, 2005 Connecticut State Fire Safety Code Supplement with the 2009 Amendment, 2003 IBC, 2003 IPC, 2003 IMC, Connecticut Public Health Code, 2003 NFPA 101, all applicable NFPA Codes, NEC, UL, NEMA, O.S.H.A., with all requirements of local utility companies and the requirements of all governmental departments having jurisdiction.
- B. Precedence: Requirements of the above shall take precedence over plans and specifications.
- C. Equipment construction standards shall be as follows: Pressure vessels shall be constructed in accordance with the ASME Code, all electrical equipment shall be UL listed and approved and conform to the N.E.C., gas equipment shall be approved by A.G.A. and conform to N.F.P.A. Codes, piping materials, fittings, valves and accessories shall be constructed in accordance with A.S.T.M. and A.N.S.I. standards for class of work involved. All equipment and materials shall be new and of domestic manufacture. All the above codes shall be referenced and dated in the Connecticut Basic Building Code.
- D. Wherever discrepancies occur between above regulations and agencies and contract drawings and specifications, the requirements of above shall take precedence, except that the contract drawings and specifications shall be minimum requirements and that contractors shall advise engineer of any required changes before proceeding with work.

#### 1.5 APPROVED FITTINGS:

- A. No material other than that contained in the "Latest List of Electric Fittings" approved by the Underwriters' Laboratories, Inc., shall be used in any part of the work. All wiring, conduit, switches and other material for which label service has been established, shall bear the label of the Underwriters' Laboratories, Inc.

1.6 PERMITS, FEES:

- A. Include all necessary notices, obtain all permits and pay all governmental taxes, fees, and other costs. File all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction. Obtain all required Certificates of the Town before request for acceptance and final payment for the work.

1.7 DEFINITIONS:

- A. Words "finish" or "finished" refer to all rooms and areas listed in Finished Schedule on Drawings. All rooms and areas not covered in Schedule, including underground tunnels and areas above ceilings, shall be considered not finished except as otherwise noted.
- B. The word "provide" means to "furnish and install" reference item.

1.8 PROTECTION:

- A. Work under each section shall include protecting the work and materials of all other sections from damage by work or workmen, and shall include making good any and all damage thus caused.
- B. Each section shall be responsible for work and equipment until finally inspected, tested and accepted. Protect work against theft, weather, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing materials.
- C. If so specified under the respective section, work may include receiving, unloading, uncrating, storing, protecting, setting in place and connecting up completely of any motor starters, control equipment having mechanical/electrical service connections which may be furnished by Town or furnished under another section. Work under each section shall include exercising special care in handling and protecting equipment and fixtures. Any of the above equipment and fixtures which are missing or damaged by reason of mishandling or failure to protect shall be replaced at no additional cost to the Town.

1.9 EQUIPMENT SUBSTITUTIONS AND DEVIATIONS:

- A. Wherever more than one manufacturer is mentioned in specifications and drawings, any of these named are considered equally acceptable to that on upon which design was based and, providing all requirements are met, insofar as performance, space requirements, noise levels and special accessories or materials are concerned, any of those named may be included in Contractor's bid.
- B. Where Contractor proposes to use an item of equipment which differs from that upon which design was based, which required any redesign of structure, partitions, foundations, piping, wiring or of any other part of Mechanical or Electrical Layout, all such redesign, new drawings or detailing required shall be prepared by Contractor at his own expense for approval of Engineer.

- C. Where approved substitutions or deviations require a different quantity, size or arrange of structural supports, wiring, conduit, piping, ductwork, and equipment from that upon which design was based, all additional items required by the systems shall, with the approval of Engineer, be furnished by Contractor at no additional cost to Town.

**1.10 ELECTRICAL WORK:**

- A. The Electrical Section includes all power wiring for all electrical switches, motor starters and unmounted motors, furnished at the job site by other sections or furnished under the Electrical Sections as stated in other sections of the specifications.
- B. The Electrical Section shall install and wire all starters, switches and controls, as specified and/or shown on drawings. This shall include all operating and safety controls. Refer to sections 16000 and 16400 for additional information.
- C. Electrically operated equipment supplied by other sections which will be installed and wired by Electrical Section shall be delivered to him with detailed instructions for their installation and wiring in sufficient time and proper sequence to enable him to meet his work schedule.
- D. Control devices that include mechanical elements, such as float switches, shall be installed by the section furnishing them, but be wired by the Electrical Sections.
- E. Equipment which includes a number of correlated electrical control devices mounted in a single enclosure or on a common base with equipment shall be supplied for installation completely wired as unit with terminal boxes and ample leads and/or terminal strips, ready for electrical wiring.
- F. Electrical Contractor shall furnish local disconnect switch for all equipment and manual motor starter for fractional HP motors.

**1.11 DRAWINGS:**

- A. The mechanical and electrical drawings are intended to supplement each other and are to be considered as a unit which, taken together in conjunction with the specifications, completely describes the work to be done. All drawings shall be checked to verify spaces in which work will be installed. Where headroom or space conditions appear inadequate, notification shall be given to Engineer before proceeding with installation.
- B. The Engineer may without charge, make modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
- C. Note that the drawings are diagrammatic and indicate the general arrangement of the Mechanical and Electrical Equipment and systems, without showing every detail and fitting.
- D. Where conflicts occur between drawings and specifications or within either, the item or arrangement of better quality, greater quality or highest cost shall be included in Contract price. Engineer shall determine the manner or item with which work shall be installed.

- E. Keep one complete set of all drawings, specifications, shop drawings and addenda on the premises at all times in good condition and available to the Engineer and Town.

1.12 REVIEWS:

- A. The materials, workmanship, design and arrangement of all work installed under the Mechanical and Electrical sections shall be subject to the review of the Engineer.
- B. Where any specific material process of method of construction or manufactured article is specified by name or by reference to the catalog number of a manufacturer, the specifications are to be used as a guide and not intended to take precedence over the basic duty and performance specified or noted on drawings. In all cases, the specific characteristics of the equipment offered for approval, shall be indicated on the shop drawings.
- C. All component parts of each item of equipment or device shall bear the manufacturer's nameplate, giving name of manufacturer, description, size, type, serial or model number, electrical characteristics, etc. in order to facilitate maintenance or replacement. The nameplate of a subcontractor or distributor will not be acceptable.
- D. If material or equipment is installed before it is reviewed, it shall be removed and replaced at no extra charge to the Town if, in the opinion of the Engineer, the material or equipment does not meet the intent of the drawings and specifications.

1.13 SHOP DRAWINGS:

- A. Contractor shall submit for review seven (7) copies each of shop drawings of all new equipment, materials, piping, lighting fixtures, devices, panels and wiring. Engineer's review of shop drawings must be completed before any equipment is purchased or any work is installed.
- B. Shop drawings shall consist of manufacturer's certified scale drawings, cuts or catalog, including descriptive literature and complete certified characteristics of equipment, showing dimensions, capacity, code requirements, motor and drive testing as indicated on the drawings or specifications. Also, sheet metal fabrication drawings drawn to scale of 1/4" to the foot or larger.
- C. Certified performance curves for all pumping equipment shall be submitted for review.
- D. Samples, drawings, specifications, catalogs, etc. submitted for review shall be properly labeled indicating specific service for which material or equipment is to be used, division and article number of specifications governing Contractor's name and name of job.
- E. Catalog, pamphlets or other documents submitted to describe items on which review is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.
- F. Review stamp rendered on shop drawings shall not be considered as a guarantee of measurements of building conditions.

Where drawings are reviewed, said review does not mean that drawings have been checked in detail. Said review does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications.

- G. Failure by the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of Contract and no claim for extension by reason of such default will be allowed.
- H. Prior to submission to shop drawings, the Contractor shall thoroughly check each shop drawing, reject those not conforming to the specifications and indicate by his signature that the shop drawings submitted in his opinion meet Contract requirements.

1.14 CUTTING AND PATCHING:

- A. All cutting of openings in walls, floors, partitions, etc. must be done by the Electrical and/or Mechanical Contractor as required to install the work including all cutting of existing construction work. Cutting shall be neatly done and limited to the minimum size necessary. Contractor shall patch and restore to its original condition any work disturbed as a result of work under this Contract.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP:

- A. All materials and apparatus used shall be new, of first class quality and shall be furnished, delivered, erected, connected and finished in every detail. No materials or apparatus used shall be discontinued or about to be discontinued items.
- B. The Engineer shall have the right to reject any part of the work in case material or workmanship is not of satisfactory quality.
- C. Any unacceptable work and material shall be replaced with acceptable work and material at no additional expense to the Town.
- D. In case there is any doubt of the acceptability of any material, submit samples to the Engineer for approval and only definite approval in writing from the Engineer shall be evidence of such approval.
- E. Such approval shall also be subject to the satisfactory installation of the material.
- F. The work in each of these sections shall be constantly under the direction of a competent superintendent who shall be on the premises during such period as the work is in progress. The superintendent shall familiarize himself with the work of all other sections involved insofar as they relate to or in any way affect the work of these sections, and shall coordinate the work.
- G. Unless otherwise noted, all equipment and materials shall be installed and/or applied in accordance with the recommendations of the manufacturer of said equipment, including the performance of any tests recommended by the manufacturer.

2.2 EQUIPMENT VARIATIONS:

- A. In these specifications and on the accompanying drawings, one or more makes of materials, apparatus or appliances have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship performance of any materials, apparatus or appliance which shall be substituted for those mentioned herein shall also conform to these standards.
- B. Where no specified make or material, apparatus or appliance is mentioned, any first class product made by a reputable manufacturer may be used, providing it conforms to the requirements of these specifications and meets the approval of the Engineer prior to installation.
- C. Refer to Article 15 of the General Conditions of the contract for substitution procedures.
- D. To substitute other makes of materials, apparatus or appliance, than those mentioned under the mechanical or electrical sections, a request in writing to be allowed to make the substitution shall be made. This request shall be accompanied by complete plans and specifications of the substitution offered. If so requested by the Engineer, also submit samples of both the specified material or appliance and the substitute.

2.3 MOTOR CONTROL:

- A. All motors will be fed from a motor starter. Motor starters shall be furnished by each respective trade for motor driven equipment provided by them. The Electrical Contractor shall install the starters and shall provide all power wiring to the starters, and from the starters to the motors they control. Where required, remote pushbuttons, plates and pilots will be furnished with the starter and will be installed by the Electrical Contractor, unless otherwise called for under the Temperature Control Section of these specifications. All starters for motors which are to be interlocked with another motor shall have suitable auxiliary contacts.
- B. All small motors without built-in thermal protection shall be furnished with thermal switches. These switches and pilots shall be furnished by the Electrical Contractor.

2.4 ELECTRIC MOTORS:

- A. All motors 1/2 h.p. and above shall be integral horsepower polyphase induction motors conforming to NEMA standards MG-1-1967 and shall be T-frame design in sizes 143 T through 445 T. Each shall be NEMA design B with minimum torque values per MG 1-12.37 and 12.38.
- B. Duty shall be continuous, ambient temperature 40 degrees maximum, allowable temperature rise for open drip-proof -90 degrees, TEFC, 80 degrees C with Class B insulation rating all per MG 1-12.42.
- C. Horsepower, speed and frame sized per MG 1-10, 32, 13.02 and 13.06a.
- D. Enclosures - open drip-proof and TEFC per MG 1-1.25, 1.26 and 1.27.

- E. All dimensions per MG 1-11.31a, 11.32a and 11.34a. All motors shall have stainless steel nameplates with NEMA voltage standards shown.
- F. Locked rotor KVA per horsepower shall be designated by proper NEMA code letter per MG 1.10.37.
- G. All motors shall be premium efficiency type with a full load efficiency range of 80 percent to 95 percent. High efficiency motor rating shall meet Northeast Utilities Energy Action Program in accordance with the following schedule:

**MINIMUM NOMINAL MOTOR EFFICIENCIES**

HP	OPEN DRIP PROOF			HP	TOTALLY ENCLOSED		
	MINIMUM EFFICIENCY				MINIMUM EFFICIENCY		
	1200	1800	3600		1200	1800	3600
1	82.5%	85.5%	80.0%	1	82.5%	85.5%	78.5%
1.5	86.5%	86.5%	85.5%	1.5	87.5%	86.5%	85.5%
2	87.5%	86.5%	86.5%	2	88.5%	86.5%	86.5%
3	89.5%	89.5%	86.5%	3	89.5%	89.5%	88.5%
5	89.5%	89.5%	89.5%	5	89.5%	89.5%	89.5%
7.5	91.7%	91.0%	89.5%	7.5	91.7%	91.7%	91.0%
10	91.7%	91.7%	90.2%	10	91.7%	91.7%	91.7%
15	92.4%	93.0%	91.0%	15	92.4%	92.4%	91.7%
20	92.4%	93.0%	92.4%	20	92.4%	93.0%	92.4%
25	93.0%	93.6%	93.0%	25	93.0%	93.6%	93.0%
30	93.6%	94.1%	93.0%	30	93.6%	93.6%	93.0%
40	94.1%	94.1%	93.6%	40	94.1%	94.1%	93.6%
50	94.1%	94.5%	93.6%	50	94.1%	94.5%	94.1%
60	95.0%	95.0%	94.1%	60	94.5%	95.0%	94.1%
75	95.0%	95.0%	94.5%	75	95.0%	95.4%	94.5%
100	95.0%	95.4%	94.5%	100	95.4%	95.4%	95.0%

- H. Service Factors - open-drip-proof, 1 h.p. through 200-1.15 TEFC all horsepower - 1.0.
- I. Noise level within NEMA standard MG 1-12.49.
- J. In addition to the above, all motors 1 through 20 h.p. shall be TEFC with drain holes for both horizontal and vertical positions. Each shall be equipped with deep groove double shielded ball bearings prelubricated with provisions for regreasing.
- K. Motors smaller than 1/2 h.p. shall be capacitor-start or split-phase type designed for 120 volts, single phase, 60 cycles alternating current.

