



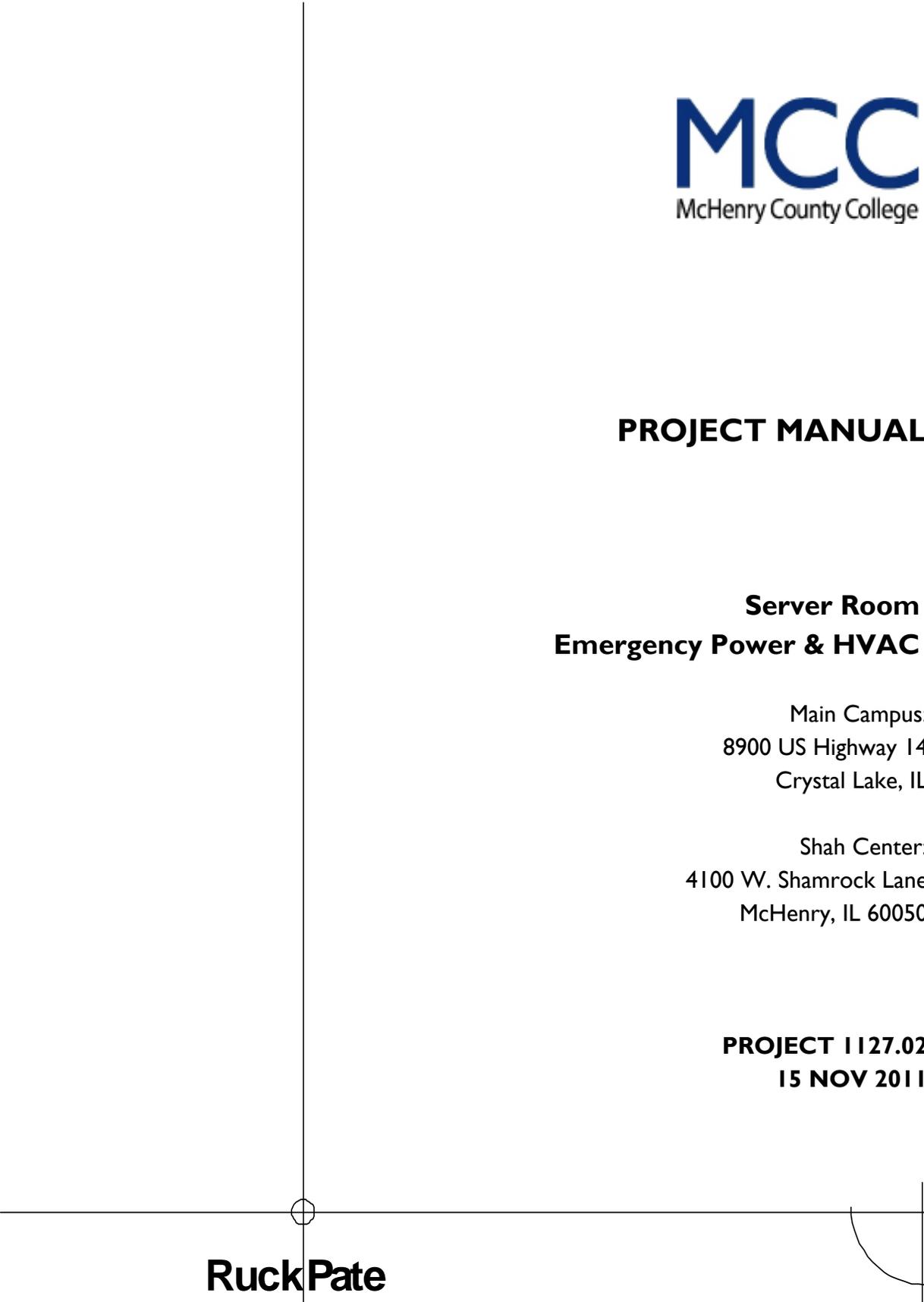
PROJECT MANUAL

Server Room Emergency Power & HVAC

Main Campus:
8900 US Highway 14
Crystal Lake, IL

Shah Center:
4100 W. Shamrock Lane
McHenry, IL 60050

**PROJECT 1127.02
15 NOV 2011**



RuckPate

A R C H I T E C T U R E

22102 North Pepper Road, #201
Barrington, Illinois 60010
tel 847.381.2946
fax 847.304.1218

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LIST OF DRAWING SHEETS
SECTION 00 01 15

1 **Summary:**

1.1 List of drawing sheets included as bidding and contract documents.

2 **Sheet List**

<u>Sheet No.</u>	<u>Description</u>
T1.0	Title Sheet, Drawing Index
A1.0	Plans, Detail, and Sections
MD1.1	First Floor Plan - Building A - Demo - Mechanical
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End of Section

**ADVERTISEMENT FOR BIDS
SECTION 00 11 13**

1. Notice is hereby given by the Board of Trustees, McHenry County College, McHenry County, Illinois, that sealed lump sum bids will be received for the following project:

PROJECT: Server Room Emergency Power & HVAC McHenry County College Main Campus & Shah Center	OWNER: McHenry County College 8900 US Highway 14 Crystal Lake, IL 60012	ARCHITECT: RuckPate Architecture 22102 North Pepper Road, Ste 201 Barrington, Illinois 60010 (847) 381-2946 (847) 304-1218 fax
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2. **Description:** generally the work may be described as emergency power and HVAC improvements for server rooms.
3. **Bids Due:** bids will be received until 1:00 PM, 1 December 2011 at the Business Services Office of the Owner, Building A, Room A246 and will be publicly opened and read at that time.
4. **Document Date:** the bidding documents are dated 15 November 2011.
5. **Document Availability:** the bidding documents are available at the office of the Architect after Noon, 15 November 2011 upon receipt of \$50.00 for one set of bidding documents, not refundable, or in PDF electronic format my email at no cost upon fax or written request to the Architect.
6. **Bid Security:** each bid must be accompanied a bid bond or certified check payable to the Owner in an amount not less than ten percent (10%) of the bid, as required by the Bidding Documents.
7. **Time Bids Held Good:** no bid shall be withdrawn, modified, or cancelled without the consent of the Owner for a period of sixty (60) days after the opening of Bids.
8. **Site Visits:** bidders may visit the site by appointment only. Bidders shall contact Ms. Jennifer Jones, Director of Business Services (jjones@mchenry.edu) to schedule a visit.
9. **Pre-Bid Meeting:** an optional Pre-Bid Meeting will be held at: 9:00 AM, 22 November 2011 at Room A218.
10. **Owner's Rights:** the Owner reserves the right to reject any and all bids or waive any informalities at its discretion.
11. **Bonds:** the successful bidder for the project is required furnish Performance and Labor and Material Payment Bonds in an amount equal to one hundred percent (100%) of the contract amount, with sureties acceptable to the Owner, and in the form required by the Bidding documents.
12. **Prevailing Wage:** the successful bidder shall pay not less than the prevailing rates of wages to all laborers, workmen, and mechanics performing work under this contract, as ascertained by the Illinois Department of Labor, and shall submit certified payroll records, in compliance with the Prevailing Wage Act (820 ILCS 130) and the requirements of the Bidding Documents.
13. **Headings:** headings in this notice are for reader's convenience and are not intended to limit the scope of the information.

End of Advertisement

INSTRUCTIONS TO BIDDERS
SECTION 00 21 00

1 DEFINITIONS

1.1 Definitions are as set forth in the 00 73 00 Supplementary Conditions, and elsewhere in the Contract Documents.

2 BIDDING DOCUMENTS

2.1 The Bidding Documents consist of the following documents:

2.1.1 Procurement and Contracting Requirements Group, Division 00, contained in the Project Manual.

2.1.2 Specifications Group, Divisions 01 - 49 inclusive, contained in the Project Manual

2.1.3 Drawings

2.1.4 Addenda issued prior to opening of Bids.

2.2 Availability:

2.2.1 Documents are available on the McHenry County College web site: www.McHenry.edu/bid and as indicated in Section 00 11 13 Advertisement for Bid. Bidders are responsible for verifying that they have obtained all addenda that may have been issued by the Architect.

2.2.2 Documents will be available for viewing at the office of the Architect.

2.2.3 Documents may also be available for viewing from Dodge, Reed Construction Data, or other plan rooms, however,

2.3 Interpretation:

2.3.1 Interpretations, clarifications and changes to the Bidding Documents will be made by Addendum only. Bidders shall not rely on any method other than Addendum for interpretation, clarifications and changes to the Bidding Documents.

2.3.2 Requests for interpretation or clarification shall be submitted in writing by mail, fax or delivery to the office of the Architect. Requests shall include reference to Project Manual Section and Paragraph number or Drawing Sheet and Detail number. Requests submitted less than two (2) business days prior to receipt of bids may not be answered.

2.4 Substitutions

2.4.1 Bids shall be based on indicated products and materials, without substitutions.

2.4.2 Bidders may propose substitutions on the form provided with the Bid Form.

2.4.3 Substitutions will not be used to determine the low bid.

2.4.4 Substitutions will not be considered prior to award of the Contract. Requirements for substitutions are contained in 01 25 00 Substitution Procedures.

2.5 Addenda

- 2.5.1 Addendum will be posted on the McHenry County College web site www.McHenry.edu/bid. Bidders of record who have obtained documents from the office or the Architect will be notified by email. Copies will be available for viewing at the office of the Architect. Bidders are responsible for verifying that they have obtained all addenda that may have been posted on the College web site.
- 2.5.2 The Bidder shall ascertain that all Addenda, if any, have been received by the Bidder and shall acknowledge receipt of Addenda in the space provided on the Bid Form.

2.6 Other Information:

- 2.6.1 Time and Place of Pre-Bid Meeting, if any, is indicated in Section 00 11 13 Advertisement for Bids.
- 2.6.2 Site Visits: Restrictions on visits to the site, if any, are indicated in Section 00 11 13 Advertisement for Bids.
- 2.6.3 AIA Documents: Referenced AIA Documents are available for purchase from www.aia.org; AIA Chicago, 222 Merchandise Mart Plaza, Suite 1049, Chicago, Illinois 60654, (312) 670-7770; and are available for viewing at the office of the Architect.

3 BIDDING PROCEDURES

3.1 Form of Bids

- 3.1.1 Bidders shall make use of complete documents to prepare bids.
- 3.1.2 Bids shall be submitted using the Bid Form provided, complete with all necessary bid submittals.
- 3.1.3 All blanks shall be filled in by typewriter or by hand in ink.
- 3.1.4 All dollar figures shall be expressed in words and numbers, written words shall govern in the case of discrepancy.
- 3.1.5 All necessary representations and certifications shall be completed and submitted with the Bid.
- 3.1.6 Two copies of the Form of Bid and bid submittals shall be submitted.

3.2 Bid Security

- 3.2.1 Each Bid shall be accompanied Bid Security in the form of a Bid Bond or certified check made payable to the Owner, in an amount not less than ten percent (10%) of the Base Bid, or aggregate amount of multiple Base Bids offered. The attorney-in-fact who executes the bond shall affix a certified and current copy of the power of attorney. Bonds shall be written on AIA Document A310 Bid Bond, by surety with a rating A-, A, or A+ by Best Insurance Guide, latest edition.
- 3.2.2 The Owner will retain Bid Security of Bidders under consideration of award until a Contract is executed with the successful Bidder and the Performance and Labor and Material Payment bonds are delivered.
- 3.2.3 If the Bidder to whom a Contract is awarded fails to enter into a contract with the Owner and deliver Bonds and suitable evidence of insurance within ten (10) calendar days from the date notification of award, the Bidder will be considered as having abandoned the Bid and the bid security shall be forfeited to the Owner as liquidated damages for the delay and loss caused the Owner by reason of such failure on the part of the Bidder.

3.3 Submission of Bids

- 3.3.1 Bids shall be submitted in a sealed, opaque envelope, marked:
SEALED BID FOR
PROJECT NAME, PROJECT NUMBER (*Bidder insert applicable information*)
- 3.3.2 Mailed bids shall be inside a separate mailing envelope.
- 3.3.3 Bids shall be submitted prior to the time for receipt of Bids and at the place identified in the Advertisement for Bids
- 3.3.4 If Bidder wishes to submit bids for multiple separate Bid Packages (when so identified in the Bid Documents) submit a complete and separate bid for each package, with each bid in a separate, clearly marked, sealed envelope.

3.4 Withdrawal or Modification of Bids

- 3.4.1 A bid shall not be withdrawn, modified or cancelled after the time for receipt of bids for the period stipulated on the Form of Bid.
- 3.4.2 A Bid may be withdrawn if a written notice is received at the administration office of the Owner prior to the time of receipt of the Bids.
- 3.4.3 Bids withdrawn and modified may be resubmitted prior to the time for the receipt of Bids.

3.5 Examination of Documents

- 3.5.1 Bidders shall thoroughly examine the Bidding Documents, shall visit the site and become familiar with the local conditions under which work will be performed, shall become familiar with applicable laws and regulations governing the work, and shall correlate all observations and information with the requirements of the of the Bidding Documents.
- 3.5.2 Bidders shall report any errors, inconsistencies and ambiguities, in writing, to the Architect at once.
- 3.5.3 Complete sets of Bidding Documents shall be used by Bidders in submitting a bid.
- 3.5.4 No division of work by trades or subcontractors is intended by the division of the Project Manual or Drawing sheets.

3.6 Other Bid Submittals

- 3.6.1 The Bidder shall submit qualifications statements and documentation of experience as identified in Section 00 45 13 Bidder's Qualifications.
- 3.6.2 The Bidder may be required to submit information regarding the amount and type of work to be performed by Bidder's own forces, and/or the identity, qualifications and other information regarding subcontractors, when required by the Bid Documents.
- 3.6.3 The Bidder may optionally submit additional information which will demonstrate the Bidders responsibility. Such information shall be labeled "Optional Submittal" .

4 POST-BID SUBMITTALS

4.1 Within 24 hours of a request by the Owner the Bidder shall submit additional Post-Bid Submittal information identified in Section 00 45 13 Bidders Qualifications.

5 CONSIDERATION OF BIDS

5.1 Opening Bids

5.1.1 Bids will be publicly opened and read at the time and place indicated in the Advertisement for Bids.

5.2 Rejection of Bids

5.2.1 The Owner shall have the right to reject Bids: 1) which arrive after the stated time for receipt of the bids, 2) from a Bidder which did not attend a mandatory pre-bid meeting, 3) received by oral, telephonic or telegraphic means, 4) which are incomplete or do not contain required data, 5) not accompanied by a required bid security or by other data required by the Bidding Documents, 6) which are in any way is incomplete, irregular, or which otherwise deviates from the requirements of the Bid Documents, 7) from a Bidder who the Owner has determined as non-responsible.

5.2.2 The Owner shall have the right to reject all Bids.

5.3 Bid Evaluation and Award

5.3.1 The Owner shall have the right to waive informalities or irregularities in a Bid received and to accept the Bid which, in the Owner's judgement, is in the Owner's best interest.

5.3.2 It is the intent of the Owner to award a Contract to the low responsible Bidder(s), as determined pursuant to the Bidding Documents

5.3.3 There are two prime concerns in awarding the Contract(s): the lowest Bid and the responsibility of the Bidder, in the opinion of the Owner, to complete the project satisfactorily and within the time set forth in the Bidding Documents.

5.3.4 Low Bid:

5.3.4.1 The low bid amount will be determined on the basis of Base Bid plus accepted Alternate Bids.

5.3.4.2 Substitutions will not be considered in evaluating the low bid.

5.3.4.3 When the Bid Form includes line-item bidding or multiple Base Bids, the Owner reserves the right to split the award among multiple bidders in the manner that provides the best value to the Owner, in the Owner's opinion.

5.3.5 Responsible Bidder

5.3.6 In determining whether a Bidder is a "responsible Bidder", the Owner will consider information provided by the Bidder and by others relating to the Bidder's history of satisfactorily completing work on time and reputation for performing in a prompt, efficient manner without conflict with the owner or architect, and will particularly consider the following factors:

5.3.6.1 Bidder's history of timely project completion without revision or extension of schedule for factors that were within the Bidder's control or which the Bidder should have anticipated.

5.3.6.2 Bidder's history of completing projects without additional expense to the owner for factors that were within the Bidder's control or which the Bidder should have anticipated.

- 5.3.6.3 Bidder's history of completing projects without accident, injury, or damage to property.
- 5.3.6.4 Bidder's history of performance on projects in occupied and partially occupied facilities, with minimum disruption to on-going uses of the facility during construction.
- 5.3.6.5 Bidder's history of cooperation with owners and architects during construction and completion of projects without adversarial actions, arbitration or litigation, except where not due to Bidder's own material fault or neglect.
- 5.3.6.6 Bidder's history of maintaining accurate and complete project documentation, submitting complete and accurate applications for payment, waivers and other required documents and making timely payment to subcontractors and suppliers.
- 5.3.6.7 Bidder's history of providing adequate personnel and management resources for the efficient prosecution and successful completion of projects without undue burden on owners or architects.
- 5.3.6.8 Bidder's possession of adequate personnel, management and financial resources for the successful completion of the project.
- 5.3.6.9 Bidder's history of continuous business operation in the current form of business organization for at least five years prior to the date of this bid:
 - 5.3.6.9.1 Without resort to protection from creditors under bankruptcy laws, placement under receivership or similar action.
 - 5.3.6.9.2 Without termination of a contract by an owner, except through no material fault of the Bidder.
 - 5.3.6.9.3 Without claim on Bidder's bond.
- 5.3.7 False or deceptive responses in any material submitted, or failure to provide required materials may be interpreted as evidence of non-responsibility.

6 PERFORMANCE AND PAYMENT BONDS

- 6.1 Performance Bond and Payment Bond shall be written on AIA Document A312, or other form acceptable to the Owner,, in the amount of one hundred percent (100%) of the Contract Sum .
- 6.2 Bonds shall be dated on or after the date of the Contract.
- 6.3 Bonds shall be delivered to the Owner within seventy-two (72) hours of the execution of the Contract. The attorney-in-fact who executes the bond shall affix a certified and current copy of the power of attorney.

7 INSURANCE:

- 7.1 The successful bidder is required to furnish insurance, including guarantees of indemnity to the Owner and Architect, in form and amounts required by the Bidding Documents.

8FORM OF AGREEMENT

- 8.1 The Contract for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum, 2007 edition, as modified below:
 - 8.1.1 Add the following Sub-subparagraph 3.4:
"3.4 The Contractor shall achieve final completion of the entire Work not later than thirty (30) days after the date of Substantial Completion.
 - 8.1.2 Delete Subparagraph 8.2 and substitute with the following Subparagraph:

"Payments due and unpaid under the contract shall bear interest in accordance with the provisions of the Local Government Prompt Payment Act (50 ILCS 505/)"

End of Section

**PRELIMINARY SCHEDULES
SECTION 00 31 13**

1 Summary:

- 1.1 This Section contains preliminary schedule information which establishes mandatory schedule criteria with which the Contractor is obligated to comply.
- 1.2 Schedule information contained herein is preliminary in that it establishes minimum requirements. The Contractor shall prepare detailed schedules incorporating and consistent with this preliminary information, and shall execute the Work to achieve the objectives of the Preliminary Schedules.
- 1.3 The Owner reserves the right to change dates and sequences identified in the Preliminary Schedule subject to equitable adjustment of the Contract Time.
- 1.4 Information on the Owner's Academic Calendar is available at the Owner's web site: <http://www.mchenry.edu/AcademicCalendar.asp>

2 Time of Commencement:

- 2.1 Work shall commence upon execution of the Contract, and delivery to the Owner of Performance and Payment Bonds and satisfactory evidence of Contractor's insurance.
- 2.1.1 The performance of work on site may be restricted subject to the requirements of Section 01 10 00 Summary, and dates established in the Preliminary Schedule, below.

3 Completion Date:

- 3.1 The Contractor shall achieve Substantial Completion of the Work so the Owner's can occupy and use the Work, for the use for which it is intended, by the date established as the Completion Date.
- 3.2 When phased completion and occupancy of various portions of the Work is intended, a Completion Date is established for each phase or portion of the Work
- 3.3 The Completion Date is a date certain, and may be changed only by Change Order properly executed by the Owner and Architect.
- 3.4 In the event that the Completion Date in the Contract between Owner and Contractor differs from the Completion Date specified herein, the Completion Date stipulated in the contract shall take precedence.

(Continued on next page)

4

Preliminary Schedule

14 Dec 2011	Tentative contract award by Board of Trustees
05 Mar 2012	Commence work on site
25 Mar 2012	Spring Recess begins No classes held, offices open for normal operations
02 Apr 2012	Classes resume
12 Apr 2012	Completion Date - Substantial Completion
11 May 2012	Final Completion Date

End of Section

**OWNER'S TAX EXEMPTION
SECTION 00 33 13**

1 Tax Exemption:

- 1.1 The Owner holds an exemption from the Illinois Retailers Occupation Tax, the Illinois Use Tax, and Illinois Service Occupation Tax. A copy of the Owner's Certificate of Tax Exemption will be provided after execution of the Contract.

2 Other Taxes:

- 2.1 Contractor shall include in the Bid and shall pay all other applicable taxes.

End of Section

**BID FORM
SECTION 00 41 00**

Bid to: Board of Trustees
McHenry County College
8900 US Highway 14
Crystal Lake, IL 60012

Bid from: _____
(Bidder's name)

(Bidder's address)

(Telephone Number)

(Fax Number)

1 The Undersigned Bidder acknowledges receipt of:

1.1 Project Manual and Drawings for
Server Room Emergency Power & HVAC
Project No. 1127.02
Dated: 15 Nov 2011

1.2 Addenda: No. _____ Dated _____
No. _____ Dated _____
No. _____ Dated _____

2 The Undersigned Bidder represents that:

- 2.1 Bidder has examined the site where the Work is to be executed; and has become familiar with local conditions and applicable laws and regulations as they might in any way affect the cost and/or execution of the Work.
- 2.2 Bidder has carefully examined and understands the Bidding Documents and that the Bid is in accordance with these documents.
- 2.3 Bidder has based this Bid upon the materials, equipment and systems required by the Bidding Documents without exception.
- 2.4 Bidder has checked all of the figures contained in this Bid and further understands that the Owner will not be responsible for any errors in or omissions from the Bid.
- 2.5 Time is an essential condition of this Bid, and that the Completion Date required by the Bidding Documents is a reasonable and achievable requirement.
- 2.6 The person(s) signing this Bid is(are) fully authorized to sign on behalf of the named firm and to fully bind the named firm to all the conditions and provisions of the Bidding Documents.
- 2.7 No person or company other than the Bidder, unless otherwise disclosed herein., has any interest whatsoever in this Bid or the Contract that may be entered into as a result hereof, and that in all respects the Bid is legal and fair, submitted in good faith, without collusion or fraud.
- 2.8 Bidder has complied or will comply with all licensing requirements and with all other local, state, and national laws, and regulations and that no legal requirement has been or will be violated in making or accepting this Bid, in awarding the Contract to the Bidder or in the prosecution of the Work required thereunder.

3 The undersigned Bidder further represents that the Bidder will enter into and execute a Contract with the Owner within seven days of Notice of Award, if awarded on the basis of this Bid, and in connection therewith will:

3.1 Furnish all bonds and insurance required by the Bidding Documents.

3.2 Commence the Work immediately upon execution of the Contract and delivery to the Owner of Bonds and suitable evidence of insurance.

3.3 Execute the Work in accordance with the Bidding Documents and provide all labor, materials, plant, equipment, transportation and other facilities as necessary or required for the complete and satisfactory execution of the Work.

3.4 Prosecute the Work regularly and diligently and complete the Work on or before the Completion Date required by the Bidding documents.

3.5 Provide the equipment and personnel necessary for timely and proper completion of the Work, and will provide additional equipment and personnel, including overtime labor and additional work shifts beyond the normal working hours, if necessary, to complete Work by the required Completion Date, without additional cost to the Owner.

4 The undersigned Bidder agrees that:

4.1 This Bid shall be valid after the opening of Bids for a period sixty (60) calendar days, and that this Bid shall not be modified, withdrawn or cancelled during that time period without consent of the Owner.

4.2 The Owner may reject Bids subject to the provisions of the Bidding Documents and may waive any informalities or irregularities in the bidding to accept the Bid which, in the Owner's judgement, is in the Owner's best interest.

5 BASE BID

Bidder agrees to perform all Work including the specified allowances, as set forth in the Bidding Documents for the sum of:

_____ Dollars (\$_____)

6 ALTERNATE BIDS

Alternate Bid 1 - Aleternatename

(Add) | _____ Dollars (\$_____)

7 UNIT PRICES (Not Used)

8 Work By Own Forces

8.1 Bidder proposes to perform _____ percent of the project labor with Bidder's own forces, which shall include the following types of work:

9 SUBSTITUTIONS

9.1 The following is a schedule of substitutions offered by the Bidder, with the difference in price being added to or deducted from the Base Bid.

	<u>Manufacturer's Name & Product</u>	<u>Add</u>	<u>Deduct</u>
9.1.1	_____	_____	_____
9.1.2	_____	_____	_____
9.1.3	_____	_____	_____
9.1.4	_____	_____	_____
9.1.5	_____	_____	_____
9.1.6	_____	_____	_____

9.2 Bidder agrees that:

9.2.1 Substitutions proposed by the Bidder will not be used in determining the low responsible Bidder.

9.2.2 The Owner is not obligated to consider any substitution proposed by the Bidder.

9.2.3 Rejection of any substitution offered will not affect the Base and Alternate Bids.

9.2.4 Substitutions offered but not accepted prior to execution of the Contract may be withdrawn.

9.2.5 Substitutions shall be incorporated in the Work only if Owner's acceptance is indicated in the Contract or in a written Change Order properly executed by Owner and Architect.

9.3 In proposing the substitutions herein, the Bidder represents that::

9.3.1 Bidder has investigated the proposed substitution, and has determined that it is equal or superior in all respects to that specified.

9.3.2 Bidder will provide the same guarantee for the substitution as for the item specified.

9.3.3 Bidder will coordinate installation of an accepted substitution into the Work, making all such changes as may be required for the Work to be complete in all respects.

9.3.4 Bidder waives all claims for additional costs related to the substitution.

9.3.5 Cost data is complete and includes all related costs under his Contract, and will pay all costs incurred by the Owner for investigation, evaluation and changes to the design and Contract Documents which may be required to incorporate the proposed substitutions.

10 **BIDDERS CERTIFICATIONS**

10.1.1 **Eligibility:** The undersigned Bidder hereby certifies that Bidder is not barred from submitting this bid as a result of a bid-rigging or bid-rotating violation of 720 ILCS 5/33E-3 or 33E-4.

10.1.2 **Illinois Human Rights Act:** The undersigned Bidder hereby certifies pursuant to Illinois Human Rights Act, 775 ILCS 5, that Bidder has adopted a written sexual harassment policy that includes at a minimum the following information: (I) the illegality of sexual harassment; (ii) the definition of sexual harassment under Illinois law; (iii) a description of sexual harassment, utilizing examples; (iv) internal complaint process including penalty; (v) the legal recourse, investigative and complaint process available through the Illinois Department of Human Rights and the Illinois Human Rights Commission; (vi) directions on how to contact the Department and Commission; and (vii) protection against retaliation as provided by Section 6-101 of the Illinois Human Rights Act.

10.1.3 **Illinois Drug-Free Workplace Act:** (initial one of the two certifications below, as applicable)

_____ The undersigned Bidder hereby certifies that Bidder has fewer than 25 employees.
(Initial)

Or

_____ The undersigned Bidder, having 25 or more employees, hereby certifies pursuant the Illinois Drug-Free
(Initial) Workplace Act, 30 ILCS 580, that Bidder shall provide a drug-free workplace for all employees engaged in the performance of work under the contract by complying with the requirements of the Illinois Drug-Free Workplace Act and, further certifies, that Bidder is not ineligible for award of this contract by reason of debarment for a violation of the Illinois Drug-Free Workplace Act.

10.1.4 **Certification Regarding Criminal Background Investigations:** At the direction and expense of Owner, any employee of Contractor or its subcontractors shall submit and pass a Criminal Background Check as a condition of employment on the Project. The employees of contractor shall submit on forms supplied by Owner, verified identifying information including name, address, Social Security Number, date of birth, height, weight, hair, eye color, previous names and addresses, prior criminal convictions other than minor traffic violations and any pending criminal charges, and authorization to release the results of the background check to the Owner. The information submitted shall be certified by the employee under penalty of perjury. Any employee of Contractor whose Criminal Background Check reflects convictions as enumerated in 105 ILCS 5/21/-21a shall not be employed on the Project.

Contractor represents, warrants and certifies that no officer or director will knowingly engage any employee on the Project who has been convicted of committing or attempting to commit indecent solicitation of a child, public indecency, prostitution, soliciting for a prostitute, soliciting for a juvenile prostitute, pimping, juvenile pimping, exploitation of child, obscenity, sexual assault, aggravated criminal sexual assault, criminal sexual abuse, aggravated criminal sexual abuse and or those offenses defined in the Cannabis Control Act.

10.2 These certifications are executed on the date hereinafter indicated by the designated Bidder or by its duly authorized officer.

By: _____
(Signature)

(Title)

(Printed Name)

(Date)

11 Non-Collusion Affidavit:

The undersigned bidder or agent, being duly sworn, deposes and says that this proposal was prepared independently for this project and that it contains no fees or amounts other than for legitimate execution of this work as specified, and that it includes no understandings or agreements in restraint of trade.

By: _____
(Signature of Bidder or Agent) (Title)

(Printed Name) (Date)

Subscribed to and sworn before me this ____ day of _____ 20____

My commission expires: _____

Notary Public _____ Seal

(Remainder of Page Intentionally Blank)

12 BIDDERS SIGNATURE

Respectfully submitted, this ____ day of _____ 20____

(Name of firm)

By: _____
(Signature)

(Printed Name) (Title)

Subscribed and sworn before me this _____ day of _____ 20____

Notary Public _____

My commission expires: _____

12.1 If Bidder is a corporation, attach a sworn statement signed by an Executive Officer of the corporation, stating that the individual signing and executing this proposal is authorized to bind this corporation thereby and affix corporate seal.

13 ENCLOSURES (two copies of each)

- ___ This Bid Form
- ___ Contractor's Qualification Statement, AIA A305, and attachments
- ___ Supplementary Qualification Statement and attachments
- ___ Bid Security
- ___ Disclosure of interested persons or entities (if applicable - see ¶ 2.7)
- ___ Corporate authorization to bind (see ¶ 12.1)
- ___ Optional Information (describe) _____

End Bid Form

**BIDDERS QUALIFICATIONS
SECTION 00 45 13**

1 RELEVANT EXPERIENCE

- 1.1 Years in Business: Bidder shall have conducted business in the current form of business organization for a minimum of five (5) continuous years prior to the date of this bid. (Provide information on AIA A305 ¶ 1)
- 1.2 Relevant Projects: Bidder shall have successfully completed, within five (5) years prior to the date of this bid, a minimum of three (3) projects in the State of Illinois of similar scope, complexity and contract amount for institutions of higher education, or institutions of public education, or other public sector experience which is relevant to this project. (Provide information on Supplementary Qualification Statement form included in this Section)
- 1.3 Failure to Complete: Bidder shall **not** have failed to satisfactorily complete any project in the past five (5) years except where not due to a material fault of the Bidder.(Provide information on Supplementary Qualification Statement form included in this Section)
- 1.4 Project Manager: The Project Manager proposed by the Bidder for the project shall have a minimum of three (3) years experience managing institutional or commercial projects for a prime contractor, and at least one (1) public project in the State of Illinois of similar scope, complexity and contract amount. (Provide information on Supplementary Qualification Statement form included in this Section)
- 1.5 Field Superintendent: The Field Superintendent proposed by the Bidder for the project shall have a minimum of three (3) years superintending institutional or commercial projects for a prime contractor, and at least one (1) public project in the State of Illinois of similar scope, complexity and contract amount.(Provide information on Supplementary Qualification Statement form included in this Section)
- 1.6 The Owner shall be the sole judge of the relevance and adequacy of bidder's experience, and may consider information obtained independently from bidder's submittals.
- 1.7 The Project Manager and Field Superintendent proposed by the Bidder shall not be changed without the Owner's written approval.

2 LICENSURE AND PREQUALIFICATION

- 2.1 Bidder or bidder's proposed subcontractors shall be appropriately licensed to perform the work of this project at the date of this bid.
- 2.2 Roofing Work: When the project includes roofing work, either the Bidder or the Bidder's proposed subcontractor shall be licensed in the State of Illinois as a Roofing Contractor.
- 2.3 Plumbing Work: When the project includes plumbing work, either the Bidder or the Bidder's proposed plumbing subcontractor shall be registered as a plumbing contractor with the Illinois Department of Public Health.
- 2.4 Paving Work: When the project includes paving work of more than \$50,000, either the Bidder or the Bidder's proposed subcontractor shall be pre-qualified by the Illinois Department of Transportation. For the applicable categories of work.
- 2.5 Subcontractors proposed to satisfy licensure and pre-qualification requirements shall not be changed without written approval of the Owner.

3 **MANDATORY BID SUBMITTALS**

- 3.1 Contractor's Qualification Statement, AIA Document A305, latest edition, completed.
- 3.2 Supplementary Qualifications Statement, using the form provided at the end of this section, with attachments.

4 **OPTIONAL BID SUBMITTALS**

- 4.1 The Bidder may optionally submit additional information which will demonstrate the Bidders responsibility. Such information shall be labeled "Optional Submittal" .

5 **WORK BY OWN FORCES OR BY SUBCONTRACTORS**

- 5.1 The Bidder's ability to perform a portion of the work with its own forces; the qualifications of certain subcontractors and nature and extent of work so performed may be considered essential qualifications.
- 5.2 When such information is stipulated or required on the Bid Form, Bidder shall provide complete information on the Bid Form and indicated Bid Submittals.
- 5.3 Work By Own Forces shall include only the labor provided by persons directly employed by the Contractor, whose labor shall be documented by certified payroll records. Labor provided by subcontractors or other independent contractors; equipment, and materials shall not be considered in evaluating Work By Own Forces.

6 **WORK BY SUBCONTRACTORS**

- 6.1 The qualifications of certain subcontractors and nature and extent of work so performed may be considered essential qualifications.
- 6.2 When such information is stipulated or required on the Bid Form, Bidder shall provide complete information on the Bid Form and indicated Bid Submittals.
- 6.3 Work By Own Forces shall include only the labor provided by persons directly employed by the Contractor, whose labor shall be documented by certified payroll records. Labor provided by subcontractors or other independent contractors; equipment, and materials shall not be considered in evaluating Work By Own Forces.

7 **POST-BID SUBMITTALS**

- 7.1 Bidders under consideration for award of Contract shall, within twenty-four (24) hours after request of the Owner or Architect submit the following information:
 - 7.1.1 Audited financial statement.
 - 7.1.2 Proposed construction schedule.
 - 7.1.3 Supporting documentation for proposed substitutions, if any, indicated on the Bid form. Supporting documentation requirements are indicated in Section 01 25 00 Substitution Procedures.

End of Section

(one page follows)

SUPPLEMENTARY QUALIFICATION STATEMENT

Project: _____

Complete and submit with Bid Form

Bid From: _____

- 1 On a separate sheet, list all projects for a college, university, institution of higher education or public education, that your organization has completed in the last five years, including the following information for each:

Project Name
Owner Name, address, telephone.
Architect Name, address, telephone
Final Contract Amount
Total Change Order Amount
Scheduled Date of Substantial Completion
Actual Date of Substantial Completion,
Percentage and Description of Work Performed with Own Forces.

- 2 In the absence of at least 5 projects listed for item 1 above, provide the same information listed above for at least 5 comparable projects (other than higher education) completed within the last five years, including the following information for each:

All items listed for Item 1 above
Explain why each project listed is relevant to the work of this contract.

- 3 Has your organization incurred any penalties, liquidated damages or compensatory settlements in the last five years? _____. If so, attach a separate sheet of paper listing each such project, including the following information for each:

Project Name
Owner Name, address, telephone.
Amount of the penalty, liquidated damages or settlement
Brief explanation of the matter.

- 4 Has your organization ever failed to satisfactorily complete any work awarded to it?: _____. If so, attach a separate sheet of paper listing each such project, including the following information for each:

Project Name
Owner Name, address, telephone.
Amount of the penalty, liquidated damages or settlement
Brief explanation of the matter.

(Continued on next page)

SUPPLEMENTARY QUALIFICATION STATEMENT - CONTINUED

5 Proposed Project Manager name: _____ . Attach Project Manager's resume including information to substantiate compliance with the relevant experience requirements.

6 Proposed Field Superintendent name: _____ . Attach Field Superintendent's resume including information to substantiate compliance with the relevant experience requirements.

7 If project includes roofing:
(if none, mark NA):
IL Licensed Roofing Contractor name: _____ , Lic. #: _____

8 If project includes plumbing:
(if none, mark NA)
IDPH Plumbing Contractor name: _____ , Reg. #: _____

9 If project includes paving work in excess of \$50,000:
(if none, mark NA)
IDOT pre-qualified Paving Contractor name: _____ , . #: _____

10 Signature

Dated this _____ day of _____ 20____

(Name of firm)

The undersigned bidder or agent, being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

(Signature)

(Printed Name) (Title)

Subscribed and sworn before me this _____ day of _____ 20____

Notary Public _____

My commission expires: _____

PART 1 - GENERAL

1.01 Project Forms Included:

- A. The following forms are included at the end of this section:
1. RFI - Request for Interpretation
 2. Sample CG2026 Additional Insured Endorsement Form
 3. Change Order Request Detail
 4. Authorization for Criminal Background Investigation

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section

(5 pages follow)

(page intentionally blank)

RFI

Project Name _____

PKG#:	RFI#	Date Created:	Date Required:
-------	------	---------------	----------------

To:		From:	
Phone:	Fax:	Phone:	Fax:

Subject	Discipline	Category

Drawing References:	Spec Section References:

Question:

Suggestion:

Response:

Signature: _____ Date: _____

Sample CG2026 Additional Insured Endorsement Form

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED - DESIGNATED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART.

SCHEDULE

Name of Person or Organization:

SAMPLE ONLY

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

WHO IS AN INSURED (Section II) is amended to include as an insured the person or organization shown in the Schedule as an insured but only with respect to liability arising out of your operations or premises owned by or rented to you.

CG 20 26 11 85

Copyright, Insurance Services Office, Inc. 1984

CHANGE ORDER REQUEST DETAIL

Project Name: _____

Change Order Request Detail					COR #	
Project Name						
Project Number					Date Submitted	
Contractor/Subcontractor					Contractor's Request No.	
Description of Change						
Labor						
Description	Classification	Hours	Hourly Rate	Raw Cost		
			x	= \$	-	
			x	= \$	-	
			x	= \$	-	
			x	= \$	-	
					Labor Total	\$ -
Material & Equipment						
Description	Qty	Unit	Unit Price	Raw Cost		
			x	= \$	-	
			x	= \$	-	
			x	= \$	-	
			x	= \$	-	
					Subtotal	\$ -
					0.00% Sales Tax	\$ -
					10% Markup on M & E	\$ -
					Materials & Equipment Total	\$ -
Subcontractors						
Subcontractor	Description of Subcontract Work			Raw Cost		
					Subtotal	\$ -
					5.00% Markup on Subcontract Work	\$ -
					Subcontract Total	\$ -
					LMS: Labor + Materials & Equipment + Subcontract Total	\$ -
Bonds & Insurance						
Description	Rate			Raw Cost		
Performance and Payment Bonds	0.00%	x	LMS Total	= \$	-	
Builder's Risk Insurance		x	LMS Total	= \$	-	
Project Protective Liability Insurance		x	LMS Total	= \$	-	
					Bonds & Insurance Total	\$ -
					Grand Total	\$ -
Notes						
1 COR # to be assigned by Construction Manager or General Contractor						
2 Attach additional sheets as necessary. Include a separate sheet for each subcontractor						
3 Hourly rates for labor from Hourly Labor Rate sheets, which include markup						
4 Markup is subject to limitations established in the Contract Documents.						
5 Bonds & Insurance may be added only to the extent that the specific coverages are required by the Contract Documents						

AUTHORIZATION FOR CRIMINAL BACKGROUND INVESTIGATION

The undersigned hereby authorizes the Board of Trustees, McHenry County College, Crystal Lake, McHenry County, Illinois to request a criminal background investigation from the Illinois State Police, and to receive criminal history record information pursuant thereto.

(Contractor /Employer name printed or typed)

(Applicant or Employee name printed or typed)

(Signature of Applicant or Employee)

Date _____, 20_____

CLOSEOUT FORMS
SECTION 00 65 00

1 Summary:

1.1 Forms used in the process of contract closeout.

2 Forms:

2.1 The following forms are hereby incorporated by Reference:

2.1.1 "Contractor's Affidavit of Payment of Debts and Claims", AIA Document G706.

2.1.2 "Contractor's Affidavit of Payment of Release of Liens", AIA Document G706A.

2.1.3 "Consent of Surety to Final Payment", AIA Document G707

2.2 The following forms are included elsewhere in the Project Manual:

2.2.1 Contractor's Request for Substantial Completion Inspection: Section 01 77 00

2.2.2 Contractor's Certification Regarding Regarding Final Completion: Section 01 77 00

2.2.3 Contractor's Certification of Final Completion and Request for Inspection: Section 01 77 00

2.2.4 Asbestos Free Construction Certification: Section 00 73 19.01

End of Section

GENERAL CONDITIONS
SECTION 00 72 00

1 General Conditions:

- 1.1 The general conditions of the Contract are contained in "General Conditions of the Contract for Construction" AIA A201, 2007 Edition, as amended by the Supplementary Conditions - Section 00 73 00, hereinafter collectively referred to as the "General Conditions".

End of Section

HEALTH AND SAFETY REQUIREMENTS - ASBESTOS
SECTION 00 73 19.01

1 Summary:

1.1 Section contains special requirements pertaining to asbestos.

2 Health and Safety Requirements:

2.1 Contractor shall ensure that all work under the Contract is performed in compliance with all applicable regulations including, but not limited to:

2.1.1 Asbestos Hazard Emergency Response Act, as amended.

2.1.2 40 CFR 763, 40 CFR 61 and other US EPA Rules and Regulations

2.1.3 Illinois Commercial and Public Building Asbestos Abatement Act (225 ILCS 207/)

2.1.4 Asbestos Abatement for Public and Private Schools and Commercial and Public Buildings in Illinois (77 Ill. Adm. Code 855)

2.1.5 Other rules and regulations promulgated by the Illinois Department of Public Health, municipalities and localities.

2.2 No asbestos or asbestos containing materials shall be used in the Work.

2.3 The Contractor shall certify compliance by submitting the competed form on the following page within SEVEN (7) days of occupancy or use of any portion of the building by the Owner. An duplicate original copy of the certification shall be submitted with the closeout documents.

2.4 Ensure that modifications, patching or demolition required by the work will not disturb asbestos containing materials or release asbestos fibers into the school or environment.

2.5 Suspected asbestos containing materials which have been tested are indicated on the inspection report, a copy of which is available for viewing at the office of the Owner.

2.6 Prior to work commencing on suspect materials verify that all materials which might be disturbed during the course of the work do not contain asbestos.

3 Testing and Abatement:

3.1 If a suspect material has not been tested, the testing will be done by the Owner. Costs for testing will be paid for by the Owner.

3.2 If the material tested is found to contain asbestos work will not proceed until an abatement procedure in conformance with the Illinois Asbestos Abatement Act has been completed. Abatement work will be by the Owner. Costs for the work will be paid by the Owner.

3.3 There will be no additional costs or extensions of contract time due to delays of seven (7) calendar days or less as a result of testing or abatement procedures.

4 Alternative Procedures:

4.1 Work may be relocated or otherwise changed with the Owner's approval in order to avoid disturbing the asbestos containing materials. There will be no additional costs to the Owner for this work.

End of Section (one page follows)

**ASBESTOS FREE CONSTRUCTION CERTIFICATION
MCHENRY COUNTY COLLEGE**

Project: _____ Building: _____

Project Address: _____, _____, IL

Architect's Project Number: _____

The undersigned hereby certifies that no asbestos or asbestos containing materials have been used in, or are contained in products used for, the construction of this project through the date of this certification.

Respectfully submitted, this _____ day of _____ 20____

(Name of Firm)

By: _____

Printed Name: _____

Title: _____

Subscribed and sworn before me this _____ day of _____ 20____

Notary Public _____

My Commission expires: _____

If the firm is a corporation, attach a sworn statement signed by an executive officer of the corporation stating that the individual signing this certification is authorized to bind this corporation thereby, and affix the corporate seal.

1 Illinois Department of Labor Requirements:

- 1.1 This contract constitutes the construction of a “public work,” within the meaning of the Illinois Prevailing Wage Act, 820 ILCS 130/.01 et seq. (“the Act”). The Act requires contractors and subcontractors to pay laborers, workers and mechanics performing services on public works projects no less than the “prevailing rate of wages” (hourly cash wages plus fringe benefits) in the county where the work is performed. For information regarding current prevailing wage rates, as ascertained by the Illinois Department of Labor. The Contractor and each subcontractor rendering services under this contract shall comply with all requirements of the Act, including but not limited to, all wage, notice and record keeping duties, and shall include in Bids the cost for compliance with the Act
- 1.2 A copy of the Illinois Department of Labor Prevailing Wages for location of the project, current as of the date of the Documents, is included at the end of this Section. As changes are made to the prevailing wages, the Contractor and each subcontractors shall conform to the changes and shall determine when such changes are made. No additional costs shall be incurred by the Owner as a result of changes in the prevailing wage.
- 1.3 The Contractor and each subcontractor shall comply with all record-keeping requirements of the Illinois Prevailing Wage Act, including, but not limited to, (1) make and keep, for a period of not less than 3 years, records of all laborers, mechanics, and other workers employed by them on the project; the records shall include each worker's name, address, telephone number when available, social security number, classification or classifications, the hourly wages paid in each pay period, the number of hours worked each day, and the starting and ending times of work each day; and (2) shall submit monthly a certified payroll in conformance with law, and in the form and manner specified by the Contract Documents, or otherwise as acceptable to the Owner.
- 1.4 The Contractor and each subcontractor shall comply with the Employment of Illinois Workers on Public Works Act (30 ILCS 570). All record keeping requirements are the obligation of the Contractor and Subcontractors.
- 1.5 The Contractor and each subcontractor shall indemnify and hold harmless both the Owner, Architect and their respective officers, employees and agents, from any and all costs incurred, directly or indirectly, by the Owner or Architect in responding to or complying with demands made by the Illinois Department of Labor, or an aggrieved employee of the Contractor or subcontractor, or any third party, as a result of any claimed violation of or inquiry regarding these Acts. Any such cost incurred by the Owner or Architect may be deducted from the Contract Sum. It is the intention that the Owner and Architect shall suffer no time loss or other additional expenses in complying with any inquiry made with regard to these Acts.

End of Section

(5 pages follow)

Mchenry County Prevailing Wage for November 2011

Trade Name	RG	TYP	C	Base	FRMAN	*M-F>8	OSA	OSH	H/W	Pensn	Vac	Trng
=====	==	===	=	=====	=====	=====	===	===	=====	=====	=====	=====
ASBESTOS ABT-GEN	ALL			35.200	35.700	1.5	1.5	2.0	12.18	8.820	0.000	0.450
ASBESTOS ABT-MEC	BLD			32.850	0.000	1.5	1.5	2.0	10.82	10.66	0.000	0.720
BOILERMAKER	BLD			43.020	46.890	2.0	2.0	2.0	6.720	9.890	0.000	0.350
BRICK MASON	BLD			39.780	43.760	1.5	1.5	2.0	9.300	11.17	0.000	0.730
CARPENTER	ALL			40.770	42.770	1.5	1.5	2.0	9.840	9.800	0.000	0.490
CEMENT MASON	ALL			41.550	43.550	2.0	1.5	2.0	9.250	12.51	0.000	0.250
CERAMIC TILE FNSHER	BLD			33.600	0.000	2.0	1.5	2.0	9.200	6.680	0.000	0.580
COMMUNICATION TECH	BLD			29.960	31.760	1.5	1.5	2.0	5.842	6.290	0.000	0.375
ELECTRIC PWR EQMT OP	ALL			34.240	45.510	1.5	1.5	2.0	5.000	10.62	0.000	0.260
ELECTRIC PWR GRNDMAN	ALL			26.480	45.510	1.5	1.5	2.0	5.000	8.200	0.000	0.200
ELECTRIC PWR LINEMAN	ALL			41.000	45.510	1.5	1.5	2.0	5.000	12.71	0.000	0.310
ELECTRIC PWR TRK DRV	ALL			27.420	45.510	1.5	1.5	2.0	5.000	8.500	0.000	0.210
ELECTRICIAN	ALL			43.080	47.380	1.5	1.5	2.0	12.06	11.41	0.000	0.540
ELEVATOR CONSTRUCTOR	BLD			47.410	53.340	2.0	2.0	2.0	10.53	10.71	2.840	0.000
FENCE ERECTOR	E ALL			32.660	34.660	1.5	1.5	2.0	12.42	10.00	0.000	0.250
FENCE ERECTOR	S ALL			44.950	47.200	2.0	2.0	2.0	8.890	17.69	0.000	0.400
GLAZIER	BLD			38.000	39.500	1.5	2.0	2.0	10.19	13.64	0.000	0.790
HT/FROST INSULATOR	BLD			43.800	46.300	1.5	1.5	2.0	10.82	11.86	0.000	0.720
IRON WORKER	E ALL			40.750	42.750	2.0	2.0	2.0	13.20	19.09	0.000	0.350
IRON WORKER	S ALL			44.950	47.200	2.0	2.0	2.0	8.890	17.69	0.000	0.400
IRON WORKER	W ALL			35.000	36.750	2.0	2.0	2.0	8.000	19.59	0.000	0.950
LABORER	ALL			35.200	35.950	1.5	1.5	2.0	11.97	9.030	0.000	0.450
LATHER	ALL			40.770	42.770	1.5	1.5	2.0	9.840	9.800	0.000	0.490
MACHINIST	BLD			43.160	45.160	1.5	1.5	2.0	7.980	8.950	0.000	0.000
MARBLE FINISHERS	ALL			29.100	0.000	1.5	1.5	2.0	9.300	11.17	0.000	0.660
MARBLE MASON	BLD			39.030	42.930	1.5	1.5	2.0	9.300	11.17	0.000	0.730
MATERIAL TESTER I	ALL			25.200	0.000	1.5	1.5	2.0	11.97	9.030	0.000	0.450
MATERIALS TESTER II	ALL			30.200	0.000	1.5	1.5	2.0	11.97	9.030	0.000	0.450
MILLWRIGHT	ALL			40.770	42.770	1.5	1.5	2.0	9.840	9.800	0.000	0.490
OPERATING ENGINEER	BLD 1			45.100	49.100	2.0	2.0	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	BLD 2			43.800	49.100	2.0	2.0	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	BLD 3			41.250	49.100	2.0	2.0	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	BLD 4			39.500	49.100	2.0	2.0	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	BLD 5			48.850	49.100	2.0	2.0	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	BLD 6			46.100	49.100	2.0	2.0	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	BLD 7			48.100	49.100	2.0	2.0	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	HWY 1			43.300	47.300	1.5	1.5	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	HWY 2			42.750	47.300	1.5	1.5	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	HWY 3			40.700	47.300	1.5	1.5	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	HWY 4			39.300	47.300	1.5	1.5	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	HWY 5			38.100	47.300	1.5	1.5	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	HWY 6			46.300	47.300	1.5	1.5	2.0	14.40	9.550	1.900	1.250
OPERATING ENGINEER	HWY 7			44.300	47.300	1.5	1.5	2.0	14.40	9.550	1.900	1.250
ORNAMNTL IRON WORKER	E ALL			40.200	42.450	2.0	2.0	2.0	12.67	14.81	0.000	0.500
ORNAMNTL IRON WORKER	S ALL			44.950	47.200	2.0	2.0	2.0	8.890	17.69	0.000	0.400
PAINTER	ALL			40.180	42.180	1.5	1.5	1.5	8.950	8.200	0.000	1.250
PAINTER SIGNS	BLD			32.770	36.800	1.5	1.5	1.5	2.600	2.620	0.000	0.000
PILEDRIVER	ALL			40.770	42.770	1.5	1.5	2.0	9.840	9.800	0.000	0.490
PIPEFITTER	BLD			44.050	47.050	1.5	1.5	2.0	8.460	13.85	0.000	1.820
PLASTERER	BLD			39.250	41.610	1.5	1.5	2.0	10.60	10.69	0.000	0.550
PLUMBER	BLD			44.500	47.500	1.5	1.5	2.0	11.05	12.40	0.000	1.700
ROOFER	BLD			37.650	40.650	1.5	1.5	2.0	7.750	6.570	0.000	0.430
SHEETMETAL WORKER	BLD			41.660	43.660	1.5	1.5	2.0	9.540	11.57	0.000	0.780
SIGN HANGER	BLD			26.070	27.570	1.5	1.5	2.0	3.800	3.550	0.000	0.000
SPRINKLER FITTER	BLD			49.200	51.200	1.5	1.5	2.0	9.250	8.050	0.000	0.450
STEEL ERECTOR	E ALL			40.750	42.750	2.0	2.0	2.0	13.20	19.09	0.000	0.350
STEEL ERECTOR	S ALL			44.950	47.200	2.0	2.0	2.0	8.890	17.69	0.000	0.400
STONE MASON	BLD			39.780	43.760	1.5	1.5	2.0	9.300	11.17	0.000	0.730
TERRAZZO FINISHER	BLD			35.150	0.000	1.5	1.5	2.0	9.200	9.070	0.000	0.430
TERRAZZO MASON	BLD			39.010	42.010	1.5	1.5	2.0	9.200	10.41	0.000	0.510
TILE MASON	BLD			40.490	44.490	2.0	1.5	2.0	9.200	8.390	0.000	0.640
TRAFFIC SAFETY WRKR	HWY			28.250	29.850	1.5	1.5	2.0	4.896	4.175	0.000	0.000
TRUCK DRIVER	ALL 1			32.200	32.750	1.5	1.5	2.0	5.700	5.500	0.000	0.150
TRUCK DRIVER	ALL 2			32.350	32.750	1.5	1.5	2.0	5.700	5.500	0.000	0.150
TRUCK DRIVER	ALL 3			32.550	32.750	1.5	1.5	2.0	5.700	5.500	0.000	0.150
TRUCK DRIVER	ALL 4			32.750	32.750	1.5	1.5	2.0	5.700	5.500	0.000	0.150
TUCKPOINTER	BLD			39.200	40.200	1.5	1.5	2.0	7.830	10.25	0.000	0.770

Legend: M-F>8 (Overtime is required for any hour greater than 8 worked each day, Monday through Friday.)

