SPECIFICATIONS
NORTHEAST BRANCH PUBLIC LIBRARY IMPROVEMENTS
FOR THE CITY OF READING
PENNSYLVANIA
### TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>PART</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>NOTICES AND INSTRUCTIONS</td>
</tr>
<tr>
<td>II</td>
<td>DOCUMENTS TO BE SUBMITTED WITH BID</td>
</tr>
<tr>
<td>III</td>
<td>CONTRACT DOCUMENTS</td>
</tr>
<tr>
<td>IV</td>
<td>DAVIS-BACON LABOR AND INDUSTRY WAGE RATES</td>
</tr>
<tr>
<td>V</td>
<td>SECTION 3 REQUIREMENTS</td>
</tr>
<tr>
<td>VI</td>
<td>GENERAL PROVISIONS</td>
</tr>
<tr>
<td>VII</td>
<td>SUPPLEMENTARY GENERAL TERMS AND CONDITIONS</td>
</tr>
<tr>
<td>VIII</td>
<td>TECHNICAL SPECIFICATIONS</td>
</tr>
</tbody>
</table>

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NOTICE AND INSTRUCTIONS
CITY OF READING, PENNSYLVANIA
NOTICE TO CONTRACTORS

The City of Reading will receive sealed proposals in the Office of the City Purchasing Coordinator, Rm. 2-45, City Hall, 815 Washington Street, Reading, PA., until 3:00 p.m., prevailing time on July 18, 2017 for the Northeast Branch Public Library Improvements Project for the City of Reading, Pennsylvania, as per specifications on file in the Office of the Purchasing Coordinator.

Specifications and Proposal Forms for the above work can be obtained via the City's website at www.readingpa.gov.

Each proposal shall be accompanied by bid surety in the amount of ten percent (10%) of the proposal. A certified check or bid bond will be accepted.

Attention is called to the fact that Davis-Bacon Act prevailing wage rates must be paid by the contractor and that employees shall not be discriminated against because of race, color, age, religion, sex or national origin.

The City of Reading reserves the right to accept or reject any and all bids, and to accept or reject any part of a bid, as may be in the public interest.

Funding for this project is from the United States Department of Housing and Urban Development Community Development Block Grant.

Tammi Reinhart
Purchasing Coordinator
INSTRUCTIONS TO BIDDERS

PROPOSAL SUBMISSION

Proposals shall be submitted in duplicate on the "Proposal Forms" included in the specifications for the work, and shall be based on the specifications. Each proposal should be submitted in a sealed envelope, and shall plainly indicate on it the title of the proposal, and the date for receiving the bid. This shall be delivered to the City Purchasing Coordinator on or before the time stated in the NOTICE TO CONTRACTORS.

Bids received at the Office of the Purchasing Coordinator after the hour specified, will not be considered. Bidders are invited to be present at the opening of bids.

BONDS

Bid security, in the amount of ten percent (10%) of the bid price shall accompany each proposal. This bid security may be a Certified or Cashier's Check, or a bid bond furnished by a surety company, satisfactory to the City of Reading. The successful bidder, upon award of contract, shall furnish at the time of execution of the same, a Maintenance Bond, Payment Bond, and Performance Bond by a surety company acceptable to the City of Reading, in an amount equal to ONE HUNDRED PERCENT (100%) of the contract to guarantee satisfactory performance, and a Wage Rate Compliance Bond in an amount equal to FIFTY PERCENT (50%) of the contract. All bonds are subject to approval by the City Solicitor.

In case the contract is awarded to a bidder who fails to enter the contract or to deliver all required bonds and affidavits, the cash or check deposited shall become absolute property of the City; or if a bond has been deposited, it shall become payable immediately. Cash, checks or bonds deposited will be returned to unsuccessful bidders as soon as the contract is awarded, or all bids rejected.

INSURANCE

The Contractor, at the time of execution of the contract, shall also furnish the City with insurance certificates of adequate limits, as later indicated, to protect the City of Reading, its agents, and employees from any litigation involving Worker's Compensation, Public Liability and Property Damage, involved in the work. All subcontractors must also furnish copies of their liability insurance and Worker's Compensation Insurance certificates to the City. No subcontractor will be allowed to perform any work under this contract by the City unless such certificates are submitted to and approved by the City beforehand.

WORKERS’ COMPENSATION AND PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE

The status of the Contractor in the work to be performed by the Contractor is that of any independent Contractor and as such, he shall properly safeguard against any and all injury or damage to the public, to public and private property, materials and things, and as such he alone shall be responsible for any and all damage, loss or injury to persons or property that may arise, or be incurred, in or during the conduct or progress of said work without regard to whether or not the Contractor, his sub-contractors, agents, or employees have been negligent, and the Contractor shall keep the City free and discharged of and from any and all responsibility and liability therefore of any sort or kind. The Contractor shall assume all responsibility for risks or casualties of every description, for any or all damage, loss or injury to persons or property arising out of the nature of the work from the action of the elements, or from any unforeseen or unusual difficulty. The Contractor shall assume and be liable for all blame and loss of whatsoever nature by reason of neglect or violation of any Federal, State, County or Local laws, regulations, or ordinances; the Contractor shall indemnify and save harmless the City from all suits or actions of law of any kind whatsoever in connection with this work and shall if required by the City, produce evidence of settlement of any such action before final payment shall be made by the City. Contractor's Liability Insurance Certificate shall include the save harmless clause and shall be filed with the City.
The Contractor shall maintain such insurance as will protect him from claims under worker’s compensation acts and from claims for damages because of bodily injury, including death, and property damage, which may arise from and during operations under this Contract, whether such operations be by himself, by any subcontractor or anyone directly or indirectly employed by either of them. Contractor's liability insurance shall be in the names of the Contractor and the City, as their respective interests may appear. Certificates of such insurance shall be filed with the City Risk and Safety Manager.

The minimum amount of liability insurance to be maintained by the Contractor during the life of the contract shall be as follows:

**Comprehensive General Liability** – for bodily injury and property damage – including any liability normally covered by a general liability policy with limits of not less than $1,000,000 per occurrence and $2,000,000 in the annual aggregate.

**Business Automobile Liability** – For owned, non-owned, leased and hired vehicles with a combined single limit of not less than $1,000,000 for bodily injury and property damage.

**Professional Liability** – in minimum amounts of $1,000,000 per occurrence and $2,000,000 aggregate.

**Worker’s Compensation** – Statutory limits in each state in which Service Provider is required to provide Worker’s Compensation coverage including “All States” and “Voluntary Compensation” endorsement, and a Waiver of Subrogation endorsement in favor of the County.

**Employer’s Liability** – with limits of not less than $100,000 Accident – Each Accident, $100,000 Disease – Each Employee; and $500,000 Disease – Policy Limit.

Prior to commencement of performance of this Agreement, Contractor shall furnish to the City a certificate of insurance evidencing all required coverage in at least the limits required herein, naming the City of Reading, its elected officials, agents, and employees as additional insureds under the Comprehensive General Liability coverage, and providing that no policies may be modified or cancelled without thirty (30) days advance written notice to the City. Such certificate shall be issued to: *City of Reading, 815 Washington Street, Reading, PA 19601*. All policies shall be in effect with companies holding an A.M. Best rating of “A-” or better and shall be licensed to do business in the Commonwealth of Pennsylvania. Such companies shall also be acceptable to the City.

Please forward a certificate of insurance verifying these insurance requirements.

Liability insurance shall include automobile coverage, including "hired automobiles and non-ownership automobiles."

Liability insurance shall include the hazard of collapse, damage to underground utilities, underground blasting, and excavation. Prior to any blasting which may be required, blasting insurance shall be obtained by the Contractor in an amount satisfactory to the City Engineer.

Liability insurance shall include the hazard of building collapse and of damage to adjoining properties and/or to individuals located within or adjacent to each project site.

All subcontractors performing work under this contract must furnish to the City a copy of their Certificate of Insurance for Workers’ Compensation and liability for bodily injury and property damage.

**WAGES AND EMPLOYMENT REQUIREMENTS**

Bidder agrees that not less than the Federal Davis Bacon Act prevailing wages will be paid.
The Contractor will further agree to comply with Commonwealth of Pennsylvania Act of August 15, 1961, P.L. 1225 and amendments as applicable.

EQUAL EMPLOYMENT OPPORTUNITY

During the performance of this Contract, the Contractor agrees as follows:

The Contractor will not discriminate against any employees or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices which may be provided by the City setting forth the provisions of this nondiscrimination clause.

The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

The Contractor will send to each labor union or representative of workers with which the Contractor has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers’ representatives of the Contractor, commitments under this Section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

In the event of the Contractor’s noncompliance with the non-discrimination clauses of this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further City contracts.

The Contractor will include the provisions of these paragraphs in every subcontract or purchase order unless exempted.

EMPLOYMENT OF CERTAIN PERSONS PROHIBITED

No person who, at the time, is serving sentence in a penal or correctional institution shall be employed on the work covered by this Contract.

SUPERVISION OF WORKERS

The Contractor shall provide qualified supervision of each crew at all times while working under this contract. Each supervisor shall be authorized by the Contractor to accept and act upon all directives issued by the City. Failure for the supervisor to act on said directives shall be sufficient cause to give notice that the Contractor is in default of the contract unless such directives would create potential personal injury or safety hazards.

This contract will be under the direct supervision of the City or its authorized representatives. Any alterations or modifications of the work performed under this contract shall be made only by written agreement between the Contractor and the City authorized representatives and shall be made prior to commencement of the altered or modified work. No claims for extra work or materials shall be allowed unless covered by written agreement.

SUBCONTRACTS

The Contractor will not be allowed to subcontract work under this contract unless written approval is granted by the City. The Subcontractor, as approved, shall be bound by the conditions of the contract between the
City and the Contractor. The authorization of a Subcontractor is to perform in accordance with all terms of the contract and specifications. All required notices, work orders, directives, and requests for emergency services will be directed to the Contractor. All directions given to the Subcontractor in the field shall bind the Contractor as if the notice had been given directly to the Contractor.

QUALITY

Where a bid is asked for a certain article or “Approved Equal” and the bidder intends to furnish an article which the bidder considers equal to the one named, the bidder must specify in the bid the name and grade of said article. All disputes concerning grade and quality of materials or work shall be determined by a person duly authorized by the City.

BRAND NAME OR EQUAL

If an item in this solicitation is identified as “brand name or equal,” the purchase description reflects the characteristics and level of quality that will satisfy the Government’s needs. The salient physical, functional, or performance characteristics that “equal” products must meet are specified in the solicitation.

To be considered for award, offers of “equal” products, including “equal” products of the brand name manufacturer, must—

- Meet the salient physical, functional, or performance characteristic specified in this solicitation;
- Clearly identify the item by Brand name, if Make or model number;
- Include descriptive literature such as illustrations, drawings, or a clear reference to previously furnished descriptive data or information available to the Contracting Officer; and
- Clearly describe any modifications the offeror plans to make in a product to make it conform to the solicitation requirements. Mark any descriptive material to clearly show the modifications.
- The Contracting Officer will evaluate “equal” products on the basis of information furnished by the offeror or identified in the offer and reasonably available to the Contracting Officer. The Contracting Officer is not responsible for locating or obtaining any information not identified in the offer.
- Unless the offeror clearly indicates in its offer that the product being offered is an “equal” product, the offeror shall provide the brand name product referenced in the solicitation.

TIME OF COMPLETION

The bidders are herewith cautioned that the time of completion indicated in their proposal must be complied with. To insure timely completion, the successful bidder will be required to furnish adequate equipment, and qualified personnel in sufficient numbers at all times.

Where a date is set for delivery of materials or the performance of work, said materials must be delivered, or work performed, in accordance with the specifications or description herein contained on or before said date, or the order to the delinquent party will be canceled and awarded to the next lowest responsible bidder.

ANY AND ALL WORK MUST BE COMPLETED WITHIN TWELVE (12) WEEKS FROM THE NOTICE TO PROCEED DATE.

BUSINESS PRIVILEGE TAX
The City of Reading imposes a Business Privilege License, at $55.00 per calendar year. In addition, a Business Privilege Tax is imposed at the rate of 2-1/4 mills upon the gross receipts attributable to business conducted within the City of Reading.

PERMITS/LICENSES

The Contractor shall, at his expense, pay all fees and procure all necessary licenses and permits needed to conduct the work required under the terms of this contract. The Contractor shall give any and all necessary formal notices required in conjunction with the lawful prosecution of the work of this contract.

BASIS OF PAYMENT

All prices to be quoted F.O.B. Reading, PA destination. The City of Reading is tax exempt.

OBSERVANCE OF LAWS, ORDINANCES AND REGULATIONS

The Contractor at all times during the term of this contract shall observe and abide by all Federal, State, and Local laws which in any way affect the conduct of the work and shall comply with all decrees and orders of courts of competent jurisdiction. The Contractor shall comply fully and completely with any and all applicable State and Federal Statutes, rules and regulations as they relate to hiring, wages, and any other applicable conditions of employment.

PRE-BID MEETING

There is no pre-bid meeting for this project.
WITHDRAWAL OF PROPOSALS/BIDS

After a bid has been opened, it may not be withdrawn except as provided by Act of January 23, 1974, P.L. 9 No. 4, as same may be amended.

No bids may be withdrawn for a period of ninety (90) days following the formal opening and receipt of bids by the City of Reading.

BID REJECTION

The City of Reading reserves the right to reject any or all bids and to accept or reject any part of any bid. It also reserves the right to waive any technical defects or minor irregularities, which in its discretion, is in the best interest of the City.

EXECUTION OF CONTRACT

The successful Bidder shall, within ten (10) calendar days after mailing of contract documents by the City to the Principal, enter into contract with the City on form as included within the bidding documents for the appropriate bonds, indemnities and insurances required hereunder.

The contract, when executed, shall be deemed to include the entire agreement between the parties; the Contractor shall not base any claim for modification of the contract upon any prior representation or promise made by the representatives or the City, or other persons.

All attachments are considered as part of this document.

METHOD OF PAYMENT

Payments shall be based on an invoice submitted by the General Contractor or approved representative Construction Manager. The City shall have the right to withhold disbursement funds if in the City's opinion construction work for which payment has been requested is of poor workmanship, contrary to any applicable codes and contract specifications, violation of appropriate paperwork requirements that are not up to date and approved for this billing period, General Contractor fails to comply with this Agreement, or for other conditions or circumstances which the City deems not to be in the best interest of the public.

Ten percent (10%) of each General Contractor invoice request shall be retained by the City on this contract until it is completed up to City codes and contract specifications and approved by a City Official or person representing a City Official (Architect or Engineer).

ACCESS TO ACCOUNTING RECORDS

The contractor shall certify that all materials, equipment, and labor charged to the City are accounted for and shall keep such full and detailed accounts as may be necessary for proper financial management under this Agreement. The City or its representative shall be afforded access the all the Contractor’s records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to this Contract, and the Contractor shall preserve all such records for a period of three (3) years, or for such longer period as may be required by law, after the final payment.
ASSIGNMENT OF REFUND RIGHTS

The City is not subject to federal, state, or local sales or use tax or federal excise tax. Contractor hereby assigns to City all of its rights, title, and interest in any sales or use tax which may be refunded as a result of the purchase of any materials purchased in connection with the Contract and Contractor, unless directed by the City, shall not file a claim for any sales or use tax refund subject to this assignment. Contractor authorizes the City, in its own name or the name of the Contractor, to file a claim for a refund of any sales or use tax subject to this assignment.

CONTRACTS WITH SUBCONTRACTORS

The Contractor agrees to include the above references paragraphs in any contract with subcontractors and to provide proof thereof to the City of Reading if requested.

NOTICE TO PROCEED

The Contractor shall begin work on the job site within ten (10) days after receiving Notice to Proceed from the City.

DISCONTINUANCE OF WORK

Any practice obviously hazardous as determined by the City shall be immediately discontinued by the Contractor upon receipt of either written or oral notice to discontinue such practice.

CONTRACT TERMINATION

The City shall have the right to terminate a contract or a part thereof before the work is completed in the event:

1. Previous unknown circumstances arise making it desirable in the public interest to void the contract.
2. The contractor is not adequately complying with the specifications.
3. The contractor refuses, neglects, or fails to supply properly trained or skilled supervisory personal and/or workers or proper equipment.
4. The contractor in the judgment of the City is unnecessarily or willfully delaying the performance and completion of the work.
5. The contractor refuses to proceed with work when and as directed by the City.
6. The contractor abandons the work.

Contractors who have questions concerning various aspects of this Contract should contact the following persons:
QUESTIONS REGARDING SPECIFICATIONS OR BID PROCESS

To ensure fair consideration for all bidders, the City prohibits communication to or with any department or division manager or employee during the bid process with the exception of those questions relative to interpretation of specifications of the bid process. Such questions shall be submitted to the Purchasing Coordinator in writing by 2:00 pm, July 7, 2017. Responses to questions shall be issued to all bidders in the form of a written addendum no later than July 11, 2017.

Tammi Reinhart, Purchasing Coordinator
City Hall Purchasing Office
815 Washington Street
Reading, PA 19601-3690
(610) 655-6427 (fax)
tammi.reinhart@readingpa.org

Notice: Payment of invoices are subject to the terms and conditions of the sources of funding for this project.
NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION
TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246, AS AMENDED)

(1) The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

(2) The goals are timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

<table>
<thead>
<tr>
<th>Timetables</th>
<th>Goals for Minority</th>
<th>Goals for Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Until Further Notice</td>
<td>2.5% for all trades</td>
<td>6.9% for All Trades</td>
</tr>
</tbody>
</table>

These goals are applicable to all the Contractor's construction work (whether or not it is federal or federally-assisted) performed in the covered area.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

(3) **THE CONTRACTOR SHALL PROVIDE WRITTEN NOTIFICATION TO THE DIRECTOR OF THE OFFICE OF FEDERAL CONTRACT COMPLIANCE PROGRAMS WITHIN 10 WORKING DAYS OF AWARD OF ANY CONSTRUCTION SUBCONTRACT IN EXCESS OF $10,000 AT ANY TIER FOR CONSTRUCTION WORK UNDER THE CONTRACT RESULTING FROM THIS SOLICITATION. THE NOTIFICATION SHALL LIST THE NAME, ADDRESS AND TELEPHONE NUMBER OF THE SUBCONTRACTOR; EMPLOYER IDENTIFICATION NUMBER; ESTIMATED DOLLAR AMOUNT OF THE SUBCONTRACT; ESTIMATED STARTING AND COMPLETION DATES OF THE SUBCONTRACT; AND, THE GEOGRAPHICAL AREA IN WHICH THE CONTRACT IS TO BE PERFORMED.**

**OFFICE OF FEDERAL CONTRACT COMPLIANCE PROGRAMS**
**THE CURTIS CENTER SUITE 750 WEST**
**170 SOUTH INDEPENDENCE MALL WEST**
**PHILADELPHIA, PA 19106-3309**
**PHONE (215) 861-5764**

As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is the City of Reading, Pennsylvania.
State of ______________________)
County of ______________________)

I, ______________________________, Notary Public, being duly sworn, deposes and says that he is
_________________________________ of ______________________________,
(Name of Organization)
and that the answers to the foregoing questions and all statements therein contained are true and
correct.

Subscribed and sworn to before me this _____ day of _____________________, _______.

____________________________
NOTARY PUBLIC

My Commission Expires:
DOCUMENTS TO BE SUBMITTED WITH BID
PROPOSAL

Proposal of:

Name:

Address:

TO: Mayor Scott
City of Reading
815 Washington Street
Reading, PA 19601

Dear Mayor Scott:

In conformity with City Plans and specifications, all as prepared by the Community Development Department and after an examination of the site of the work, and the Contract Documents, including the instructions to Bidders, Form of Proposal, Bid Bond and Conditions, the undersigned submits this proposal, and encloses herewith as proposal guaranty, a Certified or Treasurer's Check, or Bid Bond, in an amount not less than ten percent (10%) of the bid herein submitted, which it is understood will be forfeited if this proposal is accepted by the City of Reading, and the undersigned fails to furnish approved bonds and execute the contract within the time stipulated; otherwise, the guarantee will be returned.

The undersigned declares that no Member of Council, Director of Department, Division Manager, deputy thereof or clerk therein, or other officer of the City of Reading, is directly or indirectly interested as principal, surety of otherwise in this proposal or has any supervision or overall responsibility for the implementation in administration of the contract.

It is certified that the undersigned is the only person(s) interested in this proposal as principal and that the proposal is made without collusion with any person, firm, or corporation.

It is hereby agreed to execute the contract and furnish surety company bonds, on the forms enclosed in the Contract Documents, in the amount of one hundred percent (100%) of the contract price within ten (10) days of mailing of the contract documents from the City to the Principal, and to begin work within ten (10) days after receipt of Notice to Proceed from the City of Reading.

It is proposed to furnish and deliver all materials, tools, equipment, power, tests and transportation, perform all labor, superintendence, and all means of construction, and do all incidental work, and to execute, construct and finish in an expeditious and workman-like manner, in accordance with the plans and specifications, to the satisfaction and acceptance of the Department of Community Development of the City of Reading and its Engineer for the total base bid as herein bid:

_________________________________________________________________________(written)

$___________________________ (figures).
IN WITNESS WHEREOF, this proposal has been executed this ____ day _____ A.D. 20____, by the setting hereunto of his or its hand and seal.

(INDIVIDUAL: PRINCIPAL)

_______________________________(Seal)

(Signature of Individual)

Witness:

______________________________

Trading and Doing Business as:

______________________________
(PARTNERSHIP PRINCIPAL)

Witness: ______________________________
By: ______________________________ (Seal)

Witness: ______________________________
By: ______________________________ (Seal)

Witness: ______________________________
By: ______________________________ (Seal)

Witness: ______________________________
By: ______________________________ (Seal)

(CORPORATION PRINCIPAL)

Attest:

______________________________
(Assistant Secretary)

______________________________
(Name of Corporation)

By: ______________________________
(Vice) President

(CORPORATE SEAL) 

or (if appropriate)

______________________________
(Name of Corporation)

By: ______________________________
Authorized Representative
FORM OF BID BOND

BOND

KNOW ALL MEN BY THESE PRESENTS that we, the undersigned,
________________________, as Principal (the "Principal"), and _______________________________
a corporation organized and existing under laws of the _______________ of ______________, as
Surety (the "Surety"), are held and firmly bound unto______________________________________ as
Obligee (the "Obligee"), as hereinafter set forth, in the full and just sum of
__________________________________________________________________ Dollars
($___________).

lawful money of the United States of America, for the payment of which sum we bind ourselves, our
heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WITNESSETH THAT:

WHEREAS, the Principal herewith is submitting a Proposal to the Obligee to perform the
_____________________ Work in connection with the construction of ____________________________
pursuant to plans, specifications and other documents constituting the Contract Documents which are
incorporated into said Proposal by reference (the "Contract Documents"), as prepared by the Department of
Public Works, City Hall, 815 Washington Streets, Reading, PA 19601-3690.

WHEREAS, it is a condition of the receipt and consideration by the Obligee of said Proposal that it shall be
accompanied by proposal guaranty to be held by the Obligee on terms hereinafter set forth.

NOW, THEREFORE, the condition of this Bond shall be such that, if the Principal, within ten (10) days after
mailing of contract document by the City to Principal, shall furnish to the Obligee a Performance Bond,
Payment Bond and a Wage Rate Compliance Bond, and upon award of a contract to him by the Obligee, shall
execute and deliver the Agreement and furnish to the Obligee proper evidence of effectiveness of insurance
coverage, respectively within the time, in the forms and in the amounts, as appropriate, required by the
Contract Documents, then this Bond shall be void, otherwise, this Bond shall remain in full force and effect.
The Principal and the Surety agree to pay to the Obligee the difference between the amount of said Proposal, as accepted by the Obligee, and any higher amount for which the required work shall be contracted for by the Obligee, together with any additional advertising costs, architect's fees, legal fees and any all other fees and expenses incurred by the Obligee by reason of the failure of the Principal to enter into such Agreement with the obligee, or to furnish such Contract Bonds, or to furnish evidence of effectiveness of such insurance coverage; provided, however, that (1) the obligation of the Surety shall not exceed the stated principal amount of this Bond; and (2) if the Obligee should not procure an executed contract with any other person for the performance of the work contemplated in said Proposal, as accepted by the Obligee, upon the same terms and conditions, other than price, as provided in the Contract Documents, within the period provided in the Contract Documents during which no proposals of bidders may be withdrawn, whether because of the lack of other proposals, or because of the inability or refusal of any other bidder to enter into an appropriate contract, or because the cost under any higher proposal would be greater than the Obligee shall determine, in its sole discretion, that it can afford, then the Principal and the Surety agree to pay to the Obligee the full amount of this Bond as liquidated damages.

IN WITNESS WHEREOF, the Principal and the Surety cause this Bond to be signed, sealed and delivered this ____________ day of _______________, 20_____

(INDIVIDUAL PRINCIPAL)

______________________________ (Seal)

(Signature of Individual)

Witness:

______________________________

Trading and Doing Business as:

______________________________
(PARTNERSHIP PRINCIPAL)

(Name of Partnership)

Witness:

____________________________
By:____________________________ (Seal)
(Partner)

Witness:

____________________________
By:____________________________ (Seal)
(Partner)

Witness:

____________________________
By:____________________________ (Seal)
(Partner)
(CORPORATION SURETY)

(Name of Corporation) ________________________________

By: ________________________________

(Attorney-In-Fact) ________________________________

Witness: ________________________________

(Corporate Seal)

** Attach an appropriate Power of Attorney, valid and in effect as of the date of this affidavit, evidencing the authority of the Attorney-in-Fact to act in behalf of the corporation.
This Non-Collusion Affidavit is material to any contract pursuant to this bid. According to the Pennsylvania Antibid-Rigging Act, 73 P.S. 1611 et seq., governmental agencies may require Non-Collusion Affidavits to be submitted together with bids.

This Non-Collusion affidavit must be executed by the member, officer, or employee of the bidder who is authorized to legally bind the bidder.

Bid rigging and other efforts to restrain competition, and the making of false sworn statements in connection with the submission of bids are unlawful and may be subject to criminal prosecution. The person who signs the Affidavit should examine it carefully before signing and assure himself or herself that each statement is true and accurate, making diligent inquiry, as necessary, of all other persons employed by or associated with the bidder with responsibilities for the preparation, approval, or submission of the bid.

In the case of a bid submitted by a joint venture, each party to the venture must be identified in the bid documents, and an Affidavit must be submitted separately on behalf of each party.

The term "complementary bid" as used in the Affidavit has the meaning commonly associated with that term in the bidding process, and includes the knowing submission of bids higher than the bid of another firm, any intentionally high or noncompetitive bid, and any form of bid submitted for the purpose of giving a false appearance of competition.

Failure to file an Affidavit in compliance with these instructions will result in disqualification of the bid.
NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of ______________________

County of ______________________

_______________________________, being first duly sworn, deposes and says that:

He/She is _____________________(Owner, Partner, Officer, Representative or Agent) of
________________________________________, the Bidder that has submitted the attached Bid or Bids;

He/She is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

Such Bid is genuine and is not a collusive or sham Bid;

Neither the said Bidder nor any of its officers; partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly, with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication of conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overheld, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the City of Reading or any person interested in the proposed Contract;

The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant; and,

Neither the said Bidder nor any of its officers, partners, owners, agents or parties in interest, have any interest, present or prospective, that can be reasonably construed to result in a conflict of interest between them and the City of Reading, which the Bidder will be required to perform.
I state that ___________________________ understands
(Name of Firm)
and acknowledges that the above representations are material and important, and will be relied on by the City of Reading in awarding the contract(s) for which this bid is submitted. I understand and my firm understands that any misstatement in this affidavit is and shall be treated as fraudulent concealment from the City of Reading of the true facts relating to the submission of bids for this contract.

_________________________
(Name and Company Position)

SWORN TO AND SUBSCRIBED
BEFORE ME THIS ________
DAY OF ________, 20___

_________________________          My Commission Expires
Notary Public
PROVIDER'S CERTIFICATION OF NON-INDEBTEDNESS
TO THE CITY OF READING

Provider hereby certifies and represents that Provider and Provider's parent company(ies) and subsidiary(ies) are not currently indebted to the City of Reading (the "City"), and will not at any time during the term of this Contract (including any extensions or renewals thereof) be indebted to the City, for or on account of any delinquent taxes, liens, judgments, fees or other debts for which no written agreement or payment plan satisfactory to the City has been established. In addition to any other rights or remedies available to the City at law or in equity, Provider acknowledges that any breach or failure to conform to this certification may, at the option of the City, result in the withholding of payments otherwise due to Provider and, if such breach or failure is not resolved to the City's satisfaction within a reasonable timeframe specified by the City in writing, may result in the offset of any such indebtedness against said payments and/or the termination of this Contract for default (in which case Provider shall be liable for all excess costs and other damages resulting from the termination).

____________________________________
NAME OF PROVIDER

By: _____________________________________
AUTHORIZED SIGNATORY

Title: _____________________________________
PRESIDENT OR VICE PRESIDENT

Attest: _____________________________________
RESOLUTION NO. 192-92

WHEREAS, reportedly, twenty-five cement manufacturing facilities in the United States are currently burning well over two billion pounds a year of hazardous waste as a source of fuel and additional profit in the cement manufacturing process; and

WHEREAS, approximately twenty cement manufacturing facilities are seeking permission to start this practice; and

WHEREAS, sufficient data and evidence as to the safety of cement products made from hazardous waste has not been proven; and

WHEREAS, it is in the best interest of the citizens of the City of Reading in regard to their health and quality of life that cement derived from hazardous waste be banned from any City projects.

NOW, THEREFORE, the Council of the City of Reading resolves that the City of Reading will not purchase cement from any facility that burns hazardous waste as fuel in its manufacturing process, nor allow the use of concrete made from this type of cement. This policy shall be reflected in city bid specifications.

PASSED COUNCIL  April 1, 1993

WARREN H. HAGGERTY, JR.
Mayor

ATTEST:

RUTH M. THOMPSON
City Clerk
STATEMENT REGARDING MANUFACTURE OF CEMENT

The following statement is to be signed by an authorized officer of the company.

The undersigned contractor hereby certifies in accordance with City of Reading Resolution #192-92, that any cement used in performance of this contract shall not have been manufactured by a process using hazardous materials, as defined by the Environmental Protection Agency, in the manufacture and makeup thereof.

CONTRACTOR

By:___________________________

Title:________________________

ATTEST:

________________________________________
STATEMENT OF BIDDER’S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder:__________________________________________________________

2. Permanent main office address:______________________________________________

3. When organized:__________________________________________________________

4. If a corporation, where incorporated:_________________________________________

5. How many years have you been engaged in the contracting business under your present firm or trade name:________________________________________________________

6. Contracts on hand: (Schedule these on an attached sheet, showing amount of each contract and the appropriate anticipated dates of completion.)

7. Have you ever failed to complete any work awarded to you? If so, where and why?
   _________________________________________________________________________

8. Have you ever defaulted on a contract?______________. If so, where and why?
   _________________________________________________________________________

9. List the more important projects recently completed by your company on an attached sheet, stating the approximate cost of each, and the month and year completed.

10. List your major equipment available for this contract.
    _________________________________________________________________________
        _________________________________________________________________________

11. Describe experience in construction work similar in importance to this project on an attached sheet.
12. Background and experience of the principal members of your organization, including the officers.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

13. Credit available: $_______________________________________________________

14. Give Bank reference:_____________________________________________________

15. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the City? ________________________________

16. (A) Have you ever been a party to or otherwise involved in any action or legal proceeding involving matters related to race, color, nationality or religion? _____________ If so, give full details.

_________________________________________________________________________

(B) Have you ever been accused of discrimination based upon race, color, nationality or religion in any action or legal proceeding including any proceeding related to any Federal Agency? _____________. If so, give full details ___________________________

17. All prospective bidders are required to present proof of an acceptable disposal method approved by the Pennsylvania Department of Environmental Protection. The proof may consist of a copy of a State Solid Waste Disposal Permit issued to the prospective bidder by the Pennsylvania Department of Environmental Protection, or a letter of approval from the Pennsylvania Department of Environmental Protection for the use of a proposed or existing disposal facility which has a permit or is under review for a permit. Same to be in accordance with Section 7 (a) application and permits, Pennsylvania Solid Waste Management - "Act 241."
18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the "City of Reading" in verification of the recitals comprising this Statement of Bidder's Qualifications.

19. Name, address, phone number, and contact person at surety company who will provide bonding for this contract:

________________________________________________________________________
________________________________________________________________________

20. Name, address, phone number, and contact person at insurance company who will provide insurance coverage for this contract:

________________________________________________________________________
________________________________________________________________________

21. The undersigned hereby authorizes any person, firm or corporation to furnish any information requested by the City of Reading in verification of the recitals comprising this Statement of Bidder’s Qualifications.

DATED at _________________________ this _____ day of ______________________, 20_____.

__________________________________
(NAME OF BIDDER)

BY: ______________________________
TITLE:____________________________
The Undersigned, being duly sworn under oath, certifies that the following statements are true and correct:

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:
NAME:
ADDRESS:
PRINCIPAL:

1. What is the bidder's form of business, i.e., corporation, partnership, sole proprietor, or joint venture:

2. How many years has your organization been in business?

3. How many years have your organization been in business under its present name?

4. Give all trade names and former names that your organization has or is using?

5. If your organization is a corporation, give the:
   A. Date of incorporation:
   B. State of incorporation:
   C. President's name:
   D. Vice President's name(s):
6. If an individual or a partnership, give the:
   A. Date or organization:
   B. Name and address of all partners (state whether general or limited partnership):

7. If other than a corporation or partnership, describe your organization and name all principals or owners:

8. List states and categories in which your organization is legally qualified to do business giving all registration or license numbers.

9. List states in which partnership or trade name is filed.

10. List the types of work normally performed by your own forces.

11. Have you ever failed to complete any work awarded to you? If so, note when, where, and why:

12. Within the last five years, has any owner, officer or partner of your organization ever been an owner, officer or partner of another organization when it failed to complete a construction contract? If so, attach a separate sheet of explanation.

13. On a separate sheet, list major construction projects your organization has in process, giving the name or project, owner, architect, contract amount, percent complete, and scheduled completion date.

14. On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion, and percentage of the cost of the work performed with your own forces.
15. On a separate sheet, list the construction experience of the key individuals of your organization.

16. Trade References:

17. Bank References:

18. Name of Bonding Company and name and address of agent:

19. Attach a financial statement, audited if available, including Contractor's latest balance sheet and income statement showing the following items:

   A. Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses):

   B. Net Fixed Assets:

   C. Other Assets:

   D. Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries, and accrued payroll taxes):

   E. Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares per values, earned surplus, and retained earnings):

Name of firm preparing financial statement and date thereof:
Is this financial statement for the identical organization named on page 00420-1?

If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

Will this organization act as guarantor of the contractor for construction?

Dated at ____________________________ this ___ of ______________________, 20__.

Name of Organization: ________________________________

BY: ________________________________

TITLE: ________________________________

Subscribed and sworn before me this ___ day of ____________, 20__.

Notary Public:

My Commission Expires:
EQUAL EMPLOYMENT OPPORTUNITY AND SECTION 3 QUESTIONNAIRE

(Please complete the following information and answer all questions; use an attached sheet as necessary.)

1.  
   (a) Contractor: How many persons from the City of Reading ________,  
       low income City residents ________, and minorities: ______Black, ______ Hispanic, ______ 
       White, ______ Asian/Pacific Islander, ______ Other, are on your present basic payroll?

   (b) Subcontractor: How many persons from the City of Reading ________,  
       low income City residents ________, and minority groups: ______Black, ______ Hispanic, 
       ______ White, ______ Asian/Pacific Islander, ______ Other, are on your present basic 
       payroll?

2.  How many City of Reading residents ________, low income City residents ________,  
    and minorities: ______Black, ______ Hispanic, ______ White, ______ Asian/ Pacific Islander, 
    ______ Other, are presently in training programs run by your company, your subcontractors, and 
    associations to which you or your subcontractors may belong or with unions with which you and your 
    subcontractors have collective bargaining agreements?

3.  Does your firm, subcontractors, associations to which you or they belong or unions 
    with which you or your subcontractors have collective bargaining agreements a definite plan for 
    creating career situations, training and employment for residents of the City of Reading, low income 
    citizens, and minorities? ______. If so, please include a copy of the plan with your formal bid 
    and specify the number of individuals (from the groups referred to previously), to be placed in 
    apprenticeship or other training situations. When is the program scheduled to 
    begin?__________ What portion of the program is already in operation?

4.  What plans does your firm have to utilize business concerns located in, or owned in 
    substantial part by persons residing in the City?
CERTIFICATION OF NON-SEGREGATED FACILITIES

The Bidder certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The Bidder certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The Bidder agrees that a breach of this certification will be a violation of the Equal Opportunity clause in any contract resulting from acceptance of this bid. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion or national origin, because of habit, local custom or otherwise. The Bidder agrees that (except where he has obtained identical certification from proposed subcontractors for specific time periods) he will obtain identical certification from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

Note: The penalty for making false statement in offers is prescribed in 18 U.S.C. 1001.

DATE: _________________,

BY: ______________________________  ______________________________
    (NAME OF BIDDER)    (TITLE)

OFFICIAL ADDRESS:
CONTRACTOR'S STATEMENT FOR PUBLIC DISCLOSURE *

1. a/ Name of Contractor:

b/ Address and Zip Code of Contractor:

2. If the Contractor is not an individual doing business under his own name, the Contractor has the status indicated below and is organized or operating under the laws of _________:

   _____ a corporation

   _____ a partnership known as:

   _____ a business association or a joint venture known as:

   _____ a Federal, State or Local government or instrumentality thereof

   _____ other (explain)

3. If the Contractor is not an individual or a government agency or instrumentality, give date of organization:_____________________________

4. Names, addresses, title of position (if any), and nature and extent of the interest of the officers and principal members, shareholders, investors other than a government agency or instrumentality, are set forth as follows:

   a/ If the Contractor is a corporation, the officers, directors, trustees, and each stockholder owning more than 10% of any share of stock.

   b/ If the Contractor is a partnership, each partner, whether a general or limited partner, and either the percent of interest or a description of the character and extent of interest.

   c/ If the Contractor is a business association or a joint venture, each participant and either the percent of interest or a description of the character and extent of interest.

   d/ If the Contractor is some other entity, the officers, the members of the governing body, and each person having an interest of more than 10%.

* If space on this form is inadequate for any requested information, this should be furnished on an attached page which is referred to under the appropriate numbered item on the form.
5. Name, address and nature and extent of interest of each person or entity (not named in response to Item 4) who has a beneficial interest in any of the shareholders or investors named in response to Item 5 which gives such person or entity more than a computed 10% interest in the Contractor (for example, more than 20% of the stock in a corporation which holds 50% of the stock of the Contractor, or more than 50% of the stock in a corporation which holds 20% of the stock of the Contractor).

6. Names (if not given above) of officers and directors or trustees of any corporation or firm listed under Item 4 or Item 5 above:

7. Is the Contractor a subsidiary of or affiliated with any other corporation or any other firm or firms? ____YES ____NO. If yes, list each such corporation or firm by name and address, specify its relationship to the Contractor, and identify the officers and directors or trustees common to the Contractor and such other corporation or firm:

8. Other federal grant projects under Title I of the Housing and Community Development Act of 1974 (CP.L.93-383), as amended, in which the Contractor or any of the principals of the Contractor is or has been the contractor, or a stock-holder, officer, director or trustee, or partner of such a contractor:

9. If the Contractor or a parent corporation, a subsidiary, an affiliate or a principal of the Contractor is to participate in the work or services as a Subcontractor or consultant:

   a/ Name and address of such Subcontractor or consultant:

   b/ Has such Subcontractor within the last 10 years ever failed to qualify as a responsible bidder, refused to enter into a contract after an award has been made, or failed to complete a contract? ____YES ____NO. If yes, explain:
c/ Outstanding contract bids of such Subcontractor or consultant:

<table>
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<tr>
<th>Awarding Agency</th>
<th>Amount</th>
<th>Date Opened</th>
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10. Brief statement respecting equipment, experience, financial capacity, and other resources available to such Subcontractor or consultant for the performance of the work or services involved in the contract, specifying particularly the qualifications of the personnel, the nature of the equipment, and the general experience of the Subcontractor or consultant.

11. a/ Does any member of the governing body or employee of the Local Public Agency or any officer or employee of the Local Public Agency who exercises any functions or responsibilities in connection with the awarding and/or carrying out of the contract have any direct or indirect personal interest in the Contractor or in the Contractor's performance under the contract? ___YES ___NO. If yes, explain:

b/ Does any member of the governing body of the locality in which the Public Improvement Project is situated or any other public official of the locality, who exercises any functions or responsibilities in the review or approval of the awarding and/or carrying out of the contract have any direct or indirect personal interest in the Contractor or in the Contractor's performance under the contract? ___YES ___NO. If yes, explain:
CERTIFICATION

I (We) ______________________________________________________________ certify that this Contractor's Statement for Public Disclosure is true and correct to the best of my (our) knowledge and beliefs.

DATED: ______________       DATED: ______________

(SIGNATURE) ___________________________ (SIGNATURE) ___________________________

(TITLE) ___________________________ (TITLE) ___________________________

(ADDRESS & ZIP CODE) ___________________________ (ADDRESS & ZIP CODE) ___________________________

1 - If the Contractor is an individual, this Statement should be signed by such individual; if a partnership, by one of the partners; if a corporation or other entity, by one of its chief officers having knowledge of the facts required by this Statement.

2 - Penalty For False Certification: Section 1001, Title 18, of the U.S.C. provides a fine of not more than $10,000, or imprisonment of not more than five years, or both, for knowingly and willfully making or using any false writing or document, knowing the same to contain any false, fictitious or fraudulent statement or entry in a matter within the jurisdiction of any Department of the United States.
(ONLY AS NEEDED)

CERTIFICATE OF ACKNOWLEDGMENT OF RECEIPT OF ADDENDUM

THE CITY OF READING

ADDENDUM NO. _______________ TO BID FOR: _________________________________

OPENING DATE:__________________

____________________________

NOTICE

This addendum must be signed, attached to, and returned with your proposal to the City of Reading by the time and date indicated above. This sheet is now part of the Contract Documents.

I, HEREBY CERTIFY, THAT THE CHANGES COVERED BY THIS ADDENDUM HAVE BEEN TAKEN INTO ACCOUNT WITH THE TOTAL BID PRICE.

Firm Name (Type or Print)_______________________________________

Authorized Signature _____________________Title__________________

Name (Type or Print)_____________________Date___________________
CONTRACT DOCUMENTS
NOTE: This contract is not to be filled in until contract is awarded.

THIS AGREEMENT, made and concluded this ________________ day of ________________, in the year two thousand and ______, by and between the City of Reading, a municipal corporation of the Commonwealth of Pennsylvania, located in the County of Berks, said Commonwealth, party of the first part, and ____________________, Contractor, party of the second part, pursuant to law and to the provisions and requirements of the ordinance of the City of Reading, Pennsylvania.