2.5 ELECTRICAL MOTOR STARTERS:

- A. Motor starters shall be furnished by each respective trade for motor driven equipment provided by them. The Electrical Contractor shall install the starters and shall provide all power wiring to the starters, and from the starters to the motors they control.
- B. Motor starters shall conform to requirements of NEC, NEMA, UL, CSA, and ANSI and shall be suitable for the required horsepower, duty, voltage, phase, frequency, service, and location. All starters shall be furnished in NEMA enclosures suitable for the environment in which they are to be located.
- C. All starters shall be of the same manufacture and shall be furnished in Cutler-Hammer, Square D, General Electric, or Allen Bradley.
- D. Thermal Overloads:
  - 1. All motors 1/8 horsepower or larger shall be provided with thermal-overload protection. Thermal overloads shall be melting alloy ambient temperature compensating type.
  - 2. Thermal overloads shall be sized in accordance with NEC requirements for the nameplate data of the motor(s) as actually delivered to the site.
- E. Starters for manual control of single phase motors up to one (1) horsepower furnished without integral thermal overloads shall be combination manual disconnect switch and starters with thermal overload protection for each ungrounded leg. Starters shall be inoperable if a thermal unit is removed. These starters shall be 2-pole and shall be provided with green neon pilot light and handle guard/lock-off.
- F. Starters for three phase motors shall be full voltage, circuit breaker combination magnetic starters. All circuit breaker combination magnetic starters shall include melting alloy type thermal overload protection, low voltage protection, and two (2) sets of auxiliary normally open and normally closed contacts. Thermal overload protection shall be provided in each ungrounded leg. Starters shall be inoperable if a thermal unit is removed.

All circuit breaker combination magnetic starters shall be equipped with control power circuits. Provide starters with control power transformers of secondary voltage required for the control power circuitry. Provide control power transformers with secondary fusing.

The disconnect handle on circuit breaker combination magnetic starters shall always be in control of the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "on" or "off", and shall include a two-color handle grip, the black side visible in the "off" position, and the red side visible in the "on" position.

- 1. All circuit breaker combination magnetic starters for manual control of three phase motors shall have start-stop push buttons in the cover and shall be provided with red and green pilot lights.



- 2. All circuit breaker combination magnetic starters for automatic or interlocking control of three phase motors shall have hand-off-automatic selector switches in the cover and shall be provided with red and green pilot lights.

G. Starters shall be furnished as part of respective equipment furnished under each Division.

**PART 3 - EXECUTION**

**3.1 CONNECTING TO EXISTING UTILITIES:**

- A. Connections to existing utilities that will interrupt the service to the present buildings shall be made at a time agreed upon by the Town,
- B. If it is necessary to make connections to existing utilities outside the regular working hours, this shall be noted on the written work order and the respective Contractor will be paid for the additional cost of labor over and above what it would cost at regular day time rates.

**3.2 FREIGHT, CARTING AND RIGGING:**

- A. Contractor shall pay all freight and carting charges necessary to deliver all equipment furnished under his Contract to the site and furnish all necessary rigging to properly rig and set the apparatus on the foundations, frames, etc.
- B. All scaffolding, blocks and tackle, ropes and chains and other equipment necessary to rig and set the apparatus shall be furnished by the Contractor.
- C. The Contractor shall set, level and align all equipment before starting operations.

**3.3 SEISMIC RESTRAINTS:**

- A. It is the intent of this seismic restraint portion of the specification to provide restraint of all non-structural building system components provided in Sections 15 and 16 in Seismic Zone II. Restraint systems and devices are intended to withstand, without failure, the "G" forces detailed in the chart below:

Design Level of Acceleration At Equipment Center of Gravity Seismic Zone 2)  
 (Av - >0.1 to 0.19)

Elevation (feet rel. to grade level)	Rigid* Mnt'd Equip	Non-Struct. Architect Component	Flexible* Mnt'd Equip	Pipe, Duct, Cable trays, Conduit, Etc.	Life Safe. Equip
Below Grade up to 20 feet above grade	0.125 "g"	0.250 "g"	0.500 "g"	0.350 "g"	1.000 "g"
21 ft. - 300 ft.	0.500 "g"	0.550 "g"	0.750 "g"	0.650 "g"	1.000 "g"
301 ft. - 600 ft.	0.750 "g"	0.900 "g"	1.000 "g"	1.000 "g"	1.000 "g"

\* Rigid mounted equipment is any equipment mounted directly to structure. Flexible mounted equipment is any equipment mounted on resilient supports, ceiling suspended,

- roof supported or mounted on an independent frame with any primary natural frequency below 16 Hz.
- B. Seismic restraints shall be as required by 2003 IBC, Chapter 16 and State of Connecticut 2005 Supplement.
- C. Seismic Certificate and Analysis
1. Seismic restraint calculations must be provided for all connections of equipment to the structure.
  2. Calculations to support seismic restraint designs must be stamped by a registered professional engineer licensed in the State of Connecticut.
  3. Analysis must indicate dead loads, derived loads, and materials used for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameters, embedment, and weld length.
  4. A seismic design errors and omissions insurance certificate must accompany submittals.
- D. Submit drawings showing locations of all seismic restraints for equipment, piping, and conduit provided under Sections 15 and 16:
1. The term EQUIPMENT includes ALL non-structural components. These specifications are applicable within the facility and 5 feet outside of the foundation wall. Equipment buried underground is excluded but entry of services through the foundation wall is included.
- E. Submittals shall include a listing of all isolated and non-isolated equipment to be restrained.
- F. Seismic restraints shall not be required for the following installations:
1. Piping in mechanical rooms less than 1 1/4-inch inside diameter.
  2. All other piping less than 2 1/2-inch inside diameter.
  3. All electrical conduit less than 2 1/2-inch inside diameter.
  4. All rectangular air-handling ducts less than 6 square feet in cross-sectional area.
  5. All round air-handling ducts less than 28 inches in diameter.
  6. All piping suspended by individual hangers 12 inches or less in length from the top of the pipe to the bottom of the support for the hanger.
  7. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of the support for the hanger.
- G. Life safety systems defined:
1. All systems involved with fire protection including sprinkler piping, service water supply piping, fire dampers and smoke exhaust systems.
  2. All systems involved with and/or connected to emergency power supply including all generators, transfer switches, transformers and all flowpaths to fire protection and/or emergency lighting systems.
  3. Fresh air relief systems on emergency control sequence including air handlers, conduit, duct, dampers, etc.

3.4 COOPERATION WITH OTHER TRADES:

- A. No piping, conduit, valves, boxes, etc., shall be installed until the entire run has been checked for clearance and the work has been coordinated between all the trades. Each tradesman shall be responsible for taking his own field measurements and maintaining proper clearance from the Town's equipment and the work of other trades, and for coordinating his work with that of other Contractors and Town. Furnish all necessary information, dimensions, templates, etc. in order that a perfectly coordinated job will result.
- B. Contractor shall carry out his work in conjunction with other trades and shall give full cooperation to other trades. Contractor shall furnish all information necessary to permit work of all trades to be installed in a satisfactory manner.
- C. Where space is so limited that Contractor's work shall be installed in close proximity to the work of other trades or where it is evident that Contractor's work will interfere with other trades, he shall assist in working out space conditions to make satisfactory adjustments. If required or directed by Engineer, the Contractor shall prepare composite working drawings and sections of not less than 3/4" -1'-0" scale clearly showing how his work is to be installed in conjunction with other trades; he shall make corrections necessary to satisfactorily complete installation at no additional cost to Town.
- D. All supports for hanging material to be connected to steel structure shall be installed prior to installation of fire proofing material. Any damage to fireproofing caused by late installation of hanging material shall be repaired by the Fire-proofing Contractor at the expense of the Contractor responsible.
- E. The Heating Contractors shall give to the Electrical Contractor all information on switches, controls, pilots, etc. furnished under the Heating Contracts, together with makes and catalog numbers where required to permit the Electrical Contractor to leave the proper boxes to receive same. This information shall be given well in advance so that the Electrical Contractor may install his work as construction progresses. In the event that this information is not given in time to permit the Electrical Contractor to leave proper boxes, etc. as construction progresses, it shall be the responsibility of the Contractor to pay all costs of cutting and patching.

3.6 INFORMATION FOR ELECTRICAL CONTRACTOR:

- A. Deliver to the Electrical Contractor all information on motors and controls furnished under the Mechanical Contract, together with makes and catalog numbers, to permit the Electrical Contractor to leave the proper boxes and wiring.

3.7 SLEEVES, INSERTS AND ANCHOR BOLTS:

- A. All pipes and conduits passing through floors, walls or partitions shall be provided with sleeves sized to give a minimum of 1/2" clearance between sleeve and the outside diameter of the pipe, conduit or insulation, enclosing the pipe or conduit.
- B. Sleeves through concrete floors or interior masonry walls shall be Schedule 40 steel pipe, set flush with finished wall or ceiling surfaces, but extending 2 inches above finished floors

or shall be in accordance with details on drawings. In all mechanical equipment rooms sleeves shall extend 6 inches above finished floor.

- C. Inserts shall be individual or strip type of steel or malleable iron construction for removable nuts and threaded rods up to 3/4" diameter, permitting lateral adjustment.

3.8 ACCESSIBILITY:

- A. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include but not be limited to motors, controllers, switchgear, drain points, etc.
- B. In the event that any equipment is not installed to permit convenient servicing, disassemble, removal of parts, etc. the Contractor shall, at his own expense, make all corrections necessary to accomplish this.

3.9 LUBRICATION:

- A. All equipment having moving parts and requiring lubrication which is installed under this Contract, shall be properly lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication is subject to rejection and replacement at no cost to the Town. Units furnished with sealed bearings are accepted.

3.10 TAGS, CHARTS AND NAMEPLATES:

- A. Each valve, control, switch, electrical panel, motor and any piece of apparatus installed under these sections shall be properly identified.
- B. Each sectional shutoff valve shall have a brass tag with identifying number. Tag shall be secured to valve stem with sufficient length of copper coated jack chain to allow tag to be easily read.
- C. All other equipment, including panels and switches, shall be provided with a suitable laminated plastic nameplate fastened with screws or rivets. Small equipment labels may use a pressure sensitive tape.
- D. All nameplates and labels shall identify components by proper nomenclature and numbered according to equipment schedule or as designated.
- E. Charts shall be furnished in duplicate and shall include the valve identification number, location and purpose. One chart shall be mounted in frame with a clear glass front and secured to wall in location directed.  
Second chart shall be for use throughout building and shall be provided with transparent plastic closure for top and attached 8" bead chain for hanging. Holes to be reinforced with brass grommets. Tags and closures as manufactured by Seton Name Plate Corp., New Haven, Conn., or approved equal.

3.11 INSTRUCTIONS:

- A. Prepare written instructions frames for the proper maintenance and operation of any special equipment furnished and installed under this Contract.
- B. Personally instruct the Town's Custodian or official representative in addition to furnishing all manuals, diagrams, etc. in the proper operation and maintenance of all equipment and piping installed under this Contract.
- C. Prepare a portfolio with all tags, operating manuals, parts lists, guarantees, etc. that are packed with all equipment furnished under this Contract and submit same to the Engineer.

3.12 PIPING CODE MARKERS:

- A. All service piping which is accessible for maintenance operations shall be identified with vinyl plastic color bands and legends at each branch and riser take-off, at each passage through wall, floor and ceiling, adjacent to each valve and on all pipe runs marked each 20'-0". Pipe markers to conform to A.S.A. Bulletin A-13. Where pipes are too small for legends, brass identification tags 1-1/2" in diameter with depressed 1/2" high black filled letters shall be fastened with chain. Pipe markers and tags as manufactured by the Seton Name Plate Corp., New Haven, Conn., or equal approved.

3.13 CLEANING PIPING, CONDUITS AND EQUIPMENT:

- A. Thoroughly clean all piping and equipment of all foreign substances inside and out before being placed in operation.
- B. If any part of a system should be stopped by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and remove obstructions.  
Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Town.
- C. During the course of construction, all pipe and electrical conduits shall be capped in an approved manner to insure adequate protection against the entrance of foreign matter.

3.14 CLEANING UP:

- A. After completion of the work, remove all waste, rubbish and other materials left as a result of operations and leave the premises in clean condition.
- B. All fixtures, equipment, etc. installed under the Mechanical and Electrical Sections shall be free of dirt, grease and other foreign material and left in perfectly clean condition and ready to use.

3.15 GUARANTEE:

- A. All parts of the work and all equipment shall be guaranteed for a period of 18 months from the date of acceptance of the job by the Town.

- B. If during that period of general guarantee, any part of the work installed fails, becomes unsatisfactory or does not function properly due to any fault in material or workmanship, whether or not manufactured or job built, each section shall upon notice from the Town, promptly proceed to repair or replace such faulty material or workmanship without expense to the Town, including cutting, patching and painting or any other work involved and including repair or restoration of any damaged sections of the premises resulting from such faults.
- C. In the event, that a repetition of any one defect occurs, indicating the probability of further failure, and which can be traced to faulty design, material or workmanship, then repairs or replacement shall not continue to be made but, the fault shall be remedied by a complete replacement of the entire defective unit.
- D. In addition to the general guarantee, obtain and transmit to the Town any guarantees or warranties from manufacturers of specialties but only as a supplement to the general guarantee which will not be invalidated by same.