OSA (Overtime is required for every hour worked on Saturday)

OSH (Overtime is required for every hour worked on Sunday and Holidays)

H/W (Health & Welfare Insurance)

Pensn (Pension)

Vac (Vacation)

Trng (Training)

Explanations

MCHENRY COUNTY

FENCE ERECTOR (EAST) - That part of the county East and Northeast of a line following Route 31 North to Route 14, northwest to Route 47 north to the Wisconsin State Line.

IRONWORKERS (EAST) - That part of the county East of Rts. 47 and 14.

IRONWORKERS (SOUTH) - That part of the county South of Route 14 and East of Route 47.

IRONWORKERS (WEST) - That part of the county West of Route 47.

The following list is considered as those days for which holiday rates of wages for work performed apply: New Years Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day and Veterans Day in some classifications/counties. Generally, any of these holidays which fall on a Sunday is celebrated on the following Monday. This then makes work performed on that Monday payable at the appropriate overtime rate for holiday pay. Common practice in a given local may alter certain days of celebration. If in doubt, please check with IDOL.

EXPLANATION OF CLASSES

ASBESTOS - GENERAL - removal of asbestos material/mold and hazardous materials from any place in a building, including mechanical systems where those mechanical systems are to be removed. This includes the removal of asbestos materials/mold and hazardous materials from ductwork or pipes in a building when the building is to be demolished at the time or at some close future date.

ASBESTOS - MECHANICAL - removal of asbestos material from mechanical systems, such as pipes, ducts, and boilers, where the mechanical systems are to remain.

CERAMIC TILE FINISHER

The grouting, cleaning, and polishing of all classes of tile, whether for interior or exterior purposes, all burned, glazed or unglazed products; all composition materials, granite tiles, warning detectable tiles, cement tiles, epoxy composite materials, pavers, glass, mosaics, fiberglass, and all substitute materials, for tile made in tile-like units; all mixtures in tile like form of cement, metals, and other materials that are for and intended for use as a finished floor surface, stair treads, promenade roofs, walks, walls, ceilings, swimming pools, and all other places where tile is to form a finished interior or exterior. The mixing of all setting mortars including but not limited to thin-set mortars, epoxies, wall mud, and any other sand and cement mixtures or adhesives when used in the preparation, installation, repair, or maintenance of tile and/or similar materials. The handling and unloading of all sand, cement, lime, tile, fixtures, equipment, adhesives, or any other materials to be used in the preparation, installation, repair, or maintenance of tile and/or similar materials. Ceramic Tile Finishers shall fill all joints and voids regardless of method on all tile work, particularly and especially after installation of said tile work. Application of any and all protective coverings to all types of tile installations including, but not be limited to, all soap compounds, paper products, tapes, and all polyethylene coverings, plywood, masonite, cardboard, and any new type of products that may be used to protect tile installations, Blastrac equipment, and all floor scarifying equipment used in preparing floors to receive tile. The clean up and removal of all waste and materials. All demolition of existing tile floors and walls to be re-tiled.

COMMUNICATIONS TECHNICIAN

Construction, installation, maintenance and removal of telecommunication facilities (voice, sound, data and video), telephone, security systems, fire alarm systems that are a component of a multiplex system and share a common cable, and data inside wire, interconnect, terminal equipment, central offices, PABX and equipment, micro waves, V-SAT, bypass, CATV, WAN (wide area network), LAN (local area networks), and ISDN (integrated system digital network), pulling of wire in raceways, but not the installation of raceways.

MARBLE FINISHER

Loading and unloading trucks, distribution of all materials (all stone, sand, etc.), stocking of floors with material, performing all rigging for heavy work, the handling of all material that may be needed for the installation of such materials, building of scaffolding, polishing if needed, patching, waxing of material if damaged, pointing up, caulking, grouting and cleaning of marble, holding water on diamond or Carborundum blade or saw for setters cutting, use of tub saw or any other saw needed for preparation of material, drilling of holes for wires that anchor material set by setters, mixing up of molding plaster for installation of material, mixing up thin set for the installation of material, mixing up of sand to cement for the installation of material and such other work as may be required in helping a Marble Setter in the handling of all material in the erection or installation of interior marble, slate, travertine, art marble, serpentine, alberene stone, blue stone, granite and other stones (meaning as to stone any foreign or domestic materials as are specified and used in building interiors and exteriors and customarily known as stone in the trade), carrara, sanionyx, vitrolite and similar opaque glass and the laying of all marble tile, terrazzo tile, slate tile and precast tile, steps, risers treads, base, or any other materials that may be used as substitutes for any of the aforementioned materials and which are used on interior and exterior which are installed in a similar manner.

MATERIAL TESTER I: Hand coring and drilling for testing of materials; field inspection of uncured concrete and asphalt.

MATERIAL TESTER II: Field inspection of welds, structural steel, fireproofing, masonry, soil, facade, reinforcing steel, formwork, cured concrete, and concrete and asphalt batch plants; adjusting proportions of bituminous mixtures.

OPERATING ENGINEER - BUILDING

Class 1. Asphalt Plant; Asphalt Spreader; Autograde; Backhoes with Caisson Attachment; Batch Plant; Benoto (requires Two Engineers); Boiler and Throttle Valve; Caisson Rigs; Central Redi-Mix Plant; Combination Back Hoe Front End-loader Machine; Compressor and Throttle Valve; Concrete Breaker (Truck Mounted); Concrete Conveyor; Concrete Conveyor (Truck Mounted); Concrete Paver Over 27E cu. ft; Concrete Paver 27E cu. ft. and Under; Concrete Placer; Concrete Placing Boom; Concrete Pump (Truck Mounted); Concrete Tower; Cranes, All; Cranes, Hammerhead; Cranes, (GCI and similar Type); Creter Crane; Crusher, Stone, etc.; Derricks, All; Derricks, Traveling; Formless Curb and Gutter Machine; Grader, Elevating; Grouting Machines; Highlift Shovels or Front Endloader 2-1/4 yd. and over; Hoists, Elevators, outside type rack and pinion and similar machines; Hoists, One, Two and Three Drum; Hoists, Two Tugger One Floor; Hydraulic Backhoes; Hydraulic Boom Trucks; Hydro Vac (and similar equipment); Locomotives, All; Motor Patrol; Lubrication Technician; Manipulators; Pile Drivers and Skid Rig; Post Hole Digger; Pre-Stress Machine; Pump Cretes Dual Ram; Pump Cretes: Squeeze Cretes-Screw Type Pumps; Gypsum Bulker and Pump; Raised and Blind Hole Drill; Roto Mill Grinder; Scoops - Tractor Drawn; Slip-Form Paver; Straddle Buggies; Tournapull; Tractor with Boom and Side Boom; Trenching Machines.

Class 2. Boilers; Broom, All Power Propelled; Bulldozers; Concrete Mixer (Two Bag and Over); Conveyor, Portable; Forklift Trucks; Highlift Shovels or Front Endloaders under 2-1/4 yd.; Hoists, Automatic; Hoists, Inside Elevators; Hoists, Sewer Dragging Machine; Hoists, Tugger Single Drum; Rock Drill (Self-Propelled); Rock Drill (Truck Mounted); Rollers, All; Steam Generators; Tractors, All; Tractor Drawn Vibratory Roller; Winch Trucks with "A" Frame.

Class 3. Air Compressor; Combination Small Equipment Operator; Generators; Heaters, Mechanical; Hoists, Inside Elevators; Hydraulic Power Units (Pile Driving, Extracting, and Drilling); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Low Boys; Pumps, Well Points; Welding Machines (2 through 5); Winches, 4 Small Electric Drill Winches; Bobcats (up to and including ¾ cu yd.) .

Class 4. Bobcats and/or other Skid Steer Loaders (other than bobcats up to and including ¾ cu yd.); Oilers; and Brick Forklift.

Class 5. Assistant Craft Foreman.

Class 6. Gradall .

Class 7. Mechanics.

OPERATING ENGINEERS - HIGHWAY CONSTRUCTION

Class 1. Asphalt Plant; Asphalt Heater and Planer Combination; Asphalt Heater Scarfire; Asphalt Spreader; Autograder/GOMACO or other similar type machines; ABG Paver; Backhoes with Caisson Attachment; Ballast Regulator; Belt Loader; Caisson Rigs; Car Dumper; Central Redi-Mix Plant; Combination Backhoe Front Endloader Machine, (1 cu. yd. Backhoe Bucket or over or with attachments); Concrete Breaker (Truck Mounted); Concrete Conveyor; Concrete Paver over 27E cu. ft.; Concrete Placer; Concrete Tube Float; Cranes, all attachments; Cranes, Tower Cranes of all types; Creter Crane: Crusher, Stone, etc.; Derricks, All; Derrick Boats; Derricks, Traveling; Dowell Machine with Air Compressor; Dredges; Formless Curb and Gutter Machine; Grader, Elevating; Grader, Motor Grader, Motor Patrol, Auto Patrol, Form Grader, Pull Grader, Subgrader; Guard Rail Post Driver Truck Mounted; Hoists, One, Two and Three Drum; Hydraulic Backhoes; Backhoes with shear attachments; Lubrication Technician; Manipulators; Mucking Machine; Pile Drivers and Skid Rig; Pre-Stress Machine; Pump Cretes Dual Ram; Rock Drill - Crawler or Skid Rig; Rock Drill - Truck Mounted; Rock/Track Tamper; Roto Mill Grinder; Slip-Form Paver; Soil Test Drill Rig (Truck Mounted); Straddle Buggies; Hydraulic Telescoping Form (Tunnel); Tractor Drawn Belt Loader (with attached pusher - two engineers); Tractor with Boom; Tractaire with Attachments; Trenching Machine; Truck Mounted Concrete Pump with Boom; Raised or Blind Hole Drills (Tunnel Shaft); Underground Boring and/or Mining Machines 5 ft. in diameter and over tunnel, etc; Underground Boring and/or Mining Machines under 5 ft. in diameter; Wheel Excavator; Widener (APSCO).

Class 2. Batch Plant; Bituminous Mixer; Boiler and Throttle Valve; Bulldozers; Car Loader Trailing Conveyors; Combination Backhoe Front Endloader Machine (Less than 1 cu. yd. Backhoe Bucket or over or with attachments); Compressor and Throttle Valve; Compressor, Common Receiver (3); Concrete Breaker or Hydro Hammer; Concrete Grinding Machine; Concrete Mixer or Paver 7S Series to and including 27 cu. ft.; Concrete Spreader; Concrete Curing Machine, Burlap Machine, Belting Machine and Sealing Machine; Concrete Wheel Saw; Conveyor Muck Cars (Haglund or Similar Type); Drills, All; Finishing Machine - Concrete; Highlift Shovels or Front Endloader; Hoist - Sewer Dragging Machine; Hydraulic Boom Trucks (All Attachments); Hydro-Blaster; All Locomotives, Dinky; Off-Road Hauling Units (including articulating)/2 ton capacity or more; Non Self-Loading Ejection Dump; Pump Cretes: Squeeze Cretes - Screw Type Pumps, Gypsum Bulker and Pump; Roller, Asphalt; Rotary Snow Plows; Rototiller, Seaman, etc., self-propelled; Scoops - Tractor Drawn; Self-Propelled Compactor; Spreader - Chip - Stone, etc.; Scraper; Scraper - Prime Mover in Tandem (Regardless of Size); Tank Car Heater; Tractors, Push, Pulling Sheeps Foot, Disc, Compactor, etc.; Tug Boats.

Class 3. Boilers; Brooms, All Power Propelled; Cement Supply Tender; Compressor, Common Receiver (2); Concrete Mixer (Two Bag and Over); Conveyor, Portable; Farm-Type Tractors Used for Mowing, Seeding, etc.; Fireman on Boilers; Forklift Trucks; Grouting Machine; Hoists, Automatic; Hoists, All Elevators; Hoists, Tugger Single Drum; Jeep Diggers; Low Boys; Pipe Jacking Machines; Post-Hole Digger; Power Saw, Concrete Power Driven; Pug Mills; Rollers, other than Asphalt; Seed and Straw Blower; Steam Generators; Stump Machine; Winch Trucks with "A" Frame; Work Boats; Tamper-Form-Motor Driven.

Class 4. Air Compressor; Combination - Small Equipment Operator; Directional Boring Machine; Generators; Heaters, Mechanical; Hydraulic Power Unit (Pile Driving, Extracting, or Drilling); Hydro- Blaster; Light Plants, All (1 through 5); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Pumps, Well Points; Tractaire; Welding Machines (2 through 5); Winches, 4 Small Electric Drill Winches.

Class 5. Bobcats (all); Brick Forklifts; Oilers.

Class 6. Field Mechanics and Field Welders.

Class 7. Gradall and machines of like nature.

TRAFFIC SAFETY - work associated with barricades, horses and drums used to reduce lane usage on highway work, the installation and removal of temporary lane markings, and the installation and removal of temporary road signs.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION

Class 1. Two or three Axle Trucks. A-frame Truck when used for transportation purposes; Air Compressors and Welding Machines, including those pulled by cars, pick-up trucks and tractors;

Ambulances; Batch Gate Lockers; Batch Hopperman; Car and Truck Washers; Carry-alls; Fork Lifts and Hoisters; Helpers; Mechanics Helpers and Greasers; Oil Distributors 2-man operation; Pavement Breakers; Pole Trailer, up to 40 feet; Power Mower Tractors; Self-propelled Chip Spreader; Skipman; Slurry Trucks, 2-man operation; Slurry Truck Conveyor Operation, 2 or 3 man; Teamsters; Unskilled dumpman; and Truck Drivers hauling warning lights, barricades, and portable toilets on the job site.

Class 2. Four axle trucks; Dump Crets and Adgetors under 7 yards; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment under 16 cubic yards; Mixer Trucks under 7 yards; Ready-mix Plant Hopper Operator, and Winch Trucks, 2 Axles.

Class 3. Five axle trucks; Dump Crets and Adgetors 7 yards and over; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnatrailers or turnapulls when pulling other than self-loading equipment or similar equipment over 16 cubic yards; Explosives and/or Fission Material Trucks; Mixer Trucks 7 yards or over; Mobile Cranes while in transit; Oil Distributors, 1-man operation; Pole Trailer, over 40 feet; Pole and Expandable Trailers hauling material over 50 feet long; Slurry trucks, 1-man operation; Winch trucks, 3 axles or more; Mechanic--Truck Welder and Truck Painter.

Class 4. Six axle trucks; Dual-purpose vehicles, such as mounted crane trucks with hoist and accessories; Foreman; Master Mechanic; Self-loading equipment like P.B. and trucks with scoops on the front.

TERRAZZO FINISHER

The handling of sand, cement, marble chips, and all other materials that may be used by the Mosaic Terrazzo Mechanic, and the mixing, grinding, grouting, cleaning and sealing of all Marble, Mosaic, and Terrazzo work, floors, base, stairs, and wainscoting by hand or machine, and in addition, assisting and aiding Marble, Masonic, and Terrazzo Mechanics.

Other Classifications of Work:

For definitions of classifications not otherwise set out, the Department generally has on file such definitions which are available. If a task to be performed is not subject to one of the classifications of pay set out, the Department will upon being contacted state which neighboring county has such a classification and provide such rate, such rate being deemed to exist by reference in this document. If no neighboring county rate applies to the task, the Department shall undertake a special determination, such special determination being then deemed to have existed under this determination. If a project requires these, or any classification not listed, please contact IDOL at 217-782-1710 for wage rates or clarifications.

LANDSCAPING

Landscaping work falls under the existing classifications for laborer, operating engineer and truck driver. The work performed by landscape plantsman and landscape laborer is covered by the existing classification of laborer. The work performed by landscape operators (regardless of equipment used or its size) is covered by the classifications of operating engineer. The work performed by landscape truck drivers (regardless of size of truck driven) is covered by the classifications of truck driver.

PART 1 - GENERAL

1.01 Section Includes:

- A. General scope of work
- B. Work by Owner
- C. Contractor use of site and premises.
- D. General project requirements

1.02 Related Sections:

- A. Section 01 33 00 - BIM requirements.

1.03 General Scope of Work:

- A. The intent and meaning of the Contract Documents is that the Contractor shall provide labor, plant, service, transportation, materials and appurtenances thereto which are indicated or reasonably implied by the Drawings and Specifications to provide a complete and functional facility.

1.04 Work by Owner:

- A. Any items indicated on the Drawings as NIC (Not in Contract) shall be furnished and installed by the Owner, or by separate Owner-employed contractor.
- B. Work by Others: The Owner reserves the right to let other contracts for additional work that may be required in connection with this project. There shall be complete cooperation between and among contractors as well as between the Contractor and each Subcontractor to ensure satisfactory progress and performance of the work.
- C. The following items will be performed by the Owner directly or by others under separate contracts with the Owner:
 - 1. Disconnection and re-connection of electronic display monitor(s) as indicated on the Drawings.

1.05 Contractor Use of Site and Premises:

- A. Site: non-exclusive use, restricted access.
 - 1. Work can be performed at times lawfully permitted, except that construction activities that may impede vehicle or pedestrian traffic shall be restricted to times of reduced traffic on campus.
 - 2. Work area, space for storage, staging and parking will be restricted to locations designated by the Owner.
- B. Interior of building: non-exclusive use, restricted access.
 - 1. Special time restrictions: Hazardous or potentially disruptive work shall be performed on Saturdays, Sunday or weekdays after 10:00 PM and before 7:00 AM. At the Owner's sole discretion, special accommodations may be possible at other times. Hazardous and potentially disruptive work includes, without limitation, the following:
 - a. Welding, torch-applied roofing, and other activities involving open flame in or on the buildings.
 - b. Demolition and construction in public corridors and public spaces, private offices, classrooms, and other normally occupied spaces.
 - c. Electrical and other utility shut-downs.

- (1) Uninterrupted electrical power must be maintained to Server Rooms, except for momentary shut-downs which must be scheduled and coordinated in advance with the Owner.
2. The site and buildings will be occupied for normal operations during the course of the project. See Preliminary Schedules Section 00 31 13 for additional information.
 - a. Perform work at times to minimize interference with the operation of the College. Determination of the times when work may be performed and the nature and extent of any interference which may be permitted shall be at the sole discretion of the Owner.
 - b. Schedule work in public and occupied spaces and potentially disruptive work with Owner a minimum of seventy-two (72) hours in advance.
 - c. Maintain safe conditions.
 - d. Maintain safe emergency egress from occupied areas of the building
 - e. Maintain fire alarm and fire suppression systems in operation. Exceptions for service on such systems permitted only when the building is unoccupied, subject to written approval of the Owner and approval of the local fire authority having jurisdiction.
 - f. Maintain occupied areas free of fumes, noxious odors, and dust.
 - g. Maintain occupied areas free of excessive noise.
 - h. Clean work areas at the end of each work shift.
 3. If the presence of occupants at any time precludes Contractor's performance of hazardous or disruptive work, the Contractor shall perform such work at times when occupants are not present, without additional cost to the Owner.

1.06 Scheduling:

- A. Prepare and maintain a Schedule for the project.
 1. Type and Detail:
 - a. Use Critical Path Method (CPM).
 - b. Every line in the Schedule of Values shall be represented by at least one activity.
 - c. Activities with internal dependencies shall be broken down into sub-activities (for example: floor prep, floor finish).
 - d. Include procurement activities for long-lead items
 - e. Include activities for Work by Others on which timely completion of the contract is dependent.
 - f. Include activities for service outages and shutdowns, milestones and completion dates required by the Contract Documents.
 - g. Negative float is prohibited. Revise logic and dependencies to prevent negative float
 2. Revisions:
 - a. Revise monthly or more frequently as required by the conditions of the Work, including, without limitation:
 - (1) Delay in actual or projected completion of any item on the critical path.
 - (2) Change in the critical path
 - (3) Change in constraints affecting the schedule.
 - (4) When circumstances render previous logic inappropriate

3. Updates: Update at least every two weeks to show actual progress.
 4. Distribution:
 - a. Submit original schedule in accordance with the General Conditions of the Contract.
 - b. Distribute schedule, revisions and updates to Architect and each subcontractor.
 5. Format: provide all of the following:
 - a. Printed, page size of 8.5 x 11 or 11 x 17 inches, on white paper.
 - b. Electronic: Adobe PDF (Portable Document Format) file.
- B. Review and Approval: Contractor's initial schedule and each revision shall be submitted for the review and approval of the Architect and Owner.
- C. Schedule with the Owner all potentially hazardous or disruptive activities.
- D. Prosecute the work to maintain progress in accordance with the Schedule and avoid causing delay to other Contractors.
- E. If Contractor fails to maintain progress according to the Schedule it shall furnish such additional labor, services and expedited delivery as may be necessary to bring its operations up to schedule.
- F. Contractor shall provide overtime labor when necessary to maintain or recover its schedule compliance. Such overtime shall be provided without additional cost to the Owner unless the delay is caused by the willful action of the Owner.
- G. If the Contractor or any Subcontractor has installed its work in a manner or at such a time as to prevent an other contractor or subcontractor from installing its work, they shall remove such work and reinstall it at a proper time without additional cost to the Owner.

1.07 Meetings:

A. Contractor shall be responsible for the following:

- B. Owner-Architect-Contractor Meeting: conduct a meeting weekly with the Architect and Owner to review project status, schedule, pending changes change proposals. Project manager and field superintendent shall be present. Payout review will be conducted monthly as part of this meeting. Prepare an agenda for each meeting, to be distributed at the meeting. Prepare minutes of each meeting. Minutes shall be distributed to all attendees, Owner and Architect not later than 7 calendar days following the meeting, and prior to the next meeting.
1. Logs: Prepare, maintain and distribute at each meeting the following logs:
 - a. Change Request Log, include at least the following information: CR number, Description, Originating Party, Requested Amount, Requested Time, Date submitted, Status, Executed Change Order Number.
 - b. Submittal Log, include at least the following information: : Reference Number, Trade, Contractor/Subcontractor, Submittal Type, Submittal Description/Title, Date Submitted, Date Requested, Date Received, Action.
 - c. RFI Log, include at least the following information: RFI Number, Title/Description, Originating Party, Date Issued, Date Resolved, Status
- C. Coordination Meeting: conduct a job progress and coordination meeting a minimum of once a week, at which a responsible decision-making representative from each active Contractor and subcontractor must be present. Prepare an agenda for each meeting, to be distributed at the meeting. Prepare minutes of each meeting. Minutes shall be distributed to all attendees, Owner and Architect prior to the next meeting.
- D. Pre-Installation Conferences: Arrange and conduct pre-installation conferences as specified in the individual sections of the Specifications. Prepare and distribute meeting minutes. Report on follow-up activities at subsequent Owner-Architect-Contractor Meetings.

1.08 Project Communications:

- A. The following project communications shall be made available electronically in PDF (Portable Document Format) files, in addition to printed copy. Files shall be sent to the Architect by email or web posting as directed by the Architect, not later than four (4) hours following distribution of printed copy:
 - 1. Schedules
 - 2. Meeting Minutes
 - 3. Requests For Information (RFI)
 - 4. Change Requests
 - 5. Logs of submittals, RFIs, change requests, etc.

1.09 Existing Conditions:

- A. Existing conditions are indicated to the best knowledge of the Architect. Actual conditions encountered during demolition and construction may vary. The Architect will cooperate with the Contractor to make modifications to the construction documents, when necessitated by field conditions, in order to accomplish the design intent.
- B. The Contractor shall verify measurements and existing conditions at the site and shall be responsible for correctness of same; any discrepancies encountered shall be immediately reported to the Architect, prior to proceeding.

1.10 Locating Utilities and Services:

- A. Contractor shall make use of public utility locating service (JULIE) prior to excavating.
- B. Contractor shall provided services of a private utility locator to check for private utilities, including but not limited to private electrical, communications, water, and sewer lines prior to excavation.
- C. Contractor shall use portable X-ray or other methods of detecting concealed services in concrete, masonry, stud and drywall, plaster and other materials prior to cutting, coring or demolishing.
- D. Contractor is responsible for cost of repair and restoration of damaged utilities and services, whether concealed or not.

1.11 Grades, Lines and Levels:

- A. Lay out the project and establish other lines and levels as necessary for the execution of the Work.
- B. Verify measurements at site before ordering material for doing work. No extra charge or compensation is allowed on account of differences between actual dimensions and measurements indicated on drawings. Submit any difference to Architect for clarification before proceeding.

1.12 Application of Documents:

- A. In the absence of any specific instruction or specification, employ workmanship and material approved by Architect with quality equal to that in the Contract Documents.
- B. It should be noted that the specification sections are not intended to divide work responsibilities among various subcontractors.
- C. The Drawings indicate generally the design and arrangements of equipment, apparatus, fixtures, accessories, etc., necessary to complete the installation of systems. The exact location or arrangement of apparatus and equipment, unless otherwise dimensioned, is subject to minor changes necessitated by field conditions and shall be verified by actual observation at construction site; and Contractor shall be responsible for his work fitting into place in a satisfactory and workmanlike manner and to the approval of the Architect.
- B. Contractor shall be responsible for leaving necessary room for all trades. No extra payments will be allowed to cover the cost of removing and relocating equipment found encroaching on space required by others.

- D. Manufacturers as listed in each Section of the Specifications are considered as acceptable insofar as they meet the requirements of the Specifications.

1.13 Material and Workmanship:

- A. The workmanship of trades shall be the best obtainable, and materials shall be installed true to line, level, plumb, and dimension.
- B. Any materials, manufactured articles, or equipment which may affect the architectural aspect or appearances of the work shall be subject to the express approval of the Architect, and should such work be rejected for appearance reason, the Contractor shall remove and replace at his own expense and replace with materials, etc. to the satisfaction of the Architect.
- C. Any materials, manufactured articles, or equipment which may affect the architectural aspect or appearances of the work shall be subject to the express approval of the Architect, and should such work be rejected for appearance reason, the Contractor shall remove and replace at his own expense and replace with materials, etc. to the satisfaction of the Architect.
- D. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturers, unless herein specified to the contrary.

1.14 Minimum Work Requirements:

- A. Technical requirements and methods of operation and procedures specified under indexed sections of these construction specifications constitute minimum requirements. Manufacturer's guarantees and agreements shall be observed and shall be in effect and valid.

1.15 Jurisdiction of Work:

- A. The Contractor shall make all appropriate contractual arrangements for proper performance of the Work in accordance with applicable trade jurisdictions and labor agreements. The division of the specifications into various sections does not imply an intent to subdivide the work among subcontracts or trades.

1.16 Acceptance of Preceding Work:

- A. Before starting any operation, the Contractor and each Subcontractors shall examine work performed by others to which his work adjoins or is applied and shall remedy or report to the Architect conditions that will prevent satisfactory accomplishment of his contract. Failure to notify the Architect in writing of deficiencies or faults in preceding work will constitute acceptance thereof and waiver of any claim of its unsuitability.

1.17 Damage to Other Work:

- A. The Contractor shall be responsible for damage caused by the work, the contractor's employees, agents and subcontractors, to adjoining property, existing facilities, present work, and work installed by himself or others.
- B. It is the responsibility of the Contractor and each Subcontractor to make a report immediately to the Architect if a utility line or service or any kind is encountered unexpectedly, and to protect and maintain it until instructions for its disposition can be issued.

1.18 Safety and Health Requirements:

- A. The Contractor and each Subcontractor shall comply with applicable federal, state and local acts and regulations, and without limiting this obligation, and in addition to other indemnities provided for in this contract, shall comply with the Code of Federal Regulations, 29 CFR 1926, Occupational Safety and Health Administration, Safety and Health Regulations for Construction.
- B. Additional requirements are specified in Section 00 73 19.01 - Safety and Health Requirements - Asbestos.

1.19 Clean-up:

- A. The Contractor shall keep the work areas reasonably clean and free of debris and shall obtain and pay for containers and disposal.

- B. The Contractor shall remove dirt and debris from the public way surrounding the site to the satisfaction of the authority having jurisdiction.

1.20 **Publicity:**

- A. Any publicity giving reference to this project, whether in the form of press releases, brochures, photographic coverage, or verbal announcement shall be only with the general or specific approval of the Owner, and in all instances shall give due mention of the Architect and the Architect's consultants.

PART 2 - PRODUCTS: Not used.

PART 3 - EXECUTION: Not used.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. For the purposes of maintaining a safe and effective educational environment for students, faculty, and staff, the Contractor shall enforce compliance with these Rules of Conduct at all times. The Owner may revise the rules from time to time. The Contractor shall instruct employees, each subcontractor's employees, and all delivery personnel to behave in a manner appropriate to the campus environment. This will include, but not be limited to the following:
1. Language, posted materials, publications, and/or actions that might be considered offensive are prohibited. The Contractor shall take all necessary measures to ensure that proper behavior is maintained.
 2. Interaction with students, faculty and staff is prohibited, excepting representatives designated by the College.
 3. Access to school dining facilities or snack areas is prohibited.
 4. Parking outside of the designated construction parking area may result in ticketing and/or towing.
 5. Contractors and workers must use designated toilet facilities.
 6. Smoking or other use of tobacco products is prohibited.
 7. Drinking or possession of alcoholic beverages is prohibited.
 8. Use or possession of drugs, intoxicants or illegal substances is prohibited.
 9. Use or possession of firearms or other weapons is prohibited.
 10. Use or possession of knives with blades longer than 2-3/4" is prohibited.
 11. Use of headphones, ear phones, personal music players, televisions, and similar devices is prohibited.
 12. Compliance with the Owner's security procedures is required.
 13. Food shall be consumed only in designated areas.
 14. Trash shall be disposed properly in designated containers. Littering is prohibited
 15. Appropriate clothing, long or short-sleeved shirts, long pants, work boots shall be worn at all times.
 16. Personal protective equipment, appropriate to the conditions and work, shall be work at all times.
- B. Violation of any of these rules is grounds for immediate removal of the violator from the site and the violator may be barred from returning to the project.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section

SUBSTITUTION PROCEDURES
SECTION 01 25 00

PART 1 - GENERAL

1.01 Description:

- A. Procedural requirements for substitutions

1.02 Consideration of Substitutions:

- A. No consideration will be given to substitutions prior to receipt of Bids.
- B. The Owner may choose to consider substitutions proposed by the Contractor when submitted with the bid in the form and manner prescribed by the Section 00 21 00 Instructions To Bidders.
- C. After the Contract is executed substitutions will be considered only under the conditions established by the General Conditions.
- D. The Contractor shall pay the Owner for the cost of the Architect's Additional Services for review of proposed substitutions and for changes in the design and documents to accommodate the proposed substitution.
 - 1. Review cost will not exceed \$500 without written notice to the Contractor and opportunity for the Contractor to withdraw the request from further consideration.
- E. Contractor shall submit all information reasonable requested by the Architect for evaluation of a proposed substitution including, but not limited to, product information, performance data, test results, cost information.
- F. No substitution shall be incorporated in the work unless authorized by a written Change Order properly executed by Owner and Architect.

1.03 Post-Contract Request For Substitution

- A. Submit a complete request using the form provided at the end of this section together with all necessary information.
- B. The cost incurred by the Owner for the Architect's review of the proposed substitution will be deducted from the amount owed the Contractor whether or not the substitution is accepted and authorized by written Change Order.

PART 2 - PRODUCTS Not used.
PART 3 - EXECUTION Not used.

End of Section
(one page follows)

REQUEST FOR SUBSTITUTION

Project: _____

Project No.: _____

Date: _____

Submitted By _____ (Contractor)

Contact: _____ (Name) _____ (Telephone)

INSTRUCTIONS

Complete this form.
Attach additional sheets as necessary.
Attach supporting information
Sign form and submit to the Architect

1. Description of Proposed Substitution

(Include reference to Specification Section and Paragraph, and to Drawing Sheet and number where applicable. Attach additional sheets as necessary.)

2. Reason for Proposed Substitution

(Explain why substitution is proposed and what benefit the Owner will derive. Attach additional sheets as necessary)

3. Affect on other Work

(Describe how the proposed substitution will affect other work. Identify what, if any, changes are required to other work or elements of the design to accommodate the proposed substitution)

4. Affect on Cost:

(Detail change in cost. Provide detailed breakdown of labor and material)

5. Affect on Time

(Indicate how the proposed change affects the project schedule)

6. Supporting Information

(Attach all additional data necessary for Architect's evaluation of the proposed substitution. List all that apply)

Product Data:

Performance Data:

Test Results

Preliminary Submittal Drawings:

Schedule

7. The undersigned

- A. Has researched the proposed substitution and believes it to be equal to or better than the specified products and materials.
- B. Certifies that the information provided is true and accurate.
- C. Agrees to pay all costs incurred by the Owner for the evaluation of this proposed substitution, whether or not accepted and incorporated into the work, however cost will not exceed \$500 without written notice to the Contractor and opportunity for the Contractor to withdraw this request from further consideration.
- D. Agrees to pay all costs necessary for incorporation of the proposed substitution if accepted, including changes to and coordination of other work.

Signature _____

Date _____

Printed Name _____

Title _____

This form shall be signed by the proprietor, partner, or a corporate officer of the Contractor.

PART 1 - GENERAL

1.01 Description:

- A. This section shall govern payment procedures, including, but not necessarily limited to, the following:
 - 1. Schedule of Values
 - 2. Application for payment.
 - 3. Lien waivers
 - 4. Certified payroll
 - 5. Related documentation.
- B. Related sections:
 - 1. Section 00 72 00: General conditions.
 - 2. Section 00 73 00: Supplementary conditions.
 - 3. Section 01 77 00: Closeout procedures.

1.02 Submittals:

- A. Schedule of values, to be submitted within fourteen (14) days of the signing of the Contract.
- B. Cash flow projection: A complete schedule of anticipated pay requests for the duration of the project, to be submitted within fourteen (14) days of the signing of the Contract. This projection is advisory and will neither limit nor assure payment of the amounts indicated.
- C. Payment request package, to be submitted monthly.

1.03 Schedule of Values:

- A. Schedule of Values shall be prepared on Chicago Title Insurance Company form F.3619 "Sworn Statement for Contractor and Subcontractors to Owner", or similar form acceptable to the Architect, in such a manner that each subcontractor is shown as a single line item. In addition, each major portion of the Work being performed by the Contractor shall be listed as a separate line item including supervision, overhead, and profit. Form must be signed, sealed if a corporation, and notarized.

1.04 Payment Procedure:

- A. Monthly progress payments will be made by the Owner. The Contractor shall submit applications for payment in accordance with the procedure established in the General Conditions.
 - 1. The Architect will certify or take other appropriate action on the Application.
 - a. If the amount is appropriate the Architect will certify payment.
 - b. If the amount is not appropriate or if necessary documentation is missing the

Architect may certify payment of a reduced amount or may refuse certification, and shall notify the Owner and Contractor of the reasons therefore.

2. The Architect will forward the payment request package to the Owner.
3. The Board of Trustees will act upon the payment request certified by the Architect at the next regularly scheduled business meeting of the Board of Trustees.
4. The Owner will make payment as provided in the General Conditions.

1.05 Application for Payment:

- A. Application for Payment shall be for work properly completed and materials acceptably stored on site through the date of the payout application and not beyond.
- B. All payments shall be for 90% of the value of work properly completed and materials acceptably stored on site with 10% being held as retention.
- C. At the Owner's sole discretion the Owner may reduce retention and may reinstate retention in accordance with the provisions of the General Conditions.
- D. Retention shall be paid upon final payment after completion of all punch list items from the Certificate of Substantial Completion. An application package is necessary for the final payment.

1.06 Payment Request Packages:

- A. Payment request packages must be complete and accurate. An improperly prepared package in need of correction may cause the contractor to miss the deadline for application resulting in a month delay in payment. A complete payment request package include the following, in triplicate:
 1. Application and Certificate for Payment, AIA Document G702; signed, sealed if a corporation, and notarized.
 2. Sworn Statement for Contractor and Subcontractors to Owner, Chicago Title Insurance Company Form F.3619; signed, sealed if a corporation, and notarized.
 - a. List separately each of the following:
 - (1) General Conditions.
 - (2) Overhead and Profit or Fee.
 - (3) Bonds and project-specific insurance.
 - (4) Each subcontract.
 - b. Line items shall be updated monthly to incorporate approved Change Orders and other subcontract changes. Change Orders shall not be listed as separate line items.
 3. Certification by Contractor and each sub-contractor of any tier, as required by the General Conditions, on the form included at the end of section.
 4. Waiver Submittal Summary Sheet, form included at the end of this section. Form must be signed, sealed if a corporation, and notarized. Final waivers shall be indicated with an asterisk (*).

5. Waivers of Lien:
 - a. Progress Payments: Submit waivers and affidavit from:
 - (1) Contractor, for the amount requested.
 - (2) Subcontractors and suppliers, for the amounts paid on the prior request.
 - b. Final Payment: Submit waivers and affidavit from:
 - (1) Contractor, Subcontractor and suppliers, for the amounts requested.
 - c. Forms:
 - (1) Partial waiver: Chicago Title Co. Form 1722 (pink)
 - (2) Final waiver: Chicago Title Co. Form 3870 (blue)
 - d. Instructions:
 - (1) Waiver and affidavit must be completed in full.
 - (2) The amount waived shall be the actual amount of the payment, not the gross amount before retainage is deducted.
 - (3) Subcontractors and suppliers shall be listed on the affidavit, unless identified on the Contractor's Sworn Statement.
 - (4) The phrase "All material taken from fully paid stock" shall not be used when lien rights are applicable.
6. Certified payroll records as specified herein, accompanied by the form provided at the end of this section.

B. Certified Payroll Records:

1. The Contractor and each subcontractor, shall submit certified payroll records in conformance with Illinois law, Illinois Department of Labor requirements, and the following:
 - a. Certified payroll records shall be included for all laborers, mechanics, and other workers employed by them on the project; the records shall include each worker's name, address, telephone number when available, social security number, classification or classifications, the hourly wages paid in each pay period, the number of hours worked each day, and the starting and ending times of work each day.
 - b. The certified payroll records shall be accompanied by a statement signed by the contractor or subcontractor which avers that: (i) such records are true and accurate; (ii) the hourly rate paid to each worker is not less than the general prevailing rate of hourly wages required by Public Act 94-0515; and (iii) the contractor or subcontractor is aware that filing a certified payroll that he or she knows to be false is a Class B misdemeanor.
2. Certified payroll records shall be submitted with the Application for Payment for the period covered by the Application. Records shall be submitted on forms available from the Illinois Department of Labor or other form as may be directed by the Owner.
3. The Contractor and each subcontractor shall make certified payroll records available for

inspection upon 2 business days notice, in accordance with law.

1.07 Samples:

- A. Samples of all payout documents as well as completed forms are available for viewing at the office of the Architect.

1.08 Accuracy:

- A. Since the payout documents are subject to review by many authorities accuracy is of great importance. Failure of the Contractor to strictly follow these procedures may result in delays of payment.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section
(three pages follow)

CONTRACTOR'S CERTIFICATION

MCHENRY COUNTY COLLEGE

PROJECT: _____

PROJECT NO. _____

Regarding the Application for Payment for the period of _____ to _____

Submitted by:

CONTRACTOR: _____
(Firm Name)

or

SUBCONTRACTOR: _____ for _____ work.
(Firm Name) (Type of Work)

Firm is a **Sole Proprietorship**, **Partnership**, **Corporation**.
(Check one above)

The Undersigned, certifies that:

- (1) There are no written claims or mechanics' or materialmen's liens with respect to the Work.
- (2) All due and payable bills with respect to the Work have been paid to date or shall be paid from the proceeds of the Application for Payment indicated above.
- (3) There is no known basis for the filing of any mechanics' or materialmen's liens on the Work.
- (4) Waivers submitted by the Undersigned and by Subcontractors and Sub-Subcontractors of the Undersigned constitute an effective waiver of lien under the laws of Illinois to the extent of payments that have been made or with respect to payments that will be made concurrently with Application for Payment indicated above.

Respectfully submitted, this _____ day of _____ 20____

By: _____
(Signature)

(Print Name)

(Title)

STATE OF: _____ COUNTY OF: _____
Subscribed and sworn before me this

_____ day of _____ 20____ (seal)

Notary Public
My commission
expires _____

Instructions: If certification is made by other than the Proprietor, a Partner, or an Executive Officer of the corporation, attach a sworn statement signed by the Proprietor, Partner, or an Executive Officer of the corporation, stating that the individual making this certification is authorized to do so on behalf of the firm.

CERTIFIED PAYROLL RECORDS for

MCHENRY COUNTY COLLEGE

PROJECT: _____

PROJECT NO. _____

for the period of _____ to _____

Submitted by:

CONTRACTOR: _____
(Firm Name)

or

SUBCONTRACTOR: _____ for _____ work.
(Firm Name) (Type of Work)

Firm is a **Sole Proprietorship**, **Partnership**, **Corporation**.
(Check one above)

The Undersigned, avers that:

- (i) The attached payroll records are true and accurate;
- (ii) The hourly rate paid to each worker is not less than the general prevailing rate of hourly wages required by this Public Act 94-0515; and
- (iii) The Undersigned is aware that filing a certified payroll that he or she knows to be false is a Class B misdemeanor.

By: _____
(Signature)

STATE OF: _____ COUNTY OF: _____
Subscribed and sworn before me this

(Print Name)

_____ day of _____ 20____ (seal)

(Title)

Notary Public
My commission
expires _____

Instructions: If certification is made by other than the Proprietor, a Partner, or an Executive Officer of the corporation, attach a sworn statement signed by the Proprietor, Partner, or an Executive Officer of the corporation, stating that the individual making this certification is authorized to do so on behalf of the firm.

Waiver Submittal Summary

Project: _____
 Project No. _____
 Contract For: _____

PAY REQUEST NO. _____
 PAY PERIOD ENDING _____

RuckPate Architecture
 22102 N. Pepper Rd Suite 201
 Barrington, IL 60010

CONTRACTOR	TOTAL AMOUNT OF CONTRACT	NET PREVIOUSLY PAID	AMOUNT DUE THIS PAYMENT	AMOUNT OF PREVIOUS WAIVERS	AMOUNT THIS WAIVER	STATUS
1						
SUBCONTRACTORS AND SUPPLIERS						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

CONTRACTOR'S CERTIFICATION

The undersigned certifies that to the best of his/her knowledge, information and belief the above information is accurate.

By: _____
 Title: _____
 Date: _____

State of _____
 County of _____
 Subscribed and sworn to before me this
 this _____
 day of _____
 Notary Public _____
 My commission expires: _____

(seal)

PART 1 - GENERAL

1.01 Description:

- A. This section regulates the requirements for the submittals required by individual specification sections. The requirements pertain, generally, to the following:
 - 1. Shop drawings, product data, samples and other submittals.
 - 2. Electronic submittals.
 - 3. Duties of Contractor and Architect.
 - 4. Fees for third and subsequent submittal review by the Architect.
 - 5. Requirements for optional BIM use.
- B. Related sections:
 - 1. Section 01 10 00: Log submission requirements.
 - 2. Section 01 78 00: Closeout submittal requirements.
 - 3. Specific shop drawings and submittal requirements are specified in Specifications Sections of Divisions 2 through 49.

1.02 Field and Project Records:

- A. One set of reviewed submittals shall be maintained by the Contractor at the project site, throughout the construction project.
- B. One set of reviewed submittals shall be compiled and maintained by the Contractor for delivery to the Owner prior to Substantial Completions as specified in Section 01 77 00.

1.03 Definitions:

- A. Shop drawings: shop drawings are original drawings prepared by Contractor, Subcontractor, Sub-subcontractor, supplier or distributor, which illustrate some portion of the work, showing fabrication, layout, setting or erection details.
 - 1. Prepare by qualified detailer.
 - 2. Identify details by reference to sheet and detail numbers shown on Contract Drawings.
 - 3. Minimum sheet size: 8½" x 11".
 - 4. Reproduction of Contract Documents, in whole or in part, for submittals is expressly prohibited.

B. Product data:

1. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, standard schematic drawings and other standard descriptive data.
 - a. Clearly mark each copy to identify pertinent materials, products or models.
 - b. Modify to delete information which is not applicable to project.
 - c. Supplement standard information to provide additional information applicable to project.
 - d. Show dimensions and clearances required.
 - e. Show performance characteristics and capacities.
 - f. Show wiring diagrams and controls.

C. Samples: Physical samples to illustrate materials, equipment or workmanship, and to establish standards by which complete work is judged.

1. Submit two (2) samples, indicate if samples are to be used in construction and should be returned otherwise Architect will retain all samples.
2. Color selection samples: physical samples of actual finish. Reproduced color charts are not acceptable.
3. Office samples: of sufficient size to clearly illustrate:
 - a. Functional characteristics of product or material, with integrally related parts and attachment devices.
 - b. Full range of color samples.
 - c. After review, samples may be used in construction of project.
4. Field samples and mock-ups:
 - a. Erect at project site at location acceptable to Architect.
 - b. Construct each sample or mock-up complete, including work of all trades required in finished work.

D. Other Submittals:

1. Certifications: written certification of facts as specified in individual sections, on the form provided or as acceptable to the Architect, with original signatures.
2. Calculations: written and numeric data to support manufacturer/supplier design decisions. Submit in a form acceptable to the Architect, with original signatures.
3. Waste disposal and recycling records: written data documenting disposal and recycling of demolition debris and construction waste. Submit for record. No review or response by Architect is required
4. Operation and Maintenance Data: manufacturer's data describing procedures for operation and maintenance of equipment and products.

- a. Operating Manuals for HVAC and electrical equipment:
 - (1) Submit for Owner's use upon delivery of equipment to site. Submit in electronic PDF form. No review or response by Architect is required.
 - (2) Submit additional copies with Closeout Documents as required by Section 01 78 00.
 - b. Submit all other Operation and Maintenance data with Closeout Documents as required by Section 01 78 00.
5. Material Safety Data Sheets(MSDS): Submit to the Owner MSDS for all materials used in the construction process or incorporated into the work. Submit for record. No review or response by Owner or Architect is required. MSDS submittals are not specified in individual sections.

1.04 Submittal Requirements:

- A. Electronic submittals: Where submittals are specified in conventional printed format, the Architect will accept electronic submittal in PDF format, subject to the following:
 - 1. Content must be text and vector graphics or high-quality scan, legible on screen and when printed at original sheet size. Provide PDFs generated directly from source documents rather than scans whenever possible. Scans shall retain color when present in original documents.
 - 2. File must allow electronic markup using Adobe Acrobat. Electronic markups must include editor's firm and identity.
 - 3. File must allow high-resolution printing.
 - 4. Electronic submittals are **not acceptable** for certifications and other documents that require original signatures.
 - 5. Electronic submittals shall be transmitted by email or web posting as directed by the Architect. The Architect may require adherence to file naming conventions and other protocols to facilitate management of electronic submittals.
 - 6. Upon review, the Architect will return the electronic submittal with notations and/or review action indicated in the PDF file. No printed copies will be returned.
 - 7. Where submittals are specified to be provided in both printed and electronic formats, both shall be provided.
 - 8. PDF formats shall not be substituted for submittals that are specified to be provided in BIM, CAD or other electronic formats.
- B. Submittal Schedule: Within 30 days of execution of the Contract submit a schedule indicating submittals and dates of submission to the Architect, include special requirements (i.e. specific order dates or critical time lines.).
- C. Submittal Log: Log showing the status of all submittals. Update and submit weekly during the course of the project.
- D. Shop Drawings: two (2) copies. Architect will make reproductions and return four (4) copies of reviewed submittals.
- E. Product data: six (6) copies are to be submitted, two (2) copies will be retained by the Architect.

- F. Certifications and Calculations: two (2) copies, unless a greater quantity is specified in individual sections. All copies will be retained by the Architect.
- G. Accompany submittals with transmittal letter containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. Submittal log number.
 - 5. Notification of deviations from Contract Documents.
 - 6. Supplier and/or manufacturer.
 - 7. Specification section.
- H. Furnish the Owner with one copy of final reviewed shop drawings with table of contents as specified in Section 01 77 00 Closeout Procedures.

1.05 Contractor Duties:

- A. Prepare and submit in a timely manner complete and accurate information for the applicable submittal.
 - 1. Review and approve shop drawings, product data and samples prior to submission, including submittals of subcontractors. Each submittal shall be signed by the Contractor indicating his approval. Failure of the Contractor to review and approve submittals may result in submittals being returned not reviewed.
- B. Coordinate submittals with information contained in related documents and transmit to the Architect.
- C. Verify:
 - 1. Dimensions.
 - 2. Quantities.
 - 3. Field construction criteria.
 - 4. Catalog numbers and similar data.
 - 5. Means and methods of construction.
- D. Coordinate each submittal with requirements of the work and of Contract Documents for other work.
- E. Contractor's responsibility for errors and omissions in submittals is not relieved by the Architect's review.
- F. Notify Architect in writing at time of submission, of deviations in submittals from Contract Documents.
- G. Do not begin any work which requires submittals without having received Architect's approval evidenced by Architect's stamp indicating approval, dated and initialed by the Architect.
- H. Resubmission requirements:

1. Shop drawings:
 - a. Revise initial drawings as required and resubmit as specified for initial submittal.
 - b. Indicate on drawings all changes which have been made other than those requested by Architect.
 2. Product data and samples: Submit new data and samples as required for initial submittal.
 3. The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selection of fabrication process, for techniques of assembly, errors or omissions in the shop drawings or samples, and for performing his work in a safe manner.
 4. For third and subsequent review by the Architect, Contractor shall reimburse the Owner for Architect's services to review the submittal. Architect's time will be billed at the normal hourly rates in increments of 0.5 hour.
- I. Maintain at the site one copy of reviewed submittals.

1.06 Architect's Duties:

- A. Review and act on submittals with reasonable promptness.
- B. Approval is for general conformance with the design concept expressed in the Contract Documents.
- C. Review of separate item does not constitute review of an assembly in which item functions.
- D. The Architect may hold shop drawings in cases where partial submission cannot be reviewed until the complete submission has been received or where shop drawings cannot be reviewed until correlated items affected by them have been received. When such shop drawings are held by the Architect, he will advise the Contractor that the shop drawings submitted will not be reviewed until shop drawings for all related items have been received.
- E. The Architect will hold color selection samples until all color selection samples have been submitted and a complete color board is approved by the Owner. The Contractor is encouraged to submit color samples as soon as possible in order to prevent any delay in the ordering of materials. The Contractor is solely responsible for all delays as a result of failure to submit all color selection samples.
- F. Affix stamp, date and initials or signature indicating review of submittal, and with instructions for Contractor response.
- G. Return submittals to Contractor for response or distribution.