WITNESSETH, that the parties to these presents, each in consideration of the agreements on the part of the other herein contained, have agreed, and hereby do agree, the party of the first part for itself, its successors and assign, and the party of the second part for itself, himself, or themselves, its successors, or his or their executors and administrators as follows:

CONTRACTOR'S GENERAL AGREEMENT. The Contractor covenant, promises and agrees to and with the party of the first part, for the consideration hereinafter mentioned and contained, and under the penalty expressed in a bond bearing date of ________________ and hereto attached, to furnish all the material, machinery, equipment, tools, labor and transportation, except as hereinafter otherwise provided, at his own cost, necessary or proper for the purpose of executing the work embraced in this contract in a good, substantial and workmanlike manner, and in strict accordance with the specifications pertaining to this contract a herein contained.

PARTS OF CONTRACT. The Location Map; Notice to Contractors; Bid Instructions; Documents to be Submitted with Bid; Contract Documents; Documents to be Submitted During the Course of the Contract; Wage Rate Determinations; Notice of Preconstruction Requirements and Pre-Construction Conference Questionnaire; Affirmative Action Requirements; General Provisions; Supplementary General Terms and Conditions; Technical Specifications; Supplementary Technical Specifications; and Correspondence and Supportive Documentation shall each form a part of the Contract.

THE CONTRACT SUM. The City shall pay the Contractor for the performance of the Contract, subject to additions and deductions provided therein, in current funds as follows: ________________ (state here the lump sum amount, unit prices, or both as desired in individual cases.)

Where the quantities originally contemplated are so changed that application of the agreed unit price to the quantity of work performed is shown to create a hardship to the Owner or the Contractor, there shall be an equitable adjustment of the Contract to prevent such hardship.

TIME & MANNER OF DOING WORK. The party of the second part agrees to commence the construction of the work to be done under this contract, immediately upon receiving written notice from the Director of Public Works, or other applicable Director, so to do and to complete the entire work as specified in the technical specifications, it being expressly agreed and understood that the time of beginning, rates of progress and time of completion of the work are essential under this contract. Time is to be considered to be the essence of this contract.

STIPULATED DAMAGES. The Contractor shall begin work within ten (10) days of receipt of written notice from the applicable Director, to do so. If the Contractor fails to complete and finish the work in conformity with the terms and provisions of this Contract within the time hereinbefore specified, he shall pay to the City the sum of Five Hundred Dollars ($500.00) for each and every day thereafter, including Sundays and holidays, that the finishing of the Contract is delayed, which sum shall be construed as stipulated and liquidated damages and not as a penalty and shall be deducted from the amount due by the terms of the Contract; provided, however, that in case of justifiable delay, the City shall extend the time for completion of said work as provided for in Article G.7, but no extension of time for any reason beyond the time fixed herein.
for the completion of the work shall be deemed a waiver by the City of the right to abrogate this Contract for abandonment for delay.

LIENS. Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the City a complete release of all liens arising out of this Contract, or receipts in full in lien thereof, and, if required in either case, an affidavit that so far as he has knowledge or information the release and receipts include all the labor and material for which a lien could be filed. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the City all monies that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

BASIS OF CONTRACT. This contract is founded on ____________________________________________

____________________________________________________________________________________

IN WITNESS WHEREOF, the said City of Reading has caused this Agreement to be executed by its Mayor, and its corporate seal to be hereunto affixed, duly attested by its City Clerk, and the party of the second part.

____________________________________________________________________________________

the day and year first above written.

CITY OF READING

By: __________________________
Mayor

ATTEST:

_______________________
City Clerk

Signed and Sealed in the Presence of

______________________________
CONTRACTOR

______________________________
PRESIDENT

______________________________
SECRETARY
PERFORMANCE BOND

Know All Men By These Presents that we, ____________________________

(CONTRACTOR)

hereinafter called the PRINCIPAL, and ____________________________

(SURETY)

hereinafter called the SURETY, a corporation organized and existing under the laws of

the _________________________________________ are held and firmly bound unto

__________________________________________ hereinafter called the OBLIGEE, as hereinafter

set forth, in the full and just sum of ____________________________ Dollars

($__________), lawful money of the United States of America, for the payment of which sum we bind

ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these

presents.

WITNESSETH THAT:

WHEREAS, the PRINCIPAL heretofore submitted to the OBLIGEE a certain PROPOSAL, dated

______________, 20____, to perform the WORK for the OBLIGEE, in connection with the

__________________________________________________ as set forth in CONTRACT DOCUMENTS.

WHEREAS, the OBLIGEE is a "contracting body" under provisions of Act No. 385 of the General

Assembly of the Commonwealth of Pennsylvania, approved by the Governor on December 20, 1967, known

and cited as the "Public Works Contractors Bond Law of 1967" (the "Act"); and

WHEREAS, the Act, in Section 3(a), requires that, before an award shall be made to the PRINCIPAL

by the OBLIGEE in accordance with the PROPOSAL, the PRINCIPAL shall furnish this BOND to the

OBLIGEE, with this BOND to become binding upon the award of the CONTRACT to the PRINCIPAL by the

OBLIGEE in accordance with the PROPOSAL; and

WHEREAS, it also is a condition of the CONTRACT DOCUMENTS that this BOND shall be furnished

by the PRINCIPAL to the OBLIGEE; and

WHEREAS, under the CONTRACTOR DOCUMENTS, it is provided inter alia, that if the PRINCIPAL

shall furnish this BOND to the OBLIGEE, and if the OBLIGEE shall make an award to the PRINCIPAL, in

accordance with the PROPOSAL, then the PRINCIPAL and OBLIGEE shall enter into a CONTRACT with

respect to performance of the WORK, the form of which CONTRACT is set forth in the CONTRACT

DOCUMENTS.

NOW, THEREFORE, the terms and conditions of this BOND are and shall be that if the PRINCIPAL

will truly and faithfully comply with and perform the WORK in accordance with the CONTRACT DOCUMENTS,
at the time and in the manner provided in the CONTRACT DOCUMENTS, and if the PRINCIPAL shall satisfy
all claims and demands incurred in or related to the performance of the WORK by the PRINCIPAL, and if the
PRINCIPAL shall indemnify completely and shall hold harmless the OBLIGEE and all of its officers, agents and
employees from any and all costs and damages which the OBLIGEE and all of its officers, agents and
employees may sustain or suffer by reason of the failure of the PRINCIPAL to do so, and if the PRINCIPAL
shall reimburse completely and shall pay to the OBLIGEE any and all costs and expenses which the OBLIGEE
and all of its officers, agents or employees may incur by reason of any such default or failure of the
PRINCIPAL, then this BOND shall be void; otherwise, this BOND shall remain in force and effect.
This BOND, is executed and delivered under and subject to the Act, to which reference hereby is made.

The PRINCIPAL and the SURETY agree that any alterations, changes and/or additions to the CONTRACT DOCUMENTS, and/or any alterations, changes and/or additions to the WORK to be performed in accordance with the CONTRACT DOCUMENTS, and/or any alterations, changes and/or additions to the CONTRACT, and/or any giving by the OBLIGEE of any extensions of time for the performance of the WORK in accordance with the CONTRACT DOCUMENTS, and/or any act of forebearance of either the PRINCIPAL or the OBLIGEE toward the other with respect to the CONTRACT DOCUMENTS, and/or the reduction of any percentage to be retained by the OBLIGEE as permitted by the CONTRACT DOCUMENTS, shall not release, in any manner whatsoever, the PRINCIPAL and the SURETY, or either of them, or their heirs, executors, administrators, successors and assigns, from liability and obligations under this BOND; and the SURETY, for value received, does waive notice of any such alterations, changes, additions, extensions of time, acts of forebearance and/or reduction of retained percentage.

IN WITNESS WHEREOF, the PRINCIPAL and the SURETY cause this BOND to be signed, sealed and delivered this_____________________ day of________________________,20____.

(INDIVIDUAL PRINCIPAL)

__________________________________ (Seal)
(Signature of Individual)

Witness:

_______________________________

Trading and Doing Business as:

_______________________________
(PARTNERSHIP PRINCIPAL)

______________________________________ (Seal)
(Name of Partnership)
Witness:
______________________________________ (Seal)
(Partner)
Witness:
______________________________________ (Seal)
(Partner)
Witness:
______________________________________ (Seal)
(Partner)

(CORPORATION PRINCIPAL)

________________________________________
(Name of Corporation)
By:____________________________________ (Vice) President
Attest:
________________________________________
(Assistant Secretary)
(Corporate Seal)

(OR, IF APPROPRIATE)

________________________________________
(Name of Corporation)
By:____________________________________
(Authorized Representative)
Signed ______________________________
____________________________________ (Title)
** Attach an appropriate Power of Attorney, valid and in effect as of the date of this affidavit, evidencing the authority of the Attorney-In-Fact to act in behalf of the corporation.
PAYMENT BOND

Know All Men by These Presents:

That We, __________________________ (CONTRACTOR) hereinafter called the PRINCIPAL, and __________________________ (SURETY) hereinafter called the SURETY, a corporation organized and existing under laws of the ________________ of _______________ are held and firmly bound unto __________________________, hereinafter called the OBLIGEE, as hereinafter set forth, in the full and just sum of __________________________ dollar (__________), lawful money of the United States of America, for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Witnesseth That:

WHEREAS, the PRINCIPAL heretofore submitted to the OBLIGEE a certain PROPOSAL, dated ____________, 20 __, to perform the WORK for the OBLIGEE, in connection with the __________________________ of __________________ as set forth in the CONTRACT, DOCUMENTS; and _______________ Public Works, City of Reading, Pennsylvania.

WHEREAS, the OBLIGEE is a "contracting body" under provisions of the Act of the General Assembly of the Commonwealth of Pennsylvania, approved by the Governor on December 20, 1967, known as and cited as the "Public Works Contractors" Bond Law of 1967", P L 869 (the Act"); and

WHEREAS, the Act, in section 3(a), requires that, before an award shall be made to the PRINCIPAL by the OBLIGEE in accordance with the PROPOSAL, the PRINCIPAL shall furnish this BOND to the OBLIGEE, with this BOND to become binding upon the award of a CONTRACT to the PRINCIPAL by the OBLIGEE in accordance with the PROPOSAL: and

WHEREAS, it also is a condition of the CONTRACT DOCUMENTS that this BOND shall be furnished by the PRINCIPAL to the OBLIGEE; and

WHEREAS, under the CONTRACT DOCUMENTS, it is provided, inter alia, that if the PRINCIPAL shall furnish this BOND to the OBLIGEE, and if the OBLIGEE shall make an award to the PRINCIPAL in accordance with the PROPOSAL then the PRINCIPAL and the OBLIGEE shall enter into a CONTRACT with respect to performance of the WORK, the form of which CONTRACT is set forth in the CONTRACT DOCUMENTS.

NOW, THEREFORE, the terms and conditions of this BOND are and shall be that if the PRINCIPAL and any SUBCONTRACTOR of the PRINCIPAL to whom any portion of the WORK shall be subcontracted, and if all assignees of the PRINCIPAL and of any such SUBCONTRACTOR, promptly shall pay or shall cause to be paid, in full all money which may be due any claimant supplying labor or materials in the prosecution and performance of the WORK in accordance with the CONTRACT DOCUMENTS, including any amendment, extension or addition to the CONTRACT DOCUMENTS, for material furnished or labor supplied or labor performed, then this BOND shall be void; otherwise, this BOND shall be and shall remain in force and effect.

This BOND, as provided by the Act, shall be solely for the protection of claimants supplying labor or materials to the PRINCIPAL or to any SUBCONTRACTOR of the PRINCIPAL in the prosecution of the WORK covered by the CONTRACT DOCUMENTS, including any amendment, extension or addition thereto. The term "claimant", where used herein and as required by the Act, shall mean any individual, firm, partnership, association or corporation. The phrase "labor or materials", when used herein and as required by the Act, shall include public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the site of the WORK covered by the CONTRACT. As required by the Act, the provisions of this BOND shall be applicable whether or not the material furnished or labor performed enters into and becomes a component part of the public building, public work or public improvement contemplated by the CONTRACT DOCUMENTS.
As provided and required by the Act, the PRINCIPAL and the SURETY agree that any claimant, who has performed labor or furnished material in the prosecution of the WORK in accordance with the CONTRACT DOCUMENTS, including any amendment, extension or addition to the CONTRACT DOCUMENTS, and who has not been paid therefore, in full, before the expiration of ninety (90) days after the last day on which such claimant performed the last of such labor or furnished the last of such materials for which payment is claimed, may institute an action upon this BOND, in the name of the claimant, in assumpsit, to recover any amount due the claimant for such labor or material, and may prosecute such action to final judgment and may have execution upon the judgment; provided, however, that:

(a) Any claimant who has a direct contractual relationship with any SUBCONTRACTOR of the PRINCIPAL, but has no contractual relationship, express or implied, with the PRINCIPAL, may institute an action upon this BOND only if such claimant first shall have given written notice, served in the manner provided in the Act, to the PRINCIPAL, within ninety (90) days from the date upon which such claimant performed in the last of the labor or furnished the last of the materials for which payment is claimed, stating, with substantial accuracy, the amount claimed and the name of the person for whom the WORK was performed or to whom the material was furnished; and

(b) No action upon this BOND shall be commenced after the expiration of one (1) year from the day upon which the last of the labor was performed or material was supplied, for the payment of which such action is instituted by the claimant; and

(c) Every action upon this BOND shall be instituted either in the appropriate court of the County where the WORK is to be performed or of such other County as Pennsylvania statutes shall provide, or in the United States District Court for the district in which the PROJECT, to which the CONTRACT relates, is situated, and not elsewhere.

This BOND is executed and delivered under and subject to the Act, to which reference hereby is made.

The PRINCIPAL and the SURETY agree that any alterations, changes and/or additions to the CONTRACT DOCUMENTS, and/or any alterations, changes and/or additions to the WORK to be performed in accordance with the CONTRACT DOCUMENTS, and/or any alterations, changes and/or additions to the CONTRACT, and/or any given by the OBLIGEE of any extensions of time for the performance of the WORK in accordance with the CONTRACT DOCUMENTS, and/or any act of forebearance of either the PRINCIPAL or the OBLIGEE toward the other with respect to the CONTRACT DOCUMENTS, and/or the reduction of any percentage to be retained by the OBLIGEE as permitted by the CONTRACT DOCUMENTS, shall not release, in any manner whatsoever, the PRINCIPAL and the SURETY, or either of them, or their heirs, executors, administrators, successors and assigns, from liability and obligations under this BOND; and the SURETY for value received, does waive notice of any such alterations, changes, additions, extensions of time, acts of forebearance and/or reduction of retained percentage.

If the PRINCIPAL is a foreign corporation (incorporated under the laws other than those of the Commonwealth of Pennsylvania) then further terms and conditions of this BOND are and shall be that the PRINCIPAL or the SURETY shall not be discharged from liability on this BOND, nor this BOND surrendered until such PRINCIPAL files with the OBLIGEE a certificate from the Pennsylvania Department of Revenue evidencing the payment in full of all bonus taxes, penalties and interest, and a certificate from the Bureau of Employment and Unemployment Compensation of the Pennsylvania Department of Labor and Industry, evidencing the payment of all unemployment compensation, contributions, penalties and interest due the Commonwealth from said PRINCIPAL or any foreign corporation,

SUBCONTRACTOR thereunder or for which liability has accrued but the time for payment has not arrived, all in accordance with provisions of the Act of June 10, 1947, P.L 493, of the Commonwealth of Pennsylvania.
In Witness Whereof, the PRINCIPAL and the SURETY cause this BOND to be signed, sealed and delivered this day ______ of ____________, 20 __.

(INDIVIDUAL PRINCIPAL)

__________________________________ (Seal)
(Signature of Individual)
Witness:
__________________________________
Trading and Doing Business as:
__________________________________
(PARTNERSHIP PRINCIPAL)

__________________________________ (Seal)
(Name of Partnership)
Witness:
__________________________________
By:________________________________ (Seal)
(Partner)
Witness:
__________________________________
By:________________________________ (Seal)
(Partner)
Witness:
__________________________________
By:________________________________ (Seal)
(Partner)
(CORPORATION PRINCIPAL)

(Name of Corporation) __________________________________
By: ____________________________________________

(Vice) President
Attest:

________________________________________
(Assistant Secretary)

(Corporate Seal)

(OR, IF APPROPRIATE)

(Name of Corporation) __________________________________
By: ____________________________________________

(Authorized Representative)

Signed ______________________________
____________________________________
(Title)

(CORPORATION SURETY)

(Name of Corporation) __________________________________
By: ____________________________________________

(Attorney-In-Fact)

Witness:

________________________________________
(Corporate Seal)

** Attach an appropriate Power of Attorney, valid and in effect as of the date of this affidavit, evidencing the authority of the Attorney-In-Fact to act in behalf of the corporation.
KNOW ALL MEN BY THESE PRESENTS, that ____________________________________________,
(Contractor)
____________________________________________________________________, (hereinafter referred
(Full Address)
to as EMPLOYER), _______________________________, Insurance Company, a corporation organized
(Surety Company)
and existing under the laws of the State of ____________________ (hereinafter referred to as SURETY),
are hereby severally held and firmly bound in the sum of _________________ Dollars, being 50% of the
estimated or bidded price of the contract, lawful money of the United States of America, unto the City of
Reading, City Hall, 815 Washington Street, Reading, PA, 19601-3690, (hereinafter referred to as CITY), as its
interests may appear.

NOW THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that if Employer and any
subcontractors shall promptly pay wages due their employees for work performed under an agreement dated
________________, 20____ (including amendments thereto), between Employer and City based on the
minimum prevailing wages specified in said Agreement as published by the United States Department of Labor
and as reflected in a Contract between Employer and City, dated __________, 20__, then the above obligation
shall be void, otherwise it shall remain in full force and effect.

The Surety's obligation under this Bond shall cover payments due as aforesaid for work performed by
employees during the period commencing _____________________, 20____, and ending with the completion
of the project in accordance with a certificate of Completion issuable by the City.
We, the said Employer and Surety, and each of us do bind and oblige ourselves, to the extent of our respective liabilities hereunder, as well as our heirs, executors, administrators, successors and assigns, and every one of them, firmly by these presents.

SIGNED, SEALED, AND DATED this _____________ day of __________________, 20____.

(INDIVIDUAL PRINCIPAL)

__________________________________ (Seal)
(Signature of Individual)

Witness:

___________________________________

Trading and Doing Business as:

___________________________________

(PARTNERSHIP PRINCIPAL)

__________________________________ (Seal)
(Name of Partnership)

Witness:

___________________________________ By:________________________________ (Seal)
(Partner)

Witness:

___________________________________ By:________________________________ (Seal)
(Partner)

Witness:

___________________________________ By:________________________________ (Seal)
(Partner)
** Attach an appropriate Power of Attorney, valid and in effect as of the date of this affidavit, evidencing the authority of the Attorney-In-Fact to act in behalf of the corporation.
MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _________________________________________
_____________________________________________ hereinafter called the PRINCIPAL, and

(CONTRACTOR)

_____________________________ hereinafter called the SURETY, a corporation organized and existing

(SURETY)

under laws of the ______________________ of ______________________________, are held and firmly
bound unto ________________________, hereinafter called the OBLIGEE, as hereinafter set (OWNER)
forth, in the full and just sum of_________________________________ Dollars ($_________________),
lawful money of the United States of America, for the payment of which we bind ourselves, our heirs,
executors, administrators, successors and assigns, jointly and severally, firmly by these presents,

WITNESSETH THAT:

Whereas, the PRINCIPAL heretofore submitted to the OBLIGEE a certain PROPOSAL, dated _______,
20___ to perform the WORK for the OBLIGEE, in connection with the construction of_______________
___________________________________________________________________ as  set forth in the

CONTRACT

DOCUMENTS as prepared by the CITY OF READING.

Now, therefore, the condition of this BOND shall be such that: If the PRINCIPAL shall remedy, without cost to
the OBLIGEE, all defects which may develop during the period of one (1) year from the date of completion by
the PRINCIPAL and final acceptance of the OBLIGEE of the WORK performed in accordance with the

CONTACT

DOCUMENTS, which defects, in the sole judgment of the OBLIGEE, shall be caused by or shall
result from defective or inferior materials or workmanship, and if the PRINCIPAL shall satisfy all claims and
demands arising from or related to such defects or growing out of such defects. and if the PRINCIPAL shall
indemnify completely and shall save harmless the OBLIGEE from any and all costs and damages which the
OBLIGEE may sustain or suffer by reason of the failure so to do; and if the PRINCIPAL shall reimburse
completely and shall pay to the OBLIGEE any and all costs and expenses which the OBLIGEE may incur by
reason of any such default or failure of the PRINCIPAL, then this BOND shall be void; otherwise, this BOND
shall be and shall remain in full force and effect.

The PRINCIPAL and the SURETY agree that any alterations, changes and/or additions to the CONTRACT
DOCUMENTS, and/or any alterations, changes and/or additions to the WORK to be performed in accordance
with the CONTRACT DOCUMENTS, and/or any alterations, changes and/or additions to the CONTRACT,
and/or any giving by the OBLIGEE of any extensions of time for the performance of the WORK in accordance
with the CONTRACT DOCUMENTS, and/or any act of forbearance of either the PRINCIPAL or the OBLIGEE
toward the other with respect to the CONTRACT DOCUMENTS, and/or the reduction of any percentage to be
retained by the OBLIGEE as permitted by the CONTRACT DOCUMENTS, shall not release, in any manner
whatsoever, the PRINCIPAL and the SURETY, or either of them, or their heirs, executors, administrators,
successors and assigns from liability and obligations under this BOND; and the SURETY for value received,
does waive notice of any such alterations, changes, additions, extensions of time, acts of forbearance and/or
reduction of retained percentage.

In Witness Whereof, the PRINCIPAL and the SURETY cause this BOND to be signed, sealed and delivered
this ___________day of __________________, 20____.
(INDIVIDUAL PRINCIPAL)

__________________________________ (Seal)

(Signature of Individual)

Witness:

_______________________________

Trading and Doing Business as:

___________________________________

(PARTNERSHIP PRINCIPAL)

___________________________________ (Seal)

(Name of Partnership)

Witness:

_______________________________

By:________________________________ (Seal)

(Partner)

Witness:

_______________________________

By:________________________________ (Seal)

(Partner)

Witness:

_______________________________

By:________________________________ (Seal)

(Partner)

Witness:

_______________________________

By:________________________________ (Seal)

(Partner)
**  Attach an appropriate Power of Attorney, valid and in effect as of the date of this affidavit, evidencing the authority of the Attorney-In-Fact to act in behalf of the corporation.
STATEMENT ACCEPTING PROVISIONS OF WORKERS’ COMPENSATION ACT

STATE OF __________________________

ss.

COUNTY OF _________________________

The undersigned contractor has accepted the provisions of the Workers' Compensation Act of Pennsylvania, with all supplements, and has insured liability thereunder in accordance with the terms thereof with the insurance company whose signature is attached hereto.

For Individual

______________________________(SEAL)

FOR CORPORATION

____________________________________

(Name of Corporation)

By:_________________________________

(Official Title)

Attest:____________________________

(Secretary or Asst. Secretary)

FOR PARTNERSHIP

____________________________________

(Name of Partnership)

By:______________________________(SEAL)

____________________________________(SEAL)

(Partners)

____________________________________(Name of Insurance Company)

By:_________________________________

(Attorney-In-Fact)
STIPULATION AGAINST LIENS

WHEREAS, ____________________________, hereinafter called the CONTRACTOR, has entered into a CONTRACT, dated _______________, 20___, with ____________________________, hereinafter called the CITY, to provide materials and perform labor necessary for the manufacture and furnishing of the: as set forth in the CONTRACT DOCUMENTS as prepared by the City of Reading.

NOW, THEREFORE, it is hereby stipulated and agreed by and between the said parties, as part of the said CONTRACT, and for the consideration therein set forth, that neither the undersigned CONTRACTOR, any SUBCONTRACTOR or material man, nor any other person furnishing labor or materials to the said CONTRACTOR under this CONTRACT shall file a lien, commonly called a mechanic's lien, for WORK done or materials furnished for the above manufacture.

This stipulation is made and shall be filed with the Berks County Prothonotary within ten (10) days after execution, in accordance with the requirements of Section 1402 of the Mechanics Lien Law of 1963 of the Commonwealth of Pennsylvania in such case provided.

IN WITNESS WHEREOF, the parties hereto have caused the signature of their proper officers to be affixed thereto on this _______________ day of ___________________ 20___.

(SEAL)

_________________________  BY:______________________

(CITY OF READING)

TITLE:_____________________

ATTEST:

BY:_______________________

TITLE:_____________________

(SEAL) ___________________________

(CONTRACTOR)

ATTEST:

BY:________________________

TITLE:______________________
INDEMNITY AGREEMENT & HOLD HARMLESS

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, the undersigned has entered into a contract with the CITY OF READING, dated ________________, 20__, providing for the _____________________________________________City of Reading, Pennsylvania.

NOW, THEREFORE, in consideration of the award of said contract to the undersigned, ________________, as well as in further consideration of the sum of ONE DOLLAR ($1.00) in hand paid to the said ________________ by the City of Reading, receipt whereof is hereby acknowledged, the said ________________ agrees to indemnify and save harmless the CITY OF READING, its officers, agents, servants, and employees against any and all loss, damage, costs and expenses which the said CITY may hereafter suffer, incur, be put to or pay by reason of any bodily injury (including death) or damage to property arising out of any act or omission in performance of the work undertaken under the aforesaid contract.

EXECUTED this _____ day of ________________, 20__.

By: ______________________________

Title: ___________________________

ATTEST:

__________________________________________

__________________________________________

(Title)
NOTICE TO PROCEED

TO:

Project_____________________________________
Contract No._________________________________
Amount of Contract__________________________

You are hereby notified to commence work on the referenced contract on or before _________________, 20___, and shall fully complete all of the work of said contract within______ consecutive calendar days thereafter. Your completion date is therefore _________________, 20____.

The contract provides for an assessment of the sum of $______________ as liquidated damages for each consecutive calendar day after the above established contract completion date that the work remains incomplete.

Dated this ___________day of ______________, 20___.

By_________________________________
Title________________________________

ACCEPTANCE OF NOTICE

Receipt of foregoing Notice to Proceed is hereby acknowledged

By ____________________________________
this ___________day of ________________ 20____.

By ____________________________________
Title ____________________________________
DAVIS-BACON LABOR & INDUSTRY WAGE RATES
TO: ALL CONTRACTORS

FROM: City of Reading Community Development

RE: Davis Bacon Prevailing Wage Act

Because of the use of federal funding, below is a checklist of items that contractors are required to properly complete and submit in order for the CD Office to process the first payment request:

- IRS Number
- Certified Payrolls
- Certificate Appointing Officer or Employee To Supervise Payment of Employees
- Contractor or Subcontractor Certification
- Attachments I and II
- Affirmative Action Plan (for contracts over $100,000)
- Section 3 Certification (for contracts over $100,000)
- Section 3 Statement
- Equal Employment / Section III Questionnaire
- Construction Start Date
- Fringe Benefit Plan
- Workforce Roster
- Apprenticeship Agreements (If Apprentice’s work on project)

It is the GENERAL CONTRACTOR’S responsibility to explain, obtain and review the above documentation from their subcontractors. The Community Development Office will accept only documentation forwarded by the General Contractor.
NOTICE

THE DAVIS-BACON ACT PREVAILING WAGE RATES SPECIFIED ON THE FOLLOWING PAGES ARE FOR ESTIMATING PURPOSES ONLY AND ARE SUBJECT TO CHANGE.

THE RATES TO BE USED AND ENFORCED FOR THE PROJECT WILL BE MADE AVAILABLE BY THE CITY PURCHASING COORDINATOR VIA CONTRACT ADDENDUM TEN DAYS PRIOR TO THE BID OPENING DATE.
General Decision Number: PA170100 06/16/2017  PA100

Superseded General Decision Number: PA20160100

State: Pennsylvania

Construction Type: Building

County: Berks County in Pennsylvania.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number     Publication Date
0              01/06/2017
1              01/27/2017
2              03/17/2017
3              04/21/2017
4              06/02/2017
5              06/16/2017

ASBE0023-008 06/27/2016

Rates          Fringes

ASBESTOS WORKER/HEAT & FROST INSULATOR - MECHANICAL (Duct, Pipe & Mechanical System Insulation)......................$ 32.00            25.46
----------------------------------------------------------------
BOIL0013-008 01/01/2017

Rates          Fringes

BOILERMAKER......................$ 44.26            33.02
----------------------------------------------------------------
BRPA0001-017 05/01/2014

Rates          Fringes

TILE FINISHER....................$ 20.93            22.09
<table>
<thead>
<tr>
<th>Position</th>
<th>Rate</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TILE SETTER</td>
<td>$38.36</td>
<td>22.72</td>
</tr>
<tr>
<td>BRICKLAYER (Including Pointing, Caulking, and Cleaning)</td>
<td>$33.53</td>
<td>13.56</td>
</tr>
<tr>
<td>CARPENTER (Including Drywall Hanging, Metal Stud Installation, Floor Laying-Vinyl, and Form Work)</td>
<td>$28.16</td>
<td>15.02</td>
</tr>
<tr>
<td>ELECTRICIAN (Includes Alarm Installation, Installation of Sound and Communication Systems, and Low Voltage Wiring; Excludes HVAC/Temperature Controls Installation)</td>
<td>$34.77</td>
<td>20.19</td>
</tr>
<tr>
<td>POWER EQUIPMENT OPERATOR Mechanic</td>
<td>$32.59</td>
<td>18.10</td>
</tr>
</tbody>
</table>

**FOOTNOTES:**

A. VACATION CREDIT: Employer contributes 8% basic hourly rate for 5 years or more of service as vacation pay credit, and 6% for 6 months to 5 years of service.  

B. Eight Paid Holidays (provided employee has worked 5 consecutive days before and the working day after the holiday): New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day and the Friday after Thanksgiving Day, and Christmas Day.
<table>
<thead>
<tr>
<th>ENGI0542-033 09/08/2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rates</strong></td>
</tr>
<tr>
<td><strong>POWER EQUIPMENT OPERATOR</strong></td>
</tr>
<tr>
<td>Crane, Gradall, Bulldozer, Bobcat/Skid Steer/ Skid Loader, Grader/Blade, Loader, Paver (Asphalt, Aggregate, and Concrete)</td>
</tr>
<tr>
<td>Hoist (Single Drum), Forklift (under 20 ft., excludes masonry work)</td>
</tr>
<tr>
<td>Hoist (With Two Towers), Forklift (20 ft and over, excludes masonry work)</td>
</tr>
<tr>
<td>Oiler</td>
</tr>
<tr>
<td>Pump</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IRON0401-005 07/01/2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rates</strong></td>
</tr>
<tr>
<td><strong>IRONWORKER, REINFORCING</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IRON0420-011 07/01/2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rates</strong></td>
</tr>
<tr>
<td><strong>IRONWORKER, STRUCTURAL</strong></td>
</tr>
<tr>
<td>Projects over $25 million</td>
</tr>
<tr>
<td>Projects under $25 million</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAB00135-001 05/01/2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rates</strong></td>
</tr>
<tr>
<td><strong>LABORER (Mason Tender- Brick)</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAB00135-009 05/01/2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rates</strong></td>
</tr>
<tr>
<td><strong>LABORER</strong></td>
</tr>
<tr>
<td>Mason Tender- Cement/Concrete</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAB01174-011 05/01/2017</th>
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</thead>
<tbody>
<tr>
<td><strong>Rates</strong></td>
</tr>
<tr>
<td><strong>LABORER</strong></td>
</tr>
<tr>
<td>Concrete Saw (Hand Held/Walk Behind); Concrete Worker; Fire Watch</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Forklift (Masonry Work Only)</td>
</tr>
<tr>
<td>PAINT0021-036 05/01/2016</td>
</tr>
<tr>
<td>Painter: Spray Only</td>
</tr>
<tr>
<td>* PLUM0420-011 05/01/2017</td>
</tr>
<tr>
<td>Pipe Fitter (Including HVAC Pipe Installation)</td>
</tr>
<tr>
<td>ROOF0030-009 05/01/2016</td>
</tr>
<tr>
<td>Roofer (Including Waterproofing)</td>
</tr>
<tr>
<td>SFPA0669-004 04/01/2017</td>
</tr>
<tr>
<td>Sprinkler Fitter (Fire Sprinklers)</td>
</tr>
<tr>
<td>SHEE0019-015 12/01/2016</td>
</tr>
<tr>
<td>Sheet Metal Worker (Includes HVAC Duct Installation)</td>
</tr>
<tr>
<td>FOOTNOTE: Paid Holiday: Election Day</td>
</tr>
<tr>
<td>* UAVG-PA-0017 01/01/2016</td>
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<tr>
<td>Electrician (HVAC/Temperature Controls Installation Only)</td>
</tr>
<tr>
<td>SUPA2011-034 08/20/2014</td>
</tr>
<tr>
<td>Cement Mason/Concrete Finisher</td>
</tr>
<tr>
<td>Glazier</td>
</tr>
<tr>
<td>Ironworker, Ornamental</td>
</tr>
</tbody>
</table>
LABORER: Asbestos Abatement (Removal from Floors, Walls, & Ceilings) ...................... $ 21.43  11.13
LABORER: Common or General......$ 19.43             8.63
OPERATOR: Backhoe/Excavator/Trackhoe.......$ 34.34            15.47
OPERATOR: Drill.....................$ 28.55            15.78
PAINTER (Brush and Roller Only)....................$ 27.07            15.79
PLUMBER..........................$ 40.90            18.13
TRUCK DRIVER: Dump Truck........$ 22.64             0.00
----------------------------------------------------------------
WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
================================================================
Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

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 clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular
rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.
A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:
4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION
INTRODUCTION

THE DAVIS-BACON AND RELATED ACTS (DBRA)

The Davis-Bacon Act as amended, requires that each contract over $2,000 to which the United States or the
District of Columbia is a party for the construction, alteration, or repair of public buildings or public works shall
contain a clause setting forth the minimum wages to be paid to various classes of laborers and mechanics
employed under the contract. Under the provisions of the Act, contractors or their subcontractors are to pay
workers employed directly upon the site of the work no less than the locally prevailing wages and fringe
benefits paid on projects of a similar character. The Davis-Bacon Act directs the Secretary of Labor to
determine such local prevailing wage rates.

In addition to the Davis-Bacon Act itself, Congress has added prevailing wage provisions to approximately 60
statutes which assist construction projects through grants, loans, loan guarantees, and insurance. These
"related Acts" involve construction in such areas as transportation, housing, air and water pollution reduction,
and health. If a construction project is funded or assisted under more than one Federal statute, the Davis-
Bacon prevailing wage provisions may apply to the project if any of the applicable statutes require payment of
Davis-Bacon wage rates.

The geographic scope of the Davis-Bacon Act is limited, by its terms, to the 50 States and the District of
Columbia. By the same token, the scope of each of the related Acts is determined by the terms of the
particular statute under which the Federal assistance is provided. For example, Davis-Bacon prevailing wage
provisions would apply to a construction contract located in Guam or the Virgin Islands funded under the
Housing and Community Development Act of 1974, even though the Davis-Bacon Act itself does not apply to
Federal construction contracts to be performed outside the 50 States and the District of Columbia.
A "wage determination" is the listing of wage rates and fringe benefit rates for each classification of laborers and mechanics which the Administrator of the Wage and Hour Division of the U.S. Department of Labor has determined to be prevailing in a given area for a particular type of construction (e.g., building, heavy, highway, or residential).

The Wage and Hour Division issues two types of wage determinations: general determinations, also known as area determinations, and project determinations. The term "wage determination" is defined as including not only the original decision but any subsequent decisions modifying, superseding, correcting, or otherwise changing the rates and scope of the original decision.

General wage determinations reflects those rates determined by the Division to be prevailing in a specific geographic area for the type of construction described. General wage decisions and modifications and supersedeas decisions thereto, contain no expiration dates and are effective from their date of notice in the Federal Register, or on the date written notice is received by the agency, whichever is earlier. If a contracting agency has a proposed construction project to which a general determination would be applicable, the published determination may be used by the contracting agency without consulting the Department of Labor, provided that questions concerning its use shall be referred to the Department of Labor.

Project wage determinations are issued at the specific request of a contracting agency; each is applicable to the named project only; and expires 180 calendar days from the date of issuance unless an extension of the expiration date is requested by the agency and approved by the Wage and Hour Division. If such a determination is not used in the period of its effectiveness, it is void. Project determinations are issued in response to contracting agencies submitting to the Wage and Hour Division a Standard Form 308 requesting a wage determination.

Modifications of general and project wage determinations are issued to update data in the original determination. Where a contract will be entered pursuant to competitive bidding procedures, a modification, notice of which is published in the Federal Register less than 10 days before the opening of bids shall be effective unless the agency finds that there is not a reasonable time still available before bid opening to notify bidders of the modification and a report of the finding is inserted in the contract file. (For projects assisted under the National Housing Act, and for projects to receive housing assistance payments under section 8 of the U.S. Housing Act of 1937, dates other than bid opening apply. See Regulations, 29 CFR Part 1, section 1.6). If the contracting officer chooses to disregard a modification, a report of this action shall be inserted in the contract file and made available to the Wage and Hour Division upon request.

If a contract has not been awarded within 90 days after bid opening, modifications prior to award to a general wage determination in the contract shall be effective with respect to that contract unless the agency requests and obtains an extension of the 90-day period from the Wage and Hour Division.

Supersedeas Wage Determinations are issued annually to replace general decisions issued in the previous edition of the publication entitled General Wage Determinations Issued Under the Davis-Bacon and Related Acts. Supersedeas project wage determinations may also be issued. Supersedeas decisions affecting determinations are effective under the same circumstances as "modifications." Whereas a modification to a wage determination may make changes in only selected provisions of the wage determination, a supersedeas determination replaces the entire existing wage decision.

Notice is published in the Federal Register each week (usually on Friday) to advise the public of the publication of general wage determinations, modifications, supersedeas actions, withdrawal actions, and corrections affecting such wage determinations.

Extensions of Wage Determinations
When a general wage determination has not been awarded within 90 days after bid opening, the head of the contracting/assisting agency may request an extension of the 90 day period from the Wage and Hour Administrator. When, due to unavoidable circumstances, a project wage determination expires before award but after bid opening, the head of the contracting/assisting agency may request an extension of the expiration date of the project wage determination in the bid specifications instead of issuing a new wage determination. (For projects assisted under the National Housing Act, and for projects to receive housing assistance payment under section 8 of the U.S. Housing Act of 1937, dates other than bid opening apply. See Regulations 29 CFR, Part 1, section 1.6.)

Extension requests should be supported by a written finding including a brief statement of the factual support, that extension of the expiration date of the determination is necessary and proper in the public interest to prevent injustice or undue hardship or to avoid serious impairment in the conduct of Government business.

The Administrator will either grant or deny the request for an extension after consideration of all the circumstances, including an examination to determine if the previously issued rates remain prevailing. If a request for the extension of a project wage determination is denied, a new wage determination will be issued to replace an expired project wage determination.

Section B

How to Interpret General Wage Determinations

A. WAGE DETERMINATIONS ARE STRUCTURED ACCORDING TO THE FOLLOWING FORMAT:

Each wage determination begins with a cover sheet that defines its applicability. Included on this sheet are:

The decision number.

The number of the decision superseded, if applicable.

State(s) covered.

Type of construction (building, heavy, highway, and/or residential).

County(ies) or city(ies) covered.

Description of the construction to which the wage determination applies and/or construction excluded from its application.

Record of modifications, including the initial publication date, modification numbers and dates.

In the body of each wage determination is the listing of classifications (laborers and mechanics) and accompanying basic hourly wage rates and fringe benefit rates that have been determined to be prevailing for the specified type(s) of construction in the geographic area(s) covered by the wage determination. Classification listings may also include classification groupings, fringe benefit footnotes, descriptions of the geographic areas to which subclassifications and different wage rates apply, and/or certain classification definitions. (See below for how to know the source of a rate.)

In wage determination modifications, an asterisk (“*”) is used to indicate that the item marked is changed by that modification.

The wage determination appeals process is explained at the end of the wage determination. The explanation includes a description of the criteria for appeal and where to file the appeal.
The last page of each wage determination ends with "END OF DECISION" centered above the last page number for the determination. Users can refer to the page number at the bottom of that page to check back to be sure that they have all the preceding pages of the determination.

B. HOW TO FIND THE WAGE RATE FOR A PARTICULAR CLASSIFICATION AND UNDERSTAND THE BASIS FOR THE WAGE RATE:

Review the wage determination in light of the following information:

1. The body of each wage determination lists the classifications and wage rates that have been found prevailing for the cited type(s) of construction in the area covered by the wage determination.

The classifications are listed in alphabetical order of "identifiers" that indicate whether particular rates are union or non-union rates.

Many wage determinations contain only non-union wage rates, some contain only union-negotiated wage rates, and others contain both union and non-union wage rates that have been found prevailing in the area for the type of construction covered by the wage determination.

2. Above each classification (or group of classifications) listed, an alphanumeric "identifier" and date provide information about the source of the classification(s) and wage rate(s) listed for it. (SU means the rates listed under that identifier were derived from survey data and are not union rates, although the survey data on which they are based may include both union and non-union data.)

   a. The identifier is SUAR0037A. SU indicates rates that are not union rates; AR = Arkansas; 0037A is a sequential number and character used in producing the wage determination. Dates before 1993 that appear with such "SU" identifiers were generated in producing the wage determinations and are not meaningful to users. However, a 1993 or later date will indicate that the classification(s) and wage rate(s) under that identifier were issued in the general wage determination on that date and reflect the results of a survey.

   b. Any identifier beginning with characters other than SU is used where union classification(s) and wage rate(s) have been found prevailing.

   In each such identifier, the first four letters indicate the international union (see listing, below) for the local union that negotiated the wage rates listed under that identifier. Then, there is a four-digit number that indicates the local union number. For example, the identifier is ELEV0101A. ELEV = Elevator Constructors; 0101 = the local union number (district council number where applicable); and "A" = a character used internally in processing the wage determination. The date shown is the effective date of the most current negotiated rate entered into the automated system that generates general wage determinations.

   Special identifiers are necessary for two trades because the same local union number(s) is accompanied by different wage rates in different states. Bricklayers local union numbers are not unique nationwide, but are unique within each State. Similarly, Sprinkler Fitters Local Union No. 669 has negotiated different wage rates in each State within its territorial jurisdiction. Therefore, the identifiers for the Bricklayers unions are in the format "BR + state abbreviation," (referred below as BRXX), and the identifier "SF + state abbreviation" is used for Sprinkler Fitter Local No. 669's rates.

   It is common for many local unions to negotiate wage rates for more than one classification. Where this is done, all the classifications for which that union's wage rates are determined to be prevailing will appear under the identifier for that union.

   For example, the same union may negotiate wage and fringe benefits for painters and glaziers. In such a case, the wage rate for the glazier, as well as that for the painter will be found under a classifier beginning with "PAIN." Similarly, users may need to look under an identifier beginning with "CARP" to find not only rates for carpenters, but also those for millwrights, piledrivermen and (marine) divers.
3. Following are the identifier codes used to reference the various craft unions. Examples of classifications for which their local unions commonly negotiate wage and fringe benefit rates are shown in parentheses.