3.17 TOWN'S INSTRUCTIONS AND SYSTEM OPERATION:

- A. At the time of the job's acceptance by the Town, Contractor shall furnish maintenance and operating instructions for all equipment including parts list. These instructions shall be written in layman's language and shall be inserted in vinyl covered three-ring loose leaf binder. This information in binder shall be first sent to the approved by the Engineer before turning over to the Town.
- B. Upon completion of all work and of all tests, each Division shall furnish the necessary skilled labor and helpers for operating the system and equipment for a period of one (1) day of eight (8) hours, or in two (4) hours separate sessions. During this period, instruct the Town or his representative fully in operation, adjustment and maintenance of all equipment furnished. Give at least forty-eight (48) hours notice to the Town in advance of this period.

3.18 TOWN'S ACCEPTANCE TEST:

- A. After the various systems are complete as determined by preliminary operating tests, the Contractor shall arrange for the Town's final acceptance tests.
- B. The Contractor shall have present at each acceptance test, representatives of the several Contractors whose work is directly or indirectly involved, with instruments as necessary in accordance with the design and to include the following.
  - 1. All equipment installed and operating in accordance with manufacturer's instructions and performance guarantee.
  - 2. All systems operating in accordance with specifications.
  - 3. All distribution systems properly adjusted for distribution to equipment as specified.
  - 4. The various systems properly flushed, cleaned, and free of entrapped air and dirt.
  - 5. All motors installed with proper thermal overload protection and not operating under overload conditions as determined by ammeter readings.

6. All valve charts, etc. as specified in various parts of the specifications installed or ready for delivery to the Town.
- C. The date of the Town's acceptance of the equipment shall be the start of the 18 months guarantee period.

**3.19 TEST:**

- A. **Conducting Tests:** Conduct all tests called for under the various sections or as required and repair or replace any defects. Perform all tests in the presence of and to the satisfaction of the Engineer and such other parties as may have legal jurisdiction.
- B. **Defective Work:** The Town shall have the privilege of stopping any of the work not being properly installed. All such defective work shall be repaired or replaced and the tests shall be repeated.
- C. **Repair Damaged Work:** Repair all damages resulting from tests and replace damaged materials.

**END OF SECTION 15010**

SECTION 15180

INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The General Provisions of the Contract, including General and Supplementary Conditions and Division 1, General requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this Section.
- C. Scope of Work: This Section contains details for the insulation of pipe, ductwork and equipment installed under Division 15.

1.2 SUBMITTALS:

- A. In accordance with Section 15010, the following items shall be submitted for approval.
  - Piping insulation
  - Fitting insulation
  - Equipment insulation

1.3 MECHANICAL SYSTEMS INSULATION:

- A. Furnish and install all thermal and protective insulation as specified herein for piping, and equipment as shown on the drawings.
- B. The following mechanical items shall be insulated:
  - Piping – Chilled Water Supply and Return
  - Fittings - Valve bodies, Victaulic couplings, elbows, tees, etc.
  - Equipment insulation

1.4 SYSTEM PERFORMANCE

- A. Insulation materials furnished and installed hereunder should meet the minimum thickness requirements of ASHRAE 90.1 (2001), "Energy Efficient Design of New Buildings," of the American Society of Heating, Refrigeration, and Air Conditioning Engineers. However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall comply with NFPA 255 and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with the following testing standard:

Underwriters' Laboratories, Inc.                      UL 723

Adhesives used for applying the sealed jackets shall also conform to these same ratings. The use of wheat paste or any other material not meeting these requirements will not be allowed.



1.5 QUALITY ASSURANCE

- A. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications.
- B. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.
- C. All covering and insulating materials shall be manufactured by Owens-Corning, Knauf, Johns Manville or Armstrong.

1.6 SEAMS:

- A. On exposed insulation, all longitudinal seams shall be kept at the top and back of the pipe and circumferential joints shall be kept to a minimum. Raw end of insulation shall be concealed by neatly folding the ends of the jackets. Fittings, valve bodies and flanges shall be furnished with the same jacket materials used on adjoining insulation.

1.7 PRIOR TESTING:

- A. Covering shall not be applied until all parts of the work have been tested by the Contractor and reviewed by the Engineer.

1.8 VAPOR BARRIER:

- A. Vapor barrier shall be applied in accordance with the manufacturer's instructions to maintain the integrity of the vapor barrier on cold systems.
- B. An approved vapor retarder mastic compatible with PVC must be applied between pipe insulation and fitting cover, and on fitting cover and throat overlap seam.
- C. For fittings where operating temperature is below 45 deg. For where pipe insulation thickness is greater than 1 ½", two or more layers of Hi-Lo temp insulation inserts shall be installed beneath fitting cover.

1.9 METAL SHIELDS:

- A. Metal shields, 16 gauge galvanized, shall be applied between hangers or supports and the pipe insulation. Shields shall be roll formed to fit the insulation and shall extend up to the center line of the pipe and the length specified for the insert. Insulation shall be rigid type for length of shield to prevent crushing.

1.10 DELIVERY AND STORAGE OF MATERIALS

- A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.

- B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories (wick material, sealing tape, etc) before, during, and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.

PART 2 - PRODUCTS

2.1 PIPING:

- A. Insulate all supply and return chilled water lines in the Mechanical Room, with Owens-Corning Fiberglass ASJ with S.S.L. II, pipe insulation with double self-sealing lap having a factory applied jacket, vapor seal all joints, seams, elbows and fittings. All horizontal and vertical insulated piping located below 8'-0" AFF level and not protected with enclosures shall be protected with Zeston 2000 P.V.C. 30 Mil jacketing.
- B. All piping shall be covered as follows: Apply insulation to clean dry pipe with side and end joints butted tightly. Seal lap of jacket and butt joint strips with Benjamin Foster 82-07 vapor barrier lap adhesive.
- Insulate fittings, flanges and valves of piping with mitered pipe insulation, or F/G premolded fittings made smooth with insulating cement and jacket with glass cloth saturated with Benjamin Foster 30-60 lagging adhesive. Vinyl or plastic fitting jackets will be allowed.
- C. Insulate domestic cold water, in the same as for piping above.
- D. Foam insulation:
1. Piping and Fittings. MicroLok plain pipe insulation shall be wired or taped in place over clean, dry pipe with all joints butted firmly together. Vapor retarder shall be Micro-Lok AP-T plus.
  2. The insulation shall be finished with metal jacketing with a laminated moisture retarder. Metal jacketing shall be overlapped 2 to 3 inches (51 to 76 mm) and held in place with sheet metal screws or metal bands.
  3. Elbows and tees shall be finished with matching metal fitting covers. Other fittings in metal-jacketed systems shall be finished with conventional weather-resistant insulating materials with painted aluminum finish.

- E. Provide minimum insulation thickness in accordance with the following table.  
 Minimum Pipe Insulation

Piping System Types	Fluid Temp. Range	Runouts 2 in +	1 in. and less	1-1/4 to 2 in.	2-1/2 to 4 in.	5 and Larger
	F	in.	in.	in.	in.	in.
<b>Plumbing &amp; CHW Systems</b>						
Hot & Recic. Hot Water	100-200	1.0	1.0	1.0	1.5	1.5
Chilled Water	Below 70	0.5	1.0	1.5	1.5	1.5

**2.2 FITTING COVERS:**

- A. Fitting covers may be used in lieu of insulating cement and jacket. Provide fitting covers in Zeston - 2000 P.V.C. (20 Mil thickness) by Manville.
- B. General - The matching insert (fiberglass) should either be wrapped completely around the fitting or snugly positioned inside the fitting for proper fit. The insert shall cover the full inner surface area of the fitting cover. The fitting cover is then to be applied over the fitting and insert, and the throat secured by either tack fastening, taping, or banding.
- C. Cold Pipe - Fitting systems below ambient temperature must have a continuous vapor barrier, either with pressure sensitive PVC Tape, or an approved adhesive system. When PVC Tape is used, a 2" downward lap is required. On cold lines in severe ambient temperatures, the fiberglass insert shall be the same thickness as the adjacent pipe insulation. All joints shall then be sealed with PVC Tape.
- D. For pipes exposed to weather apply a 16 mil embossed aluminum jacket with 2" overlap at longitudinal and circumferential joints. Secure in place with 3/4" x .015" aluminum band 18" on centers. All seams shall be sealed weather tight.

**PART 3 – EXECUTION**

**3.1 SITE INSPECTION**

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.

- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturer's recommendations.
- C. Verify, by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments, that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

### 3.2 PREPARATION

- A. Ensure that insulation is clean, dry, and in good mechanical condition and that all factory-applied facings are intact and undamaged. Wet, dirty, or damaged insulation is not acceptable for installation.
- B. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

### 3.3 INSTALLATION

- A. General
  - 1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.
  - 2. Install insulation on piping subsequent to painting, and acceptance tests.
  - 3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.
- B. Fittings
  - 1. Wrap valves, fittings, and similar items in each piping system with wicking material to ensure a continuous path (100% coverage) for the removal of condensation.
  - 2. Cover valves, fittings, and similar items in each piping system using one of the following:
    - a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
    - b. PVC Fitting Covers insulated with material equal in thickness and composition to adjoining insulation.
  - 3. Seal all fitting joints with contractor supplied VaporWick Sealing Tape or approved vapor retarder mastic compound.

C. Penetrations

Extend piping insulation without interruption through walls, floors and similar piping penetrations.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

- A. Replace damaged, removed or disturbed insulation with appropriate fiberglass insulation.
- B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

END OF SECTION 15180

SECTION 15682

AIR - COOLED WATER CHILLER

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The General Provisions of the Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this Section.
- C. Section includes design, performance criteria, refrigerants, controls, and installation requirements for air-cooled rotary screw packaged chillers.

1.02 SCOPE

- A. Section includes design, performance criteria, controls and control connections, chilled water connections, electrical power connections and refrigerants of the chiller package.

1.03 REFERENCES

- A. Products shall be designed, rated and certified in accordance with applicable sections of the following Standards and Codes:
  - 1. To comply with the most recent versions of applicable Standards and Codes of ARI 550 / 590.
  - 2. ARI 370 - Standard for Sound Rating of Large outdoor Refrigerating and Air-conditioning Equipment.
  - 3. To comply with the most recent versions of applicable Standards and Codes of ASHRAE 15.
  - 4. Units shall meet the efficiency standards of the latest ASHRAE 90.1 Standard.
  - 5. Unit shall comply with ASME section VIII

1.04 QUALITY ASSURANCE

- A. UL 1995 -- Standard for Heating and Cooling Equipment.
- B. Manufactured facility to be ISO 9001.
- C. 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.

- D. Qualifications: Equipment manufacturer must specialize in the manufacture of the products specified and have five years experience with the equipment and refrigerant offered.
- E. Regulatory Requirements: Comply with the codes and standards specified.

1.05 SUBMITTALS

- A. Submit shop drawings and product data in accordance with specification requirements.
- B. Submittals shall include the following:
  - 1. Dimensioned plan and elevation view drawings, required clearances, and location of all field connections,
  - 2. 1/3 octave band sound ratings per ARI Standard 370.
  - 3. Single line schematic drawing of the field power hookup requirements, indicating all items that are furnished.
  - 4. Certification of factory run test.
  - 5. Installation manuals.

1.06 OPERATION AND MAINTENANCE DATA

- A. Include manufacturer's descriptive literature, installation checklist, start-up instructions and maintenance procedure.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Chillers shall be delivered to the job site completely assembled and charged with refrigerant and oil by the manufacturer.
- B. Comply with the manufacturer's instructions for rigging and handling.
- C. If unit is to be stored, comply with manufacturer instructions for storage.
- D. During shipment, provide protective covering over vulnerable components. Fit nozzles and open pipe ends with enclosures.

1.08 WARRANTY

- A. Warranty (domestic): The refrigeration equipment manufacturer's warranty shall be for a period of 18 months from the time the installation was accepted by the Owner. It shall cover replacement parts (and the labor to replace them) having proven defective within the above period.
- B. Extended Compressor Warranty: 5 Years

- C. Extended Unit Warranty: 4 years extended warranty, entire unit, parts and labor.
- D. Refrigerant Warranty: 5 years.
- E. Delayed Warranty Start: None. (Startup within 6 months of shipment)

1.09 Sustained Operational Performance and Reliability

- A. During the first 24 months of operation, the manufacturer shall perform quarterly remote or on-site operating inspections to confirm the chiller's operational performance. Resulting from each inspection, the manufacturer shall provide the owner with a report describing the condition of the equipment and each of its major components, a log of its current operating data, any issues needing to be addressed, and any recommended corrective actions.
- B. Manufacturer shall include chiller spring start-up and fall draining and winterizing services for the first 24 months of operation.

1.10 Summary of General Options

- A. Warranty: List design requirement options listed in section 1.06.
- B. Sustained Operational Performance: List design requirement options listed in section 1.09.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Basis of Design - Daikin Applied Pathfinder™ Chiller Model AWS, including the standard product features and all special features required per the plans and specifications.
- B. Equal Products - Equipment manufactured by Trane Model RTAE 330T and York Model YVAA0295EHV46 may be acceptable as an equal. Naming these products as equal does not imply that their standard construction or configuration is acceptable or meets the specifications. Equipment proposed "as equal", must meet the specifications including all architectural, mechanical, electrical, and structural details, all scheduled performance and the job design, plans and specifications.

2.02 UNIT DESCRIPTION

- A. Provide and install as shown on the plans, factory assembled, factory charged with R-134a, air-cooled, rotary-screw compressor packaged chillers in the quantity and size specified. Each chiller



shall consist of multiple semi-hermetic screw compressors, direct-expansion evaporator, air-cooled condenser section, control system and all components necessary for protected and controlled unit operation.