<input type="checkbox"/> APPROVED
<input type="checkbox"/> APPROVED, EXCEPTIONS NOTED
<input type="checkbox"/> REVISE AND RESUBMIT
APPROVAL IS FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT EXPRESSED IN THE CONTRACT DOCUMENTS PURSUANT TO THE TERMS OF THE OWNER-ARCHITECT AGREEMENT. APPROVAL DOES NOT RELIEVE CONTRACTOR OF THE OBLIGATION TO CONFORM TO THE CONTRACT DOCUMENTS. CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF DIMENSIONS AND QUANTITIES AND FOR COORDINATION WITH FIELD CONDITIONS AND OTHER WORK
<div style="display: flex; justify-content: space-between;"> _____ _____ </div> <div style="display: flex; justify-content: space-between;"> DATE BY </div>

H. Sample Architect's Review Stamp, shown at right:

1.07 Requirements for Optional BIM Use:

- A. The Owner has required certain parts of the project design and documents to be prepared using Building Information Modeling (BIM). The Architect has used Autodesk Revit 2012 software to implement this requirement.
1. The BIM model contains a limited and generalized representation of existing conditions based on the Owner's available records and limited field investigation, and of the proposed construction. Model elements are representational and not an exact depiction of existing or proposed construction. The model does not include all elements of the existing conditions or of the proposed construction.
 2. The BIM model will be provided in electronic form to the Contractor for the Contractor's use subject to the BIM Terms of Use contained in this Section. The BIM model is an instrument of the Architect's service and, as such, the Architect retains ownership and all copyright therein.
 3. The BIM model is not a contract document. The BIM model shall not be relied upon for determining quantities, dimensions or other characteristics of the Work.
- B. BIM Terms of Use: The Contractor, each subcontractor and party that receives the BIM model shall be bound by the following terms:
1. BIM models prepared by the Architect are instruments of professional service intended for one-time use in the construction of this project.
 2. The Contractor shall have a fiduciary responsibility to the Architect to protect the Architect's proprietary information and copyright interest in the BIM model. The Contractor shall have a fiduciary responsibility to the Owner to safeguard and protect the Owner's security interest in the BIM model. The Contractor shall not allow the BIM model to be transmitted to any party without express written approval of the Architect and then only upon said party's acknowledgement and acceptance of these Terms of Use.
 3. Contractor may use the BIM model in conjunction with the the construction of the project, but may not transfer them to any third party other than the Owner. Unauthorized transfer for the purpose of reproducing any or all of the project is expressly prohibited.
 4. The Contractor acknowledges that the BIM model is neither an exact representation of existing conditions, nor of the proposed Work, nor is it an exact facsimile of the Contract Documents.
 5. The Contractor acknowledges that the BIM model is not to be relied upon for dimensional, quantity or other information.
 6. The Contractor acknowledges that the BIM model shall be used only as an additional tool to facilitate the construction of the project and the documentation of completed conditions for the Owner's on-going use and management of the facility. The Contractor acknowledges that use of BIM model will be at Contractor's sole risk and without any liability, obligation, risk by the Architect.
 7. The Contractor, and each subcontractor an party that receives the BIM model, shall to the fullest extent permitted by law defend, indemnify, and hold harmless the Architect and Architect's consultants from all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of or resulting from the use of the BIM model prepared by the Architect and Architect's consultants. Each subcontractor or party

- C. Collision Detection and Coordination: **At the Contractor's option**, the Contractor may use the BIM model and compatible software together with additional models of proposed work prepared by the Contractor and its subcontractors as one means of coordination of the Work, including detection and resolution of potential conflicts in proposed locations and routing of mechanical and electrical elements of the Work. Use of the BIM model shall be in addition to other conventional techniques for coordination and shall not relieve the Contractor of responsibility to thoroughly investigate the existing conditions and coordinate the Work.
- D. Record BIM Model: If the contractor prepares BIM models of proposed work, such models may be submitted to satisfy, in whole or in part, the Record Documents requirements established by Section 3.11 of the General Conditions.
- E. CAD Files: The Architect will not provide CAD plans. The Contractor may use the BIM model to generate CAD base plans for use in preparing submittals, however the Architect's BIM model shall not be used a shop drawing or submittal.
- F. The Contractor is required to provide all necessary software, licensing, and services necessary to implement the optional use of BIM, and to pay all costs thereof.
- G. As a condition of the Contract for Construction the Contractor agrees to the BIM Terms of Use contained in this Section and shall bind all Subcontractors to the same terms.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Perform alterations in accordance with procedures specified herein when explicit indications are not given elsewhere in the Contract Documents for individual cases. Procedures include, but are not necessarily limited to the following:
 - 1. Alterations to existing spaces and materials.
 - 2. Installation of products removed.
 - 3. Transitions in surfaces, levels, and finishes.
 - 4. Patching, infilling, and extending surfaces.
 - 5. Restoration of existing surfaces affected by demolition and cutting.
 - 6. Alterations to existing mechanical and electrical systems when affected by demolition.
 - 7. Chases for mechanical and electrical systems.
 - 8. Adjustment of operational items.
 - 9. Finishing items not otherwise indicated.
- B. Submittal of proposed solutions is to ensure an acceptable finished appearance. Review of proposed solutions is not an approval of additional costs. Costs for solutions to meet the design intent of the Project and the requirements of this Section are to be included in the Bid.
- C. Related Sections:
 - 1. Section 01 10 00 - Summary
 - 2. Section 01 73 29 - Cutting and Patching
 - 3. Section 07 84 00 - Firestopping

1.02 Submittals:

- A. Shop drawings: proposed solutions, including dimensions, details, and existing and proposed materials. Submit where required in PART 3 - EXECUTION below.
- B. Samples: materials for finish selection. If materials have been reviewed previously for use in other applications resubmittal is not required, reference previous submittal on transmittal, Architect will make selections from previously submitted samples.

PART 2 - PRODUCTS

2.01 Products for Patching and Extending Work:

- A. New materials: as specified in individual Specification Sections and as required to match existing

materials.

- B. Match existing products and work for patching and extending work.
- C. Determine type and quality of existing products by inspection and any necessary testing. Presence of a product, finish, or type of work, requires that patching, extending, or matching shall be performed as necessary to make work complete and consistent, unless otherwise indicated.

PART 3 - EXECUTION

3.01 Inspection:

- A. Verify that demolition is complete, and areas are ready for installation of new work.
- B. Beginning of restoration work means acceptance of existing conditions.

3.02 Preparation:

- A. Cut, move, or remove items as necessary for access to alterations and renovations work.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, rusted metals, and deteriorated masonry and concrete.
- C. Remove debris and abandoned items from area and from concealed spaces.
- D. Prepare surfaces and remove surface finishes to provide for proper installation of new work and new finishes.
- E. Insulate ductwork and piping to prevent condensation in exposed areas.
- F. Perform additional cutting to allow space for patching and infilling and for constructing transitions.

3.03 Installation:

- A. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate Owner occupancy.
- B. Replace and restore all materials cut moved or removed for alteration and renovation work to proceed.
- C. Replace unsuitable materials, as determined by the Architect, with material matching original condition of the item removed and as specified for finish work.
- D. Project shall be complete in all respects, including operational mechanical and electrical systems.
- E. Remove, cut and patch work in a manner to minimize damage and to provide means of restoring products and finishes to original condition, unless otherwise indicated.
- F. In addition to specified replacement of equipment and fixtures, restore existing plumbing, heating, ventilation, air conditioning and electrical systems to full operational condition.
- G. Install products as specified in individual Specification Sections.

3.04 Transitions:

- A. Where new work abuts or aligns with existing, make a smooth and even transition. Cut back existing construction to allow for adequate thickness of patch and infill construction.

- B. Where finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division. Submit proposed solution to Architect for review prior to execution.
- C. Where removal of partitions results in adjacent spaces becoming one, rework floors, walls, and ceilings create transitions as specified below.
- D. Floor surface transitions shall be smooth and shall be level unless change in elevation is required. If change of elevation is required:
 - 1. Provide sloped transition not exceeding 1:50 for change of 1" or less, 1:16 in other cases. Where a change of elevation of 1/4" or more occurs, submit proposed slope transition to Architect for review before execution.
 - 2. At doorways an offset threshold of up to 1/2" may be used.
- E. Ceiling surface transitions:
 - 1. Separate junctions between dissimilar materials in the same plane with a 1/2" x 1/2" metal reveal.
 - 2. When difference in elevation exists construct soffit to accommodate difference as follows, submit proposed solution to Architect for review prior to executing transition.
 - a. Matching acoustical ceilings: acoustical soffit.
 - b. Differing acoustical ceilings, acoustical and gypsum board ceilings: gypsum board soffit.
 - c. Other unspecified conditions: soffit matching either ceiling surface, or adjacent wall surface, as selected by Architect.
- F. Trim existing doors as necessary to clear new floor finishes; refinish trimmed surfaces.

3.05 Extending and Infilling Surfaces:

- A. Where existing finished surfaces are extended by the addition of area in the same plane, and when openings in existing finished surfaces are infilled, and refinishing of the entire area is not indicated, proceed as follows:
 - 1. Construct extended area and infill to allow subsequent finishing with minimum visual and textural difference.
 - 2. Adjacent concrete masonry: extend and infill surfaces with concrete masonry units having same face dimensions and similar texture. Match bond pattern. Tooth-in units except when adjacent masonry is laid in stack bond. Finish as specified below.
 - 3. Adjacent brick surface: construct extended areas and infill areas with matching brick and mortar, if possible use brick salvaged from areas of demolition and tooth-in new brick. If brick selected for project has noticeable difference in color and texture divide surfaces with full height vertical control joints. Architect may direct either method to be used in individual areas before work on the area is commenced.
 - 4. Adjacent wood surfaces: extend and infill surfaces with wood materials of same species and cut (graining), and jointing as existing. Finish extended area to matching existing appearance. Refinish entire area when infilled to achieve a uniform appearance matching the original.

5. Adjacent plaster surfaces: extend and infill surfaces with plaster matching existing texture.
6. Adjacent gypsum board: extend and infill surfaces without visible joints. Finish as specified below.
7. Adjacent ceramic and quarry tile finish: finish extended areas and infill areas with matching tile and grout. If tile materials cannot be obtained to achieve an exact match submit a range of options for selection by Architect.
8. Adjacent acoustical ceiling: extend ceiling into added area and infill openings with materials matching existing. If possible use materials salvaged from areas of demolition.
 - a. Align grid with existing grid if possible.
 - b. Double grid members and acoustical tiles of less than six inches (6") are not acceptable.
9. Adjacent resilient floor finish: finish extended areas and infill areas with matching resilient floor finish.
10. Adjacent carpeted finish: finish extended areas and infill areas with matching carpet.
11. Adjacent painted surface: prepare surfaces, paint extended areas and infill areas and repaint entire existing surface for uniform appearance.
12. Adjacent vinyl wall covering: remove existing wall covering and finish entire surface with wall covering as selected by Architect.
13. Adjacent resilient base: extend and infill resilient base with matching material. When an exact match cannot be achieved, remove existing base to nearest corner or other break and replace with new resilient base.
14. Other unspecified conditions: patched work shall match existing adjacent work in texture and appearance. When an exact match is not possible submit the range of options for selection by Architect.

3.06 Restoration:

- A. When surfaces affected by demolition and cutting are to remain exposed at completion of the project cut back existing construction to allow patching.
- B. When interior walls and partitions are removed exposing uneven concrete surfaces cut and remove concrete to a depth to allow patching: 1/4" for polymer-modified cementitious patching materials, 2" for concrete and grout patches.
- C. When interior walls and partitions are removed exposing uneven and broken masonry: cut out masonry units to a depth of at least 2", and fill solidly with masonry as specified for infill applications. For bearing walls submit proposed solution to Architect for review prior to executing patching.
 1. Architect may elect to permit patching by grinding and surfacing with rubbed mortar in certain cases where a patched appearance is acceptable.
 2. Architect may elect to allow holes in masonry from removed fasteners to be patched with colored mortar in certain cases where a patched appearance is acceptable.
- D. When interior walls and partitions and other elements are removed leaving gaps in ceiling: patch ceiling as specified for infill applications, construct specified transition if elevation difference exists.

- E. When interior equipment, fixtures or other construction is removed exposing uneven surfaces, residue of mortar, adhesive or uneven surfacing: scrape or grind to remove protrusions, fill and patch substrate to obtain a smooth uniform surface. Minor variations in texture of finished surface are acceptable.

3.07 Mechanical and Electrical Systems:

- A. Where existing mechanical and electrical lines, devices or equipment are located in an area of existing construction indicated to be demolished and disposition of existing items is not indicated:
 - 1. When elements are to remain active: remove and reroute lines, relocate devices and equipment to nearest suitable location.
 - 2. When elements are inactive or unnecessary: remove lines to point of nearest activity and terminate. Remove devices and equipment. Remove abandoned wiring back to electrical panels.
- B. Where existing mechanical and electrical or equipment are located in an area which would be obstructed by new construction: relocate as specified under paragraph 3.07A.
- C. Where existing clearance is not adequate to accommodate installation of new work and work is indicated to be concealed: reroute to allow concealment.
- D. Submit proposed solution to Architect for review prior to executing removal.

3.08 Chases:

- A. Where mechanical and electrical lines (conduits, raceways, pipes, ducts, etc.) are to be run through finished spaces and no means of concealment is indicated.
 - 1. Vertically: construct chases matching adjacent wall construction and finish to provide concealment.
 - 2. Horizontally: construct soffits matching ceiling finish to provide concealment.
 - 3. Lines may remain exposed when space has exposed structure, a predominance of existing exposed mechanical or electrical lines and when explicitly indicated to be exposed.
- B. Conform to requirements specified in Section "Electrical Remodeling" for treatment of electrical conduits and raceways.

3.09 Adjustment of Operational Items:

- A. Operational items include, but are not limited to doors, hardware and equipment, and other items with movable operating parts.
- B. Where operational items are indicated to have any work performed on that item adjust the item for proper operation when the project is complete.
- C. Contractor will **not** be required to replace broken or defective operational equipment on the basis of this Section. Broken and defective items shall be identified by the Contractor in writing to the Architect.
- D. As it may be difficult to determine if broken or defective items were in that condition prior to construction or became broken and defective as a result of the Work, the Contractor's failure to promptly identify broken and defective operational items in writing to the Architect shall constitute an acceptance of the responsibility to return broken and defective items to a fully operational condition, by repair or replacement, as part of the Work.

3.10 **Repair of Damaged Surfaces:**

- A. Patch or replace portions of existing surfaces which are damaged, discolored, or showing other imperfections.
- B. Patch and prepare surfaces to be refinished to achieve finish quality equal to new work.

3.11 **Finishes:**

- A. Finish surfaces as specified in individual Specification Sections.
- B. Finish all new surfaces which will remain exposed when project is complete. Where finishing is not indicated elsewhere in the Contract Documents:
 - 1. Paint interior wall surfaces, apply resilient base.
 - 2. Apply finish to interior floor surfaces to match adjacent rooms or spaces.
 - 3. Paint ceiling or exposed structure.
 - 4. Omit finishing for materials with integral finish such as brick and factory-finished items.
 - 5. Submit proposed solution for finishing to Architect for review prior to execution.
- C. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.12 **Penetrations:**

- A. Provide penetrations of floors, walls, ceilings and roof structure to accommodate installation of other work. When specific requirements for constructing penetrations are not indicated elsewhere in the Documents:
 - 1. Cut penetrations as specified in Section 01 73 29.
 - 2. Reinforce openings in floor and roof structure. If specific reinforcement is not indicated in the Documents use members sizes and details of construction similar to those used in similar applications. Fabricate and install steel reinforcements as specified in Sections 05 12 00 and 05 50 00.
 - 3. Seal penetrations and openings through fire rated walls and floors, whether penetrations and openings were made as part of the Work or discovered during alteration and renovation work, as specified in Section 07 84 00.
 - 4. Seal penetrations of exterior building envelope watertight and weather-tight. Seal and flash penetrations using details similar to those used for similar work.
 - 5. Submit proposed solutions for penetration, reinforcement, and sealing to Architect for review prior fabrication and execution.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Section includes particular requirements pertaining to building codes, code administration and compliance procedures including, but not limited to, the following:
 - 1. Applicable Building Code.
 - 2. Utilities.
 - 3. Permits, Fees and Notices.
 - 4. Stormwater Management
 - 5. CCDD

- B. Related sections:
 - 1. Section 01 45 23: Special Inspections performed by Testing Laboratory Service.
 - 2. Section 01 45 23: Testing and Certification to be performed by Testing Laboratory Service. for uncontaminated soil exported for the site.

1.02 Principal Codes:

- A. Applicable Building Code:
 - 1. International Building Code 2006.

- B. Other Codes:
 - 1. International Mechanical Code 2006
 - 2. International Fuel Gas Code 2006
 - 3. National Electrical Code 2005
 - 4. ASHRAE 90.1 2007, as amended by 71 Ill Adm Code 600
 - 5. Fire Prevention and Safety 41 Ill. Adm. Code 100
 - 6. Boiler and Pressure Vessel Safety 41 Ill Adm Code 120
 - 7. Illinois Accessibility Code 71 Ill Adm Code 400
 - 8. Illinois Energy Conservation Code 71 Ill Adm Code 600
 - 9. Illinois Plumbing Code 77 Ill Adm Code 890

1.03 Utilities:

- A. The following is a summary of the primary public utilities serving the project, provided for informational purposes.
 - 1. Electric: Commonwealth Edison Company.
 - 2. Gas: NICOR.
 - 3. Telephone: AT&T.
 - 4. Cable Television: Comcast.

1.04 Permits, Fees and Notices:

A. Permits:

1. Building Permit: No building permit required. Owner will obtain project approval from Illinois Community College Board.
2. Due to the limited area of hydrologic disturbance and other factors the project is exempt from IEPA NPDES permit requirements and is not subject to McHenry County or City of Crystal Lake stormwater permit requirements.
3. Contractor shall obtain and pay for all other permits legally required for the execution of the Work.

B. Fees:

1. Contractor shall pay all other fees legally required for the execution of the Work.
2. Contractor shall give the Owner seven (7) calendar days notice of the amount of any fees to be paid pursuant to applications filed by the Contractor as provided herein.

C. Notices and Inspections:

1. Contractor shall give all other notices and arrange all inspections legally required for the execution of the Work.
2. The project is not subject to the jurisdiction of the City of Crystal Lake or the City of McHenry..

1.05 Stormwater Management:

- A.** Provide and maintain appropriate erosion, sediment and other stormwater management controls during construction in accordance with the Section 2.2 of the *Technical Reference Manual for McHenry County Stormwater Management Ordinance*.

1.06 CCDD (Clean Construction and Demolition Debris):

A. Contractor Responsibility:

1. Provide Testing Laboratory Services and services of a Licensed Professional Engineer for testing and applicable LPC-663 certification of uncontaminated soil and CCDD to be removed from the project site.
2. Ensure construction activity is performed in accordance with applicable provisions of 415 ILCS 5/22 et seq, Illinois Public Act 096-1416, 35 Ill Adm Code 1150 and other applicable rules of the Illinois EPA, and the following:
3. Provide source certification for imported uncontaminated soil and imported CCDD when applicable.
 - a. LPC-662 (Site Owner/Operator) certification if site of origin is non-commercial/industrial
 - b. LPC-663 (Professional Engineer) certification if site of origin is commercial/industrial.

4. Create and maintain records for every load of material imported to the project site:
 - a.: Site of origin address, owner or operator name, contact
 - b. Material type
 - c. Quantity, in tons or cubic yards
 - d. Hauler name
 - e. Date and time of delivery to project site
 - f. Purpose and location in project
 - g. Copy of LPC-662 or LPC-663 certification for uncontaminated
5. Deliver copy of all records to Owner upon Substantial Completion, and from time to time as may be required by the Architect.

1.07 Recycled Content:

- A. In accordance with 415 ILCS 20/3.1 the Owner is required
- B.
- C. Contractor shall compile data showing the value and recycled content of all materials and products incorporated into the project. Recycled content shall be calculated on the basis of Post-Consumer content + ½ Pre-Consumer content, excluding in-house waste and trimmings). Mechanical and electrical equipment and materials shall be included in this calculation.
- D. Project Goal: 15% or greater recycled content.
- E. Deliver records to Owner upon Substantial Completion, and from time to time as may be required by the Architect.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION Not used.

End of Section

PART 1 - GENERAL

1.01 Section Includes:

- A. Definitions
- B. Abbreviations and acronyms
- C. Reference Standards

1.02 Related Sections:

- A. Additional definitions are contained in the General Conditions and in the various Sections of the Project Manual

1.03 Definitions:

- A. As used in the Contract Documents, the terms below shall have the meanings described in this Section. Any definitions given in the General Conditions shall take precedence in the case of a conflict in the definition of the same term:

Addenda: Written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections. For projects performed under a Construction Manager, Addenda include instruments issued by the Construction Manager which modify or interpret those portions of the Bidding Documents prepared by the Construction Manager.

Alternate Bid: An Alternate Bid (or Alternate) is the amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted by the Owner and incorporated into the contract for the Work.

Base Bid: The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

Bid: A Bid is a complete and properly signed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

Bidder: A Bidder is a person or entity who submits a Bid.

Completion Date: The date required by the Contract Documents for Substantial Completion of the Work or of a particular Phase of part of the Work.

Final Completion: Final completion occurs when the contractor has completed the contract requirements, the Architect has certified final payment, and the Owner has made final payment to the contractor in accordance with the provisions of § 9.10 of the General Conditions..

Furnish: To supply and deliver to the project site, ready for installation.

Install: To place in final position and make ready for service or use.

Product: Material(s), equipment, and system(s).

Provide: To furnish and install.

Sub-bidder: A Sub-bidder is a person or entity who submits a quote or bid to a Bidder for materials, equipment or labor for a portion of the Work.

1.04 Abbreviations and Acronyms

A

AB Anchor Bolt
ACI American Concrete Institute
ACOUST PNL Acoustic Panel
ACS DR Access Door
ACS PNL Access Panel
ACT Acoustic tile
ADJ Adjustable, Adjacent
AGGR Aggregate
A/C Air conditioning
ALT Alternate
ALUM Aluminum
L Angle
ARCH Architectural
ASB Asbestos
ASPH Asphalt
ASTM ASTM International
@ At
AUTO Automatic
AVG Average

B

B/B Back-to-Back
BBD Bulletin Board
BC Bottom Curb
BD Board
BIT Bituminous
BLDG Building
BLK Block
BLKG Blocking
BLT-IN Built-In
BM Beam
BOT Bottom
BPL Base Plate
BRDG Bridging
BRG Bearing
BRKT Bracket
BRZ Bronze
BSMT Basement

C

C Channel
CAB Cabinet
CB Catch Basin

CEM Cement
CFM Cubic feet per minute
CH Coat Hook
CHK BD Chalk Board
CI Cast Iron
C JT Control joint
CLKG Caulking
CL Center Line
CLO Closet
CL RM Class Room
CLG Ceiling
CMU Concrete Masonry Units
(Concrete block)
CO Clean Out
COL Column
COMP Composition
CONT Continuous
CONC Concrete
CONN Connection
CONST Construction
CONST JT Construction Joint
CONTR Contractor
CONV Convectur
CONT Continuous
CPT Carpet
CORR Corridor
CSK Counter sunk
CT Ceramic Tile
C - C Center-to-Center
CTR Center
CU FT Cubic feet
CW Cold Water

D

DP Dampproofing
DL Dead load
DET Detail
DK Deck
DIA Diameter
DIM Dimension
DML Demolish
DO Ditto
DIV Division
DR Door
DSA Double strength A grade glass
DSB Double strength B grade glass

DS	Down Spout		
DWG	Drawing	<u>H</u>	
DF	Drinking fountain		
DN	Down	HD BD	Hardboard
		HDW	Hardware
<u>E</u>		HDWD	Hardwood
ELEC	Electrical	HS	High Strength
ELEV	Elevator	HD	Head
EG	Existing	HC	Hollow Core
EL	Elevation	HT	Height
ENCL	Enclosure	HTR	Heater
EQUIP	Equipment	HM	Hollow Metal
EWC	Electric water cooler	HTG	Heating
EXIST	Existing	HORIZ	Horizontal
EXPN BLT	Expansion Bolt	HB	Hose bibb
EXPN JT	Expansion Joint	HW	Hot Water
EXP	Exposed	HWH	Hot Water Heater
EP	Epoxy	HP	High Point
		<u>I</u>	
<u>F</u>		INCAND	Incandescent
FAB	Fabricate	INCL	Include
FIN	Finish	INSUL	Insulation
FE	Fire Extinguisher	INSUL GL	Insulated Glass
FC	Fire Code	INT	Interior
FEC	Fire Extinguisher Cabinet	INV EL	Invert elevation
FHC	Fire Hose Cabinet	ID	Inside diameter
FND	Fem. Napkin Dispenser		
FLASH	Flashing	<u>J</u>	
FHMC	Flat Head Machine Screw	J	Jamb
FHWC	Flat Head Wood Screw	JAN	Janitor
FL	Floor	JT	Joint
FD	Floor Drain	JST	Joist
FTG	Footing	JB	Junction Box
FLG	Flooring	JC	Jan Closet
FND	Foundation		
FS	Full Size		
FR	Frame	<u>K</u>	
FA	Fresh Air	KIT	Kitchen
		KD	Knock Down
<u>G</u>		KP	Kick Plate
GALV	Galvanized		
GI	Galvanized iron	<u>L</u>	
GRD	Grade	LKR	Locker
GCB	Glazed Concrete Block	LAB	Laboratory
GA	Gauge	LAM	Laminate
GEN CONT	General Contractor	LIB	Library
GEN COND	General Conditions	LAV	Lavatory
GFI	Ground Fault Interruption	LTG	Lighting
GL	Glass, glaze	LP	Low Point
GMU	Glazed masonry units	LL	Live load
GYP	Gypsum	LS	Limestone
GYP BD	Gypsum Board (Drywall)		
GVL	Gravel	<u>M</u>	
GRND	Ground		
G	Gutter		

MH	Manhole	PROP	Property
MFR	Manufacturer		
MO	Masonry opening	<u>Q</u>	
MAT	Material		
MAX	Maximum	QT	Quarry Tile
MBH	1000 x BTU		
MECH	Mechanical	<u>R</u>	
MC	Medicine cabinet		
MEMB	Membrane	RAD	Radiator
MET	Metal	R	Radius, riser
MTL	Material	RA	Return air
MET PAN	Metal Pan	RB	Rubber base
MIN	Minimum	RECP	Receptacle
MIR	Mirror	REINF	Reinforcing
MISC	Miscellaneous	REQ	Require
MLDG	Moulding	REQD	Required
MOD	Module	REG	Register
MED	Medium	RETG	Retaining
		REV	Revision
<u>N</u>		RM	Room
		RFG	Roofing
NOM	Nominal	RF	Roof
NAP	Napkin	RD	Roof drain
NIC	Not in contract	RUB	Rubber
NTS	Not to scale	ROW	Right of way
NO	Number		
NG	New grade	<u>S</u>	
<u>O</u>		SCHED	Schedule
		SB	Splash Block
OFF	Office	SCR	Screw
OC	On Center	SECY	Secretary
OD	Outside diameter	SECT	Section
OPNG	Opening	SLR	Sealer
OPP	Opposite	STL	Steel
O - O	Out to out	SV	Stain and Varnish
OA	Overall	SS	Service sink
OZ	Ounce	SERV	Service
OH	Overhead	SHT	Sheathing
		SHT MET	Sheet Metal
<u>P</u>		STD	Standard
		SHT	Sheet
PTD	Paper Towel Dispenser	SHR	Shower
PART	Partition	SH	Shelves
PLAST	Plaster	SIM	Similar
PLAS	Plastic	SPEC	Specification
PLAS LAM	Plastic Laminate	SPKLR	Sprinkler
PL	Plate	SQ FT	Square Foot
PLBG	Plumbing	SST	Stainless Steel
PWD	Plywood	SK	Sink
PR	Pair	STWY	Stairway
PT	Paint	SLOT	Slotted
PNL	Panel	STOR	Storage
POL	Polished	SP	Stand Pipe
PORC	Porcelain	SF	Split Face
PREC	Precast	STRUCT	Structural
PREFAB	Prefabricated	SGFT	Structural Glazed Facing Tile
PREFIN	Prefinished	SUSP CLG	Suspended Ceiling

S4S	Smooth four sides	<u>V</u>	
<u>T</u>			
T	Tread	VB	Vinyl Base
TEL	Telephone	V	Vinyl
T BD	Tack Board	VG	Vertical grain
TEMP	Tempered	VIF	Verify in field
TERR	Terrazzo	VTR	Vent thru roof
THK	Thick, Thickness	VEST	Vestibule
T & G	Tongue & Groove	VERT	Vertical
TOIL	Toilet	VWG	Vinyl wall cover
TC	Top of curb	VCT	Vinyl Composition Tile
TS	Top of steel	VT	Vinyl Tile
TV	Television	<u>W</u>	
TYP	Typical	WIND	Window
TR	Towel rod	WAINS	Wainscot
TPH	Toilet Paper Holder	W.D.	Window dimension
THRU	Through	WD	Wood
<u>U</u>		WT	Weight
UNFIN	Unfinished	WP	Work Point
UH	Unit Heater	WF	Wide flange
UR	Urinal	WWF	Welded wire fabric
UV	Unit Ventilator	W GL	Wire glass
UL	Underwriters Laboratory	WH	Water heater
		WC	Water closet
		WCR	Water cooler
		WP	Water proof, weather proof
		WR	Water
		W/O	Without
		W/	With

1.05 Reference Standards and Industry Specifications:

- A. Any material or operation specified by reference to published specifications of a manufacturer, a society, an association, a code, or other published standard, shall comply with requirements of the listed document which is current sixty (60) days prior to the date of the Project Manual. In case of a conflict between referenced document and the Specifications, the Specifications shall govern.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section

TEMPORARY FACILITIES AND CONTROLS
SECTION 01 50 00

PART 1 - GENERAL

1.01 Description:

- A. Provide all temporary facilities and controls required to properly prosecute the Work in accordance with applicable codes, laws, and regulations and to comply with requirements contained herein including, but not necessarily limited to, the following:
 - 1. Temporary facilities:
 - a. Field office.
 - b. Storage and fabrication sheds.
 - 2. Temporary utilities:
 - a. Sewers and drainage.
 - b. Water.
 - c. Sanitary facilities.
 - d. HVAC
 - e. Electric power.
 - f. Lighting.
 - 3. Support facilities:
 - a. Traffic controls.
 - b. Parking.
 - c. Dewatering facilities and drains.
 - d. Temporary signs:
 - e. Waste disposal facilities.
 - f. Lifts and hoists.
 - g. Temporary elevator use.
 - h. Temporary stairs.
 - i. Scaffolding and runways.
 - j. Shoring and bracing..
 - 4. Security and protection facilities:
 - a. Environmental protection.
 - b. Erosion and sedimentation control.
 - c. Stormwater control.
 - d. Indoor air quality during construction.
 - e. Tree and plant protections.
 - f. Barricades, warning signs and lights.
 - g. Walkways and temporary egress.
 - h. Temporary enclosures.
 - i. Temporary partitions.
 - j. Temporary fire protection.
- B. Related sections:
 - 1. Section 01 41 00: Regulatory requirements.

2. Section 03 30 00: Cold weather requirements for cast-in-place concrete work.
3. Section 07 50 00: Requirements for torch-applied roofing.
4. Divisions 02 - 16: Special environmental requirements are specified in the individual Sections.
5. Division 22: Requirements for plumbing, heating, cooling and ventilating work.
6. Division 26: Requirements for electrical work.
7. Section 31 00 00: Barricade requirements for open excavations, dewatering, other excavation requirements.

1.02 Temporary Facilities and Controls, General:

- A. Design, furnish, install, operate and maintain all temporary facilities and controls necessary for the prosecution of the work and for the safety of workers, the Owner, and the public. Remove temporary facilities and controls when no longer necessary.
- B. Temporary connections to utilities and services shall be acceptable to the Architect, Owner and the Authorities Having Jurisdiction. OSHA standards and regulations shall apply if more restrictive. Make such connections, remove same when no longer required and restore services and sources of supply to proper operating condition.
- C. Temporary utilities shall be installed in accordance applicable codes and regulations.
- D. Pay all costs of temporary facilities and controls.
- E. Maintain strict supervision of use of temporary utilities.
 1. Enforce conformance with applicable codes and standards.
 2. Enforce safe practices.
 3. Prevent abuse of service.
 4. Prevent damage to permanent construction.
- F. The Contractor shall be exclusively responsible for the safe condition and use of temporary facilities and controls.

1.03 Temporary Facilities:

- A. Field Office: none required or provided.
- B. Storage and fabrication sheds: none required or provided. Location subject to Owner's approval if provided by the Contractor.

1.04 Temporary Utilities:

- A. Sewers and drainage: provide temporary sewers and drainage and diversion systems for control and discharge of storm water, ground water and runoff, and to prevent damage to the work in progress, completed work and adjacent facilities.
- B. Water: water may be obtained for construction use from existing sources at the facilities.

- C. Sanitary facilities: provide temporary toilet facilities meeting OSHA and Illinois Department of Labor requirements as to type and quantity per number of workers.
- D. Heating, ventilation and humidity control
 - 1. Permanent building HVAC system will remain in operation during the project. Protect existing system from contamination by the Work.
 - (1) Suitable filters are provided and maintained on all air inlets wherever dust and may be present.
 - (2) Operation is strictly supervised to prevent damage.
 - (3) Equipment is serviced and new filters installed in equipment prior to Substantial Completion.
 - (4) Warranty is extended to provide the specified term of coverage beginning with Substantial Completion.
 - (5) Ductwork and equipment are thoroughly cleaned and restored if contaminated.
 - 2. Protect work in place from damage due to heat, cold and high humidity. Provide insulating materials, heating, ventilation and dehumidification to prevent damage.
 - 3. Take all necessary measures to prevent smoke, fumes, vapors, odors, particulates and other noxious substances entering Owner-occupied areas from the work area. Provide temporary ventilation of work area and temporary modifications to permanent HVAC system and operations to maintain satisfactory environmental quality in Owner-occupied areas.
- E. Electric power: electrical power for construction use not exceeding 120VAC-20A per circuit may be obtained from existing facilities, however caution shall be exercised to avoid overloading existing circuits or interfering with Owner's ongoing operations.
 - 1. Provide portable generation or extend existing services to usable locations, restore existing equipment to original condition when temporary extensions are no longer needed.
- F. Lighting: Existing lighting may be used for work in existing spaces. Provide temporary portable lighting when existing lighting is inadequate for construction purposes and for exterior work between dusk and dawn.

1.05 Support Facilities:

- A. Traffic controls
 - 1. Provide barricades, signage, warning lights flaggers and other controls necessary for traffic control and public safety.
- B. Parking: Park only in locations designated by the Owner.
- C. Dewatering:
 - 1. Provide and operate pumping and bailing equipment, sumps, drains well-points and other measures to
 - a. Create conditions suitable for construction activity.

- b. Remove water from excavations
 - c. Prevent accumulation of water from any source in any location detrimental to stored material, work in progress, completed work, and adjacent facilities.
 - 2. Remove snow and ice as necessary for the protection and prosecution of the work.
- D. Temporary signs:
 - 1. Provide directional and warning signs for vehicles and pedestrians.
 - 2. Provide temporary signs for identification of construction entrances and special-use areas.
 - 3. Provide signage for temporary egress facilities.
- E. Waste disposal facilities:
 - 1. Provide containers and disposal service for safe, prompt and lawful off-site recycling and disposal of all debris and waste produced by the work.
 - 2. Recycle at least 50% of all waste materials by volume. Prepare and implement a construction waste management plan to maximize recycling of eligible materials, including, but not limited to, concrete debris, metals, glass, plastics, paper and cardboard, gypsum products, Provide separate containers for recyclable and non-recyclable materials. Maintain records for recycling and disposal and enforce appropriate waste handling and disposal practices on the job site.
- F. Lifts and hoists:
 - 1. Provide, operate, and maintain construction hoists and derricks, as may be required for execution of work.
 - 2. Provide necessary guards, signals and safety devices required for a safe operation, and suitable runways from the hoists to each floor level and roof. Construction and operation of material hoist shall comply with applicable requirements of ANSI A10.5, and AGC Manual of Accident Prevention in Construction, OSHA, and to applicable state and municipal codes. Prohibit the use of material hoist for transporting personnel.
- G. Temporary elevator use: construction use of permanent elevators is not permitted without Owner's express written permission.
- H. Temporary stairs:
 - 1. Temporary use of permanent stairs is permitted
 - 2. Provide temporary stairs, ladders and ramps necessary for proper execution of the Work.
- I. Scaffolding, runways, work platforms:
 - 1. Provide scaffolding, runways, work platforms, temporary bracing and temporary supports necessary for proper execution of the Work..
- J. Shoring and bracing:
 - 1. Provide shoring and bracing to facilitate the safe and proper execution of the work. Repair damage caused by unsuitable shoring or bracing or lack of adequate support during construction.

1.06 **Security and Protection Facilities:**

- A. Environmental protection:
 - 1. Comply with all applicable requirements for environmental protection including, but not limited to pollutant discharge control, noise control, dust control, and waste disposal.
 - 2. Supervise and enforce measures specified in Section 00 41 00.
- B. Temporary erosion and sedimentation control.
 - 1. Provide all measures necessary to control erosion and sedimentation, and to comply with applicable regulatory requirements including, but not limited to, maintaining water quality in detention basins, wetlands, streams and other watercourses.
- C. Stormwater control
 - 1. Comply with all applicable requirements for stormwater control.
 - 2. Supervise and enforce measures specified in Section 00 41 00 and 31 00 00.
 - 3. Control stormwater and runoff to avoid accumulation of water in excavations, work in progress, completed work, adjacent facilities, and the work area in general.
 - 4. Prevent stormwater from damaging construction, stored materials or existing facilities.
- D. Indoor Air Quality During Construction:
 - 1. Prepare and implement a Construction Indoor Air Quality Plan to minimize contamination of interior building spaces in accordance with SMACNA "IAQ Guidelines For Occupied Buildings Under Construction"
- E. Tree and plant protections
 - 1. Protect trees and plants which are to remain in the vicinity of construction activity.
- F. Barricades, warning signs and lights
 - 1. Provide barricades, warnings, and other protective measures for the protection of workers, visitors, and the public. Such measures installed in the public way shall be satisfactory to local and other authorities having jurisdiction.
 - 2. Provide barricades around all exterior work areas.
 - 3. Barricades and construction aids shall comply with the requirements of OSHA and all other applicable federal, state and local laws, regulations, and requirements.
- G. Walkways and temporary egress
 - 1. When construction will occur in any part of the building or site occupied by the Owner or accessible by the public, provide walkways and temporary egress facilities.
 - a. Maintain permanent exit doorways and paths of travel at all times when building is occupied. Provide temporary exits and egress if permanent facilities are obstructed. Temporary exits and egress facilities are subject to the prior review and approval of the Owner.

- b. Provide safe, smooth, weather-resistant walkways with barricades for travel through exterior work areas.
- c. Provide protective covering where falling-object hazard may exist.
- d. Provide exit and directional signage, illuminated or luminescent for interior egress paths
- e. Provide battery-powered emergency illumination of interior egress paths.
- f. All walkways and temporary egress facilities shall be acceptable to the Authorities Having Jurisdiction.

H. Temporary enclosures

- 1. Provide secure, weathertight, temporary enclosures for exterior openings when required to maintain environmental requirements as required by individual sections of the specifications, and to protect the building from unauthorized access as soon as possible.
- 2. Provide substantial temporary partitions to separate occupied areas from interior work areas, and work area is not separated by completed permanent construction. Temporary partitions shall maintain security of occupied areas.
- 3. Provide dust partitions to limit the spread of dust and when temporary partitions are needed in place for 14 days or less. Dust partitions shall consist of 6 mil or heavier polyethylene film with sufficient framing and attachment to maintain position. Provide fire retardant material in lieu of polyethylene film if work involves sparks, open flame or fire hazard.
- 4. HVAC Protection
 - a. Systems under construction and materials in storage:
 - (1) Cover all duct openings and protect equipment and stored duct materials with tight-fitting plastic film coverings to prevent entrance of dirt or moisture.
 - b. Prior to start-up and during operation for temporary purposes, if and when permitted:
 - (1) Provide temporary filters on all HVAC exhaust and return inlets. Filters shall have a MERV 8 rating or higher per ASHRAE 52.2. Inspect filters weekly and replace when dirty.
 - (2) Provide temporary filters in all HVAC system filter banks as specified for permanent use.

I. Fire Prevention:

- 1. Take adequate precautions against fire; keep flammable material at absolute minimum; and ensure that such material is properly handled and stored.
- 2. Construction practices, including cutting and welding, torches or other open flame during construction, shall be in accordance with the published standards of the National Fire Protection Association (NFPA). Provide a sufficient number of approved portable fire extinguishers distributed about the project. Maintain a fire watch during and for a minimum of 1 hour after completion of such hazardous operations.

3. Gasoline and other flammable liquids shall be stored in safety containers and dispensed in accordance with the National Board of Fire Underwriter's recommendations. Flammable liquids shall not be stored within the building.
4. Tarpaulins used for any purpose during the construction of the work shall be made of materials which are resistant to fire, water, and weather.
5. Do not light fire of any kind in or about the premises.
6. The use of open flame heaters is forbidden without prior written approval.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. This section pertains to the selection and handling of materials and equipment including, but not necessarily limited to, the following:
 - 1. Products.
 - 2. Hazardous materials.
 - 3. Transportation and handling.
 - 4. Storage and protection.
- B. Related sections:
 - 1. Section 01 25 00: Substitution Procedures
 - 2. Section 01 33 00: MSDS submittal requirements.
 - 3. Additional requirements are contained in individual sections of the specifications.

1.02 Products:

- A. Products: means new material, machinery, components, equipment, fixtures, and systems forming the work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the work. Products may also include existing materials or components required for reuse.
- B. Any materials, manufactured articles, or equipment which may affect the architectural aspect or appearances of the Work shall be subject to the express approval of the Architect, and should such work be rejected for appearance reasons, the Contractor shall remove and replace at his own expense to the satisfaction of the Architect.
- C. Provide products which comply with requirements, and which are undamaged and unused at time of installation and which include accessories, trim, finish, safety guards, and other devices and details needed for installation, intended use, and effect.
- D. Comply with capacity size, make, type, and quality specified.
- E. Standard products: where available, provide standard products of types which have been produced and used previously and successfully on other projects and in similar applications.
- F. Products shall be suitable for service conditions.
- G. Continued availability: Where additional amounts of product, by nature of application, are likely to be needed by Owner at later date for maintenance and repair or replacement work, provide standard, domestically produced product which is likely to be available to Owner at such later date.
- H. Manufacture like parts of duplicate units to standard interchangeable sizes and gauges. Two or more items of same kind shall be identical and shall be produced by the same manufacturer.

- I. In the absence of more stringent requirements:
 - 1. Design, fabricate and assemble products in accordance with engineering and shop practices normal to trade.
 - 2. Comply with manufacturer's standards and published specifications.
- J. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
- K. Nameplates:
 - 1. Except for testing laboratory approval labels, and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces or products which will be exposed to view either in occupied spaces or on exterior of work.
 - 2. Locate required labels and stamps on concealed surface or where required for observation after installation on accessible surface which in occupied spaces is not conspicuous.
- L. Equipment nameplates:
 - 1. Provide permanent nameplate on each item of service connected or power operated equipment.
 - 2. Indicate manufacturer, product name, model number, serial number, capacity, speed, ratings and similar essential operating data.
 - 3. Locate nameplates on an easily accessed surface which in occupied spaces is not conspicuous.

1.03 Hazardous Materials:

- A. The Contractor shall review the Contract Document and promptly notify the Owner and the Architect in writing of any materials and systems shown or specified, which, to the best of Contractor's knowledge, contain hazardous materials.
- B. Except with the Owner's prior written consent, the Contractor shall not incorporate into the Work any materials or systems, which to the best of Contractor's knowledge, contain hazardous materials, even if it is shown or specified in the Contract Documents.

1.04 Transportation and Handling:

- A. Deliver, handle, and store products in accordance with manufacturer's recommendations and by methods and means which will prevent damage, deterioration and loss including theft.
- B. Coordinate delivery and installation to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss.
- C. Immediately upon delivery, inspect shipments to assure compliance with requirements of contract documents.
- D. Deliver products in undamaged condition, in manufacturer's original containers and prepackaging, with identifying labels intact and legible.
- E. Promptly remove non-complying materials from site.
- F. Furnish equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.05 **Storage:**

- A. Store products and materials subject to damage from exposure to weather in weathertight storage facilities of suitable size with floors raised above ground. Products or materials not subject to weather damage may be stored on blocks off ground.
- B. When materials such as pipe, fittings, valve, steel fabrications, heavy machinery, and similar items are stored in the building protect floors with plywood or hardboard sheets. Store large items on blocks off floor.
- C. Store fabricated products in accordance with manufacturer's instructions with seals and labels intact and legible. Maintain temperature and humidity within ranges required by manufacturer's instructions.
- D. Cover materials which are subject to deterioration with impervious sheet covering providing adequate ventilation to avoid condensation.
- E. Cover openings of HVAC equipment and ductwork with tight-fitting plastic sheet to prevent contamination of airstream surfaces.
- F. Store loose granular materials in well-drained area on solid surfaces to prevent mixing with foreign matter and cover during inclement weather. Store cementitious and clay products clear of earth or concrete floors away from walls.
- G. Arrange storage in manner to permit access for inspections.
- H. Protect metal from damage, dirt, and dampness. Furnish flat, solid support for sheet products during storage.
- I. Do not use materials in work which have deteriorated, become damaged, or are otherwise unfit for use.
- J. Make periodic inspections of stored materials to verify that products are maintained under specified conditions and are free from damage or deterioration.
- K. Store and mix paints in assigned room or area kept under lock and key.
- L. Remove oil, rags and other combustible materials daily and take precautions to prevent fire hazards.
- M. Do not overload structure during construction by storing materials with load greater than structure is designed to bear. Special attention should be paid to the storage of materials on the roof.

1.06 **Manufacturer's Instructions:**

- A. Review manufacturer's printed instructions prior to start of installation. Distribute copies of instructions to parties involved in installation. Notify Architect in writing of conflict between Manufacturer's instructions and job conditions or requirements of the Contract Documents. Obtain clarification before proceeding with installation.
- B. Maintain one set of complete instructions at jobsite during installation and until completion.
- C. Maintain copies of manufacturers printed instructions for project record documents.
- D. Handle, install, connect, clean, condition, and adjust products in strict accord with manufacturer's instructions and in conformity with specified requirements. Perform work in accordance with manufacturer's instructions. Do not omit preparatory steps or installation procedures unless specifically modified or exempted by contract documents.

- E. Inspect substrate to receive work and conditions under which work is to be performed.
- F. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each item of material or equipment.
- G. Isolate incompatible materials to prevent deterioration.

1.07 Protection:

- A. Protect products against weather.
- B. Maintain work, materials, apparatus, and fixtures free from damage.
- C. Protect items having factory finish to prevent damage to finish and equipment.
- D. At end of day's work, cover new work likely to be damaged or otherwise protect as necessary.
- E. After installation, provide substantial protective coverings as necessary to protect installed products from damage from traffic and subsequent construction operations.
- F. Remove protection when no longer needed. Upon completion of work, remove storage facilities from site.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Perform cutting and patching required to complete the work and make its several parts fit together properly, as specified herein.
- B. Related Sections:
 - 1. Section 01 35 16: special procedures for alterations projects.

1.02 Submittals:

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, of safety of any operational element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of Owner or separate contractor.
- B. Include in request:
 - 1. Identification of project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed work, and products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on work of Owner or separate contractor.
 - 7. Written permission of affected separate contractor.
 - 8. Date and time work will be executed.

PART 2 - PRODUCTS

2.01 Materials:

- A. Those required for original installation.
- B. For any change in materials, submit request for substitution under provisions of Section 01 60 00.

PART 3 - EXECUTION

3.01 General:

- A. Execute cutting, fitting and patching including excavation and fill, to complete work, and to:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install ill-timed work.
 - 3. Remove and replace defective and non-conforming work.
 - 4. Remove samples of installed work for testing.
 - 5. Provide openings in elements of work for penetrations of mechanical and electrical work.

3.02 Inspection:

- A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- B. After uncovering, inspect conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.03 Preparation:

- A. Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

3.04 Performance:

- A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- B. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- C. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- D. Restore work with new products in accordance with requirements of contract documents.
- E. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- F. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-resistant material, full thickness of the construction element, to maintain rating.
- G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. This section governs the required procedures for closing out the construction contract, including, but not necessarily limited to, the following:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Adjusting.
 - 4. Project record documents.
 - 5. Operation and Maintenance Data.
 - 6. Warranties.
 - 7. Spare parts and maintenance materials.
- B. Related sections:
 - 1. Section 01 10 00: Summary
 - 2. Section 01 33 00: Submittal Procedures
 - 3. Section 01 78 00: Closeout Submittals

1.02 Definition:

- A. Closeout is defined to include general requirements near the end of Contract Time, in preparation for Substantial Completion, final completion, final payment, normal termination of Contract, occupancy by Owner and similar actions evidencing completion of the Work.
- B. Time of closeout may be a series of time periods for individual parts of the work which have been certified as complete at different dates. That time variation shall be applicable to other provisions of this Section, regardless of whether resulting from "phased completion" originally specified by the Contract Documents or subsequently agreed upon by Owner and Contractor.

1.03 Quality Assurance:

- A. Contractor is responsible to complete the project in accordance with the Contract Documents and enforce the requirements on employees, suppliers and subcontractors.

1.04 Prerequisites to Substantial Completion:

- A. Submit a listing of incomplete work with the monetary value of each item, the reason each item is incomplete, and the expected date of completion.
- B. Advise Owner of insurance change-over requirements.

- C. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
- D. Submit record drawings, maintenance manuals, test and balance reports, damage or settlement survey, and similar final record information.
- E. Submit one copy of all shop drawings.
- F. Complete start-up testing of systems, and schedule instructions to Owner's operating/maintenance personnel. Discontinue and remove from work site temporary facilities and services, along with construction tools and facilities, mock-ups and similar elements.
- G. Complete keying schedule and make final changes to lock cylinders and plan for shifting responsibility for security to Owner.
- H. Deliver replacement and maintenance stock of material.
- I. Complete final cleaning requirements and restore all damaged finishes.
- J. Submit written request for Architect's inspection on the form provided herein.

1.05 Substantial Completion:

- A. In order to act upon the Contractor's request for Substantial Completion, the Architect will inspect the work.
- B. If the work is found to be substantially complete, the Architect will issue a Certificate of Substantial, AIA Document G704, completion and a "punch list" inspection report indicating items, in addition to the Contractor's list, required for completion and acceptance.
- C. Any non-conforming or incomplete work detected during this period will be added to the list.
- D. The Contractor will proceed immediately to complete all items and will transmit to the Architect every other week a report of the progress on or completion of each item on the "punch list" and the Contractor's list. Any non-conforming or incomplete work detected during this period will be added to the list.
- E. If the work is found not to be substantially complete, the Architect will notify the Contractor of work that must be performed prior to issuance of a Certificate of Substantial Completion.
- F. Should Architect be required to perform additional substantial completion inspections because the work or portion of the work is not substantially complete, or because of failure of work to comply with original certifications of Contractor, Owner will compensate Architect for additional services and deduct amount paid from final payment to Contractor.

1.06 Final Cleaning:

- A. Execute final cleaning prior to Substantial Completion inspection.
- B. Clean interior and exterior floors to a broom-clean condition; remove temporary labels, stains and foreign substances. Replace damaged, broken or scratched glass.
 - 1. The following will be performed by Owner:
 - a. Vacuuming carpet
 - b. Moping and waxing resilient and hard-surface flooring

- c. Cleaning glass, doors, frames and hardware, counters, casework, plumbing fixtures, toilet accessories.
- C. Replace filters of operating equipment.
- D. Clean debris from roofs, gutters, downspouts, and drainage systems.
- E. Clean site; sweep paved areas, rake clean landscaped surfaces.
- F. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.07 **Adjusting:**

- A. Adjust operating products and equipment to ensure smooth unhindered operation.

1.08 **Project Records Documents:**

A. Regulatory Submittals:

1. Structural members fabricated off-site:

- a. Without fabricator approval: final inspection reports for off-site *special inspections*.
- b. With fabricator approval: Certification of Compliance by Approved Fabricator

B. Record Drawings: each trade shall keep current a marked set of Contract Documents indicating accurately in words and dimensioned drawings any deviations from the Contract Documents and final location of concealed items or items indicated schematically in the Contract Documents, including but not limited to:

- 1. Significant changes in schedules, plans, sections, elevations and details, such as shifts in location of walls, doors, stairs, etc., made during construction.
- 2. Significant changes in foundations, columns, beams, openings, concrete reinforcing, lintels, concealed anchorages and knockout panels made during construction.
- 3. Final location of electric panels, final arrangement of electric circuits, conduits, and significant changes made in electrical design as a result of job conditions.
- 4. Final location and arrangement of mechanical equipment and major concealed mechanical work items, including, but not limited to, supply and circulating mains, vent stacks, drainage lines, control and shut-off valves, dampers, and diverters.
- 5. Final location and arrangement of all connections and routing of utilities, including, but not limited to, sanitary, storm, heating, electric, gas, water, and telephone.
- 6. All points of control or adjustment.
- 7. All work as a result of change order or clarifications.

C. At the end of the project the Owner will provide the Contractor with a set of reproducible transparencies of the Contract Documents onto which all changes of each trade shall be transferred.

D. Control diagrams:

1. Control and zone valve lists and diagrams for plumbing and heating systems shall be framed under glass and mounted on the wall of the Mechanical Room.
 2. Wiring and control schematic drawings for each major system and piece of equipment shall be mounted under glass adjacent each piece of equipment, including but not limited to air handlers, boilers, and elevator.
- E. Record Specifications: submit a copy of the Project Manual annotated to designate the actual manufacturer or system used when multiple manufacturers or systems are specified.

1.09 Regulatory Submittals:

- A. Submit reports, documents and certifications as specified including, but not limited to:
1. Section 00 73 19.01: Asbestos-Free Construction Certification
 2. Section 01 45 26: Certifications and reports for off-site fabricated structural items.
- B. Submit other reports, documents and certifications as required by Authorities Having Jurisdiction.

1.010 Operation and Maintenance Data:

- A. Submit in accordance with Section 01 78 00.

1.11 Warranties and Bonds:

- A. Submit in accordance with Section 01 78 00.

1.12 Attic Stock:

- A. Provide extra materials as specified in individual Sections. Deliver to Owner and submit to the Architect a written description of materials and quantities.

1.13 Closeout Procedures:

- A. Submit written certification on the form provided that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with contract documents and ready for the Architect's final inspection.
- B. Submit a final application for payment complete with all final waivers of lien.
1. Submit Consent of Surety to Final Payment, AIA Document G706.
 2. Submit "Contractor's Affidavit of Payment of Debts and Claims", AIA Document G706.
 3. Submit "Contractor's Affidavit of Payment of Release of Liens", AIA Document G706A.

1.14 Final Inspection:

- A. The Architect will, make the final inspection.
- B. Should Architect consider that work is finally complete in accordance with requirements of Contract Documents, he shall indicate final completion.
- C. Should Architect consider that work is not finally complete: he shall notify Contractor, in writing, stating reasons. Contractor shall take immediate steps to remedy the stated deficiencies, and send

additional written notice to the Architect. This procedure shall continue until the work is finally complete.

- D. Should Architect be required to perform additional final completion inspections because of failure of work to comply with original certifications of contractor, Owner will compensate Architect for additional services and deduct amount paid from final payment to contractor.

1.15 Final Payment:

- A. After final inspection is complete, liquidated damages and other costs to be deducted from Contractor's final payment, if any, shall be included in a final change order.
- B. The Contractor shall submit a final pay request package to the Architect who will certify final payment.
- C. The Contractor shall submit Consent of Surety to final payment with the final pay request.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section
(three pages follows)

CONTRACTOR'S REQUEST FOR SUBSTANTIAL COMPLETION INSPECTION

Project: _____

Architect's Project Number: _____

Date: _____

From Contractor: _____

To: RuckPate Architecture
22102 North Pepper Road, Suite 201
Barrington, Illinois 60010

Please be advised that the _____ entire project _____ part of the project _____ is substantially complete. We hereby request your inspection of the work.