ASBE = International Association of Heat and Frost Insulators and Asbestos Workers

BOIL = International Brotherhood of Boiler Makers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers

BRXX = International Union of Bricklayers, and Allied Craftsmen
(bricklayers, cement masons, stone masons, tile, marble and terrazzo workers)

CARP = United Brotherhood of Carpenters and Joiners of America
(carpenter, millwright, piledrivermen, soft floor layers, divers)

ELEC = International Brotherhood of Electrical Workers
(electricians, communication systems installers, and other low voltage specialty workers)

ELEV = International Union of Elevator Constructors

ENGI = International Union of Operating Engineers
(operators of various types of power equipment)

IRON = International Association of Bridge, Structural and Ornamental Iron Workers

LABO = Laborers' International Union of North America

PAIN = International Brotherhood of Painters and Allied Trades
(painters, drywall finishers, glaziers, soft floor layers)

PLAS = Operative Plasterers' and Cement Masons' International Association of the United States and Canada
(cement masons, plasterers)

PLUM = United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada
(plumbers, pipefitters, steamfitters, sprinkler fitters)

ROOF = United Union of Roofers, Waterproofers and Allied Workers

SHEE = Sheet Metal Workers International Association

SU... = As discussed above, the "SU..." identifier is for rates derived from survey data where the union rate(s) were not determined to be prevailing for the classification(s) listed. (The data reported for such a classification and used in computing the prevailing rate may have included both union and non-union wage data.) Note that various classifications, for which non-union rates have been determined to be prevailing, may be listed in alphabetical order under this identifier, which the computer places into the wage determination in alphabetical order, as listed here.

TEAM = International Brotherhood of Teamsters
Questions and Answers on the use of Davis-Bacon Wage Determinations

Question. How do I obtain a wage determination for a construction project to be performed at a location not covered by a published determination?

Answer. If no general wage determination is listed for a given county and type of construction, the following procedure to obtain a project wage determination should be followed.

The Federal agency funding or financially assisting the construction project requests a wage determination under the Davis-Bacon Act or any of the related prevailing wage statutes by submitting a Standard Form (SF) 308 to the following address:

U.S. Department of Labor
Employment Standards Administration
Wage and Hour Division
Branch of Construction Wage Determinations
200 Constitution Avenue, N.W., Room S-3014
Washington, D.C. 20210

In completing a SF-308, the agency must furnish:

(1) A sufficiently detailed description of the project to indicate the type(s) of construction involved. Separate attachments, if necessary for identification of the type of project, must be furnished.

(2) The county (or other civil subdivision) and State in which the proposed project is located. The time required for processing requests for wage determinations varies according to the facts and circumstances in each case. An agency should anticipate that such processing will take at least 30 days.

Question. The wage determination applicable to my project does not contain a class of workers which is needed to complete construction. Can other worker classification(s) and wage rate(s) be approved for use on the project?

Answer. Prior to bid opening, if the only classification that will perform work on a contract is not listed on a general wage determination for the type of construction in the area, the contracting/assisting agency may submit a SF-308 request for a project wage determination for application to that project. In order to assure special treatment of a request where this circumstance exists, a note explaining the special circumstances should be made in the project description block of the SF-308. (A similar note may be made on a SF-308 request for a project wage determination, where a general wage determination is not applicable, and all of the work on the project will be performed by a particular classification, as a means to assure that a wage rate for that classification will be issued for the project).

Example: An upcoming contract calls for repainting all the residences at a military base, and there is no painter classification in the general wage schedule issued for application to residential construction in the county where the project is located. A SF-308 may be submitted by the agency for application to that contract, and a project wage determination will be issued with a painter classification and wage rate for use prior to bid opening (or the other applicable date where certain assistance programs of the Department of Housing and Urban Development (HUD) are the basis for coverage under the Davis-Bacon and related Acts). If there is no general wage determination issued for that area and type of construction, the same procedure should be followed.
After contract award, if the contract wage determination does not contain a class of workers that is needed to complete the construction, a contractor shall submit to the contracting officer a request for the addition of the needed classification(s) of laborers or mechanics not listed in the wage determination, together with proposed wage rates and fringe benefits conformable to the wage determination.

The contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract be classified in conformance with the wage determination. An additional classification action, even if undisputed, is not valid unless the Department of Labor has approved it. If a dispute exists, the matter must be referred to the Wage and Hour Division for resolution, together with the views of all interested parties and the recommendation of the contracting officer. Approval of the additional classification and the proposed wage rate and fringe benefits requires that the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by any classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) There is evidence of agreement on the classification and proposed wage rate among the parties involved, or the views of those involved -- the contractor(s), employees (if known) or their representative, and the contracting officer/agency -- are forwarded for consideration to the Wage and Hour Division; and

(5) The request does not involve wage rates for apprentices or trainees.

All conformance notices should be responded to in writing within 30 days of receipt. These responses either approve or deny the request or inform the submitting agency that additional time will be required. Failure to receive a response does not constitute approval. If a response is not received, the Wage and Hour Division should be contacted directly. Every conformance request is analyzed to verify that the criteria for approval are met.

Any interested person requesting reconsideration of a conformance should present their request in writing accompanied by supporting data or other pertinent information to the Wage and Hour Division. The Wage and Hour Division should respond within 30 days or notify the requestor within this time frame that additional time is needed.

If reconsideration of a conformance action has been sought and denied, an appeal for review may be filed with the Administrative Review Board. (See 29 CFR 1.8 and 1.9, and 29 CFR Part 7).

Question. How do workers on a construction site know that a project is covered by the Davis-Bacon Act? How do they know the prevailing wage to which they are entitled?

Answer. The wage determination (including any additional classifications and wage rates conformed) and a Davis-Bacon poster (WH-1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen. The WH-1321 poster may be obtained at no charge from offices of the Wage and Hour Division. In the absence of such posted information, any person who wants to determine if the project is covered should contact the federal agency funding or assisting the project or the Wage and Hour Division. Multi-year construction contracts that contain option provisions by which a contracting agency may unilaterally extend the term of the contract require inclusion of a current wage determination at the time the option is exercised. (In contrast, in situations where a contractor is given additional time to complete original contract commitments, the wage determination in that contract applies).
Question: Once construction has begun, are the workers' wage rates affected when the wage determination for the area in which the project is located is changed?

Answer. As a general rule, the wage determination incorporated into a bid solicitation and related contract award establishes the minimum wage rates and fringe benefits which must be paid for the entire term of the contract.

Where the proper wage determination is incorporated into a contract prior to award of the contract, wage determination modifications issued after bid opening are not applicable to the contract -- except in the case of a general wage determination in a contract that has not been awarded within 90 days after the bid opening and an extension of the 90-day limit has not been granted. (Specific requirements involving dates other than bid opening apply for projects assisted under the National Housing Act and for projects that receive housing assistance payments under section 8 of the U.S. Housing Act of 1937).

Upon his or her own initiative or at the request of an agency, the Administrator may correct any wage determination if he or she finds that the determination contains an inadvertent clerical error. For example, a wage determination contains a wage rate where there is a transposition of numbers, such as a fringe benefit of $2.53 appears in the wage determination as $2.35.

Also, the Administrator may issue a wage determination after contract award or after the beginning of construction if:

(a) the contracting/assisting Federal agency has failed to incorporate the applicable wage determination in a contract required to contain prevailing wage rates determined in accordance with the Davis-Bacon Act, or has used a wage determination which by its terms or the provisions of Regulations, 29 CFR Part 1, clearly does not apply to the contract, or

(b) the wrong wage determination has been incorporated in the contract because of an inaccurate description of the project or its location in the agency's SF-308 request.

Under either of these two circumstances, the agency shall either terminate and resolicit the contract with the valid wage determination, or incorporate the valid wage determination retroactive to the beginning of construction through supplemental agreement or through change order, provided that the contractor is compensated for any increases in wages resulting from such change. The method of incorporation of the valid wage determination, and adjustment in contract price, where appropriate, should be in accordance with applicable procurement law.

Question. Is it possible for more than one wage schedule to apply to specifications for a particular contract?

Answer. Construction projects are generally classified as either Building, Heavy, Highway or Residential for purposes of issuing wage determinations. Wage schedules for one or more of these construction categories may have application to construction items contained in a proposed construction project. Guidelines for the selection of proper wage schedules are set forth in All Agency Memoranda Nos. 130 (March 17, 1978) and 131 (July 14, 1978). Any questions regarding the application of these guidelines to a particular project, or any disputes regarding the application of the wage schedules issued for the various construction categories are to be referred to the Wage and Hour Division, together with relevant information, including a complete description of the project and area practice.

Question. As the contracting officer/Federal agency representative, what is my obligation when the wage determination(s) applicable to a construction project contains multiple wage schedules (for different counties and/or types of construction)?

Answer. It is the responsibility of the contracting officer/Federal agency representative to advise contractors which schedule of prevailing wages shall be applied to the various construction items in the bid specifications.
Because of the complexities in the application of multiple schedules, the contracting officer should consult with the Wage and Hour Division to resolve any questions.

Question. Can apprentices, trainees, and/or helpers work on a project covered by the Davis-Bacon or related Acts (DBRA), and what wage rates must they be paid?

Answer. Individuals who meet the following definition may be employed as apprentices on DBRA projects:

(a) A person employed and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or

(b) A person in the first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been properly certified to be eligible for probationary employment as an apprentice.

Trainees employed must be persons registered in a construction occupation under a program which has been approved in advance by the U.S. Department of Labor, Employment and Training Administration, as meeting its standards for on-the-job training programs and which have been so certified by that Administration.

Information on wage rates paid to apprentices and trainees is not reflected in Davis-Bacon wage determinations. Similarly, their addition through the additional classification procedure (conformance) is neither necessary nor appropriate. On projects funded by the Federal-Aid Highway Act, apprentices and trainees certified by the Secretary of Transportation are not covered by Davis-Bacon labor standards.

The proper wage rates to be paid to apprentices and trainees are those specified by the particular programs in which they are enrolled, expressed as a percentage of the journeyman rate on the wage determination. In the event employees reported as apprentices or trainees on a covered project have not been properly registered within the meaning of the Regulations and the contract stipulations, or are utilized at the job site in excess of the ratio to journeymen permitted under the approved program, they must be paid the applicable wage rates for laborers and mechanics employed on the project performing in the classification of work they actually performed. This applies regardless of work classifications which may be listed on the submitted payrolls and regardless of their level of skill.

Helper classifications may be issued in or added to a wage determination only where the (a) the duties of the helpers are clearly defined and distinct from those of the journeyman classification and from the laborer, (b) the use of such helpers is an established prevailing practice in the area, and (c) the term "helper" is not synonymous with "trainee" in an informal training program.

Question. What wage rates must be paid to supervisory employees (foremen, superintendents, etc.) employed on a covered project?

Answer. The wage rates for bona fide supervisory employees are not regulated under the Davis-Bacon and related Acts because their duties are primarily administrative or executive in nature rather than those of laborers or mechanics. However, such employees who devote more than 20 percent of their time during a workweek to mechanic or laborer duties are laborers and mechanics for the time so spent, and must be paid at least the appropriate wage rates specified in the wage determination. Employees who are bona fide executive, administrative, or professional employees as defined under the Fair Labor Standards Act at 29 CFR Part 541 are not covered by the Davis-Bacon Act.

Question. If it is believed that the rates on a wage determination do not accurately reflect those prevailing in the area, how may the wage determination be appealed?
Answer. Any interested person requesting reconsideration of a wage determination or of a ruling regarding application of a wage determination to a specific construction project should present their request in writing accompanied by supporting data or other pertinent information to the Wage and Hour Division. The Wage and Hour Division should respond within 30 days or notify the requestor within this time frame that additional time is needed.

An "interested person" is considered to include, without limitation:

(1) Any contractor, or an association representing a contractor, who is likely to seek or to work under a contract containing a particular wage determination, or any laborer or mechanic, or any labor organization which represents a laborer or mechanic, who is likely to be employed or to seek employment under a contract containing a particular wage determination, and,

(2) Any Federal, State, or local agency concerned with the administration of a proposed contract or contract containing a particular wage determination issued pursuant to the Davis-Bacon Act or any of its related statutes.

If reconsideration of a wage determination has been sought and denied, an appeal for review of the wage determination or its application may be filed with the Administrative Review Board, U.S. Department of Labor, Room N-1651, 200 Constitution Avenue, N.W., Washington, D.C. 20210. Requests for review of wage determinations must be filed, and any new wage determination resulting from the appeal must be issued, before contract award or start of construction where there is no award (or under the National Housing Act, before the date of initial endorsement, or the beginning of construction, whichever occurs first; or under Section 8 of the U.S. Housing Act of 1937, before the date of the housing assistance payments agreement, or the beginning of construction, whichever occurs first).

The Wage Appeals Board (now the Administrative Review Board) was established by the Secretary of Labor in 1963 to decide, at its discretion, appeals concerning questions of fact and law related to final decisions of the Wage and Hour Division concerning:

Controversies over the payment of prevailing wage rates, overtime pay, or proper classifications;

Wage determinations issued under the Davis-Bacon and related Acts;

Debarment cases arising under 29 CFR Part 5;

Cases involving the assessment of liquidated damages under the Contract Work Hours and Safety Standards Act;

Appeal of any other final decision under 29 CFR Parts 1, 3, or 5.

The Administrative Review Board consists of three members, one of whom is designated chairman. The members are appointed by the Secretary of Labor and majority vote of the Administrative Review Board is necessary for a decision, except that a decision to hear any appeal may be made by one member. The Board can act as fully and finally as the Secretary of Labor concerning the matters within its jurisdiction. The rules prescribed in 29 CFR, Part 7, "Practice Before Wage Appeals Board", govern the proceedings of the Board.
Applicability  The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance. A.1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer’s payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conforming under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers. (ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met: (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (2) The classification is utilized in the area by the construction industry; and (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination. (b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where Office of Labor Relations appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.) (c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.) (d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification. (iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof. (iv)
If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.) 2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts. 3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section l(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.) (ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, DC 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.) (b) Each payroll submitted shall be accompanied by a “Statement of Compliance,” signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following: (1) That the payroll for the payroll period contains the information required to be maintained under 29 CFR 5.5(a)(3)(i) and that such information is correct and complete; (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract. (c) The
weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b). (d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code. (iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12. 4. Apprentices and Trainees. (i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman’s hourly rate) specified in the contractor’s or subcontractor’s registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice’s level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved. (ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee’s level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination.
for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved. **(iii) Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30. 5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract. **6. Subcontracts.** The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 of this paragraph and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph. **7. Contract termination; debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12. 8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract. **9. Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives. **10. (i) Certification of Eligibility.** By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor’s firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24. **(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24. **(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., “Federal Housing Administration transactions”, provides in part: “Whoever, for the purpose of influencing in any way the action of such Administration... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than $5,000 or imprisoned not more than two years, or both.” 11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer. **B. Contract Work Hours and Safety Standards Act.** The provisions of this paragraph B are applicable only where the amount of the prime contract exceeds $100,000. As used in this paragraph, the terms “laborers” and “mechanics” include watchmen and guards. **(1) Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek. **(2) Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in sub paragraph (1) of this paragraph. **(3) Withholding for unpaid wages and liquidated damages.** HUD or its designee shall upon its own action or upon written request of an authorized representative of the
Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph. (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph. C. Health and Safety. The provisions of this paragraph C are applicable only where the amount of the prime contract exceeds $100,000. (1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation. (2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, 40 USC 3701 et seq. (3) The Contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The Contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.
SUPPLEMENTARY GENERAL TERMS AND CONDITIONS

1. **Lead-Based Paint Hazard**

The contractor is hereby specifically made aware of the HUD lead-based paint regulations, 24 CFR, Part 35, which are applicable to the construction or rehabilitation of residential structures. To the extent that the subject matter of this contract involves residential structures, the contractor will comply with the lead-based paint regulations.

2. **Compliance With Air and Water Acts**

The contract is subject to the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Control Act, as amended, 32 USC 1251 et seq., and the regulations of the Environmental Protection Agency (EPA) with respect thereto, at 40 CFR Part 15, as amended from time to time.

The contractor and any of its subcontractors for work funded under the contract which is in excess of $100,000 agree to the following agreements:

   (a) A stipulation by the contractor or subcontractors that any facility to be utilized in the performance of any non-exempt contract or subcontract is not listed on the List of Violating Facilities issued by the EPA pursuant to 40 CFR 15.20.

   (b) Agreement by the contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act; as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.

   (c) A stipulation that as a condition for the award of the contract prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized or to be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

   (d) Agreement by the contractor that he will include or cause to be included the criteria and requirements in paragraph (a) through (d) of this Section in every non-exempt subcontract and requiring that the contractor will take such action as the Government may direct as a means of enforcing such provision.

In no event shall any amount of the assistance provided under this contract be utilized with respect to a facility which has given rise to a conviction under Section 113(c)(1) of the Clean Air Act or Section 309(c) of the Federal Water Pollution Control Act.

3. **Interest of Members, Officers, or Employees of Public Body, Member of Local Governing Body, or Other Public Officials**

No member, officer, or employee of the Public Body, or its designees or agents, no member of the governing body of the locality in which the program is situated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the program during his tenure or for one (1) year thereafter, shall have any interest, direct or indirect, in any contract or subcontract, or the proceeds thereof, for work to be performed in connection with the program assisted under the contract.

4. **Prohibition Against Payments of Bonus or Commission**

The assistance provided under the contract shall not be used in the payment of any bonus or commission for the purpose of obtaining HUD approval of the application for such assistance, or HUD approval of applications...
for additional assistance, or any other approval or concurrence of HUD required under this contract, Title I of the Housing and Community Development Act of 1974 or HUD regulations with respect thereto; Provided, however, that reasonable fees or bona-fide technical consultant managerial or other such services, other than actual solicitation, are not hereby prohibited if otherwise eligible as program costs.

5. **Energy Conservation Provisions**

The contractor must recognize mandatory standards and policies relating to energy efficiency contained in the Cost Effective Energy Conservation Measures.

6. **Section 109 of the Housing and Community Development Act of 1974**

No person in the United States shall on the grounds of race, color, national origin, or sex be excluded from participation in, be denied the benefits, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this Title.

7. **Executive Order 11625 – Minority Business Enterprise**

   (a) It is the policy of the City to take positive steps to maximize the utilization of minority business enterprises in all contract activity administered by the City.

   (b) The contractor will utilize his best efforts to carry out this policy in the award of his subcontracts to the fullest extent consistent with the efficient performance of this contract.

   As used in the contract, the term "minority business enterprise" means a business, at least fifty percent (50%) of which is owned by minority group members, or in the case of publicly owned businesses, at least fifty-one percent (51%) of the stock is owned by minority group members. For the purpose of this definition, minority groups are members of Blacks, Hispanics, Asians, Native Americans, Alaskans, or Pacific Islanders.

8. **Executive Order 12138 – Women's Business Enterprise**

   (a) It is the policy of the City to take positive steps to maximize the utilization of women business enterprises in all contracts administered by the City.

   (b) The contractor will utilize his best efforts to carry out this policy in the award of his subcontracts to the fullest extent consistent with the efficient performance of this contract.

   As used in the contract, the term "women business enterprise" means a business, that is at least fifty-one percent (51%) owned by a woman or women who also control and operate it. "Control" in this context means exercising the power to make policy decisions. "Operate" in this context means being actively involved in the day-to-day management.

9. **Age Discrimination Act of 1975**

No person in the United States shall, on the basis of age be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

10. **Section 504 Handicapped (if $2,500 or over)**

Affirmative Action for Handicapped Workers:

   (a) The contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The contractor agrees to take affirmative action to employ, advance in employment,
and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as the following: Employment upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

(b) The contractor agrees to comply with rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(c) In the event of the contractor's non-compliance with the requirements of this clause, actions for non-compliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(d) The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, provided by or through the contracting officer. Such notices shall state the contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.

(e) The contractor will notify each labor union or representative or workers with which it has a collective bargaining agreement or other contract understanding, that the contractor is bound by the terms of Section 503 of the Rehabilitation Act of 1973, and is committed to take affirmative action to employ and advance in employment physically and mentally handicapped individuals.

(f) The contractor will include the provisions of this clause in every subcontract or purchase order of $2,500 or more unless exempted by rules, regulations, or orders of the Secretary issued pursuant to Section 503 of the Act, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for non-compliance.
SECTION 3 CLAUSE AND CERTIFICATION FOR COMPLIANCE FOR TRAINING, EMPLOYMENT AND CONTRACTING OPPORTUNITIES FOR BUSINESS AND LOW INCOME PERSONS
(contracts over $100,000)

A. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, (12 U.S.C. of 170lu) (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low and very low income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement section 3. As evidenced by their execution of the contract, the parties certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

C. The contractor agrees to send to each labor organization or representative of worker with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or worker's representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

D. The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135 (if subcontract is over $100,000), and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

E. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contacts.

G. The following forms: Contractor's Certification of Compliance with Section 3, Workforce Needs Table (Attachment I) and Utilization of Section 3 Business Concerns (Attachment II) must be completed and submitted to the Bureau of Development and Inspections PRIOR to executing the contract in order to determine compliance with Section 3 requirements. The Bureau will determine the acceptability of the submission.

COMPANY

By: ____________________________

AUTHORIZED SIGNATURE

Title: ____________________________

Date: ____________________________
**WORKFORCE NEEDS TABLE**

TOTAL # OF LOW INCOME CITY RESIDENTS TO BE HIRED *

<table>
<thead>
<tr>
<th>OCCUPATION CATEGORY</th>
<th>TOTAL # OF SKILLED WORKERS</th>
<th>TOTAL # OF TRAINEES</th>
<th>TOTAL # OF SKILLED WORKERS ON PAYROLL</th>
<th>TOTAL # OF TRAINEES ON PAYROLL</th>
<th>TOTAL # TO BE HIRED</th>
<th>TOTAL # TO BE HIRED ON PAYROLL</th>
<th>TOTAL # SKILLED WORKERS TRAINEES</th>
</tr>
</thead>
</table>

**TOTALS:**

* The numerical goal for hires is 20% of the aggregate number of new hires.
+ These classifications should relate to the classifications found in the wage rate determination.

**EMPLOYMENT AND TRAINEE CERTIFICATION**

A. The Company hereby certifies that the above table represents the approximate number of employee and trainee positions required in the execution of this contract and which are not presently filled by regular and permanent employees and also represents the number of low income City residents that the company proposes to make good faith efforts to employ.

B. The Company certifies that it will make a good faith effort to employ the number of lower income employees and trainees stated above utilizing: [1] such community based organizations and service agencies as the Spanish Speaking Council of Reading and Berks County, Berks Employment and Training Office, Berks Community Action Program, Reading Housing Authority Tenant Councils, and any others that may assist in meeting the goals; and [2] on-site company employment posters.

C. The Company certifies that the trainees to be utilized on the project in no event is less than the number of trainees determined by the Secretary of Labor for each construction occupation.

<table>
<thead>
<tr>
<th>COMPANY</th>
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<tbody>
<tr>
<td>DATE: ____________________________</td>
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<tr>
<td>(Authorized Signature)</td>
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</table>
ATTACHMENT II

UTILIZATION OF SECTION 3 PROJECT BUSINESSES

The Company shall require the services of companies engaged in the business of:

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<th>PROPOSED SUPPLIERS AND SUBCONTRACTORS</th>
<th>ESTIMATED $ AMOUNT</th>
<th>SECTION 3 (YES OR NO)*</th>
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* The numerical goal for committing to award to Section 3 business concerns is at least 10% of the total dollar amount of all Section 3 covered contracts for building trades work arising in connection with housing rehabilitation, housing construction, and other public construction; and, at least 3% of the total dollar amount of all other Section 3 covered contracts.

NOTE: A Section 3 business concern is defined as business: [1] that is 51% or more owned by Section 3 residents; or [2] whose permanent, full-time employees include persons, at least 30% of whom are currently Section 3 residents, or within three years of the date of first employment with the business concern were Section 3 residents; or [3] that provide evidence of a commitment to subcontract in excess of 25% of the dollar award of a subcontract to be awarded to business concerns that meet the qualifications set forth in number 10 and 20 of this definition. The Company certifies that it will make a good faith effort to utilize business concerns located in the City of Reading to the greatest extent feasible for Contract No.____________________ in contracting for work to be performed in connection with the completion of the contract.

________________________ COMPANY

DATE:_____________________________ BY:_________________________

(Authorized Signature)
GENERAL PROVISIONS

G.1 SUB-HEADINGS. The paragraph headings are inserted in these provisions and the following specifications for convenience only and shall not be considered as interpreting or limiting the application of paragraphs.

G.2 DEFINITIONS. The following terms and expressions used in this contract and specifications shall be understood as follows:

The expression "The City" shall mean the City of Reading, Pennsylvania, the party of the first part to this contract.

The word "Engineer" shall mean the Engineer, Architect, or other official in direct charge of the work for the City or his authorized representative as designated by the applicable Director.

The word "Inspector" shall mean an inspector of the City assigned to the inspection of materials, structures and workmanship under this contract.

The word "Contractor" shall mean the party of the second part to this contract, whether a corporation, partnership, or individual.

The word "Specifications" shall mean the specifications describing the work, the drawings, and the general provisions.

The word "Drawings/Plans" shall mean the general drawings, plans, maps, diagrams or illustrations accompanying these specifications, and such supplementary drawings as may be furnished from time to time.

The term "Materials" as used herein includes, in addition, to materials incorporated in the project used or to be used in the operation thereof, equipment and other materials used and/or consumed in the performance of the work.

Wherever in the specifications the words "to be," "to be done," "if," "as," "directed," "required," "permitted," "ordered," "instructed," "designated," "considered necessary," or words of like import are used, it shall be understood that the direction, requirement, permission, order, instruction, designation or decision of the Engineer is intended, and similarly the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, acceptable or satisfactory to, the applicable Director or the Engineer, unless the context show that another meaning is plainly intended.

G.3 SPECIFICATIONS AND DRAWINGS. The specifications and drawings are intended to cover all of the work that is known to be required to effect a complete installation. They are intended to be mutually explanatory of each other, but should any discrepancy or inconsistency appear or any misunderstanding arise as to the import of anything contained in either the specifications or the drawings, the interpretation of the doubtful portions will be made by the Engineer, whose decision shall, in all cases, be final and binding on the Contractor. Any materials or workmanship obviously necessary to satisfactory completion shall be furnished and installed whether or not specifically shown or mentioned. Any corrections of errors or omissions in the specifications or drawings, or both, may be made by the Engineer when such correction is necessary for the proper fulfillment of their intention as determined by him/her. Figures shall have preference over scale in reading dimensions. Copies of the specifications and drawings shall be kept constantly at the work. Any supplementary or detail drawings which may be made by the Engineer subsequent to the date of this contract, relating to the work herein contemplated, as showing more particularly the details of the work to be done, or specifications and the drawings furnished by the Contractor and approved by the Engineer, are, and are to be held to be, controlling parts of this contract insofar as they do not conflict with other provisions of the contract.

If the Contractor, in the course of the work, finds any discrepancy between the plans and the physical conditions of the locality, or any errors or omissions in the plans or in the layout as given by the points and
instructions furnished by the Engineer, it shall be his duty to inform the Engineer, in writing, and the Engineer shall promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

G.4 ENGINEER TO DECIDE. All work under this contract shall be done in a manner acceptable to the Engineer, who shall determine the amount, quality, acceptability and fitness of the several kinds of work and material which are to be paid for hereunder, and shall decide all questions which may arise as to measurements of quantities and the fulfillment of the conditions of this contract on the part of the Contractor.

G.5 WORK TO BE DONE IN ACCORDANCE WITH SPECIFICATIONS AND DRAWINGS. The work at all stages of its completion must conform with the specifications and drawings and with the lines and grades and other instructions of the Engineer, as given from time to time during the progress of the work. In no case will any work in excess of the requirements of the drawings as interpreted by the Engineer be paid for unless authorized in writing by the Engineer.

G.6 RIGHT TO MAKE CHANGES IS RESERVED. The City reserves the right to make alterations in the location, lines, grade, plan, form dimensions, numbers or materials of the work herein contemplated, either before or after the commencement of construction. If such alterations diminish the amount of work to be done, they shall not form the basis for a claim for damage or for loss of anticipated profits from the work which may be dispensed with; if they increase the amount of work, such increase shall be paid for according to the quantity of work actually done and at prices stipulated for such work under this contract. All work actually done under a unit price (where applicable) contract, whether more or less than the quantity estimated or specified, shall be paid for by the determined units, on the basis of the bid per unit in the proposal.

G.7 EXTENSION OF TIME. If the Contractor is delayed at any time in the progress of the work by any act or neglect of the City, or by City employees, or by any other contractor employed by the City, or by changes ordered in the work, or by strikes, lockouts, fire, unusual delay in transportation, unavoidable casualties or any causes beyond the Contractor's control, or by any cause which the Engineer shall decide to justify the delay, then the time of completion shall be extended for such reasonable time as the Engineer may decide subject to the approval of the applicable Director.

No such extension shall be made for delay due to rejection of defective materials or workmanship or for any delay occurring more than seven (7) days before claim therefore is made in writing to the Engineer. In the case of a continuing cause of delay, only one claim is necessary.

If no schedule or agreement stating dates upon which drawings shall be furnished is made, then no claim for delay shall be allowed because of any delay in the furnishing of drawings to the Contractor.

G.8 ADEQUATE PLANT AND METHODS. The Contractor shall furnish such construction plant and use such methods and appliances as will secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the time specified. Before starting the installation of the construction plant, the Contractor shall submit to the Engineer, for approval, a plan showing the general arrangement of the plant to be installed and the proposed facilities for storage of materials and equipment. If at any time the plant or any portion of it shall appear to the Engineer to be, or likely to become, inadequate, incomplete, faulty or unsafe, the Contractor shall promptly obey the orders of the Engineer to supplement or to remove or replace the same; but the failure of the Engineer to issue such orders shall not relieve the Contractor of his responsibility for the efficiency, adequacy and safe operation of the plant.

He shall cover and protect his work from damage, and all injury to the same, before completion of the contract.

He shall be financially responsible for all damage to the party of the first part or its property, to other contractors, to the neighboring premises, or to any private or personal property, for any cause whatsoever, during the period of the contract.
G.9 WORKERS. The Contractor shall employ only competent and skillful employees to do the work, and whenever the Engineer shall notify the Contractor, in writing, that any person on the work is, in his/her opinion, incompetent, unfaithful or disorderly, uses threatening or abusive language to any official having supervision of the work, or is in any other way unsatisfactory, such person shall be discharged from the work and shall not again be employed on it except with the consent of the Engineer.

Neither party shall employ or hire any employee of the other party without the latter's consent.

G.10 WAGES. All employees directly employed on this work shall be paid wages which shall in no event be less than the minimum hourly wage rates for skilled, semi-skilled, and unskilled labor prescribed by the Commonwealth of PA Prevailing Wage Act, P.L. 987 as may be amended, if applicable.

G.11 PENALTY FOR FAILURE TO LIVE UP TO MINIMUM WAGE CONTRACT. A penalty shall be exacted from the Contractor in an amount equal to twice the difference between the minimum wage contained in the prescribed wage rates, and the wage actually paid to each laborer or mechanic for each day during which he has been employed at a wage less than that prescribed.

G.12 INSPECTORS TO REPORT VIOLATIONS. Every person assigned as an Inspector of the work to be performed under this contract, in order to aid in enforcing the fulfillment of the minimum wage requirements thereof, shall, upon observation or investigation, report to the applicable Director, all violations of minimum wage stipulations, together with the name of each laborer or mechanic who has been paid a wage less than that prescribed, and the day or days of such violation.

G.13 PENALTIES TO BE WITHHELD FROM MONEYS DUE THE CONTRACTOR. All minimum wage violation penalties shall be withheld and deducted for the use of the City from any moneys due the Contractor by the City; provided, that if the Contractor subsequently pays to all laborers and mechanics the balance of the amounts stipulated as minimum wages, the City shall pay to the Contractor the amounts so withheld.

G.14 CONTRACTOR'S RESPONSIBILITY FOR EMPLOYEES. The Contractor hereby assumes all responsibility for himself/herself, his/her agents and employees growing out of connection with the execution of the work called for by this contract, for the violation of, City ordinances and the laws governing contract work in the Commonwealth of Pennsylvania. The Contractor further agrees to hold the City of Reading harmless from all responsibility for employees on this work under the Workmen's Compensation Act of the Commonwealth of Pennsylvania, and to carry insurance on his/her employees, as provided thereby.

G.15 CONTRACTOR REPRESENTED ON THE WORK. The Contractor shall give personal attention constantly to the faithful prosecution of the work and shall be present, either in person or by a competent superintendent, on the site of the work, continuously during its progress. Such representative shall have authority to receive and to act without delay upon all instructions of the Engineer or assistants in the prosecution of the work in conformity with the contract.

Insofar as it is practicable, all orders given by the Engineer to the Contractor shall be in writing. In those cases where orders are given orally they shall be confirmed in writing. Orders or directions, written or oral, from the Engineer, delivered to the Contractor's office shall be considered as delivered to the Contractor.

G.16 REPRESENTATIVE MUST BE PRESENT. In case the Engineer or a representative may at any time have occasion to give directions regarding the work for the reason that the same is not, in the Engineer's opinion, being carried out in accordance with the provisions of this contract, and should there be no responsible representative of the Contractor on the ground empowered to receive such instructions, the Engineer or a representative shall order that particular portion of the work to be stopped until such representative of the Contractor appears and receives instructions. It is hereby agreed that suspensions of the work for such cause shall not entitle the Contractor to claims for damage of any kind, nor to an extension of the time in which to complete the work to be done under this contract.
G.17 LEGAL ADDRESS OF CONTRACTOR. The address given in the bid or proposal upon which this contract is based is hereby designated as the legal address where all notices, letters and other communications to the Contractor shall be mailed or delivered prior to the beginning of the work provided for in this contract. The delivery at the above-named place, or depositing in a post-paid wrapper directed to the above place, in any post office box regularly maintained by the post office, of any notice, letter or other communication to the Contractor, shall be deemed sufficient service thereof upon the Contractor and the date of said service shall be the date of such delivery or mailing.

G.18 CHANGE IN ADDRESS. Such address may be changed at any time by an instrument in writing executed and acknowledged by the Contractor and delivered to the City. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter or other communication upon the Contractor personally.

G.19 LAWS, ORDINANCES AND REGULATIONS. The Contractor shall be fully informed as to all laws, ordinances and regulations in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction over the same, if any discrepancy or inconsistency shall be discovered in this contract, specifications or drawings, in relation to any such law, ordinance, population, order or decree, the contractor shall immediately report the same in writing to the Engineer. At all times the Contractor shall observe and comply with all laws, ordinances, regulations, orders and decrees which may be in effect during the progress of this contract; and shall indemnify and save harmless the City and its officers and employees against any claim or liability arising from the violation of any legal requirement in the prosecution of this contract.

G.20 INDEMNIFICATION OF CITY. In case any action at law, proceeding in eminent domain, or suit in equity may or shall be brought against the party of the first part, or any of its offices or agents, for or on account of the failure, omission or neglect of the Contractor or the subcontractors, his/her or their employees or agents, to do and perform any of the covenants acts, matters, or things by this contract undertaken to be done or performed by the Contractor or subcontractors, his/her or their employees or agents, or for any injury or damage caused by the negligence of the Contractor or subcontractors, his/her or their employees or agents, or for damage or injury for which the Contractor undertakes responsibility under the provisions of this contract, the Contractor shall immediately assume and take charge of the defense to such actions, proceedings or suits in like manner and to all intents and purposes, as if said actions, proceedings or suits had been brought directly against the Contractor; and the Contractor shall also indemnify and save harmless the party of the first part, its officers and agents, of and from all loss, cost or damage whatever arising out of such actions, proceedings or suits as may or shall be brought as aforesaid.

G.21 SUITS AND CLAIMS. The Contractor agrees to indemnify and save harmless the City of Reading, the applicable Director, the Engineer, and their assistants, from all suits or actions of every name and description, either in law or in equity, including proceedings in eminent domain for the recovery of consequential damages, or for or on account of use of patented appliance, brought against them or either of them, or for any damage or injuries received or sustained by any party or parties, person or persons, natural or artificial, either in the performance or as a result of the work under this agreement, regardless of whether such suits, actions or proceedings brought are based or grounded upon negligence of the Contractor, the subcontractors, or his/her or their agents, servants or employees. The Contractor further agrees that all or as much of the monies due under this agreement as shall be or may be considered necessary by the applicable Director, shall or may be retained, without any liability of the City to the Contractor, for interest thereon because of the retention thereof, until all such suits, proceedings or claims have been settled or terminated, and satisfactory evidence to that effect furnished to the applicable Director, provided however, that no such monies shall be retained by the City after six (6) years following the completion and acceptance of the work under the contract, excepting for or on account of claims filed or suits or proceedings begun before the expiration of the applicable statute of limitations.

G.22 RESPONSIBILITY FOR INJURY. The Contractor shall assume all responsibility for loss, damage or injury to persons or property arising out of the nature of the work, from the actions of the elements, or from any
unforeseen or unusual difficulties over which the City has no control, in addition to and without limiting the Contractor's liability under the other provisions of the contract.

G.23 CONTRACTOR'S CLAIMS FOR DAMAGE. If the Contractor claims compensation for any damage alleged to have been sustained by reason of any act or omission on the part of the City or any of its agents, he shall, within one (1) week after the sustaining of such damage, make a written statement to the Engineer of the nature of the damage sustained, and shall, on or before the fifteenth (15th) day of the month succeeding that in which any such damage shall have been sustained, file with the Engineer an itemized statement of the details and amounts of such damage, and unless such statement shall be made as so required, the claim for compensation shall be forfeited and invalid, and the Contractor shall not be entitled to payment on account of any such damage.

G.24 LINES AND GRADES. All lines and grades will be given by the Engineer, but the Contractor shall provide such material and give such assistance therefore as may be required by the Engineer, and the marks so given shall be carefully preserved. The Contractor shall keep the Engineer informed, a reasonable time in advance, of the time and places at which he/she intends to work, in order that lines and grades may be furnished and necessary measurements for record and payment made with the minimum inconvenience to the Engineer or delay to the Contractor. No claim for extra payment will be allowed for the cost to the Contractor of any material, work or delay occasioned by giving lines and grades, or making necessary measurements or inspections, as all such cost shall be considered to have been included in the price bid for the work.

G.25 INSPECTION. The Engineer will appoint such person or persons as may be deemed necessary to inspect properly the materials furnished and the work done under this contract, and to see that the same correspond strictly with these specifications. Such materials and workmanship shall always be subject to the approval of the Engineer, but no inspection, approval or acceptance of any part of the work herein contracted for or of the materials used therein, nor any payment on account thereof, shall prevent the rejection of said work or materials at any time thereafter during the existence of this contract, should said work or materials be found to be defective, or not in accordance with the requirements of the contract.

The Contractor shall permit, or secure permission for the Engineer or a duly authorized Inspector or representative to enter any manufactory, shop or other place where any material for, or part of the work is being prepared, manufactured or constructed, at any time when such work is in progress. The Contractor shall furnish and prepare, or cause to be furnished or prepared, without charge, all such assistance, appliances, samples of materials and test specimens as may be ordered by the Engineer or such Inspector or representative for the purpose of making official tests and investigations. The Engineer shall be notified of the time and place of preparation, manufacture or construction of any material for, or part of the work which he/she may wish to inspect before delivery at the site of the work. Such notification shall be given a sufficient time in advance of the beginning of the work on such material or part to allow arrangements to be made for inspection and testing.

G.26 NIGHT WORK. No night work, except for the inspection of lighting, requiring the presence of the Engineer or Inspector will be permitted except in case of emergency, and then only with the written consent of the Engineer and to such an extent as may be judged necessary.

G.27 SUNDAY WORK. No Sunday work will be permitted, except in case of great emergency, and then only with the written consent of the Engineer, and to such extent as is absolutely necessary.

G.28 NO WORK IN BAD WEATHER. No work shall be done under this contract when, in the opinion of the Engineer, the weather is unsuitable for good and careful work to be performed. No concrete work shall be done on days on which the temperature falls below 25 degrees Fahrenheit. Should the severity of the weather continue such that the work cannot be prosecuted successfully, the Contractor, upon order of the Engineer, shall cease all such work until directed to resume the same. In the latter case, suitable extension of time shall be allowed to compensate for time actually lost as provided for in Article G.7.
G.29. NOT TO SUBLET OR ASSIGN. The Contractor shall give personal attention constantly to the faithful prosecution of the work and shall not assign, transfer, convey, sublet or otherwise dispose of this contract, or his/her title, right or interest in or to the same or any part thereof, nor shall the Contractor assign, by power of attorney or otherwise, any of the monies due or to become due, nor issue any order or orders or drafts on the Controller or Treasurer of the City of Reading for any monies due or to become due under this contract, unless by and with the consent of the City first duly had and obtained by resolution entered upon the minutes of said City.

G.30 RIGHT OF PROPERTY IN MATERIALS. Nothing in this contract shall be considered as vesting in the Contractor any right of property in materials used, after they shall have been attached to or incorporated in the work, nor in materials which have been estimated for partial payment, but all such materials, upon being so attached, incorporated or estimated, shall become the property of the City.

G.31 DEFECTIVE MATERIALS AND WORKMANSHIP. No materials of any kind shall be used until they have been examined and approved by the Engineer, who shall have full power to condemn any work and materials not in accordance with the specifications, and to require the Contractor to remove any work or materials so condemned. Inspections of the work shall not relieve the Contractor from any of his/her obligations to fulfill the contract as herein described, and defective work shall be made good, and unsuitable materials may be rejected, notwithstanding that such work or materials may have been previously overlooked by the Engineer and accepted or estimated for payment if the work or any part thereof shall be found defective at any time before the final acceptance of the whole work, the Contractor shall immediately make good such defect in a manner satisfactory to the Engineer, and if any material brought upon the ground for use in the work shall be condemned by the Engineer as unsuitable or not in conformity with the drawings or specifications, the Contractor shall forthwith remove such materials from the vicinity of the work. If the Contractor shall fail to remove or replace any defective or damaged materials or work after reasonable notice, the Engineer may cause such material or work to be removed or replaced, and the expense thereof shall be borne by the Contractor.

G.32 RESPONSIBILITY FOR WORK. The Contractor shall be held responsible for any or all materials or work to the full amount of all payments made thereon, and shall be required to make good, at his/her own cost, any injury or damage which said materials or work may have sustained from any source or cause whatever before its final acceptance.

G.33 CONDITIONS UNDER WHICH CITY MAY COMPLETE WORK. If the work to be done under this contract shall be neglected or abandoned, or the contract or any claim thereunder shall be assigned by the Contractor otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing to the City's representative, that the rate of progress is insufficient or that the work, or any part thereof, is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the provisions of this contract or carelessly executing any portion of the work, the City may notify the Contractor and surety in writing to fulfill the conditions of the Contract; and should the Contractor or the surety fail to comply with said notice within ten (10) days, the City may notify the Contractor and the surety to discontinue all work, or any part thereof; and thereupon the Contractor and the surety shall discontinue said work, or said part thereof as the City may designate; and the City may thereupon, by contract or otherwise, as it may determine, complete the work or such part thereof, and charge the expenses thereof to the Contractor or the surety; and may take possession of and use therein such materials, animals, machinery, equipment, implements and tools of every description as may be found upon the work. The expense so incurred shall be deducted and paid by the City out of any monies then due or to become due the Contractor under this contract; or any part thereof; and in case such expense is less than the sum which would have been payable under this contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference, and in case such expense shall exceed the latter sum, the Contractor or the surety shall pay the amount of such excess to the party of the first part.