2.03 DESIGN REQUIREMENTS

- A. General: Provide a complete rotary-screw packaged chiller as specified herein and as shown on the drawings. The unit shall be in accordance with the standards referenced in section 1.02.
- B. Performance: Refer to the schedule of performance on the drawings. The chiller shall be capable of stable operation to a minimum of 20% percent of full load without hot gas bypass. The unit shall have factory mounted, low ambient head pressure control providing operation to 35°F (-4.4°C).
  - 1. The unit shall provide ventilation in the controller to provide operation above 105°F up to 125°F ambient air temperatures.
- C. Manufacturer must provide both sound power and sound pressure data in decibels. Sound pressure data per ARI 370 must be provided in 8 octave band format at full load. In addition, A-weighted sound pressure at 30 feet should be provided at 100%, 75%, 50% and 25% load points to identify the full operational noise envelope. Sound power must be provided in 1/3 octave band format to highlight any tonal quality issues. If manufacturer cannot meet the noise levels (per the attached chart), sound attenuation devices and/or barrier walls must be installed to meet this performance level.

Sound Pressure (at 30 feet)											
63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	800 HZ	OVERALL dBA	75% Load dBA	50% Load dBA	25% Loa dB,
80	71	70	69	66	61	57	50	71	68	66	65
Sound Power											
63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	800 HZ	OVERALL dBA	75% Load dBA	50% Load	25% Loa

										dBA	dB.
107	98	97	96	93	87	83	76	98	95	93	92

2.04 CHILLER COMPONENTS

- A. Compressors: The compressors shall be field serviceable, semi-hermetic, single-rotor screw type with one central helical rotor meshing with two opposing gaterotors. The gaterotor contact element shall be constructed of engineered composite material, dimensionally stable up to 1500°F and wear resistant for extended life. Compressors shall be vibration isolated from the frame by neoprene compression mounts. If a twin-screw design is used, the manufacturer shall provide an extended 5-year parts and labor warranty covering all additional moving parts. Each compressor shall be equipped with a suction and discharge shut-off valve.
- B. Electric motors: Motors shall be high-torque, two-pole, semi-hermetic, squirrel-cage induction-type with inherent thermal protection on all three phases, and cooled by suction gas.
- C. Variable Frequency Drive (VFD): Each compressor shall be equipped with a VFD providing compressor speed control as a function of the cooling load. Each VFD shall provide controlled motor acceleration and deceleration, and shall provide protection for the following conditions: electronic thermal overload, over/under current, stalled motor, input and output phase loss, high load current, and current unbalance. The VFD shall provide a minimum 94% unit power factor at all load points. The drive shall be equipped with DC reactors. Compressors used in VFD controlled units must have electrically insulated, coated bearings to mitigate bearing and/or lubricant damage from stray electric current passage. Units without this protection must have an extended 5-year compressor warranty.
  - 1. The unit controller shall display the following data:
    - a. Output Frequency
    - b. Output Current
    - c. Output Voltage
    - d. Output Power
    - e. Fault Code
  - 2. The unit controller shall display the following alarms and faults:
    - a. Over Current-Hold

- b. Over Current-Unload
  - c. Over Current-Alarm
  - d. Overheat-Hold
  - e. Overheat-Unload
  - f. Overheat-Alarm
  - g. Communication Fault
3. The unit shall be equipped with ground fault protection.
- D. Evaporator: The evaporator shall be of the direct expansion type with single pass on the refrigerant and water side for high efficiency counter-flow heat transfer and low pressure drops, carbon steel shell, and high efficiency finned copper-tubes rolled into steel tube sheets. The evaporator shall be designed, inspected, and stamped in accordance with ASME Section VIII requirements. It shall be heated with a thermostatically controlled electric heater to help freeze protection to -20°F (-29°C). The evaporator shall be designed, inspected, and stamped in accordance with ASME Section VIII requirements.
1. Flow Switch: Chilled water flow switch to be factory-mounted in the chilled water outlet nozzle and factory wired to terminals in the control panel.
  2. Evaporator shall have standard left-hand connections when looking at the unit control panel.
  3. The evaporator shall be insulated with ¾-inch (19 mm) closed cell polyurethane insulation.
- E. Condenser: The condenser coils shall have seamless copper tubes, mechanically bonded into aluminum plate-type fins. The fins shall have full drawn collars to completely cover the tubes. A sub-cooling coil shall be an integral part of the main condenser coil. Condenser fans shall be propeller-type, arranged for vertical air discharge and individually driven by direct-drive fan motors. Fan motors shall be weather protected, three-phase, direct-drive, 850 rpm, totally enclosed air-over motors (TEAO), with class F insulation or better. ODP motors are not acceptable. Each fan shall be housed in its own compartment to eliminate condenser air cross-flow during fan cycling and shall be equipped with a heavy-gauge close-meshed PVC-coated fan guard.
- F. Refrigerant Circuit: The unit must have refrigerant circuits completely independent of each other with one compressor per circuit. Each circuit shall include an electronic expansion valve, liquid line shut-off valve, replaceable core filter-drier, sight glass with moisture indicator, and combination discharge check and shutoff valve. Unit shall be equipped with a liquid line solenoid valve.
- G. Unit casing and all structural members and rails shall be fabricated of steel and painted to meet ASTM B117 500-hour salt spray test. The control enclosure and unit panels shall be corrosion resistant painted before assembly. Unit shall have condenser coil grilles and base frame grilles.

H. Advanced microprocessor based control system:

1. Control Panel: Single-point power connection to disconnect switch with through-the-door handle and with individual circuit breakers. A NEMA Type 3R weatherproof control panel shall contain the unit control system, control interlock terminals and field-power connection points. Hinged control panel access doors shall be tool-lockable. Barrier panels shall be provided to protect against accidental contact with line voltage when accessing the control system. Fan motors shall have inherent overload protection and compressor motors shall have three-phase motor overload protection. Factory-supplied power components shall include:
  - a. Individual contactors and circuit breakers for fan motors,
  - b. Circuit breakers and factory-mounted transformers for each control-circuit,
  - c. Unit power terminal blocks for connection to remote disconnect switch,
  - d. Terminals for power supply to the evaporator heater circuit.
2. Control system starting components shall include solid-state start timer.
3. The control logic shall be designed to maximize operating efficiency and equipment life with protections for operation under unusual conditions and to provide a history of operating conditions. The system shall intelligently stage the unit to sustain leaving water temperature precision and stability while minimizing compressor cycling.
4. Equipment protection functions controlled by the microprocessor shall include high discharge pressure, loss of refrigerant, loss of water flow, freeze protection, and low refrigerant pressure. User controls shall include:
  - a. auto/stop switch,
  - b. chilled water set-point adjustment,
  - c. anti-recycle timer,
  - d. digital display with water temperature and setpoint,
  - e. operating temperatures and pressures, and diagnostic messages.
5. The following features and functions shall be included:
  - a. Durable liquid crystal display (LCD) screen type, having minimum four 20-character lines with 6 key input pad conveniently mounted on the unit controller. Default language and units of measure shall be English and I-P respectively. Messages shall be in plain English. Coded messages, LED indicators and LED displays are not acceptable.
  - b. 115-volt convenience outlet mounted in control panel for all 60-Hz units.
  - c. Separate control section and password protection for critical parameters.

- d. Remote reset of chilled water temperature using a 4-20mA signal
- e. Soft-load operation, protecting the compressor by preventing full-load operation during the initial chilled fluid pull-down period
- f. BAS communication flexibility through modular plug-in BACnet® with MSTP
- g. Non-volatile program memory allowing auto-restart after a power failure.
- h. Recording of safety shutdowns, including date-and-time stamp, system temperatures and pressures. A minimum \_\_\_\_\_ of six previous occurrences shall be maintained in a revolving memory
- i. Start-to-start and stop-to-start cycle timers, providing minimum compressor off time while maximizing motor protection
- j. Lead-lag compressor staging for part-load operation by manual selection or automatically by circuit run hours
- k. Discharge pressure control through intelligent cycling of condenser fans to maximize efficiency
- l. Pro-active compressor unloading when selected operating parameters exceed design settings, such as high discharge pressure or low evaporator pressure
- m. Diagnostic monitoring of unit operation, providing a pre-alarm signal in advance of a potential shutdown, allowing time for corrective action
- n. Factory-installed amperage and voltage meter.
- o. Ground fault relay.
- p. 115-volt convenience outlet mounted in control panel for all 60-Hz units.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install in strict accordance with manufacturer's requirements, submittal drawings, and contract documents.
- B. A 20-mesh strainer shall be placed in the supply water line just prior to the inlet of the evaporator. Care shall be exercised when welding pipe or flanges to the evaporator to prevent any slag from entering the vessel.
- C. Adjust and level chiller in alignment on supports.
- D. Arrange piping to enable dismantling and permit head removal for tube cleaning.
- E. Coordinate electrical installation with electrical contractor.
- F. Coordinate controls with control contractor.
- G. Provide all appurtenances required to ensure a fully operational and functional chiller.

H. Communication Wiring

1. Conduit shall be installed between each chiller's unit control panel and the building for current and future control wiring for equipment located external to the facility. The conduit installation shall be per all NEC and local electrical codes inclusive of the depth of the conduit and placement of the communications conduit in relation to the chiller's power conduit and water piping. If multiple units are in close proximity, a single conduit from the building LAN may be run to the closest unit. Then conduit shall be extended from the closest chiller control panel to multiple units in a star configuration. Consult the equipment manufacturer regarding cabling options and limitations for multiple units.
2. A minimum capacity CAT 5e Ethernet cable shall be provided in the communications conduit to the chiller from a network switch in the facility. After connecting the conduit to each unit's control panel, the CAT 5e cable shall be extended 3 feet and coiled inside each panel for connection as required for chiller communications. The cable length, continuity, electrical isolation and installation shall be per NEC requirement and local code requirements for communication cabling running from a building to a location exterior to the building.

I. Coordinate controls and BMS interface with controls contractor.

J. Provide all material required for a fully operational and functional chiller.

3.02 SCHEDULE

A. Units shall be field charged with HFC-134A refrigerant.

B. Factory Start-Up Services: Provide factory supervised start-up on-site for a minimum of two working days ensure proper operation of the equipment. During the period of start-up, the factory authorized technician shall instruct the owner's representative in proper care and operation of the equipment.

C. The contractor shall furnish manufacturer complete submittal wiring diagrams of the unit as applicable for field maintenance and service

END OF SECTION 15682

SECTION 15700

COOLING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this Section.
- C. Examine all drawings and data and coordinate the work of this Section with all related and adjoining work.

1.2 SCOPE OF WORK:

- A. This Contract includes all labor, material, equipment, tests and appliances required to furnish and install all HVAC as shown on drawings, implied and herein specified.
- B. The present location of the building will be as shown on drawings. Visit the site and examine the Architectural, Structural and other Mechanical trades showing all details of construction before submitting proposal.
- C. Connect new chillers with piping, ductwork and controls and leave ready to operate. Check all Structural, Mechanical and Electrical drawings and coordinate all work accordingly.
- D. Provide seismic restraints, vibration isolators and flexible connections in accordance with Section 15240. Provide flexible connections at all locations where pipes cross building seismic or expansion joints. Coordinate with Architectural.
- E. Drawings are diagrammatic and indicate the general arrangement of piping and do not show all minor details and fittings. Such items shall be included, as well as reasonable modification, in the layout as directed to prevent conflict with other trades. Attention is brought to Section 15010, "Coordination Drawings".

1.3 SUBMITTALS:

- A. In accordance with Section 15010, the following items shall be submitted for review.

Pipe and fittings  
Hydronic Equipment and Specialties

1.4 MOTOR CONTROL:

- A. Each electric motor of 3 phase characteristics shall be furnished with an automatic starter as specified in Section 15010, Motor Control.

PART 2 -PRODUCTS

2.1 PIPE AND FITTINGS:

A. Copper Tubing:

1. Type "L", ASTM Specifications B88, shall be used for water lines.
2. Fittings shall be wrought copper or cast brass solder- joint pressure rated type.
3. Type "K" shall be used for underground piping with flared fittings.

B. Steel Piping:

1. Pipe shall be Standard Wall (Sch. 40) black carbon steel, ASTM A-120, Grade B, with threaded ends for sizes 1/2" through 2", for hot water heating piping.
2. All steam condensate return piping shall be run in (SCH 80) black steel.
3. Fittings shall be standard weight (125 lbs.), cast iron screwed, ASTM A126, Class A, for sizes 1/2" through 2". Piping 2" and under shall be screwed.
4. Victaulic Grade E couplings, fittings and accessories in conjunction with grooved end schedule 40 piping will be permitted in existing and new construction for hot water heating system.

2.2 PIPE AND FITTINGS:

- A. All fittings on welded lines shall be furnished in accordance with ASTM A105 Specification designed for welding. Branch outlets on mains 2-1/2" and smaller to be made with Weldolets or Thredolets. Welding fittings on mains and branches 3" and larger are to be full size of reducing tube designed for welding. All flanged valves 3" and larger and special equipment connections to be installed with weld neck flanges for welded construction.
- B. All nipples shall be extra strong as follows: Pipe size 1/2" to 4" - 6" close. Pipe size 5" - 12" - 12" close and of the same material as the piping they are used with.
- C. All copper tubing shall be furnished in Type "L" using sweat fittings unless otherwise noted. Copper tubing shall be furnished in Chase, Anaconda, Bridgeport or Revere.
- D. All black steel over 4" or other welded pipe shall have long radius welding ells and tees of the same wall thickness as the pipe. Welding tees will not be required where the mains and branches comply with the following schedule:

Min. Size of Mains

Max. Size of Branch

2 1/2"	3/4"
3"	1 1/4"
4"	2"
5"	3"
6"	4"
8"	6"



10"	8"
12"	10"

- E. Welding flanges shall be slip-on or welding neck type, 300 psig forged steel conforming to ANSI Specification B-16.5.
- F. All necessary precautions shall be taken when welding in the new building to prevent combustion of structure.