The following documents are attached: *(all are required)*

- ___ A listing of all incomplete work, including the monetary value of each item, the reason each item is incomplete, and the expected date of completion.
- ___ Instructions to the Owner regarding insurance change-over requirements.
- ___ Contractor's Certification Regarding Final Completion.

The following items have been submitted previously: *(check all that apply)*

- ___ All warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
- ___ Record drawings, maintenance manuals, test and balance reports, and other final record information.
- ___ One record copy of all shop drawings for Owner's use.
- ___ Final keying schedule.

The following items have been completed: *(check all that apply)*

- ___ Start-up testing of all systems, instructions to Owner's operating/maintenance personnel.
- ___ Removal of temporary facilities and services.
- ___ Installation of final lock cylinders.
- ___ Final cleaning.
- ___ Delivery of replacement and maintenance stock material to Owner.
- ___ Delivery of permanent keys to Owner.

By: _____
signature

_____ name

CONTRACTOR'S CERTIFICATION REGARDING FINAL COMPLETION

Project: _____

Architect's Project Number: _____

Date: _____

From Contractor: _____

To: RuckPate Architecture
22102 North Pepper Road, Suite 201
Barrington, Illinois 60010

In accordance with the requirements of SECTION 9.8.1 of the General Conditions, I hereby certify that:

ALL REMAINING WORK WILL BE COMPLETED WITHIN 30 CALENDAR DAYS
or as may agreed upon following the Date of Substantial Completion, upon the Owner's written consent.

By: signature _____

name _____

title _____

Instructions: Submit this completed certification with the Contractor's Request for Substantial Completion Inspection.

CONTRACTOR'S CERTIFICATION OF FINAL COMPLETION AND REQUEST FOR INSPECTION

Project: _____

Architect's Project Number: _____

Date: _____

From Contractor: _____

To: RuckPate Architecture
22102 North Pepper Road, Suite 201
Barrington, Illinois 60010

I hereby certify that:

I have reviewed the Contract Documents, and

I have inspected the work and found it to be complete and in accordance with the contract documents,

The work is ready for final inspection.

I therefore request the Architect's final inspection.

The following documents are attached: *(check all that apply)*

- ___ Final Application for Payment.
- ___ All final waivers of lien.
- ___ Consent of Surety to Final Payment.
- ___ "Contractor's Affidavit of Payment of Debts and Claims", AIA Document G706.
- ___ "Contractor's Affidavit of Payment of Release of Liens", AIA Document G706A.

By: _____

signature

name

title

that all remaining Work will be completed within thirty (30) calendar days

PART 1 - GENERAL

1.01 Description:

A. This section contains requirements for submittals in connection with closing out the construction contract, including, but not necessarily limited to, the following:

:

1. Project record documents.
2. Operation and Maintenance Data.
3. Warranties, bonds and maintenance contracts.
4. Spare parts and maintenance materials.
5. Regulatory submittals.
6. Submittals Required for Final Payment.

B. Related sections:

1. Section
2. Various specification sections with requirements for extended warranties, bonds and maintenance contracts.

1.02 Project Record Documents:

A. Record Drawings:

1. Contractor and each subcontractor shall keep current a marked set of Contract Documents comprising a complete and exact record of "as-built" conditions, in words and dimensioned drawings including, but not limited to:
 - a. Deviations from the Contract Documents
 - b. Changes in schedules, plans, sections, elevations and details, such as location of walls, doors, stairs, etc..
 - c. Changes in foundations, columns, beams, openings, concrete reinforcing, lintels, concealed anchorages and knockout panels made during construction.
 - d. Final location of electric panels, final arrangement of electric circuits, locations of conduits, and changes to electrical circuiting.
 - e. Final location and arrangement of mechanical equipment, fixtures, piping, vents, drainage lines, valves, dampers, control devices and equipemnt.
 - f. Final location and arrangement of all connections and routing of utilities, including, but not limited to, sanitary, storm, heating, electric, gas, water, and telephone.
 - g. All points of control or adjustment.

1.05 Spare Parts and Maintenance Materials:

- A. Provide extra materials as specified in individual Sections. Deliver to Owner with listing of materials and quantities. Obtain signed receipt. Submit copy of list and receipt to Architect.

1.06 Format of Submittals:

A. Record Documents:

- 1. Record Drawings: submit one (1) set, rolled.
- 2. Shop Drawings:
 - a. Submit one (1) set.
 - b. Fold submittals and place in covered file storage boxes, in sequence by submittal specification Division and submittal number. Include copy of Log or Table of Contents listing indicating contents of each box.
- 3. Record BIM and CAD Files:
 - a. Shop drawings and models prepared using BIM or CAD backgrounds furnished by the Architect shall be submitted in electronic format in accordance with the requirements of Section 01 33 00.
 - b. Submit 1 set, on CDROM, standard (ISO 9660) format.
 - (1) CDROM shall contain a text file, named README.txt, in ASCII text format, listing each file with a brief description of the contents.
 - (2) CAD files shall be in AutoCad .dwg or .dxf format. BIM files in native format.
 - (3) Label CDROM, printed or handwritten, indicating Project, Contractor Name, content.
 - c. Place CDROM(s) in punched clear plastic pocket(s), inserted in three ring binder with other O&M data.

B. Operating and Maintenance Data:

- 1. Submit
 - a. Draft: (1) copy
 - b. Final: (1) copy & 1 PDF.
- 2. Prepare data in the form of an instructional manual for use by Owner's personnel.
- 3. Manual format:
 - a. Three-ring binders, "Vue" type with transparent covers, maximum ring size of 2-1/2". When multiple binders are used, correlate the data into related consistent groupings. Use one or more separate binders for each category of submittal.
 - b. Sheets: 8-1/2" x 11", 20 pound white paper, printed, typed or legible xerographic copies.

- c. Cover and Spine: identification inserted in binder cover, similar to sample at end of Section.
 - d. Index tabs and Table of Contents:
 - (1) Provide tabs for each piece of operating equipment or system.
 - (2) Table of Contents for each volume, arranged in a systematic order. listing contents of each tab with subcontractor and supplier names, addresses and phone numbers, similar to sample at end of this Section.
4. Large format drawings and booklets:
- a. Fold oversize drawings.
 - b. Insert in plastic file pockets in 3-ring binders.
5. Product data:
- a. Include only those sheets which are pertinent to the specific product.
 - b. Annotate each sheet to:
 - (1) Clearly identify the specific product or part.
 - (2) Clearly identify the data applicable to the installation.
 - (3) Delete references to inapplicable information.
6. Drawings:
- a. Supplement product data with drawings as necessary to clearly illustrate:
 - (1) Relations of component parts of equipment and systems.
 - (2) Control and flow diagrams.
 - b. Coordinate drawings with information on Record Documents to assure correct depiction of completed installation.
 - c. Do not use Record Documents as maintenance drawings.
7. Written text, as required to supplement product data for the particular installation:
- a. Organize in a consistent format under separate headings for different procedures.
 - b. Provide a logical sequence of procedure instructions.
8. Warranties, bonds and maintenance contracts:
- a. Original warranty, bond or maintenance contract.
 - b. Provide complete information for each bond or maintenance contract.
 - (1) Product or work item.
 - (2) Firm, with name of principal, address and telephone number.

- (3) Scope.
- (4) Date of beginning of warranty, bond or maintenance contract.
- (5) Duration.
- (6) Provide information for Owner's personnel:
 - (a) Proper procedure in case of failure.
 - (b) Instances which might affect the validity of warranty or bond.
- (7) Contractor, name of responsible principal, address and telephone number.

1.07 Quality Assurance:

- A. Preparation of Closeout Submittals shall be done by personnel:
 1. Completely familiar with requirements of this section.
 2. Skilled as a technical writer to the extent required to communicate essential data.
 3. Skilled as a draftsman competent to prepare drawings.
 4. Operation and Maintenance Data: Trained and experienced in maintenance and operation of the described products.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

End of Section
(sample forms - three pages follow)

OPERATIONS AND MAINTENANCE DATA

PROJECTNAME

CONTRACT

**CONTRACTOR NAME
CONTRACTOR ADDRESS
CONTRACTOR PHONE**

(sample binder cover insert)

PROJECTNAME

O & M DATA

CONTRACT

(sample binder spine insert)

OPERATIONS & MAINTENANCE DATA

TABLE OF CONTENTS

PROJECTNAME
CONTRACT
CONTRACTOR

TAB 1	ITEM	SUBCONTRACTOR/SUPPLIER NAME ADDRESS PHONE NUMBER
	APPROVED SUBMITTAL DOCUMENTS CAPACITIES/RATINGS/UTILITY CONSUMPTION OPERATING DATA MAINTENANCE DATA MAINTENANCE SCHEDULE PARTS LISTS WIRING DIAGRAMS INSPECTION & TEST REPORTS INSTRUCTION BOOKS, CARDS & MANUALS FURNISHED WITH THE EQUIPMENT WARRANTY or BOND MAINTENANCE CONTRACT	

TAB 2	ITEM	SUBCONTRACTOR/SUPPLIER NAME ADDRESS PHONE NUMBER
	APPROVED SUBMITTAL DOCUMENTS CAPACITIES/RATINGS/UTILITY CONSUMPTION OPERATING DATA MAINTENANCE DATA MAINTENANCE SCHEDULE PARTS LISTS WIRING DIAGRAMS INSPECTION & TEST REPORTS INSTRUCTION BOOKS, CARDS & MANUALS FURNISHED WITH THE EQUIPMENT WARRANTY or BOND MAINTENANCE CONTRACT	

(CONTINUE FOR EACH ITEM)

(sample Table of Contents)

SELECTIVE DEMOLITION
SECTION 02 41 18

PART 1 - GENERAL

1.01 Description:

- A. Provide all necessary labor, material, equipment and disposal service to perform demolition as indicated on the Drawings, specified herein and as required for complete performance of other work. The work includes but is not necessarily limited to the following:
 - 1. Remove designated landscaping.
 - 2. Remove designated building equipment and fixtures.
 - 3. Remove designated partitions, doors, frames, borrowed lights and other components.
 - 4. Remove existing construction as required for completion of other work.
 - 5. Remove utilities and services located in construction to be demolished, unless such items are indicated to be salvaged or relocated.
 - 6. Separation and recycling of all recyclable debris including metals, concrete, asphalt pavement, gypsum board, wood, glass, plastic, and carpet.

- B. Work Not Included:
 - 1. Per detail 5 sheet A1.0, owner shall disconnect existing wall-mount TV. Contractor shall remove, preserve and remount TV as necessary.
 - 2. Demolition of asbestos-containing materials (ACM), if any, will be performed under a separate contract.

- C. Related Sections:
 - 1. Section 01 35 16: Alteration Project Procedures
 - 2. Section 01 50 00: Construction facilities and temporary controls: temporary barriers and enclosures, security, cleaning during construction.

- D. Application of Documents: the Drawings depict demolition in a schematic manner and are intended to describe only the general nature and extent of demolition work required. Perform demolition, whether or not specifically indicated on the Drawings, which can reasonably be inferred from examination of all Contract Documents and of existing site conditions.

1.02 References:

- A. ANSI A10.6 - Safety requirements for demolition.
- B. NFPA 241 - Safeguarding building construction and demolition operations.

1.03 Submittals:

- A. Submit record drawings under provisions of section 01 77 00.

1.04 **Existing Conditions:**

- A. Owner reserves the right to retain ownership of items removed from the building.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 **Preparation:**

- A. Inspect existing conditions prior to start of demolition.
- B. Coordinate demolition with temporary partitions, and other temporary facilities specified in section 01 50 00 to protect the remaining construction and to prevent spread of dust, fumes, noise, and smoke to provide for Owner occupancy or Owner's on going operations.
- C. Verify that temporary barriers are in place to separate and protect occupied areas from work areas.
- D. Protect existing items which are not indicated to be altered.
- E. Disconnect, remove, and cap designated utility services within demolition areas.
- F. Mark location of disconnected utilities. Identify and indicate capping locations on project record documents.

3.02 **Lead:**

- A. Paint and other elements of the existing construction are likely to contain lead. Prevent the discharge of lead-containing dust and debris into the air and upon the site. Remove, handle and properly dispose of all lead-containing material in accordance with applicable regulations and in accordance with USEPA recommended practice.

3.03 **Mercury:**

- A. Remove intact and recycle items containing mercury:
 - 1. Thermostats with mercury vial switching elements.
 - 2. Switches with mercury switching elements.
 - 3. Other items containing mercury.

3.04 **Execution:**

- A. Conduct demolition to minimize interference with adjacent building areas. Maintain protected egress and access at all times for occupied areas.
- B. Conduct demolition operations in accordance with ANSI A10.6, NFPA 241 and applicable codes and regulations.
- C. Demolish in an orderly and careful manner. Protect existing structural members and construction to maintain structural stability and integrity.
- D. Except where noted otherwise, immediately remove demolished materials from site.

- E. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect under provisions of section 01 60 00.
- F. Remove, store, and protect for re-installation designated materials and equipment.
- G. Remove designated material and equipment to be retained by Owner. Deliver to location agreed upon.
- H. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.

3.05 **Recycling and Disposal:**

- A. Do not burn or bury materials on site.
- B. Recycle refrigerants and items containing mercury.
- C. Separate and recycle all recyclable materials including metals, concrete, gypsum board, wood, plastic, and carpet.
- D. Remove demolished materials from site as work progresses. Upon completion of work, leave areas of work in clean condition.
- E. Record keeping:
 - 1. Maintain records of material type, quantity (by weight or volume), name of recycling or disposal firm, date and time of pick-up for every load of material removed from site.
 - 2. Maintain copies of load tickets.
 - 3. Deliver records to Architect upon request, or at completion of demolition.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Furnish all labor, materials, equipment and services necessary to complete all concrete work as shown on the Drawings and as specified herein. The work includes, but is not necessarily limited to, the following:
 - 1. Formwork, shoring, bracing, and anchorage.
 - 2. Concrete reinforcement and accessories.
 - 3. All concrete work shown on civil, architectural and structural drawings.
 - 4. Foundations for all mechanical and electrical equipment including concrete pads, bases, thrust blocks and curbs.
 - 5. Exterior pads for electrical transformers and gas service equipment.
 - 6. Concrete pavement, including roads, drives, curbs, and sidewalks.
 - 7. Granular base for concrete slabs on grade.
 - 8. Concrete curing.
 - 9. Grouting of steel base plates and setting plates, including for structural steel.
 - 10. Integral finishes of cast-in-place concrete.
 - 11. All necessary patching of this work.
- B. Related Sections:
 - 1. Section 01 45 23: Testing laboratory services.
 - 2. Section 31 00 00: Compaction and testing requirements for granular base.

1.02 References:

- A. ANSI/ASTM A185 - Welded wire fabric for concrete reinforcement.
- B. ASTM A615 - Deformed and plain billet steel for concrete reinforcement.
- C. ASTM C33 - Concrete aggregates.
- D. ASTM C94 - Ready mix concrete.
- E. ASTM C150 - Portland cement.
- F. ASTM C260 - Air entraining admixtures for concrete.
- G. ASTM C309 - Liquid membrane-forming compounds for curing concrete.
- H. FS TT-C-800 - Curing compound, concrete, for new and existing surfaces.

1.03 Quality Assurance:

- A. The following items of work shall be in accordance with the American Concrete Institute Code, ACI 301:
 - 1. Design, construction and removal of forms.
 - 2. Bending, placement and concrete protective covering for steel reinforcement.

3. Shrinkage reinforcement where not shown or specified.
 4. Cold and hot weather requirements and protection, including ACI 306R, "Cold Weather Concreting".
- B. Workmanship: the Contractor is responsible for correction of concrete work which does not conform to specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by architect.

1.04 Submittals:

- A. Shop drawings: reinforcing steel and formwork; indicate reinforcing sizes, spacing, locations and quantities of reinforcing steel; include joining, splicing, ties and accessories.
- B. Product Data: mix designs, vapor barrier, accessories, curing materials.

PART 2 - PRODUCTS

2.01 Form Materials:

- A. Conform to ACI 301.
- B. Formwork shall be of wood or metal construction, designed, constructed, braced, and maintained so that finished concrete will be as specified and supplied in sufficient quantities so that work can be properly accomplished.
- C. Wood forms for exposed surfaces shall be made of dressed lumber or plywood, and shall be sized to uniform thickness.
- D. Metal forms shall be of such thickness that they will remain true to shape. Bolts and rivet heads in contact with concrete shall be countersunk. Metal forms which do not present a smooth surface or line up properly shall not be used. Special care shall be exercised to keep metal forms free from rust, grease, or other foreign matter which would discolor the concrete.
- E. Coating materials shall not stain or cause injury to exposed concrete surfaces.
- F. Form ties: removable snap-off metal, of fixed length, cone ends.
- G. Tubular column type: round, spirally wound laminated fiber material; inside surface treated with release agent.

2.02 Reinforcing:

- A. Reinforcing bars: ASTM 615 Grade 60 new billet steel deformed bars.
- B. Welded wire fabric: ANSI/ASTM A185, plain type.
- C. Tie wire: minimum 16 gauge annealed type.
- D. Chairs, bolsters, bar supports, spacers:
 1. Size and shape for strength and support of reinforcing during installation and placement of concrete.
 2. Include sand plate to prevent vapor barrier puncture where placed on vapor barrier.
 3. Adjacent to exposed concrete surfaces: plastic tipped or stainless steel type.
- E. Use wire bar type supports complying with PS7, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.

2.03 Concrete:

- A. Cement: ASTM C150, Ready Mix, Normal 1, Portland.
- B. Fine and coarse aggregates: ASTM C33.

- C. Water: clean and not detrimental to concrete.

2.04 Admixtures:

- A. Air entrainment admixture: ASTM C260.
- B. Use of calcium chloride is PROHIBITED.

2.05 Accessories:

- A. Shrinkage Resistant Grout: Premixed and packaged, non-ferrous aggregate type complying with Corps. of Engineers CRD-C621, Type D (Non-metallic, non-shrink); "Masterflow 713" (Master Builders), or "Euco NS" (The Euclid Chemical Company). The grout manufacturer shall furnish test data from an independent testing laboratory indicating that the grout, when placed, at a fluid consistency, shall achieve 95% bearing under a 4' X 4' base plate.
- B. Jointing Materials: Premolded joint filler shall be thickness shown on Drawings. Interior joints adjacent to walls and columns shall be cork type conforming to ASTM D1752, Type II; exterior joints (other than where sealant is indicated) asphalt ASTM D994.
- C. Vapor barrier: ASTM E1745 Class B, thickness 10 mils or greater, 0.05 perms or less; "Raven Industries VaporBlock 10" or Stego Industries "Stego Wrap 15 mil". Provide manufacturer's recommended double sided pressure sensitive sealing tape and recommended elastomeric sealant.

2.06 Curing and Sealing Materials:

- A. Liquid hardener/sealer/dustproofers: Fluorosilicate type "Lapidolith" (Sonneborn Building Products), "Conolith", (Conspec Marketing & Manufacturing Co.), "Hornolith" (A.C. Horn), "Pena-lith" (W.R. Meadows).

2.07 Concrete Mix:

- A. The design mixes shall be obtained from the following:
 1. Concrete mix basic properties:

CONCRETE MIX BASIC PROPERTIES					
Application	Strength, PSI @ 28 Days	Slump, inches (1)	Minimum Cement Content, bag/C.Y.	Air Content by volume	Other
Exterior exposed walls	3000	4", ±1"	4-1/2	5% - 8%	0.40 max ratio (by weight) of water to cementitious materials
Notes: (1) Slump may be increased by ½" for pumped and architectural concrete.					

- B. Mix in accordance with ASTM C94.

2.08 Granular Base:

- A. CA6 crushed stone or crushed gravel complying with Illinois Department of Transportation Standard Specification.

PART 3 - EXECUTION

3.01 Formwork:

- A. Verify lines, level, and measurement before proceeding with formwork.
- B. Construct forms to slopes, lines and dimensions shown, plumb, straight and sufficiently tight to prevent leakage and so braced that no distortion or settling can take place during or after placing of concrete.

- C. Forms for concrete shall be tied with rods or patented ties where the concrete is to be exposed. Wire ties will not be permitted where finished exposed concrete work occurs.
- D. Provide smooth surfaced forms and/or take other precautions as necessary to produce smooth finished surfaces free of honeycomb.
- E. Install all necessary inserts in formwork such as dove tails, anchor bolts, and other devices.

3.02 **Reinforcement:**

- A. Reinforcing and accessories shall be fabricated, properly placed and wired in accordance with applicable requirements of the A.C.I. Manual 315.
- B. Before concrete is poured, reinforcement shall be clean of rust, dirt, scale, and oil and shall be free of defects and damage of any kind. An architect's approval of proper placement of reinforcement is to be obtained before any concrete is poured.

3.03 **Placing Concrete:**

- A. Forty-eight (48) hours advance notice is to be given to the architect prior to commencement of concreting operations.
- B. Concrete placement shall comply with ACI 304.
- C. Deposit concrete continuously to prevent formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation due to rehandling or flowing.
- D. Consolidate placed concrete by vibrators, supplemented by hand-spading, rodding or tamping. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at regular intervals to insure uniform consolidation throughout entire section being placed without causing segregation of mix. Do not insert vibrators into lower layers of concrete that have begun to set.
- E. Forms shall not be disturbed until the concrete is cured sufficiently to carry its own weight and all other weights that may occur during the progress of construction and as certified by the concrete testing reports. Allow three (3) days after pouring foundations before stripping forms. When forms are removed, remove fins and cut tie wires as previously described, 3/4" below surface.
- F. Pointing of concrete work is not to be done until the concrete has been examined by the architect and his permission has been given.
- G. Cold weather placement: ACI 306.1.

3.4 **Protection:**

- A. During cold weather protect slabs on grade, shallow footings and other on-grade and below grade concrete elements which may be susceptible to damage or displacement by frost or frozen ground.

3.05 **Finish Schedule:**

- A. Broom finish light texture, on concrete pavement, with texture perpendicular to direction of traffic.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Furnish and install all masonry and accessory materials, as indicated on the Drawings and as specified. The work includes, but is not necessarily limited to, the following:
 - 1. Concrete block.

1.02 Related Sections:

- A. Section 07 84 00 - Firestopping.

1.03 Quality Assurance:

- A. Qualifications:
 - 1. Installer: company specializing in performing the work of this section with minimum five (5) years experience.
- B. Regulatory Requirements:
 - 1. Comply with requirements of Section 01 41 00 and the applicable building code.
 - 2. Conform to UL assembly classifications as indicated or required to comply with applicable codes and regulations.
 - 3. Fire ratings, estimated rating and equivalent thickness tables shall be as listed in "Fire Resistance Ratings" as published by American Insurance Association, and Underwriter's Laboratories, where UL designs are indicated.

1.04 Delivery, Storage, and Handling:

- A. Masonry units and related materials shall be delivered, unloaded and stored on pallets, under watertight tarpaulin covers, carefully stacked, and properly protected from possible injury. In no case shall units be dumped from trucks or wheelbarrows.
- B. Cementitious materials and aggregates shall be delivered, stored, and handled in such manner as to prevent deterioration or intrusion of foreign materials. Manufactured materials shall be in their original packages or containers, plainly marked with brand and maker's name. All pieces that are chipped, cracked, broken, patched, marred, or stained, or otherwise defective, will be rejected and shall be removed and replaced. All material that has, in the Architect's opinion, become unsuitable for good construction shall not be used.

PART 2 - PRODUCTS

2.01 Materials:

- A. Concrete Masonry Units (CMU):
 - 1. Conform to ASTM C90, medium weight, or light weight at Contractor's Option.
 - 2. Face size: 7-5/8" x 15-5/8" unless indicated otherwise.
 - 3. Thickness: as indicated on Drawings.
 - 4. Fire resistance: provide units of solidity and aggregate type necessary to achieve indicated fire resistance ratings.
 - 5. Faces of all exposed concrete block shall be free from defects, and be of uniform height.
- B. Anchors and Ties:

1. Acceptable manufacturers: model numbers refer to Hohmann & Barnard, Inc. equal products manufactured by Dur-o-wall, Hecknann Building Products, Ty-wall or Cumberland Corp. are acceptable.
2. Continuous wire reinforcing and ties: provide welded wire units prefabricated in straight lengths of not less than 10'. Fabricate from cold-drawn steel wire complying with ASTM A82, with deformed or embossed continuous 9 gauge side rods and plain cross-rods, with 1.5 oz. hot dip zinc coating complying with ASTM A153, Class B2, with unit width of 1-1/2" to 2" less than thickness of wall or partition.
 - a. 1-wythe walls and composite interior partitions: H&B 120, two wire truss type. ASTM A641 Class 1 galvanized coating, permitted only for use in interior construction which is not exposed to a moist environment such as pool or shower room.

2.02 Mortar and Grout:

- A. Mortar and grout: preblended, dry packaged or bulk.
 1. Manufacturer, one of the following:
 - a. Amerimix Div. of Bonsal America
 - b. BMI Products
 - c. Spec Mix
 2. Mortar mixes: Portland cement-lime mortar, comply with the ASTM C1714 and with the property requirements of ASTM C270, except air content shall not exceed 12%.
 - a. Type N, for all applications unless indicated otherwise.
 3. Water: clean and potable.
- B. Measuring: The method of measuring materials for mortar shall be such that the specified proportions of mortar materials can be controlled and accurately maintained during the entire progress of the work.
- C. Mixing: Cementitious materials and aggregates shall be mixed in a mechanical drum mixer with the amount of water recommended by the manufacturer for satisfactory workability. Mix for time recommended by the manufacturer.
- D. Re-tempering and use of mortar:
 1. Natural mortar may be re-tempered on the board only to replace water lost by evaporation.
 2. Mortar shall be used within two (2) hours of initial mixing. No mortar shall be used after it has begun to set.

PART 3 - EXECUTION

3.01 Examination:

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- C. Beginning installation means installer accepts existing conditions.

3.02 Preparation:

- A. Direct and coordinate placement of metal anchors.
- B. Build chases and recesses as shown or required for the work of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to opening.

3.03 Laying CMU:

- A. CMU shall not be wetted before placing in the wall. Lay with thicker end of face shell on top. Units shall be laid to a line with full mortar coverage on vertical and horizontal face shells. Special care shall be taken with striking of joints in exposed units so that joint are completely filled. Any cutting of units shall be done with a power driven carborundum disc blade.
- B. Bond: Running, unless indicated otherwise.
- C. Bed and head joints:
 - 1. 3/8" wide, tool concave and strike flush in cavity to match existing.
- D. Reinforce all concrete block walls and partitions as follows:
 - 1. Reinforcement shall be placed full-length of courses every 16" in height of wall; shall be continuous in area of work.
 - 2. Side rods shall be lapped at least 6" at splices.
 - 3. Reinforcing shall be placed to assure a 5/8" minimum mortar coverage on the exterior face, unless otherwise noted on the drawings.
- E. Prevent mortar smears on exposed CMU surfaces. If a mortar smear occurs, it shall be allowed to dry, large particles removed by a trowel, and the remaining mortar removed by a stiff fiber brush. All mortar smears, drippings, on exposed faces of concrete masonry shall be removed, as specified in Article "Cleaning".

3.4 **Tolerances:**

- A. Maximum variation in cross-sectional dimensions: 1/4".
- B. Maximum variation of joint thickness: 1/8" in 3'.
- C. Maximum variation from unit to adjacent unit: 1/32".

3.5 **Cleaning:**

- A. Cleaning exposed, unglazed masonry surfaces: wipe off excess mortar as the work progresses. Dry brush at end of each day's work.
- B. Final cleaning: after mortar is thoroughly set and cured, clean sample wall area of approximately 20 sq. ft. Obtain architect's acceptance of sample cleaning before proceeding to clean rest of masonry work. Cleaner shall be commercial grade, equal to "Sure-Klean 600" (Process Solvent Company, Inc.).
- C. Schedule cleaning so that:
 - 1. Cleaning operations will not damage adjacent surfaces, materials, and equipment.
 - 2. Cleaned surfaces are ready for the installation of equipment and other materials.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Furnish and install roofing system and accessories as indicated on the Drawings and as specified. The work includes, but is not necessarily limited to:
 - 1. Building A: Cutting and patching of existing built-up roofing and insulation on insulated gypsum deck with APP Modified Bitumen Membrane heat welded roofing and flashing.
 - 2. Shah Center: Cutting and patching of existing EPDM roofing and insulation, under warranty, on metal deck with EPDM roofing and flashing.
 - 3. Rigid insulation board, insulation accessories and attachment.
 - 4. Modified bitumen and EPDM sheet roofing and flashings.
 - 5. Sheet Metal counterflashing.
- B. Related Sections:
 - 1. Division 23: Prefabricated metal curbs and supports.
 - 2. Division 23: Disconnection, extension, and reconnection of existing mechanical services, removal and reinstallation of mechanical equipment.
 - 3. Division 26: Disconnection, extension, and reconnection of existing electrical services, removal and reinstallation of electrical fixtures and equipment.

1.02 Submittals:

- A. Product Data: Manufacturer's data for all products to be incorporated into roof and flashing.
- B. Shop Drawings: Flashing details.
- C. Required certifications.
- D. Manufacturer's installation instructions: remove portions that do not apply, indicate manufacturer and trade name of products manufactured by other than system manufacturer. Clearly identify materials and procedures, if any, at variance with these specifications.

1.03 Certifications:

- A. System manufacturer:
 - 1. Installer is authorized to install the specified modified bitumen products on built-up roof.
 - 2. Manufacturer is supplying all materials, or if materials are supplied by others, manufacturer approves the use of such materials (list each) in the specific application.

1.04 **Quality Assurance:**

- A. Installer: authorized by system manufacturer to install the specific products with a minimum of five (5) years experience.
- B. Mechanics involved in heat-welding shall be torch-certified.
- C. Products: all products shall be furnished by the system manufacturer, or approved by the system manufacturer for use in the specific application.
- D. Prerroof Conference: conduct conference prior to start of roofing operations. Schedule conference and notify attendees 7 days in advance. Review schedule, required preparation, and performance expected of each party. Conference shall be attended by Contractor, Installer, manufacturer's representative, representatives of each trade performing related work, Architect. Intent of conference is to resolve potential problems prior to start of roofing operations.
- E. NRCA: National Roofing Contractors Association "Roofing and Waterproofing Manual" 1989 edition.
- F. SMACNA: Sheet Metal and Air Conditioning Contractors National Association "Architectural Sheet Metal Manual" 4th edition.

1.05 **Delivery, Storage, and Handling:**

- A. Deliver materials to jobsite on pallets. Pallet label shall indicate material name, production date or product code.
- B. Store materials in dry, protected areas. Control temperature of storage areas in accordance with manufacturer's instructions. Protect materials from freezing.
- C. Store roll materials in an upright position on platforms above ground or deck. Store roofing membrane rolls above 50 degrees F. for a minimum period of 24 hours before application.
- D. Locate stored materials to avoid exceeding safe load capacity of structure.

1.06 **Project Conditions:**

- A. Existing roof conditions are shown on Drawings based on available information. Visit the project site prior to submission of bid and verify existing project conditions. No allowances will be made for failure to ascertain existing conditions.
- B. Comply with local, state and federal regulations, safety standards and codes. When a conflict exists use the stricter document.
- C. Follow system manufacturer's instructions and insurance underwriter's requirements for torch application methods.
- D. Designate one mechanic trained in fire safety to inspect the work area and torch-applied membrane for smoke, shouldering, hot-spots and fire. Maintain a fire watch for a minimum of 1 hour after torch work has been completed. Use infra-red thermal imaging equipment to inspect work area for hot spots before terminating the fire watch. Maintain a daily log which shall be signed by the designated individual prior to departure from the jobsite.
- E. Ensure roof deck is structurally sound to support the live and dead load requirements of roofing system and sufficiently rigid to support construction traffic.

1.07 **Sequence:**

- A. Schedule work to coordinate with other work such as installation of nailers and curbs, sheet metal work and modifications to mechanical and electrical equipment and systems.
- B. Patch and make watertight all cuts and penetrations the same day. Complete all patching at one time. Phased repairs are not acceptable.

1.8 **Warranty:**

- A. Building A: Installer shall warrant the weathertightness of patching and repairs for 2 years.
- B. Shah Center: Maintain existing roof manufacturer's warranty. Patching and repairs shall be covered for the remainder of the current warranty.

PART 2 - PRODUCTS

2.01 **General:**

- A. Building A: The existing built-up roof is not under warranty. Use materials that are compatible with the existing roof.
- B. Shah Center: The existing EPDM roof is currently under warranty (Firestone # EC4285). Use only materials authorized by the original manufacturer. Installer shall be authorized by the manufacturer to perform warranty work.

2.02 **Manufacturers/Systems:**

- A. Building A: APP Modified Bitumen Flashing and Membrane.
 - 1. Documents **for the APP** system are based on roofing system manufactured by Firestone Building Products Co. Other equal systems **for the APP** by Johns-Manville or Tamko, Soprema are acceptable. Flashing details for other systems shall conform to the intent of the Drawings and be executed in strict accordance with system manufacturer's recommendations. Installation procedures at variance with these specifications require Architect's review.
 - 2. 2-ply APP Modified Bituminous Membrane Roofing heat welded.
 - a. Firestone APP 160 Base.
 - b. Firestone APP 180 FR Granular Surface Cap.
 - c. Class A fire rating for the assembly.
- B. Shah Center: EPDM Flashing and Membrane: Firestone EPDM, not less than 60 mil thickness, with manufacturer's recommended fasteners, adhesives, sealants and accessory materials.

2.03 **Insulation Materials:**

- A. Rigid board roof insulation, isocyanurate.
 - 1. For crickets, provide factory tapered board, 1/4" per foot taper.
 - 2. Closed cell polyisocyanurate foam with thermal resistance (R-value) at 75 Degrees F of 5.6 per inch per NRCA/MRCA Technical Bulletin, bearing RIC/TIMA label; with facers compatible with built-up and modified bitumen roofing systems.
 - 3. Conform to Federal Specification HH-I-1972.

4. Firestone ISO95+ GL, or equal product of Johns-Manville, Atlas Energy Products, or product of membrane manufacturer.

2.04 Miscellaneous Materials:

- A. Mechanical fasteners for insulation attachment to metal deck:
 1. Corrosion-resistant screws with 3" dia. galvanized metal plates. Conform to the recommendations of the insulation manufacturer. Provide pull-out resistance meeting requirements of Factory Mutual Approval Standard 4550. Provide type and size to suit insulation thickness and deck type.
2. Bolts: plain steel threaded fasteners, 1/2" diameter unless indicated otherwise, with suitable washers and nuts.
 - B. Adhesive for insulation on gypsum deck substrates:
 1. Firestone ISO Twin-Pack Insulation Adhesive, or approved equal.
 - C. Flashing nails:
 1. Wood nailer applications: galvanized, 11 gage ring-barbed or spiral-threaded shank, 5/8" minimum head, length to allow penetration of nailer.
 - D. Other materials as recommended by system flashing membrane manufacturer.

2.05 Sheet Metal Counter Flashing:

- A. Prefinished, zinc-coated (galvanized) steel: ASTM A-525, commercial quality, G90 zinc coating, 24 gauge minimum, Kynar 500 fluoropolymer coating: 0.2 mil base coat and 0.8 mil finish coat on face. Epoxy washcoat on reverse. Face color as selected by Architect from manufacturer's standard color range.
- B. Fabrication - General:
 1. Hem all exposed edges. Form angled drip in bottom edge of copings, fascias, counterflashings and similar items.
 2. Comply in all respects with SMACNA. Provide profiles and details as follows: Plate 55D. 4" Exposed coverplate or lap at splices.

PART 3 - EXECUTION

3.01 General:

- A. For EPDM roof, all work affecting existing roof shall be performed in a manner to maintain existing warranty (Firestone # EC4285).
- B. For APP Modified Bitumen flashing and roofing on existing built-up roofing install flashing and membrane in accordance with flashing manufacturer's recommended procedures to achieve a durable and weathertight installation.

3.02 **Roof Removal:**

- A. As necessary, remove existing roof membrane within area of new curb and wood blocking.
- B. Take precautions for the protection of the building, occupants, contents and grounds during removal and prior to restoration of permanent weathertight enclosure.
 - 1. Provide dust protection at interior spaces below roof removal area.
 - 2. Maintain adequate supply of materials to provide emergency weather protection in case of unforeseen inclement weather. Provide temporary weathertight enclosure if sudden change prevents completion of permanent weathertight enclosure.
 - 3. Protect building and grounds from damage due to traffic, falling debris, soiling and other hazards.
- C. Exercise caution when removing existing roofing; if a vapor barrier is present on the deck, leave it intact. If more than one complete roof system exists, flash the lowest membrane independently.
- D. Properly dispose of debris from removal operations.

3.03 **Preparation:**

- A. Inspect substrates prior to start of application. Verify surfaces are dry and reasonably smooth. Verify nailers, curbs and wood cants are securely attached, properly aligned and at the correct height. Beginning application constitutes acceptance of conditions.
- B. Remove trash, debris, grease, oil, water, moisture and contaminants which may affect bond of asphalt to deck or insulation surface.
- C. Prepare surfaces according to manufacturer's instructions.
- D. Use compatible materials on voids and joints so finished deck surface will be even and smooth.
- E. Protect adjacent areas from damage with tarpaulin or other durable materials. Take particular caution to protect building and site from asphalt drip, splash or spill.
- F. Where membrane or flashings are tied-into existing membrane remove all traces of existing gravel and roof coating, if any, from areas to receive membrane or flashing. Remove and replace damaged, deteriorated and otherwise unsuitable membrane to achieve satisfactory long-term watertight performance.

3.04 **Installation - General:**

- A. Install materials and systems in accordance with manufacturer's printed instructions and these specifications.
- B. Take precautions to protect building during heat weld:
 - 1. All applicators shall be torch certified.
 - 2. Perform heat welding weekends, holidays, or weekdays between 10:00 PM and 7:00 AM when building is not fully occupied.
 - 3. Maintain fire watch for minimum 1 hour after completion of all work.

4. Use infrared imaging to locate any hot spots.

3.05 Installation - Insulation:

A. General:

1. Comply with insulation manufacturer's instructions for the particular conditions of installation, and roof membrane manufacturer's instructions.
2. Maintain insulation and substrate in dry condition. Install only as much insulation as can be covered by roofing immediately thereafter.
3. For Modified Bitumen flashing, install insulation cants at intersections with vertical surfaces. Cut edges of insulation to match slope of cant.
4. Install factory tapered insulation crickets, on high sides of curbs to insure a positive drainage pattern on the roof.

B. Gypsum Decks: Install insulation using adhesive to prepared membrane surface, in accordance with adhesive manufacturer's instructions. .

C. Metal Decks: Mechanically attach insulation to deck, fastening through existing roof insulation Secure in accordance with manufacturers instructions.

3.06 Roofing Membrane:

A. Install membrane materials in accordance with Manufacturer's current published application instructions.

B. Begin installation at lowest point. Overlap sheets in direction of slope so that water will never lie against a lap.

C. Observe manufacturer's requirements for application cold weather when ambient temperature is below 50 degrees F.

D. APP Modified bitumen flashings and membrane:

1. Extend base ply a minimum of 4" onto prepared existing roof surface. Extend top ply 4" beyond base ply onto prepared existing roof surface.
2. Heat weld modified bitumen flashings by torching with hand torch and sealing with heated trowel.
3. Nail top edge of flashing at 8" maximum on center.

E. EPDM:

1. Mechanically attach loose edge of existing membrane by bonding existing membrane to a reinforced perimeter fastening strip mechanically attached with manufacturer's recommended threaded fastener and 2" diameter galvanized metal plates spaced per manufacturer's recommendations.
2. Lap membrane on prepared existing membrane extending a minimum of 3" beyond edge of existing membrane.
3. Redistribute ballst gravel after flashing and patching is completed.

- F. Phased application is prohibited.
- G. Provide sheet metal counter flashing over all base flashings..

3.07 **Field Quality Control:**

- A. Inspect all seams continuously for complete and proper bond.
 - 1. APP inspect for proper flow-out at edge.
 - 2. EPDM: Probe seam edge continuously along seam length. Verify edge sealant is properly applied.
- B. Inspect work area and torch-applied membrane for evidence of fire. Inspect all work areas within 1/2 hour of torching and not less than 1 hour after completion of torch work each day torches are used.
- C. Finished roof membrane must be solid and tight. Inspect roof and make necessary corrections and repairs as work progresses to ensure proper adhesion and watertightness.

3.8 **Cleaning:**

- A. Remove trash, debris, equipment and parts from jobsite.
- B. Repair damage and remove stains caused by work of this section.

3.9 **Protection:**

- A. Protect existing construction from damage due to asphalt spill, splash, drip and any other potential hazards.
- B. Protect finished roof areas from damage during construction.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Furnish and install foamed silicone, silicone sealants, intumescent putties and tapes, mortars, and other firestopping products, systems and related materials to stop the passage of fire, smoke and water through openings in fire-rated walls and floors, as shown on the Drawings and hereinafter specified. Materials and application shall be coordinated with requirements as described in other Sections and as noted on the Drawings. The work includes penetrations, openings, joints and voids created in connection with the Work, but not necessary limited to the following:
1. Penetrations through floor slabs, both empty holes and holes accommodating items such as cables, pipes, ducts and conduit.
 2. Penetrations through walls and partitions, both empty holes and holes accommodating items such as cables, pipes, ducts and conduit.
 3. Construction gaps, including gaps, joints, and other openings between walls and floors, between walls and roof decks, between walls and walls, and any linear breach in fire rated barriers and smoke barriers.
 4. Openings and/or penetrations through smoke barriers, or special compartmentalized areas.

1.02 System Description:

- A. Technical requirements:
1. Designs selected for installation shall provide a fire resistance rating at least equal to the hourly resistance rating of the floor, wall or partition into which the firestop design will be installed. For installation in non-fire-rated construction provide a minimum of 1-hour rated firestop assembly.
 2. Systems and materials shall not require special tools for installation and shall not emit hazardous, combustible or irritating fumes during installation, curing or use.
 3. When more than one firestop design is applicable, individual product characteristics shall be evaluated for secondary benefits in performance, e.g. environmental/water sealing, or ease of installation/modification.
- B. General Considerations:
1. Firestop systems do not re-establish the structural integrity of load bearing partitions. consult Architect prior to drilling or coring operations in any load bearing assembly.
 2. Firestop systems are not intended to support live loads and traffic. Curbs or steel plates may be required to restrict or accommodate potential traffic. Notify Architect if there is reason to believe these limitations may be violated.

1.03 Submittals:

- A. Manufacturer's Literature: provide Manufacturer's product information, including product description, limitations and performance characteristics; delete inapplicable portions.

1. Provide certified test reports of:
 - a. Fire test reports of sealant and foam application to substrate materials similar to project conditions.
 - b. Reports from reputable independent testing agencies, of product proposed for use, which indicate conformance to ASTM E814-83.
- B. Record Documents:
 1. Certification: stating that firestopping has been completed in full accordance with the Contract Documents to provide necessary fire-resistance ratings.

1.04 **Quality Assurance:**

- A. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by applicable building code and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests. The F rating shall be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s) on the non-fire side of the penetration. The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.
- B. Installer Qualifications: minimum of two (2) years experience on comparable projects. Firestopping work shall be performed by a single subcontractor to maintain consistency and accountability on the project.
- C. Compatibility: investigate sealant and foamed elastomer's compatibility with the joint surfaces, joint fillers and other materials in the joint system. Provide only materials (manufacturer's recommended variation of the specified materials) which are known to be fully compatible with the actual installation condition, as shown by manufacturer's published data or certification.
- D. Definitions:
 1. Fire Rated: having the ability to withstand the effects of fire for a specified time period, as determined by qualified testing.
 2. Fire Rated Assembly: a floor, wall or other partitions able to withstand a design fire and hose stream test without failure.
 3. Fire resistance rating: the time, in hours, for which the rated assembly can withstand the effects of fire without burn-through or structural failure.
 4. Firestop: a means of sealing openings in fire rated assemblies to preserve or restore the fire resistance rating.
 5. Firestop System: the combination of materials and/or devices, including the penetrating items, required to make up a complete firestop.
 6. Penetrating Item: a pipe duct, conduit, cable tray, cable, or other element passing through an opening in a fire rated assembly.

1.05 **Delivery, Storage and Handling:**

- A. All materials shall be delivered on the job in original unopened labeled containers of bundles, and

stored in a place protected from damage, moisture and exposure to the elements in exact accordance with manufacturer's instructions.

- B. Store materials in original containers, out of the weather at a temperature below 90°.
- C. Foam: store unmixed liquid components in their original, unopened containers at temperature of 65°F. to 80°F. for a minimum of 12 hours before use.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of, and at no additional cost to, the Owner.

1.06 Project Conditions:

- A. Do not apply sealants or foamed elastomers when temperature of substrate material and surrounding air is below 40°F.
- B. Maintain sealant and foamed elastomers at a minimum of 70°F. for best workability.
- C. Use forced air ventilation when installing foam in areas having less than two (2) cubic feet of free air for each 1 pound of liquid mixture being foamed.
- D. Firestopping requirements may be created under related sections of the Project Specification. Contractor shall:
 - 1. Identify all locations requiring firestopping.
 - 2. Schedule installation of firestopping after completion of duct, piping, electrical runs, but prior to covering or concealing of openings or eliminating access thereto.

PART 2 - PRODUCTS

2.01 Manufacturers:

- A. Provide products complying with requirements of the contract Documents and make by one of the following:
 - 1. Specified Technologies, Inc. (STI)
 - 2. 3M Fire Protection Products (3M)
 - 3. Grace Construction Products
 - 4. Hilti Firestop Systems
 - 5. International Protective Coatings Corp. (IPC)
 - 6. Nelson Firestop Products
 - 7. Tremco

2.02 Materials:

- A. General: provide firestopping materials that expand to fill cavities or provide adhesion to substrates, and that will maintain seal under normal expected movements of substrates.
- B. UL Classification: provide firestopping materials that are currently classified with UL as "Fill, Void

or Cavity Materials", and "Through Penetration Firestop Systems".

- C. Fire Test: provide firestopping materials that have been tested in accordance with ASTM E814-83 "Methods for Fire Tests of Through-Penetration Fire Stops" and UL 1479 "Fire Tests of Through-Penetration Firestops."
- D. Intumescent Firestop Sealants and Caulks: "SpecSeal S100 and S500 Sealant" (STI), "Fire Barrier Caulk CP25WB+" (3M).
- E. Latex Firestop Sealant: "SpecSeal LC150" (STI)
- F. Silicone Firestop Sealants and Caulks: "SpecSeal Pensil 100 and 300" (STI), "Fire Barrier Silicone Sealants" (3M), "FlameSafe FS1900" (IPC), "CLK non-sag Firestop Sealant" (Nelson), "FYRE-SIL" (Tremco).
- G. Sealant, self-leveling silicone: "FYRE-SIL S/L" (Tremco), "CLK self-leveling Fire Stop Sealant" (Nelson).
- G. 2-Part Silicone Firestop Foam: "SpecSeal Pensil 200" (STI), "Fire Barrier 2001 Silicone Foam" (3M).
- H. Firestop Putty: "SpecSeal Firestop Putty Bars and Pads" (STI), "Fire Barrier Moldable Putty" (3M), "FSP1000, FSP1100 Non-hardening Putty and FSP1077 Putty Pads" (IPC), "FSP Firestop Putty" (Nelson).
- I. Intumescent Firestop Collars: "SpecSeal Firestop Collars SSC" (STI), "Fire Barrier PPD's" (3M), "Flamesafe firestop Device FSD" (IPC), "Pipe Choke System PCS" (Nelson).
- J. Intumescent Wrap Strips: "SpecSeal Wrap Strip SSW" (STI), "Fire Barrier FS195 Wrap Strip" (3M).
- K. Firestop Mortar: "SpecSeal Mortar SSM" (STI), "Firestop Compound CMP" (Nelson), "FlameSafe Mortar Seal" (IPC).
- L. Sheet: "CS-195 Composite Sheet" (3M), CPS Composite Sheet (Nelson).
- M. Damming Materials: alumina silicate fire board, mineral fiberboard, mineral fiber matting, mineral fiber putty as listed by UL in the assembly.
- N. Primer: as recommended by the respective manufacturer.
- O. Masking Tape: pressure-sensitive adhesive tape.

PART 3 - EXECUTION

3.01 Examination:

- A. Examine the areas and condition under which sealants and foams are to be applied. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Confirm compatibility of surfaces to receive sealant materials.
- C. Verify that surfaces of openings are sound, clean, dry and ready to receive application of sealants.
- D. Verify the penetration elements are securely fixed and properly located; with a minimum of 1/2 inch space between penetrations and surfaces of openings.
- E. Starting of work will be construed as acceptance of the surfaces and conditions within any particular area.

3.02 **Preparation:**

- A. Provide drop cloths or other satisfactory covering for protection of adjacent areas in accordance with good work practices.
- B. Clean substrate of dirt, dust, grease, oil, loose material and other mater that may affect bond of firestopping material.
- C. Clean metal and glass surfaces with non-alcohol solvent.
- D. If necessary, install damming material to hold the firestopping material in place.
- E. If necessary, apply primer in accordance with manufacturer's instructions. Test sealant adhesion to each substrate material. Apply primer to any surface showing poor adhesion.

3.03 **Application:**

- A. Sealant: use sealant for simple fire-rated wall and floor penetrations, including plumbing fixtures, simple cable systems, conduit or pipe through sleeves, and fire-rated expansion joints.
 - 1. Apply sealant from cartridge by pushing ahead of the nozzle and against the sides of the penetration opening. If bulk sealant is used, using a trowel, putty knife or spatula, work it into the penetration opening. Ensure sealant is in contact with all surfaces.
 - 2. Apply sealant to a minimum depth of 1½" and with a uniform density and texture or, at Contractor's option, install a minimum of 3" of fire-resistant mineral fiber as damming material and seal with 1½" of firestopping sealant with a uniform density and texture.
- B. Foam: use foam for complex fire-rated wall and floor penetrations, including multiple cables, multiple cables in trays, multiple conduit and pipes and mixtures of cables, conduits and pipes.
 - 1. Follow the manufacturer's installation instructions for damming penetrations.
 - 2. All gaps or cracks left after damming materials are in place shall be sealed.
 - 3. Immediately after mixing, dispense liquid foam into the penetration opening, in accordance with manufacturer's installation instructions.
 - 4. Do not overfill penetration openings with liquid foam. Make proper allowance for foam expansion during curing. Follow the guidelines provided below.
 - a. When dispensing liquid foam continuously, be sure the thickness of the liquid foam does not exceed one inch at any given spot.
 - b. If the opening is not filled when the cured foam has completed its expansion, repeat the injection and cure procedure until the opening is filled to the desired level. Allow 10 minutes between application of each shot.
 - 5. Leave dam in place for 24 hours to allow foam to fully cure.
- C. Intumescent Tape: where plastic pipes pass through fire-rated floors and walls, they shall be wrapped with intumescent tape. Wrap the tape as close to the wall or floor as possible; secure in place with wire ties or foil tape.

3.04 **Field Quality Control:**

- A. Examine penetration seals for proper installation, adhesion and curing as may be appropriate for the respective seal materials.
- B. Keep areas of work accessible and notify code authorities or designated inspectors of work released for inspection.
- C. Document completion and inspection as required.
- D. Perform manufacturer's in-line quality control check at least once daily and upon changing to new lot of material, in order to ensure performance of both dispensing equipment and foam product prior to installing penetration seals.
- E. Inspect cured penetration seal after 24-hour cure by removing damming materials to examine seal.
- F. Identify damaged or re-entered seals requiring repair or modification.
- G. Remove loose or damaged materials.
- H. If penetrating elements are to be added, remove enough material to insert new elements being careful not to cause damage to the balance of the seal.
- I. Insure that surfaces to be sealed are clean and dry.
- J. Re-install materials as required. Use only materials approved by manufacturer as suitable for repair of original seal.
- K. Damming materials required to achieve a fire rating shall be returned to the penetration.
- L. Cutting and patching and repairing of damaged or unsatisfactory material shall be provided by the Contractor.
- M. All areas from which samples have been removed shall be patched to provide the specified rating and thicknesses.

3.05 **Adjusting and Cleaning - Exposed Areas:**

- A. Clean up spills of liquid components with high-flash mineral spirit solvent, following manufacturer's instructions and precautions on container label.
- B. If necessary, trim excess cured foam and sealant with a sharp knife or blade.
- C. Remove foam and sealant from materials and surfaces not specifically required to be sealed.
- D. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.
- E. If support aids or forms are installed they shall be removed after the designated cure time unless the support materials used are of a fire resistant or noncombustible nature.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Furnish and install all labor, materials, equipment and services required to complete all acoustical tile work indicated on the drawings and as specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Suspended metal grid ceiling system.
 - 2. Acoustical tile.

1.02 References:

- A. ASTM C635 - Metal suspension systems for acoustical tile and lay-in panel ceilings.
- B. ASTM C636 - Installation of metal ceiling suspension systems for acoustical tile and lay-in panels.

1.03 Quality Assurance:

- A. Installer: company specializing in work of this type with minimum five (5) years experience and approved by the ceiling grid and tile manufacturers.

1.04 Environmental Instructions:

- A. Maintain uniform temperatures of minimum 60 degrees F, and humidity of 20 to 40 percent prior to, during and after installation.

1.05 Extra Stock:

- A. Provide one (1) extra, unopened box of acoustic units. Provide one box for each different style or color from the same run as those installed.

PART 2 - PRODUCTS

2.01 Suspension System:

- A. Exposed grid system: ASTM C635, intermediate duty, cold-rolled steel, capped, double webbed, galvanized or corrosion-resistant coated finish, 1-1/2" x 3/4" members, USG/Donn "DX" or equal manufactured by Armstrong, or Chicago Metallic Corp.
 - 1. Match existing grid spacing, including areas of 2' x 4' grid spacing and 30" x 60" grid spacing.
- B. Hanger wire, toe wire, clips and attachment devices for support system; class: intermediate-duty system as per manufacturer's specifications.
- C. System shall include main runner sections, cross tees, wall moldings, splices, other accessories required for and designed for this type of system. Members that will be exposed shall have factory-applied, low-luster painted finish, white color.