G.34 ALL PARTS OF WORK COVERED. The Contractor further agrees that the following clauses relative to the construction of the work shall apply to each and all of the separate parts of the work, as though specially mentioned under the different headings in the specifications:
Delivery of Materials - The Contractor shall be entirely responsible for delivery of all materials to the site of the work, making the arrangements therefore.

Engineer Shall Measure - No work shall be covered over or filled in until it shall have been inspected by the Engineer.

Materials Properly Stored - The materials to be used in construction shall be protected from deterioration and damage, and shall be so disposed of as not to endanger the work and in such manner that full access may be had at all times to all work under construction or completed.

Surplus Materials Removed - All parts of the work shall be kept in as neat and orderly condition as circumstances will permit and upon completion of the work, all surplus materials, earth, sand, rubbish and refuse of every kind, and all tools, machinery, equipment and other materials belonging to the Contractor shall be removed from the construction works and adjoining premises so as to leave everything in an acceptable condition, within a week after receipt of final certificate.

G.35 ESTIMATED QUANTITIES APPROXIMATE. In unit price contracts, the quantities of the various classes of work to be done and materials to be furnished under this contract, as estimated by the Engineer and listed in Specifications, attached hereto, are approximate and only for the purpose of comparing, on a uniform basis, the bids offered for the work under this contract; and neither the City nor the Council nor any member of the Council of the City of Reading is to be held responsible if any of the said estimated quantities shall be found to be not even approximately correct in the construction of the work; and the Contractor shall make no claim for damages on anticipated profits or loss of profit, because of a difference between the quantities of the various items of work actually done or materials actually furnished and the estimated quantities stated in the Specifications, or because of the entire omission of any of the quantities or items stated in the Specifications.

G.36 EXTRA WORK. The Contractor shall do any work not herein otherwise provided for which, in the opinion of the Engineer, is necessary for the proper completion of the work, but not such work will be allowed or paid for except on a written order of the Engineer, and there shall be no claim for extra work or materials for damage sustained except under this Article. The extra work order issued by the Engineer shall specify the basis of payment for the extra work. Any extra work or changes in the work involving changes in the plans and/or specifications shall be approved by the applicable Director, prior to the execution of the work.

G.37 MONTHLY ESTIMATES. Current payments for work done under this contract will be made as follows: on invoices submitted by the Contractor and approved by the Engineer or Architect. Ten percent (10%) of each General Contractor invoice request shall be retained by the City on this contract until it is completed up to City codes and contract specifications and approved by a City Official or person representing a City Official Architect or Engineer.

It is further agreed and understood that inclusion of any portion of the work in the monthly estimate shall not be construed as final approval or acceptance of the same.

G.38 CONTRACTOR SHALL PREPARE FOR FINAL INSPECTION. Upon the completion of the work the Contractor shall tear down and remove all temporary buildings and structures built by the Contractor, remove and thoroughly clear away all debris, forms and surplus materials and leave the site of the work in a neat and satisfactory condition, and shall notify the Engineer when the work is ready for final inspection.

G.39 WORK TO BE PROPERLY PERFORMED. It is expressly understood that acceptance of work and materials during construction will not imply final acceptance of the work, if the final inspection shall disclose faulty workmanship or materials; and all work of whatever kind that, during its progress and before it is finally accepted, may become damaged from any cause, shall be repaired in a manner satisfactory to the Engineer or, if necessary, shall be broken up and removed and replaced with good and satisfactory work by the Contractor at his own expense. All work of every description shall be the best of its respective kind; and everything not particularly specified herein shall be done and finished in the best manner, and as is usual in first-class work of the several kinds.
Failure or neglect on the part of the Engineer, or any authorized agents to condemn or reject any bad or inferior work or materials shall not be construed to imply an acceptance of such work or materials, if such bad or inferior materials or work becomes evident at any time prior to the final acceptance of the work and the release of the Contractor by the Council of the City of Reading; nor shall it be construed as barring the City of Reading at any subsequent time from the recovery for damages of such sum of money as may be needed to build a new all portions of the work in which fraud was practiced or improper materials hidden, whenever found.

G.40 ACCEPTANCE AND FINAL PAYMENT. Upon receipt of written notice that the work is ready for final inspection and acceptance, the Engineer or Architect shall promptly make such inspection, and when he/she finds the work acceptable under the contract fully performed he/she shall promptly issue a final certificate, over his/her own signature, stating that the work provided for in this contract has been completed and is accepted under the terms and conditions thereof, and the entire balance found to be due the Contractor, including the retained percentage, shall be paid to the Contractor within (30) days after the execution of said final certificate.

G.41 WAIVER. Neither acceptance by the City, or any of its officers or employees, nor any order, measurement or certificate by the Engineer, nor any order by the City Council for payment of money, nor any payment for, nor any extension of time, nor any possession taken by the City or its officers or employees, shall operate as a waiver of any portion of this contract or of any power herein reserved to the City, or of any right to damage herein provided; nor shall any waiver of any breach of this contract be held to be a waiver of any other or subsequent breach. All remedies provided in this contract shall be taken and construed as cumulative; that is, in addition to each and every other remedy herein provided.

G.42 ACCEPTANCE OF FINAL CERTIFICATE. The acceptance by the Contractor of payment of the final estimate shall be conclusive evidence of acceptance and approval of estimates, accounting and deductions, and of full payment by the City for all work, labor, materials and services done or furnished hereunder, and of full satisfaction, discharge, release and waiver of all claims and demand of; or on behalf of the Contractor against the City, arising out of this agreement and the execution thereof. It is hereby further agreed that the Contractor shall not be entitled to demand or receive payment except in the manner set forth in this contract; and the Contractor further agrees that the final payment of the amount due under this contract and payment of the bills rendered for work done and materials furnished in accordance with any alterations of the same, shall release the City of Reading from any and all claims and liabilities on account of the work performed and materials furnished under said contract, or any alteration thereof.

G.43 MAINTENANCE AFTER COMPLETION. The Performance Bond shall remain in force for one (1) year from the date of completion and acceptance of the work under this contract, as security against any and all damage which may result from defects of materials or workmanship which may become apparent prior to the expiration of the one-year maintenance period. During this period the Contractor shall, promptly upon notification from the Engineer, repair all breaks and failures due to defects of material or workmanship at his own expense. If the Engineer shall deem it necessary and shall so direct, such repairs shall be made within twenty-four (24) hours after service of notice. If the Contractor unnecessarily delays making repairs ordered, or if delay would cause serious loss or damage, the City may undertake to have such repairs made or defects repaired without previous notice, and the expense of such repairs shall be borne by the Contractor or the surety. The Contractor shall be responsible for any damage resulting to any person or property from any violation of the guarantee and from unnecessary delays in making repairs.

G.44 PRICES. The City agrees to pay, and the Contractor agrees to receive, the price specified in the proposal submitted, as full compensation for furnishing all the materials called for, and for all labor and use of all machinery, equipment and tools necessary for executing the work contemplated in this contract; for all royalties, for patents and patented materials, appliances and processes; also for all loss or damage arising out of the nature of the work, or from the action of the elements, or from any unforeseen reasons, obstructions or difficulties which may be encountered in the prosecution of the work, for all risks of every description connected with the work, and for all expenses incurred by or in consequence of the suspension of discontinuance of said work as herein specified, and for well and faithfully completing the work, and the whole thereof, according to the specifications and drawings and the requirements of the Engineer under them.
G.45  NO EXTRA COMPENSATION. The Contractor further agrees not to ask, demand, sue for, or recover for any extra compensation, for any materials furnished or work done under this contract, beyond the amounts payable for the several classes of work or kinds of materials herein enumerated, which shall be actually performed and furnished at the prices therefore herein agreed upon and fixed.

G.46  CONTRACTOR TO TAKE OUT ALL PERMITS. The Contractor shall take out all necessary permits required by agencies of the City of Reading and/or all other governmental agencies; shall give all notices required by law or ordinances; shall pay all fees and charges incident to the due and lawful prosecution of the work covered by the contract, and shall comply with all laws and regulations relating to buildings and public highways. All permits shall be at his expense.

G.47  NO CLAIM FOR EXTRA WORK. No claim for extra work or material shall be allowed to the Contractor, unless before the performance of all such extra work the applicable Director shall have first authorized the same in writing, and the price or prices to be paid therefore shall first have been agreed upon in writing between the Director and the Contractor, and the same shall have been done or furnished under a written order from the Director given before the performance of such extra work or the furnishing of such extra materials. All claims for extra work or materials in any month shall be made to the Director in writing before the fifteenth (15th) day of the following month, and failing to make such claim within the time required, the right of the Contractor to extra pay for such extra work or materials shall be deemed to have been waived and forfeited.

G.48  WORK TO BE DONE TO THE SATISFACTION OF THE CITY ENGINEER. All the work under this contract shall be done to the satisfaction of the City Engineer, who shall in all cases determine the amount, quality, acceptability and fitness of the several amounts of work and materials which are to be paid for hereunder and shall decide all questions which may arise as to the measurement of quantities in the fulfillment of this contract on the part of the Contractor, and shall determine all questions respecting the true construction or meaning of the plans and specifications, and the determination and decision thereon shall be final and conclusive; and such determination and decision, in case any question shall arise, shall be a condition precedent to the right of the Contractor to receive any money hereunder.

G.49  ENGINEER TO INSPECT AND REJECT. The Engineer shall inspect the materials furnished and the work done, and see that the same strictly correspond to the specifications, and he shall at all times have free access to the works, storehouse and yard of the Contractor, and shall be privileged to take such samples therefrom as he may deem necessary; and if the work, or any material brought on the grounds for the use of the work, or selected for the same, shall be condemned by the Engineer, as unsuitable or not in conformity with the specifications, the Contractor shall forthwith remove such materials from the work.

Before issuance of the final certificate the Contractor shall furnish evidence satisfactory to the Engineer that all payrolls, materials, bills and other indebtedness connected with the work have been paid.

It is understood and agreed by the parties hereto that the final estimate of the Engineer shall be evidence of the amount of work performed by the Contractor under and by virtue of this agreement, and shall be taken as the full measure of the compensation to be received by the Contractor. The aforesaid estimate shall be based upon the contract price for the furnishing of all the different materials and labor, and the performance of all the work mentioned in this contract, including the specifications, and where there may be any ambiguity therein, the Engineer's instructions shall be considered explanatory and the decision shall be final.

No inspection, approval or acceptance of any of the work herein contracted for, or of the materials used herein, or any payment on account thereof shall prevent the party of the first part from objecting to the acceptance of said work or materials at any time during the existence of this contract. Neither the inspection of the applicable Director, or Division Head, or the City Engineer or any of their employees nor any order, measurement or certificate by the City Engineer nor any order by the Director for the payment of money, nor any payment for, or acceptance of, the whole or any part of the work, by the Director of the Division of Planning, nor any extension of time, nor any possession taken by the Director or his employees, shall operate as a waiver of any
provision of this contract, or any power herein reserved to the party of the first part, or of any right to damage herein provided; nor shall any waiver of any breach of this contract be held to be a waiver of any other subsequent breach.

Any remedy provided in this contract shall be taken and construed as cumulative; that is, in addition to each and every other remedy herein provided; and in addition to all other suits, actions or legal proceedings the party of the first part shall be entitled to as of right.

G.50 CONTRACTOR NOT TO DISCOMMODE PRIVATE COMPANIES. The Contractor shall afford while the work is underway, the necessary facilities to any and all companies owning railway tracks, pipes, subway ducts, or other surface, sub-surface or super-surface construction on the line of the work, in the preservation of the same from injury, all without charge therefore the expense to the City.

G.51 EXAMINATIONS. At any time before or after completion of the work, should the City Engineer require it, the Contractor shall make such openings, and to such extent, through such part or parts of the work, as the City Engineer may direct, and shall restore the work so distributed to the satisfaction of the City Engineer; and should the work, in the opinion of the City Engineer, whose decision shall be final and conclusive therein, be found faulty in any respect, the whole of the expense incurred thereby shall be defrayed by the Contractor, according to and upon the prices herein set forth, but if otherwise, by the City.
SUPPLEMENTARY GENERAL TERMS & CONDITIONS
SUPPLEMENTARY GENERAL CONDITIONS

PENNSYLVANIA HUMAN RELATIONS ACT CONDITIONS

GENERAL

The CONTRACTOR shall conform to the provisions of Act No. 222 (October 27, 1955) and as amended and supplemented, known as the "Pennsylvania Human Relations Act", and in accordance with the provisions of the Regulations of the Pennsylvania Human Relations Commission, as adopted March 8, 1974, 4 Pa.B. 409, amended March 7, 1975, 5 Pa. B. 434, 16 Pa. Code Chapter 49.

NON-DISCRIMINATION PROVISION

During the term of this CONTRACT, the CONTRACTOR shall agree to the following provisions

(a) The CONTRACTOR shall not discriminate against any employee, applicant for employment, independent contractor or any other person because of race, color, religious creed, ancestry, national origin, age or sex.

The CONTRACTOR shall take affirmative action to ensure that applicants are employed, and that employees or agents are treated during employment, without regard to their race, color, religious creed, ancestry, national origin, age or sex. Such affirmative action shall include, but is not limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training.

The CONTRACTOR shall post in conspicuous places, available to employees, agents, applicants for employment and other persons, a notice, to be provided by the OWNER, setting forth the provisions of this nondiscrimination clause.

(b) The CONTRACTOR shall in advertisements or requests for employment, placed by it or on its behalf, state that all qualified applicants will receive consideration for employment without regard to race, color, religious creed, ancestry, national origin, age or sex.

(c) The CONTRACTOR shall send each labor union or workers’ representative or understanding, a notice advising said labor union or workers’ representative of its commitment to this nondiscrimination clause. Similar notice shall be sent to every other source of recruitment regularly utilized by the CONTRACTOR.
1. **Contract Work Hours and Safety Standards Act Provisions**

The Contractor, if the contract is in excess of $2,000, and any of his subcontractors, shall comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 USC 327-330) as supplemented by Department of Labor Regulations contained in 29 CFR Part 5.

Under Section 103 of the Act, the Contractor and any of his subcontractors, shall be required to compute the wages of every mechanic and laborer on the basis of a standard work day of eight hours and a standard work week of forty hours. Work in excess of the standard work day or week is permissible, provided the worker is compensated at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of eight hours in any calendar day or forty hours in any work week. Section 5 of the Federal Labor Standards Provisions, for the Community Development Block Grant Program, dated 9/75, and appearing elsewhere in this Contract, sets forth in detail the Section 103 requirements.

Section 107 of the Act provides that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous to his health and safety, as determined under construction, safe and health standards promulgated by the Secretary of Labor. These requirements do not apply to the purchase of supplies or materials or articles ordinarily available on the open market.

2. **Lead-Based Paint Hazard**

The Contractor is hereby specifically made aware of the HUD lead-based paint regulations, 24 CFR, Part 35, which are applicable to the construction or rehabilitation of residential structures. To the extent that the subject matter of this Contract involves residential structures, the Contractor will comply with the lead-based paint regulations.

3. **Compliance with Air and Water Acts**

This Agreement is subject to the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Control Act, as amended, 32 USC 1251 et seq., and the regulations of the Environmental Protection Agency with respect thereto, at 40 CFR Part 15, as amended from time to time.

The Contractor and any of its subcontractors for work funded under this Agreement which is in excess of $100,000 agree to the following requirements:

1. A stipulation by the Contractor or subcontractors that any facility to be utilized in the performance of any non-exempt contract or subcontract is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR 15.20.

2. Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act; as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.

3. A stipulation that as a condition for the award of the Contract prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized or to be utilized for the Contract is under consideration to be listed on the EPA List of Violating Facilities.

4. Agreement by the Contractor that he will include or cause to be included the criteria and requirements in paragraph (1) through (4) of this Section in every non-exempt subcontract and requiring that the Contractor will take such action as the Government may direct as a means of enforcing such provision.
In no event shall any amount of the assistance provided under this Agreement be utilized with respect to a facility which has given rise to a conviction under Section 113(c)(1) of the Clean Air Act or Section 309(c) of the Federal Water Pollution Control Act.

4. **Interest of Members, Officers, or Employees of Public Body, Member of Local Governing Body, or Other Public Officials**

No member, officer, or employee of the Public Body, or its designees or agents, no member of the governing body of the locality in which the program is situated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the program during his tenure or for one year thereafter, shall have any interest, direct or indirect, in any contract or subcontract, or the proceeds thereof, for work to be performed in connection with the program assisted under the Agreement.

5. **Prohibition Against Payments of Bonus or Commission**

The assistance provided under this Agreement shall not be used in the payment of any bonus or commission for the purpose of obtaining HUD approval of the application for such assistance, or HUD approval of applications for additional assistance, or any other approval or concurrence of HUD required under this Agreement, Title I of the Housing and Community Development Act of 1974 or HUD regulations with respect thereto; Provided, however, that reasonable fees or bona-fide technical consultant managerial or other such services, other than actual solicitation, are not hereby prohibited if otherwise eligible as program costs.
SUPPLEMENTAL GENERAL CONDITIONS

FEDERAL AND STATE STATUTES

This Section is a listing of Federal and State statutes, rules, and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources that could effect the project. The CONTRACTOR shall be responsible for compliance with all applicable statutes, rules and regulations, including, but not limited to the following.

PENNSYLVANIA STATUTES AND REGULATIONS


Pennsylvania Sewage Facilities Act, Act of January 24, 1966, P.L. 1535, Subsection 1 (35 P.S., Subsection 750.1) and Chapters 71 and 73 of Department of Environmental Resources regulations promulgated thereunder.

Air Pollution Control Act, Act of January 8, 1960, P.L. 2119, as amended, October 26, 1972, 35 P.S. Subsection 4001 et seq. and Chapters 121, 123, 127, 129, 131, 135, 137, 139, and 141 of Department of Environmental Resources regulations promulgated thereunder.

Surface Mining Conservation and Reclamation Act, Act of May 31, 1945, P.L. 1193, as amended, 52 P.S. 1396.1 et seq. and Chapter 77 of Department of Environmental Resources regulations promulgated thereunder.

Bituminous Coal Open Pit Mining Conservation Act, Act of May 31, 1945, P.L. 1198, 52 P.S. 1396.1 et seq.


Atomic Energy Act, Act of January 28, 1966, P.L. 152s, Subsection 301 (73 P.S. 1301) and Chapters 221, 227, 229, 231, 233, and 235 of the Department's Regulations issued thereunder.

Act of November 18, 1968, P.L. (No. 322), Subsection 4, (63 P.S. 1004) and Chapters 301, 303, and 305 of the Department's regulations promulgated thereunder.

The State-Pennsylvania Environmental Bill of Rights, Article 1, section 27 of Pennsylvania Constitution.

Land Acquisition Act, Act of June 22, 1964, P.L. 131, 72 P.S. 3946.1 et seq.
Act authorizing Commonwealth to acquire open space, Act of January 19, 1968, P.L. 992, 3 P.S. 5001 et seq.


Brandywine River Valley Compact, Act of September 9, 1959, P.L. 848, 32 P.S.

Great Lakes Basin Compact, Act of March 22, 1956, P.L. 1333, 32 P.S. 817.1-817


Ohio River Valley Sanitation Compact, Act of April 2, 1945, P.L. 103, 32 P.S., 816.1 et seq.

Potomac River Valley Compact, Act of May 29, 1945, P.L. 1134 32 P.S. 741 et seq.

Act of June 4, 1945, P.L. 1383, 32 P.S. 751.1 et seq.

Uniform Interstate Air Pollution Agreements Act, Act of February 17, 1972

Act limiting the amount of noise produced by motor vehicles, providing noise testing and fixing penalties, Act of January 26, 1972

Act regulating vehicle emission systems, Act of June 16, 1972


Hazardous Substances: Transportation Act, 1966 of (November 9, 1966), 75 P.S., 2101 et seq., P.L. 657


State Highway Law, Act of (June 1, 1945), 36 P.S. 670-101 et seq., P.L. 1242, as amended.


Regulating snowmobiles, providing registration and fees, and providing penalties, Act of (August 12, 1971)
Providing for roadside landscaping and scenic development, Act of (September 27, 1966), 36 P.S. 670-413.1, P.L. 94

Act restricting the establishment and maintenance of junkyards along highways, Act of (July 28, 1966), 36 P.S. 2719.1 et seq., P.L. 91

Camp Regulation Act, Act of (November 10, 1959), 35 P.S. 3001 et seq., P.L. 14

The Fish Law of 1925, Act of May 2, 1925, P.L. 448, as amended, 30 P.S. 1 et seq.

Act creating the “Pennsylvania Historical and Museum Commission”, Act of June 6, 1945, P.S. 61, 62, 70, 104, 142, 158, 716, P.L. 1398

Relating to wildlife land management and research, Act of (June 24, 1939), 34 P.S. 1311.944, P.L. 239

Penal Code, Act of (June 24, 1939) 18 P.S. 4101 et seq., P.L. 872, as amended

Workmen's Compensation Act, Act of (June 21, 1939), 77 P.S. 1 et seq., P.L. 15

Occupational Disease Act, Act of (June 21, 1939), 77 P.S. 1201 et seq., P.L. 5

The Game Law, Act of (June 3, 1937), 34 P.S. 1311.1 et seq., P.L. 1225

Uniform Standards Code for Mobile Homes, Act 69, May 11, 1972

Industrial Housing Act, Act 70, May 11, 1972


Housing Agency Law, P.L. 1688 (1959), 35 P.S. 1680, 101 et seq.


Local Health Administration Law, Act of (August 24, 1951) 16 P.S. 1201 et seq, P.L. 1305

Housing and Redevelopment Assistant Law, Act of (May 20, 1949) 35 P.S. 166I et seq., P.L. 1633

Housing and Redevelopment Assistance Law, Act of (May 20, 1949) 72 P.S. 5860 612; 5860 701, 5860 703; P.L. 579


General Safety Law, Act of (May 18, 1937), 43 P.S. 25-1 et seq., P.L. 654

Explosives Law, Act of (July 1, 1937), 73 P.S. 151 et seq., P.L. 2681

Milk Sanitation Law, Act of (1935), 31 P.S. 645 to 660g


Development Act, Act of (May 6, 1968), 73 P.S. 361 et seq.

Urban Redevelopment Law, Act of (November 16, 1967), 35 P.S., 1704. 1 et seq., P.L. 498
Industrial Development Assistance Law, Act of (May 31, 1956), 73 P.S. 351 et seq., P.L. 1911

Industrial Development Authority Law, Act of (May 17, 1957), 73 P.S. 301 et seq., P.L. 1609

Commerce Law, Act of (May 10, 1939), 71 P.S. 1709-1 et seq., P.L. 111

Act 484 (August 23, 1961) bringing clay mines within the scope (Subsidence Insurance) of the Act, Act of (July 1, 1971)

Refuse Disposal Control Act, Act of (September 24, 1968), 52 P.S. 3051 et seq.

Bituminous Mine Subsidence and Land Conservation Act, Act of (April 27, 1966), 52 P.S. 1406.1 et seq., P.L. 31

Interstate Mining Compact, Act of (May 5, 1966), 52 P.S., 3251 et seq., P.L. 40


Oil and Gas Conservation Law, Act of (July 25, 1961), 58 P.S. 401 et seq., P.L. 825

Laws relating to bituminous coal mines, Act of (July 17, 1961), 52 P.S. 701-101 et seq., P.L. 659

Relating to Subsidence Safety, Anthracite Coal, Act of (Sept. 20, 1961), 52 P.S. 672.1 et seq., P.L. 1538


Providing for anthracite mine drainage, Act of (July 7, 1955), 52 P.S. 687 et seq., P.S. 258


FEDERAL STATUTES & REGULATIONS


Atomic Energy Act of 1954 4z U.S.C., Sec. 2011

<table>
<thead>
<tr>
<th>Year</th>
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<td>2012</td>
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**42 U.S.C.**

- 2011. ..... 10 C.F.R. Parts 1 and 4
- 2013. ..... 10 c.F.R. Part 50
- 2021. ..... 10 c.F.R. Part 150
- 2051. ..... 10 c.F.R. Part 37
- 2071. ..... 10 c.F.R. Part 70
- 2073. ..... 10 c.F.R. Parts 20, 70-73
- 2077. ..... 10 c.F.R. Part 110
- 2092. ..... 10 c.F.R. Part 40
- 2093. ..... 10 c.F.R. Parts 20, 40, 71
- 2111. ..... 10 c.F.R. Parts 20, 30-40, 71
- 2131. ..... 10 c.F.R. Part 50
- 2132. ..... 10 c.F.R. Parts 2, 50
- 2133. ..... 10 c.F.R. Parts 20, 50
- 2134. ..... 10 c.F.R. Parts 20, 50
- 2137. ..... 10 c.F.R. Parts 55
- 2232. ..... 10 c.F.R. Parts 30, 32-38, 40-50, 70-71, 100
- 2233. ..... 10 c.F.R. Parts 2, 30-36, 40-50, 70-71, 73
- 2234. ..... 10 c.F.R. Parts 30, 40, 50, 70
- 2235. ..... 10 c.F.R. Part 50
- 2236. ..... 10 c.F.R. Parts 2, 30, 36, 40, 50, 55, 70
- 2237. ..... 10 c.F.R. Parts 30, 40, 50, 55, 70
- 2239. ..... 10 c.F.R. Parts 2, 50
- 2241. ..... 10 c.F.R. Parts 2, 115

Bankhead-Jones Tenant Act, 7 U.S.C. 1010, 1012

- 1011: 55 C.F.R. 211, 231, 7 C.F.R. Part 15, 600, 1800
- 1012: 7 C.F.R. Part 5

Black Bass Act

- 16 U.S.C. 851
- 852
- 852a
- 852b
- 852c
- 853
- 854
- 855
- 856

Clean Air Act

- 1857d, 1857d-1, 1857e, 1857-6b, 1857f t. 1857f-5a,
- 1857-6 to 1857f-6c, 1857f-6e, 1857f-7, 1857f-9 to
1857f-12, 1857g, 1857h to 1857h- 1857i, a857j to 1857-3, 1857k, 18571, 1858, 1858a.

42 U.S.C, 1857 et seq. 40 C.F.R. Parts 30, 51
1857b 42 C.F.R. Parts 52,61
1857c 40 C.F.R. Part 81
1857f-3 19 C.F.R. Part 12
1857f-6b 40 C.F.R. Part 30
1857f-6c 40 C.F.R. Part 79
1857g 40 C.F.R. Parts 81 and 85
42 C.F.R. Parts 52 and 61
1857h-2 45 C.F.R. Part 54
1858 et seq. 40 C.F.R. Part 30

Consolidated Farmers Home Administration Act of 1961

7 U.S.C. 1921 7 C.F.R. Part 1800
1922; 7 C.F.R. Part 15, 1821
1923 7 C.F.R. Part 15, 1821
1924 7 C.F.R. Part 15, 1821
1925 7 C.F.R. Part 1821
1926 7 C.F.R. Part 15

Delaware River Basin Compact 75 Stat. 688 Enacted 1961


Dingell-Johnson Sport Fish Restoration Act, 23 U.S.C. 204; 23 C.F.R. Part 15


Environmental Protection Agency Regulations, 40 C.F.R. Part 15

23 U.S.C. 131 23 C.F.R. Parts 20, 21, 22
205 36 C.F.R. Parts 212

National Historic Preservation Act of 1966

16 U.S.C.

Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C.
135, 135a, I35b-k
135d 40 C.F.R. Part 162, 164

Federal Power Act
16 R.S.C. 803; 18 C.F.R. Parts 4-8, 11-12, 131;
16 R.S.C. 828

Federal Water Project Recreation Act, 16 U.S.C. 460L-5, 460L-72 to 460L-21
16 U.S.C. 460L-5 36 C.F.R. Part 251

Fish and Game Sanctuary Act, 16 U.S.C. 694-694b

Fish Restoration and Management Project Act, 16 U.S.C. 777-777k, 777a, 777c, 777c-777g, 16 U.S.C. 777 43
C.F.R. Part 17

Fish and Wildlife Act of 1956, 16 U.S.C. 742a-742j
16 U.S.C. 742c 50 C.F.R. Part 250
742c 50 C.F.R. Part 255
260-264
266-279

Fish and Wildlife Coordination Act, 16 U.S.C. 661-666c


Game and Wildlife Act, 16 U.S.C, 715d-1, 715d-2, 715e, 715e-1, 715k-1, 715s, 718b-818e;
16 U.S.C. 715s
18 U.S.C. 42, 44, 2054, 3112;
16 U.S.C. 715
43 C.F.R. Part 17
50 C.F.R. Parts 28, 34
18 U.S.C. 42
19 C.F.R. Part 12
50 C.F.R. Part 13

Highway Beautification Act of 1965, 23 U.S.C. 131, 23 C.F.R. Parts 20, 21 @ 22


Migratory Bird Conservation Act, 16 U.S.C. 715-715r, 715g, 715c, 715i-715k,
16 U.S.C. 715i
36 C.F.R. Part 322
43 C.F.R. Parts 5, 4250
50 C.F.R. Parts 25-33, 60

Migratory Bird Treaty Act, 16 U.S.C. 703-708, 709a, 710, 668aa, 668b, 668d-1
60 U.S.C. 668aa,
50 C.F.R. Part 17
668bb 50 C.F.R. Parts 70, 71, 31, 35
668cc-1 50 C.F.R. Part 17

Multiple-Use Sustained Yield Act of 1966, 16 U.S.C. 475, 528, 531
16 U.S.C. 475
36 C.F.R. Part 221
528-531
36 C.F.R. Part 212, 221, 251-261

Federal Noise Control Act of 1972, 42 USCA Section 1858

National Emission Standards Act, 42 U.S.C. 1857f-1 to 1857f-7
42 U.S.C. 4321 et. seq.  40 C.F.R. Part 30
4332
45 C.F.R. Part 640
10 C.F.R. Part 50
14 C.F.R. Part 1204
National Trails System Act, 16 U.S.C. 1241-1249,
36 C.F.R. Part 251
National Wildlife Refuge System Administration Act of 1966,
16 U.S.C. 668dd, 668ee
16 U.S.C. 668dd  50 C.F.R. Part 32
33 U.S.C. 1007  46 C.F.R. Parts 2, 35, 78, 93, 97,
1008-1011 32 C.F.R. 151
Parts 25-29, 31-33, 70-71
River and Harbor Act of 1958, 33 U.S.C. 610
Soil Conservation and Domestic Allotment Act
16 U.S.C. 590-a-590-g, 590i, -590o
16 U.S.C. 590a-7  C.F.R. Part 15;
16 U.S.C. 5909  7 C.F.R. Parts 701-706, 708, 780
Solid Waste Disposal Act,
42 U.S.C. 3251-3259,  40 C.F.R. Part 30
Water Bank Act, 16 U.S.C. 1301-1311
Watershed Protection and Flood Prevention Act,
16 U.S.C. 1001-1008, 1006a, 1006b
1006a  7 C.F.R. Part 1800, 1861
Wetlands Acquisition Act, 16 U.S.C. 715K-3 to 715K-5
Wilderness Act, 16 U.S.C. 1131-1136;
36 C.F.R. Parts 251-261,
43 C.F.R. Part 19
50 C.F.R. Part 35
Wildlife Restoration Act, 16 U.S.C. 669-669b, 669c-669i
669i  50 C.F.R. Part 30
Wild and Scenic Rivers Act, 16 U.S.C. 1271-1287
SECTION 15000 - HVAC – GENERAL

BRAND NAME OR EQUAL

If an item in this solicitation is identified as “brand name or equal,” the purchase description reflects the characteristics and level of quality that will satisfy the Government’s needs. The salient physical, functional, or performance characteristics that “equal” products must meet are specified in the solicitation.

To be considered for award, offers of “equal” products, including “equal” products of the brand name manufacturer, must—

- Meet the salient physical, functional, or performance characteristic specified in this solicitation;
- Clearly identify the item by Brand name, if Make or model number;
- Include descriptive literature such as illustrations, drawings, or a clear reference to previously furnished descriptive data or information available to the Contracting Officer; and
- Clearly describe any modifications the offeror plans to make in a product to make it conform to the solicitation requirements. Mark any descriptive material to clearly show the modifications.

- The Contracting Officer will evaluate “equal” products on the basis of information furnished by the offeror or identified in the offer and reasonably available to the Contracting Officer. The Contracting Officer is not responsible for locating or obtaining any information not identified in the offer.
- Unless the offeror clearly indicates in its offer that the product being offered is an “equal” product, the offeror shall provide the brand name product referenced in the solicitation.

1.1 GENERAL

A. Applicable requirements of the Contract Documents, preceding the Technical Specifications, apply to this Section. In the event of conflict between the Specifications, the most stringent shall apply.

B. Separation of these Specifications into Divisions and Sections is for convenience only and is not intended to establish limits of work.

C. Consult index to be certain that set of Documents and Specifications is complete. Report omissions or discrepancies to the Owner’s Representative.

D. The Contractor shall employ high standards of good workmanship and shall pay special attention to the safety of the equipment. The installation of material and equipment shall be in conformance with the codes and standards listed in Paragraph: STANDARDS. The agency having the most stringent requirements shall be adhered to.

E. The Contractor shall make a thorough examination of the site and shall make due allowances for difficulties and contingencies to be encountered. All dimensions shall be checked and verified by the Contractor at the site.

F. The Contractor and all Sub-Contractors shall have a minimum of three years proven experience on projects with similar levels of complexity and magnitude. Experience shall be based on the experience as a company and not on the experience as individuals.
G. The Drawings and Specifications are intended to function as a common set of documents. Anything shown on the Drawings but not mentioned in the Specifications or mentioned in the Specifications and not shown on the Drawings shall be equally binding as if both noted on the Drawings and called for in the Specifications.

1.2 SCOPE

A. The work covered by and included in these Specifications consists of the furnishing of all materials, all equipment, labor, tools and supervision and performing all operations necessary for the proper and complete execution of the Heating, Ventilating and Air Conditioning work in strict accordance with the Specifications and the Drawings and subject to the terms and conditions of the Contract.

1.3 DEFINITIONS

A. The term "Contractor" or "HVAC Contractor" or "Mechanical Contractor" when used in this Specification refers to the Contractor responsible for all work under this Section.

B. The term "Provide" refers to this Contractor purchasing, delivering and installing as a part of this Contract.

C. The term "HVAC" refers to Heating, Ventilating and Air Conditioning.

D. The term "ATC" refers to Automatic Temperature Controls.

1.4 STANDARDS

A. Meet requirements and recommendations of applicable portions of the latest edition of all codes and standards, as adopted by the local authority having jurisdiction, including those listed.

1. Air Movement and Control Association Standards (AMCA)
   a. 210 Laboratory Methods of Testing Fans for Rating Purposes
   b. 230 Laboratory Methods of Testing Air Circulator Fans for Rating
   c. 500-D Laboratory Methods of Testing Dampers for Rating
   d. 500-L Laboratory Methods of Testing Louvers for Rating
   e. 511 Certified Ratings Program for Air Control Devices

2. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)
   a. 52 Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter

3. 90.1 2007 Energy Efficient Design for New Building

4. American National Standards Institute Standards (ANSI)
   a. ANSI/ASME B16.5 Pipe Flanges and Flanged Fittings
5. American Society of Mechanical Engineers (ASME)
   a. Boiler and Pressure Vessel Code and Interpretations Section VIII; Unfired
      Pressure Vessels (latest edition with addenda)

6. American Society for Testing and Materials Standards (ASTM)
   a. A-181 Carbon Steel Forgings For General Purpose Piping
   b. A-234 Piping Fittings of Wrought Carbon Steel and Alloy Steel For
      Moderate and High Temperature Service
   c. A-53 Welded and Seamless Steel Pipe
   d. B-88 Seamless Copper Water Tube
   e. E-84 Surface Burning Characteristics of Building Materials
   f. C-411 Test Method for Hot Surface Performance of High Temperature
      Thermal Insulation

7. American Welding Society Standards (AWS)
   a. B3.0 Qualification Procedure

8. The Uniform Construction Code (PA)

9. International Mechanical Code 2009 (IMC)


12. National Fire Protection Association Standards (NFPA)
   a. 70 National Electrical Code (NEC)
   b. 90A Installation of Air Conditioning and Ventilating Systems
   c. 96 Ventilation Control and Fire Protection of Commercial Cooking
      Operations
   d. 255 Surface Burning Characteristics of Building Materials

    Tube (Commercial) Radiation (latest edition)

14. Occupational Safety and Health Administration (OSHA)

16. Sheet Metal and Air Conditioning Contractors National Association, Inc., Publication (SMACNA)
   a. HVAC Duct Construction Standards: Metal and Flexible, Second Edition

17. Air Conditioning and Refrigeration Institute (ARI)
   a. ANSI/ARI 210/240 Unitary Air Conditioning Equipment and Air Source Heat Pump Equipment
   b. ANSI/ARI 410 Forced Circulation Air-Cooling and Air-Heating Coils
   c. ANSI/ARI 430 Central Station Air Handling Units
   d. ANSI/ARI 550 Centrifugal and Rotary Screw Water-Chilling Packages

18. Underwriters Laboratories Publication (UL)
   a. 1025 Electric Air Heaters
   b. 1995 Heating and Cooling Equipment

19. Regulations of the Pennsylvania State Police, Fire Marshall Division

20. Pennsylvania Department of Labor and Industry, Fire and Panic Regulations

B. Should any change in the Drawings and/or Specifications be required to conform to the codes, ordinances, regulations or laws mentioned above, the Owner's Representative shall be notified prior to the time of submitting bids.

1.5 NOTIFICATION

A. Trades that have work connected with the heating, ventilating and air conditioning work and trades that do preparatory work for heating, ventilating and air conditioning shall be notified for installation requirements and scheduling.

B. The Owner's Representative shall be informed of the installation schedule to allow sufficient time for inspection without any work delay.

C. All work shall be coordinated to avoid cutting of work in place and interfering with other operations.

1.6 CONTRACT DRAWINGS

A. Contract Drawings are diagrammatic and indicate the relation of piping, ductwork, connections and equipment. The Drawings do not indicate all offsets, elbows and fittings that may be required. Therefore, the Contractor shall carefully investigate the structural and finish conditions affecting the work. The Contractor shall furnish all offsets, elbows, fittings, hangers and accessories as may be required to meet these conditions at no additional cost to the Owner.
B. Do not scale the Drawings. The Contractor shall check conditions at the site for dimensions and sizes pertaining to the structure.

C. Do not deviate from the Drawings without prior approval.

1.7 LINES, GRADES AND SURVEYS

A. All necessary surveys, lines, grades and measurements are the responsibility of the Contractor desiring the information for the proper installation of his work. The Contractor is responsible for the proper installation of the work with respect to other Contractors.

B. Grades, elevations and locations shown on the Drawings are approximate and the Contractor shall check all such information on the site before proceeding with the work.

1.8 WORKMANSHIP

A. All equipment, piping, conduit, insulation, fixtures, etc. shall be installed meeting the accepted standards of the representative industry.

B. All work to be performed shall be done by qualified mechanics. All mechanics in the employ of this Contractor on this project shall be skilled in the phases of the work to which they are used. The mechanic's affiliation with labor organizations shall be acceptable to all trades employed on the project.

1.9 SUBMITTAL PROCEDURES

A. Transmit each submittal with an Owner's Representative's accepted form. Include one copy each for the Owner and the Owner's Representative in addition to copies required by the Contractor.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contractor, Sub-Contractor or Supplier; pertinent Drawing sheet and detail number and Specification Section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the work and Contract Documents.

E. Incomplete submittals shall not relieve the Contractor of providing a complete and functional system.

F. Schedule submittals to expedite the Project. Coordinate submission of related items.

G. Submittals by the Contractor must be in complete compliance with the Contract Documents unless exceptions are identified. Exceptions to the Contract Documents may only be made to improve the project. Exceptions cannot be taken which would provide an incomplete and/or nonfunctional system.

1. Exceptions must be included in/on the submittal in a separate paragraph or drawing block located below the Contractor's stamp identified by the title "Exception to Contract Documents." Exceptions cannot be part of the standard Contractor's stamp.
H. Provide space for Contractor and Owner's Representative review stamps.

I. The Owner's Representative will return Shop Drawings with the following designations:

1. Reviewed: Further submission not required.

2. Reviewed as Noted: Corrections must be incorporated in final installation. Further submission not required unless specifically noted.

3. Review Not Required: Placed in project files for information only.

4. Revise and Resubmit: Make necessary changes and resubmit prior to fabrication.

5. Rejected: Does not meet project requirements. Resubmit in accordance with Contract Documents.

J. Revise and resubmit submittals as required, identify all changes made since previous submittal.

K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.10 SHOP DRAWINGS/PRODUCT DATA

A. Submit manufacturer's installation instructions.

B. Submit Shop Drawings and/or catalog cuts for all specified materials and equipment, piping layouts and ductwork layouts.

C. Submit Shop Drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.

D. Mark dimensions and values in units to match those specified.

E. Show equipment sizes and locations, by dimensions, of ducts, equipment and other items.

F. Include wiring diagrams, hole location and sizes and other data that could affect work by other trades.

G. Show manufacturer's names, trade names, catalog numbers, accessories, special features and rating data.

H. Indicate required clearances for operating parts, for removal and for servicing.

I. Show performance data, including fan and pump curves.

J. Show sound power levels of all rotating equipment.

K. Indicate efficiencies and air leakage rates for filters and filter housings.

1.11 SUBSTITUTIONS

A. Any bidder wishing to substitute "or equal" equipment may request a substitution. Manufacturers which are submitted as substitutions for approved equal status are considered to have equipment of similar quality; however, the Contractor shall not assume
that a piece of equipment by a manufacturer submitted as a “substitution” will be automatically accepted. Compliance with the Drawings and Specifications is still required. If the substituted material is considered to be unacceptable, the Contractor shall provide the equipment as originally specified.

B. Substitutions are encouraged when there is significant cost savings or an improvement to project. Submit reasons for changes with any requests for substitution. All requests for substitutions must be made within 30 days of contract award unless stated otherwise in the General Conditions.

C. Bid alternates shall be clearly defined on the bid forms in order to be evaluated during the bidding process.

D. By submitting an alternate or substitution, the Contractor automatically agrees to the following:

1. The Owner shall be reimbursed by the Contractor for any additional costs incurred by the Owner's Representative to review the substituted materials, in accordance with the then current Owner's Representative's hourly rate.

2. The Owner shall be reimbursed by the Contractor for any additional costs incurred by the Owner's Representative for field or office conferences caused by the substituted materials in accordance with the then current Owner's Representative's hourly rate.

3. The consideration of alternates/substitutions does not obligate the Owner's Representative to accept same.

4. In the event a brand is approved and substituted, it is the responsibility of the Contractor to so coordinate his substituted material into the original work at no extra cost to the Owner or any other Contractor.

1.12 CUTTING AND PATCHING

A. The Contractor shall engage the services of a qualified General Contractor (as a Sub-Contractor) and shall provide complete information to this 'Sub' as to size of openings required in floors and walls, etc., so that such openings may be provided as the project progresses.

B. All cutting and patching of every nature required in connection with this Contract shall be done by the Contractor with mechanics experienced in their respective lines of work. All patching shall match adjacent finishes.