2.3 GROOVE PIPING:

- A. Victaulic couplings may be used in lieu of welding, thread or flanging on 2 1/2" through 30" carbon steel pipe, on heating water services from -30 deg. F. to 230 deg. F. within the manufacturer's rated working pressures. Pipe grooving shall be cut grooved and/or rolled grooved as per manufacturer's latest spec. Installation is per manufacturer's latest recommendations. All piping shall be Schedule 40. grooved piping shall be used only in concealed or service areas. Grooved piping will not be accepted in finished areas with no ceiling.
- B. Piping Components  

Grooved couplings consisting of two or more pieces of ductile or malleable iron. Coupling gaskets will be a synthetic rubber gasket with a central cavity pressure responsive design. Coupling bolts and nuts shall be heat treated carbon steel, track head conforming to physical properties of ASTM-A-183. All grooved couplings shall be as manufactured by Victaulic Co. Style 77, 07 or equal.
- C. For piping 2 1/2" and larger, full size branch connections shall be made with manufactured grooved end tees. Branch connections for less than full size shall be made with Victaulic hole cut products. Style 920 or Style 921 branch connections with locating collar engaging into hole or style 72 outlet coupling used to join grooved pipe and to create a branch connection.  

Gaskets for branch connection shall be Victaulic Grade "E" EPDM Compound with working temperature of -30 deg. F. to 230 deg. F.
- D. Flanges  

Vic-Flange Style 741 (2-24") for connection to ANSI class 125 and 150 flanged components.
- E. Fittings  

Fittings shall be full flow cast fittings, steel fittings or segmentally welded fittings with grooves or shoulders designed to accept Victaulic grooved end couplings.

  - 1. Standard Fittings - shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12) or malleable iron conforming to ASTM A-47, Grade 32510, painted with a rust inhibiting modified vinyl Alkyd enamel or hot-dip galvanized to ASTM A-153 or zinc electroplated to ASTM B-633, as required.

2. Standard Steel Elbow Fittings - (14" - 24"), shall be forged steel conforming to ASTM A-106 Grade B (0.375" wall), painted with rust inhibiting modified vinyl Alkyd enamel or hot-dip galvanized to ASTM A-153.
3. Standard Segmentally Welded Fittings - shall be factory fabricated, by fitting manufacturer, of carbon steel pipe as follows, 3/4" - 4" conforming to ASTM A-53, Type F; 5" - 6" Sch. 40 conforming to ASTM A-53, Type E or S, Grade B; 8" - 12" Sch. 30 conforming to ASTM A-53, Type E or S, Grade B; 14" - 24" 0.375" wall conforming to ASTM A-53, Type E or S, Grade B, painted with rust inhibiting modified vinyl Alkyd enamel or hot-dip galvanized to ASTM A-153, as required.

F. Victaulic Pipe Hanging (Victaulic Hanging Standard A-130)

1. Style 07 Zero-Flex for rigid piping systems should be supported as per Building Services B31.9 Hanging.
2. Style 77 flexible piping systems are supported as per Victaulic Hanging Standard A-130.

2.4 PIPING JOINTS:

- A. Welded Joints shall be fusion welded in accordance with American Standard B31.1, Section 6, except as modified hereinafter. Changes in direction of piping shall be made with welding fittings only. Mitering, notching or direct welding of pipe to the main in order to form tees or ells will not be permitted. Branch connections may be made with welding tees or forced branch outlet fittings, as manufactured by Bonney Forge, either being acceptable without size limitation. Bonney Thredolets shall be used in lieu of Hald couplings when reducing from a welded run to a screwed branch. Outlet fittings where used shall be forged, flared for improved flow where attached to the run, reinforced against external strains and designed to maintain full pipe bursting strength. Fillet welds shall be used for welding screwed and slip-on steel flanges to pipes. Where lateral connections are to be used, either lateral fittings or Bonney Latrolets are acceptable. Wedded joints shall be used in finished areas with no ceiling.
- B. Screwed Joints: The ends of pipes to be threaded shall be cut square and reamed. Pipe threads shall be standard taper, shall be cut straight and clean and to full depth, and shall be free from dirt, chips and burrs when the joint is made. Pipe joint lubricant or compound shall be selected for the pipe line service and shall be applied to male threads only. Screwed joints shall not be caulked.
- C. Flanged Joints: This heading covers flanged joints of all types, including those made with flange unions. Flanged joints shall be made with suitable reinforced gaskets. Clean all parts and align the joint before assembling; support pipes or heavy parts independently. Opposite bolts shall be pulled up successively. Screwed steel flanges shall be welded to pipes; slip-on steel flanges shall be welded front and back.

Cast iron flanges shall not be welded to pipes. If raised face flanges are to be bolted against plain face flanges, the raised face shall be removed and a full face gasket used. Where flanged base elbows are installed, the base shall not be used for anchoring the line or otherwise subjected to tension or shear.

- D. Soldered Joints in Copper Tubing: Cut the ends of tubes square, remove burrs, clean tube ends and fitting sockets with emery cloth and remove all particles before applying flux and making the joint. Insert tubes to full socket depth. Use the following solders at the given conditions.

95 - 5% Tin-Antimony/all services/high pressure 250 degrees F. Max.  
Silver - 35 to 45% alloy-refrigerant piping/high pressure and temperature.

2.5 PIPE HANGERS:

- A. Securely hang and anchor pipe as shown and required with proper provision for expansion, contraction and elimination of undue stress and strain on piping.
- B. Provide a pipe hanger within two (2) feet of each elbow, tee, wye, valve, strainer and similar device.
- C. Secure and support runs at base and at sufficiently close intervals to hold pipe at alignment and to carry safely the weight of piping and contents without undue stress thereon.
- D. Except as indicated to the contrary, secure and support all horizontal piping as follows and required to prevent sagging, undue pipe movement and preserve proper alignment in each run.

<u>Piping</u>	<u>Sizes</u>	<u>Maximum Interval</u>
Cast Iron	All sizes	At each hub or joint
Steel	2" & smaller	Six (6) feet
Steel	2 1/2" & larger	Ten (10) feet
Copper Tubing	1 1/4" & smaller	Five (5) feet
Copper Tubing	1 1/2" & larger	Eight (8) feet

- E. Hangers up to and including 2" shall be the adjustable band type equal to Empire. Figure 310 for iron pipe and Fig. 310CT for copper tubing.
- F. Hangers for piping 2-1/2" and up shall be the clevis type, equal to Empire. Figure 11 for iron pipe and Figure 110CT for copper tubing.
- G. Hangers shall be suspended from one of the following devices:
1. "C" clamps.
  2. Trapeze hanger assemblies consisting of back-to-back horizontal steel channels with end-type rod hangers.
  3. Expansion shield embedded into concrete or masonry.
- H. On chilled water systems, provide over-sized hangers.
- I. Refer to Section 15240 for Seismic Restraints.

2.6 VALVES:

- A. This Contractor shall furnish and install valves where shown on plans and also wherever necessary to make the system complete in its operation. All valves shall be as manufactured by Stockham, Jamesbury, Centerline, Appollo, Milwaukee and Victaulic.

Chilled Water:

2" and smaller

Ball valves	Apollo 71-100/200
Check valves	Stockham B-310-T
Vertical check valves	Stockham B-310-T

2-1/2" and larger

Butterfly valves	Stockham - LG712-BS3-B (Lug Style)
Check valves	Centerline - Series 800 S.S. plate and spring, and nypalon seats.

Furnish all valve materials suitable for service intended. No gate valves shall be allowed. Provide all valves with factory installed extension stems.

2.7 UNIONS:

- A. All unions shall be furnished in Nibco-633 or equal in Chase, Revere, Jefferson and Anaconda.

2.8 GASKETS:

- A. Where flanges occur, they shall be packed with Klinger or approved equivalent high quality non-asbestos material composed of fibers for industrial maintenance service with high chemical stability and heat resistance. Nitrile rubber bonded.

Temperature	750 deg. F. max.
Pressure	1450 psi max.
Compressibility	ASTM F36A
Tensile Strength	ASTM F152

2.9 FLOOR AND CEILING PLATES:

- A. Furnish and install satin chrome plated pressed metal floor and ceiling plates on all exposed pipes passing through floors, walls, ceilings, and partitions throughout.

2.10 REAMING OF PIPES:

- A. All pipes to be carefully reamed after cutting and threading.

2.11 PIPE ANCHORS:

- A. Furnish and install all steel clamps around mains not less than 1/4" thick and welded to pipe and necessary angle braces to substantial construction to meet job conditions. Anchored mains shall be properly guided.
- B. Vertical risers, if any, shall be anchored by similar clamps secured to floor, concealed in wall construction.

2.12 EXPANSION LOOPS AND JOINTS:

- A. Furnish and install all expansion joints with mains and loops properly anchored and guided to allow for the necessary expansion of mains and all run outs shall be piped to allow for necessary expansion on risers and mains. In cases where space is limited, expansion joints with compensators, guides and anchors may be used in place of expansion loops as approved by the Engineer.
- B. Provide all expansion joints in Keflex or equal in Fulton Syphon, Flexonics or Adscos, with compensator guides and anchors. Piping joints 3" and larger shall be free-flexing type with Type 304 stainless steel bellows and 150-lb. van stone flanges. Lines of 2-1/2" and smaller shall be equipped with Quadra Side H compensators having multi-ply stainless steel bellows, carbon steel thread and shroud, each for 1" compression and 3" extension.
- C. Pipe alignment guides shall be installed in accordance with manufacturer's published bulletin. Anchors shall have sufficient strength to prevent movement of the piping beyond anchor points.

2.13 HANGERS AND SLEEVES:

- A. All horizontal piping shall be supported in a good, firm and substantial manner. No chains, horizontal pieces of pipe or hangers formed by means of perforated steel bands, pipe rings and hooks will be permitted. Provide cast iron ceiling plates for all hangers in finished basement ceilings. All hangers shall be oversized.
- B. Furnish and place "Hole-Outs" plastic preformed knockout sleeves for all pipes passing through concrete or tile floors or partitions. All pipes passing through toilet room and mechanical room floors shall be provided with grouted, split Schedule 80 steel pipe sleeves, packed with hair felt and Portland cement to allow for flushing of floors without leakage. All pipes and conduits passing through floors, walls or partitions shall be provided with sleeves sized to give a minimum of 1/2" clearance between sleeve and the outside diameter of the pipe, conduit or insulation, enclosing the pipe or conduit.
- C. Sleeves through concrete floors or interior masonry walls shall be Schedule 40 steel pipe, set flush with finished wall or ceiling surfaces, but extending 2 inches above finished floors or shall be in accordance with details on drawings. In all mechanical equipment rooms or penthouses, sleeves shall extend 6 inches above finished floor.

- D. All outside piping passing through exterior walls, foundation walls and floors shall be furnished with flanged C.I. wall sleeves in Zurn, J.R. Smith or Josam. Furnish with flashing clamp where sleeve passes through waterproof membrane.

2.14 CHEMICAL FEEDING EQUIPMENT :

- A. For each closed system the Contractor shall furnish and install the following apparatus (including isolation and drain valves):
1. One shot combination filter feeder, minimum five gallon capacity with quarter turn cap and 3 1/2" opening. The feeder shall be rated for 200 psi service.
- B. The Contractor shall provide ports to test the chemical concentration. Install in the Boiler room as recommended by the manufacturer. Provide with isolation valves.
- C. Furnish one year's supply of filters and the formulas for control of scale and corrosion in the closed hot/chilled water recirculating system. Formulations shall not contain any ingredients which may be harmful to system materials of construction. Provide MSD sheets on all chemical products. No system shall be operated without the benefit of chemical protection. Once the recommended chemical residual is achieved, any additional chemicals required to re-treat the system due to water loss or to accomplish other work shall be provided by the Mechanical Contractor.

2.15 SPECIALTIES FOR CHILLED WATER SYSTEM:

- A. Furnish and install the following accessories and equipment in make other than Bell & Gossett.
1. Thermometers: Install Ashcroft Fig. 7173T BI-Metal "Every Angle" thermometers where shown and/or called for on plans or in specifications.
  2. Thermometers shall have 5" aluminum hermeticism sealed case with stainless steel stem with 1/2" NPT connection. Install in separable well in brass with lagging extension neck. Stem length and dial range shall be 6" and 0 degrees to 250 degrees F., respectively.
  3. Furnish and install on non-critical systems, gauges suitable for use on hot water where indicated on drawings or called for in specifications. Gauge shall be Ashcroft Fig. 2070 with silver brazed boudon tube, aluminum back flange type epoxy coated case, chrome ring, 1/4" NPT lower connection, stainless steel movement with 1% accuracy. Pressure range shall be as required. Furnish 1/4" needlepoint valve in Crane #88 for each gauge. Where sharp pressure fluctuations may occur, mount gauge on a 1/4" Fig. 1106B pulsation dampener. Provide compound gauges where required or called for.
  4. Furnish and install gauges on all pump discharge and compound gauges on all pump suction.
  5. Furnish and install balancing valves on supply and return mains and branch mains from 1-1/2" and larger.
  6. Expansion fittings shall be provided in Flexonics Type H expansion joints, sized as required to take up all expansion in mains and/or branches or equal in Anaconda.