- 2.02 Acoustical Units and Panels:** Match existing. Panels may be reused if they are free from damage and acceptable to the Owner and Architect.

PART 3 - EXECUTION

3.01 Inspection:

- A. Verify that existing conditions are ready to receive work.
- B. Verify that layout of hangars will not interfere with other work.
- C. Beginning of installation mean acceptance of existing conditions.

3.02 Installation - General:

- A. Install suspension system and acoustical units in accordance with ASTM C 636, manufacturer's instructions, and as supplemented in this section.
- B. Coordinate layout of grid, lights, sprinklers, and air diffusers to match existing.

3.03 Installation - Suspension System:

- A. Install system capable of supporting imposed loads to a deflection of 1/270 span maximum.
- B. Space hangers and main runner channels to receive suspension systems in accordance with details and instructions of system manufacturer, dependent upon type and weight of entire installation, but not to exceed 4 feet on centers, with galvanized hangar wire of not less than 12 gauge.
- C. Center locate system from work points designated on the reflected ceiling plan, or in absence thereof, on center of room axis assuring equal boarder units of not less than 1/2 unit size.
- D. Provide main runners on maximum 4 foot centers. Do not allow to come in contact with walls or partitions.
- E. Install wall molding at intersection with walls, beams, and other vertical surfaces.
- F. No hangers shall be attached to pipes, ducts, or conduit.

3.04 Installation - Acoustic Units:

- A. Install acoustical units in a true and even plane, in straight line courses laid out symmetrically about center lines of ceiling or panel, continuing pattern through wall openings.
- B. Border tile shall not be less than 6 inches wide. Fit border units neatly against vertical surfaces.
- C. Do not install ceiling tile until work of other trades above the ceiling has been completed and approved.
- D. Carefully coordinate and fit units to grilles, lighting fixtures and other related items of work. In determining spacing and locations of hangers and primary runner channels, take into consideration the weight of grilles, fixtures, etc. that are to be installed in conjunction with acoustic ceilings.

3.05 Cleaning and Replacement:

- A. Following installation, clean soiled or discolored surfaces of units and grid. Remove and replace units which are damaged or improperly installed.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Perform all work necessary to complete all painting and related work as shown on the Drawings and as specified herein. Work includes furnishing all required labor and materials including, but not necessarily limited to, the following principal items:
 - 1. Surface preparation.
 - 2. Finishing of interior exposed items and surfaces.
 - 3. Painting of all bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical work.
 - 4. Finishing of all exposed surfaces, otherwise unfinished, in a manner the same as similar specified work.

- B. Painting not included:
 - 1. Asphalt or concrete traffic marking.
 - 2. Shop priming requirements of ferrous metal items, including structural steel, miscellaneous metal, hollow metal work, and similar items; also, fabricated components such as and shop-fabricated or factory-built mechanical and electrical equipment or accessories are included under other sections.
 - 3. Pre-finished items: do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) acoustic materials, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, doors and equipment. Exception: Rooftop HVAC units will be field painted even though they are factory finished.
 - 4. Rooftop HVAC equipment.
 - 5. Concealed surfaces: unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, and duct shafts.
 - 6. Finished metal surfaces: metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 - 7. Operating parts and labels:
 - a. Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise indicated.
 - b. Do not paint over any code-required labels, such as underwriters' laboratories and factory mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.02 **Definitions:**

- A. Conform to ANSI/ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- C. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections.
- D. DFT
 - 1. Dry Film Thickness.
 - 2. The thickness of the dry film of a coating measured either in mils or microns.
- E. Mil
 - 1. One one-thousandth of an inch.
 - 2. Used to measure the thickness of coating films.
- F. Gloss or Sheen Levels: Percentage reflection as measured on a 60 degree Gloss Meter.
 - 1. Flat: Up to 5% reflection
 - 2. Eggshell / Low Lustre: 5% to 15% reflection
 - 3. Pearl / Low Lustre: 15% to 25% reflection
 - 4. Satin / Soft Gloss: 35% to 55% reflection
 - 5. Semi-Gloss: 35% to 60% reflection
 - 6. Gloss: 60% or greater reflection

1.03 **Quality Assurance:**

- A. Applicator Qualifications: company specializing in commercial painting and finishing with minimum five years experience on comparable projects.
- B. The current edition of "A Modern Guide to Painting Specifications", shall hereby be made part of this specification insofar as applicable.
- C. Manufacturer's standard specifications and recommendations for preparation and application of his products are hereby made a part of this specification and shall be adhered to in all cases. Diluting or thinning of materials is absolutely prohibited except when specified, or approved by manufacturer.
- D. Product compatibility:
 - 1. Provide barrier coats over incompatible primers or remove and reprime as required. Notify the architect in writing of any anticipated problems using the coating systems as specified with substrates primed by others.
 - 2. Provide finish coats which are compatible with the prime paints used. Review other sections

of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon requests from other subcontractors, furnish information on the characteristics of the specified finish materials, to ensure that compatible prime coats are used.

1.04 Regulatory Requirements:

- A. Use only materials meeting current Volatile Organic Compound (VOC) regulations for the project location.
- B. In the event that specified products exceed the allowable VOC limits provide alternative VOC compliant products with equivalent appearance and durability characteristics.

1.05 Delivery, Storage, and Handling:

- A. Deliver paints and enamels ready-mixed to job site.
- B. Deliver all materials to the job site in original, new and unopened containers bearing manufacturer's name and label.
- C. All materials used on the job shall be stored in a single place. Storage place shall be kept neat and clean and all damage thereto or to its surroundings shall be made good. All oily rags, waste, etc., must be removed from the building every night and every precaution taken to avoid danger of fire. Paints shall not be stored, mixed or applied in any room having finished floor installed without taking approved methods of protection. Used containers shall have labels cancelled and shall be clearly marked as contents.
- D. Gasoline, benzine or other material not provided for under this specification shall not be brought on the job.

1.06 Site Conditions:

- A. Environmental conditions:
 - 1. Do not apply water-base paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 50°F., unless otherwise permitted by paint manufacturer's printed instructions.
 - 2. Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45°F., unless otherwise permitted by paint manufacturer's printed instructions.
 - 3. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions. Painting may be continued during inclement weather only if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.
- B. Maintain uniform temperatures of minimum 60 degrees F, and humidity of 20 to 40 percent prior to, during and after installation.
- C. Maintain adequate illumination in work areas during application of coatings.
- D. Provide ventilation as necessary to eliminate fumes and odors. Ensure building ventilation system is in continuous operation for a period of two weeks following completion of interior finish coats, with not less than 10% outdoor air supply.

1.07 Maintenance:

- A. Extra stock: provide a one gallon container of each color and surface texture to the owner. Label each container with color, texture, room locations, in addition to manufacturer's label.

PART 2 - PRODUCTS

2.01 Manufacturers:

- A. Sherwin Williams.
- B. Pratt & Lambert.
- C. Benjamin Moore.
- D. PPG Industries.

2.02 Colors and Finishes:

- A. To match existing.
- B. Proprietary names used to designate colors or materials are not intended to imply that products of that manufacturer are required to exclusion of equivalent products of other approved manufacturers.

2.03 Material Quality:

- A. Provide the best quality of the various types of coatings as regularly manufactured by the paint materials manufacturers listed. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits. Base coats and undercoats of paints shall be tinted or shaded differently than the finish coats.

PART 3 - EXECUTION

3.01 Examination:

- A. Examine the areas and environmental conditions under which painting work is to be applied. Do not proceed with work until unsatisfactory conditions have been established.
- B. Examine surfaces scheduled to receive paint and finishes for condition that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work. Report in writing to the Architect all unsatisfactory conditions, errors, or deficiencies prior to proceeding with work.
- C. Starting of painting work will be construed as acceptance of the surfaces and conditions within any particular area.

3.02 Surface Preparation:

- A. General:
 - 1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

2. Perform preparation and cleaning procedures in strict accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
3. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of each space or area, reinstall removed items by workmen skilled in trades involved.
4. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

B. Cementitious materials:

1. Prepare surfaces of concrete and concrete block to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
2. Fill minor cracks and irregularities with spackling compound to provide uniform surface texture that matches existing adjacent texture.
3. If necessary, to match existing adjacent texture provide additional coats of spackling compound, primer, and/or paint. In any case do not use less than the required 1 coat primer and 2 coats paint.

3.03 Materials Preparation:

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Stir materials before application to produce a mixture of uniform density, and stir as required during application of materials. Do not stir surface film into the material. Remove film and if necessary, strain the material before using.

3.04 Prime Coats:

- A. Apply prime coat to material to be painted or finished, and which has not been prime coated by others. Omit the primer on metal surfaces which have been shop-primed and touch-up painted, unless otherwise directed.
- B. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

3.05 Application:

- A. Paint all exposed surfaces whether or not colors are designated in "schedules", except where the natural finish of the material is obviously intended and/or specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.
- B. Method of application:
 1. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied.
 2. Apply paint with suitable brushes, rollers, or spraying equipment.

3. Apply stain and varnish with brushes.
 4. Spraying paint will not be allowed.
 5. Rate of application shall not exceed average rate-of-coverage recommended by paint manufacturer for type of surface involved, less 10 percent allowance for losses, unless manufacturer's printed specifications state the recommended rate includes normal expected losses.
- C. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.
 - D. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 - E. Paint the back sides of access panels, and removable or hinged covers to match the exposed surfaces.
 - F. On wood or metal surfaces thoroughly and uniformly sand each coat, except final coat with #00 sandpaper, or other equal abrasive, removing all surface defects and providing a smooth, even surface for subsequent coats.
 - G. First application of stain shall provide desired result. "Second-coating" will not be permitted. Materials that are not properly stained with first application shall be replaced with new materials at no additional cost.
 - H. Completely finish each coat in an area or space and obtain architect's approval thereof before proceeding with following coat. In multi-coat paint work, tint each coat for easy identification by using varying degrees of required finish color for tinting of undercoats.
 - I. When applying latex coatings, the product has to be "hung-up" and "laid-off" to get good flow which is necessary to good hiding quality.
 - J. If, for whatever cause, there is a lack of proper coverage, Contractor shall apply additional coats of paint or finish as required to cover surfaces completely to provide uniform color and appearance.
 - K. Whenever necessary to obtain required results, a whole wall shall be refinished rather than "spot-finishing" where a portion of finish is unsatisfactory.
 - L. Minimum drying time shall comply with that recommended by paint manufacturer. Each coat shall be thoroughly dry before application of succeeding coats.
 - M. Make edges of paint adjoining other materials or colors sharp and clean, and without overlapping.
 - N. For window frames that are required to be painted, apply primer before glazing is executed.
 - O. Change colors at outside corner of door stop where colors differ between adjoining spaces or rooms and where door frames match wall colors.
 - P. Where ferrous metal panels, boxes, access doors, registers, louvers or grilles occur in finished doors, walls or ceilings, paint in with surrounding surfaces unless otherwise directed.
 - Q. Pigmented (opaque) finishes: completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, roughness or other surface imperfections will not be acceptable.
 - R. Completed work: match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.06 Minimum Coating Thickness:

- A. Apply each material at not less than the manufacturer's recommended spreading rate, to provide a total dry film thickness of not less than 5.0 Mils for the entire coating system of prime and finish coats for 3-coat work.
- B. Provide a total dry film thickness of not less than 3.5 Mils for the entire coating system of prime and finish coat for two (2)-coat work, for non-epoxy coating.

3.07 Clean-up and Protection:

- A. Clean-up: during progress of the work, remove from project daily all discarded paint materials, rubbish, cans and rags.
- B. Protection: protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damages by cleaning, repairing or replacing, and repainting, as directed by the Architect.
- C. Provide "wet paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings after completion of painting operations.

3.08 Schedule:

- A. Paint all instances of the following applications utilizing products of one of the acceptable manufacturer's equal to the Benjamin-Moore products specified:
- B. Interior finishes: Paint all exposed surfaces which are not prefinished or which do not have an integral finish, whether or not specifically indicated on the drawings:
 - 1. Concrete block: Latex, Semi-Gloss
 - a. Prime: One (1) coat S-W Loxon Block Surfacer A24W200, 8 mils DFT.
 - b. Finish: Two (2) coats S-W ProMar 200 Interior Latex Semi-Gloss Enamel B31W2200 Series, 1.5 mils DFT/coat.
 - 2. Ferrous metals, (pipes, railings, steel doors and frames, etc.); Acrylic, Gloss:
 - a. Prime: Bare surfaces and abraded areas of previously primed surfaces: S-W Kem Bond HS Universal Metal Primer B50Z Series, 3.0 mils DFT.
 - b. Finish: Two (2) coats S-W DTM Acrylic Semi-Gloss B66-200; 3.0 mils DFT/coat

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements applicable to all Division 23 Sections. Also refer to Division 1 - General Requirements.
- B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced in the specification section.

1.2 SCOPE OF WORK

- A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.
- B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make his portion of the Mechanical Work a finished and working system.

1.3 WORK SEQUENCE

- A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours will be required.

1.4 COORDINATION DRAWINGS

- A. Definitions:
 - 1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.
 - a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, hydronic piping, and any item that may impact coordination with other disciplines.
 - b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
 - c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
 - d. Maintenance clearances and code-required dedicated space shall be included.
 - e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the General Contractor.
 - a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.
3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. KJWW will provide electronic file copies of ventilation drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by KJWW. KJWW will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.
 - a. Scale of drawings:
 - 1) General plans: 1/4 Inch = 1'-0" (minimum).
 - 2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
 - 3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
 - 4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
 - 5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).
2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in his/her bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.
 - a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
 - b. Potential layout changes shall be made to avoid additional access panels.
 - c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
 - d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
 - e. When additional access panels are required, they shall be provided without additional cost to the Owner.
10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.5 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the City of Crystal Lake, Illinois Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all State Codes.
3. If there is a discrepancy between the codes and regulations and these specifications, the Engineer shall determine the method or equipment used.
4. If the Contractor notes, at the time of bidding, any parts of the drawings or specifications that do not comply with the codes or regulations, he shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, he shall submit with his proposal a separate price to make the system comply with the codes and regulations.
5. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
6. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
7. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.

2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be approved or listed by Underwriter's Laboratories, Inc.

E. Examination of Drawings:

1. The drawings for the mechanical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.
 - a. Any item listed as furnished shall also be installed, unless otherwise noted.
 - b. Any item listed as installed shall also be furnished, unless otherwise noted.

F. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

G. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit MEP.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by KJWW.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by KJWW for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by KJWW as to the accuracy or correctness of the information provided. KJWW accepts no responsibility or liability for the Contractor's use of these documents.

1.6 **SUBMITTALS**

- A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

<u>Referenced Specification Section</u>	<u>Submittal Item</u>
23 81 21	Computer Room Units

- B. In addition to the provisions of Division 1, the following provisions are required:

1. Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
2. The Contractor shall submit **seven (7)** copies of each shop drawing for review by the Architect/Engineer BEFORE releasing any equipment for manufacture or shipment.
3. Shop drawings which are larger than 11"x 17" or are plan size layout or erection drawings such as ductwork layout drawings shall be submitted on reproducible media.

Submit one reproducible and one print of each drawing or plan. All Contractor approval stamps shall be made on the reproducible.

4. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. CONTRACTOR'S APPROVAL STAMP IS REQUIRED ON ALL SUBMITTALS. APPROVAL WILL INDICATE THE CONTRACTOR'S REVIEW of all material and a COMPLETE UNDERSTANDING OF EXACTLY WHAT IS TO BE FURNISHED. Contractor shall clearly mark all deviations from the contract documents on all submittals. IF DEVIATIONS ARE NOT MARKED BY THE CONTRACTOR, THEN THE ITEM SHALL BE REQUIRED TO MEET ALL DRAWING AND SPECIFICATION REQUIREMENTS.
5. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
6. The Contractor shall clearly indicate the size, finish, material, etc.
7. Assemble and submit by specification section numbers for all submittals. All sets shall be identical and contain an index of the items enclosed with a general topic description on the cover.
8. Each set shall be bound in a manufacturer's folder or inside of a manila file folder.
9. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is relevant to the work.
10. Failure to comply with the above shall be reason to resubmit all shop drawing submittals.
11. The Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Engineer to recheck and handle the additional shop drawing submittals.

C. Provide Schedule of Values:

1. Application forms: Use AIA Document Continuation Sheets G703 (or similar) as the form for application.
2. Provide line items on the Schedule of Values including:
 - a. Mechanical Contractor General Conditions (mobilization, bonds, insurance, etc.)
 - b. Piping (refrigerant, pipe insulation, etc.)
3. Change orders shall have schedule of values broken out as listed above submitted with each change order.
4. Coordinate with the Project Engineer the items included in the Schedule of Values. The intent is to not create schedules in addition to those the Mechanical Contractor normally submits to the General Contractor for payment.

1.7 EQUIPMENT SUPPLIERS' INSPECTION

- A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:

1. Computer Room Units

- B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.
- C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

1.8 **PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE**

- A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.
- B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.
- C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.
- D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate his/her work with other trades.

1.9 **WARRANTY**

- A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.
- B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.
- C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.10 **INSURANCE**

- A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.11 **MATERIAL SUBSTITUTION**

- A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis for job design and establishes the quality required.
- B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications, and fits in the allocated space.

- C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.
- D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on his part or on the part of other Contractors whose work is affected.
- E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.
- F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

- A. Neither the professional activities of the Engineer, nor the presence of the Engineer or his or her employee and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Engineer and his or her personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Engineer and the Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

- A. General:
 - 1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found by calling 811.
 - 2. The Contractor shall do all excavating, filling, backfilling and compacting associated with his work.
- B. Excavation:
 - 1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
 - 2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly

compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.

3. Trim bottom and sides of excavations to grades required for foundations.
4. Protect excavations against frost and freezing.
5. Take care in excavating not to damage surrounding structures, equipment or buried pipe. Do not undermine footing or foundation.
6. Perform all trenching in a manner to prevent cave-ins and risk to workmen.
7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.

C. Dewatering:

1. Contractor shall furnish, install, operate and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. No rubbish or waste material is permitted for fill or backfill.
2. Provide all necessary sand for backfilling.
3. Dispose of the excess excavated earth as directed.
4. Backfill materials shall be suitable for required compaction, clean and free of perishable materials and stones greater than 4 inches in diameter. Water shall not be permitted to rise in unbackfilled trenches. No material shall be used for backfilling that contains frozen earth, debris or earth with a high void content.
5. Backfill all trenches and excavations immediately after installing pipes, or removal of forms, unless other protection is provided.
6. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.

7. Lay all piping on a compacted bed of sand at least 3 inches deep. Backfill around pipes with sand, 6 inch layers, and compact each layer.
8. Use sand for backfill up to grade for all piping under slabs or paved areas. All other piping shall have sand backfill to 6 inches above the top of the pipe.
9. Place all backfill above the sand in uniform layers not exceeding 6 inches deep. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
10. Where the fill and backfill will ultimately be under a building, floor or paving, each layer of fill shall be compacted to 95% of the maximum density determined by AASHTO Designation T-99 or ASTM Designation D-698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T-99 or ASTM D-698 test.

F. Surface Restoration:

1. Where trenches are cut through graded, planted or landscaped areas, the areas shall be restored to the original condition. Replace all planting removed or damaged to its original condition. A minimum of 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded.
2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition.

3.3 **ENGINEER OBSERVATION OF WORK**

A. The Contractor shall provide seven (7) calendar days notice to the Engineer prior to:

1. Placing fill over underground and underslab utilities.
2. Covering exterior walls, interior partitions and chases.
3. Installing hard or suspended ceilings and soffits.

B. The Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

C. Above-Ceiling Final Observation

1. All work above the ceilings must be complete prior to the Engineer's review. This includes, but is not limited to:
 - a. Pipe insulation is installed and fully sealed.
 - b. Pipe and duct wall penetrations are sealed.
 - c. Pipe identification and valve tags are installed.
2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.4 **PROJECT CLOSEOUT**

- A. The following paragraphs supplement the requirements of Division 1.
- B. Final Jobsite Observation:
 - 1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
 - 2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
 - 3. Upon Contractor certification that the project is complete and ready for a final punch, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
 - 4. It is understood that if the Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Engineers additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.
- C. Before final payment is authorized, This Contractor must submit the following:
 - 1. Operation and maintenance manuals with copies of approved shop drawings.
 - 2. Record documents including reproducible drawings and specifications.
 - 3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
 - 4. Start-up reports on all equipment requiring a factory installation inspection or start-up.

3.5 **OPERATION AND MAINTENANCE INSTRUCTIONS**

- A. Submit three properly indexed and bound copies, in 'D' Ring style notebooks, of the Operations and Maintenance Instructions to the Architect/Engineer. Make all corrections or additions required.
- B. Manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.
- C. Operation and maintenance data shall consist of written instructions for the care, maintenance, and operation of all equipment and systems. Include all instruction books, cards, and manuals furnished with the equipment.

3.6 **INSTRUCTING THE OWNER'S REPRESENTATIVES**

- A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of all systems installed under this contract.
- B. Provide verbal and written instructions to the Owner's representatives by **FACTORY PERSONNEL** in the care, maintenance, and operation of the equipment and systems.

- C. The Owner has the option to video tape all instructions. Coordinate schedule of instructions to facilitate this recording.
- D. The instructions shall include:
 - 1. Explanation of all air handling systems.
 - 2. Temperature control system operation including calibration, adjustment and proper operating conditions of all sensors.
 - 3. Maintenance of equipment.
 - 4. Start-up procedures for all major equipment.
 - 5. Explanation of seasonal system changes.
 - 6. Description of emergency system operation.
- E. The Architect/Engineer shall be notified of the time and place instructions will be given to the Owner's representatives so he or his representative can attend if desired.
- F. Minimum hours of instruction for each item shall be:
 - 1. Computer Room System(s) - 4 hours.
- G. Operating Instructions:
 - 1. Contractor is responsible for all instructions to the Owner's representatives for the mechanical and control systems.
 - 2. If the Contractor does not have staff that can adequately provide the required instructions he shall include in his bid an adequate amount to reimburse the Owner for the Engineer to perform these services.

3.7 **SYSTEM COMMISSIONING**

- A. The mechanical systems shall be complete and operating. System start-up, testing, balancing, and satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final comfort adjustments as required.
- B. Operate all HVAC systems continuously for at least one week prior to occupancy to bring construction materials to suitable moisture levels. Areas with mechanical cooling shall be maintained below 60% RH.
- C. Contractor shall adjust the mechanical systems and controls at season changes during the one year warranty period, as required, to provide satisfactory operation and to prove performance of all systems in all seasons.
- D. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.
- E. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

- A. The following paragraph supplements Division 1 requirements:
- Contractor shall maintain at the job site a separate and complete set of mechanical drawings and specifications on which he shall clearly and permanently mark in complete detail all changes made to the mechanical systems.
- B. Mark drawings to indicate revisions to piping and ductwork, size and location, both exterior and interior; including locations of coils, dampers, other control devices, filters, and other units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (e.g., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- C. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.
- D. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.
- E. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.9 PAINTING

- A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.
- B. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, he shall have the equipment and all its supports, hangers, etc., painted to match the room decor.
- C. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.
- D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer his color preference and furnish this color.
- E. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.
- F. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.
- G. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:
1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.

2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic latex paint.

3.10 **ADJUST AND CLEAN**

- A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.
- B. Clean all drain pans and areas where moisture is present. Immediately report any mold, biological growth, or water damage.
- C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.11 **SPECIAL REQUIREMENTS**

- A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.
- B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.
- C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

3.12 **IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION**

- A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:
 1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:
 - a. Minimizing the amount of dust generated.
 - b. Reducing solvent fumes and VOC emissions.
 - c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
 2. Request that the Owner designate an IAQ representative.
 3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
 4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
 5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
 6. Request copies of and follow all of the Owner's IAQ and infection control policies.
 7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.

8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

END OF SECTION

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

In order to prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. All fans shall be operating and balanced.
2. All temperature control systems operating, programmed and calibrated.
3. Pipe insulation complete, pipes labeled and valves tagged.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Engineer so that the final observation can be scheduled.

It is understood that if the Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

* * * * *

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Mechanical demolition.
- B. Cutting and Patching.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. THE DRAWINGS ARE INTENDED TO INDICATE THE GENERAL SCOPE OF WORK AND DO NOT SHOW EVERY PIPE, DUCT, OR PIECE OF EQUIPMENT THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY CONDITIONS PRIOR TO SUBMITTING A BID.
- B. Where walls, ceilings, etc., are shown as being removed on general drawings, the Contractor shall remove all mechanical equipment, devices, fixtures, piping, ducts, systems, etc., from the removed area.
- C. Where ceilings, walls, partitions, etc., are temporarily removed and replaced by others, This Contractor shall remove, store, and replace equipment, devices, fixtures, pipes, ducts, systems, etc.
- D. Verify that abandoned utilities serve only abandoned equipment or facilities. Extend services to facilities or equipment that shall remain in operation following demolition.
- E. Coordinate work with all other Contractors and the Owner. Schedule removal of equipment to avoid conflicts.
- F. This Contractor shall verify all existing equipment sizes and capacities where equipment is scheduled to be replaced or modified, prior to ordering new equipment.
- G. Bid submittal shall mean the Contractor has visited the project site and verified existing conditions and scope of work.

3.2 PREPARATION

- A. Disconnect mechanical systems in walls, floors, and ceilings scheduled for removal.
- B. Provide temporary connections to maintain existing systems in service during construction. When work must be performed on operating equipment, use personnel experienced in such operations.

3.3 **DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK**

- A. Demolish and extend existing mechanical work under provisions of Division 2 and this Section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned ducts and piping to source of supply and/or main lines.
- D. Remove exposed abandoned pipes and ducts, including abandoned pipes and ducts above accessible ceilings. Cut ducts flush with walls and floors, cap duct that remains, and patch surfaces. Cut pipes above ceilings, below floors and behind walls. Cap remaining lines. Repair building construction to match original. Remove all clamps, hangers, supports, etc. associated with pipe and duct removal.
- E. Disconnect and remove mechanical devices and equipment serving equipment that has been removed.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Maintain access to existing mechanical installations which remain. Modify installation or provide access panels as appropriate.
- H. Remove unused sections of supply and return air ductwork back to mains. Patch opening with sheet metal and seal airtight. Patch existing insulation to match existing. Where existing ductwork is to be capped and reused, locate the end cap within 6" of the last branch. End caps shall be 3" pressure class and seal class "A".
- I. Extend existing installations using materials and methods compatible with existing installations, or as specified.
- J. Properly reclaim and dispose of all refrigerant in demolished equipment and as required for extension of existing equipment.

3.4 **CUTTING AND PATCHING**

- A. This Contractor is responsible for all penetrations of existing construction required to complete the work of this project. Refer to Section 23 05 29 for additional requirements.
- B. Penetrations in existing construction should be reviewed carefully prior to proceeding with any work.
- C. Penetrations shall be neat and clean with smooth and/or finished edges. Core drill where possible for clean opening.
- D. Repair existing construction as required after penetration is complete to restore to original condition. Use similar materials and match adjacent construction unless otherwise noted or agreed to by the Architect/Engineer prior to start of work.
- E. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.5 **CLEANING AND REPAIR**

- A. Clean and repair existing materials and equipment which remain or are to be reused.

- B. Clean all systems adjacent to project which are affected by the dust and debris caused by this construction.
- C. MECHANICAL ITEMS REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.

3.6 **SPECIAL REQUIREMENTS**

- A. Install temporary filter media over outside air intakes which are within 100 feet of the limits of construction or as noted on the drawings. This Contractor shall complete any cleaning required for existing systems which are affected by construction dust and debris.
- B. Review locations of all new penetrations in existing floor slabs or walls. Determine construction type and review for possible interferences. Bring all concerns to the attention of the Architect/Engineer before proceeding.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Single Phase and Three Phase Electric Motors.

1.2 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- C. ANSI/IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.
- D. ANSI/NEMA MG 1 - Motors and Generators.
- E. ANSI/NFPA 70 - National Electrical Code.

1.3 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data including assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in the manufacture of commercial and industrial motors and accessories, with a minimum of three years documented manufacturing experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof coverings. For extended outdoor storage, follow manufacturer's recommendations for equipment and motor.

PART 2 - PRODUCTS

2.1 MOTORS - GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Refer to the drawings for required electrical characteristics.
- B. Design motors for continuous operation in 40°C environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- C. Visible Nameplate: Indicating horsepower, voltage, phase, hertz, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, insulation class.
- D. Electrical Connection: Boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.

- E. Unless otherwise indicated, motors 3/4 HP and smaller shall be single phase, 60 hertz, open drip-proof or totally enclosed fan-cooled type.
- F. Unless otherwise indicated, motors 1 HP and larger shall be three phase, 60 hertz, squirrel cage type, NEMA Design B (low current in-rush, normal starting torque), open drip-proof or totally enclosed fan-cooled type.
- G. Each contractor shall set all motors furnished by him.
- H. All motors shall have a minimum service factor of 1.15.
- I. All motors shall have ball or roller bearings with a minimum L-10 fatigue life of 150,000 hours in direct-coupled applications and 50,000 hours for belted applications. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG1-14.43.
- J. Provide all belted motors with a means of moving and securing the motor to tighten belts. Motors over 2 HP shall have screw type tension adjustment. Slide bases shall conform to NEMA standards.

2.2 PREMIUM EFFICIENCY MOTORS (INCLUDING MOST 3-PHASE GENERAL PURPOSE MOTORS)

- A. All motors, unless exempted by EPAct legislation that becomes federal law on December 19, 2010, shall comply with the efficiencies listed in that standard, which are reprinted below. These match the 2010 NEMA premium efficiency ratings. All ratings listed are nominal full load efficiencies, verified in accordance with IEEE Standard 112, Test Method B. Average expected (not guaranteed minimum) power factors shall also be at least the following:

HP	Full-Load Efficiencies %					
	Open Drip-Proof			Totally Enclosed Fan Cooled		
	1200 rpm	1800 rpm	3600 rpm	1200 rpm	1800 rpm	3600 rpm
1.0	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	86.5	84.0	87.5	86.5	84.0
2.0	87.5	86.5	85.5	88.5	86.5	85.5
3.0	88.5	89.5	85.5	89.5	89.5	86.5
5.0	89.5	89.5	86.5	89.5	89.5	88.5

- B. Motor nameplate shall be noted with the above ratings.

2.3 MOTOR DRIVEN EQUIPMENT

- A. No equipment shall be selected or operate above 90% of its motor nameplate rating. Motor size may not be increased to compensate for equipment with efficiency lower than that specified.
- B. If a larger motor than specified is required on equipment, the contractor supplying the equipment is responsible for all additional costs due to larger starters, wiring, etc.

2.4 SHEAVES

- A. All sheaves shall conform to NEMA Standard MG1-14.42, which lists minimum diameters and maximum overhangs. Locate motors to minimize overhang.
- B. When replacing sheaves, use sheaves of at least the originally supplied sizes.

- C. Contractor responsible for motor shall also be responsible for replacement sheaves. Coordinate with testing and balancing of the equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Hangers, Supports, and Associated Anchors.
- B. Equipment Bases and Supports.
- C. Sleeves and Seals.
- D. Flashing and Sealing of Equipment and Pipe Stacks.
- E. Cutting of Openings.
- F. Escutcheon Plates and Trim.

1.2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

1.3 REFERENCES

- A. ANSI/ASME B31.1 - Power Piping.
- B. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, and Manufacture.
- C. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.
- D. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

PART 2 - PRODUCTS

2.1 HANGER RODS

- A. Hanger rods for single rod hangers shall conform to the following:

Pipe Size	Hanger Rod Diameter Copper Pipe
2" and smaller	3/8"

- B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8 inches.
- C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

2.2 PIPE HANGERS AND SUPPORTS

- A. All pipe hangers, clamps, and supports shall conform to Manufacturers Standardization Society MSS-SP-69.
- B. Oversize all hangers, clamps, and supports on insulated piping to allow insulation and jacket to pass through unbroken. This applies to both hot and cold pipes.
- C. On all insulated piping, provide a semi-cylindrical metallic shield and fire resistant vapor barrier jacket.

- D. As an alternative to separate pipe insulation insert and saddle, properly sized integral rigid insulation sections may be used for this application.

Acceptable Products:

Cooper/B-Line - Fig. B3380 through B3384
 Pipe Shields - A1000, A2000
 Erico - Model 124, 127

- E. Support and laterally brace vertical pipes at every floor level in multi-story structures, but never at intervals over 15 feet. Support vertical pipes with riser clamps installed below hubs, couplings or lugs welded to the pipe.

Acceptable Products:

Anvil - Fig. CT121
 Cooper/B-Line - Fig. B3373CT
 Erico - Model 510
 Nibco/Tolco - Fig. 82

- F. Place restrained neoprene mounts beneath vertical pipe riser clamps to prevent sweating of cold pipes. Insulate over mounts.

Acceptable Products: Mason RBA, RCA, or BR.

- G. Hangers in direct contact with copper pipe shall be coated with plastic with appropriate temperature range. HYDRA-ZORB clamps are permitted for this application for bare pipes within their temperature limits of - 65°F to + 275°F.

- H. Unless otherwise indicated, hangers shall be as follows:

1. Clevis Type:
 Service: Bare Metal Pipe
 Insulated Cold Pipe
 Insulated Hot Pipe - 3 inches & smaller

Acceptable Products:	Bare Metal or Insulated Pipe	Bare Copper Pipe
Anvil	Fig. 260	Fig. CT65
Cooper/B-Line	Fig. 3100	Fig. B3104CT
Erico	Model 400	Model 402
Nibco/Tolco	Fig. 1	Fig. 81

2. Adjustable Swivel Ring Type:
 Service: Bare Metal Pipe - 4 inches and Smaller

Acceptable Products:	Bare Steel Pipe	Bare Copper Pipe
Anvil	Fig. 69	Fig. CT69
Cooper/B-Line	Fig. B3170NF	Fig. B170CT
Erico	Model FCN	
Nibco/Tolco	Fig. 200	Fig. 202

- I. Support may be fabricated from U-Channel strut or similar shapes. Piping less than 4" in diameter shall be secured to strut with clamps of proper design and capacity as required to maintain spacing and alignment. Strut shall be independently supported from hanger drops or building structure. Size and support shall be per manufacturer's installation requirements for structural support of piping. Clamps shall not interrupt piping insulation.

1. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

J. Unless otherwise indicated, pipe supports for use with struts shall be as follows:

1. Clamp Type:
 Service: Bare Metal Pipe
 Insulated Cold Pipe
 Insulated Hot Pipe - 3 inches and smaller
 - a. Clamps in direct contact with copper pipe shall be plastic coated.
 - b. Pipes subject to expansion and contraction shall have clamps slightly oversized to allow limited pipe movement.

Acceptable Products:	Bare Metal or Insulated Pipe	Bare Copper Pipe
Unistrut	Fig. P1100 or P2500	
Cooper/B-Line	Fig. B2000 or B2400	Fig. BVT
Nibco/Tolco	Fig. A-14 or 2STR	

K. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as follows:

1. Beam Clamps:

Acceptable Products:	
Anvil	Fig. 228, 292
Cooper/B-Line	Fig. B3054
Erico	Model 360
Nibco/Tolco	Fig. 329
2. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318-05. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.
3. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

L. Wall supports shall be used where vertical height of structure exceeds minimum spacing requirements. Install wall supports at same spacing as hangers or strut supports along vertical length of pipe runs.

M. Welding:

1. Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded in lieu of bolting, clamping, or riveting to the building structural frame. Take adequate precautions during all welding operations for fire prevention and for protecting walls and ceilings from being damaged by smoke.

2.3 FOUNDATIONS, BASES, AND SUPPORTS

A. Basic Requirements:

1. Furnish and install foundations, bases, and supports (not specifically indicated on the Drawings or in the Specifications of either the General Construction or Mechanical work as provided by another Contractor) for mechanical equipment.
2. All concrete foundations, bases and supports, shall be reinforced. All steel bases and supports shall receive a prime coat of zinc chromate or red metal primer. After completion of work, give steel supports a final coat of gray enamel.

B. Equipment Roof Support (Curbs):

1. Rooftop equipment such as packaged air handling units, roof hoods and rooftop exhaust fans shall be provided with curbs by the unit manufacturer.
2. Where not furnished with rooftop equipment, provide prefabricated full perimeter curb as follows:
 - a. 12" high above the top surface of the roof (not the roof structure).
 - b. 14 or 18 gauge galvanized sheet metal, as required for the equipment weight.
 - c. Internal reinforcing.
 - d. 2" x 4" pressure treated wood nailer.
 - e. 18 gauge counter flashing completely covering nailer.
 - f. Factory insulated with rigid fiberglass.
3. Match units to the building roof with either a raised cant to match roof insulation (for built-up roofs), or with no cant (for single-ply roofs).
4. Where legs of equipment rest on rails, provide 1/4" bent plates 18" long.
5. Acceptable Manufacturers: Thy, Pate, United, Roof Products Systems or Portals Plus.
6. Equipment requiring curbs is as follows:
 - a. Condensing Units

C. Roof Pipe Supports:

1. Provide pre-fabricated roof pipe supports for all piping installed on the roof.
2. Support shall guide and align pipe while permitting longitudinal expansion.
3. The base shall be rounded to prevent damage to the roof, and drainage holes shall prevent ponding of water in the support.
4. Support shall be UV resistant and corrosion resistant.
5. Acceptable Products: Miro Industries 1.5, 3-R, 4-R or 5-R to match pipe, B-Line Dura-Blok, Erico Caddy Pyramid 50, 150, 300, or 600 to match load.

D. Supports:

1. Provide sufficient clips, inserts, hangers, racks, rods, and auxiliary steel to securely support all suspended material, equipment and conduit without sag.

2. Hang heavy equipment from concrete floors or ceilings with Architect-approved concrete inserts, furnished and installed by the Contractor whose work requires them, except where indicated otherwise.
- E. Grout:
1. Grout shall be non-shrinking premixed (Master Builders Company "Embecco"), unless otherwise indicated on the drawings or approved by the Architect/Engineer.
 2. Use Mix No. 1 for clearances of 1" or less, and Mix No. 2 for all larger clearances.
 3. Grout under equipment bases, around pipes, at pipe sleeves, etc., and where shown on the drawings.

2.4 **OPENINGS IN FLOORS, WALLS AND CEILINGS**

- A. Exact locations of all openings for the installation of materials shall be determined by the Contractor and given to the General Contractor for installation or construction as the structure is built.
- B. Coordinate all openings with other Contractors.
- C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.
- D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at his expense.
- E. Do not cut structural members without written approval of the Architect or Structural Engineer.

2.5 **ROOF PENETRATIONS**

- A. Seal pipes with surface temperature below 150°F penetrating single-ply roofs with conical stepped pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots. Material shall match roofing membrane.
- B. Break insulation only at the clamp for pipes between 60°F and 150°F. Seal outdoor insulation edges watertight.

2.6 **PIPE SLEEVES AND LINTELS**

- A. Each Contractor shall provide pipe sleeves and lintels for all openings required for the Contractor's work in masonry walls and floors, unless specifically shown as being by others.
- B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings. Provide continuous sleeve. Cut or split sleeves are not acceptable.
- C. Fabricate all lintels from structural steel shapes or as indicated on the drawings. Have all lintels approved by the Architect or Structural Engineer.
- D. Sleeves shall not penetrate structural members without approval from the Structural Engineer. Sleeves shall then comply with the Engineer's design.

- E. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.
- F. Size sleeves large enough to allow expansion and contraction movement. Provide continuous insulation wrapping.

2.7 ESCUTCHEON PLATES AND TRIM

- A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.
- B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.
- C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes pipe openings.

2.8 PIPE PENETRATIONS

- A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.
- B. Seal fire rated wall and floor penetrations with fire seal system as specified.

2.9 PIPE ANCHORS

- A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.
- B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

2.10 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 HVAC SUPPORTS AND ANCHORS

- A. Install all items per manufacturer's instructions.
- B. Install roof pipe supports to resist wind movement per manufacturer's recommendations. Method of securing base to roof shall be compatible with roofing materials.
- C. Support all piping and equipment, including valves, strainers, traps and other specialties and accessories to avoid objectionable or excessive stress, deflection, swaying, sagging or vibration in the piping or building structure during erection, cleaning, testing and normal operation of the systems.
- D. Do not, however, restrain piping to cause it to snake or buckle between supports or to prevent proper movement due to expansion and contraction.
- E. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.

- F. Piping shall not introduce strains or distortion to connected equipment.
- G. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
- H. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
- I. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
- J. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.
- K. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.
- L. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
- M. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.
- N. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:
 - 1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
 - 2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:
 - a. The hanger is attached within 6" from a web/chord joint.
 - b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.
 - 3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
 - 4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.
- O. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- P. Do not exceed the manufacturer's recommended maximum load for any hanger or support.
- Q. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
- R. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

- S. Spacing of Hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:

	<u>Pipe Material</u>	<u>Maximum Spacing</u>
1.	Hard Drawn Copper & Brass (Liquid Service):	
	3/4" and under	5'-0"
	1"	6'-0"
	1-1/4"	7'-0"
	1-1/2"	8'-0"
	2"	8'-0"
	2-1/2"	9'-0"
	3"	10'-0"
	4"	12'-0"
	6"	12'-0"
2.	Hard Drawn Copper & Brass (Vapor Service):	
	3/4" & under	7'-0"
	1"	8'-0"
	1-1/4"	9'-0"
	1-1/2"	10'-0"
	2"	11'-0"
	2-1/2" & larger	12'-0"
3.	Installation of hangers shall conform to MSS SP-69, MSS SP-89 and the applicable Plumbing Code.	

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Vibration Isolation.

PART 2 - PRODUCTS

2.1 BASIC CONSTRUCTION AND REQUIREMENT

- A. All neoprene shall have UV resistance sufficient for 20 years of outdoor service.

2.2 MOUNTINGS

- A. Type M1:
 - 1. 0.75" thick waffled neoprene pad with minimum static deflection of 0.07" at calculated load and 0.11" at maximum load.
 - 2. Units need not be bolted down unless called for or needed to prevent movement. If bolted down, prevent short circuiting with neoprene bushings and washers between bolts and isolators.
 - 3. Acceptable Manufacturers: Mason "Super W", Kinetics "NGS", Amber/Booth "SPNR", Vibration Eliminator Co. "400N".

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install all products per manufacturer's recommendations.
- B. Provide vibration isolation as indicated on the drawings and as described herein.
- C. Clean the surface below all mountings that are not bolted down and apply adhesive cement equal to Mason Type WG between mounting and floor. If movement occurs, bolt mountings down. Isolate bolts from baseplates with neoprene washers and bushings.
- D. Support equipment to be mounted on structural steel frames with isolators under the frames or under brackets welded to the frames. Where frames are not needed, fasten isolators directly to the equipment.

3.2 PIPE ISOLATION

- A. Provide sufficient piping flexibility for vibrating refrigerant equipment, or furnish flexible connectors with appropriate temperature and pressure ratings.
- B. Vibration isolators shall not cause any change in position of piping that will result in stresses in connections or misalignment of shafts or bearings. Equipment and piping shall be maintained in a

rigid position during installation. Do not transfer load to the isolators until the installation is complete and under full operational load.

- C. Support piping to prevent extension of flexible connectors.

3.3 VIBRATION ISOLATION SCHEDULE

EQUIPMENT DESIGNATION	BASE TYPE	ISOLATOR TYPE	STATIC DEFLECTION	FLEXIBLE CONNECTIONS
Condensing Unit (roof mounted)	NA	M1	NA	NA
Air Cooled Condenser (roof mounted)	NA	M1	NA	NA
Floor Mounted CRU	NA	M1	NA	NA

VIBRATION ISOLATION SUBMITTAL FORM											
COLUMN 1	2	3	4	5	6	7	8	9	10	11	12
ITEM SERVED	MIN DEFL (")	PROPOSED ISOLATOR							CALCULATIONS		
		TAG	MODEL	MAX LOAD (#)	DEFL @ MAX LOAD (")	DEFL TO SOLID (")	FREE HT (")	Kx/Ky	LOAD (#)	DEFL (")	DEFL RATIO

COLUMN NOTES: Note numbers correspond to the column numbers above.

1. Item served should match designation on the design drawings.
2. List the deflection scheduled or specified in the design documents.
3. List the designation for this isolator. This is most useful when one item has multiple different isolators to support its weight.
4. List the manufacturer's complete model designation for the isolator.
5. List the manufacturer's maximum rated load for the isolator.
6. List the isolator deflection at the maximum rated load in column 5.
7. For spring isolators list the deflection when the springs are solid. This is not normally the same entry as in column 6.
8. List the height of the isolator when unloaded. Shop drawings must show where this is measured.
9. List the rated horizontal to vertical stiffness ratio. This must be between 0.8 and 2.0.
10. List the calculated equipment load on each isolator. For items with unequal weight distribution, calculate each isolator separately.
11. List the calculated deflection under the calculated load. For springs this will be column 10*(column 6 / column 5).
12. List the answer from dividing column 7 by column 11. This must be at least 1.5. If not, select an isolator with more nominal deflection.

GENERAL NOTES:

1. When submitting hangers or supports for a weight range, fill in two rows - one for the maximum and one for the minimum weight.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Identification of products installed under Division 23.

1.2 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.
- B. ASTM B-1, B-3, and B-8 for copper conductors.
- C. ASTM D-1248 for Polyethylene Extrusion Materials, ICEA S-70-547 Weatherproof Resistant Polyethylene Conductors, ICEA S-61-402/NEMA WC5 Thermoplastic Insulated Wire & Cable, ICEA S-95-658/NEMA WC70 Non-Shielded 0 – 2kv Cables.
- D. UL 1581 Standard for Electrical Wires, Cables, and Flexible Cords.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. 3M, Bunting, Calpico, Craftmark, Emedco, Kolbi Industries, Seton, W.H. Brady, Marking Services.

2.2 MATERIALS

- A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

<u>O.D. of Pipe or insulation</u>	<u>Marker Length</u>	<u>Size of Letters</u>
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"

Plastic tags may be used for outside diameters under 3/4".

- B. Plastic Nameplates: Laminated three-layer phenolic with engraved black, 1/4" minimum letters on light contrasting background.
- C. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.
- D. Plastic Tags: Minimum 1-1/2" square or round laminated three-layer phenolic with engraved, 1/4" minimum black letters on light contrasting background.
- E. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.
- F. Plastic Pipe Markers: Semi-rigid plastic, preformed to fit around pipe or pipe covering; indicating flow direction and fluid conveyed.

- G. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.
- H. Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape 6" wide by 3.5 mils thick, manufactured for direct burial, with aluminum foil core for location by non-ferric metal detectors and bold lettering identifying buried item.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all products per manufacturer's recommendations.
- B. Degrease and clean surfaces to receive adhesive for identification materials.
- C. Pipe Markers:
 - 1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.
 - 2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.
 - 3. Apply markers and arrows in the following locations where clearly visible:
 - a. At each valve.
 - b. On both sides of walls that pipes penetrate.
 - c. At least every 20 feet along all pipes.
 - d. On each riser and each leg of each "T" joint.
 - e. At least once in every room and each story traversed.
 - 4. Underground Pipe Markers: Install 8" to 10" below grade, directly above buried pipes.
- D. Equipment:
 - 1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function such as air handling units, exhaust fans, filters, reheat coils, dampers, etc.; shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.
 - 2. Fasten nameplates or plastic tags with stainless steel self-tapping screws or permanently bonding cement.
- E. Miscellaneous:
 - 1. Attach self-adhesive vinyl labels at all duct access doors used to reset fusible links or actuators on fire, fire/smoke, or smoke dampers. Lettering shall be a minimum of 1/2" high. Labels shall indicate damper type.
 - 2. Provide engraved plastic tags at all hydronic or steam system make-up water meters.

3.2 **SCHEDULE**

A. Pipes to be marked:

<u>Pipe Service</u>	<u>Lettering Color</u>	<u>Background Color</u>
Pumped Condensate	Black	Yellow
Natural Gas	Black	Yellow
All Underground Pipes	Varies	Varies
Refrigerant (Liquid or Suction)	Black	Yellow

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping Insulation.
- B. Insulation Jackets.

1.2 REFERENCES

- A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- B. ANSI/ASTM C534 - Elastomeric Foam Insulation.
- C. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- D. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.
- E. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.
- F. ASTM E84 - Surface Burning Characteristics of Building Materials.
- G. NFPA 255 - Surface Burning Characteristics of Building Materials.
- H. UL 723 - Surface Burning Characteristics of Building Materials.
- I. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

1.3 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping insulation application with five years minimum experience.
- B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723 (where required).

PART 2 - PRODUCTS

2.1 INSULATION

- A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75°F; non-combustible. All purpose, white kraft jacket bonded to aluminum foil and reinforced with fiberglass yarn, 25/50 flame spread/smoke developed rating.
- B. Type B: Elastomeric cellular foam; ANSI/ASTM C534; flexible plastic; 0.27 maximum 'K' value at 75°F, 25/50 flame spread/smoke developed rating. Maximum 3/4" thick per layer where multiple layers are specified.
- C. Type C: Molded rigid cellular glass; ANSI/ASTM C-552; 0.35 maximum 'K' value at 75°F; moisture resistant, non-combustible; suitable for -100°F to +900°F. For below grade installations

use asphaltic mastic paper vapor barrier jacket. Use self-seal all-purpose white kraft jacket for above grade installations.

2.2 VAPOR BARRIER JACKETS

- A. Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

2.3 JACKET COVERINGS

- A. Plastic Jackets and Fitting Covers: High impact, glossy white, 0.030" thick, self-extinguishing plastic. Suitable for use indoors or outdoors with ultraviolet inhibitors. Suitable for -40°F to 150°F. 25/50 maximum flame spread/smoke developed.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

3.2 INSTALLATION

- A. Install materials per manufacturer's instructions, building codes and industry standards.
- B. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.
- C. On exposed piping, locate and cover seams in least visible locations.
- D. On insulated piping operating below 60°F, insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
- E. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a 180° cylindrical segment the same length as metal shields. Inserts shall be cellular glass with a minimum compressive strength of 50 psi. Factory fabricated inserts may be used. Rectangular blocks, plugs, or wood material are not acceptable. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor.
- F. Neatly finish insulation at supports, protrusions, and interruptions.
- G. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.

H. Shields shall be at least the following lengths and gauges:

	<u>Pipe Size</u>	<u>Shield Size</u>
1.	1/2" to 3-1/2"	12" long x 18 gauge

3.3 INSULATION

A. Type A Insulation:

1. All Service Jackets: Seal all longitudinal joints with self-seal laps using a single pressure sensitive adhesive system. Do not staple.
2. Insulation without self-seal lap may be used if installed with Benjamin Foster 85-20 or equivalent Chicago Mastic, 3M or Childers lap adhesive.
3. Apply insulation with laps on top of pipe.
4. Fittings, Valve Bodies and Flanges: For 4" and smaller pipes, insulate with 1 lb. density insulation wrapped under compression to a thickness equal to the adjacent pipe insulation. For pipes over 4", use mitered segments of pipe insulation. Finish with preformed plastic fitting covers. Secure fitting covers with pressure sensitive tape at each end. Overlap tape at least 2" on itself. For pipes operating below 60°F, seal fitting covers with vapor retarder mastic in addition to tape.

B. Type B Insulation:

1. Elastomeric Cellular Foam: Where possible, slip insulation over the open end of pipe without slitting. Seal all butt ends, longitudinal seams, and fittings with adhesive. At elbows and tees, use mitered connections. Do not compress or crush insulation at cemented joints. Joints shall be sealed completely and not pucker or wrinkle. Paint the outside of outdoor insulation with two coats of latex enamel paint recommended by the manufacturer.
2. Self-seal insulation may be used on pipes operating below 170°F.

C. Type C Insulation:

1. Seal all longitudinal joints with manufacturer approved adhesive. Secure butt joint strips in a similar manner.
2. Insulate fittings with prefabricated fittings.

3.4 JACKET COVER INSTALLATION

A. Plastic Covering:

1. Provide vapor barrier as specified for insulation type. Cover with plastic jacket covering. Position seams to shed water.
2. Solvent weld all joints with manufacturer recommended cement.
3. Overlap all laps and butt joints 1-1/2" minimum. Repair any loose ends that do not seal securely. Solvent weld all fitting covers in the same manner. Final installation shall be watertight.

4. Use plastic insulation covering on all exposed pipes including, but not limited to:
 - a. All exposed piping in areas noted on drawings.
 - b. All exposed piping below 8'-0" above floor.
5. Elastomeric piping insulation may have two coats of latex paint instead of plastic jacket.
6. Use colored plastic covering on the following pipes:
 - a. All exterior piping.

3.5 SCHEDULE

Piping System	Insulation Type/Thickness
A. Condensate	A / 1-1/2"
B. Refrig. Suction Lines (25°F & Above)	
Up to 1-1/2"	B / 1-1/2"
1-1/2" and above	B / 1-1/2" (2 layers of 3/4")
C. Insulation Inserts at hangers	C - Match pipe insulation thickness

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe and Pipe Fittings.
- B. Valves.
- C. Natural Gas Piping System.

1.2 REFERENCES

- A. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- B. ANSI/ASME B16.9 - Factory-Made Wrought Steel Butt Welding Fittings.
- C. ANSI/ASME B31.3 - Chemical Plant and Petroleum Refinery Piping.
- D. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.
- E. ANSI/AWS D1.1 - Structural Welding Code.
- F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- G. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- H. NFPA 54 - National Fuel Gas Code.
- I. NFPA 58 - Storage and Handling of Liquefied Petroleum Gases.