C. All cutting in the building shall be done with great care so as not to leave an unsightly surface, which may not be concealed by plates, escutcheons or other normal concealing construction. If such unsightly conditions occur, the Contractor shall be required, at his own expense, to engage the General Contractor to replace the damaged materials with new materials.

1.13 CONCRETE AND MASONRY WORK

A. Unless otherwise noted, all concrete bases, reinforcing, etc. and masonry work required to install the respective Contract Work shall be furnished and installed by the respective Contractor.
B. The Contractor shall furnish all materials, labor, equipment and tools necessary to complete concrete work.

C. Contractor shall provide minimum of four-inch thick concrete bases under all floor mounted equipment.

D. Contractor shall provide a minimum four inch thick concrete pad on six inches of 3/4 inch crushed stone for each outdoor condensing unit or heat pump.

E. All concrete work shall comply with the requirements of the ACI Building Code (ACI 318), the ACI Detailing Manual (ACI 315) and the Specifications for Structural Concrete for Buildings (ACI 301).

F. If cold weather construction is required, freeze protection must be provided for all concrete. The subgrade cannot be frozen. The concrete must be treated and blankets must be used during curing. All the requirements of ACI 306R must be followed. Any contractor not experienced in cold weather concrete construction shall obtain a copy of the most recent version of ACI 306R and take all precautions prescribed therein.

G. All reinforcing steel shall be manufactured from high strength billet steel conforming to ASTM Designation A-615, Grade 60. WWF shall comply with ASTM A-185.

1.14 MATERIALS

A. All materials and equipment provided by this Contractor shall be new, without imperfections and blemishes and shall be protected from the elements prior to installation in building.

B. All equipment shall be tested, listed and labeled by an approved authority (UL, AGA, ETL) and shall be installed in accordance with its listing. Installation instructions shall be available at the job site.

C. All equipment subject to specific requirements of the Owner's insurance company (gas trains, etc.) shall meet the insurance companies requirements.

1.15 METHODS

A. The HVAC Contractor shall confer with all other Contractors and shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the Drawings. Ductwork, piping or equipment improperly placed because of the HVAC Contractor's failure to obtain this information shall be relocated and reinstalled by the HVAC Contractor without additional expense to the Owner.

B. Each Contractor, upon request of the Owner's Representative shall expedite the work of a specific area, section or part of the project to permit the installation of another part of the work.

C. All ductwork, piping, accessories and equipment shall be installed in such a manner as to preserve access with sufficient space provided for proper operation and maintenance to any existing equipment or to any new equipment installed under this Specification or under other Specifications or Contracts for this building.

D. This Contractor shall coordinate his work with that of other trades so that all work may be installed in the most direct manner and so that interference between piping, ducts,
equipment, architectural or structural features will be avoided. In the case of interference results, the Owner's Representative shall decide which work is to be relocated, regardless of which is first installed. Such relocation shall be at no additional cost to the Owner.

E. All materials and equipment installed by the Contractor shall be firmly supported and secured to the building structure where required.

F. All items of labor, material and equipment not specified in detail or shown on the Drawings but incidental to, or necessary for, the complete and proper installation and proper operation of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for in detail by the Specifications or Drawings.

G. The Contractor shall provide isolation valves and unions or flanges at all pieces of equipment and at all branch take-offs serving five or more pieces of equipment (whether indicated or not) to facilitate replacement or service of the equipment.

H. All equipment shall be installed in accordance with the manufacturer's recommendations and installation instructions. The manufacturer's installation recommendations and instructions shall be considered part of this Contract.

I. Any questions regarding means or methods of construction shall be addressed during the bidding phase of the project.

1.16 SCHEDULING OF WORK

A. The Contractor shall attend all planning meetings, provide scheduling information and work with all trades to obtain a workable project schedule that meets the Owner's requirements.

1.17 PROTECTION

A. Each Contractor shall effectively protect his work and materials with tarpaulins or heavy plastic material against dirt, water, chemicals, plaster or damage during the entire period of installation or until he is directed to remove the coverings by the Owner's Representative. Any damaged material must be removed and replaced by the Contractor without additional cost regardless of the cause of the damage. All openings in pipes, fittings, ductwork, etc. must be effectively sealed to exclude dirt, sand and other foreign substances.

1.18 PROTECTION OF OWNER'S EQUIPMENT

A. The Contractor shall provide any temporary work required to protect the Owner's equipment and to contain the dust generated during construction. Any measures taken by the Contractor for the protection of equipment shall be installed to the satisfaction of the Owner or the Owner's Representative, which may include any and all provisions listed in DIVISION-1: GENERAL REQUIREMENTS and/or in accordance with the appropriate Technical Specifications for wood and plastics in DIVISION-6. An approved protection material is nylon reinforced flame retardant and anti-static Griffolyn T-75 ASFR 8 mil film. Telephone No. 1-800-231-6074.

1.19 WORK IN THE EXISTING BUILDING

A. The HVAC Contractor shall be responsible for thoroughly surveying the existing building to determine the extent and cost of installing new equipment and materials in the existing building.
B. All new equipment and materials shall be installed in the existing building as herein specified.

C. All Contractors, before starting any cutting of the present building, must first obtain approval from the Owner’s Representative on the site before cutting at each location. This Contractor shall provide any temporary work required to retain the dust generated by his work as may be directed by the Owner's Representative. All dust found, which has escaped the area of cutting, shall be properly removed by the Contractor without additional cost to the Owner.

D. All openings cut into the exterior of the existing structure must be completely sealed and waterproofed before leaving the job site each day. This shall be done by the Contractor responsible for the cutting.

E. Contractor should not assume utilities can be installed as shown. Drawings are diagrammatic and utilities may need to shift to accommodate existing conditions. In some cases equivalent duct sizes may be required to be used or relocating and existing utility may expedite or simplify construction. It is believed that in general the project can be constructed with utilities in approximately the locations as shown.

F. Construction phasing could require installation of some temporary feeds and system shutdowns to accommodate construction.

1.20 INTERRUPTION OF SERVICES

A. The Contractor shall schedule his work to avoid any interruption of any utility services to the operation areas of the building during normal working hours. Interruption of services shall be done during off hours at no additional cost to the Owner.

B. The Contractor shall notify the Owner and the Owner's Representative at least three days prior to any interruption of services. The scheduling of all interruptions shall be approved by the Owner.

1.21 RUBBISH REMOVAL AND CLEANUP

A. Each Contractor is responsible for periodic removal of all rubbish resulting from his work. All surplus material, refuse, rubbish, etc., shall be removed from the job site at completion of Contract. The Owner's Representative must be satisfied with the removal and cleanup.

1.22 DELIVERING AND STORAGE OF MATERIALS AND EQUIPMENT

A. Deliver accessories, small-unmarked parts, adhesives and incidental items to the site in manufacturer's original, unopened, labeled containers.

B. Store materials and equipment to prevent damage and injury. Store ferrous materials to prevent rusting. Store equipment to prevent staining and discoloring.

1.23 AS-BUILT DRAWINGS

A. During construction, the Contractor shall maintain a record set of red lined installation prints. He shall record on these prints, all deviations from the Contract Drawings in pipe sizing, duct sizing, equipment, pipe or duct location, depth of pipe cover and details.

B. At the completion of the work, the Contractor shall transfer this information neatly onto clean prints and forward them to the Owner's Representative.
1.24  OPERATION AND MAINTENANCE INSTRUCTIONS

A. Prior to completion of this project, the Contractor shall deliver to the Owner's Representative for approval three copies of an Operating and Maintenance Manual consisting of items outlined hereinafter.

B. The purpose of this manual is to assist the Owner in routine operation, maintenance, servicing, troubleshooting and procurement of replacement parts. All information in the manual shall be as-built and only material pertinent to the project shall be included.

C. The manual shall include the following:

1. Manuals shall be bound, 8-1/2 x 11 inch text pages and set in three-ring binders with durable covers.

2. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of project and subject matter of binder when multiple binders are required. All subject matter shall be in typewritten format.

3. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab labeling clearly printed under reinforced laminated plastic tabs.

   a. Contents: Prepare a Table of Contents for each volume with product or system description identified, type on white paper.

   b. Part 1: Directory, listing names, addresses and telephone numbers of Owner's Representative, Contractor, Sub-Contractors and major equipment suppliers.

   c. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses and telephone numbers of Sub-Contractors and suppliers. Operating and start-up instructions shall be written in a concise step-by-step manner. Maintenance instructions shall include maintenance schedules, procedures, adjustments and troubleshooting techniques. All non-pertinent information in the manuals shall be either eliminated or crossed out in a neat and thorough manner. Identify the following:
      1) List of equipment
      2) Parts list for each component
      3) Operating instructions
      4) Maintenance instructions for equipment and systems

   d. Part 3: Project documents and certificates, including the following:
      1) Corrected shop drawings and product data
      2) Control wiring diagrams
      3) Certificates
      4) Photocopies of warranties

   e. Submit one copy of completed volumes in final form 30 days prior to final inspection. This copy will be returned after final inspection, with the Owner's Representative's comments. Revise content of documents as required prior to final submittal.

   f. Submit final volumes revised, within ten days after Owner's review.
1.25 PAINTING

A. Where factory finishes are provided and no additional field painting is specified; all marred or damaged surfaces shall be touched up or refinished to a smooth and uniform finish.

B. All exposed ferrous metalwork, pipe, supports, hangers, insulation, exterior equipment including aluminum and other surfaces not factory painted shall be painted with one prime and two finish coats. Paint, surface preparation and application shall be as specified in Section: PAINTING. Colors shall match existing work or shall be as selected by the Owner's Representative.

1.26 LAWS, ORDINANCES AND REGULATIONS

A. All systems in all and/or part shall conform to all pertinent laws, ordinances and regulations of ALL bodies having jurisdiction, at all governing levels. In case of conflict between governing levels, the more stringent law shall apply. As a minimum, all work shall comply with IMC, IBC, NFPA, OSHA, SMACNA and Pennsylvania Labor & Industry requirements.

B. The Contractor shall pay all fees, prepare and submit all utility applications and obtain and pay for all permits, inspections, and certifications required for his work including L&I boiler room plans and L&I inspections and approvals.

1.27 BUILDING EXPANSION JOINTS AND FIRE RATED ASSEMBLIES

A. Provide expansion joints in ductwork and piping where they cross building expansion joints.

B. Provide fire dampers in all penetrations through fire rated floors, walls and partitions and provide ceiling radiation dampers in penetrations through fire rated ceiling assemblies as required to maintain the necessary fire rating and/or UL rating of the assembly.

C. Meet all requirements of Underwriter's Laboratories and all applicable codes for maintaining the integrity of all fire rated assemblies.

D. Seal space around ducts, pipes or conduits with approved fireproof material where they pass through fire rated assemblies.

E. Contractor shall engage the services of a fire protection contractor to review the drawings and install fire protection products to maintain the integrity of all pipe, wire, conduit, duct, diffuser, register, grille, etc. penetrations through any and all fire rated walls, floors, barriers, and assemblies. Fire stop training and products shall be 3M or approved equal.

1.28 ACCESS DOORS

A. The Contractor shall provide access panels/access doors for access to dampers, valves, controllers or any other equipment or component requiring access for maintenance, adjustment or service wherever these items are concealed in building walls, partitions or ceilings. Frames shall be anchored in walls, partitions or ceilings and shall be set true to lines of the building and flush with the finished surfaces. Access panels/access doors shall be as specified in the General Construction Sections of the Specifications.

1.29 FASTENING, SUPPORTS AND HANGERS

A. All fastenings, supports, hangers, miscellaneous steel, clamps and anchors shall be of the type made for the specific purpose for which they are to be used. Toggle bolts or machine
bolt fastenings shall be used for hollow tile, terra cotta or lath construction. Machine screws shall be used for structural steel fastenings. Lead expansion shield and machine screws or lag screws shall be used for solid masonry fastening. Lag screws shall be used for wood fastening. All equipment, piping and ductwork shall be rigidly and firmly installed to prevent swaying, vibrating or sagging by malleable or wrought steel hangers of standard design, pipe clamps or fabricated steel supports of approved design. Hangers of horizontal piping runs shall be adjustable clevis-type. Perforated strap iron hangers and caddy clips are not permissible.

1.30 CONCRETE INSERTS

A. The HVAC Contractor shall provide and install concrete inserts of an approved carbon steel wedge-type for all hangers. Where two or more parallel pipes are installed continuous inserts may be used. Where required to distribute the load on the inserts, a piece of reinforcing steel of sufficient length shall be passed through the insert. Each insert shall include a knockout piece. Inserts shall have a minimum safety factor of five.

1.31 SLEEVES

A. The HVAC Contractor shall provide and install sleeves where required to protect equipment or facilities in the installation. Each sleeve shall extend through its respective floor, wall or partition and shall be cut flush with each surface unless otherwise required.

B. Sleeves in bearing and masonry walls, floors and partitions shall be of standard weight steel pipe, finished with smooth edges. For other masonry partitions, through suspended ceilings and for concealed vertical piping, sleeves shall be No. 22 U.S.G. galvanized iron.

C. All sleeves shall be properly installed and securely cemented in place.

D. Floor sleeves shall extend one-inch above the finished floor. Space between floor sleeves and passing conduit shall be caulked with an approved graphite packing or waterproof caulking compound.

E. Where pipes pass through waterproofed floors or walls, design of sleeves shall be such that waterproofing can be flashed into and around the sleeves.

F. Where pipes, ducts or conduits pass through fire resisting portions of the structure, the annular space between the sleeve and the pipe, duct or conduit shall be filled with an approved fireproof material as required to maintain the fire rating of that portion of the structure.

1.32 FIRE STOPPING

A. The contractor shall be responsible to provide and install fire-stopping materials and/or systems where his work penetrates fire and/or smoke rated portions of the building and non-fire resistance-rated assemblies. All materials used shall be manufactured such that they are intended to resist the spread of fire and the passage of smoke. This includes but is not limited to rated walls, floors, shafts, ceilings, and non-fire resistance-rated horizontal assemblies. All fire stopping materials used shall have a fire resistance rating equal to or greater than the rated assembly for which they are installed.

B. For locations where the installed fire stopping material is exposed to normal view, the contractor shall conceal the material with chrome-plated escutcheon plates or other materials that have a flame-spread value of 25 or less and a smoke developed rating of 50.
or less, as determined per ASTM E 84. The concealing device shall be approved by the owner's representative prior to installation. Provide shop drawings for each device.

C. The contractor shall provide components/accessories for each fire-stopping system that are needed to install fill materials and to comply with all system performance requirements as recommended by the fire stopping material manufacturer. Accessories include but are not limited to: mineral wool insulation, ceramic fiber, sealants used to aid in the formation of the fire stopping materials, fire-rated formboard, joint fillers and sealers, collars and steel sleeves.

D. Fire stopping materials and systems shall include, but are not limited to, the following: fire barrier caulk and sealants, intumescent caulk, intumescent putty, intumescent wrap strips, silicone foams and sealants, fire barrier composite sheets and cast-in-place fire barrier systems.

E. Fire stopping materials and systems shall as manufactured by 3M Fire Protection Products, Hilti Corporation, ProSet Systems Inc.

1.33 ANCHOR BOLTS

A. The Contractor shall provide and set in place, at the time of pouring of concrete foundations, all necessary anchor bolts as required for the equipment called for in these Specifications. Anchor bolts shall be of the hook-type, of proper size and length to suit the equipment. Anchor bolts shall be set in pipe sleeves of approximately twice the bolt diameter and one half the embedded length of the bolt. The Contractor shall assume full responsibility for proper coordination and placement of the bolts. Upon completion of equipment installation, pipe sleeves shall be caulked in accordance with Paragraph: "SLEEVES" in this Section of the Specifications.

1.34 DEMOLITION

A. The Contractor shall perform all demolition work as indicated on the Drawings and as described below as part of this Contract.

B. The Contractor shall cut and patch as required to perform the demolition work. All openings created must be repaired to match existing conditions.

C. All cutting and patching shall be performed by mechanics experienced in their respective line of work. If the Owner's Representative is not satisfied with quality of work, the Contractor shall be required, at his own expense, to engage the General Contractor to replace damaged materials with new materials.

D. The Owner shall be given the opportunity to retain ownership of all removed materials and equipment. All such items shall be carefully handled and protected and shall be stored by this Contractor at the site as directed by the Owner. Any such materials and equipment not desired by the Owner shall become the property of the Contractor and shall be removed promptly from the project site. Disposal shall be in accordance with the regulations of the authorities at the disposal site.

E. If the Contractor encounters or suspects hazardous or toxic material, the Contractor shall advise the Owner immediately. The work in the affected area shall not be resumed by the Contractor until the hazardous material has been removed or rendered harmless by the Owner.
1.35 WARRANTY

A. The systems specified herein shall be guaranteed to be free from defects in workmanship and material under normal use and service for a period of one year (five years for all compressors) from date of substantial completion.

B. If, within the aforementioned warranty period, any material specified herein is proven to be defective in any way, it shall be replaced or repaired at no additional cost to the Owner. Warranty shall include providing of all labor and materials necessary for repair or replacement of any defective components. The Contractor is responsible for costs of any services required by equipment suppliers that are not included in suppliers’ warranties.

C. The Contractor shall, after acceptance of the installation by the Owner or the Owner’s Representative, provide any service incidental to the proper performance of the systems under the warranties outlined above for the time periods listed above.

END OF SECTION 15000
SECTION 15100 - HVAC - MATERIALS AND EQUIPMENT

1.1 GENERAL

A. All applicable requirements of Section 15000 - HEATING, VENTILATING AND AIR CONDITIONING, GENERAL shall apply to this entire Section and shall have the same force and effect as if fully included herein.

B. The Contractor shall coordinate installation of all equipment, ductwork, piping, conduit and other work to prevent obstructions, which might interfere with filter removal. Initial installation shall include one complete set of air filters installed by the Contractor. The Contractor shall also furnish one complete set of additional air filters for all filter housings for future installation.

1.2 SCOPE

A. The Contractor shall provide and install all material and equipment specified and shall furnish all appurtenances necessary to properly install the equipment and place it in operation.

1.3 MOTORS AND MOTOR STARTERS

A. Motors shall be high efficiency type built in accordance with NEMA Specifications.

1.4 VARIABLE FREQUENCY DRIVE (VFD)

A. Unless otherwise specified, VFDs shall be a combination type VFD motor starter with manual bypass and isolation. The VFD shall have an NEC compliant disconnect device (three pole switch or circuit breaker), bypass and normal overload protection, a Drive-Off-Bypass switch, a Hand-Off-Auto switch and 120 VAC control power transformer.

B. The AC drive and all associated optional equipment shall be UL listed according to UL 508C Power Conversion Equipment. A UL label shall be attached inside each enclosure as verification. The AC drive shall be designed, constructed and tested in accordance with NEMA, IEEE, ANSI, NEC, VDE and IEC standards.

C. Alternate control techniques other than pulse width modulated (PWM) are not acceptable.

D. The AC drive shall have metal oxide varistor (MOV) protection and shall convert the input AC mains power to an adjustable frequency and voltage as defined below.

1. For AC drives rated up to 75 HP, the AC drive manufacturer shall use a six pulse bridge rectifier design with AC line reactors for effective harmonic mitigation. The diode rectifiers shall convert fixed voltage and frequency, AC line power to fixed DC voltage. The power section shall be insensitive to phase rotation of the AC line.

2. For AC drives rated 100 HP and above, the AC drive manufacturer shall supply an 18-pulse topology using a multiple bridge rectifier design with integral reactor and phase shifting transformer. The 18-pulse configuration shall result in a multiple pulse current waveform that approximates near sinusoidal input current waveform. The power section shall be insensitive to phase rotation of the AC line.

E. The output power section shall change fixed DC voltage to adjustable frequency AC voltage. This section shall use insulated gate bipolar transistors (IGBT) or intelligent power modules (IPM) as required by the current rating of the motor. The VFD shall have one 16-bit microprocessor control logic circuit board for all horsepower ratings.
F. The AC drive shall be mounted in a Type 1 [Type 12] enclosure with an externally operated disconnect device. VFD's used outdoors shall have weather tight NEMA 4 enclosures. A mechanical interlock shall prevent an operator from opening the AC drive door when the disconnect is in the on position. Another mechanical interlock shall prevent an operator from placing the disconnect in the on position while the AC drive door is open. It shall be possible for authorized personnel to defeat these interlocks. Provisions shall be made for locking all disconnects in the off position with up to three padlocks. Provisions shall be made for accepting a padlock to lock the enclosure door.

G. Current limiting fuses sized for the motor shall be installed and wired to the AC drive input.

H. The AC drive shall be sized and matched to the AC motor manufacturer, horsepower, motor full load ampere, motor RPM, motor voltage and motor service factor of 1.15 (i.e., the drive maximum ampere rating shall be greater than or equal to 115 percent of the motor full load amperes).

I. The AC drive shall be sized to operate a variable torque or constant torque load as required for the application.

J. The speed range shall be from a minimum speed of 0.5 Hz to a maximum speed of 200 Hz.

K. The AC drive shall be designed to operate in an ambient temperature from minus ten to +40 degrees C (+26 to 104 degrees F). The maximum relative humidity shall be 95 percent at 40 degrees C, non-condensing. The AC drive shall be rated to operate at altitudes less than or equal to 3,300 feet. For altitudes above 3,300 feet, derate the AC drive by 1.2 percent for every 300 feet. The AC drive shall meet the IEC 68-2 Operational Vibration Specification. The AC drive shall meet IEC 664-1 and NEMA ICS 1 Standards.

L. The AC drive shall be designed to operate from an input voltage as shown on the Drawings +/- 10 percent. The AC drive shall operate from an input voltage frequency range of 60 Hz +/- two percent. The displacement power factor shall not be less than 0.95 lagging under any speed or load condition. The efficiency of the AC drive at 100 percent speed and load shall not be less than 96 percent.

M. The torque rated AC drive overcurrent capacity shall be 125 percent for one minute. The output carrier frequency of the AC drive shall be randomly modulated and selectable at 2, 4, or 10 kHz depending on drive rating for low noise operation. No AC drive with an operable carrier frequency above 10 kHz shall be allowed. The AC drive will be able to develop rated motor torque at 0.5 Hz (60 Hz base) in a sensorless flux vector (SVC) mode using a standard induction motor without an encoder feedback signal.

N. The AC drive shall be UL 508C listed for use on distribution systems with available fault current equal to the upstream protective device rating unless otherwise noted. The AC drive shall have a coordinated short circuit rating designed to UL 508C and NEMA ICS 7.1.09 and listed on the nameplate. The power converter shall be protected against short circuits, between output phases and ground; and the logic and analog outputs.

O. For a fault condition other than a ground fault, short circuit or internal fault, an auto restart function will provide up to five programmable restart attempts. The programmable time delay before restart attempts will range from one second to 600 seconds.

P. There shall be three skip frequency ranges that can each be programmed with a selectable bandwidth of 2 or 5 Hz. The skip frequencies shall be programmed independently, back-to-back or overlapping.
Q. The AC drive shall be factory preset to operate the motor load indicated. All programming shall be maintained in non-volatile RAM memory so the program will be maintained when power is removed.

R. The operator interface terminal will offer the modification of AC drive adjustments via a touch keypad. The display will be a high resolution, LCD backlit screen capable of displaying graphics such as bar graphs as well as six lines of 21 alphanumeric characters. A single keystroke scrolling function shall allow dynamic switching between display variables.

S. External pilot devices shall be able to be connected to a terminal strip for starting/stopping the AC drive, speed control and displaying operating status. All control inputs and outputs will be software assignable. Two-wire or three-wire control strategy shall be defined within the software. Two-wire control allows automatic restart of the AC drive without operator intervention after a fault or loss of power. Three-wire control required operator intervention to restart the AC drive after a fault or loss of power. The control power for the digital inputs and outputs shall be 24 VDC.

T. There will be two software assignable, optically isolated analog inputs. The analog inputs will be software selectable and consist of the following configurations: 0-20 mA, 4-20 mA.

U. There will be four software assignable, optically isolated logic inputs that will be selected and assigned in the software. The selection of assignments shall consist of run/reverse, jog, plus/minus speed (two inputs required), setpoint memory, preset speeds (up to two inputs), auto/manual control, controlled stop, terminal or keypad control, bypass (two inputs required), motor switching and fault reset.

V. Two voltage free Form C relay output contacts will be provided. One of the contacts will indicate AC drive fault status. The other contact will be user assignable.

W. The AC drive door mounted control island shall include a power 'on', drive 'run', drive fault light and hand-off-auto selector switch with manual speed potentiometer.

X. The AC drive shall include IEC rated isolation and bypass contactors complete with thermal overload relay, circuit breaker or molded case switch disconnect interlocked with the door, control power transformer, motor flux decay timer, drive run light, bypass run light and drive/off/bypass switch. The operator shall have full control of the bypass starter operation of the door mounted selector switch.

Y. Installation shall comply with manufacturer's instructions, drawings and recommendations. The AC drive manufacturer shall provide a factory certified technical representative to supervise the Contractor's installation, testing and startup of the AC drive(s) furnished under this specification. An on site training course shall be provided by a representative of the AC drive manufacturer for plant and/or maintenance personnel.

Z. All disconnect switches downstream of the VFD shall have an auxiliary contact wired to the VFD such that opening the disconnect de-energizes the VFD prior to disconnecting power to the motor.

1.5 VARIABLE REFRIGERANT FLOW SYSTEM

A. The HVAC basis of design shall be Trane 4TVR/4TVH Air Source VRF as scheduled.

B. Bidders shall provide the minimum system as indicated on drawing, including Heat Recovery or Heat Pump systems as defined by model and family numbers. All systems shall be capable of
providing the scheduled capacity at the location of the indoor unit regardless of pipe length. Nominal or catalog capacities will not be accepted.

D. The Heat Pump system shall consist of Trane 4TVH Air Source unit(s), multiple Trane indoor units, and Trane VRF System Controls.

1.1 QUALITY ASSURANCE

A. System efficiencies (SEER and HSPF) for units less than 65,000 BTUH shall be certified by AHRI standard 210-240, and shall be published for public review at www.ahrinet.org. Equipment that is “rated” in accordance with AHRI Standard 210-240, but not published for public review by AHRI shall not be accepted.

B. System efficiencies (IEER and SCHE) for units greater than 65,000 BTUH shall be certified by AHRI standard 1230, and shall be published for public review at www.ahrinet.org. Equipment that is “rated” in accordance with AHRI Standard 1230, but not published for public review by AHRI shall not be accepted.

C. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

D. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

E. Project shall comply with the applicable version of ASHRAE standard 15.

F. Project shall comply with the applicable version of ASHRAE 90.1

G. The VRF manufacturing facility shall be registered to ISO 9001 and ISO14001.

H. All components shall be provided by one manufacturer including but not limited to:
   1) Outdoor Units
   2) Indoor Units
   3) Mode Control Units as required
   4) All necessary and applicable controls for the VRF System
   5) Factory refrigerant charge for outdoor unit(s) only
   6) Factory Y and or T-Branch(s) as required
   7) Condensate Lift Pump(s) as shown on the contract documents
   8) Refrigerant Ball Valves as shown on the contract documents
   9) Service Software

1.2 DELIVERY, STORAGE AND HANDLING

A. Installing contractor will take all reasonable and appropriate care to store and handle equipment per the manufacturer’s recommendation.

1.3 SUBMITTALS

A. Installing contractor shall provide the following:
   1) Trane VRF Guide Specification
   2) Trane VRF Dimensional Data for all products submitted
   3) Trane VRF Product Data for all products submitted.
4) Trane VRF Select report showing design conditions, total load profile, and actual capacity at actual Indoor Unit location,
5) Trane VRF Select Piping and Wiring layout showing estimated piping, wiring sizes, equipment quantities, piping length estimate, and additional refrigerant charge.
6) Trane VRF Select Schedule showing the performance for all pieces of equipment.

1.5 INSTALLATION AND OPERATION MANUALS
A. Owner shall be provided with a complete and comprehensive electronic set of Installation and Operation Manuals.

1.5 QUALIFICATIONS
A. Manufacturer shall have a minimum of twenty-five (25) years of HVAC experience in the North America market.
B. Manufacturer to have Local Factory Service within seventy-five (75) miles of jobsite.
C. The Trane VRF system shall be installed by a Trane certified installer with extensive Trane VRF installation and service training. The mandatory contractor service and install training shall be performed by the manufacturer.

1.6 WARRANTY
A. The units shall be covered by the manufacturer’s standard limited warranty for a period of 12 months from date of installation. If during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.
B. The units shall carry an extended manufacturer’s parts and compressor warranty for a period of 10 years from date of installation. The following steps shall be taken by the contractor to ensure systems are eligible for extended warranty.
   1) System is designed and submitted using the approved application tool (Trane VRF Select).
   2) System installed by a contractor who has successfully completed the Trane factory training class.
   3) Upon completion of installation and prior to final commissioning, contractor shall provide revised piping layout reflecting actual installation conditions to Trane VRF technician for submittal to Trane Factory Service Department.
   4) Provide a verified and submitted commissioning report to Trane Factory Service Department.

2.1 MANUFACTURERS
A. Basis of design shall be: Trane VRF
B. The following manufacturers shall be allowed to bid as a deductive alternate provided they meet the scheduled performance indicated on the drawings:
   1) Daikin
   2) Mitsubishi

MATERIALS AND EQUIPMENT
2.2 HEAT PUMP AIR SOURCE UNITS

A. The Trane 4TVH VRF Heat Pump Air Source unit shall be specifically used with Trane VRF Heat Pump components. The unit electrical power shall be 208/230 volts or 460 volts, 3 phase, 60 hertz as specified. Units shall have weather tight construction for outdoor installation, (outdoor unit).

B. The Trane Heat Pump outdoor unit shall be equipped with multiple circuit boards. These boards shall perform all functions necessary for operation. The outdoor unit shall be completely factory assembled, internally piped and wired. Each unit shall be run tested.

1) The combination ratio of the nominal indoor cooling capacity versus the nominal outdoor rated cooling capacity shall range from 50% to 130%.
2) Outdoor unit shall have a sound rating no higher than 62/83(Pressure/Power) dB(A).
3) Unit shall have a night quiet setting to reduce nighttime sound levels.
4) All refrigerant lines from the outdoor unit to IDUs (Indoor Units) shall be field insulated with a minimum insulation as referenced in the Trane VRF IOM (VRF-SVN034A-EN) Table 27, “Pipe insulation selector.”
5) The outdoor unit shall have an accumulator.
6) The outdoor unit shall have a high pressure safety switch, fuse, over-current protection and crank case heater.
7) If the outdoor unit is above the indoor unit, the outdoor unit shall have the ability to operate with a maximum height difference of 361ft. If the indoor unit requirement is greater than 164 ft, contact your local Trane Sales Office.
8) If the outdoor unit is below the indoor unit, the outdoor unit shall have the ability to operate with a maximum height difference of 131 ft.
9) The system shall have a maximum total refrigerant tubing length of 3281ft.
10) The maximum length between outdoor unit and the furthest indoor units is not to exceed 656 ft (722 equivalent feet).
11) The maximum height difference between indoor units shall be 164 ft.
12) The outdoor unit shall be capable of operating in cooling mode from 23°F to 120°F.
13) The outdoor unit shall be capable of operating in heating mode from 75°F to -13°F ambient temperatures without additional low ambient controls, additional modules, or low ambient accessories.
14) The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
15) The outdoor units shall provide continuous heating during oil return and the defrost cycle through the use of rotational defrost. (multiple module systems)
16) Units shall have a snow blower feature to ensure the dispersion of accumulated snow

D. The unit casing(s) shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

E. The outdoor unit condenser fans shall be furnished with direct drive, variable speed motor(s). All fan motors shall have inherent motor protection, have permanently lubricated bearings. All fan motors shall be mounted for quiet operation. All fans shall be provided with a raised guard to prevent contact with moving parts. The outdoor unit shall have vertical discharge airflow.

F. R410A refrigerant shall be required for Trane VRF outdoor unit systems. Manufacturer shall only provide the refrigerant as required for unit charge. Contractor shall be required to provide additional refrigerant as specified in Trane VRF Select reports.

G. System shall use Polyvinylether (PVE) oil. Due to the increased risk of hydrolysis and formation of acids, Polyolester (POE) oil shall not be acceptable.
H. The outdoor condenser coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing. The condenser coil shall have Blue Fin anti-corrosion protection as a standard feature. The coil shall be protected with an integral metal guard. The coil fins shall be coated with hydrophilic paints.

I. The Trane VRF Heat Pump outdoor units shall be equipped with inverter driven vapor injection asymmetric scroll compressor(s). The asymmetric design will allow for only one point of contact for the scroll compressor blades resulting in reduced friction, and increased efficiency. Conventional scroll compressors with 2-points of contact will not be allowed due to their inherent inefficiency.

1) The outdoor unit compressor shall utilize inverter driven technology to modulate capacity. The compressors shall also utilize advanced technology adaptive sine wave control for reduced harmonics and faster frequency acceleration.
2) The compressor shall be capable of 1/60th second advanced micro-control.
3) The outdoor unit compressor shall utilize vapor injection technology which shall increase the mass flow rate of refrigerant, resulting in improved performance for low temperature conditions.
4) The compressor will be equipped with an internal thermal overload protection.
5) The compressor shall be mounted to avoid the transmission of vibrations.

J. Use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire for communications wiring. Splicing of communication wiring shall not be permitted.

2.3 4-WAY MINI/ 4-WAY CEILING CASSETTE INDOOR UNITS

A. The Trane 4TVB/4TVC are four-way cassette style indoor units that recess into the ceiling grid with an exposed ceiling grille and an integral 2000 step modulating expansion device. The unit electrical power shall be 208-230 volts, 1-phase, 60 hertz.

B. The indoor unit shall be a factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, the electronic modulating linear expansion device, control circuit board, and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. The unit shall be provided with a face mounted infrared receiver for use with a handheld wireless remote controller. The unit shall have an integral return air sensor.

C. The unit cabinet shall be a space-saving ceiling-recessed cassette.

D. The indoor fan shall consist of a turbo fan with a single direct drive motor. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings. The indoor fan shall have high, medium, and low fan speeds. The fan speed shall be adjustable by an optional remote controller. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution. If require the cassette shall be capable of closing off one or more vanes to prevent “stray airflow”.

E. Return air shall be filtered by means of a long-life washable permanent filter.

F. The indoor coil shall be constructed as follows:

1) The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2) The tubing shall have inner grooves for high efficiency heat exchange.
3) All tube joints shall be brazed with phos-copper or silver alloy.
4) The coils shall be pressure tested at the factory.
5) A condensate pan and drain shall be provided under the coil.
6) The coil fins shall be coated with hydrophilic paints.
7) The factory installed condensate lift mechanism shall be able to raise drain water 29.5 inches water column above the condensate pan.
8) Both refrigerant lines to the indoor units shall be insulated.

G. Use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire for communications wiring. Splicing of communication wiring shall not be permitted.

H. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 3 of this guide specification for details on controllers and other control options.

2.4 SLIM DUCT DUCTED INDOOR UNITS

A. The Trane 4TVL/4TVD/4TVA are ducted indoor fan coil designs that mounts above the ceiling. The unit shall have a 2000 step modulating expansion device. The unit electrical power shall be 208-230 volts, 1-phase, 60 hertz.

B. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, the electronic modulating linear expansion device, control circuit board, and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. The unit shall be capable of accepting a VRF Duct Signal Receiver (optional) for use with a handheld wireless remote controller. The unit shall have integral return air sensor, integral discharge air sensor, and integral contacts to interface with an external auxiliary heat source.

C. The unit cabinet shall be a space saving, ceiling-concealed, ducted unit. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. The indoor unit fan shall consist of two or three Sirocco fans, direct driven by a single motor. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall have high, medium, and low fan speeds. The fan speed shall be adjustable by an optional remote controller. The airflow may also be adjusted based on static pressure using the Trane VRF Technician Utility Tool (TUT).

E. The return air shall be filtered by means of a standard factory installed return air filter. An optional return filter box (rear placement) with high-efficiency filter shall be available for ducted indoor units. If using the optional return filter box, verify the filter/filter box performance is within the bounds of the unit’s external pressure performance.

F. The indoor coil shall be constructed as follows:

1) The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2) The tubing shall have inner grooves for high efficiency heat exchange.
3) All tube joints shall be brazed with phos-copper or silver alloy.
4) The coils shall be pressure tested at the factory.
5) A condensate pan and drain shall be provided under the coil.
6) The coil fins shall be coated with hydrophilic paints.
7) The optional field installed condensate lift mechanism shall be able to raise drain water 29.5 inches water column above the condensate pan.
8) Both refrigerant lines to the indoor units shall be insulated.

G. Use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire for communications wiring. Splicing of communication wiring shall not be permitted.
H. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 3 of this guide specification for details on controllers and other control options.

2.5 CONVERTIBLE AIR HANDLER INDOOR UNITS

A. The Trane 4TVM are convertible multi-position indoor air handler designs. The unit shall have a 2000 step modulating expansion device. The AHU electrical power shall be 208-230 volts, 1-phase. Units may use an optional 1-phase or 3-phase electric heater kit. 1-phase units may receive power via the 3-phase heater kit.

B. The unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, the electronic modulating linear expansion device, sensors, and fan motor. Sensors shall require field termination to the AHU Controller (4TVCTRLAHV001).

C. The unit shall require an AHU Controller (4TVCTRLAHV001). The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. The AHU controller shall interface with the Trane Wired Controller. The Wired Controller shall be installed in the occupied zone. The AHU controller shall be shipped separately for field installation and termination.

D. The unit cabinet shall mount upflow, or horizontal left, and is convertible to horizontal right. Unit shall have an insulated painted galvanized steel cabinet.

E. The indoor unit shall have a direct driven blower wheel. 2 through 4 tons shall have of a 3-speed, PSC direct drive motor. 5-ton units shall have an ECM direct driven motor. The indoor fan shall be statically and dynamically balanced, and run on a motor with permanently lubricated bearings. The indoor fan shall have high, medium, and low fan speeds.

F. The return air shall be filtered by a remote field installed filter. Verify the filter performance is within the bounds of the unit’s external pressure performance.

G. The indoor coil shall be constructed as follows:
   9) The indoor coil shall be of nonferrous construction with an all-aluminum coil.
   10) The coils shall be pressure tested at the factory.
   11) A poly carbonate condensate pan and drain shall be provided under the coil.
   12) Both refrigerant lines to the indoor units shall be insulated.

H. Use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire for communications wiring. Splicing of communication wiring shall not be permitted.

I. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 3 of this guide specification for details on controllers and other control options.

2.6 ACCESSORIES

A. Y-Joint Kits- are a required component for Trane VRF-Systems with multiple evaporators or MCU's on the same system. Y-joints shall be provided for liquid, suction, and hot gas fittings as required. Y-joints shall be provided with polystyrene insulation. Y-branches shall facilitate different pipe sizes without having to braze additional fittings. Field fabrication or substitution of non-Trane Y-Joints shall void warranty. Kits shall be installed per manufacturer guidelines. Requires field installation.
B. T-Joint Kits – are a required component for Trane VRF systems capable of operating multiple outdoor modules on a single system, (check catalog(s) for factory approved combinations). The T-Joint shall be provided for liquid, suction, and hot gas fittings as required. T-Joints shall be provided with polystyrene insulation. T-Branches shall facilitate different pipe sizes without having to braze additional fittings. Field fabrication or substitution of non-Trane T-joints shall void warranty. Kits shall be installed per manufacturer guidelines. Requires field installation.

C. EEV KITs- the EEV (Electronic Expansion Valve) provides refrigerant management of indoor units. The EEV shall be required for field installation on ceiling suspended (floor) indoor units. Heat Recovery systems shall use the one unit EEV kit. Heat Pump systems may utilize the one, two, or three unit EEV kits. Kits shall be installed per manufacturer guidelines. Requires field installation.

D. Condensate Drain Pumps shall be provided for field installation as required for efficient condensate management. Condensate pumps shall be capable of 29.5” of lift to allow condensate to reach the closest gravity drain line. Condensate pumps shall include a check valve to prevent water form flowing back into the indoor unit. Pump shall be mounted in the chassis of the indoor unit. Pump shall draw on required power from the associated indoor unit. Requires field installation (Standard factory installed for all ceiling cassettes).

E. Refrigerant Isolation Ball Valves - shall be provided for field installation as specified by the contract documents. Valves shall utilize a uni-body full port design to minimize leaks and internal pressure drops. Valves shall be rated for 700PSIG, and are offered with an optional factory insulation package. Valves shall be factory tested under pressure. Valves shall require polytetrafluoroethylene (PTFE) seals and gaskets. No synthetic O-rings are allowed. Design shall permit valve operation without removal of seal cap. Valves shall have a temperature operation range of -40°F to 300°F. Valves 5/8” and smaller shall be flare fittings. Valves larger than 5/8” shall be sweat fittings. Valves shall be provided with formed and fitted insulated jacket. Requires field installation.

F. Simple wired remote controller can be used with all Trane VRF Indoor Units. Remote shall utilize a multi-function LCD display and shall possess the following functionality:
   1) Power on/off setting
   2) Mode selection
   3) Temperature set point control
   4) Fan speed setting
   5) On/off timer
   6) Controls up to 16 idus
   7) Up to 2 simple remotes may be configured as Master Slave for 1 IDU
   8) Child lock
   9) Filter timer

G. The VRF Duct Signal Receiver is a wall or ceiling-mounted device that receives signals from the Wireless (Infrared) Remote Control. It re-transmits those signals to an associated concealed VRF Indoor Unit. This allows for use of remote control of concealed indoor units. Requires field installation.

H. Auxiliary heat contact shall enable the operation of external auxiliary supplemental heat (if scheduled or included).

I. Standard Cassette Panels shall be required with as indicated for all 1-way, Mini 4-way, and 4-way ceiling cassettes.
J. Filter Box is an optional return filter box (rear placement) that enables the use of high efficient filters with ducted concealed indoor units. If using the optional return filter box, verify the filter/filter box performance is within the bounds of the unit’s external pressure performance. Requires field installation.

K. Electric Heater Kit allows a Convertible Air Handling Unit (only) to provide supplemental heat with an optional electric resistance heater. The electric heater shall be available in 4KW, 5KW, 8KW, 10KW, 15KW, and 20 KW sizes. Heater kits are available with circuit breaker, pull disconnect, or lug connections (choose one). Review product IOM (VRF-SVX038A-EN) for specific kit details. Requires field installation.

L. Single point power entry kit allows a Convertible Air Handling Unit (only) to use single point power if the desired Electric Heater kit is greater than 10 KW. Heaters 10KW and less are single point connection as standard. Requires field installation.

M. Filter rack allows a Convertible Air Handling Unit (only) comes in three sizes and will accept a 1” filter. Rack is painted to match the Convertible Air handling Unit, and is hinged for easy front filter access. Requires field installation.

N. Mode Select Switch shall enable the manually override mode control for the VRF HP system. The switch shall set the operating mode as Cool, Heat, or Auto. (For use on heat pump systems only.) Requires field installation.