7. Furnish and install all balancing valves on radiation, air handling unit coil, fan coil unit coil, cabinet and unit heater coil, etc., runouts 2" and smaller in Tour Andersson STA-D Series with "A metal" construction. Branch mains 2 1/2" and larger shall be provided with Tour Andersson STA-F Series balancing valve.
8. Furnish and install dielectric fittings.
9. Furnish and install brass cap with chain on all strainers, drains and hose connections.

### PART 3 -EXECUTION

#### 3.1 INSTALLATION:

- A. Furnish and install chilled water piping as shown on plans.
- B. Provide chilled water shutoff valves and combination shutoff and balancing cock for all equipment, hose cocks and drain valves at all low points. Provide air vents on all equipment where they are required for proper operation of the system.
- C. Provide balancing cocks on all main branches for balancing flow to and from the various zones. Provide on all low points of mains or branches, brass hose cocks with hose connection for draining the system.
- D. Check all electrical drawings as well as the structural drawings to make sure that his piping will not conflict with such work.
- E. All piping work shall be installed with proper provision to allow for expansion and contraction of lines so as to prevent any undue strains on pipe and fittings, any trapping of lines or lifting or dislocating of any appliances. Rectify without cost to the Town any conditions of noisy circulation due to trapped or air bound lines, including the expense of cutting and repairing of the building structure incident to making such alterations.
- F. Install the work to conform to space conditions and the work of other trades. The drawings indicate generally the runs and sizes of piping and, although the size must not be decreased, nor the drawings deviated from, except as unforeseen space conditions may require, the right is reversed to make minor changes in the arrangement of the work to meet conditions arising during construction.

#### 3.2 MISCELLANEOUS PIPING:

- A. Provide drain from relief valves to waste.

#### 3.3 TESTING:

- A. All flow piping shall be tested and made tight.
- B. All piping, including chilled water piping, shall be tested and made tight at 100 psi or 50 psi above the Town pressure before any piping is concealed or approved.

- C. After the system is thoroughly cleaned, it shall be put into operation by this Contractor. All parts of the system shall be thoroughly tested and this Contractor shall carefully instruct the Town's authorized representative as to the proper operation and care of the entire system.
- D. All low pressure piping shall be tested and made tight at 100 lbs. per square inch hydrostatic pressure before any piping is concealed or covered.
- E. Contractor shall waste all returns for a minimum period of two weeks after all steam lines, return lines and heating surfaces have been connected up and in operation or until all traces of grease, oil and dirt disappear.
- F. After the systems are thoroughly cleaned, they shall be put into operation by the Mechanical Contractor after all traps and strainers have been removed and cleaned. All parts of the system shall be thoroughly tested and this Contractor shall carefully instruct the Town's authorized representatives as to the proper operation and care of the entire system.

3.4 FLUSHING OUT SYSTEM:

- A. Contractor shall flush out the chilled water systems before balancing up the systems.

3.5 BALANCING AND VENTING OF D CHILLED WATER SYSTEM:

- A. Contractor shall provide all labor and materials as required to assist the Balancing Contractor in proper balancing of the water systems. Contractor shall return to the job and shall make necessary adjustments and corrections to the systems as required by the Balancing Contractor in order to achieve satisfactory system performance in accordance with design parameters.
- B. Contractor shall carefully vent the system when filling same and return to the job during the eighteen months guarantee period as required, to assure the Town of a proper operating system.
- C. System shall be slowly filled with cold water to purge air and shall maintain 4 psig on a gauge located conveniently near the top of the system.

END OF SECTION 15700



SECTION 15950

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this Section.
- C. Examine all drawings and data and coordinate the work of this Section with all related and adjoining work.

1.2 SCOPE OF WORK:

- A. Provide all labor, materials, equipment and tools required to complete the work described and shown on the contract drawings.

PART 2 - PRODUCTS

2.1 PRODUCTS:

- A. None required.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Work shall be performed only by a firm which employs certified testing, adjusting and balancing technicians as listed by the Sheet Metal Industry National Certification Board of TAB Technicians. The work may be performed by a certified Test, Adjusting and Balancing technician who may be assisted by other TAB technicians. This firm shall provide personnel trained and experienced in system balancing. This requirement will not be waived under any condition.
- B. Before submitting system performance data for approval or acceptance, the firm shall perform all necessary tests and make all necessary adjustments as required to obtain the flow as called for on the Contract Documents.
- C. The balance reports shall include the names, signatures and registration numbers of the technicians assigned to the project. Submit reports prior to final payment.

3.2 ACCEPTABLE FIRMS:

- A. The following listed firms are approved to perform this work:

Environmental Testing and Balance  
James Brennan Company  
Technical Associates Group, Inc.  
Wing's Testing and Balancing

- B. Request to employ any other balancing and testing firm must be accompanied by a complete brochure of the firm listing previous installations successfully balanced, length of time in business, names and qualifications of employees and list of instruments available for use on the project.

3.3 HYDRONIC SYSTEMS:

- A. Prior to the start of balancing, the firm shall check the rotation of all pumps.
- B. The firm shall compile the following data for each pump insofar as they apply and shall include it on the final submittal:

PUMP DESCRIPTIVE DATA

Pump Number  
System Served  
Pump Size  
Pump Make  
Pump Horsepower  
Motor Safety Factor  
Motor Manufacturer & Size  
Voltage & Phase

PUMP DESIGN & DELIVERED CONDITIONS

Pump Rpm  
Pump Inlet & Outlet Pressure  
Amperage  
Brake Horsepower  
Gpm Supply

SYSTEM DESIGN & DELIVERED CONDITIONS

Flow (Gpm) through each pump  
Inlet & Outlet temperature at 3-way valve  
Type of instrument and method used

- C. The firm shall provide all instruments and accessories required to perform the tests and shall make their own provisions for inserting the instruments.
- D. The firm shall notify the Town's Representative when they will start work. Prior to this time, the firm shall send their supervising engineer to the office of the Town or his Representative to review the design, desired operation, and method of balancing of the job.
- E. Upon completion of the work, the firm shall certify that all systems are properly balanced and are delivering, returning or exhausting the required quantities. The firm shall deliver to the subcontractor five (5) copies of the test report for transmittal to the Owner's Representative.
- F. Check all safety controls and record control sequences.
- G. Check scheduled air control record the operation by simulating complete operating cycle.
- H. After completion of balancing, mark location of all final positions of dampers.

3.5 INSTALLATION TOLERANCES:

- A. Adjust system to the following tolerances:
  - 1. Supply water temperature 80 degree F to 120 deg. F 0% to +10% of design value.
  - 2. Supply water temperature 120 degree F to 160 deg. F -5% to +10% of design value.
  - 3. Supply water temperature above 160 degree F -10% to +10% of design value.

3.6 FIELD VERIFICATION:

- A. The design Engineer may request verification of data contained in the balancing report. If requested the TAB technician whose initials appear on the data sheets shall take readings selected at random by the Engineer who will compare these readings to those in the submitted report. If the field verification is not satisfactory, the firm doing the TAB work shall completely rebalance the system and a new report shall be prepared and submitted for approval.

END OF SECTION 15950

SECTION 16000

GENERAL ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The General Provisions of the Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the work specified in this Section.
- B. Section 16000, General Electrical, shall govern the work under all Sections of Division 16.

1.2 DESCRIPTION:

- A. Work Included: The electrical work shall consist of all labor, equipment and services required to complete, ready for correct operation, all of the work called for by the accompanying drawings and these specifications.
- B. The work shall include, but is not limited to:
  - 1. Demolition.
  - 2. Raceways and Boxes.
  - 3. Branch Circuit Wiring.
  - 4. Wiring Devices.
  - 5. Circuit Breakers.

1.3 SITE CONDITIONS:

- A. Prior to submitting bid, visit the site and identify existing conditions and difficulties that will affect work called for by the Contract Documents.
- B. No compensation will be granted for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observers. Include in the bid amount all demolition work required.
- C. The Contractor shall verify and obtain all necessary dimensions at the site.

1.4 DEFINITIONS:

- A. Furnish: The word "furnish" is used to mean "supply and deliver the referenced item to the project site, ready for unloading, unpacking, assembly, and installation".
- B. Install: The word "install" is used to describe operations at the project site involving the referenced item including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
- C. Normally Occupied: The words "normally occupied" are used to mean "all rooms within a building except for crawlspaces, underground tunnels, attic spaces, mechanical rooms, telephone rooms, data distribution rooms, and electrical rooms".

- D. Or Approved Equal: The words "or approved equal" are used to mean "any product which in the opinion of the Engineer is essentially equal in quality, size, arrangement, appearance, construction, and performance to that product specified or shown on the drawings".
- E. Provide: The word "provide" means "to furnish and install the referenced item, complete and ready for the intended use".
- F. Remove: The word "remove" means "to disconnect from its present position, remove from the project site, and to dispose of in a legal manner".

1.5 QUALITY ASSURANCE:

A. Codes and Standards

- 1. All work under this section shall comply with the applicable requirements of the National Electrical Code, local electrical and other codes, laws, regulations and standards including those of all state authorities. Where references are made in laws codes regulation and standards, these documents, including the latest revisions and amendments in effect as of the date of bid opening, shall form part of these specifications. Upon completion of the work, the contractor shall furnish Certificates of Approval from the local inspection authorities having jurisdiction for approving materials, equipment, installation pertaining to the electrical work as may be required by the local and/or state authority for the issuance of a permanent Certificate of Occupancy. All expenses arising from the procurement of these Certifications shall be paid by the contractor and shall be included in the lump sum contract price.
- 2. Codes enforced at time at time of bidding include: 2009 Amendment to the 2005 Connecticut State Building Code Supplement, 2003 IBC, 2005 Connecticut Fire Code Supplement, 2005 National Electrical Code, ICC/ANSI A117.1-2003, Accessible and Usable Buildings and Facilities, ADA, and 2003 International Energy Conservation Code(IECC).

B. Submittals

- 1. The contractor shall submit for approval a complete list of materials, fixtures and equipment to be incorporated in the work. The list shall include manufacturer's names and catalog numbers, descriptive data, manufacturer's ratings and application recommendations, cuts, diagrams, performance curves and such other information as may be required by the Owner to judge compliance with the requirements of the contract and suitability to the application. Items on the list shall be clearly identified as to proposed application. Approval of materials and equipment will be based on manufacturer's published ratings. Submittal procedures shall be in accordance with Division 1 of these specifications.
- 2. When directed by the Owner, the contractor shall submit in approved form for record, a Certificate of Compliance with a cited code or standard for the designated materials and equipment; such certificates may be accepted in lieu of samples. Any materials or

equipment submitted for approval, which are not in accordance with the specifications requirements may be rejected.

3. As part of the coordination work required of the contractor, installation drawings shall be prepared by the contractor as necessary. It is intended that these drawings be used to coordinate the work of the various trades and to clarify details of proposed assembly, erection and installation. Installation drawings shall be prepared when indicated in these specifications or on the electrical drawings, or when directed by the Owner for comment or approval when an installation condition or problem arises which the contractor wishes the Owner to review. All installation drawings submitted for review will be considered and treated as shop drawings and the requirements pertaining to shop drawings shall govern.

C. Equipment alternates, substitutions, and deviations:

1. Wherever more than one manufacturer is mentioned in the specifications or on the drawings, any of those named shall be considered equally acceptable to that on upon which design was based, and providing all aspects of the specification are met insofar as quality, construction, performance, space requirements, noise levels and special accessories or materials, any of those named may be included in Contractor's bid.
2. Bidders wishing to obtain approval on brands other than those specified by name shall submit their request to the Engineer not less than ten (10) business days before the date fixed for opening of bids. Approval by the Engineer will be in the form of an Addendum to the specifications issued to all prospective bidders, indicating that the additional brand or brands are approved as equal to those specified so far as the requirements of the project are concerned.
3. Wherever a single manufacturer is used in the specifications or on the drawings and is followed by the words "or approved equal" the Contractor must use the item named or he may apply for an alternate equipment deviation.
4. Alternate equipment to that specified or shown on the drawings, as proposed to be provided by the contractor, must be essentially equal in quality, size, construction, and performance to that item specified or shown on the drawings.
5. Submittals for alternate equipment shall list all deviations and differences from the specified equipment. Failure to submit this list will result in rejection of the submittal.

Any deviations and differences not listed but discovered after installation shall be rectified as directed by the Engineer at the Contractor's cost.

6. Furnish samples of alternate equipment proposed to be provided when so requested by the Engineer.
7. Where the Contractor proposes to use an item of equipment which differs from that upon which design was based, which requires any redesign of the structure, partitions, foundations, piping, wiring or of any other part of Mechanical, Electrical Layout, all such redesign, new drawings or detailing required shall be prepared by Contractor at his own expense for approval of the Engineer.