1.3 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 NATURAL GAS (0 TO 125 PSI)

- A. Design Pressure: 125 psi.
Maximum Design Temperature: 350°F

- B. Piping – 2” and Under:
 - 1. Pipe: Standard weight steel, threaded and coupled, ASTM A53.
 - 2. Joints: Screwed. (NOTE: For below ground, all sizes to have welded joints.).
 - 3. Fittings: 150# steam – 300# CWP, black malleable iron, banded, ASTM A197, ANSI B16.3.
 - 4. Unions: 250# - 500# CWP, black malleable iron, ANSI B16.39, ground joint with brass seat.
- C. For Underground Gas Piping - Refer to paragraph “Underground Piping Protection.”
- D. Shut-Off Valves/Throttling Valves:
 - 1. BA-13: 2” and under, threaded 600 psi CWP; UL listed for 250# LP, flammable liquid, heating oil, natural and manufactured gases, 150 psi steam, bronze body and chrome plated brass ball, Teflon seats and packing. Apollo #80-100, Nibco #T580-70-UL or #T585-70-UL, Watts #B-6000.

2.2 DRAIN VALVES

- A. Drain valves shall be shutoff valves as specified for the intended service with added 3/4” male hose thread outlet and cap.

2.3 VALVE CONNECTIONS

- A. Provide all connections to match pipe joints. Valves shall be same size as pipe unless noted otherwise.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install all products per manufacturer’s recommendations.
- B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- C. Remove scale and dirt, on inside and outside, before assembly.
- D. Connect to equipment with flanges or unions.

3.2 TESTING PIPING

- A. Gas Piping:
 - 1. Low Pressure - Up to 1 psi:
 - a. Test piping with 20 psi air pressure. System must hold this pressure without adding additional air for two hours.

2. High Pressure - Above 1 psi:
 - a. Test piping with compressed air at twice the operating gas pressure but at least 20 psi. System must hold this pressure without adding air for two hours.
3. A non-combustible odorant, such as oil of wintergreen, may be added to help locate leaks.

3.3 **CLEANING PIPING**

A. Assembly:

1. Before assembling pipe systems, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer's representative. Blow chips and burrs from machinery or thread cutting operation out of pipe before assembly. Wipe cutting oil from internal and external surfaces.
2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing.
3. Notify the Architect/Engineer's representative before starting any post erection cleaning in sufficient time to allow witnessing the operation. Consult with and obtain approval from the Architect/Engineer's representative with regard to specific procedures and scheduling. Dispose of cleaning and flushing fluids properly.
4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, and be certain all strainer screens are in place.

3.4 **INSTALLATION**

- A. Install piping to allow for expansion and contraction without stressing pipe, joints, or equipment.
- B. Provide clearance for installation of insulation and access to valves and fittings.
- C. Lay all underground piping in trenches. Provide and operate pumping equipment to keep trenches free of water.
- D. For all underground piping, provide a foundation (the layer below the bedding) if the trench bottom is unstable. Lay underground plastic piping on 4" to 6" of sand bedding. When the trench is in rock, lay underground metallic piping on 6" of sand bedding. Provide recessed areas for pipe bells and joints. After joints are made, any misalignment in elevation shall be corrected by tamping sand around the pipe. Backfill with sand in uniform layers not over 6" deep to the spring line of all underground pipes, and carefully compact each layer to 90 percent Standard Proctor density. Backfill with sand up to 6" above pipe for landscaped areas. Remaining backfill may be soil. Under paving and buildings, the remaining backfill shall be sand and compacted to 98 percent Standard Proctor density.
- E. Underground Piping Protection:
 1. Direct buried, uninsulated steel pipe shall have a factory applied external protective coating consisting of two coats with an intermediate layer of 18 mil fibrous glass mat. Coating thickness shall total not less than 3/32". The outer coating shall be further protected by a wrapping of heavy kraft paper. This external protection shall extend and be exposed for a minimum of 1 foot beyond the buried or concealed portion of the pipe.

- a. Acceptable Manufacturers: Pipe Line Service Co., Franklin Park, Illinois, Lithcote Corp., Melrose Park, Illinois
2. As an option, the Contractor may provide factory applied protective coatings consisting of a polyethylene plastic film bonded to the pipe surface by a hot applied thermo-plastic adhesive.
 - a. Acceptable Manufacturer: Republic Steel Corp. "X-Tru-Coat"
3. Exercise care in handling, storing and laying pipe to avoid damaging factory applied coatings. If any damage occurs, repair the coating to a condition equal to the original.
4. Field application of protective coatings to joints, fittings and to any damaged factory applied coatings shall be similar to factory applied coatings specified above and shall be done in strict accordance with recommendations of the supplier of pipe coatings.
5. After completion of the fabrication, laying and field coating of the joints and fittings, but prior to backfilling, inspect the entire line in the presence of the Architect/Engineer's representative with an electronic holiday detector. Any defects in the protective coatings shall be repaired in accordance with requirements for original coatings.
6. Coat flange bolts and nuts in pits and below ground at the time of installation with a corrosion protective coating.

3.5 PIPE ERECTION AND LAYING

- A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be removed from the job immediately.
- B. All pipe, fittings, valves, equipment and accessories shall have factory applied markings, stampings, or nameplates with sufficient data to determine their conformance with specified requirements.
- C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not install any item that is not clean.
- D. Until system is fully operational, all openings in piping and equipment shall be kept closed except when actual work is being performed on that item or system. Closures shall be plugs, caps, blind flanges or other items specifically designed and intended for this purpose.
- E. Run pipes straight and true, parallel to building lines with minimum use of offsets and couplings. Provide only offsets required to provide needed headroom or clearance and to provide needed flexibility in pipe lines.
- F. Make changes in direction of pipes only with fittings or pipe bends. Changes in size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified.
- G. Provide flanges or unions at all final connections to equipment, traps and valves.
- H. Arrange piping and connections so equipment served may be totally removed without disturbing piping beyond final connections and associated shut-off valves.
- I. Use full and double lengths of pipe wherever possible.

- J. Unless otherwise indicated, install all piping, including shut-off valves to equipment at line size with reduction in size being made only at equipment.
- K. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- L. Underground pipe shall be laid in dry trenches maintained free of accumulated water. Provide and operate sufficient pumping equipment to maintain excavations, trenches and pits free of water. Dispose of pumped water so operation areas and other facilities are not flooded. Pipe laying shall follow excavating as closely as possible.
- M. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either a 45° or 90° angle from the horizontal plane for air and gas lines, and from top, bottom or side for liquids.

3.6 DRAINING AND VENTING

- A. Unless otherwise indicated on the drawings, all gas lines, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate and venting.
- B. Maintain accurate grade where pipes pitch or slope for venting and drainage. No pipes shall have pockets due to changes in elevation.
- C. Provide drip legs at low points and at the base of all risers in gas pipes. Drip legs shall be full line size on pipes through 4" and at least 4", but not less than half line size over 4". Drip legs shall be 12" minimum length, capped with a reducer to a drain valve.
- D. Use eccentric reducing fittings on horizontal runs when changing size of pipes for proper drainage and venting. Install gas pipes with bottom of pipe and eccentric reducers in a continuous line; all other liquid lines with top of pipe and eccentric reducers in a continuous line.
- E. Install air vents in accessible locations. If necessary to trap and vent air in a remote location, install an 1/8" pipe from the tapping location to an accessible location and terminate with a venting device.
- F. All vent and drain piping shall be of same materials and construction for the service involved.

3.7 BRANCH CONNECTIONS

- A. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.
- B. All branch piping connections for natural gas shall take off on the top or on the side of the main.

3.8 JOINING OF PIPE

- A. Threaded Joints:
 - 1. Threads shall conform to ANSI B2.1 "Pipe Threads".
 - 2. Ream pipe ends and remove all burrs and chips formed in cutting and threading.
 - 3. Protect plated pipe and valve bodies from wrench marks when making up joints.
 - 4. Apply thread lubricant to male threads with Teflon tape.

B. Welded Joints:

1. Welding of all pipe joints, both as to procedures and qualification of welders, shall be in accordance with Section IX, ASME "Boiler & Pressure Vessel Code" unless mandatory local codes take precedence.
2. Furnish to the Owner's Representative prior to start of work certificates qualifying each welder.
3. The Owner's Representative reserves the right to require qualifying demonstration, at the Contractor's expense, of any welders assigned to the job.
4. Ends of pipe and fittings to be joined by butt welding shall be beveled, cleaned to bare metal and internal diameters aligned before tack welding.
5. Backing rings shall be used for all butt weld joints 3" size and over, and for all sizes where operating pressure is over 200 psig and/or temperature is over 400°F. Backing rings shall be of the material being welded.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe and Pipe Fittings.
- B. Valves.

1.2 REFERENCES

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
- D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- E. ASTM B32 - Standard Specification for Solder Metal.
- F. ASTM B88 - Seamless Copper Water Tube.
- G. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube.

1.3 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.
- B. Welding Materials, Procedures, and Operators: Conform to ASME Section 9, ANSI/AWS D1.1, and applicable state labor regulations.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect piping to prevent entrance of foreign matter into pipe and to prevent exterior corrosion.
- B. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 CONDENSATE

- A. Copper Tubing: DWV drawn temper seamless copper drainage tube, ASTM B306.
 - 1. Fittings: ASME B16.23 cast brass, or ASME B16.29 solder wrought copper.
 - 2. Joints: Solder with Type 95-5 solder. 50-50 solder is not acceptable.

- B. Piping 4" and Under (Contractor's Option):
1. Tubing: DWV drawn temper seamless copper drainage tube, ASTM B306
 2. Joints: Mechanical press connection.
 3. Fittings: Copper, ANSI B-16.22, with embedded EPDM o-ring, NSF-61.
 4. Acceptable Manufacturers: Viega.
- C. Shut-Off Valves:
1. Ball Valves:
 - a. BA-1: 3" and under, 125 psi saturated steam, 600 psi WOG, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-206 BR1-R, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

NOTES:

- 1) Provide extended shaft for all valves in insulated piping.
- 2) Provide lock out trim for all valves opening to atmosphere installed in condensate. Solid extended shaft is not required on valves with lock out trim.

2.2 CONNECTIONS BETWEEN DISSIMILAR METALS

- A. Connections between dissimilar metals shall be insulating dielectric types that allow no metal path for electron transfer and that provide a water gap between the connected metals.
- B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.
- C. Aluminum, iron, steel, brass, copper, bronze and stainless steel are commonly used and require isolation from each other with the following exceptions:
1. Iron, steel, and stainless steel connected to each other.
 2. Brass, copper, and bronze connected to each other.
 3. Brass or bronze valves and specialties connected to steel or iron in closed systems. Where two brass items occur together, they shall be connected with brass nipples.
 4. Brass or bronze valves or specialties under 3/4" size connected to steel, iron, or stainless steel.
- D. Dielectric protection is required at connections to equipment of a material different than the piping.
- E. Screwed Joints (acceptable up to 2" size):
1. Dielectric union rated for 125 psi CWP and 250°F.

2. Where a sweat-to-screw union is used, the union shall be soldered onto the copper pipe prior to screwing the union onto opposing pipe material.
 3. Install dielectric unions per manufacturer's recommendations.
 4. Acceptable Manufacturers: HCI Terminator U, Central Plastics, Wilkins DUX-HT, Watts.
- F. Flanged Joints (any size):
1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.
 2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.
 3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.
 4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.
 5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.
 6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator, F. H. Maloney, or Calpico.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends, remove burrs, bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Connect to all equipment with flanges or unions.
- D. After completion, fill, clean, and treat systems. Refer to Section 23 25 00 for treatment.

3.2 TESTING PIPING

- A. Condensate:
 1. Test pipes underground or in chases and walls before piping is concealed.
 2. Complete testing before insulation is applied. If insulation is applied before pipe is tested and a leak ruins the insulation, replace all damaged insulation.
 3. Test the pipe with 100 psig water pressure. Hold pressure for at least two hours.
 4. Test to be witnessed by the Architect/Engineer or their representative, if requested by the Architect/Engineer.

3.3 **CLEANING PIPING**

A. Assembly:

1. Prior to assembly of pipe and piping components, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer. Blow chips and burrs out of pipe before assembly. Wipe cutting oil from internal and external surfaces.
2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing to the degree consistent with good piping practices.
3. Notify the Architect/Engineer prior to starting any post erection cleaning operation in time to allow witnessing the operation. Properly dispose of cleaning and flushing fluids.
4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, control valves, and balance valves, and verify all strainer screens are in place.

3.4 **INSTALLATION**

- A. Route piping in orderly manner, straight, plumb, with consistent pitch, parallel to building structure, with minimum use of offsets and couplings. Provide only offsets required for needed headroom or clearance and needed flexibility in pipe system.
- B. Install piping to conserve building space, and not interfere with other work.
- C. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment plus its required clearance space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance for installation of insulation, and access to valves and fittings.
- G. Provide shut-off valves and flanges or unions at all connections to equipment, traps, and items that require servicing.
- H. Arrange piping and piping connections so equipment may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- I. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it. Where pipe sizes are not shown, the larger size in either direction shall continue through the fitting nearest to the indication of a smaller pipe size.
- J. Provide flanges or unions at all final connections to equipment, traps and valves.
- K. Branch take-offs shall be from the side of piping.

3.5 PIPE ERECTION AND LAYING

- A. Carefully inspect all pipe, fittings, valves, equipment and accessories prior to installation. Immediately reject and remove from the job any items which are unsuitable, cracked or otherwise defective.
- B. All pipe, fittings, valves, equipment and accessories shall have factory-applied markings, stampings, or nameplates sufficient to determine their conformance with specified requirements.
- C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any unclean item.
- D. During construction, until system is fully operational, keep all openings in piping and equipment closed at all times except when actual work is being performed on that item. Closures shall be plugs, caps, blind flanges or other items designed for this purpose.
- E. Change direction of pipes only with fittings or pipe bends. Change size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. **All fittings shall be long radius type**, unless otherwise shown on the drawings or specified. Construct welded elbows of angles not available as standard fittings by cutting and welding standard elbows to form smooth, long radius fittings.
- F. Use full and double lengths of pipe wherever possible.
- G. Unless otherwise indicated, install all inlet and outlet piping, including shut-off valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or pump.
- H. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- I. Do not create, even temporarily, undue loads, forces or strains on valves, equipment or building elements.

3.6 DRAINING AND VENTING

- A. Unless otherwise indicated on the drawings, all horizontal pipes, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate, and venting.
- B. Provide drain valves at all low points of water piping systems or where indicated on drawings for complete or sectionalized draining. Drain valves are defined above.
- C. Use eccentric reducing fittings on horizontal runs when changing size for proper drainage and venting. Install all liquid lines with top of pipe and eccentric reducers in a continuous line.

3.7 JOINING OF PIPE

- A. Solder Joints:
 - 1. Make up joints with 95% tin and 5% antimony (95-5) solder conforming to ASTM B32 Grade 95TA. Cut copper tubing ends perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but sparingly, to all surfaces to be joined. Heat joints uniformly to proper soldering temperature so solder flows to all mated surfaces. Wipe excess solder, leaving a uniform fillet around cup of fitting.

2. Flux shall be non-acid type conforming to ASTM B813.
3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470°F melting point solder. Remove composition discs and all seals during soldering if not suitable for 470°F.

B. Mechanical Press Connection:

1. Copper press fitting shall be made in accordance with the manufacturer's installation instructions.
2. Fully insert tubing into the fitting and mark tubing.
3. Prior to making connection, the fitting alignment shall be checked against the mark made on the tube to ensure the tubing is fully engaged in the fitting.
4. Joint shall be pressed with a tool approved by the manufacturer.

END OF SECTION

REFRIGERATION PIPING AND SPECIALTIES
SECTION 23 23 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping and Pipe Fittings

1.2 REFERENCES

- A. ANSI/ASME SEC 8D - Boilers and Pressure Vessels Code, Rules for Construction of Pressure Vessels.
- B. ANSI/ASME SEC 9 - Boilers and Pressure Vessels Code, Welding and Brazing Qualifications.
- C. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- D. ANSI/ASME B31.5 - Refrigeration Piping.
- E. ANSI/ASTM B32 - Solder Metal.
- F. ANSI/ASTM B88 - Seamless Copper Water Tube.
- G. ANSI/AWS A5.8 - Brazing Filler Metal.
- H. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

1.3 QUALITY ASSURANCE

- A. Remanufactured specialties are not acceptable.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties in shipping containers with labels in place.
- B. Protect piping and specialties from entry of foreign material by leaving caps and plugs in place until installation.

PART 2 - PRODUCTS

2.1 PIPING

- A. Design Pressure: 450 psig.
 - 1. Maximum Design Temperature: 250°F.
- B. Piping - 4" and under.
 - 1. Tubing: Type ACR hard drawn seamless copper tube, ASTM B280. Sizes indicated are nominal designation.
 - 2. Joints: Brazed with silver solder.

3. Fittings: Wrought copper solder joint, ANSI B16.22.
4. Special Requirements: All tubing shall be cleaned, dehydrated, pressurized with dry nitrogen, plugged and tagged by manufacturer "for refrigeration service". During brazing operations, continuously purge the interior of the pipe with nitrogen to prevent oxide formation.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.

3.2 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment.
- F. Group piping whenever practical at common elevations and locations. Slope piping 1% in direction of oil return.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Provide access doors for concealed valves and specialties.
- J. Where pipe support members are welded to structural building frame, brush clean, and apply zinc rich primer to welding.
- K. Insulate piping per Section 23 07 19.
- L. Install flexible connectors parallel to the shafts of compressors.
- M. Fully charge system with refrigerant after testing.

3.3 PIPE ERECTION AND LAYING

- A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be rejected and removed from the job immediately.

- B. All pipe, fittings, valves, equipment and accessories shall have factory applied identification sufficient to determine their conformance with specified requirements.
- C. Exercise care at all times to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.
- D. During construction, until system is fully operational, keep all openings in piping and equipment closed except when actual work is being performed on that item or system. Closures shall be plugs, caps, blind flanges or other items designed for this purpose.
- E. Change direction of pipes only with fittings or pipe bends. Change size only with fittings.
- F. Cut all pipe to exact measurement and install without springing or forcing.

3.4 **FIELD QUALITY CONTROL**

- A. Test piping system with nitrogen at 300 psig for at least 8 hours without loss of pressure.
- B. During the 8 hour period under the test pressure, strike all soldered joints sharply with a rubber or rawhide mallet to cause failure of all weak joints.
- C. After pressure testing, evacuate all refrigerant piping to at least 28" of mercury for 24 hours without loss of vacuum. Evacuate at an ambient temperature of 70°F or higher.

END OF SECTION

COMPUTER ROOM AIR CONDITIONING UNITS
SECTION 23 81 21

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Package Computer Room Air Conditioning Wall Mounted Units.
- B. Package Computer Room Air Conditioning Floor Mounted Units.

1.2 REFERENCES

- A. ANSI NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- B. ANSI/ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality.
- C. ANSI/ASHRAE 90.1 - 07 - Energy Standard for Buildings Except for Low-Rise Residential Buildings.
- D. ANSI/ASME - Boilers and Pressure Vessels Code.
- E. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- F. ASHRAE 52 - Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
- G. FS TT-C-490 - Cleaning Method and Pretreatment of Ferrous Surfaces for Organic Coatings.
- H. UL - Underwriters' Laboratories.

1.3 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A for the installation of computer room air conditioning units.
- B. Conform to ASHRAE 90.1 - 07.

1.4 SUBMITTALS

- A. Submit shop drawings under provisions of Section 23 05 00.
- B. Indicate water, drain, electrical and refrigeration rough-in connections on shop drawings or product data.
- C. Submit manufacturer's installation instructions.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.6 WARRANTY

- A. Provide five (5) year manufacturer's warranty on all compressors.

PART 2 - PRODUCTS

2.1 COMPUTER ROOM AIR CONDITIONING WALL MOUNTED UNITS

A. Acceptable Manufacturers:

- 1. Mitsubishi
- 2. Daikin
- 3. Sanyo

B. Manufactured Units:

- 1. Provide packaged, air cooled, factory assembled, pre-wired and pre-piped unit, consisting of cabinet, fans, filters, remote condensing unit, and controls.
- 2. Assemble unit for wall installation with service access required.
- 3. Performance shall be as scheduled on the drawings.

C. Evaporator Cabinet and Frame:

- 1. Cabinet: Heavy gauge galvanized steel or 16 ga. aluminum.

D. Evaporator Fans and Motors:

- 1. Fans: Double inlet, forward curved, direct drive centrifugal fans or plenum fan, statically and dynamically balanced, on steel shaft with self-aligning permanently lubricated bearings.
- 2. Motor: Permanent split capacitor, high efficiency single speed with internal overload protection.

E. Evaporator Coils (Direct Expansion):

- 1. Direct expansion cooling coil of seamless copper tubes expanded into aluminum fins.
- 2. Install a drain pan under each cooling coil meeting requirements as outlined in ASHRAE 62.1. The drain pans shall extend the entire width of each coil, including piping and header if in the air stream. The length shall be as necessary to limit water droplet carryover beyond the drain pan to 0.0044oz per ft² of face area per hour under peak sensible and peak dew point design conditions, considering both latent load and coil face velocity. Pitch drain pans in two directions towards the outlet, with a slope of at least 1/8" per foot.

F. Filters:

- 1. Media: Pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid; enclosed in cardboard frame; 1 inch nominal thickness.

2. Rating: ASHRAE 52; 25-30 percent dust spot efficiency, 90-92 percent weight arrestance; 500 ft/min face velocity.

G. Electrical Panel:

1. Service Connections, Wiring, and Disconnect Requirements: Conform to the National Electrical Code.
2. Disconnect Switch: Non-automatic molded NEMA-3R or NEMA-12 case circuit breaker or non-fused disconnect with lockable handle.

H. Control System:

1. Microprocessor based with wall mounted control enclosure with LCD display and membrane keypad for user interface.
2. Wall mounted control shall display unit status, allow setpoint adjustment, and show alarm conditions.
3. Controls shall allow for:
 - a. Restart after power loss.
 - b. Maintain room temperature and relative humidity setpoints by activation of refrigeration coil.
 - c. Provide internal seven day clock function for set back temperatures.
 - d. User LCD shall provide indication of on/off, fan speed, operating mode, current day/time, and temperature/relative humidity.
 - e. System shall monitor and alarm with audible and visual signal high temperature, low temperature and high humidity. Silence switch shall be available to shut off audible alarm.
4. Provide relay or acceptable alternative for connection of key alarm conditions to building DDC system.

I. Air Cooled Condensing Unit (Remote Mounted):

1. Hermetic or scroll refrigerant compressors with resilient suspension system, oil strainer, sight glass/moisture indicator, internal motor protection, high pressure switch, and crankcase heater.
2. Corrosion resistant cabinet with copper tube aluminum fin coils, direct drive propeller fan with permanently lubricated ball bearings, single phase motors with internal overload protection.
3. Provide pre-charged refrigerant line sets and accessories of sizes needed for installation. Verify lengths of piping required for installation.

- J. Condensate Pump:
1. Packaged unit matched to evaporator unit including float switch, pump, motor assembly, check valve, and reservoir.
 2. Provide alarm to indicate high level reservoir.
 3. Unit shall be powered from evaporator unit with appropriate field connections available.

2.2 COMPUTER ROOM AIR CONDITIONING FLOOR MOUNTED UNITS

- A. Acceptable Manufacturers:
1. Liebert
 2. Stulz Air Technology Systems (SATS)
 3. Canatal
- B. Manufactured Units:
1. Provide packaged, air cooled, factory assembled, pre-wired and pre-piped unit, consisting of cabinet, fans, filters, and controls.
 2. Assemble unit for down-flow air delivery, in draw-through or blow-through configuration.
- C. Cabinet and Frame:
1. Structural Frame: Welded steel suitably braced for rigidity, capable of supporting compressors and other mechanical equipment and fittings, welded tubular steel floor stand with adjustable legs and vibration isolation pads.
 2. Doors and Access Panels: Galvanized steel with polyurethane gaskets, hinges to allow removal of panels, and concealed fastening devices.
 3. Insulation: Thermally and acoustically line cabinet interior with one inch thick, 1.5 lb. glass fiber insulation.
 4. Finish of Exterior Surfaces: powder coated; color by Architect.
- D. Evaporator Fans and Motors:
1. Fans: Backward inclined plenum fan with direct drive motors mounted on rubber-in-shear isolators or double inlet, forward curved centrifugal fans, statically and dynamically balanced, on steel shaft with self-aligning permanently lubricated ball bearings, and V-belt drive.
 2. Motor: Drip-proof, permanently lubricated ball bearing motor with built-in current and overload protection.
 3. Drive: Site tunable electronic inverter drive that enables the adjustment of airflow to site external static pressure or V-belt, cast iron or steel sheaves, dynamically balanced, keyed, variable and adjustable pitch motor sheave, minimum of two matched belts, drive rated minimum 2.0 times nameplate rating of motor.

E. Compressors:

1. Semi-hermetic with suction gas cooled motors, vibration isolators, thermal overloads, oil sight glass, manual reset high pressure switch, suction line strainer, reversible oil pumps, 1750 RPM.
2. Provide with fan speed control to operate a variable speed motor from 10 to 1050 rpm. System shall be complete with transducers, thermostats, and control circuit to sense the highest head pressure of either operating compressor and control the variable speed fan to maintain head pressure. The fan speed control system shall provide positive start-up an operation to -20°F.
3. Compressors shall be individually serviceable without dismantling other components or removing unit from service.

F. Evaporator Coils:

1. Alternate row circuits, direct expansion cooling coils of seamless copper tubes expanded into aluminum fins, in A-frame configuration.
2. Two refrigeration circuits, thermal expansion valve with external equalizer, liquid line solenoid valve, liquid line filter-drier, refrigerant sight glass with moisture indicator, service shut-off valves and charging valves.
3. Install a drain pan under each cooling coil meeting requirements as outlined in ASHRAE 62.1. The drain pans shall extend the entire width of each coil, including piping and header if in the air stream. The length shall be as necessary to limit water droplet carryover beyond the drain pan to 0.0044oz per ft² of face area per hour under peak sensible and peak dew point design conditions, considering both latent load and coil face velocity. Pitch drain pans in two directions towards the outlet, with a slope of at least 1/8" per foot.

G. Condensers:

1. Air Cooled: Air cooled refrigerant condenser consisting of corrosion resistant cabinet, copper tube aluminum fin coils arranged for two circuits, multiple direct drive propeller fans with permanently lubricated ball bearing single phase motors with internal overload protection.

H. Filters:

1. Media: Pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid; enclosed in cardboard frame; 2 inch nominal thickness.
2. Rating: ASHRAE 52; 25-30 percent dust spot efficiency, 90-92 percent weight arrestance; 500 ft/min face velocity, 0.30 inch WG initial resistance, 1.0 inch WG recommended final resistance.

I. Electrical Panel:

1. Service Connections, Wiring, and Disconnect Requirements: Conform to the National Electrical Code.

2. Control Cabinet: NEMA 250; Type 2 enclosure, UL listed, with piano hinged door, grounding lug, combination magnetic starters with overload relays, circuit breakers and cover interlock, and fusible control circuit transformer.
 3. Disconnect Switch: Non-automatic molded case circuit breaker with handle accessible with panel closed and capable of preventing access until switched to "off" position.
- J. Microprocessor Control System:
1. Logic Circuitry: Microprocessor shall continuously monitor operation of process cooling system; continuously digitally display room temperature and room relative humidity, sound alarm on system malfunction and simultaneously display problem. When more than one malfunction occurs, flash fault in sequence with room temperature, remember alarm even when malfunction cleared, and continue to flash fault until reset.
 2. Malfunctions: Power Loss, Loss of Air Flow, Clogged Air Filter, High Room Temperature, Low Room Temperature, High Humidity, Smoke/Fire, Compressor No. 1 - Overload, Compressor No. 1 - Low Pressure, Compressor No. 1 - High Pressure, Compressor No. 2 - Overload, Compressor No. 2 - Low Pressure, Compressor No. 2 - High Pressure, and Supply Fan Overload.
 3. Light Emitting Diodes Display: Control Power On, System On, Dehumidification taking place, Compressor No. 1 operating, Compressor No. 2 operating, Economy Cooling.
 4. Provide push buttons to STOP process cooling system, START process cooling system, SILENCE audible alarm, push-to-test LED indicators, and display room relative humidity.
- K. Condensate Pump:
1. Packaged unit matched to evaporator unit including float switch, pump, motor assembly, check valve, and reservoir.
 2. Provide alarm to indicate high level reservoir.
 3. Unit shall be powered from evaporator unit with appropriate field connections available.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that flooring system is ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.
- B. Verify that proper power supply is available.

3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Coordinate installation of computer room air conditioning units with computer room raised floor installer.

- C. Provide adequate drainage connections for condensate system.
- D. Install condensate pump if required to remove condensate. Discharge to nearest code approved receptor or to a properly vented indirect waste fitting.
- E. Flush all piping before making final connections to units.
- F. Comb all coils to repair bent fins.
- G. Factory authorized service agent who will assist in commissioning the unit shall inspect installation prior to start-up. Submit start-up report with O&M manuals.

END OF SECTION

BASIC ELECTRICAL REQUIREMENTS
SECTION 26 05 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements applicable to all Division 26 Sections. Also refer to Division 1 - General Requirements.
- B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced in each specification section.

1.2 SCOPE OF WORK

- A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Electrical Systems.
- B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make his portion of the Electrical Work a finished and working system.
- C. Description of Systems shall be as follows:
 - 1. Extension of existing electrical power system to and including equipment, motors, devices, etc.
 - 2. Extension of existing grounding system.
 - 3. Wiring of equipment furnished by others.
 - 4. Removal work and/or relocation and reuse of existing systems and equipment.

1.3 WORK SEQUENCE

- A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours are required.
- B. All required power shutdowns shall be coordinated with the Owner at least 48 hours prior. Advanced scheduling is the responsibility of the contractor. Switchovers shall be done one at a time to minimize interruption of owner operations. It is expected that each switchover lasts no more than 8 hours. Owner shall have discretion on when shutdowns may occur.

1.4 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL, AND CONTROL CONTRACTORS

- A. Division of work is the responsibility of the Prime Contractor. Any scope of work described at any location on the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described on the contract documents on bid day. The following division of responsibility is a guideline based on typical industry practice.

B. Definitions:

1. "Mechanical Contractors" refers to the Contractors listed in Division 21/22/23 of this Specification.
2. Motor Power Wiring: The single phase or 3 phase wiring extending from the power source (transformer, panelboard, feeder circuits, etc.) through disconnect switches and motor controllers to, and including the connections to the terminals of the motor.
3. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case, the devices are usually single phase, have "Manual-Off-Auto" provisions, and are usually connected into the motor power wiring through a manual motor starter.
4. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
5. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. When the motor power wiring exceeds 120 volts, a control transformer is usually used to give a control voltage of 120 volts.
6. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring that directly powers or controls a motor used to drive equipment such as fans, pumps, etc. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt), in which case a control transformer shall be furnished as part of the temperature control wiring.
7. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.

C. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractors' responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors, etc. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals approved. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall furnish complete wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. The Electrical Contractor shall establish electrical utility elevations prior to fabrication and installation. The Electrical Contractor shall coordinate utility elevations with other trades. When a conflict arises, priority shall be as follows:
 - a. Lighting Fixtures
 - b. Gravity flow piping, including steam and condensate.

- c. Electrical bus duct.
- d. Sheet metal.
- e. Cable trays, including access space.
- f. Other piping.
- g. Conduits and wireway.

D. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment furnished by the Mechanical Contractor.
2. Assumes all responsibility for miscellaneous items furnished by the Mechanical Contractor that require wiring but are not shown on the electrical drawings or specified in the Electrical Specification. If items such as relays, flow switches, or interlocks are required to make the mechanical system function correctly or are required by the manufacturer, they are the responsibility of the Mechanical Contractor.
3. Assumes all responsibility for Temperature Control wiring, if the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

E. Temperature Control Contractor's or Subcontractor's Responsibility:

1. Wiring of all devices needed to make the Temperature Control System functional.
2. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring is required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Contractor or Subcontractor.
3. Coordinating equipment locations (such as PE's, EP's, relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

F. Electrical Contractor's Responsibility:

1. Furnishes and installs all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor in the Mechanical Drawings or Specifications.
2. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Contractor when such so noted on the Electrical Drawings.
3. Furnishes and installs motor control and temperature control wiring, when noted on the drawings.
4. Furnishes, installs, and connects all relays, etc., for automatic shutdown of certain mechanical equipment (supply fans, exhaust fans, etc.) upon actuation of the Fire Alarm System.
5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.5 QUALITY ASSURANCE

- A. Contractor's Responsibility Prior to Submitting Pricing/Bid Data:
1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guides, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Architect/Engineer any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
 2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Architect/Engineer will be done at the Contractor's risk.
- B. Qualifications:
1. Only products of reputable manufacturers as determined by the Engineer are acceptable.
 2. All Contractors and subcontractors shall employ only workmen who are skilled in their trades. At all times, the number of apprentices at the job site shall be less than or equal to the number of journeymen at the job site.
- C. Compliance with Codes, Laws, Ordinances:
1. Conform to all requirements of the current National Electrical Code and other regulations having jurisdiction over this installation.
 2. If there is a discrepancy between the codes and regulations and these specifications, the Engineer shall determine the method or equipment used.
 3. If the Contractor notes, at the time of bidding, any parts of the drawings or specifications that do not comply with the codes or regulations, he shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, he shall submit with his proposal a separate price to make the system comply with the codes and regulations.
 4. All changes to the system made after the letting of the contract to comply with codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.
 5. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
- D. Permits, Fees, Taxes, Inspections:
1. Procure all applicable permits and licenses.
 2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.

3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.

E. Examination of Drawings:

1. The drawings for the electrical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of raceways so as to best fit the layout of the job.
3. Scaling of the drawings will not be sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either shown on the drawings or called for in the specifications, it shall be included in this contract.
7. The Contractor shall determine quantities and quality of material and equipment required from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater and better quality number shall govern.
8. Where used in electrical documents the word "furnish" shall mean supply for use, the word "install" shall mean connect up complete and ready for operation, and the word "provide" shall mean to supply for use and connect up complete and ready for operation.
9. Any item listed as furnished shall also be installed unless otherwise noted.
10. Any item listed as installed shall also be furnished unless otherwise noted.

F. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing AutoCAD MEP Release 2009 and Revit MEP Release 2011.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.

3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by KJWW.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by KJWW for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by KJWW as to the accuracy or correctness of the information provided. KJWW accepts no responsibility or liability for the Contractor's use of these documents.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any conduit, conductors, wireways, bus duct, fittings, etc.

1.6 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

Referenced Specification	<u>Section</u>	<u>Submittal Item</u>
	26 22 00	Dry Type Transformers
	26 24 16	Panelboards
	26 28 16	Disconnect Switches
	26 32 13	Packaged Engine Generator Systems
	26 36 00	Transfer Switch
	26 43 00	Surge Protection Devices

B. In addition to the provisions of Division 1, the following provisions are required:

1. Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
2. The Contractor shall submit seven (7) copies of each shop drawing for review by the Architect/Engineer BEFORE releasing any equipment for manufacture or shipment.

3. Review and markup air conditioning and ventilating contractor's layout drawings with electrical equipment and conduit routings for coordination.
4. Shop drawings that are larger than 11" x 17" or are plan size layout or erection drawings such as cable tray or busduct drawings, shall be submitted on reproducible media. Submit one reproducible and one print of each drawing or plan. All Contractor approval stamps shall be on the reproducible.
5. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. CONTRACTOR'S APPROVAL STAMP IS REQUIRED ON ALL SUBMITTALS. APPROVAL WILL INDICATE THE CONTRACTOR'S REVIEW of all material and a COMPLETE UNDERSTANDING OF EXACTLY WHAT IS TO BE FURNISHED. Contractor shall clearly mark all deviations from the contract documents on all submittals. IF THE CONTRACTOR DOES NOT MARK DEVIATIONS, THEN THE ITEM SHALL BE REQUIRED TO MEET ALL DRAWING AND SPECIFICATION REQUIREMENTS.
6. Each data sheet shall clearly show at the top of the sheet what General Electrical Equipment Schedule symbol (and applicable variations and subscripts) that data sheet corresponds to.
7. Each data sheet shall show the size, rating, style, finish, material, catalog number, manufacturer name and product photos for each item to ensure compliance with these specifications.
8. Assemble all submittals in sets, such as panelboards, fire alarm, lighting, or motor control. All sets shall be identical and contain an index of the items enclosed with a general topic description on the cover.
9. Bind each set in a manufacturer's folder or inside of a manila file folder.
10. Where more than one model is shown on a manufacturer's sheet, clearly indicate exactly which item and which data is relevant to the work.
11. Where the manufacturer lists multiple part numbers or options on a single data sheet, the part number and options to be used shall be clearly set apart from other part numbers shown on that sheet.
12. Failure to comply with the above shall be reason to resubmit all shop drawings.
13. The Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost to the Owner, for the Engineer to recheck and handle the additional shop drawing submittals.

1.7 **PRODUCT DELIVERY, STORAGE, HANDLING AND MAINTENANCE**

- A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage.
- B. Keep all materials clean, dry and free from damaging environments.
- C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Electrical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling

and moving.

- D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate his/her work with other trades.

1.8 **WARRANTY**

- A. Provide one-year warranty for all fixtures, equipment, materials, and workmanship.
- B. The warranty period for all work in this specification Division shall commence on the date of Substantial Completion or successful system performance whichever occurs later. The warranty may also commence if a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization of the Owner. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.
- C. Warranty requirements extend to correction, without cost to the Owner, of all work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage due to defects or nonconformance with contract documents excluding repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Architect/Engineer.

1.9 **INSURANCE**

- A. This Contractor shall maintain insurance coverage as set forth in Division 1 of these specifications.

1.10 **MATERIAL SUBSTITUTION**

- A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis of design and establishes the quality required.
- B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications, and fit in the allocated space. The Engineer shall make the final determination of whether a product is equivalent.
- C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer via addendum. The Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on his part or on the part of other Contractors whose work is affected.
- D. Voluntary add or deduct prices for alternate materials may be listed on the bid form. These items will not be used in determining the low bidder. This Contractor assumes all costs incurred as a result of using the offered material or equipment on his part or on the part of other Contractors whose work is affected.
- E. All material substitutions requested after the final addendum must be listed as voluntary changes on the bid form.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All items of material having a similar function (e.g., safety switches, panelboards, switchboards, contactors, motor starters, dry type transformers) shall be of the same manufacturer unless specifically stated otherwise on drawings or elsewhere in specifications.

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

- A. Neither the professional activities of the Engineer, nor the presence of the Engineer or his or her employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Engineer and his or her personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Engineer and the Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 ENGINEER OBSERVATION OF WORK

- A. The contractor shall provide seven (7) calendar days notice to the Engineer prior to:
 - 1. Placing fill over underground and underslab utilities.
 - 2. Covering exterior walls, interior partitions and chases.
- B. The Engineer will review the installation and provide a written report noting deficiencies requiring correction. The contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

3.3 PROJECT CLOSEOUT

- A. The following paragraphs supplement the requirements of Division 1.
- B. Final Jobsite Observation:
 - 1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor shall review the completion status of the project and certify that the job is ready for the final jobsite observation.
 - 2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review. The Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
 - 3. It is understood that if the Engineer finds the job not ready for the final observation and additional trips and observations are required to bring the project to completion, the cost of the additional time and expenses incurred by the Engineers will be deducted from the Contractor's final payment.

- C. The following must be submitted before Architect/Engineer recommends final payment:
1. Operation and maintenance manuals with copies of approved shop drawings.
 2. Record documents including reproducible drawings in AutoCAD and PDF format and specifications.
 3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of this Contractor and shall be signed by the Owner's representatives.
 4. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed and submit receipt to Architect/Engineer.
 5. Inspection and testing report by the fire alarm system manufacturer.
 6. Start-up reports on all equipment requiring a factory installation or start-up.

3.4 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Submit three (3) properly indexed and bound copies, in "D" ring style notebooks, of the Operations and Maintenance Instructions to the Architect/Engineer. Make all corrections or additions required.
- B. Operation and Maintenance Instructions shall include:
1. Notebooks shall be heavy duty locking three ring binders and incorporate clear vinyl sheet sleeves on the front cover and spine for slip-in labeling. "Peel and stick" labels are **not** acceptable. Sheet lifters shall be supplied at the front of each notebook. Provide "Wilson-Jones" or equal, color black. Size notebooks a minimum of 1/2" thicker than material for future inserts. Label the spine and front cover of each notebook. If more than one notebook is required, label in consecutive order. For example; 1 of 2, 2 of 2. No other forms of binding will be acceptable.
 2. Prepare binder covers (front and spine) with printed title "Operation and Maintenance Instructions", title of project, and subject matter of binder when multiple binders are required.
 3. Title page with project title, Architect, Engineer, Contractor, and Subcontractor with addresses, telephone numbers, and contacts.
 4. Table of Contents describing all index tabs.
 5. Listing of all Subcontractors and major equipment suppliers with addresses, telephone numbers, and contacts.
 6. Index tabs dividing information by specification section, major equipment, or systems. All tab titles shall be clearly printed under reinforced plastic tabs. Label all equipment to match the identification in the construction documents.
 7. Copies of warranties.
 8. Copies of all final approved shop drawings and submittals.
 9. Copies of all factory inspection and/or equipment start-up reports.

10. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
11. Dimensional drawings of equipment.
12. Detailed parts lists, each with a list of suppliers.
13. Operating procedures for each system.
14. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
15. Repair procedures for major components.
16. Replacement parts and service material requirements for each system and the frequency of service required.
17. Instruction books, cards, and manuals furnished with the equipment.

3.5 **INSTRUCTING THE OWNER'S REPRESENTATIVE**

- A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of the complete systems installed under this contract.
- B. Provide verbal and written instructions to the Owner's representatives by **FACTORY PERSONNEL** in the care, maintenance, and operation of the equipment and systems.
- C. The Owner has the option to video tape all instructions. Coordinate schedule of instructions to facilitate this recording.
- D. The instructions shall include:
 1. Maintenance of equipment.
 2. Start-up procedures for all major equipment.
 3. Description of emergency system operation.
- E. Notify the Architect/Engineer of the time and place for the verbal instructions to the Owner's representative so his representative can be present if desired.
- F. Minimum hours of instruction time for each item and/or system shall be four (4) hours.
- G. Operating Instructions:
 1. Contractor is responsible for all instructions to the Owner's representatives for the electrical and specialized systems.
 2. If the Contractor does not have staff that can adequately provide the required instructions, he shall include in his bid an adequate amount to reimburse the Owner for the Engineer to perform these services.

3.6 **RECORD DOCUMENTS**

- A. The following paragraphs supplement the requirements of Division 1.
- B. Maintain at the job site a separate and complete set of electrical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

- C. Mark drawings and specifications to indicate approved substitutions; Change Orders, and actual equipment and materials used. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should this Contractor fail to complete Record Documents as required by this contract, this Contractor shall reimburse Architect/Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly rates in effect at the time of work.
- D. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.
- E. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.7 PAINTING

- A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available. All equipment shall have a finished coat of paint applied unless specifically allowed to be provided with a prime coat only.
- B. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, he shall have the equipment and all its supports, hangers, etc., painted to match the room decor. Painting shall be performed as described in project specifications.
- C. Equipment cabinets, casings, covers, metal jackets, etc., located in equipment rooms or concealed spaces, shall be furnished in standard finish, free from scratches, abrasions, chippings, etc.
- D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chipping, etc. If color option is specified or is standard to the unit, verify with the Architect/Engineer his color preference before ordering.
- E. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, and storage rooms. Equipment furnished with a suitable factory finish need not be painted; provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.
- F. After surfaces have been thoroughly cleaned and are free of oil, dirt or other foreign matter, paint exposed raceway and equipment with the following:
 - 1. Bare Metal Surfaces - Apply one coat of metal primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
 - 2. Plastic Surfaces - Paint plastic surfaces with two coats of semi-gloss acrylic latex paint.

3.8 ADJUST AND CLEAN

- A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.
- B. Clean all foreign paint, grease, oil, dirt, labels, stickers, etc. from all equipment.
- C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.9 **SPECIAL REQUIREMENTS**

- A. Coordinate the installation of all equipment, controls, devices, etc., with other trades to maintain clear access area for servicing.
- B. Install all equipment to maximize access to parts needing service or maintenance. Review the final location, placement, and orientation of equipment with the Owner's representative prior to setting equipment.
- C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's representative will result in removal and reinstallation of the equipment at the Contractor's expense.

3.10 **INDOOR AIR QUALITY (IAQ) MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION**

- A. Within the limits of Construction:
 - 1. The Electrical Contractor shall coordinate all work with the contractor responsible for IAQ.
 - 2. The means, methods and materials used by the Electrical Contractor shall be coordinated with the contractor responsible for IAQ and shall comply with the IAQ requirements set forth in Division 1 and Division 21/22/23 of these specifications.
- B. Outside the limits of Construction:
 - 1. IAQ shall be the responsibility of the electrical contractor for work that is required outside the limits of construction.
 - 2. The Electrical Contractor is responsible for the IAQ set forth in Division 1 and Division 21/22/23 of these specifications.
 - 3. The Electrical Contractor shall review and coordinate all IAQ plans and procedures with the owner's IAQ representative.

3.11 **SYSTEM COMMISSIONING**

- A. The electrical systems shall be complete and operating. System start-up, testing, balancing, and satisfactory system performance is the responsibility of the Contractor. This includes all calibration and adjustment of electrical controls, balancing of loads, troubleshooting and verification of software, and final adjustments that may be needed.
- B. All operating conditions and control sequences shall be tested during the start-up period. Testing all interlocks, safety shut-downs, controls, and alarms.
 - 1. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.12 FIELD QUALITY CONTROL

A. General:

1. Conduct all tests required during and after construction.
2. Supply necessary instruments, meters, etc., for the tests. Supply competent technicians with training in the proper testing techniques.
3. All cables and wires shall be tested for shorts and grounds following installation and connection to devices. Replace shorted or grounded wires and cables.
4. Any wiring device, electrical apparatus or lighting fixture, if grounded or shorted on any integral "live" part, shall have all defective parts or materials replaced.
5. Test cable insulation of service and panel feeder conductors for proper insulation values. Tests shall include the cable, all splices, and all terminations. Each conductor shall be tested and shall test free of short circuits and grounds and have an insulation value not less than the National Electrical Code Standards. Take readings between conductors, and between conductors and ground.
6. If the results obtained in the tests are not satisfactory make adjustments, replacements, and changes as needed. Then repeat the tests, and make additional tests, as the Architect/Engineer or authority having jurisdiction deems necessary.

B. Other Equipment:

1. Give other equipment furnished and installed by the Contractor all standard tests normally made to assure that the equipment is electrically sound, all connections properly made, phase rotation correct, fuses and thermal elements suitable for protection against overloads, voltage complies with equipment nameplate rating, and full load amperes are within equipment rating.

C. If any test results are not satisfactory, make adjustments, replacements and changes as needed and repeat the tests and make additional tests as the Architect/Engineer or authority having jurisdiction deem necessary.

D. Upon completion of the project, the Contractor shall provide amperage readings for all panelboards and switchboards and turn the results over to the Owner for "benchmark" amperages.

END OF SECTION

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

In order to prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations of fire-rated construction fire sealed in accordance with specifications.
2. Electrical panels have typed circuit identification.
3. Per Specification Section 26 05 00, cable insulation test results have been submitted.
4. Operation and Maintenance manuals have been submitted as per Specification Section 26 05 00.
5. Bound copies of approved shop drawings have been submitted as per Specification Section 26 05 00.
6. Report of instruction of Owner's representative has been submitted as per Specification Section 26 05 00.
7. Start-up reports from factory representative have been submitted as per Specification Section 26 05 00.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Engineer so that the final observation can be scheduled.

It is understood that if the Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

* * * * *

THROUGH PENETRATION FIRESTOPPING
SECTION 26 05 03

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Through-Penetration Firestopping.

1.2 REFERENCES

- A. UL 723 - Surface Burning Characteristics of Building Materials
- B. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops
- C. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)
- D. Warnock Hersey - Directory of Listed Products
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- F. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops
- G. The Building Officials and Code Administrators National Building Code
- H. 2006 International Building Code
- I. NFPA 5000 – Building Construction Safety Code

1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.
 - 2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings:
 - a. Floor penetrations located outside wall cavities.
 - b. Floor penetrations located outside fire-resistance-rated shaft enclosures.
 - c. Wall penetrations above corridor ceilings which are not part of a fire-resistive assembly.
 - d. Wall penetrations below any ceiling that are larger than 4" diameter or 16 square inches.
 - 3. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft (0.01524cu. m/s x sq. m) at both ambient temperature and 400°F (204°C).

- C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. For through-penetration firestop systems in air plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.4 **QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.
- B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.
- B. Install material prior to expiration of product shelf life.

1.6 **WARRANTY**

- A. Provide one year warranty on parts and labor.
- B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

PART 2 - PRODUCTS

2.1 **MANUFACTURERS**

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers. All firestopping systems installed shall be provided by a single manufacturer.
 1. 3M; Fire Protection Products Division.
 2. Hilti, Inc.
 3. RectorSeal Corporation, Metacaulk.
 4. Tremco; Sealant/Weatherproofing Division.
 5. Johns-Manville.
 6. Specified Technologies Inc. (S.T.I.)
 7. Spec Seal Firestop Products
 8. AD Firebarrier Protection Systems
 9. Wiremold/legrand: FlameStopper

2.2 **THROUGH PENETRATION FIRESTOP SYSTEMS**

- A. Provide materials and systems classified by or listed by Warnock Hersey to provide firestopping equal to time rating of construction being penetrated.
- B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that would require hazardous waste removal.
- C. Firestopping shall be flexible to allow for normal penetrating item movement due to expansion and contraction.
- D. Firestopping systems for plumbing and wet pipe sprinkler piping shall be moisture resistant.
- E. Provide firestopping systems capable of supporting floor loads where systems are exposed to possible floor loading or traffic.
- F. Provide firestopping systems allowing continuous insulation for all insulated pipes.
- G. Provide firestopping systems classified by UL or listed by Warnock Hersey for penetrations through all fire rated construction. Firestopping systems shall be selected from the UL or listed by Warnock Hersey Fire Resistance Directory Category XHEZ based on substrate construction and penetrating item size and material and shall fall within the range of numbers listed:

- 1. Combustible Framed Floors and Chase Walls - 1 or 2 Hour Rated
 F Rating = Floor/Wall Rating
 T Rating = Floor/Wall Rating

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	FC 0000-0999*
Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999
Insulated Pipes	FC 5000-5999
Bus Duct and Misc. Electrical	FC 6000-6999
Duct without Damper and Misc. Mechanical	FC 7000-7999
Multiple Penetrations	FC 8000-8999

- 2. Non-Combustible Framed Walls - 1 or 2 Hour Rated
 F Rating = Wall Rating
 T Rating = 0

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999

3. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated
 F Rating = Wall/Floor Rating
 T Rating (Floors) = Floor Rating

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999

*Alternate method of firestopping is patching opening to match original rated construction.

- H. Any opening in walls or floors not covered by the listed series of numbers shall be coordinated with the firestopping manufacturer.
- I. Any openings in floors or walls not described in the UL or listed by Warnock Hersey Fire Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having Jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form-release agents from concrete.
- B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.
- C. Surfaces to which sealing materials are to be installed must meet the selected UL or Warnock Hersey system substrate criteria.
- D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

3.2 INSTALLATION

- A. In existing construction, provide firestopping of openings prior to and after installation of penetrating items. Remove any existing coatings on surfaces prior to firestopping installation. Temporary firestopping shall consist of packing openings with fire resistant mineral wool for the full thickness of substrate, or an alternate method approved by the Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately upon their installation and shall remain so until the permanent UL or listed by Warnock Hersey listed firestopping system is installed.
- B. Install penetration seal materials in accordance with printed instructions of the UL or Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application instructions.

- C. Install dams as required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Remove combustible damming after appropriate curing.

3.3 **CLEANING AND PROTECTING**

- A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.4 **INSPECTION**

- A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.
- B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.
- C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.

END OF SECTION

**ELECTRICAL DEMOLITION FOR REMODELING
SECTION 26 05 05**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY BOX, CONDUIT, OR WIRE THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS.
- B. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities and equipment that will remain in operation following demolition. Extension of conduit and wire to equipment shall be compatible with the surrounding area.
- C. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.
- D. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and scope of work.

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, structures, and ceilings scheduled for removal.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.
- C. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 **DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A. Demolish and extend existing electrical work under provisions of Division 1 of Specifications and this Section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring and raceway to source of supply.
- D. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- H. Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.
- K. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- L. All penetrations shall be x-rayed prior to cutting and/or drilling to avoid any tension cables or utilities encased in floor construction.
- M. Floor slabs may contain conduit systems. This Contractor is responsible for taking any measures required to ensure no conduits or other services are damaged. This includes x-ray or similar non-destructive means.
- N. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.4 **CLEANING AND REPAIR**

- A. Clean and repair existing materials and equipment that remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. ELECTRICAL ITEMS (E.G., LIGHTING FIXTURES, RECEPTACLES, SWITCHES, CONDUIT, WIRE, ETC.) REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF MATERIAL THE OWNER DOES NOT WANT.

3.5 **INSTALLATION**

- A. Install relocated materials and equipment under the provisions of Division 1 of Specifications.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building wire
- B. Cable
- C. Wiring connections and terminations

1.2 REFERENCES

- A. NEMA WC 3 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- B. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- C. UL 44 – Thermoset-Insulated Wires and Cables
- D. UL 854 – Service-Entrance Cables

PART 2 - PRODUCTS

2.1 BUILDING WIRE

- A. Thermoplastic-insulated Building Wire: NEMA WC 5.
- B. Rubber-insulated Building Wire: NEMA WC 3.
- C. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt insulation, THHN/THWN.
- D. Feeders and Branch Circuits Larger than 6 AWG in Underground Conduit: Copper, stranded conductor, 600 volt insulation, THWN.
- E. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THHN/THWN. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded conductor, unless otherwise noted on the drawings.