O. Hail guards shall protect the air source condenser coil(s) from damaging hail. Requires field installation.

P. Wind/Snow Prevention Duct. The kits are used in windy or snowy regions to prevent cold gusts of air from interfering with stable operation of the units. They are also for use in snowy regions to prevent snow from accumulating on the units. The kit is recommended when low ambient heating is required. The Wind/Snow prevention kit may require the additional use of the Duct Discharge Kit. Requires field installation.

Q. Snow Hood/Duct Discharge Kit protects the Air Source VRF Outdoor unit from heavy snowfall. The kit also allows the Air Source VRF unit to be located inside a structure, and duct the condenser discharge air to the exterior of the structure. Requires field installation.

3.1 ELECTRICAL CHARACTERISTICS

A. The Trane VRF System Network Controls shall operate at 12VDC. Controller power and communications shall be via a common non-polar communications bus.

B. Control wiring shall be installed in a system daisy chain configuration from the wired remote controller to the indoor unit, to the and to outdoor unit. Control wiring to wired remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.

C. Control wiring for system controllers, and centralized controllers shall be installed in a daisy chain configuration from interface module to interface module, to system controllers, to the power supply.

D. For communication wiring between ODUs, IDUs, MCU, system controller, and remote controllers use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire. Splicing of communication wiring shall not be permitted.

E. The Trane VRF SC Web UI shall be capable of being networked with the VRF System Controller TVCTRLTIMD00A0, system controllers for web based control.
F. Network wiring shall be CAT-5e with RJ-45 connection.

3.2 SYSTEM NETWORK CONTROLS

VRF-SYSTEM TOUCHSCREEN CONTROLLER

A. The VRF System Touchscreen shall provide an intuitive, fast and convenient method of centrally operating a Trane VRF system. The VRF System Touchscreen shall communicate with associated VRF components through a dedicated control network. It can control many comfort and energy-saving settings, including temperature, fan speeds, and operating schedules for up to 128 indoor units, and up to 16 outdoor units. The unit shall be housed in an attractive enclosure suitable for wall-mounting in an office, corridor or utility room.

B. The System Touchscreen shall feature a 7” Color Capacitive Touch Screen. The User interface shall display operating equipment icons indicating mode status at a glance. All units within a zone shall be managed with one-button control. Unique zone description icons shall make it easy to recognize a zone.

C. Control shall include but not be limited to the following; On/Off control, temperature set-point, mode settings Auto/Heat/Cool/Auto/Dry/Fan, air-direction adjustment, and local temperature set-point restrictions.

D. The System Touchscreen shall be capable of setting up to up to 10 unique schedules including exception day setting for holidays, and Daylight Saving Time adjustment.

E. The System Touchscreen shall be capable of grouping indoor unit in common zones. There may be up to 12 zones. Zones may be individually named.

F. The System Touchscreen shall provide management of multiple indoor units as 1 unit (Group control). Additionally, the controller shall provide monitoring and control points for Interlocking of external equipment via 2 Binary Inputs and 1 Binary Output.

G. The System Touchscreen shall provide an alarm/error display, and alarm history.

H. Security shall be provided by a secure password.

I. The System Touchscreen shall connect via R1/R2 VRF communications link for monitoring and control of up to 128-total Indoor Units and MCUs, associated with up to 16-outdoor units. Alternately, the system shall connect via F1/F2 VRF communications link for monitoring and control of up to 64-indoor units plus up to 16-MCUs, associated with 1-Outdoor Unit.

4.0 INSTALLATION

A. System shall be installed in accordance with manufacturer’s guidelines.

B. Installing contractor shall attend and successfully complete the Trane VRF Installation factory training class. Contractor shall submit certificate of completion as part of project closeout documents.

C. Installing contractor shall install units to comply with all applicable building codes.

D. Trane VRF systems shall be installed in such a way as to permit access for routine maintenance.
4.1 COMMISSIONING

A. Trane Factory Technician will support Installing Mechanical Contractor with 2 days of site support for system startup, commissioning, and trouble shooting.

B. Upon completion of installation and prior to final commissioning, contractor shall provide revised piping layout reflecting actual installation conditions to Trane VRF technician.

C. The system shall then be reviewed and commissioned by a Trane Factory VRF Technician. Contractor shall provide a verified and submitted commissioning report to Trane Factory Service Department, and to the owner’s agent verifying the system has met the requirements for proper installation, and function.

D. Engage a Trane Factory Certified VRF Technician to train owner’s maintenance personnel to adjust, operate, and maintain units.

1.6 AIR COOLED CONDENSING UNITS

A. Condensing units shall be scroll compressored air-cooled factory assembled and wired. They shall be constructed of a 14 gauge welded galvanized steel frame. Panels and access doors are 14 and 16 gauge, galvanized steel. The unit surface is phosphatized and finished with slate gray air-dry paint. This air-dry paint finish exceeds 500 consecutive hour salt spray resistance in accordance with ASTM B117. All units shall be standard with factory installed decorative louvered grilles to protect the condenser coils.

B. Scroll compressors shall be direct drive, 3600 RPM.

C. Condenser coils shall have configured aluminum fins mechanically bonded to seamless copper tubing with an integral subcooler. Condensers shall be factory leak tested at 450 PSIG air pressure underwater. Direct drive vertical discharge fans are statically and dynamically balanced. Three phase motors have permanently lubricated ball bearings and thermal overload protection. Low ambient allows operation down to zero degrees F with external damper assembly for head pressure control.

D. Units shall have two circuits with four capacity steps. Each circuit has two compressors piped in parallel.

E. Control shall include a W973 controller with four cool steps, which shall be provided.

F. Factory installed head pressure control damper assembly permits operation down to zero degrees F by maintaining proper head pressure. Ten minute timer is standard for protection against nuisance trips.

1.7 AIR HANDLING UNITS

A. Air handling unit shall be modular vertical type complete with low velocity combination filter/mixing box section, outside and return air dampers, coil section, drain pan, fan section, fan, motor and adjustable v-belt drive and vibration isolators. Unit shall be ARI Certified, carry the UL label and be rated in accordance with the AMCA test code. Units shall meet the capacities indicated on the Drawings and be as manufactured by the Trane Company.

B. Unit casing shall be designed for low pressure up to three-inch total static pressure. Casing shall be insulated with one-inch, 3/4-pound fiberglass insulation with a flame resistant coating. The casing shall be of sectionalized construction consisting of removable insulated panels.
supported by a steel frame. Fan and filter sections shall have access doors with handles. Drain pan shall extend completely underneath the coil sections. The unit’s insulation smoke and flame spread ratings shall be in accordance with NFPA. All surfaces inside and out shall be galvanized mill finish or painted with the manufacturer's standard paint.

C. Unit shall have a double width, double inlet forward curved centrifugal fan. Fan shall be statically and dynamically balanced as a complete fan assembly. Fan bearings shall be self-alining, selected for 200,000 hour average operating life. Bearings shall be greased from drive side of fan. Fan motors shall not exceed 1800 RPM and be of the energy efficient type. V-belt drives shall be designed for not less than 150 percent of the connected driving capacity and adjustable motor sheaves to provide not less than 20 percent speed variation. Sheaves shall be selected to drive the fan at such speed to produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motor shall be mounted externally of the unit. An OSHA approved fan belt guard shall be installed with provisions for RPM measurement.

D. Filters shall be factory furnished with the units, be 35 percent efficient and be as specified in Paragraph "Air Filters."

E. DX cooling coil shall be by the unit manufacturer.

F. Outside air and return air dampers shall have leakage rates less than nine CFM per square foot at one-inch w.g. differential pressure.

1.8 AIR FILTERS

A. Air filters shall be rated in accordance with the ASHRAE Standard Test 52 using atmospheric dust. Filters shall be listed by the Underwriter's Laboratories.

1. Prefilters shall be of the dry disposable pleated type. Filters shall have an average efficiency of 35 percent. Media shall be composed of a non-woven fine fibered media laminated to a rigid backing to hold the plant formation. Filters shall be encased in a sturdy kraftboard frame. Filters shall be Aeropleat as manufactured by Cambridge Filter Corporation.

1.9 AIR PURIFICATION SYSTEMS

A. The air purification system shall consist of a plasma ion generator with bipolar ionization output to reduce space contaminants in accordance with the ASHRAE 62.1 IAQ engineered exception. The system shall be as manufactured by Global Plasma Solutions, or equal.

B. GPS-FC-1 units shall be installed within all new VRF indoor air handlers.

C. Provide to the owner a portable hand-held ion counter with a calibrated range of 0 to 20,000 ions/cm3 and an accuracy of ±25% within the specified range. Ion counter shall have automatic zeroing capability on 10 minute intervals.

1.10 FANS

A. Centrifugal cabinet fans shall have centrifugal steel wheels, galvanized steel fan casing with integral backdraft damper, disconnect switch mounted and wired and perforated metal face grille with extruded aluminum frame where scheduled. Fans shall carry the UL label and be rated in accordance with the AMCA test code. Fans shall be provided with a speed controller. Capacities shall be as indicated on the Drawings. Fans shall be as manufactured by Loren Cook or equal with model numbers as scheduled.
1.11 PUMPS
A. Inline centrifugal pumps shall be equipped with cast iron casing and shall be bronze fitted with bronze impeller, bronze case wear ring, back pull-out design and mechanical seal having flush line positive circulation and venting, with seal being carbon against Ni-resist face with 303 stainless steel metallic parts and "Buna N" elastomers. Mechanical seal shall be mounted on bronze shaft sleeve. Pumps shall be driven by open drip-proof motors. All pumps shall have 175 PSIG case working pressure as standard. Pump capacities shall be as indicated on the Drawings. Pumps shall be as manufactured by Bell & Gossett, Taco or Grundfos and shall be supplied with factory mounted variable speed controls.

1.12 ELECTRIC WALL HEATERS
A. Wall heaters shall have steel finned tubular elements, 18 gauge steel grille with epoxy-polyester powder paint finish, integral thermostat, automatic reset thermal cutout, and totally enclosed fan. Units shall be as scheduled on the Drawings.

1.13 VARIABLE VOLUME BOXES
A. Variable volume boxes shall be pressure independent single duct type with primary air valve and air flow sensor. Casing shall be 22 gauge galvanized steel with 1/2 inch thick, four pound per cubic foot density fiberglass insulation covered with scrim backed foil faced insulation. Insulation edges shall all be covered with foil or aluminum nosing.
B. Airflow sensors shall traverse the duct with two perpendicular tubes. A minimum of 12 sensing points shall be used.
C. Electric heaters shall have a hinged access panel, power-disconnect, single point electrical connection, mercury contacts, automatic reset high limit, secondary high limit, 80/20 nickel chromium elements, and NEC fusing.
D. Controls shall be provided with the unit and shall include a thermostat and electronic controls that control the unit heating, cooling, and maximum and minimum air flows. On a call for cooling the air valve shall modulate open to maintain setpoint. On a call for heat or when there is no call for heat or cooling the valve shall modulate to its minimum position. On a further call for heat the damper shall modulate to full open.
E. VAV boxes shall be as scheduled on the Drawings.

1.14 Boilers
A. Provide packaged, modulating, sealed combustion, power-vented, high efficiency condensing type gas-fired boiler with cast iron heat exchanger that use ducted outside air for combustion. Install packaged boiler unit according to manufacturer’s installation instructions. All work to be done in a neat and workmanlike manner. Boilers shall be a Peerless condensing type boiler capable of burning natural of the size as scheduled on the drawings with capacities as indicated and shall meet minimum doe efficient as required by national energy conservation act or ashrae 90.1.
B. Boiler shall be capable of full modulation firing with a turn down of up to 10 to 1. Boiler shall be manufactured by iso 9001 registered company to conform to section iv of the asme boiler and pressure vessel code. Heat exchanger to be fire tested and hydrostatically pressure tested at factory in accordance with asme requirements. Maximum allowable working pressure 30 psig water as listed on the rating label.
C. Other manufacturer’s boiler must comply with specifying engineer’s requirements, including:
   1. full intent of these specifications, and
   2. Provide complete submittal including literature, manuals, wiring diagrams, fuel piping diagrams, and list of similar installations. Any alternate must be of similar size and footprint, piping configuration, clearance requirements and heating surface.
   3. Submittal presented to engineer at least seven working days before bid opening for approval. Substitutions are not permitted after contract is awarded.

D. Boiler construction
   1. Boiler heat exchanger:
      a. Cast iron.
   2. Boiler(s) main components:
      a. The combustion chamber will be sealed and located at the top of the heat exchanger, which will be of counterflow design, to assure that sediment and any lime that might form will flow to the bottom, away from the top section of the heat exchanger.
      b. Boiler shall be supplied with a gas valve designed with pressure regulation.
      c. The burner shall be premix combustion type, made with stainless steel and a woven metal fiber outer covering providing a wide range of modulating firing rates.
      d. The boiler shall be equipped with a variable speed blower system, capable of modulating the boiler firing rate.
      e. The boiler shall be equipped with a device capable of controlling the air/fuel ratio through a 10 to 1 turndown ratio.
      f. The control system shall have an electronic display for boiler set-up, boiler status, and boiler diagnostics

E. Venting and combustion air
   1. Boiler(s) must be capable of using outside air piped directly to boiler for combustion. Inlet and termination of these pipes must be connected to separate roof terminations as recommended by the manufacturer.
   2. The boiler shall be direct vented in accordance with the manufacturer’s instructions.

F. Boiler trim
   1. All electrical components to be high quality manufacture and bear ul label.
   2. Water boiler(s) controls furnished:
      a. High limit temperature control (190 degrees f maximum allowable boiler water temperature).
b. Combination pressure-temperature gauge. Gauge dial clearly marked and easy to read.

c. Asme certified pressure relief valve, set to relieve at 30 psig.

d. Flue gas, outlet water temperature, and return water temperature sensors.

e. Low water protection.

f. Built-in freeze protection.

g. Integral expansion vessel.

h. Integral primary/secondary piping capability.

1.15 VIBRATION TOLERANCES AND VIBRATION ISOLATORS

A. General: Furnish and install equipment for vibration and balancing requirements.

B. Vibration Tolerances: Rotating, non-reciprocating equipment shall be balanced both statically and dynamically at factory and at job site after installation. Equipment, when mounted and placed in operation, shall not exceed a self-excited vibration velocity of 0.10-inches per second when measured with a vibration meter on bearing caps of machine in vertical, horizontal and axial directions or measured at equipment mounting feet if bearings are concealed.

C. Vibration Isolation

1. Static Deflection: Vibration isolators shall have minimum static deflection as outlined in Equipment Vibration Isolation Schedule, this Section. Equipment supporting structure (Vibration Isolating System) shall not have any natural frequency within plus 20 percent of operating speeds.

2. No metal-to-metal contact shall be permitted between fixed and floating parts.

3. Lateral Motion: Vibration isolation system shall have a maximum lateral motion under equipment startup and shutdown conditions of 1/4-inch. Restrain excess motion by spring type mountings.

4. Connections to equipment shall allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections etc. made to rotating or reciprocating equipment (fans, compressor, etc.) which rest on vibration isolators, shall be isolated from building structure for first fifty pipe diameters or as indicated in the ASHRAE Guide.

5. Uniform Loading: Select and locate isolators to produce uniform loading and deflection even when equipment weight is not evenly distributed.

D. Types of Isolators: Type of isolation, base and minimum static deflection shall be as required for each specific equipment application as recommended by isolator or equipment manufacturer but subject to the following minimum requirements:

1. Pumps and air compressor shall have spring isolator with a minimum static deflection of 0.75-inches.
2. Fans with wheel diameters of 18-inches and less shall have spring isolator with a minimum static deflection of 0.75-inches.

3. Fans with wheel diameters greater than 18-inches shall have spring isolators with a minimum static deflection of 1.5-inches.

4. Floor mounted air handling units shall have spring isolators and a minimum static deflection of 0.75-inches.

5. Suspended air handling units shall have spring isolators and a minimum static deflection of one-inch.

6. Spring type isolators shall be free standing and laterally stable without any housing and complete with 1/4-inch neoprene acoustical friction pads between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection.

7. Pads, Washers and Bushings: Pads shall be felt, cork, neoprene waffle, neoprene and steel waffle or reinforced canvas duck and neoprene. Washers and bushings shall be reinforced canvas duck and neoprene.

8. Spring type hangers shall contain a steel spring and 0.3-inch deflection neoprene element in series. Neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit hanger rod to swing through a 300 degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection.

E. Flexible Connections

1. Flexible Pipe Connections: Shall be provided on suction and discharge piping of all reciprocating and/or rotating mechanical equipment and sized to allow for vibrational displacement of machine. Flexible connectors shall be as manufactured by Flexonics Division, Universal Oil Products Co.

2. Flexible Duct Connections: Shall be provided at all connections to air moving units (fan coils, air handlers and fans) and shall be Duro-Dyne with 30 ounce Neoprene fabric.

1.16 THERMOSTAT COVERS AND MOUNTING HEIGHT

A. Provide all new and relocated thermostats with tamper-proof transparent covers and mounting height shall be in accordance with ADA requirements.

END OF SECTION 15100
SECTION 15200 – HVAC - DUCTWORK AND ACCESSORIES

1.1 GENERAL

A. All applicable requirements of SECTION 15000 - HEATING, VENTILATING AND AIR CONDITIONING, GENERAL shall apply to this entire Section and shall have the same force and effect as if fully included herein.

1.2 SCOPE

A. This Section of the Specifications covers the furnishing of all labor, materials, equipment and services necessary for and incidental to the installation of all ductwork and accessories.

1.3 DUCTWORK

A. Ductwork shall be fabricated and supported in accordance with the latest publication of Sheet Metal and Air Conditioning Contractor's National Association, Inc., (SMACNA) manual. All rectangular elbows shall have single thickness turning vanes. All branch ducts shall be constructed with 45 degree take-offs with balancing dampers. All duct joints shall be sealed airtight with duct sealer manufactured by Hard Cast Incorporated of Dallas, Texas. All duct devices shall be constructed of the same material as the duct in which they are installed.

B. Duct supplies to grilles, registers and diffusers shall be installed to provide uniform airflow to the outlet. Provide control grids, volume extractors and/or turning vanes where two duct diameters of straight ductwork cannot be provided to the outlet.

C. All supply air, outside air intakes, return air and general exhaust ductwork shall be galvanized steel, constructed and installed for pressures up to two-inches.

D. Control grids shall be constructed with individually adjustable louvers, shall be spring tensioned to hold their setting and provide rattle-free performance with minimum noise and turbulence. Control grids shall be constructed of the same material as the ductwork and shall be as manufactured by Tuttle & Bailey.

E. Volume extractors shall be constructed from two sets of individually adjustable blades to equalize flow and control volume to diffusers or registers. Volume control shall be accomplished by the upstream blades and the downstream blades shall be adjusted for uniform flow to the diffuser or register. Volume extractors shall be constructed of the same material as the ductwork and shall be as manufactured by Tuttle & Bailey.

F. Double Wall Ductwork (exposed, spiral ductwork)

1. Solid outer and inner wall as indicated.
   a. Outer wall shall be galvanized steel designed for 2" pressures in accordance with SMACNA.
   b. Insulation: One inch thick, three pound density fiberglass acoustical liner with fire resistant fiber bonding coating.
   c. Inner wall: Minimum 18 gauge.

2. Acceptable manufacturers: McGill Airflow LLC, Semco or as approved.
3. Perforated inner wall shall not be permitted.

G. Flexible ductwork shall be UL 181 Class 1 complete with a 1-1/2-inch thick, R-5, insulating fiberglass blanket, foil faced vapor barrier and designed to withstand pressures up to six-inches positive pressure w.g. Ductwork shall be labeled as "flexible duct". Flexible duct runs shall be a maximum of five feet in length and shall be Type 5M-Insulated as manufactured by Flexmaster USA, Inc.

1.4 DUCT ACCESS DOORS

A. Duct access doors shall be provided at all coils, fire dampers, fire/smoke dampers, balancing dampers, automatic dampers, smoke detectors and other apparatus requiring service or inspection. Doors shall be constructed for the same static pressure class as the duct in which it is installed. Doors shall be 18 x 18 inches unless duct size will not accommodate this size; then, the doors shall be made as large as practical. Doors in insulated ducts shall be of the insulated type with a minimum of one-inch of fiberglass insulation. Doors shall be rigid with neoprene gaskets for frame-to-duct and frame-to-door, continuous piano hinges and cam locks. Doors shall be as manufactured by Ruskin. Label all access doors associated with smoke dampers or fire dampers or combined smoke/fire dampers with letters not less than 0.5-inches in height reading: "Smoke Damper," or "Fire Damper," or "Fire/Smoke Damper" respectively.

1.5 DIFFUSERS

A. Ceiling diffusers shall be constructed of steel and be complete with opposed blade dampers. Diffusers shall be of the sizes and configurations as indicated on the Drawings. Diffusers shall have a baked-on enamel finish.

1.6 GRILLES

A. Return and exhaust grilles shall have fixed, heavy duty, horizontal face bars and plaster frames where required. Grilles shall be heavy duty all steel construction and shall have a baked on white enamel finish. Grilles shall be of the configurations and sizes indicated on the Drawings.

1.7 DAMPERS

A. Balancing dampers shall be multiple opposed blade type in square or rectangular ducts and butterfly type in round ducts. Damper shall be complete with locking quadrants and accessible operating mechanisms. Operating mechanisms shall be of the elevated type where located in insulated ducts. Dial regulators shall be Ventlok type, complete with die cast core, heavy gauge dial, 3/32-inch steel handle, 1/4-inch dial, open/shut identification and accessories and be manufactured by Ventfabrics, Inc. or approved equal. Provide elevated standoffs, matching insulation thickness for insulated ducts. Dampers shall be constructed of the same material as the duct in which they are installed except they shall be two gauges heavier. Individual blades in opposed blade dampers shall not exceed eight-inches in width.

B. Backdraft dampers in ductwork shall be extruded aluminum type designed for velocities up to 3500 FPM. Dampers shall have adjustable counterbalances. 0.125-inch wall thickness frame, 0.070-inch wall thickness blades with vinyl edge seals and Zytel bearings. Dampers shall be Ruskin Type CBD6.

C. Automatic dampers, also referred to as motor operated dampers, shall be as specified in Section: AUTOMATIC TEMPERATURE CONTROLS and shall be installed by the Mechanical Contractor.
D. Fusible link fire dampers shall be UL labeled dynamic shutter type with the blade storage section completely out of the air stream, conforming to NFPA. Dampers shall be installed in a manner to maintain the integrity of the fire partition. Dampers shall be complete with 22 gauge roll formed steel frame, 22 gauge steel blades, replaceable 165 degrees F fusible link, closure spring, and blade lock. All fire dampers shall be as manufactured by Air Balance Inc.

1.8 LOUVERS

A. Existing louvers are to remain. Provide new motorized control dampers as indicated on the drawings.

END OF SECTION 15200
SECTION 15300 - COPPER – HVAC - PIPING & ACCESSORIES

1.1 GENERAL

A. All applicable requirements of Section 15000 - HEATING, VENTILATING AND AIR CONDITIONING, GENERAL shall apply to this entire Section and shall have the same force and effect as if fully included herein.

B. Unless otherwise specified herein, pipe and fittings shall conform to the requirements of ANSI Standard B31.1. Install piping to avoid interference with moving parts and to be clear of equipment that could cause damage or be damaged. Run piping straight and, where practicable and exposed, parallel or perpendicular to building lines. Run risers plumb and with minimum offsets. Run lines to slope as necessary to drain properly. Maintain indicated or required grades without sagging of lines. Open pipes shall be capped or plugged at the end of each workday to protect the pipe against the entrance of dirt, water or any extraneous material. Provide a drain at each low point in the water piping systems and a manual air vent at all high points.

C. Do not run piping over electrical equipment.

D. Install all devices in piping system required by the automatic temperature control system and the monitor and control system.

E. Install sleeves for all pipes passing through walls and floors. Use size to permit passing of pipe and full thickness of insulation. Extend sleeves two-inches above finished floor. For sleeves through walls, use length same as wall thickness.

F. Ream pipe after cutting. Remove obstructions that could interfere with normal intended flow.

G. Install piping to prevent undue stresses due to expansion, contraction or imposed loads. Provide expansion loops and offsets as indicated or as necessary to prevent damage.

H. Provide unions in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, pumps, control valves and similar items.

I. Reducing fittings shall be used in lieu of bushings.

J. Valves installed in horizontal pipes shall have stems installed no lower than the center of the pipe.

K. Provide dielectric unions between ferrous and non-ferrous piping to prevent galvanic corrosion on low temperature water. Dielectric unions shall meet requirements for tensile strength of pipe fittings and shall be suitable for temperatures and pressures encountered. The dielectric unions shall have metal connections on both ends of union. The ends shall be threaded, brazed or soldered to match adjacent piping. The metal parts of the union shall be separated so that the electrical current is below one percent of the galvanic current, which would exist with metal-to-metal contact.

1.2 SCOPE

A. This Section of the Specifications covers the furnishing of all labor, materials, equipment and services necessary for and incidental to the installation of all piping and accessories.
1.3 PIPING SUPPORT

A. Support piping with adjustable hangers or supports. Space hangers or supports, as necessary, to maintain slope and prevent sagging. Do not use perforated metal strap iron or band iron hangers. Offsets in hangers shall not be permitted. Threads shall be on ends only where hanger rods are installed exposed in finished areas.

B. Support pipe risers at regular intervals to prevent undue stress and distortion. Provide riser clamps at floor penetrations.

C. Use hangers or supports on insulated piping sized to permit insulation passing continuously through hanger. Support insulated piping outside of covering. Use 16 gauge galvanized sheet metal shields for protecting pipe covering. Shields shall be a minimum of six-inches long for pipe sizes up through 2-1/2-inches and nine-inches long for three-inch through six-inch pipe. Where roller supports or hangers are used pipe covering protection saddles shall be used in lieu of shields. Saddles and shields shall be standard catalogued products.

D. Hang and support piping to prevent pipe load from bearing on equipment, flanges, connections and insulation.

E. Hangers supporting copper pipe shall be copper plated steel.

F. Pipe hangers shall be supported from the building structure with either "Parabolt" concrete anchors as manufactured by USM Corporation, Molly Fastener Division or "C" clamps or beam clamps sized and placed to accommodate the loads imposed by the piping system. "C" clamps shall be used only to support pipes three-inches and smaller.

G. Hangers, supports and appurtenances shall be as manufactured by F&S Central, Carpenter and Patterson, Grinnell or approved equal. The following, as manufactured by F&S Central are representative of the types and quality required. Pipe Rings - Fig. Nos. 4, 22 and 86; Clamps - Fig. Nos. 88, 91 and 92; Brackets - Fig Nos. 65, 800, 801, 805 and 850; Rods and Rod Attachments - Fig. Nos. 225, 226, 11, 33, 39 and 966; Saddles - Fig. Nos. 420, 421, 424 and 427.

H. Hanger Spacing: The spacing of single hangers for straight runs of pipe shall not exceed spans listed in table. The spacing of multiple trapeze hangers shall not exceed ten feet. A hanger shall be placed within one foot of each horizontal elbow.

I. Hanger Spacing Table

<table>
<thead>
<tr>
<th>Size Pipe Inch</th>
<th>Max. Span Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 to 1</td>
<td>5</td>
</tr>
<tr>
<td>1-1/2</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>

1.4 REFRIGERANT PIPING

A. Piping shall be seamless Type "ACR" copper ASTM B-280.

B. Fittings shall be long radius wrought-copper or forged-brass sweat fittings designed for refrigerant use.

C. Refrigerant line sizes between indoor and outdoor sections shall be sized in accordance with the manufacturer's recommendations for capacities required and pipe lengths to be installed.
1.5 CONDENSATE DRAIN

A. Condensate drain piping and fittings shall be Schedule 40 PVC. Pipe shall be installed with a minimum slope of 1/8-inch per foot.

END OF SECTION 15300 - 1
SECTION 15400 – HVAC – INSULATION

1.1 GENERAL

A. All applicable requirements of Section 15000 - HEATING, VENTILATING AND AIR CONDITIONING, GENERAL shall apply to this entire Section and shall have the same force and effect as if fully included herein.

B. All insulations shall be as manufactured by Johns Manville, Owens Corning or Armstrong. The execution of the work shall be under the direct control and supervision of the insulation manufacturer or his authorized representative, in strict accordance with the manufacturer's instructions and recommendations, the best practice of the trade and the intent of these Specifications. All insulation shall be tested for Fire and Smoke Hazard Classification ratings in accordance with ASTM E-84, NFPA 255 and UL 723. Ratings shall not exceed FHC 25/50.

C. Do not omit insulation where piping passes through sleeves or hangers. Provide a galvanized sheet metal protector on the exterior of the bottom half of the covering, between the covering and the hanger, to prevent the hanger band from cutting into the insulation. High density insulation shall be used at each hanger. All piping shall be tested before insulation is applied or joints left uncovered until the tests have been performed.

1.2 SCOPE

A. This Section of the Specifications covers the furnishing of all labor, materials, equipment and services necessary for and incidental to the installation of all insulation and accessories.

1.3 ITEMS TO BE INSULATED ARE AS FOLLOWS:

A. Piping

1. All refrigerant piping.

B. Ductwork

1. Supply ductwork and plenums.

2. Return ductwork and plenums.

3. Outside air ductwork and plenums.

4. Exhaust air ductwork and plenums.

1.4 INSULATION THICKNESSES SHALL BE AS FOLLOWS:

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>PIPE SIZE INCHES</th>
<th>THICKNESS INCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerant</td>
<td>≤ 1.5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&gt; 1.5</td>
<td>1-1/2</td>
</tr>
</tbody>
</table>
B. Ductwork

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>LOCATION</th>
<th>INSULATION TYPE</th>
<th>THICKNESS INCHES</th>
<th>R VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Ductwork</td>
<td>Concealed</td>
<td>Blanket</td>
<td>2.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Supply Ductwork</td>
<td>Exposed in Unconditioned Space*</td>
<td>Board</td>
<td>1.5</td>
<td>6.8</td>
</tr>
<tr>
<td>Supply Plenums</td>
<td>All</td>
<td>Board</td>
<td>1.5</td>
<td>6.8</td>
</tr>
<tr>
<td>Return Ductwork</td>
<td>Concealed</td>
<td>Blanket</td>
<td>2.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Return Ductwork</td>
<td>Exposed in Unconditioned Space*</td>
<td>Board</td>
<td>1.5</td>
<td>6.8</td>
</tr>
<tr>
<td>Return Plenums</td>
<td>All</td>
<td>Board</td>
<td>1.5</td>
<td>6.8</td>
</tr>
<tr>
<td>Outside Air Ductwork</td>
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<td>Board</td>
<td>2.0</td>
<td>9.1</td>
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<tr>
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<td>Board</td>
<td>2.0</td>
<td>9.1</td>
</tr>
<tr>
<td>Exhaust Air Ductwork</td>
<td>Concealed</td>
<td>Blanket</td>
<td>2.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

*Unconditioned space includes attics, crawl spaces and mechanical rooms.

1.5 PREPARATION

A. Surfaces prepared to receive insulation shall be clean, dry and free from extraneous materials. Do not apply insulation until systems have been tested, are free from leaks and have been approved.

1.6 INSULATING MATERIALS

A. Piping

1. Refrigerant piping shall be insulated with a flexible closed cell insulation having a thermal conductivity of 0.27 Btu-In/(Hr-Ft²-°F) at 75 degree F mean temperature. Insulation shall be Armacell AP Armaflex pipe insulation. All joints and longitudinal seams shall be sealed with Armacell Armaflex 520 adhesive. Exterior pipe insulation shall be the same as interior insulation except insulation shall be painted with two coats of Armacell WB Armaflex finish.

B. Ductwork

1. Concealed ducts shall be insulated with flexible fiberglass blanket insulation having an aluminum foil facing reinforced with fiberglass scrim. Insulation shall have an installed R-value of 3.0 per inch thickness at 75 degrees F mean temperature and a density of one-pound per cubic foot. Insulation shall be secured to the duct with Childers CP-85 adhesive or mechanical fasteners. Joints shall be sealed with sealing tape and adhesive. Insulation shall be Microlite Type 100 with FSK facing.

2. Plenums and exposed ducts shall be insulated with non-flexible fiberglass board insulation having an aluminum foil facing reinforced with fiberglass scrim. Insulation shall have a thermal conductivity of 0.22 Btu-In/(Hr-Ft²-°F) at 75 degrees F mean temperature and a density of six-pounds per cubic foot. Insulation shall be secured to ducts with
adhesive or mechanical fasteners. Joints shall be secured with sealing tape and Childers CP-85 adhesive or mechanical fasteners. Insulation shall be 817 Spin-Glas with FSK facing.

END OF SECTION 15400
SECTION 15500 - HVAC - AUTOMATIC TEMPERATURE CONTROLS

1.1 GENERAL

A. All applicable requirements of Section 15000 - HEATING, VENTILATING AND AIR CONDITIONING, GENERAL shall apply to this entire section and shall have the same force and effect as if fully included herein.

B. Furnish and install an electronic/solid state system of Automatic Temperature Controls. The system shall be complete in all respects including labor, materials, equipment and services necessary and shall be installed by personnel employed by the Control Manufacturer.

C. Performance of this work shall be accomplished by firms specializing in Automatic Temperature Control Systems for heating, ventilating and air conditioning systems. The firm shall provide proof of having successfully completed a minimum of five projects of similar size and scope. The Automatic Temperature Control System shall be as manufactured by Honeywell or Equal. The control system manufacturer shall have an office staffed with factory trained engineers, technicians and mechanics who are fully capable of providing maintenance and service on all system components. The manufacturer shall have a service organization to provide 24 hour/day, 365 day/year emergency service.

D. All wiring for controls shall be furnished and installed by the Control Manufacturer. Unless noted otherwise, this Contractor shall furnish and install all control devices together with control wiring, conduit and all appurtenances and accessories necessary to perform the sequence of operation specified. Wiring materials and installation shall conform to the National Electric Code.

1. All input and output low voltage control wiring to the control units shall be #20 twisted cable. All trunk communication wiring shall be #24 AWG twisted shielded cable (low capacitance).

2. All cable splices shall have joints soldered and taped including the shield. No mechanical connections will be acceptable.

3. No digital input or output points shall be more than 250 feet from its respective panel.

4. All connections within the panels must be made with connectors of appropriate size and design for the terminals being applied.

5. All low voltage (30V and below) wiring above accessible, concealed and dry locations may be run in plenum-rated cable without conduit. All other wiring (low or high voltage) must be run in electric metallic tubing (EMT), 3/4-inch or greater. All AI and DI point wiring must be run in EMT separate from DO point wiring when EMT is required.

6. All wiring associated with the installation will be the responsibility of this Contractor, unless otherwise directed herein. The term “wiring” is construed to include furnishing of wire, conduit, miscellaneous material and labor as required to install a total working system.

E. The Contractor shall be responsible for coordinating the interface of controls to electrical contactors, motor starters and equipment. A 120 VAC control power transformer, a hand-off-auto (HOA) switch and a 120 VAC starter coil are provided with all electrical equipment unless noted otherwise. The Contractor shall provide either a "dry" contact in the auto position of the HOA switch or an interposing relay if 120 VAC is an unacceptable voltage. The interposing
relay with coil voltage acceptable to the ATC system shall be field mounted in the starter enclosure by the Contractor with an adequately rated contact in the auto position of the HOA switch. Where monitoring of a starter or relay by the ATC system is required, the Contractor shall provide and install either a field installed auxiliary contact to the starter or one 120 VAC interposing relay with "dry" contacts which the ATC system can monitor. The Contractor shall be responsible to ensure adequate voltage and power capacities are available for operation of all controls. The Contractor shall provide additional control power transformers for control equipment operating at other than 120 VAC or line voltage.

1.2 SCOPE

A. This section of the Specifications covers the furnishing of all labor, materials, equipment and services necessary for and incidental to the installation of all automatic temperature controls.

B. The Contractor shall be required to enlist the services of a qualified HVAC controls sub-contractor to provide a new control system capable of controlling the HVAC system as indicated in this specification and as required to provide a complete and fully functional system.

1.3 EQUIPMENT

A. Transformers shall be provided for electric or electronic controls. Each transformer shall be connected to an electric circuit, which serves no other equipment. Spare circuits in electric panels may be used for controls. Control wiring shall not be connected to lighting circuits. When controls serve an individual air handling unit, transformers may be connected to fan motor leads of the unit controlled.

B. Controllers

1. Temperature controller shall be accomplished using programmable thermostats, Honeywell Vision Pro series or equal

2. Hot water reset temperature controller shall be of the time-proportioned, three-point, floating-type with PID characteristics or the zero to 20 VDC proportional type with PI characteristics, such that the reset functions eliminate sustained system offset. Controller shall be capable of resetting its control point automatically due to outdoor air temperature and information transmitted from appropriate sensors. Controller shall be capable of adjustable night setback from contact closure. Reset schedule shall be fully adjustable with regards to outdoor air temperature. Output lamps shall be provided to indicate controller output status.

C. Low Limit Thermostats

1. Low limit thermostats shall be line voltage type and used to detect low temperature conditions in an airstream, which could cause freeze-up conditions in water coils. Controller shall be of the liquid-filled type responsive only to the lowest temperature sensed along any one foot of its 20 foot measuring element. Controller shall be adjustable and of the manual reset type.

D. Automatic Dampers

1. Automatic dampers shall be factory fabricated and shall be provided by the temperature control manufacturer. The control damper shall be installed by the Contractor under the supervision of the automatic temperature control manufacturer or his authorized agent. All dampers shall be full duct size or louver size unless indicated otherwise. All damper frames shall be constructed of 12 gauge galvanized sheet metal or extruded aluminum of...
12 gauge, 0.081-inch minimal thickness and shall have flanges for duct mounting. The blades shall be parallel or opposed, as required and suitable for the air velocities to be encountered in the system. Replaceable edge and end seals shall be provided with damper, installed along the top, bottom and sides of the frame and each blade. Provide insulated blades for the mechanical room louver. Seals and bearings shall be able to withstand temperatures ranging from minus 40 degrees F to plus 200 degrees F. Dampers shall be rated for leakage in the full closed position, at 50-pounds per square inch torque applied by the control operator. Dampers shall not leak air at more than 20 CFM per square foot at four-inch static pressure water gauge.

E. Damper Actuators

1. Actuators shall be of the push-pull type for either modulating or two-position control. Actuators shall stroke by a rotating motion of an overload-proof synchronous motor. Control voltage shall be either 24 VAC or zero to 20 VDC as required by the application. Actuators shall be available with spring return to the fully extended position upon power failure. Three point, floating actuator shall be available with adjustable end switches. Minimum/maximum manual positioners shall be available for proportional motors.

F. Indicators - Digital

1. A plug-in base-mounted digital indicator shall be capable of providing digital readout of the temperature sensor and set point of six different controllers.

2. The indicator shall have LED display channel selection buttons and LED display of type of sensor being read. The indicator shall also have a plug connector for connection of a portable printer.

G. Boiler Controls

1. Dual high limit aquastat shall be Honeywell L4081A or equal.

2. Low water cutoff shall be McDonnell No. 63 low water fuel cutoff.

1.4 SEQUENCE OF OPERATION

A. Air Handling Units AH-1 thru 7 and HP-1A & B (Base Bid) / Air Handling Unit AH-1 and CU-1 (Alternate Bid).

1. AHU-1 thru 7 and HP-1A and B:

a. Occupied mode: when any of the systems are in a scheduled occupied mode the outside air damper shall open and the supply fans shall run continuously and the heating and cooling portions of the system shall function as required to maintain space temperature.

b. Unoccupied mode: when the systems are in a scheduled unoccupied mode the outside air damper shall close and the supply fans shall cycle with the heating and cooling portions of the system to maintain space temperature.

c. The air handling unit supply fan(s) shall run whenever there is a call for heat.

2. AH-1 and CU-1:
a. Occupied mode: when AH-1 is in a scheduled occupied mode the outside air damper shall open and the supply fan shall run continuously and the heating and cooling portions of the system shall function as required to maintain space temperature.

b. Unoccupied mode: when the AH-1 is in a scheduled unoccupied mode the outside air damper shall close and the supply fan shall cycle with the heating and cooling portions of the system to maintain space temperature.

c. The air handling unit supply fan(s) shall run whenever there is a call for heat.

3. Exhaust fans EF-1 and EF-2: EF-1 and EF-2 shall run continuously when the air conditioning/heating system is in a scheduled occupied mode and shall be off when the system(s) are in a scheduled unoccupied mode.

B. Heating Water System

1. The boiler system shall be energized when the outdoor air temperature falls to below 65 degrees F (this shall be field adjustable) and the boiler shall function via its own controls to supply a heating water temperature to the primary loop of 150 degrees F.

2. Heating water pumps, P-1, P-2, P-3, P-4, P-5 and P-6 shall be controlled by Hand-Off-Automatic switches. The Automatic leg shall be controlled as described below.

   a. The primary loop pump (P-1) shall run whenever the boiler is firing and shall cycle as required to maintain the primary loop temperature.

   b. The secondary pumps (P-2, 3, 4, 5) that supply the hot water duct coils shall cycle as required to maintain the zone temperature (sensed by the space thermostat).

   c. The secondary loop pump P-6 shall run continuously whenever the outdoor temperature falls to below 55 degrees F (adjustable).

3. Boiler leaving water temperature shall be maintained in accordance with the following reset schedule:

<table>
<thead>
<tr>
<th>OUTSIDE AIR</th>
<th>BOILER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 degrees F</td>
<td>155 degrees F</td>
</tr>
<tr>
<td>65 degrees F</td>
<td>120 degrees F</td>
</tr>
</tbody>
</table>

4. Safety controls shall be provided to prevent burner operation on loss of flame, low water level and high temperature.

5. Note: under Alternate #1, the existing cabinet heater in the vestibule and hot water convectors shall remain. These shall be re-piped as required and new circuit setters added.

C. Mechanical Room Ventilation

1. Provide a new motorized air damper with insulated blades and edge seals on the existing room louver. On a rise in the mechanical room temperature above setpoint (80 degrees F, the automatic damper shall open. The damper shall be closed when the room temperature is less than 78 degrees F.

1.5 DRAWING AND LAYOUTS
A. The Contractor shall provide diagrammatic layouts of the Control System specified herein. Layouts shall show all control equipment and the function of each item shall be indicated. The Contractor shall submit six (6) copies of Drawings of the entire control system to the Owner's Representative for approval before starting work.

B. Bill of material shall include a schedule of all units, accessories and nameplates, which includes a complete description, rating and location of equipment being furnished.

1.6 INSTRUCTION AND ADJUSTMENT

A. On completion of the installation, the ATC Contractor shall have completely adjusted the entire control system. Instruction on system operation shall be provided to the Owner's Representative.

END OF SECTION 15500
SECTION 15600 - HVAC - COMPLETION, TESTING AND BALANCING

1.1 GENERAL
   A. All applicable requirements of Section 15000 - HEATING, VENTILATING AND AIR CONDITIONING, GENERAL shall apply to this entire Section and shall have the same force and effect as if fully included herein.

1.2 SCOPE
   A. This Section of the Specifications covers the furnishing of all labor, materials and accessories necessary for, but not limited to, the completion of the Contract, the required start up and field service requirements and the testing and balancing of all equipment specified in the Heating, Ventilating and Air Conditioning Sections of the Specification.

1.3 SERVICE
   A. The Contractor shall, after acceptance, provide any service incidental to the proper performance of the systems during the warranty period outlined in Section 15000.
   B. The Contractor shall, upon completion of the installation, during the warranty period, make available to the Owner an annual Service Agreement covering all labor and material required to efficiently maintain the control system.