8. Where approved substitutions or deviations require a different quantity, size or arrangement of structural supports, wiring, conduit, piping, ductwork, and equipment from that upon which design was based, all additional items required by the systems shall, with the approval of the Engineer, be furnished by Contractor at no additional cost to Owner.
- D. Allow sufficient time so that the delivery and installation of equipment will not be delayed as a result of the time required to review, process and transmit submittals, including resubmittals. Failure by the Contractor to transmit submittals to the Engineer in ample time for review and processing shall not entitle him to an extension of the Contract Time and no claim for an extension of time by reason of such default will be allowed.
- E. Submittals, shop drawings, and samples will be reviewed with reasonable promptness and will be stamped indicating appropriate action as follows:
1. "No Exceptions Taken" means that fabrication, manufacture, or construction may proceed providing submittal complies with contract documents.
  2. "Amend as Noted" means that fabrication, manufacture, or construction may proceed, providing the submittal complies with Engineer's notations and contract documents.
  3. "Resubmit" means that submittal, or equipment proposed to be provided, does not comply fully with the contract documents and that fabrication, manufacture, or construction shall not proceed. Resubmit in accordance with the Engineer's notations and contract documents.
  4. "Rejected" means that submittal does not comply with contract documents, or that equipment proposed to be provided does not comply with the specified requirements or is not equal or better in quality and performance than that item specified. Fabrication, manufacture, or construction shall not proceed. Resubmit in accordance with the contract documents and specified requirements.
- F. If material or equipment is installed prior to review, or without review, it shall be removed and replaced at no extra charge to the Owner if, in the opinion of the Engineer, the material or equipment is not in compliance with the Contract Documents.
- G. Record Drawings
1. The contractor shall maintain an accurate record of all deviations in work as actually installed from work as indicated. This record shall be kept current and shall be kept available at the site for inspection. Upon completion of the work, and before final payment is authorized, marked prints with signed certifications of accuracy shall be delivered to the engineer.
- H. Manuals
1. The contractor shall furnish to the Owner operating and maintenance instructions for each piece of equipment and each device.

2. The instructions shall provide detailed descriptions of the operation and maintenance of the equipment or device and shall include manufacturer's literature, detailed wiring diagrams, device internal wiring diagrams, characteristics curves and graphs, data sheets and descriptive literature. The instructions shall be furnished to the Owner 30 days prior to the completion of the building work.

I. Product Handling

1. All work, materials and equipment, whether incorporated into the building or not, shall be protected from damage due to moisture, dirt, plaster, concrete, or from carelessness.
2. All material and equipment which is damaged, including installed work, shall be repaired or replaced to the satisfaction of the Owner.
3. After work is complete, all equipment, including switchboards, transformers, panelboards, lighting fixtures and lamps, shall be cleaned of all construction dirt.

1.6 INTENT OF SPECIFICATIONS:

- A. It is the intent of these Specifications each subcontractor or equipment suppliers to furnish all equipment complete with all motors, drives and magnetic starters throughout for all equipment furnished under these specifications. The above shall also apply to any additions to this Contract, either as covered by and Addenda or Change Orders.
- B. The Electrical Contractor shall provide overload and short circuit protection for all motors unless provided by equipment supplier for packaged type equipment.

1.7 GUARANTEE FOR EQUIPMENT AND SYSTEMS:

- A. Refer to Specifications.
- B. The entire Electrical System included under this Section of the Specifications shall be guaranteed by this Contractor against original defects of equipment and workmanship for a period of 12 months from date of acceptance, unless otherwise specified.

1.8 CUTTING AND PATCHING:

- A. Cutting and patching for all electrical work inside building shall be done in accordance with Division 1.

1.9 SLEEVES AND OPENINGS:

- A. This Electrical Contractor shall furnish and install all necessary sleeves and openings as required to permit the installation of the electrical systems.

1.10 ACCESS PANELS:



- A. Provide access panels to make all junction and pull boxes accessible as required by The National Electrical Code.

1.11 PAINTING:

- A. All painting of electrical work will be done in accordance with Division 9 unless otherwise specified.

1.12 RUBBISH AND CLEANING:

- A. This Contractor shall be responsible for removal of all rubbish and trash created by the installation of the electrical systems and equipment from the job site. Contractor shall sweep clean all areas.

1.14 INSTRUCTIONS:

- A. The Superintendent of the electrical work for this particular project shall spend all necessary time required to instruct the custodians of the building, together with representatives from the Maintenance Department, in the installation including all special controls and devices installed or connected under this contract.

1.15 POWER SHUTDOWNS:

- A. Any power shutdown required for the completion of the electrical work shall be scheduled with the owner at least ten working days in advance and shall be done at owner's convenience.

1.17 SEISMIC:

- A. Provide seismic restraining devices on all required items of electrical equipment in accordance with ICC Chapter 16. Refer to specification Section 15010 and details on mechanical drawings.

END OF SECTION 16000

SECTION 16060

BASIC ELECTRICAL MATERIALS & METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Bidding Requirements, Contract Forms and Conditions of the Contract, including General Conditions of the Contract for Construction, and Division 1 - General Requirements, apply to the work specified in this Section.
- B. Section 16000, General Electrical, shall also govern the work under this Section.
- C. This Section includes requirements that are binding on other Sections of Division 16.

1.2 SCOPE:

- A. Scope of work consists of installation of materials to be furnished under this Section, and without limiting generality thereof consists of furnishing labor, materials, equipment, hoisting, plant, transportation, rigging, staging, appurtenances, and services necessary and/or incidental to properly complete all electrical work as shown on the drawings, as described in these specifications or as reasonably inferred from either as being required in opinion of the Owner.
- B. Work Included: Provide complete electrical services where shown on the drawings, as specified herein and as needed for a complete and proper installation including but not necessarily limited to:
  - 1. General
  - 2. Conduits & Raceways
  - 3. Identification
  - 4. Wire and Cables
  - 5. Wiring Devices
  - 6. Outlet Boxes, Junction Boxes, Pull Boxes
  - 7. Supporting Devices
  - 8. Disconnect Switches
  - 9. Grounding.
  - 10. Circuit Breakers.

1.3 QUALITY ASSURANCE:

- A. Refer to Section 16000.

1.4 SUBMITTALS:

- A. Shop Drawings: Submit for all items listed in Paragraph 1.2.B.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Provide only materials that are new and of type and quality specified, or approved equal. Where Underwriters' Laboratories, Inc. has established standards for such materials, provide only materials bearing the UL label.
- B. Provide materials and equipment necessary to make installation complete in every detail, and to conform to manufacturers' latest installation instructions, under this contract whether or not specifically shown on drawings or specified herein.

2.2 TEMPORARY FACILITIES:

- A. Refer to the requirements of Division 1 regarding temporary facilities.
- B. Scaffolding and other temporary construction shall be rigidly built in accordance with Local and State requirements. Remove from premises upon completion of work.
- C. Provide temporary construction required for electrical work as directed by the Owner.

2.3 RACEWAYS:

A. Electrical Metallic Tubing:

- 1. Shall be manufactured from high grade mild strip steel, shall be hot dipped galvanized, and shall be chromated and lacquered to form additional protective layer. EMT conduit shall conform to UL 797 and ANSI C80.3 and shall be as manufactured by Allied Tube and Conduit, or approved equal.
- 2. Connectors and couplings shall be galvanized steel set screw type. Provide gland compression type couplings and connectors for exposed work in wet locations.
- 3. Shall be used all branch circuit wiring.

B. Flexible Steel Conduit:

- 1. Shall be manufactured from high grade strip steel and shall be hot dipped in a molten zinc bath. The steel strip shall be formed into interlocking convolutions that are continuously joined, metal to metal, assuring continuous grounding contact. Flexible steel conduit shall be UL listed and shall be as manufactured by AFC Cable Systems, or approved equal.
- 2. May be used in short lengths where EMT cannot be installed due to interferences and obstacles.
- 3. Provide for final connections to motor driven equipment or where subject to vibration.

C. Liquid tight Flexible Steel Conduit:

- 1. Shall be similar to flexible steel conduit, but with pressure-extruded moisture and oil-proof outer jacket of gray polyvinyl chloride plastic. Liquid tight flexible steel conduit

shall be UL listed (UL 360) and shall be as manufactured by AFC Cable Systems, or approved equal.

2. Fittings, couplings and connectors shall be hot dipped galvanized and threaded, liquid tight type.
3. Provide where located outdoors or in damp or wet areas for final connections to motor driven equipment or where subject to vibration.

2.4 IDENTIFICATION:

- A. Identify all junction boxes and pull boxes installed above ceilings and in unfinished spaces with branch circuit designations. Identification shall be done with black felt tip permanent marker in a neat and readily legible manner.

2.5 SAFETY SWITCHES:

- A. Furnish and install disconnect switches where shown on the drawings..

2.6 CONDUCTORS:

- A. All branch circuit conductors shall be copper rated 600 volts, 90 deg. C., Type THWN-2.
- B. Grounding electrode conductors and bonding conductors shall be soft drawn copper, ASTM B3 solid bare copper for sizes smaller than #8AWG, ASTM B8 stranded bare copper for sizes #8AWG and larger.
- C. Minimum gauge conductors for power and lighting shall be #12 AWG. Increase to #10 AWG for runs exceeding 75'-0", and #8AWG for runs exceeding 150'-0".
- D. Wire Size #8 AWG and larger shall be stranded. Wire of size smaller than #8 AWG shall be solid.
- E. Wire and cable conductors shall be soft drawn copper with conductivity of not less than 98 percent of ANSI Standard for annealed copper. Aluminum conductors shall not be used.

2.7 OUTLET, JUNCTION AND PULL BOXES:

- A. Provide outlet boxes as required for a complete installation.
- B. Outlet boxes shall be code gauge galvanized steel and shall be of shapes and sizes to suit their respective locations and installations, and shall be provided with covers to suite their function and installation. Outlet boxes shall be equipped with fixture stud or straps where required.
- C. The minimum box size for all wall outlet boxes shall be nominal 4" square x 2 1/8" deep (2-gang). Provide larger size outlet boxes, or gangable type boxes where required for the installation.
- D. For exposed work in normally unoccupied (unfinished) areas, provide pressed steel boxes with galvanized or cadmium plated steel covers with rounded corners. Provide cast boxes for work exposed to wet locations and where called for on the drawings.

- E. For above ground pull boxes, provide galvanized code-gauge sheet steel units with screwed on covers, of size and shape required to accommodate wires without crowding, and to suit the location. Provide pull boxes as specified herein, as required for job conditions, and as follows:
  - 1. Indoors: NEMA Type 1.
  - 2. Outdoors or Damp or Wet Locations: NEMA Type 3R.
  - 3. Hosedown and Splashing Water Locations: NEMA Type 4.
  
- H. Wireways shall be code gauge galvanized steel, manufactured standard sections and fittings, with hinged and/or screw covers, indoors NEMA Type 1/Outdoors NEMA Type 3R. Wireways shall be sized to code conductor fill requirements and shall be provided as required for job conditions.

2.8 WIRING DEVICES:

- A. All devices shall be furnished in Hubbell or approved equal in Pass & Seymour, or Leviton. Devices specified herein are based on Hubbell unless otherwise noted.
  
- B. Lighting Switches:
  - 1. Toggle Type: Institutional Heavy Duty specification grade, flush mounting, quiet operation AC type with abuse resistant colored nylon toggle operator, heat resistant composition plastic housing, silver cadmium oxide contacts and copper alloy spring contact arm. Rated at 120-277 VAC, capable of full capacity on tungsten or fluorescent lamp load. Designed for side or back wiring with up to No. 10 wire, and with #8 brass terminal screws.

	<u>20 AMP</u>	<u>30 AMP</u>
Single Pole	#HBL1221	#HBL3031
Two Pole	#HBL1222	#HBL3032
Three way	#HBL1223	#HBL3033
Four way	#HBL1224	-

- C. Receptacles:
  - 1. Duplex convenience receptacles shall be heavy duty specification grade, 2 pole, 3 wire grounding, NEMA 5-20R, rated 20AMP at 125 Volts AC.
  
  - 2. Receptacles shall have a one-piece nickel plated brass wrap around mounting strap with integral ground contacts and ground tension retaining clips, tandem bypass contact, heat resistant thermoplastic rynite base, and high impact thermoplastic polyester face. Receptacles shall be back and side wired, shall have a back wired green ground terminal, automatic ground clip, and threaded bronze square head center rivet assembly. Duplex Receptacle #HBL5362
  
  - 3. Ground Fault Duplex convenience receptacles shall be heavy duty specification grade, 2 pole, 3 wire grounding, NEMA 5-20R, rated 20AMP at 125 volts AC. Receptacles shall have a solid brass wrap around mounting strap with pre-tensioned ground contacts, tandem modified bypass contacts, all glass circuit board with conformal coating for superior moisture immunity, 7 noise filtering capacitors, heat resistant thermoplastic base and high impact nylon face. Receptacles shall be side wired and shall have a green ground terminal.

Duplex GFCI Receptacle #GF5362.

D. Cover Plates:

1. Cover plates shall be specification grade non-magnetic Type 302 stainless steel, brushed finish. Where multiple devices are ganged together they shall be mounted under a common cover plate. Provide switch and receptacle combination plates where switches and receptacles are located together. Cover plates shall be furnished in same Manufacturer as devices.

2.9 CIRCUIT BREAKERS:

- A. Provide circuit breakers as noted on the drawings.

2.10 ACCESS PANELS:

- A. Provide access panels for electrical equipment and wiring splices which are not readily accessible. This includes electrical equipment and wiring splices installed above hung ceilings which are not readily removable, within walls, inside chases, or inside dead cavity spaces.
- B. Access panels shall be prime painted steel, with screwdriver lock, shall bear the same fire rating as the wall or ceiling in which they are installed, and shall be of sufficient size for wiring splice access or electrical equipment removal and replacement.

Access panels shall be provided in Milcor manufacture, or approved equal. Provide Milcor Type A in acoustical tile surfaces, Type K for plastered surfaces, and Type M for masonry construction.

2.11 OTHER MATERIALS:

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the contractor subject to the approval of the engineer.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Unless specifically noted or shown otherwise, install all equipment and material specified herein or shown on drawings whether or not specifically itemized herein. PART 3 covers particular installation methods and requirements peculiar to certain items and classes of materials and equipment.
- B. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until satisfactory conditions are corrected.
- C. The electrical drawings are diagrammatic, but are required to be followed as closely as actual construction and work of other trades will permit. Where deviations are required to conform with actual construction and the work of the other trades, make such deviations without additional cost to the Owner.