2.2 WIRE FOR SPECIALIZED SYSTEMS

- A. Wire for the following specialized systems shall be as designated on the drawings, or elsewhere in these specifications. If not designated on the drawings or specifications, the system manufacturer's recommendations shall be followed:
 - 1. Electronic Control

2.3 REMOTE CONTROL AND SIGNAL CABLE

- A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 60°C, individual conductors twisted together, shielded, and covered with a PVC jacket.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

- A. Use no wire smaller than 12 AWG for power circuits, and no smaller than 14 AWG for control wiring.
- B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.
- C. The ampacity of multiple conductors in one conduit shall be derated per National Electrical Code, Article 310. In no case shall more than 4 conductors be installed in one conduit to such loads as motors larger than 1/4 HP, panelboards, motor control centers, etc.
- D. Where installing parallel feeders, place an equal number of conductors for each phase of a circuit in same raceway or cable.
- E. Splice only in junction or outlet boxes.
- F. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- G. Make conductor lengths for parallel circuits equal.
- H. All conductors shall be continuous in conduit from last outlet to their termination.

3.2 CONTRACTOR CHANGES

- A. The basis of design is copper conductors installed in raceway based on ambient temperature of 30°C, NEC Table 310.16.
- B. The Contractor shall be responsible for derating and sizing conductors and conduits to equal or exceed the ampacity of the basis of design circuits, if he/she chooses to use methods or materials other than the basis of design.

3.3 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Pulling shall be continuous without unnecessary stops and starts with wire or cable only partially thru raceway.
- D. Where reels of cable or wire are used, they shall be set up on jacks close to the point where the wire or cable enters the conduit or duct so that the cable or wire may be unreeled and run into the conduit or duct with a minimum of change in the direction of the bend.
- E. Cables or wires shall not be laid out on the ground before pulling.
- F. Cables or wires shall not be dragged over earth or paving.
- G. Care shall be taken so as not to subject the cable or wire to high mechanical stresses that would cause damage to the wire and cable.

- H. Conductors shall not be pulled through conduits until plastering or masonry work is completed and conduits are free from moisture. Care shall be taken so that long pulls of wire or pulls around several bends are not made where the wire may be permanently stretched and the insulation damaged.
- I. Only nylon rope shall be permitted to pull cables into conduit and ducts.
- J. At least six (6) inch loops or ends shall be left at each outlet for installation connection of fixtures or other devices.
- K. All wires in outlet boxes not connected to fixtures or other devices shall be rolled up, spliced if continuity of circuit is required, and insulated.
- L. Completely and thoroughly swab raceway system before installing conductors.

3.4 **CABLE INSTALLATION**

- A. Provide protection for exposed cables where subject to damage.
- B. Use suitable cable fittings and connectors.
- C. Run all open cable in a neat and symmetrical manner. Follow the routing as illustrated on the drawings as closely as possible. If routing is not illustrated then the Contractor shall choose his own routing, but in any case it shall be run in a manner previously stated.
- D. Open cable shall be supported by the appropriate size bridle rings or other means if called for on the drawings. Wire and cable from different systems shall not be installed in the same bridle rings.
- E. Open cable installed above suspended ceilings shall not rest on the suspended ceiling construction, nor utilize the ceiling support system for wire and cable support.
- F. Where open cables are grouped, they shall be neatly bundled and held together with nylon tie wraps placed every 2.5 ft. on the bundle. Where tie bundle passes through a bridle ring it shall be fastened to the ring with a tie wrap.
- G. Bridle ring supports shall be installed at five foot (5') intervals. All rings shall be installed where completely accessible and not blocked by piping, ductwork, inaccessible ceilings, etc.
- H. Open cable shall only be installed where specifically shown on the drawings, or permitted in these specifications.

3.5 **WIRING CONNECTIONS AND TERMINATIONS**

- A. Splice and tap only in accessible junction boxes.
- B. Use solderless, tin-plated copper, compression terminals (lugs) applied with circumferential crimp for copper conductor terminations, 8 AWG and larger.
- C. Use solderless, tin-plated, compression terminals (lugs) applied with indenter crimp for copper conductor terminations, 10 AWG and smaller.
- D. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.

- E. Use copper, compression connectors applied with circumferential crimp for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- F. Thoroughly clean wires before installing lugs and connectors.
- G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- H. Terminate spare conductors with electrical tape, unless otherwise indicated on the drawings.
- I. Phase Sequence: All apparatus shall be connected to operate in the phase sequence A-B-C representing the time sequence in which the phase conductors so identified reach positive maximum voltage.
- J. As a general rule, applicable to switches, circuit breakers, starters, panelboards, switchgear and the like, the connections to phase conductors are intended thus:

Facing the front and operating side of the equipment, the phase identification shall be:

Left to Right - A-B-C
Top to Bottom - A-B-C
- K. Connection revisions as required to achieve correct rotation of motors shall be made at the load terminals of the starters or disconnect switches.

3.6 **FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Division 1.
- B. Cable Testing: Test shall be made by means of an insulation testing device such as a “Megger” using not less than 500 volts D.C. test potential.
- C. Inspect wire and cable for physical damage and proper connection.
- D. Torque test conductor connections and terminations to manufacturer's recommended values.
- E. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.7 **WIRE AND CABLE INSTALLATION SCHEDULE**

- A. Concealed Interior Locations: Building wire in raceways.
- B. Exposed Interior Locations: Building wire in raceways.
- C. Above Accessible Ceilings: Building wire in raceways.
- D. Wet or Damp Interior Locations: Building wire in raceway.
- E. Exterior Locations: Building wire in raceways.

- F. Underground Locations: Building wire in raceways.
- G. Below Accessible Floor: Building wire in raceways.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Power system grounding
- B. Electrical equipment and raceway grounding and bonding

1.2 SUMMARY

- A. This section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section 26 05 13 "Wire and Cable".
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Grounding Electrode Conductors: Stranded cable.
- D. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- E. Sizes and types below are typical. Adjust to suit Project conditions and requirements.
- F. Copper Bonding Conductors: As follows:
 - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
 - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
 - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- G. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.2 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.
- C. Bolted Connectors: Bolted-pressure-type connectors.

PART 3 - EXECUTION

3.1 APPLICATION

- A. In raceways, use insulated equipment grounding conductors.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- D. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- D. Remote control and signaling circuits shall be grounded in accordance with the most recent version of the National Electric Code.

3.3 INSTALLATION

- A. Provide a separate, insulated equipment grounding conductor in feeder, motor, branch, and receptacle circuits. Terminate each end on a grounding lug, bus, or bushing.
- B. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.
- C. Supplementary Grounding Electrode: Use driven ground rod on exterior of building.
- D. Ground Rods: Install at least two rods spaced at least 20 feet from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 12 inches below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- E. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- F. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 2. Make connections with clean, bare metal at points of contact.
 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- F. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 **FIELD QUALITY CONTROL**

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports
- B. Fastening hardware

1.2 COORDINATION

- A. Coordinate size, shape and location of concrete pads with Section on Cast-in-Place Concrete or Concrete Topping.

1.3 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Allied Support Systems
- B. Cooper B-Line
- C. Erico, Inc.
- D. Hilti
- E. Power Fasteners

2.2 MATERIAL

- A. Support Channel: Painted steel for interior/dry locations. All field cut ends shall be touched up with matching finish to inhibit rusting.
- B. Hardware: Corrosion resistant.
- C. Anchorage and Structural Attachment Components:
 - 1. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to Authorities Having Jurisdiction.
 - a. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.
 - 2. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
 - 3. Welding Lugs: Comply with MSS-SP-69, Type 57.

4. Beam clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.
5. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.
6. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.
7. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318-05. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.
8. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors in concrete and beam clamps on structural steel.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- C. Do not fasten supports to ceiling systems, piping, ductwork, mechanical equipment, or conduit, unless otherwise noted.
- D. Do not use powder-actuated anchors without specific permission.
- E. Do not drill structural steel members.
- F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- G. In wet locations and on all building floors below exterior earth grade install free-standing electrical equipment on concrete pads.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

- I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
- J. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- K. Refer to Section 26 05 33 for special conduit supporting requirements.

3.2 **FINISH**

- A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.
- B. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes
- B. Pull and junction boxes
- C. Accessories

1.2 REFERENCES

- A. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
- B. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- D. Federal Specification A-A-50563 – Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical Cast Metal

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, minimum of 14 gauge, with 1/2 inch male fixture studs where required.
- B. Cast Boxes: NEMA FB1, Type FD, Aluminum or cast ferrous alloy, deep type, gasketed cover, threaded hubs.

2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.
- B. Sheet metal boxes larger than 12 inches in any dimension that contain terminations or components: Continuous hinged enclosure with 1/4 turn latch and white back panel for mounting terminal blocks and electrical components.
- C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Cast Metal Boxes for Underground Installations: NEMA 250; Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron box and plain cover with neoprene gasket and stainless steel cover screws.
- E. Flanged type boxes shall be used where installed flush in wall.

PART 3 - EXECUTION

3.1 BOX INSTALLATION SCHEDULE

- A. Galvanized steel boxes may be used in:
 - 1. Concealed interior locations above ceilings and in hollow studded partitions.
 - 2. Exposed interior locations in mechanical rooms and in rooms without ceilings; higher than 8' above the highest platform level.
 - 3. Direct contact with concrete except slab on grade.
- B. Cast boxes shall be used in:
 - 1. Exterior locations.
 - 2. Exposed interior locations within 8' of the highest platform level.
 - 3. Direct contact with earth.
 - 4. Direct contact with concrete in slab on grade.
 - 5. Wet locations.

3.2 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on the Contract Drawings are approximate, unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- C. Locate and install boxes to allow access. Avoid interferences with ductwork, piping, structure, equipment, etc. Where installation is inaccessible, provide access doors. Coordinate locations and sizes of required access doors with the General Contractor.
- D. Locate and install to maintain headroom and to present a neat appearance.

3.3 OUTLET BOX INSTALLATION

- A. The Contractor shall anchor switch and outlet box to wall construction so that it is flush with the finished masonry, paneling, drywall, plaster, etc. The Contractor shall check the boxes as the finish wall surface is being installed to assure that the box is flush. (Provide plaster rings as necessary.)
- B. Mount at heights shown or noted on the drawings or as generally accepted if not specifically noted.
- C. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
- D. Provide knockout closures for unused openings.
- E. Support boxes independently of conduit.

- F. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioned to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- G. Provide cast outlet boxes in exterior locations and wet locations, and where exposed rigid or intermediate conduit is used.

3.4 **PULL AND JUNCTION BOX INSTALLATION**

- A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
- B. Support pull and junction boxes independent of conduit.

3.5 **EXPOSED BOX INSTALLATION**

- A. Boxes shall be secured to the building structure with proper size screws, bolts, hanger rods, or structural steel elements.
- B. On brick, block and concrete walls or ceilings, exposed boxes shall be supported with no less than two (2) Ackerman-Johnson, Paine, Phillips, or approved equal screw anchors or expansion shields and round head machine screws. Cast boxes shall not be drilled.
- C. On steel structures, exposed boxes shall be supported to the steel member by drilling and tapping the member and fastening the boxes by means of round head machine screws.
- D. Boxes may be supported on steel members by APPROVED beam clamps if conduit is supported by beam clamps.
- E. Wood, plastic, or fiber plugs shall not be used for fastenings.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Rigid metallic conduit and fittings
- B. Electrical metallic tubing and fittings
- C. Flexible metallic conduit and fittings
- D. Liquidtight flexible metallic conduit and fittings
- E. Rigid non-metallic conduit and fittings

1.2 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
 - 2. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated and Fittings
 - 3. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
- B. NECA "Standards of Installation"
- C. National Electrical Manufacturers Association (NEMA):
 - 1. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
 - 2. RN 1 – Polyvinyl chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
 - 3. TC 2 – Electrical Polyvinyl Chloride (PVC) Conduit
 - 4. TC 3 – PVC Fittings for use with Rigid PVC Conduit and Tubing
 - 5. TC 6/TC 8 – PVC Plastic Utilities Duct for Underground Installations
 - 6. TC 9 – Fittings for PVC Plastic Utilities Duct for Underground Installation
- D. National Fire Protection Association (NFPA):
 - 1. ANSI/NFPA 70 – National Electrical Code
- E. Underwriters Laboratories (UL): Applicable Listings
 - 1. UL 1 – Flexible Metal Conduit
 - 2. UL 6 – Rigid Metal Conduit
 - 3. UL 6A – Standard for Electrical Rigid Metal Conduit - Aluminum
 - 4. UL 360 – Liquid Tight Flexible Steel Conduit

5. UL514-B – Conduit Tubing and Cable Fittings
6. UL651-A – Type EB and a PVC Conduit and HDPE Conduit
7. UL746A – Standard for Polymeric Materials – Short Term Property Evaluations
8. UL797 – Electrical Metal Tubing

F. Definitions:

1. Fittings: Conduit connection or coupling.
2. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only.
3. Mechanical Spaces: Enclosed areas, usually kept separated from the general public, where the primary use is to house service equipment and to route services. These spaces generally have exposed structures, bare concrete and non-architecturally emphasized finishes.
4. Finished Spaces: Enclosed areas where the primary use is to house personnel and the general public. These spaces generally have architecturally emphasized finishes, ceilings and/or floors.
5. Concealed: Not visible by the general public. Often indicates a location either above the ceiling, in the walls, in or beneath the floor slab, in column coverings, or in the ceiling construction.
6. Above Grade: Not directly in contact with the earth. For example, an interior wall located at an elevation below the finished grade shall be considered above grade but a wall retaining earth shall be considered below grade.
7. Slab: Horizontal pour of concrete used for the purpose of a floor or sub-floor.

1.3 SUBMITTALS

- A. Include conduits 1.5” and larger in coordination files. Include all in--floor and underfloor conduit in coordination files. Refer to Section 26 05 00 for coordination drawing requirements.

PART 2 - PRODUCTS

2.1 RIGID METALLIC CONDUIT (RMC) AND FITTINGS

- A. Acceptable Manufacturers:
1. Acceptable Manufacturers: Allied, LTV, Steelduct, Wheatland Tube Co, O-Z Gedney, or approved equal.
 2. Acceptable Manufacturers of RMC Conduit Fittings: Appleton Electric, O-Z/Gedney Co., Electroline, Raco, Bridgeport, Midwest, Regal, Thomas & Betts, Crouse-Hinds, Killark, or approved equal.
- B. Minimum Size Galvanized Steel: 3/4 inch (19mm), unless otherwise noted.

- C. Fittings and Conduit Bodies:
1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
 2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.
 3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.
 4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. **High impact phenolic threaded type bushings are not acceptable.**
 5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.
- D. PVC Externally Coated Conduit: NEMA RN 1; rigid steel conduit with external 40 mil PVC coating and internal galvanized surface. All fittings and conduit bodies shall be complete with coating. Acceptable Manufacturers: Robroy, Permacote, or approved equal.

2.2 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

- A. Minimum Size Electrical Metallic Tubing: 3/4 inch, unless otherwise noted.
- B. Acceptable Manufacturers of EMT Conduit: Allied, LTV, Steelduct, Wheatland Tube Co, or approved equal.
- C. Fittings and Conduit Bodies:
1. 2" Diameter or Smaller: Compression type of steel designed for their specific application.
 2. Larger than 2": Compression type of steel designed for their specific application.
 3. Acceptable Manufacturers of EMT Conduit Fittings: Appleton Electric, O-Z/Gedney Co., Electroline, Raco, Bridgeport, Midwest, Regal, Thomas & Betts, or approved equal.

2.3 FLEXIBLE METALLIC CONDUIT (FMC) AND FITTINGS

- A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted. Lighting branch circuit wiring to an individual luminaire may be a manufactured, UL listed 3/8" flexible metal conduit with #12 AWG THHN conductors and an insulated ground wire.
- B. Acceptable Manufacturers: American Flex, Alflex, Electri-Flex Co, or approved equal.
- C. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel. Provide a separate equipment grounding conductor when used for equipment where flexibility is required.

- D. Fittings and Conduit Bodies:
1. Threadless hinged clamp type, galvanized zinc coated cadmium plated malleable cast iron or screw-in type, die-cast zinc.
 2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
 3. Acceptable Manufacturers: O-Z/Gedney Co., Thomas & Betts, Appleton Electric, Electroline, Bridgeport, Midwest, Regal, or approved equal.

2.4 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC) AND FITTINGS

- A. Acceptable Manufacturers: Anaconda Type UA, Electri-Flex Type LA, Alflex, Carlon (Lamson & Sessions), or approved equal.
- B. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel and an extruded PVC cover.
- C. Fittings and Conduit Bodies:
1. Watertight, compression type, galvanized zinc coated cadmium plated malleable cast iron, UL listed.
 2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
 3. Acceptable Manufacturers: Appleton Electric, O-Z/Gedney Co., Electroline, Bridgeport, Thomas & Betts, Midwest, Regal, Carlon (Lamson & Sessions), or approved equal.

2.5 RIGID NON-METALLIC CONDUIT (RNC) AND FITTINGS

- A. Minimum Size Rigid Smooth-Wall Nonmetallic Conduit: 3/4 inch, unless otherwise noted.
- B. Acceptable Manufacturers: Carlon (Lamson & Sessions) Type 40, Cantex, J.M. Mfg., or approved equal.
- C. Construction: Schedule 40 and Schedule 80 rigid polyvinyl chloride (PVC), UL labeled for 90°C.
- D. Fittings and Conduit Bodies: NEMA TC 3; sleeve type suitable for and manufactured especially for use with the conduit by the conduit manufacturer.
- E. Plastic cement for joining conduit and fittings shall be provided as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 CONDUIT SIZING

- A. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to N.E.C. (Latest Edition). Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the National Electrical Code (to include enlarged conductors due to

temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.

B. Minimum Conduit Size (Unless Noted Otherwise):

1. Above Grade: 3/4 inch. (The use of 1/2 inch would be allowed for installation conduit to individual light switches, individual receptacles and individual fixture whips from junction box.)
2. Below Grade 5' or less from Building Foundation: 1 inch.
3. Below Grade More than 5' from Building Foundation: 1 inch.

C. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

3.2 CONDUIT ARRANGEMENT

A. In general, conduit shall be installed concealed in walls, in finished spaces and where possible or practical, or as noted otherwise. In unfinished spaces, mechanical and utility areas, conduit may run either concealed or exposed as conditions dictate and as practical unless noted otherwise on drawings. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.

B. Conduit runs shall be routed as shown on large scale drawings. Conduit routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatic, unless noted otherwise. The correct routing, when shown diagrammatically shall be chosen by the Contractor based on information in the contract documents, in accordance with manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", in accordance with recognized industry standards, and coordinated with other contractors.

C. Contractor shall adapt his work to the job conditions and make such changes as required and permitted by the Engineer, such as moving to clear beams and joists, adjusting at columns, avoiding interference with windows, etc., to permit the proper installation of other mechanical and/or electrical equipment.

D. Contractor shall cooperate with all Contractors on the project. He shall obtain details of other Contractor's work in order to ensure fit and avoid conflict. Any expense due to the failure of This Contractor to do so shall be paid for in full by him. The other trades involved as directed by the Engineer shall perform the repair of work damaged as a result of neglect or error by This Contractor. The resultant costs shall be borne by This Contractor.

3.3 CONDUIT SUPPORT

A. Conduit runs installed above a suspended ceiling shall be properly supported. In no case shall conduit rest on the suspended ceiling construction, nor utilize ceiling support system for conduit support.

B. Conduit shall not be supported from ductwork, water, sprinkler piping, or other non-structural members, unless approved by the Engineer. All supports shall be from structural slabs, walls, structural members, and bar joists, and coordinated with all other applicable contractors, unless noted otherwise.

C. Conduit shall be held in place by the correct size of galvanized one-hole conduit clamps, two-hole conduit straps, patented support devices, clamp back conduit hangers, or by other means if called for on the drawings.

- D. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- E. Spring-steel conduit clips specifically designed for supporting single conduits or tubing may be used in lieu of malleable-iron hangers for 1" and smaller raceways serving lighting and receptacle branch circuits above accessible ceilings and for securing raceways to slotted channel and angle supports.
- F. Group conduits in parallel runs where practical and use conduit racks or trapeze hangers constructed of steel channel, suspended with threaded solid rods or wall mounted from metal channels with conduit straps or clamps. Provide space in each rack or trapeze for 25% additional conduits.
- G. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Supports for metallic conduit shall be no greater than 10 feet. A smaller interval may be used if necessitated by building construction, but in no event shall support spans exceed the National Electrical Code requirements. Conduit shall be securely fastened within 3 feet of each outlet box, junction box, device box, cabinet, or fitting.
- J. Supports of flexible conduit shall be within 12 inches of each outlet box, junction box, device box, cabinet, or fitting and at intervals not to exceed 4.5 feet.
- K. Supports for non-metallic conduit shall be at sufficiently close intervals to eliminate any sag in the conduit. The manufacturer's recommendations shall be followed, but in no event shall support spans exceed the National Electrical Code requirements.
- L. Finish:
 - 1. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.
 - 2. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

3.4 CONDUIT INSTALLATION

- A. Conduit Connections:
 - 1. Shorter than standard conduit lengths shall be cut square using industry standards. The ends of all conduits cut shall be reamed or otherwise finished to remove all rough edges.
 - 2. Metallic conduit connections in slab on grade installation shall be sealed and one coat of rust inhibitor primer applied after the connection is made.
 - 3. Where conduits with tapered threads cannot be coupled with standard couplings, then approved split or Erickson couplings shall be used. Running threads will not be permitted.

4. Install expansion/deflection joints where conduit crosses structure expansion/seismic joints.
- B. Conduit terminations for all low voltage wiring shall have nylon bushings installed on each end of every conduit run.
- C. Conduit Bends:
1. Use a hydraulic one-shot conduit bender or factory elbows for bends in conduit 2" in size or larger. All steel conduit bending shall be done cold; no heating of steel conduit shall be permitted.
 2. All bends of rigid non-metallic conduit (RNC) shall be made with the manufacturer's approved bending equipment. The use of spot heating devices will not be permitted (i.e. blow torches).
 3. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360°), including those bends located immediately at the outlet or body.
 4. Provide product submittals, per specifications, on slip sleeves and/or gutters to the Engineer for approval prior to purchase and installation.
 5. Rigid non-metallic conduit (RNC) runs longer than 100 feet or runs which have more than two 90° equivalent bends (regardless of length) shall use rigid steel factory elbows for bends.
 6. Use conduit bodies to make sharp changes in direction (i.e. around beams).
- D. Conduit Placement:
1. Conduit shall be mechanically continuous from source of current to all outlets. Conduit shall be electrically continuous from source of current to all outlets, unless a properly sized grounding conductor is routed within the conduit. All metallic conduits shall be bonded per the National Electrical Code.
 2. Route exposed conduit and conduit above suspended ceilings (accessible or not) parallel/perpendicular to the building structural lines, and as close to building structure as possible. Wherever possible, route horizontal conduit runs above water and steam piping.
 3. Route conduit through roof openings provided for piping and ductwork where possible. If not provided or routing through provided openings is not possible, route through roof jack with pitch pocket. Coordinate roof penetrations with other trades.
 4. Conduits, raceway, and boxes shall not be installed in concealed locations in metal deck roofing or less than 1.5" below bottom of roof decking.
 5. Avoid moisture traps where possible. Where unavoidable, provide a junction box with drain fitting at conduit low point.
 6. All conduits through walls shall be grouted or sealed into openings. Where conduit penetrates firewalls and floors, seal with a UL listed sealant. Seal penetrations with intumescent caulk, putty, or sheet installed per manufacturer's recommendations. All materials used to seal penetrations of firewalls and floors shall be tested and certified as a system per ASTM E814 Standard for fire tests or through-penetration fire stops as manufactured by 3M or approved equal.

7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN MASONRY OR EXTERIOR WALLS UNDER THIS DIVISION. A QUALIFIED MASON AT THE EXPENSE OF THIS CONTRACTOR SHALL REPAIR ALL OPENINGS TO MATCH EXISTING CONDITIONS.
8. Seal interior of conduit at exterior entries and where the temperature differential can potentially be greater than 20°F, to prevent moisture penetration. Seal shall be placed where conduit enters warm space. Conduit seal fitting shall be a drain/seal, with sealing compound, equal to O-Z/Gedney type EYD.
9. Rigid non-metallic conduit (RNC) shall be installed when material surface temperatures and ambient temperature are greater than 40°F.
10. Where rigid non-metallic conduit (RNC) conduit is used below grade, a transition to rigid galvanized steel or PVC-coated steel conduit shall be installed before conduit exits earth. The metallic conduit shall extend a minimum of 6" into the surface concealing the non-metallic conduit.
11. Contractor shall provide suitable mechanical protection around all conduits stubbed out from floors, walls or ceilings during construction to prevent bending or damaging of stubs due to carelessness with construction equipment.
12. Contractor shall provide a polypropylene pull cord with 2000 lbs. tensile strength in each empty conduit (indoor and outdoor), except in sleeves and nipples.

3.5 CONDUIT TERMINATIONS

- A. Where conduit bonding is indicated or required in the contract documents, the bushings shall be a grounding type sized for the conduit and ground bonding conductor as manufactured by O-Z/Gedney, Appleton, Thomas & Betts, Burndy, Regal, or approved equal.
- B. Conduits with termination fittings shall be threaded for one (1) lock nut on the outside and one (1) lock nut and bushing on the inside of each box.
- C. Where conduits terminate in boxes with knockouts, they shall be secured to the boxes with lock nuts and provided with approved screw type tinned iron bushings or fittings with plastic inserts.
- D. Where conduits terminate in boxes, fittings, or bodies with threaded openings, they shall be tightly screwed against the shoulder portion of the threaded openings.
- E. Conduit terminations to all motors shall be made with flexible metallic conduit (FMC), unless noted otherwise. Final connections to roof exhaust fans, or other exterior motors and motors in damp or wet locations shall be made with liquidtight flexible metallic conduit (LFMC).
- F. Rigid non-metallic conduit (RNC) conduit shall be terminated using fittings and bodies produced by the manufacturer of the conduit, unless noted otherwise. Prepare conduit as per manufacturer's recommendations before joining. All joints shall be solvent welded by applying full even coat of plastic cement to the entire areas that will be joined. Turn the conduit at least a quarter to one half turn in the fitting and let the joint cure for 1-hour minimum or as per the manufacturer's recommendations.
- G. All conduit ends shall be sealed with plastic immediately after installation to prevent the entrance of any foreign matter during construction. The seals shall be removed and the conduits blown clear of any and all foreign matter prior to any wires or pull cords being installed.

3.6 UNDERGROUND CONDUIT INSTALLATION

A. Conduit Connections:

1. Conduit joints in a multiple conduit run shall be staggered at least one foot apart.

B. Conduit Bends (Lateral):

1. Conduits shall have long sweep radius elbows instead of standard elbows wherever special bends are indicated and noted on the drawings, or as required by the manufacturer of the equipment or system being served.

C. Conduit Elbows (vertical):

1. Minimum steel elbow radiuses shall be 30 inches for primary conduits (>600V) and 18 inches for secondary conduits (<600V). Increase radius, as required, based on pulling tension calculation requirements.

D. Conduit Placement:

1. Conduit runs shall be pitched a minimum of 4" per 100 feet to drain toward the terminations. Duct runs shall be installed deeper than the minimum wherever required to avoid any conflicts with existing or new piping, tunnels, etc.
2. For parallel runs, use suitable separators and chairs installed not greater than 4' on centers. Band conduit together with suitable banding devices. Securely anchor conduit to prevent movement during concrete placement or backfilling.
3. Where concrete is required, the materials for concreting shall be thoroughly mixed to a minimum $f_c = 2500$ and immediately placed in the trench around the conduits. No concrete that has been allowed to partially set shall be used.
4. Before the Contractor pulls any cables into the conduit he shall have a mandrel 1/4" smaller than the conduit inside diameter pulled through each conduit and if any concrete or obstructions are found, the Contractor shall remove them and clear the conduit. Spare conduit shall also be cleared of all obstructions.
5. Conduit terminations in manholes, masonry pull boxes, or masonry walls shall be with malleable iron end bell fittings.
6. All spare conduits not terminated in a covered enclosure shall have its terminations plugged as described above.
7. Ductbanks and conduit shall be installed a minimum of 24" below finished grade, unless otherwise noted on the drawings or elsewhere in these specifications.
8. All non-metallic conduit installed underground outside of a slab shall be rigid.

E. Raceway Seal:

1. Where a raceway enters a building or structure, it shall be sealed with a sealing bushing or duct seal to prevent the entry of liquids or gases. Seal must be compatible with conductors and raceway system. Spare or unused raceway shall also be sealed.

3.7 CONDUIT INSTALLATION SCHEDULE

- A. In the event the location of conduit installation represents conflicting installation requirements as specified in the following schedule, a clarification shall be obtained from the Engineer. If This Contractor is unable to obtain a clarification as outlined above, concealed rigid galvanized steel conduit installed per these specifications and the National Electrical Code shall be required.
- B. The following schedule shall be adhered to unless they constitute a violation of applicable codes or are noted otherwise on the drawings. The installation of RMC conduit will be permitted in place of any and all conduit specified in this schedule.
 - 1. Dry Mechanical Spaces:
 - a. Exposed:
 - 1) Switchboards, panel feeders, etc.: EMT.
 - 2) Branch Circuits (lighting, receptacles, controls, etc.): EMT.
 - 3) Mechanical Equipment Feeders (pumps, AHU's, chillers, etc.): EMT.
 - b. Concealed: EMT.
 - 2. Wet or Damp Locations: RMC Conduit.
 - 3. Finished Spaces: Concealed EMT.
 - 4. In or Under Slabs on Grade or Site Conduits:
 - a. Within 5' from the Perimeter of a Building Foundation: RMC conduit with a minimum of 3" thickness between the surface of the concrete and the nearest conduit. Concrete to be doweled into the foundation.
 - b. 5' or Greater from the Perimeter of a Building Foundation: RNC.
 - 5. Interior Locations:
 - a. Exposed: EMT conduit.
 - b. Concealed: EMT.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and tape labels
- B. Wire and cable markers
- C. Conduit labeling
- D. Conduit color coding
- E. Electrical gear labeling
- F. Power distribution equipment labeling
- G. Transformer equipment labeling

1.2 REFERENCES

- A. ANSI C2 – National Electrical Safety Code
- B. NFPA 70 – National Electrical Code
- C. ANSI A13.1 – Standard for Pipe Identification
- D. ANSI Z535.4 – Standard for Product Safety Signs and Labels

PART 2 - PRODUCTS

2.1 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Colored Adhesive Marking Tape for banding Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.
- B. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Cable Identification: flexible acrylic bands sized to suit the cable diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the cable.
- C. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.
- D. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50°F to 350°F. Provide ties in specified colors when used for color coding.
- E. Underground Plastic Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inches wide by 4 mil thick, printed legend indicating type of underground line, manufactured for direct burial service. Tape shall contain a continuous metallic wire to allow location with a metal detector.
- F. Aluminum, Wraparound Marker Bands: 1" in width, .014 inch thick aluminum bands with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

- G. Brass or aluminum Tags: 2" by 2" by .05-inch metal tags with stamped legend, punched for fastener.
- H. Indoor/Outdoor Number and Letters: Outdoor grade vinyl label, minimum of 3/4" high x 9/16" wide, with acrylic adhesive designed for permanent application in severe indoor and outdoor environments.

2.2 NAMEPLATES AND SIGNS

- A. Engraved, Plastic-Laminated Labels, Signs and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Labels shall be punched for mechanical fasteners. Engraving legend shall be as follows:
 - 1. Black letters on white face for normal power.
 - 2. White letters on red face for emergency power.
 - 3. White letters on green face for grounding.
 - 4. Black letter on yellow face for Caution or UPS.
- B. Baked-Enamel Signs for interior Use: Preprinted aluminum signs, punched, or drilled for fasteners, with colors, legend, and size required for application. Mounting 1/4" grommets in corners.
- C. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with .0396 inch galvanized-steel backing; and with colors, legend, and size required for application. Mounting 1/4" grommets in corners.
- D. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.
- E. Fasteners for Plastic-Laminated Signs; Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as required by code.
- B. Install identification devices in accordance with manufacturer's written instruction and requirements of NEC.
- C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work. All mounting surfaces shall be cleaned and degreased prior to identification installation.
- D. Identify Junction, Pull and Connection Boxes: Labeling shall be 3/8-inch Kroy tape or Brother self-laminating vinyl label, or permanent magic marker (color coded), neatly hand printed. In rooms that are painted out, provide labeling on inside of cover.

- E. Circuit Identification: Tag or label conductors as follows:
1. Multiple Power or Lighting Circuits in Same Enclosure: Where multiple branch circuits are terminated or spliced in a box or enclosure, label each conductor with source and circuit number.
 2. Multiple Control Wiring and Communication/Signal Circuits in Same Enclosure: For control and communications/signal wiring, use wire/cable marking tape at terminations in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tape.
 3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- F. Apply warning, caution and instruction signs as follows:
1. Install warning, caution or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
 2. Emergency Operating Signs: Install, where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect, engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.
- G. Apply circuit/control/item designation labels of engraved plastic laminate for pushbuttons, pilot lights, alarm/signal components, and similar items, except where labeling is specified elsewhere.
- H. Install labels parallel to equipment lines at locations as required and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- I. Install ARC FLASH WARNING signs on all switchboards, panelboards, industrial control panels, and motor control centers. Sign at a minimum shall contain:



- J. Underground Electrical Lines: For exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

3.2 **BOX LABELING**

- A. All junction, pull, and connection boxes shall be identified as follows:
 - 1. For power and lighting circuits, indicate system voltage and identity of contained circuits (“120V, 1LA1-3,5,7”).
 - 2. For other wiring, indicate system type and description of wiring (“FIRE ALARM NAC #1”).
- B. Box covers shall be painted to correspond with system type as follows:
 - 1. Fire Alarm: Red
 - 2. Optional Emergency Branch: Yellow
 - 3. Temperature Control/Building Automation: Blue

3.3 **CONDUCTOR COLOR CODING**

- A. Color coding shall be applied at all panels, switches, junction boxes, pull boxes, vaults, manholes etc., where the wires and cables are visible and terminations are made. The same color coding shall be used throughout the entire electrical system, therefore maintaining proper phasing throughout the entire project.
- B. All wires and cables, 6 AWG or larger, used in motor circuits, main feeders, sub-main feeders and branch circuits, shall be coded by the application of plastic tape. The tape shall be 3-M, Plymouth or Permacel, in colors specified below. The tape shall be applied at each conductor termination with two 1-inch tape bands at 6-inch centers. Contractor option to use colored cabling in lieu of the tape at each end for conductor 6 AWG to 500 KCM.
- C. Wire and cables smaller than 6 AWG shall be color coded by the manufacturer.
- D. Colored cable ties shall be applied in groups of three ties of specified color to each conductor at each terminal or splice point starting 3 inches from the termination and spaced at 3- inches centers. Tighten to a snug fit, and cut off excess length.
- E. Where more than one nominal voltage system exists in a building or facility, each ungrounded conductor of a multi-wire branch circuit, where accessible, shall be identified by phase and system.
- F. Conductors shall be color coded as follows:
 - 1. 208Y/120 Volt, 4-Wire:
 - a. A-Phase – Black
 - b. B-Phase – Red
 - c. C-Phase – Blue
 - d. Neutral – White
 - e. Ground Bond – Green
 - 2. 480Y/277 Volt, 4-Wire:
 - a. A-Phase – Brown
 - b. B-Phase – Orange
 - c. C-Phase – Yellow
 - d. Neutral – Gray

- e. Ground Bond – Green

3.4 **ELECTRICAL GEAR LABELING**

- A. Exterior electrical gear shall be identified with vinyl label names and numbers to be visible on the exterior of the gear. The labels shall correspond to the 1-line nomenclature and identify each cubicle of multi-section gear.

3.5 **CONTROL EQUIPMENT IDENTIFICATION**

- A. Provide identification on the front of all control equipment, such as disconnect switches. Nameplate text shall be a minimum of 1/4” high.
- B. Labeling shall include:
 - 1. Equipment type and contract documents designation of equipment being served.
 - 2. Location of equipment being served if it is not located within sight.
 - 3. Voltage and phase of circuit(s).
 - 4. Panel and circuit number(s) serving the equipment.

EXHAUST FAN EF-1 ("LOCATED ON ROOF") 480V, 3-PHASE FED FROM "IHA1-1"
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3.6 **POWER DISTRIBUTION EQUIPMENT IDENTIFICATION**

- A. Provide identification on the front of all power distribution equipment, such as panelboards, switchboards, etc. The identification material shall be engraved plastic-laminated labels. Text shall be a minimum of 1/4” high, Swis 721 Bold.
- B. Labeling shall include:
 - 1. Equipment type and contract documents designation of equipment.
 - 2. Voltage of the equipment.
 - 3. Name of the upstream equipment and location of the upstream equipment if it is not located within sight.
 - 4. Rating and type of the overcurrent protection device serving the equipment if it is not located within sight ("FED BY 400A/3P BREAKER").

DISTRIBUTION PANEL <u>DP-H1</u> 480Y/277V FED FROM SWITCHBOARD "SB-1" (LOCATED IN MAIN ELECTRIC ROOM)

- C. Distribution panelboards and switchboards shall have each overcurrent protection device identified with name and location of the load being served ("AHU-1 LOCATED IN PENTHOUSE 1").
- D. Branch panelboards shall be provided with typed panel schedules upon completion of the project. Existing panelboards shall have their existing panel schedules typed, with all circuit changes, additions or deletions also typed on the panel schedules. A copy of all panel schedules for the project shall be turned over as part of the O&M Manuals. Refer to 26 05 00 for other requirements.

3.7 **TRANSFORMER EQUIPMENT IDENTIFICATION**

- A. Provide identification on the front of all transformers. The identification nameplate shall be an engraved plastic-laminated label. Text shall be a minimum of 1/4" high.
- B. Labeling shall include:
 - 1. Equipment type and contract documents designation of equipment
 - 2. Name of the upstream equipment.
 - 3. Voltage and rating of the equipment.
 - 4. Location of the upstream equipment if it is not located within sight.

<p>TRANSFORMER <u>TR-15</u> 480Y: 208Y/120V 15KVA FED FROM SWITCHBOARD "SB-1" (LOCATED IN MAIN ELECTRIC ROOM)</p>

END OF SECTION

DRY TYPE TRANSFORMERS
SECTION 26 22 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Dry type two winding transformers

1.2 REFERENCES

- A. NEMA - ST 1 - Specialty Transformers
- B. NEMA ST 20 - Dry Type Transformers for General Applications
- C. ANSI/IEEE C57.12.01 - General Requirements for Dry Type Distribution and Power Transformers
- D. ANSI/IEEE C57.12.91 - Test Code for Dry Type Distribution and Power Transformers
- E. NEMA TP 1 - Guide for Determining Energy Efficiency for Distribution Transformers
- F. NEMA TP 2 - Standard Test Method for Measuring the Energy Consumption of Distribution Transformers
- G. NEMA TP 3 - Standard for the Labeling of Distribution Transformer Efficiency

1.3 SUBMITTALS

- A. Submit product data under provisions of Section 26 05 00.
- B. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, loss data, efficiency at 35, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect products under provisions of Section 26 05 00.
- B. Store in a warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.
- C. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow if handled in inclement weather.

PART 2 - PRODUCTS

2.1 DRY TYPE TWO WINDING TRANSFORMERS

- A. Dry Type Transformers: NEMA ST 20, NEMA TP 1; factory-assembled, air cooled dry type transformers; ratings as shown on the drawings.

B. Insulation system and average winding temperature rise for rated KVA as follows:

Ratings	Class	Rise (degree C)
Less than 15	185	As shown on the drawings
15 or higher	220	As shown on the drawings

C. Case temperature shall not exceed 40°C rise above ambient at its warmest point.

D. Winding Taps, Transformers Less than 15 KVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

E. Winding Taps, Transformers 15 KVA and Larger: Two (2) 2-1/2% below and two (2) 2-1/2% above rated voltage, full capacity taps on primary winding.

F. Sound Levels: Maximum sound levels are as follows:

KVA Rating	Sound Level
0-9	40 dB
10-50	45 dB
51-150	50 dB
151-300	55 dB
301-500	60 dB
501-700	62 dB
701-1000	64 dB

G. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

H. Mounting: Transformers 75 KVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 75 KVA shall be suitable for floor or trapeze mounting.

I. Coil Conductors: Continuous windings with terminations brazed or welded.

J. Enclosure: NEMA ST 20; Type 1. Provide lifting eyes or brackets.

K. Isolate core and coil from enclosure using vibration-absorbing mounts.

L. Nameplate: NEMA TP 3; Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set transformer plumb and level.

B. Use flexible conduit, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

C. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

3.2 **FIELD QUALITY CONTROL**

- A. Check for damage and tight connections prior to energizing transformer.
- B. Measure primary and secondary voltages and make appropriate tap adjustments. Adjustments shall be made at completion of project and at approximately 6 months following project acceptance when requested by the Owner.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Distribution panelboards
- B. Appliance branch circuit panelboards

1.2 REFERENCES

- A. NEMA AB 1 - Molded Case Circuit Breakers
- B. NEMA KS 1 - Enclosed Switches
- C. NEMA PB 1 - Panelboards
- D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
- E. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment
- F. UL 67 - Panelboards

1.3 SUBMITTALS

- A. Submit shop drawings for equipment and component devices under provisions of Section 26 05 00.
- B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

1.4 SPARE PARTS

- A. Keys: Furnish four (4) each to the Owner.

PART 2 - PRODUCTS

2.1 RATINGS

- A. Definitions:
 - 1. Series rated equipment shall be defined as equipment that can achieve a required UL AIC rating with an upstream device such as a main breaker or a combination of devices to meet or exceed a required UL AIC rating. All series rated equipment shall have a permanently attached nameplate indicating that device rating must be maintained. See Section 26 05 53 for additional requirements.
 - 2. Fully rated equipment shall be defined as equipment where all devices in that equipment shall carry a minimum of the AIC rating that is specified.
- B. The panelboards for this project shall be fully rated unless otherwise specifically noted in the Drawings or Specifications.

2.2 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1; type as shown on the drawings.
- B. Enclosure: NEMA PB 1; Type 1.
- C. Provide cabinet front with hinged door with flush lock. Finish in manufacturer's standard gray enamel.
- D. Provide panelboards with copper bus, ratings as scheduled on the drawings. Provide copper ground bus in all panelboards.
- E. Minimum Integrated Short Circuit Rating: 100,000 amperes rms symmetrical for 240 volt panelboards; 50,000 amperes rms symmetrical for 480 volt panelboards, or as shown on the drawings.
- F. Molded Case Circuit Breakers: Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

2.3 BRANCH CIRCUIT PANELBOARDS

- A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.
- B. Enclosure: NEMA PB 1; Type 1.
- C. Provide cabinet front with door-in-door construction, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
- D. Provide panelboards with copper bus, ratings as scheduled on the drawings. Provide copper ground bus in all panelboards.
- E. All multiple-section panelboards shall have the same dimensional back box and cabinet front size.
- F. Minimum Integrated Short Circuit Rating: As shown on the drawings.
- G. Molded Case Circuit Breakers: Bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on the drawings. Do not use tandem circuit breakers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards plumb as indicated on the drawings in conformance with NEMA PB 1.1.
- B. Height: 6 feet to handle of highest device.
- C. Provide filler plates for unused spaces in panelboards.
- D. Provide typed circuit directory for each branch circuit panelboard. Label each circuit with the type of load and the name and number of the area served. Revise directory to reflect circuit changes required to balance phase loads.
- E. Install fuses in fusible switch assemblies.

3.2 **FIELD QUALITY CONTROL**

- A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Receptacles including GFCI
- B. Device plates and box covers

1.2 REFERENCES

- A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet
- B. NEMA WD 1 – General Color Requirements for Wiring Devices
- C. NEMA WD 6 – Wiring Devices – Dimensional Requirements
- D. U.L. 943 – Standard for Ground Fault Circuit Interrupters
- E. U.L. 498 – Standard for Attachment Plugs and Receptacles
- F. U.L. 20 – Standard for General Use Snap Switches
- G. DSCC W-C-896F – General Specification for Electrical Power Connector

1.3 SUBMITTALS

- A. Submit product data under provisions of Section 26 05 00.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

1.4 QUALITY ASSURANCE

- A. Provide similar devices from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency to Authorities Having Jurisdiction and marked for intended use.
- C. Comply with NFPA 70.

1.5 COORDINATION

- A. Receptacles for Owner Furnished Equipment: Match plug configurations.
- B. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 RECEPTACLES

- A. Refer to General Electrical Equipment Schedule for configuration and ratings.

- B. Back wired devices shall be complete with eight holes that are screw activated with metal clamps for connection to #12 or #10 copper conductors.
- C. Side wired devices shall have four binding screws that are undercut for positive wire retention.
- D. Ground Fault Circuit Interrupter (GFCI) receptacles shall comply with the 2006 edition of U.L. 943 requiring increased surge immunity, improved corrosion resistance, improved resistance to false tripping and diagnostic indication for miswiring if the line and load conductors are reversed during installation.

2.2 WALL PLATES

- A. Weatherproof coverplates shall be as shown on the drawings.
- B. Plate securing screws shall be metal with head color matching the wall plate finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install specific-use receptacles at heights shown on the contract drawings. Install devices level, plumb, and square with building lines. Coordinate installation of adjacent devices of separate systems with common mounting heights, including lighting, power, systems, technology, and temperature rough-ins.
- B. Install receptacles vertically with ground slot up or where indicated on the drawings, horizontally with ground slot to the left.
- C. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- D. Install devices and wall plates flush and level.
- E. Test receptacles for proper polarity, ground continuity and compliance with requirements.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fuses

1.2 REFERENCES

- A. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Types
- B. UL 198E - Class R Fuses
- C. FS W-F-870 - Fuseholders (For Plug and Enclosed Cartridge Fuses)
- D. NEMA FU 1 - Low Voltage Cartridge Fuses
- E. NFPA 70 – National Electrical Code

1.3 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40°F (5°C) or more than 100°F (38°C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – FUSES

- A. Cooper Bussman
- B. Eagle Electric Mfg. Co.; Cooper Industries
- C. Mersen
- D. Tracor; Littelfuse Subsidiary

2.2 FUSES

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.
- C. Fuses with ratings larger than 600 amperes: Class L (time delay), unless otherwise noted on the drawings.
- D. Fuses with ratings larger than 200 amperes but equal to or less than 600 amperes: Class RK-1 (time delay), unless otherwise noted on the drawings.
- E. Fuses with ratings less than or equal to 200 amperes (not including control transformer fuses): Class RK-5, unless otherwise noted on the drawings.
- F. Control transformer fuses: Class CC (time delay).
- G. Fuses for packaged equipment: Size and type as recommended by equipment manufacturer.

2.3 **INSTALLATION**

- A. Install fuses where indicated on the drawings and specifications.
- B. Install fuses in accordance with manufacturer's instruction.
- C. Install fuses in packaged equipment as required by equipment manufacturer.
- D. Install fuse with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fusible switches
- B. Nonfusible switches
- C. Molded-case circuit switches
- D. Molded-case switches
- E. Enclosures

1.2 REFERENCES

- A. NEMA KS 1 - Enclosed Switches

1.3 SUBMITTALS

- A. Submit product data under provisions of Section 26 05 00.
- B. Product Data: For each type of enclosed switch, circuit breaker, accessory and component indicated, include dimensions, weights, and manufacturer's technical data on features, performance, and ratings.
- C. Electrical Characteristics: For each type of enclosed switch, enclosure types, current and voltage ratings, short-circuit current ratings, UL listing for series rating of installed devices, features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.4 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE AND NONFUSIBLE SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Class 'R' fuse clips only, unless indicated otherwise on the drawings.
- B. Non-fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: Type as indicated on the disconnect schedule.
- D. Accessories: As indicated on the disconnect schedule.

2.2 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip settings.
 - 3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t responses.
 - 4. Current-Limiting Circuit Breakers; Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
- B. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Accessories: As indicated on the disconnect schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated on the drawings.
- B. Install fuses in fusible disconnect switches.
- C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

END OF SECTION

PACKAGED ENGINE GENERATOR SYSTEMS
SECTION 26 32 13

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Packaged engine generator system
- B. Exhaust silencer and fittings
- C. Remote annunciator panel
- D. Battery and charger
- E. Weatherproof enclosure

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 22 30 00 - Plumbing Equipment
- B. Section 23 21 00 - Hydronic Piping

1.3 REFERENCES

- A. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- B. ANSI/NEMA MG 1 - Motors and Generators
- C. ANSI/NFPA 70 - National Electrical Code
- D. ANSI/NEMA AB 1 - Molded Case Circuit Breakers
- E. NFPA 37 – Installation and Use of Stationary Combustion Engines and Gas Turbines
- F. NFPA 110 – Emergency and Standby Power Systems
- G. Environmental Protection Agency EPA Emission Standards for Compressed Ignition Engines
- H. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at property boundaries due to sound emitted by the generator set, its components and the operation thereof.

1.4 SYSTEM DESCRIPTION

- A. Engine generator system to provide source of emergency and standby power.
- B. System Capacity: Refer to drawings. Capacity to be rated at an elevation of 1,000 feet above sea level, and ambient temperature between -20°F and 110°F; standby rating using engine-mounted radiator.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 26 05 00.
- B. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.

- C. Submit product data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery charger, battery heater, exhaust silencer, vibration isolators, and remote annunciator.
- D. Submit certificates for compliance with EPA Emissions Standards for Compressed Ignition Engines.
- E. Submit manufacturer's installation instructions under provisions of Section 26 05 00.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 26 05 00.
- B. Accurately record location of engine generator and mechanical and electrical connections.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 26 05 00.
- B. Include instructions for normal operation, routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in packaged engine generator system with minimum five (5) years documented experience.
- B. Supplier: Authorized distributor of engine generator manufacturer with service facilities within 50 miles of the project site.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 26 05 00.
- B. Store and protect products under provisions of Section 26 05 00.
- C. Accept packaged engine generator set and accessories on site in crates and verify damage.
- D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.10 WARRANTY

- A. Provide a five (5) year warranty under provisions of Section 26 05 00.

1.11 MAINTENANCE SERVICE

- A. Furnish service and maintenance of packaged engine generator system for one (1) year from Date of Substantial Completion. Maintenance service shall be performed by skilled employees of manufacturer's designated service organization. Include quarterly exercising, and routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Maintenance agreements shall include parts, supplies, and labor.

1.12 EXTRA MATERIALS

- A. Submit maintenance materials under provisions of Section 26 05 00.

- B. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal toolbox.
- C. Provide two additional sets of each fuel, oil, and air filter element required for the engine generator system. Provide additional fuel polishing filters for one year of operation.
- D. Provide one fuse for every type and rating used.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Cummins Power Generation GGLB (150kw), GGPC (50kw).
- B. Caterpillar Olympian G15LG, G50LG.
- C. Kohler 150REZG8, 50REZGB.

2.2 PACKAGED ENGINE-GENERATOR SET

- A. Packaged engine-generator set shall be a coordinated assembly of compatible components.
- B. Safety Standard: Comply with ASME B15.1 and UL 2200.
- C. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, model and serial number, and component rating in integrated set and as required by the contract documents.
- D. Fabricate engine-generator set mounting frame and attachment of components to resist generator-set movement during a seismic event when generator-set mounting frame is anchored to building structure.
- E. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components. Provide a rigging diagram permanently attached to the mounting frame to indicate the capacity of each lifting attachment and the generator-set center of gravity.

2.3 ENGINE

- A. Type: Water-cooled in-line or V-type, four-stroke cycle spark-ignition internal combustion engine.
- B. Rating: Sufficient to operate at 100 percent load for two hours at specified elevation and ambient limits.
- C. Fuel: Appropriate for use of natural gas.
- D. Engine Speed: 1800 RPM.
- E. Governor: Isochronous type with speed sensing.
- F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.

- G. Frequency Response:
1. Steady State Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
 2. Transient Response: Less than 5 percent for a 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady state operating band within 5 seconds.
- H. Fuel System: Natural gas system carburetor, secondary gas regulator, fuel shutoff solenoid valve, and flexible fuel connectors.
- I. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90°F, and suitable for operation on 208-3Ø for GEN-IT and 208-1Ø for GEN-1 volts AC. The wattage of the heater shall be as recommended by the manufacturer. Design is based on 20A circuit for GEN-IT and 20A circuit for GEN-1. Contractor shall be responsible for any circuit changes.
- J. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator set mounting frame and integral engine-driven coolant pump.
1. Fan and Core: Nonferrous-metal construction sized to contain expansion of total system. Blower type fan, sized to maintain safe engine temperature in ambient temperature of 110°F. Radiator Airflow Restriction: 0.5 inches of water, maximum.
 2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anti-corrosive additives.
 3. Provide expansion tank with gage glass and petcock, and self-contained, thermostatic-control temperature control valve.
- K. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel. Provide the following accessories:
1. Battery: Voltage to match starter with capacity for three cranking cycles without recharge. Provide with battery cables and acid resistant battery tray.
 2. Battery-Charging Alternator: Factory mounted on engine with solid state voltage regulation.
 3. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide wall-mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements.
- L. Exhaust System: Critical type silencer (85 dBA max at 10 feet), side inlet with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized in accordance with engine manufacturer's instructions. Silencer shall include a threaded opening for connection of ¾" drain line. Opening shall be flush on inside of silencer.
- M. The packaged engine generator shall comply with the current Environmental Protection Agency EPA Emissions standards.

- N. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine-generator control panel.
- O. Mounting: Provide unit with suitable spring-type vibration isolators.