1.4 FINAL CLEANING
   A. Remove soil, stain and adhered extraneous materials, caused by heating, ventilating and air conditioning work, from adjacent surfaces.
   B. Remove obstructions from ducts and piping. Remove, clean and replace strainers and filters that have been used during construction or testing period. Vacuum clean the inside of the ductwork where a significant amount of construction dust has accumulated.
   C. Clean exposed portions of heating, ventilating and air conditioning materials and equipment until it is free from soil, stain and extraneous materials.
   D. Remove and replace items or materials that cannot be satisfactorily cleaned.
   E. Flush all piping and clean strainers before operating the system.

1.5 BALANCING AND TESTING
   A. General
      1. The Contractor shall employ a balancing Contractor specializing in total system air and hydronic balancing, testing and commissioning. This balancing Contractor shall be certified by Associated Air Balance Council (AABC) or National Environment Balancing Bureau (NEBB) and shall provide all labor, engineering and test equipment required to adjust and balance all heating, ventilating and air conditioning and exhaust systems as hereinafter specified. All personnel involved in the execution of the work under the balancing contract shall be experienced and factory trained specifically in the total balancing of mechanical systems, as well as being regular employees of the balancing Contractor. Balancing contractor shall review the drawings during bid period.
B. The balancing contract shall incorporate the following:

1. Adjust and balance the complete mechanical system as hereinafter specified.

2. Record all test data and submit four copies upon completion of the balancing contract to the Owner’s Representative.

3. At the completion of the balancing contract instruct the Owner’s personnel in the proper operation and maintenance of each piece of equipment.

C. All test equipment will be furnished by the balancing Contractor and will remain his property. All instruments will have been calibrated recently and verification of calibration provided with submittal data.

D. Testing and balancing shall not begin until the system has been completed and is in full working order with all filters installed. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation. Correct operation of equipment and system components and cleanliness of piping and ductwork shall be the responsibility of the Contractor.

E. The Contractor shall make any changes required for correct balance, as recommended by the balancing Contractor, at no additional cost to the Owner. Such changes may encompass but are not necessarily restricted to pulleys, belts, ductwork, dampers or the addition of dampers and access doors.

F. Testing Requirements

1. Air Systems

   a. The testing and balancing shall include but is not necessarily limited to the following requirements:
      1) Test and adjust fan speeds to deliver the required CFM and record rpm and full load amperes.
      2) Make pitot tube traverse of main supply ducts to verify design CFM, where possible. Seal duct access holes with rubber or metal snap-in-plugs. The use of duct tape to seal access holes will not be permitted.
      3) Test and adjust system for design outside air.
      4) Test and adjust system for design recirculated air.
      5) Adjust all supply and return zones to design CFM.
      6) Test and adjust each diffuser, register and grille to within ten percent of design requirements and also adjust to minimize drafts in all areas.
      7) Balance the system to minimize noise. Add branch duct balancing dampers as required.

2. Hydronic Systems

   a. The testing and balancing shall include but is not necessarily limited to the following requirements:
      1) Prior to testing and balancing of the water system the following items will be accomplished to prepare the system for balancing.
         a) Verify that strainers have been removed and cleaned.
         b) Check expansion tanks and verify that the system is not air bound and is completely filled with water.
         c) Check air vents at coils and high points of the water system and verify all are installed and operating freely.
d) Obtain a representative system water sample and have a chemical analysis performed by a reputable water treatment firm. The results are to be included as part of the final balancing report.

e) Position all automatic valves, hand valves and balancing valves for full flow through coils, converters, etc.

2) Measure and adjust circulating water pump flow capacity to proper quantity.
3) Adjust flow of chilled water through chillers.
4) Balance chilled water coil flow.
5) Mark and record flow readings of balancing devices.
6) Coordinate chiller operation and output performance with the manufacturer's representative.

G. Balancing Data:

1. The test report shall include the following information:

a. Motors:
   1) Manufacturer
   2) Model and Serial number
   3) Rated amperage and voltage
   4) Rated horsepower
   5) Rated RPM
   6) Corrected full load amperage
   7) Measured amperage and voltage
   8) Calculated BHP
   9) Measured RPM
   10) Sheave size, type and manufacturer

b. Fans:
   1) Manufacturer
   2) Model or Serial number
   3) Rated CFM
   4) Rated RPM
   5) Rated pressures
   6) Measured CFM
   7) Measured RPM
   8) Measured pressures
   9) Pulley size, type and manufacturer
   10) Belt size and quantity

c. Pumps:
   1) Manufacturer
   2) Model or Serial number
   3) Rated GPM
   4) Rated head
   5) Rated pressures
   6) Measured discharge pressure (full flow and no flow)
   7) Measured GPM
   8) Operating head
   9) Operating RPM

d. Air Systems (including inlets and outlets):
   1) Diffuser or register reference number and manufacturer
   2) Diffuser or register location
   3) Design velocity
   4) Design CFM
5) Effective area factor and size
6) Measured velocity
7) Measured CFM

e. Heat Transfer Elements:
   1) Manufacturer and Type
   2) Design inlet and outlet temperatures (air and water side)
   3) Design pressure drop (air and water side)
   4) Design flow rate (air and water side)
   5) Measured inlet and outlet temperatures (air and water side)
   6) Measured pressure drop (air and water side)
   7) Measured flow rate (air and water side)

f. Boiler Test Report shall include the following information:

<table>
<thead>
<tr>
<th>Unit Data</th>
<th>Test Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location/Service</td>
<td>(List Design &amp; Actual for each)</td>
</tr>
<tr>
<td>Make/Type</td>
<td>Operating Press./Temp.</td>
</tr>
<tr>
<td>Model Number/Size</td>
<td>Ent./Lvg. Temp.</td>
</tr>
<tr>
<td>Serial Number</td>
<td>No. Safety Valves/Size</td>
</tr>
<tr>
<td>Fuel/Input</td>
<td>Safety Valve Settings</td>
</tr>
<tr>
<td>No. of Phases</td>
<td>High Limit Setting</td>
</tr>
<tr>
<td>Ignition Type</td>
<td>Operating Contr. Setting</td>
</tr>
<tr>
<td>Burner Control</td>
<td>High Fire Set Point</td>
</tr>
<tr>
<td>Volts/Phase/Hertz</td>
<td>Low Fire Set Point</td>
</tr>
</tbody>
</table>

| Voltage T1-T2, T2-T3, T3-T1| Draft Fan Volts/Amps                           |
| Amps A1, A2, A3            | Manifold Press.                                |
|                            | Safety Controls-Check                          |

    g. Instrument Calibration Report shall include the following information:

<table>
<thead>
<tr>
<th>Data Reported</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument/Make</td>
<td>Serial No.</td>
</tr>
<tr>
<td>Application</td>
<td>Dates of Use</td>
</tr>
<tr>
<td>Date(s) of Calibration</td>
<td></td>
</tr>
</tbody>
</table>

    h. Component Failure Report shall include the following information and shall be submitted as soon as a problem is encountered:

<table>
<thead>
<tr>
<th>Data Reported</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>Contractor</td>
</tr>
<tr>
<td>Architect/Engineer</td>
<td>Submittal Data</td>
</tr>
<tr>
<td>System</td>
<td>Description and Problem</td>
</tr>
<tr>
<td>Component</td>
<td>Field Test Results</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Probable Cause</td>
</tr>
<tr>
<td>Serial No.</td>
<td>Recommendations</td>
</tr>
<tr>
<td>Model No.</td>
<td>Date</td>
</tr>
</tbody>
</table>

1.6 START-UP ASSISTANCE FOR BOILERS AND AUTOMATIC TEMPERATURE CONTROLS

A. The Contractor shall include in his proposal an allowance for providing a factory trained field service technician at the job site during critical stages of installation and tests and at the time of
start-up of the equipment, to perform the checkout, calibration and initial operation and to advise
and instruct the Owner's personnel regarding operating techniques.

1. The Contractor shall allow four hours for training of personnel in boiler and chiller
maintenance, trouble shooting and operation and eight hours of training for automatic
temperature control system maintenance, trouble shooting and operation.

2. The Contractor shall cycle all equipment in the presence of the Owner or Owner’s
Representative.

3. The field service technician shall submit a report to the Owner's Representative at each
visit to the job site certifying that the equipment is being installed in accordance with the
manufacturer's recommendations and shall report, immediately, any deviation from
accepted installation procedures.

B. At completion of the installation, the Contractor shall furnish to the Owner's Representative a
certificate certifying that the equipment was installed in accordance with the manufacturer's
recommendations.

1.7 EQUIPMENT START-UP

A. Provide equipment start-up report, including checklist confirming manufacturer's start-up
procedure has been followed in its entirety.

1.8 COMPLETION

A. Upon completion of the work, the Contractor shall remove all his excess materials, machinery
and equipment from the premises and replace all filters.

END OF SECTION 15600
SECTION 16000 – ELECTRICAL - GENERAL

1.1 GENERAL

A. Applicable requirements of the Contract Documents, preceding the Technical Specifications, apply to this Section. In the event of conflict between the Specifications, the most stringent shall apply.

B. Separation of these Specifications into Divisions and Sections is for convenience only and is not intended to establish limits of work.

C. Consult index to be certain that set of Documents and Specifications is complete. Report omissions or discrepancies to the Owner's Representative.

D. The Contractor shall employ high standards of good workmanship and shall pay special attention to the safety of personnel and equipment. The installation of material and equipment shall be in conformance with the latest edition of all codes and standards, as adopted by the local authority having jurisdiction, including those listed in Paragraph: STANDARDS. The agency having the most stringent requirements shall be adhered to.

E. The Contractor shall make a thorough examination of the site and shall make due allowances for difficulties and contingencies to be encountered. All dimensions shall be checked and verified by the Contractor at the site.

F. The Contractor and all Sub-Contractors shall have a minimum of three years proven experience on projects with similar levels of complexity and magnitude. Experience shall be based on the experience as a company and not on the experience as individuals.

G. The Drawings and Specifications are intended to function as a common set of documents. Anything shown on the Drawings but not mentioned in the Specifications, or mentioned in the Specifications and not shown on the Drawings, shall be equally binding as if both noted on the Drawings and called for in the Specifications.

H. The Owner's Representative is the person appointed by the Owner. The Owner's Representative will advise and consult with the Owner during construction and until final payment is due. The Owner's instructions to the Contractor shall be forwarded through the Owner's Representative.

1.2 SCOPE

A. The work covered by and included in these Specifications consists of the furnishing of all materials, all equipment, labor, tools and supervision and performing all operations necessary for the proper and complete execution of the Electrical work in strict accordance with the Specifications and the Drawings and subject to the terms and conditions of the Contract.

B. Unless noted otherwise, this Contractor shall furnish and install all control devices together with control wiring, conduit and all appurtenances and accessories necessary to perform the operating functions as specified. Control devices shall include, but not be limited to, thermostats, switching relays, control relays and transformers. Control wiring shall include but is not limited to, 120 volt control wiring, as well as, low voltage wiring for dimming, occupancy sensor wiring and other wiring. Wiring materials and installation shall conform to the National Electric Code. All control system wiring except low voltage wiring, shall be 14 AWG minimum installed in 1/2 inch diameter minimum conduit.
C. It is the intent of these Drawings and Specifications to provide complete and fully functional systems unless otherwise indicated. The Contractor shall provide all incidental components (locknuts, screws, washers, etc.) required to accomplish this intent. This shall include furnishing devices which are obviously required by the design intent such as the second three-way switch where one such switch is shown, fuses for fused disconnect switches, etc.

1.3 DEFINITIONS

A. The term "Contractor" or "Electrical Contractor" when used in this Specification refers to the Contractor responsible for all work under this Section.

B. The term "Provide" refers to this Contractor purchasing, delivering and installing as a part of this Contract.

1.4 STANDARDS

A. NFPA 70 National Electrical Code (NEC)

B. NFPA 72 National Fire Alarm Code

C. NFPA 99 Standard for Health Care Facilities

D. NFPA 101 Code for Safety to Life from Fire in Buildings and Structures

E. Pennsylvania Act 45, Uniform Construction Code (UCC)

F. Underwriters Laboratories Electrical Construction Materials Directory

G. International Building Code (IBC)


I. ASTM B-8 Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft

J. ASTM B-496 Specification for Compact Round Concentric-Lay-Stranded Copper Conductors

K. ICEA S-95-658/NEMA WC70 Non-Shielded 0-2 KV Cables


M. NETA ATS acceptance testing specifications for electrical power distribution equipment and systems

1.5 NOTIFICATION

A. Trades that have work connected with the Electrical work and trades that do preparatory work for electrical equipment shall be notified for installation requirements and scheduling.

B. The Owner's Representative shall be informed of the installation schedule to allow sufficient time for inspection without any work delay.

C. All work shall be coordinated to avoid cutting of work in place and interfering with other operations.
D. In compliance with state law, contact individual companies to have utility locations marked in the field and to otherwise locate underground objects as may be necessary prior to the start of construction. Pennsylvania law requires three working days notice for the construction phase and ten working days in design stage. Call Pennsylvania One Call System, Inc. (1-800-242-1776, as of this writing).

1.6 CONTRACT DRAWINGS

A. The Contract Drawings are diagrammatic and indicate relation of conduits, connections and equipment. Vendor catalog numbers do not necessarily indicate trim and fitting requirements. Drawings do not indicate all boxes and fittings that may be required. Therefore, the Contractor shall carefully investigate structural and finish conditions affecting work. The Contractor shall furnish all boxes, fittings, hangers and accessories as may be required to meet these conditions at no additional cost to the Owner.

B. Do not scale the Drawings. The Contractor shall check conditions at the site for dimensions and sizes pertaining to the structure.

C. Do not deviate from the Drawings without prior written approval.

1.7 LINES, GRADES AND SURVEYS

A. All necessary surveys, lines, grades and measurements are the responsibility of the Contractor desiring the information for the proper installation of his work. The Contractor is responsible for the proper installation of the work with respect to other Contractors.

B. Grades, elevations and locations shown on the Drawings are approximate and the Contractor shall check all such information on the site before proceeding with the work.

1.8 WORKMANSHIP

A. All equipment, conduit, fixtures, etc. shall be installed in a workmanlike manner meeting the accepted standards of the representative industry.

B. All work to be performed shall be done by qualified mechanics. All mechanics in the employ of this Contractor on this project shall be skilled in the phases of the work to which they are used. The mechanic’s affiliation with labor organizations shall be acceptable to all trades employed on the project.

1.9 SUBMITTAL PROCEDURES

A. Transmit each submittal with an Engineer accepted form. Include one copy each for the Owner and the Owner's Representative in addition to copies required by the Contractor.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contractor, Sub-Contractor or Supplier; pertinent drawing sheet and detail number and specification section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the work and Contract Documents.
E. Incomplete submittals shall not relieve the Contractor of providing a complete and functional system.

F. Schedule submittals to expedite the Project. Coordinate submission of related items.

G. Submittals by the Contractor must be in complete compliance with the Contract Documents unless exceptions are identified. Exceptions to the Contract Documents may only be made to improve the project. Exceptions cannot be taken which would provide an incomplete and/or nonfunctional system.

1. Exceptions must be included in/on the submittal in a separate paragraph or drawing block located below the Contractor's stamp identified by the title "Exception to Contract Documents." Exceptions cannot be part of the standard Contractor's stamp.

H. Provide space for Contractor and Owner's Representative review stamps.

I. The Engineer will return shop drawings with the following designations:

1. Reviewed: Further submission not required.

2. Reviewed as Noted: Corrections must be incorporated in final installation. Further submission not required unless specifically noted.

3. Review Not Required: Placed in project files for information only.

4. Revise and Resubmit: Make necessary changes and resubmit prior to fabrication or purchase.

5. Rejected: Does not meet project requirements. Resubmit in accordance with Contract Documents.

J. Revise and resubmit submittals as required, identify all changes made since previous submittal.

K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.10 SHOP DRAWINGS/PRODUCT DATA

A. Submit shop drawings and/or catalog cuts for all specified materials and equipment.

B. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.

C. Mark dimensions and values in units to match those specified.

D. Show equipment sizes and dimensions.

E. Include wiring diagrams, hole location and sizes, and other data that could affect work by other trades.

F. Show manufacturer's names, trade names, catalog numbers, accessories, special features and rating data.

G. Indicate required clearances for operating parts, for removal and for servicing.
H. Show all applicable performance data.

I. Show sound power levels of all rotating equipment.

1.11 CUTTING AND PATCHING

A. In new construction, the Contractor shall give the General Contractor complete information as to size of openings required in floors and walls, etc., so that such openings may be provided as the project progresses. In existing construction, the Contractor shall do his own cutting and patching required for the installation of his work.

B. If openings are omitted or are incorrect through failure of the Contractor to follow these instructions, the Contractor shall, at his own expense, engage the trade, which originally installed the work, to cut and patch to the satisfaction of the Owner's Representative.

C. All cutting and patching of every nature required in connection with this Contract shall be done by the Contractor with mechanics experienced in their respective lines of work. All patching shall match adjacent finishes.

D. All cutting in building shall be done with great care so as not to leave an unsightly surface, which may not be concealed by plates, escutcheons, or other normal concealing construction. If such unsightly conditions occur the Contractor shall be required at his own expense, to engage the General Contractor to replace the damaged materials with new materials.

E. Any penetrations of a roof shall be done in accordance with the roof manufacturer's recommended details for that type of roof and per industry recognized good practices. The penetration methods shall not invalidate any existing warranties.

1.12 SUBSTITUTIONS

A. Any bidder wishing to substitute "or equal" equipment may request a substitution. Manufacturer's which are submitted as substitutions for approved equal status are considered to have equipment of similar quality, however, the Contractor shall not assume that a piece of equipment by a manufacturer submitted as a "substitution" will be automatically accepted. Compliance with the Drawings and Specifications is still required. If the substituted material is considered to be unacceptable, the Contractor shall provide the equipment as originally specified.

B. Substitutions are encouraged when there is significant cost savings or improvement to the project. Submit reasons for changes with any requests for substitution. All requests for substitutions must be made within 30 days of contract award unless stated otherwise in the General Conditions.

C. Bid alternates shall be clearly defined in order to be evaluated during the bidding process.

D. By submitting an alternate or substitution, the Contractor automatically agrees to the following:

1. The Owner shall be reimbursed by the Contractor for any additional costs incurred by the Owner's Representative to review the substituted materials, in accordance with the then current Owner's Representative's hourly rate.

2. The Owner shall be reimbursed by the Contractor for any additional costs incurred by the Owner's Representative field or office conferences caused by the substituted materials in accordance with the then current Owner's Representative's hourly rate.
3. The consideration of alternates/substitutions does not obligate the Owner's Representative to accept same.

4. In the event a brand is approved and substituted, it is the responsibility of the Contractor to so coordinate his substituted material into the original work at no extra cost to the Owner or any other Contractor.

1.13 CONCRETE AND MASONRY WORK

A. Unless otherwise noted, all concrete bases, reinforcing, etc. and masonry work required to install the respective Contract Work shall be furnished and installed by the respective Contractor.

B. Provide a 3-1/2 inch high housekeeping pad for all substations, switchboards, motor control centers, transformers, power converters, and other floor mounted equipment. Pads shall extend one inch in all directions beyond the edge of the equipment.

C. The Contractor shall furnish all materials, labor, equipment and tools necessary to complete concrete and cement work.

D. All concrete work shall comply with the requirements of the ACI Building Code (ACI 318), the ACI Detailing Manual (ACI 315) and the Specifications for Structural Concrete for Buildings (ACI 301).

E. If cold weather construction is required, freeze protection must be provided for all concrete. The subgrade cannot be frozen. The concrete must be treated and blankets must be used during curing. All the requirements of ACI 306R must be followed. Any contractor not experienced in cold weather concrete construction shall obtain a copy of the most recent version of ACI 306R and take all precautions prescribed therein.

F. All reinforcing steel shall be manufactured from high strength billet steel conforming to ASTM Designation A-615 Grade 60. Welded-wire fabric shall comply with ASTM A-185.

1.14 MATERIALS

A. All materials and equipment provided by this Contractor shall be new, without imperfections and blemishes and shall be protected from the elements prior to installation in building.

B. All equipment shall meet the requirements of NFPA 70 and, in addition, shall be tested, listed and labeled by an approved authority (UL) and shall be installed in accordance with its listing. The Owner's Representative shall have full authority to reject any equipment, material or installation of same, showing defects of manufacture or workmanship.

C. All equipment subject to specific requirements of the Owner's insurance company (fire alarm system, security system, etc.) shall meet the insurance company's requirements.

1.15 METHODS

A. The Electrical Contractor shall confer with all other Contractors and shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the Drawings. Outlets, equipment or wiring improperly placed because of the Electrical Contractor's failure to obtain this information shall be relocated and reinstalled by the Electrical Contractor without additional expense to the Owner.
B. Each Contractor, upon request of the Owner's Representative, shall expedite the work of a specific area, section or part of the project to permit the installation of another part of the work.

C. All conduits, wire, cable, wiring devices and equipment shall be installed in such a manner as to preserve access with sufficient space provided for proper operation and maintenance to any existing equipment or to any new equipment installed under this Specification or under other Specifications or Contracts for this building.

D. This Contractor shall coordinate his work with that of other trades so that all work may be installed in the most direct manner and so that interference between piping, ducts, equipment, architectural or structural features will be avoided. If an interference results, the Owner's Representative shall decide which work is to be relocated, regardless of which was first installed. Such relocation shall be at no additional cost to the Owner.

E. All materials and equipment installed by the Contractor shall be firmly supported and secured to the building construction where required.

F. All items of labor, material and equipment not specified in detail or shown on the Drawings but incidental to, or necessary for, the complete and proper installation and proper operation of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for in detail by the Specifications or Drawings.

G. All equipment shall be installed in accordance with the manufacturer's recommendations and installation instructions. The manufacturer's installation recommendations and instructions shall be considered part of the Contract.

H. The equipment installation shall also adhere to the installation recommendations and instructions of other building components such as wall and roof materials which the installation impacts.

I. Any questions regarding means or methods of construction shall be addressed during the bidding phase of the project.

1.16 SCHEDULING OF WORK

A. The Contractor shall attend all planning meetings, provide scheduling information and work with all trades to obtain a workable project schedule that meets the Owner's requirements.

1.17 PROTECTION

A. Each Contractor shall effectively protect his work and materials with tarpaulins or heavy plastic material against dirt, water, chemicals, plaster, or damage during the entire period of installation or until he is directed to remove the coverings by the Owner's Representative. Any damaged material must be removed and replaced by the Contractor without additional cost regardless of the cause of the damage. All openings in conduit, fittings, etc., must be effectively sealed to exclude dirt, sand and other foreign substances.

1.18 PROTECTION OF OWNER'S EQUIPMENT

A. The Contractor shall provide any temporary work required to protect the Owner's equipment and to contain the dust generated during construction. Any measures taken by the Contractor for the protection of equipment shall be installed to the satisfaction of the Owner or Owner's Representative, which may include any and all provisions listed in DIVISION-1 General Requirements and/or in accordance with the appropriate technical specifications for wood and
plastics in DIVISION-6. An approved protection material is nylon reinforced flame retardant and anti-static Griffolyn T-55 ASFR 6 mil film (1-800-231-6074 - as of this writing).

1.19 WORK IN THE EXISTING BUILDING

A. The Electrical Contractor shall be responsible for thoroughly surveying the existing building to determine the extent and cost of installing new equipment and materials in the existing building.

B. All new equipment and materials shall be installed in existing building as herein specified.

C. All Contractors before starting any cutting in the existing building must first obtain approval from the Owner’s Representative on the site before cutting at each location. This Contractor shall provide any temporary work required to retain the dust generated by his work as may be directed by the Owner’s Representative. All dust found, which has escaped the area of cutting shall be properly removed by the Contractor without additional cost to the Owner.

D. All openings cut into the exterior of the existing structure must be completely sealed and waterproofed before leaving the job site each day. This shall be done by the Contractor responsible for the cutting.

E. Contractor should not assume utilities can be installed as shown. Drawings are diagrammatic and utilities may need to shift to accommodate existing conditions. It is believed that in general the project can be constructed with utilities in approximately the locations as shown.

1.20 INTERRUPTION OF SERVICES

A. The Contractor shall schedule his work to avoid any interruption of any utility services to the operating areas of the building during normal working hours. Interruption of services shall be done during off hours at no additional cost to the Owner.

B. The Contractor shall notify the Owner and the Owner’s Representative at least three days prior to any interruption of services. The scheduling of all interruptions shall be approved by the Owner.

1.21 RUBBISH REMOVAL AND CLEAN-UP

A. Each Contractor is responsible for periodic removal of all rubbish resulting from his work. All surplus material, refuse, rubbish, etc., shall be removed from the job site at the completion of the Contract. The Owner’s Representative must be satisfied with the removal and clean up.

B. All rubbish shall be legally disposed of by the Contractor. Rubbish removed from the site shall become the responsibility of the Contractor.

C. Any hazardous materials discovered which are not included in the contract shall be brought to the Owner’s attention prior to removal from the site.

1.22 DELIVERING AND STORAGE OF MATERIALS AND EQUIPMENT

A. Deliver accessories, small unmarked parts, adhesives, sealants and incidental items to site in manufacturer’s original, unopened, labeled containers.

B. Store materials and equipment to prevent damage and injury. Store ferrous materials to prevent rusting. Store equipment and lighting fixtures to prevent staining and discoloring.

1.23 AS-BUILT DRAWINGS
A. During construction, the Contractor shall maintain a record set of “red-lined” installation prints. He shall record on these prints, all deviations from the Contract Drawings in conduit and electrical conductor sizing, equipment sizing, location and details.

B. At the completion of the work, the Contractor shall transfer this information neatly onto sepias and forward these sepias and the as-built prints to the Owner's Representative.

C. At the completion of the work, the Contractor shall transfer this information onto one set of prints and onto computer generated construction documents and forward the as-built prints and an electronic copy to the Owner's Representative. Electronic copies of the most recent drawings without title blocks will be made available to the Contractor in AutoCAD versions 2011

OPERATION AND MAINTENANCE INSTRUCTIONS

A. Prior to completion of this project, the Contractor shall deliver to the Owner's Representative for approval three copies of an Operating and Maintenance Manual consisting of items outlined hereinafter.

B. The purpose of this manual is to assist the Owner in routine operation, maintenance, servicing, troubleshooting and procurement of replacement parts. All information in the manual shall be as-built and only material pertinent to the project shall be included.

C. The manual shall include the following:

1. Manuals shall be bound, 8-1/2 x 11 inch text pages and set in three-ring binders with durable covers.
   a. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of project and subject matter of binder when multiple binders are required. All subject matter shall be in typewritten format.

2. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab labeling clearly printed under reinforced laminated plastic tabs.
   a. Contents: Prepare a Table of Contents for each volume with product or system description identified, type on white paper.
   b. Part 1: Directory, listing names, addresses and telephone numbers of Owner's Representative, Contractor, Sub-Contractors and major equipment suppliers.
   c. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses and telephone numbers of Sub-Contractors and suppliers. Operating and start-up instructions shall be written in a concise step-by-step manner. Maintenance instructions shall include maintenance schedules, procedures, adjustments and trouble-shooting techniques. Identify the following:
      1) List of equipment
      2) Parts list for each component
      3) Operating instructions
      4) Maintenance instructions for equipment and systems
d. Part 3: Project documents and certificates, including the following:

1) Shop drawings and product data
2) Control wiring diagrams
3) Certificates
4) Photocopies of warranties
5) Electrical inspection certificate
6) Copy of panelboard directory

e. Submit one copy of completed volumes in final form 30 days prior to final inspection. This copy will be returned after final inspection, with the Owner's Representative comments. Revise content of documents as required prior to final submittal.

f. Submit final volumes revised, within ten days after the Owner's review.

1.25 IDENTIFICATION OF MATERIALS AND EQUIPMENT

A. All panels, combination motor starters, safety switches, motor operated time switches, junction and pull boxes, in-panel sub-feeders and similar items installed under this project shall be identified by name, function and/or control. Included on nameplates shall be the voltage of the involved circuits. Nameplates shall be at least one by three inch with characters not less than 1/4-inch high. They shall be made up of two laminated black plastic sheets bonded with a middle sheet of white plastic and characters engraved in one black sheet to the depth of the white plastic. Provide warning labels on the front of enclosures warning of potential electric arc flash hazard in accordance with the National Electric Code.

B. The Contractor shall provide a typewritten indexed directory in each panelboard indicating the item or items controlled by each circuit.

C. Directories in any existing panelboards shall be updated in typewritten format showing all circuit changes.

D. All circuits shall be identified in outlet boxes as to the specific circuit connection. All circuit conductors shall also be identified as to the voltage of the circuit.

E. Color coding shall be as listed in Section "WIRING" of these Specifications.

F. A typewritten list of nameplates shall be submitted to the Owner's Representative for approval before ordering.

1.26 PAINTING

A. Where factory finishes are provided and no additional field painting is specified; all marred or damaged surfaces shall be touched up or refinished to a smooth and uniform finish. Provide one-pint quantity of factory finish touch-up paint to the Owner.

B. All exposed ferrous metalwork, pipe, supports, hangers, insulation and other surfaces not factory painted shall be painted with one prime and two finish coats. Paint, surface preparation
and application shall be as specified in the Architectural Section: PAINTING. Colors shall match existing work or shall be as selected by the Owner’s Representative.

C. A quantity of touch-up paint (minimum size - one pint) shall be provided for each color used by the Contractor. Touch-up paint shall be delivered to the Owner.

1.27 LAWS, ORDINANCES, AND REGULATIONS

A. All systems in all and/or part shall conform to all pertinent laws, ordinances, and regulations of ALL bodies having jurisdiction, at all governing levels. In case of conflict between governing levels, the more stringent law shall apply. As a minimum, all work shall comply with IBC, NFPA, OSHA and USBC requirements.

B. The Contractor shall pay all fees and prepare and submit all utility applications and obtain and pay for all permits, inspections, and certifications required with his work.

C. All electrical work shall be inspected and certified by the local authorities; if no local authority inspection is available an independent inspection agency such as the Middle Department Inspection Agency (MDIA) shall be hired by the Contractor.

D. The Contractor shall make the Owner’s Representative aware of any and all code variances that may apply to the electrical equipment/systems. Application for said variances shall be the responsibility of the Owner’s Representative.

1.28 BUILDING EXPANSION JOINTS

A. Provide expansion joints in conduits where they cross building expansion joints.

1.29 FASTENINGS, SUPPORTS, AND HANGERS

A. Fastenings, supports, hangers, miscellaneous steel, clamps, and anchors shall be made for purpose for which they are to be used. Toggle bolts or machine bolt fastenings shall be used for hollow tile, terra cotta or lath construction; machine screws for structural steel fastenings; lead expansion shields, and machine screws or lag screws for solid masonry fastening; lag screws for wood fastening. All equipment and conduit shall be rigidly and firmly installed to prevent swaying, vibrating or sagging by malleable or wrought steel hangers of standard design, pipe clamps or fabricated steel supports of approved design. Hangers of horizontal conduit runs shall be adjustable clevis type. Perforated strap iron hangers and caddy clips are not permissible.

1.30 SOUND PARTITIONS

A. Contractor shall be responsible to identify all sound partitions indicated on the architectural plans. Contractor shall seal all penetrations through the wall to maintain the sound absorption integrity of the partition.

1.31 CONCRETE INSERTS

A. The Electrical Contractor shall provide concrete inserts of an approved carbon steel wedge type for all hangers. Where two or more parallel conduits are installed continuous inserts may be used. Where required to distribute the load on the inserts, a piece of reinforcing steel of sufficient length shall be passed through the insert. Each insert shall include a knockout piece. Concrete inserts shall have a minimum safety factor of five.

1.32 SLEEVES
A. The Electrical Contractor shall provide and install sleeves where required to protect equipment or facilities in the installation. Each sleeve shall extend through its respective floor, wall, or partition and shall be cut flush with each surface unless otherwise required.

B. Sleeves in bearing and masonry walls, floors and partitions shall be of standard weight steel pipe finished with smooth edges. For other masonry partitions, through suspended ceilings and for concealed vertical piping, sleeves shall be No. 22 U.S.G. galvanized iron.

C. All sleeves shall be properly installed and securely cemented in place.

D. Floor sleeves shall extend one inch above the finished floor. Space between floor sleeves and passing conduit shall be caulked with an approved graphite packing and/or waterproof caulking compound.

E. Where conduits pass through waterproofed floors or walls, design of sleeves shall be such that waterproofing can be flashed into and around the sleeves.

F. Where sleeves pass through fire-rated walls or floors, a fire barrier protection system shall be used.

G. See architectural drawings for fire ratings of building components.

1.33 FIRE STOPPING

A. Where cables or conduits pass through fire rated portion of the structure, the annular space between them and the structure shall be filled with an approved fireproof material.

B. The contractor shall be responsible to provide and install fire-stopping materials and/or systems where his work penetrates fire and/or smoke rated portions of the building and non-fire resistance-rated assemblies. Contractor shall engage the services of a fire protection contractor to review the drawings and install fire protection products to maintain the integrity of all pipe, wire, conduit, etc. penetrations through any and all fire rated walls, floors, barriers, and assemblies or, after providing documentation that proper training has been provided by a qualified fire-stopping vendor, he may provide the fire-stopping work with his own staff. All materials used shall be manufactured such that they are intended to resist the spread of fire and the passage of smoke. This includes but is not limited to rated walls, floors, shafts, ceilings, and non-fire resistance-rated horizontal assemblies. All fire stopping materials used shall have a fire resistance rating equal to or greater than the rated assembly for which they are installed.

C. For locations where the installed fire stopping material is exposed to normal view, the contractor shall conceal the material with chrome-plated escutcheon plates or other materials that have a flame-spread value of 25 or less and a smoke developed rating of 50 or less, as determined per ASTM E 84. The concealing device shall be approved by the owner's representative prior to installation. Provide shop drawings for each device.

D. The contractor shall provide components/accessories for each fire-stopping system that are needed to install fill materials and to comply with all system performance requirements as recommended by the fire stopping material manufacturer. Accessories include but are not limited to: mineral wool insulation, ceramic fiber, sealants used to aid in the formation of the fire stopping materials, fire-rated formboard, joint fillers and sealers, collars and steel sleeves.

E. Fire stopping materials and systems shall include, but are not limited to, the following: fire barrier caulk and sealants, intumescent caulk, intumescent putty, intumescent wrap strips, silicone foams and sealants, fire barrier composite sheets and cast-in-place fire barrier systems.
F. Fire stopping materials and systems shall be as manufactured by 3M Fire Protection Products, Hilti Corporation, or ProSet Systems Inc.

G. Meet all requirements of Underwriter’s Laboratories and all applicable codes for maintaining the integrity of all fire rated assemblies.

1.34 ANCHOR BOLTS

A. The Contractor shall provide and set in place, at the time of pouring of concrete foundations, all necessary anchor bolts as required for the equipment called for in these specifications. Anchor bolts shall be of the hook type, of proper size and length to suit the equipment. Anchor bolts shall be set in pipe sleeves of approximately twice the bolt diameter and one half the embedded length of the bolt. The Contractor shall assume full responsibility for proper coordination and placement of the bolts. Upon completion of equipment installation, pipe sleeves shall be caulked in accordance with Section, “SLEEVES” of these Specifications.

1.35 HOODS AND SHIELDS

A. Hoods and shields shall be installed to protect important electrical equipment from sprinkler system discharge. Hoods and shields shall be constructed of non-combustible material and shall be sized to prevent direct contact of the discharging water and the important electrical equipment. The local authority having jurisdiction shall determine what electrical equipment will be classified “important electrical equipment.”

1.36 DEMOLITION

A. The Contractor shall perform all demolition work as indicated on the Drawings as part of this Contract.

B. The Contractor shall cut and patch as required to perform the demolition work. All openings created must be repaired to match existing conditions.

C. All cutting and patching shall be performed by mechanics experienced in their respective line of work. If the Owner's Representative is not satisfied with the quality of work, the Contractor shall be required, at his own expense, to engage the General Contractor to replace the damaged materials with new materials.

D. Contractor shall re-establish circuit continuity to wiring devices that may be affected by the demolition process.

E. Demolition shall be accomplished in accordance with the construction phasing schedule. Where necessary the Contractor shall provide temporary circuits, supports, equipment, etc. as needed to keep equipment, building area, etc. operational or to allow relocation of the same during demolition of adjacent areas.

F. Abandoned wire, conduit, devices, and circuits in the area of demolition or individually identified shall be removed in their entirety.

G. The Owner shall be given the opportunity to retain ownership of all removed materials and equipment. All such items shall be carefully handled and protected and shall be stored by this Contractor on site as directed by the Owner. Any such materials and equipment not desired by the Owner shall become the property of the Contractor and shall be removed promptly from the project site. Disposal shall be in accordance with the regulations of the authorities at the disposal site.
H. Discovery of any equipment and/or material which is scheduled for removal and which is suspected of containing asbestos shall require termination of demolition until the Owner is informed and proper testing can be conducted to ensure the material does not contain asbestos. Equipment and/or material found to contain asbestos remediation by others at the cost of the Owner prior to completion of demolition.

I. Any equipment scheduled for removal found to contain PCB’s shall be disposed of in accordance with the Environmental Protection Agency requirements. All disposal documentation shall be delivered to the Owner. Costs of said services shall be the responsibility of the Owner.

J. Fluorescent lamps shall be recycled and/or legally disposed of in accordance with EPA rules. Contractor shall provide documentation of legal disposal when requested. The cost of disposal shall be the responsibility of the Contractor.

1.37 WARRANTY

A. The systems specified herein shall be guaranteed to be free from defects in workmanship and material under normal use and service for a period of one year from acceptance by the Owner or Owner's Representative.

B. If, within the aforementioned warranty period, any of the materials specified herein is proven to be defective in any way, it shall be replaced or repaired at no additional cost to the Owner. The warranty shall include the providing of all labor and materials necessary for repair or replacement of any defective components. The Contractor is responsible for the costs of any services required by equipment suppliers that are not included in the suppliers' warranties.

C. The Contractor shall, after acceptance of the installation by the Owner or the Owner's Representative, provide any service incidental to the proper performance of the system under the warranties outlined above for the time periods listed above.

D. The Contractor shall be responsible to ensure that his work does not invalidate either wholly or partially any existing warranties or the warranties of material or work performed by others. The Contractor is responsible for the costs to repair damaged work and to re-establish the warranty.

1.38 TEMPORARY ELECTRICAL POWER

A. Electrical power from the Owner’s existing system shall be used without metering and without payment of use charges.

B. The Contractor must make arrangements with the Owner for power and provide installation of equipment, wiring, switches and outlets necessary to provide adequate supply for lighting and power for construction purposes as well as power for construction site offices and other temporary storage and construction buildings.

C. The Contractor must provide and maintain lights and signs to prevent damage or injury and must illuminate all hazardous areas. Safety lights must be illuminated during all periods of occupancy.

D. Materials used for temporary electrical power may be new or used but must be adequate in capacity for the purpose intended and must not create unsafe conditions or violate the requirements of applicable codes.
E. The Contractor shall install all work to have a neat and orderly appearance and to make it structurally sound throughout. The Contractor must maintain all temporary electrical systems to give continuous service and provide safe working conditions.

F. The Contractor must modify the service as required by the progress of this job.

G. The Contractor shall remove all temporary equipment and materials upon completion of construction, repair all damage caused by the installation and restore the area to satisfactory construction.

END OF SECTION 16000
SECTION 16100 – ELECTRICAL - INTERIOR ELECTRICAL WORK

1.1 GENERAL

A. All applicable requirements of Section 16000 - ELECTRICAL, GENERAL shall apply to this entire section and shall have the same force and effect as if fully included herein.

1.2 SCOPE

A. This Section of the Specifications covers the furnishing of all labor, materials, equipment and services necessary for and incidental to the installation of all electrical equipment in this building.

1.3 MOUNTING HEIGHTS

A. Unless otherwise noted, all mounting heights indicated on the Drawings shall be to the centerline of the wall box or device indicated except that devices with operable components including receptacles above and/or below the center line shall be adjusted as necessary so that the most extreme portion of the operable component for all operating positions is below 48 inches and above 15 inches. All device mounting heights shall be ADA compliant for front approach. Devices which protrude more than four-inches from the wall in any part of the means of egress shall be mounted such that the bottom of the device is 80 inches above finished floor.

1.4 LOCATION OF OUTLETS

A. The Contractor shall verify location of all outlets before roughing in for same. The Owner or the Owner's Representative shall have the right to relocate any outlet on the project ten feet from the location indicated on the plans, prior to roughing in for same.

B. Maintain a minimum horizontal spacing of 24 inches between all outlets on opposite sides of fire rated walls.

C. No back-to-back outlets.

1.5 WIRING IN EXISTING BUILDING

A. The Contractor shall disconnect and remove all existing wiring and electrical equipment in the existing building as indicated on the Drawings.

B. Where devices and wiring are removed from existing junction boxes, the Contractor shall provide blank cover plates on boxes and knockout snap-in blanks in any open knockout holes.

C. Where existing flush mounted panelboards are indicated to be removed, they shall have their interiors and covers removed. This Contractor shall provide a new blank cover on the backbox.

D. It is the intent of this project to provide the Owner with a complete new wiring and conduit system. No existing conduit or wiring shall be retained or re-used unless shown otherwise or approved by the Owner's Representative.

1.6 CONDUIT & RACEWAY

A. Wherever the terms "conduit" or "raceways" appear, it shall be understood to mean any one, or combination of, the following types:
1. Rigid Galvanized Steel Conduit (RGS)
2. Intermediate Metal Conduit (IMC)
3. Rigid Nonmetallic Conduit (PVC)
4. Electrical Metallic Tubing (EMT)
5. Flexible Metal Conduit (FMC)
6. Liquid-Tight Flexible Metal Conduit
7. Surface Metal Raceway (where specifically called for)
8. Factory Wiring Assembly Systems (for use in concealed, above slab, areas only)
9. Other conduits (where specifically called for)

B. Use of conduit smaller than 3/4 inch trade size is not permitted unless part of a factory wiring assembly system or specifically called for.

C. RGS, IMC or EMT shall be steel piping, zinc galvanized. It shall be of sufficient weight and toughness to withstand cracking and peeling during bending. RGS, IMC or EMT protected solely by enamel shall not be used.

D. Only non-flexible types of "conduit" such as RGS, IMC, PVC, or EMT shall be permitted for installations for future wiring or wiring by others.

E. Each piece of conduit shall be straight, free from blisters and other defects, cut square and taper reamed and shall be furnished in ten foot lengths, threaded at each end. Couplings shall be supplied at one end with a protective sleeve at the other end. All threads shall be cleanly cut. Each length shall bear the Underwriters' label.