- D. Data indicated on the drawings and in these specifications are as exact as could be secured, but their absolute accuracy is not warranted. The exact locations, distances, levels and other conditions will be governed by actual construction and the drawings and specifications should be used only for guidance in such regard.
- E. Verify all measurements at the building. No extra compensation will be allowed because of differences between work shown on the drawings and actual measurements at the site of construction.
- F. Do not scale drawings. Scale indicated on drawings is for establishing reference points only. Actual field conditions shall govern all dimensions.
- G. Coordinate:
  - 1. Coordinate as necessary with other trades to assure proper and adequate provisions in the work of those trades for interface with the work of this Section.
  - 2. Coordinate delivery of electrical equipment to project prior to installation. Equipment stored for an extended period of time prior to installation may be subject to rejection by Engineer.
  - 3. Coordinate the installation of electrical items with the schedule for work of other trades to prevent unnecessary delays in the total work.
  - 4. Where electrical items are shown in conflict with locations of structural members and mechanical or other equipment, provide required supports and wiring to clear the encroachment.
  - 5. Prior to roughing, the contractor shall obtain exact fixture and device locations from the Engineer. Outlet and fixture locations shown on the drawings are to be used for general reference only. Roughing of fixtures and outlets shall not proceed until exact locations, heights, and orientations of fixtures and outlets have been agreed upon with the Engineer and Owner.
  - 6. Arrange installation to provide access to equipment for easy maintenance and repair.

3.2 INSTALLATION OF RACEWAYS AND FITTINGS:

- A. Install wire and cable in approved raceways as specified and as approved by authorities having jurisdiction.
- B. All conduits shall be concealed from view above ceilings, in chases, and in walls. Conduits may only be installed exposed to view in mechanical and electrical rooms and where run overhead in rooms without ceilings.
- C. Run conduit and cable parallel to or at right angles with lines of the building, to present a neat appearance.
  - 1. Make bends with standard conduit elbows or conduit bent to not less than the same radius.
  - 2. Make bends free from dents and flattening.
- D. Provide code sized conduit unless a larger size is shown on the drawings or specified herein. Minimum size shall be  $\frac{3}{4}$ ".

- E. Securely and rigidly support conduit throughout the work with approved conduit clips and hangers all in conformance with code seismic requirements.
  - 1. Do not use mechanics wire for supporting conduit.
  - 2. Do not support conduits on hung ceilings or from mechanical or electrical equipment.
  - 3. Steel supports and racks shall be galvanized steel channel and fittings, unistrut or approved equal.
  - 4. Provide clamps and support rods as required.
  - 5. Steel support rods or support bolts for conduits shall be 1/8 inch diameter for each inch or fraction thereof of diameter of conduit size, but no rod or bolt shall be less than 1/4" in diameter.
  - 6. Horizontal and vertical conduit supports shall not be more than 10' apart or more than 1' from any fitting.
- F. Do not install conduit runs exposed on the building exterior.
- G. Maintain at least 3" clearance between conduits and heating pipes when running parallel to these pipes, and at least 1" clearance when running perpendicular to these pipes.
- H. Provide double locknuts on all conduits terminating in sheet metal enclosures.
- I. Provide expansion couplings for rigid metallic and non-metallic conduits where such conduits are subject to thermal expansion and contraction.
- J. Provide full wall steel flexible conduit for all conduit penetrations through fire walls. Full wall steel flexible conduit shall be 3-hour through penetration fire wall rated and shall be as manufactured by AFC Cable Systems, or approved equal.
- K. Provide necessary sleeves and chases where conduits and cables pass through floors, walls, ceilings, and roofs, and provide other necessary openings and spaces, all arranged for in proper time to prevent unnecessary cutting. Perform cutting and patching in accordance with the provisions for the original work.
- L. Provide offsets prior to entrance into outlet boxes and other electrical equipment for proper adjustment to finished building surfaces.
- M. Seal around all conduit and cable penetrations through fire rated walls and ceilings with 3M Brand CP25N/S fire barrier caulking.
- N. Carefully clean and dry all conduit before installation of conductors. Plug conduit ends to exclude dust, moisture, plaster, or mortar while building is under construction. Lubricants or cleaning agents which might have deleterious effect on conductor coverings shall not be used for drawing conductors into raceways.
- O. All wiring shall be installed in electrical metallic tubing unless otherwise specified herein or called for on the drawings.



3.3 SLEEVES:

- A. Provide EMT sleeves for each conduit and cable passing through walls, partitions, and floors.
  - 1. Set pipe sleeves in place before wall, floor, or partition is finished. Seal between sleeves and wall, partition, or floor.
  - 2. Support conduit and cable free from sleeves.
  - 3. Provide sleeves two pipe sizes larger than the conduit or cable passing through, or provide a minimum of 1/2" clearance.
- B. Caulk the space between sleeve and conduit or cable using 3M Brand OP25N/S fire barrier caulking.
- C. Fireproof all penetrations made in fire rated walls or floors with UL approved materials to prevent passage of fire and smoke and maintain original fire rating of floors or walls.
- D. Provide chrome plated escutcheon plates for each sleeve where exposed to view in finished areas.

3.4 CONDUCTOR INSTALLATION:

- A. General:
  - 1. The interior of all conduits shall be cleared of burrs, moisture, dirt and obstructions before wires are pulled.
  - 2. Lubricant for pulling wires shall be inert to cable and conduit, shall not in any way restrict ease of pulling through conduit with passage of time, and shall be special lubricant designed specifically for cable pulling and shall be chemically compatible with cable.

B. Color Coding:

- 1. Consistent phase identification of all conductors shall be maintained as follows:

	<u>120/208V</u>
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral Wire	White

Provide colored plastic tape of specified color code identification for large size conductors available only in black. Wrap tape three complete turns around conductor, at ends and at connections and splices. Provide same color coding for switch legs as corresponding phase conductor.

C. Minimum Conductor Sizes:

- 1. The minimum branch circuit conductor size shall be #12AWG. Provide #10AWG conductors for branch circuits where the conductor run exceeds 75 feet, and #8AWG conductors where the conductor run exceeds 150 feet.

- D. Provide the number of conductors required for a given branch circuit, or as required for circuitry, whether indicated on the drawings or not.
- E. Neutral Conductors:
1. All branch circuits shall be installed with a separate neutral conductor. Shared neutrals for groups of branch circuits shall not be permitted.
- F. Provide each circuit with a dedicated ground wire. Use #12 minimum size.
- G. Identify conductors passing through pull boxes, junction boxes, and wireways to indicate circuit designation. Identify pull boxes and junction boxes as specified herein.
- H. Branch circuit wiring and arrangement of home runs have been designed for maximum economy consistent with adequate sizing for voltage drops, circuit ampacities and other considerations.
1. Install the wiring with circuits arranged as shown on the drawings, except as otherwise approved in advance by the Engineer.
  2. Do not make changes and rearrange circuits without prior approval.
  3. If more than 3 current carrying conductors are installed in one conduit they shall be derated in accordance with the National Electric Code.
  4. Do not install more than three 30 Amp single phase or four 20 Amp single phase circuits in the same conduit. Do not run emergency and normal power wiring in the same conduit.
- I. Splices and Connections:
1. Makes splices electrically and mechanically secure with pressure-type connectors.
    - a. For wires size #8AWG and smaller, provide solderless, screw-on connectors, "Scotch-Lock" or equal, 600V rating, of size and type to manufacturer's recommendation, with temperature ratings equal to the conductor insulation.
    - b. Make splices and terminations to conductors #6AWG and larger with corrosion-resistant, high conductivity, pressure indent, hex screw or bolt clamp connectors, with or without tongues, designed specifically for intended service.
  2. Insulate splices with a minimum of two layers of scotch brand No. 33 vinyl-plastic electrical tape where insulation is required.
  3. Tape joints as required with rubber tape 1 ½ times the thickness of the conductor insulation, then cover with the vinyl-plastic electrical tape specified above.
  4. Provide high conductivity copper alloy bolt-on lugs with pressure plate and socket set screw or hex head screw to attach wire and cable to disconnect switches, transformers, and other electrical equipment as required.

3.5 OUTLET BOXES:

- A. All outlet boxes in finished areas shall be concealed from view above hung ceilings or recessed (flush) in walls and floors. Outlet boxes may only be exposed to view or surface mount type in mechanical and electrical rooms, or for feeding items overhead in rooms without ceilings.
- C. Install outlet boxes at uniform heights and straight and true with reference to walls, floors, ceilings and casework.
- D. Provide knockout plugs in boxes with unused openings.
- E. Secure all outlet boxes to building structure with metal straps, rods, or bolts independently of entering conduits or cables.
- F. Provide bar hanger outlets in hollow framed partitions with bar hanger secured to partition studs with self-threading screws, or drill through hangers with Caddy or equal clips.
- G. Provide horizontal separation for outlet boxes mounted on opposite sides of common wall. Back to back or thru-wall boxes will not be permitted.

3.6 PULL BOXES AND JUNCTION BOXES:

- A. Provide pull boxes and junction boxes where shown on the plans and where required to facilitate proper pulling of wires and cables. Install pull boxes or pull fittings no less than one every 100 ft. of straight horizontal conduit run, or three 90 degree bends, unless otherwise noted.

3.7 WIRING DEVICES:

- A. Wherever possible install switches directly adjacent to the strike side of door. Check drawings for door swing.
- B. Device mounting heights indicated below are general. Refer to drawings for special cases. Mounting heights are to centerline of device whether shown on plans or indicated below.

Receptacles	1'-6" AFF
Switches	4'-0" AFF

- C. Where receptacles and outlets are shown over counters, refer to drawings for mounting heights.
- D. Install receptacles vertically with grounding posts at top of device, except locate grounding post to left for horizontal mounting.

3.8 WIRING DEVICE PLATES:

- A. Set plates so that all edges are in contact with mounting surface. Provide common device plate for multi-device locations.
- B. Provide electric outlet and switch sealers for all receptacles, switches and technology outlets installed at exterior walls.

- C. Align all wall plate screws with screw slots aligned in the vertical position.

3.9 MOTOR POWER AND CONTROL WIRING:

- A. Contractor shall provide and be responsible for the complete power wiring of all motors and motorized equipment.
- B. Furnish proper overload and short circuit protection for all new motors. Provide a combination thermal overload and disconnect for switch all equipment using fractional horsepower motors.
- C. Check electrical connections and sizing of motor circuit protection and prevent damage to motor and equipment from incorrect direction of rotation.
- D. Provide mounting for motor and equipment disconnect switches adjacent to motor and supported independent of motor.
- E. Connections to miscellaneous building equipment:
  - 1. Wire to and connect to, all items of building equipment not specifically described in this Section but to which electrical power is required.
  - 2. Coordinate as necessary with other trades and suppliers to verify types, numbers and locations of equipment.

3.10 GROUNDING SYSTEM:

- A. Provide a complete grounding system which will thoroughly ground the non-current carrying metal parts of every piece of installed equipment, as described herein and as indicated on the drawings.
- B. System shall be mechanically and electrically connected to provide an independent return path to the grounding sources.
- C. Each grounding conductor shall have a minimum capacity of 25 percent of the rated capacity of the equipment it grounds, unless otherwise indicated.
- D. The minimum size of grounding conductors shall be No. 12 AWG copper. Insulation color of grounding conductors shall be green.
- E. Provide a separate green ground conductor for each branch circuit.

3.11 SPECIAL REQUIREMENTS:

- A. Wiring shall be bundle tied where passing through pull boxes, wireways, and panelboards in neat and orderly manner with plastic cable ties. Cable ties shall be Ty-Raps as manufactured by Thomas & Betts, or equal.

- B. Provide miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws, and other such items, with galvanized or cadmium plated finish, or other approved rust inhibiting coatings.
- C. Unload electrical equipment and materials delivered to site. Pay cost for rigging, hoisting, lowering and moving electrical equipment on site, in building or on roof. During construction provide additional protection against moisture, dust accumulation and physical damage of electrical equipment. Provide temporary heaters within units, as approved to evaporate excessive moisture and provide ventilation as required.

3.12 TESTING AND INSPECTION:

- A. Provide personnel and equipment, make required tests, and secure required approvals from the Engineer and governmental agencies having jurisdiction.
- B. When material and/or workmanship is found to not comply with the specified requirements, within three days after receipt of notice of such non-compliance remove the non-complying items from the job site and replace them with items complying with the specified requirements, all at no additional cost to the Owner.
- C. Perform all required adjustments and settings. Verify and correct deficiencies as necessary including voltages, tap settings, trip settings and phasing of equipment from distribution system to point of use.
- D. Provide all necessary testing equipment.
- E. In the Owner's Presence:
  - 1. Test all parts of the electrical system and prove that all such items provided under this Section function electrically in the required manner.

3.13 PROJECT COMPLETION:

- A. Upon completion of the work of this Section, thoroughly clean all exposed portions of the electrical installation, removing all traces of soil, labels, grease, oil and other foreign material, and using only the type cleaner recommended by the manufacturer of the item being cleaned.
- B. Equipment with damage to painted finish shall be repaired to satisfaction of the Engineer.
- C. On the first day the facility is in operation, for at least eight hours, at a time directed by the Engineer, provide a qualified foreman and crew to perform such electrical work as may be required by the Engineer.
- E. Thoroughly indoctrinate the Owner's operation and maintenance personnel in the contents of the operations and maintenance manual required to be submitted under these Specifications.

**3.14 EQUIPMENT SPECIFIED:**

- A. Contractor shall furnish equipment or systems in manufacturers specified or named herein or on the drawings. No other manufacturers shall be considered.

**END OF SECTION 16060**