2.4 GENERATOR

- A. Generator: ANSI/NEMA MG 1; three phase, re-connectible brushless synchronous generator with brushless exciter and PMG alternator excitation.
- B. Rating: As indicated on the drawings, at 0.8 power factor, 60 Hertz at RPM to match engine rating.
- C. Insulation: ANSI/NEMA MG 1, Class H.
- D. Temperature Rise: 105°C continuous.
- E. Enclosure: ANSI/NEMA MG 1; open drip-proof.
- F. Voltage Regulation:
 - 1. The maximum voltage drop shall be 28 percent.
 - 2. Include solid-state type voltage regulator, separate from exciter to match engine and generator characteristics, with voltage regulation ± 1 percent from no load to full load. Include manual controls to adjust voltage drop ± 5 percent voltage level, and voltage gain.
- G. Subtransient Reactance ($X'd$): Maximum 15 percent.
- H. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

2.5 CONTROLS AND INDICATION

- A. Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.
- B. Ground Fault: Provide ground fault sensing at the generator. The sensor shall be located ahead of the generator service disconnect. Provide a ground fault indication on the engine-generator control panel. Provide an instruction nameplate at the control panel.
 - 1. Instruction nameplate: Provide operational instructions for a ground fault indication as approved by the local Authority Having Jurisdiction.
- C. Engine-Generator Control Panel: ANSI/NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:
 - 1. Alarm indication as required by NFPA 110 for a Level 2 system.
 - 2. AC frequency meter.
 - 3. AC output voltmeter with phase selector switch.
 - 4. AC output ammeter with phase selector switch.

5. Output voltage adjustment.
 6. DC voltmeter (alternator battery charging).
 7. Engine start/stop selector switch.
 8. Engine running time meter.
 9. Oil pressure gauge.
 10. Engine coolant temperature gauge.
 11. Shut down devices for overspeed, coolant high-temperature, coolant low-level, and oil low-pressure.
 12. Fuel derangement alarm.
 13. Generator overload.
 14. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
 15. Ground fault indication.
- D. Remote Engine Annunciator Panel: NFPA 110 for a Level 2 system. Include the listed pre-alarm and alarm points, audible alarm, alarm silencing means, repetitive alarm circuitry, and lamp test switch in a surface mounted panel with brushed stainless steel finish. Provide all interconnecting wiring in conduit per manufacturer's requirements by the Electrical Contractor. The remotely reported alarms shall include the following.
1. Overcrank
 2. Low water (engine) temperature
 3. High engine temperature prealarm
 4. High engine temperature
 5. Low lube oil pressure prealarm
 6. Low lube oil pressure
 7. Overspeed
 8. Low coolant level
 9. Not in auto
 10. Emergency Power Supply (EPS) supplying load
 11. High battery voltage
 12. Low battery voltage
 13. Battery charger failure (includes AC failure)
 14. Generator running
 15. Normal utility power
 16. Emergency stop
 17. Emergency Power Off Switch activated (EPO)
- E. Building Automation System Integration:
1. Provide a terminal block to allow the Direct Digital Control (DDC) to report generator alarms. Provide individual terminal points for each of the annunciator alarms and pre-alarms. Provide an additional terminal point to combine all of the generator alarms under a single terminal point. Provide a permanent label for each terminal point. Each terminal will provide a binary output for the DDC control system to read.

2.6 ACCESSORIES

- A. Generator Circuit Breaker: Molded or insulated case, service-rated thermal-magnetic type; 100% rated breaker complying with NEMA AB1 and UL 489.
1. Tripping Characteristic: Designed specifically for generator protection.

2. Trip Rating: Matched to generator rating.
 3. Shunt Trip: Connected to trip breaker when generator is shut down by other protective devices.
 4. Mounting: Provide freestanding enclosure or mount integrally with control and monitoring panel.
- B. Remote Manual Stop Station (Emergency Power Off EPO): Provide a remote manual stop station with weather proof stainless steel or die cast housing, red mushroom button - push to stop operation, breakable cover/lens to access mushroom button, 120 volt rated. The manufacturer shall provide automatic monitoring of the EPO switch. Placing the EPO switch in the "Generator Powered OFF" status shall initiate a visual and audible alarm at each generator annunciator panel.
- C. Battery heater, resistance type, 120V. Powered from battery charger connection or spare 20A circuit.

2.7 OUTDOOR GENERATOR-SET ENCLOSURE SKIN-TIGHT

- A. Prefabricated or pre-engineered skin tight enclosure with the following features:
1. Construction: Reinforced galvanized steel, metal clad, integral structural steel framed housing anchored to a concrete foundation. Construction shall allow access to control panels and service points. The panels shall enclose all components, including intake/exhaust louvers and sound attenuators. Extend the enclosure base frame as required for panels.
 2. The generator control panel shall be located no greater than 5'-0" above finished grade for ease of access.
 3. Structural Design and Anchorage: Wind resistant up to 100 mph.
 4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
 5. Hinged Doors: Provide a minimum of four doors with padlocking provisions. Double doors shall be 60" wide and 84" high. As standard, doors shall include rain-rail moldings above all door openings, recessed, keyed mortise locks, panic bar door hardware and full weather-stripping. Doors shall be removable.
 6. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits as required by engine-generator-set components.
 7. The exhaust system silencer shall be installed within the enclosure housing.
 8. Acoustical Treatment: Provide critical sound attenuated enclosure with acoustical treatment including wall panels, intake and exhaust air paths, ventilation openings, and tailpipe exhaust to achieve 77dBA at 23ft. Basis of design is the Cummins Level 1 enclosure. Sound attenuators shall be concealed within the enclosure panels. Panels shall extend from the enclosure base frame to the height of the generator section.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work and field dimensions are as shown on the drawings.
- B. Verify that required utilities are available in proper location and ready for use.
- C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install remote manual stop station in location shown on plans. Provide 120 Volt power and wiring in conduit as required. Coordinate installation with the manufacturer approved shop drawings and wiring diagrams. The remote manual stop station shall signal the engine prime mover to stop.
- C. The A-B-C phase rotation of the generator source shall match the A-B-C phase rotation of the utility source. The Contractor shall verify the generator and utility phase rotation match to prevent three phase motors and similar loads from operating backwards while being served by the generator.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 26 05 00 and in compliance with NFPA 110 requirements.
- B. Provide portable test bank for full load test, if required. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal.
- C. The on-site installation test shall be conducted as follows:
 - 1. With the prime mover in a "cold start" condition and the emergency load at standard operating level, a primary power failure shall be initiated by opening all switches or breakers supplying the primary power to the building or facility.
 - 2. The test load shall be that load that is served by the Emergency Power Supply System (EPSS).
 - 3. The time delay on start shall be observed and recorded.
 - 4. The cranking time until the prime mover starts and runs shall be observed and recorded.
 - 5. The time taken to reach operating speed shall be observed and recorded.
 - 6. The voltage and frequency overshoot shall be recorded.
 - 7. The time delay on transfer to emergency power for each switch shall be recorded. Life safety and critical branch transfer switches must transfer within 10 seconds.
 - 8. The time taken to achieve a steady-state condition with all switches transferred to the emergency position shall be observed and recorded.
 - 9. The voltage, frequency, and amperes shall be recorded.

10. The prime mover oil pressure and water temperature shall be recorded, where applicable.
 11. The battery charge rate shall be recorded at 5-minute intervals for the first 15 minutes and at 15 minute intervals thereafter.
 12. When primary power is returned to the building or facility, the time delay on retransfer to primary for each switch with a minimum setting of 5 minutes shall be recorded.
 13. The time delay on the prime mover cool down period and shutdown shall be recorded.
 14. Allow prime mover to cool for 5 minutes.
 15. A load shall be applied for 4 hours total. The building load shall be permitted to serve as part or all of the load, supplemented by a load bank of sufficient size to provide a load equal to 100 percent of the nameplate rating of the Emergency Power Supply (EPS), less applicable derating factors for site conditions. Observe and record load changes and the resultant effect on voltage and frequency.
 16. The full load test shall be initiated immediately after the cooling time has expired by any method that starts the prime mover and, immediately upon reaching rated rpm, picks up 100 percent of the nameplate kW rating on one step, less applicable derating factors for site conditions.
 17. During test, record the following at 5-minute intervals for the first 15 minutes and every 15 minutes for the rest of the test:
 - a. Kilowatts
 - b. Amperes
 - c. Voltage
 - d. Frequency
 - e. Coolant temperature
 - f. Enclosure temperature (interior)
 - g. Oil pressure
 - h. Engine exhaust temperature
 - i. Engine inlet temperature
 - j. Oil Temperature
 - k. Battery charge rate
 18. Upon completion of the test and after a cool down period, the crank/rest cycle shall be tested.
 - a. Any method recommended by the manufacturer for the cycle crank test shall be utilized to prevent the prime mover from running.
 - b. The control switch shall be set at "run" to cause the prime mover to crank.
 - c. The complete crank/rest cycle shall be observed and recorded.
 19. Test alarm and shutdown circuits by simulating conditions.
- D. Contractor shall fill fuel tanks upon completion of test.
- E. Testing documentation shall be submitted to the Engineer for review and approval.
- F. Generator testing worksheets are included with this specification section.

3.4 **MANUFACTURER'S FIELD SERVICES**

- A. Prepare, start, test, and adjust systems under provisions of Section 26 05 00.

3.5 **ADJUSTING**

- A. Adjust generator output voltage and engine speed.

3.6 **CLEANING**

- A. Clean work under provisions of Section 26 05 00.
- B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.7 **DEMONSTRATION**

- A. Provide systems demonstration. Coordinate the demonstration schedule with the owner and architect/engineer.
- B. Describe loads connected to emergency and standby systems and restrictions for future load additions.
- C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide emergency and standby power.

END OF SECTION

DATE: _____
 CUSTOMER: _____
 ENGINE MODEL: _____
 GENERATOR MODEL: _____
 UNIT RATING: _____

W.O.# _____
 S/N: _____
 S/N: _____
 PKG _____

BATTERY VOLT: 24
 VOLTAGE: 480
 FUEL TYPE: Diesel
 TESTED BY: _____

KW: 1250
 KVA: 1563
 PHASE: 3
 HERTZ: 60
 RPM: 1800

ELAPSED TIME	DURATION	1	2	3	1	2	3	KW	TARGET	HZ	RPM	HOUR METER	P.F.	OIL PRESS.	FUEL PRESS.	AMBIENT AIR TEMP.	ENGINE WATER TEMP.	EXHAUST TEMP		ENGINE OIL TEMP.	IN.HG BOOST	COOLANT AT HEAT EXCH. OR RADIATOR		COOLANT AT THE ENGINE		
		VOLTS	VOLTS	VOLTS	AMPS	AMPS	AMPS		KW									L	R			OUT	IN	OUT	IN	
0:10	0:10								313																	
0:20	0:10								625																	
0:40	0:20								1,250																	
1:00	0:20								1,250																	
1:20	0:20								1,250																	
1:40	0:20								1,250																	
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3:00	0:20								1,250																	
3:20	0:20								1,250																	
3:40	0:20								1,250																	
4:00	0:20								1,250																	
4:10	0:10								1,375																	
4:20	0:10								625																	
4:25	0:05								-																	

Load Profile	Time	Load %
	10 Min	25%
	10 Min	50%
	4 Hours	100%
	10 Min	110%
	10 Min	50%
	5 Min	0%

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Automatic transfer switch

1.2 REFERENCES

- A. NEMA ICS 1 - General Standards for Industrial Control and Systems
- B. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies
- C. NEMA ICS 2-447 - AC Automatic Transfer Switches
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems
- E. UL 1008 - Standard for Automatic Transfer Switches

1.3 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in automatic transfer equipment with three (3) years documented experience.

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 26 05 00.
- B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, and environmental requirements.
- C. Submit manufacturer's installation instructions under provisions of Section 26 05 00.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 26 05 00.
- B. Include instructions for operating equipment.
- C. Include instructions for operating equipment under emergency conditions when engine generator is running.
- D. Identify operating limits which may result in hazardous or unsafe conditions.
- E. Document ratings of equipment and each major component.
- F. Include routine preventive maintenance and lubrication schedule.
- G. List special tools, maintenance materials, and replacement parts.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for emergency and standby electrical systems.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. ASCO.
- B. Russelectric, Inc.
- C. Zenith Controls, Inc.
- D. Caterpillar.
- E. Cummins.
- F. Kohler.

2.2 AUTOMATIC TRANSFER SWITCH

- A. Description: NEMA ICS 2; automatic transfer switch.
- B. Configuration: Electrically-operated, mechanically-held transfer switch.
- C. Control panel shall be micro-processor based.

2.3 SERVICE CONDITIONS

- A. Service Conditions: NEMA ICS 1.

2.4 RATINGS

- A. Refer to the one-line diagrams for the available interrupting capacity (AIC) of the transfer switch. The transfer switch shall be series rated with the equipment feeding the transfer switch. The series rating shall be the larger of the two AIC values when the AIC rating of the equipment feeding the normal and emergency sides of the transfer switch is not equal.
- B. Series rating with upstream devices shall be allowed per UL-1008.

2.5 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
- B. Time Delay to Start Alternate Source Engine Generator: 0 to 10 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- D. Time Delay Before Transfer to Alternate Power Source: 0 to 30 seconds, adjustable.
- E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- F. Time Delay Before Transfer to Normal Power: 0 to 30 minutes, adjustable; bypass time delay in event of alternate source failure.
- G. Time Delay Before Engine Shut Down: 0 to 30 minutes, adjustable, of unloaded operation.
- H. Engine Exerciser: Start engine every seven (7) days. Run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.

2.6 ENCLOSURE

- A. Enclosure: NEMA ICS 6; Type 1.

2.7 ACCESSORIES

- A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION.
- B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
- C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
- D. Transfer Switch Auxiliary Contacts: 2 normally open; 2 normally closed indicating switch to normal source or emergency source.
- E. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 Hertz from rated nominal value, values shall be field adjustable.
- F. Alternate Source Monitor: Monitor each line of alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent Hertz from rated nominal voltage, values shall be field adjustable.
- G. In-Phase Monitor: Inhibit transfer until source and load are within 30 electrical degrees.
- H. Provide 2 N.O. and 2 N.C. isolated contacts to indicate:
 - 1. Normal source available.
 - 2. Emergency source available.
 - 3. Exercise mode in operation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify field measurements are as instructed by the manufacturer.
- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.3 SCHEDULE

- A. As shown on the drawings.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section describes materials and installation requirements for low voltage surge protection devices (SPD) for the protection of all AC electrical circuits. SPD equipment to be installed at designated

1.2 REFERENCES

- A. ANSI/IEEE C62.33 – IEEE Guide on Testing of MOV components
- B. ANSI/IEEE C62.35 – IEEE Guide on Testing of SAD components
- C. ANSI/IEEE C62.41-2002 - IEEE Recommended Practice on Surge Voltage in Low Voltage AC Power Circuits
- D. ANSI/IEEE C62.45-1992 - IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits
- E. ANSI/UL 1449 Third Edition, 2009 (Version 3.0) - UL Standard for Safety for Surge Protective Devices
- F. CBEMA – Computer Business Equipment Manufacturers Association
- G. IEC 664 – International Engineering Consortium, Standard for Clamping Voltage
- H. National Electrical Code 285 - 2008 - Surge Protection Devices
- I. NFPA 70 - National Electrical Code
- J. UL 67 – Listed for Internal Panelboard Transient Voltage Surge Suppressors
- K. UL 96A – Devices listed as approved for secondary surge arrestors (OWHX)
- L. UL 248-1 - Fusing
- M. UL 1283 – Electromagnetic Interference Filters, Fifth Edition

1.3 QUALITY ASSURANCE

- A. The specified unit shall be designed, manufactured, tested and installed in compliance with the above references. The unit shall be “Listed by Underwriters Laboratories” to UL 1449.
- B. Each unit shall be designed and manufactured by a qualified manufacturer of power conditioning equipment. The qualified manufacturer must have been engaged in the design and manufacturer of such products for a minimum of five years.

1.4 SUBMITTALS

- A. Shop Drawings: Should include device dimensions, mounting requirements including wire size and over-current protection device rating, nameplate nomenclature, electrical ratings, short circuit

current rating, and test results as indicated below under “Testing, Warranty and Life Expectancy” as provided by an independent test lab or a UL certified test lab for the category of suppression device specified using the appropriate IEEE test wave. Product data sheets with installation instructions for each size and type of device are required. Shop drawings submitted without the testing data as required by section this section will be rejected.

- B. Fuse information: Provide fuse information if required for operation. Include size, manufacturer, time-current chart responses to UL 1449 testing requirements, maximum surge protection capability per mode and phase as limited by the fuse, and verification of repetitive surge protection device operation without system degeneration greater than 10%.

1.5 TESTING, WARRANTY AND LIFE EXPECTANCY

- A. Manufacturer must provide independent testing on repetitive capability and maximum surge current rating of service entrance suppressor units. This shall be performed at a nationally recognized lab not affiliated with the manufacturer.
 - 1. Single pulse surge current capacity: Single pulse surge current tested in a mode at rated surge currents.
 - 2. Single pulse surge current capacity test: An initial UL 1449 defined 1.2 x 50 μ s, 6000V open circuit voltage waveform and an 8 x 20 μ s, 500A and 3kA short circuit current waveform shall be applied to benchmark the unit’s suppression voltage (VPR).
 - 3. A single 8 x 20 μ s waveform pulse of maximum rated surge current per mode shall then be applied. To complete the test, another UL 1449 surge shall be applied to verify the unit’s survival. Survival is achieved if the suppression voltage measured from the two UL1449 surges does not vary by more than 10%.
- B. Minimum Repetitive Surge Current Capacity:
 - 1. Service entrance suppressor units should be tested repetitively at an independent lab to verify repetitive capacity.
 - 2. Minimum Repetitive Surge Current Capacity Test:
 - a. An initial UL 1449 surge defined as 1.2 x 50 μ s, 6000V open circuit voltage waveform and an 8 x 20 μ s, 500A and 3kA short circuit current waveform shall be applied to benchmark the unit’s suppression voltage.
 - b. A repetitive number of ANSI/IEEE C62.41.2-2002 (Category C3) surges, defined as a 1.2 x 50 μ s 10kV or 20kV open circuit voltage waveform and an 8 x 20 μ s 10,000A short circuit current waveform, shall then be applied at one-minute intervals.
 - c. To complete the test, another UL 1449 surge shall be applied to verify the unit’s survival.
 - 3. Survival is achieved if the suppression voltage (VPR) does not vary by more than 10%.
 - 4. Proof of such testing shall be the test log generated by the surge generator.
- C. Provide UL 1449 classification white sheet pages indicating the VPR (voltage protection rating) for each SPD unit submitted for this product using the 6kV/3kA combination wave surge.
- D. Warranty: Five (5) years. Includes workmanship, installation and programming.

- E. No scheduled parts replacement or preventative maintenance shall be required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – REFER TO GENERAL ELECTRICAL EQUIPMENT SCHEDULE ON DRAWINGS

2.2 DESCRIPTION

- A. General: The unit shall provide transient voltage suppression, surge current diversion and high-frequency noise attenuation, when connected in parallel to the facilities distribution system. The unit MCOV shall not be less than 115% of the nominal system voltage. Operating frequency shall be for a 60 Hz system. The unit shall provide protection in all normal modes for "wye" and "delta" systems. The short circuit current rating shall be the larger of the listed value on the drawings or as required by the equipment protected.

2.3 RATINGS

A. Secondary Distribution Suppressors – NonModular:

- 1. For 277/480 or 120/208 volt, 3 phase, 4 wire, type 2, category B3/C1 unit.
 - a. Surge current capacity: 60,000/120,000 amps per protection mode/phase
 - b. Nominal Discharge Current: 20 kA.
 - c. Mounting: Refer to the drawings.
 - d. Voltage Protection Rating: Refer to requirements below.
 - e. Components: Modular units composed of 20mm Metal Oxide Varistors (MOV).

B. Voltage Protection Rating:

- 1. Protection modes and UL 1449 voltage protection rating for surge suppression units per each mode (L-N, L-L, L-G, and N-G as appropriate).
 - a. 1200 Volt for 277/480 Volt, 3 phase, 4 wire.
 - b. 700 Volt for 120/208 Volt, 3 phase, 4 wire.

C. EMI/RFI Noise Rejection or Filtering:

- 1. Each unit shall include a UL1283 first order, high-frequency filter for noise filtering between 10 KHz and 100 MHz.

D. Indication:

- 1. Each unit shall include solid-state indicators with externally mounted LED visual status indicators that indicate on-line status of each protection mode of the unit.
- 2. Provide each secondary distribution type unit(s) with a transient counter.

- E. Fuses:
 - 1. Use fuses recommended by the manufacturer to satisfy repetitive UL 1449 operation of the surge suppression unit.
 - 2. Fuses shall be rated 200, 000 AIC minimum interrupting capacity.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine equipment for size and type of surge protection device to be used to ensure physical compatibility.
- B. Inspect surge protection device for any signs of physical damage due to shipping or handling before installing surge protection device.

3.2 INSTALLATION

- A. Mounting Location:
 - 1. The unit shall be installed as close as practical to the panel secondary lugs in accordance with applicable national/Local Electrical Codes and the manufacturer's recommended installation instructions. Connect the unit to the panel using a conduit nipple. Flush mount the unit in the front of the switchboard. Mount unit directly across from the breaker or disconnect serving it.
- B. Connections:
 - 1. Conductors from the protected bus to the unit shall not be any longer than necessary avoiding unnecessary bends. The conductor leads shall be twisted together and as short as possible. Connection shall be with mechanical lugs for each phase, neutral, and ground if applicable. Conductors shall be provided with unit; sized per manufacturer's instructions.
 - 2. The surge protection unit shall be isolatable from the electrical distribution system via 3 pole circuit breaker mounted in the switchboard/panelboard or be equipped with a factory supplied integral fused switch or circuit breaker.
 - 3. Neutral and ground shall not be bonded together at secondary panelboard locations.
- C. General:
 - 1. Check unit for proper operation of protection and indication under start-up.
 - 2. Check unit to ensure all MOVs for each mode of protection are operational. Verify integral fuse links are operational and have not melted.
 - 3. Surge suppression devices shall not be installed ahead of the main service disconnect(s).
 - 4. Install fuses in all fuse holders and fused disconnects internal to the surge protection unit. Use fuses recommended by the manufacturer to satisfy repetitive UL 1449 operation of the surge suppression unit. External fusing of the surge protection device is not allowed.

5. Coordinate location of surge protection device to allow adequate clearances for maintenance.

END OF SECTION

PART 1 - GENERAL

1.01 Description:

- A. Perform all work necessary to complete all excavating, filling, compacting, and grading and related work as shown on the Drawings and as specified herein including, but not necessarily limited to, the following principal items:
1. Protect existing trees and shrubs adjacent to the work area.
 2. Remove sod and plant materials.
 3. Strip and stockpile topsoil.
 4. Control erosion, sediment, dust, and chemical contamination in accordance with governmental regulations and specified requirements.
 5. Excavate for foundations and slabs and walls to the levels indicated on the Drawings.
 6. Excavate for pavements, utilities and drainage improvements.
 7. Provide shoring, cribbing, and bracing as may be necessary to safely support and maintain the banks of all excavated areas.
 8. Rough and finish grading to the horizontal and vertical limits shown on the Drawings.
 9. Stockpiling excavated material suitable for fill.
 10. Disposal of all excess and contaminated material, including material excavated from utility trenches specified.
 11. Pumping and dewatering for this work.
 12. Provide additional fill, backfill, granular base and topsoil.
 13. Cooperate with testing laboratory for testing and inspection of fill material and compaction.
 14. Placing and grading of backfill to the subgrade of topsoil elevations or other controls shown on the Drawings.
 15. Furnishing and installing compacted granular filter materials in planters, foundation drains, and curtain drains.
 16. Site retaining walls.
- B. Related work:
1. Section 01 41 00: NPDES, CCDD and other regulatory requirements.
 2. Division 23: Excavating and backfilling for plumbing and mechanical systems.
 3. Division 26: Excavating and backfilling for electrical system.

4. Section 32 12 16: Granular base under asphalt paving.
5. Section 32 91 19: Placing topsoil, fine grading.

1.02 Definitions:

- A. Work Area: area of building, slabs, structures, pavements and other areas to be excavated or graded.
- B. Excavation: digging, trenching, cutting, filling, compacting, and grading of earth, rock and soil materials.
- C. Soils terminology based on Unified Soil Classification System, ASTM D-2487..
 1. Gravel: groups GW, GP, GM, GC.
 2. Sand: groups SW, SP, SM, SC
 3. Silt and clay:
 - a. Liquid Limit \leq 50%
 - (1) Inorganic: groups CL, ML
 - (2) Organic: groups OL
 - b. Liquid Limit $>$ 50%
 - (1) Inorganic: CH, MH
 - (2) Organic: groups OH
 4. Peat: group PT

1.03 Submittals:

- A. Source Data: for each type and source of imported earth, aggregate, and other fill material:
 1. Proposed source information, including material type, proposed use and location in project, site of origin address, owner or operator name, contact.
 2. Soil materials: Certification that proposed source material is uncontaminated, on Illinois EPA forms, as follows:
 - a. LPC-662 (Site Owner/Operator) certification if site of origin is residential, agricultural or conservation land (non-commercial/industrial)
 - b. LPC-663 (Professional Engineer) certification if site of origin is commercial/industrial; with copy of any chemical analysis or test results, laboratory accreditation status, certification of analysis or test results by authorized laboratory agent, and other attachments to Form LPC-663..
- B. Quality Control: Report of Testing Laboratory evaluation of proposed materials, as specified for Field Quality Control in this Section..
- C. Closeout Documents: Copy of all uncontaminated soil and CCDD records for imported material.

1.04 Quality Assurance:

- A. Qualifications:

1. Geometric Control: establishment of horizontal and vertical benchmarks, lines, and other geometric controls shall be performed under the supervision of a Surveyor licensed in the State of Illinois.
 2. Layout: simple layout of lines and levels within the site from established geometric control shall be performed by persons skilled in the use of surveying instruments and measuring devices, and knowledgeable of surveying and layout techniques.
- B. Reference standards: the current edition of "Standard Specifications for Road and Bridge Construction", prepared by the State of Illinois Department of Transportation (IDOT), adopted 1 January 2002, and all amendments thereto adopted by IDOT. They are sometimes referred to herein as the "Standard Specifications" and except as may be otherwise stated, the work to be done under this section shall conform to the requirements of said "Standard Specifications".
1. In case of conflict between portions of these Contract Documents and the "Standard Specifications", this Specification and the applicable Drawings shall govern.
 2. Where the word "Engineer" appears in the "Standard Specifications" change it to "Architect". Where the words "State" or "Department" are used, they shall be taken to mean the "Owner". Where the word "Inspector" is used, it shall be taken to mean the "Architect".
- C. Regulatory requirements: Comply with Illinois EPA rules and other applicable local, state and federal regulations including, but not limited to providing and maintaining records for uncontaminated soil and CCDD material imported to the site in accordance with requirements specified in Section 01 41 00.

1.05 Site Conditions:

- A. Existing contours indicated on the Drawings and existing ground lines indicated on the cross sections represent the existing conditions at the time of the field survey. The Owner and the Architect assume no responsibility for the Contractor's failure to examine the site or to make the proper adjustments in the amount of work involved.
- B. Data on indicated subsurface conditions are not intended as representations or warrants of continuity of such conditions between soil borings. The Owner is not responsible for interpretations or conclusions of Contractor.
- C. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
- D. Protection: the work shall be executed in such a manner that no damage will occur to the existing improvements that exist at or adjacent to the site. If damage does occur, Contractor shall, at his own expense, correct the affected improvements to the satisfaction of the Architect.
 1. Protect trees, shrubs, lawns, rock outcroppings, and other features remaining as portion of final landscaping.
 2. Protect bench marks, existing structures, fences, roads, walks and curbs which are to remain.
 3. Protect existing utilities which are to remain.
 4. Protect existing improvements to remain from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
- E. Barricades: barricade open excavation occurring as part of this work and post with warning lights. Operate warning lights from dusk to dawn each day and as otherwise required.
- F. Explosives prohibited: the use of explosives is prohibited.

- G. Street cleaning: streets adjoining property shall be kept broom clean and free of dirt and debris any kind caused by the Work.

PART 2 - PRODUCTS

2.01 Unit Landscaping Wall:

- A. Provide Keystone Legacy Stone system or approved equal.

2.02 Fill Materials:

A. General:

1. Obtain fill material from excavations on site if sufficient quantities of suitable material are available.
2. Obtain fill material from uncontaminated off-site sources if on-site sources are inadequate.
3. Material shall be free of debris, cinders, combustibles, frost, ice, roots, sod, wood, cellulose, organic materials, materials that may be subject to long term settlement, chemical contamination, and hazardous or noxious materials.
4. Construction and demolition debris are prohibited.
5. Materials shall not be obtained from sites which are subject to a cleanup or removal operation as defined by the Illinois EPA.

- B. Mass fill: sand, gravel, or inorganic clay and silty clay having liquid limit <40 and plasticity index <15, tested by the Testing Laboratory and reviewed by the Architect.

1. The following existing site materials shall NOT be used for mass fill: natural silt (ML), sandy silt (ML or ML-SM), sandy-clayey silt (ML-CL) and clayey-sandy silt (ML), except such materials may be used to fill borrow pits and may be used as fill to a maximum depth of spread in 18 inches below lawn areas.

- C. Structural fill below footings and foundations: one of the following:

1. Crushed stone or crushed gravel (Grade 8 or 9), free of fines, complying with Illinois Department of Transportation Standard Specification CA1, CA5 or CA7. Pea gravel is expressly prohibited.
2. Concrete, 3000 psi minimum 28-day compressive strength, conforming to requirements of Section 03 30 00.

- D. Fill for areas under slabs, walks, drives, parking, and slabs, including against foundation walls where those conditions exist: crushed stone, complying with Illinois Department of Transportation Standard Specification CA3, CA5, CA6 or CA7. Pea gravel is expressly prohibited.

- E. Drainage fill in planters and like applications: gravel or crushed gravel, 1" to No. 4 nominal, conforming to IDOT CA7.

- F. Clay liner for ponds and wet detention basins: inorganic clay, groups CL, CH, and having low permeability ($k = 10^{-3}$ cm/sec or less).

- G. Fill below lawns, planting areas, and other areas without pavements or structures: sand, gravel, clay and silt;

1. Within 18" of topsoil subgrade: free of sod, wood and roots over 1/4" in diameter.
2. Deeper than 18" below grade:
 - a. Up to 10 percent of fill material may be rock-like materials not more than one half cubic foot in volume nor more than 4 inches in length.
 - b. Up to 20 percent of fill material may be topsoil.

H. Topsoil:

1. Reuse topsoil from on-site sources if sufficient quantities of suitable material are available.
2. Imported topsoil: Obtain topsoil from uncontaminated off-site sources if on-site sources are inadequate. Conform to the following:
 - a. Friable loam; free of subsoil, roots, grass, excessive amount of weeds, stone, and foreign matter; acidity range (ph) of 5.5 to 7.5; containing a minimum of four (4) percent and a maximum of 25 percent organic matter.
 - b. Topsoil shall be free of debris, cinders, combustibles, frost, ice, roots, sod, wood, cellulose, organic materials, materials that may be subject to long term settlement, chemical contamination, and hazardous or noxious materials.

2.03 **Accessories:**

- A. Silt Fence: Extra-strength polypropylene filter fabric manufactured by Linq, Amoco Fabrics, "Propex", or approved equal
- B. Geotextile fabric: Linq GTF 225EX or approved equal.
- C. Filter media shall be Linq GTF 225EX or approved equal equal.
- D. Slope Stabilization Blanket:
 1. Slopes to 4:1, low-flow channels: 1.5 lb accelerated photo-degradable polypropylene top net with 100% straw fiber matrix, 45 day nominal longevity, FHWA FP03 Type 2.C: North American Green DS-75, or approved equal.
 2. Slopes between 4:1 and 2:1, medium flow channels: 1.5 lb accelerated photo-degradable polypropylene top and bottom net with 100% straw fiber matrix, 12 month nominal longevity, FHWA FP03 Type 2.D: North American Green S150, or approved equal.
 3. Fasteners: manufacturer's recommended wire staples or wood stake soil fasteners.

PART 3 - EXECUTION:

3.01 **Preparation:**

- A. Geometric Control: establish benchmarks and lines for horizontal and vertical geometric control. Verify that controls are consistent with available survey data and the information indicated in the Construction Documents.
 1. Verify elevation of existing finish floor at each location where existing elevation is to be met.
 2. Verify elevation of existing pavement at each location where existing elevations are to be met.

- B. Utilities:
 - 1. Notify utility companies or authorized public utility locating service.
 - 2. Provide services of a private utility locating service to locate non-public utilities, if any, within the work area.
 - 3. Mark location and identify all underground utilities within the work area.
- C. Concealed conditions: upon discovery of any unknown utility or discovery of concealed conditions which materially affect the work, discontinue affected work, notify the Architect.
- D. Tree and shrub protection:
 - 1. Protect trees which are to remain with temporary fencing at the "drip line" of the tree or three feet beyond the perimeter of shrubs; maintain protection until completion of exterior construction activity.
 - a. Protect all trees and shrubs within the work area which area not indicated for removal.
 - b. Trees and shrubs to remain within the work area will be marked for identification by the Owner.
 - 2. Protect trees in close proximity to construction activity with 2" x 4" wood lagging to a height of eight (8) feet above grade, in addition to fencing placed as far from trunk as possible.

3.02 Clear and Strip:

- A. Clear the Work Area.
 - 1. Remove all obstructions such as trees, stumps, shrubs, sod, other vegetation, existing pavements, foundations, debris, accumulation of rubbish of whatever nature, and existing structures not otherwise provided for.
- B. Strip topsoil and organic material within the Work Area.
 - 1. Separate topsoil from roots, debris and other soils. Prevent contamination of topsoil by other material to the greatest extent possible.
 - 2. Avoid excavating wet material, if possible.
 - 3. Stockpile sufficient material for project use. Remove excess material.
 - 4. Stockpile topsoil and other organic soils separately.
- C. Remove obstructions and items indicated to be removed.
 - 1. Remove items indicated to be demolished and remove existing construction which obstructs the work.
 - 2. Pipes, manholes and similar structures indicated to be abandoned:

- a. Remove all portions within 12" of the subgrade of slabs, pavements and lawns.
- b. Fill pipes, manholes and other hollow structures with sand. Plug open ends with concrete.

3.03 Proof Roll:

- A. Proof roll subgrade after stripping and cutting prior to placing fill. Proof roll operations shall be witnessed by the Testing Laboratory Service.
- B. Perform proof roll using a loaded tandem axle dump truck with gross weight of 25 tons or more, or other equipment providing equivalent subgrade loading.
- C. Remove unstable material from subgrade areas which yield under proof roll as follows:
 1. Materials which are unstable due to excessive moisture may be dried and re-placed and recompact.
 2. If prevailing conditions or construction schedule preclude drying and recompacting the unstable material remove unstable material and fill with granular material.
 3. Remove otherwise unsuitable materials. Fill with granular material or other suitable mass fill.
- D. Avoid unnecessary traffic on soils of silt, clayey silt, clayey sand, silty sand and other soils which are subject to loss of stability when disturbed. If "pumping" or other loss of stability occurs remove and replace soil as specified for unstable material.

3.04 Excavation:

- A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate for building foundations, slabs on grade, paving, drainage and detention, site structures, and construction operations.
- C. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, etc. and for inspection.
- D. Notify Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- E. Foundation excavation:
 1. Take care not to disturb bottom of excavation. Excavate by hand to final grade. Excavate by hand to remove mud and muck from excavations affected by ground water, precipitation or runoff. Trim bottoms to required lines and grades to leave solid base to receive concrete.
 2. Overexcavate to the depth necessary to achieve the indicated bearing capacity when bearing capacity of native soil is insufficient at design foundation depth.
 - a. Base dimension of overexcavations shall exceed footing dimension by a minimum of 12 inches.
 - b. Base dimension of overexcavation shall increase 6 inches horizontally in each direction for every foot of vertical overdig, where overdig depth exceeds 2 feet.

- c. Fill overexcavation with structural fill and compact to design foundation depth.
- F. Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.
- G. Excavations shall not interfere with nominal 45° bearing splay of foundations.

3.05 Stockpiling:

- A. Stockpile excavated materials at location(s) indicated on the Drawings, or if not indicated, where acceptable to Architect and authorities having jurisdiction. Limit stockpile heights to 12 feet.
 - 1. Provide erosion control measures.
 - 2. Prevent sediment from entering drainage systems, waterways, wetlands, pavements, undisturbed site areas and from leaving the site.
 - 3. Prevent blowing of dust and dirt from stockpiles.
 - 4. Prevent public nuisance.

3.06 Shoring and Bracing:

- A. Machine slope banks to angle of repose or less, until shored. Slopes must comply with applicable regulations, codes and ordinances. Shore and brace where sloping is not possible either because of space restrictions or stability of material excavated.
- B. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
- C. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses. When applicable provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal or sheet piling might permit lateral movement of soil under adjacent structures. Top as required and leave permanently in place.

3.07 Dewatering:

- A. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- B. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
- C. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
- D. Convey water removed from excavations and rain water to collecting or run-off areas. Provide and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.
- E. Provide sedimentation and filtering measures to prevent discharge of excessive sediment into the public sewers. When required by authorities having jurisdiction inspect and clean sewers to remove accumulated sediment.

3.08 Filling:

- A. Place fill material in layers to required subgrade elevations using specified materials.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
 - 1. Inspection, testing, approval, and recording locations of underground utilities.
 - 2. Review by Architect of construction below finish grade including, waterproofing, and perimeter insulation.
 - 3. Removal of concrete formwork.
 - 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities.
 - 5. Removal of trash and debris.
 - 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- C. Backfill in layers to subgrade elevations with specified materials.
 - 1. Subgrade for planting and lawn areas shall be a minimum of 4" below finish elevation unless indicated otherwise.
- D. Install granular fill base course directly below all concrete slabs on earth within structures. Roll and tamp until top surface is absolutely true to line and grade after compaction. Minimum thickness or compacted granular fill shall be as noted on drawings; or, if not so noted, minimum compacted thickness of 4 inches.
- E. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- F. Place fill materials in layers not more than 8" in loose depth.
- G. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum density for each area classification. Do not place backfill or fill material or surfaces that are muddy, frozen, or contain frost or ice.
- H. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift.
- I. Slope grade away from building minimum 2" in 10'.
- J. Leave fill stockpile area completely free of excess materials.

3.09 Compaction:

- A. Provide density specified for each area classification.
- B. Provide not less than following percentages of maximum density of soil material in accordance with ASTM D1557, Modified Proctor, compacted at optimum moisture content, for actual density of each layer of soil material-in-place.
 - 1. Foundations: compact top 12" of subgrade and each layer of backfill or fill at 97% maximum density.

2. Slabs: compact top 12" of subgrade and each layer of backfill or fill material at 95% maximum density.
 3. Lawn and landscape areas: compact top 6" of subgrade and each layer of backfill or fill at 85% maximum density.
- C. When existing ground has a density less than specified, break-up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

3.10 Granular Base under Slabs:

- A. Inspection prior to placement: inspect all building slab subgrades to assure that the following work has been completed:
1. Installation, testing, and backfilling of all sanitary drainage, subsoil drainage, and storm drainage lines, and all basins, cleanouts, etc. required in connection therewith.
 2. Compaction of surface layer as specified and final review of subgrade by the Architect.
- B. Placement of granular base: place and compact a layer of specified clean granular material over all subgrades that will support building slabs. Top elevation of the granular cushion shall be accurate within tolerances of +1/2" and -1-1/2". Granular layer shall be of thicknesses indicated.

3.11 Moisture Control:

- A. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
- B. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing or pulverizing, until moisture content is reduced to a satisfactory value, as determined by moisture-density relation tests.

3.12 Grading:

- A. Uniformly grade areas within limits, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Grading outside building lines: grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:
1. Grassed areas: finish areas to received topsoil to within not more than 0.10' above or below the required subgrade elevation.
 2. Walks: shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10' above or below the required elevation.
 3. Pavements: shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below the required elevation.
- C. Grading surface of fill under building slabs: grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/4" when tested with a 10' straightedge.

3.013 Placing Topsoil:

- A. Place topsoil to a depth of 6 inches in areas where seeding, sodding, and planting are indicated.
- B. Use topsoil in relatively dry state. Place during dry weather.
- C. Fine grade topsoil eliminating rough or low areas. Conform to elevations, profiles and drainage patterns indicated on the Drawings.
- D. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.
- E. Manually spread topsoil around trees plants and building elements to prevent damage.
- F. Lightly roll topsoil after placement..

3.14 Disposal of Excess and Waste Materials:

- A. Remove all material contaminated during the work by fuel, oil, or chemicals, or made unsuitable in any way for reuse. Dispose of unsuitable and contaminated material lawfully.
- B. Remove from site all excess excavated material, including material excavated from utility trenches specified in Division 22 and 26.
- C. Dispose legally of all material removed from site.
- D. Final clean-up: on completion of the Work and before requesting review from the Architect and acceptance by the Owner, thoroughly clean the areas affected and remove all surplus materials and debris resulting from the Work of the Section and legally dispose of same off Owner's property.

3.15 Restoration:

- A. Restore or replace site improvements damaged by construction activity. Restoration or replacement shall be acceptable to the Architect. Remove and replace damaged items if restoration results in impairment of function or aesthetic qualities of the items.
- B. Existing trees and shrubs indicated to remain which have been damaged by construction activity shall be replaced at no additional cost to the Owner:
 - 1. Replacement material: Same species or similar species selected by Architect, complying with applicable requirement for new nursery stock.
 - a. Trees: 2" caliper minimum, total replacement caliper equal to caliper of damaged trees.
 - b. Shrubs: Sizes and quantity as selected by Architect to approximate size of damaged shrubs.

3.16 Field Quality Control:

- A. The Testing Laboratory Service shall provide quality control testing during earthwork operations in accordance with Section 01 45 23, and as specified herein:
 - 1. Such inspections and tests will not relieve the Contractor of responsibility for providing properly installed materials in compliance with specified requirements.

2. The Testing Laboratory shall provide an engineer or technician in attendance during filling and compaction operations to perform inspections and tests as specified.
3. The Testing Laboratory shall verify the load carrying capacity of the soils encountered at the design elevations for footings and fill. If the bearing characteristics are below the design values, the Contractor shall not proceed with the related work until correction measures are defined by the Architect.
4. The Testing Laboratory's inspection and evaluation shall include, but not be limited to, the following:
 - a. Sample and evaluate proposed soil, aggregates, and other fill materials for conformance with specified requirements. Samples shall be taken by Testing Laboratory Service representative at the proposed source and submitted for review prior to commencement of excavation.
 - b. Inspection of excavation operations and evaluations of materials encountered for use in fill.
 - c. Observe proof rolling of subgrades. Record time, place, equipment used, and results. On a Drawing, note locations of subgrades which yield under proof rolling.
 - d. Inspection and testing of subgrade soils exposed at design elevations for support of floor slabs and footings.
5. The Testing Laboratory's testing program shall include the following:
 - a. Measure the strength and density of subgrade soils exposed at design elevations.
 - b. Determine earthwork control values for cohesive soils per the procedures outlined in ASTM D1557, Modified Proctor. Determine control values for cohesionless soils per ASTM D4253.
 - c. Measure strength or density of bearing soils relative to design load. The minimum field testing program shall be as follows:
 - (1) One strength test for each separate footing and for each 60 L.F. of continuous footing. Perform Dynamic Cone Penetrometer (DCP) test or hand-auger probe holes and perform in-situ vane shear test to a depth of at least $\frac{1}{2}$ the footing width, or a minimum of 3 feet below each isolated column footing and 2 feet below continuous footings.
 - (2) One strength or density test for each 2,500 S.F. of undisturbed subgrade under building slabs, pavements and sidewalks.
 - d. Measure compacted density of fill and base course per the following:
 - (1) Make one field density check test on fill and base course for every 2,500 S.F. of area or portion thereof of each layer of compacted fill. The field density check tests shall be made in accordance with ASTM D2922 (nuclear density method), ASTM D2167 (rubber balloon method), or ASTM D1556 (sandcone method).
 - (2) Field density tests on backfill against foundation walls and in utility trenches shall be performed at the rate of one test for each layer of compacted fill for every 100 L.F. of backfill. The field density check tests shall be made in

accordance with ASTM D2922 (nuclear density method), ASTM D2167 (rubber balloon method), or ASTM D1556 (sandcone method).

- e. Measure depth of compacted granular base below slabs and pavements. Make one depth test per 2,500 S.F. of area or portion thereof.
 6. During cold weather the Testing Laboratory shall monitor the subsurface soil temperature by means of thermocouple devices implanted in the ground when there is danger of frost action affecting foundations, slabs on grade, or other elements of construction. Thermocouples shall be placed prior to the anticipated danger period and monitored periodically until the danger has passed.
- B. CCDD Certifications: The Contractor shall provide services to inspect, test and certify exported soil and CCDD materials, in accordance with the 415 ILCS 5/22.51 and requirements specified for Contractor Responsibility under Section 01 41 00 - Regulatory Requirements, including but not limited to the following:
1. Visual inspection of excavation operations and such testing as may be necessary for a competent evaluation of freedom from contamination
 2. Certification by an Illinois Licensed Professional Engineer using IEPA Form LPC-663
 3. Creation and maintenance of records as may be required for Owner's compliance with applicable rules of the Illinois EPA.

End of Section

PART 1 - GENERAL

1.01 Description:

- A. Perform all work necessary to complete all sodding and related work as shown on the Drawings and as specified herein including, but not necessarily limited to, the following principal items:
 - 1. Fertilizing.
 - 2. Sod installation.
 - 3. Maintenance.
- B. Related Sections:
 - 1. Section 31 00 00: Earthwork.

1.02 Submittals:

- A. Submit maintenance data for owner maintenance. Include maintenance instructions, cutting method and maximum grass height; types, application frequency, watering, and recommended coverage of fertilizer.

1.03 Quality Assurance:

- A. Sod producer: company specializing in sod production and harvesting with minimum five (5) years experience, and certified by the State of Illinois.
- B. Installer: company approved by the sod producer.
- C. Regulatory requirements:
 - 1. Comply with all local, county, state and federal laws, rules codes and regulations that may affect this section of work.
 - 2. Comply with regulatory agencies for fertilizer and herbicide composition.
- D. Reference standards: ASPS (American Sod Producers Association) - Guideline Specifications to Sodding.
- E. Definitions: "weeds" includes dandelion, jimsonweed, quackgrass, horsetail, morning glory, rush grass, mustard, lambsquarter, chickweed, cress, crabgrass, Canadian thistle, nutgrass, poison oak, blackberry, tansy ragwort, Bermuda grass, Johnson grass, poison ivy, , nut sedge, nimble will, bindweed, bent grass, wild garlic, perennial sorrel, and brome grass.
- F. Submit sod certification for grass species and location of sod source.

1.04 Delivery, Storage, and Handling:

- A. Delivery sod on pallets. Protect exposed roots from dehydration. Do not deliver more sod than can be laid within 24 hours.
- B. Delivery of sod shall be accompanied by an invoice from the vendor giving the quantity and certifying

that the sod received meets all the requirements contained in the specifications, together with the analysis of seed from which the sod was grown.

1.05 Maintenance Service:

- A. Maintain sodded areas immediately after placement for two cuttings.

1.06 Warranty:

- A. Guarantee sodded areas for a period of 30 days from the date of initial acceptance by Architect. The guarantee shall run concurrently with the maintenance period and shall end at the time of final inspection and acceptance.
- B. Replacement: contractor shall replace without additional cost to the owner, within ten (10) days, weather permitting, all lawn areas not in a thriving condition as determined by the Architect during, and at the end of the guarantee period. Replacements shall be in conformance with the specifications.
- C. At the end of the guarantee period, the Architect shall inspect all sodded areas for final acceptance upon the written request of the Contractor. The request shall be submitted at least five (5) calendar days before the anticipated date for final inspection.

PART 2 - PRODUCTS

2.01 Materials:

- A. Sod:
 - 1. Premium mineral grown, minimum age of 18 months, with root development that will support its own weight, without tearing, when suspended vertically by holding the upper two corners.
 - 2. Sod shall meet the requirements of Article 717.07 of the "Standard Specifications for Road and Bridge Construction", State of Illinois, Department of Transportation.
 - 3. Sod shall be well established and shall contain a dense root system, free from noxious weeds, objectionable grasses, grubs, diseases or injurious insects.
 - 4. Sod shall be premium blend and shall consist of the following blend:
 - a. 25% Parade Kentucky Bluegrass.
 - b. 25% Rugby Kentucky Bluegrass.
 - c. 25% Delray Perennial Ryegrass.
 - d. 25% Pennfine Perennial Ryegrass or approved equal.
- B. Fertilizer:
 - 1. Fertilizer shall be delivered to the site in marked, unopened containers, indicating the weight and analysis. At least 50% by weight, of the nitrogen content shall be derived from organic sources. Fertilizer shall contain the following composition by weight:
 - 2. FS O-F-241 - fertilizers, mixed, commercial.
- C. Topsoil: topsoil materials shall be natural fertile, agricultural soil, capable of sustaining vigorous plant growth; uniform composition throughout, without admixture of subsoil; free of stones, lumps, plants and their roots, sticks and other extraneous matter. Do not deliver when frozen or muddy.

1.	1st application	0-10-10:
a.	Nitrogen	0%
b.	Phosphorous	10%
c.	Potash	10%
2.	2nd application	10-6-4:
a.	Nitrogen	10%
b.	Phosphorous	6%
c.	Potash	4%

2.02 Accessories:

- A. Woods pegs: Softwood; sufficient size and length to ensure anchorage of sod on slope.

2.03 Harvesting Sod:

- A. Machine cut sod and load on pallets in accordance with ASPA guidelines.
- B. Sod shall be cut in not less than 12" widths, nor more than 24" widths, uniform in length, not exceeding 6' in length, nor more than 1" thick. Before cutting, sod shall have been mowed to a height of not less than 1", nor more than 2".

PART 3 - EXECUTION

3.01 Inspection:

- A. Verify that previous soil base is ready to receive the work of this section.
- B. Beginning of installation means acceptance of existing site conditions.
- C. Notify the Architect, in writing, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until conditions have been corrected.

3.02 Preparation of Subsoil:

- A. Ground preparation shall not be started until all stones, debris and similar material larger than one (1) inch in diameter have been removed, depressions and ruts filled and the entire area to be sodded has been shaped, trimmed, and finished uniformly to the lines, grades and levels shown on the drawings by this Contractor.
- B. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, and contours. Make changes in grade gradual. Blend slopes into level areas.
- C. Scarify subsoil to a depth of four (4) inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

3.03 Time of Sodding:

- A. The Architect shall be notified by the Contractor not less than one (1) day, nor more than five (5) days prior to the beginning of sodding. Sodding shall be done under favorable weather conditions, as determined by accepted practice in the locality of this project. At the Contractor's option and full responsibility, sodding operations may be conducted under unseasonable conditions, without additional compensation.

- B. Layout: sodding shall be located where it is shown on the Drawings, except where changes in construction have been made.

3.04 Sodding:

- A. Sod shall be placed within 48 hours of cutting and shall be protected and maintained during transit or storage on site as necessary to insure vigorous growth after placement. Sod remaining on the site after 24 hours will be rejected and replaced without additional cost to the owner. All yellowish, or otherwise discolored sod will be rejected.
- B. Sodding operation: lawn construction shall be performed by personnel familiar with the accepted procedure of sodding and under the supervision of a qualified foreman. Place sod between March 15th and June 30th, or September 1st and November 30th.
- C. Ground preparation: immediately prior to, but not in excess of 24 hours before sod is to be placed, the soil surface shall be worked until it is free of debris, washes, gullies, clods and stones. The surface shall be worked to a depth of not less than 3" with a disc, tiller or other equipment. Prepared surfaces that become hard, shall be reworked to an acceptable condition for sodding operations.
- D. Application of fertilizer: commercial fertilizer shall be applied by the Contractor in two applications. The first application shall be 0-10-10 and applied at the rate of 20 pounds per 1,000 square feet. The second application shall be 10-6-4 and applied at the rate of 15 pounds per 1,000 square feet. The second application shall be applied following the second cutting of grass and thoroughly watered in by the Contractor.
- E. Application of sod: fit sod pieces tightly together so that no joint is visible, alternate courses staggered and tamp firmly to eliminate all air pockets, provide a true and even surface and insure knitting without displacement of sod or deformation of the surface of sodded areas. Following tamping, screened topsoil shall be used to fill all exposed seams between sod pieces. The Contractor shall water all sodded areas within five (5) hours after the sod has been placed, to a uniform depth of 4".

3.05 Maintenance:

- A. Maintenance and protection of completed work all sodded areas shall be maintained by the Contractor for a period of 30 days after completion of all sodding work, or until after the second mowing, whichever is longer.
- B. Maintain sodded areas by watering, re-sodding, mowing, trimming, repair of all erosion, and settlement in order to establish a uniform, knitted turf. Initial watering of sodded areas shall be at three day intervals for a period of 18 days from time of placement. Apply at each watering, 1" of water or supplement natural rain to the equivalent of 1". Continue watering after the 18 day period as necessary to maintain sod in a thriving condition until acceptance.
- C. At the time of the first mowing, and subsequent cuttings, mower blades shall be set at a height of 2". Grass shall be cut when it reaches a height of 3".
- D. Contractor's responsibility for maintenance shall cease at the time of acceptance.
- E. Damage resulting from natural storms, creating erosion, gullies, washouts, or other causes during the maintenance period, shall be repaired by filling with topsoil, re-sodding, re-fertilizing and tamping by the Contractor at his expense, if the damage occurs prior to final acceptance by the Architect.

End of Section