F. All conduit shall be manufactured to UL-6, UL-1242 or UL-797 and ANSI C80.1, ANSI C80.6 or ANSI C80.3 standards.

1.7 RIGID GALVANIZED STEEL CONDUIT

A. The Contractor shall provide RGS conduit for the following applications:

1. In gravel or other sub-base floor fills
2. Horizontal runs in concrete floor slabs
3. In masonry walls below grade
4. Vertical or horizontal runs in poured concrete walls
5. Areas subject to severe physical damage, such as, but not limited to, mechanical equipment rooms/spaces or corridors with fork truck traffic
6. Hazardous areas
7. Areas with corrosive atmosphere
8. For support of fixtures or other equipment
9. On exposed exterior pipe bridges
10. Where RGS is called for on the Drawings
11. Where other types of conduit are not specifically required or permitted in these specifications

B. RGS conduit may be supplied in lieu of IMC, PVC or EMT for all applications.

C. RGS shall not be used:
   1. Where other types of conduit are called for on the Drawings
   2. For short sections where FMC is required for vibration isolation

1.8 INTERMEDIATE METAL CONDUIT

A. The Contractor may provide IMC in lieu of RGS for the following:
   1. Horizontal runs in concrete floor slabs
   2. In masonry walls below grade
   3. Vertical or horizontal runs in poured concrete walls
   4. Hazardous areas
   5. Areas with corrosive atmosphere
   6. On exposed exterior pipe bridges
   7. For support of fixtures or other equipment

1.9 RIGID NONMETALLIC CONDUIT (PVC)

A. PVC conduit shall be provided for direct burial or encasement in concrete duct banks.

B. PVC conduit shall be composed of High Impact PVC, shall conform to industry standards and be UL listed for underground and exposed use.

C. Direct buried PVC conduit shall be Schedule 40. Concrete encased PVC conduit used for duct banks may be Schedule EB.

D. PVC conduit shall not be used for interior applications unless called for on the Drawings.

1.10 ELECTRICAL METALLIC TUBING

A. EMT shall be provided for the following applications, except where RGS, IMC, or PVC are required.
   1. In masonry walls above grade
2. Concealed locations except in masonry walls below grade and in poured concrete walls and floors.

3. Exposed interior locations

4. Exposed exterior locations if RGS or IMC are not required by these specifications

5. Higher than ten feet in corridors with fork truck traffic

B. EMT shall not be used for the following applications:

1. Where RGS, IMC or PVC are required

2. Areas subject to severe physical abuse

3. Direct burial including burial in cinder fill

4. Applications subject to galvanic action

C. RGS or IMC shall be provided for any applications where EMT is prohibited.

D. EMT applications shall have short lengths of FMC as required for vibration isolation and to allow movement of lighting fixtures.

E. Concealed conduit shall be EMT except where factory wiring assembly systems are permitted.

1.11 FLEXIBLE METAL CONDUIT

A. Flexible metallic steel conduit shall be provided for connection to motors, transformers, and other equipment subject to vibration, noise transmission or movement and to recessed lighting fixtures as short whips. This flexible conduit, unless otherwise noted, shall be of the same size as the conduit to which it is connected and shall be bonded. Connection to motors, transformers and other high vibration producing equipment shall not exceed 18 inches in length. Half inch flexible metallic conduit may be used for "fixture whip" final connections to lighting fixtures. Fixture whips shall not exceed 72 inches in length. Where used at wet or damp locations, the flexible conduit shall have an outer, listed liquid-tight, corrosion resistant, plastic coating.

B. All flexible metallic steel conduits shall be terminated in squeeze type connectors with insulated throats. Connectors shall use two-screw tightening configuration on conduit one inch and above. Where liquid-tight flexible conduit is used, connector shall include screw-in metal ferrules and insulated throats.

C. Flexible metallic conduit shall not be utilized as part of the "Grounding System." An insulated grounding conductor shall be used at all locations where flexible metallic conduit is installed.

1.12 FACTORY WIRING ASSEMBLY SYSTEMS

A. Factory wiring assembly systems, such as Type MC cable, are a factory assembly of one or more conductors, each individually insulated and enclosed in a metallic sheath of interlocking tape or smooth or corrugated tube.

B. The Contractor may provide factory wiring assembly systems for all interior wiring AWG #8 and smaller which is concealed in non-masonry walls above slab and concealed above ceilings,
unless otherwise required to be run in RGS, EMT or other raceway. Type MC AWG #12 shall be the minimum size wiring used.

C. Factory wiring assembly systems (MC cable) shall not be used for exposed applications.

D. Where used in health care facilities, MC cable shall have an outer sheath approved for use as a grounding conductor in addition to the separate isolated green grounding conductor.

E. MC cable shall not be used for any hospital emergency system circuit.

F. MC cable shall be rated 600V and shall have galvanized steel interlocking armor, copper THHN insulated conductors and a green insulated grounding conductor. MC cable shall be provided with UL listed MC cable fittings and connectors.

G. Type MC cable shall be supported and secured at intervals not exceeding six feet and shall be secured within 12 inches from every outlet box, junction box, cabinet or fitting. MC cable shall not be supported from the ceiling system or wires nor shall it rest on or drape over the ceiling tiles.

H. MC cable shall be permitted to be fished into walls and ceilings of existing finished buildings without being supported.

1.13 CONDUIT INSTALLATION - STEEL

A. The conduit system shall be concealed in the construction except in rooms used exclusively to house mechanical and electrical equipment or in portions of the building where it is impractical. However, at these locations the conduit shall be installed as inconspicuously as possible and in a manner as approved by the Owner's Representative.

B. Conduits in masonry walls shall be run in core of blocks. The Contractor shall cooperate and coordinate his work with the Masonry Contractor to prevent any cutting or chasing after installation of the masonry walls.

C. In the existing building, the Contractor shall cut and patch as required to conceal the conduits to new equipment installed.

D. Conduits shall be installed in such a manner that wires may be removed and replaced at a later date.

E. All conduits shall be run as straight and direct as possible to hold the number of bends or offsets to a minimum. All conduits shall be installed with runs parallel or perpendicular to walls, ceiling and structural members and with right angle turns utilizing condulets or symmetrical bends.

F. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g. conduit bodies and boxes.

G. A separation of six inches shall be maintained between all conduit and hot water lines, steam lines and flues in the building. Where conduits and hot water lines and steam lines are closer than six inches, an approved pipe covering shall be used over the conduit for the length of the run of such exposure.

H. Running threads shall not be permitted. Approved threaded couplings, such as Erikson or a suitable union shall be used where such construction is required. Support of conduit shall be
spaced not more than ten feet apart and within three feet of outlet boxes, junction boxes or cabinets. Conduit runs shall be supported by approved straps or beam clamps.

I. Where it is necessary to cross expansion joints in the building construction, conduit runs shall be provided with suitable expansion fittings and copper bonding jumpers.

J. In exterior locations or interior locations subject to extreme temperature fluctuations, long continuous straight runs of conduit shall be provided with suitable expansion fittings and copper bonding jumpers every 200 feet.

K. All couplings shall be tightened to provide an electrical bond throughout the entire conduit system.

L. Each end of every conduit run shall terminate with a galvanized locknut and bushing inside and a locknut outside of the terminating box or in an approved hub.

M. All conduit fittings shall be separate from the conduit and shall be an approved type. Couplings and connections shall be compression type for all EMT and threaded type for IMC or RGS. Indenter type fittings or set screw type conduit fittings are not acceptable.

N. Do not install crushed or deformed conduits. Prevent plaster, dirt or trash form lodging in conduits. Free clogged conduits of all obstructions.

O. No horizontal conduit runs shall be made in tile or masonry walls. Conduits shall not be installed in cinder fills unless encased in concrete.

P. All conduits, which are to remain empty for future introduction of conductors, shall be provided with a 200# test nylon line. Spare conduits shall be tagged at both ends in an approved manner indicating destination and future use.

Q. All spare or future conduits shall be sealed with metal conduit seals (pennies) and secured in place with a malleable conduit bushing.

1.14 CONDUIT INSTALLATION - PVC

A. In addition to the applicable portions of "CONDUIT INSTALLATION - STEEL," the following additional requirements apply to the installation of PVC conduit:

1. PVC shall be installed only at locations specifically approved by the Owner's Representative. The Contractor shall obtain said approval for each location where it is desired to install PVC.

2. PVC conduit runs shall transition to the appropriate metal conduit five feet prior to any bend which causes the conduit run to become exposed.

3. PVC shall not be installed where subject to physical damage.

4. PVC shall be cut square and deburred. PVC sections shall be joined using an approved solvent cement applied as recommended by the manufacturer. Each joint shall be completely watertight.

5. All field bends shall be made using an electric hot box bender designed to handle the size of PVC to be bent. The heating, forming and cooling of each bend and the minimum radius of the curve of the inner edge shall be in strict compliance with manufacturer's recommendations and the minimum inner edge bending radius established by the NEC.
6. PVC conduit shall not be used in return air plenum ceiling or fire-rated ceiling assemblies. The Contractor shall review the architectural and mechanical Drawings to determine these locations.

1.15 CONDUCTORS

A. Unless otherwise directed, all conductors for lighting, power feeders and branch circuit wiring shall be American Wire Gauge, rated 600 volts and 98 percent conductivity copper with THWN-THHN type insulation.

B. All sizes shown on Drawings, unless noted otherwise, are based on copper. Aluminum conductors shall not be permitted.

C. Conductor size No. 10 AWG and smaller shall be solid, except that No. 10 AWG or smaller wiring used for motor branch circuit wiring may be stranded. Conductor size No. 8 AWG and larger shall be stranded.

D. Unless otherwise called for, minimum size conductors for branch circuits shall be No. 12 AWG, except that circuits over 100 feet shall use #10 AWG as the minimum size conductors; for Class 1 power-limited remote-control and signal circuits, No. 14 AWG; and for Class 2 low-energy remote-control and signal circuits, No. 16 AWG.

1.16 WIRING

A. Great care shall be exercised in pulling wires into conduits so as not to damage insulation. Only approved compounds shall be used to assist in the pulling of wires.

B. Multiple circuits in common conduit shall have individual neutrals unless otherwise noted. Circuits to modular furniture whips shall have combined neutrals. Any combined neutral circuit (i.e. multi-wire circuit) shall have a circuit breaker which simultaneously disconnects all ungrounded conductors. Multi-wire circuit conductors shall be grouped as required by the code.

C. The feeder circuits to panelboards with a 200 percent neutral shall have two neutral conductors sized the same as the phase conductors or a single conductor of equivalent ampacity.

D. Conductors shall be continuous from outlet to outlet and no splice shall be made except within outlet or junction boxes. Where called for, branch circuit wiring may be run as a multi-wire circuit to the extent of three different phases and one neutral per conduit, maximum.

E. For convenience in maintenance and testing, no painting or taping for identification of cables will be permitted on a permanent basis, except as noted below:

F. Color coding shall be as follows:

1. 120 Volt, Two Wire Circuit: Grounded neutral - white; ungrounded leg - black.

2. 208Y/120 Volt, Three Phase, Four Wire: Grounded neutral - white; one hot leg - black; one hot leg - red; one hot leg - blue.

3. 240/120 Volt, Single Phase, Three Wire: Grounded neutral - white; one hot leg - black; one hot leg - red.

4. 480Y/277 Volt, Three Phase, Four Wire: Grounded neutral - gray; one hot leg - brown; one hot leg - orange; one hot leg - yellow.
5. All ground wires shall be green.

G. Color coding shall be factory applied to the entire length of the conductors by one of the following methods, except as noted and limited below:

1. Solid color compound.

2. Solid color coating.

H. Field applied color coding may be used in lieu of factory coded wire for sizes larger than No. 6 AWG, where allowed by the NEC.

I. Colored, pressure sensitive plastic or vinyl tape shall be applied in half overlapping turns for a distance of six inches for all terminal points and in all boxes in which conductors are accessible. The last two laps of tape shall be applied with no tension to prevent possible unwinding. Tape shall be 3/4 inch wide, 0.004 inch thick and colors shall be as hereinbefore specified. Tape shall be resistive to acids, alkalines, alcohol, chemicals and weathering. Cable identification markings shall not be obliterated by taping and tape location may be adjusted slightly to prevent obliteration of cable marking.

J. In every pull or splice box and all other places where wires and cables may not be readily identified by nameplate markings on the equipment to which they connect, each circuit shall be identified with a permanent identification tag securely fastened to the conductors with plastic ties. Identification tags shall have the number of conductors, gauge and circuit identification engraved thereon in 1/4 inch high letters. Tags shall be made on label-maker tape.

1.17 SYSTEM BALANCING

A. The system of feeder and branch circuits for power and lighting shall be connected to panelboard buses in a manner that loads connected thereto will be balanced on all phases as closely as practicable (within ten percent). Should there be any unfavorable condition of balance on any part of the electrical systems, Electrical Contractor shall make changes to remedy unbalanced condition. Each circuit in a group of circuits having a common neutral wire shall be connected to different phases.

1.18 SPLICES AND TERMINATIONS

A. Splices and terminations in wires No. 6 AWG and larger shall be made with mechanical splicing or compression type devices and lugs. Mechanical splicing devices and lugs for wires No. 2 AWG and larger shall be of a type in which the contact pressure on the wire is obtained by two or more screws or bolts and so designed that the failure of any one screw bolt or nut will not result in a total loss of contact pressure.

B. Splices in conductors sizes No. 8 AWG and smaller may be made with pressure connectors consisting of cone shaped coiled springs with insulating covers or, for stranded conductors, with crimped sleeve connectors having insulating covers and installed with proper compression tools.

C. Splices and terminations in all equipment, material, etc. shall be rated for 75 degree C temperature to allow use of higher rated conductor.

D. Compression tools shall be ratchet type. Proof of calibration shall be provided upon the Owner’s Representative’s request.

1.19 FUSES
A. Provide, for every fuse clip to which a circuit has been connected, a nonrenewable cartridge fuse of the size indicated on the Drawings or as required in accordance with the manufacturer’s requirements. All fuses shall be dual element, time delay, unless noted otherwise.

B. Unless otherwise specified, current limiting fuses shall be Class RK1 dual element or Class L as indicated on the Drawings. Sizes shall be as indicated. All fuse holders for R type fuses shall be provided with rejection clips.

C. Provide the Owner with three spare fuses for each size and type used on this project.

D. Fuses shall be manufactured by Buss, Gould, CEFCO or approved equal.

1.20 CAST FITTINGS

A. All cast fittings shall be provided with heavy threaded hubs to fit the conduit used. Iron cast fittings shall be cast malleable iron thoroughly coated inside and outside after all machined work is completed. Cast fittings shall be used on all conduit runs except at locations where it is impractical. At these locations factory ells can be used. No factory ells shall be used on exterior of building. All conduits on exterior of buildings or locations where they will be subject to moisture shall be weatherproof.

1.21 WIRING TROUGHS

A. Wiring troughs shall be furnished and installed where indicated on the Drawings or where required by job conditions. Troughs up to six inches square shall be made of 16 gauge sheet steel with larger sizes being made of 14 gauge sheet steel with factory or painted finish; have screwed or hinged cover and insulated cross brackets to support conductors at three foot intervals. Troughs shall be of sufficient size to accommodate feeder conduits and cables and provide ample room for installation and training of conductors.

B. All troughs shall be supported from the building structure independent of the conduits entering them. Feeders in troughs shall be identified by identification tag as hereinbefore specified.

1.22 OUTLET BOXES

A. At all locations shown on the Drawings, an outlet box of proper type and size to satisfy the intended requirement shall be provided. Boxes shall be rigidly secured in position, set true and square. Boxes shall be supported independent of conduits entering them.

B. Outlet boxes shall be sheet steel, zinc coated and be of a class to satisfy the conditions for each outlet.

C. Concealed outlet boxes shall not be less than four inches square or rectangular and provided with the proper size knockouts for the conduits used. All unused knockouts must remain closed. Boxes in plaster construction shall be provided with approved covers or plaster rings. Where permitted by construction, depth of outlet boxes shall be 2-1/4 inch minimum.

D. Where voltage between switches exceeds 300 volts, isolating barriers shall be provided between each gang of box. All ganged switches connected to 277 volts shall have isolating barriers.

E. Where convenience outlets and data/communications outlets are installed in a common box, dividers coated with a foil shield for the isolation of EMI/RFI interference shall be provided between the power and signal sections.
F. All outlets occurring in other than plaster construction and used for other than lights, shall be provided with flush, rectangular, square cornered boxes made for the purpose. No sectional switch boxes will be permitted and a box shall be installed for each single device. Where devices are ganged, gang-type boxes shall be provided.

G. Boxes shall be of unit construction and of size required for the number of devices shown. The shape of the box shall be such as to permit surfacing materials to be cut in straight lines and to fit closely around the box. The box shall be so placed that the cover plate will be flush with the finished wall surface.

H. All boxes for lighting outlets shall be round or octagonal and provided with fixture studs of a size suitable for the weight of the fixture to be supported.

I. Outlet boxes used for exposed interior conduit runs shall be of cast rust-resisting metal. Gasketed covers shall be provided where the outlet is exposed to weather or moisture, or where indicated on the Drawings. At all locations where boxes are provided for special systems the boxes shall be the type and size recommended by the special system manufacturer.

1.23 JUNCTION BOXES, PULL BOXES AND TERMINAL BOXES

A. Junction boxes of ample size shall be provided as required by the construction. Boxes shall be constructed of cast rust-resisting metal or of 14 gauge galvanized steel with riveted or welded joints and provided with covers of the same material which shall be screwed or hinged to the box. Boxes shall be flanged and tapped to receive machine screws. Holes in covers shall be in alignment with tapped holes in box. Where no sizes are given on the Drawings, boxes shall be no smaller than the minimum size allowed by NEC. Where feeders of different systems or voltages pass through the same box, barriers shall be provided for proper separation.

B. Flush mounted boxes shall be fitted with a cover, which overlaps the box one inch all around. Boxes shall be installed every 100 feet in all major feeders.

C. Boxes shall not be placed in locations made inaccessible by piping, ducts, conduits, or other equipment. Attached to all junction and pull boxes shall be the manufacturer's label, Underwriter's label, and an indication of the metal gauge. Each junction box and pull box shall contain an identification plate on the cover indicating the characteristics of the service therein. Boxes shall be rigidly secured to building construction in position, set true and square. Boxes shall be supported independent of conduits entering them.

D. Terminal boxes shall be used in all cases where splices are required in cables or conductors for control wiring or for the telephone and communications systems. All terminal boxes shall include an interior mounting panel and have a hinged cover. For communication system, use terminal block type as recommended by equipment manufacturer.

1.24 CONVENIENCE RECEPTACLES

A. Convenience receptacles, either duplex or simplex, shall be Specification grade 20 amp, two pole, three wire, 125 volts, NEMA 5-20R, shall be listed under FED SPEC WC-596, UL 498 and NEMA WD6 and shall be constructed of heavy duty high impact nylon with brass triple wipe contacts, side wired and designed to accommodate up to and including #10 solid or stranded copper wire. Mounting bracket and screws shall be steel zinc plated. Spring clip type ("Push In") termination is not allowed.

B. All receptacles shall have green grounding screws. Receptacle and cover plate color shall be as directed by the Owner's Representative except that receptacles powered from the emergency generator shall have a red face unless otherwise directed by the Owner.
C. Unless otherwise shown, mount wall receptacles 18 inches above finished floor.

D. Convenience receptacles shall be manufactured by Hubbell, Leviton, Bryant or approved equal.

1.25 GFCI RECEPTACLES

A. Ground Fault Circuit Interrupter Receptacles (GFCI) shall be provided at the locations shown on the Drawings and at all other locations where required by the NEC. This shall include but is not limited to outlets for drinking fountains and/or electric water cooler (EWC) receptacles. Where shown, they shall be wired in a "non-feed-through" manner. These devices shall be the same grade as the Convenience Receptacles specified above and be listed under FED SPEC WC-596, UL 498, NEMA WD 6 and UL Standard 943, Class A, Group 1, rated 20 amp, 125 volts, 60 Hz and provided with a 20 amp NEMA 5-20R rectangular duplex receptacle face. Receptacle face and cover plate color shall be as directed by the Owner's Representative.

B. GFCI receptacles shall be manufactured by Hubbell, Leviton, Bryant or approved equal.

1.26 WEATHERPROOF RECEPTACLES

A. Outdoor receptacles shall be listed as weather resistant, be protected by a GFCI, and have weatherproof covers, which retain their rating while in use. Weatherproof receptacles shall meet all the same specifications as GFCI Receptacles in addition to these specifications.

B. Weatherproof covers shall be manufactured by Bell, Mulberry, Leviton or approved equal.

1.27 WALL PLATES

A. All local control switches, telephone outlets, receptacles, blank outlets and similar devices shall be provided with a specification grade, UL listed, smooth, thermoplastic wall plate with beveled edges. Where more than one switch or device is installed in an outlet box, gang plates shall be used. Wall plate color shall be as directed by the Owner's Representative. Screws shall match color of plates.

B. Finished wall plates shall be manufactured by Hubbell, Leviton, Bryant or approved equal.

C. At locations where FS and FD device boxes are used for switches and receptacle outlets, a stainless steel plate shall be used. Plate shall fit flush with all sides of the box.

D. Stainless steel plates shall be manufactured by Hubbell, Leviton, Bryant or approved equal.

1.28 DISCONNECT SWITCHES

A. Disconnect switches shall be of the rating indicated on Drawings. Disconnect switches shall be heavy-duty type, fused or non-fused, as indicated, with positive quick-make and quick-break operating mechanism with external operating handle. Switches for indoor use shall be contained within a general purpose, NEMA Type 1 enclosure and for outdoor use, in a NEMA 3R enclosure, unless otherwise indicated. Switch shall be painted gray inside and outside. Each switch shall be equipped to accommodate size wire indicated on the Drawings. Where used as service entrance equipment, disconnect switches shall be provided with service entrance labels.

B. Unless otherwise called for, the switches shall disconnect each phase and shall contain a solid neutral bar where a neutral is indicated, and a ground bar. The enclosure shall be provided with openings in the proper location to permit installation of the conduit and wiring system indicated on the Drawings. Disconnect switches provided with "R" type fuses shall have rejection clips.
C. All switches shall be of proper horsepower rating as applicable and have dual cover interlocks designed to prevent opening of the switch door when the handle is in the “ON” position and to prevent closing of the switch mechanism with the door open. The handle position shall indicate whether the switch is "ON" or "OFF." Unit cover shall be provided with a suitable means of interlock release. Provisions shall be made for locking the operating handle in the "OFF" position.

D. Approved type NEMA enclosures shall be supplied for switches exposed to weather. At locations where special enclosures are provided, conduit sealing fittings shall be installed for conduit entering the enclosure.

E. Disconnect switches shall be manufactured by Square D, Siemens, General Electric or approved equal.

1.29 ENCLOSED CIRCUIT BREAKERS

A. Enclosed circuit breakers shall be of the rating indicated on Drawings. Enclosed circuit breakers for indoor use shall be contained within a general purpose, NEMA Type 1 enclosure and for outdoor use, in a NEMA 3R enclosure, unless otherwise indicated. At locations where special enclosures are provided, conduit sealing fittings shall be installed for conduit entering the enclosure. Enclosed circuit breakers shall be painted gray inside and outside. Each enclosed circuit breaker shall be equipped to accommodate size wire indicated on the Drawings. Where used as service entrance equipment, enclosed circuit breakers shall be provided with service entrance labels. Provide warning labels on the front of enclosures warning of potential electric arc flash hazard in accordance with the National Electric Code.

B. Unless otherwise called for, the enclosed circuit breakers shall contain a solid neutral bar where a neutral is indicated, and a ground bar. Lugs shall be rated to allow use of 75 degree C rated conductors. The enclosure shall be provided with openings in the proper location to permit installation of the conduit and wiring system indicated on the Drawings.

C. Circuit breakers shall have a short circuit rating equal to the short circuit rating of the next upstream protective device unless otherwise noted. The handle position shall indicate whether the breaker is "ON" or "OFF." Provisions shall be made for locking the operating handle in the "OFF" position.

D. Provide 120 VAC shunt tripping device where indicated on the Drawings.

E. Circuit breakers shall be manufactured by Square D, Siemens, General Electric or approved equal.

1.30 PANELBOARDS - CIRCUIT BREAKER TYPE

A. All panelboards shall be of the dead front type, shall be manufactured in accordance with UL 67 and shall have branch circuit protectors in the quantity and of ratings indicated on the Drawings. Panelboards shall be provided with a neutral bar insulated from the cabinet and a ground bar bonded to the steel cabinet. Isolated ground panelboards shall have a second ground bar isolated from the cabinet and the normal ground bar. Panelboards shall be sequence phased.

B. Bus bars and all current carrying parts of panelboards, exclusive of circuit breakers, shall be tin or silver plated copper, sized in accordance with the requirements of the Underwriter's Laboratories, Inc.

C. Branch circuit protectors of each panelboard shall be interchangeable, bolt-on (except that Square D I-Line breakers are acceptable), thermal magnetic type; single or multiple pole with a
All circuit breakers within each panelboard (unless approved otherwise by the Owner’s Representative) shall be by the same manufacturer as that of the panelboard.

D. Branch circuit breakers shall have short circuit interrupting capacities as indicated, not less than 10,000 amperes symmetrical for 208/120 volt system and 14,000 amperes symmetrical minimum for 480/277 volt system. Service and feeder circuit breakers in main distribution panels shall have short circuit interrupting capacities as indicated or not less than 22,000 amperes symmetrical. Series rating of circuit breakers to achieve the required short circuit interrupting ratings is not allowed. (Electrical Contractor shall be responsible for coordinating the main distribution panelboard equipment AIC rating with available short circuit value as provided by the utility.)

E. Circuit breakers shall be readily removable from front of panelboard without disturbing adjacent units. Circuit breakers shall have their ampere rating engraved on the breaker handle. They shall have quick-make and quick-break toggle mechanisms, non-fusible contacts, with inverse time-current characteristics. Breakers shall trip free on overload and shall indicate clearly whether they are in open, tripped or closed position. Multiple pole units shall have a thermal element in each pole and a single handle. Closely grouped circuit breakers and thermal tripping devices mounted in a common cabinet shall be derated when necessary in accordance with NEMA standard recommended practices for high ambient temperatures. All circuit breakers for lighting circuits shall be "SWD" rated or "HID" rated for HID lighting fixtures, "HM" rated for lighting fixture circuits with inherent high inrush current or individual dimmer applications and "HACR" rated for heating, air conditioning and refrigeration. Provide arc-fault circuit interrupter (AFCI) circuit breakers for all single-phase circuits to dwelling unit bedrooms.

F. Circuit breakers shown on the Drawings to be installed in existing panelboards shall be of the same manufacturer, type and configuration as the existing panel circuit breaker.

G. All lugs installed in panelboards shall be copper or high percentage copper alloy rated for use with 75 degree C wiring. Any lug with screws or bolts, which, after installation, operates at a higher temperature than the cable it connects, shall be replaced by the Contractor at no additional cost to the Owner.

H. All bus contact surfaces shall be plated. The bus bars shall be hard drawn tin or silver plated copper of at least 98 percent conductivity, in continuous lengths and of such size and current density so that when carrying the full rated capacity they shall not have a temperature rise of more than 30 degrees C above that of the surrounding atmosphere. Each panel shall have a neutral bus unless otherwise noted. Provide a neutral bus with 200 percent current capacity where indicated. Provisions for future breakers shall include all bus and hardware for the future breakers.

I. Where integral surge protection is indicated, panelboards shall include factory installed integrated transient voltage surge suppression (TVSS) which conforms to NEMA LS1, UL 67, 1449 and 1283 and is suitable for ANSI/IEEE C62.4 category C1 environments. The minimum total surge current shall be 120 KA per phase and 60 KA permode for 9000 C3 waves at 10 KA. The TVSS shall be immediately installed on the load side of the main breaker or main lugs via a direct bus bar connection (cable connection is not acceptable). The TVSS shall not limit the use of feedthrough lugs. The panelboard shall be capable of being energized upon removal of the TVSS. Monitoring diagnostics features shall be visible from the front of the equipment.

J. Panelboards shall be manufactured by Square D, Siemens, General Electric, or approved equal.

1.31 PANELBOARD CABINETS
A. All panelboards shall be mounted in a sheet steel enclosing cabinet designed for surface or flush mounting as indicated on the Drawings. Cabinets shall be fabricated of code-gauge, galvanized sheet steel and, unless otherwise specified, shall be furnished with manufacturer's standard gray finish. Provide warning labels on the front of enclosures warning of potential electric arc flash hazard in accordance with the National Electric Code. The rear of the cabinets shall be provided with a suitable means of supporting the panelboard in such a manner that adjustments may be made in all directions.

B. Cabinets shall have suitable lugs for mounting and be provided with steel trims and doors. Doors shall be hung on trim with heavy flush butt hinges. Doors and trims shall be of integral single-door construction and so designed that doors will close without a rabbet. Doors 48 inches high or less shall be equipped with spring locks and catches. Doors larger than 48 inches in height shall be provided with a vault type handle.

C. Panelboards located indoors shall be rated NEMA 1 unless otherwise noted. Panelboards located outdoors shall be rated NEMA 3R unless otherwise noted.

D. Unless otherwise shown, panelboards shall be installed so that the operating handle of the top branch circuit protector does not exceed 72 inches above finished floor and the bottom of the cabinet is not less than 18 inches above finished floor.

E. All cabinets shall have wiring gutters at top, bottom and sides of sufficient size to adequately accommodate the conduits, wires and cables entering and leaving same and having minimum depth of 5-3/4 inches and a minimum width of 20 inches. Cabinets shall be manufactured in accordance with Underwriter's Laboratories, Inc. standard for Cabinets and Boxes (UL 50). Unless otherwise called for, no splicing of wires shall be allowed in panelboard backboxes.

F. Fronts of all cabinets shall have adjustable indicating type clamps and angle iron rest near the bottom to aid in installation and removal. All two-section panelboards shall have split covers.

G. All cabinets shall be provided with the proper number and size openings for conduits installed. No openings will be permitted which are not to be utilized.

H. Circuit directory holders shall be metal frames welded to inside of each cabinet and have transparent cover under which shall be placed neatly typewritten schedules identifying circuit control.

I. All panelboards in areas exposed to other than authorized personnel shall be provided with lockable covers with all locks keyed alike.

J. The Contractor shall provide the Owner with two keys for each panelboard.

1.32 CIRCUIT BREAKER "LOCK-ON" DEVICES

A. Provide, install and connect handle "Lock-On" devices on the circuit breakers indicated on the schedules. "Lock-On" devices shall prevent accidental turning "off" of critical circuits. These devices shall be "trip-free" and permit the circuit breaker to trip automatically on overload. Lock-on devices shall be of the type recommended by the panelboard and circuit breaker manufacturer.

1.33 MANUAL MOTOR STARTERS

A. Full voltage manual starters for single phase, single speed, non-reversing motors up to one horsepower shall be horsepower rated and operated by means of an OFF/ON toggle.
mechanism. The toggle mechanism shall be positive acting quick-make and break, toggle action with double-break silver alloy contacts.

B. A "trip-free" current sensing overload mechanism with inverse time limit features shall be an integral part of the starter and it shall be so designed as to open the contacts if the motor is overloaded. Provide overload heater of the proper size based on the horsepower, voltage and RPM of the motor, or on motor full load current.

C. Manual motor starters shall be manufactured by Square D, Siemens, General Electric or approved equal.

1.34 MOTOR STARTER RELAYS

A. Motor starter relays for single phase, single speed, non-reversing motors up to one horsepower shall be horsepower rated with one 30A N.O. contact for 120V motors and two 30A N.O. contacts for 208V or 240V motors.

B. Motor starter relays shall be controlled by a continuous rated coil of AC or DC voltage as required by the ATC Contractor. Coordinate requirements with the ATC Contractor prior to purchase. For installation not controlled by the ATC system, provide 120 VAC coils.

C. Indoor installations shall be provided in the available NEMA 1 enclosure. Outdoor installations shall be an open relay mounted in a separate NEMA 3R or 4 box.

D. Motor starter relays shall be Class 8501 Type C manufactured by Square D or equal.

1.35 MOTOR STARTERS AND CONTACTORS

A. Unless otherwise specified, motor starters shall be of the magnetic type, NEMA class, size and type as indicated on the Drawings with red indicating light, HAND-OFF-AUTOMATIC selector switch, four auxiliary contacts (two N.O. and two N.C.) and fused control power transformer to provide 120 volts AC control voltage. Surge protection shall be provided for the motor starting coil.

B. Connections to selector switch shall be such that only normal automatic regulatory control devices will be bypassed when the switch is in the "hand" position. All safety control devices, such as low and high pressure cutouts, high temperature cutouts and motor overload protective devices shall be connected in the motor control circuit in both the "hand" and the "automatic" positions. Overload protective devices shall give adequate protection to the motor windings, be of the solid state type which also provide phase loss protection and include a manual-reset type pushbutton on the outside of the case.

C. Motor starters and contactors shall be manufactured by Square D, Siemens, General Electric or approved equal.

1.36 COMBINATION MOTOR STARTERS

A. Unless otherwise specified, combination motor starters shall be of the fused disconnect switch type complete with dual element, current limiting fuses. Unit shall be of the NEMA Class and size as noted on the Drawings, with overload protection in each pole. Overload elements shall be of the proper size to protect the motor. Unless otherwise noted, units shall be equipped with red indicating light, HAND-OFF-AUTOMATIC selector switch, four auxiliary contacts (two N.O. and two N.C.) and fused control power transformer to provide 120 volts A.C. control voltage. Surge protection shall be provided for the motor starting coil.
B. Connections to the selector switch shall be such that only the normal automatic regulatory control devices will be bypassed when the switch is in the "hand" position. All safety control devices, such as low and high pressure cutouts, high temperature cutouts and motor overload protective devices shall be connected in the motor control circuit in both the "hand" and the "automatic" positions. Overload protective devices shall give adequate protection to the motor windings, be of the solid state type which also provide phase loss protection and include a manual-reset type pushbutton on the outside of the case.

C. Disconnect operating handle shall be interlocked with the door so that the door cannot be opened with the switch in the "ON" position, except through an interlock release mechanism known only to authorized personnel. The operating handle shall be arranged for padlocking in the "OFF" position with up to three padlocks.

D. Combination motor starters shall be manufactured by Square D, Siemens, General Electric or approved equal.

1.37 GROUNDING

A. All electrical systems shall be suitably grounded, including all non-current carrying components of all equipment and metallic conduits. Grounding shall be accomplished by means of the following grounding systems and shall be in complete accordance with the latest issue of the National Electrical Code.

B. The grounding electrode conductor system shall comprise a common ground conductor interconnected to an acceptable coldwater service pipe. Grounded conductor shall be continuous throughout its length without any splices. The water pipe connection shall be made with a mechanical clamp type ground fitting that bonds both conduit and cable to the water pipe ahead of meter. Provide jumper around water meter and hot water heaters. Unless otherwise specified, conductor shall be installed in exposed conduit with conductor securely bonded to the conduit where it enters and leaves the raceway.

C. Contractor shall install a water stop for each grounding conductor, which passes through a foundation wall.

D. Unless otherwise specified, the grounding system shall be augmented by the following:

1. Extend grounding electrode conductor to steel frame of building and to 20 feet of #4 AWG copper conductor located in the concrete footing near the building perimeter with a minimum of 2 inches of cover. Where steel building frame or grounded water pipe does not exist, install grounding counterpoise.

2. Grounding counterpoise shall consist of three 3/4 inch x 10 foot copper clad steel ground rods spaced 10 feet zero inches (minimum) on center. Rods shall be installed with top of rod 12 inches below finished grade. Rods shall be interconnected by means of a #2 (minimum) copper ground wire. Ground conductor shall be bonded to ground rods with exothermic bond type ground connectors.

E. Connect grounding electrode conductor to neutral of separately derived systems (transformers) and to structural steel of building. Unless otherwise indicated, size per NEC.

F. A code size ground conductor shall be extended in each conduit. Where parallel conduits are indicated a full code size ground conductor shall be extended in each parallel conduit.

G. All connections to equipment and conduits shall be made with an approved type solderless connector. Connectors shall be securely bolted or clamped to the equipment. All contact
surfaces shall be thoroughly cleaned and bright before connections are made in order to insure a good metal-to-metal contact.

H. All connections to ground conductors shall be made accessible for visual inspection. The resistance between the grounding system and absolute earth shall not exceed 10 ohms and shall be measured by the Electrical Contractor in the presence of the Owner or the Owner's Representative prior to placing equipment in operation.

I. All grounding conductors shall be identified by green color insulation unless indicated to be bare.

J. Access flooring system grounding conductor shall match or exceed size of largest power source feeder grounding conductor provided for any of the electrical equipment installed in or on the access flooring system. Selection of power source grounding conductors shall conform to the NEC.

1.38 CONTROL RELAYS

A. Control relays shall be industrial electro-mechanical type, UL listed with standard cartridge-type contact assemblies to allow individual removal of cartridge without disturbing adjacent cartridges. Relay shall be provided with two normally open contacts and two normally closed contacts and a control coil rated for operation at 120 volts A.C. Control relay shall be mounted in a NEMA 1 enclosure and shall be manufactured in accordance with NEMA standard ICS2.

B. Control relays shall be manufactured by Square D, Siemens, General Electric or approved equal.

END OF SECTION 16100
SECTION 16300 – ELECTRICAL - EQUIPMENT WIRING

1.1 GENERAL

A. All applicable requirements of SECTION 16000 - ELECTRICAL GENERAL shall apply to this entire section and shall have the same force and effect as if fully included herein.

1.2 SCOPE

A. This Section of the Specifications covers the furnishing of all labor, materials, and accessories necessary for, but not necessarily limited to, the installation of a complete, approved power wiring system for electrical equipment supplied by others on this Project.

1.3 ELECTRICAL EQUIPMENT SUPPLIED BY OTHERS

A. Unless indicated otherwise, the Contractor shall provide all required control equipment including motor starters and relays, control wiring, conduit, and all other items necessary for satisfactory operation of all equipment provided on this project. The Contractor shall review the General Construction, Mechanical, and Plumbing Sections of these Specifications for equipment provided by others and wired by this Contractor.

B. The Contractor shall sequence rough-in of electrical connections to coordinate with installation schedule of equipment.

C. The Contractor shall furnish and install disconnect switches for all equipment unless otherwise noted.

D. The Contractor shall complete all power wiring for equipment, through the disconnect switch and/or the thermal cutouts and local control stations to the equipment as required or as specified in accordance with manufacturer's instructions.

E. The Contractor shall provide a 120-volt, 20 amp circuit (2#12 & 1#12G, 3/4 inch CND and a 20A, 1P circuit breaker) from the nearest panelboard with spare capacity for each building automation control panel, PC, and printer.

F. The Contractor shall maintain proper phase rotation sequence and shall be responsible for proper rotation of all electrical equipment.

END OF SECTION 16300
SECTION 16700 - ELECTRICAL - COMPLETION AND TESTING

1.1 GENERAL

A. All applicable requirements of SECTION 16000 - ELECTRICAL, GENERAL shall apply to this entire Section and shall have the same force and effect as if fully included herein.

1.2 SCOPE

A. This Section of the Specifications covers the furnishing of all labor, materials and accessories necessary for, but not necessarily limited to, the completion of the contract and testing of all electrical work performed on this project.

1.3 SERVICE

A. The Contractor shall, after acceptance, provide any service incidental to the proper performance of the systems during the warranty period outlined in SECTION 16000 - ELECTRICAL, GENERAL.

1.4 FINAL ADJUSTMENTS

A. Panelboard covers shall be adjusted to be plumb and level with all cover catches engaged and tight.

B. Doors of all panelboards, switchgear, junction boxes, enclosures, etc. shall swing free for 90 degrees or greater and be adjusted so that all locks, clasps and catches can be easily operated.

C. Install plugs in any unused conduit opening in panelboards, switchboards and other enclosures.

D. Install space cover plates in any unused circuit breaker positions in all panelboards.

1.5 FINAL CLEANING

A. Remove soil, stain and adhered extraneous materials from adjacent surfaces.

B. Clean all soil, extraneous materials, stains, fingerprints, etc. from all lighting fixtures, panels, plates and any other exposed portion of electrical work installed under this project so that no cleaning is required by the Owner.

C. Remove and replace items or materials that cannot be satisfactorily cleaned.

D. Remove any remaining protective covers, tapes or packing materials.

1.6 TESTING OF UNDERGROUND PVC CONDUIT SYSTEMS

A. All underground PVC conduit systems, as noted on the Drawings, shall be tested at a compressed air pressure of not less than 10 PSI. The conduit system shall be without leaks at this pressure for a 24-hour time period.

B. The test shall be conducted by the Contractor and witnessed by the Owner’s Representative. The test shall be performed at no additional cost to the Owner and shall be performed prior to concrete concealment.
C. All fittings, joints, etc. shall be carefully examined for leakage during the tests. A soap solution or other equally effective means shall be used as a leak detection medium. Any defective conduits, joints, etc. shall be replaced by the Contractor at no additional cost to the Owner.

1.7 SYSTEM INSPECTION

A. Upon completion of the work, all electrical work shall be inspected by the local Authority Having Jurisdiction, an inspection group selected by the local Authority Having Jurisdiction, or an independent inspection agency such as the Middle Department Inspection Agency. All costs related to same shall be paid for by the Electrical Contractor.

B. The Contractor shall correct and reinspect, at no additional cost to the Owner, any work failing to pass inspection.

C. Final inspection certificates shall be issued in triplicate and shall be delivered to the Owner’s Representative.

1.8 ELECTRICAL SYSTEM TESTING

A. Upon completion of the work, all manually operable components of the electrical system such as switches, control devices, circuit breakers, etc. shall be operated a minimum of three times. Operation of devices shall cause the appropriate function as herein specified. Testing shall be performed in the presence of the Owner or his representative.

B. Upon completion of the work, all wiring of the electrical installation shall be tested and proved free of unwarranted grounds and other defects. Final tests shall be accomplished by use of a megger or as covered in this Specification. The values of all secondary wiring insulation shall meet or exceed the aforementioned Regulatory Bodies. A complete report of this test shall be submitted to the Owner’s Representative in triplicate, upon request.

C. Upon completion of the work, test the grounding system to assure continuity and that the resistance to ground is not excessive. The maximum resistance to ground of the grounding system shall not exceed 10 ohms under normally dry conditions. Test each ground rod for resistance to ground before making any connections to the rod; then tie entire grounding system together and test for resistance to ground. Make resistance measurements in normally dry weather, not less than 48 hours after rainfall. Submit written results of each test to the Owner’s Representative and indicate the location of the rods as well as the resistance and soil conditions at the time the measurements were made.

D. At the time of testing, all overload devices, including equipment furnished under other contracts, shall be set and adjusted to suit the load conditions.

E. Adjustable settings of molded case breakers shall be set per manufacturer’s recommendation. Devices with three poles shall be adjusted to the same setting.

F. Relays and circuit breaker electrostatic trip units shall be tested and set using a manufacturer approved test set by an electrical test technician with five years continual experience.

G. Megger all service cables and feeder cables #2 and larger before energizing.

H. All equipment and manpower required to perform testing shall be provided by the Contractor at no additional cost to the Owner.

I. Any devices, equipment or wiring failing to pass testing procedures shall be replaced and re-tested by the Contractor at no additional cost to the Owner.
J. Enlist the cooperation of the equipment manufacturer where needed to obtain proper equipment test performances.

1.9 COMPLETION

A. Upon completion of the work, the Contractor shall remove all his excess materials, machinery and equipment from the premises.

B. Upon completion of the work, the Contractor shall return all keys, badges, passes or parking permits issued by the Owner for use during the project.

END OF SECTION 16700